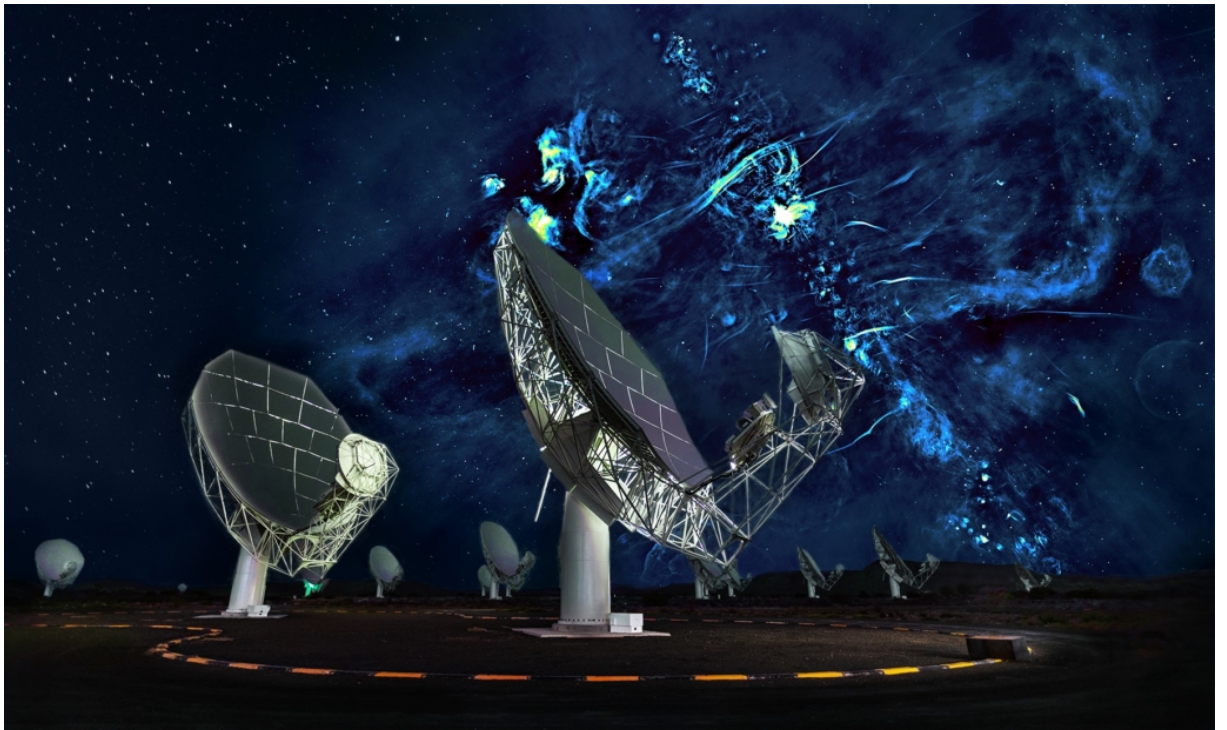


MeerKat Operator Manual

SARAO



Telescope Operators

Preface

This manual is designed to help new users (i.e Students,Visitors,) of the MeerKat Radio Telescope[] to link and to undestand basic operational procedures[], and scientific procedures[] that are being used to carry out scientific observations. The complexity of the instrument requires many software interfaces for instrument setup, scheduling, monitorig and maintenace management.

Most of the operational terminologies and commands can only be understood by people in the operations and commissioning divisions of SARA0, thus the document bridges that gap. The sientific community is more interested in underlying scientific methods, validation and qualification procedures that are the ultimate goal of all the operational activities.

Naming Conventions

The following typographical rules and standards [?] [1] have been adopted for this manual:

- Units
- Names of servers and computers
- Names of software packages
- Names of software programs
- Command line/terminal command e.g

```
ssh kat@obs.mkat.karoo.kat.ac.za
```
- Windows command
- Filename, e.g
- Program option
- Acchronyms
- Placeholder for changeable parameters
- Optional parameter,
- List of possible commands or parameters

List of acronyms

ABL	Allocated Baseline
Ac	Critical Availability
ADR	Architecture Design Review
AGN	Active Galactic Nuclei
Ai	Inherent Availability
AOR	Annual Operating Requirement
AR	Acceptance Review
BOM	Bill Of Material
CA	Criticality Analysis
CDR	Critical Design Review
DDR	Detail Design Review
D-Level	Deport Level
DLM	Depot Level Maintenance
FAT	Factory Acceptance Tests
FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes, Effects and Criticality Analysis
FPGA	Field Programmable Gate Array
FRACAS	Failure Reporting and Corrective Action System
GHz	Giga Hertz
GUI	Graphical User Interface
HartRAO	Hartbeeshoek Radio Astronomy Observatory
Hrs	Hours
I-Level	Intermediate Level
ILM	Intermediate Level Maintenance
ILOR	Intended Learning Outcomes Report
ILS	Integrated Logistic Support
ISO	International Standards Organisation
KAT-7	Karoo Array Telescope, 7 array
Kg	Kilogram
Km	Kilometer
L3/4/5	Level 3/Level 4/Level 5
LEMP	Logistic Engineering Management Plan
LRU	Line Replaceable Unit
LSA	Logistic Support Analysis
MBL	Manufacturing Baseline
MSCDR	Media Selection & Curriculum Development Report
MSP	Maintenance & Support Plan

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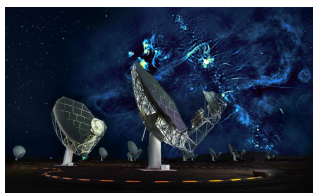
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Chapter 1

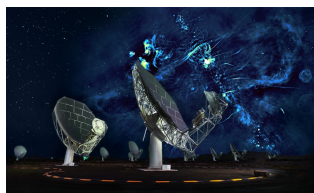
Introduction

1.1 Int

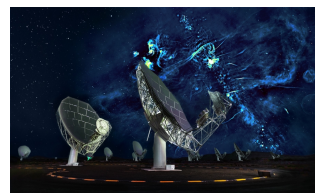
see **Figure:1.1**



(a) $y = x$



(b) $y = 3\sin x$



(c) $y = 5/x$

Figure 1.1: Three simple graphs

Chapter 2

Instrument Calibration Procedures

2.1 Receiver System Tests (RTS) and Calibration

2.2 Cable Delay Calibration

2.2.1 Band Pass Calibration

2.3 Phase-up and Phase Down

2.4 Pointing Calibration

2.4.1 Single Dish Pointing

Pointing Check

Interferometric Pointing

AP Motion Profilers

2.5 Holography Test

2.6 Digitiser attenuation levels

2.7 System Synchronisation

10

2.7.1 Digitiser Master Controller

2.7.2 Digitiser Synchronisation

2.7.3 Antenna Control Unit Synchronisation

Chapter 3

Safety Procedure

3.1 Operational Safety Procedure

Chapter 4

System Settings Procedures

4.1 Moving Skarabs

WARNING: *do not try to move the skarabs right after stopping or starting a subarray. The SKARABs need a couple of minutes to restart. Otherwise, they will not be found by the script, and will be left behind on the unwanted cmc.*

IP addresses:

cmc1: 10.103.254.1 and name: cmc1.cbf.mkat.karoo.kat.ac.za cmc2: 10.103.254.3 and name: cmc2.cbf.mkat.karoo.kat.ac.za, You can use the IP addresses or hostnames interchangeably (whichever you prefer)

This will connect to all the switches, discover which skarabs are currently online on the various ports, and move them to the requested master controller (-m switch).

From the obs Machine:

```
kcpcmd -t 10 -s cmc1.cbf.mkat.karoo.kat.ac.za:7147 resource-list | grep "up$"
```

(this will give you the number of skarabs available on cmc1.)

```
kcpcmd -t 10 -s cmc2.cbf.mkat.karoo.kat.ac.za:7147 resource-list | grep "up$"
```

(this will give you the number of skarabs available on cmc2.)

If moving to cmc1, use -m cmc1::

```
./usersnfs/cbf_support/./cmc_manage_skarabs.py -m cmc1 -a 5 6 7 8 9 10 11 12
```

If moving to cmc2 use -m cmc2:

```
./usersnfs/cbf_support/./cmc_manage_skarabs.py -m cmc2 -a 5 6 7 8 9 10 11 12  
-k cmc1 cmc2
```

This will connect to all the switches, discover which skarabs are currently online on the various ports, and move them to the requested master controller (-m switch).

4.2 Global Synchronisation

This script seeks to synchronize all digitisers to the Digitiser Master Controller so that signal/data coming into the correlator is in sync and correlates.

- Ensure epoch sync on all usable digitisers (all bands) is done for the day
- In the GUI, verify that all subarrays are inactive

4.2.1 Mark Digitiser Ready

4.3 Requesting which receptors have UHF-band digitisers

4.4 Receivers

4.5 AP Motion Profilers

4.5.1 To check if profilers are on or off

To switch profilers off

To switch profilers on

4.5.2 To check which antenna belong to which proxy

4.6 AP Point Error Tiltmeters

4.6.1 SE tilt sensor measurements observations [if wind
i 4 m/s]

4.6.2 Flights

Chapter 5

Chapter Three Title

Chapter 6

Chapter Four Title

Chapter 7

Conclusion

Appendix A

Appendix Title

Bibliography

- [1] Albert Einstein. International union of pure and applied physics. symbols, units, nomenclature and fundamental constants in physics. 322(10):891–921, 1905.