

SKA PHASE 1 SYSTEM (LEVEL 1) REQUIREMENTS SPECIFICATION

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Document No.: SKA-TEL-SKO-000008 FOR PROJECT USE ONLY

Revision: 6 Author: W Turner Date: 2015-04-23 Page 2 of 275

TABLE OF CONTENTS

1	Introduc	TION	19
	1.1 Purpos	se of the Document	19
		pproach	
		erb Convention	
		or but not with	
		arent Requirements of the Document	
	•	dentification	
2	REFERENCE	ES	21
	2.1 Applic	able documents	21
		ence documents	
	2.3 Refere	ence Standards	22
3	O BSERVAT	ORY STRUCTURE	23
	3.1 Observ	vatory functions	23
		l Headquarters	
		cation	
		oution and deploymentustralia	
	3.4.1 A	SKA1_low array	
	3.4.1.2	SKA1_low central frequency reference	
	3.4.1.3	SKA1_low CSP Facility	
	3.4.1.4	Australian Science Operations Centre	
	3.4.1.5	Australian Engineering Operations Centre	
	3.4.1.6	Australian Science Processing Centre	
	3.4.2 S	outh Africa	
	3.4.2.1	SKA1_mid array	
	3.4.2.2	SKA1_mid CSP Facility	26
	3.4.2.3	SKA1_mid central frequency reference	26
	3.4.2.4	South African Science Operations Centre	26
	3.4.2.5	South African Science Processing Centre	26
	3.4.2.6	South African Engineering operations Centre	26
4	TELESCOPE	ES	28
	4.1 SKA1_	Low	28
	4.1.1 S	KA1_Low Configuration and Performance	28
	4.1.1.1	Receptor type	28
	4.1.1.2	Array resolution	28
	4.1.1.3	Electromagnetic frequency range	28
	4.1.1.4	Spectral stability	29
	4.1.1.5	SKA1_Low array sensitivity at 50 MHz	29

Document No.: SKA-TEL-SKO-0000008

Revision: 6

4.1.1.6	SKA1_Low array sensitivity at 100 MHz	.29
4.1.1.7	SKA1_Low array sensitivity at 160 MHz	.30
4.1.1.8	SKA1_Low array sensitivity at 220 MHz	.30
4.1.1.9	SKA1_Low array sensitivity at 280MHz	.30
4.1.1.10	SKA1_Low array sensitivity at 340MHz	.31
4.1.1.11	Sensitivity for off zenith angles	.31
4.1.1.12	SKA1_Low antennas per station	.31
4.1.1.13	SKA1_Low station diameter	.32
4.1.1.14	SKA1_Low number of stations	.32
4.1.1.15	SKA1_Low configuration	.32
4.1.1.16	SKA1_Low maximum baseline length between stations	.32
4.1.1.17	7 SKA1_Low Instantaneous Bandwidth	.33
4.1.1.18	SKA1_Low separation	.33
4.1.1.19	Digitisation	.33
4.1.1.20	O Clipping	.33
4.1.1.21	Clipped data flagging	.33
4.1.1.22	2 Linearity	.34
4.1.1.23	B Absolute flux scale	.34
4.1.2	SKA1_Low beamformer	.34
4.1.2.1	Dynamic range	.34
4.1.2.2	SKA1_Low station beams	.34
4.1.2.3	Control of station beam properties	.35
4.1.2.4	Station beam stability	.35
4.1.2.5	Calibration update rate	.35
4.1.2.6	Real time calibration	.35
4.1.2.7	Beam products	.36
	SKA1_Low Correlator	
4.1.3.1	SKA1_Low correlator sub-array support	
4.1.3.2	SKA1_Low channelisation	
4.1.3.3	SKA1_Low Correlator signal to noise	
4.1.3.4	SKA1_Low correlator integration time	
	ctor Antennas Diameter	
	Aperture efficiency	
	Precision pointing repeatability	
	Standard pointing repeatability	
	Degraded pointing repeatability	
	Number of receivers Polarisation purity	
	Elevation limit	

Revision: 6

		Azimuth range	
4.3	_	_Mid SKA1_Mid configuration and performance	
	4.3.1.1	Inclusion of MeerKAT	
	4.3.1.2	Absolute flux scale	.41
	4.3.1.3	SKA1_Mid configuration	.41
	4.3.2	SKA1_Mid antenna	.41
		Antenna RF system	
	4.3.3.1	RF system frequency range band 1	
	4.3.3.2	RF system frequency range band 2	
	4.3.3.3	RF system frequency range band 3	
	4.3.3.4	RF system frequency range band 4	
	4.3.3.5	RF system frequency range band 5	
	4.3.3.6	RF system sampled bandwidth band 1	
	4.3.3.7	RF system sampled bandwidth band 2	
	4.3.3.8	RF system sampled bandwidth band 3	.43
	4.3.3.9	RF system sampled bandwidth band 4	
	4.3.3.10	RF system sampled bandwidth band 5	.44
	4.3.3.11	RF digitisation	.44
		SKA1_Mid Correlator	
	4.3.4.1	SKA1_Mid correlator sub-array support	
	4.3.4.2	SKA1_Mid channelisation	
	4.3.4.3	SKA1_Mid correlation signal to noise	
	4.3.4.4	SKA1_Mid correlation integration time	
	4.3.4.5	SKA1_Mid correlator Pulsar binning	
	4.3.4.6	Inclusion of MeerKAT into SKA1_Mid Correlator	.48
		SKA1_Mid Central Beam-former	
	4.3.5.1	Beam-former sub-array support	
	4.3.5.2	Pulsar search and timing within sub-arrays	
	4.3.5.3	Pulsar search array diameter	
	4.3.5.4	Pulsar search beamformer centre frequency	
	4.3.5.5	Pulsar search beamformer bandwidth	
	4.3.5.6	Number of beams: Pulsar survey	
	4.3.5.7	Beam-former S/N: Pulsar survey	
	4.3.5.8	Pulsar search beamformer output	
	4.3.5.9	Pulsar search beamformer output frequency resolution	
	4.3.5.10	·	
	4.3.5.11	Pulsar timing array diameter	.51
	4.3.5.12	Pulsar timing beamformer centre frequency	.52

4.3.5.13	Pulsar timing beamformer bandwidth	52
4.3.5.14	Number of beams: Pulsar timing	52
4.3.5.15	Beamformer S/N performance: Pulsar timing	53
4.3.5.16	SKA1_mid VLBI	53
4.3.6 S	KA1_Mid Pulsar Search	57
4.3.6.1	Pulsar search sub-array support	57
4.3.6.2	Pulsar search processing bandwidth	57
4.3.6.3	Dispersion measure	57
4.3.6.4	Time resolution	58
4.3.6.5	Pulsar search observation time	58
4.3.6.6	Single pulse searches	58
4.3.6.7	Binary search	59
	KA1_Mid Pulsar Timing	
4.3.7.1	Pulsar timing sub-array support	
4.3.7.2	Pulsar timing processing bandwidth	
4.3.7.3	Frequency agility	
4.3.7.4	Pulsar timing observation time	
4.3.7.5	Time stamping	
4.3.7.6	Multiple simultaneous timings	
4.3.7.7	Dispersion Measure	61
5 OBSERVIN	G	61
•	tional Modes	
5.1.1 N 5.1.1.1	lormal observing Continuum and Spectral Imaging Mode	
5.1.1.2	Pulsar Search Mode	
5.1.1.3	Pulsar Timing Mode	62
5.1.1.4	Simultaneous operation	
5.1.1.5	Mode transition	
	Observations on a fixed schedule	
5.1.2.1	Specific epoch observations	
5.1.3 T	ime-critical overrides	63
5.1.3.1	Overriding normal processes	
5.1.3.2	Overriding allocated time	63
	ommensal observing	
5.1.4.1	Data access rights	
5.1.5 S 5.1.5.1	ub arraysSub arraying	
5.2 Telesc	ope Manager	64

Revision: 6

5.2.1.1	Authentication and Authorisation	64
5.2.1.2	Scheduled Maintenance Logs	65
5.2.1.3	System error logs	65
5.2.1.4	System status	65
5.2.1.5	Central location for data bases	66
5.2.1.6	Target of opportunity	66
5.2.1.7	Latency of TOO scheduling block initiation	66
5.2.1.8	Discard previous scheduling block	66
5.2.2 P 5.2.2.1	Proposal submissionProposal submission	
	ool for proposal submissionelescope Scheduling Pre and post conditions	67
5.2.4.2	Semester Queue (of duration related to the proposal cycle)	68
5.2.4.3	Operations responsible for Short Term Schedule	68
5.2.4.4	Short term schedule construction tool	68
5.2.4.5	API for construction of schedule	68
5.2.4.6	Simulated execution of scheduling blocks	69
5.2.4.7	Operator control	69
	Response to internal detections of transients	
5.2.5.1	Response policy	
5.2.5.2	Responses to transients	
5.2.5.3	Observing mode latency	
5.2.5.4	Rules for issuing VOEvents	
5.2.5.5	Latency of initiating response	
5.2.6 R 5.2.6.1	Response to external detections of transients	
5.2.6.2	VOEvent issue latency	70
5.2.7 T 5.2.7.1	elescope model	
5.2.7.2	Single geodetic model	71
5.2.7.3	Single geometric model	71
5.2.7.4	Dish pointing model	72
5.2.7.5	AA element and station beam model	72
5.2.8 F 5.2.8.1	orensic analysis of telescope behaviour Forensic tool for telescope behaviour	
5.2.8.2	Interfaces	73
5.2.8.3	Replay of sequences	73
5.2.9 A	Narms	73

Revision:

5.2.9.1	Active alarms	73
5.2.9.2	Alarm filtering	73
5.2.9.3	Alarm latency	73
5.2.10	Data bases	
5.2.10.2	1 Access to historical data	74
5.2.10.2	2 Total Electron Content	74
5.2.10.3	3 Ionospheric Activity	74
5.2.10.4	4 Weather Station	74
5.2.10.5	5 Satellites	74
5.2.10.6	6 Commercial flights	75
5.2.10.7	7 RFI	75
	nce Data processor	
	Calibration and imaging formalism	
5.3.2 5.3.2.1	Calibration model	
5.3.3	Imaging model	
5.3.3.1	Global Sky Model	
5.3.3.2	Multi-frequency synthesis imaging	76
5.3.3.3	Deconvolution of single channels	76
5.3.3.4	Solution for pointing errors	76
5.3.3.5	Peeling	77
5.3.4	Direction dependent effects	77
	Image processing model	
5.3.5.1	S	
5.3.5.2	Spectral line source finding	
5.3.5.3	Stacking	
5.3.6 5.3.6.1	Pipelines Standard pipeline products Standard pipeline products	
5.3.6.2	Calibration pipeline	79
5.3.6.3	Continuum imaging pipeline	79
5.3.6.4	Continuum imaging data products	79
5.3.6.5	Spectral line emission pipeline	80
5.3.6.6	Spectral line emission data products	80
5.3.6.7	Spectral line absorption pipeline	80
5.3.6.8	Spectral line absorption data products	81
5.3.6.9	Slow transient pipeline	81
5.3.6.10	Slow transient data products	81
5.3.6.12	1 Automated Quality Assessment	82
5.3.7	Data Products	83

5.3.7.1	Archive	83
5.3.7.2	Role of science processing centres	84
5.3.7.3	Mirror sites	84
5.3.7.4	Web interface	84
5.3.7.5	VO interface	84
5.3.7.6	Archive API	85
5.3.7.7	Data product provenance	85
5.3.7.8		
5.3.7.9		
5.3.7.10		
5.3.7.11		
	·	
5.3.8.1	•	
SYNCHROI	NISATION AND TIMING	88
•		
6.1.2	Coherence loss: 1 min	89
6.1.3 F	requency reference linear phase drift	89
	·	
	·	
	•	
	• •	
6.2.3 S	SKA1 UTC offsets	90
INFRASTRI	UCTURE	91
.1 Site M	Monitoring	91
	_	
.3 Power	r	92
.4 Acces	s	92
.5 Wateı	r and Sanitation	92
.6 Buildi	ngs	93
.7 Anten	nna earthing and bonding	94
.8 Telepl	hone network	94
.9 Vehicl	les	95
	5.3.7.3 5.3.7.4 5.3.7.5 5.3.7.6 5.3.7.7 5.3.7.8 5.3.7.10 5.3.7.11 5.3.7.12 5.3.7.13 5.3.7.14 5.3.7.15 5.3.7.16 5.3.7.17 5.3.7.18 5.3.8.1 SYNCHRO 1 Synch 6.1.1 (6.1.2 (6.1.3 f6.1.4 f6.1.5 f2.2 (6.1.3 f6.1.4 f6.1.5 f2.2 f6.1.3 f6.1.4 f6.1.5 f2.1 f6.1 f6.1 f6.1 f6.1 f6.1 f6.1 f6.1 f6	5.3.7.2 Role of science processing centres 5.3.7.3 Mirror sites

Revision: 6

8	EXTE	RNAL INTERFACES	95
	8.1	Power	95
	8.1.1	Site steady state power budget Africa	95
	8.1.2	Site steady state power budget Australia	96
	8.2	Time Reference	96
	8.3	VLBI	96
9	INTE	RNAL INTERFACES	98
•		AIV	
	9.1.1		
	9.1.1	_	
	9.1.2	_	
	9.1.3	=	
		Central Signal Processor	
	9.2.1		
	9.2.2		
	_	Dish	
	9.3.1		
	9.3.2		
		Low Frequency Aperture Array	
	9.4.1		
	9.4.2		
	_	SADT	
	9.5.1		
	9.5.2		
	9.5.3		
	9.5.4		
	9.5.5		
		Telescope Manager	
	9.6.1	,	
	9.6.2		
	9.6.3		
	9.6.4	TM to CSP	103
	9.6.5	TM to INFRA	103
	9.7	Science Data Processor	104
	9.7.1	SDP to TM	104
	9.7.2	SDP to INFRA	104
1	O RF	FI AND EMC	104
	10.1	Electromagnetic Radiation	104
		Self-induced RFI	
		Electromagnetic Compatibility Standards	
		Electricity network Electromagnetic Compatibility	
		EMC Compatibility Marking	
		Electromagnetic Susceptibility	
		Receiver linearity - space borne RFI	
		Receiver linearity airborne RFI	
		RFI flagging	
	10.10	RFI excision	
	10.11	RFI masking	
		-	

10.12 RI	FI zones of avoidance	107
11 EXTEN	SIBILITY	108
11.1 Desi	gn for SKA2 extensibility	108
	ONMENTAL, SAFETY AND OCCUPATIONAL HEALTH (ESOH)	
12.1 Envi	ronmental Protection	
12.1.1	Environmental Impact Assessment	
12.1.2	Environment protection plan	
12.1.2.	'	
	ty	
12.2.1 12.2.1.	Safe Design	
12.2.1.		
12.2.1.		
12.2.1.	,	
12.2.1.	5 Hazard analysis	115
12.2.1.	6 Hazardous Materials List	115
12.2.1.	7 Hazard warning marking	116
12.2.1.	8 Fail-Safe Design	117
12.2.1.	9 Emergency stop	117
12.2.1.	10 Safety documentation file	118
12.2.1.	11 Sharp Metal edges	118
12.2.2	Electrical safety	119
12.2.2.	•	
12.2.2.	2 Safety grounding and bonding	120
12.2.2.	3 Electrical circuit interlocks	120
12.2.3	Emergency Communications	120
12.2.3.	1 Safety preparation for construction and operations	121
12.3 Occi	upational Health	124
12.3.1	Noise level dosage	
12.3.2	Transient noise level dosage	
12.3.3	Illumination	
12.3.4 12.3.5	Clean air Humidity	
	ITY	
13.1 Secu	rity Management	128
	onnel security	
	sical security	
13.3.1	Equipment Security	
13.3.2	Intrusion Detection	
	rmation security	
13.4.1	Accessibility	
13.4.2	Archive Security	130

	13.4.3	Security of communications bearers	130
14	Syste	M ENVIRONMENT	130
14	.1 Nor	n-weather protected locations - protection of equipment	130
	14.1.1	Allowable air temperature range	131
	14.1.2	Air temperature operation range	131
	14.1.3	Wind velocities	
14	.2 We	ather protected locations - protection of equipment	
	14.2.1	Protection of equipment in non-weather protected locations	
	14.2.2	Storage and transport temperature	
	14.2.3	Operating humidity	
	14.2.4	Storage and transport humidity	
	14.2.5	Condensation	
	14.2.6	Pressure	
	14.2.7	Facilities and equipment intrusion	
	14.2.8	Sand and Dust	
	14.2.9	Fungus	
14		rage of equipment	
14 14		nsportation - protection of equipment micity	
		•	
15		ABILITY RELIABILITY AND MAINTAINABILITY	
15		ilability Reliability and Maintenance Plan	
15		ilability	
	15.2.1	Telescope availability	
	15.2.2	Availability budgets	
		ability	
	15.3.1 15.3.2	Best practice	
	15.3.2 15.3.3	Critical-useful-life components Stress strength analysis	
	15.3.4	Component selection	
	15.3.4 15.3.5	Matching parts	
	15.3.6	Known failure rate parts	
	15.3.7	High failure rate parts	
	15.3.8	Reliability testing	
	15.3.9	Spares and repair parts testing	
	15.3.10	Component derating	
	15.3.11	Shelf life and wear out characteristics	
	15.3.12	Special procurement components	
	15.3.13	Fail safe provisions	
15	.4 Ma	ntainability	
	15.4.1	Maintainability Budgets	140
	15.4.2	Test and Repair Instructions	
	15.4.3	Level of Maintenance	
	15.4.4	Maintenance Test and Support Equipment	
	15.4.5	Design for maintainability	
	15.4.5	.1 Modular packaging	143
	15.4.5	.2 Maintenance Provisions	143
	15.4.5	.3 Discard at failure items	144

Revision: 6

15.4.5	.4 Plug-in modules	144
15.4.5	.5 Module access	144
15.4.5	.6 Component removal	144
15.4.5	.7 Secure mounting of modules	144
15.4.5	· ·	
15.4.5		
15.4.5		
15.4.5	.11 Mounting guides	145
15.4.5	.12 Module labelling	145
15.4.5	.13 Label robustness	146
15.4.5	.14 Disposable item labelling	146
15.4.6	Component obsolescence plan	
15.4.7	Long lead time items	
15.4.8	Parts availability	146
16 QUAL	ITY FACTORS REQUIREMENTS	147
-	lity Control	
	rkmanship	
16.2.1	Scope of Workmanship Standards	
16.3 Test	ability	147
16.3.1	Test and support equipment	148
16.3.2	Test and support equipment	
16.3.3	Test and support equipment life cycle costs	
16.3.4	Test equipment reliability	
16.3.5	Training Plan	
16.3.6	Direct fault indicators	
16.3.7 16.3.8	Self-test Continuous performance monitoring	
16.3.8	Malfunction detection	
	essibility	
16.4.1	Access tools.	
_	dictability - Design for manufacture	
16.5.1	Design for economic production	
16.5.2	Design definition	150
16.5.3	Manufacturing facilities	151
16.5.4	Standard manufacturing tools	151
17 CONFI	IGURATION MANAGEMENT	151
17.1 Prod	duct configuration information	151
17.1.1	Materials	
17.1.1.		
17.1.1	.2 Parts List	152
17.1.1	.3 Process list	152
17.1.2	Nameplates and Marking	152
	.1 Serial numbers	

	17.1.2.2	Drawing numbers	152
	17.1.2.3	Marking method	153
	17.1.2.4	Electronically readable or scannable ID	153
	17.1.2.5	Packaging part number marking	153
	17.1.2.6	Packaging serial number marking	153
	17.1.2.7	LRU electrostatic warnings	153
	17.1.2.8	Packing electrostatic warnings	154
	17.1.2.9	Cable identification	154
	17.1.2.10	Connector plates	154
18	VERIFICAT	ION PROVISIONS	154
18.3		S	
19	A PPENDIX	A: REQUIREMENTS TRACEABILITY MATRICES	155
20	APPENDIX	B: VERIFICATION MATRICES	155
21	APPENDIX	C: REQUIREMENT ALLOCATION MATRICES	202
22	A PPENDIX	D: Power Budget Allocation	250
22.3	1 Power B	udget allocation Africa	250
22.2	2 Power B	udget Allocation Australia	250
23	A PPENDIX	E: AVAILABILITY, RELIABILITY MAINTAINABILITY ALLOCATIONS	250
23.2	1 SKA1_lo	w availability allocations	250
23.2	_	id availability allocations	
23.3		ty, Availability and Maintainability analysis process	
24	A PPENDIX	F REQUIREMENT CHANGES THIS ISSUE	253
25	GLOSSARV	,	274

Revision: 6

LIST OF FIGURES

Figure 1 SKA Phase 1 System Requirements Specification Context	19
Figure 2 Observatory Functions	23
Figure 3 The availability block diagram for SKA1-low	250
Figure 4 The availability block diagram for SKA1-Mid	251
Figure 5 RAM analysis process	252
Figure 1 SKA Phase 1 System Requirements Specification Context	254
Figure 11 SKA1_Survey Context diagram	261
LIST OF TABLES	
Table 1Traceability Matrices	155
Table 2 Verification Matrix	
Table 3 Allocation Matrix	250
Table 4 Availability Requirements for Sub-systems of SKA1_Low	251
Table 5 Availability Requirements for Sub-systems of SKA1_Mid	252

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 15 of 275

LIST OF ABBREVIATIONS

ADC	Analogue to Digital Convertor
	Advanced Instrumentation Programme
	Advanced Instrumentation Programme
	Assembly Integration and Verification
	Application Program Interface
	.Astrometric Performance Metric
AUS	
CDR	-
	Comité International Spécial des Perturbations Radioélectriques
CPU	.Central Processor Unit
CSP	.Central Signal Processing
DAA	.Dense Aperture Array
DDBH	.Digital Data Backhaul
DDE	.Direction Dependent Effects
DOI	.Document Object Identifier
DRM	.Design Reference Mission
DSH	.Dish
ECSS	European Committee on Space Standardisation
EIA	.Environmental Impact Assessment
EMC	.Electromagnetic Compatibility
EMI	.Electromagnetic Interference
EPA	.Environmental Protection Agency
EPBC	.Environment Protection and Biodiversity Conservation
ESD	.Electrostatic Discharge
ESOH	.Environmental Safety and Occupational Health
EVLA	.Expanded Very Large Array
EWP	.Elevating Work Platform
FLD	.Folder (i.e. not a requirement)
FLOPS	.Floating Point Operations
FMEA	.Failure Mode and Effects Analysis
GASS	.General Assembly and Scientific Symposium
GHQ	
-	Global Positioning System
	Global System for Mobile Communications
	.Her Majesty's Government
HPBW	
	.High Performance Computing
	Interface Control Document

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 16 of 275

Revision: 6
Date: 2015-04-23

IEC	International Electrotechnical Commission
	Institute of Electrical and Electronics Engineers
	Intellectual Property Rights
	Ionospheric Prediction Service
	International Standards Organisation
	International Virtual Observatory Alliance
	Intrinsic cross polarisation ratio
LFAA	Low Frequency Aperture Array
LNA	Low Noise Amplifier
	Low Frequency Array
LRU	Line Replaceable Unit
MHZ	Mega Hertz
MIL	Military
MRO	Murchison Radio Observatory
MTBF	Mean Time Before Failure
MTBM	Mean Time Between Maintenance
MTTR	Mean Time to Repair
NEMA	National Environmental Management Act
NOHSC	National Occupational Health and Safety Commission
NZS	New Zealand Standard
OHS	Occupational Health and Safety
PAF	Phased Array Feed
PDR	Preliminary Design Review
PPM	Photometric Performance Metric
PSF	Point Spread Function
RAM	Reliability, Availability, Maintainability
RFI	Radio Frequency Interference
RPM	Radiometric Performance Metric
SADT	Signal and Data Transport (includes Synchronisation and Timing)
SANS	South African National Standard
SDP	Science Data Processor
SIMBAD	Set of Identifications, Measurements and Bibliography for Astronomical Data
(Astronomical Databas	se)
SKA	Square Kilometre Array
SKADS	Square Kilometre Array Design Study
SKAO	Square Kilometre Array Organisation (or Office)
SMS	Short Message Service
SPF	Single Pixel Feed
SPM	Spectrometric Performance Metric

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 17 of 275

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 18 of 275

1 Introduction

1.1 Purpose of the Document

This document serves as a vehicle to communicate the high-level quantitative and qualitative characteristics of the SKA Phase 1 Observatory in the form of formal requirements that are to be allocated to each of its constituent elements.

Intentionally blank: New diagram to be inserted in future revision of this document

Figure 1 SKA Phase 1 System Requirements Specification Context

Figure 1 provides an initial simplified context assumed for this document in relation to other SKA documentation. There may be changes to the figure as the system engineering process progresses.

This figure should be studied carefully since the SKA development process may not be as expected. In particular, the root document is not the Level 0 requirements;

There are no security, intellectual property, or privacy considerations attached to the use or distribution of this document.

1.1.1 Approach

This document will reside within a requirements capture tool (Jama Contour) and for each requirement statement will include relational links back to the following source documents:

- Baseline Design + SKA-BD-17-13a and SKA-BD-17-13c rebase-lining documents presented to the SKA board.
- Science Priority Outcome
- Operations Concept Guidance

This document is a living document that will converge on the requirements for the SKA1 system. The convergence process is an iterative one between the SKA Office and the consortia involved with the Element design work.

At present, some requirement statements have no traceability link available back to higher level source documents. These will usually be identified as TBJ (to be justified). However, if no link is identified then it is to be assumed that this is the case. If the requirement cannot be justified it will be removed.

Each requirement identified within this document will have a unique four digit identifier preceded by a short hand prefix of "SYS_REQ_". The identifier is a truncation of the "SKA1-SYS_REQ_" that is generated be generated by the requirements capture tool. It provides a useful reference tag and indicates where in the system hierarchy the requirement resides.

Each requirement will identify the type of verification method.

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 19 of 275

The status of each requirement will be identified.

The allocation of requirements to Elements is provided in Appendix C of this document

The latest issued document will take precedence over the contents of the requirements capture tool. However, an issued Level 1 Requirement document represents a requirements capture tool baseline. The data-base baseline identifier will be referenced in the document history.

Amendments to the document will be via change control. If accepted, amendments will be via the requirements capture tool. Up issue of this document will require a new baseline and export from the requirements tool and subsequent submission and approval via the Document Management System.

1.1.2 Verb Convention

"Shall" is used whenever a statement expresses a convention that is binding. The verbs "should" and "may" express non-mandatory provisions. "Will" is used to express a declaration of purpose on the part of the design activity.

1.1.3 For but not with

"For but not with" in a requirement denotes that provision is to be made for a sub-assembly in the design but that such a sub-assembly is not necessarily to be delivered. An example would be mount positions for feeds at the focal plane of an antenna that are not necessarily all to be immediately filled with feeds.

1.1.4 Parent Requirements

Parent Requirements: The Parent Requirement field denotes the source of information providing justification. The allowed values or types of value are:

- "Root": No further justification is considered to be necessary. Rarely used.
- "Established Precedent": There is a known precedent such as an existing computing centre at a given location.
- Other requirement: Another requirement acts as justification.
- Baselined SKA document: for example ConOps or Baseline design.
- SKA document in preparation
- Publically available document with established naming conventions such as standard, academic papers, DOIs.

Within this definition, we will provide a parent requirement for all requirements.

1.2 Scope of the Document

The Square Kilometre Array Phase 1 (SKA1) Level 1 Requirements Specification ultimately aims to provide:

- A complete set of traceable level 1 requirements for the SKA1 Observatory allocated to each Element at the next level down in the observatory hierarchy.
- Identify the verification method for each requirement presented
- Allocate each requirement to the appropriate Element in the next level of the Observatory hierarchy

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 20 of 275

1.2.1 Identification

The SKA Observatory is assumed to include all of the associated equipment, facilities, material, software, hardware, policy, technical documentation, services, and personnel required for its operation.

2 References

2.1 Applicable documents

In the event of conflict between the contents of the applicable documents and this SKA1 System Requirement Specification (SRS) document, the applicable documents shall take precedence;

- [1] SKA1 System Baseline Design SKA-TEL-SKO-DD-001 Rev 1
- [2] Concept of Operations for the SKA Observatory SKA.TEL.SE.OPS-SKO-COO-001-0-A
- [3] Operational Concepts [in prep]
- [4] SKA EMI/EMC standards SKA EMI/EMC Standards and Procedures SKA-TEL-SKO-0000202-AG-RFI-ST-01
- [5] SKA1_Low Configuration Coordinates (in preparation)
- [6] SKA1_Mid Configuration Coordinates (in preparation)
- [7] SKA1 Rebaselining outcome summary (in preparation)

2.2 Reference documents

The following documents are referenced in this document. In the event of conflict between the contents of the referenced documents and this document, this document shall take precedence.

[8]SKA Memo 130: 'SKA Phase 1: Preliminary System Description', P.E. Dewdney et al, dated November 2010.

- [9]Logistics Engineering and Management B.S. Blanchard Sixth Edition Prentice Hall
- [10] Reliability-Centred Maintenance John Moubray Second Edition Butterworth-Heinemann
- [11] Practical Reliability Engineering Patrick D.T. O'Connor Fourth Edition Wiley
- [12] System Engineering Management B.S Blanchard Third Edition Wiley
- [13] The Basics of FMEA R.E. McDermott, R.J. Mikulak
- [14] M.R. Beauregard Second Edition CRC Press
- [15] RFI Protection and Threshold Levels for the SKA SKA.TEL.OFF.PAQA.RFI-SK0-TN-001 (available T0 + 12 weeks)

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 21 of 275

- [16] Rau, U., Bhatnagar, S., Voronkov, M.A., and Cornwell, T.J., "Advances in Calibration and Imaging Techniques in Radio Interferometry", Proc IEEEE, 97, 1472-1481, (2008)
- [17] U. Rau and T. J. Cornwell, A multi-scale multi-frequency deconvolution algorithm for synthesis imaging in radio interferometry A&A 532, A71 (2011)
- [18] S.J. Wijnholds, J.D. Bregman and A.van Ardenne, Calibratability and its immpact on configuration design for LOFAR and SKA phased array radio telescopes, Radio Science, vol. 46, No. RS0F07, 8 November 2011
- [19] C.J. Lonsdale, D. Oberoi, A.J Coster and P.J Erickson, The Effects of Variable Ionospheric and Plasmaspheric Faraday Rotation on Low Frequency Radio Arrays, Proceedings of the XXXth General Assembly and Scientific Symposium of the Interation Union of Radio Science (URSI GASS), Istanbul (Turkey), 13 20 August 2011
- [21] A. Schutte SKA1 Power Budget SKA-SE-POW-TN-001 Rev2

2.3 Reference Standards

- [22] IEEE Systems and Software engineering System life cycle processes ISO/IEC 15288-2008
- [23] IEEE Guide for Developing Systems Specifications IEEE Std 1233 1998 Edition
- [24] MIL-HDBK-520A Specification Practices
- [25] Occupational Health and Safety [OHS] Act, No. 181 1993 (General Machinery regulations 1988, Construction regulation 2003)
- [26] National Environmental Management Act [NEMA] Act No. 107 1998
- [27] Occupational Health and Safety (Commonwealth Employment) Act 1991
- [28] Safety of machinery Functional safety of safety-related electrical, electronic and programmable electronic control systems IEC 61508
- [29] Safety of machinery. Electrical equipment of machines general requirements BS EN 60204-1
- [30] Low voltage switchgear and controller gear BS EN 60947-5-5
- [31] Safety of machinary. Safety-related parts of control systems general principles for design BS EN ISO 13849-1
- [32] Generic Requirements for Network Equipment in the Outside Plant (OSP) GR-3108-Core Iss 3.
- [33] Equipment Engineering Environmental conditions and environmental tests for telecommunications equipment Part 1-2: Classification of environmental conditions Transportation ETS 300 019-1-2

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

3 Observatory structure

3.1 Observatory functions

The Observatory functions have been described by the Board[1]. Here we show the allocation of these functions to the top level components of the adopted Observatory model .

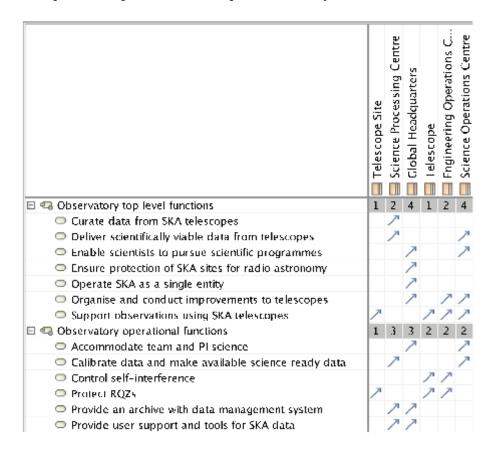


Figure 2 Observatory Functions

3.2 Global Headquarters

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2113	Global Headquarters The	Accepted	Concept of Operations	Inspection
	SKA Global Headquarters		for the SKA	
	(GHQ) will have overall		Observatory :	
	responsibility for the SKA		SKA.TEL.SE.OPS-SKO-	
	Observatory.		COO-001-0-A Rev B	

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 23 of 275

3.3 Site location

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2114	•	Accepted	Concept of Operations for the SKA Observatory : SKA.TEL.SE.OPS-SKO-COO-001-0-A Rev B	
	Australia.			

3.4 Distribution and deployment

3.4.1 Australia

3.4.1.1 SKA1_low array

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2124	SKA1_low array. The SKA1_low array shall be located within the legal boundary of the Boolardy	Accepted	•	Inspection
	station.			

3.4.1.2 SKA1_low central frequency reference

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2713	SKA1_low central	Accepted	SKA-TEL.SKO-DD-002	Inspection
	frequency reference. The			
	SKA1_low central frequency			
	reference shall be located in			
	the SKA1_low Central Signal			
	Processing facility			

3.4.1.3 SKA1_low CSP Facility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2654	SKA1_low CSP facility. The	Accepted	Baseline Design	Inspection
	facility housing the station			
	beamformers for the inner			
	area of the SKA1_Low and			
	the central signal processing			
	for SKA1_Low shall be at a			
	distance of 2 km South West			
	of the centre of the			
	SKA1_Low array.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 24 of 275

3.4.1.4 Australian Science Operations Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2120	Australian Science	Accepted	Baseline design	Inspection
	operations centre. The		section 2.1 para 4 and	
	Australian Science		section 2.3 para 6	
	Operations Centre shall be in		·	
	Perth.			

3.4.1.5 Australian Engineering Operations Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2121	Australian Engineering	Accepted	Existing Precedent	Inspection
	Operations Centre The			
	Australian Engineering			
	Operations Centre shall be in			
	in Geraldton.			

3.4.1.6 Australian Science Processing Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2123	Australian Science	Accepted	SKA-TEL.SKO-DD-002	Inspection
	processing centre The			
	Australian Science			
	Processing Centre shall make			
	use of floor space, power,			
	cooling, and other			
	infrastructure at the Pawsey			
	centre in Perth.			

3.4.2 South Africa

3.4.2.1 SKA1_mid array

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2119	SKA1_Mid array. The	Accepted	Baseline design	Inspection
	SKA1_Mid dish array shall		section 1.3.1 first	
	be located in the Karoo		bullet point	
	Central Astronomy			
	Advantage Area.			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23

Page 25 of 275

3.4.2.2 SKA1_mid CSP Facility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2656	SKA1_mid CSP facility.	Accepted	SKA-TEL.SKO-DD-002	Inspection
	The CSP facility for			
	SKA1_mid shall be located in			
	the Karoo Array Processor			
	Building.			

3.4.2.3 SKA1_mid central frequency reference

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2714	SKA1_mid central	Accepted	SKA-TEL.SKO-DD-002	Inspection
	frequency reference. The			
	SKA1_mid central frequency			
	reference shall be located in			
	the SKA1_mid Central			
	Signal Processing facility			

3.4.2.4 South African Science Operations Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2115	South African Science	Accepted	Concept of Operations	Inspection
	Operations. The South		for the SKA	
	African Science Operations		Observatory :	
	Centre shall be located in		SKA.TEL.SE.OPS-SKO-	
	Cape Town.		COO-001-0-A RevB	

3.4.2.5 South African Science Processing Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2118	South African Science	Accepted	Baseline design	Inspection
	Processing Centre The		section 2 first para	
	South African Science		·	
	Processing centre shall be			
	located in Cape Town			

3.4.2.6 South African Engineering operations Centre

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2116	South African Engineering	Accepted	Existing Precedent	Inspection
	Operations Centre. The			
	South African Engineering			
	Operations Centre shall be			
	located at Klerefontein.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 26 of 275

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 27 of 275

4 Telescopes

4.1 SKA1_Low

4.1.1 SKA1_Low Configuration and Performance

4.1.1.1 Receptor type

ı	D	Requirement			Status	Parent Requi	rement	Verification
9	SYS_REQ-2671	Receptor t	ype. T	he	Accepted	Baseline	design	Analysis
		SKA1_Low shall utilise dual,			section 6.6			
		orthogonal, pol	arization lo	g-				
		periodic antenna	as.					

4.1.1.2 Array resolution

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2673	Array resolution (core). The	Accepted	Baseline design	Analysis
	SKA1_Low shall have an		section 6.2 bullet 4	
	array resolution of better than			
	5 arc minutes at 100 MHz			
	(centre of the EoR frequency			
	range).			

4.1.1.3 Electromagnetic frequency range

Note the baseline design Rev1 states the upper operating frequency as both 300 and 350 MHz. An rfp clarification confirms the figure is 350 MHz. This is corrected in the catch-all addendum to the baseline design.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2134	Electromagnetic frequency	Accepted	Baseline Design	Test
	range. SKA1_Low shall be		Section 2.1 and Table 2	
	able to measure		Rows 2 & 3. See also	
	electromagnetic radiation in a		catch-all addendum to	
	frequency range from 50		the baseline design.	
	MHz to 350 MHz.			

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 28 of 275

4.1.1.4 Spectral stability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2621	Spectral stability: The	Accepted	Derived from science	Test
	spectral stability, on a time		requirements	
	scale of 600 sec., of the station			
	beam bandpass, post station			
	calibration and RFI-			
	mitigation, shall be within 1.3			
	%, 0.4 %, 0.6 % and 1.1 % at			
	50 MHz, 100 MHz, 160			
	MHz, and 220 MHz			
	respectively compared to the			
	full polarization,			
	parameterized beam model.			

4.1.1.5 SKA1_Low array sensitivity at 50 MHz

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2135	SKA1_Low array	Accepted	Baseline Design Table	Test
	sensitivity at 50MHz. The		3 Row 20	
	SKA1_Low array shall have			
	sensitivity per polarization at			
	zenith greater than 72 m ² K ⁻¹			
	at 50MHz when assuming a			
	sky noise temperature			
	following the law 60.lamda ^{2.}			

4.1.1.6 SKA1_Low array sensitivity at 100 MHz

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2136	SKA1_Low array	Accepted	Baseline Design Table	Test
	sensitivity at 110MHz. The		3 Row 21	
	SKA1_Low array shall have			
	a sensitivity per polarization			
	at zenith greater than 380			
	m ² K ⁻¹ at 100 MHz when			
	assuming a sky noise			
	temperature following the			
	law 60.lambda^2.55			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23

Page 29 of 275

4.1.1.7 SKA1_Low array sensitivity at 160 MHz

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2137	SKA1_Low array	Accepted	Baseline Design Table	Test
	sensitivity at 160MHz. The		3 Row 22	
	SKA1_Low array shall have			
	a sensitivity per polarization			
	at zenith of greater than 535			
	m ² K ⁻¹ at 160 MHz when			
	assuming a sky noise			
	temperature following the			
	law 60.lambda^2.55			

4.1.1.8 SKA1_Low array sensitivity at 220 MHz

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2138	SKA1_Low array	Accepted	Baseline Design Table	Test
	sensitivity at 220MHz. The		3 Row 23	
	SKA1_Low array shall have			
	a sensitivity per polarization			
	at zenith of greater than 530			
	m ² K ⁻¹ at 220 MHz when			
	assuming a sky noise			
	temperature following the			
	law 60.lambda^2.55.			

4.1.1.9 SKA1_Low array sensitivity at 280MHz.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2814	SKA1_Low array	Accepted	Baseline Design,	Test
	sensitivity per polarization		Chapter 6	
	at 280 MHz. The			
	SKA1_Low array shall have			
	a sensitivity per polarization			
	at zenith greater than 500			
	m^2/K at 280 MHz when			
	assuming a sky noise			
	temperature following the			
	law 60.lambda^2.55			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 30 of 275

4.1.1.10 SKA1_Low array sensitivity at 340MHz.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2815	SKA1_Low array	Accepted	Baseline Design,	Test
	sensitivity per polarization		Chapter 6	
	at 340 MHz. The			
	SKA1_Low array shall have			
	a sensitivity per polarization			
	at zenith greater than 453			
	m^2/K at 340 MHz when			
	assuming a sky noise			
	temperature following the			
	law 60.lambda^2.55			

4.1.1.11 Sensitivity for off zenith angles

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2622	Sensitivity for off zenith	Accepted	Baseline Design	Test
	angles. The SKA1_low		section 6.1 item 6	
	receptor has an off-zenith			
	beam response defined by the			
	receptor, a log-periodic			
	dipole antenna,in the			
	Baseline Design.			

4.1.1.12 SKA1_Low antennas per station

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2139	SKA1_Low antennas per	Accepted	Baseline Design Table	Inspection
	station. The SKA1_Low shall comprise of stations each containing 256 antennas.		2 Row 4 + addendum	

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner 2015-04-23 Page 31 of 275

Date:

4.1.1.13 SKA1_Low station diameter

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2140	SKA1_Low station	Accepted	Baseline Design Table	Inspection
	diameter. The station		2 Row 10	
	diameter will be 35 metres,			
	which is consistent with			
	being able to provide a single,			
	circularly symmetric, beam			
	of 5 degrees at the half-power			
	points at 100 MHz (centre of			
	the EoR frequency range)			
	while meeting the sensitivity			
	requirements with 256			
	antennas per station evenly			
	distributed in an irregular-			
	random configuration.			

4.1.1.14 SKA1_Low number of stations

ID Requ	quirement	Status	Parent Requirement	Verification
stati shal	ntions. The SKA1_Low	Accepted	Baseline Design Table 2 Row 11 + addendum	Inspection

4.1.1.15 SKA1_Low configuration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2143	SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD.	•	Baseline Design Table 2 Row 12	Inspection

4.1.1.16 SKA1_Low maximum baseline length between stations

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2817	SKA1_Low maximum	Accepted	Baseline Design,	Inspection
	baseline length between		section 6.2	
	stations. The maximum			
	distance between station			
	centres shall be			
	approximately 80 km			

Document No.: SKA-TEL-SKO-000008

Revision: 6

4.1.1.17 SKA1_Low Instantaneous Bandwidth

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2147	Instantaneous bandwidth.	Accepted	Baseline Design Table	Test
	The SKA1_Low shall be		2 Row 18 + addendum	
	capable of simultaneously			
	processing 300 MHz of			
	bandwidth.			

4.1.1.18 SKA1_Low separation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2652	SKA1_Low separation. The	Accepted	Baseline design	Measurement
	SKA1_Low core shall be		section 6.9 para. 1	
	located at a minimum		•	
	distance of 10km from the			
	ASKAP core.			

4.1.1.19 Digitisation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2674	Digitisation. Digitisation of SKA1_antenna (SKA1_Low only) signals shall be to at	•	Baseline Design	Demonstration
	least 8 bits.			

4.1.1.20 Clipping

Clipping occurs when the range of the input signal voltages to the ADC is larger than the ADC voltage range.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2639	Clipping. The amplitude		Operational	Test
	dynamic range of the		requirement to meet	
	SKA1_Low ADC's shall be		availability	
	such that no clipping will		,	
	occur for 95% of the time			

4.1.1.21 Clipped data flagging

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2640	Clipped data flagging. Clipped data shall be flagged accordingly within the data stream.		Operational requirement to meet availability	Demonstration

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 33 of 275

4.1.1.22 Linearity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2653	Linearity. At the finest	Accepted	Related to Signal Chain	Test
	frequency resolution in the		dynamic range	
	processing chain, the level of			
	spurious signals due to non-			
	linearity shall be less than the			
	noise level when no external			
	input signal is present.			

4.1.1.23 Absolute flux scale

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2824	Absolute flux scale : The	Accepted	Established Precedent	Test
	absolute flux scale shall be			
	accurate to 5%			

4.1.2 SKA1_Low beamformer

4.1.2.1 Dynamic range

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2676	Dynamic range. The	Accepted	Signal chain	Test
	SKA1_Low beams shall have		performance	
	a dynamic range of bette		document in	1
	than 40 dB		preparation	

4.1.2.2 SKA1_Low station beams

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2146	SKA1_Low station beams	Accepted	Baseline Design Table	Demonstration
	The antennas within each		2 Row 17	
	station shall be coherently			
	beam-formed to provide one			
	pair of station beams,one			
	beam for each orthogonal			
	polarization,for primary			
	science.			

Document No.: SKA-TEL-SKO-000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 34 of 275

4.1.2.3 Control of station beam properties

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2779	Control of station beam properties: It shall be possible to control specific properties of the station beam by setting the station beam weights appropriately.	·	Control of LFAA Station Properties [doc, in prep]	Test

4.1.2.4 Station beam stability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2629	Station beam stability. The	Accepted	Derived from Science	Test
	difference between the		Requirements	
	parameterized station beam			
	model and the actual station			
	beam shall remain smaller			
	than 1.3 %, 0.4 %, 0.6 % and			
	1.1 % relative to the main			
	beam peak power, after			
	calibration, at 50 MHz, 100			
	MHz, 160 MHZ and 220			
	MHz respectively			

4.1.2.5 Calibration update rate

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2634	Calibration update rate.	Accepted	References [16], [17]	Demonstration
	Calibration measurements			
	shall be necessary at a rate of			
	no more than 10seconds.			

4.1.2.6 Real time calibration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2635	Real-time calibration. The	Accepted	Derived from DRM	Demonstration
	LFAA reception system at			
	station level shall provide			
	on-line instrumental			
	calibration functions with an			
	update rate of 10 minutes			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

Date:

2015-04-23 Page 35 of 275

4.1.2.7 Beam products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2636	Beam products. The	Accepted	Baseline design Table	Demonstration
	SKA1_Low shall be capable		2 row 17 and 18	
	of outputting beam products			
	as voltage time series.			

4.1.3 SKA1_Low Correlator

4.1.3.1 SKA1_Low correlator sub-array support

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2773	SKA1_Low correlator sub-	Accepted	SYS_REQ-2127,	Test
	array support . The		Baseline design	
	SKA1_Low correlator shall		section 5	
	be able to correlate			
	SKA1_low station beams			
	from one to sixteen sub-			
	arrays independently and			
	concurrently.			

4.1.3.2 SKA1_Low channelisation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2148	SKA1_Low channelisation.	Accepted	Baseline Design Table	Test
	The SKA1_Low		2 Row 28, SYS_REQ-	
	channelisation for each sub		2127	
	array shall provide up to			
	65,536 linearly spaced			
	frequency channels across the			
	available frequency range of			
	each band.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2149	SKA1_Low channeliser maximum leakage power for adjacent frequency channels. The SKA1_Low channeliser for each subarray shall have a maximum noise leakage power from immediately adjacent frequency channels of < -30 dB.	Accepted	Signal chain performance document in preparation	Test

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 36 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2810	SKA1_Low channeliser	Accepted	Signal chain	Test
	maximum leakage power		performance	
	for non-adjacent frequency		document in	
	channels. The SKA1_Low		preparation	
	channeliser for each sub-			
	array shall have a maximum			
	noise leakage power from			
	non adjacent frequency			
	channels better than -60 dB.			

ID	Requirement	Status	Parent Requirem	nent	Verification
SYS_REQ-2811	channel amplitude variation. The fine frequency channels for the SKA1_Low channeliser shall have a total amplitude variation as a function of frequency of less than 0.01 dB.	Accepted	Signal performance document preparation	chain in	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2812	SKA1_Low fine frequency channel band edge. The fine frequency cells for the SKA1_Low channeliser shall have a -3dB transition band amplitude at the channel band edge.		Signal cha performance document preparation	in Test

4.1.3.3 SKA1 Low Correlator signal to noise

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2678	SKA1_Low correlatation signal to noise. SKA1_Low correlation, for each sub array, shall not degrade the Signal to Noise ratio by more than 2 % compared to ideal analogue correlation.	Accepted	Signal chain performance document to be issued, SYS_REQ-2127	Analysis

4.1.3.4 SKA1_Low correlator integration time

The correlator dump time is derived from the level of acceptable image smearing. This is nominally identified as < 2% in the base line design. However this isn't sufficient information as the field of view this is applicable to needs to be specified. The baseline designs a factor of 2 over and above the half power beam width though this isn't explicitly stated.

The base line design suggests two separate ranges of baselines with associated dump rates. This is problematic for Imaging processing and not included in the SKA1 requirements

Document No.: SKA-TEL-SKO-000008 FOR PROJECT USE ONLY

Revision: 6 Author: W Turner Date: 2015-04-23 Page 37 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2150	SKA1_Low correlator	Accepted	Baseline Design Table	Test
	Integration rate. The		4 Row 9	
	SKA1_Low correlator for			
	each sub array shall have			
	independently configurable			
	visibility integration periods			
	in the range 9s to 0.9s.			

4.2 Reflector Antennas

4.2.1 Diameter

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2153	Diameter . SKA1 dishes shall	Accepted	Baseline Design Table	Inspection
	have a projected diameter of		5 Row 1	
	larger than 15m and smaller			
	than 16.5m.			

4.2.2 Aperture efficiency

ID Requirement Status	Parent Requirement Verification
SYS_REQ-2155 Aperture Efficiency. Accepted Aperture efficiency shall be within +/- 5 % of: • 60% at 350MHz with gradual degradation from 400 to 350 MHz • 65% at 400MHz • 78% from 600MHz to 8000MHz • 70% from 8 to 15 GHz • 65% from 15 to 20 GHz	·

4.2.3 Precision pointing repeatability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2158	Pointing repeatability. The	Accepted	Baseline Design Table	Test
	pointing repeatability shall be		5 Rows 15 and 17	
	better than 10 arc seconds rms			
	for winds < 7 m/s at night			
	time.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 38 of 275

4.2.4 Standard pointing repeatability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2159	Pointing repeatability. The	Accepted	Baseline Design Table	Test
	pointing repeatability shall be better than 17 arc seconds rms		5 Rows 15 and 18	
	for an average wind speed of			
	< 7 m/s in the day time			

4.2.5 Degraded pointing repeatability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2160	Pointing repeatability. The	Accepted	Baseline Design Table	Test
	pointing repeatability shall be		5 Rows 15 and 19	
	better than 180 arc seconds			
	rms for an average wind			
	speed between 7 and 20 m/s			

4.2.6 Number of receivers

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2162	Number of feeds . There shall	Accepted	Baseline Design Table	Inspection
	be space at the Gregorian		5 Row 12	
	focus of SKA1 dishes for five			
	single pixel feeds (SPF) or			
	three Phased Array Feeds			
	(PAF)			

4.2.7 Polarisation purity

The polarisation purity of reflector antenna shall be expressed by using the intrinsic polarisation ratio (IXR). It will give coordinate system independent FoM of the polarisation purity and quantify the polarimetric performances even after the calibration.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2165	Polarisation Purity. The	•	•	Test
	IXR shall be better than 15		5 Row 10 SCI-T_REQ-	
	dB over the whole observing		0440	
	bandwidth within the HPBW			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 39 of 275

2015-04-23 Date:

4.2.8 Elevation limit

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2170	Elevation limit. Reflector	Accepted	Baseline Design Table	Demonstration
	antennas shall be capable of		5 Rows 13	
	operating at all elevations			
	greater than 15 degrees			

4.2.9 Azimuth range

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2171	Azimuth range. The Dish	Accepted	Baseline Design Table	Demonstration
	shall have a continuous		5 Row 14	
	useable azimuth observation			
	range from -270° to $+270^{\circ}$,			
	inclusive measured relative			
	to true North defined as 0°			
	and with East defined as			
	+90°			

4.3 SKA1_Mid

4.3.1 SKA1_Mid configuration and performance

4.3.1.1 Inclusion of MeerKAT

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2833	SKA1_Mid inclusion of	Accepted	Baseline Design	Demonstration
	MeerKAT. The SKA1_Mid		section 9.5.1 para 2	
	shall incorporate the 64		bullets 2 and 3	
	antennas in both monitor and			
	control and data collection			
	functions.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2173	MeerKAT array. The	Accepted	Baseline Design	Demonstration
	monitor and control		section 8.4.2 para 2	
	functions of MeerKAT shall		bullet 1	
	be made available to			
	SKA1_Mid via a Foreign			
	Telescope interface			
	consisting of a Local			
	Monitor and Control system			
	connected to the SKA1_Mid			
	Telescope Manager.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

Date: 2015-04-23

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2834	SKA1_Mid-MeerKAT	Accepted	Baseline Design	Analysis
	infrastructure reuse. Where		section 9.5.1 para 2	
	economically practicable, the		bullets 2 and 3	
	existing MeerKAT			
	infrastructure will be reused			

4.3.1.2 Absolute flux scale

ID	Requirement	Status	Parent Requirement	Verification
_	Absolute flux scale: The absolute flux scale shall be accurate to 5% rms.	Accepted	Established Precedent	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2826	Absolute flux scale: The	Accepted	Established Precedent	Test
	absolute flux scale shall be			
	accurate to 3% rms.			

4.3.1.3 SKA1_Mid configuration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2174	Combined SKA1 Mid	Accepted	Array Configurations	Inspection
	Configuration. The		Document []	
	SKA1_Mid shall have the			
	configuration defined in the			
	TBD			

4.3.2 SKA1_Mid antenna

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2712	SKA1_Mid antenna. The	Accepted	Baseline design Table 6	Inspection
	SKA1_Mid array shall		row 1	
	consist of 133 antennas			
	centred in the same location			
	as the MeerKAT array			

4.3.3 Antenna RF system

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2179	Antenna RF system. The Dish Element shall make available only a single frequency band at any one			Inspection
	time.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 41 of 275

4.3.3.1 RF system frequency range band 1

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2180	RF system frequency range	Accepted	Baseline Design Table	Test
	band 1 The array of		6 Row 17	
	SKA1_Mid dishes, when the			
	band 1 capability is selected,			
	shall operate over a frequency			
	range from 0.35 to 1.050 GHz			
	for each polarisation.			

4.3.3.2 RF system frequency range band 2

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2181	RF system frequency range	Accepted	Baseline Design Table	Test
	band 2. The SKA1_Mid		6 Row 18	
	dishes, when the band 2			
	capability is selected, shall			
	operate over a frequency			
	range from 0.95 to 1.76 GHz			
	for each polarisation.			

4.3.3.3 RF system frequency range band 3

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2182	RF system frequency range band 3. The SKA1_Mid dishes, when the band 3 capability is selected, shall operate over a frequency range from 1.65 to 3.05 GHz for each polarisation	·	Baseline Design Table 6 Row 19	Test

4.3.3.4 RF system frequency range band 4

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2183	RF system frequency range	Accepted	Baseline Design Table	Test
	band 4. The SKA1_Mid		6 Row 20	
	dishes, when the band 4			
	capability is selected, shall			
	operate over a frequency			
	range from 2.80 to 5.18 GHz			
	for each polarisation			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 42 of 275

4.3.3.5 RF system frequency range band 5

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2184	RF system frequency range	Accepted	Baseline Design Table	Test
	band 5. The SKA1_Mid		6 Row 21	
	dishes, when the band 5			
	capability is selected, shall			
	operate over a frequency			
	range from 4.6 to 13.8 GHz			
	for each polarisation.			

4.3.3.6 RF system sampled bandwidth band 1

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2185	RF system sampled	Accepted	Baseline Design Table	Test
	bandwidth band 1. The		6 Row 17	
	instantaneous bandwidth for			
	band 1 will be 700MHz and			
	shall be sampled to at least			
	2.0 G samples per second for			
	each polarisation.			

4.3.3.7 RF system sampled bandwidth band 2

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2186	RF system sampled	Accepted	Baseline Design Table	Test
	bandwidth band 2. The		6 Row 18	
	instantaneous bandwidth for			
	band 2 will be 810 MHz and			
	shall be sampled to at least			
	2.0 G sample per second for			
	each polarisation.			

4.3.3.8 RF system sampled bandwidth band 3

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2187	RF system sampled	Accepted	Baseline Design Table	Test
	bandwidth band 3 The		6 Row 19	
	instantaneous bandwidth for			
	band 3 will be 1,403 MHz and			
	shall be sampled to at least			
	5.0 G samples per second for			
	each polarisation			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 43 of 275

Date: 2015-04-23

4.3.3.9 RF system sampled bandwidth band 4

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2188	RF system sampled	Accepted	Baseline Design Table	Test
	bandwidth band 4 The		6 Row 20	
	instantaneous bandwidth for			
	band 4 will be 2,380 MHz and			
	shall be sampled at at least 5.0			
	G samples per second for			
	each polarisation.			

4.3.3.10 RF system sampled bandwidth band 5

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2189	RF system sampled	Accepted	Baseline Design Table	Test
	bandwidth band 5 The		6 Row 21	
	SKA_Mid, for band 5, shall			
	digitise two separate 2.5 GHz			
	bands for each polarisation.			

4.3.3.11 RF digitisation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2190	RF digitisation. Digitisation	Accepted	Baseline Design Table	Demonstration
	for each polarisation shall		6 Row 36 to 40	
	be:			
	band 1 8 bits			
	band 2 8 bits			
	band 3 6 bits			
	 band 4 at least 4 bits 			
	• band 5 at least 2			
	streams of 3 bits			

4.3.4 SKA1_Mid Correlator

4.3.4.1 SKA1_Mid correlator sub-array support

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2774	SKA1_Mid correlation	Accepted	Baseline design	Demonstration
	sub-array support. The		paragraph 5 bullet 6	
	SKA1_Mid shall be able to			
	correlate SKA1_mid dishes			
	as multiple sub-arrays			
	independently and			
	concurrently			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 44 of 275

4.3.4.2 SKA1_Mid channelisation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2195	SKA1_Mid channelisation.	Accepted	Baseline Design Table	Test
	The SKA1_Mid		10 Row 3	
	channelisation for each sub			
	array shall provide up to			
	65,536 linearly spaced			
	frequency channels across the			
	sampled bandwidth of each			
	band.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2196	SKA1_Mid channelisation	Accepted	Signal chain	Test
	maximum leakage power		performance	
	for adjacent channels. The		document to be issued	
	SKA1_Mid for each sub-			
	array shall have a maximum			
	noise leakage power from			
	immediately adjacent			
	frequency channels of < -30			
	dB			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2803	SKA1_Mid maximum	Accepted	Signal processing chain	Test
	leakage power for non-		performance	
	adjacent frequency		document in	
	channels. The SKA1_Mid,		preparation	
	for each sub-array, shall have			
	a maximum noise leakage			
	power from non adjacent			
	frequency channels better			
	than -60 dB.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2805	SKA1_Mid fine frequency	Accepted	Signal processing chain	Test
	channel amplitude		performance	
	variation. The fine frequency		document in	
	channels for the SKA1_Mid		preparation	
	channeliser shall have a total		, ,	
	amplitude variation as a			
	function of frequency of less			
	than 0.01 dB after bandpass			
	calibration			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 45 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2804	SKA1_Mid fine frequency channel band edge. The fine frequency cells for the SKA1_Mid channeliser shall have a -3dB transition band amplitude at the channel band edge.		Signal processing chain performance document in preparation	Test

4.3.4.3 SKA1_Mid correlation signal to noise

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2679	SKA1_Mid correlation signal to noise. The SKA1_Mid correlation, for the same sub-array, shall not degrade the Signal to Noise ratio by more than 2% compared to ideal analogue correlation.	Accepted	Signal chain performance document in preparation	Analysis

4.3.4.4 SKA1_Mid correlation integration time

The base line design suggests two separate ranges of baselines with associated dump rates. This is problematic for Imaging processing and not included in the SKA1 requirements

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2197	SKA1_Mid correlation	Accepted	Baseline Design Table	Demonstration
	integration period. The		10 Row 14	
	SKA1_Mid shall have			
	independently configurable			
	visibility integration period			
	from a maximum integration			
	time of 1.4s to a minimum of			
	0.14s for each subarray.			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 46 of 275

4.3.4.5 SKA1_Mid correlator Pulsar binning

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2616	SKA1_Mid Pulsar phase	Accepted	Baseline design	Demonstration
	binning. The SKA1_Mid, for each subarray, shall allow for pulse phase-resolved observations supporting the product of the number of phase bins, channel and polarisation products up to 262,144 (i.e. 4 x 65,536).	,	section 8.6.1.6 para 3	

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2830	SKA1_Mid Pulsar phase	Accepted	Baseline design	Test
	bin width. The SKA1_Mid		section 8.6.1.6 para 3	
	shall be capable of providing			
	pulsar phase bin widths with			
	a time resolution of better			
	than 10us.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2831	SKA1_Mid Pulsar phase	Accepted	Baseline design	Test
	bin synchronisation. The		section 8.6.1.6 para 3	
	SKA1_Mid shall be capable			
	of synchronising phase bins			
	to the ephemeris to limit drift			
	to less than 10% of the			
	selected bin width within the			
	selected correlator integration			
	period.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2835	SKA1_Mid Phase bin	Accepted		Demonstration
	averaging time. The			
	SKA1_Mid phase bin			
	averaging time shall be			
	constrained to limit the			
	output data rate to at most			
	the single bin configuration			
	output data rate.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 47 of 275

4.3.4.6 Inclusion of MeerKAT into SKA1_Mid Correlator

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2740	Inclusion of MeerKAT into	Accepted	Baseline design	Demonstration
	SKA1_mid correlator. The		section 8.6.1 para 2,	
	SKA1_Mid correlator shall		table 10 row 20, table	
	be capable of forming real		11 row 2	
	time cross correlation			
	products from all antenna			
	within the SKA1_Mid			
	combined array including			
	those MeerKAT.			

4.3.5 SKA1_Mid Central Beam-former

4.3.5.1 Beam-former sub-array support

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2201	Beam-former sub-array	Accepted	SYS_REQ-2127,	Demonstration
	support. The SKA1_Mid		Baseline design	
	central beam-former shall be		section 5 bullet 6	
	able to form beams or more			
	beams for one to sixteen sub-			
	arrays independently and			
	concurrently.			

4.3.5.2 Pulsar search and timing within sub-arrays

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2751	Pulsar search and timing	Accepted	Baseline design	Demonstration
	within sub-arrays. SKA1_Mid shall be capable of Pulsar search and timing processing within individual sub-arrays.		section 5 bullet 3, section 8.6.3.1, section 8.6.3.2	

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 48 of 275

2015-04-23 Date:

4.3.5.3 Pulsar search array diameter

The baseline design suggests a diameter of ~ 1000m based on the figure of merit (Ndish Adish/Ddish)² for the current baseline design configuration. The normal operation of Pulsar search will be at the array optimised figure of merit. However, allowing sub-array to optionally extend to 20km diameter allows small area observations at higher sensitivity.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2202	Pulsar search array	Accepted	Baseline Design Table	Demonstration
	diameter. The central beam-		11 Row 4	
	former for pulsar search shall			
	be capable of forming beams			
	independently across all			
	dishes (SKA1_Mid and			
	MeerKAT) within each of			
	the SKA1_Mid sub-arrays			
	up to a distance of up to			
	10,000 metres from sub-			
	array centres.			

4.3.5.4 Pulsar search beamformer centre frequency

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2755	Pulsar search beamformer	Accepted	Baseline design Table	Demonstration
	centre frequency . The		12	
	Pulsar search beamformer			
	shall form beams for each of			
	the search sub arrays with an			
	independently selectable			
	centre frequency for the sub-			
	array in the range from the			
	lowest frequency of			
	SKA1_Mid band 1 through			
	to the highest frequency of			
	band 5.			

4.3.5.5 Pulsar search beamformer bandwidth

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2756	Pulsar search	Accepted	Baseline design Table	Demonstration
	beamforming bandwidth.		13 line 12	
	The SKA1_Mid Pulsar			
	search shall have a			
	contiguous processing			
	bandwidth for beamforming			
	of up to 300 MHz.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

2015-04-23 Date:

Page 49 of 275

4.3.5.6 Number of beams: Pulsar survey

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2203	Number of beams: Pulsar	Accepted	Baseline Design Table	Demonstration
	search. SKA1_Mid, when		13 row 17	
	performing the Pulsar Search			
	function, shall			
	simultaneously form up to a			
	total of 1111 beams per			
	observation across all sub			
	arrays.			

4.3.5.7 Beam-former S/N: Pulsar survey

The signal to noise, S/N, performance includes all losses including but limited to coherence, quantisation, scalloping but not RFI

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2205	Beamformer S/N pulsar search. The SKA1_Mid central beam-forming for each sub array shall have a Signal to Noise ratio greater or equal to 98% of ideal analogue beam forming for the same sub array:	Accepted	Signal chain performance document in preparation	Analysis

4.3.5.8 Pulsar search beamformer output

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2753	Pulsar search beamformer	Accepted	Baseline design Table	Demonstration
	output. For each SKA1_Mid		13 row 18	
	Pulsar search sub-array the			
	output shall be the power of			
	summed polarisation beams.			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 50 of 275

4.3.5.9 Pulsar search beamformer output frequency resolution

Pulsar search beamformer output frequency resolution. The frequency resolution for each Pulsar search sub-array shall be independently configurable in frequency resolution with values in the range of 20kHz to 75kHz

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2752	Pulsar search	Accepted	Baseline design Table	Demonstration
	beamforming output		13 row 13, Table 12	
	frequency resolution. The		column 7	
	frequency resolution for			
	SKA1_Mid Pulsar search			
	shall be independently			
	configurable in frequency			
	resolution with values in the			
	20 kHz and 75 kHz			

4.3.5.10 Pulsar search beamformer output time resolution

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2754	Pulsar search	Accepted	Baseline design Table	Demonstration
	beamforming output time		11 Row 4	
	resolution: SKA1_Mid			
	Pulsar search output beams			
	shall have a minimum time			
	resolution of 50us.			

4.3.5.11 Pulsar timing array diameter

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2206	Pulsar timing array radius.	Accepted	Baseline Design Table	Demonstration
	The central beam-former for		11 Row 4	
	pulsar timing shall be			
	capable of forming beams			
	across all dishes within the			
	SKA1_Mid sub-arrays to a			
	distance of up to 10,000			
	metres from their centres.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

2015-04-23 Date:

4.3.5.12 Pulsar timing beamformer centre frequency

This requirement supports the baseline design timing scenario but has been expressed in a form that isn't scenario specific which provisionally includes all available SKA1_mid frequency bands.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2757	Pulsar timing beamformer	Accepted	Baseline design Table	Demonstration
	centre frequency. The		8 rows 15 through 35	
	Pulsar timing beamformer			
	shall form beams for each of			
	the timing sub-arrays with a			
	selectable centre frequency			
	for the sub-array in the range			
	from the lowest frequency of			
	SKA1_Mid band 1 through			
	to the highest frequency of			
	band 5.			

4.3.5.13 Pulsar timing beamformer bandwidth

This requirement supports the baseline design timing scenario but has been expressed in a form that isn't scenario specific which provisionally includes all available SKA1_mid frequency bands.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2758	Pulsar timing beamformer bandwidth. The SKA1_Mid Pulsar timing beamformer for each timing sub-array shall have a contiguous processing	Accepted	Baseline design Table 8 rows 16 through 35, Table 14 rows 11 through 15	Test
	bandwidth up to the full bandwidth of the selected band up to a bandwidth of 2.5 GHz.			

4.3.5.14 Number of beams: Pulsar timing

The maximum number of simultaneous beams has been increased from "up to 10" in the baseline design to "up to 16" to support simultaneous Pulsar timing in each of up to 16 sub arrays

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2207	Number of beams: Pulsar	Accepted	Baseline Design Table	Demonstration
	timing. The SKA1_Mid		14 Row 17, section 5	
	central beam-former for		bullet point 6.	
	Pulsar timing shall be		·	
	capable of forming up to 16			
	dual polarisation coherent			
	beams in total across all			
	timing sub-arrays.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 52 of 275

4.3.5.15 Beamformer S/N performance: Pulsar timing

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2208	Beamforming S/N ratio: Pulsar timing. The SKA1_Mid for Pulsar timing shall have a Signal to Noise ratio greater or equal to 98% of an ideal analogue beam former.	·	Signal chain performance document in preparation	Analysis

4.3.5.16 SKA1_mid VLBI

The VLBI community indicate there should be at least 4 beams generated for VLBI usage: one for target and three for calibrators to establish calibration plane.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2689	SKA1_Mid VLBI beam number. SKA1_Mid shall be capable of producing up to four VLBI beams		ConOps 8.6, Baseline design section 5 bullet 6.	Analysis

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2759	SKA1_Mid VLBI array	Accepted	Baselime Design Table	Analysis
	diameter. SKA1_Mid shall		8 row 9	
	be able to generate VLBI			
	beams from sub-arrays with			
	receptors separated by up to			
	100km.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2760	SKA1_Mid VLBI centre	Accepted	Con Ops 8.6, Baseline	Test
	frequency. SKA1_Mid shall		design Table 8 rows 17	
	be able to form a VLBI beam		to 30	
	with a 0.01MHz step			
	selectable centre frequency			
	within the boundaries of the			
	defined frequency bands for			
	SKA1_Mid.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2761	SKA1_Mid VLBI beam	Accepted	Con Ops 8.6. Baseline	Analysis
	bandwidth. SKA1_Mid		design Table 8 row 27	
	VLBI beamforming shall			
	have a contiguous processing			
	bandwidth up to the full			
	bandwidth of the selected			
	band			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 53 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2762	SKA1_Mid VLBI	Accepted	Signal chain	Test
	beamformer S/N		performance	
	performance . SKA1_Mid		document to be issued	
	VLBI beamforming shall			
	have the Signal to Noise ratio			
	by more than 98% compared			
	to an ideal analogue beam			
	former.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2847	SKA1_Mid VLBI store the	Accepted	Baseline Design	Test
	time-dependent antenna			
	weights. SKA1_Mid shall be			
	able to store the time-			
	dependent antenna weights			
	used for each tied-array beam			
	sum			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2848	SKA1_Mid VLBI	Accepted	Baseline Design	Test
	timestamp accuracy.			
	SKA1_Mid shall be able to			
	generate data from the VLBI			
	beams with samples traceable			
	to a timestamp with an			
	accuracy of 1 nsec or better.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2849	SKA1_Mid VLBI beams	Accepted	Baseline Design	Test
	sampling rate. SKA1_Mid			
	shall be able to output VLBI			
	beams with a sampling rate			
	selectable between Nyquist			
	and oversampled rates for the			
	selected bandwidth.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2850	SKA1_Mid VLBI	Accepted	Baseline Design	Test
	beamforming . SKA1_Mid			
	shall be able to allocate			
	antennas to be included in, or			
	excluded from, individual			
	tied-array beams.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 54 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2851	SKA1_Mid VLBI relative	Accepted	Baseline Design	Test
	sensitivity and coherence			
	losses. The SKA1_Mid			
	beamformer shall be able to			
	weight the antenna inputs into			
	the tied-array sums based on			
	relative sensitivity and			
	coherence losses.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2852	SKA1_Mid VLBI configurability. SKA1_Mid shall be able to change the pointing, centre frequency, and bandwidth of the individual tied-array beams within a single observing schedule.	Accepted	Baseline Design	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2853	SKA1_Mid VLBI	Accepted	Baseline Design	Test
	configurability. SKA1_Mid			
	shall be capable of selecting,			
	through configuration, 1, 2, 3,			
	or 4 separate VLBI specific			
	beams, each with			
	independently selectable			
	centre frequency, bandwidth,			
	frequency resolution and			
	pointing.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2854	SKA1_Mid VLBI	Accepted	Baseline Design	Test
	configurability. SKA1_Mid			
	shall be capable of			
	reconfiguring the centre			
	frequency, frequency band,			
	and bandwidth for each tied-			
	array beam, in less than 30			
	seconds.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2855	SKA1_Mid VLBI spectral	Accepted	Baseline Design	Test
	resolution. SKA1_Mid shall			
	be able to generate VLBI			
	beams with a spectral			
	resolutions different from the			
	spectral resolution used for			
	imaging within the same			
	VLBI sub-array			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 55 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2856	SKA1_Mid VLBI channel	Accepted	Baseline Design	Test
	width. SKA1_Mid shall be			
	able to generate VLBI beam			
	data with a selectable channel			
	width of: 512MHz, 256 MHz,			
	128MHz, 64MHz, 32MHz,			
	16MHz, 4MHz or 1MHz.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2857	SKA1_Mid VLBI imaging	Accepted	Baseline Design	Test
	and beamforming			
	SKA1_Mid shall be able to			
	simultaneously generate			
	imaging data using all			
	antennas in a VLBI sub-			
	array, as well as generating			
	the VLBI beams.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2859	SKA1_Mid VLBI spectral	Accepted	Baseline Design	Demonstration
	line and time domain			
	observation SKA1_Mid			
	shall be able to generate			
	VLBI beams optimised for			
	either spectral line			
	observations (to mitigate			
	spectral leakage) or time			
	domain observations (to			
	mitigate time smearing)			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2860	SKA1_Mid VLBI beams	Accepted	Baseline Design	Test
	and sub-arrays. SKA1_Mid			
	shall be able to allocate			
	individual VLBI beams to			
	different sub-arrays.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2861	SKA1_Mid VLBI array	Accepted	Baseline Design	Demonstration
	diameter. SKA1_Mid shall			
	be able to generate VLBI			
	beams from sub-arrays with			
	receptors separated by up to			
	20km.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 56 of 275

4.3.6 SKA1_Mid Pulsar Search

4.3.6.1 Pulsar search sub-array support

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2765	Pulsar search sub-array	Accepted	SYS_REQ-2127,	Demonstration
	support. The SKA1_Mid		Baseline design	
	Pulsar search shall be able to		section 5	
	independently process a total			
	of up to 1111 beams from			
	one to sixteen sub-arrays			
	independently and			
	concurrently.			

4.3.6.2 Pulsar search processing bandwidth

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2767	Pulsar search processing bandwidth. The Pulsar search processing shall have a contiguous processing	Accepted	Baseline design section 5 bullet 6, section 8.6.3.1 para 3.	Test
	bandwidth up to 300 MHz for each search sub array.			

4.3.6.3 Dispersion measure

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2212	Dispersion Measure.	Accepted	Baseline Design Table	Demonstration
	SKA1_Mid for pulsar search		12 Row 2	
	shall provide, for each sub			
	array, trial dispersion			
	corrections across the			
	observation frequency range			
	for dispersion measures from			
	0 up to 3000 pc cm ⁻³ .			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23

4.3.6.4 Time resolution

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2216	Time resolution. The time resolution of the SKA1_Mid pulsar search processing for each sub-array shall be equivalent to the temporal smearing due to dispersion at the observation frequency and bandwidth of the observation with a quantisation of value in		Parent Requirement Baseline Design Table 13 Row 9	Verification Analysis
	powers of 2 from 50 μs to 800 us			

4.3.6.5 Pulsar search observation time

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2218	Pulsar search observation	Accepted	Baseline Design Table	Demonstration
	time. For each Pulsar search		13 Row 6	
	sub-array, the processing			
	shall provide independently			
	configurable observation			
	times up to 1800 seconds			
	duration.			

4.3.6.6 Single pulse searches

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2219	Single pulse searches. For each search sub-array within SKA1_Mid Pulsar search, the processing shall be capable of searching for single dispersed pulses over dispersion measure range up to 3000 pc cm ⁻³ commensally with searches for periodic pulses with a S/N performance better than 7	·	Baseline Design 1.3.2 para 4, section 2.2 para 1, section 2.2 para 6, Table 12 row 2 column 2.	Analysis

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 58 of 275

4.3.6.7 Binary search

The baseline design identifies the number of trial accelerations up to 120 in the representative sizing of Appendix B. The requirement states 350 trial accelerations based on known systems presented at the Pulsar science workshop.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2220	Binary search. For each	Accepted	Baseline design Table	Analysis
	Pulsar search sub-array		24 line 35	
	within SKA1_Mid the			
	processing shall be capable of			
	searching for binary systems			
	with accelerations due to their			
	orbital motion of up to 350			
	ms ⁻² .			

4.3.7 SKA1_Mid Pulsar Timing

4.3.7.1 Pulsar timing sub-array support

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2763	Pulsar timing sub-array	Accepted	Baseline design	Demonstration
	support. The SKA1_Mid		section 5 bullet 8	
	Pulsar timing processing			
	shall be able to			
	independently process a total			
	of up to 16 beams from one			
	to sixteen sub-arrays			
	independently and			
	concurrently.			

4.3.7.2 Pulsar timing processing bandwidth

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2768	Pulsar timing processing	Accepted	Baseline design Table 8	Test
	bandwidth. The Pulsar		row 27	
	timing engine shall have a			
	contiguous processing			
	bandwidth up to the full			
	bandwidth of the selected			
	band up to a bandwidth of 2.5			
	GHz for each timing sub-			
	array			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 59 of 275

2015-04-23 Date:

4.3.7.3 Frequency agility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing sub-array, be able to change from observing in any frequency band, to observing in any other frequency band in less	Accepted	Baseline design section 8.4.2 third para main bullet point 9	Demonstration
	than or equal to 30 seconds.			

4.3.7.4 Pulsar timing observation time

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2766	Pulsar timing observation	Accepted	Baseline design Table	Demonstration
	time. The observation period		14 rows 6, 7, 9 and 10	
	for each observation for each			
	timing sub-array shall be			
	independently configurable			
	between 3 minutes and 300			
	minutes.			

4.3.7.5 Time stamping

Time stamping is required to facilitate multiple temporally separate timings over a period of up to 10 years.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2764	individual Pulsar timing	Accepted	Baseline design Table 14 row 16, section	Demonstration
	observation within a sub- array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of the SKA1_Mid		11.1 para 5, REQ_2274	
	array.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23

4.3.7.6 Multiple simultaneous timings

The number of simultaneous timings is 16 as opposed to 10 given in table 14 of the baseline design. This is to facilitate timing in up to 16 sub-arrays.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2230	Multiple timings. The SKA	Accepted	Baseline design	Demonstration
	Phase 1 shall be capable of		section 5 bullet 6,	
	timing up to 16 pulsars simultaneously in total		Table 14 row 18.	
	across all timing sub arrays .			

4.3.7.7 Dispersion Measure

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2231	Pulsar timing Dispersion	Accepted	Baseline Design Table	Analysis
	Measure. The SKA1_Mid		14 Row 20	
	shall be capable of timing			
	pulsars with dispersion			
	measures between 0 to 3000			
	pc cm ⁻³ such that residual			
	dispersive smearing is less			
	than 500 ns.			

Observing 5

5.1 Operational Modes

5.1.1 Normal observing

5.1.1.1 Continuum and Spectral Imaging Mode

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2128	Continuum and spectral	Accepted	ConOps[2]	Demonstration
	line imaging mode. Both			
	SKA1 telescopes shall be			
	capable of operating in a			
	Continuum and Spectral-line			
	imaging mode concurrently.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner 2015-04-23 Date: Page 61 of 275

5.1.1.2 Pulsar Search Mode

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2129	Pulsar Search Mode. The	Accepted	ConOps[2]	Demonstration
	SKA1_mid telescope shall			
	be capable of operating in a			
	Pulsar search mode,			
	concurrently with			
	Continuum imaging mode.			

5.1.1.3 Pulsar Timing Mode

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2130	Pulsar Timing Mode. The	Accepted	ConOps[2]	Demonstration
	SKA1_mid telescope shall			
	be capable of operating in a			
	Pulsar timing mode,			
	concurrently with continuum			
	imaging mode.			

5.1.1.4 Simultaneous operation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2126	Simultaneous operation of	Accepted	BD section 5	Demonstration
	telescopes. Both SKA1			
	telescopes shall be capable			
	of operating concurrently			
	and independently.			

5.1.1.5 Mode transition

Requirement will enable the ability of the system to observe targets of opportunity.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2133	Mode transition. The	Accepted	Operations	Test
	switching time between		Requirements	
	telescope operating modes		document	
	shall take less than 30			
	seconds (not including			
	antenna slewing time)			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 62 of 275

5.1.2 Observations on a fixed schedule

5.1.2.1 Specific epoch observations

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2681	Specific epoch	Accepted	Concept of operations	Demonstration
	observations. The		section 8.2	
	observatory shall have the			
	capability of scheduling			
	observations at a specific			
	epoch for time dependent			
	phenomena.			

5.1.3 Time-critical overrides

5.1.3.1 Overriding normal processes

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2682	Overriding normal	Accepted	Concept of operations	Inspection
	processes. There shall be a		section 8.3	
	mechanism for requesting			
	observing time outside the			
	normal observing time			
	allocation process for			
	unpredicted phenomena or in			
	cases of high current			
	scientific interest.			

5.1.3.2 Overriding allocated time

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2683	Overriding allocated time.	Accepted	Concept of operations	Inspection
	The Director-General or		section 8.3	
	his/her delegate shall have the			
	power to override allocation			
	of time to other projects.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Date: Page 63 of 275

2015-04-23

5.1.4 Commensal observing

5.1.4.1 Data access rights

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2688	Data access rights. There shall be a documented data	•	Concept of operations section 8.5	Inspection
	access rights policy for commensal observing for data sets shared across projects.			

5.1.5 Sub arrays

5.1.5.1 Sub arraying

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2127	Sub-Arraying. Both of the SKA1 telescopes shall be capable of operating independently with one to		· ·	Demonstration
	sixteen sub-arrays (i.e. collecting area is split and allocated to separate, concurrently observing programmes).			

5.2 Telescope Manager

5.2.1 General

5.2.1.1 Authentication and Authorisation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2736	Authentication and	Accepted	ConOps 4.6	Demonstration
	Authorisation . All SKA			
	users shall require to be			
	registered and authenticated			
	for the purposes of proposal			
	and project submission.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 64 of 275

Date: 2015-04-23

5.2.1.2 Scheduled Maintenance Logs

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2278	Scheduled maintenance	Accepted	Operational	Demonstration
	logs. A maintenance		Concepts[3]	
	database shall be established			
	that logs all the scheduled			
	maintenance and unexpected			
	repairs.			

5.2.1.3 System error logs

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2279	System error logs. A failure	Accepted	Operational	Demonstration
	database shall be established,		Concepts[3]	
	which logs the errors of the			
	system and its subsystems,			
	including the corrective			
	actions taken.			

5.2.1.4 System status

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2280	System status. The system shall extract information about the current condition of the system from the science and calibration data streams, and log this information along with other relevant system and environmental status information. Based on this information, it shall be possible to monitor, save,	Accepted	Parent Requirement ConOps 5.2	Verification Demonstration
	and analyse the technical performance of the system.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 65 of 275

5.2.1.5 Central location for data bases

The telescope must control the information used by Elements.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2282	Central location for data	Accepted	ConOps 5.2	Demonstration
	bases. External sources of			
	information used by the			
	Elements shall be cached by			
	Telescope Manager. No			
	sources other than those			
	cached by TM shall be used.			

5.2.1.6 Target of opportunity

Certain classes of astronomical transient events occur at frequent and unpredictable intervals (e.g. gamma ray bursts). Principal Investigators wishing to study such events as a class are required to submit proposals at the time of regular proposal submission. Such an object is designated as a Target of Opportunity. In circumstances meeting the proposed conditions, observations of the TOO will be triggered.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2283	Target of opportunity. TOO observing shall be via Scheduling Blocks.	Accepted	ConOps 4.2	Test

5.2.1.7 Latency of TOO scheduling block initiation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2285	Latency of TOO scheduling	Accepted	SKA-SYS_REQ-2283	Test
	block initiation . Scheduling	-	_	
	intervention on TOO triggers			
	shall be initiated within 1s of			
	receiving the trigger.			

5.2.1.8 Discard previous scheduling block.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2286	Discard previous	Accepted	ConOps 4.3	Test
	scheduling block. At the			
	launching of a TOO			
	Scheduling Block, the results			
	from any active Scheduling			
	Blocks shall be discarded.			

FOR PROJECT USE ONLY Document No.: SKA-TEL-SKO-0000008 Revision: Author: W Turner Page 66 of 275

2015-04-23 Date:

5.2.2 Proposal submission

5.2.2.1 Proposal submission

ID	Requirement		Status	Parent Requirement	Verification
SYS_REQ-2289	Proposal	submission.	Accepted	ConOps 4.1	Inspection
	Program	submission,			
	assessment, a	and time			
	allocation shall	governed by			
	an official policy	document			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2723	Proposal submission tool.	Accepted	ConOps 4.1	Test
	There shall be a tool to			
	facilitate the assessment,			
	review and ranking of			
	proposals, guided by official			
	SKA Policies.			

5.2.3 Tool for proposal submission

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2647	Tool for proposal	Accepted	SKA1-SYS-REQ-2647	Test
	submission. There shall be a			
	tool, either web or client, for			
	the construction and			
	submission of proposals, as			
	necessary facilitating access			
	to relevant sources of			
	information such as			
	Telescope characteristics,			
	previous observations,			
	SIMBAD, templates.			

5.2.4 Telescope Scheduling

Scheduling Blocks are the indivisible executable units of a project and contain all the information necessary to execute a single observation, including configuration, and scripts to be executed.

5.2.4.1 Pre and post conditions

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2290	Pre and post conditions. Scheduling Blocks shall have computable pre- and post-conditions.	•	SYS_REQ-2290	Demonstration

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 67 of 275

5.2.4.2 Semester Queue (of duration related to the proposal cycle)

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2291	Semester queue. A	Accepted	ConOps 4.2	Demonstration
	Semester Queue (SQ) shall			
	be constructed by Operations			
	following acceptance of			
	proposals.			

5.2.4.3 Operations responsible for Short Term Schedule

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2292	Operations: Operations shall be responsible for constructing an executable schedule and Scheduling Blocks and submitting for execution.	Accepted	ConOps 4.1	Inspection

5.2.4.4 Short term schedule construction tool

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2293	Short term schedule	Accepted	ConOps 4.2	Demonstration
	construction tool. There			
	shall be an interactive tool to			
	aid the proposer in			
	constructing Scheduling			
	Blocks and an executable			
	schedule.			

5.2.4.5 API for construction of schedule

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2646	API for construction of	Accepted	ConOps 4.2	Test
	schedule. There shall be a			
	API or APIs for the			
	construction of scheduling			
	blocks from Python and Java.			

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 68 of 275

5.2.4.6 Simulated execution of scheduling blocks.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2294	Simulated execution of	Accepted	ConOps 4.2	Demonstration
	scheduling blocks. The			
	scheduling tool shall offer			
	the option to simulate			
	execution of Scheduling			
	Blocks in order to verify			
	correctness and scientific			
	performance at some limited			
	level of accuracy.			

5.2.4.7 Operator control

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2735	Operator control. It shall be possible for the operator to take manual control of the telescope.		Operational Concepts[3]	Test

5.2.5 Response to internal detections of transients

5.2.5.1 Response policy

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2295	Response policy. The nature	Accepted	ConOps 8.3	Inspection
	of the response to a transient			
	event shall be controlled by			
	policy administered by			
	Telescope Manager.			

5.2.5.2 Responses to transients

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2296	Responses to transients	Accepted	ConOps 8.3	Demonstration
	Responses shall be one of the			
	following (a) invoking a			
	special mode on the			
	telescope of origin, (b)			
	issuing an VOEvent, (c)			
	issuing a TOO			
	announcement to SKA			
	Telescopes, (d) no action.			

Document No.: SKA-TEL-SKO-0000008

Revision: Author: W Turner 2015-04-23 Page 69 of 275 Date:

FOR PROJECT USE ONLY

5.2.5.3 Observing mode latency

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2297	Observing mode latency	Accepted	ConOps 8.3	Demonstrate
	The maximum allowed			
	latency between event and			
	detection shall be allowed to			
	be Observing Mode			
	dependent.			

5.2.5.4 Rules for issuing VOEvents.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2298	Rules for issuing	Accepted	ConOps 8.3	Demonstration
	VOEvents Proposals to			
	search for transients shall			
	include rules for issuing			
	VOEvents.			

5.2.5.5 Latency of initiating response

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2299	Latency of initiating a	Accepted	ConOps 8.3	Test
	response. Response to an			
	event shall be initiated within			
	1 second of notification.			

5.2.6 Response to external detections of transients

5.2.6.1 TOO VOStreams

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2300	TOO VOStreams. TOO proposals shall include specified VOEvent streams to be monitored.	Accepted	ConOps 8.3	Test

5.2.6.2 VOEvent issue latency

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2301	VOEvent issue latency. A	Accepted	ConOps 8.3	Test
	qualifying VOEvent shall			
	lead to initiation of a response			
	by the Telescope Manager			
	within 1 second.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 70 of 275

5.2.7 Telescope model

The telescope model is shared across the entire Telescope. It describes the telescope via:

- Structural and behavioural models
- Specific equations, such as geodetic, geometric, antennas, pointing
- Configuration parameters such as frequency setups, pointing, sky direction,
- Labelling information such as names and ids

5.2.7.1 Telescope Model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2645	Telescope model. A	Accepted	ConOps 5.2	Demonstration
	dynamic computational			
	model of the Telescope shall			
	be used to answer all queries			
	about the state of the			
	Telescope. The telescope			
	model shall consist of			
	configuration information,			
	numerical models, empirical			
	parameters, and conventions.			

5.2.7.2 Single geodetic model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2302	Single geodetic model	Accepted	SYS_REQ-2645	Demonstration
	(Telescopes). There shall be			
	a single geodetic model for			
	all telescopes, published as			
	part of the Telescope Model.			

5.2.7.3 Single geometric model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2303	Single geometric model. There shall be a single geometric model for all receptor types, published by	·	•	Demonstration
	TM.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 71 of 275

5.2.7.4 Dish pointing model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2304	Dish pointing model. The	Accepted	SYS_REQ-2321	Demonstration
	dish receptor system shall			
	include a model for pointing			
	including structural model,			
	thermal model, reference			
	pointing model, and			
	refraction model, published			
	by TM.			

5.2.7.5 AA element and station beam model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2305	AA element and station	Accepted	SYS_REQ-2321	Demonstration
	beam model. The AA			
	receptor system shall include			
	a model for element and			
	station beams as a function			
	of azimuth and zenith angle,			
	frequency, and polarisation,			
	published by TM.			

5.2.8 Forensic analysis of telescope behaviour

5.2.8.1 Forensic tool for telescope behaviour

This will draw upon the monitor data archive, the System Configuration database, Alarm Log, Calibration data, and other related sources of information.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2306	Forensic tool for telescope	Accepted	ConOps 5.1	Demonstration
	behaviour There shall be an			
	interactive forensic tool for			
	evaluating and			
	understanding the state and			
	behaviour of the system at			
	any one time.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 72 of 275

2015-04-23 Date:

5.2.8.2 Interfaces

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2307	Interfaces. The interactive	Accepted	SYS_REQ_2306	Demonstration
	forensic tool shall have an			
	Internet interface with			
	availability on a range of			
	platforms including desktop			
	and mobile devices.			

5.2.8.3 Replay of sequences

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2308	Replay of sequences. The interactive forensic tool shall allow replay of selected sequences.	·	SYS_REQ_2306	Demonstration

5.2.9 Alarms

5.2.9.1 Active alarms

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2309	Active alarms. Alarm	Accepted	SYS_REQ_2306	Demonstration
	notification shall be active			
	(via SMS, email, etc.) rather			
	than passive (requiring an			
	Operator query)			

5.2.9.2 Alarm filtering

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2310	Alarm filtering . It shall be possible to filter alarms individually or by group.	Accepted	Operational Concepts[3]	Demonstration

5.2.9.3 Alarm latency

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2312	Alarm latency. Latency from	Accepted	Operational	Test
	event to alarm shall be no		Concepts[3]	
	more than 5 seconds.			

Document No.: SKA-TEL-SKO-000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 73 of 275

5.2.10 Data bases

5.2.10.1 Access to historical data

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2313	Access to historical data.	Accepted	ConOps 5.2	Demonstration
	All current and historic Site			
	monitor data shall be as			
	examinable as that from any			
	telescope component.			

5.2.10.2 Total Electron Content

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2314	Total electron content. The	Accepted	SYS_REQ-2645	Inspection
	SKA Phase 1 TM shall			
	retrieve, persist and publish			
	data on Total Electron			
	Content (TEC) from dual			
	frequency GPS as part of the			
	Telescope Model.			

5.2.10.3 Ionospheric Activity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2315	Ionospheric activity. There	Accepted	SYS_REQ-2645	Demonstration
	shall be timely access to			
	information from other			
	relevant sources e.g. IPS			
	concerning unusual			
	ionospheric activity or alerts.			

5.2.10.4 Weather Station

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2316	Weather station . There	Accepted	SYS_REQ-2645	Demonstration
	shall be a data base for site			
	weather station data.			

5.2.10.5 Satellites

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2317	Satellites. There shall be a	Accepted	SYS_REQ-2645	Demonstration
	database of relevant satellite			
	trajectories, including orbit			

Document No.: SKA-TEL-SKO-0000008

Revision:

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 74 of 275

information,	emission		
characteristi	es and owner.		

5.2.10.6 Commercial flights

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2318	Commercial flights. There shall be a data base of commercial flights in the neighbourhood of the site.	·	SYS_REQ-2645	Demonstration

5.2.10.7 RFI

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2734	RFI database. There shall	Accepted	ConOps 4.3	Demonstration
	be a database holding			
	information about RFI.			

5.3 Science Data processor

5.3.1 Calibration and imaging formalism

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2729	Calibration and imaging	Accepted	Reference [1]	Demonstration
	formalism. The Calibration			
	and Imaging formalism shall			
	be based upon the Rau			
	framework [14].			

5.3.2 Calibration model

5.3.2.1 Closed loop calibration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2319	Closed loop calibration. The telescope calibration shall be solved by comparison of observed with GSM predictions with a time	Accepted	ConOps 4.3	Demonstration
	scale appropriate to the component and physical effect being calibrated and fed back to the telescope.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 75 of 275

5.3.3 Imaging model

5.3.3.1 Global Sky Model

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2322	Global sky model.	Accepted	ConOps 9.8	Demonstration
	Calibration and continuum			
	subtraction shall use a Local			
	Sky Model, derived from a			
	Global Sky Model or			
	previous Local Sky Model.			

5.3.3.2 Multi-frequency synthesis imaging

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2324	Multi-frequency synthesis	Accepted	Reference [2]	Demonstration
	imaging. All imaging shall			
	construct and make use of			
	frequency dependent image			
	models over the entire			
	observed bandwidth.			

5.3.3.3 Deconvolution of single channels

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2325	Deconvolution of single	Accepted	Reference [1]	Demonstration
	channels Scale sensitive			
	two-dimensional (i.e. on the			
	tangent plane) deconvolution			
	shall be available.			

5.3.3.4 Solution for pointing errors

Pointing self-calibration has been demonstrated on EVLA data.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2328	Solution for pointing	Accepted	Reference [1]	Demonstration
	errors. It shall be possible to			
	solve for and correct time-			
	and station-dependent			
	pointing errors with			
	accuracy and timescale			
	limited by signal to noise			
	ratio.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 76 of 275

5.3.3.5 Peeling

Peeling is defined as the solution for and subtraction of both source model and calibration parameters for a relatively compact source.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2330	Peeling. Peeling of bright	•	ConOps 9.8	Demonstration
	sources (strength limited by			
	signal to noise ratio) from			
	the visibility data shall be			
	possible.			

5.3.4 Direction dependent effects

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2321	Direction dependent	Accepted	Baseline Design 8.7	Demonstration
	effects. Self-calibration and			
	image reconstruction			
	algorithms shall be capable			
	of dealing with direction			
	dependent effects.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2724	Aperture Array DDE . There	Accepted	SYS_REQ-2321	Test
	shall be a direction dependent			
	model for the aperture array			
	primary beam to be used in			
	calibration and imaging.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2727	Dish DDE. There shall be a direction dependent model for the dish primary beam to be used in calibration and imaging.	Accepted	SYS_REQ-2321	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2725	Faraday rotation DDE.	Accepted	SYS_REQ-2321	Test
	There shall be a direction			
	dependent Faraday Rotation			
	model for use in calibration			
	and imaging.			

Document No.: SKA-TEL-SKO-000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 77 of 275

5.3.5 Image processing model

5.3.5.1 Continuum source finding

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2333	Continuum source finding. Where appropriate, continuum source finding shall be conducted on images generated by the Continuum	Accepted	ConOps 4.3	Test
	Imaging pipeline. Polarization shall be fitted if available.			

5.3.5.2 Spectral line source finding

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2334	Spectral line source finding.	Accepted	ConOps 4.3	Test
	Where appropriate, spectral			
	line source finding shall be			
	conducted on image cube			
	generated by the Spectral			
	Line pipeline.			

5.3.5.3 Stacking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2335	Stacking. Where appropriate, spectral line stacking shall be conducted on image cubes generated by the pipelines using <i>a priori</i> known source lists.	Accepted	ConOps 4.3	Test

5.3.6 Pipelines

5.3.6.1 Standard pipeline products

ID)	Requirement	Status	Parent Requirement	Verification
SY	'S_REQ-2336	Standard pipeline products.	Accepted	ConOps 4.5	Test
		All pipelines shall include as			
		data products the pipeline			
		processing log, and Quality			
		Assessment log.			

Document No.: SKA-TEL-SKO-0000008

Revision:

Author: W Turner Page 78 of 275 2015-04-23 Date:

FOR PROJECT USE ONLY

5.3.6.2 Calibration pipeline

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2338	Calibration pipeline. There	Accepted	ConOps 4.4	Test
	shall be a Calibration pipeline			
	that derives current telescope			
	parameters using a recent			
	observation and a Global Sky			
	Model, either a known GSM			
	or the most recent GSM.			

5.3.6.3 Continuum imaging pipeline

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2339	Continuum imaging	Accepted	SYS_REQ-2128	Test
	pipeline. There shall be a			
	Continuum Imaging pipeline			
	that shall have the goal of			
	constructing noise-limited			
	wide-band images for			
	observations up to 1000h			
	integration time. Polarisation			
	shall be available if requested			
	or necessary for calibration or			
	quality assurance.			

5.3.6.4 Continuum imaging data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2340	Continuum imaging data	Accepted	SYS_REQ-2128	Test
	products. The Data Products			
	shall include the first n			
	moment images for multi-			
	frequency synthesis,			
	corresponding residual			
	images (if deconvolved),			
	sensitivity image and			
	representative PSF image,			
	where n is set by signal to			
	noise ratio.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 79 of 275

5.3.6.5 Spectral line emission pipeline

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2341	Spectral line emission	Accepted	SYS_REQ-2128	Test
	pipeline. There shall be a			
	Spectral Line Emission			
	pipeline that is optimised for			
	constructing noise-limited			
	(up to 1000h integration)			
	channel cubes of spectral line			
	emission either with			
	continuum emission			
	remaining or with continuum			
	emission removed.			

5.3.6.6 Spectral line emission data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2342	Spectral line emission data	Accepted	SYS_REQ-2128	Test
	products. The data products			
	shall include spectral line			
	cube image, continuum			
	model images, sensitivity			
	image, and representative			
	point spread function.			

5.3.6.7 Spectral line absorption pipeline

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2343	Spectral line absorption pipeline. There shall be a Spectral Line Absorption pipeline that is optimised for constructing noise-limited channel cubes of spectral line absorption with continuum	Accepted	SYS_REQ-2128	Test
	sources removed.			

Document No.: SKA-TEL-SKO-0000008

Date:

Revision: Author: W Turner 2015-04-23 Page 80 of 275

FOR PROJECT USE ONLY

5.3.6.8 Spectral line absorption data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2344	Spectral line absorption	Accepted	SYS_REQ-2128	Test
	data products. The data			
	products shall include			
	spectral line cube image,			
	continuum model images,			
	sensitivity image, and			
	representative point spread			
	function.			

5.3.6.9 Slow transient pipeline

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2345	Slow transient pipeline.	Accepted	SYS_REQ-2131	Test
	There shall be a Slow			
	Transient imaging pipeline			
	that shall be capable of			
	constructing a continuum			
	image after a GSM has been			
	subtracted for every			
	correlator integration time or			
	slower, searching for			
	transient sources, and			
	producing a time-ordered			
	catalogue.			

5.3.6.10 Slow transient data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2346	Slow transient data	Accepted	SYS_REQ-2131	Test
	products. The data products			
	shall include a catalogue of			
	found sources, a sensitivity			
	image, and representative			
	PSF image.			

Document No.: SKA-TEL-SKO-000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 81 of 275

5.3.6.11 Automated Quality Assessment

SYS_REQ-2347 Automated Quality Assessment. All pipelines shall perform standardised, automated Quality Assessment of Images along the axes of astrometry, photometry, radiometry	ID	Requirement	Status	Parent Requirement	Verification
polarimetry, and spectrometry.	SYS_REQ-2347	Automated Assessment. All pipelines shall perform standardised, automated Quality Assessment of Images along the axes of astrometry, photometry, polarimetry, and			Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2742	Performance assessment: Performance assessment shall be based on multi-valued functions of an observed	Accepted	ConOps Section 2.1	Test
	Image and optionally a template Image.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2743	Performance Goals: Performance goals shall be based on multi-valued functions of an observed Image and optionally a	Accepted	ConOps Section 2.1	Test
	template Image.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2744	Quality assessment: Quality assessment shall be based on the comparison of a Performance Assessment and a Performance Goal.	Accepted	ConOps Section 2.1	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2745	Astrometric performance	Accepted	ConOps Section 2.1	Test
	metric: The Astrometric	-		
	performance metric (APM)			
	shall measure deviation (rms,			
	average offset, and med) of			
	source positions from known			
	standards.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 82 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2746	Photometric performance	Accepted	ConOps Section 2.1	Test
	metric: The Photometric	-		
	performance metric (PPM)			
	shall measure deviation (rms,			
	average offset, and med) of			
	source fluxes from known			
	standards.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2747	Radiometric performance	Accepted	ConOps Section 2.1	Test
	metric: The Radiometric			
	performance metric (RPM)			
	shall measure noise			
	fluctuations (rms, average			
	offset, and med) in an Image.			

SYS_REQ-2748 Polarimetric performance metric: The Polarimetric performance metric (OPM) shall measure deviation (rms,	ID	Requirement	Status	Parent Requirement	Verification
average offset, and med) of source polarisations (polarisation degree and angle) from known standards.	SYS_REQ-2748	Polarimetric performance metric: The Polarimetric performance metric (OPM) shall measure deviation (rms, average offset, and med) of source polarisations (polarisation degree and		•	+

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2749	Spectrometric performance	Accepted	ConOps Section 2.1	Test
	metric: The Spectrometric			
	performance metric (SPM)			
	shall measure deviation (rms,			
	average offset, and med) of			
	source spectral lines from			
	known standards.			

5.3.7 Data Products

5.3.7.1 Archive

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2821	Archive. There shall be an	Accepted	ConOps	Demonstration
	archive for each telescope,			
	located in the Science			
	Processing Centre, for			
	storing selected science data			
	products for subsequent			
	access by users according to			
	science data access policy.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 83 of 275

5.3.7.2 Role of science processing centres

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2348	Role of science processing	Accepted	ConOps 4	Test
	centres. The science-			
	processing centre will			
	convert the output data from			
	the CSP into science data			
	products to be stored in the			
	science data archive.			

5.3.7.3 Mirror sites

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2350	Mirror sites. All data within	Accepted	ConOps 4.5	Test
	Science Archives shall have a			
	secondary copy located			
	offsite in a secure location.			

5.3.7.4 Web interface

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2352	Web interface. The science data archives shall be accessible from the internet via a standardised web	Accepted	ConOps 4.5	Demonstration
	interface.			

5.3.7.5 VO interface

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2353	Virtual Observatory	Accepted	ConOps 4.5	Test
	interface. The science data			
	archives shall be accessible			
	via a set of recommended			
	IVOA services chosen to			
	allow access to all approved			
	data products.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 84 of 275

5.3.7.6 Archive API

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2354	Archive API. The science	Accepted	ConOps 4.5	Test
	data archives shall publish a			
	user accessible, open API in a			
	small number of			
	complementary languages			
	such as Python, C++, and			
	Java.			

5.3.7.7 Data product provenance

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2355	Data product provenance.	Accepted	ConOps 4.5	Definition
	An official data product shall			
	have known, documented			
	provenance, and shall have			
	been produced via SKA			
	observations and processing.			

5.3.7.8 QA annotation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2357	QA annotation. The	Accepted	ConOps 4.6	Test
	telescope shall facilitate the			
	addition of QA annotations			
	by Users.			

5.3.7.9 Third party data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2358	Third party data products. Third party data products shall not be admitted to the archive.	·	ConOps 4.5	Inspection

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 85 of 275

5.3.7.10 Operations DP archive policy

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2360	Science data product	Accepted	ConOps 4.5	Inspection
	archive policy. There shall			
	be a policy, developed and			
	administered by Operations,			
	governing which types and			
	sizes of data products will be			
	retained in the archive and for			
	how long.			

5.3.7.11 Archive Access

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2361	Archive access. A telescope	Accepted	ConOps 4.5	Test
	archive will be nominally			
	open for access 24/7/365,			
	with no more than 24 hrs			
	planned downtime per year.			
	Unplanned downtime shall be			
	consistent with availability			
	budget.			

5.3.7.12 Archive lifetime

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2363	Archive lifetime. The	Accepted	ConOps 4.5	Inspection
	science data archives shall be			
	designed to provide an			
	archived data lifetime of not			
	less than 50 years from the			
	start of archived			
	observations.			

5.3.7.13 Data migration design

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2728	Data migration design. The	Accepted	ConOps 4.5	Demonstration
	archive design shall support			
	and facilitate migration from			
	one medium to another.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 86 of 275

5.3.7.14 Data migration plan

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2364	Data migration plan.	Accepted	ConOps 4.6	Inspection
	Operations shall maintain at			
	all times and update yearly a			
	current data migration plan			
	covering the contingency of			
	moving from one archive			
	platform to another.			

5.3.7.15 Distribution of data products

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2366	Distribution of data	Accepted	ConOps 4.5	Test
	products. As limited by			
	resource constraints, it will be			
	possible to deliver science			
	data products to approved			
	off-site facilities, which may			
	be globally distributed.			

5.3.7.16 Backup archive retrieval

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2660	Backup archive retrieval.	Accepted	ConOps 4.5	Demonstration
	Backup archive items shall			
	be retrievable to the full			
	archive from an alternate			
	source within 24 hours			

5.3.7.17 Backup archive user access conversion

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2661	Backup archive user access	Accepted	ConOps 4.5	Demonstration
_	conversion. Users shall have	-		
	access to the data of the			
	entire archive within one			
	week following an incident.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 87 of 275

5.3.7.18 Levels of access

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2739	Levels of access. Access to	Accepted	ConOps 4.6	Test
	the archive shall be either			
	anonymous with			
	correspondingly limited			
	capabilities or via SKA			
	authentication and			
	authorisation.			

5.3.8 Early Science

5.3.8.1 Processing

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2657	Processing capability. SDP	Accepted	Root	Test
	processing per telescope at			
	Early Science shall support			
	processing rates 10% of that			
	required for Full Observing			
	(decimation being in any or			
	all of time, frequency, field of			
	view)			

6 Synchronisation and Timing

6.1 Synchronisation

6.1.1 Coherence losses: 1s

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2268	·		Baseline Design addendum SKA- TEL.SKO-DD-003	Demonstration
	equivalent to 0.2 radians, within a maximum integration period of 1s.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 88 of 275

Date: 2015-04-23

6.1.2 Coherence loss: 1 min.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2692	Coherence loss 1min. The	Accepted	Baseline Design	Demonstration
	SKA frequency reference		Addendum SKA-TEL-	
	system shall provide a 2%		SKO-DD-003	
	maximum coherence loss ,			
	equivalent to 0.2 radians,			
	within a maximum solution			
	interval for in-beam			
	calibration of 1 minute.			

6.1.3 Frequency reference linear phase drift

ID	Requirement	Status	Parent Requirement		Verification
SYS_REQ-2693	Frequency reference phase	Accepted	Baseline	design	Demonstration
	drift. The SKA Frequency		addendum	SKA-	
	Reference System shall have		TEL.SKO-DD-003		
	a phase drift of less than 1				
	radian, over calibration				
	intervals of up to 10 minutes,				
	when using out of beam				
	calibration sources.				

6.1.4 Pulse per Second precision

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2269	Pulse per Second precision.	Accepted	Baseline design	Test
	The SKA synchronisation		addendum SKA-	
	and timing system shall		TEL.SKO-DD-003	
	provide a 1 pps heartbeat			
	signal, precise to the			
	sampling clock (the pulse-to-			
	pulse scatter is less than one			
	sampling time), derived from			
	the distributed frequency			
	reference.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 89 of 275

Date: 2015-04-23

6.1.5 Pulse per second phase relative to UTC

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2695	Pulse per second phase	Accepted	Baseline design	Demonstration
	relative to UTC. The SKA		addendum SKA-TEL-	
	synchronisation and timing		SKO-DD-003	
	system shall provide a 1PPS			
	heartbeat signal with phase			
	relative to UTC that over a			
	10 minute calibration			
	interval shall survive			
	synchronisation loss.			

6.2 Timing

6.2.1 UTC accuracy

ID	Requirement	Status	Parent Requirement		Verification
SYS_REQ-2274	UTC accuracy . The SKA1 timescale shall be connected to UTC with an accuracy of 10 ns, on a timescale of 10	·	Baseline addendum SKO-DD-003	design SKA-TEL-	Analysis
	years.				

6.2.2 Central frequency reference

ID	Requirement	Status	Parent Requ	irement	Verification
SYS_REQ-2275	Central frequen	cy Accepted	Baseline	design	Demonstration
	reference. In order to avo	id	addendum	SKA-TEL-	
	large offsets, the cent		SKO-DD-003		
	frequency reference shall	pe			
	steered to UTC to within	at			
	least 1 microsecond, with	a			
	frequency drift of less th	an			
	10 ns/day.				

6.2.3 SKA1 UTC offsets

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2276	SKA1 UTC offsets. The	•	Baseline design	Demonstration
	solution period for the		addendum SKA-TEL-	
	calculation of offsets		SKO-DD-001	
	between SKA1 timescale			
	and UTC shall be less than 1			
	day			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 90 of 275

7 Infrastructure

7.1 Site Monitoring

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2370	Weather Monitoring. Weather monitoring stations (2 No at each core and 2 No within each spiral arm) shall be provided as part of the infrastructure - wind, temperature and humidity.	Accepted	Operations Concept Plan. Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted).	Inspection

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2730	RFI Monitoring. Permanent	Accepted	Concept of Operations	Inspection
	stations and mobile RFI		[2] 5.3	
	monitoring units shall be			
	provided as part of			
	infrastructure.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 91 of 275

7.2 Tropospheric Monitoring

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2372	Tropospheric Monitoring.	Accepted	Baseline Design 1.3.1	Inspection
	Existing Tropospheric		and 8.3	
	monitoring stations shall be			
	expanded as part of the SKA1			
	infrastructure to provide at			
	least 3 No sensor units in each			
	of the Australia and South			
	Africa locations.			

7.3 Power

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2373	Low RFI power delivery.	Accepted	SYS_REQ-2462	Test
	The power delivery			
	infrastructure shall comply			
	with the SKA1 RFI levels			
	documentation.			

7.4 Access

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2374	Site Access. Roads and track-	Accepted	Baseline Design 15.1.4	Analysis and
	ways (including drainage) for		and 16.1.4	Inspection
	the safe, secure and economic			
	construction and operation of			
	the SKA1 shall be provided.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2375	Air-strip . There shall be	Accepted	Baseline Design 15.1.5	Inspection
	access to an air strip on site.		and 16.1.5	

7.5 Water and Sanitation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2376	Construction. Potable and non-potable water shall be available at SKA1 construction camps including	·	Baseline Design 15.1.5 and 16.1.5	Inspection
	foundation concrete plants.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY

Revision:

Author: W Turner Date: 2015-04-23 Page 92 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2377	Steady state. Sufficient	•	Baseline Design 15.1.5	Inspection
	water shall be continually		and 16.1.5	
	available at SKA1 facilities in			
	support of equipment cooling			
	for each telescope.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2378	Standards and Regulations.	Accepted	Regulatory	Analysis
	The delivery and disposal of			
	water and all construction			
	activity shall be compliant			
	with local and national			
	standards and regulations.			

7.6 Buildings

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2382	Central Processing Facility	Accepted	Baseline Design 14 and	Test
	RFI shielding . Each Central		SYS_REQ-2462	
	Processing Facility shall			
	provide RFI shielding greater			
	than that derived from zoning			
	specifications given in the			
	SKA RFI levels			
	documentation (to be			
	published by T0 + 12w).			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2383	Central Processing Facility	Accepted	Baseline Design 14 and	Inspection
	RFI penetrations. The		SYS_REQ-2462	
	Central Processing Facility		_	
	shall provide RFI compliant			
	penetrations for signal and			
	power cables entering the			
	facility and also for all other			
	penetrations.			

Document No.:SKA-TEL-SKO-000008FOR PROJECTRevision:6Author

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 93 of 275

7.7 Antenna earthing and bonding

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2397	Dish Antenna earthing . For	Accepted	Established precedent	Test
	lightning protection of each			
	dish antenna the earthing			
	system shall conform to the			
	requirements of IEC 62305			
	and also to national standards			
	SANS 10142 and 10313.			
	National standards shall take			
	precedence.			

7.8 Telephone network

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2398	Telephone Network. All populated facilities shall provide connectivity to the public telephone network.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted).	Test

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 94 of 275

2015-04-23 Date:

7.9 Vehicles

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2400	Communication. All vehicles used on site shall be equipped with long range communication devices.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Demonstration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2401	Training. All drivers on or to	Accepted	Legislation - RSA No.	Inspection
	the sites shall have		85 of 1993:	
	appropriate awareness		Occupational Health	
	training.		and Safety Act, as	
			amended, and related	
			Regulations.	
			Australian OH&S Act	
			1984, OH&S	
			Regulations 1996.	
			Western Australia	
			WHS Regulations and	
			Codes of Practice (as	
			adopted)	

8 External Interfaces

8.1 Power

8.1.1 Site steady state power budget Africa

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2402	Site steady state power	Accepted	SKA Power Budget	Test
	budget Africa. The total		SKA-SE-POW-TN-001	
	steady state power budget for		[21]	
	the African site shall be			
	within the limits specified in			
	SKA Power Budget SKA-			
	SE-POW-TN-001 [21].			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 95 of 275

8.1.2 Site steady state power budget Australia

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2404	Site steady state power	Accepted	SKA Power Budget	Test
	budget Australia . The total		SKA-SE-POW-TN-001	
	steady state power budget for		Revision 1 [21]	
	the Australian site shall be			
	within the limits specified in			
	SKA Power Budget SKA-			
	SE-POW-TN-001 Revision 1			
	[21].			

8.2 Time Reference

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2769	Time Reference: SKA1 shall use a time reference derived		Baseline Design	Inspection
	from Global Positioning System (GPS).			

8.3 VLBI

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2838	VLBI data sources. The	Accepted	Baseline Design	Demonstration
	SKA1_Mid telescope shall			
	be a data source for VLBI			
	data acquisition system. The			
	interface between the			
	SAK1_Mid telescope and			
	the external VLBI data			
	acquisition system shall be			
	compliant with the ICD			
	SKA-TEL-SKO-0000116			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2839	Provision of equipment for	Accepted	Baseline Design	Demonstration
	recording . Provision of			
	equipment for recording or			
	capturing VLBI data is			
	outside the scope of SKA1			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 96 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2840	VLBI equipment and	Accepted	Baseline Design	Demonstration
	eVLBI connectivity. VLBI			
	equipment and eVLBI			
	connectivity beyond the			
	interface boundary described			
	in the ICD SKA-TEL-SKO-			
	0000116 is outside the scope			
	of supply of the SKA1			
	project.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2841	Infrastructure for VLBI equipment:. The following infrastructure shall be provided to allow eventual outfitting of SKA1_Mid with VLBI equipment: 1. Adequate access for the potential fitment of VLBI equipment 2. Equipment space 3. Power 4. Cooling 5. Cable trays	Accepted	Baseline Design	Demonstration

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2842	Provision for VLBI	Accepted	Baseline Design	Demonstration
	terminal . Provision for			
	VLBI terminals or			
	equivalent equipment shall			
	be made in the Science			
	Processing Centres for the			
	associated telescopes.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2843	Compatibility with existing	Accepted	Baseline Design	Demonstration
	VLBI terminal. SKA1 shall			
	be able to output VLBI beam			
	data with each individual			
	stream limited to 512 MHz			
	of signal bandwidth to			
	ensure compatibility with			
	existing VLBI terminal			
	capability			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 97 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2844	VLBI Processing . VLBI	Accepted	Baseline Design	Demonstration
	processing, with the			
	exception of beam-forming			
	and SKA1 imaging in			
	support of VLBI. is outside			
	the scope of the SKA1			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2845	VLBI beam output data. SKA1 shall be able to produce VLBI beam output data with either dual or single polarization	Accepted	Baseline Design	Test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2846	Word length of VLBI beam	Accepted	Baseline Design	Test
	output data. SKA1 shall be			
	able to output VLBI beam			
	data with configurable word			
	formats, the allowed values			
	being 2, 4, 8, and 16-bit			
	integer.			

9 Internal Interfaces

9.1 AIV

9.1.1 MeerKAT to SKA1_mid CSP interface

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2410	MeerKAT to SKA1_mid	Accepted	SKA-TEL.SE.INTERF-	Test
	CSP interface . The interface		SKO-MP-001 section	
	between MeerKAT and		3.2.3	
	SKA1_mid CSP shall be			
	compliant with SKA-			
	TEL.AIV.SE-TEL.CSP.SE-			
	ICD-001 Interface Control			
	Document			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

2015-04-23 Date:

Page 98 of 275

9.1.2 MeerKAT to SKA1_Mid SADT

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2412	MeerKAT to SKA1_mid	Accepted	SKA-TEL.SE.INTERF-	Test
	SADT interface. The		SKO-MP-001 section	
	interface between MeerKAT		3.2.3	
	and SKA1_mid SADT shall			
	be compliant with SKA-			
	TEL.AIV.SE-			
	TEL.SADT.SE-ICD-001			
	Interface Control Document			

9.1.3 MeerKAT to SKA1_Mid TM

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2414	MeerKAT to SKA1_mid	Accepted	SKA-TEL.SE.INTERF-	Test
	SADT interface. The		SKO-MP-001 section	
	interface between MeerKAT		3.2.3	
	and SKA1_mid SADT shall			
	be compliant with SKA-			
	TEL.AIV.SE-TEL.TM.SE-			
	ICD-001 Interface Control			
	Document.			

9.1.4 MeerKat to SKA1_INFRA

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2775	MeerKAT to	Accepted	SKA-TEL.SE.INTERF-	Test
	SKA1_INFRA interface.		SKO-MP-001 section	
	The interface between		3.2.3	
	MeerKAT and			
	SKA1_INFRA shall be			
	compliant with SKA-			
	TEL.AIV.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 99 of 275

Date: 2015-04-23

9.2 Central Signal Processor

9.2.1 CSP to Infra

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2416	CSP to Infra interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between CSP and		SKO-MP-001 section	
	Infra shall be compliant with		3.2.3	
	the SKA-TEL.CSP.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

9.2.2 CSP to SDP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2738	CSP to SDP interface . The	Accepted	SKA.TEL.SE.INTERF-	Test
	interface between CSP and		SKO-MP-001 section	
	SDP shall be compliant with		3.2.3	
	the SKA-TEL.SDP.SE-			
	TEL.CSP.SE-ICD-001			
	Interface Control Document			

9.3 Dish

9.3.1 Dish to CSP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2418	Dish to CSP interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between CSP and		SKO-MP-001 section	
	Dish shall be compliant with		3.2.3	
	the SKA-TEL.DSH.SE-			
	TEL.CSP.SE-ICD-001			
	Interface Control Document.			

9.3.2 DSH to Infra

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2419	Dish to Infra interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between Dish and		SKO-MP-001 section	
	Infra shall be compliant with		3.2.3	
	the SKA-TEL.DSH.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

Date:

2015-04-23 Page 100 of 275

9.4 Low Frequency Aperture Array

9.4.1 LFAA to CSP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2420	LFAA to CSP interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between LFAA and		SKO-MP-001 section	
	CSP shall be compliant with		3.2.3	
	the SKA-TEL.LFAA.SE-			
	TEL.CSP.SE-ICD-001			
	Interface Control Document.			

9.4.2 LFAA to Infra

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2421	LFAA to Infra interface.	Accepted	SKA-TEL.SE.INTERF-	Test
	The interface between LFAA		SKO-MP-001 section	
	and INFRA shall be		3.2.3	
	compliant with the SKA-			
	TEL.LFAA.SE-TEL.INFRA			
	AUS.SE-ICD-001Interface			
	Control Document.			

9.5 **SADT**

9.5.1 SADT to DSH

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2422	SADT to DSH interface.	Accepted	SKA-TEL.SE.INTERF-	Test
	The interface between SADT		SKO-MP-001 section	
	and DSH shall be compliant		3.2.3	
	with the SKA-			
	TEL.SADT.SE-			
	TEL.DSH.SE-ICD-001			
	Interface Control Document.			

9.5.2 SADT to LFAA

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2423	SADT to LFAA interface.	Accepted	SKA-TEL.SE.INTERF-	Test
	The interface between SADT		SKO-MP-001 section	
	and LFAA shall be compliant		3.2.3	
	with the SKA-			
	TEL.SADT.SE-			
	TEL.LFAA.SE-ICD-001			
	Interface Control Document.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 101 of 275

9.5.3 SADT to CSP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2424	SADT to CSP interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between SADT and		SKO-MP-001 section	
	CSP shall be compliant with		3.2.3	
	the SKA-TEL.SADT.SE-			
	TEL.CSP.SE-ICD-001			
	Interface Control Document.			

9.5.4 SADT to SDP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2425	SADT to SDP interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between SADT and		SKO-MP-001 section	
	SDP shall be compliant with		3.2.3	
	the SKA-TEL.SADT.SE-			
	TEL.SDP.SE-ICD-001			
	Interface Control Document.			

9.5.5 SADT to Infra

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2426	SADT to Infra interface . The interface between SADT	Accepted	SKA-TEL.SE.INTERF- SKO-MP-001 section	Test
	and Infra shall be compliant		3.2.3	
	with the SKA.TEL.SADT.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

9.6 Telescope Manager

9.6.1 TM to DISH

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2427	TM to Dish interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between TM and		SKO-MP-001 section	
	Dish shall be compliant with		3.2.3	
	the SKA-TEL.TM.SE-			
	TEL.DSH.SE-ICD-001.			
	Interface Control Document.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 102 of 275

9.6.2 TM to LFAA

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2428	TM to LFAA interface. The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between TM and		SKO-MP-001 section	
	LFAA shall be compliant		3.2.3	
	with the SKA-TEL.TM.SE-			
	TEL.LFAA.SE-ICD-001			
	Interface Control Document.			

9.6.3 TM to SADT

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2429	TM to SADT interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between TM and		SKO-MP-001 section	
	SADT shall be compliant		3.2.3	
	with the SKA-TEL.TM.SE-			
	TEL.SADT.SE-ICD-001			
	Interface Control Document.			

9.6.4 TM to CSP

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2430	TM to CSP interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between CSP and		SKO-MP-001 section	
	TM shall be compliant with		3.2.3	
	the SKA-TEL.CSP.SE-			
	TEL.TM.SE-ICD-001.			
	Interface Control Document.			

9.6.5 TM to INFRA

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2737	TM to INFRA Interface.	Accepted	SKA.TEL.SE.INTERF-	Test
	The interface between TM		SKO-MP-001	
	and INFRA shall be			
	compliant with the			
	SKA.TEL.TM.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

Date: 2015-04-23 Author: W Turner Page 103 of 275

9.7 Science Data Processor

9.7.1 SDP to TM

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2431	SDP to TM interface . The	Accepted	SKA-TEL.SE.INTERF-	Test
	interface between SDP and		SKO-MP-001 section	
	TM shall be compliant with		3.2.3	
	the SKA-TEL.SDP.SE-			
	TEL.TM.SE-ICD-001			
	Interface Control Document.			

9.7.2 SDP to INFRA

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2432	SDP to INFRA interface.	Accepted	SKA-TEL.SE.INTERF-	Test
	The interface between SDP		SKO-MP-001 section	
	and Infra shall be compliant		3.2.3	
	with the SKA.TEL.SDP.SE-			
	TEL.INFRA.SE-ICD-001			
	Interface Control Document.			

10 RFI and EMC

10.1 Electromagnetic Radiation

The levels and the verification procedures are described in the RFI/EMI Protection and Threshold Levels for the SKA document, which is part of the Level 1 Requirements, to be published in its final form by T0+12w

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2462	Electromagnetic Radiation.	Accepted	EMI/EMC Standards[4]	Test
	Any component of the			
	observatory shall not emit			
	electromagnetic radiation, in			
	any of the stated frequency			
	intervals for broad band and			
	narrow band cases, that			
	exceeds the SKA RFI/EMI			
	Threshold Levels[4]			

10.2 Self-induced RFI

The levels and testing and acceptance procedures are described in the RFI/EMI Protection and Threshold Levels for the SKA document, which will be an Applicable Document of the Level 1 Requirements, to be published in its final form by T0+12 weeks.

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 104 of 275

Date: 2015-04-23

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2463	Self-induced RFI. The SKA1 Telescope shall generate less self-induced RFI, within the Telescope's operating frequency bands, than the SKA RFI/EMI Protection Levels, for both broad band and narrow band cases, as specified in the "RFI/EMI Protection and Threshold Levels for the SKA" document. The SKA RFI/EMI Protection Levels are defined at the respective receiver input, and measured at the respective Telescope time series output	Accepted	EMI/EMC Standards[4]	Test

10.3 Electromagnetic Compatibility Standards

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2464	Electromagnetic Compatibility Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity: *BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C	Accepted	Root	Inspection

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 105 of 275

10.4 Electricity network Electromagnetic Compatibility

The levels and verification procedures are described in the RFI/EMI Protection and Threshold Levels for the SKA document, which is part of the Level 1 Requirements, to be published in its final form by T0+12 weeks.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2465	Electricity network	Accepted	EMI/EMC Standards[4]	Analysis
	Electromagnetic			
	Compatibility. The SKA1			
	telescopes shall follow the			
	TBD code of practice for the			
	application of			
	Electromagnetic			
	Compatibility (EMC)			
	standards and guidelines in			
	electricity utility networks.			

10.5 EMC Compatibility Marking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2466	EMC compatibility	Accepted	EMI/EMC Standards[4]	Inspection
	marking. All "off-the-shelf"			
	equipment shall possess as a			
	minimum the host country			
	EMC marking.			

10.6 Electromagnetic Susceptibility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2467	Electromagnetic	Accepted	EMI/EMC Standards[4]	Test
	susceptibility. The			
	observatory shall not be			
	susceptible to terrestrial			
	electromagnetic radiation at			
	any frequency that			
	significantly interferes with			
	its normal operation.			

10.7 Receiver linearity - space borne RFI

The levels and testing and acceptance procedures are described in the RFI/EMI Protection and Threshold Levels for the SKA document, which is part of the Level 1 Requirements, to be published in its final form by T0+12w

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 106 of 275

Date: 2015-04-23

10.8 Receiver linearity airborne RFI

The levels and testing and acceptance procedures are described in the RFI/EMI Protection and Threshold Levels for the SKA document, which is part of the Level 1 Requirements, to be published in its final form by T0+12w

10.9 RFI flagging

An RFI mask identifies individual frequency data to the resolution of one channel and time data to the integration unit that is likely to be corrupted by RFI

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2472	RFI flagging. The SKA1	Accepted	EMI/EMC Standards[4]	Test
	telescopes shall automatically			
	flag frequency data with a			
	resolution of one channel and			
	time data to the resolution of			
	the integration unit if the data			
	is corrupted by RFI.			

10.10 RFI excision

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2473	RFI excision. The SKA1	Accepted	EMI/EMC Standards[4]	Test
	Telescopes shall	-		
	automatically excise data that			
	is corrupted by RFI.			

10.11 RFI masking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2474	RFI masking. The SKA1 Telescopes shall flag data according to a pre-selected RFI Mask.	,	EMI/EMC Standards[4]	Demonstration

10.12 RFI zones of avoidance

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2475	RFI zones of avoidance.	Accepted	EMI/EMC	Demonstration
	The SKA1 telescopes shall		Standards[4]	
	allow spatial zones of			
	avoidance to be defined.			

FOR PROJECT USE ONLY Document No.: SKA-TEL-SKO-0000008 Revision:

2015-04-23 Date:

Author: W Turner Page 107 of 275

11 Extensibility

11.1 Design for SKA2 extensibility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2433	Design for Extensibility. Design trade studies for SKA1 shall include scenarios where design features are included which will allow 1. Increases in the number of receptors for SKA2 over SKA1 by a factor of 10 whilst re-using more than 90% of SKA1 hardware 2. The introduction of AIP technologies at SKA2 scales whilst re-using more than 90% of SKA1 hardware	Accepted	Baseline Design	Inspection
	Such trade studies shall yield the incremental cost of such scenarios over those which do not include such design features.			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 108 of 275

12 Environmental, Safety and Occupational Health (ESOH)

12.1 Environmental Protection

NOTE: This section states requirements for the protection of the environment from the impacts of SKA activities and facilities. A separate section of requirements provide details of the environmental conditions that could impact the SKA systems.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2484	Environmental legislation	Accepted	Legislation. SA - NEMA.	Analysis
_	and regulations. The	,	Australia EPBC, WA	,
	observatory shall be		EPA et al.	
	compliant with all local, State			
	and national environmental			
	protection legislation and			
	regulations.			
	NOTE: Legislation takes			
	precedence over			
	project/contract			
	documentation and			
	requirements. Omission of a			
	law from this requirement			
	does not affect its			
	enforceability. Legislation is			
	also subject to amendment and so the Environmental			
	Laws identified during the			
	Request for Information			
	(copied below) may be			
	modified by the Hosting			
	Agreements and subsequent			
	Acts and Amendments.			
	Legislation and regulations			
	identified during the response			
	to Request for Information			
	include:			
	South Africa:			
	National Environmental			
	Management Act, 1998			
	("NEMA");			
	National Water Act, 1998;			
	National Environmental			
	Management: Air Quality			
	Act, 2004;			
	National Environmental			
	Management Waste Act, 2008;			
	National Environment			
	Management: Biodiversity			
	Act, 2004;			
	National Heritage Resources			
	Act, 1999.*			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 109 of 275

Australia: The Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC) 1999. The Western Australian Environmental Protection 1986 The Western Australian Land Administration Act 1997 In addition, approvals will be required under the Western Australia Mining Act 1978, Heritage of Western Australia Act 1990. the Western Australian Aboriginal Heritage Act 1972 and the MRO Indigenous Land Use Agreement 2009. Other South African environmental statutes include the Environment Conservation Act, 1989, various air pollution statutes, the National Heritage Resources Act, 1999, the Hazardous Substances Act, 1973, the Health Act, 1977, the Nuclear Energy Act, 1999, the National Nuclear Regulatory Act, 1999, the National Environmental Management: Protected Areas Act, 2003, the Fertilisers, Farm Feeds. Agricultural Remedies and Stock Remedies Act, 1947, the Marine Living Resources Act, 1998, and the National Environmental Management: Integrated Coastal Management Act, 2008.

FOR PROJECT USE ONLY Document No.: SKA-TEL-SKO-0000008 Revision: Author: W Turner Page 110 of 275

2015-04-23 Date:

12.1.1 Environmental Impact Assessment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2790	Environmental Impact	Accepted	SYS_REQ-2484	Inspection
	Assessment . The			
	Observatory shall undertake			
	an Environmental Impact			
	Assessment (EIA) in			
	accordance with the local and			
	national environmental			
	legislation. NOTE: the EIA			
	shall be undertaken in			
	accordance with: South			
	Africa - the National			
	Environmental Management			
	Act (NEMA); Australia -			
	Western Australian EPA and			
	Commonwealth EPBC.			

12.1.2 Environment protection plan

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2483	Environment protection	Accepted	SYS_REQ-2484	Inspection
	plan . An Environmental			
	protection plan shall be			
	developed and maintained.			
	This shall include the			
	management of			
	Environmental Impact			
	Assessments (EIA) in			
	accordance with SA NEMA,			
	WA EPA and			
	Commonwealth EPBC.			

12.1.2.1 Material environmental rule compliance

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2572	Material environmental	Accepted	SYS_REQ-2484	Inspection
	rule compliance. All			
	materials used in the SKA1			
	design shall be fully			
	compliant to all			
	environmental rules			
	applicable to the SKA1 core			
	and remote sites.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

Date: 2015-04-23

12.2 Safety

The safety priorities of the system shall be:

- i. protection of persons,
- ii. guarding the technical integrity of the observatory and other equipment potentially affected by the operation of the observatory, and
- iii. protection of scientific data, in this order.

SKA Observatory hazard analysis and safety practices will be governed by an order of precedence as follows:

- 1. Design for Minimum Risk: The primary means for mitigation of risk shall be to eliminate the hazard through design.
- 2. Incorporate Safety Devices: Fixed, automatic or other protective devices shall be used in conjunction with the design features to attain an acceptable level of risk. Provisions shall be made for periodic functional checks as applicable.
- 3. Provide Warning Devices: When neither design nor safety items can effectively eliminate or reduce hazards, devices shall be used to detect the condition, and to produce an adequate warning to alert personnel of a hazard. Devices may include audible or visual alarms, permanent signs or movable placards.

Procedures and Training: Where it is impractical to substantially eliminate or reduce the hazard or where the condition of the hazard indicates additional emphasis, special operating procedures and training shall be used.

12.2.1 Safe Design

12.2.1.1 Safety of machinery risk assessment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2819	Requirement Safety of machinery risk assessment. A risk assessment shall be conducted for each item of machinery in accordance with BS EN ISO 12100.		Parent Requirement Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996.	Verification Inspection
			Regulations 1996. Western Australia WHS Regulations and	
			Codes of Practice (as adopted)	

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 112 of 275

Date: 2015-04-23

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2450	Safety information for use.	Accepted	Legislation - RSA No.	Inspection
	Where risks remain despite		85 of 1993:	
	inherently safe design		Occupational Health	
	measures, safeguarding and		and Safety Act, as	
	the adoption of		amended, and related	
	complementary protective		Regulations.	
	measures, the residual risks shall be identified in the		Australian OH&S Act	
	information for use in		1984, OH&S	
	accordance with BS EN ISO		Regulations 1996.	
	12100 (section 6).		Western Australia	
	The information for use shall		WHS Regulations and	
	include, but not be limited to,		Codes of Practice (as	
	the following:		adopted)	
	□ operating procedures for			
	the use of the machinery			
	consistent with the expected			
	ability of personnel who use			
	the machinery or other			
	persons who can be exposed			
	to the hazards associated with			
	the machinery;			
	☐ the recommended safe			
	working practices for the use			
	of the machinery and the related training requirements			
	adequately described;			
	□ sufficient information,			
	including warning of residual			
	risks for the different phases			
	of the life of the machinery;			
	□the description of any			
	recommended personal			
	protective equipment,			
	including detail as to its need			
	as well as to training needed			
	for its use.			
	Information for use shall not			
	be a substitute for the correct			
	application of inherently safe			
	design measures,			
	safeguarding or			
	complementary protective			
	measures.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 113 of 275

12.2.1.3 Ergonomics and Human Factors

This section specifies the requirements with the ease with which the system can be used. Other potential standards:

ISO9241 Ergonomic requirements for office work with visual display terminals

ISO11064 Ergonomic design of control centres

ISO 12407 Human-centred design processes for interactive systems (1999)

ISO DTR 16982 Usability methods supporting human centred design

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2554	Ergonomics. The ergonomic design shall be compliant with ISO 6385.		Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related	Inspection
			Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	

12.2.1.4 Safety of equipment < 600V

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2820	Safety of equipment with rated voltage not exceeding 600V. Equipment shall comply with the safety requirements of BS EN IEC 60950. NOTE: This includes electric shock, energy related hazards, fire, heat related hazards, mechanical hazards, radiation and chemical hazards.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 114 of 275

12.2.1.5 Hazard analysis

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2437	Design for hazard elimination. Designs shall demonstrate the elimination, or mitigation to a risk level practically achievable, of all hazards by means of a subsystem hazard analysis (SSHA) report as described in EN 14738 and tailored by SKA Product Assurance and Safety Plan SKA-OFF.PAQA-SKO-QP-001.	·	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Analysis

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2435	Hazard analysis. A hazard analysis shall be performed at the system and element level in accordance with BS IEC 61882 and, where applicable, shall include a FMEA in accordance with EN 60812.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

12.2.1.6 Hazardous Materials List

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2567	Hazardous Materials list. Each Element supplier shall provide a list of hazardous materials used for all items intended for use in the SKA1 detailing suggested handling precautions, disposal instructions and contraindications.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 115 of 275

12.2.1.7 Hazard warning marking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2579	Hazard warning marking. All items that present a potential hazard shall be labelled in accordance with BS EN ISO 7010.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

ID	Requirement	Status	Parent Requirement	Verification
ID SYS_REQ-2818	Requirement Marking of machinery - safety. In accordance with ISO 61310_2, machinery shall bear all markings which are necessary – for its unambiguous identification; – for its safe use; and supplementary information shall be given, as appropriate: – permanently on the machinery; – in accompanying documents such as	Status Accepted	Parent Requirement SYS_REQ-2579	Verification Demonstration
	instruction handbooks; – on the packaging			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 116 of 275

12.2.1.8 Fail-Safe Design

ID	Requirement		Status	Parent Requirement	Verification
SYS_REQ-2438	Fail safe	design.	Accepted	SYS_REQ-2437	Analysis
	Components and	Equipment			
	shall be designed	to be locally			
	fail-safe and no	ot rely on			
	external safety	devices or			
	measures to opera	te safely.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2788	Non-propagation of	Accepted	SYS_REQ-2437	Demonstration
	failures . The equipment			
	shall be designed such that			
	hardware failures and			
	software errors should not			
	create a hazardous situation			
	to interfacing systems.			

12.2.1.9 Emergency stop

Emergency stop buttons are to be provided as a backup for use in emergency only. They need to be robust, dependable and available at all positions where it might be necessary to operate them.

As guidance BS EN 60204-1 standard defines the categories of operation and BS EN 60947-5-5 the characteristics of the emergency stop switches.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2439	Emergency stop. The SKA1	Accepted	SYS_REQ-2437	Demonstration
	Elements shall have			
	emergency stop switches or			
	brakes for all electro-			
	mechanical or mechanical			
	systems that have been			
	identified by safety analyses			
	(required under SYS_REQ-			
	2435) to pose a hazard.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2733	Location of Emergency	Accepted	SYS_REQ-2437	Analysis
	stop . Emergency stop			
	switches shall be located in			
	such a way to minimize the			
	risk of injury. (Verified by			
	Analysis as 'minimisation' is			
	unverifiable any other way.)			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 117 of 275

12.2.1.10 Safety documentation file

The pre-construction safety plan should take into account the applicable pre-cursor safety plan.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2786	Safety documentation file.	Accepted	SYS_REQ-2436	Inspection
	Elements shall provide			
	procedures for maintainers to			
	recover from an unplanned			
	shut-down, including safety			
	checks to be conducted prior			
	to start-up, as specified in			
	SKA PRODUCT			
	ASSURANCE & SAFETY			
	PLAN SKA-OFF.PAQA-			
	SKO-QP-001.			

12.2.1.11 Sharp Metal edges

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2447	Sharp metal edges. If they cannot be eliminated from design, sharp edges, access openings and corners shall be protected with covers or coatings.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 118 of 275

2015-04-23 Date:

12.2.2 Electrical safety

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2446	Electrical safety. Electrical risks and hazards shall be controlled in accordance with local, State and national legislation and Codes of Practice. NOTE: In South Africa, SANS 10142-1 and SANS 10142-2 shall apply. NOTE: In Australia, in addition to legislation, the following Codes of Practice shall be applied: AS/NZ 3000 Safe Work Australia 'Managing Electrical Risks at the Workplace'; Western Australia Director of Energy Safety 'Safe Low Voltage Work Practices by Electricians'		Legislation	Inspection

12.2.2.1 Protection from high voltages

Safety equipment used by electrical workers includes insulated rubber gloves and mats. These protect the user from electric shock. Safety equipment is tested regularly to ensure it is still protecting the user. Test regulations vary according to country. Testing companies can test at up 300,000V and offer services from glove testing to Elevated Working Platform or EWP Truck testing.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2443	Protection from high	Accepted	National Standards	Inspection
	voltages. High voltage cages		AS/NZS3000 &	
	or enclosures shall be used to		SANS10142	
	protect personnel from			
	inadvertent access to high			
	voltages in accordance with			
	AS/NZS3000 (Australia) and			
	SANS10142 (South Africa).			

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 119 of 275

12.2.2.2 Safety grounding and bonding

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2444	Safety grounding and	Accepted	Legislation	Test
	bonding. External			
	conductive parts shall be			
	grounded in compliance to:			
	South Africa:			
	National Building			
	Regulations and Building			
	Standards Act, 1977			
	Occupational Health and			
	Safety act, 1993			
	SANS 10313			
	Australia:			
	AS/NZ 3000,			
	AS/NZ 1768			

12.2.2.3 Electrical circuit interlocks

Guidance to safeguarding and complementary protective measures are provided in BS EN 12100-2 clause 5.

Monitoring of safety signals is available in BS EN ISO 13849-1.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2445	Electrical circuit interlocks.	Accepted	Legislation: AS/NZ	Inspection
	Electrical circuit inter-locks		3000; SANS 10142	
	shall be provided to prevent			
	personnel coming into			
	contact with hazards that			
	cannot otherwise be			
	eliminated from design.			

12.2.3 Emergency Communications

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2481	Emergency communication. The observatory shall provide an independent system to communicate with outside locations in emergencies.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and	Demonstration

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 120 of 275

	Codes of Practice (as	
	adopted).	

12.2.3.1 Safety preparation for construction and operations

12.2.3.1.1 Construction & AIV Safety Plan

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2449	Construction and AIV Safety Plan. A comprehensive safety plan, tailored to construction and AIV activities, shall be established and implemented before the construction starts at the observatory site.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted).	Inspection

12.2.3.1.2 Safety incident recovery plan

A plan detailing the actions and corrective actions required in the eventuality of a safety incident. This is generated in conjunction with or part of the Hazard analysis. Not all hazards can be completely eliminated from the system

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2436	plan. A safety incident recovery plan shall be produced in accordance with SKA PRODUCT ASSURANCE & SAFETY PLAN SKA-OFF.PAQA-SKO-QP-001.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Inspection

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 121 of 275

2015-04-23 Date:

12.2.3.1.3 Safety training

Training for first aid, fire fighting and other safety related skills

ID	Requirement	Status	Parent Requirement	Verification
ID SYS_REQ-2451	Requirement Safety training. All personnel shall be provided with appropriate Health and Safety training in compliance with local regulations.	Accepted	Parent Requirement Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S	Verification Test
			Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	

12.2.3.1.4 Fire fighting equipment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2454	Fire fighting equipment. Fire fighting equipment shall be made available at all SKA premises and facilities.	•	SYS_REQ-2477	Inspection

12.2.3.1.5 First aid stations

The location and capability for first aid stations is to be determined in association with the hazard analysis.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2453	First aid stations. First aid	Accepted	Legislation - RSA No.	Inspection
	stations shall be provisioned.		85 of 1993:	
			Occupational Health	
			and Safety Act, as	
			amended, and related	
			Regulations.	
			Australian OH&S Act	
			1984, OH&S	
			Regulations 1996.	
			Western Australia	
			WHS Regulations and	
			Codes of Practice (as	
			adopted)	

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 122 of 275

12.2.3.1.6 Protective Clothing

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2452	Protective clothing.	Accepted	Legislation - RSA No.	Inspection
	Protective Clothing for areas		85 of 1993:	
	where environments		Occupational Health	
	detrimental to human safety		and Safety Act, as	
	shall be worn.		amended, and related	
			Regulations.	
			Australian OH&S Act	
			1984, OH&S	
			Regulations 1996.	
			Western Australia	
			WHS Regulations and	
			Codes of Practice (as	
			adopted)	

12.2.3.1.7 Travel Safety

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2795	Travel safety. Personnel	Accepted	SYS_REQ-2791	Inspection
	shall adhere to local safety			
	procedures for travelling in			
	remote areas.			
	NOTE: Safety procedures			
	should include the training			
	and equipment required, such			
	as driving instruction,			
	vehicles appropriate for the			
	environment and radio			
	equipment.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 123 of 275

2015-04-23 Date:

12.3 Occupational Health

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2460	Occupational health legislation and regulations. The observatory shall comply with all applicable local, State and national occupational health regulations and standards in force at the time. Regulations include, but are not limited to: South Africa: Occupational Health and Safety Act, 1993, and all its regulations. Australia: Commonwealth Occupational Health and Safety Act 1991; OHS (Safety Arrangements) Regulations 1991; OHS (Safety Standards) Regulations 1994; OHS Codes of Practice 2008. Western Australia: Occupational Safety and Health Act 1984; Harmonised OHS legislation (as enacted).	Accepted	Legislation. South African Occupational Health and Safety Act, 1993, and all its regulations. Australia - Occupational Safety and Health Act 1984; WA Harmonised OHS legislation, as approved by WA and Commonwealth Acts.	Analysis

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 124 of 275

12.3.1 Noise level dosage

UK guidelines suggest hearing protection is provided where average daily or weekly upper exposure is greater than 85dB (Noise at work a brief guide to controlling risks: Health and Safety Executive)

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2455	Noise level dosage.	Accepted	Legislation as listed.	Test
	Personnel shall not be		Legislation - RSA No.	
	exposed to noise level		85 of 1993:	
	dosages exceeding local		Occupational Health	
	health and safety guideline		and Safety Act, as	
	levels. The maximum noise		amended, and related	
	levels shall not exceed an 8-		Regulations.	
	hour average exposure of 85		Australian OH&S Act	
	decibels as specified in the		1984, OH&S	
	Australian National Standard		Regulations 1996.	
	for Occupational Noise		Western Australia	
	NOHSC: 1007(2000) and		WHS Regulations and	
	South African Noise-Induce		Codes of Practice (as	
	Hearing Loss Regulations (No		adopted)	
	R.307 2003) of the			
	Occupational Health and			
	Safety Act, 1993 (Act No 85 of			
	1993). The desirable			
	maximum noise level is 75			
	decibels. Note: The National			
	Code of Practice for Noise			
	Management and Protection			
	of Hearing at Work			
	[NOHSC:2009(2004)]			
	provides practical guidance			
	on how NOHSC:1007(2000)			
	can be achieved.			

12.3.2 Transient noise level dosage

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2456	Transient noise level. Noise levels exceeding 85dB shall be controlled or mitigated in accordance with NOHSC National Standard for Occupational Noise [NOHSC: 1007].	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and	Test

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 125 of 275

	Codes of Practice (as	
	adopted)	

12.3.3 Illumination

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2457	Illumination. Personnel shall	Accepted	SYS_REQ-2460	Test
	be provided with a working			
	illumination level which is			
	compliant with local and			
	national regulations including			
	the current issue of SANS			
	10114-1 in South Africa and			
	the AS/NZS 1680 series in			
	Australia.			

12.3.4 Clean air

Dust is likely to be a principal but not limited to driver of this requirement. Where the air quality cannot be managed, protective masks may be required. This is covered by the protective clothing requirement

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2458	Clean air. Personnel shall be	Accepted	SYS_REQ-2460	Test
	provided with air quality at			
	least compliant with the			
	current issue of SANS 10400-			
	O (South Africa - The			
	application of National			
	Building Regulations Part O :			
	Lighting and ventilation) and			
	the AS 1668 series of codes			
	(Australia - The use of			
	mechanical ventilation and			
	air conditioning in buildings).			

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 126 of 275

12.3.5 Humidity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2649	Humidity. Working environments shall be designed, built and maintained to provide air quality that meets or exceeds the guidance provided in the Australian Code of Practice for Managing the Work Environment and Facilities, National Code of Australia and AS 1668. NOTE: Building humidity required for computing facilities is specified in Req 2367.	Accepted	Legislation - RSA No. 85 of 1993: Occupational Health and Safety Act, as amended, and related Regulations. Australian OH&S Act 1984, OH&S Regulations 1996. Western Australia WHS Regulations and Codes of Practice (as adopted)	Test

13 Security

The SKA will be a very attractive target for criminals, including theft of infrastructure and cyber attacks exploiting the HPC and networks. It will also be seen to be a 'soft' target with connections to the academic and research communities. The potential impacts include financial cost to replace equipment and to restore systems, loss of observing opportunities (telescopes could be rendered useless for weeks or months) and loss of reputation for the SKA and the host nations. The threats will exist from the outset and security will need to be established before physical installation starts (including security of information systems to deter trojan horses from being installed early in the development phase).

There is currently no ISO Standard for a Security Management System, although DPC: 13 / 30278101 DC included Draft BS ISO 34001 Security Management System which forms the basis of the Security requirements. In addition, the UK Cabinet Office HMG Security Policy Framework (Version 11.0) has been used to derive requirements.

The security risk management system shall include: i.personnel security, ii.physical security and counter terrorism, and iii.security of information.

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 127 of 275

13.1 Security Management

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2791	Security Management System. The SKA shall provide a security management system that includes : i. personnel security, ii. physical security (asset) iii. security of information	Accepted	'BS EN 50600-2-5. Data centre facilities and infrastructures. Part 2-5. Security systems' and others	Inspection

13.2 Personnel security

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2793	Personnel security training.	Accepted	SYS_REQ-2791	Inspection
	All personnel shall receive			
	the security training			
	identified in the Security			
	Management System			
	necessary for their location.			
	Additional specialist pre-			
	deployment training shall be			
	given prior to working in			
	remote environments.			

13.3 Physical security

SKA assets must be safeguarded against a range of physical threats, including crime (theft, criminal damage, assaults on staff etc), natural hazards (e.g. flooding), and security threats such as terrorism and exploitation by criminal and malicious groups (including hacktivists).

Physical security describes a range of controls that are intended to protect individuals from violence; prevent unauthorised access to sites and / and other valuable assets; and reduce the risk a range of physical threats and mitigate their impact to a levels that is acceptable to the organisation. Security must be incorporated into the initial stages of planning, selecting, designing or modifying any building or facility, using appropriate methodologies; putting in place integrated and proportionate control measures to prevent, deter, detect and/or delay attempted "physical attacks", and to trigger an appropriate response.

Host Country security organisations will need to be consulted to determine the terrorism threat to the SKA (currently negligible but may vary in time).

This section on physical security requirements will expand as the use cases are developed and the need for perimeter, interior and inter-site security is better understood.

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 128 of 275

13.3.1 Equipment Security

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2478	Equipment security. The	Accepted	SYS_REQ-2791	Analysis
	observatory shall provide a			
	secure environment for			
	equipment. This shall include			
	protection of generators, fuel,			
	solar cells and inter-station			
	assets such as copper cables.			

13.3.2 Intrusion Detection

13.4 Information security

The Information Security Management System will be based upon the ISO 27000 series, tailored for the SKA project. Information security is important to the SKA project in order to protect: availability of telescopes being impacted by attacks and viruses; legal, regulatory and reputational damage should SKA systems be exploited by criminal and malicious organisations; protection of IPR; and protection of personal and financial information stored on SKA business systems. Assets that have vulnerabilities that are exploitable include hardware, software, network, personnel, site and organisation.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2822	Information security risk	Accepted	SYS_REQ-2791	Inspection
	assessment . An information			
	security risk assessment shall			
	be conducted for each			
	element in accordance with			
	ISO/IEC 27005.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2823	Information security	Accepted	SYS_REQ-2791	Demonstration
	management for inter-			
	organizational			
	communications.			
	Information transfer between			
	organisations shall be			
	controlled in accordance			
	with ISO/IEC 27010 as			
	tailored by SKA			
	Organisation Security			
	Policy.			

FOR PROJECT USE ONLY Document No.: SKA-TEL-SKO-0000008 Revision: Author: W Turner Page 129 of 275

2015-04-23 Date:

13.4.1 Accessibility

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2482	Accessibility. It shall be	Accepted	SYS_REQ-2791	Demonstration
	possible to control on a per			
	user basis which SKA1			
	facilities and resources (both			
	hardware and software) may			
	be accessed by the user.			

13.4.2 Archive Security

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2479	Archive security. The observatory shall provide a secure environment for all its data archives.	,	SYS_REQ-2478	Test

13.4.3 Security of communications bearers

14 System Environment

14.1 Non-weather protected locations - protection of equipment.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2798	Protection of equipment in	Accepted	Concept of Operations	Inspection
	stationary use at non-		Sect 5	
	weather protected			
	locations . Equipment in			
	stationary use at non-weather			
	protected locations shall be			
	protected against			
	environmental conditions			
	4K4H/ 4Z1/ 4Z5/ 4Z6/ 4B2/			
	4C1/4S3/4M4 in accordance			
	with BS EN IEC 60721-3-4.			
	NOTE: 4Z5 refers to the			
	survival, non-operational			
	mode. The equipment shall			
	be able to operate normally			
	for air movement up to 11 m/s			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 130 of 275

2015-04-23 Date:

14.1.1 Allowable air temperature range

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2488	Allowable air temperature range. SKA1 equipment located at the dishes or aperture arrays or outside the central processing and operating facilities shall be able to withstand (non-operating if necessary) an outside air temperature within the range of -15 °C to +60 °C. Note this takes precedence over IEC 60721-3-4 4K4H of parent requirement.	Accepted	SYS_REQ-2798	Test

14.1.2 Air temperature operation range

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2489	Air temperature operation	Accepted	SYS_REQ-2798	Test
	range. SKA1 equipment			
	located at the dishes or			
	aperture arrays or outside the			
	central processing and			
	operating facilities shall be			
	able to operate within			
	specification if the outside air			
	temperature is within the			
	range of -5 °C to +50 °C.			
	Note this takes precidence			
	over IEC60721-3-4 4K4H			

14.1.3 Wind velocities

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2490	Wind velocities. SKA1	Accepted	SYS_REQ-2798	Test
	equipment shall be able to			
	survive wind velocities up to			
	160 km/hr, and shall operate			
	within normal specification			
	ranges for wind velocities up			
	to 40 km/hr.			
	Note: this takes precedence			
	over IEC60721-3-4 4Z5			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 131 of 275

14.2 Weather protected locations - protection of equipment

Specify and control noise, illumination, humidity and temperature in areas where personnel are required to perform operating and maintenance functions.

14.2.1 Protection of equipment in non-weather protected locations

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2799	Protection of equipment in	Accepted	Concept of Operations	Inspection
	weather-protected		Section 5	
	locations. Equipment in			
	stationary use at weather			
	protected locations shall be			
	protected against			
	environmental conditions			
	3K8H/ 3Z1/ 3Z11/ 3Z12/			
	3B3/ 3C1R/ 3S3/ 3M4 in			
	accordance with BS EN IEC			
	60721-3-3.			

14.2.2 Storage and transport temperature

14.2.3 Operating humidity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2500	Operating Humidity. The	Accepted	SYS_REQ-2799	Test
	operating humidity shall be			
	between 40% and 60%			

14.2.4 Storage and transport humidity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2501	Storage and transport	Accepted	SYS_REQ-2799, ETSI	Analysis
	Humidity. The storage and		ETS 300 0019-1-2 class	
	transport humidity shall be		2.1 and 2.3	
	between 40% and 95%.			

14.2.5 Condensation

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2502	Condensation. Appropriate	Accepted	SYS_REQ-2799	Inspection
	measures shall be taken to			
	prevent the formation of			
	condensation on operating			
	electronic components.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 132 of 275

14.2.6 Pressure

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2503	Pressure. Components	Accepted	SYS_REQ-2799	Analysis
	shipped by air shall be			
	capable of surviving			
	pressures down to 11 kPa			
	(equivalent altitude ~ 50,000			
	feet).			

14.2.7 Facilities and equipment intrusion

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2504	Facilities and Equipment	Accepted	SYS_REQ-2799	Inspection
	Intrusion. Where			
	appropriate, SKA1			
	equipment facilities shall be			
	adequately protected against			
	intrusion by insect and			
	"larger" wandering animals.			

14.2.8 Sand and Dust

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2505	Sand and Dust. SKA1 systems shall be adequately protected against sand and dust ingress.		SYS_REQ-2799	Inspection

14.2.9 Fungus

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2506	Fungus. Equipment shall be	Accepted	SYS_REQ-2799	Inspection
	protected against fungus			
	growth.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 133 of 275

Date: 2015-04-23

14.3 Storage of equipment

The maintenance plan will detail the level of protection provided to equipment when in storage. Protection may range from temperature-controlled buildings away from roads to non-weatherproofed areas exposed to sand and vibration from passing vehicles.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2801	Storage of equipment.	Accepted	Concept of Operations	Inspection
	Designs shall identify any		Section 5	
	requirements for equipment			
	to be stored in environmental			
	conditions less severe than			
	1K11/1B3/1C1/1S3/1M3 as			
	specified inBS EN IEC			
	60721-3-1. Note: It may be			
	assumed that equipment will			
	be stored in its original			
	packaging.			

14.4 Transportation - protection of equipment

This section of requirements relates only to the movement of equipment by maintenance staff from an engineering site to a station by road. Note that this may be modified as the Concept of Maintenance is developed. It excludes air and sea transport of equipment to the engineering site which will be decided at Level 2.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2800	Transportation of	Accepted	Concept of Operations	Inspection
	equipment . Equipment shall		Sect 5	
	be designed to withstand			
	transportation from an			
	engineering depot to a station			
	exposed to environmental			
	conditions			
	2K5H/2B3/2C1/2S3/2M3 as			
	detailed in BS EN IEC 60721-			
	3-2. NOTE: It may be			
	assumed that the equipment			
	will be transported in the			
	original packaging that it was			
	delivered to the engineering			
	depot.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 134 of 275

2015-04-23 Date:

14.5 Seismicity

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2491	Safety. SKA1 equipment and	Accepted	Legislation	Analysis
	buildings shall be designed			
	and built in compliance with			
	national and State regulations			
	including AS 1170.4			
	(Importance level 3, design			
	life 50 years) and SANS			
	10160-4 for earthquakes of			
	magnitude up to Richter 3.8.			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2650	Seismic resilience. SKA1	Accepted	Council for Geoscience	Analysis
	structures and equipment		Internal report no.:	
	shall survive and be fully		2005-0121 Section 4	
	operational after a seismic			
	event of magnitude up to			
	Richter 3.8. Note: Seismic			
	event includes underground			
	collapses in addition to			
	earthquakes.			

15 Availability Reliability and Maintainability

High availability of the telescopes to conduct science will be a key user requirement in measuring the success of the SKA. In turn, availability is dependent upon both the reliability and maintainability of the telescopes. Both of these factors may have considerable impact on the whole life costs of the observatory. Therefore, although the Level 0 requirements should be targeting availability, the Level 1 requirements will need to allocate reliability and maintainability constraints on the elements.

BS 5760-0:1986 defines the following terms:

Availability - the ability of an item (under combined aspects of its reliability, maintainability and maintenance support) to perform its required function at a stated instant of time or over a stated period of time.

Reliability - the ability of an item to perform a required function under stated conditions for a stated period of time.

Maintainability - the ability of an item, under stated conditions of use, to be retained in, or restored to, a state in which it can perform its required functions, when maintenance is performed under stated conditions and using prescribed procedures and resources

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 135 of 275

15.1 Availability Reliability and Maintenance Plan

The availability, reliability and maintenance plan for the SKA1 telescopes will be developed concurrently so as to fit within the allocated capital and operating (maintenance) budgets. The plans and designs will be developed using the iterative method outlined in Appendix E.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2722	Availability, reliability, and	Accepted	ConOps 5.1	Inspection
	maintenance plans. There			
	shall be an availability,			
	reliability and maintenance			
	plan for each SKA1			
	telescope.			

15.2 Availability

The following applies to each of SKA1-low and SKA1-mid telescopes separately. In general available means that the telescope or a fraction thereof as defined below is available to an operator to be scheduled for science or other operations.

Availability is defined as A=MTBF' / (MTBF' + MTTR'), where MTBF' is the mean time between failures (based on the conditional probability of failure), given that regular inspection or preventative maintenance is done, and MTTR' is the total time spent on these two activities plus any repair time.

- Availability Fraction is defined as (N Ae) / (Nmax Ae_max), where N is the number of schedulable major modes and Ae is the effective area available; Nmax is the number of major modes in the full set of defined modes; Ae_max is the maximum effective area of the telescope.
- Major modes correspond to the main categories of observations that the telescope is designed to carry out. For each frequency band defined for the telescope they are:
 - o Spectral line observations.
 - Pulsar search observations.
 - o Pulsar timing observations.
 - o Continuum observations.
 - o Transient detection.

The telescope system will have three availability states:

- 1. Available: The availability fraction is 95%
- 2. Degraded: The availability fraction is between 50 and 95%.
- 3. Unavailable: The availability fraction is less than 50%.

In a running average over a year, the design requirement is:

- O Unavailable for <5% of the time, corresponding to ~18 days per year.
- O Degraded for <5% of the time, corresponding to ~18 days per year.
- O Available >90% of the time, corresponding to ~329 days per year.

Natural disturbances of severity outside design boundaries are not counted against availability, unless the system does not behave according to design. The availability state depends only on the telescope, itself.

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 136 of 275

The operational state of all sub-systems shall be defined as 'failed', 'degraded' or 'available'. It shall be possible to sense and log the operational state (failed, degraded, or available) of every sub-system at the system level.

15.2.1 Telescope availability

Availability includes Available and Degraded availability states.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2716	Average annual	Accepted	ConOps 5.1	Analysis
	availability. Each SKA1			
	telescope shall have an			
	operational availability of			
	95%			

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2827	System Availability . System	Accepted	SYS_REQ-2716	Analysis
	designs shall meet the system			
	availability allocations			
	specified in SKA-			
	OFF.SE.ARC-SKAO-RAM-			
	001.			

15.2.2 Availability budgets

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2718	Availability budgets. Availability budgets shall be	Accepted	ConOps 5.1	Analysis
	allocated at the system decomposition level, and shall be consistent with the system level requirements for reliability and maintainability of the system.			

15.3 Reliability

15.3.1 Best practice

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2512	Best practice. Best available	Accepted	ConOps 5.1	Analysis
	methods for reducing adverse			
	effects of operational and			
	maintenance environments			
	on critical components shall			
	be adopted.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 137 of 275

15.3.2 Critical-useful-life components

Critical-useful-life components are components with an expected life shorter than the planned life cycle of the system.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2513	Critical-useful-life	Accepted	ConOps 5.1	Inspection
	components. Any critical-			-
	useful-life components shall			
	be identified.			

15.3.3 Stress strength analysis

If stresses greater than those of normal conditions are imposed on components the reliability of the system may be affected. Over specifying is potentially expensive.

15.3.4 Component selection

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2515	Component selection. Parts	Accepted	ConOps 5.1	Analysis
	and components shall be selected to meet reliability requirements.			

15.3.5 Matching parts

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2516	Matching components. Parts requiring select on test shall be eliminated by deign if possible.	·	ConOps 5.1	Inspection

15.3.6 Known failure rate parts

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2517	Known failure rate parts.	Accepted	ConOps 5.1	Inspection
	The failure rate of parts shall			
	be known (e.g. through			
	analysis or modelling) before			
	inclusion in SKA design.			

15.3.7 High failure rate parts

ID	Requirement	Status	Parent Requirement	Verification	
Document No.:	SKA-TEL-SKO-0000008			FOR PROJECT USE ONI	LY
Revision:	6			Author: W Turne	er
Date:	2015-04-23			Page 138 of 27	75

SYS_REQ-2518	High failure rate parts.	Accepted	ConOps 5.1	Inspection
	Parts with excessive failure			
	rates shall be identified.			

15.3.8 Reliability testing

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2519	Reliability testing. A testing	Accepted	ConOps 5.1	Inspection
_	and evaluation master plan			
	shall be generated for highrisk reliability components.			

15.3.9 Spares and repair parts testing

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2520	Spares and repair parts	Accepted	ConOps 5.1	Inspection
	testing. Critical spare and			
	repair line replaceable units			
	shall be tested before			
	deployment.			

15.3.10 Component derating

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2521	Component derating. Safety	Accepted	ConOps 5.1	Analysis
	factors and margins shall be			
	applied in the selection of			
	modules and components			

15.3.11 Shelf life and wear out characteristics

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2522	Shelf life and wear out	Accepted	ConOps 5.1	Inspection
	characteristics. The shelf			
	life and wear out			
	characteristics of all			
	components and parts shall be			
	known before inclusion in			
	SKA designs.			

15.3.12 Special procurement components

ID	Requirement		Status	Parent Requirement	Verification
SYS_REQ-2523	Special procurement		Accepted	ConOps 5.1	Inspection
	components.	Critical parts			

Document No.: SKA-TEL-SKO-0000008

Revision:

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 139 of 275

requi	ng s	special
procu	ement methods, t	testing
and h	ndling provisions	s shall
be ide	ntified.	

15.3.13 Fail safe provisions

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2525	Fail safe provisions. Designs	Accepted	ConOps 5.1	Analysis
_	shall implement fail-safe	-		-
	provisions to prevent			
	secondary failures.			

15.4 Maintainability

(Con Ops Section 5.1) There are SKA-specific factors beyond standard availability requirements that require particular attention and for which additional design effort and capital expenditure is justified. These are needed mainly to keep human occupancy on the sites to a minimum, as well as to enhance maintenance efficiency:

- Remote diagnostic and repair: In practice, this means that the monitor and control systems allow for a deep level of interrogation of sensor values and system state.
- Line-replaceable units: On-site repair will be particularly difficult and expensive at the remote sites. Systems should be designed to contain line replaceable units where feasible.
- Configuration Management System: Configuration management is a systems engineering
 process for managing the logistics of maintenance, tracking system documentation, and
 supplying real-time information to inform the system model. For this to work properly the
 system model must be tailored to SKA requirements.

Due to the geographically distributed nature of the SKA observatory there will be echelons or levels of maintenance for components of the observatory. Traditionally these have included:

- Site
- Operations centre
- Supplier

The maintenance functions for components at each level need to be defined along with their turnaround time (TAT) for repair.

The logistics pipeline time and Level of repair policies will be defined in an SKA1 Logistics Engineering Management Plan. This is assumed to include personnel quantities and skills at each level of maintenance.

15.4.1 Maintainability Budgets

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2526	Maintainability budgets.	Accepted	ConOps 5.1	Inspection
	Maintainability budgets shall			

Document No.: SKA-TEL-SKO-000008 FOR PROJECT USE ONLY
Revision: 6 Author: W Turner

Date: 2015-04-23

Page 140 of 275

be allocated at the system		
decomposition level, and		
shall be consistent with the		
system level requirements for		
reliability and maintainability		
of the system.		

15.4.2 Test and Repair Instructions

ID	Requirement		Status	Parent Requirement	Verification
SYS_REQ-2527	Test and	Repair	Accepted	ConOps 5.1	Inspection
	Instructions. Where end user				
	repair is applicable	Test and			
	Repair Instructions shall be				
	delivered with all ed	quipment.			

15.4.3 Level of Maintenance

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2528	Level of maintenance. The	Accepted	ConOps 5.1	Inspection
	level of maintenance shall be			
	identified for each repairable			
	item.			

15.4.4 Maintenance Test and Support Equipment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2529	Maintenance test and	Accepted	ConOps 5.1	Inspection
	support equipment.			
	Equipment required for test			
	and support shall be			
	identified for each repairable			
	item.			

15.4.5 Design for maintainability

Maintainability is that characteristic of design and installation that reflects the ease, accuracy, safety and economy of performing maintenance actions (B. S. Blanchard & W.J. Fabrycky 'Systems Engineering and Analysis' Pearson, 2011).

The purpose of maintainability analysis is to (ECSS-Q-ST-30):

- identify the possible corrective and preventive maintenance tasks,
- provide MTBF and MTTR for availability analysis,
- provide recommendations for improvement.

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 141 of 275

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W TurnerDate:2015-04-23Page 142 of 275

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2802	Design for maintainability.	Accepted	Concept of Operations	Inspection
	Designs shall incorporate		Section 5	
	maintainability studies and			
	analysis in accordance with			
	BS EN IEC 60706-2 with			
	emphasis on minimising the			
	need for maintainers on sites.			
	This activity should			
	incorporate best practice such			
	as described by B.S.			
	Blanchard & W.J. Fabrycky			
	'Systems Engineering and			
	Analysis', Pearson 2011.			

15.4.5.1 Modular packaging

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2594	Modular packaging. The	Accepted	SYS_REQ-2802	Inspection
	packaging of components shall be modular to limit			
	maintenance to the removal			
	of one module.			

15.4.5.2 Maintenance Provisions

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2595	Maintenance provisions.	Accepted	SYS_REQ-2802	Inspection
	Repairable items shall be			
	designed to include			
	maintenance provisions such			
	as test points, accessibility,			
	and plug-in components.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner 2015-04-23 Date: Page 143 of 275

15.4.5.3 Discard at failure items

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2596	Discard at failure items.	Accepted	SYS_REQ-2802	Inspection
	Discard at failure items shall			
	be packed at low cost.			

15.4.5.4 Plug-in modules

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2597	Plug-in modules. The design shall implement plug-in modules to the maximum extent possible.	Accepted	SYS_REQ-2802	Inspection

15.4.5.5 Module access

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2598	Module access. Where	Accepted	SYS_REQ-2802	Inspection
	applicable, access between			
	modules shall be sufficient to			
	facilitate hand grasping.			

15.4.5.6 Component removal

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2599	Component removal.	Accepted	SYS_REQ-2802	Inspection
	Modules and components			
	shall be mounted such that			
	removal of any single item			
	will not require the removal			
	of other items (component			
	stacking to be avoided where			
	possible)			

15.4.5.7 Secure mounting of modules

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2600	Secure mounting of	Accepted	SYS_REQ-2802	Inspection
	modules. Modules shall be			
	securely mounted (in			
	compliance with the shock			
	and vibration requirements)			
	with the minimum number of			
	fasteners.			

Document No.: SKA-TEL-SKO-0000008

Revision:

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 144 of 275

15.4.5.8 Shock mounting provision

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2601	Shock mounting provision. Shock mounting provisions shall be made where applicable.	Accepted	SYS_REQ-2802	Inspection

15.4.5.9 Mounting preclusion

ID Requirement Status Par	arent Requirement Verification
SYS_REQ-2602 Mounting preclusion. Provisions for the preclusion of mounting the wrong module shall be provided (key coding of connectors etc.).	YS_REQ-2802 Inspection

15.4.5.10 Stand-offs and handles

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2448	Stand-off and handles.	Accepted	SYS_REQ-2802	Inspection
	Stand-offs and handles shall			
	be used to protect system			
	components from damage			
	during shop maintenance.			

15.4.5.11 Mounting guides

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2603	Mounting guides. Mounting guides and location pins shall be provided to facilitate module mounting.	·	SYS_REQ-2802	Inspection

15.4.5.12 Module labelling

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2604	Module labelling. Where	Accepted	SYS_REQ-2802	Inspection
	possible, labelling of modules	-		
	shall be on the top or adjacent			
	in plain sight.			

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 145 of 275

15.4.5.13 Label robustness

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2605	Label robustness. Labels	Accepted	SYS_REQ-2802	Inspection
	shall be permanently affixed			
	and unlikely to come off			
	during maintenance or as a			
	result of the environment.			

15.4.5.14 Disposable item labelling

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2606	Disposable LRU labelling. Disposable line replaceable units should be labelled as such.	Accepted	SYS_REQ-2802	Inspection

15.4.6 Component obsolescence plan

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2711	Component obsolescence	Accepted	SYS_REQ-2722	Inspection
	plan. There shall be a plan for			
	the management of			
	component obsolescence.			

15.4.7 Long lead time items

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2571	Long lead time items. Long lead time items shall be identified to the project management.	•	SYS_REQ-2722	Inspection

15.4.8 Parts availability

Life cycle includes tests, storage and mission.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2570	Parts availability. The	Accepted	SYS_REQ-2722	Analysis
	estimated availability of the			
	parts shall be compatible with			
	the final system's life cycle.			

Document No.: SKA-TEL-SKO-000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 146 of 275

16 Quality Factors Requirements

16.1 Quality Control

ID	Requirement	Status	Parent Requirement	Verification
	Product Assurance. Product Assurance shall be managed following a process modelled on the SKA Product Assurance & Safety Plan SKA-OFF.PAQA-SKO-QP-	Accepted	Concept of Operations	Inspection
	001			

16.2 Workmanship

Good workmanship expected for mechanical, electrical and software production. It refers to the physical characteristics relating to the level of quality introduced by the manufacturing and assembly activities.

16.2.1 Scope of Workmanship Standards

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2509	Scope of workmanship	Accepted	SYS_REQ-2806	Inspection
	standards. SKA1 dedicated			
	workmanship standards shall			
	cover all phases of			
	production, assembly and			
	integration, testing, handling,			
	and include clear			
	requirements for			
	acceptance/rejection criteria.			

16.3 Testability

Testability is an important feature in the operation and maintenance of a system or equipment and has a significant effect on its availability and maintainability. Diagnostic testing may be carried out manually or with test equipment which may contain various levels of automation. Optimum design for testability requires close cooperation between design, operation and maintenance organizations.

For a product to retain its functionality, the functional status of each sub-function should be known at any time while the product is in its operating condition. If a failure occurs, action should be taken to ensure that the fault is recognized and the faulty item localized. This requirement placed on the testability of a product might appear to be quite simple, but if it is not considered at the start of product development, subsequent realization will result in increased work and significantly increased cost. If all requirements are available at the start of development, the development engineer can specify the functional characteristic "testability" without much additional effort and therefore achieve considerable cost savings e.g. by minimizing the number

of test steps for verifying the development results. Experience has shown that the extra cost and effort in the development phase can be recovered for example in the production phase since available test

 Document No.:
 SKA-TEL-SKO-0000008
 FOR PROJECT USE ONLY

 Revision:
 6
 Author: W Turner

 Date:
 2015-04-23
 Page 147 of 275

equipment can be used. Reliable fault recognition and low in-service maintenance costs increase the market value of a testable product considerably.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2816	Design for testability.	Accepted	SYS_REQ-2802	Inspection
	Designs shall include an			
	assessment of testability in			
	accordance with BS EN IEC			
	60706-5			

16.3.1 Test and support equipment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2538	Test and support	Accepted	SYS_REQ-2816	Inspection
	equipment Test and support			
	equipment shall be identified			
	for each level of			
	maintenance.			

16.3.2 Test and support equipment

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2539	Test and support	Accepted	SYS_REQ-2802	Inspection
	equipment standardisation.			
	Any test equipment not			
	included in the standard test			
	equipment list required for			
	the integration,			
	commissioning and			
	maintenance of equipment			
	shall be declared.			

16.3.3 Test and support equipment life cycle costs

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2540	Test and support	Accepted	SYS_REQ-2802	Inspection
	equipment lifecycle costs. Life cycle costs shall be			
	generated for all test and support equipment.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision:

2015-04-23 Date:

Author: W Turner Page 148 of 275

16.3.4 Test equipment reliability

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2541	Test equipment reliability Test equipment reliability shall be sufficient to meet the maintainability requirements.	·	SYS_REQ-2802	Analysis

16.3.5 Training Plan

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2542	Training A plan detailing the training required for maintenance, calibration and repair shall be generated.	·	SYS_REQ-2802	Inspection

16.3.6 Direct fault indicators

Direct fault indicators including fault lights audio warnings etc.

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2543	Direct fault indicators Where possible, direct fault indicators shall be designed	·	SYS_REQ-2816	Inspection
	in to equipment.			

16.3.7 Self-test

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2544	Self-test. Self-Test capability such that all faults can be identified down to LRU level	Accepted	SYS_REQ-2816	Analysis
	shall be provided.			

16.3.8 Continuous performance monitoring

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2546	Continuous performance	Accepted	SYS_REQ-2816	Demonstration
	monitoring. Where			
	possible, the system shall be			
	designed to provide			
	continuous performance			
	monitoring.			

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23

Page 149 of 275

16.3.9 Malfunction detection

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2552	Malfunction detection. All	Accepted	SYS_REQ-2816	Demonstration
	equipment malfunction shall			
	be detected at the system			
	level.			

16.4 Accessibility

16.4.1 Access tools.

ID	Requirement	t			Status	Parent Requirement	Verification
SYS_REQ-2556	Access to	ools.	Acc	cess	Accepted	SYS_REQ-2802	Analysis
	requiring to	ools	shall	be			
	minimised.						

16.5 Predictability - Design for manufacture

16.5.1 Design for economic production

Requirement needs further work to reflect the balance between manufacturing cost and RAM capability and its associated cost

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2559	Design for economic	Accepted	Con Ops Section 1.2	Inspection
	production. All designs for			
	the SKA shall be designed for			
	economic production. This is			
	required to ensure that the			
	SKA is buildable for a			
	reasonable cost (Con Ops			
	Section 1.2)			

16.5.2 Design definition

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2560	Design definition. Design	Accepted	SYS_REQ-2559	Inspection
	definition shall be in			
	sufficient detail to allow one			
	or more manufacturers to			
	produce the same item within			
	identified tolerances.			

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner

2015-04-23 Date:

Page 150 of 275

16.5.3 Manufacturing facilities

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2561	Manufacturing facilities. Where possible, currently existing facilities shall be used for manufacturing.	Accepted	SYS_REQ-2559	Inspection

16.5.4 Standard manufacturing tools

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2562	Standard manufacturing	Accepted	SYS_REQ-2559	Inspection
	tools. Where possible,			
	standard manufacturing tools			
	shall be used.			

17 Configuration Management

17.1 Product configuration information

Product configuration information comprises both product definition and product operational information. This typically includes requirements, specifications, design drawings, parts lists, software documents and listings, models, test specifications, maintenance and operating handbooks.

Product configuration information should be relevant and traceable. Numbering conventions should be established that are unique and ensure proper control of configuration items. These should take into consideration the existing numbering conventions of the organization and the change control information, such as revision status.

17.1.1 Materials

Use is to be made of adequate and (ecological) allowed permissible materials, deviations to be approved by the consortia leads (or their nominated authority), including management of applied materials.

The objectives are the following:

- a) To ensure that all requirements of the program are met,
- b) To verify the Materials, Parts and Processes activity of equipment suppliers,
- c) To control and monitor the status of Materials, Parts and Processes in accordance with program milestones and regulations

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 151 of 275

17.1.1.1 Materials list

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2566	Materials list. Each sub-	Accepted	Configuration	Inspection
	system supplier shall provide a Materials list for all items intended for use within		Management Plan	
	SKA1.			

17.1.1.2 Parts List

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2568	Parts list. Each Element		Configuration	Inspection
	supplier shall provide a parts		Management Plan	
	list for all items intended for			
	use in the SKA1.			

17.1.1.3 Process list

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2569	Process list. Each element	Accepted	Configuration	Inspection
	supplier shall provide a		Management Plan	
	process list for all items			
	intended for use in the SKA1.			

17.1.2 Nameplates and Marking

Components, (sub) systems, instruments, equipment, and materials shall be marked for configuration control purposes and maintenance support purposes.

17.1.2.1 Serial numbers

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2573	Serial number. Each part shall be marked with a unique serial number in an easily visible location.	Accepted	Established Precedent	Inspection

17.1.2.2 Drawing numbers

SYS_REQ-2574 Drawing numbers. Each LRU type shall be identified with a unique drawing	ID	Requirement	Status	Parent Requirement	Verification
number.	SYS_REQ-2574	LRU type shall be identified with a unique drawing	•	Established Precedent	Inspection

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 152 of 275

17.1.2.3 Marking method

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2575	Marking method. Method of	Accepted	Operational	Inspection
	marking shall be compatible		Concepts[3]	
	with the nature of the item, its			
	environment and its use.			

17.1.2.4 Electronically readable or scannable ID

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2576	Electronically readable or	Accepted	Established Precedent	Inspection
	scannable ID. Where			
	possible line replaceable			
	items shall be marked with an			
	Electronically readable or			
	scannable ID.			

17.1.2.5 Packaging part number marking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2577	marking. All packaging shall be marked with the part		Established Precedent	Inspection
	number of the contents.			

17.1.2.6 Packaging serial number marking

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2578	Package serial number marking. All packaging shall be marked with the serial number of the contents.		Established Precedent	Inspection

17.1.2.7 LRU electrostatic warnings

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2580	LRU electrostatic warnings All LRUs with electrostatic sensitive components shall be fitted with ESD warning labels.	Accepted	Established Precedent	Inspection

Document No.: SKA-TEL-SKO-000008

Revision:

Author: W Turner 2015-04-23 Date:

Page 153 of 275

FOR PROJECT USE ONLY

17.1.2.8 Packing electrostatic warnings

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2581	Packaging electrostatic	Accepted	Established Precedent	Inspection
	warnings. All packaging containing static sensitive contents shall be marked with ESD warning labels.			

17.1.2.9 Cable identification

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-2583	Cable identification. All	Accepted	SKA Electrical	Inspection
	cables ends shall carry a		Installation Standard	
	unique identifier.		SKA-TEL.OFF.SE-SKO-	
			ST-001	

17.1.2.10 Connector plates

ID	Requirement		Status	Parent Requi	irement	Verification
SYS_REQ-2584	Connector plates.	All	Accepted	SKA	Electrical	Inspection
	connector plates shall o	carry		Installation	Standard	
	identification labels	for		SKA-TEL.OFF	.SE-SKO-	
	connectors.			ST-001		

18 Verification Provisions

18.1 Methods

Demonstration (D): Operation of the system, subsystem or a part of the system that relies on observable, functional operation, not requiring use of instrumentation, special test equipment or subsequent analysis.

Test (T): Operation of the system, subsystem or a part of the system using instrumentation or other special test equipment to collect data for later analysis.

Analysis (A): Processing of accumulated data obtained from other qualification methods. Examples are reduction interpolation or extrapolation of test results.

Inspection (I): Visual examination of system components, documentation, etc.

Special Verification Methods: Special verification methods for the system or subsystem, for example, special tools, techniques, procedures, facilities, acceptance limits, use of standard samples, preproduction or periodic production samples, pilot models or pilot lots.

Document No.:SKA-TEL-SKO-000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Page 154 of 275

Date: 2015-04-23

19 Appendix A: Requirements Traceability Matrices

This appendix contains tabularized requirements traceability to the source documentation and to the next lower tier documentation where known.

ID	Requirement	Parent ID	Parent Requirement
SYS_REQ-xxxx	Void	N/A	Void

Table 1Traceability Matrices

20 Appendix B: Verification Matrices

This appendix contains tabularized verification method for every system or subsystem requirement.

ID	Description	Priority	Verification
SYS_REQ-2113	Global Headquarters The SKA	Essential	Inspection
	Global Headquarters (GHQ) will have		
	overall responsibility for the SKA		
	Observatory		
SYS_REQ-2114	Site location. The SKA1 Antenna	Essential	Inspection
	systems and digital signal chain shall		
	be located within radio quiet zones		
	provided by the Host Countries of		
	South Africa and Australia.		
SYS_REQ-2124	SKA1_low array. The SKA1_low	Essential	Inspection
	array shall be located within the legal		
	boundary of the Boolardy station.		
SYS_REQ-2713	SKA1_low central frequency	Essential	Inspection
	reference. The SKA1_low central		
	frequency reference shall be located in		
	the SKA1_low Central Signal		
	Processing facility		
SYS_REQ-2654	SKA1_low CSP facility. The facility	Essential	Inspection
	housing the station beamformers for		
	the inner area of the SKA1_Low and		
	the central signal processing for		
	SKA1_Low shall be at a distance of 2		
	km South West of the centre of the		
	SKA1_Low array.		
SYS_REQ-2120	Australian Science operations	Essential	Inspection
	centre. The Australian Science		
	Operations Centre shall be in Perth.		
SYS_REQ-2121	Australian Engineering Operations	Essential	Inspection
	Centre The Australian Engineering		
	Operations Centre shall be in in		
	Geraldton.		
SYS_REQ-2123	Australian Science processing centre	Essential	Inspection
	The Australian Science Processing		
	Centre shall make use of floor space,		
	power, cooling, and other		
	infrastructure at the Pawsey centre in		
	Perth.		

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY

Revision: Date:

Author: W Turner 2015-04-23 Page 155 of 275

CVC DEO 5115	CTZA4 MEL	Farance 1	
SYS_REQ-2119	SKA1_Mid array. The SKA1_Mid	Essential	Inspection
	dish array shall be located in the		
	Karoo Central Astronomy Advantage		
CVC DEO 3CEC	Area.	Essential	Inenestics:
SYS_REQ-2656	SKA1_mid CSP facility. The CSP	Essentiai	Inspection
	facility for SKA1_mid shall be located		
	in the Karoo Array Processor		
CVC PEO 274.4	Building.	Farantal	
SYS_REQ-2714	SKA1_mid central frequency reference. The SKA1_mid central	Essential	Inspection
	frequency reference shall be located in		
	the SKA1_mid Central Signal		
CVC DEO 311E	Processing facility	Essential	Increation
SYS_REQ-2115	South African Science Operations. The South African Science Operations	Essential	Inspection
SYS_REQ-2118	Centre shall be located in Cape Town. South African Science Processing	Essential	Inspection
313_KEQ-2118	Centre The South African Science	Looeiiliai	inspection
	Processing centre shall be located in		
	Cape Town		
SYS_REQ-2116	South African Engineering	Essential	Inspection
313_KLQ-2110	Operations Centre. The South	LSSCIILIAI	mspection
	African Engineering Operations		
	Centre shall be located at Klerefontein.		
SYS_REQ-2671	Receptor type. The SKA1_Low shall	Essential	Analysis
313_KEQ 2071	utilise dual, orthogonal, polarization	Listerial	Analysis
	log-periodic antennas.		
SYS_REQ-2673	Array resolution (core). The	Essential	Analysis
0.02070	SKA1_Low shall have an array	2550111141	7 indivisio
	resolution of better than 5 arc minutes		
	at 100 MHz (centre of the EoR		
	frequency range).		
SYS_REQ-2134	Electromagnetic frequency range.	Essential	Test
_ , ,	SKA1_Low shall be able to measure		
	electromagnetic radiation in a		
	frequency range from 50 MHz to 350		
	MHz.		
SYS_REQ-2621	Spectral stability: The spectral	Essential	Test
	stability, on a time scale of 600 sec.,of		
	the station beam bandpass, post station		
	calibration and RFI-mitigation, shall		
	be within 1.3 %, 0.4 %, 0.6 % and 1.1		
	% at 50 MHz, 100 MHz, 160 MHz,		
	and 220 MHz respectively compared		
	to the full polarization, parameterized		
	beam model.		
SYS_REQ-2135	SKA1_Low array sensitivity at	Essential	Test
	50MHz . The SKA1_Low array shall		
	have sensitivity per polarization at		
	zenith greater than 72 m ² K ⁻¹ at 50MHz		
	when assuming a sky noise		
	temperature following the law		
	60.lamda ^{2.55}		
·			·

Revision: 6

Date: 2015-04-23

SYS_REQ-2136	SKA1 I ou annou concitivity at	Essential	Test
313_KEQ-2130	SKA1_Low array sensitivity at	LSSCIIIIdi	iest
	110MHz. The SKA1_Low array shall		
	have a sensitivity per polarization at		
	zenith greater than 380 m ² K ⁻¹ at 100		
	MHz when assuming a sky noise		
	temperature following the law		
CVC PEC 2427	60.lambda^2.55	Formatal	Total
SYS_REQ-2137	SKA1_Low array sensitivity at	Essential	Test
	160MHz . The SKA1_Low array shall		
	have a sensitivity per polarization at		
	zenith of greater than 535 m ² K ⁻¹ at 160		
	MHz when assuming a sky noise		
	temperature following the law 60.lambda^2.55		
CVC DEO 2129		Essential	Test
SYS_REQ-2138	SKA1_Low array sensitivity at 220MHz. The SKA1_Low array shall	Loociillai	iest
	have a sensitivity per polarization at		
	zenith of greater than 530 m ² K ⁻¹ at 220		
	MHz when assuming a sky noise		
	temperature following the law 60.lambda^2.55.		
SYS_REQ-2814	SKA1_Low array sensitivity per	Essential	Test
313_KLQ-2814	polarization at 280 MHz. The	Loseiitiai	Test
	SKA1_Low array shall have a		
	sensitivity per polarization at zenith		
	greater than 500 m^2/K at 280 MHz		
	when assuming a sky noise		
	temperature following the law		
	60.lambda^2.55		
SYS_REQ-2815	SKA1_Low array sensitivity per	Essential	Test
_ `	polarization at 340 MHz. The		
	SKA1_Low array shall have a		
	sensitivity per polarization at zenith		
	greater than 453 m^2/K at 340 MHz		
	when assuming a sky noise		
	temperature following the law		
	60.lambda^2.55		
SYS_REQ-2622	Sensitivity for off zenith angles. The	Essential	Test
	SKA1_low receptor has an off-zenith		
	beam response defined by the receptor,		
	a log-periodic dipole antenna,in the		
	Baseline Design.		
SYS_REQ-2139	SKA1_Low antennas per station.	Essential	Inspection
	The SKA1_Low shall comprise of		
	stations each containing 256 antennas.		
SYS_REQ-2140	SKA1_Low station diameter. The	Essential	Inspection
	station diameter will be 35 metres,		
	which is consistent with being able to		
	provide a single, circularly symmetric,		
	beam of 5 degrees at the half-power		
	points at 100 MHz (centre of the EoR		
	frequency range) while meeting the		
	sensitivity requirements with 256		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 157 of 275

	antennas per station evenly distributed		
	in an irregular-random configuration.		
SYS_REQ-2142	SKA1 Low number of stations. The	Essential	Inspection
0.0 ==	SKA1_Low shall comprise of 512	2000110101	
	stations.		
SYS_REQ-2143	SKA1_Low configuration. The	Essential	Inspection
	SKA1_Low shall have a configuration		
	as specified in TBD.		
SYS_REQ-2817	SKA1 Low maximum baseline	Essential	Inspection
	length between stations. The		·
	maximum distance between station		
	centres shall be approximately 80 km		
SYS_REQ-2147	Instantaneous bandwidth. The	Essential	Test
	SKA1_Low shall be capable of		
	simultaneously processing 300 MHz		
	of bandwidth.		
SYS_REQ-2652	SKA1_Low separation. The	Essential	Measurement
	SKA1_Low core shall be located at a		
	minimum distance of 10km from the		
	ASKAP core.		
SYS_REQ-2674	Digitisation. Digitisation of	Essential	Demonstration
	SKA1_antenna (SKA1_Low only)		
	signals shall be to at least 8 bits.		_
SYS_REQ-2639	Clipping. The amplitude dynamic	Essential	Test
	range of the SKA1_Low ADC's shall		
	be such that no clipping will occur for		
SVC DEO 2540	95% of the time		
SYS_REQ-2640	Clipped data flagging. Clipped data	Essential	Demonstration
	shall be flagged accordingly within the		
SYS_REQ-2653	data stream.	Essential	Test
313_REQ-2033	Linearity. At the finest frequency resolution in the processing chain, the	Essential	lest
	level of spurious signals due to non-		
	linearity shall be less than the noise		
	level when no external input signal is		
	present.		
SYS_REQ-2824	Absolute flux scale : The absolute flux	Essential	Test
	scale shall be accurate to 5		
SYS_REQ-2676	Dynamic range. The SKA1_Low	Essential	Test
	beams shall have a dynamic range of		
	better than 40 dB		
SYS_REQ-2146	SKA1_Low station beams The	Essential	Demonstration
	antennas within each station shall be		
	coherently beam-formed to provide		
	one pair of station beams,one beam for		
	each orthogonal polarization,for		
	primary science.		
SYS_REQ-2779	Control of station beam properties:	Essential	Test
	It shall be possible to control specific		
	properties of the station beam by		
	setting the station beam weights		
	appropriately		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 158 of 275

SYS_REQ-2629	Station beam stability. The	Essential	Test
313_KLQ-2023	difference between the parameterized	Listericia	Test
	station beam model and the actual		
	station beam shall remain smaller than		
	1.3 %, 0.4 %, 0.6 % and 1.1 % relative		
	to the main beam peak power, after		
	2 2		
	calibration, at 50 MHz, 100 MHz, 160		
CVC DEO 2624	MHZ and 220 MHz respectively	Essential	Domonstration
SYS_REQ-2634	Calibration update rate. Calibration	Essentiai	Demonstration
	measurements shall be necessary at a		
CVC DEO 2025	rate of no more than 10seconds. Real-time calibration. The LFAA	Farantial	D
SYS_REQ-2635		Essential	Demonstration
	reception system at station level shall		
	provide on-line instrumental		
	calibration functions with an update		
0/0 550 5555	rate of 10 minutes		
SYS_REQ-2636	Beam products. The SKA1_Low	Essential	Demonstration
	shall be capable of outputting beam		
	products as voltage time series.		
SYS_REQ-2773	SKA1_Low correlator sub-array	Essential	Test
	support . The SKA1_Low correlator		
	shall be able to correlate SKA1_low		
	station beams from one to sixteen sub-		
	arrays independently and concurrently		
SYS_REQ-2148	SKA1_Low channelisation. The	Essential	Test
	SKA1_Low channelisation for each		
	sub array shall provide up to 65,536		
	linearly spaced frequency channels		
	across the available frequency range of		
	each band.		
SYS_REQ-2149	SKA1_Low channeliser maximum	Essential	Test
	leakage power for adjacent		
	frequency channels. The SKA1_Low		
	channeliser for each sub-array shall		
	have a maximum noise leakage power		
	from immediately adjacent frequency		
	channels of < -30 dB.		
SYS_REQ-2810	SKA1_Low channeliser maximum	Essential	Test
	leakage power for non-adjacent		
	frequency channels. The SKA1_Low		
	channeliser for each sub-array shall		
	have a maximum noise leakage power		
	from non adjacent frequency channels		
010 5-5 5-11	better than -60 dB.		<u> </u>
SYS_REQ-2811	SKA1_Low fine frequency channel	Essential	Test
	amplitude variation. The fine		
	frequency channels for the		
	SKA1_Low channeliser shall have a		
	total amplitude variation as a function		
	of frequency of less than 0.01 dB.		
SYS_REQ-2812	SKA1_Low fine frequency channel	Essential	Test
	band edge. The fine frequency cells		
	for the SKA1_Low channeliser shall		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 159 of 275

	have a -3dB transition band amplitude		
	at the channel band edge.		
SYS_REQ-2678	SKA1_Low correlatation signal to	Essential	Analysis
	noise . SKA1_Low correlation, for		
	each sub array, shall not degrade the		
	Signal to Noise ratio by more than 2 %		
	compared to ideal analogue		
	correlation.		
SYS_REQ-2150	SKA1_Low correlator Integration	Essential	Test
	rate. The SKA1_Low correlator for		
	each sub array shall have		
	independently configurable visibility		
	integration periods in the range 9s to		
	0.9s.		
SYS_REQ-2153	Diameter . SKA1 dishes shall have a	Essential	Inspection
	projected diameter of larger than 15m		
	and smaller than 16.5m.		
SYS_REQ-2155	Aperture Efficiency. Aperture	Useful	Test
	efficiency shall be within +/- 5 % of:		
	• 60% at 350MHz with gradual		
	degradation from 400 to 350		
	MHz		
	• 65% at 400MHz		
	• 78% from 600MHz to		
	8000MHz		
	• 70% from 8 to 15 GHz		
	• 65% from 15 to 20 GHz		
	03/0 110111 13 to 20 G112		
SYS_REQ-2158	Pointing repeatability. The pointing	Essential	Test
	repeatability shall be better than 10 arc		
	seconds rms for winds < 7 m/s at night		
	time.		
SYS_REQ-2159	Pointing repeatability . The pointing	Essential	Test
- `	repeatability shall be better than 17 arc		
	seconds rms for an average wind speed		
	of < 7 m/s in the day time		
SYS REQ-2160	Pointing repeatability. The pointing	Essential	Test
_ `	repeatability shall be better than 180		
	arc seconds rms for an average wind		
	speed between 7 and 20 m/s		
SYS_REQ-2162	Number of feeds. There shall be	Essential	Inspection
	space at the Gregorian focus of SKA1		
	dishes for five single pixel feeds (SPF)		
	or three Phased Array Feeds (PAF)		
SYS_REQ-2165	Polarisation Purity. The IXR shall be	Essential	Test
	better than 15 dB over the whole		
	observing bandwidth within the		
	HPBW		
SYS_REQ-2170	Elevation limit. Reflector antennas	Essential	Demonstration
	shall be capable of operating at all		
	elevations greater than 15 degrees		
SYS_REQ-2171	Azimuth range. The Dish shall have a	Essential	Demonstration
	continuous useable azimuth		
	KV_TEL-2KU-0000008	•	EOR DROIECT LISE O

Revision: 6
Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 160 of 275

	observation range from -270° to		
	+270°, inclusive measured relative to		
	true North defined as 0° and with East		
	defined as +90°		
SYS_REQ-2833	SKA1_Mid inclusion of MeerKAT.	Essential	Demonstration
	The SKA1_Mid shall incorporate the		
	64 antennas in both monitor and		
	control and data collection functions.		
SYS_REQ-2173	MeerKAT array. The monitor and	Essential	Demonstration
	control functions of MeerKAT shall be		
	made available to SKA1_Mid via a		
	Foreign Telescope interface consisting		
	of a Local Monitor and Control system		
	connected to the SKA1_Mid		
	Telescope Manager.		
SYS_REQ-2834	SKA1_Mid-MeerKAT	Essential	Analysis
	infrastructure reuse. Where		
	economically practicable, the existing		
	MeerKAT infrastructure will be reused		
SYS_REQ-2825	Absolute flux scale: The absolute flux	Essential	Test
	scale shall be accurate to 5% rms		
SYS_REQ-2826	Absolute flux scale: The absolute flux	Useful	Test
	scale shall be accurate to 3% rms		
SYS_REQ-2174	Combined SKA1 Mid	Essential	Inspection
	Configuration. The SKA1_Mid shall		
	have the configuration defined in the		
	TB		
SYS_REQ-2712	SKA1_Mid antenna. The SKA1_Mid	Essential	Inspection
	array shall consist of 133 antennas		
	centred in the same location as the		
6)/6 850 2470	MeerKAT array		
SYS_REQ-2179	Antenna RF system. The Dish	Essential	Inspection
	Element shall make available only a		
SYS_REQ-2180	single frequency band at any one time.	Essential	Toot
313_REQ-2180	RF system frequency range band 1 The array of SKA1_Mid dishes, when	Essentiai	Test
	the band 1 capability is selected, shall		
	operate over a frequency range from		
	0.35 to 1.050 GHz for each		
	polarisation.		
SYS_REQ-2181	RF system frequency range band 2.	Essential	Test
0.02 ==0=	The SKA1 Mid dishes, when the band		
	2 capability is selected, shall operate		
	over a frequency range from 0.95 to		
	1.76 GHz for each polarisation.		
SYS_REQ-2182	RF system frequency range band 3.	Essential	Test
	The SKA1_Mid dishes, when the band		
	3 capability is selected, shall operate		
	over a frequency range from 1.65 to		
	3.05 GHz for each polarisation		
SYS_REQ-2183	RF system frequency range band 4.	Essential	Test
	The SKA1_Mid dishes, when the band		
	4 capability is selected, shall operate		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 161 of 275

	over a frequency range from 2.80 to		
	5.18 GHz for each polarisation		
SYS_REQ-2184	RF system frequency range band 5.	Essential	Test
	The SKA1_Mid dishes, when the band		
	5 capability is selected, shall operate		
	over a frequency range from 4.6 to		
	13.8 GHz for each polarisation.		
SYS_REQ-2185	RF system sampled bandwidth band	Essential	Test
_	1. The instantaneous bandwidth for		
	band 1 will be 700MHz and shall be		
	sampled to at least 2.0 G samples per		
	second for each polarisation		
SYS_REQ-2186	RF system sampled bandwidth band	Essential	Test
	2. The instantaneous bandwidth for		
	band 2 will be 810 MHz and shall be		
	sampled to at least 2.0 G sample per		
	second for each polarisation.		
SYS_REQ-2187	RF system sampled bandwidth band	Essential	Test
	3 The instantaneous bandwidth for		
	band 3 will be 1,403 MHz and shall be		
	sampled to at least 5.0 G samples per		
	second for each polarisation		
SYS_REQ-2188	RF system sampled bandwidth band	Essential	Test
	4 The instantaneous bandwidth for		
	band 4 will be 2,380 MHz and shall be		
	sampled at at least 5.0 G samples per		
	second for each polarisation.		
			- .
SYS_REQ-2189	RF system sampled bandwidth band	Essential	Test
SYS_REQ-2189	5 The SKA_Mid, for band 5, shall	Essential	lest
SYS_REQ-2189	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands	Essential	lest
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation.		
SYS_REQ-2189 SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation.RF digitisation. Digitisation for each	Essential	Demonstration
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation.RF digitisation. Digitisation for each polarisation shall be:		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3		
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits		
SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits	Essential	Demonstration
	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits		
SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able	Essential	Demonstration
SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as	Essential	Demonstration
SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and	Essential	Demonstration
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently	Essential	Demonstration Demonstration
SYS_REQ-2190	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The	Essential	Demonstration
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each	Essential	Demonstration Demonstration
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each sub array shall provide up to 65,536	Essential	Demonstration Demonstration
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each sub array shall provide up to 65,536 linearly spaced frequency channels	Essential	Demonstration Demonstration
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each sub array shall provide up to 65,536 linearly spaced frequency channels across the sampled bandwidth of each	Essential	Demonstration Demonstration
SYS_REQ-2190 SYS_REQ-2774 SYS_REQ-2195	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each sub array shall provide up to 65,536 linearly spaced frequency channels across the sampled bandwidth of each band.	Essential Essential	Demonstration Demonstration Test
SYS_REQ-2190 SYS_REQ-2774	5 The SKA_Mid, for band 5, shall digitise two separate 2.5 GHz bands for each polarisation. RF digitisation. Digitisation for each polarisation shall be: • band 1 8 bits • band 2 8 bits • band 3 6 bits • band 4 at least 4 bits • band 5 at least 2 streams of 3 bits SKA1_Mid correlation sub-array support. The SKA1_Mid shall be able to correlate SKA1_mid dishes as multiple sub-arrays independently and concurrently SKA1_Mid channelisation. The SKA1_Mid channelisation for each sub array shall provide up to 65,536 linearly spaced frequency channels across the sampled bandwidth of each	Essential	Demonstration Demonstration

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 162 of 275

	l' , l l Tl CIZA4 M':l		
	adjacent channels. The SKA1_Mid		
	for each sub-array shall have a		
	maximum noise leakage power from		
	immediately adjacent frequency		
	channels of < -30 dB		
SYS_REQ-2803	SKA1_Mid maximum leakage	Essential	Test
	power for non-adjacent frequency		
	channels. The SKA1_Mid, for each		
	sub-array, shall have a maximum noise		
	leakage power from non adjacent		
	frequency channels better than -60 dB.		
SYS_REQ-2805	SKA1_Mid fine frequency channel	Essential	Test
	amplitude variation. The fine		
	frequency channels for the SKA1_Mid		
	channeliser shall have a total		
	amplitude variation as a function of		
	frequency of less than 0.01 dB after		
	bandpass calibratio		
SYS_REQ-2804	SKA1_Mid fine frequency channel	Essential	Test
	band edge . The fine frequency cells		
	for the SKA1_Mid channeliser shall		
	have a -3dB transition band amplitude		
	at the channel band edge.		
SYS_REQ-2679	SKA1_Mid correlation signal to	Essential	Analysis
	noise. The SKA1_Mid correlation, for		
	the same sub-array, shall not degrade		
	the Signal to Noise ratio by more than		
	2% compared to ideal analogue		
	correlation.		
SYS_REQ-2197	SKA1_Mid correlation integration	Essential	Demonstration
	period. The SKA1_Mid shall have		
	independently configurable visibility		
	integration period from a maximum		
	integration time of 1.4s to a minimum		
	of 0.14s for each subarray.		
SYS_REQ-2616	SKA1_Mid Pulsar phase binning.	Essential	Demonstration
	The SKA1_Mid, for each subarray,		
	shall allow for pulse phase-resolved		
	observations supporting the product of		
	the number of phase bins, channel and		
	polarisation products up to 262,144		
	(i.e. 4 x 65,536).		
SYS_REQ-2830	SKA1_Mid Pulsar phase bin width.	Essential	Test
	The SKA1_Mid shall be capable of		
	providing pulsar phase bin widths with		
	a time resolution of better than 10us		
SYS_REQ-2831	SKA1_Mid Pulsar phase bin	Essential	Test
	synchronisation. The SKA1_Mid		
	shall be capable of synchronising		
	phase bins to the ephemeris to limit		
	drift to less than 10% of the selected		
	bin width within the selected		
	correlator integration period.		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 163 of 275

SYS_REQ-2835	SKA1_Mid Phase bin averaging	Essential	Demonstration
313_KEQ 2033	time. The SKA1_Mid phase bin	Listeria	Demonstration
	averaging time shall be constrained to		
	limit the output data rate to at		
	most the single bin configuration		
	output data rate.		
SYS_REQ-2740	Inclusion of MeerKAT into	Essential	Demonstration
313_REQ-2740	SKA1_mid correlator. The	Essertial	Demonstration
	SKA1_Mid correlator shall be capable		
	of forming real time cross correlation		
	products from all antenna within the		
	SKA1_Mid combined array including		
	those MeerKAT.		
CVC DEO 2201		Essential	Domonstration
SYS_REQ-2201	Beam-former sub-array support.	Essential	Demonstration
	The SKA1_Mid central beam-former shall be able to form beams or more		
	beams for one to sixteen sub-arrays		
CVC DEC 2751	independently and concurrently.	Essential	Demonstration
SYS_REQ-2751	Pulsar search and timing within sub-arrays. SKA1_Mid shall be	rosciitidi	Demonstration
	capable of Pulsar search and timing		
	processing within individual sub-		
SYS_REQ-2202	Pulsar search array diameter. The	Essential	Demonstration
313_REQ-2202	central beam-former for pulsar search	Essertial	Demonstration
	shall be capable of forming beams		
	independently across all dishes		
	(SKA1_Mid and MeerKAT) within		
	each of the SKA1_Mid sub-arrays up		
	to a distance of up to 10,000 metres		
	from sub-array centres.		
SYS_REQ-2755	Pulsar search beamformer centre	Essential	Demonstration
313_MEQ 2733	frequency . The Pulsar search	Listeria	Demonstration
	beamformer shall form beams for each		
	of the search sub arrays with an		
	independently selectable centre		
	frequency for the sub-array in the		
	range from the lowest frequency of		
	SKA1_Mid band 1 through to the		
	highest frequency of band 5.		
SYS_REQ-2756	Pulsar search beamforming	Essential	Demonstration
	bandwidth. The SKA1_Mid Pulsar		
	search shall have a contiguous		
	processing bandwidth for		
	beamforming of up to 300 MHz.		
SYS_REQ-2203	Number of beams: Pulsar search.	Essential	Demonstration
	SKA1_Mid, when performing the		
	Pulsar Search function, shall		
	simultaneously form up to a total of		
	1111 beams per observation across all		
	sub arrays.		
SYS_REQ-2205	Beamformer S/N pulsar search. The	Essential	Analysis
	SKA1_Mid central beam-forming for		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 164 of 275

	each sub array shall have a Signal to		
	Noise ratio greater or equal to 98% of		
	ideal analogue beam forming for the		
	same sub array:		
SYS_REQ-2753	Pulsar search beamformer output.	Essential	Demonstration
	For each SKA1 Mid Pulsar search		
	sub-array the output shall be the power		
	of summed polarisation beams.		
SYS_REQ-2752	Pulsar search beamforming output	Essential	Demonstration
	frequency resolution. The frequency		
	resolution for SKA1_Mid Pulsar		
	search shall be independently		
	configurable in frequency resolution		
	with values in the 20 kHz and 75 kHz		
SYS_REQ-2754	Pulsar search beamforming output	Essential	Demonstration
	time resolution: SKA1_Mid Pulsar		
	search output beams shall have a		
	minimum time resolution of 50us.		
SYS_REQ-2206	Pulsar timing array radius. The	Essential	Demonstration
_	central beam-former for pulsar timing		
	shall be capable of forming beams		
	across all dishes within the		
	SKA1_Mid sub-arrays to a distance of		
	up to 10,000 metres from their centres.		
SYS_REQ-2757	Pulsar timing beamformer centre	Essential	Demonstration
	frequency. The Pulsar timing		
	beamformer shall form beams for each		
	of the timing sub-arrays with a		
	selectable centre frequency for the		
	sub-array in the range from the lowest		
	frequency of SKA1_Mid band 1		
	through to the highest frequency of		
	band 5.		
SYS_REQ-2758	Pulsar timing beamformer	Essential	Test
	bandwidth. The SKA1_Mid Pulsar		
	timing beamformer for each timing		
	sub-array shall have a contiguous		
	processing bandwidth up to the full		
	bandwidth of the selected band up to a		
	bandwidth of 2.5 GHz.		
SYS_REQ-2207	Number of beams: Pulsar timing.	Essential	Demonstration
	The SKA1_Mid central beam-former		
	for Pulsar timing shall be capable of		
	forming up to 16 dual polarisation		
	coherent beams in total across all		
	timing sub-arrays.		
SYS_REQ-2208	Beamforming S/N ratio: Pulsar	Essential	Analysis
	timing. The SKA1_Mid for Pulsar		
	timing shall have a Signal to Noise		
	ratio greater or equal to 98% of an		
	ideal analogue beam former.		

Revision: 6

Date: 2015-04-23

SYS_REQ-2689	SKA1_Mid VLBI beam number.	Essential	Analysis
515_M2Q 2003	SKA1_Mid shall be capable of	2550111101	7 maryons
	producing up to four VLBI beams		
SYS_REQ-2759	SKA1_Mid VLBI array diameter.	Useful	Analysis
0.02 = 7.00	SKA1_Mid shall be able to generate	330.4.	- III.
	VLBI beams from sub-arrays with		
	receptors separated by up to 100km		
SYS_REQ-2760	SKA1_Mid VLBI centre frequency.	Essential	Test
_ `	SKA1_Mid shall be able to form a		
	VLBI beam with a 0.01MHz step		
	selectable centre frequency within the		
	boundaries of the defined frequency		
	bands for SKA1_Mid.		
SYS_REQ-2761	SKA1_Mid VLBI beam bandwidth.	Essential	Analysis
	SKA1_Mid VLBI beamforming shall		
	have a contiguous processing		
	bandwidth up to the full bandwidth of		
	the selected band		
SYS_REQ-2762	SKA1_Mid VLBI beamformer S/N	Essential	Test
	performance. SKA1_Mid VLBI		
	beamforming shall have the Signal to		
	Noise ratio by more than 98%		
	compared to an ideal analogue beam		
0/0 555 5045	former.		
SYS_REQ-2847	SKA1_Mid VLBI store the time-	Essential	Test
	dependent antenna weights.		
	SKA1_Mid shall be able to store the time-dependent antenna weights used		
	for each tied-array beam su		
SYS_REQ-2848	SKA1_Mid VLBI timestamp	Essential	Test
313_KEQ 2040	accuracy. SKA1_Mid shall be able to	Listeria	1630
	generate data from the VLBI beams		
	with samples traceable to a timestamp		
	with an accuracy of 1 nsec or better		
SYS REQ-2849	SKA1_Mid VLBI beams sampling	Essential	Test
	rate. SKA1_Mid shall be able to		
	output VLBI beams with a sampling		
	rate selectable between Nyquist and		
	oversampled rates for the selected		
	bandwidth		
SYS_REQ-2850	SKA1_Mid VLBI beamforming.	Essential	Test
	SKA1_Mid shall be able to allocate		
	antennas to be included in, or excluded		
	from, individual tied-array beams		
SYS_REQ-2851	SKA1_Mid VLBI relative sensitivity	Essential	Test
	and coherence losses. The		
	SKA1_Mid beamformer shall be able		
	to weight the antenna inputs into the		
	tied-array sums based on relative sensitivity and coherence losses		
SYS_REQ-2852	SKA1_Mid VLBI configurability.	Essential	Test
313_NEQ-2032	SKA1_Mid vLb1 configurability. SKA1_Mid shall be able to change the	Loociillai	1636
	pointing, centre frequency, and		
	pommig, centre frequency, and	l	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 166 of 275

	handwidth of the individual tied arres-		
	bandwidth of the individual tied-array		
	beams within a single observing schedule		
SYS_REQ-2853	SKA1_Mid VLBI configurability.	Essential	Test
313_KLQ-2833	SKA1_Mid shall be capable of	LSSCIILIAI	Test
	selecting, through configuration, 1, 2,		
	3, or 4 separate VLBI specific beams,		
	each with independently selectable		
	centre frequency, bandwidth,		
	frequency resolution and pointing		
SYS_REQ-2854	SKA1_Mid VLBI configurability.	Select One	Test
	SKA1_Mid shall be capable of		
	reconfiguring the centre frequency,		
	frequency band, and bandwidth for		
	each tied-array beam, in less than 30		
	seconds		
SYS_REQ-2855	SKA1_Mid VLBI spectral	Essential	Test
	resolution. SKA1_Mid shall be able		
	to generate VLBI beams with a		
	spectral resolutions different from the		
	spectral resolution used for imaging		
	within the same VLBI sub-arra		
SYS_REQ-2856	SKA1_Mid VLBI channel width.	Essential	Test
	SKA1_Mid shall be able to generate		
	VLBI beam data with a selectable		
	channel width of: 512MHz, 256 MHz,		
	128MHz, 64MHz, 32MHz, 16MHz,		
CVC PEO 2057	4MHz or 1MHz	Farantial	T
SYS_REQ-2857	SKA1_Mid VLBI imaging and beamforming SKA1_Mid shall be	Essential	Test
	able to simultaneously generate		
	imaging data using all antennas in a		
	VLBI sub-array, as well as generating		
	the VLBI beams		
SYS_REQ-2859	SKA1_Mid VLBI spectral line and	Select One	Demonstration
	time domain observation SKA1 Mid		
	shall be able to generate VLBI beams		
	optimised for either spectral line		
	observations (to mitigate spectral		
	leakage) or time domain observations		
	(to mitigate time smearing		
SYS_REQ-2860	SKA1_Mid VLBI beams and sub-	Essential	Test
	arrays. SKA1_Mid shall be able to		
	allocate individual VLBI beams to		
	different sub-arrays		
SYS_REQ-2861	SKA1_Mid VLBI array diameter.	Essential	Demonstration
	SKA1_Mid shall be able to generate		
	VLBI beams from sub-arrays with		
CVC P50 C555	receptors separated by up to 20km	Faranti I	Damas de di
SYS_REQ-2765	Pulsar search sub-array support.	Essential	Demonstration
	The SKA1_Mid Pulsar search shall be		
	able to independently process a total of up to 1111 beams from one to sixteen		
	up to 1111 beams from one to sixteen		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 167 of 275

	sub-arrays independently and		
	concurrently.		
SYS_REQ-2767	Pulsar search processing	Essential	Test
_	bandwidth . The Pulsar search		
	processing shall have a contiguous		
	processing bandwidth up to 300 MHz		
	for each search sub array.		
SYS_REQ-2212	Dispersion Measure. SKA1_Mid for	Essential	Demonstration
	pulsar search shall provide, for each		
	sub array, trial dispersion corrections		
	across the observation frequency range		
	for dispersion measures from 0 up to		
	3000 pc cm ⁻³ .		
SYS_REQ-2216	Time resolution. The time resolution	Essential	Analysis
	of the SKA1_Mid pulsar search		
	processing for each sub-array shall be		
	equivalent to the temporal smearing		
	due to dispersion at the observation		
	frequency and bandwidth of the		
	observation with a quantisation of		
	value in powers of 2 from 50 µs to 800		
	us		
SYS_REQ-2218	Pulsar search observation time. For	Essential	Demonstration
	each Pulsar search sub-array, the		
	processing shall provide independently		
	configurable observation times up to		
646 050 0040	1800 seconds duration.		
SYS_REQ-2219	Single pulse searches. For each	Essential	Analysis
	search sub-array within SKA1_Mid Pulsar search, the processing shall be		
	capable of searching for single		
	dispersed pulses over dispersion		
	measure range up to 3000 pc cm ⁻³		
	commensally with searches for		
	periodic pulses with a S/N		
	performance better than 7		
SYS_REQ-2220	Binary search. For each Pulsar search	Essential	Analysis
	sub-array within SKA1_Mid the		,
	processing shall be capable of		
	searching for binary systems with		
	accelerations due to their orbital		
	motion of up to 350 ms ⁻² .		
SYS_REQ-2763	Pulsar timing sub-array support.	Essential	Demonstration
	The SKA1_Mid Pulsar timing		
	processing shall be able to		
	independently process a total of up to		
	16 beams from one to sixteen sub-		
	arrays independently and concurrently.		
SYS_REQ-2768	Pulsar timing processing	Essential	Test
	bandwidth. The Pulsar timing engine		
	shall have a contiguous processing		
	bandwidth up to the full bandwidth of		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 168 of 275

	the selected hand up to a handwidth of		
	the selected band up to a bandwidth of		
CVC DEC 2224	2.5 GHz for each timing sub-array	Essential	Domonatustic:
SYS_REQ-2224	Frequency agility. The SKA1_Mid	Essentiai	Demonstration
	system shall, for each timing sub-		
	array, be able to change from		
	observing in any frequency band, to		
	observing in any other frequency band		
01/2 272 2722	in less than or equal to 30 seconds.		
SYS_REQ-2766	Pulsar timing observation time. The	Essential	Demonstration
	observation period for each		
	observation for each timing sub-array		
	shall be independently configurable		
	between 3 minutes and 300 minutes.		
SYS_REQ-2764	Time stamping. For each individual	Essential	Demonstration
	Pulsar timing observation within a		
	sub-array, each data sample shall be		
	traceable to a time stamp derived from		
	a clock accurate to 10ns on a time		
	scale of 10 years referenced to a		
	common delay centre at the centre of		
CVC PEO 2222	the SKA1_Mid array.		5:
SYS_REQ-2230	Multiple timings. The SKA Phase 1	Essential	Demonstration
	shall be capable of timing up to 16		
	pulsars simultaneously in total across		
CVC PEO 2224	all timing sub arrays .	Farantal	A se a le sada
SYS_REQ-2231	Pulsar timing Dispersion Measure.	Essential	Analysis
	The SKA1_Mid shall be capable of		
	timing pulsars with dispersion measures between 0 to 3000 pc cm ⁻³		
	such that residual dispersive smearing		
	is less than 500 ns.		
SYS_REQ-2128	Continuum and spectral line	Essential	Demonstration
313_NLQ-2120	imaging mode. Both SKA1 telescopes	Listeritian	Demonstration
	shall be capable of operating in a		
	Continuum and Spectral-line imaging		
	mode concurrently.		
SYS REQ-2129	Pulsar Search Mode. The SKA1 mid	Essential	Demonstration
313_MEQ 2123	telescope shall be capable of operating	Listenda	Demonstration
	in a Pulsar search mode, concurrently		
	with Continuum imaging mode.		
SYS_REQ-2130	Pulsar Timing Mode. The	Essential	Demonstration
	SKA1_mid telescope shall be capable		
	of operating in a Pulsar timing mode,		
	concurrently with continuum imaging		
	mode.		
SYS_REQ-2126	Simultaneous operation of	Essential	Demonstration
	telescopes. Both SKA1 telescopes		
	shall be capable of operating		
	concurrently and independently.		
SYS_REQ-2133	Mode transition. The switching time	Essential	Test
, -=	between telescope operating modes		
	shall take less than 30 seconds (not		
		İ	1
	including antenna slewing time)		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 169 of 275

SYS_REQ-2681	Specific epoch observations. The observatory shall have the capability of scheduling observations at a	Essential	Demonstration
	specific epoch for time dependent phenomena.		
SYS_REQ-2682	Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of	Essential	Inspection
	high current scientific interest.		
SYS_REQ-2683	Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects.	Essential	Inspection
SYS_REQ-2688	Commensal Observing Data access rights. There shall be a documented data access rights policy for commensal observing for data sets shared across projects.	Essential	Inspection
SYS_REQ-2127	Sub-Arraying. Both of the SKA1 telescopes shall be capable of operating independently with one to sixteen sub-arrays (i.e. collecting area is split and allocated to separate, concurrently observing programmes).	Essential	Demonstration
SYS_REQ-2736	Authentication and Authorisation. All SKA users shall require to be registered and authenticated for the purposes of proposal and project submission.	Essential	Demonstration
SYS_REQ-2278	Scheduled maintenance logs. A maintenance database shall be established that logs all the scheduled maintenance and unexpected repairs.	Essential	Demonstration
SYS_REQ-2279	System error logs. A failure database shall be established, which logs the errors of the system and its subsystems, including the corrective actions taken.	Essential	Demonstration
SYS_REQ-2280	System status. The system shall extract information about the current condition of the system from the science and calibration data streams, and log this information along with other relevant system and environmental status information. Based on this information, it shall be possible to monitor, save, and analyse the technical performance of the system.	Essential	Demonstration
SYS_REQ-2282	Central location for data bases. External sources of information used	Essential	Demonstration

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 170 of 275

Telescope Manager. No sources other than those cached by TM shall be used. SYS_REQ-2283 Target of opportunity. TOO observing shall be via Scheduling Blocks. SYS_REQ-2285 Latency of TOO scheduling block initiation. Scheduling intervention on TOO triggers shall be initiated within Is of receiving the trigger. SYS_REQ-2286 Discard previous scheduling block. At the launching of a TOO Scheduling Blocks. At the launching of a TOO Scheduling Block, the results from any active Scheduling Blocks shall be discarded. SYS_REQ-2289 Proposal submission. Program submission, assessment, and time allocation shall governed by an official policy document. SYS_REQ-2723 Proposal submission tool. There shall be a tool to facilitate the assessment, review and ranking of proposals, guided by official SKA Policies. SYS_REQ-2647 Tool for proposal submission of proposals, as necessary facilitating access to relevant sources of information such as Telescope characteristics, previous observations, SIMBAD, templates. SYS_REQ-2290 Pre and post conditions. Scheduling Blocks shall have computable pre- and post-conditions. SYS_REQ-2291 Semester queue. A Semester Queue (SQ) shall be constructed by Operations following acceptance of proposals. SYS_REQ-2292 Operations following acceptance of proposals. SYS_REQ-2293 Short term schedule and Scheduling Blocks and submitting for execution tool. There shall be a niteractive tool to aid the proposer in constructing Scheduling Blocks and an executable schedule and Scheduling Scheduling Blocks and an executable schedule and Scheduling Scheduling Blocks and an executable schedule and Scheduling Blocks and an executable schedule and Scheduling Blocks and an executable scheduling Blocks and an executable scheduling Blocks and an executable scheduling Blocks and submitting for execution of schedule. There shall be a API or APIs for the construction of scheduling blocks from Python and Java.		buthe Elements shall be eached by		
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SYS_REQ-2294 Simulated execution of scheduling Essential Demonstration		_		
blocks. The scheduling tool shall offer	SYS_REQ-2294		Essential	Demonstration
· · · · · · · · · · · · · · · · · · ·		blocks. The scheduling tool shall offer		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 171 of 275

	the option to simulate execution of		
	Scheduling Blocks in order to verify		
	correctness and scientific performance		
	at some limited level of accuracy.		
SYS_REQ-2735	Operator control. It shall be possible	Essential	Test
	for the operator to take manual control		
	of the telescope.		
SYS_REQ-2295	Response policy. The nature of the	Essential	Inspection
	response to a transient event shall be		
	controlled by policy administered by		
	Telescope Manager.		
SYS_REQ-2296	Responses to transients Responses	Essential	Demonstration
	shall be one of the following (a)		
	invoking a special mode on the		
	telescope of origin, (b) issuing an		
	VOEvent, (c) issuing a TOO		
	announcement to SKA Telescopes, (d) no action.		
SYS_REQ-2297	Observing mode latency The	Essential	Demonstrate
0.10_11.20 2257	maximum allowed latency between		Semonstrate
	event and detection shall be allowed to		
	be Observing Mode dependent.		
SYS_REQ-2298	Rules for issuing VOEvents	Essential	Demonstration
	Proposals to search for transients shall		
	include rules for issuing VOEvents.		
SYS_REQ-2299	Latency of initiating a response.	Essential	Test
	Response to an event shall be initiated		
	within 1 second of notification.		
SYS_REQ-2300	TOO VOStreams. TOO proposals	Essential	Test
	shall include specified VOEvent		
CVC DEO 2201	streams to be monitored.	Facantial	Took
SYS_REQ-2301	VOEvent issue latency . A qualifying VOEvent shall lead to initiation of a	Essential	Test
	response by the Telescope Manager		
	within 1 second.		
SYS_REQ-2645	Telescope model. A dynamic	Essential	Demonstration
	computational model of the Telescope		
	shall be used to answer all queries		
	about the state of the Telescope. The		
	telescope model shall consist of		
	configuration information, numerical		
	models, empirical parameters, and		
	conventions.		
SYS_REQ-2302	Single geodetic model (Telescopes).	Essential	Demonstration
	There shall be a single geodetic model		
	for all telescopes, published as part of		
CVC PEO 2222	the Telescope Model.	Facanti-1	Domos-tt-
SYS_REQ-2303	Single geometric model. There shall	Essential	Demonstration
	be a single geometric model for all		
SYS_REQ-2304	receptor types, published by TM. Dish pointing model. The dish	Essential	Demonstration
313_NLQ-2304	receptor system shall include a model	Losential	Demonstration
	for pointing including structural		
	101 Politing merading structural	<u> </u>	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 172 of 275

	model, thermal model, reference		
	pointing model, and refraction model,		
	published by TM.		
SYS_REQ-2305	AA element and station beam	Essential	Demonstration
_	model. The AA receptor system shall		
	include a model for element and		
	station beams as a function of azimuth		
	and zenith angle, frequency, and		
	polarisation, published by TM.		
SYS_REQ-2306	Forensic tool for telescope	Essential	Demonstration
	behaviour There shall be an		
	interactive forensic tool for evaluating		
	and understanding the state and		
	behaviour of the system at any one		
6)/6 050 2207	time.		
SYS_REQ-2307	Interfaces. The interactive forensic tool shall have an Internet interface	Essential	Demonstration
	with availability on a range of		
	platforms including desktop and		
	mobile devices.		
SYS_REQ-2308	Replay of sequences . The interactive	Essential	Demonstration
0.0 2000	forensic tool shall allow replay of		
	selected sequences.		
SYS_REQ-2309	Active alarms. Alarm notification	Essential	Demonstration
	shall be active (via SMS, email, etc.)		
	rather than passive (requiring an		
	Operator query)		
SYS_REQ-2310	Alarm filtering . It shall be possible to	Essential	Demonstration
	filter alarms individually or by group.		
SYS_REQ-2312	Alarm latency. Latency from event to	Essential	Test
	alarm shall be no more than 5 seconds.		
SYS_REQ-2313	Access to historical data. All current	Essential	Demonstration
	and historic Site monitor data shall be		
	as examinable as that from any		
SYS_REQ-2314	telescope component. Total electron content. The SKA	Essential	Inspection
313_KEQ-2314	Phase 1 TM shall retrieve, persist and	Essential	Inspection
	publish data on Total Electron Content		
	(TEC) from dual frequency GPS as		
	part of the Telescope Model.		
SYS_REQ-2315	Ionospheric activity. There shall be	Essential	Demonstration
_ `	timely access to information from		
	other relevant sources e.g. IPS		
	concerning unusual ionospheric		
	activity or alerts.		
SYS_REQ-2316	Weather station . There shall be a data	Essential	Demonstration
	base for site weather station data.		
SYS_REQ-2317	Satellites. There shall be a database of	Essential	Demonstration
	relevant satellite trajectories, including		
	orbit information, emission		
	characteristics and owner.		

Revision: 6

Date: 2015-04-23

SYS_REQ-2318	Commercial flights. There shall be a	Essential	Demonstration
313_NLQ-2316	data base of commercial flights in the	Lasciitiai	Demonstration
	neighbourhood of the site.		
SYS_REQ-2734	RFI database. There shall be a	Essential	Demonstration
010_1120 2754	database holding information about	2330116141	Jemonstration
	RFI.		
SYS_REQ-2729	Calibration and imaging formalism.	Essential	Demonstration
	The Calibration and Imaging		
	formalism shall be based upon the Rau		
	framework [14].		
SYS_REQ-2319	Closed loop calibration. The	Essential	Demonstration
	telescope calibration shall be solved		
	by comparison of observed with GSM		
	predictions with a time scale		
	appropriate to the component and		
	physical effect being calibrated and		
	fed back to the telescope.		
SYS_REQ-2322	Global sky model. Calibration and	Essential	Demonstration
	continuum subtraction shall use a		
	Local Sky Model, derived from a		
	Global Sky Model or previous Local		
CVC DEC 2224	Sky Model.	Faccutio	Damanatus Mari
SYS_REQ-2324	Multi-frequency synthesis imaging.	Essential	Demonstration
	All imaging shall construct and make		
	use of frequency dependent image models over the entire observed		
	bandwidth.		
SYS_REQ-2325	Deconvolution of single channels	Essential	Demonstration
0.02 _0.2	Scale sensitive two-dimensional (i.e.	2550111111	
	on the tangent plane) deconvolution		
	shall be available.		
SYS_REQ-2328	Solution for pointing errors. It shall	Essential	Demonstration
	be possible to solve for and correct		
	time- and station-dependent pointing		
	errors with accuracy and timescale		
	limited by signal to noise ratio.		
SYS_REQ-2330	Peeling. Peeling of bright sources	Essential	Demonstration
	(strength limited by signal to noise		
	ratio) from the visibility data shall be		
CVC PEC 2224	possible.	Formatic	Danis and the state of the stat
SYS_REQ-2321	Direction dependent effects. Self-	Essential	Demonstration
	calibration and image reconstruction		
	algorithms shall be capable of dealing		
SYS_REQ-2724	with direction dependent effects Aperture Array DDE . There shall be	Essential	Test
313_NEQ-2/24	a direction dependent model for the	Loociillai	1631
	aperture array primary beam to be		
	used in calibration and imaging.		
SYS_REQ-2727	Dish DDE. There shall be a direction	Essential	Test
313_NEQ 2727	dependent model for the dish primary	2332116141	1000
	beam to be used in calibration and		
	imaging.		
SYS_REQ-2726	Delete	Essential	Test
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 174 of 275

SYS_REQ-2725	Faraday rotation DDE. There shall	Essential	Test
313_NEQ 2723	be a direction dependent Faraday	Listeria	1650
	Rotation model for use in calibration		
	and imaging.		
SYS_REQ-2333	Continuum source finding. Where	Essential	Test
0.102 2000	appropriate, continuum source finding		
	shall be conducted on images		
	generated by the Continuum Imaging		
	pipeline. Polarization shall be fitted if		
	available.		
SYS_REQ-2334	Spectral line source finding. Where	Essential	Test
	appropriate, spectral line source		
	finding shall be conducted on image		
	cube generated by the Spectral Line		
	pipeline.		
SYS_REQ-2335	Stacking. Where appropriate, spectral	Essential	Test
	line stacking shall be conducted on		
	image cubes generated by the		
	pipelines using <i>a priori</i> known source		
	lists.		
SYS_REQ-2336	Standard pipeline products. All	Essential	Test
	pipelines shall include as data products		
	the pipeline processing log, and		
CVC DEO 2220	Quality Assessment log.	Essential	Took
SYS_REQ-2338	Calibration pipeline. There shall be a	Essentiai	Test
	Calibration pipeline that derives current telescope parameters using a		
	recent observation and a Global Sky		
	Model, either a known GSM or the		
	most recent GSM.		
SYS_REQ-2339	Continuum imaging pipeline. There	Essential	Test
	shall be a Continuum Imaging pipeline		
	that shall have the goal of constructing		
	noise-limited wide-band images for		
	observations up to 1000h integration		
	time. Polarisation shall be available if		
	requested or necessary for calibration		
	or quality assurance.		
SYS_REQ-2340	Continuum imaging data products.	Essential	Test
	The Data Products shall include the		
	first n moment images for multi-		
	frequency synthesis, corresponding		
	residual images (if deconvolved),		
	sensitivity image and representative		
	PSF image, where n is set by signal to		
CVC DEO 2244	noise ratio.	Eccontici	Tost
SYS_REQ-2341	Spectral line emission pipeline.	Essential	Test
	There shall be a Spectral Line Emission pipeline that is optimized for		
	Emission pipeline that is optimised for constructing noise-limited (up to		
	1000h integration) channel cubes of		
	spectral line emission either with		
	special fine chilosion cities with		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 175 of 275

	continuum emission remaining or with		
	continuum emission removed.		
SYS_REQ-2342	Spectral line emission data	Essential	Test
5.5	products. The data products shall		
	include spectral line cube image,		
	continuum model images, sensitivity		
	image, and representative point spread		
	function.		
SYS_REQ-2343	Spectral line absorption pipeline.	Essential	Test
	There shall be a Spectral Line		
	Absorption pipeline that is optimised		
	for constructing noise-limited channel		
	cubes of spectral line absorption with		
	continuum sources removed.		
SYS_REQ-2344	Spectral line absorption data	Essential	Test
	products. The data products shall		
	include spectral line cube image,		
	continuum model images, sensitivity		
	image, and representative point spread		
CVC DEC 3345	function.	Facenti-1	Took
SYS_REQ-2345	Slow transient pipeline. There shall	Essential	Test
	be a Slow Transient imaging pipeline		
	that shall be capable of constructing a		
	continuum image after a GSM has		
	been subtracted for every correlator integration time or slower, searching		
	for transient sources, and producing a		
	time-ordered catalogue.		
SYS_REQ-2346	Slow transient data products. The	Essential	Test
3.5 20.0	data products shall include a catalogue		1.555
	of found sources, a sensitivity image,		
	and representative PSF image.		
SYS_REQ-2347	Automated Quality Assessment. All	Essential	Test
	pipelines shall perform standardised,		
	automated Quality Assessment of		
	Images along the axes of astrometry,		
	photometry, radiometry, polarimetry,		
	and spectrometry.		
SYS_REQ-2742	Performance assessment:	Essential	Test
	Performance assessment shall be based		
	on multi-valued functions of an		
	observed Image and optionally a		
010 5-5 5-5-	template Image		
SYS_REQ-2743	Performance Goals: Performance	Essential	Test
	goals shall be based on multi-valued		
	functions of an observed Image and		
CVC DEC 3744	optionally a template Image	Facontic	Toch
SYS_REQ-2744	Quality assessment: Quality	Essential	Test
	assessment shall be based on the		
	comparison of a Performance Assessment and a Performance Goal		
SYS_REQ-2745	Astrometric performance metric:	Essential	Test
313_REQ-2/43	The Astrometric performance metric	LSSEIILIdi	1621
	The Asirometric performance metric	l	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 176 of 275

	(APM) shall measure deviation (rms,		
	average offset, and med) of source		
	positions from known standards		
SYS_REQ-2746	Photometric performance metric:	Essential	Test
010_1120 27 10	The Photometric performance metric	2556114141	1000
	(PPM) shall measure deviation (rms,		
	average offset, and med) of source		
	fluxes from known standards		
SYS_REQ-2747	Radiometric performance metric:	Essential	Test
	The Radiometric performance metric		
	(RPM) shall measure noise		
	fluctuations (rms, average offset, and		
	med) in an Image		
SYS_REQ-2748	Polarimetric performance metric:	Essential	Test
	The Polarimetric performance metric		
	(OPM) shall measure deviation (rms,		
	average offset, and med) of source		
	polarisations (polarisation degree and		
	angle) from known standards		
SYS_REQ-2749	Spectrometric performance metric:	Essential	Test
	The Spectrometric performance metric		
	(SPM) shall measure deviation (rms,		
	average offset, and med) of source		
	spectral lines from known standards		
SYS_REQ-2821	Archive. There shall be an archive for	Essential	Demonstration
	each telescope, located in the Science		
	Processing Centre, for storing selected		
	science data products for subsequent		
	access by users according to science data access policy.		
SYS_REQ-2348	Role of science processing centres.	Essential	Test
313_KEQ 2540	The science-processing centre will	Listerial	rest
	convert the output data from the CSP		
	into science data products to be stored		
	in the science data archive.		
SYS_REQ-2350	Mirror sites. All data within Science	Essential	Test
	Archives shall have a secondary copy		
	located offsite in a secure location.		
SYS_REQ-2352	Web interface. The science data	Essential	Demonstration
	archives shall be accessible from the		
	internet via a standardised web		
	interface.		
SYS_REQ-2353	Virtual Observatory interface. The	Essential	Test
	science data archives shall be		
	accessible via a set of recommended		
	IVOA services chosen to allow access		
	to all approved data products.		
SYS_REQ-2354	Archive API. The science data	Essential	Test
	archives shall publish a user		
	accessible, open API in a small		
	number of complementary languages		
	such as Python, C++, and Java.		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 177 of 275

SYS_REQ-2355	Data product provenance. An official data product shall have known,	Essential	Definition
	documented provenance, and shall		
	have been produced via SKA		
	observations and processing.		
SYS_REQ-2357	QA annotation. The telescope shall	Essential	Test
	facilitate the addition of QA		
CVC DEO 2350	annotations by Users.	Facantial	In an action
SYS_REQ-2358	Third party data products. Third party data products shall not be	Essential	Inspection
	admitted to the archive.		
SYS_REQ-2360	Science data product archive policy.	Essential	Inspection
	There shall be a policy, developed and		
	administered by Operations, governing		
	which types and sizes of data products		
	will be retained in the archive and for		
	how long.		
SYS_REQ-2361	Archive access. A telescope archive	Essential	Test
	will be nominally open for access		
	24/7/365, with no more than 24 hrs		
	planned downtime per year.		
	Unplanned downtime shall be		
SYS_REQ-2363	consistent with availability budget. Archive lifetime. The science data	Essential	Inspection
313_REQ-2303	archives shall be designed to provide	Essential	Inspection
	an archived data lifetime of not less		
	than 50 years from the start of		
	archived observations.		
SYS_REQ-2728	Data migration design. The archive	Essential	Demonstration
	design shall support and facilitate		
	migration from one medium to		
	another.		
SYS_REQ-2364	Data migration plan. Operations	Essential	Inspection
	shall maintain at all times and update		
	yearly a current data migration plan covering the contingency of moving		
	from one archive platform to another.		
SYS_REQ-2366	Distribution of data products. As	Essential	Test
0.02 2500	limited by resource constraints, it will	2550111101	
	be possible to deliver science data		
	products to approved off-site facilities,		
	which may be globally distributed		
SYS_REQ-2660	Backup archive retrieval. Backup	Essential	Demonstration
	archive items shall be retrievable to		
	the full archive from an alternate		
CVC DEC 2554	source within 24 hours	English .	Bana anatoni'
SYS_REQ-2661	Backup archive user access	Essential	Demonstration
	conversion. Users shall have access to the data of the entire archive within		
	uie data or die elittie arcilive Withill		
	one week following an incident		
SYS RFO-2739	one week following an incident. Levels of access . Access to the	Essential	Test
SYS_REQ-2739	one week following an incident. Levels of access. Access to the archive shall be either anonymous	Essential	Test

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 178 of 275

	capabilities or via SKA authentication		
	and authorisation.		
SYS_REQ-2657	Processing capability. SDP	Essential	Test
	processing per telescope at Early		
	Science shall support processing rates		
	10% of that required for Full		
	Observing (decimation being in any or		
	all of time, frequency, field of view)		
SYS_REQ-2268	Coherence losses 1s. The SKA	Essential	Demonstration
	frequency reference system shall		
	provide a 2% maximum coherence		
	loss, equivalent to 0.2 radians, within		
	a maximum integration period of 1s.		
SYS_REQ-2692	Coherence loss 1min. The SKA	Essential	Demonstration
	frequency reference system shall		
	provide a 2% maximum coherence		
	loss, equivalent to 0.2 radians, within		
	a maximum solution interval for in-		
SYS_REQ-2693	beam calibration of 1 minute. Frequency reference phase drift.	Essential	Demonstration
313_KEQ-2093	The SKA Frequency Reference	Essential	Demonstration
	System shall have a phase drift of less		
	than 1 radian, over calibration		
	intervals of up to 10 minutes, when		
	using out of beam calibration sources.		
SYS_REQ-2269	Pulse per Second precision. The	Essential	Test
	SKA synchronisation and timing		
	system shall provide a 1 pps heartbeat		
	signal, precise to the sampling clock		
	(the pulse-to-pulse scatter is less than		
	one sampling time), derived from the		
	distributed frequency reference		
SYS_REQ-2695	Pulse per second phase relative to	Essential	Demonstration
	UTC. The SKA synchronisation and		
	timing system shall provide a 1PPS		
	heartbeat signal with phase relative to		
	UTC that over a 10 minute calibration		
	interval shall survive synchronisation		
	loss		
SYS_REQ-2274	UTC accuracy. The SKA1 timescale	Essential	Analysis
	shall be connected to UTC with an		
	accuracy of 10 ns, on a timescale of 10		
CVC PEO 2275	Control frequency reference. In	Eccontial	Domonstration
SYS_REQ-2275	Central frequency reference. In	Essential	Demonstration
	order to avoid large offsets, the central frequency reference shall be steered to		
	UTC to within at least 1 microsecond,		
	with a frequency drift of less than 10		
	ns/day.		
SYS_REQ-2276	SKA1 UTC offsets. The solution	Essential	Demonstration
	period for the calculation of offsets		2
	between SKA1 timescale and UTC		
	shall be less than 1 day		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 179 of 275

SYS_REQ-2370	Weather Monitoring. Weather	Essential	Inspection
515_N2Q 2576	monitoring stations (2 No at each core	2550111111	mopeonon
	and 2 No within each spiral arm) shall		
	be provided as part of the		
	infrastructure - wind, temperature and		
	humidity.		
SYS_REQ-2371	Visual monitoring. The infrastructure	Essential	Inspection
	shall provide day and night time		
	capability for the operator(s) to		
	visually monitor all antennas: for Dish		
	antennas this shall be at every dish, for		
	LFAA this shall be located at each		
	station and also around the perimeter		
	of the core area. Monitoring to deliver		
	images at least one per minute for		
	purposes of security and general		
	telescope visual monitoring and shall		
	be able to detect personnel at each dish		
	and within each LFAA station.		
SYS_REQ-2730	RFI Monitoring. Permanent stations	Essential	Inspection
	and mobile RFI monitoring units shall		
	be provided as part of infrastructure		
SYS_REQ-2372	Tropospheric Monitoring. Existing	Essential	Inspection
	Tropospheric monitoring stations shall		
	be expanded as part of the SKA1		
	infrastructure to provide at least 3 No		
	sensor units in each of the Australia		
	and South Africa locations.		
SYS_REQ-2373	Low RFI power delivery. The power	Essential	Test
	delivery infrastructure shall comply		
	with the SKA1 RFI levels		
	documentation.		
SYS_REQ-2374	Site Access . Roads and track-ways	Essential	Analysis and
	(including drainage) for the safe,		Inspection
	secure and economic construction and		
	operation of the SKA1 shall be		
	provided		
SYS_REQ-2375	Air-strip . There shall be access to an	Essential	Inspection
000 577 577	air strip on site.		
SYS_REQ-2376	Construction. Potable and non-	Essential	Inspection
	potable water shall be available at		
	SKA1 construction camps including		
CVC DEO 2277	foundation concrete plants.	Faccutial	luanastian
SYS_REQ-2377	Steady state. Sufficient water shall be	Essential	Inspection
	continually available at SKA1		
	facilities in support of equipment		
CVC PEO 2270	cooling for each telescope.	Essential	Analysis
SYS_REQ-2378	Standards and Regulations. The	ESSELLIAL	Analysis
	delivery and disposal of water and all		
	construction activity shall be compliant with local and national		
	standards and regulations.		
	standards and regulations.	<u> </u>	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 180 of 275

SYS_REQ-2382	Central Processing Facility RFI	Essential	Test
	shielding. Each Central Processing Facility shall provide RFI shielding		
	greater than that derived from zoning		
	specifications given in the SKA RFI		
	levels documentation (to be published		
	by T0 + 12w).		
SYS_REQ-2383	Central Processing Facility RFI	Essential	Inspection
	penetrations . The Central Processing		
	Facility shall provide RFI compliant		
	penetrations for signal and power		
	cables entering the facility and also for		
SYS_REQ-2397	all other penetrations. Dish Antenna earthing . For lightning	Essential	Test
313_KEQ 2337	protection of each dish antenna the	Essericial	1630
	earthing system shall conform to the		
	requirements of IEC 62305 and also to		
	national standards SANS 10142 and		
	10313. National standards shall take		
	precedence.		
SYS_REQ-2398	Telephone Network . All populated	Essential	Test
	facilities shall provide connectivity to		
SYS_REQ-2400	the public telephone network. Communication. All vehicles used on	Essential	Demonstration
313_KEQ-2400	site shall be equipped with long range	Essential	Demonstration
	communication devices.		
SYS_REQ-2401	Training. All drivers on or to the sites	Essential	Inspection
	shall have appropriate awareness		
	training.		
SYS_REQ-2402	Site steady state power budget	Essential	Test
	Africa. The total steady state power		
	budget for the African site shall be within the limits specified in SKA		
	Power Budget SKA-SE-POW-TN-		
	001 [21]		
SYS_REQ-2404	Site steady state power budget	Essential	Test
	Australia. The total steady state		
	power budget for the Australian site		
	shall be within the limits specified in		
	SKA Power Budget SKA-SE-POW-		
SYS_REQ-2769	TN-001 Revision 1 [21]. Time Reference: SKA1 shall use a	Essential	Inspection
3.5 2703	time reference derived from Global		
	Positioning System (GPS).		
SYS_REQ-2838	VLBI data sources. The SKA1_Mid	Essential	Demonstration
	telescope shall be a data source for		
	VLBI data acquisition system. The		
	interface between the SAK1_Mid		
	telescope and the external VLBI data		
	acquisition system shall be compliant with the ICD SKA-TEL-SKO-		
i .	with the ICD SIGN-LET-SIGN-		i l
	0000116		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 181 of 275

SYS_REQ-2839	Provision of equipment for	Essential	Demonstration
0.02 =000	recording . Provision of equipment for		
	recording or capturing VLBI data is		
	outside the scope of SKA		
SYS_REQ-2840	VLBI equipment and eVLBI	Essential	Demonstration
	connectivity. VLBI equipment and		
	eVLBI connectivity beyond the		
	interface boundary described in the		
	ICD SKA-TEL-SKO-0000116 is		
	outside the scope of supply of the		
	SKA1 project		
SYS_REQ-2841	Infrastructure for VLBI	Essential	Demonstration
	equipment:. The following		
	infrastructure shall be provided to		
	allow eventual outfitting of		
	SKA1_Mid with VLBI equipment:		
	1. Adequate access for the		
	potential fitment of VLBI		
	equipment		
	2. Equipment space3. Power		
	4. Cooling5. Cable trays		
	5. Cable trays		
SYS_REQ-2842	Provision for VLBI terminal.	Essential	Demonstration
313_KEQ 2042	Provision for VLBI terminals or	Listeria	Demonstration
	equivalent equipment shall be made in		
	the Science Processing Centres for the		
	associated telescopes		
SYS_REQ-2843	Compatibility with existing VLBI	Select One	Demonstration
	terminal. SKA1 shall be able to		
	output VLBI beam data with each		
	individual stream limited to 512 MHz		
	of signal bandwidth to ensure		
	compatibility with existing VLBI		
	terminal capabilit		
SYS_REQ-2844	VLBI Processing. VLBI processing,	Essential	Demonstration
	with the exception of beam-forming		
	and SKA1 imaging in support of		
SYS_REQ-2845	VLBI. is outside the scope of the SKA VLBI beam output data. SKA1 shall	Essential	Test
313_REQ-2845	be able to produce VLBI beam output	ESSENTIAL	Test
	data with either dual or single		
	polarizatio		
SYS_REQ-2846	Word length of VLBI beam output	Essential	Test
	data. SKA1 shall be able to output		
	VLBI beam data with configurable		
	word formats, the allowed values		
	being 2, 4, 8, and 16-bit integer		
SYS_REQ-2410	MeerKAT to SKA1_mid CSP	Essential	Test
	interface . The interface between		
	MeerKAT and SKA1_mid CSP shall		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 182 of 275

	be compliant with SKA-TEL.AIV.SE-		
	TEL.CSP.SE-ICD-001 Interface		
	Control Document		
SYS_REQ-2412	MeerKAT to SKA1 mid SADT	Essential	Test
	interface . The interface between		
	MeerKAT and SKA1_mid SADT		
	shall be compliant with SKA-		
	TEL.AIV.SE-TEL.SADT.SE-ICD-001		
	Interface Control Documen		
SYS_REQ-2414	MeerKAT to SKA1_mid SADT	Essential	Test
	interface . The interface between		
	MeerKAT and SKA1_mid SADT		
	shall be compliant with SKA-		
	TEL.AIV.SE-TEL.TM.SE-ICD-001		
	Interface Control Document.		
SYS_REQ-2775	MeerKAT to SKA1_INFRA	Essential	Test
	interface. The interface between		
	MeerKAT and SKA1_INFRA shall be		
	compliant with SKA-TEL.AIV.SE-		
	TEL.INFRA.SE-ICD-001 Interface		
	Control Document		<u> </u>
SYS_REQ-2416	CSP to Infra interface . The interface	Essential	Test
	between CSP and Infra shall be		
	compliant with the SKA-		
	TEL.CSP.SE-TEL.INFRA.SE-ICD-		
CVC PEO 2720	001 Interface Control Document. CSP to SDP interface . The interface	Eccentici	Tost
SYS_REQ-2738	between CSP and SDP shall be	Essential	Test
	compliant with the SKA-		
	TEL.SDP.SE-TEL.CSP.SE-ICD-001		
	Interface Control Document		
SYS_REQ-2418	Dish to CSP interface . The interface	Essential	Test
	between CSP and Dish shall be		
	compliant with the SKA-		
	TEL.DSH.SE-TEL.CSP.SE-ICD-001		
	Interface Control Document.		
SYS_REQ-2419	Dish to Infra interface . The interface	Essential	Test
	between Dish and Infra shall be		
	compliant with the SKA-		
	TEL.DSH.SE-TEL.INFRA.SE-ICD-		
	001 Interface Control Document.		
SYS_REQ-2420	LFAA to CSP interface . The	Essential	Test
	interface between LFAA and CSP		
	shall be compliant with the SKA-		
	TEL.LFAA.SE-TEL.CSP.SE-ICD-001		
010 555	Interface Control Document.		<u> </u>
SYS_REQ-2421	LFAA to Infra interface. The	Essential	Test
	interface between LFAA and INFRA		
	shall be compliant with the SKA-		
	TEL.LFAA.SE-TEL.INFRA AUS.SE-		
CVC DEO 2422	ICD-001Interface Control Document.	Eccentici	Tost
SYS_REQ-2422	SADT to DSH interface. The	Essential	Test
	interface between SADT and DSH		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 183 of 275

	shall be compliant with the SKA-		
	TEL.SADT.SE-TEL.DSH.SE-ICD-		
	001 Interface Control Document.		
SYS_REQ-2423	SADT to LFAA interface. The	Essential	Test
0.02 22	interface between SADT and LFAA	2550111141	1000
	shall be compliant with the SKA-		
	TEL.SADT.SE-TEL.LFAA.SE-ICD-		
	001 Interface Control Document.		
SYS_REQ-2424	SADT to CSP interface. The	Essential	Test
	interface between SADT and CSP		
	shall be compliant with the SKA-		
	TEL.SADT.SE-TEL.CSP.SE-ICD-001		
	Interface Control Document.		
SYS_REQ-2425	SADT to SDP interface . The	Essential	Test
	interface between SADT and SDP		
	shall be compliant with the SKA-		
	TEL.SADT.SE-TEL.SDP.SE-ICD-		
	001 Interface Control Document.		
SYS_REQ-2426	SADT to Infra interface. The	Essential	Test
	interface between SADT and Infra		
	shall be compliant with the		
	SKA.TEL.SADT.SE-TEL.INFRA.SE-		
676 550 5457	ICD-001 Interface Control Document.		
SYS_REQ-2427	TM to Dish interface. The interface	Essential	Test
	between TM and Dish shall be		
	compliant with the SKA-TEL.TM.SE-TEL.DSH.SE-ICD-001. Interface		
	Control Document.		
SYS_REQ-2428	TM to LFAA interface. The interface	Essential	Test
515_M2Q 2 125	between TM and LFAA shall be	2550111141	1001
	compliant with the SKA-TEL.TM.SE-		
	TEL.LFAA.SE-ICD-001 Interface		
	Control Document.		
SYS_REQ-2429	TM to SADT interface . The interface	Essential	Test
	between TM and SADT shall be		
	compliant with the SKA-TEL.TM.SE-		
	TEL.SADT.SE-ICD-001 Interface		
	Control Document.		
SYS_REQ-2430	TM to CSP interface . The interface	Essential	Test
	between CSP and TM shall be		
	compliant with the SKA-		
	TEL.CSP.SE-TEL.TM.SE-ICD-001.		
CVC DEO 2727	Interface Control Document.	Farantal	T
SYS_REQ-2737	TM to INFRA Interface. The	Essential	Test
	interface between TM and INFRA		
	shall be compliant with the SKA.TEL.TM.SE-TEL.INFRA.SE-		
	ICD-001 Interface Control Document.		
SYS_REQ-2431	SDP to TM interface. The interface	Essential	Test
515_NEQ-2451	between SDP and TM shall be	Logeritia	
	compliant with the SKA-		
	TEL.SDP.SE-TEL.TM.SE-ICD-001		
	Interface Control Document.		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 184 of 275

SYS_REQ-2432	SDP to INFRA interface. The	Essential	Test
313_NEQ 2432	interface between SDP and Infra shall	Essential	1636
	be compliant with the		
	SKA.TEL.SDP.SE-TEL.INFRA.SE-		
	ICD-001 Interface Control Document.		
SYS_REQ-2462	Electromagnetic Radiation. Any	Essential	Test
	component of the observatory shall not		
	emit electromagnetic radiation, in any		
	of the stated frequency intervals for		
	broad band and narrow band cases,		
	that exceeds the SKA RFI/EMI		
	Threshold Levels[4]		
SYS_REQ-2463	Self-induced RFI. The SKA1	Essential	Test
_ `	Telescope shall generate less self-		
	induced RFI, within the Telescope's		
	operating frequency bands, than the		
	SKA RFI/EMI Protection Levels, for		
	both broad band and narrow band		
	cases, as specified in the "RFI/EMI		
	Protection and Threshold Levels for		
	the SKA" document. The SKA		
	RFI/EMI Protection Levels are defined		
	at the respective receiver input, and		
	measured at the respective Telescope		
	time series output.		
SYS_REQ-2464	Electromagnetic Compatibility	Essential	Inspection
	Standards. The SKA1 Telescopes		
	Standards. The SKA1 Telescopes shall be compliant with one or more of		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments.		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2.		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC).		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments.		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1.		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission.		
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C	Essential	Analysis
SYS_REQ-2465	standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic	Essential	Analysis
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic Compatibility. The SKA1 telescopes	Essential	Analysis
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic Compatibility. The SKA1 telescopes shall follow the TBD code of practice	Essential	Analysis
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic Compatibility. The SKA1 telescopes shall follow the TBD code of practice for the application of Electromagnetic	Essential	Analysis
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic Compatibility. The SKA1 telescopes shall follow the TBD code of practice for the application of Electromagnetic Compatibility (EMC) standards and	Essential	Analysis
	Standards. The SKA1 Telescopes shall be compliant with one or more of the following standards for emissions and one or more for susceptibility/immunity:*BS EN 61000-6-2. Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments. *BS EN 61000-6-4 AMD2. Electromagnetic compatibility (EMC). Part 6-4. Generic standards. Emission standard for industrial environments. *BS CISPR 14-1. Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1. Emission. *MIL-STD-464C Electricity network Electromagnetic Compatibility. The SKA1 telescopes shall follow the TBD code of practice for the application of Electromagnetic	Essential	Analysis

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 185 of 275

SYS_REQ-2466	EMC compatibility marking. All	Essential	Inspection
	"off-the-shelf" equipment shall		
	possess as a minimum the host country		
	EMC marking.		_
SYS_REQ-2467	Electromagnetic susceptibility. The	Essential	Test
	observatory shall not be susceptible to		
	terrestrial electromagnetic radiation at		
	any frequency that significantly		
SYS_REQ-2472	interferes with its normal operation. RFI flagging. The SKA1 telescopes	Essential	Test
313_KEQ-2472	shall automatically flag frequency data	Essential	rest
	with a resolution of one channel and		
	time data to the resolution of the		
	integration unit if the data is corrupted		
	by RFI.		
SYS_REQ-2473	RFI excision. The SKA1 Telescopes	Essential	Test
	shall automatically excise data that is		
	corrupted by RFI.		
SYS_REQ-2474	RFI masking. The SKA1 Telescopes	Essential	Demonstration
	shall flag data according to a pre-		
	selected RFI Mask.		
SYS_REQ-2475	RFI zones of avoidance . The SKA1	Essential	Demonstration
	telescopes shall allow spatial zones of		
CVC DEO 2422	avoidance to be defined.	Essential	Inconcetion
SYS_REQ-2433	Design for Extensibility . Design trade studies for SKA1 shall include	Essential	Inspection
	scenarios where design features are		
	included which will allow		
	1. Increases in the number of		
	receptors for SKA2 over		
	SKA1 by a factor of 10 whilst		
	re-using more than 90% of		
	SKA1 hardware		
	2. The introduction of AIP		
	technologies at SKA2 scales		
	whilst re-using more than 90%		
	of SKA1 hardware		
	Such trade studies shall yield the		
	incremental cost of such scenarios		
	over those which do not include such		
SYS_REQ-2484	design features. Environmental legislation and	Essential	Analysis
313_NLQ-2464	regulations. The observatory shall be	Loociitiai	Allalysis
	compliant with all local, State and		
	national environmental protection		
	legislation and regulations.		
	NOTE: Legislation takes precedence		
	over project/contract documentation		
	and requirements. Omission of a law		
	and requirements. Offission of a faw		
I	from this requirement does not affect		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 186 of 275

	T		1
	Environmental Laws identified during		
	the Request for Information (copied		
	below) may be modified by the		
	Hosting Agreements and subsequent		
	Acts and Amendments.Legislation and		
	regulations identified during the		
	response to Request for Information		
	include:South Africa:		
	National Environmental Management		
	Act, 1998 ("NEMA");		
	National Water Act, 1998;		
	National Environmental Management:		
	Air Quality Act, 2004;		
	National Environmental Management		
	Waste Act, 2008;		
	National Environment Management:		
	Biodiversity Act, 2004;		
	National Heritage Resources Act,		
	1999.*Australia:		
	The Commonwealth Environment		
	Protection and Biodiversity		
	Conservation (EPBC) Act 1999.		
	The Western Australian		
	Environmental Protection Act 1986		
	The Western Australian Land		
	Administration Act 1997		
	In addition, approvals will be required		
	under the Western Australia Mining		
	Act 1978, Heritage of Western		
	Australia Act 1990, the Western		
	Australian Aboriginal Heritage Act		
	1972 and the MRO Indigenous Land		
	Use Agreement 2009.* Other South		
	African environmental statutes include		
	the Environment Conservation Act,		
	1989, various air pollution statutes, the		
	National Heritage Resources Act,		
	1999, the Hazardous Substances Act,		
	1973, the Health Act, 1977, the		
	Nuclear Energy Act, 1999, the		
	National Nuclear Regulatory Act,		
	1999, the National Environmental		
	Management: Protected Areas Act,		
	2003, the Fertilisers, Farm Feeds,		
	Agricultural Remedies and Stock		
	Remedies Act, 1947, the Marine		
	Living Resources Act, 1998, and the		
	National Environmental Management:		
	Integrated Coastal Management Act,		
	2008.		
SYS_REQ-2790	Environmental Impact Assessment.	Essential	Inspection
2.00	The Observatory shall undertake an		
	Environmental Impact Assessment		
		l	I .

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 187 of 275

2015-04-23 Date:

(EIA) in accordance with the local and	
(EIA) in accordance with the local and	
national environmental legislation.	
NOTE: the EIA shall be undertaken in	
accordance with: South Africa - the	
National Environmental Management	
Act (NEMA); Australia - Western	
Australian EPA and Commonwealth	
EPBC	
SYS_REQ-2483 Environment protection plan. An Essential Inspection	
Environmental protection plan shall be	
developed and maintained. This shall	
include the management of	
Environmental Impact Assessments	
(EIA) in accordance with SA NEMA,	
WA EPA and Commonwealth EPBC.	
SYS_REQ-2572 Material environmental rule Essential Inspection	
compliance. All materials used in the	
SKA1 design shall be fully compliant	
to all environmental rules applicable to	
the SKA1 core and remote sites	
SYS_REQ-2819 Safety of machinery risk assessment. Essential Inspection	
A risk assessment shall be conducted	
for each item of machinery in	
accordance with BS EN ISO 12100	
SYS_REQ-2450 Safety information for use. Where Essential Inspection	
risks remain despite inherently safe	
design measures, safeguarding and the	
adoption of	
complementary protective measures,	
the residual risks shall be identified in	
the information for use in accordance	
with BS EN ISO 12100 (section	
6). The information for use shall	
include, but not be limited to, the	
following:	
operating procedures for the use of	
the machinery consistent with the	
expected ability of personnel who use	
the machinery or other persons who	
can be exposed to the hazards	
associated with the machinery;	
The recommended safe working	
practices for the use of the machinery	
and the related training requirements	
and the related training requirements adequately described;	
Sufficient information, including	
warning of residual risks for the	
different phases of the life of the	
machinery;	
The description of any recommended	
personal protective equipment,	
including detail as to its need as well as to training needed for its	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 188 of 275

	use.Information for use shall not be a		
	substitute for the correct application of		
	inherently safe design measures,		
	safeguarding or complementary		
	protective measures.		
SYS_REQ-2554	Ergonomics. The ergonomic design	Essential	Inspection
515_NEQ 2554	shall be compliant with ISO 6385.	Essential	mspection
SYS_REQ-2820	Safety of equipment with rated	Essential	Inspection
_ `	voltage not exceeding 600V.		
	Equipment shall comply with the		
	safety requirements of BS EN IEC		
	60950. NOTE: This includes electric		
	shock, energy related hazards, fire,		
	heat related hazards, mechanical		
	hazards, radiation and chemical		
	hazards		
SYS_REQ-2437	Design for hazard elimination.	Essential	Analysis
	Designs shall demonstrate the		
	elimination, or mitigation to a risk		
	level practically achievable, of all		
	hazards by means of a subsystem		
	hazard analysis (SSHA) report as		
	described in EN 14738 and tailored by		
	SKA Product Assurance and Safety		
0/0 550 5405	Plan SKA-OFF.PAQA-SKO-QP-001.		
SYS_REQ-2435	Hazard analysis. A hazard analysis	Essential	Inspection
	shall be performed at the system and element level in accordance with BS		
	IEC 61882 and, where applicable, shall include a FMEA in accordance		
	with EN 60812.		
SYS_REQ-2567	Hazardous Materials list. Each	Essential	Inspection
313_KEQ 2307	Element supplier shall provide a list of	Listeria	inspection.
	hazardous materials used for all items		
	intended for use in the SKA1 detailing		
	suggested handling precautions,		
	disposal instructions and contra-		
	indications.		
SYS_REQ-2579	Hazard warning marking. All items	Essential	Inspection
	that present a potential hazard shall be		
	labelled in accordance with BS EN		
	ISO 7010		
SYS_REQ-2818	Marking of machinery - safety. In	Essential	Demonstration
	accordance with ISO 61310_2,		
	machinery shall bear all markings		
	which are necessary		
	– for its unambiguous identification;		
	– for its safe use;		
	and supplementary information shall		
	be given, as appropriate:		
	– permanently on the machinery;		
	– in accompanying documents such as		

Revision: 6

	instruction handbooks;		
	– on the packagin		
SYS_REQ-2438	Fail safe design. Components and	Essential	Analysis
_ `	Equipment shall be designed to be		,
	locally fail-safe and not rely on		
	external safety devices or measures to		
	operate safely.		
SYS_REQ-2788	Non-propagation of failures. The	Essential	Demonstration
	equipment shall be designed such that		
	hardware failures and software errors		
	should not create a hazardous situation		
	to interfacing systems		
SYS_REQ-2439	Emergency stop. The SKA1 Elements	Essential	Demonstration
	shall have emergency stop switches or		
	brakes for all electro-mechanical or		
	mechanical systems that have been		
	identified by safety analyses (required		
	under SYS_REQ-2435) to pose a		
	hazard.		
SYS_REQ-2733	Location of Emergency stop.	Essential	Analysis
	Emergency stop switches shall be		
	located in such a way to minimize the		
	risk of injury. (Verified by Analysis as		
	'minimisation' is unverifiable any other		
	way.		
SYS_REQ-2786	Safety documentation file . Elements	Essential	Inspection
	shall provide procedures for		
	maintainers to recover from an		
	unplanned shut-down, including safety		
	checks to be conducted prior to start-		
	up, as specified in SKA PRODUCT		
	ASSURANCE & SAFETY PLAN		
	SKA-OFF.PAQA-SKO-QP-001.		
SYS_REQ-2447	Sharp metal edges. If they cannot be	Essential	Inspection
	eliminated from design, sharp edges,		
	access openings and corners shall be		
CVC PEO 2446	protected with covers or coatings.	Farantal	Annua Addana
SYS_REQ-2446	Electrical safety. Electrical risks and	Essential	Inspection
	hazards shall be controlled in		
	accordance with local, State and		
	national legislation and Codes of Practice.NOTE: In South Africa,		
	SANS 10142-1 and SANS 10142-2		
	shall apply.NOTE: In Australia, in		
	addition to legislation, the following		
	Codes of Practice shall be applied:		
	AS/NZ 3000		
	Safe Work Australia 'Managing		
	Electrical Risks at the Workplace';		
	Western Australia Director of Energy		
	Safety 'Safe Low Voltage Work		
	Practices by Electricians'		
	Tractices by Electricians		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 190 of 275

SYS_REQ-2444 SYS_REQ-2444	Protection from high voltages. High voltage cages or enclosures shall be used to protect personnel from inadvertent access to high voltages in accordance with AS/NZS3000 (Australia) and SANS10142 (South Africa). Safety grounding and bonding. External conductive parts shall be grounded in compliance to:South Africa: National Building Regulations and Building Standards Act, 1977 Occupational Health and Safety act, 1993 SANS 10313Australia: AS/NZ 3000, AS/NZ 1768	Essential	Test
SYS_REQ-2445	AS/NZ 1/68 Electrical circuit interlocks.	Essential	Inspection
313_NEQ*2443	Electrical circuit interlocks. Electrical circuit inter-locks shall be provided to prevent personnel coming into contact with hazards that cannot otherwise be eliminated from design.	Listinai	таресион
SYS_REQ-2481	Emergency communication. The	Essential	Demonstration
	observatory shall provide an		
	independent system to communicate with outside locations in emergencies.		
SYS_REQ-2449	Construction and AIV Safety Plan.	Essential	Inspection
	A comprehensive safety plan, tailored to construction and AIV activities, shall be established and implemented before the construction starts at the observatory site.		
SYS_REQ-2436	Safety incident recovery plan. A safety incident recovery plan shall be produced in accordance with SKA PRODUCT ASSURANCE & SAFETY PLAN SKA-OFF.PAQA-SKO-QP-001.	Essential	Inspection
SYS_REQ-2451	Safety training. All personnel shall be provided with appropriate Health and Safety training in compliance with local regulations.	Essential	Test
SYS_REQ-2454	Fire fighting equipment. Fire fighting equipment shall be made available at all SKA premises and facilities.	Essential	Inspection
SYS_REQ-2453	First aid stations. First aid stations shall be provisioned.	Essential	Inspection
SYS_REQ-2452	Protective clothing. Protective Clothing for areas where environments detrimental to human safety shall be worn.	Essential	Inspection

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 191 of 275

SYS_REQ-2795	Travel safety. Personnel shall adhere	Essential	Inspection
313_NEQ-2733	to local safety procedures for	Logeritian	spection
	travelling in remote areas.		
	NOTE: Safety procedures should		
	include the training and equipment		
	required, such as driving instruction,		
	vehicles appropriate for the		
	environment and radio equipment		
SYS_REQ-2460	Occupational health legislation and	Essential	Analysis
313_REQ-2400	regulations. The observatory shall	Essertial	Allalysis
	comply with all applicable local, State		
	and national occupational health		
	regulations and standards in force at		
	the time. Regulations include, but are		
	not limited to:		
	South Africa:		
	Occupational Health and Safety Act,		
	1993, and all its regulations.		
	Australia:		
	Commonwealth Occupational Health		
	and Safety Act 1991;		
	OHS (Safety Arrangements)		
	Regulations 1991;		
	OHS (Safety Standards) Regulations		
	1994;		
	OHS Codes of Practice 2008.		
	Western Australia:		
	Occupational Safety and Health Act		
	1984;		
	Harmonised OHS legislation (as		
CVC DEO 34FF	enacted).	Facantial	Took
SYS_REQ-2455	Noise level dosage. Personnel shall	Essential	Test
	not be exposed to noise level dosages		
	exceeding local health and safety		
	guideline levels. The maximum noise		
	levels shall not exceed an 8-hour		
	average exposure of 85 decibels as		
	specified in the Australian National		
	Standard for Occupational Noise		
	NOHSC: 1007(2000) and South African		
	Noise-Induce Hearing Loss		
	Regulations (No R.307 2003) of the		
	Occupational Health and Safety Act,		
	1993 (Act No 85 of 1993). The		
	desirable maximum noise level is 75		
	decibels. Note: The National Code of		
	Practice for Noise Management and		
	Protection of Hearing at Work		
	[NOHSC:2009(2004)] provides		
	practical guidance on how		
	NOHSC:1007(2000) can be achieved		

Revision: 6

SYS_REQ-2456	Transient noise level. Noise levels	Essential	Test
	exceeding 85dB shall be controlled or		
	mitigated in accordance with NOHSC		
	National Standard for Occupational		
	Noise [NOHSC: 1007]		
SYS_REQ-2457	Illumination. Personnel shall be	Essential	Test
	provided with a working illumination		
	level which is compliant with local		
	and national regulations including the		
	current issue of SANS 10114-1 in		
	South Africa and the AS/NZS 1680		
	series in Australia.		
SYS_REQ-2458	Clean air. Personnel shall be provided	Essential	Test
	with air quality at least compliant with		
	the current issue of SANS 10400-O		
	(South Africa - The application of		
	National Building Regulations Part O:		
	Lighting and ventilation) and the AS		
	1668 series of codes (Australia - The		
	use of mechanical ventilation and air		
	conditioning in buildings).		
SYS_REQ-2649	Humidity. Working environments	Essential	Test
	shall be designed, built and maintained		
	to provide air quality that meets or		
	exceeds the guidance provided in the		
	Australian Code of Practice for		
	Managing the Work Environment and		
	Facilities, National Code of Australia and AS 1668.		
	NOTE: Building humidity required for		
	computing facilities is specified in Req		
	2367.		
SYS_REQ-2791	Security Management System. The	Essential	Inspection
0.0 2.02	SKA shall provide a security		
	management system that includes :		
	i. personnel security,		
	ii. physical security (asset)		
	iii. security of informatio		
SYS_REQ-2793	Personnel security training. All	Essential	Inspection
	personnel shall receive the security		
	training identified in the Security		
	Management System necessary for		
	their location. Additional specialist		
	pre-deployment training shall be given		
	prior to working in remote		
	environments.		
SYS_REQ-2478	Equipment security. The observatory	Essential	Analysis
	shall provide a secure environment for		
	equipment. This shall include		
	protection of generators, fuel, solar		
	cells and inter-station assets such as		
	copper cables.		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 193 of 275

SYS_REQ-2822	Information security risk	Essential	Inspection
	assessment . An information security		
	risk assessment shall be conducted for		
	each element in accordance with		
	ISO/IEC 27005		
SYS_REQ-2823	Information security management	Essential	Demonstration
	for inter-organizational		
	communications. Information transfer		
	between organisations shall be		
	controlled in accordance with ISO/IEC		
	27010 as tailored by SKA		
	Organisation Security Policy		
SYS_REQ-2482	Accessibility. It shall be possible to	Essential	Demonstration
	control on a per user basis which		
	SKA1 facilities and resources (both		
	hardware and software) may be		
	accessed by the user.		
SYS_REQ-2479	Archive security. The observatory	Essential	Test
	shall provide a secure environment for		
	all its data archives		
SYS_REQ-2798	Protection of equipment in	Essential	Inspection
	stationary use at non-weather		
	protected locations . Equipment in		
	stationary use at non-weather		
	protected locations shall be protected		
	against environmental conditions		
	4K4H/ 4Z1/ 4Z5/ 4Z6/ 4B2/ 4C1/ 4S3/		
	4M4 in accordance with BS EN IEC		
	60721-3-4.		
	NOTE: 4Z5 refers to the survival, non-		
	operational mode. The equipment shall		
	be able to operate normally for air		
	movement up to 11 m/s		
SYS_REQ-2488	Allowable air temperature range.	Essential	Test
	SKA1 equipment located at the dishes		
	or aperture arrays or outside the		
	central processing and operating		
	facilities shall be able to withstand		
	(non-operating if necessary) an outside		
	air temperature within the range of -15		
	°C to +60 °C.		
	Note this takes precedence over IEC		
	60721-3-4 4K4H of parent		
CVC DEO 3400	requirement	Facantial	Took
SYS_REQ-2489	Air temperature operation range.	Essential	Test
	SKA1 equipment located at the dishes		
	or aperture arrays or outside the		
	central processing and operating facilities shall be able to operate		
	within specification if the outside air		
	temperature is within the range of -5		
	°C to +50 °C.		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 194 of 275

	Note this takes precidence over		
	IEC60721-3-4 4K4		
SYS_REQ-2490	Wind velocities. SKA1 equipment	Essential	Test
	shall be able to survive wind velocities		
	up to 160 km/hr, and shall operate		
	within normal specification ranges for		
	wind velocities up to 40 km/hr. Note: this takes precedence over		
	IEC60721-3-4 4Z		
SYS_REQ-2799	Protection of equipment in weather-	Essential	Inspection
0.02 = 7.00	protected locations. Equipment in		
	stationary use at weather protected		
	locations shall be protected against		
	environmental conditions 3K8H/ 3Z1/		
	3Z11/ 3Z12/ 3B3/ 3C1R/ 3S3/ 3M4 in		
	accordance with BS EN IEC 60721-3-		
	3.		<u> </u>
SYS_REQ-2500	Operating Humidity. The operating	Essential	Test
	humidity shall be between 40% and		
SYS_REQ-2501	60% Storage and transport Humidity.	Essential	Analysis
313_KEQ-2301	The storage and transport humidity	Lissential	Allalysis
	shall be between 40% and 95%.		
SYS_REQ-2502	Condensation. Appropriate measures	Essential	Inspection
	shall be taken to prevent the formation		
	of condensation on operating		
	electronic components.		
SYS_REQ-2503	Pressure. Components shipped by air	Essential	Analysis
	shall be capable of surviving pressures		
	down to 11 kPa (equivalent altitude ~		
CVC DEO 3E04	50,000 feet).	Essential	Increation
SYS_REQ-2504	Facilities and Equipment Intrusion. Where appropriate, SKA1 equipment	Essentiai	Inspection
	facilities shall be adequately protected		
	against intrusion by insect and "larger"		
	wandering animals.		
SYS_REQ-2505	Sand and Dust. SKA1 systems shall	Essential	Inspection
	be adequately protected against sand		
	and dust ingress.		
SYS_REQ-2506	Fungus. Equipment shall be protected	Essential	Inspection
	against fungus growth.		
SYS_REQ-2801	Storage of equipment. Designs shall	Essential	Inspection
	identify any requirements for		
	equipment to be stored in environmental conditions less severe		
	than 1K11/1B3/1C1/1S3/1M3 as		
	specified inBS EN IEC 60721-3-1.		
	Note: It may be assumed that		
	equipment will be stored in its original		
	packaging		
SYS_REQ-2800	Transportation of equipment.	Essential	Inspection
	Equipment shall be designed to		
	withstand transportation from an		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 195 of 275

	engineering depot to a station exposed		
	to environmental conditions		
	2K5H/2B3/2C1/2S3/2M3 as detailed		
	in BS EN IEC 60721-3-2. NOTE: It		
	may be assumed that the equipment		
	will be transported in the original		
	packaging that it was delivered to the		
	engineering depot.		
SYS_REQ-2491	Safety. SKA1 equipment and	Essential	Analysis
	buildings shall be designed and built		
	in compliance with national and State		
	regulations including AS 1170.4		
	(Importance level 3, design life 50		
	years) and SANS 10160-4 for		
	earthquakes of magnitude up to		
	Richter 3.8.		
SYS_REQ-2650	Seismic resilience. SKA1 structures	Essential	Analysis
	and equipment shall survive and be		
	fully operational after a seismic event		
	of magnitude up to Richter 3.8. Note:		
	Seismic event includes underground		
	collapses in addition to earthquakes.		
SYS_REQ-2722	Availability, reliability, and	Essential	Inspection
	maintenance plans. There shall be an		
	availability, reliability and		
	maintenance plan for each SKA1		
CVC DEO 2716	telescope.	Essential	Analysis
SYS_REQ-2716	Average annual availability. Each SKA1 telescope shall have an	Essential	Analysis
	operational availability of 95%		
SYS_REQ-2827	System Availability. System designs	Essential	Analysis
0.02 _0	shall meet the system availability	2550111111	7
	allocations specified in SKA-		
	OFF.SE.ARC-SKAO-RAM-001		
SYS_REQ-2718	Availability budgets. Availability	Essential	Analysis
	budgets shall be allocated at the		
	system decomposition level, and shall		
	be consistent with the system level		
	requirements for reliability and		
	maintainability of the system.		
SYS_REQ-2512	Best practice. Best available methods	Essential	Analysis
	for reducing adverse effects of		
	operational and maintenance		
	environments on critical components		
	shall be adopted.		
SYS_REQ-2513	Critical-useful-life components. Any	Essential	Inspection
	critical-useful-life components shall be		
	identified.		
SYS_REQ-2515	Component selection. Parts and	Essential	Analysis
	components shall be selected to meet reliability requirements.		

Revision: 6

SYS_REQ-2516	Matching components. Parts	Essential	Inspection
_ , , , ,	requiring select on test shall be		•
	eliminated by deign if possible.		
SYS_REQ-2517	Known failure rate parts. The failure	Essential	Inspection
	rate of parts shall be known (e.g.		
	through analysis or modelling) before		
	inclusion in SKA design.		
SYS_REQ-2518	High failure rate parts. Parts with	Essential	Inspection
	excessive failure rates shall be		
	identified.		
SYS_REQ-2519	Reliability testing. A testing and	Essential	Inspection
	evaluation master plan shall be		
	generated for high-risk reliability		
	components.		
SYS_REQ-2520	Spares and repair parts testing.	Essential	Inspection
	Critical spare and repair line		
	replaceable units shall be tested before		
	deployment.		
SYS_REQ-2521	Component derating. Safety factors	Essential	Analysis
	and margins shall be applied in the		
	selection of modules and components		
SYS_REQ-2522	Shelf life and wear out	Essential	Inspection
	characteristics. The shelf life and		
	wear out characteristics of all		
	components and parts shall be known		
	before inclusion in SKA designs.		
SYS_REQ-2523	Special procurement components.	Essential	Inspection
	Critical parts requiring special		
	procurement methods, testing and		
CVC PEO 3535	handling provisions shall be identified.	Facewatt-1	Amah :-!-
SYS_REQ-2525	Fail safe provisions. Designs shall	Essential	Analysis
	implement fail-safe provisions to		
CVC PEO 3E3C	prevent secondary failures.	Econtial	Inchestics
SYS_REQ-2526	Maintainability budgets shall be	Essential	Inspection
	Maintainability budgets shall be allocated at the system decomposition		
	level, and shall be consistent with the		
	system level requirements for		
	reliability and maintainability of the		
	system.		
SYS_REQ-2527	Test and Repair Instructions. Where	Essential	Inspection
J.5Q 2527	end user repair is applicable Test and	2550116141	mope cuon
	Repair Instructions shall be delivered		
	with all equipment.		
SYS_REQ-2528	Level of maintenance. The level of	Essential	Inspection
	maintenance shall be identified for		-1
	each repairable item.		
SYS_REQ-2529	Maintenance test and support	Essential	Inspection
	equipment. Equipment required for		- 1
	test and support shall be identified for		
	each repairable item.		
SYS_REQ-2802	Design for maintainability . Designs	Essential	Inspection
_ ,	shall incorporate maintainability		
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 197 of 275

	studies and analysis in accordance		
	with BS EN IEC 60706-2 with		
	emphasis on minimising the need for		
	maintainers on sites. This activity		
	should incorporate best practice such		
	as described by B.S. Blanchard & W.J.		
	Fabrycky 'Systems Engineering and		
	Analysis', Pearson 2011		
SYS_REQ-2594	Modular packaging. The packaging	Essential	Inspection
	of components shall be modular to		
	limit maintenance to the removal of		
	one module.		
SYS_REQ-2595	Maintenance provisions. Repairable	Essential	Inspection
	items shall be designed to include		
	maintenance provisions such as test		
	points, accessibility, and plug-in		
	components.		
SYS_REQ-2596	Discard at failure items. Discard at	Essential	Inspection
	failure items shall be packed at low		
	cost.		
SYS_REQ-2597	Plug-in modules. The design shall	Essential	Inspection
	implement plug-in modules to the		
	maximum extent possible.		
SYS_REQ-2598	Module access. Where applicable,	Essential	Inspection
	access between modules shall be		
CVC PEO 3500	sufficient to facilitate hand grasping.	Farantial	1
SYS_REQ-2599	Component removal. Modules and	Essential	Inspection
	components shall be mounted such		
	that removal of any single item will not require the removal of other items		
	(component stacking to be avoided		
	where possible)		
SYS_REQ-2600	Secure mounting of modules.	Essential	Inspection
015_M2Q 2000	Modules shall be securely mounted (in	2556116161	speedie
	compliance with the shock and		
	vibration requirements) with the		
	minimum number of fasteners.		
SYS_REQ-2601	Shock mounting provision. Shock	Essential	Inspection
	mounting provisions shall be made		•
	where applicable.		
SYS_REQ-2602	Mounting preclusion. Provisions for	Essential	Inspection
	the preclusion of mounting the wrong		
	module shall be provided (key coding		
	of connectors etc.).		
SYS_REQ-2448	Stand-off and handles. Stand-offs	Essential	Inspection
	and handles shall be used to protect		
	system components from damage		
	during shop maintenance.		
SYS_REQ-2603	Mounting guides. Mounting guides	Essential	Inspection
	and location pins shall be provided to		
	facilitate module mounting.		

Revision: 6

SYS_REQ-2604	Module labelling. Where possible,	Essential	Inspection
313_NEQ 2004	labelling of modules shall be on the	Loscitiai	mspection.
	top or adjacent in plain sight.		
SYS_REQ-2605	Label robustness. Labels shall be	Essential	Inspection
313_MEQ 2003	permanently affixed and unlikely to	Loscitiai	mspection.
	come off during maintenance or as a		
	result of the environment.		
SYS_REQ-2606	Disposable LRU labelling.	Essential	Inspection
313_M2Q 2000	Disposable line replaceable units	Loscitta	inspection.
	should be labelled as such.		
SYS_REQ-2711	Component obsolescence plan. There	Essential	Inspection
	shall be a plan for the management of		
	component obsolescence.		
SYS_REQ-2571	Long lead time items. Long lead time	Essential	Inspection
	items shall be identified to the project		
	management.		
SYS_REQ-2570	Parts availability. The estimated	Essential	Analysis
_ `	availability of the parts shall be		,
	compatible with the final system's life		
	cycle.		
SYS_REQ-2806	Product Assurance. Product	Essential	Inspection
	Assurance shall be managed following		
	a process modelled on the SKA		
	Product Assurance & Safety Plan		
	SKA-OFF.PAQA-SKO-QP-00		
SYS_REQ-2509	Scope of workmanship standards.	Essential	Inspection
	SKA1 dedicated workmanship		
	standards shall cover all phases of		
	production, assembly and integration,		
	testing, handling, and include clear		
	requirements for acceptance/rejection		
	criteria.		
SYS_REQ-2816	Design for testability. Designs shall	Essential	Inspection
	include an assessment of testability in		
	accordance with BS EN IEC 60706-		
SYS_REQ-2538	Test and support equipment Test	Essential	Inspection
	and support equipment shall be		
	identified for each level of		
CVC DEC 3530	maintenance.	Facantici	In an a attio :-
SYS_REQ-2539	Test and support equipment	Essential	Inspection
	standardisation. Any test equipment not included in the standard test		
	equipment list required for the		
	integration, commissioning and		
	maintenance of equipment shall be declared.		
SYS_REQ-2540		Essential	Inspection
313_REQ-2540	Test and support equipment lifecycle costs. Life cycle costs shall	Esseillidi	inspection
	be generated for all test and support		
	equipment.		
SYS_REQ-2541	Test equipment reliability Test	Essential	Analysis
313_NEQ-2341	equipment reliability shall be	ESSCITUAL	Allulysis
	equipment renavinty shall be	l	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 199 of 275

	sufficient to meet the maintainability		
	sufficient to meet the maintainability		
SYS_REQ-2542	requirements. Training A plan detailing the training	Essential	Inspection
313_KEQ-2542	required for maintenance, calibration	Essential	inspection
	and repair shall be generated.		
SYS_REQ-2543	Direct fault indicators Where	Essential	Inspection
313_REQ-2545	possible, direct fault indicators shall be	Essential	inspection
	designed in to equipment.		
SYS_REQ-2544	Self-test. Self-Test capability such that	Essential	Analysis
313_NLQ-2344	all faults can be identified down to	LSSCIILIAI	Allalysis
	LRU level shall be provided.		
SYS_REQ-2546	Continuous performance	Essential	Demonstration
313_NEQ 2340	monitoring. Where possible, the	Listiniai	Demonstration
	system shall be designed to provide		
	continuous performance monitoring.		
SYS_REQ-2552	Malfunction detection. All	Essential	Demonstration
	equipment malfunction shall be		
	detected at the system level.		
SYS_REQ-2556	Access tools. Access requiring tools	Essential	Analysis
	shall be minimised.		
SYS_REQ-2559	Design for economic production. All	Essential	Inspection
_ `	designs for the SKA shall be designed		
	for economic production. This is		
	required to ensure that the SKA is		
	buildable for a reasonable cost (Con		
	Ops Section 1.2)		
SYS_REQ-2560	Design definition. Design definition	Essential	Inspection
	shall be in sufficient detail to allow		
	one or more manufacturers to produce		
	the same item within identified		
	tolerances.		
SYS_REQ-2561	Manufacturing facilities. Where	Essential	Inspection
	possible, currently existing facilities		
	shall be used for manufacturing.		
SYS_REQ-2562	Standard manufacturing tools.	Essential	Inspection
	Where possible, standard		
CVC PEO CECC	manufacturing tools shall be used.	Farance	Inches 12
SYS_REQ-2566	Materials list. Each sub-system	Essential	Inspection
	supplier shall provide a Materials list		
	for all items intended for use within		
SYS_REQ-2568	SKA1. Parts list. Each Element supplier shall	Essential	Inspection
313_NEQ-2308	provide a parts list for all items	Loociilidi	IIIspection
	intended for use in the SKA1.		
SYS_REQ-2569	Process list. Each element supplier	Essential	Inspection
313_NEQ-2303	shall provide a process list for all	Losential	шэресион
	items intended for use in the SKA1.		
SYS_REQ-2573	Serial number. Each part shall be	Essential	Inspection
313_KEQ-23/3	marked with a unique serial number in	Losciidai	Порсскоп
	an easily visible location.		
SYS_REQ-2574	Drawing numbers. Each LRU type	Essential	Inspection
3.32 25/4	shall be identified with a unique		
	drawing number		
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Revision: 6

SYS_REQ-2575	Marking method. Method of marking	Essential	Inspection
	shall be compatible with the nature of		
	the item, its environment and its use.		
SYS_REQ-2576	Electronically readable or scannable	Essential	Inspection
	ID. Where possible line replaceable		
	items shall be marked with an		
	Electronically readable or scannable		
	ID		
SYS_REQ-2577	Package part number marking. All	Essential	Inspection
	packaging shall be marked with the		
	part number of the contents.		
SYS_REQ-2578	Package serial number marking. All	Essential	Inspection
	packaging shall be marked with the		
	serial number of the contents.		
SYS_REQ-2580	LRU electrostatic warnings All	Essential	Inspection
	LRUs with electrostatic sensitive		
	components shall be fitted with ESD		
	warning labels.		
SYS_REQ-2581	Packaging electrostatic warnings.	Essential	Inspection
	All packaging containing static		
	sensitive contents shall be marked		
	with ESD warning labels.		
SYS_REQ-2583	Cable identification. All cables ends	Essential	Inspection
	shall carry a unique identifier.		
SYS_REQ-2584	Connector plates. All connector	Essential	Inspection
	plates shall carry identification labels		
	for connectors.		

Table 2 Verification Matrix

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 201 of 275

21 Appendix C: Requirement Allocation Matrices

SYS_REQ-2113 Global Headquarters The SKA Global Headquarters (GHQ) will have overall responsibility for the SKA Observatory Site location. The SKA1 Antenna systems and digital signal chain shall be located within radio quiet zones provided by the Host Countries of South Africa and Australia. SYS_REQ-2124 SKA1_low array. The SKA1_low array shall be located within the legal boundary of the Boolardy station. SYS_REQ-2713 SKA1_low central frequency reference. The SKA1_low central frequency reference. Shall be located in the SKA1_low Central Signal Processing facility SYS_REQ-2654 SKA1_Mow CSP facility. The facility housing the station beamformers for the inner area of the SKA1_Low and the central signal processing for SKA1_Low shall be at a distance of 2 km South West of the centre of the SKA1_Low array. SYS_REQ-2120 Australian Science operations centre. The Australian Science Operations Centre shall be in Perth. SYS_REQ-2121 Australian Science operations Centre The Australian Engineering Operations Centre shall be in in Geraldton. SYS_REQ-2123 Australian Science processing centre The Australian Science Processing Centre The Australian Engineering Operations Centre shall be in in Geraldton. SYS_REQ-2123 Australian Science processing centre The Australian Science Processing Centre the Australian dother infrastructure at the Pawsey centre in Perth. SYS_REQ-213 SKA1_mid drary. The SKA1_Mid dish array shall be located in the Karoo Central Astronomy Advantage Area. SYS_REQ-2656 SKA1_mid CSP facility. The CSP facility for SKA1_mid shall be located in the Karoo Array Processor Building.	ID	Description	Allocation
Global Headquarters (GHQ) will have overall responsibility for the SKA Observatory SYS_REQ-2114 Site location. The SKA1 Antenna systems and digital signal chain shall be located within radio quiet zones provided by the Host Countries of South Africa and Australia. SYS_REQ-2124 SKA1_low array. The SKA1_low array shall be located within the legal boundary of the Boolardy station. SKA1_low central frequency reference. The SKA1_low central frequency reference. The SKA1_low central frequency reference shall be located in the SKA1_low Central Signal Processing facility. The facility housing the station beamformers for the inner area of the SKA1_Low and the central signal processing for SKA1_Low shall be at a distance of 2 km South West of the centre of the SKA1_Low shall be at a distance of 2 km South West of the centre. The Australian Science Operations Centre The Australian Science Operations Centre The Australian Engineering Operations Centre shall be in in Geraldton. SYS_REQ-2121 Australian Engineering Operations Centre The Australian Science Processing Centre shall make use of floor space, power, cooling, and other infrastructure at the Pawsey centre in Perth. SYS_REQ-2119 SKA1_mid array. The SKA1_Mid dish array shall be located in the Karoo Central Astronomy Advantage Area. SYS_REQ-2656 SKA1_mid CSP facility. The CSP facility for SKA1_mid Shall be located in the Karoo Array Processor Building.	SYS_REQ-2113		
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facility for SKA1_mid shall be located in the Karoo Array Processor Building.	SYS_REQ-2656		SADT, CSP, INFRA, TM
located in the Karoo Array Processor Building.			
Building.		_	
SYS_REQ-2714 SKA1_mid central frequency SADT, CSP, INFRA, TM	SYS_REQ-2714	SKA1_mid central frequency	SADT, CSP, INFRA, TM
reference. The SKA1_mid central			
frequency reference shall be located		frequency reference shall be located	
in the SKA1_mid Central Signal		1 0	
Processing facility		_	

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 202 of 275

SYS_REQ-2115	South African Science Operations.	SADT, TM, INFRA
	The South African Science	, ,
	Operations Centre shall be located in	
	Cape Town.	
SYS_REQ-2118	South African Science Processing	SDP, INFRA, TM, SADT
	Centre The South African Science	
	Processing centre shall be located in	
	Cape Town	
SYS_REQ-2116	South African Engineering	SADT, SDP, TM, INFRA, DSH, CSP
	Operations Centre. The South	
	African Engineering Operations	
	Centre shall be located at Klerefontein.	
CVC DEO 2671		LFAA
SYS_REQ-2671	Receptor type. The SKA1_Low shall utilise dual, orthogonal,	LFAA
	polarization log-periodic antennas.	
SYS_REQ-2673	Array resolution (core). The	LFAA
3.5_NEQ 2075	SKA1_Low shall have an array	
	resolution of better than 5 arc	
	minutes at 100 MHz (centre of the	
	EoR frequency range).	
SYS_REQ-2134	Electromagnetic frequency range.	LFAA, CSP, SDP
	SKA1_Low shall be able to measure	
	electromagnetic radiation in a	
	frequency range from 50 MHz to 350	
	MHz.	
SYS_REQ-2621	Spectral stability: The spectral	LFAA, CSP, SDP
	stability, on a time scale of 600	
	sec., of the station beam bandpass,	
	post station calibration and RFI- mitigation, shall be within 1.3 %, 0.4	
	%, 0.6 % and 1.1 % at 50 MHz, 100	
	MHz, 160 MHz, and 220 MHz	
	respectively compared to the full	
	polarization, parameterized beam	
	model.	
SYS_REQ-2135	SKA1_Low array sensitivity at	LFAA
	50MHz . The SKA1_Low array shall	
	have sensitivity per polarization at	
	zenith greater than 72 m ² K ⁻¹ at	
	50MHz when assuming a sky noise	
	temperature following the law	
CVC PEO CICC	60.lamda ^{2.55}	1500
SYS_REQ-2136	SKA1_Low array sensitivity at	LFAA
	110MHz . The SKA1_Low array shall have a sensitivity per	
	polarization at zenith greater than	
	380 m ² K ⁻¹ at 100 MHz when	
	assuming a sky noise temperature	
	following the law 60.lambda^2.55	
SYS_REQ-2137	SKA1_Low array sensitivity at	LFAA
	160MHz . The SKA1_Low array	
	shall have a sensitivity per	
	Shan have a sensitivity per	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 203 of 275

		T
	polarization at zenith of greater than	
	535 m ² K ⁻¹ at 160 MHz when	
	assuming a sky noise temperature	
	following the law 60.lambda^2.55	
SYS_REQ-2138	SKA1_Low array sensitivity at	LFAA
	220MHz . The SKA1_Low array	
	shall have a sensitivity per	
	polarization at zenith of greater than	
	530 m ² K ⁻¹ at 220 MHz when	
	assuming a sky noise temperature	
	following the law 60.lambda^2.55.	
SYS_REQ-2814	SKA1_Low array sensitivity per	LFAA
	polarization at 280 MHz. The	
	SKA1_Low array shall have a	
	sensitivity per polarization at zenith	
	greater than 500 m^2/K at 280 MHz	
	when assuming a sky noise	
	temperature following the law	
CVC PEC 2015	60.lambda^2.55	1500
SYS_REQ-2815	SKA1_Low array sensitivity per	LFAA
	polarization at 340 MHz. The	
	SKA1_Low array shall have a	
	sensitivity per polarization at zenith	
	greater than 453 m^2/K at 340 MHz	
	when assuming a sky noise	
	temperature following the law 60.lambda^2.55	
SYS_REQ-2622	Sensitivity for off zenith angles.	LFAA
313_KLQ-2022	The SKA1_low receptor has an off-	LIAA
	zenith beam response defined by the	
	receptor, a log-periodic dipole	
	antenna,in the Baseline Design.	
SYS_REQ-2139	SKA1_Low antennas per station.	LFAA, SADT, INFRA
	The SKA1_Low shall comprise of	
	stations each containing 256	
	antennas.	
SYS_REQ-2140	SKA1_Low station diameter. The	LFAA, SADT, INFRA
	station diameter will be 35 metres,	, , ,
	which is consistent with being able	
	to provide a single, circularly	
	symmetric, beam of 5 degrees at the	
	half-power points at 100 MHz	
	(centre of the EoR frequency range)	
	while meeting the sensitivity	
	requirements with 256 antennas per	
	station evenly distributed in an	
	irregular-random configuration.	
SYS_REQ-2142	SKA1_Low number of stations.	LFAA, SADT, CSP, SDP, TM, INFRA
	The SKA1_Low shall comprise of	
	512 stations.	
SYS_REQ-2143	SKA1_Low configuration. The	LFAA, SADT, INFRA
	SKA1_Low shall have a	
	configuration as specified in TBD.	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 204 of 275

CVC PEO 2017	SKA1 Low maximum baselina	LFAA
SYS_REQ-2817	SKA1_Low maximum baseline	LFAA
	length between stations. The maximum distance between station	
CVC DEO 3147	centres shall be approximately 80 km Instantaneous bandwidth. The	LEAA CADT CCD CDD
SYS_REQ-2147		LFAA, SADT, CSP, SDP
	SKA1_Low shall be capable of	
	simultaneously processing 300 MHz	
	of bandwidth.	
SYS_REQ-2652	SKA1_Low separation. The	LFAA, SADT, INFRA, DSH
	SKA1_Low core shall be located at a	
	minimum distance of 10km from the	
	ASKAP core.	
SYS_REQ-2674	Digitisation. Digitisation of	LFAA
	SKA1_antenna (SKA1_Low only)	
	signals shall be to at least 8 bits.	
SYS_REQ-2639	Clipping. The amplitude dynamic	LFAA, SADT
	range of the SKA1_Low ADC's shall	
	be such that no clipping will occur	
	for 95% of the time	
SYS_REQ-2640	Clipped data flagging. Clipped data	LFAA, CSP, Dish, SDP
	shall be flagged accordingly within	
	the data stream.	
SYS_REQ-2653	Linearity. At the finest frequency	LFAA, SADT
	resolution in the processing chain,	
	the level of spurious signals due to	
	non-linearity shall be less than the	
	noise level when no external input	
	signal is present.	
SYS_REQ-2824	Absolute flux scale : The absolute	LFAA, SDP
	flux scale shall be accurate to 5	
SYS_REQ-2676	Dynamic range. The SKA1_Low	LFAA
	beams shall have a dynamic range of	
	better than 40 dB	
SYS_REQ-2146	SKA1_Low station beams The	LFAA
	antennas within each station shall be	
	coherently beam-formed to provide	
	one pair of station beams,one beam	
	for each orthogonal polarization,for	
	primary science.	
SYS_REQ-2779	Control of station beam	LFAA, TM
	properties: It shall be possible to	
	control specific properties of the	
	station beam by setting the station	
	beam weights appropriately	
SYS_REQ-2629	Station beam stability. The	LFAA, SDP
	difference between the parameterized	
	station beam model and the actual	
	station beam shall remain smaller	
	than 1.3 %, 0.4 %, 0.6 % and 1.1 %	
	relative to the main beam peak	
	power, after calibration, at 50 MHz,	
	100 MHz, 160 MHZ and 220 MHz	
	respectively	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 205 of 275

SYS_REQ-2634	Calibration update rate.	LFAA, TM, SDP
	Calibration measurements shall be	
	necessary at a rate of no more than	
	10seconds.	
SYS_REQ-2635	Real-time calibration. The LFAA	LFAA
_ `	reception system at station level shall	
	provide on-line instrumental	
	calibration functions with an update	
	rate of 10 minutes	
SYS_REQ-2636	Beam products. The SKA1_Low	LFAA
	shall be capable of outputting beam	
	products as voltage time series.	
SYS_REQ-2773	SKA1_Low correlator sub-array	CSP
_	support . The SKA1_Low correlator	
	shall be able to correlate SKA1_low	
	station beams from one to sixteen	
	sub-arrays independently and	
	concurrently	
SYS_REQ-2148	SKA1_Low channelisation. The	LFAA, CSP, SDP
	SKA1_Low channelisation for each	
	sub array shall provide up to 65,536	
	linearly spaced frequency channels	
	across the available frequency range	
	of each band.	
SYS_REQ-2149	SKA1_Low channeliser maximum	CSP, LFAA
	leakage power for adjacent	
	frequency channels. The	
	SKA1_Low channeliser for each	
	sub-array shall have a maximum	
	noise leakage power from	
	immediately adjacent frequency	
	channels of < -30 dB.	
SYS_REQ-2810	SKA1_Low channeliser maximum	CSP, LFAA
	leakage power for non-adjacent	
	frequency channels. The	
	SKA1_Low channeliser for each	
	sub-array shall have a maximum	
	noise leakage power from non	
	adjacent frequency channels better	
	than -60 dB.	
SYS_REQ-2811	SKA1_Low fine frequency channel	CSP
	amplitude variation. The fine	
	frequency channels for the	
	SKA1_Low channeliser shall have a	
	total amplitude variation as a	
	function of frequency of less than	
010 000	0.01 dB.	
SYS_REQ-2812	SKA1_Low fine frequency channel	CSP
	band edge. The fine frequency cells	
	for the SKA1_Low channeliser shall	
	have a -3dB transition band	
	amplitude at the channel band edge.	

Revision: 6

SYS_REQ-2678	SKA1_Low correlatation signal to noise. SKA1_Low correlation, for	CSP
	each sub array, shall not degrade the	
	Signal to Noise ratio by more than 2	
	% compared to ideal analogue	
	correlation.	
SYS_REQ-2150	SKA1_Low correlator Integration	CSP, SDP
	rate. The SKA1_Low correlator for	
	each sub array shall have	
	independently configurable visibility	
	integration periods in the range 9s to	
	0.9s.	
SYS_REQ-2153	Diameter. SKA1 dishes shall have a	DSH
	projected diameter of larger than	
CVC DEO 24EE	15m and smaller than 16.5m.	DCII
SYS_REQ-2155	Aperture Efficiency . Aperture	DSH
	efficiency shall be within +/- 5 % of:	
	• 60% at 350MHz with	
	gradual degradation from 400 to 350 MHz	
	GEO/	
	65% at 400MHz78% from 600MHz to	
	8000MHz	
	• 70% from 8 to 15 GHz	
	• 65% from 15 to 20 GHz	
	• 03% Holli 13 to 20 GHZ	
SYS_REQ-2158	Pointing repeatability. The pointing	TM, DSH, SDP, SaDT
313_KEQ 2130	repeatability shall be better than 10	1111, 2311, 321 , 3421
	arc seconds rms for winds < 7 m/s at	
	night time.	
SYS_REQ-2159	Pointing repeatability . The pointing	TM, DSH, SDP, SaDT
	repeatability shall be better than 17	
	arc seconds rms for an average wind	
	speed of < 7 m/s in the day time	
SYS_REQ-2160	Pointing repeatability. The pointing	TM, DSH, SDP, SaDT
	repeatability shall be better than 180	
	arc seconds rms for an average wind	
	speed between 7 and 20 m/s	
SYS_REQ-2162	Number of feeds . There shall be	DSH
	space at the Gregorian focus of	
	SKA1 dishes for five single pixel	
	feeds (SPF) or three Phased Array Feeds (PAF)	
SYS_REQ-2165	Polarisation Purity. The IXR shall	DSH, SDP
313_NEQ-2103	be better than 15 dB over the whole	5511, 551
	observing bandwidth within the	
	HPBW	
SYS_REQ-2170	Elevation limit. Reflector antennas	DSH
	shall be capable of operating at all	
	elevations greater than 15 degrees	
SYS_REQ-2171	Azimuth range. The Dish shall have	DSH
	a continuous useable azimuth	
	observation range from -270° to	
	KV-1E1-2KU-0000008	EOR DROIECT LISE O

Revision: 6
Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 207 of 275

	±270° inclusive measured valative to	
	+270°, inclusive measured relative to true North defined as 0° and with	
	East defined as +90°	
SYS_REQ-2833	SKA1_Mid inclusion of MeerKAT.	SADT, CSP, SDP, TM, INFRA, DSH, AIV
313_REQ-2033	The SKA1_Mid shall incorporate the	SADT, CSP, SDP, TIVI, IIVFRA, DSH, AIV
	64 antennas in both monitor and	
	control and data collection functions.	
SYS_REQ-2173	MeerKAT array. The monitor and	SADT, INFRA, DSH, TM
313_KLQ-2173	control functions of MeerKAT shall	SADT, INTRA, DSII, IIVI
	be made available to SKA1_Mid via	
	a Foreign Telescope interface	
	consisting of a Local Monitor and	
	Control system connected to the	
	SKA1_Mid Telescope Manager.	
SYS_REQ-2834	SKA1_Mid-MeerKAT	SADT, CSP, SDP, TM, INFRA, DSH, AIV
515_KEQ 2054	infrastructure reuse. Where	SABT, CST, SBT, TW, INTRA, BSTI, AIV
	economically practicable, the	
	existing MeerKAT infrastructure	
	will be reused	
SYS_REQ-2825	Absolute flux scale: The absolute	DISH, CSP, SDP
	flux scale shall be accurate to 5%	, , , , ,
	rms	
SYS_REQ-2826	Absolute flux scale: The absolute	DSH, CSP, SDP
	flux scale shall be accurate to 3%	
	rms	
SYS_REQ-2174	Combined SKA1 Mid	SADT, INFRA, DSH, SDP
	Configuration. The	
	SKA1_Mid shall have the	
	configuration defined in the TB	
SYS_REQ-2712	SKA1_Mid antenna. The	SADT, INFRA, DSH
	SKA1_Mid array shall consist of 133	
	antennas centred in the same location	
	as the MeerKAT array	
SYS_REQ-2179	Antenna RF system. The Dish	DSH
	Element shall make available only a	
	single frequency band at any one	
	time.	
SYS_REQ-2180	RF system frequency range band 1	DSH
	The array of SKA1_Mid dishes,	
	when the band 1 capability is	
	selected, shall operate over a	
	frequency range from 0.35 to 1.050	
SYS_REQ-2181	GHz for each polarisation.	DSH
313_KEQ-2101	RF system frequency range band 2. The SKA1_Mid dishes, when the	
	band 2 capability is selected, shall	
	operate over a frequency range from	
	0.95 to 1.76 GHz for each	
	polarisation.	
SYS_REQ-2182	RF system frequency range band 3.	DSH
3.5_NEQ 2102	The SKA1_Mid dishes, when the	
	band 3 capability is selected, shall	
	operate over a frequency range from	
	perate over a frequency range from	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 208 of 275

	1.65 to 3.05 GHz for each	
	polarisation	
SYS_REQ-2183	1	DSH
313_NEQ-2103	RF system frequency range band 4. The SKA1_Mid dishes, when the	5311
	band 4 capability is selected, shall	
	operate over a frequency range from	
	2.80 to 5.18 GHz for each	
	polarisation	
SYS_REQ-2184	RF system frequency range band	DSH
,	5. The SKA1 Mid dishes, when the	
	band 5 capability is selected, shall	
	operate over a frequency range from	
	4.6 to 13.8 GHz for each	
	polarisation.	
SYS_REQ-2185	RF system sampled bandwidth	SADT, CSP, SDP, DSH
	band 1. The instantaneous	
	bandwidth for band 1 will be	
	700MHz and shall be sampled to at	
	least 2.0 G samples per second for	
0,42 === -	each polarisation	CART COS COS COS COS
SYS_REQ-2186	RF system sampled bandwidth	SADT, CSP, SDP, DSH
	band 2. The instantaneous	
	bandwidth for band 2 will be 810	
	MHz and shall be sampled to at least	
	2.0 G sample per second for each polarisation.	
SYS_REQ-2187	RF system sampled bandwidth	SADT, CSP, SDP, DSH
5.5_NLQ-210/	band 3 The instantaneous bandwidth	(A)
	for band 3 will be 1,403 MHz and	
	shall be sampled to at least 5.0 G	
	samples per second for each	
	polarisation	
SYS_REQ-2188	RF system sampled bandwidth	SADT, CSP, SDP, DSH
	band 4 The instantaneous bandwidth	
	for band 4 will be 2,380 MHz and	
	shall be sampled at at least 5.0 G	
	samples per second for each	
	polarisation.	
SYS_REQ-2189	RF system sampled bandwidth	SADT, CSP, SDP, DSH
	band 5 The SKA_Mid, for band	
	5, shall digitise two separate 2.5	
CVC DEC 3400	GHz bands for each polarisation.	SADT CSD DSU
SYS_REQ-2190	RF digitisation. Digitisation for	SADT, CSP, DSH
	each polarisation shall be:	
	• band 1 8 bits	
	• band 2 8 bits	
	• band 3 6 bits	
	• band 4 at least 4 bits	
	• band 5 at least 2 streams of 3	
	bits	
CVC DEC 3	CIZA4 B5'1	CCD
SYS_REQ-2774	SKA1_Mid correlation sub-array	CSP
	support. The SKA1_Mid shall be	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 209 of 275

	able to correlate SKA1_mid dishes	
	as multiple sub-arrays independently	
	and concurrently	
SYS_REQ-2195	SKA1 Mid channelisation. The	CSP, SDP
0.0 ====	SKA1_Mid channelisation for each	33.703.
	sub array shall provide up to 65,536	
	linearly spaced frequency channels	
	across the sampled bandwidth of	
	each band.	
SYS_REQ-2196	SKA1_Mid channelisation	CSP
	maximum leakage power for	
	adjacent channels. The SKA1_Mid	
	for each sub-array shall have a	
	maximum noise leakage power from	
	immediately adjacent frequency	
	channels of < -30 dB	
SYS_REQ-2803	SKA1_Mid maximum leakage	CSP
	power for non-adjacent frequency	
	channels. The SKA1_Mid, for each	
	sub-array, shall have a maximum	
	noise leakage power from non	
	adjacent frequency channels better than -60 dB.	
SYS_REQ-2805	SKA1_Mid fine frequency channel	CSP
313_NEQ 2003	amplitude variation. The fine	CSI
	frequency channels for the	
	SKA1_Mid channeliser shall have a	
	total amplitude variation as a	
	function of frequency of less than	
	0.01 dB after bandpass calibratio	
SYS_REQ-2804	SKA1_Mid fine frequency channel	CSP
	band edge . The fine frequency cells	
	for the SKA1_Mid channeliser shall	
	have a -3dB transition band	
	amplitude at the channel band edge.	
SYS_REQ-2679	SKA1_Mid correlation signal to	CSP
	noise. The SKA1_Mid correlation,	
	for the same sub-array, shall not degrade the Signal to Noise ratio by	
	more than 2% compared to ideal	
	analogue correlation.	
SYS_REQ-2197	SKA1_Mid correlation integration	CSP, SDP
	period. The SKA1_Mid shall have	,
	independently configurable visibility	
	integration period from a maximum	
	integration time of 1.4s to a	
	minimum of 0.14s for each subarray.	
SYS_REQ-2616	SKA1_Mid Pulsar phase binning.	CSP, SDP
	The SKA1_Mid, for each subarray,	
	shall allow for pulse phase-resolved	
	observations supporting the product	
	of the number of phase bins, channel	

Revision: 6

	and polarication products up to	
	and polarisation products up to	
SYS_REQ-2830	262,144 (i.e. 4 x 65,536). SKA1_Mid Pulsar phase bin	CSP, SDP
313_REQ-2030	width. The SKA1 Mid shall be	CSP, SDP
	capable of providing pulsar phase	
	bin widths with a time resolution	
	of better than 10us	
SYS_REQ-2831	SKA1_Mid Pulsar phase bin	CSP
0.02 2001	synchronisation. The SKA1_Mid	
	shall be capable of synchronising	
	phase bins to the ephemeris to limit	
	drift to less than 10% of the selected	
	bin width within the selected	
	correlator integration period.	
SYS_REQ-2835	SKA1_Mid Phase bin averaging	CSP
	time. The SKA1_Mid phase bin	
	averaging time shall be constrained	
	to limit the output data rate to at	
	most the single bin configuration	
	output data rate.	
SYS_REQ-2740	Inclusion of MeerKAT into	AIV, CSP
	SKA1_mid correlator. The	
	SKA1_Mid correlator shall be	
	capable of forming real time cross	
	correlation products from all antenna	
	within the SKA1_Mid combined	
676 550 5504	array including those MeerKAT.	CCD CDD T14
SYS_REQ-2201	Beam-former sub-array support.	CSP, SDP, TM
	The SKA1_Mid central beam-former shall be able to form beams or more	
	beams for one to sixteen sub-arrays	
	independently and concurrently.	
SYS_REQ-2751	Pulsar search and timing within	CSP
313_KEQ 2731	sub-arrays. SKA1_Mid shall be	CSI
	capable of Pulsar search and timing	
	processing within individual sub-	
	arrays.	
SYS_REQ-2202	Pulsar search array diameter. The	CSP
	central beam-former for pulsar	
	search shall be capable of forming	
	beams independently across all	
	dishes (SKA1_Mid and MeerKAT)	
	within each of the SKA1_Mid sub-	
	arrays up to a distance of up to	
	10,000 metres from sub-array	
	centres.	
SYS_REQ-2755	Pulsar search beamformer centre	CSP
	frequency . The Pulsar search	
	beamformer shall form beams for	
	each of the search sub arrays with an	
i	independently selectable centre	
	fraguancy for the cub assessing the	
	frequency for the sub-array in the range from the lowest frequency of	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 211 of 275

SKA1_Mid band 1 through to the highest frequency of band 5. SYS_REQ-2756 Pulsar search beamforming bandwidth. The SKA1_Mid Pulsar search shall have a contiguous processing bandwidth for beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall simultaneously form up to a total of	
SYS_REQ-2756 Pulsar search beamforming bandwidth. The SKA1_Mid Pulsar search shall have a contiguous processing bandwidth for beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
bandwidth. The SKA1_Mid Pulsar search shall have a contiguous processing bandwidth for beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
search shall have a contiguous processing bandwidth for beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
processing bandwidth for beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
beamforming of up to 300 MHz. SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
SYS_REQ-2203 Number of beams: Pulsar search. SKA1_Mid, when performing the Pulsar Search function, shall	
SKA1_Mid, when performing the Pulsar Search function, shall	
Pulsar Search function, shall	
1111 beams per observation across	
all sub arrays.	
SYS_REQ-2205 Beamformer S/N pulsar search. CSP	
The SKA1_Mid central beam-	
forming for each sub array shall have	
a Signal to Noise ratio greater or	
equal to 98% of ideal analogue beam	
forming for the same sub array:	
SYS_REQ-2753 Pulsar search beamformer output. CSP	
For each SKA1_Mid Pulsar search	
sub-array the output shall be the	
power of summed polarisation	
beams.	
SYS_REQ-2752 Pulsar search beamforming output CSP	
frequency resolution. The	
frequency resolution for SKA1_Mid	
Pulsar search shall be independently	
configurable in frequency resolution	
with values in the 20 kHz and 75	
kHz	
SYS_REQ-2754 Pulsar search beamforming output CSP	
time resolution: SKA1_Mid Pulsar	
search output beams shall have a	
minimum time resolution of 50us.	
SYS_REQ-2206 Pulsar timing array radius. The CSP	
central beam-former for pulsar	
timing shall be capable of forming	
beams across all dishes within the	
SKA1_Mid sub-arrays to a distance	
of up to 10,000 metres from their	
centres.	
SYS_REQ-2757 Pulsar timing beamformer centre CSP	
frequency. The Pulsar timing	
beamformer shall form beams for	
each of the timing sub-arrays with a	
selectable centre frequency for the	
sub-array in the range from the	
lowest frequency of SKA1_Mid	
band 1 through to the highest	
frequency of band 5.	
SYS_REQ-2758 Pulsar timing beamformer CSP	
bandwidth. The SKA1_Mid Pulsar	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 212 of 275

	timing beamformer for each timing	
	_	
	sub-array shall have a contiguous	
	processing bandwidth up to the full	
	bandwidth of the selected band up to	
	a bandwidth of 2.5 GHz.	
SYS_REQ-2207	Number of beams: Pulsar timing.	CSP, SDP
	The SKA1_Mid central beam-former	
	for Pulsar timing shall be capable of	
	forming up to 16 dual polarisation	
	coherent beams in total across all	
	timing sub-arrays.	
SYS_REQ-2208	Beamforming S/N ratio: Pulsar	CSP
	timing. The SKA1_Mid for Pulsar	
	timing shall have a Signal to Noise	
	ratio greater or equal to 98% of an	
	ideal analogue beam former.	
SYS_REQ-2689	SKA1_Mid VLBI beam number.	CSP, TM, SADT
	SKA1_Mid shall be capable of	
	producing up to four VLBI beams	
SYS_REQ-2759	SKA1_Mid VLBI array diameter.	CSP, TM
313_KEQ-2733	SKA1_Mid shall be able to generate	CSF, TIVE
	VLBI beams from sub-arrays with	
CVC DEO 2760	receptors separated by up to 100km	CCD TM
SYS_REQ-2760	SKA1_Mid VLBI centre	CSP, TM
	frequency. SKA1_Mid shall be able	
	to form a VLBI beam with a	
	0.01MHz step selectable centre	
	frequency within the boundaries of	
	the defined frequency bands for	
	SKA1_Mid.	
SYS_REQ-2761	SKA1_Mid VLBI beam	CSP, TM, SADT
	bandwidth. SKA1_Mid VLBI	
	beamforming shall have a contiguous	
	processing bandwidth up to the full	
	bandwidth of the selected band	
SYS_REQ-2762	SKA1_Mid VLBI beamformer S/N	CSP,SADT
	performance. SKA1_Mid VLBI	
	beamforming shall have the Signal to	
	Noise ratio by more than 98%	
	compared to an ideal analogue beam	
	former.	
SYS_REQ-2847	SKA1_Mid VLBI store the time-	CSP, TM, SADT,SDP
	dependent antenna weights.	
	SKA1_Mid shall be able to store the	
	time-dependent antenna weights	
	used for each tied-array beam su	
SYS_REQ-2848	SKA1_Mid VLBI timestamp	CSP, SADT
	accuracy. SKA1_Mid shall be able	
	to generate data from the VLBI	
	beams with samples traceable to a	
	timestamp with an accuracy of 1	
	nsec or better	
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 213 of 275

SYS_REQ-2849 SYS_REQ-2850	SKA1_Mid VLBI beams sampling rate. SKA1_Mid shall be able to output VLBI beams with a sampling rate selectable between Nyquist and oversampled rates for the selected bandwidth SKA1_Mid VLBI beamforming. SKA1_Mid shall be able to allocate antennas to be included in, or excluded from, individual tied-array	CSP, TM, SADT CSP, TM, SADT
	beams	
SYS_REQ-2851	SKA1_Mid VLBI relative sensitivity and coherence losses. The SKA1_Mid beamformer shall be able to weight the antenna inputs into the tied-array sums based on relative sensitivity and coherence losses	CSP, SDP, TM, SADT
SYS_REQ-2852	SKA1_Mid VLBI configurability. SKA1_Mid shall be able to change the pointing, centre frequency, and bandwidth of the individual tiedarray beams within a single observing schedule	CSP, TM, SADT
SYS_REQ-2853	SKA1_Mid VLBI configurability. SKA1_Mid shall be capable of selecting, through configuration, 1, 2, 3, or 4 separate VLBI specific beams, each with independently selectable centre frequency, bandwidth, frequency resolution and pointing	CSP, TM, SADT
SYS_REQ-2854	SKA1_Mid VLBI configurability. SKA1_Mid shall be capable of reconfiguring the centre frequency, frequency band, and bandwidth for each tied-array beam, in less than 30 seconds	CSP, TM, SADT
SYS_REQ-2855	SKA1_Mid VLBI spectral resolution. SKA1_Mid shall be able to generate VLBI beams with a spectral resolutions different from the spectral resolution used for imaging within the same VLBI subarra	CSP, TM, SDP
SYS_REQ-2856	SKA1_Mid VLBI channel width. SKA1_Mid shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz, 16MHz, 4MHz or 1MHz	CSP, TM
SYS_REQ-2857	SKA1_Mid VLBI imaging and beamforming SKA1_Mid shall be able to simultaneously generate	CSP, TM, SADT, SDP

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 214 of 275

	imaging data using all antennas in a	
	VLBI sub-array, as well as	
	generating the VLBI beams	
SYS_REQ-2859	SKA1_Mid VLBI spectral line and	CSP, TM, SDP
2.02	time domain observation	,,
	SKA1_Mid shall be able to generate	
	VLBI beams optimised for either	
	spectral line observations (to	
	mitigate spectral leakage) or time	
	domain observations (to mitigate	
	time smearing	
SYS_REQ-2860	SKA1_Mid VLBI beams and sub-	CSP, TM
_	arrays. SKA1_Mid shall be able to	
	allocate individual VLBI beams to	
	different sub-arrays	
SYS_REQ-2861	SKA1_Mid VLBI array diameter.	CSP, TM
	SKA1_Mid shall be able to generate	
	VLBI beams from sub-arrays with	
	receptors separated by up to 20km	
SYS_REQ-2765	Pulsar search sub-array support.	CSP
	The SKA1_Mid Pulsar search shall	
	be able to independently process a	
	total of up to 1111 beams from one	
	to sixteen sub-arrays independently	
0.40 5-5 5-5-	and concurrently.	
SYS_REQ-2767	Pulsar search processing	CSP
	bandwidth . The Pulsar search	
	processing shall have a contiguous	
	processing bandwidth up to 300 MHz for each search sub array.	
SYS_REQ-2212	Dispersion Measure. SKA1_Mid	CSP
313_NEQ-2212	for pulsar search shall provide, for	Cor
	each sub array, trial dispersion	
	corrections across the observation	
	frequency range for dispersion	
	measures from 0 up to 3000 pc cm ⁻³ .	
SYS_REQ-2216	Time resolution. The time	CSP
	resolution of the SKA1_Mid pulsar	
	search processing for each sub-array	
	shall be equivalent to the temporal	
	smearing due to dispersion at the	
	observation frequency and	
	bandwidth of the observation with a	
	quantisation of value in powers of 2	
	from 50 µs to 800 us	
SYS_REQ-2218	Pulsar search observation time.	CSP, TM
	For each Pulsar search sub-array, the	
	processing shall provide	
	independently configurable	
	observation times up to 1800	
	seconds duration.	
SYS_REQ-2219	Single pulse searches. For each	CSP
	search sub-array within SKA1_Mid	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 215 of 275

	Pulsar search, the processing shall be	
	capable of searching for single	
	dispersed pulses over dispersion	
	measure range up to 3000 pc cm ⁻³	
	commensally with searches for	
	periodic pulses with a S/N	
	performance better than 7	
SYS_REQ-2220	Binary search. For each Pulsar	CSP, SDP
	search sub-array within SKA1_Mid	
	the processing shall be capable of	
	searching for binary systems with	
	accelerations due to their orbital	
	motion of up to 350 ms ⁻² .	
SYS_REQ-2763	Pulsar timing sub-array support.	CSP
	The SKA1_Mid Pulsar timing	
	processing shall be able to	
	independently process a total of up to	
	16 beams from one to sixteen sub-	
	arrays independently and	
	concurrently.	
SYS_REQ-2768	Pulsar timing processing	CSP
	bandwidth. The Pulsar timing	
	engine shall have a contiguous	
	processing bandwidth up to the full	
	bandwidth of the selected band up to	
	a bandwidth of 2.5 GHz for each	
1	THIRD SUD-AFTAV	İ
SYS REQ-2224	timing sub-array Frequency agility. The SKA1 Mid	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing sub-	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency	CSP, SDP, TM, DSH
SYS_REQ-2224	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30	CSP, SDP, TM, DSH
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds.	
SYS_REQ-2224 SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time.	CSP, SDP, TM, DSH
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each	
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing sub-	
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently	
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and	
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes.	CSP
	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual	
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a	CSP
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be	CSP
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived	CSP
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a	CSP
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a	CSP
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of	CSP
SYS_REQ-2766 SYS_REQ-2764	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of the SKA1_Mid array.	CSP CSP, SADT, Dish, LFAA
SYS_REQ-2766	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of the SKA1_Mid array. Multiple timings. The SKA Phase 1	CSP
SYS_REQ-2766 SYS_REQ-2764	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of the SKA1_Mid array. Multiple timings. The SKA Phase 1 shall be capable of timing up to 16	CSP CSP, SADT, Dish, LFAA
SYS_REQ-2766 SYS_REQ-2764	Frequency agility. The SKA1_Mid system shall, for each timing subarray, be able to change from observing in any frequency band, to observing in any other frequency band in less than or equal to 30 seconds. Pulsar timing observation time. The observation period for each observation for each timing subarray shall be independently configurable between 3 minutes and 300 minutes. Time stamping. For each individual Pulsar timing observation within a sub-array, each data sample shall be traceable to a time stamp derived from a clock accurate to 10ns on a time scale of 10 years referenced to a common delay centre at the centre of the SKA1_Mid array. Multiple timings. The SKA Phase 1	CSP CSP, SADT, Dish, LFAA

Revision: 6

SYS_REQ-2231	Pulsar timing Dispersion Measure.	CSP
	The SKA1_Mid shall be capable of	
	timing pulsars with dispersion	
	measures between 0 to 3000 pc cm ⁻³	
	such that residual dispersive	
	smearing is less than 500 ns.	
SYS_REQ-2128	Continuum and spectral line	CSP, SDP, TM
	imaging mode. Both SKA1	
	telescopes shall be capable of	
	operating in a Continuum and	
	Spectral-line imaging mode	
	concurrently.	
SYS_REQ-2129	Pulsar Search Mode. The	CSP, SDP, TM
	SKA1_mid telescope shall be	
	capable of operating in a Pulsar	
	search mode, concurrently with	
	Continuum imaging mode.	
SYS_REQ-2130	Pulsar Timing Mode. The	CSP, SDP, TM
	SKA1_mid telescope shall be	
	capable of operating in a Pulsar	
	timing mode, concurrently with	
	continuum imaging mode.	
SYS_REQ-2126	Simultaneous operation of	SADT, CSP, SDP, TM, INFRA
	telescopes. Both SKA1 telescopes	
	shall be capable of operating	
	concurrently and independently.	
SYS_REQ-2133	Mode transition. The switching	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	time between telescope operating	
	modes shall take less than 30	
	modes shall take less than 30 seconds (not including antenna	
CVC PEO 2001	modes shall take less than 30 seconds (not including antenna slewing time)	The
SYS_REQ-2681	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The	TM
SYS_REQ-2681	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability	TM
SYS_REQ-2681	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a	TM
SYS_REQ-2681	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent	ТМ
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena.	
SYS_REQ-2681 SYS_REQ-2682	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes.	TM
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for	
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the	
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation	
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena	
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific	
SYS_REQ-2682	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest.	SPO
_	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The	
SYS_REQ-2682	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate	SPO
SYS_REQ-2682	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override	SPO
SYS_REQ-2682 SYS_REQ-2683	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects.	SPO
SYS_REQ-2682	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects. Commensal Observing Data access	SPO
SYS_REQ-2682 SYS_REQ-2683	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects. Commensal Observing Data access rights. There shall be a documented	SPO
SYS_REQ-2682 SYS_REQ-2683	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects. Commensal Observing Data access rights. There shall be a documented data access rights policy for	SPO
SYS_REQ-2682 SYS_REQ-2683	modes shall take less than 30 seconds (not including antenna slewing time) Specific epoch observations. The observatory shall have the capability of scheduling observations at a specific epoch for time dependent phenomena. Overriding normal processes. There shall be a mechanism for requesting observing time outside the normal observing time allocation process for unpredicted phenomena or in cases of high current scientific interest. Overriding allocated time. The Director-General or his/her delegate shall have the power to override allocation of time to other projects. Commensal Observing Data access rights. There shall be a documented	SPO

Revision: 6

Date: 2015-04-23

SYS_REQ-2127 Sub-Arraying. Both of the SKA1 telescopes shall be capable of
a managhing in damaged the to 1
operating independently with one to
sixteen sub-arrays (i.e. collecting
area is split and allocated to separate,
concurrently observing
programmes).
SYS_REQ-2736 Authentication and Authorisation. TM
All SKA users shall require to be
registered and authenticated for the
purposes of proposal and project
submission.
SYS_REQ-2278 Scheduled maintenance logs. A TM, INFRA, AIV
maintenance database shall be
established that logs all the
scheduled maintenance and
unexpected repairs.
SYS_REQ-2279 System error logs. A failure TM, INFRA
database shall be established, which logs the errors of the system and its
subsystems, including the corrective
actions taken.
SYS_REQ-2280 System status. The system shall LFAA, SADT, CSP, SDP, TM, INFRA, DSH
extract information about the current
condition of the system from the
science and calibration data streams,
and log this information along with
other relevant system and
environmental status information.
Based on this information, it shall be
possible to monitor, save, and
analyse the technical performance of
the system.
SYS_REQ-2282 Central location for data bases. TM
External sources of information used
by the Elements shall be cached by
Telescope Manager. No sources
other than those cached by TM shall
be used.
SYS_REQ-2283 Target of opportunity. TOO TM
observing shall be via Scheduling
Blocks.
SYS_REQ-2285 Latency of TOO scheduling block TM SDP CSP DSH LFAA
initiation . Scheduling intervention
on TOO triggers shall be initiated
within 1s of receiving the trigger.
SYS_REQ-2286 Discard previous scheduling block. TM SDP CSP
At the launching of a TOO
Scheduling Block, the results from
any active Scheduling Blocks shall
be discarded.
SYS_REQ-2289 Proposal submission. Program SPO TM
submission, assessment, and time

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 218 of 275

	allocation shall governed by	
	allocation shall governed by an	
0/0 5== 5===	official policy document	
SYS_REQ-2723	Proposal submission tool. There	TM
	shall be a tool to facilitate the	
	assessment, review and ranking of	
	proposals, guided by official SKA	
	Policies.	
SYS_REQ-2647	Tool for proposal submission.	TM
	There shall be a tool, either web or	
	client, for the construction and	
	submission of proposals, as	
	necessary facilitating access to	
	relevant sources of information such	
	as Telescope characteristics,	
	previous observations, SIMBAD,	
	templates.	
SYS_REQ-2290	Pre and post conditions.	ТМ
	Scheduling Blocks shall have	
	computable pre- and post-conditions.	
SYS_REQ-2291	Semester queue. A Semester Queue	TM
	(SQ) shall be constructed by	
	Operations following acceptance of	
	proposals.	
SYS_REQ-2292	Operations: Operations shall be	SPO, TM
	responsible for constructing an	
	executable schedule and Scheduling	
	Blocks and submitting for execution.	
SYS_REQ-2293	Short term schedule construction	SPO, TM
	tool. There shall be an interactive	
	tool to aid the proposer in	
	constructing Scheduling Blocks and	
	an executable schedule.	
SYS_REQ-2646	API for construction of schedule.	SPO, TM
_	There shall be a API or APIs for the	
	construction of scheduling blocks	
	from Python and Java.	
SYS_REQ-2294	Simulated execution of scheduling	SPO, TM
	blocks. The scheduling tool shall	
	offer the option to simulate	
	execution of Scheduling Blocks in	
	order to verify correctness and	
	scientific performance at some	
	limited level of accuracy.	
SYS_REQ-2735	Operator control. It shall be	TM
	possible for the operator to take	
	manual control of the telescope.	
SYS_REQ-2295	Response policy. The nature of the	TM
	response to a transient event shall be	
	controlled by policy administered by	
	Telescope Manager.	
SYS_REQ-2296	Responses to transients Responses	тм
_ ,	shall be one of the following (a)	
	invoking a special mode on the	
	a special mode on the	

Revision: 6

Date: 2015-04-23

	talanana of avigin (b) inquing an	
	telescope of origin, (b) issuing an	
	VOEvent, (c) issuing a TOO	
	announcement to SKA Telescopes, (d) no action.	
SYS_REQ-2297	Observing mode latency The	TM
313_KLQ-2237	maximum allowed latency between	1101
	event and detection shall be allowed	
	to be Observing Mode dependent.	
SYS_REQ-2298	Rules for issuing VOEvents	TM
313_MEQ 2230	Proposals to search for transients	
	shall include rules for issuing	
	VOEvents.	
SYS_REQ-2299	Latency of initiating a response.	TM
	Response to an event shall be	
	initiated within 1 second of	
	notification.	
SYS_REQ-2300	TOO VOStreams. TOO proposals	TM
	shall include specified VOEvent	
	streams to be monitored.	
SYS_REQ-2301	VOEvent issue latency. A	TM
	qualifying VOEvent shall lead to	
	initiation of a response by the	
	Telescope Manager within 1 second.	
SYS_REQ-2645	Telescope model. A dynamic	TM, SDP
	computational model of the	
	Telescope shall be used to answer all	
	queries about the state of the	
	Telescope. The telescope model shall	
	consist of configuration information,	
	numerical models, empirical	
SYS_REQ-2302	parameters, and conventions.	TM
313_REQ-2302	Single geodetic model (Telescopes). There shall be a single geodetic	1141
	model for all telescopes, published as	
	part of the Telescope Model.	
SYS_REQ-2303	Single geometric model. There shall	SPO, TM
0.02	be a single geometric model for all	o. 5,
	receptor types, published by TM.	
SYS_REQ-2304	Dish pointing model. The dish	SPO, TM, DSH
	receptor system shall include a	
	model for pointing including	
	structural model, thermal model,	
	reference pointing model, and	
	refraction model, published by TM.	
SYS_REQ-2305	AA element and station beam	SPO, LFAA, TM
	model. The AA receptor system	
	shall include a model for element	
	and station beams as a function of	
	azimuth and zenith angle, frequency,	
CVC DEO 222C	and polarisation, published by TM.	The
SYS_REQ-2306	Forensic tool for telescope behaviour There shall be an	тм
	interactive forensic tool for	
	interactive forelistic (001 101	

Revision: 6

Date: 2015-04-23

	evaluating and understanding the	
	state and behaviour of the system at	
	any one time.	
SYS_REQ-2307	Interfaces. The interactive forensic	TM
313_KEQ-2307	tool shall have an Internet interface	1101
	with availability on a range of	
	platforms including desktop and	
	mobile devices.	
SYS_REQ-2308	Replay of sequences. The	TM
	interactive forensic tool shall allow	
	replay of selected sequences.	
SYS_REQ-2309	Active alarms. Alarm notification	TM
	shall be active (via SMS, email, etc.)	
	rather than passive (requiring an	
	Operator query)	
SYS_REQ-2310	Alarm filtering . It shall be possible	TM
	to filter alarms individually or by	
	group.	
SYS_REQ-2312	Alarm latency. Latency from event	LFAA, SADT, CSP, SDP, TM, DSH
	to alarm shall be no more than 5	
	seconds.	
SYS_REQ-2313	Access to historical data. All	TM
	current and historic Site monitor data	
	shall be as examinable as that from	
	any telescope component.	
SYS_REQ-2314	Total electron content. The SKA	TM
	Phase 1 TM shall retrieve, persist	
	and publish data on Total Electron	
	Content (TEC) from dual frequency	
646 050 0045	GPS as part of the Telescope Model.	
SYS_REQ-2315	Ionospheric activity. There shall be	TM
	timely access to information from	
	other relevant sources e.g. IPS	
	concerning unusual ionospheric activity or alerts.	
SYS_REQ-2316	Weather station . There shall be a	TM
313_KLQ-2310	data base for site weather station	1101
	data.	
SYS_REQ-2317	Satellites. There shall be a database	TM
0.02 2027	of relevant satellite trajectories,	
	including orbit information, emission	
	characteristics and owner.	
SYS_REQ-2318	Commercial flights. There shall be	тм
_ ,	a data base of commercial flights in	
	the neighbourhood of the site.	
SYS_REQ-2734	RFI database. There shall be a	TM
	database holding information about	
	RFI.	
SYS_REQ-2729	Calibration and imaging	SDP
	formalism. The Calibration and	
	Imaging formalism shall be based	
	upon the Rau framework [14].	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 221 of 275

SYS_REQ-2319	Closed loop calibration. The	SDP, TM
515_NEQ 2515	telescope calibration shall be solved	351, 1111
	by comparison of observed with	
	GSM predictions with a time scale	
	appropriate to the component and	
	physical effect being calibrated and	
	fed back to the telescope.	
SYS_REQ-2322	Global sky model. Calibration and	SDP
	continuum subtraction shall use a	
	Local Sky Model, derived from a	
	Global Sky Model or previous Local	
	Sky Model.	
SYS_REQ-2324	Multi-frequency synthesis	SDP
	imaging. All imaging shall construct	
	and make use of frequency	
	dependent image models over the	
	entire observed bandwidth.	
SYS_REQ-2325	Deconvolution of single channels	SDP
	Scale sensitive two-dimensional (i.e.	
	on the tangent plane) deconvolution	
	shall be available.	
SYS_REQ-2328	Solution for pointing errors. It	SDP, DSH, LFAA, TM
	shall be possible to solve for and	
	correct time- and station-dependent	
	pointing errors with accuracy and	
	timescale limited by signal to noise	
0/2 555 555	ratio.	
SYS_REQ-2330	Peeling. Peeling of bright sources	SDP
	(strength limited by signal to noise	
	ratio) from the visibility data shall be possible.	
SYS_REQ-2321	Direction dependent effects. Self-	SDP
313_REQ-2321	calibration and image reconstruction	3DF
	algorithms shall be capable of	
	dealing with direction dependent	
	effects	
SYS_REQ-2724	Aperture Array DDE. There shall	SDP, LFAA, TM
313_KEQ-2724	be a direction dependent model for	JULY LIAA, TWI
	the aperture array primary beam to	
	be used in calibration and imaging.	
SYS_REQ-2727	Dish DDE. There shall be a direction	TM
0.0 2.2.	dependent model for the dish	
	primary beam to be used in	
	calibration and imaging.	
SYS_REQ-2726	Delete	TM
SYS_REQ-2725	Faraday rotation DDE. There shall	TM
313_NLQ-2/23	be a direction dependent Faraday	1101
	Rotation model for use in calibration	
	and imaging.	
SYS_REQ-2333	Continuum source finding. Where	SDP
3.52 2555	appropriate, continuum source	
	finding shall be conducted on images	
	generated by the Continuum Imaging	
<u> </u>	KA-TEL-SKO-0000008	FOR DROJECT LISE OF

Revision: 6 Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 222 of 275

	pipeline. Polarization shall be fitted	
	if available.	
SYS_REQ-2334	Spectral line source finding. Where	SDP
	appropriate, spectral line source	
	finding shall be conducted on image	
	cube generated by the Spectral Line	
0.40 0.00	pipeline.	
SYS_REQ-2335	Stacking. Where appropriate,	SDP
	spectral line stacking shall be	
	conducted on image cubes generated by the pipelines using <i>a priori</i>	
	known source lists.	
SYS_REQ-2336	Standard pipeline products. All	SDP
315_MEQ 2550	pipelines shall include as data	
	products the pipeline processing log,	
	and Quality Assessment log.	
SYS_REQ-2338	Calibration pipeline. There shall be	SDP
_ ,	a Calibration pipeline that derives	
	current telescope parameters using a	
	recent observation and a Global Sky	
	Model, either a known GSM or the	
	most recent GSM.	
SYS_REQ-2339	Continuum imaging pipeline.	SDP
	There shall be a Continuum Imaging	
	pipeline that shall have the goal of	
	constructing noise-limited wide-band	
	images for observations up to 1000h	
	integration time. Polarisation shall be available if requested or necessary	
	for calibration or quality assurance.	
SYS_REQ-2340	Continuum imaging data products.	SDP
313_MEQ 2340	The Data Products shall include the	
	first n moment images for multi-	
	frequency synthesis, corresponding	
	residual images (if deconvolved),	
	sensitivity image and representative	
	PSF image, where n is set by signal	
	to noise ratio.	
SYS_REQ-2341	Spectral line emission pipeline.	SDP
	There shall be a Spectral Line	
	Emission pipeline that is optimised	
	for constructing noise-limited (up to	
	1000h integration) channel cubes of	
	spectral line emission either with	
	continuum emission remaining or with continuum emission removed.	
SYS_REQ-2342	Spectral line emission data	SDP
313_NEQ-2342	products. The data products shall	
	include spectral line cube image,	
	continuum model images, sensitivity	
	image, and representative point	
	spread function.	
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 223 of 275

CVC DEC 2242	Constral line above the selection	CDD
SYS_REQ-2343	Spectral line absorption pipeline.	SDP
	There shall be a Spectral Line	
	Absorption pipeline that is optimised	
	for constructing noise-limited	
	channel cubes of spectral line	
	absorption with continuum sources	
CVC PEC 2244	removed.	CDD
SYS_REQ-2344	Spectral line absorption data	SDP
	products. The data products shall	
	include spectral line cube image,	
	continuum model images, sensitivity	
	image, and representative point	
CVC DEO 224E	spread function.	CDD
SYS_REQ-2345	Slow transient pipeline. There shall	SDP
	be a Slow Transient imaging pipeline	
	that shall be capable of constructing	
	a continuum image after a GSM has	
	been subtracted for every correlator	
	integration time or slower, searching	
	for transient sources, and producing	
SYS_REQ-2346	a time-ordered catalogue.	SDP
313_KEQ-2346	Slow transient data products. The	3Ur
	data products shall include a catalogue of found sources, a	
	sensitivity image, and representative	
	PSF image.	
SYS_REQ-2347	Automated Quality Assessment.	SDP, TM
313_NEQ-2347	All pipelines shall perform	351, 1101
	standardised, automated Quality	
	Assessment of Images along the axes	
	of astrometry, photometry,	
	radiometry, polarimetry, and	
	spectrometry.	
SYS_REQ-2742	Performance assessment:	SDP, TM
	Performance assessment shall be	,
	based on multi-valued functions of	
	an observed Image and optionally a	
	template Image	
SYS_REQ-2743	Performance Goals: Performance	SDP, TM
	goals shall be based on multi-valued	
	functions of an observed Image and	
	optionally a template Image	
SYS_REQ-2744	Quality assessment: Quality	SDP, TM
	assessment shall be based on the	
	comparison of a Performance	
	Assessment and a Performance Goal	
SYS_REQ-2745	Astrometric performance metric:	SDP, TM
	The Astrometric performance metric	
	(APM) shall measure deviation (rms,	
	average offset, and med) of source	
	positions from known standards	
SYS_REQ-2746	Photometric performance metric:	SDP, TM
	The Photometric performance metric	
		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 224 of 275

	(DDM) shall measure deviation (
	(PPM) shall measure deviation (rms,	
	average offset, and med) of source	
CVC DEO 2747	fluxes from known standards	CDD TAA
SYS_REQ-2747	Radiometric performance metric:	SDP, TM
	The Radiometric performance metric	
	(RPM) shall measure noise	
	fluctuations (rms, average offset, and	
SYS_REQ-2748	med) in an Image	SDP, TM
313_REQ-2/46	Polarimetric performance metric: The Polarimetric performance metric	SDP, TIVI
	(OPM) shall measure deviation (rms,	
	average offset, and med) of source	
	polarisations (polarisation degree	
	and angle) from known standards	
SYS_REQ-2749	Spectrometric performance	SDP, TM
313_REQ-2749	metric: The Spectrometric	SDF, IIVI
	performance metric (SPM) shall	
	measure deviation (rms, average	
	offset, and med) of source spectral	
	lines from known standards	
SYS_REQ-2821	Archive. There shall be an archive	SDP
313_KEQ 2021	for each telescope, located in the	
	Science Processing Centre, for	
	storing selected science data	
	products for subsequent access by	
	users according to science data	
	access policy.	
SYS_REQ-2348	Role of science processing centres.	SDP CSP
	The science-processing centre will	
	convert the output data from the CSP	
	into science data products to be	
	stored in the science data archive.	
SYS_REQ-2350	Mirror sites. All data within Science	SADT, SDP, INFRA
	Archives shall have a secondary	
	copy located offsite in a secure	
	location.	
SYS_REQ-2352	Web interface. The science data	SADT, SDP
	archives shall be accessible from the	
	internet via a standardised web	
	interface.	
SYS_REQ-2353	Virtual Observatory interface. The	SDP
	science data archives shall be	
	accessible via a set of recommended	
	IVOA services chosen to allow	
010 5-5 5	access to all approved data products.	
SYS_REQ-2354	Archive API. The science data	SDP
	archives shall publish a user	
	accessible, open API in a small	
	number of complementary languages	
000 522 5522	such as Python, C++, and Java.	l con
SYS_REQ-2355	Data product provenance. An	SDP
	official data product shall have known, documented provenance, and	
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 225 of 275

	shall have been produced via SKA	
	observations and processing.	
SYS_REQ-2357	QA annotation. The telescope shall	SDP
	facilitate the addition of QA	
	annotations by Users.	
SYS_REQ-2358	Third party data products. Third	SDP
	party data products shall not be	
	admitted to the archive.	
SYS_REQ-2360	Science data product archive	SDP
	policy. There shall be a policy,	
	developed and administered by	
	Operations, governing which types	
	and sizes of data products will be	
	retained in the archive and for how	
	long.	
SYS_REQ-2361	Archive access. A telescope archive	SDP
	will be nominally open for access	
	24/7/365, with no more than 24 hrs	
	planned downtime per year.	
	Unplanned downtime shall be	
	consistent with availability budget.	
SYS_REQ-2363	Archive lifetime. The science data	SDP
	archives shall be designed to provide	
	an archived data lifetime of not less	
	than 50 years from the start of	
CVC PEO 2720	archived observations.	SDP
SYS_REQ-2728	Data migration design. The archive design shall support and facilitate	JUF
	migration from one medium to	
	another.	
SYS_REQ-2364	Data migration plan. Operations	SDP
3.01.2 2507	shall maintain at all times and update	
	yearly a current data migration plan	
	covering the contingency of moving	
	from one archive platform to	
	another.	
SYS_REQ-2366	Distribution of data products. As	SDP
	limited by resource constraints, it	
	will be possible to deliver science	
	data products to approved off-site	
	facilities, which may be globally	
	distributed	
SYS_REQ-2660	Backup archive retrieval. Backup	SDP
	archive items shall be retrievable to	
	the full archive from an alternate	
	source within 24 hours	
SYS_REQ-2661	Backup archive user access	SDP
	conversion. Users shall have access	
	to the data of the entire archive	
	within one week following an	
CVC DEC 3730	incident.	CDD
SYS_REQ-2739	Levels of access . Access to the	SDP
	archive shall be either anonymous	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 226 of 275

	with correspondingly limited	
	capabilities or via SKA	
	authentication and authorisation.	
SYS_REQ-2657	Processing capability. SDP	SADT, CSP, SDP
	processing per telescope at Early	
	Science shall support processing	
	rates 10% of that required for Full	
	Observing (decimation being in any	
	or all of time, frequency, field of	
	view)	
SYS_REQ-2268	Coherence losses 1s. The SKA	SADT
	frequency reference system shall	
	provide a 2% maximum coherence	
	loss, equivalent to 0.2 radians,	
	within a maximum integration period of 1s.	
SYS_REQ-2692	Coherence loss 1min. The SKA	SADT
	frequency reference system shall	
	provide a 2% maximum coherence	
	loss, equivalent to 0.2 radians,	
	within a maximum solution interval	
	for in-beam calibration of 1 minute.	
SYS_REQ-2693	Frequency reference phase drift.	SADT
	The SKA Frequency Reference	
	System shall have a phase drift of	
	less than 1 radian, over calibration	
	intervals of up to 10 minutes, when	
	using out of beam calibration	
CVC DEO 2360	Sources. Pulse per Second precision. The	SADT
SYS_REQ-2269	Pulse per Second precision. The SKA synchronisation and timing	SADI
	system shall provide a 1 pps	
	heartbeat signal, precise to the	
	sampling clock (the pulse-to-pulse	
	scatter is less than one sampling	
	time), derived from the distributed	
	frequency reference	
SYS_REQ-2695	Pulse per second phase relative to	SADT
	UTC. The SKA synchronisation and	
	timing system shall provide a 1PPS	
	heartbeat signal with phase relative	
	to UTC that over a 10 minute	
	calibration interval shall survive	
CVC DEC 2274	synchronisation loss	CART
SYS_REQ-2274	UTC accuracy. The SKA1	SADT
	timescale shall be connected to UTC	
	with an accuracy of 10 ns, on a timescale of 10 years	
SYS_REQ-2275	Central frequency reference. In	SADT
3.5_NEQ 22/3	order to avoid large offsets, the	
	central frequency reference shall be	
	steered to UTC to within at least 1	
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 227 of 275

	migrosogond with a fraguency duift	
	microsecond, with a frequency drift	
CVC DEC 2276	of less than 10 ns/day. SKA1 UTC offsets. The solution	SADT
SYS_REQ-2276	period for the calculation of offsets	SADI
	between SKA1 timescale and UTC	
	shall be less than 1 day	
SYS_REQ-2370	Weather Monitoring. Weather	INFRA, SADT, AIV, TM
313_KEQ 2370	monitoring stations (2 No at each	INTRA, SADI, AIV, IIVI
	core and 2 No within each spiral	
	arm) shall be provided as part of the	
	infrastructure - wind, temperature	
	and humidity.	
SYS_REQ-2371	Visual monitoring. The	INFRA, DSH, TM, SADT, AIV, LFAA
	infrastructure shall provide day and	,,,,
	night time capability for the	
	operator(s) to visually monitor all	
	antennas: for Dish antennas this shall	
	be at every dish, for LFAA this shall	
	be located at each station and also	
	around the perimeter of the core area.	
	Monitoring to deliver images at least	
	one per minute for purposes of	
	security and general telescope visual	
	monitoring and shall be able to	
	detect personnel at each dish and	
	within each LFAA station.	
SYS_REQ-2730	RFI Monitoring. Permanent stations	INFRA, AIV, TM, SADT
	and mobile RFI monitoring units	
	shall be provided as part of	
	infrastructure	
SYS_REQ-2372	Tropospheric Monitoring . Existing	INFRA, SADT, AIV, TM
	Tropospheric monitoring stations	
	shall be expanded as part of the	
	SKA1 infrastructure to provide at	
	least 3 No sensor units in each of the Australia and South Africa locations.	
CVC DEO 2272		INITOA
SYS_REQ-2373	Low RFI power delivery. The	INFRA
	power delivery infrastructure shall comply with the SKA1 RFI levels	
	documentation.	
SYS_REQ-2374	Site Access. Roads and track-ways	INFRA
	(including drainage) for the safe,	
	secure and economic construction	
	and operation of the SKA1 shall be	
	provided	
SYS_REQ-2375	Air-strip . There shall be access to an	INFRA
	air strip on site.	
SYS_REQ-2376	Construction. Potable and non-	INFRA
	potable water shall be available at	
	SKA1 construction camps including	
	foundation concrete plants.	
SYS_REQ-2377	Steady state. Sufficient water shall	INFRA
	be continually available at SKA1	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 228 of 275

	facilities in support of equipment	
	cooling for each telescope.	
SYS_REQ-2378	Standards and Regulations. The	INFRA
0.02 _0.70	delivery and disposal of water and all	
	construction activity shall be	
	compliant with local and national	
	standards and regulations.	
SYS_REQ-2382	Central Processing Facility RFI	INFRA
0.00	shielding. Each Central Processing	
	Facility shall provide RFI shielding	
	greater than that derived from zoning	
	specifications given in the SKA RFI	
	levels documentation (to be	
	published by T0 + 12w).	
SYS_REQ-2383	Central Processing Facility RFI	INFRA
	penetrations . The Central	
	Processing Facility shall provide RFI	
	compliant penetrations for signal and	
	power cables entering the facility and	
	also for all other penetrations.	
SYS_REQ-2397	Dish Antenna earthing . For	INFRA, DSH
	lightning protection of each dish	
	antenna the earthing system shall	
	conform to the requirements of IEC	
	62305 and also to national standards	
	SANS 10142 and 10313. National	
	standards shall take precedence.	
SYS_REQ-2398	Telephone Network . All populated	INFRA, AIV
	facilities shall provide connectivity	
CVC PEO 2400	to the public telephone network.	INFOA ANY DOLL LEAA CADT CCD
SYS_REQ-2400	Communication. All vehicles used	INFRA, AIV, DSH, LFAA, SADT, CSP
	on site shall be equipped with long	
SYS_REQ-2401	range communication devices. Training. All drivers on or to the	INFRA
313_REQ-2401	sites shall have appropriate	INFRA
	awareness training.	
SYS_REQ-2402	Site steady state power budget	INFRA
313_KLQ-2402	Africa. The total steady state power	INFINA
	budget for the African site shall be	
	within the limits specified in SKA	
	Power Budget SKA-SE-POW-TN-	
	001 [21]	
SYS_REQ-2404	Site steady state power budget	INFRA
	Australia. The total steady state	
	power budget for the Australian site	
	shall be within the limits specified in	
	SKA Power Budget SKA-SE-POW-	
	TN-001 Revision 1 [21].	
SYS_REQ-2769	Time Reference: SKA1 shall use a	SADT
	time reference derived from Global	
	Positioning System (GPS).	
SYS_REQ-2838	VLBI data sources. The SKA1_Mid	INFRA,CSP,TM, SADT, SDP
	telescope shall be a data source for	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 229 of 275

interface between the SAK1_Mid telescope and the external VLBI data acquisition system shall be compliant with the ICD SKA-TEL-SKO- 0000116 SYS_REQ-2839 Provision of equipment for recording. Provision of equipment for recording or capturing VLBI data is outside the scope of SKA SYS_REQ-2840 VLBI equipment and eVLBI connectivity. VLBI equipment and eVLBI connectivity beyond the interface boundary described in the ICD SKA-TEL-SKO-0000116 is outside the scope of supply of the SKA1 project SYS_REQ-2841 Infrastructure for VLBI equipment:. The following infrastructure shall be provided to allow eventual outfitting of SKA1_Mid with VLBI equipment: 6. Adequate access for the potential fitment of VLBI equipment 7. Equipment space 8. Power
acquisition system shall be compliant with the ICD SKA-TEL-SKO-0000116 SYS_REQ-2839 Provision of equipment for recording. Provision of equipment for recording or capturing VLBI data is outside the scope of SKA SYS_REQ-2840 VLBI equipment and eVLBI connectivity. VLBI equipment and eVLBI connectivity beyond the interface boundary described in the ICD SKA-TEL-SKO-0000116 is outside the scope of supply of the SKA1 project SYS_REQ-2841 Infrastructure for VLBI equipment:. The following infrastructure shall be provided to allow eventual outfitting of SKA1_Mid with VLBI equipment: 6. Adequate access for the potential fitment of VLBI equipment 7. Equipment space
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SYS_REQ-2840 VLBI equipment and eVLBI connectivity. VLBI equipment and eVLBI connectivity beyond the interface boundary described in the ICD SKA-TEL-SKO-0000116 is outside the scope of supply of the SKA1 project SYS_REQ-2841 Infrastructure for VLBI equipment:. The following infrastructure shall be provided to allow eventual outfitting of SKA1_Mid with VLBI equipment: 6. Adequate access for the potential fitment of VLBI equipment 7. Equipment space
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SYS_REQ-2841 Infrastructure for VLBI equipment:. The following infrastructure shall be provided to allow eventual outfitting of SKA1_Mid with VLBI equipment: 6. Adequate access for the potential fitment of VLBI equipment 7. Equipment space
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SKA1_Mid with VLBI equipment: 6. Adequate access for the potential fitment of VLBI equipment 7. Equipment space
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equipment 7. Equipment space
O. FUWEI
9. Cooling
10. Cable trays
SYS_REQ-2842 Provision for VLBI terminal. INFRA
Provision for VLBI terminals or
equivalent equipment shall be made
in the Science Processing Centres for
the associated telescopes
SYS_REQ-2843 Compatibility with existing VLBI CSP,SADT
terminal. SKA1 shall be able to
output VLBI beam data with each individual stream limited to 512
MHz of signal bandwidth to ensure
compatibility with existing VLBI
terminal capabilit
SYS_REQ-2844 VLBI Processing, VLBI processing, CSP,TM, SADT, SDP
with the exception of beam-forming
and SKA1 imaging in support of
VLBI. is outside the scope of the
SKA
SYS_REQ-2845 VLBI beam output data. SKA1 CSP, TM, SADT
shall be able to produce VLBI beam
output data with either dual or single
polarizatio

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 230 of 275

SYS REQ-2846	Word length of VLBI beam output	CSP, TM, SADT
313_NEQ 2546	data . SKA1 shall be able to output	C31 , 1111, 3A31
	VLBI beam data with configurable	
	word formats, the allowed values	
	being 2, 4, 8, and 16-bit integer	
CVC DEO 2440		CCD DCII
SYS_REQ-2410	MeerKAT to SKA1_mid CSP	CSP, DSH
	interface. The interface between	
	MeerKAT and SKA1_mid CSP shall	
	be compliant with SKA-	
	TEL.AIV.SE-TEL.CSP.SE-ICD-001	
	Interface Control Document	
SYS_REQ-2412	MeerKAT to SKA1_mid SADT	SADT, DSH, AIV
	interface . The interface between	
	MeerKAT and SKA1_mid SADT	
	shall be compliant with SKA-	
	TEL.AIV.SE-TEL.SADT.SE-ICD-	
	001 Interface Control Documen	
SYS_REQ-2414	MeerKAT to SKA1_mid SADT	SADT, DSH
	interface . The interface between	
	MeerKAT and SKA1_mid SADT	
	shall be compliant with SKA-	
	TEL.AIV.SE-TEL.TM.SE-ICD-001	
	Interface Control Document.	
SYS_REQ-2775	MeerKAT to SKA1_INFRA	AIV, INFRA, SADT, TMGR
	interface. The interface between	
	MeerKAT and SKA1_INFRA shall	
	be compliant with SKA-	
	TEL.AIV.SE-TEL.INFRA.SE-ICD-	
	001 Interface Control Document	
SYS_REQ-2416	CSP to Infra interface . The	CSP, INFRA
	interface between CSP and Infra	
	shall be compliant with the SKA-	
	TEL.CSP.SE-TEL.INFRA.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2738	CSP to SDP interface . The interface	CSP, SDP
	between CSP and SDP shall be	
	compliant with the SKA-	
	TEL.SDP.SE-TEL.CSP.SE-ICD-001	
	Interface Control Document	
SYS_REQ-2418	Dish to CSP interface . The interface	CSP, DSH
	between CSP and Dish shall be	
	compliant with the SKA-	
	TEL.DSH.SE-TEL.CSP.SE-ICD-001	
	Interface Control Document.	
SYS_REQ-2419	Dish to Infra interface. The	INFRA, DSH
	interface between Dish and Infra	
	shall be compliant with the SKA-	
	TEL.DSH.SE-TEL.INFRA.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2420		
	LFAA to CSP interface. The	LFAA, CSP
	LFAA to CSP interface . The interface between LFAA and CSP	LFAA, CSP

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 231 of 275

	TEL.LFAA.SE-TEL.CSP.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2421	LFAA to Infra interface. The	LFAA, INFRA
515_KEQ 2421	interface between LFAA and INFRA	
	shall be compliant with the SKA-	
	TEL.LFAA.SE-TEL.INFRA	
	AUS.SE-ICD-001Interface Control	
	Document.	
SYS_REQ-2422	SADT to DSH interface. The	SADT, DSH
313_KEQ 2422	interface between SADT and DSH	3,51,5311
	shall be compliant with the SKA-	
	TEL.SADT.SE-TEL.DSH.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2423	SADT to LFAA interface. The	LFAA, SADT
313_KEQ 2423	interface between SADT and LFAA	LIAA, JADI
	shall be compliant with the SKA-	
	TEL.SADT.SE-TEL.LFAA.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2424	SADT to CSP interface. The	SADT, CSP
313_NEQ-2424	interface between SADT and CSP	SAD1, CSF
	shall be compliant with the SKA-	
	TEL.SADT.SE-TEL.CSP.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2425	SADT to SDP interface. The	SADT, SDP
313_REQ-2425	interface between SADT and SDP	SADI, SDP
	shall be compliant with the SKA- TEL.SADT.SE-TEL.SDP.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2426	SADT to Infra interface. The	SADT, INFRA
313_REQ-2420	interface between SADT and Infra	SADI, INFRA
	shall be compliant with the	
	SKA,TEL.SADT.SE-	
	TEL.INFRA.SE-ICD-001 Interface	
	Control Document.	
SYS_REQ-2427	TM to Dish interface . The interface	TM. DSH
313_REQ-2427	between TM and Dish shall be	IW, D3H
	compliant with the SKA-	
	TEL.TM.SE-TEL.DSH.SE-ICD-001.	
	Interface Control Document.	
SYS_REQ-2428	TM to LFAA interface. The	LFAA, TM
313_REQ-2428	interface between TM and LFAA	LFAA, IIVI
	shall be compliant with the SKA-	
	TEL.TM.SE-TEL.LFAA.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2429	TM to SADT interface. The	SADT, TM
313_NEQ-2429	interface between TM and SADT	JADI, IIVI
	shall be compliant with the SKA- TEL.TM.SE-TEL.SADT.SE-ICD-	
	001 Interface Control Document.	
SYS_REQ-2430	TM to CSP interface. The interface	CSP, TM
313_REQ-2430	between CSP and TM shall be	CSF, TIVI
	compliant with the SKA-	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 232 of 275

	TEL.CSP.SE-TEL.TM.SE-ICD-001.	
	Interface Control Document.	
CVC DEO 2727		TAA INIEDA
SYS_REQ-2737	TM to INFRA Interface. The	TM, INFRA
	interface between TM and INFRA	
	shall be compliant with the	
	SKA.TEL.TM.SE-TEL.INFRA.SE-	
	ICD-001 Interface Control	
010 000	Document.	
SYS_REQ-2431	SDP to TM interface . The interface	SDP, TM
	between SDP and TM shall be	
	compliant with the SKA-	
	TEL.SDP.SE-TEL.TM.SE-ICD-001	
	Interface Control Document.	
SYS_REQ-2432	SDP to INFRA interface. The	SDP, INFRA
	interface between SDP and Infra	
	shall be compliant with the	
	SKA.TEL.SDP.SE-TEL.INFRA.SE-	
	ICD-001 Interface Control	
0/0 550 5400	Document.	
SYS_REQ-2462	Electromagnetic Radiation. Any	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	component of the observatory shall	
	not emit electromagnetic radiation, in	
	any of the stated frequency intervals	
	for broad band and narrow band	
	cases, that exceeds the SKA	
CVC DEO 2462	RFI/EMI Threshold Levels[4] Self-induced RFI. The SKA1	LEAA CADT CCD CDD TAA INIFDA DCII
SYS_REQ-2463		LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Telescope shall generate less self-	
	induced RFI, within the Telescope's	
	operating frequency bands, than the SKA RFI/EMI Protection Levels, for	
	both broad band and narrow band	
	cases, as specified in the "RFI/EMI	
	Protection and Threshold Levels for	
	the SKA" document. The SKA	
	RFI/EMI Protection Levels are	
	defined at the respective receiver	
	input, and measured at the respective	
	Telescope time series output.	
SYS_REQ-2464	Electromagnetic Compatibility	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.02 =	Standards. The SKA1 Telescopes	
	shall be compliant with one or more	
	of the following standards for	
	emissions and one or more for	
	susceptibility/immunity:*BS EN	
	61000-6-2. Electromagnetic	
	compatibility (EMC). Generic	
	standards. Immunity standard for	
	industrial environments.	
	*BS EN 61000-6-4 AMD2.	
	Electromagnetic compatibility	
	(EMC). Part 6-4. Generic standards.	
	Emission standard for industrial	
	1	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 233 of 275

	environments.	
	*BS CISPR 14-1. Electromagnetic	
	compatibility. Requirements for	
	household appliances, electric tools	
	and similar apparatus. Part 1. Emission.	
	*MIL-STD-464C	
SYS_REQ-2465		LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_REQ-2403	Electricity network Electromagnetic Compatibility.	LEAA, SADI, CSF, SDF, TWI, INFRA, DSH
	The SKA1 telescopes shall follow	
	the TBD code of practice for the	
	application of Electromagnetic	
	Compatibility (EMC) standards and	
	guidelines in electricity utility	
	networks.	
SYS_REQ-2466	EMC compatibility marking. All	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	"off-the-shelf" equipment shall	, 3 , , ,
	possess as a minimum the host	
	country EMC marking.	
SYS_REQ-2467	Electromagnetic susceptibility. The	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	observatory shall not be susceptible	
	to terrestrial electromagnetic	
	radiation at any frequency that	
	significantly interferes with its	
	normal operation.	
SYS_REQ-2472	RFI flagging. The SKA1 telescopes	LFAA, CSP, SDP, TM, DSH
	shall automatically flag frequency	
	data with a resolution of one channel	
	and time data to the resolution of the	
	integration unit if the data is	
676 858 3453	corrupted by RFI.	ccp cpp
SYS_REQ-2473	RFI excision. The SKA1 Telescopes	CSP, SDP
	shall automatically excise data that is	
SYS_REQ-2474	corrupted by RFI. RFI masking. The SKA1	LEAA CSD SDD TM DSH
313_REQ-2474	Telescopes shall flag data according	LFAA, CSP, SDP, TM, DSH
	to a pre-selected RFI Mask.	
SYS_REQ-2475	RFI zones of avoidance. The SKA1	TM
313_KEQ 2473	telescopes shall allow spatial zones	
	of avoidance to be defined.	
SYS_REQ-2433	Design for Extensibility.Design	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	trade studies for SKA1 shall include	
	scenarios where design features are	
	included which will allow	
	3. Increases in the number of	
	receptors for SKA2 over	
	SKA1 by a factor of 10	
	whilst re-using more than	
	90% of SKA1 hardware	
	4. The introduction of AIP	
	technologies at SKA2 scales	

Revision:

Author: W Turner 2015-04-23 Page 234 of 275 Date:

FOR PROJECT USE ONLY

whilst re-using more than 90% of SKA1 hardware Such trade studies shall yield the incremental cost of such scenarios over those which do not include such design features. SYS_REQ-2484 **Environmental legislation and** SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH **regulations.** The observatory shall be compliant with all local, State and national environmental protection legislation and regulations. NOTE: Legislation takes precedence over project/contract documentation and requirements. Omission of a law from this requirement does not affect its enforceability. Legislation is also subject to amendment and so the Environmental Laws identified during the Request for Information (copied below) may be modified by the Hosting Agreements and subsequent Acts and Amendments.Legislation and regulations identified during the response to Request for Information include:South Africa: National Environmental Management Act, 1998 ("NEMA"); National Water Act, 1998: National Environmental Management: Air Quality Act, 2004; National Environmental Management Waste Act, 2008; National Environment Management: Biodiversity Act, 2004; National Heritage Resources Act, 1999.*Australia: The Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The Western Australian Environmental Protection Act 1986 The Western Australian Land Administration Act 1997 In addition, approvals will be required under the Western Australia Mining Act 1978, Heritage of Western Australia Act 1990, the Western Australian Aboriginal Heritage Act 1972 and the MRO Indigenous Land Use Agreement 2009.* Other South African

Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 235 of 275

		1
	environmental statutes include the	
	Environment Conservation Act,	
	1989, various air pollution statutes,	
	the National Heritage Resources Act,	
	1999, the Hazardous Substances Act,	
	1973, the Health Act, 1977, the	
	Nuclear Energy Act, 1999, the	
	National Nuclear Regulatory Act,	
	1999, the National Environmental	
	Management: Protected Areas Act,	
	2003, the Fertilisers, Farm Feeds,	
	Agricultural Remedies and Stock	
	Remedies Act, 1947, the Marine	
	Living Resources Act, 1998, and the	
	National Environmental	
	Management: Integrated Coastal	
	Management Act, 2008.	
SYS_REQ-2790	Environmental Impact	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NLQ-2/30	Assessment . The Observatory shall	Si O, Li AA, SAD I, CSF, SDF, HVI, HVFRA, DSA
	undertake an Environmental Impact	
	Assessment (EIA) in accordance	
	with the local and national	
	environmental legislation. NOTE:	
	the EIA shall be undertaken in	
	accordance with: South Africa - the	
	National Environmental	
	Management Act (NEMA); Australia	
	- Western Australian EPA and	
	Commonwealth EPBC	
SYS_REQ-2483	Environment protection plan. An	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Environmental protection plan shall	
	be developed and maintained. This	
	shall include the management of	
	Environmental Impact Assessments	
	(EIA) in accordance with SA	
	NEMA, WA EPA and	
	Commonwealth EPBC.	
SYS_REQ-2572	Material environmental rule	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	compliance. All materials used in	
	the SKA1 design shall be fully	
	compliant to all environmental rules	
	applicable to the SKA1 core and	
	remote sites	
SYS_REQ-2819	Safety of machinery risk	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	assessment . A risk assessment shall	
	be conducted for each item of	
	machinery in accordance with BS	
	EN ISO 12100	
SYS_REQ-2450	Safety information for use. Where	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	risks remain despite inherently safe	, . , , ,
	design measures, safeguarding and	
	the adoption of	
	complementary protective measures,	
	1 comprementary protective measures,	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 236 of 275

	the residual risks shall be identified	
	in the information for use in	
	accordance with BS EN ISO 12100	
	(section 6). The information for use	
	shall include, but not be limited to,	
	the following:	
	operating procedures for the use of	
	the machinery consistent with the	
	expected ability of personnel who	
	use the machinery or other persons	
	who can be exposed to the hazards	
	associated with the machinery;	
	The recommended safe working	
	practices for the use of the	
	machinery and the related training	
	requirements adequately described;	
	Sufficient information, including	
	warning of residual risks for the	
	different phases of the life of the	
	machinery;	
	The description of any	
	recommended personal protective	
	equipment, including detail as to its	
	need as well as to training needed for	
	its use.Information for use shall not	
	be a substitute for the correct	
	application of inherently safe design	
	measures, safeguarding or	
CVC DEO 3EE4	complementary protective measures.	LEAA CADT CCD CDD TAA INIFDA DCII
SYS_REQ-2554	Ergonomics. The ergonomic design shall be compliant with ISO 6385.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2820	Safety of equipment with rated	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_REQ-2020	voltage not exceeding 600V.	SPO, LPAA, SADT, CSP, SDP, TW, INFRA, DSH
	Equipment shall comply with the	
	safety requirements of BS EN IEC	
	60950. NOTE: This includes electric	
	shock, energy related hazards, fire,	
	heat related hazards, mechanical	
	hazards, radiation and chemical	
	hazards	
SYS_REQ-2437	Design for hazard elimination.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Designs shall demonstrate the	
	elimination, or mitigation to a risk	
	level practically achievable, of all	
	hazards by means of a subsystem	
	hazard analysis (SSHA) report as	
	described in EN 14738 and tailored	
	by SKA Product Assurance and	
	Safety Plan SKA-OFF.PAQA-SKO-	
	QP-001.	
SYS_REQ-2435	Hazard analysis . A hazard analysis	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
		·
1	shall be performed at the system and element level in accordance with BS	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 237 of 275

	IEC 61000 and typose applicable	
	IEC 61882 and, where applicable,	
	shall include a FMEA in accordance	
	with EN 60812.	
SYS_REQ-2567	Hazardous Materials list. Each	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Element supplier shall provide a list	
	of hazardous materials used for all	
	items intended for use in the SKA1	
	detailing suggested handling	
	precautions, disposal instructions and	
	contra-indications.	
SYS_REQ-2579	Hazard warning marking. All	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	items that present a potential hazard	
	shall be labelled in accordance with	
	BS EN ISO 7010	
SYS_REQ-2818	Marking of machinery - safety. In	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	accordance with ISO 61310_2,	
	machinery shall bear all markings	
	which are necessary	
	– for its unambiguous identification;	
	– for its safe use;	
	and supplementary information shall	
	be given, as appropriate:	
	– permanently on the machinery;	
	– in accompanying documents such	
	as instruction handbooks;	
CVC PEO 2420	– on the packagin	LEAA CADT CCD CDD TAA INIFDA DCU
SYS_REQ-2438	Fail safe design. Components and	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Equipment shall be designed to be	
	locally fail-safe and not rely on	
	external safety devices or measures	
CVC DEO 2700	to operate safely.	LEAA CADT CCD CDD TM INEDA DCU
SYS_REQ-2788	Non-propagation of failures . The equipment shall be designed such	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	that hardware failures and software	
	errors should not create a hazardous	
	situation to interfacing systems	
SYS_REQ-2439	Emergency stop. The SKA1	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_KEQ-2433	Elements shall have emergency stop	11 AA, 3AD1, C31, 3D1, 11VI, IIVI KA, D311
	switches or brakes for all electro-	
	mechanical or mechanical systems	
	that have been identified by safety	
	analyses (required under SYS_REQ-	
	2435) to pose a hazard.	
SYS_REQ-2733	Location of Emergency stop.	DSH, LFAA, CSP, SDP, TM, INFRA, SADT
_ ,	Emergency stop switches shall be	, , , , , ,
	located in such a way to minimize	
	the risk of injury. (Verified by	
	Analysis as 'minimisation' is	
	unverifiable any other way.	
SYS_REQ-2786	Safety documentation file.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Elements shall provide procedures	
	for maintainers to recover from an	
	unplanned shut-down, including	
	, . · · ·	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 238 of 275

	safety checks to be conducted prior	
	to start-up, as specified in SKA	
	PRODUCT ASSURANCE &	
	SAFETY PLAN SKA-OFF.PAQA-	
	SKO-QP-001.	
SYS_REQ-2447	Sharp metal edges. If they cannot	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
515_NEQ 2447	be eliminated from design, sharp	
	edges, access openings and corners	
	shall be protected with covers or	
	coatings.	
SYS_REQ-2446	Electrical safety. Electrical risks and	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	hazards shall be controlled in	
	accordance with local, State and	
	national legislation and Codes of	
	Practice.NOTE: In South Africa,	
	SANS 10142-1 and SANS 10142-2	
	shall apply.NOTE: In Australia, in	
	addition to legislation, the following	
	Codes of Practice shall be applied:	
	AS/NZ 3000	
	Safe Work Australia 'Managing	
	Electrical Risks at the Workplace';	
	Western Australia Director of	
	Energy Safety 'Safe Low Voltage	
	Work Practices by Electricians'	
SYS_REQ-2443	Protection from high voltages.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	High voltage cages or enclosures	
	shall be used to protect personnel	
	from inadvertent access to high	
	voltages in accordance with	
	AS/NZS3000 (Australia) and	
	SANS10142 (South Africa).	
SYS_REQ-2444	Safety grounding and bonding.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	External conductive parts shall be	
	grounded in compliance to:South	
	Africa:	
	National Building Regulations and	
	Building Standards Act, 1977	
	Occupational Health and Safety act, 1993	
	SANS 10313Australia:	
	AS/NZ 3000,	
	AS/NZ 1768	
SYS_REQ-2445	Electrical circuit interlocks.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Electrical circuit inter-locks shall be	, . , , ,
	provided to prevent personnel	
	coming into contact with hazards	
	that cannot otherwise be eliminated	
	from design.	
SYS_REQ-2481	Emergency communication. The	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	observatory shall provide an	
	independent system to communicate	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 239 of 275

	with outside locations in	
	emergencies.	
SYS_REQ-2449	Construction and AIV Safety Plan.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH, AIV
515_NEQ-2445	A comprehensive safety plan,	ELAC, SADI, COL, SDI, HVI, HVI HA, DOLL, ALV
	tailored to construction and AIV	
	activities, shall be established and	
	implemented before the construction	
	starts at the observatory site.	
SYS_REQ-2436	Safety incident recovery plan. A	SPO
	safety incident recovery plan shall be	
	produced in accordance with SKA	
	PRODUCT ASSURANCE &	
	SAFETY PLAN SKA-OFF.PAQA-	
	SKO-QP-001.	
SYS_REQ-2451	Safety training. All personnel shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	be provided with appropriate Health	, , , , ,
	and Safety training in compliance	
	with local regulations.	
SYS_REQ-2454	Fire fighting equipment. Fire	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	fighting equipment shall be made	
	available at all SKA premises and	
	facilities.	
SYS_REQ-2453	First aid stations. First aid stations	INFRA
	shall be provisioned.	
SYS_REQ-2452	Protective clothing. Protective	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Clothing for areas where	
	environments detrimental to human	
	safety shall be worn.	
SYS_REQ-2795	Travel safety. Personnel shall	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	adhere to local safety procedures for	
	travelling in remote areas.	
	NOTE: Safety procedures should	
	include the training and equipment	
	required, such as driving instruction,	
	vehicles appropriate for the	
CVC PEO 2452	environment and radio equipment	CDO LEAA CADT CCD CDD Tra WEDA DC''
SYS_REQ-2460	Occupational health legislation	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	and regulations. The observatory	
	shall comply with all applicable	
	local, State and national occupational	
	health regulations and standards in force at the time. Regulations	
	include, but are not limited to:	
	South Africa:	
	Occupational Health and Safety Act,	
	1993, and all its regulations.	
	Australia:	
	Commonwealth Occupational Health	
	and Safety Act 1991;	
	OHS (Safety Arrangements)	
	Regulations 1991;	
	OHS (Safety Standards) Regulations	
	1994;	
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 240 of 275

	OHS Codes of Practice 2008.	
	Western Australia:	
	Occupational Safety and Health Act 1984;	
	Harmonised OHS legislation (as	
	enacted).	
SYS_REQ-2455	Noise level dosage. Personnel shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	not be exposed to noise level	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	dosages exceeding local health and	
	safety guideline levels. The	
	maximum noise levels shall not	
	exceed an 8-hour average exposure	
	of 85 decibels as specified in the	
	Australian National Standard for	
	Occupational Noise NOHSC:	
	1007(2000) and South African Noise-	
	Induce Hearing Loss Regulations (No	
	R.307 2003) of the Occupational	
	Health and Safety Act, 1993 (Act No	
	85 of 1993). The desirable maximum	
	noise level is 75 decibels. Note: The	
	National Code of Practice for Noise	
	Management and Protection of	
	Hearing at Work	
	[NOHSC:2009(2004)] provides	
	practical guidance on how	
0/0 555 5456	NOHSC:1007(2000) can be achieved	
SYS_REQ-2456	Transient noise level. Noise levels	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	exceeding 85dB shall be controlled	
	or mitigated in accordance with NOHSC National Standard for	
	Occupational Noise [NOHSC: 1007]	
SYS_REQ-2457	Illumination. Personnel shall be	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NEQ 2437	provided with a working illumination	ייי פון פון פון פון פון פון פון פון פון פון
	level which is compliant with local	
	and national regulations including	
	the current issue of SANS 10114-1	
	in South Africa and the AS/NZS	
	1680 series in Australia.	
SYS_REQ-2458	Clean air. Personnel shall be	INFRA
	provided with air quality at least	
	compliant with the current issue of	
	SANS 10400-O (South Africa - The	
	application of National Building	
	Regulations Part O : Lighting and	
	ventilation) and the AS 1668 series	
	of codes (Australia - The use of	
	mechanical ventilation and air	
CVC DEO 3C40	conditioning in buildings).	INIFDA
SYS_REQ-2649	Humidity. Working environments	INFRA
	shall be designed, built and maintained to provide air quality that	
	maintained to provide air quanty that	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 241 of 275

	meets or exceeds the guidance	
	provided in the Australian Code of	
	Practice for Managing the Work	
	Environment and Facilities, National	
	Code of Australia and AS 1668.	
	NOTE: Building humidity required	
	for computing facilities is specified	
	in Req 2367.	
SYS_REQ-2791	Security Management System. The	SPO, TM, INFRA
313_KEQ 2731	SKA shall provide a security	Si Si Ni, illi NA
	management system that includes :	
	i. personnel security,	
	ii. physical security (asset)	
	iii. security of informatio	
SYS_REQ-2793	Personnel security training. All	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.02 2750	personnel shall receive the security	
	training identified in the Security	
	Management System necessary for	
	their location. Additional specialist	
	pre-deployment training shall be	
	given prior to working in remote	
	environments.	
SYS_REQ-2478	Equipment security. The	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	observatory shall provide a secure	
	environment for equipment. This	
	shall include protection of	
	generators, fuel, solar cells and inter-	
	station assets such as copper cables.	
SYS_REQ-2822	Information security risk	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	assessment . An information security	
	risk assessment shall be conducted	
	for each element in accordance with	
	ISO/IEC 27005	
SYS_REQ-2823	Information security management	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	for inter-organizational	
	communications. Information	
	transfer between organisations shall	
	be controlled in accordance with	
	ISO/IEC 27010 as tailored by SKA	
	Organisation Security Policy	
SYS_REQ-2482	Accessibility. It shall be possible to	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	control on a per user basis which	
	SKA1 facilities and resources (both	
	hardware and software) may be	
	accessed by the user.	
SYS_REQ-2479	Archive security. The observatory	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	shall provide a secure environment	
	for all its data archives	
SYS_REQ-2798	Protection of equipment in	SPO, SADT, CSP, SDP, TM, INFRA, DSH, AIV
	stationary use at non-weather	
	stationary use at non-weather protected locations. Equipment in	
	stationary use at non-weather	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 242 of 275

against anvivonmental conditions	
against environmental conditions	
4K4H/ 4Z1/ 4Z5/ 4Z6/ 4B2/ 4C1/	
4S3/ 4M4 in accordance with BS EN	
IEC 60721-3-4.	
NOTE: 4Z5 refers to the survival,	
non-operational mode. The	
equipment shall be able to operate	
normally for air movement up to 11	
m/s	
SYS_REQ-2488 Allowable air temperature range. LFAA, SADT, TM, INFRA, DSH	
SKA1 equipment located at the	
dishes or aperture arrays or outside	
<u> </u>	
the central processing and operating	
facilities shall be able to withstand	
(non-operating if necessary) an	
outside air temperature within the	
range of -15 °C to +60 °C.	
Note this takes precedence over IEC	
60721-3-4 4K4H of parent	
requirement	
SYS_REQ-2489 Air temperature operation range. LFAA, SADT, TM, INFRA, DSH	
SKA1 equipment located at the	
dishes or aperture arrays or outside	
the central processing and operating	
facilities shall be able to operate	
•	
within specification if the outside air	
temperature is within the range of -5	
°C to +50 °C.	
Note this takes precidence over	
IEC60721-3-4 4K4	
SYS_REQ-2490 Wind velocities. SKA1 equipment LFAA, SADT, TM, INFRA, DSH	
shall be able to survive wind	
velocities up to 160 km/hr, and shall	
operate within normal specification	
ranges for wind velocities up to 40	
km/hr.	
Note: this takes precedence over	
IEC60721-3-4 4Z	
SYS_REQ-2799 Protection of equipment in SPO, LFAA, SADT, CSP, SDP, TM, INFRA, D	SH
weather-protected locations.	
Equipment in stationary use at	
weather protected locations shall be	
protected against environmental	
conditions 3K8H/ 3Z1/ 3Z11/ 3Z12/	
3B3/ 3C1R/ 3S3/ 3M4 in accordance	
with BS EN IEC 60721-3-3.	
SYS_REQ-2500 Operating Humidity. The operating LFAA, SADT, CSP, SDP, TM, INFRA, DSH	
humidity shall be between 40% and	
60%	
SYS_REQ-2501 Storage and transport Humidity. LFAA, SADT, CSP, SDP, TM, INFRA, DSH	
The storage and transport humidity	
shall be between 40% and 95%.	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 243 of 275

SYS_REQ-2502	Condensation. Appropriate	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.0020	measures shall be taken to prevent	
	the formation of condensation on	
	operating electronic components.	
SYS_REQ-2503	Pressure. Components shipped by	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_KEQ-2303	air shall be capable of surviving	LIAA, SADI, CSI, SDI, HVI, HVI NA, DSH
	pressures down to 11 kPa (equivalent	
	` *	
CVC DEC 2504	altitude ~ 50,000 feet).	LEAA CADT CCD CDD TAA INIEDA DCU
SYS_REQ-2504	Facilities and Equipment	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Intrusion. Where appropriate, SKA1	
	equipment facilities shall be	
	adequately protected against	
	intrusion by insect and "larger"	
	wandering animals.	
SYS_REQ-2505	Sand and Dust. SKA1 systems shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	be adequately protected against sand	
	and dust ingress.	
SYS_REQ-2506	Fungus. Equipment shall be	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	protected against fungus growth.	
SYS_REQ-2801	Storage of equipment. Designs	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	shall identify any requirements for	
	equipment to be stored in	
	environmental conditions less severe	
	than 1K11/1B3/1C1/1S3/1M3 as	
	specified inBS EN IEC 60721-3-1.	
	Note: It may be assumed that	
	equipment will be stored in its	
i .	1 - 1 - P	1
	original packaging	
SYS_REQ-2800		SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment.	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2800	original packaging Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original packaging that it was delivered to the	SPO, LFAA, SADT, CSP, SDP, TM, INFRA, DSH LFAA, SADT, CSP, SDP, TM, INFRA, DSH
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SYS_REQ-2491	Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original packaging that it was delivered to the engineering depot. Safety. SKA1 equipment and buildings shall be designed and built in compliance with national and State regulations including AS 1170.4 (Importance level 3, design life 50 years) and SANS 10160-4 for earthquakes of magnitude up to Richter 3.8. Seismic resilience. SKA1 structures	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2491	Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original packaging that it was delivered to the engineering depot. Safety. SKA1 equipment and buildings shall be designed and built in compliance with national and State regulations including AS 1170.4 (Importance level 3, design life 50 years) and SANS 10160-4 for earthquakes of magnitude up to Richter 3.8. Seismic resilience. SKA1 structures and equipment shall survive and be	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2491	Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original packaging that it was delivered to the engineering depot. Safety. SKA1 equipment and buildings shall be designed and built in compliance with national and State regulations including AS 1170.4 (Importance level 3, design life 50 years) and SANS 10160-4 for earthquakes of magnitude up to Richter 3.8. Seismic resilience. SKA1 structures and equipment shall survive and be fully operational after a seismic	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2491	Transportation of equipment. Equipment shall be designed to withstand transportation from an engineering depot to a station exposed to environmental conditions 2K5H/2B3/2C1/2S3/2M3 as detailed in BS EN IEC 60721-3-2. NOTE: It may be assumed that the equipment will be transported in the original packaging that it was delivered to the engineering depot. Safety. SKA1 equipment and buildings shall be designed and built in compliance with national and State regulations including AS 1170.4 (Importance level 3, design life 50 years) and SANS 10160-4 for earthquakes of magnitude up to Richter 3.8. Seismic resilience. SKA1 structures and equipment shall survive and be	LFAA, SADT, CSP, SDP, TM, INFRA, DSH

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 244 of 275

	underground collapses in addition to	
	earthquakes.	
SYS_REQ-2722	Availability, reliability, and	SPO
	maintenance plans. There shall be	
	an availability, reliability and	
	maintenance plan for each SKA1	
	telescope.	
SYS_REQ-2716	Average annual availability. Each	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	SKA1 telescope shall have an	
CVC DEO 2027	operational availability of 95%	LEAA CADT CCD CDD TAA INIFDA DCU
SYS_REQ-2827	System Availability . System designs shall meet the system availability	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	allocations specified in SKA-	
	OFF.SE.ARC-SKAO-RAM-001	
SYS_REQ-2718	Availability budgets. Availability	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_KEQ 2710	budgets shall be allocated at the	ETAA, 3AD 1, CS1 , 3D1 , 1101, 1101 IVA, DS11
	system decomposition level, and	
	shall be consistent with the system	
	level requirements for reliability and	
	maintainability of the system.	
SYS_REQ-2512	Best practice. Best available	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	methods for reducing adverse effects	
	of operational and maintenance	
	environments on critical components	
	shall be adopted.	
SYS_REQ-2513	Critical-useful-life components.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Any critical-useful-life components	
CVC DEO 3515	shall be identified.	LEAA CADT CCD CDD TAA INIFDA DCU
SYS_REQ-2515	Component selection. Parts and components shall be selected to meet	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	reliability requirements.	
SYS_REQ-2516	Matching components. Parts	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.02 _0.10	requiring select on test shall be	
	eliminated by deign if possible.	
SYS_REQ-2517	Known failure rate parts. The	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	failure rate of parts shall be known	
	(e.g. through analysis or modelling)	
	before inclusion in SKA design.	
SYS_REQ-2518	High failure rate parts. Parts with	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	excessive failure rates shall be	
	identified.	
SYS_REQ-2519	Reliability testing. A testing and	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	evaluation master plan shall be	
	generated for high-risk reliability	
CVC PEO 3F30	components. Spares and repair parts testing.	LEAA SADT CSD SDD TAA INISDA DSU
SYS_REQ-2520	Critical spare and repair line	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	replaceable units shall be tested	
	before deployment.	
SYS_REQ-2521	Component derating. Safety factors	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
5.5	and margins shall be applied in the	
	selection of modules and	
	components	
1		

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 245 of 275

SYS REQ-2522	Shelf life and wear out	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
5.5_M2Q 2522	characteristics. The shelf life and	
	wear out characteristics of all	
	components and parts shall be	
	known before inclusion in SKA	
	designs.	
SYS_REQ-2523	Special procurement components.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.0 2020	Critical parts requiring special	
	procurement methods, testing and	
	handling provisions shall be	
	identified.	
SYS_REQ-2525	Fail safe provisions. Designs shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
_ `	implement fail-safe provisions to	, , , , ,
	prevent secondary failures.	
SYS_REQ-2526	Maintainability budgets.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Maintainability budgets shall be	
	allocated at the system	
	decomposition level, and shall be	
	consistent with the system level	
	requirements for reliability and	
	maintainability of the system.	
SYS_REQ-2527	Test and Repair Instructions.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Where end user repair is applicable	
	Test and Repair Instructions shall be	
	delivered with all equipment.	
SYS_REQ-2528	Level of maintenance. The level of	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	maintenance shall be identified for	
	each repairable item.	
SYS_REQ-2529	Maintenance test and support	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	equipment. Equipment required for	
	test and support shall be identified	
	for each repairable item.	
SYS_REQ-2802	Design for maintainability . Designs	SPO, SADT, SDP, TM, INFRA, DSH, CSP, LFAA
	shall incorporate maintainability	
	studies and analysis in accordance	
	with BS EN IEC 60706-2 with	
	emphasis on minimising the need for	
	maintainers on sites. This activity	
	should incorporate best practice such	
	as described by B.S. Blanchard & W.J. Fabrycky 'Systems Engineering	
	and Analysis', Pearson 2011	
SYS_REQ-2594	Modular packaging. The packaging	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NLQ-2334	of components shall be modular to	ELAA, SAUT, CSF, SUF, TIVI, HYFINA, USIT
	limit maintenance to the removal of	
	one module.	
SYS_REQ-2595	Maintenance provisions.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
3.52 2555	Repairable items shall be designed to	
	include maintenance provisions such	
	as test points, accessibility, and plug-	
	in components.	
	, <u>r</u>	<u> </u>

Revision: 6

Date: 2015-04-23

CVC DEO 350C	Discord at failure itams Discord -	LEAA CADT CCD CDD TAA INIEDA DCU
SYS_REQ-2596	Discard at failure items. Discard at failure items shall be packed at love	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	failure items shall be packed at low	
CVC PEO 3507	Plug in modules The design shall	LEAA SADT CSD SDD TM INISDA DSU
SYS_REQ-2597	Plug-in modules. The design shall implement plug-in modules to the	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	maximum extent possible.	
SYS_REQ-2598	Module access. Where applicable,	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_KEQ-2398	access between modules shall be	LIMA, SAUT, CSF, SUP, TIVI, INFRA, UST
CVC DEC 3500	sufficient to facilitate hand grasping.	LEAA SADT CSD SDD TM INISDA DSU
SYS_REQ-2599	Component removal. Modules and components shall be mounted such	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	1 1	
	that removal of any single item will	
	not require the removal of other	
	items (component stacking to be avoided where possible)	
SYS_REQ-2600	Secure mounting of modules.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NLQ-2000	Modules shall be securely mounted	S. AA, SAD I, GSF, SDF, TIVI, HVFRA, DSF
	(in compliance with the shock and	
	vibration requirements) with the	
	minimum number of fasteners.	
SYS_REQ-2601	Shock mounting provision. Shock	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
J.5_NEQ-2001	mounting provisions shall be made	E. T. S. GALET, GOLY, TIVI, HYEINA, DON
	where applicable.	
SYS_REQ-2602	Mounting preclusion. Provisions	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	for the preclusion of mounting the	, , , , , ,
	wrong module shall be provided (key	
	coding of connectors etc.).	
SYS_REQ-2448	Stand-off and handles. Stand-offs	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	and handles shall be used to protect	1
	system components from damage	
	during shop maintenance.	
SYS_REQ-2603	Mounting guides. Mounting guides	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	and location pins shall be provided to	
	facilitate module mounting.	
SYS_REQ-2604	Module labelling. Where possible,	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	labelling of modules shall be on the	
	top or adjacent in plain sight.	
SYS_REQ-2605	Label robustness. Labels shall be	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	permanently affixed and unlikely to	
	come off during maintenance or as a	
	result of the environment.	
SYS_REQ-2606	Disposable LRU labelling.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Disposable line replaceable units	
	should be labelled as such.	
SYS_REQ-2711	Component obsolescence plan.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	There shall be a plan for the	
	management of component	
	obsolescence.	
SYS_REQ-2571	Long lead time items. Long lead	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	time items shall be identified to the	
0/0 ===	project management.	
SYS_REQ-2570	Parts availability. The estimated	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	availability of the parts shall be	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 247 of 275

	compatible with the final system's	
	life cycle.	
SYS_REQ-2806	Product Assurance. Product	SPO, SADT, SDP, TM, INFRA, DSH, CSP, LFAA
	Assurance shall be managed	
	following a process modelled on the	
	SKA Product Assurance & Safety	
	Plan SKA-OFF.PAQA-SKO-QP-00	
SYS_REQ-2509	Scope of workmanship standards.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	SKA1 dedicated workmanship	
	standards shall cover all phases of	
	production, assembly and	
	integration, testing, handling, and	
	include clear requirements for	
SYS_REQ-2816	acceptance/rejection criteria. Design for testability. Designs shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_REQ-2010	include an assessment of testability	LFAA, SADT, CSP, SDP, TWI, INFRA, DSH
	in accordance with BS EN IEC	
	60706-	
SYS_REQ-2538	Test and support equipment Test	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	and support equipment shall be	, , , , , , , ,
	identified for each level of	
	maintenance.	
SYS_REQ-2539	Test and support equipment	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	standardisation. Any test equipment	
	not included in the standard test	
	equipment list required for the	
	integration, commissioning and	
	maintenance of equipment shall be	
CVC DEO 3E40	declared.	LEAA CADT CCD CDD TAA INIFDA DCII
SYS_REQ-2540	Test and support equipment lifecycle costs. Life cycle costs shall	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	be generated for all test and support	
	equipment.	
SYS_REQ-2541	Test equipment reliability Test	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0.02	equipment reliability shall be	
	sufficient to meet the maintainability	
	requirements.	
SYS_REQ-2542	Training A plan detailing the	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	training required for maintenance,	
	calibration and repair shall be	
	generated.	
SYS_REQ-2543	Direct fault indicators Where	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	possible, direct fault indicators shall	
ove pro state	be designed in to equipment.	LEAA CARE COR CREATE THE THE TABLE
SYS_REQ-2544	Self-test. Self-Test capability such	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	that all faults can be identified down	
SYS_REQ-2546	to LRU level shall be provided. Continuous performance	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NEQ-2340	monitoring. Where possible, the	LEMM, JADI, COF, JUF, HVI, HVERM, DOF
	system shall be designed to provide	
	continuous performance monitoring.	
L	communice monitoring.	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 248 of 275

CAC DEU JEEJ	Malfunction detection. All	LEAA SADT CSD SDD TM INIEDA DSU
SYS_REQ-2552		LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	equipment malfunction shall be	
CVC DEC 2556	detected at the system level.	LEAA CADE CCD CDD TAA INIEDA DCU
SYS_REQ-2556	Access tools. Access requiring tools	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
0//0 0000	shall be minimised.	
SYS_REQ-2559	Design for economic production.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	All designs for the SKA shall be	
	designed for economic production.	
	This is required to ensure that the	
	SKA is buildable for a reasonable	
	cost (Con Ops Section 1.2)	
SYS_REQ-2560	Design definition. Design definition	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	shall be in sufficient detail to allow	
	one or more manufacturers to	
	produce the same item within	
0/0 550 550	identified tolerances.	
SYS_REQ-2561	Manufacturing facilities. Where	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	possible, currently existing facilities	
CVC PEO 3EG3	shall be used for manufacturing.	LEAA CADE CCD CCD TAA INITCA CCU
SYS_REQ-2562	Standard manufacturing tools.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	Where possible, standard	
CVC PEO CECC	manufacturing tools shall be used.	LEAA CADE CCD CCD TAA INITE CCC
SYS_REQ-2566	Materials list. Each sub-system	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	supplier shall provide a Materials list	
	for all items intended for use within	
CVC DEC 35C0	SKA1.	LEAA CADT CCD CDD TAA INIEDA DCU
SYS_REQ-2568	Parts list. Each Element supplier	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	shall provide a parts list for all items intended for use in the SKA1.	
SVS DEO 3EGO		LEAA SADT CSD SDD TM INIEDA DSU
SYS_REQ-2569	Process list. Each element supplier shall provide a process list for all	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	items intended for use in the SKA1.	
SYS_REQ-2573	Serial number. Each part shall be	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
313_NEQ-23/3	marked with a unique serial number	ELECT, SEET, SOL, SOL, HVI, HVERNA, DOLL
	in an easily visible location.	
SYS_REQ-2574	Drawing numbers. Each LRU type	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
3.5_NEQ 23/4	shall be identified with a unique	2.7.2.9 07.2.1, 331, 331, 1111, 1111 IVA, 2311
	drawing number	
SYS_REQ-2575	Marking method. Method of	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
3.5 25/5	marking shall be compatible with the	
	nature of the item, its environment	
	and its use.	
SYS_REQ-2576	Electronically readable or	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	scannable ID. Where possible line	, , , , , , , , , , , , , , , , , , , ,
	replaceable items shall be marked	
	with an Electronically readable or	
	scannable ID	
SYS_REQ-2577	Package part number marking. All	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	packaging shall be marked with the	
	part number of the contents.	
SYS_REQ-2578	Package serial number marking.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
	All packaging shall be marked with	
	the serial number of the contents.	
	•	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 249 of 275

SYS_REQ-2580	LRU electrostatic warnings All LRUs with electrostatic sensitive components shall be fitted with ESD warning labels.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2581	Packaging electrostatic warnings. All packaging containing static sensitive contents shall be marked with ESD warning labels.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2583	Cable identification. All cables ends shall carry a unique identifier.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH
SYS_REQ-2584	Connector plates. All connector plates shall carry identification labels for connectors.	LFAA, SADT, CSP, SDP, TM, INFRA, DSH

Table 3 Allocation Matrix

22 Appendix D: Power Budget Allocation

22.1 Power Budget allocation Africa

Values are to be informed in by the Power Allocation Process.

22.2 Power Budget Allocation Australia

Values are to be informed by the Power Allocation Process.

23 Appendix E: Availability, Reliability Maintainability Allocations

23.1 SKA1_low availability allocations

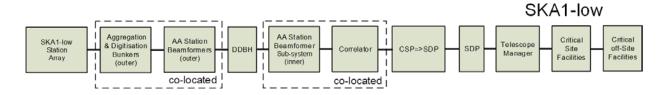


Figure 3 The availability block diagram for SKA1-low

Availability Requirements for Sub-systems of SKA1-low				
Block	Availability Requirement		Notes	
	Available	Available or Degraded		
SKA1-low Outer Station Array	> 0.9969	>0.9937	MTBF margin of 1.5	
Signal Aggregation & Digitisation Beamformers	"	"	п	
AA Station Beamformers	11	"	"	
DDBH	"	11	"	
SKA1-low Inner Station Array	"	"	"	

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY

Revision:

Author: W Turner 2015-04-23 Date:

Page 250 of 275

AA Station Beamformer	"	"	"
Sub-system			
Correlator	"	"	"
CSP=>SDP	"	"	"
SDP	"	"	"
Telescope Manager	**	"	"
Critical Site Facilities	**	=	"
Critical Off-site Facilities	**	"	"

Table 4 Availability Requirements for Sub-systems of SKA1_Low

23.2 SKA1_mid availability allocations

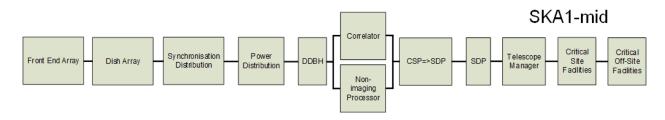


Figure 4 The availability block diagram for SKA1-Mid

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Revision: Author: W Turner Page 251 of 275

2015-04-23 Date:

Availability Requirements for Sub-systems of SKA1-mid				
Block	Availability Requirement		Notes	
	Available	Available or Degraded		
Front End Array	>0.9969	> 0.9937	MTBF margin of 1.5	
Dish Array	"	"	"	
Synchronisation Dist'n	"	"	"	
Power Dist'n	"	"	"	
DDBH	"	"	"	
Correlator	>0.9969	"	"	
Non-Imaging Processor	>0.90	>0.85	Lower requirement	
CSP=>SDP	"	"	"	
SDP	"	"	"	
Telescope Manager	"	"	"	
Site Facilities	"	"	"	
Critical Off-site Facilities	"	п	"	

Table 5 Availability Requirements for Sub-systems of SKA1_Mid

23.3 Reliability, Availability and Maintainability analysis process

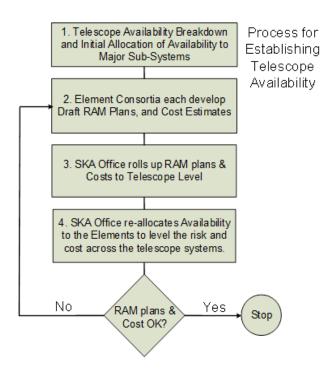


Figure 5 RAM analysis process

Figure 5 illustrates the procedure for each telescope. The initial allocation of availability requirements (Step 1) is provided in Appendix E, based on simplified availability block diagrams. These are subject to refinement and change as the design matures.

RAM plans, provided at the Element level (Step 2), will be rolled up to the system level (Step 3), leading to the introduction of new allocations (Step 4).

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 252 of 275

Capital and operating cost estimates shall be provided in Step 2 for the Elements and Step 4 for the telescope system. In the final iteration, the costs shall fall within allocated capital and operating costs.

- The first pass through Figure 14 shall be complete at the mid-point of the preliminary design phase.
- The second pass shall be complete before the Preliminary Design Review.
- During the detailed design phase, iterations shall be as frequent as necessary to keep up with changes at the Element level. These will be merely 'adjustment passes'. Significant changes will require a formal change control procedure.
- At the conclusion of each iteration of Figure 10, the Elements will deliver a draft RAM plan. The preliminary version will be reviewed at the Preliminary Design Review (PDR), and the final version will be reviewed at the Critical Design Review (CDR).

24 Appendix F Requirement Changes this Issue

The table below identifies the requirements and supportive text that have changed from Revision 5 to this rebase-lining Revision. The changes are traceable to the documents submitted to the SKA board: **SKA-BD-17-13a** and **SKA-BD-17-13c**. No changes other than those traceable to rbs are included as there are further updates planned:

6 RBS Board decision ECP150001

6A Remove Process documents from requirements ECP150002

6B Align L1 requirements at Telescope level ECP150003

6C Outstanding and well developed ECP

6D Address comments from Revision 5

6E Inclusion of missing comments from comments

6F PDR outcomes that impact L1 requirements

7 New Architecture Pack release

7A Outstanding ECPs that require further development

7B Issues that require further development from missing requirements, PDR comments and Rev 5 comments

8

There are rbs updates that are postponed or require further work beyond Revision 6:

- The requirement document context diagram Figure 1
- Requirements relating to the potential fitment of PAFs to SKA1 _Mid dishes needs further analysis

The cells in the table present the item identifier (supportive text or requirement) with the content at Revision 6 and the immediately preceding Revision 5. The change list is provided as an aid and the main body of the document takes precedence.

Item	Revision 5 content	Revision 6 Content
Purpose of the Document	This document serves as a vehicle to communicate the high-level quantitative and qualitative characteristics of the SKA Phase 1 Observatory in the form of formal requirements that are to be allocated to each of its constituent elements.	This document serves as a vehicle to communicate the high-level quantitative and qualitative characteristics of the SKA Phase 1 Observatory in the form of formal requirements that are to be allocated to each of its constituent elements.

Document No.: SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY
Revision: 6 Author: W Turner

Date: 2015-04-23

Author: W Turner Page 253 of 275

Figure 6 SKA Phase 1 System Requirements Specification Context

Figure 1 provides an initial simplified context assumed for this document in relation to other SKA documentation. There may be changes to the figure as the system engineering process progresses.

This figure should be studied carefully since the SKA development process may not be as expected. In particular, the root document is the Baseline Design, not the Level 0 requirements;

There are no security, intellectual property, or privacy considerations attached to the use or distribution of this document.

New diagram to be inserted

Figure 1 SKA Phase 1 System **Requirements Specification** Context

Figure 1 provides an initial simplified context assumed for this document in relation other SKA to documentation.There be may changes to the figure as the system engineering process progresses. This figure should be studied carefully since the SKA development process may not be as expected. In particular, the root document is not the Level 0 requirements;

There are no security, intellectual property, or privacy considerations attached to the use or distribution of this document.

Approach

This document will reside within a requirements capture tool (Jama Contour) and for each requirement statement will include relational links back to the following source documents:

- Baseline Design
- Design Reference Mission/ Science Requirements
- Operations Concept Guidance

This document is a living document that will converge on the requirements for the SKA1 system. The convergence process is an iterative one between the SKA Office and the consortia involved with the Element design work.

At present, some requirement statements have no traceability link available back to higher level source documents. These will usually be

This document will reside within a requirements capture tool (Jama Contour) and for each requirement statement will include relational links back to the following source documents:

- Baseline Design + SKA-BD-17-13a and SKA-BD-17-13c rebase-lining documents presented to the SKA board.
- Science Priority Outcome
- **Operations Concept** Guidance

This document is a living document that will converge on the requirements for the SKA1 system. The convergence process is an iterative one between the SKA Office and the consortia involved with the Element design work.

SKA-TEL-SKO-0000008 Document No.:

Revision: 2015-04-23 Date:

FOR PROJECT USE ONLY Author: W Turner Page 254 of 275 identified as TBJ (to be justified). However, if no link is identified then it is to be assumed that this is the case. If the requirement cannot be justified it will be removed.

Each requirement identified within this document will have a unique four digit identifier preceded by a prefix of "SYS_REQ_". The identifier will be generated by the requirements capture tool. It provides a useful reference tag and indicates where in the system hierarchy the requirement resides.

Each requirement will identify the type of verification method.

The status of each requirement will be identified.

The allocation of requirements to Elements is provided in Appendix C of this document

The latest issued document will take precedence over the contents of the requirements capture tool. However, an issued Level 1 Requirement document represents a requirements capture tool baseline. The data base baseline identifier will be referenced in the document history.

Amendments to the document will be via change control. If accepted, amendments will be via the requirements capture tool. Up issue of this document will require a new baseline and export from the requirements tool and subsequent submission and approval via the Document Management System.

available back to higher level source documents. These will usually be identified as TBJ (to be justified). However, if no link is identified then it is to be assumed that this is the case. If the requirement cannot be justified it will be removed.

At present, some requirement

statements have no traceability link

Each requirement identified within this document will have a unique four digit identifier preceded by a short hand prefix of "SYS_REQ_". The identifier is a truncation of the "SKA1-SYS_REQ_" that is generated be generated by the requirements capture tool. It provides a useful reference tag and indicates where in the system hierarchy the requirement resides.

Each requirement will identify the type of verification method.

The status of each requirement will be identified.

The allocation of requirements to Elements is provided in Appendix C of this document

The latest issued document will take precedence over the contents of the requirements capture tool. However, an issued Level 1 Requirement document represents a requirements capture tool baseline. The data-base baseline identifier will be referenced in the document history.

Amendments to the document will be via change control. If accepted, amendments will be via the requirements capture tool. Up issue of this document will require a new baseline and export from the requirements tool and subsequent submission and approval via the Document Management System.

In the event of conflict between the contents of the applicable documents and this SKA1 System Requirement

Applicable documents

Date:

2015-04-23

In the event of conflict between the contents of the applicable documents and this SKA1 System Requirement

Document No.: SKA-TEL-SKO-000008

Revision: 6

FOR PROJECT USE ONLY Author: W Turner Page 255 of 275

Specification (SRS) document, the Specification (SRS) document, the applicable documents shall take applicable documents shall take precedence; precedence; [1] SKA1 System Baseline Design [1] SKA1 System Baseline Design SKA-TEL-SKO-DD-001 Rev 1 SKA-TEL-SKO-DD-001 Rev 1 [2] Concept of Operations for the [2] Concept of Operations for the **SKA Observatory SKA Observatory** SKA.TEL.SE.OPS-SKO-COO-001-SKA.TEL.SE.OPS-SKO-COO-001-0-A [3] Operational Concepts [in prep] [3] Operational Concepts [in prep] [4] EMI/EMC standards [in prep] [4] SKA EMI/EMC standards SKA EMI/EMC Standards and Procedures SKA-TEL-SKO-0000202-AG-RFI-ST-01 [5] SKA1_Low Configuration Coordinates (in preparation) [6] SKA1 Mid Configuration Coordinates (in preparation) [7] SKA1 Rebaselining outcome summary (in preparation) **Reference Documents** The following documents are The following documents are referenced in this document. In the referenced in this document. In the event of conflict between the event of conflict between the contents of the referenced contents of the referenced documents and this document, this documents and this document, this document shall take precedence. document shall take precedence. [5]SKA Science Working Group, "The [8]SKA Memo 130: 'SKA Phase 1: Square Kilometre Array Design Preliminary System Description', Reference Mission: SKA Phase 1", P.E. Dewdney et al, dated November report, v.1.3, January 2011. 2010. [6]SKA Science Working Group, "The [9]Logistics Engineering and Square Kilometre Array Design Management B.S. Blanchard Sixth reference Mission: SKA-mid and SKA-**Edition Prentice Hall** lo", report, v.0.4, October 2009 [10] Reliability-Centred Maintenance [7]SKA Memo 125: 'Concept Design John Moubray Second Edition for SKA Phase 1 (SKA₁)', M.A. Garrett, Butterworth-Heinemann J.M. Cordes, D. De Boer, J.L. Jonas, S. [11] Practical Reliability Engineering Patrick D.T. O'Connor Fourth Edition Rawlings, and R. T. Schilizzi (SSEC SKA Phase 1 Sub-committee), 30 Wiley May 2010. [12] System Engineering [8]SKA Memo 130: 'SKA Phase 1: Management B.S Blanchard Third Preliminary System Description', P.E. **Edition Wiley** Dewdney et al, dated November [13] The Basics of FMEA R.E. 2010. McDermott, R.J. Mikulak

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[9]Logistics Engineering and Management B.S. Blanchard Sixth **Edition Prentice Hall** [10] Reliability-Centred Maintenance John Moubray Second Edition **Butterworth-Heinemann** [11] Practical Reliability Engineering Patrick D.T. O'Connor Fourth Edition Wiley [12] System Engineering Management B.S Blanchard Third **Edition Wiley** [13] The Basics of FMEA R.E. McDermott, R.J. Mikulak [14] M.R. Beauregard Second Edition **CRC Press** [15] RFI Protection and Threshold Levels for the SKA SKA.TEL.OFF.PAQA.RFI-SK0-TN-001 (available T0 + 12 weeks) [16] Rau, U., Bhatnagar, S., Voronkov, M.A., and Cornwell, T.J., "Advances in Calibration and Imaging Techniques in Radio Interferometry", Proc IEEEE, 97, 1472-1481, (2008) [17] U. Rau and T. J. Cornwell, A multi-scale multi-frequency deconvolution algorithm for synthesis imaging in radio interferometry A&A 532, A71 (2011) [18] S.J. Wijnholds, J.D. Bregman and A.van Ardenne, Calibratability and its inmpact on configuration design for LOFAR and SKA phased array radio telescopes, Radio Science, vol. 46, No. RS0F07, 8 November 2011 [19] C.J. Lonsdale, D. Oberoi, A.J Coster and P.J Erickson, The Effects of Variable Ionospheric and Plasmaspheric Faraday Rotation on Low Frequency Radio Arrays, Proceedings of the XXXth General Assembly and Scientific Symposium of the Interation Union of Radio Science (URSI GASS), Istanbul (Turkey), 13 - 20 August 2011 [20] R. Braun SKA1 Array **Configurations SKA1 ARRAY** CONFIGURATIONS Rev1 2014-05-16.

[14] M.R. Beauregard Second Edition **CRC Press** [15] RFI Protection and Threshold Levels for the SKA SKA.TEL.OFF.PAQA.RFI-SK0-TN-001 (available T0 + 12 weeks) [16] Rau, U., Bhatnagar, S., Voronkov, M.A., and Cornwell, T.J., "Advances in Calibration and Imaging Techniques in Radio Interferometry", Proc IEEEE, 97, 1472-1481, (2008) [17] U. Rau and T. J. Cornwell, A multi-scale multi-frequency deconvolution algorithm for synthesis imaging in radio interferometry A&A 532, A71 (2011) [18] S.J. Wijnholds, J.D. Bregman and A.van Ardenne, Calibratability and its inmpact on configuration design for LOFAR and SKA phased array radio telescopes, Radio Science, vol. 46, No. RS0F07, 8 November 2011 [19] C.J. Lonsdale, D. Oberoi, A.J Coster and P.J Erickson, The Effects of Variable Ionospheric and Plasmaspheric Faraday Rotation on Low Frequency Radio Arrays, Proceedings of the XXXth General Assembly and Scientific Symposium of the Interation Union of Radio Science (URSI GASS), Istanbul (Turkey), 13 - 20 August 2011 [21] A. Schutte SKA1 Power Budget SKA-SE-POW-TN-001 Rev2

SKA-TEL-SKO-0000008 FOR PROJECT USE ONLY Document No.: Revision:

2015-04-23 Date:

	[64] 4 6 1 11 6444 5 5 1 1	<u> </u>
	[21] A. Schutte SKA1 Power Budget	
	SKA-SE-POW-TN-001 Rev2	
Observatory Structure	The product trees shown in this	Deleted
	section are extracted from a SysML	
	model of the baseline design, and	
	are included primarily to establish	
	product names.	
Observatory Product Tree	The top level observatory product	Deleted
,	tree is shown below.	
	Figure 3 Telescope Product Tree	
Murchison Radio	Figure 4 Murchison Radio	Deleted
Observatory Product Tree	Observatory Product Tree	2 0.000
Survey Array	Heading 3.5.1.5	Deleted
SYS_REQ-2125	SKA1_survey array. The SKA1	Deleted
313_KLQ-2123	survey array shall be located within	Deleted
	1	
	the legal boundary of the Boolardy station.	
SKA1 sumrou CSD Facility		Deleted
SKA1_survey CSP Facility	Heading 3.5.1.6 SKA1_survey CSP facility. The	Deleted
SYS_REQ-2655		Deleted
	CSP facility for SKA1_survey shall	
Australian Engineering	be the ASKAP processing facility.	Allocation: LEAA CCD CDD TM
Australian Engineering	Allocation: LFAA, CSP, SDP, TM,	Allocation: LFAA, CSP, SDP, TM,
Operations Centre	SADT, DSH	SADT
Observatory locations	Section 3.6	Deleted
-		5.1.1
SKA1_Low	Figure 7 SKA1_low Functional	Deleted
	Context	Deleted
	Context Figure 7 provides the functional	Deleted
	Context Figure 7 provides the functional context model for SKA1_low. This is	Deleted
-	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical	Deleted
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-	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created	Deleted
	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool	Deleted
	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the	Deleted
	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't	Deleted
	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for	Deleted
SKA1_Low	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration	Deleted
	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control.	
SKA1_Low SKA1_Low telescope	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control.	Deleted
SKA1_Low SKA1_Low telescope product tree	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1	
SKA1_Low SKA1_Low telescope product tree	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at	Deleted SKA1_Low array sensitivity at
SKA1_Low SKA1_Low telescope product tree	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall
SKA1_Low SKA1_Low telescope product tree	Context Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at
SKA1_Low SKA1_Low telescope product tree	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m²K-¹ at	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at
SKA1_Low SKA1_Low telescope product tree	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m ² K ⁻¹ at 50MHz when assuming a sky noise	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at 50MHz when assuming a sky noise
SKA1_Low SKA1_Low telescope product tree	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m²K-¹ at 50MHz when assuming a sky noise temperature following the law	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at 50MHz when assuming a sky noise temperature following the law
SKA1_Low telescope product tree SYS_REQ-2135	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m²K-¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda².55	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda ^{2.55}
SKA1_Low telescope product tree SYS_REQ-2135	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m²K-¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda ^{2.55} SKA1_Low array sensitivity at	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda ^{2.55} SKA1_Low array sensitivity at
SKA1_Low telescope product tree SYS_REQ-2135	Figure 7 provides the functional context model for SKA1_low. This is an export from the hierarchical model for the SKA1 system created in Magic Draw system modelling tool utilising the formalism of the graphical SysML language. It is for information only as the model isn't currently under configuration control. Section 4.1.1 SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 144 m²K-¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda².55 SKA1_Low array sensitivity at 110MHz. The SKA1_Low array shall	Deleted SKA1_Low array sensitivity at 50MHz. The SKA1_Low array shall have sensitivity per polarization at zenith greater than 72 m ² K ⁻¹ at 50MHz when assuming a sky noise temperature following the law 60.lamda ^{2.55} SKA1_Low array sensitivity at 110MHz. The SKA1_Low array shall

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 258 of 275

	MHz when assuming a sky noise	MHz when assuming a sky noise
		_ ,
	temperature following the law	temperature following the law
	60.lambda^2.55	60.lambda^2.55
SYS_REQ-2137	SKA1_Low array sensitivity at	SKA1_Low array sensitivity at
	160MHz . The SKA1_Low array shall	160MHz . The SKA1_Low array shall
	have a sensitivity per polarization at	have a sensitivity per polarization at
	zenith of greater than 1070 m ² K ⁻¹ at	zenith of greater than 535 m ² K ⁻¹ at
	160 MHz when assuming a sky noise	160 MHz when assuming a sky noise
	temperature following the law	temperature following the law
	60.lambda^2.55	60.lambda^2.55
SYS_REQ-2138	SKA1_Low array sensitivity at	SKA1_Low array sensitivity at
	220MHz. The SKA1_Low array shall	220MHz. The SKA1_Low array shall
	have a sensitivity per polarization at	have a sensitivity per polarization at
	zenith of greater than 1060 m ² K ⁻¹ at	zenith of greater than 530 m ² K ⁻¹ at
	220 MHz when assuming a sky noise	220 MHz when assuming a sky noise
	temperature following the law	temperature following the law
	60.lambda^2.55.	60.lambda^2.55.
SYS_REQ-2814	SKA1_Low array sensitivity per	SKA1_Low array sensitivity per
<u> </u>	polarization at 280 MHz. The	polarization at 280 MHz. The
	SKA1 Low array shall have a	SKA1 Low array shall have a
	sensitivity per polarization at zenith	sensitivity per polarization at zenith
	greater than 1000 m^2/K at 280	greater than 500 m^2/K at 280 MHz
	MHz when assuming a sky noise	when assuming a sky noise
	temperature following the law	temperature following the law
	60.lambda^2.55	60.lambda^2.55
I CVC DEA 31/13		
SYS_REQ-2142	SKA1_Low shall comprise of 1024	SKA1_Low number of stations. The
SYS REQ-2142	SKA1_Low shall comprise of 1024	SKA1_Low shall comprise of 512
_	SKA1_Low shall comprise of 1024 stations.	SKA1_Low shall comprise of 512 stations.
SKA1_Low 600m	SKA1_Low shall comprise of 1024	SKA1_Low shall comprise of 512
SKA1_Low 600m configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration
SKA1_Low 600m	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration SKA1_Low 600m configuration.	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration SKA1_Low configuration. The
SKA1_Low 600m configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration
SKA1_Low 600m configuration SYS_REQ-2143	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius.	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD.
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline
SKA1_Low 600m configuration SYS_REQ-2143	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius.	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius.	SKA1_Low shall comprise of 512 stations. SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius. Heading 4.1.2.17	SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius. Heading 4.1.2.17 SKA1_low spiral arm configuration. The SKA1_Low shall have a	SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm configuration	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius. Heading 4.1.2.17 SKA1_low spiral arm configuration.	SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm configuration SYS_REQ-2145	SKA1_Low shall comprise of 1024 stations. SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius. Heading 4.1.2.17 SKA1_low spiral arm configuration. The SKA1_low shall have a configuration of 3 spiral arms	SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted Deleted Deleted
SKA1_Low 600m configuration SYS_REQ-2143 SKA1_Low 1000m core configuration SYS_REQ-2144 SKA1_Low spiral arm configuration	SKA1_Low 600m configuration SKA1_Low 600m configuration. The SKA1_Low shall have 50% of its antennas within a 600 metre radius. SKA1_Low maximum baseline length between stations. The maximum distance between stations shall be approximately100 km SKA1_Low core configuration. The SKA1_low shall have 75% of its antennas within a 1000 metre radius. Heading 4.1.2.17 SKA1_low spiral arm configuration. The SKA1_low shall have a configuration of 3 spiral arms beyond a radius of 1,000 metres.	SKA1_Low configuration SKA1_Low configuration. The SKA1_Low shall have a configuration as specified in TBD. SKA1_Low maximum baseline length between stations. The maximum distance between station centres shall be approximately 80 km Deleted Deleted

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 259 of 275

	maximum distance between stations	maximum distance between stations
	shall be approximately100 km	shall be approximately 80 km
SYS_REQ-2652	SKA1_Low separation. The	SKA1_Low separation. The
	SKA1_Low core shall be located at a	SKA1_Low core shall be located at a
	minimum distance of 10km from the	minimum distance of 10km from the
	ASKAP core.	ASKAP core.
SYS_REQ-2148	SKA1_Low channelisation. The	SKA1_Low channelisation. The
	SKA1_Low channelisation for each	SKA1_Low channelisation for each
	sub array shall provide up to 256,000	sub array shall provide up to 65,536
	linearly spaced frequency channels	linearly spaced frequency channels
	across the available frequency range	across the available frequency range
	of each band.	of each band.
SKA1-SYS REQ-2150	SKA1_Low correlator Integration	SKA1_Low correlator Integration
	rate. The SKA1_Low correlator for	rate . T he SKA1_Low correlator
	each sub array shall have	for each sub array shall have
	independently configurable visibility	independently configurable visibility
	integration periods in the range 6s to	integration periods in the range 9s to
	0.6s.	0.9s.
SYS REQ-2162	Number of receivers. There shall be	Number of feeds. There shall be
	space at the Gregorian focus of SKA1	space at the Gregorian focus of SKA1
	dishes for five single pixel feeds (SPF)	dishes for five single pixel feeds (SPF)
	or three Phased Array Feeds (PAF)	or three Phased Array Feeds (PAF)
SKA1_Mid	Figure 9 SKA1_Mid Functional	Deleted
	Context	2 0.000
	Figure 9 provides the functional	
	context model for SKA1_Mid. This is	
	an export from the hierarchical	
	model for the SKA1 system created	
	7	
	in Magic Draw system modelling tool	
	utilising the formalism of the	
	graphical SysML language.	D. 1. 1
SKA1_Mid Telescope	Section 4.3.1	Deleted
product tree	On white and OKAA Asia	Operation and Olympia Maint
SYS_REQ-2174	Combined SKA1 Mid	Combined SKA1 Mid
	Configuration. 42 % of the	Configuration. The
	Combined SKA1_Midshall be within	SKA1_Mid_shall have the
	a radius of 400 m of the array centre.	configuration defined in the TBD
Combined SKA1_Mid	Heading 4.3.2.4	Deleted
configuration 1,000m		
SYS_REQ-2175	Combined SKA1_Mid	Deleted
	configuration . 17 % of the	
	combined SKA1_Mid array shall be	
	within a radius of between 400 and	
	1,000 m of the array centre.	2.1
Combined SKA1_Mid	Heading 4.3.2.5	Deleted
configuration 2,500m		
SYS_REQ-2176	Combined SKA1_Mid	Deleted
	configuration . 16 % of the	
	combined SKA1_Mid array shall be	
	within a radius between 1,000m and	
	2,500 m of the array centre.	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 260 of 275

Combined SKA1_Mid	Heading 4.3.2.6	Deleted
configuration 4,000m		
SKA1-SYS_REQ-2177	Combined SKA1_Mid	Deleted
	configuration . 11 % of the	
	combined SKA1_Mid array shall be	
	within a radius between 2,500m and	
	4,000 m of the array centre.	
Combined SKA1_Mid	Heading 4.3.2.7	Deleted
configuration 100,000m		
SYS_REQ-2178	Combined SKA1_Mid configuration.	Deleted
	14 % of the combined SKA1_Mid	
	array shall be within a radius	
	between 4,000m and 100,000 m of	
	the array centre.	
SYS_REQ-2712	SKA1_Mid antenna. The SKA1_Mid	SKA1_Mid antenna. The SKA1_Mid
	array shall consist of 190 antennas	array shall consist of 133 antennas
	centred in the same location as the	centred in the same location as the
	MeerKAT array	MeerKAT array
SYS_REQ-2195	SKA1 Mid channelisation. The	SKA1_Mid channelisation. The
	SKA1_Mid channelisation for each	SKA1_Mid channelisation for each
	sub array shall provide up to 256,	sub array shall provide up to 65,536
	000 linearly spaced frequency	linearly spaced frequency channels
	channels across the sampled	across the sampled bandwidth of
	bandwidth of each band.	each band.
SKA1_Mid correlation	SKA1_Mid correlation integration	SKA1_Mid correlation integration
integration time	period. The SKA1_Mid shall have	period. The SKA1_Mid shall have
	independently configurable visibility	independently configurable visibility
	integration period from a maximum	integration period from a maximum
	integration time of 0.8s to a	integration time of 1.4s to a
	minimum of 0.08s for each subarray.	minimum of 0.14s for each subarray.
SYS_REQ-2616	SKA1_Mid Pulsar phase binning.	SKA1_Mid Pulsar phase binning.
	The SKA1_Mid, for each subarray,	The SKA1_Mid, for each subarray,
	shall allow for pulse phase-resolved	shall allow for pulse phase-resolved
	observations supporting the product	observations supporting the product
	of the number of phase bins, channel	of the number of phase bins, channel
	and polarisation products up to	and polarisation products up to
646 550 2000	1,000,000 (i.e. 4 x 256,000).	262,144 (i.e. 4 x 65,536).
SYS_REQ-2203	Number of beams: Pulsar search.	Number of beams: Pulsar search.
	SKA1_Mid, when performing the	SKA1_Mid, when performing the
	Pulsar Search function, shall	Pulsar Search function, shall
	simultaneously form up to a total of	simultaneously form up to a total of
	2222 beams per observation across	1111 beams per observation across
	all sub arrays.	all sub arrays.
SYS_REQ-2765	Pulsar search sub-array support.	Pulsar search sub-array support.
	The SKA1_Mid Pulsar search shall	The SKA1_Mid Pulsar search shall
	be able to independently process a	be able to independently process a
	total of up to 2222 beams from one to	total of up to 1111 beams from one to
	sixteen sub-arrays independently and	sixteen sub-arrays independently and
SVA1 Survoy	concurrently. Figure 7 SKA1_Survey Context diagram	concurrently. Deleted
SKA1_Survey	i igui e / SixA1_Sui vey Context diagram	Deleted

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 261 of 275

		T
	Figure 11 provides the functional	
	context model for SKA1_survey.	
	This is an export from the	
	hierarchical model for the SKA1	
	system created in Magic Draw	
	system modelling tool utilising the	
	formalism of the graphical SysML	
	language.	
SKA1_Survey Telescope	Section 4.4.1	Deleted
	Section 4.4.1	Deleteu
product tree	TT P . 4.4.2	D.L. I
SKA1_Survey array	Heading 4.4.2	Deleted
SYS_REQ-2732	SKA1_survey array. The	Deleted
	SKA1_Survey array shall consist of 60	
	antennas centred in the same	
	location as the ASKAP array.	
SKA1_Survey	Heading 4.4.3	Deleted
configuration and		
performance		
SKA1 survey inclusion of	Heading 4.4.3.1	Deleted
ASKAP	11cduing 4.4.5.1	Beletta
	SVA1 Survey inclusion of ASVAD	Deleted
SYS_REQ-2262	SKA1_Survey inclusion of ASKAP.	Deleted
	The SKA1_Survey shall incorporate	
	the 36 ASKAP antennas in both	
	monitor and control and data	
	collection functions.	
SYS_REQ-2832	Monitor and Control of ASKAP . The	Deleted
	monitor and control functions of	
	ASKAP shall be made available to	
	SKA1_Survey via a Foreign Telescope	
	interface consisting of a Local	
	Monitor and Control system	
	connected to the SKA1_Survey	
CVC DEC 2225	Telescope Manager.	D.L. I
SYS_REQ-2265	SKA1_Survey- ASKAP	Deleted
	infrastructure reuse. Where	
	economically practicable, the	
	existing ASKAP infrastructure will	
	be reused.	
SKA1_Survey	Heading 4.4.3.2	Deleted
configuration < 400m	Filling factor 0.25%	
SYS_REQ-2232	SKA1_Survey configuration. 12%	Deleted
	of the SKA1_Survey dishes shall be	
	within a radius of 400 m of the array	
	centre.	
SKA1_Survey	Heading 4.4.3.3	Deleted
configuration 400m to	Filling factor 0.082%	
1000m		
SYS REQ-2233	SKA1_Survey configuration. 20%	Deleted
	of the SKA1_Survey Dishes shall be	
Ì		1
	located in an area with a radius of	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 262 of 275

	loss than 1000m and greater than	
	less than 1000m and greater than 400m from the array centre.	
CVA1 Comment	Ü	Deleted
SKA1_Survey	Heading 4.4.3.4	Deleted
configuration 1,000m to	Filling factor 0.031%	
2,500		
SYS_REQ-2234	SKA1_Survey configuration. 30%	Deleted
	of the SKA1_Survey Dishes shall be	
	located in an area with a radius of	
	less than 2500m and greater than	
	1000m from the array centre	
SKA1_Survey	Heading 4.4.3.5	Deleted
configuration 2,500 to	Filling factor 0.008%	
4,000m		
SYS_REQ-2235	SKA1_survey configuration . 16%	Deleted
	of the SKA1_Survey array shall be	
	within a radius of 2,500 m and 4,000	
	m of the array centre.	
SKA1_Survey	Heading 4.4.3.6	Deleted
configuration 4,000m to	Filling factor 1.2 x 10 ⁻⁵ %	
25,000		
SYS REQ-2236	SKA1_Survey configuration . 22% of	Deleted
	the SKA1_Survey array shall be	
	within a radius of 4,000 m and	
	25,000 m of the array centre.	
Antenna RF system	Heading 4.4.3.7	Deleted
Antenna Kr system	Tituding 4.4.5.7	Deleted
SYS_REQ-2237	Antenna RF system. For all	Deleted
313_KEQ 2237	SKA1_Survey antennas, only one	Beleted
	PAF system shall be available at any	
	one time	
RF system frequency	Heading 4.4.3.8	Deleted
range PAF band 1	11cuting 4.4.5.0	Beleted
	RF system frequency range PAF	Deleted
SYS_REQ-2238	band 1 The SKA1 Survey PAF for	Deleted
	band 1 shall have a frequency range	
	from 350 to 900 MHz for each	
	polarisation.	
RF system frequency	Heading 4.4.3.9	Deleted
range PAF band 2	iredulig 4.4.5.5	Delette
SYS REQ-2239	RF system frequency range PAF	Deleted
313_REQ-2239	band 2 The SKA1_Survey PAF for	Deteted
	band 2 shall have a frequency range	
	from 0.650 to 1.670 GHz for each	
	polarisation.	
RF system frequency	Heading 4.4.3.10	Deleted
range PAF band 3	incaunig 4.4.3.10	Defeteu
	DE system fragues as PAE	Dolotod
SYS_REQ-2240	RF system frequency range PAF	Deleted
	band 3 The SKA1_Survey PAF for	
	band 3 shall have a frequency range from 1.500 to 4.000 GHz for each	
	TOTAL T.SOU TO 4.000 PHZ IOL GGCU	
	polarisation.	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 263 of 275

Maximum available bandwidth	Heading 4.4.3.11	Deleted
SYS_REQ-2241	Maximum available bandwidth The SKA1_Survey shall have a PAF bandwidth of at least 500 MHz for each polarisation and beam	Deleted
SKA1_Survey digitised bandwidth	Heading 4.4.3.12	Deleted
SYS_REQ-2242	SKA1_Survey digitised bandwidth The SKA1_Survey digitised bandwidth for each PAF shall be greater than 500 MHz for each polarisation.	Deleted
SKA1_Survey - superimposed beams	Heading 4.4.3.13	Deleted
SYS_REQ-2260	SKA1_Survey – coincident beams ASKAP PAF and SKA1 PAF beamforming chains shall be capable of locating beams with identical phase and delay centres to within an accuracy set by the signal to noise ratio.	Deleted
SKA1_Survey PAF1 diameter	Heading 4.4.3.14	Deleted
SYS_REQ-2243	SKA1_Survey PAF1 diameter The SKA1_Survey PAF diameter shall be equal to or less than 1.82 m.	Deleted
SKA1_Survey PAF2 diameter	Heading 4.4.3.15	Deleted
SYS_REQ-2244	SKA1_Survey PAF2 diameter The SKA1_Survey PAF2 diameter shall be 1.0 m.	Deleted
SKA1_Survey PAF3 diameter	Heading 4.4.3.16	Deleted
SYS_REQ-2245	SKA1_Survey PAF3 diameter The SKA1_Survey PAF3 diameter shall be 0.41 m.	Deleted
SKA1_Survey number of PAF elements	Heading 4.4.3.17	Deleted
SYS_REQ-2246	SKA1_Survey number of PAF elements. The SKA1_Survey PAF arrays shall have 94 dual polarisation elements.	Deleted
SKA1_Survey array sensitivity	Heading 4.4.3.18	Deleted
SYS_REQ-2253	SKA1_Survey array sensitivity. The SKA1_Survey array shall have a net sensitivity of better than: 235 m 2 K -1 for PAF band 1 for but not with 391 m 2 K -1 for PAF band 2	Deleted

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 264 of 275

	1	
	293 m 2 K -1 for PAF band 3 for but not with	
	These array sensitivities are based on the total collecting area, of the SKA1	
	Survey Array, including the 36 ASKAP antennas, and a 80 %	
	aperture efficiency resulting in an	
	effective collecting area of 11.740 m 2 .	
SKA1_Survey imaging	Heading 4.4.3.19	Deleted
dynamic range		
SYS_REQ-2256	SKA1_Survey imaging dynamic range – band 1. The SKA1_Survey array shall have an imaging dynamic	Deleted
	range of greater than:	
	band 1: 55dB for a 1000 hour single-field integration	
	band 2: 56dB for a 1000 hour single-	
	field integration	
	band 3: 54dB for a 1000 hour single-field integration	
SKA1_Survey derotation	Heading 4.4.3.20	Deleted
SYS_REQ-2266	SKA1_Survey derotation. SKA1_Survey shall provide PAF	Deleted
	rotation capability sufficient to orient	
	Phased Array Feed beams on a sky	
	coordinate frame independent of parallactic angle.	
SKA1-Survey single array	Heading 4.4.3.21	Deleted
operation		
SYS_REQ-2263	SKA1_Survey single array operation . SKA1-Survey shall be	Deleted
	capable of operating ASKAP and	
	SKA1 dishes as single array for	
	frequency band 2.	
SKA1_Survey sub- arraying	Heading 4.4.3.22	Deleted
SYS_REQ-2264	SKA1_Survey sub-arraying. It	Deleted
	shall be possible to split the	
	SKA1_Survey array into independent operable ASKAP and SKA1 dish	
	sub-arrays.	
Absolute flux scale	Heading 4.4.3.23	Deleted
SYS_REQ-2828	Absolute flux scale: The absolute	Deleted
	flux scale shall be accurate to 5% rms	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 265 of 275

SYS_REQ-2829	Absolute flux scale: The absolute	Deleted
313_KEQ-2023	flux scale shall be accurate to 3%	Beleted
	rms	
SKA1_Survey	Heading 4.4.4	Deleted
beamformer	Treating 4.4.4	Delettu
SKA1_Survey number of	Heading 4.4.4.1	Deleted
beams	11caung 4.4.4.1	Deleted
SYS REQ-2247	SKA1_Survey number of beams.	Deleted
313_REQ-2247	The SKA1_Survey shall beam-form	Deleted
	the element signals in each band to	
	provide 36 full bandwidth, dual	
	polarisation beams per antenna.	
SKA1_Survey beam	Heading 4.4.4.2	Deleted
quantisation	Treating II II II	Belette
SYS_REQ-2248	SKA1_Survey beam quantisation.	Deleted
313_KLQ-2240	The SKA1_Survey processing shall	Delettu
	quantise beams passed to the	
	correlator to 8 effective bits.	
PAF beam properties	Heading 4.4.4.3	Deleted
SYS_REQ-2780	Control of PAF beam properties:	Deleted
	It shall be possible to control specific	
	properties of the PAF beam by	
	setting the PAF weights	
	appropriately .	
SKA1_Survey correlator	Heading 4.4.5	Deleted
SKA1_Survey correlator	Heading 4.4.5.1	Deleted
sub-array support		
SYS_REQ-2781	SKA1_Survey correlator sub-array	Deleted
	support. The SKA1_Survey	
	correlator shall be able to correlate	
	SKA1_Survey station beams from	
	one to sixteen sub-arrays	
	independently and concurrently.	
SKA1_Survey	Heading 4.4.5.2	Deleted
channelisation		
SYS_REQ-2250	SKA1_Survey correlator sub-array	Deleted
	support . The SKA1_Survey	
	correlator shall be able to correlate	
	SKA1_Survey station beams from	
	one to sixteen sub-arrays	
01/0 PEO 0700	independently and concurrently.	D.L. I
<u>SYS_REQ-2782</u>	SKA1_Survey channeliser	Deleted
	maximum leakage power for	
	adjacent channels. The	
	SKA1_Survey channeliser for each	
	sub-array shall have a maximum noise leakage power from	
	immediately adjacent channels of < -	
	30 dB.	
SYS_REQ-2807	SKA1_Survey channelisation	Deleted
575_NEQ 2007	maximum leakage power for non-	2000
	adjacent channels. The	
	adjacent enumers. The	

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 266 of 275

SKA1_Survey channels sation shall have a maximum noise leakage power from non adjacent frequency channels better than -60 dB. SYS_REQ_2808 SKA1_Survey fine frequency channels for the fine frequency channels will be the state and amplitude variation. The fine frequency channels for the SKA1_Survey channels a function of frequency of less than 0.01 dB. SYS_REQ_2809 SKA1_Survey fine frequency channel band edge. The fine frequency cells for the SKA1_Survey channeliser shall have a -3dB transition band amplitude at the channel band edge. SKA1_Survey correlation signal to noise. The SKA1_Survey correlation signal to noise. The SKA1_Survey correlation signal to noise. The SKA1_Survey correlation signal to noise. The SKA1_Survey correlation time are stated to the signal to Noise and the state of the state of the signal to Noise and the state of the signal to Noise and the state of the state of the state of the signal to Noise and the state of the state of the state of the state of the state of the state of the state of the state of the st		I	T
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Channels better than -60 dB.		have a maximum noise leakage	
Channels better than -60 dB.		power from non adjacent frequency	
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SKA1 Survey shall be able to	<u>SYS_REQ-2784</u>		Deleted
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 267 of 275

	generate VLBI beams from sub-	
	arrays with receptors separated by	
	up to 25km	
SYS_REQ-2785	SKA1_Survey VLBI beam centre	Deleted
	frequency . SKA1_Survey shall be	
	able to form a VLBI beam with a	
	0.01MHz step selectable centre	
	frequency within the boundaries of	
	the defined frequency bands for	
	SKA1_Survey.	
SYS_REQ-2778	SKA1_Survey VLBI beam bandwidth.	Deleted
	SKA1_Survey VLBI beamforming shall	
	have a contiguous processing	
	bandwidth up to the full bandwidth	
	of the selected band	
SYS REQ-2813	SKA1_Survey VLBI beamformer S/N	Deleted
	performance. SKA1 Survey VLBI	
	beamforming shall have the Signal to	
	Noise ratio by more than 98%	
	compared to an ideal analogue beam	
	former.	
SYS REQ-2862	SKA1_Survey VLBI store the time-	Deleted
313_KEQ-2802	dependent antenna weight.	Delettu
	SKA1_Survey shall be able to store	
	the time-dependent antenna weights	
	used for each tied-array beam sum.	
SVS DEO 3963	SKA1_Survey VLBI timestamp	Deleted
		Deleteti
SYS_REQ-2863		
313_NLQ-2003	accuracy. SKA1_Survey shall be able	
313_NEQ-2003	accuracy . SKA1_Survey shall be able to generate data from the VLBI	
313_NLQ-2003	accuracy. SKA1_Survey shall be able to generate data from the VLBI beams with samples traceable to a	
313_NLQ-2003	accuracy. SKA1_Survey shall be able to generate data from the VLBI beams with samples traceable to a timestamp with an accuracy of 1	
	accuracy. SKA1_Survey shall be able to generate data from the VLBI beams with samples traceable to a timestamp with an accuracy of 1 nsec or better.	
SYS_REQ-2864	accuracy. SKA1_Survey shall be able to generate data from the VLBI beams with samples traceable to a timestamp with an accuracy of 1 nsec or better. SKA1_Survey VLBI beams sampling	
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SYS_REQ-2864 SYS_REQ-2865	accuracy. SKA1_Survey shall be able to generate data from the VLBI beams with samples traceable to a timestamp with an accuracy of 1 nsec or better. SKA1_Survey VLBI beams sampling rate. SKA1_Survey shall be able to output VLBI beams with a sampling rate selectable between Nyquist and oversampled rates for the selected bandwidth. SKA1_Survey VLBI beamforming. SKA1_Survey shall be able to allocate antennas to be included in, or excluded from, individual tied-array beams. SKA1_Survey VLBI relative sensitivity and coherence. The	Deleted Deleted
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 268 of 275

SYS_REQ-2867	SKA1_Survey VLBI configurability.	Deleted
313_REQ-2807		Deleted
	SKA1_Survey shall be able to change	
	the pointing, centre frequency, and	
	bandwidth of the individual tied-	
	array beams within a single observing	
	schedule.	
<u>SYS_REQ-2868</u>	SKA1_Survey VLBI configurability .	Deleted
	SKA1_Survey shall be capable of	
	selecting, through configuration, 1, 2,	
	3, or 4 separate VLBI specific beams,	
	each with independently selectable	
	centre frequency, bandwidth,	
	frequency resolution and pointing.	
SYS REQ-2869	SKA1_Survey VLBI configurability.	Deleted
	SKA1_Survey shall be capable of	
	reconfiguring the centre frequency,	
	frequency band, and bandwidth for	
	each tied-array beam, in less than 30	
	seconds.	
SYS_REQ-2870	SKA1_Survey VLBI spectral	Deleted
<u>515_REQ 2576</u>	resolution. SKA1_Survey shall be	Beletta
	able to generate VLBI beams with a	
	spectral resolutions different from	
	the spectral resolution used for	
	·	
	imaging within the same VLBI sub-	
1	O WYON	
SVS DEO 2071	array	Deleted
SYS_REQ-2871	SKA1_Survey VLBI channel width.	Deleted
SYS_REQ-2871	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to	Deleted
SYS_REQ-2871	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a	Deleted
SYS_REQ-2871	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz,	Deleted
SYS_REQ-2871	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz,	Deleted
	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz, 16MHz, 4MHz or 1MHz	
SYS_REQ-2871 SYS_REQ-2872	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz, 16MHz, 4MHz or 1MHz SKA1_Survey VLBI imaging and	Deleted Deleted
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SYS_REQ-2872	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz, 16MHz, 4MHz or 1MHz SKA1_Survey VLBI imaging and beamforming. SKA1_Survey shall be able to simultaneously generate imaging data using all antennas in a VLBI sub-array, as well as generating the VLBI beams.	Deleted
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SYS REQ-2872 SYS REQ-2873	SKA1_Survey VLBI channel width. SKA1_Survey shall be able to generate VLBI beam data with a selectable channel width of: 512MHz, 256 MHz, 128MHz, 64MHz, 32MHz, 16MHz, 4MHz or 1MHz SKA1_Survey VLBI imaging and beamforming. SKA1_Survey shall be able to simultaneously generate imaging data using all antennas in a VLBI sub-array, as well as generating the VLBI beams. SKA1_Survey VLBI spectral line and time domain observation. SKA1_Survey shall be able to generate VLBI beams optimised for either spectral line observations (to mitigate spectral leakage) or time domain observations (to mitigate smearing). SKA1_Survey VLBI beams and sub-	Deleted Deleted
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Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 269 of 275

SYS_REQ-2875	SKA1_Survey VLBI array diameter.	Deleted
313_KEQ 2073	SKA1 Survey shall be able to	Beletta
	generate VLBI beams from sub-arrays	
	-	
	with receptors separated by up to	
	20km	2.1
SYS_REQ-2128	Continuum and spectral line	Deleted
	imaging mode. All three SKA1	
	telescopes shall be capable of	
	operating in a Continuum and	
	Spectral-line imaging mode	
	concurrently.	
SYS REQ-2126	Simultaneous operation of	Deleted
	telescopes. All three telescopes	
	shall be capable of operating	
	concurrently and independently.	
SYS_REQ-2127	Sub-Arraying. All of the SKA1	Deleted
313_KEQ 2127	telescopes shall be capable of	Beletted
	operating independently with one to	
	sixteen sub-arrays (i.e. collecting	
	area is split and allocated to separate,	
	concurrently observing programmes).	
SYS_REQ-2726	PAF DDE. There shall be a	Deleted
313_KEQ 2720	direction dependent model for the	Beleted
	dish phased array feed sensitivity	
	pattern to be used in calibration and	
	imaging.	
SYS REQ-2371		Deleted
SYS_REQ-2371	Visual monitoring. The	Deleted
SYS_REQ-2371	Visual monitoring. The infrastructure shall provide day and	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the	Deleted
SYS_REQ-2371	Visual monitoring. The infrastructure shall provide day and	Deleted
SYS_REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter	Deleted
SYS_REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring	Deleted
SYS REQ-2371	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and	Deleted
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	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing . For lightning protection of each dish	
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	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing . For lightning protection of each dish antenna the earthing system shall conform to the requirements of IEC 62305 and also to national standards	
	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing. For lightning protection of each dish antenna the earthing system shall conform to the requirements of IEC 62305 and also to national standards AS/NZS 3000 and AS/NZS 1768 or	
	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing. For lightning protection of each dish antenna the earthing system shall conform to the requirements of IEC 62305 and also to national standards AS/NZS 3000 and AS/NZS 1768 or SANS 10142 and 10313. National	
SYS_REQ-2397	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing. For lightning protection of each dish antenna the earthing system shall conform to the requirements of IEC 62305 and also to national standards AS/NZS 3000 and AS/NZS 1768 or SANS 10142 and 10313. National standards shall take precedence.	Deleted
SYS_REQ-2397	Visual monitoring. The infrastructure shall provide day and night time capability for the operator(s) to visually monitor all antennas: for Dish antennas this shall be at every dish, for LFAA this shall be located at each station in the spiral arms and also around the perimeter of the core area. Monitoring to deliver images at least one per minute for purposes of security and general telescope visual monitoring and shall be able to detect personnel at each dish and within each LFAA station. Dish Antenna earthing. For lightning protection of each dish antenna the earthing system shall conform to the requirements of IEC 62305 and also to national standards AS/NZS 3000 and AS/NZS 1768 or SANS 10142 and 10313. National standards shall take precedence. VLBI data sources. The	Deleted

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 270 of 275

		I
	VLBI data acquisition system. The	
	interface between the telescopes	
	SAK1_Mid and SkA1_Survey and	
	the external VLBI data acquisition	
	system shall be compliant with the	
	ICD SKA-TEL-SKO-0000116	
SYS_REQ-2841	Infrastructure for VLBI	Deleted
	equipment:. The following	
	infrastructure shall be provided to	
	allow eventual outfitting of	
	SKA1_Mid and SKA1_Survey with	
	VLBI equipment:	
	Adequate access for the potential	
	fitment of VLBI equipment	
	Equipment space	
	Power	
	Cooling	
	Cable trays	
ASKAP to SKA1_survey	Heading 9.1.2	Deleted
CSP		
SYS REQ-2411	ASKAP to SKA1_survey CSP	Deleted
	interface . The interface between	
	ASKAP and SKA1_survey CSP shall	
	be compliant with SKA-	
	TEL.AIV.SE-TEL.CSP.SE-ICD-002	
	Interface Control Document.	
ASKAP to SKA1_survey	Heading 9.1.4	Deleted
SADT		
SYS_REQ-2413	ASKAP to SKA1_survey SADT	Deleted
	interface . The interface between	
	ASKAP and SKA1_survey SADT	
	shall be compliant with SKA-	
	TEL.AIV.SE-TEL.SADT.SE-ICD-	
	002 Interface Control Document.	
ASKAP to SKA1_survey	Heading 9.1.6	Deleted
TM		
SYS_REQ-2415	ASKAP to SKA1_survey TM	Deleted
	interface . The interface between	
	ASKAP and SKA1_survey TM shall	
	be compliant with SKA-	
	TEL.AIV.SE-TEL.TM.SE-ICD-002	
	Interface Control Document.	
ASKAP to SKA1_INFRA	Heading 9.1.7	Deleted
SYS_REQ-2776	ASKAP to SKA1_INFRA	Deleted
	interface. The interface between	
	ASKAP/MRO and SKA1_INFRA	
	shall be compliant with the SKA-	
	TEL.AIV.INFRA.SE-ICD-002	
	Interface Control Document.	
Availability	The following applies to each of	The following applies to each of
	SKA1-low, SKA1-survey, and	SKA1-low and SKA1-mid telescopes
	SKA1-mid telescopes separately. In	separately. In general available
1		
	general available means that the	means that the telescope or a fraction

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 271 of 275 telescope or a fraction thereof as defined below is available to an operator to be scheduled for science or other operations.

Availability is defined as A=MTBF' / (MTBF' + MTTR'), where MTBF' is the mean time between failures (based on the conditional probability of failure), given that regular inspection or preventative maintenance is done, and MTTR' is the total time spent on these two activities plus any repair time.

- Availability
 Fraction is defined as
 (N Ae) / (Nmax
 Ae_max), where N is
 the number of
 schedulable major
 modes and Ae is the
 effective area
 available; Nmax is
 the number of major
 modes in the full set
 of defined modes;
 Ae_max is the
 maximum effective
 area of the telescope.
- Major modes correspond to the main categories of observations that the telescope is designed to carry out. For each frequency band defined for the telescope they are:
 - Spectral line observations.
 - O Pulsar search observations.
 - O Pulsar timing observations.

thereof as defined below is available to an operator to be scheduled for science or other operations.

Availability is defined as A=MTBF' / (MTBF' + MTTR'), where MTBF' is the mean time between failures (based on the conditional probability of failure), given that regular inspection or preventative maintenance is done, and MTTR' is the total time spent on these two activities plus any repair time.

- Availability
 Fraction is defined as
 (N Ae) / (Nmax
 Ae_max), where N is
 the number of
 schedulable major
 modes and Ae is the
 effective area
 available; Nmax is
 the number of major
 modes in the full set
 of defined modes;
 Ae_max is the
 maximum effective
 area of the telescope.
- Major modes correspond to the main categories of observations that the telescope is designed to carry out. For each frequency band defined for the telescope they are:
 - o Spectral line observations.
 - O Pulsar search observations.
 - Pulsar timing observations.

Document No.: SKA-TEL-SKO-000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 272 of 275

- O Continuum observations.
- O Transient detection.

The telescope system will have three availability states:

- 1. Available: The availability fraction is 95%
- 2. Degraded: The availability fraction is between 50 and 95%.
- 3. Unavailable: The availability fraction is less than 50%.

In a running average over a year, the design requirement is:

- Unavailable for <5%
 of the time,
 corresponding to ~18
 days per year.
- Degraded for <5% of the time, corresponding to ~18 days per year.
- Available >90% of the time, corresponding to ~329 days per year.

Natural disturbances of severity outside design boundaries are not counted against availability, unless the system does not behave according to design. The availability state depends only on the telescope, itself.

The operational state of all subsystems shall be defined as 'failed', 'degraded' or 'available'. It shall be possible to sense and log the operational state (failed, degraded, or available) of every sub-system at the system level.

- Continuum observations.
- Transient detection.

The telescope system will have three availability states:

- 1. Available: The availability fraction is 95%
- 2. Degraded: The availability fraction is between 50 and 95%.
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Document No.: SKA-TEL-SKO-0000008

Revision: 6

Date: 2015-04-23

FOR PROJECT USE ONLY Author: W Turner Page 273 of 275

SKA1_survey availability	Section 23.3	Deleted
allocations		

25 Glossary

A selected glossary extracted from IEEE Std 1233:

baseline: A specification or system that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development and can be changed only through formal change control procedures. (IEEE Std 610.12-1990)

constraint: A statement that expresses measurable bounds for an element or function of the system. That is, a constraint is a factor that is imposed on the solution by force or compulsion and may limit or modify the design changes.

derived requirement: A requirement deduced or inferred from the collection and organization of requirements into a particular system configuration and solution.

customer(s): The entity or entities for whom the requirements are to be satisfied in the system being defined and developed. This can be an end-user of the completed system, an organization within the same company as the developing organization (e.g., System Management), a company or entity external to the developing company, or some combination of all of these. This is the entity to which the system developer must provide proof that the system developed satisfies the system requirements specified.

end user: The person or persons who will ultimately be using the system for its intended purpose. **environment:** The circumstances, objects, and conditions that will influence the completed system; they include political, market, cultural, organizational, and physical influences as well as standards and policies that govern what the system must do or how it must do it.

function: A task, action, or activity that must be accomplished to achieve a desired outcome.

model: A representation of a real world process, device, or concept.

prototype: An experimental model, either functional or non-functional, of the system or part of the system. A prototype is used to get feedback from users for improving and specifying a complex human interface, for feasibility studies, or for identifying requirements.

raw requirement: An environmental or customer requirement that has not been analysed and formulated as a well-formed requirement.

representation: A likeness, picture, drawing, block diagram, description, or symbol that logically portrays a physical, operational, or conceptual image or situation. requirement:

- (A)A condition or capability needed by a user to solve a problem or achieve an objective.
- (B)A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
- (C)A documented representation of a condition or capability as in definition (A) or (B). (IEEE Std 610.12-1990)

system: An interdependent group of people, objects, and procedures constituted to achieve defined objectives or some operational role by performing specified functions. A complete system includes all of the associated equipment, facilities, material, computer programs, Firmware, technical documentation, services, and personnel required for operations and support to the degree necessary for self-sufficient use in its intended environment.

System Requirement Specification (SyRS): A structured collection of information that embodies the requirements of the system.

testability: The degree to which a requirement is stated in terms that permit establishment of test criteria and performance of tests to determine whether those criteria have been met. (IEEE Std 610.12-1990)

traceability: The degree to which a relationship can be established between two or more products of the development process, especially products having a predecessor-successor or master-subordinate

Document No.: SKA-TEL-SKO-000008 FOR PROJECT USE ONLY Revision: Author: W Turner

2015-04-23 Date:

Page 274 of 275

relationship to one another; e.g., the degree to which the requirements and design of a given system element match.(IEEE Std 610.12-1990)

validation: The process of evaluating a system or component during or at the end of the development process to determine whether a system or component satisfies specified requirements. (IEEE Std 610.12-1990)

verification: The process of evaluating a system or component to determine whether the system of a given development phase satisfies the conditions imposed at the start of that phase. (IEEE Std 610.12-1990)

well-formed requirement: A statement of system functionality (a capability) that can be validated, and that must be met or possessed by a system to solve a customer problem or to achieve a customer objective, and is qualified by measurable conditions and bounded by constraints.

Document No.:SKA-TEL-SKO-0000008FOR PROJECT USE ONLYRevision:6Author: W Turner

Date: 2015-04-23 Page 275 of 275