



**Atacama
Large
Millimeter
Array**

ALMA Product Tree

ALMA-80.03.00.00-001-O-LIS

Version: O

Status: Released

2007-06-08

Prepared By:		
Name(s) and Signature(s)	Organization	Date
Nathalie Thebaud	European Southern Observatory	2007-06-08
Approved By:		
Name and Signature	Organization	Date
Christoph Haupt		
Dick Sramek		
Released By:		
Name and Signature	Organization	Date
	Joint ALMA Office	



ALMA Project

ALMA Product Tree

Doc # : ALMA-80.03.00.00-001-O-LIS

Date: 2007-06-08

Status: Released

Page: 2 of 49

Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
A	2002-03-22	All	None	First Issue
B	2002-03-29	Site, Antennas Front Ends	None	Changed Site with Radford's PT, added Prototype Antenna PT, added Evaluation Receiver
C	2002-04-18	Backend, Management, Correlator	None	Major revision to these areas, based on requests from Sramek, Gray, and Treacy respectively
D	2002-05-08	Operations, Management, Computing, Systems, Science	None	Major revision, changes to document structure (first column dropped), significant changes to sections (see affected sections column), updated sections from Gray, Gray, Glendenning, Gray, and Wooten (and Radford), respectively
E	2002-05-23	Front End and Systems	None	Update FE PT branch, mainly first local oscillator related products; Systems, added in Quality Assurance section
F	2002-05-28	Computing	None	Update Computing PT branch, based upon changes by Ralph Marsen
G	2002-06-07	Antennas, Front End, Site	None	Update Antenna PT branch, based upon changes by J.Kingsley and S.Stanghellini, Added holography to FrontEnd, as per P.Gray, Added ATF site area to Sites, as per P.Gray
H	2002-07-10	Site, Antennas	None	Changed document number and formatting to fit with revised template and numbering requirements, corrected numbering in nutator section of Antenna PT branch, to add in skipped sequential numbers
I			None	Issue letter not used. Skipped.
J	2002-07-10	Site	None	Site Changed document number and formatting to fit with revised template and numbering requirements, corrected numbering in nutator section of Antenna PT branch, to add in skipped sequential numbers
K	2002-07-22	Site	None	Added in 20.04.05.00 and 20.10.00.00, as per Simon Radford's request.
L	2002-11-01	Backend, overall row headers, computing	None	Added in ATF Evaluation Back End segment, Changed the computing monitor and control general from 05 to 00, deleted the names of the level categories.
M	2004-03-02	Site, Antenna, Frontend, Backend, Computing, and Systems	ALMA-80.03.00.00-002-A-CRE	Major updates to the product tree, within the sections stated. ATF and prototype items removed and relocated to separate ATF product tree document numbered ALMA-80.03.00.00-004-A-LIS
N	2005-01-31	Backend, Frontend	ALMA-80.03.00.00-007-A-CRE	Major updates to the product tree, within the sections stated as per ALMA-80.03.00.00-007-A-CRE.
O	2007-05-23	All	ALMA-80.03.00.00-008-A-CRE	General update as per ALMA-80.03.00.00-008-A-CRE


	ALMA Project ALMA Product Tree	Doc # : ALMA-80.03.00.00-001-O-LIS Date: 2007-06-08 Status: Released Page: 3 of 49
--	---	---

Table of Contents

1	DESCRIPTION	4
1.1	Purpose	4
1.2	Scope	4
2	RELATED DOCUMENTS AND ACRONYMS	4
2.1	Reference Documents.....	4
2.2	Abbreviations and Acronyms	4
3	ALMA PRODUCT TREE	5



ALMA Project

ALMA Product Tree

Doc # : ALMA-80.03.00.00-001-O-LIS

Date: 2007-06-08

Status: Released

Page: 4 of 49

1 Description

1.1 Purpose

This document defines the ALMA Product Tree and explains its use within the project. The traditional purpose of a product tree is to serve as a hierarchical breakdown of the systems, subsystems, assemblies and parts for a project. The ALMA Product tree loosely follows this pattern, however it does not follow a rigid “sub-systems / modules / units” component breakdown, and has been expanded to include items that are not technically configuration items. This flexibility allows the ALMA Product Tree to serve as the structure for a document numbering scheme for the project. The manner which document numbers are assigned is described in the ALMA Documentation Standards (RD01).

1.2 Scope

This document serves to define all branches of the Product Tree, to a level adequate to enable its use as a structure for document numbering.

2 Related documents and Acronyms

2.1 Reference Documents


The documents in the following list are referenced by this document to the extent specified. If not explicitly stated differently, the latest version of the document is valid.

Reference Doc. #	Document Title	ALMA Document Number
RD01	ALMA Documentation Standards	ALMA-80.02.00.00-003-G-STD
RD02	ALMA Acronyms and Abbreviations	ALMA-80.02.00.00-004-A-LIS

2.2 Abbreviations and Acronyms

The list of acronyms and abbreviations used within this document are given below. For a complete set of acronyms and abbreviations, please see ALMA Official Acronyms and Abbreviations (RD02).

Abbreviation or Acronym	Non-abbreviated Reference
ALMA	Atacama Large Millimeter Array
ATF	ALMA Test Facility
ICD	Interface Control Document
IPT	Integrated Product Team

	<p>ALMA Project</p> <p>ALMA Product Tree</p>	<p>Doc # : ALMA-80.03.00.00-001-O-LIS</p> <p>Date: 2007-06-08</p> <p>Status: Released</p> <p>Page: 5 of 49</p>
--	--	--

3 ALMA Product Tree



Level 1	Level 2	Level 3	Level 4
00 Operations	00.00 General	00.00.00 General	00.00.00.00 General
10 Management	10.00 General	10.00.00 General	10.00.00.00 General
	10.01 ALMA Coordinating Committee/ALMA Board	10.01.00 General	10.01.00.00 General
		10.01.01 Memoranda	10.01.01.00 General
		10.01.02 Reports	10.01.02.00 General
		10.01.03 Meetings/Presentations	10.01.03.00 General
	10.02 ALMA Management Advisory Committee	10.02.00 General	10.02.00.00 General
		10.02.01 Memoranda	10.02.01.00 General
		10.02.02 Reports	10.02.02.00 General
		10.02.03 Meetings/Presentations	10.02.03.00 General
	10.03 ALMA Scientific Advisory Committee	10.03.00 General	10.03.00.00 General
		10.03.01 Memoranda	10.03.01.00 General
		10.03.02 Reports	10.03.02.00 General
		10.03.03 Meetings/Presentations	10.03.03.00 General
	10.04 Joint ALMA Office	10.04.00 General	10.04.00.00 General
		10.04.01 Memoranda	10.04.01.00 General
		10.04.02 Reports	10.04.02.00 General
		10.04.03 Meetings/Presentations	10.04.03.00 General
		10.04.04 WBS/WP/WE	10.04.04.00 General
		10.04.05 Budget	10.04.05.00 General
		10.04.06 Schedule	10.04.06.00 General
		10.04.07 Resources	10.04.07.00 General
	10.05 ALMA Executive Committee	10.05.00 General	10.05.00.00 General
		10.05.01 Memoranda	10.05.01.00 General
		10.05.02 Reports	10.05.02.00 General
		10.05.03 Meetings/Presentations	10.05.03.00 General
		10.05.04 WBS/WP/WE	10.05.04.00 General



ALMA Project

ALMA Product Tree

Doc #: ALMA-80.03.00.00-001-O-LIS

Date: 2007-06-08

Status: DRAFT

Level 1	Level 2	Level 3	Level 4
		10.05.05 Budget	10.05.05.00 General
		10.05.06 Schedule	10.05.06.00 General
		10.05.07 Resources	10.05.07.00 General
	10.06 European Project Office	10.06.00 General	10.06.00.00 General
		10.06.01 Memoranda	10.06.01.00 General
		10.06.02 Reports	10.06.02.00 General
		10.06.03 Meetings/Presentations	10.06.03.00 General
		10.06.04 WBS/WP/WE	10.06.04.00 General
		10.06.05 Budget	10.06.05.00 General
		10.06.06 Schedule	10.06.06.00 General
		10.06.07 Resources	10.06.07.00 General
	10.07 North American Project Office	10.07.00 General	10.07.00.00 General
		10.07.01 Memoranda	10.07.01.00 General
		10.07.02 Reports	10.07.02.00 General
		10.07.03 Meetings/Presentations	10.07.03.00 General
		10.07.04 WBS/WP/WE	10.07.04.00 General
		10.07.05 Budget	10.07.05.00 General
		10.07.06 Schedule	10.07.06.00 General
		10.07.07 Resources	10.07.07.00 General
	10.08 Project Safety	10.08.00 General	10.08.00.00 General
		10.08.01 Project Safety European	10.08.01.00 General
		10.08.02 Project Safety North American	10.08.02.00 General
		10.08.03 Project Safety Chile	10.08.03.00 General
		10.08.04 Project Safety Japan	10.08.04.00 General
	10.09 Japanese Office	10.09.00 General	10.09.00.00 General
		10.09.01 Memoranda	10.09.01.00 General
		10.09.02 Reports	10.09.02.00 General
		10.09.03 Meetings/Presentations	10.09.03.00 General
		10.09.04 WBS/WP/WE	10.09.04.00 General
		10.09.05 Budget	

Level 1	Level 2	Level 3	Level 4
		10.09.06 Schedule	10.09.05.00 General
		10.09.07 Resources	10.09.06.00 General
			10.09.07.00 General
11 LOGISTICS	11.00 Chile	11.00.00 General	
			11.00.00.00 General
	11.01 North America	11.01.00 General	
			11.01.00.00 General
	11.02 Europe	11.02.00 General	
			11.02.00.00 General
	11.03 Japan	11.03.00 General	
			11.03.00.00 General
12 WAREHOUSE	12.00 General	12.00.00 General	
			12.00.00.00 General
20 ALMA Chile Infrastructure	20.00 General	20.00.00 General	
			20.00.00.00 General
	20.01 Array Site Buildings	20.01.00 General	
		20.01.01 Refuge	20.01.00.00 General
			20.01.01.00 General
		20.01.02 Technical Building	20.01.02.00 General
			20.01.02.01 Civil
			20.01.02.02 Structural
			20.01.02.03 Architectural
			20.01.02.04 Plumbing
			20.01.02.05 Mechanical
			20.01.02.06 Fire Protection
			20.01.02.07 Electrical
			20.01.02.08 Controls
			20.01.02.09 Communications and tele/data
			20.01.02.10 Lightning Protection and Grounding
			20.01.02.11 Furnishings and Equipment
		20.01.03 Hangar	20.01.03.00 General
			20.01.03.01 Civil
			20.01.03.02 Structural
			20.01.03.03 Architectural
			20.01.03.04 Plumbing
			20.01.03.05 Mechanical
			20.01.03.06 Fire Protection
			20.01.03.07 Electrical
			20.01.03.08 Controls
			20.01.03.09 Communications and tele/data
			20.01.03.10 Lightning Protection and Grounding
			20.01.03.11 Furnishings and Equipment
		20.01.04 Meteorology Stations	20.01.04.00 General
		20.01.05 Utility Buildings	
			20.01.05.00 General
	20.02 Antenna Stations	20.02.00 General	



Level 1	Level 2	Level 3	Level 4
		20.02.01 Foundation	Central Cluster 20.02.00.00 General 20.02.01.00 General 20.02.01.01 Civil 20.02.01.02 Structural 20.02.01.03 Architectural 20.02.01.04 Plumbing 20.02.01.05 Mechanical 20.02.01.06 Fire Protection 20.02.01.07 Electrical 20.02.01.08 Controls 20.02.01.09 Communications and tele/data 20.02.01.10 Lightning Protection and Grounding 20.02.01.11 Furnishings and Equipment
		20.02.02 Foundation	Isolated Soft Soil 20.02.02.00 General
		20.02.03 Foundation	Isolated Hard Soil 20.02.03.00 General
		20.02.04 Station Equipment	20.02.04.00 General 20.02.04.01 Civil 20.02.04.02 Structural 20.02.04.03 Architectural 20.02.04.04 Plumbing 20.02.04.05 Mechanical 20.02.04.06 Fire Protection 20.02.04.07 Electrical 20.02.04.08 Controls 20.02.04.09 Communications and tele/data 20.02.04.10 Lightning Protection and Grounding 20.02.04.11 Furnishings and Equipment
	20.03 Antenna Stations Interconnect Roads	20.03.00 General	20.03.00.00 General 20.03.00.01 Civil 20.03.00.02 Structural 20.03.00.03 Architectural 20.03.00.04 Plumbing 20.03.00.05 Mechanical 20.03.00.06 Fire Protection 20.03.00.07 Electrical 20.03.00.08 Controls 20.03.00.09 Communications / Data Transfer 20.03.00.10 Lightning Protection and Grounding 20.03.00.11 Furnishings and Equipment
	20.04 Array Site Utility Interconnects	20.04.00 General	20.04.00.00 General
		20.04.01 Fiber Optics	20.04.01.00 General 20.04.01.01 Civil 20.04.01.02 Structural 20.04.01.03 Architectural 20.04.01.04 Plumbing 20.04.01.05 Mechanical 20.04.01.06 Fire Protection 20.04.01.07 Electrical 20.04.01.08 Controls 20.04.01.09 Communications and tele/data 20.04.01.10 Lightning Protection and Grounding 20.04.01.11 Furnishings and Equipment
		20.04.02 Low Voltage (600V)	20.04.02.00 General



Level 1	Level 2	Level 3	Level 4
			20.04.02.01 Civil 20.04.02.02 Structural 20.04.02.03 Architectural 20.04.02.04 Plumbing 20.04.02.05 Mechanical 20.04.02.06 Fire Protection 20.04.02.07 Electrical 20.04.02.08 Controls 20.04.02.09 Communications and tele/data 20.04.02.10 Lightning Protection and Grounding 20.04.02.11 Furnishings and Equipment
		20.04.03 Medium Voltage (12kV)	20.04.03.00 General 20.04.03.01 Civil 20.04.03.02 Structural 20.04.03.03 Architectural 20.04.03.04 Plumbing 20.04.03.05 Mechanical 20.04.03.06 Fire Protection 20.04.03.07 Electrical 20.04.03.08 Controls 20.04.03.09 Communications and tele/data 20.04.03.10 Lightning Protection and Grounding 20.04.03.11 Furnishings and Equipment
		20.04.04 Trenches	20.04.04.00 General 20.04.04.01 Civil 20.04.04.02 Structural 20.04.04.03 Architectural 20.04.04.04 Plumbing 20.04.04.05 Mechanical 20.04.04.06 Fire Protection 20.04.04.07 Electrical 20.04.04.08 Controls 20.04.04.09 Communications and tele/data 20.04.04.10 Lightning Protection and Grounding 20.04.04.11 Furnishings and Equipment
		20.04.05 Water and Sewer System	20.04.05.00 General 20.04.05.01 Civil 20.04.05.02 Structural 20.04.05.03 Architectural 20.04.05.04 Plumbing 20.04.05.05 Mechanical 20.04.05.06 Fire Protection 20.04.05.07 Electrical 20.04.05.08 Controls 20.04.05.09 Communications and tele/data 20.04.05.10 Lightning Protection and Grounding 20.04.05.11 Furnishings and Equipment
	20.05 Array Site Power Generation	20.05.00 General	20.05.00.00 General
	20.06 Site Access Road (CH23 to AOS)	20.06.00 General	20.06.00.00 General 20.06.00.01 Civil work 20.06.00.02 Structural 20.06.00.03 Pavements 20.06.00.04 Road furnishings (protective and directive devices)
		20.06.01 Road from CH23 to OSF	20.06.01.00 General 20.06.01.01 Civil work



Level 1	Level 2	Level 3	Level 4
			20.06.01.02 Structural
			20.06.01.03 Pavements
			20.06.01.04 Road furnishings (protective and directive devices)
		20.06.02 Road from OSF to AOS	
			20.06.02.00 General
			20.06.02.01 Civil work
			20.06.02.02 Structural
			20.06.02.03 Pavements
			20.06.02.04 Road furnishings (protective and directive devices)
	20.07 Link Communications (Array Site OSF)		
		20.07.00 General	
			20.07.00.00 General
		20.07.01 Fiber Optics	
			20.07.01.00 General
		20.07.02 Trenches	
			20.07.02.00 General
	20.08 Operations Support Facility (OSF) Buildings		
		20.08.00 General	
			20.08.00.00 General
			20.08.00.01 Civil
			20.08.00.02 Structural
			20.08.00.03 Architectural
			20.08.00.04 Plumbing
			20.08.00.05 Mechanical
			20.08.00.06 Fire Protection
			20.08.00.07 Electrical
			20.08.00.08 Controls
			20.08.00.09 Communications / Data Transfer
			20.08.00.10 Lightning Protection and Grounding
			20.08.00.11 Furnishings and Equipment
		20.08.01 Road, Site work and Landscaping	
			20.08.01.00 General
			20.08.01.01 Civil
			20.08.01.02 Structural
			20.08.01.03 Architectural
			20.08.01.04 Plumbing
			20.08.01.05 Mechanical
			20.08.01.06 Fire Protection
			20.08.01.07 Electrical
			20.08.01.08 Controls
			20.08.01.09 Communications / Data Transfer
			20.08.01.10 Lightning Protection and Grounding
			20.08.01.11 Furnishings and Equipment
		20.08.02 Medium Voltage Power Generation and Distribution	
			20.08.02.00 General
			20.08.02.01 Civil
			20.08.02.02 Structural
			20.08.02.03 Architectural
			20.08.02.04 Plumbing
			20.08.02.05 Mechanical
			20.08.02.06 Fire Protection
			20.08.02.07 Electrical
			20.08.02.08 Controls
			20.08.02.09 Communications / Data Transfer
			20.08.02.10 Lightning Protection and Grounding
			20.08.02.11 Furnishings and Equipment
		20.08.03 Water Supply, Storage and Distribution Systems	
			20.08.03.00 General
			20.08.03.01 Civil
			20.08.03.02 Structural
			20.08.03.03 Architectural
			20.08.03.04 Plumbing
			20.08.03.05 Mechanical



Level 1	Level 2	Level 3	Level 4
			20.08.03.06 Fire Protection 20.08.03.07 Electrical 20.08.03.08 Controls 20.08.03.09 Communications / Data Transfer 20.08.03.10 Lightning Protection and Grounding 20.08.03.11 Furnishings and Equipment
		20.08.04 Vehicle Fuel Supply	20.08.04.00 General 20.08.04.01 Civil 20.08.04.02 Structural 20.08.04.03 Architectural 20.08.04.04 Plumbing 20.08.04.05 Mechanical 20.08.04.06 Fire Protection 20.08.04.07 Electrical 20.08.04.08 Controls 20.08.04.09 Communications / Data Transfer 20.08.04.10 Lightning Protection and Grounding 20.08.04.11 Furnishings and Equipment
		20.08.05 Low Voltage power Distribution	20.08.05.00 General 20.08.05.01 Civil 20.08.05.02 Structural 20.08.05.03 Architectural 20.08.05.04 Plumbing 20.08.05.05 Mechanical 20.08.05.06 Fire Protection 20.08.05.07 Electrical 20.08.05.08 Controls 20.08.05.09 Communications / Data Transfer 20.08.05.10 Lightning Protection and Grounding 20.08.05.11 Furnishings and Equipment
		20.08.06 ALMA and Contractors Camp	20.08.06.00 General 20.08.06.01 Civil 20.08.06.02 Structural 20.08.06.03 Architectural 20.08.06.04 Plumbing 20.08.06.05 Mechanical 20.08.06.06 Fire Protection 20.08.06.07 Electrical 20.08.06.08 Controls 20.08.06.09 Communications / Data Transfer 20.08.06.10 Lightning Protection and Grounding 20.08.06.11 Furnishings and Equipment
		20.08.07 Transporter and Truck Shelters	20.08.07.00 General 20.08.07.01 Civil 20.08.07.02 Structural 20.08.07.03 Architectural 20.08.07.04 Plumbing 20.08.07.05 Mechanical 20.08.07.06 Fire Protection 20.08.07.07 Electrical 20.08.07.08 Controls 20.08.07.09 Communications / Data Transfer 20.08.07.10 Lightning Protection and Grounding 20.08.07.11 Furnishings and Equipment
		20.08.08 Antenna Assembly Complex (Hanger)	20.08.08.00 General 20.08.08.01 Civil 20.08.08.02 Structural 20.08.08.03 Architectural



Level 1	Level 2	Level 3	Level 4
			20.08.08.04 Plumbing 20.08.08.05 Mechanical 20.08.08.06 Fire Protection 20.08.08.07 Electrical 20.08.08.08 Controls 20.08.08.09 Communications / Data Transfer 20.08.08.10 Lightning Protection and Grounding 20.08.08.11 Furnishings and Equipment
		20.08.09 Warehouse and Workshop Complex	20.08.09.00 General 20.08.09.01 Civil 20.08.09.02 Structural 20.08.09.03 Architectural 20.08.09.04 Plumbing 20.08.09.05 Mechanical 20.08.09.06 Fire Protection 20.08.09.07 Electrical 20.08.09.08 Controls 20.08.09.09 Communications / Data Transfer 20.08.09.10 Lightning Protection and Grounding 20.08.09.11 Furnishings and Equipment
		20.08.10 Technical Complex	20.08.10.00 General 20.08.10.01 Civil 20.08.10.02 Structural 20.08.10.03 Architectural 20.08.10.04 Plumbing 20.08.10.05 Mechanical 20.08.10.06 Fire Protection 20.08.10.07 Electrical 20.08.10.08 Controls 20.08.10.09 Communications / Data Transfer 20.08.10.10 Lightning Protection and Grounding 20.08.10.11 Furnishings and Equipment
		20.08.11 Management and Administration Complex	20.08.11.00 General 20.08.11.01 Civil 20.08.11.02 Structural 20.08.11.03 Architectural 20.08.11.04 Plumbing 20.08.11.05 Mechanical 20.08.11.06 Fire Protection 20.08.11.07 Electrical 20.08.11.08 Controls 20.08.11.09 Communications / Data Transfer 20.08.11.10 Lightning Protection and Grounding 20.08.11.11 Furnishings and Equipment
		20.08.12 Gate House(s)	20.08.12.00 General 20.08.12.01 Civil 20.08.12.02 Structural 20.08.12.03 Architectural 20.08.12.04 Plumbing 20.08.12.05 Mechanical 20.08.12.06 Fire Protection 20.08.12.07 Electrical 20.08.12.08 Controls 20.08.12.09 Communications / Data Transfer 20.08.12.10 Lightning Protection and Grounding 20.08.12.11 Furnishings and Equipment
		20.08.13 Visitor's Center	20.08.13.00 General 20.08.13.01 Civil



Level 1	Level 2	Level 3	Level 4
			20.08.13.02 Structural 20.08.13.03 Architectural 20.08.13.04 Plumbing 20.08.13.05 Mechanical 20.08.13.06 Fire Protection 20.08.13.07 Electrical 20.08.13.08 Controls 20.08.13.09 Communications / Data Transfer 20.08.13.10 Lightning Protection and Grounding 20.08.13.11 Furnishings and Equipment
		20.08.14 Heliport	20.08.14.00 General 20.08.14.01 Civil 20.08.14.02 Structural 20.08.14.03 Architectural 20.08.14.04 Plumbing 20.08.14.05 Mechanical 20.08.14.06 Fire Protection 20.08.14.07 Electrical 20.08.14.08 Controls 20.08.14.09 Communications / Data Transfer 20.08.14.10 Lightning Protection and Grounding 20.08.14.11 Furnishings and Equipment
		20.08.15 Residence	20.08.15.00 General 20.08.15.01 Civil 20.08.15.02 Structural 20.08.15.03 Architectural 20.08.15.04 Plumbing 20.08.15.05 Mechanical 20.08.15.06 Fire Protection 20.08.15.07 Electrical 20.08.15.08 Controls 20.08.15.09 Communications / Data Transfer 20.08.15.10 Lightning Protection and Grounding 20.08.15.11 Furnishings and Equipment
		20.08.20	20.08.20.00 General 20.08.20.00 General
	20.09 Array Site Access Roads	20.09.00 General	20.09.00.00 General
	20.10 Chilean Phase 2 Facilities	20.10.00 General	20.10.00.00 General
	20.90 Site Development Design Reviews	20.90.00 General	20.90.00.00 General
30 Antenna Management	30.00 General	30.00.00 General	30.00.00.00 General
31 A/C/E Prototype Antenna	31.00 Antenna A/C/E Prototype Antenna	31.00.00 General	31.00.00.00 General
		31.00.10 Structure & Mechanisms	31.00.10.00 Structure & Mechanisms General 31.00.10.10 Base Structure General 31.00.10.11 Base 31.00.10.12 Azimuth Bearing 31.00.10.20 Yoke Structure General 31.00.10.21 Antenna Control Unit VME Crate



Level 1	Level 2	Level 3	Level 4
			31.00.10.22 Yoke 31.00.10.23 Elevation Bearing 31.00.10.30 Elevation Structure General 31.00.10.32 Feed shutter 31.00.10.33 Counter weights 31.00.10.40 Elevation Structure Bus General 31.00.10.41 Optical Telescope Interface 31.00.10.42 Apex Support Legs 31.00.10.43 Panels Adjusters 31.00.10.44 Panels 31.00.10.50 Elevation Structure Apex General 31.00.10.51 Subreflector 31.00.10.52 Subreflector Mechanisms 31.00.10.53 Nutator Interface
		31.00.20 Pointing & Instrumentation	31.00.20.00 Pointing & Instrumentation General 31.00.20.10 Direct Drive Torque Motors General 31.00.20.11 Azimuth Drive 31.00.20.12 Elevation Drive 31.00.20.20 Antenna Control Unit General 31.00.20.22 Portable Control Unit 31.00.20.30 Encoders General 31.00.20.32 Elevation Encoder 31.00.20.40 Metrology System General 31.00.20.50 Limit Switches General 31.00.20.51 Azimuth Limit Switches 31.00.20.52 Elevation Limit Switches 31.00.20.60 Brakes General 31.00.20.61 Azimuth Brakes 31.00.20.62 Elevation Brakes
		31.00.30 Auxiliary Equipment	31.00.30.00 Auxiliary Equipment General 31.00.30.10 Lightning Protection System 31.00.30.11 External Protection 31.00.30.12 Internal Protection 31.00.30.13 Interfaces 31.00.30.20 Cabling and Piping General 31.00.30.21 UPS 31.00.30.22 Smoke Detectors 31.00.30.23 Protection Equipment 31.00.30.24 Azimuth and Elevation Cable Wraps 31.00.30.40 Access & Handling General 31.00.30.41 Handling Equipment 31.00.30.42 Access & Service Platform 31.00.30.50 HVAC System 31.00.30.60 Safety Devices General 31.00.30.61 Stow Pins 31.00.30.62 Hard Stops 31.00.30.63 Emergency Stops Network
	31.90 Design Reviews A/C/E Prototype Antenna	31.90.00 General	31.90.00.00 General
32 VertexRSI Prototype Antenna	32.00 General	32.00.00 General	32.00.00.00 General
	32.01 Antenna Structure	32.01.00 General	32.01.00.00 General
		32.01.01 Elevation sub structure	32.01.01.00 General 32.01.01.01 Reflector panels 32.01.01.02 Panel adjusters



Level 1	Level 2	Level 3	Level 4
			32.01.01.03 Back up support 32.01.01.04 Counterweight 32.01.01.05 Receiver cabin 32.01.01.06 Feed shutter 32.01.01.07 Optical telescope interface 32.01.01.08 Evaluation front end interface 32.01.01.09 Equipment rack interface
		32.01.02 Yoke sub structure	32.01.02.00 General 32.01.02.01 Antenna yoke 32.01.02.02 Elevation bearing 32.01.02.03 Transporter interface
		32.01.03 Base sub structure	32.01.03.00 General 32.01.03.01 Antenna base 32.01.03.02 Azimuth bearing
		32.01.04 Sub reflector sub structure	32.01.04.00 General 32.01.04.01 Sub reflector support 32.01.04.02 Sub reflector 32.01.04.03 Sub reflector mechanism 32.01.04.04 Nutator interface 32.01.04.05 Apex calibration interface 32.01.04.06 Holography FE Interface
		32.01.05 Auxiliary sub structures	32.01.05.00 General 32.01.05.01 Hard stops 32.01.05.02 Stow pins 32.01.05.03 Access & service platform 32.01.05.04 FE handling equipment 32.01.05.05 FE antenna adapter plate 32.01.05.06 Cryo compressor mount
	32.02 Antenna Metrology	32.02.00 General	32.02.00.00 General
		32.02.01 Yoke arm displacement metrology structure	32.02.01.00 General 32.02.01.01 Yoke arm displacement CFRP reference structure 32.02.01.02 Yoke arm displacement laser reference structure
		32.02.02 Electronic level metrology mounting structure	32.02.02.00 General 32.02.02.01 Foundation mount 32.02.02.02 Below azimuth bearing mount 32.02.02.03 Above Azimuth bearing mount 32.02.02.04 Yoke arm mounts
		32.02.03 Thermal sensor locations	32.02.03.00 General
	32.03 Antenna Drive	32.03.00 General	32.03.00.00 General
		32.03.01 Apex displacement sensor	32.03.01.00 General 32.03.01.01 Azimuth drive motor 32.03.01.02 Azimuth encoder 32.03.01.03 Azimuth tachometer 32.03.01.04 Azimuth brakes 32.03.01.05 Azimuth limit switches
		32.03.02 Elevation drive sub system	32.03.02.00 General 32.03.02.01 Azimuth limit switches 32.03.02.02 Elevation encoder 32.03.02.03 Elevation tachometer 32.03.02.05 Elevation limit switches



Level 1	Level 2	Level 3	Level 4
	32.04 Antenna Control	32.04.00 General	32.04.00.00 General
		32.04.01 Antenna control unit	32.04.01.00 General 32.04.01.01 ACU Software 32.04.01.02 ACU housing
		32.04.02 Pointing computer	32.04.02.00 General 32.04.02.01 Pointing computer software 32.04.02.02 Pointing computer housing 32.04.02.03 Pointing computer displacement sensors 32.04.02.04 Elevation brakes 32.04.02.05 Pointing computer thermal sensors 32.04.02.06 Pointing computer electronic levels
	32.05 Antenna Cabling & Pipe Infrastructure	32.05.00 Azimuth cable wrap	32.05.00.00 General
		32.05.01 Elevation cable wrap	32.05.01.00 General
		32.05.03 EMC sub systems	32.05.03.00 General 32.05.03.01 Lightning protection devices 32.05.03.02 Line filters 32.05.03.03 Surge protection devices
		32.05.04 Cabling infrastructure	32.05.04.00 General 32.05.04.01 Power cables 32.05.04.02 M&C Signal cables 32.05.04.03 RF signal cables 32.05.04.04 Optical fibres 32.05.04.05 Cable ducts 32.05.04.06 Antenna junction box
		32.05.05 He pipe infrastructure	32.05.05.00 General 32.05.05.01 Fixed He pipes 32.05.05.02 Flexible He lines
		32.05.06 Oxygen enhancement	32.05.06.00 General
		32.05.07 UPS sub system	32.05.07.00 General 32.05.07.01 Batteries 32.05.07.02 DC/AC converter
	32.06 Antenna HVAC	32.06.00 General	32.06.00.00 General
		32.06.01 Receiver cabin HVAC	32.06.01.00 General
		32.06.02 Receiver cabin structure HVAC	32.06.02.00 General
	32.07 Antenna Specific Test & Construction	32.07.00 General	32.07.00.00 General
		32.07.01 Antenna contractor acceptance test	32.07.01.00 General
		32.07.02 Additional ALMA antenna acceptance test	32.07.02.00 General
	32.08 Tooling	32.08.00 General	32.08.00.00 General
		32.08.01 Test Tooling	32.08.01.00 Dummy Racks 32.08.01.01 Dummy FE



Level 1	Level 2	Level 3	Level 4
	32.90 Design Reviews	VertexRSI Prototype Antenna	
		32.90.00 General	32.90.00.00 General
		32.90.01 Vertex antenna specification	32.90.01.00 General
		32.90.02 Antenna Proposal	32.90.02.00 General
		32.90.03 Antenna PDR	32.90.03.00 General
		32.90.04 Antenna CDR	32.90.04.00 General 32.90.04.01 Antenna CDR 32.90.04.02 Antenna delta CDR
		32.90.05 Antenna CDD	32.90.05.00 General
33 AEM Production Antenna	33.00 General	33.00.00 General	33.00.00.00 General
	33.10 Azimuth Structure	33.10.00 General	33.10.00.00 General
		33.10.01 Azimuth Bearing	33.10.01.00 General
		33.10.02 Base	33.10.02.00 General 33.10.02.01 AZ on axis cable wrap interface
		33.10.03 Yoke Base	33.10.03.00 General
		33.10.04 Insulation System	33.10.04.00 General
		33.10.05 AZ Cable Wrap	33.10.05.00 General
		33.10.06 Yoke Arms	33.10.06.00 General
		33.10.07 Access Equipment	33.10.07.00 General 33.10.07.01 Platforms 33.10.07.02 Ladders / Staircases
	33.15 Cabin System	33.15.00 General	33.15.00.00 General
		33.15.01 Feed shutter	33.15.01.00 General
		33.15.02 EL Cable Wrap	33.15.02.00 General
		33.15.03 Elevation Bearing	33.15.03.00 General 33.15.03.01 EL on axis cable wrap interface
		33.15.04 Receiver Cabin	33.15.04.00 General 33.15.04.01 Cabin 33.15.04.02 Counter Weight 33.15.04.03 Receiver Flange 33.15.04.04 Cabin Floor 33.15.04.05 RFI Shielding 33.15.04.06 Lights 33.15.04.07 Emergency lights 33.15.04.08 Sockets
	33.20 Main Reflector	33.20.00 General	33.20.00.00 General
		33.20.01 Backup Structure	



Level 1	Level 2	Level 3	Level 4
		33.20.02 Panels	33.20.01.00 General
		33.20.03 Panels Adjusters	33.20.02.00 General
	33.25 APEX Equipment		33.20.03.00 General
		33.25.00 General	
		33.25.01 APEX	33.25.00.00 General
		33.25.02 Subreflector	33.25.01.00 General
		33.25.03 Subreflector Mechanism	33.25.02.00 General
		33.25.04 Interface Cylinder	33.25.03.00 General
		33.25.05 Quadripod Legs	33.25.04.00 General
	33.30 HVAC System		33.25.05.00 General
		33.30.00 General	
		33.30.01 HVAC System	33.30.00.00 General
			33.30.01.00 General
			33.30.01.01 HVAC Cabinet
			33.30.01.02 Chiller System
			33.30.01.03 ATU System
			33.30.01.04 HVAC Pipes
	33.35 Antenna Mechanism		
		33.35.00 General	33.35.00.00 General
		33.35.01 Azimuth Drive	33.35.01.00 General
		33.35.02 Elevation Drive	33.35.02.00 General
			33.35.02.01 Elevation Drive
			33.35.02.02 Saddle
		33.35.03 Antenna Control System	33.35.03.00 General
			33.35.03.01 ACU Hardware
			33.35.03.02 ACU Software
			33.35.03.03 Portable Control Unit
			33.35.03.04 Utility Module Hardware
			33.35.03.05 Utility Module Software
		33.35.04 EL Encoder	33.35.04.00 General
		33.35.05 AZ Encoder	33.35.05.00 General
		33.35.06 EL Brakes	33.35.06.00 General
		33.35.07 AZ Brakes	33.35.07.00 General
	33.40 Safety Equipment		
		33.40.00 General	33.40.00.00 General
		33.40.01 Hard Stops	33.40.01.00 General
		33.40.02 Stow Pins	33.40.02.00 General
		33.40.03 Smoke Detectors	33.40.03.00 General
		33.40.04 Grounding and Lightning Protection	33.40.04.00 General
		33.40.05 Stops Switches Interlocks	



ALMA Project

ALMA Product Tree

Doc #: ALMA-80.03.00.00-001-O-LIS

Date: 2007-06-08

Status: DRAFT

Level 1	Level 2	Level 3	Level 4
			33.40.05.00 General
			33.40.05.01 Emergency Stops
			33.40.05.02 Safety Switches
			33.40.05.03 Limit Switches
			33.40.05.04 Interlocks
	33.45 Metrology		
		33.45.00 General	
			33.45.00.00 General
		33.45.01 Thermal Metrology Equipment	
			33.45.01.00 General
		33.45.02 Wind Metrology Equipment	
			33.45.02.00 General
	33.50 Electrical Installations		
		33.50.00 General	
			33.50.00.00 General
		33.50.01 UPS	
			33.50.01.00 General
		33.50.02 Power Distribution	
			33.50.02.00 General
			33.50.02.01 Drives Cabinet
			33.50.02.02 Auxiliary Cabinet
			33.50.02.03 UPS Cabinet
			33.50.02.04 UPS Battery Cabinet
			33.50.02.05 Power Cabinet
			33.50.02.06 Transporter Power Cabinet
			33.50.02.07 ACU Cabinet
			33.50.02.08 RC SWB
			33.50.02.09 Lights
			33.50.02.10 Emergency Lights
			33.50.02.11 Sockets
		33.50.03 Cabling	
			33.50.03.00 General
			33.50.03.01 Quadripod Cabling
			33.50.03.02 Bus Cabling
			33.50.03.03 Cabin Cabling
			33.50.03.04 Yoke Cabling
			33.50.03.05 Base Cabling
			33.50.03.06 Platforms Cabling
		33.50.04 Piping	
			33.50.04.00 General
			33.50.04.01 Quadripod Piping
			33.50.04.02 Bus Piping
			33.50.04.03 Cabin Piping
			33.50.04.04 Yoke Piping
			33.50.04.05 Base Piping
			33.50.04.06 Platforms Piping
	33.60 Service, Test & Assembly Tools		
		33.60.00 General	
			33.60.00.00 General
		33.60.01 Tooling & Test Equipment	
			33.60.01.00 General
		33.60.02 Service Equipment	
			33.60.02.00 General
			33.60.02.01 Aut. Panel setting tool
			33.60.02.02 Man. Panel setting tool
		33.60.03 OSF Equipment	
			33.60.03.00 General
34 Production Antenna			
	34.00 General		
		34.00.00 General	
			34.00.00.00 General
35 Vertex Production Antenna			
	35.00 General		



Level 1	Level 2	Level 3	Level 4
		35.00.90 Nutator Design Reviews	
			35.00.90.00 General
	35.01 Nutator Demonstrator		
		35.01.00 General	
			35.01.00.00 General
		35.01.01 Mechanics	
			35.01.01.00 General
		35.01.02 Electronics	
			35.01.02.00 General
		35.01.03 Controls	
			35.01.03.00 General
	35.02 Prototype Nutator		
		35.02.00 General	
			35.02.00.00 General
		35.02.01 Opt mechanical structure	
			35.02.01.00 General
			35.02.01.01 Optics
		35.02.02 Electronics	
			35.02.02.00 General
			35.02.02.02 Mechanics
		35.02.03 Controls	
			35.02.03.00 General
	35.03 Production Nutator		
		35.03.00 General	
			35.03.00.00 General
		35.03.01 Opt mechanical structure	
			35.03.01.00 General
			35.03.01.01 Optics
		35.03.02 Electronics	
			35.03.02.00 General
			35.03.02.02 Mechanics
		35.03.03 Controls	
			35.03.03.00 General
36 Antenna Auxiliary Equipment			
	36.00 General		
		36.00.00 General	
			36.00.00.00 General
	36.01 Optical Pointing Telescope		
		36.01.00 General	
			36.01.00.00 General
		36.01.01 Opto Mechanical Structure	
			36.01.01.00 General
		36.01.02 Electronics	
			36.01.02.00 General
		36.01.03 Controls	
			36.01.03.00 General
	36.02 Optical Pointing Telescope for 7m Array		
		36.02.00 General	
			36.02.00.00 General
		36.02.01 Opto Mechanical Structure	
			36.02.01.00 General
		36.02.02 Electronics	
			36.02.02.00 General
		36.02.03 Controls	
			36.02.03.00 General
	36.10 Prototype Nutator		
		36.10.00 General	
			36.10.00.00 General
	36.20 Production Nutator		
		36.20.00 General	
			36.20.00.00 General
37 Antenna Transporter			
	37.00 General		



Level 1	Level 2	Level 3	Level 4
		37.00.00 General	37.00.00.00 General
	37.01 General Requirements	37.01.00 General	37.01.00.00 General
	37.02 Contract Follow up	37.02.00 General	37.02.00.00 General
	37.03 Scheuerle	37.03.00 General	37.03.00.00 General
	37.04 Structure	37.04.00 General	37.04.00.00 General
		37.04.01 Chassis	37.04.01.00 General
		37.04.02 Pick-up Structure	37.04.02.00 General
	37.05 Drive System	37.05.00 General	37.05.00.00 General
		37.05.01 Main Engine	37.05.01.00 General
		37.05.02 Drive Train	37.05.02.00 General
		37.05.03 Wheel Suspension	37.05.03.00 General
		37.05.04 Operational Brake	37.05.04.00 General
		37.05.05 Continuous Brake	37.05.05.00 General
		37.05.06 Park Brake	37.05.06.00 General
		37.05.07 Steering System	37.05.07.00 General
		37.05.08 Steering Options	37.05.08.00 General
	37.06 Loading System	37.06.00 General	37.06.00.00 General
		37.06.01 Lifting System	37.06.01.00 General
		37.06.02 Positioning System	37.06.02.00 General
		37.06.03 Clamping System	37.06.03.00 General
		37.06.04 Outriggers	37.06.04.00 General
		37.06.05 Damping System provisions	37.06.05.00 General
	37.07 Control System	37.07.00 General	37.07.00.00 General
		37.07.01 Driver Cabin	37.07.01.00 General
		37.07.02 PCU	37.07.02.00 General
		37.07.03 Controller (PLC)	37.07.03.00 General
		37.07.04 Safety Appliances	37.07.04.00 General
		37.07.05 Signaling and Lighting	37.07.05.00 General



Level 1	Level 2	Level 3	Level 4
		37.07.06 Vehicle Positioning System	
			37.07.06.00 General
		37.07.07 Navigation System	
			37.07.07.00 General
	37.08 Auxiliary Equipment		
		37.08.00 General	
			37.08.00.00 General
		37.08.01 Fuel System	
			37.08.01.00 General
		37.08.02 Antenna Mass Dummy	
			37.08.02.00 General
		37.08.03 Service Equipment	
			37.08.03.00 General
		37.08.04 Hydraulic & Pneumatic System	
			37.08.04.00 General
		37.08.05 Gen-set (ESO)	
			37.08.05.00 General
		37.08.06 Transport Brackets	
			37.08.06.00 General
	37.90 Antenna Transporter design reviews		
		37.90.00 General	
			37.90.00.00 General
38 ACA 12m Antenna			
	38.00 General		
		38.00.00 General	
			38.00.00.00 General
	38.01 Mitsubishi ACA 12m Antenna		
		38.01.00 General	
			38.01.00.00 General
	38.02 Refurbished Mitsubishi prototype ACA 12m Antenna		
		38.02.00 General	
			38.02.00.00 General
	38.90 ACA 12 m Antenna Design Reviews		
		38.90.00 General	
			38.90.00.00 General
39 ACA 7m Antenna			
	39.00 General		
		39.00.00 General	
			39.00.00.00 General
40 Front end			
	40.00 General		
		40.00.00 General	
			40.00.00.00 General
	40.01 Common optics		
		40.01.00 General	
			40.01.00.00 General
		40.01.01 Band 1 common optics	
			40.01.01.00 General
		40.01.02 Band 2 common optics	
			40.01.02.00 General
		40.01.03 Band 3 common optics	
			40.01.03.00 General
		40.01.04 Band 4 common optics	
			40.01.04.00 General
	40.02 Cartridges		
		40.02.00 General	
			40.02.00.00 General
		40.02.01 Frequency band 1 cartridge	
			40.02.01.00 General
			40.02.01.07 Band 1 support structure
		40.02.02 Frequency band 2 cartridge	
			40.02.02.00 General
			40.02.02.07 Band 2 support structure



Level 1	Level 2	Level 3	Level 4
		40.02.03 Frequency band 3 cartridge	40.02.03.00 General 40.02.03.01 Band 3 cold optics 40.02.03.02 Band 3 LO injection 40.02.03.03 Band 3 ortho mode transducer 40.02.03.04 Band 3 SIS mixer/integrated IF amplifier 40.02.03.05 CANCELLED (was Band 3 IF amplifiers) 40.02.03.06 Band 3 protection board 40.02.03.07 Band 3 support structure 40.02.03.08 Band 3 cartridge wiring 40.02.03.09 Band 3 cartridge electrical feedthroughs 40.02.03.10 Cancelled 40.02.03.11 Band 3 temperature sensors 40.02.03.12 CANCELLED (was Band 3 bias electronics) 40.02.03.13 Band 3 Warm IF amplifier
		40.02.04 Frequency band 4 cartridge	40.02.04.00 General 40.02.04.01 Band 4 cold optics 40.02.04.02 Band 4 LO injection 40.02.04.03 Band 4 ortho mode transducer 40.02.04.04 Band 4 SIS mixer/quadrature hybrid 40.02.04.05 Band 4 IF cold amplifiers 40.02.04.06 Band 4 protection board 40.02.04.07 Band 4 mechanical structure 40.02.04.08 Band 4 cartridge wiring 40.02.04.09 Band 4 cartridge electrical feedthroughs 40.02.04.10 Band 4 cryo frequency multiplier 40.02.04.11 Band 4 temperature sensors 40.02.04.12 unused 40.02.04.13 Band 4 Warm IF amplifier
		40.02.05 Frequency band 5 cartridge	40.02.05.00 General 40.02.05.01 Band 5 Cold Optics 40.02.05.02 Band 5 LO injection 40.02.05.03 Band 5 ortho mode transducer 40.02.05.04 Band 5 SIS mixer/quadrature hybrid 40.02.05.05 Band 5 IF cold amplifiers 40.02.05.06 Band 5 protection board 40.02.05.07 Band 5 support structure 40.02.05.08 Band 5 cartridge wiring 40.02.05.09 Band 5 cartridge electrical feedthroughs 40.02.05.10 Band 5 cryo frequency multiplier 40.02.05.11 Band 5 temperature sensors 40.02.05.13 Band 5 Warm IF amplifier
		40.02.06 Frequency band 6 cartridge	40.02.06.00 General 40.02.06.01 Band 6 cold optics 40.02.06.02 Band 6 LO injection 40.02.06.03 Band 6 ortho mode transducer 40.02.06.04 Band 6 SIS mixer/integrated IF amplifier 40.02.06.05 Band 6 quadrature hybrids 40.02.06.06 CANCELLED (was Band 6 IF amplifiers) 40.02.06.07 Band 6 protection board 40.02.06.08 Band 6 support structure 40.02.06.09 Band 6 cartridge wiring 40.02.06.10 Band 6 cartridge electrical feedthroughs 40.02.06.11 Band 6 cryo frequency multiplier 40.02.06.12 Band 6 temperature sensors 40.02.06.13 Band 6 Warm IF amplifier 40.02.06.14 CANCELLED (was Band 6 first local oscillator assembly)
		40.02.07 Frequency band 7 cartridge	40.02.07.00 General 40.02.07.01 Band 7 cold optics



Level 1	Level 2	Level 3	Level 4
			40.02.07.02 Band 7 LO injection 40.02.07.03 Band 7 SIS mixers 40.02.07.04 Band 7 quadrature hybrids 40.02.07.05 Band 7 IF cold amplifiers 40.02.07.06 Band 7 protection board 40.02.07.07 Band 7 support structure 40.02.07.08 Band 7 cartridge wiring 40.02.07.09 Band 7 cartridge electrical feedthroughs 40.02.07.10 Band 7 cryo frequency multiplier 40.02.07.11 Band 7 temperature sensors 40.02.07.12 CANCELLED (was Band 7 bias electronics) 40.02.07.13 Band 7 Warm IF amplifier
		40.02.08 Frequency band 8 cartridge	40.02.08.00 General 40.02.08.01 Band 8 cold optics 40.02.08.02 Band 8 LO injection 40.02.08.03 Band 8 SIS mixers 40.02.08.04 Band 8 quadrature hybrids 40.02.08.05 Band 8 cryogenic IF amplifiers 40.02.08.06 Band 8 Warm IF amplifier 40.02.08.07 Band 8 mechanical structure 40.02.08.08 Band 8 cartridge wiring 40.02.08.09 Band 8 cartridge electrical feedthroughs 40.02.08.10 Band 8 cryo frequency multiplier 40.02.08.11 Band 8 sensors and heaters 40.02.08.12 Band 8 baseband LO transmission 40.02.08.13 Band 8 protection board 40.02.08.14 Band 8 cartridge container
		40.02.09 Frequency band 9 cartridge	40.02.09.00 General 40.02.09.01 Band 9 cold optics 40.02.09.02 Band 9 LO injection 40.02.09.03 Band 9 SIS mixers 40.02.09.04 Band 9 IF amplifiers 40.02.09.05 Band 9 protection board 40.02.09.06 Band 9 support structure 40.02.09.07 Band 9 cartridge wiring 40.02.09.08 Band 9 cartridge electrical feedthroughs 40.02.09.09 Band 9 cryo frequency multiplier 40.02.09.10 Band 9 temperature sensors 40.02.09.11 CANCELLED (was Band 9 bias electronics) 40.02.09.12 CANCELLED (was Band 9 first local oscillator assembly) 40.02.09.13 Band 9 Warm IF amplifier
		40.02.10 Frequency band 10 cartridge	40.02.10.00 General 40.02.10.01 Band 10 cold optics 40.02.10.02 Band 10 LO injection 40.02.10.03 Band 10 SIS Mixers 40.02.10.04 Band 10 IF Cold amplifiers 40.02.10.05 Band 10 protection board 40.02.10.06 Band 10 support structure 40.02.10.07 Band 10 cartridge wiring 40.02.10.08 Band 10 cartridge electrical feedthroughs 40.02.10.09 Band 10 cryo frequency multiplier 40.02.10.10 Band 10 temperature sensors 40.02.10.13 Band 10 Warm IF amplifier
	40.03 Cryostat	40.03.00 General	40.03.00.00 General
		40.03.01 Dewar	40.03.01.00 General 40.03.01.01 Outer vacuum container 40.03.01.02 Radiation shields



Level 1	Level 2	Level 3	Level 4
		40.03.02 Cryocooler	40.03.01.03 Mounting plates 40.03.01.04 Windows & IR filters 40.03.01.05 Evacuation valve 40.03.02.00 General 40.03.02.01 Cold head 40.03.02.02 Cryo compressor 40.03.02.03 Indoor control unit 40.03.02.04 Buffer tank 40.03.02.05 He Pressure gauge 40.03.02.06 Helium lines
		40.03.03 Vacuum unit	40.03.03.00 General 40.03.03.01 Backing pump 40.03.03.02 Turbo pump and controller 40.03.03.03 Vacuum gauges and controller 40.03.03.04 Gate Valve and controller 40.03.03.05 Fail safe valve Hardware Interlock 40.03.03.06 Bypass Valve 40.03.03.07 24 VDC Power Supply
		40.03.04 Cryostat instrumentation	40.03.04.00 General 40.03.04.01 Electrical feed throughs 40.03.04.02 Dewar wiring 40.03.04.03 Cryostat temperature sensors 40.03.04.04 Cancelled
	40.04 Front end auxiliary modules	40.04.00 General	40.04.00.00 General
		40.04.01 Front end power supply unit	40.04.01.00 General
		40.04.02 Cartridge Bias Module	40.04.02.00 General 40.04.02.01 Cartridge Bias Board Assembly 40.04.02.02 Wiring Adapter Board Assembly 40.04.02.03 Cancelled 40.04.02.04 Cancelled 40.04.02.05 Cancelled 40.04.02.06 Cancelled
		40.04.03 Front end M&C unit	40.04.03.00 General 40.04.03.01 Front End Serial Bus Multiplexer Board 40.04.03.02 CANCELLED (was Front end embedded processor) 40.04.03.03 CANCELLED (was Front end embedded software) 40.04.03.04 FE M&C Backplane
		40.04.04 LO M&C Module	40.04.04.00 General 40.04.04.01 LO M&C Board Assembly
		40.04.05 Compressor M&C Module	40.04.05.00 General 40.04.05.01 Compressor M&C Board Assembly
		40.04.06 Cryostat M&C Module	40.04.06.00 General 40.04.06.01 Cryostat M&C Board Assembly
		40.04.07 Power distribution M&C module	40.04.07.00 General
		40.04.08 Power distribution module	40.04.08.00 General
		40.04.09 Front End Software and Firmware	40.04.09.00 General
	40.05 Front end chassis	40.05.00 General	40.05.00.00 General



Level 1	Level 2	Level 3	Level 4
		40.05.01 Front end mechanical structure	40.05.01.00 General 40.05.01.01 Front end frame 40.05.01.02 Front end support structure 40.05.01.03 Auxiliary Electronics Chassis 40.05.01.04 CPDS Subrack 40.05.01.05 IF Switch System Subrack 40.05.01.06 FE M&C Subrack 40.05.01.07 Cryostat M&C Subrack
		40.05.02 Front end cabling	40.05.02.00 General 40.05.02.01 Coaxial cabling 40.05.02.02 Power supply cabling 40.05.02.03 Monitor & control cabling
	40.06 Front end integrated calibration & widgets	40.06.00 General	40.06.00.00 General
		40.06.01 Semi transparent vane calibration unit	40.06.01.00 General
	40.06.02 Solar protection		40.06.02.00 General 40.06.02.01 Solar filter
	40.06.03 Polarization widgets		40.06.03.00 General 40.06.03.01 Quarter Wave Plate 40.06.03.02 Quarter Wave Plate Controller 40.06.03.03 Quarter Wave Plate Linear Drive
	40.06.04 Dual load calibration unit		40.06.04.00 General 40.06.04.01 Hot Load 40.06.04.02 Ambient Load 40.06.04.03 Hot/Ambient Load Controller
	40.06.05 Robotic Arm		40.06.05.00 General 40.06.05.01 Robotic Arm Controller 40.06.05.02 Robotic Arm AMB Interface 40.06.05.03 Robotic Arm Power Supply 40.06.05.04 Robotic Arm Mechanics
	40.07 Water vapour radiometer	40.07.00 General	40.07.00.00 General
	40.08 Front end IF	40.08.00 General	40.08.00.00 General
		40.08.01 IF switch sub system	40.08.01.00 General 40.08.01.01 IF Switch Module 40.08.01.02 IF Switch Control Module
	40.09 Front end specific test, construction & service equipment	40.09.00 General	40.09.00.00 General
		40.09.01 SIS mixer fabrication equipment	40.09.01.00 General
		40.09.02 SIS mixer test equipment	40.09.02.00 General
		40.09.03 Front End Test and Measurement System	40.09.03.00 General
		40.09.04 Cartridge test dewars	40.09.04.00 General
		40.09.05 Cartridge RF test fixtures	

→ Level 5, for internal use only:

- Robotic Arm Structure
- Robotic Arm#1 Motor & Gearbox
- Robotic Arm#1
- Robotic Arm#2 Motor & Gearbox



Level 1	Level 2	Level 3	Level 4
		40.09.05.00 General	
		40.09.06 Front end service vehicle	
		40.09.06.00 General	
		40.09.07 Front End Integration Centre	
		40.09.07.00 General	
		40.09.08 Front End transport cart	
		40.09.08.00 General	
	40.10 First local oscillator		
		40.10.00 General	
		40.10.00.00 General	
		40.10.01 Band 1 First Local Oscillator	
		40.10.01.00 General	
		40.10.02 Band 2 First Local Oscillator	
		40.10.02.00 General	
		40.10.03 Band 3 First Local Oscillator	
		40.10.03.00 General	
		40.10.03.01 YIG Tuned Oscillator	
		40.10.03.02 Active Multiplier Chain	
		40.10.03.03 PLL Box	
		40.10.03.04 LO Controller	
		40.10.03.05 Heat Sinks	
		40.10.03.06 Waveguides	
		40.10.03.07 Cables and Connectors	
		40.10.03.08 Power Amplifier	
		40.10.04 Band 4 First Local Oscillator	
		40.10.04.00 General	
		40.10.04.01 YIG Tuned Oscillator	
		40.10.04.02 Active Multiplier Chain	
		40.10.04.03 PLL Box	
		40.10.04.04 LO Controller	
		40.10.04.05 Heat Sinks	
		40.10.04.06 Waveguides	
		40.10.04.07 Cables and Connectors	
		40.10.04.08 Power Amplifier	
		40.10.05 Band 5 First Local Oscillator	
		40.10.05.00 General	
		40.10.06 Band 6 First Local Oscillator	
		40.10.06.01 YIG Tuned Oscillator	
		40.10.06.02 Active Multiplier Chain	
		40.10.06.03 PLL Box	
		40.10.06.04 LO Controller	
		40.10.06.05 Heat Sinks	
		40.10.06.06 Waveguides	
		40.10.06.07 Cables and Connectors	
		40.10.06.08 Power Amplifier	
		40.10.07 Band 7 First Local Oscillator	
		40.10.07.01 YIG Tuned Oscillator	
		40.10.07.02 Active Multiplier Chain	
		40.10.07.03 PLL Box	
		40.10.07.04 LO Controller	
		40.10.07.05 Heat Sinks	
		40.10.07.06 Waveguides	
		40.10.07.07 Cables and Connectors	
		40.10.07.08 Power Amplifier	
		40.10.08 Band 8 First Local Oscillator	
		40.10.08.01 YIG Tuned Oscillator	
		40.10.08.02 Active Multiplier Chain	
		40.10.08.03 PLL Box	
		40.10.08.04 LO Controller	
		40.10.08.05 Heat Sinks	
		40.10.08.06 Waveguides	
		40.10.08.07 Cables and Connectors	
		40.10.08.08 Power Amplifier	



Level 1	Level 2	Level 3	Level 4
		40.10.09 Band 9 First Local Oscillator	40.10.09.01 YIG Tuned Oscillator 40.10.09.02 Active Multiplier Chain 40.10.09.03 PLL Box 40.10.09.04 LO Controller 40.10.09.05 Heat Sinks 40.10.09.06 Waveguides 40.10.09.07 Cables and Connectors 40.10.09.08 Power Amplifier
		40.10.10 Band 10 First Local Oscillator	40.10.10.00 General
	40.11 Warm Cartridge Assembly	40.11.01 Band 1 Warm Cartridge assembly	40.11.01.00 General
		40.11.02 Band 2 Warm Cartridge assembly	40.11.02.00 General
		40.11.03 Band 3 Warm Cartridge assembly	40.11.03.00 General 40.11.03.01 Frame 40.11.03.02 Main Wiring Harness 40.11.03.03 Cables and Connectors
		40.11.04 Band 4 Warm Cartridge assembly	40.11.04.00 General 40.11.04.01 Frame 40.11.04.02 Main Wiring Harness 40.11.04.03 Cables and Connectors
		40.11.05 Band 5 Warm Cartridge assembly	40.11.05.00 General 40.11.05.01 Frame 40.11.05.02 Main Wiring Harness 40.11.05.03 Cables and Connectors
		40.11.06 Band 6 Warm Cartridge assembly	40.11.06.00 General 40.11.06.01 Frame 40.11.06.02 Main Wiring Harness 40.11.06.03 Cables and Connectors
		40.11.07 Band 7 Warm Cartridge assembly	40.11.07.00 General 40.11.07.01 Frame 40.11.07.02 Main Wiring Harness 40.11.07.03 Cables and Connectors
		40.11.08 Band 8 Warm Cartridge assembly	40.11.08.00 General 40.11.08.01 Frame 40.11.08.02 Main Wiring Harness 40.11.08.03 Cables and Connectors
		40.11.09 Band 9 Warm Cartridge assembly	40.11.09.00 General 40.11.09.01 Frame 40.11.09.02 Main Wiring Harness 40.11.09.03 Cables and Connectors
		40.11.10 Band 10 Warm Cartridge assembly	40.11.10.00 General 40.11.10.01 Frame 40.11.10.02 Main Wiring Harness 40.11.10.03 Cables and Connectors
	40.90 Front end Design Reviews	40.90.00 General	40.90.00.00 General
43 7m Array Holography Receiver	43.00 General	43.00.00 General	43.00.00.00 General



Level 1	Level 2	Level 3	Level 4
44 ACA 7m Front End	44.00 General	44.00.00 General	44.00.00.00 General
45 OSF Holography System	45.01 OSF Holography Transmitter	45.01.00 General	45.01.00.00 General
	45.02 OSF Holography Receiver	45.02.00 General	45.02.00.00 General
46 ACA Frontend Integration	46.00 General	46.00.00 General	46.00.00.00 General
50 Back End (BE)	50.00 General	50.00.00 General	50.00.00.00 General
52 IF Processor Subsystem IFP	52.00 General	52.00.00 General	52.00.00.00 General
	52.01 IF Processor	IFP LRU, contains IFDC and TPD&MC	52.01.00 IFP General
		52.01.01 IFP module construction	52.01.01.00 General
			52.01.01.01 IFP plugin wiring
			52.01.01.05 IFP mechanical assembly
	52.05 IF Downconverter IFDC assembly prototype	52.05.00 General	52.05.00.00 General
		52.05.01 Plugin module construction	52.05.01.00 General
		52.05.02 IF input subassembly (2/LRU)	52.05.02.00 General
		52.05.03 IF switch subassembly (1/LRU)	52.05.03.00 General
		52.05.04 Baseband output subassembly (4 per LRU) & bandpass filters (4 per LRU)	52.05.04.00 General
		52.05.05 Power and SPI interface board	52.05.05.00 General
		52.05.06 IFDC firmware for power and SPI interface board	52.05.06.00 General
		52.05.07 IFDC mounting plate & thermal interface	52.05.07.00 General
	52.06 IF Downconverter IFDC assembly production	52.06.00 General	52.06.00.00 General
		52.06.01 Assembly construction	52.06.01.00 General
		52.06.02 IFDC IF input subassembly (2 per IFDC)	52.06.02.00 General
		52.06.03 IFDC IF switch subassembly (2 per IFDC)	52.06.03.00 General
		52.06.04 IFDC baseband output subassembly (4 per IFDC) and bandpass filter (4 per LRU)	52.06.04.00 General
		52.06.05 IFDC power and SPI interface board	52.06.05.00 General
		52.06.06 IFDC firmware for power and SPI interface board	52.06.06.00 General
		52.06.07 IFDC mounting plate & thermal interface	



Level 1	Level 2	Level 3	Level 4
	52.07 IFP TPD&MC	total power digitizer & monitor control motherboard	52.06.07.00 General
		52.07.00 IFP TPD&MC General	52.07.00.00 General
		52.07.01 IFP FPGA firmware for TPD&MC motherboard	52.07.01.00 General
		52.07.02 IFP TPD&MC Ethernet bridge daughter board	52.07.02.00 General
	52.08 IF Processor	sub-subsystem bench test stand IFPT	
		52.08.00 General	52.08.00.00 General
		52.08.01 IFPT construction	52.08.01.00 General
		52.08.02 IFPT test equipment	52.08.02.00 General
		52.08.03 IFPT DEV plug-in module	52.08.03.00 General
			52.08.03.01 DEV construction
			52.08.03.02 Development board
			52.08.03.03 Filter board
		52.08.04 IFPT plugin Pseudo Front End module	52.08.04.00 General
			52.08.04.01 PFE construction
53 Data Transmission Subsystem DTS			
	53.00 General		
		53.00.00 General	53.00.00.00 General
	53.01 Digitizer DG	assembly (located inside DTX LRU)	
		53.01.00 General	53.01.00.00 General
		53.01.01 Digitizer service board DGSB assembly	53.01.01.00 General
			53.01.01.01 DGSB circuit board
			53.01.01.02 DGSB firmware
		53.01.02 Digitizer sampler DGS	53.01.02.00 General
			53.01.02.01 DGS circuit board
		53.01.03 Digitizer sampler demultiplexer DGD	53.01.03.00 General
			53.01.03.01 DGD circuit board
		53.01.04 DG wiring harnesses and transmitter module back plane	53.01.04.00 General
		53.01.05 DG Control Board DGCB in DG assembly	53.01.05.00 General
			53.01.05.01 DGCB circuit board
			53.01.05.02 DGCB firmware
		53.01.06 Digitizer sampler test equipment DTE	53.01.06.00 General
			53.01.06.01 DTEC correlator board with FPGA
			53.01.06.02 DTE DPA digital pattern acquisition board for PC
			53.01.06.03 DTE Noise generator assembly, 2-4 GHz
			53.01.06.04 DTE Firmware for DTEC
			53.01.06.05 DTE LabView software for PC and DPA
	53.04 Digitizer clock	DGCK LRU	
		53.04.00 DGCK boards, firmware, power supplies, harnesses	53.04.00.00 General
			53.04.00.01 DGCK clock circuit assembly (output 250 MHz & 4 GHz)
			53.04.00.02 DGCK firmware
			53.04.00.03 DGCK clock distributor (48 msec & 125 MHz)
			53.04.00.04 DGCK wiring harness (including circuit board), and cable assemblies
		53.04.01 DGCK module	53.04.01.00 General
			53.04.01.01 DGCK module assembly



Level 1	Level 2	Level 3	Level 4
	53.05 Formatter FR assembly (located inside DTX LRU)	53.05.00 FR circuit board and firmware	53.05.00.00 General 53.05.00.01 FR circuit board with FPGAs and 1/2 transponders 53.05.00.02 FR BBpr0 1/2 transponder wavelength channels 21, 23 and 25 53.05.00.03 FR BBpr1 1/2 transponder wavelength channels 27, 29 and 31 53.05.00.04 FR BBpr2 1/2 transponder wavelength channels 33, 35 and 37 53.05.00.05 FR BBpr3 1/2 transponder wavelength channels 39, 41 and 43 53.05.00.06 FR firmware
	53.06 Data receiver DRX LRU	53.06.00 DRX boards and firmware	53.06.00.00 General 53.06.00.01 Deformatter DFR circuit board 53.06.00.02 Deformatter DFR firmware 53.06.00.03 DRX receive only optical transponder 53.06.00.04 DRX optical connector mounting plate
	53.07 Transmitter monitor, control and power supply MCPS assembly (located inside DTX LRU)	53.07.00 MCPS boards and firmware	53.07.00.00 General 53.07.00.01 MCPS circuit board 53.07.00.02 Power harness including circuit board 53.07.00.03 MCPS firmware
	53.08 Data transmitter DTX LRU (contains DG, FR, MCPS assemblies) (4 per antenna)	53.08.00 General	53.08.00.00 General
		53.08.01 DTX back plane board, DG to FR transmitter	53.08.01.00 General
		53.08.02 DTX BBpr0 LRU 1/2 transponder wavelength channels 21, 23 and 25	53.08.02.00 General
		53.08.03 DTX BBpr1 LRU 1/2 transponder wavelength channels 27, 29 and 31	53.08.03.00 General
		53.08.04 DTX BBpr2 LRU 1.2 transponder wavelength channels 33, 35 and 37	53.08.04.00 General
		53.08.05 DTX BBpr3 LRU 1/2 transponder wavelength channels 39, 41 and 43	53.08.05.00 General
		53.08.06 DTX assemblies in digital rack	53.08.06.00 General 53.08.06.01 DTX module assembly 53.08.06.02 DTX insert assembly 53.08.06.03 DTX shell assembly 53.08.06.04 Other DTX assemblies
		53.08.07 DTX cable & wiring assemblies	53.08.07.00 General
	53.10 Data transmission sub-subsystem test stand DTST	53.10.00 DTST General	53.10.00.00 General
		53.10.01 DTST Labview software	53.10.01.00 General
		53.10.02 DTST rack	53.10.02.00 General
		53.10.03 DTST bin	53.10.03.00 General
		53.10.04 DTST 48VDC power supply and distribution	53.10.04.00 General
		53.10.05 DTST backplane	53.10.05.00 General
		53.10.06 DTST 125 MHz / 48 msec source	53.10.06.00 General
		53.10.07 DTST pseudo IF assembly	53.10.07.00 General
		53.10.08 DTST optical fiber attenuators	53.10.08.00 General
		53.10.09 DTST cables with connectors	



Level 1	Level 2	Level 3	Level 4
54 Fiber Optic Transmission Subsystem FOTS	54.00 General	53.10.10 DTST computer (LabView with CAN Interface Card)	53.10.09.00 General
			53.10.10.00 General
	54.02 Fiber optic DWDM multiplexer FOM LRU	54.00.00 General	54.00.00.00 General
		54.02.00 General	54.02.00.00 General
	54.02.01 FOM assembled circuit board		54.02.01.00 General
			54.02.01.02 Firmware
	54.02.02 FOM chassis		54.02.02.00 General
			54.02.02.01 Chassis cover
	54.02.03 Safety (keep alive) link assembly		54.02.02.02 Chassis bracket
			54.02.02.03 Tap monitor mounting
	54.02.04 Fiber optic multiplexer test set FOMT		54.02.02.06 Chassis tray
			54.02.03.00 General
	54.03 Fiber connector & splice boxes		54.02.03.01 Short fiber cable
			54.02.03.02 Long fiber cable
	54.03.00 General		54.02.04.00 General
			54.02.04.01 FOM test potentiometer assembly
	54.03.01 LO fiber splice box in antenna cabin fiber between analog rack and elevation FOW, contains ODF (1:2 fibers)		54.03.00.00 General
			54.03.01.00 General
	54.03.02 DTS fiber splice box in antenna cabin between elevation wrap and digital rack (8:8 fibers)		54.03.02.00 General
			54.03.03.00 General
	54.03.03 Yoke arm fiber splice box above azimuth wrap (fibers to azimuth wrap and azimuth FOW: fibers to pad)		54.03.04.00 General
			54.03.05.00 General
	54.03.04 Antenna pedestal fiber splice box (fibers to azimuth wrap and azimuth FOW: fibers to pad vault)		54.03.06.00 General
			54.03.07.00 General
	54.03.05 Fiber connector wall box in antenna pad vault AFCB LRU (8:8 fibers)		54.03.08.00 General
			54.03.08.00 General
	54.03.06 AOS TB fiber splice box (216 cables: 64x5 fibers, located inside ODC)		54.04.00.00 General
			54.04.01.00 General
	54.03.07 DRX fiber splice box DFSB LRU (64x12: 128x3 fibers)		54.05.00.00 General
			54.05.01.00 General
	54.03.08 Antenna azimuth platform splice box		54.05.01.01 Rear blanking panel
			54.05.01.02 Connector mounting bracket
	54.04 Fiber connector patch panels FCPP (64x5 fibers, located inside ODF in AOS TB)		54.05.01.03 CAN cable assembly
			54.05.01.10 Assembled backplane FOA-B
	54.04.00 General		54.05.02.00 General
			54.05.02.02 Ribbon Cable – FOA C to EDFA
	54.04.01 Optical attenuators		54.05.02.03 Power lamp assembly
	54.05 Fiber optic amplifier & demultiplexer FOAD		
	54.05.00 General		
	54.05.01 FOAD crate assembly		
	54.05.02 FOAD plugin module LRU FOA		



Level 1	Level 2	Level 3	Level 4
			54.05.02.10 FOAD temperature sensor assembly 54.05.02.20 Assembled controller circuit board FOA C 54.05.02.22 FOAD firmware
		54.05.05 FOAD rack	54.05.05.00 General
		54.05.06 FOAD power supply bin	54.05.06.00 General
		54.05.07 FOAD power supply	54.05.07.00 General
		54.05.08 Fiber optic amplifier demux test set FOADT	54.05.08.00 General 54.05.08.01 FOAD test adapter 54.05.08.02 FOAD bare circuit board test adapter 54.05.08.03 FOAD test software
	54.06 Optical fiber switch to optical spectrum analyzer	54.06.00 General	54.06.00.00 General
	54.07 Optical spectrum analyzer	54.07.00 General	54.07.00.00 General
	54.09 Optical fiber cable OFC	54.09.00 General	54.09.00.00 General 54.09.01 Optical fiber cables internal to antenna OFCA (8 fiber loose tube) 54.09.01.00 General 54.09.02 Antenna fiber on axis wrap assemblies FOW 54.09.02.00 General 54.09.02.01 Fiber wrap mechanical assembly 54.09.02.02 Fiber wrap housing assembly 54.09.02.03 Fiber wrap arm 1 assembly 54.09.02.04 Fiber wrap sun cylinder assembly 54.09.02.01 Fiber wrap mechanical assembly 54.09.02.02 Azimuth on-axis wrap mounting assembly (Vertex) 54.09.02.03 Elevation on-axis wrap mounting assembly (Vertex) 54.09.02.04 Azimuth on-axis wrap mounting assembly (Alcatel) 54.09.02.05 Elevation on-axis wrap mounting assembly (Alcatel) 54.09.02.06 Azimuth on-axis wrap mounting assembly (Mitsubishi) 54.09.02.07 Elevation on-axis wrap mounting assembly (Mitsubishi) 54.09.02.08 FOW optical fiber cable 54.09.03 External optical fiber cable (in ground) OFCB (8 fiber loose tube between antenna pad vaults and ODF inside AOS TB) 54.09.03.00 General 54.09.05 Optical fiber cables internal to technical building OFTB 54.09.05.00 General 54.09.06 Fiber on-axis wrap test stand FOWT 54.09.06.00 General
	54.10 Fiber management racks (located in AOS TB)	54.10.00 General	54.10.00.00 General
		54.10.01 Splice racks	54.10.01.00 General
		54.10.02 Patch panel racks (DTS, PLO, M&C)	54.10.02.00 General
		54.10.03 Fiber optic amplifier & demultiplexer racks (for FOADs)	54.10.03.00 General
		54.10.04 Optical fiber distribution cabinet ODC (175 + 22 cables : 197x8 fibers)	54.10.04.00 General
55 LO & Time Reference Sub-subsystem LOT (≤ 2 GHz)			
	55.00 General	55.00.00 General	55.00.00.00 General
	55.01 Master Frequency Standard MFS LRU	55.01.00 General	55.01.00.00 General



Level 1	Level 2	Level 3	Level 4
		55.01.01 Rubidium frequency standard RFS	55.01.01.00 General
		55.01.02 Hydrogen maser frequency standard HMFS (future)	55.01.02.00 General
	55.02 Central Reference Distributor CRD LRU	55.02.00 General	55.02.00.00 General
			55.02.00.01 CRD circuit board
			55.02.00.02 CRD monitor control firmware
		55.02.01 CRD monitor control and transmitter assembly	55.02.01.00 General for CRD monitor control and transmitter assembly
		55.02.02 CRD fiber optic splitter assembly	55.02.02.00 General
			55.02.02.01 Center plate mounting brackets
		55.02.03 CRD module	55.02.03.00 General
			55.02.03.01 CRD mechanical assembly
			55.02.03.02 Wiring
			55.02.03.03 Connectors
	55.03 Central Reference Generator CRG LRU	55.03.00 General	55.03.00.00 General
			55.03.00.01 CRG circuit board
		55.03.01 CRG frequency multiplier & power amplifier assembly	55.03.01.00 General
		55.03.02 CRG power splitter assembly	55.03.02.00 General
			55.03.02.01 CRG Center plate mounting brackets
		55.03.03 CRG Module	55.03.03.00 General
			55.03.03.01 CRG mechanical assembly
			55.03.03.02 CRG wiring
			55.03.03.03 CRG connectors
	55.04 LO Reference Receiver LORR LRU	55.04.00 General	55.04.00.00 General
		55.04.01 LORR monitor and control	55.04.01.00 General
			55.04.01.01 LORR monitor and control PCB
			55.04.01.02 LORR monitor control firmware
			55.04.01.03 LORR monitor control mounting plate
			55.04.01.04 Mounting Plate
		55.04.02 LORR comb generator assembly	55.04.02.00 General
		55.04.04 LORR 2 GHz PLL assembly	55.04.04.00 General
			55.04.04.01 LORR 2 GHz PLL mounting plate
		55.04.05 LORR 25 MHz oscillator assembly	55.04.05.00 General
			55.04.05.01 LORR 25 MHz mounting plate assembly
		55.04.06 LORR 125 MHz oscillator	55.04.06.00 General
			55.04.06.01 LORR 125 MHz mounting plate assembly
		55.04.07 LORR module	55.04.07.00 General
			55.04.07.01 LORR mechanical assembly
			55.04.07.02 LORR wiring
			55.04.07.03 LORR connectors
		55.04.10 LORR fiber optic module LORR FO (temporary LRU)	55.04.10.00 General
	55.05 Second LO synthesizer LO2 LRU	55.05.00 General	55.05.00.00 General



Level 1	Level 2	Level 3	Level 4
		55.05.01 LO2 monitor and control PCB assembly	55.05.01.00 General 55.05.01.01 LO2 monitor and control circuit board 55.05.01.02 LO2 monitor control firmware
		55.05.02 LO2 regulator PCB assembly	55.05.02.00 General 55.05.02.01 LO2 regulator circuit board 55.05.02.02 LO2 regulator PCB supports
		55.05.03 LO2 PLL and fine tuning synthesizer assembly	55.05.03.00 General 55.05.03.01 LO2 PLL circuit board assembly 55.05.03.02 LO2 FTS circuit board assembly 55.05.03.03 LO2 PCB housing 55.05.03.04 LO2 FTS firmware
		55.05.04 LO2 IF and lowpass filter assembly	55.05.04.00 General 55.05.04.01 LO2 IF assembly 55.05.04.02 LO2 IF lowpass filter
		55.05.05 LO2 coupled power divider assembly	55.05.05.00 General
		55.05.06 LO2 amplifier and low pass filter assembly	55.05.06.00 General 55.05.06.01 LO2 AMP&LPF Mounting Plate
		55.05.07 LO2 digital YIG Tuned Oscillator (DYTO) assembly	55.05.07.00 General
		55.05.08 LO2 module	55.05.08.00 General 55.05.08.01 LO2 mechanical assembly 55.05.08.02 LO2 module wiring harness 55.05.08.03 LO2 module connectors
	55.07 First LO Offset Generator FLOOG LRU	55.07.00 General	55.07.00.00 General
		55.07.01 FLOOG FTS PCB assembly	55.07.01.00 General 55.07.01.01 FLOOG FTS circuit board
		55.07.02 FLOOG FTS firmware	55.07.02.00 General
		55.07.03 FLOOG regulator PCB assemblies	55.07.03.00 General 55.07.03.01 FLOOG regulator circuit board
		55.07.04 FLOOG module	55.07.04.00 General 55.07.04.01 FLOOG module assembly 55.07.04.02 FLOOG module wiring 55.07.04.03 FLOOG module connectors
		55.07.05 FTS2 assembly for FEND Integration Center	55.07.05.00 General
	55.08 5 MHz Reference Distributor 5RD LRU	55.08.00 General	55.08.00.00 General
		55.08.01 5RD power dividers	55.08.01.00 General
		55.08.02 5RD power amplifiers	55.08.02.00 General
		55.08.03 5RD enclosure assembly	55.08.03.00 General
	55.09 CRG 125 MHz Reference Distributor 125RD LRU in central LO rack	55.09.00 General	55.09.00.00 General & CIDL
		55.09.01 125 MHz power dividers	55.09.01.00 General
		55.09.02 125 MHz amplifiers	



Level 1	Level 2	Level 3	Level 4
			55.09.02.00 General
		55.09.03 125RD enclosure assembly	55.09.03.00 General
	55.10 LORR distributor LORRD LRU in antenna analog rack		
		55.10.00 General	55.10.00.00 General & CIDL
		55.10.01 4 way power divider for 125 MHz comb line (8 14 GHz lines to 4xLO2)	55.10.01.00 General
		55.10.02 (9) way power divider for 125 MHz to WVR, FLOOG, FE, DGCK, 4xLO2, (2 way divider)	55.10.02.00 General
		55.10.03 2 way power divider for 125 MHz to 2x IFDC	55.10.03.00 General
		55.10.04 LORR distribution panel	55.10.04.00 General
			55.10.04.01 LORR distribution panel mechanical assembly
	55.11 LO reference & time test stand LOTT		
		55.11.00 General	55.11.00.00 General
		55.11.01 Power meter assembly	55.11.01.00 General
		55.11.02 Frequency counter assembly	55.11.02.00 General
		55.11.03 Spectrum analyzer assembly	55.11.01.03 General
56 Photonic 1st LO Reference Sub-subsystem PLO			
	56.00 General		
		56.00.00 General	56.00.00.00 General
	56.01 Master Laser ML prototype LRU		
		56.01.00 General	56.01.00.00 General
	56.02 Laser Synthesizer LS temporary LRU		
		56.02.00 General	56.02.00.00 General
		56.02.01 LS slave laser SL	56.02.01.00 General
			56.02.01.01 Temporary slave laser CTNLL (Calibrated Tunable Narrow Linewidth Laser)
		56.02.02 LS Photomixers	56.02.02.00 General
		56.02.03 LS optical phase lock loop assembly	56.02.03.00 General
		56.02.04 LS fiber frequency shifter	56.02.04.00 General
		56.02.05 LS harmonic mixer	56.02.05.00 General
		56.02.06 LS wire harnesses	56.02.06.00 General
		56.02.07 LS interface circuit board	56.02.07.00 General
		56.02.08 LS AMBSI 1 firmware	56.02.08.00 General
		56.02.09 LS module parts	56.02.09.00 General
		56.02.10 LS photomixer bias assembly	56.02.10.00 General
		56.02.11 LS RF power amplifier	56.02.11.00 General
		56.02.12 LS power supply	56.02.12.00 General
	56.03 Line Length Correction LLC LRU		
		56.03.00 General	56.03.00.00 General
			56.03.01 Production LLC fiber stretcher assembly (FSA)



Level 1	Level 2	Level 3	Level 4
		56.03.01.00 General	
		56.03.02 Production LLC mainboard	
			56.03.02.00 General
			56.03.02.01 Microcontroller firmware
			56.03.02.02 FPGA/CPLD definition
		56.03.03 Prototype LLC driver board assembly	
			56.03.03.00 General
		56.03.06 Prototype LLC DC power regulator PCB	
			56.03.06.00 General
		56.03.07 Prototype LLC wiring harness	
			56.03.07.00 General
		56.03.10 Prototype LLC AMBSI-1 firmware	
			56.03.10.00 General
	56.04 Central Variable Reference synthesizer CVR LRU		
		56.04.00 General	
			56.04.00.00 General
	56.05 1st LO Photonic Receiver LPR LRU		
		56.05.00 General	
			56.05.00.00 General
		56.05.01 LPR optical assembly	
			56.05.01.00 General
			56.05.01.01 Amplified switch path
			56.05.01.02 Round trip path
		56.05.02 LPR fiber patchcord assembly	
			56.05.02.00 General
			56.05.02.01 Insulated-cable assembly
			56.05.02.02 Meta-cable assembly
		56.05.03 LPR cable interfaces to Front End	
			56.05.03.00 General
		56.05.04 LPR mechanical assembly	
			56.05.04.00 General
		56.05.05 LPR monitor and control	
			56.05.05.00 General
		56.05.06 LPR interface PCB	
			56.05.06.00 General
		56.05.07 Photonic reference receiver PRR (temporary for ATF)	
			56.05.07.00 General
	56.06 Low frequency LO reference 1532nm distribution LFRD LRU		
		56.06.00 General	
	56.07 Master Laser Distribution MLD LRU		
		56.07.00 General	
			56.07.00.00 General
	56.08 Photonic reference distribution PRD LRU		
		56.08.00 General	
			56.08.00.00 General
	56.09 Photonic sub array switch SAS LRUs		
		56.09.00 General	
			56.09.00.00 General
		56.09.01 SAS optical module LRU	
			56.09.01.00 General
		56.09.02 SAS Electronic module LRU	
			56.09.02.00 General
			56.09.02.01 Firmware
			56.09.02.03 FPGA/CPLD assembly
	56.10 Optical diplexer filter 1532/1557 nm ODF LRU, located in antenna cabin fiber splice box		
		56.10.00 General	
			56.10.00.00 General
		56.10.01 OD diplexer device	
			56.10.01.00 General
		56.10.02 OD mounting assembly	
			56.10.02.00 General
	56.11 Laser synthesizer LS production LRU		
		56.11.00 General	



Level 1	Level 2	Level 3	Level 4
		56.11.01 LS photomixers from RAL	56.11.00.00 General 56.11.01.00 General 56.11.01.02 P12A photomixer assembly 56.11.01.03 P10B photomixer assembly 56.11.01.04 P8C photomixer assembly
		56.11.02 LS documentation by vendor	56.11.02.00 General
	56.12 Photomixers from RAL for LPR/FEND cartridges	56.12.00 General	56.12.00.00 General
		56.12.01 27-33 GHz coaxial photomixer assembly	56.12.01.00 General
		56.12.02 P12A photomixer assembly	56.12.02.00 General
		56.12.03 P10B photomixer assembly	56.12.03.00 General
		56.12.04 P8C photomixer assembly	56.12.04.00 General
	56.13 Master laser ML production LRU	56.13.00 General	56.13.00.00 General
		56.13.01 ML TBD	56.13.01.00 General
		56.13.02 ML documentation by vendor	56.13.02.00 General
	56.14 Photonic LO test stand PLOT	56.14.00 General	56.14.00.00 General
57 BE Miscellaneous Equipment	57.00 General	57.00.00 General	57.00.00.00 General
	57.02 Racks and contents other than LRUs	57.02.00 General	57.02.00.00 General
		57.02.01 Digital rack (antenna receiver cabin)	57.02.01.00 General 57.02.01.01 Coaxial cables 57.02.01.02 Wire harnesses 57.02.01.03 Top bulkhead 57.02.01.04 Bottom bulkhead 57.02.01.05 AMB cables 57.02.01.06 Optical fiber 57.02.01.07 Air baffles 57.02.01.08 Power Supply Cutoff on Overtemperature 57.02.01.09 Quadrax to DB9 splice box 57.02.01.10 Digital rack mechanical assembly
		57.02.02 Analog rack (antenna receiver cabin)	57.02.02.00 General 57.02.02.01 Coaxial cables 57.02.02.02 Wire harnesses 57.02.02.03 Top bulkhead 57.02.02.04 Bottom bulkhead 57.02.02.05 AMB cables 57.02.02.06 Optical fiber cables 57.02.02.07 Air baffles 57.02.02.08 Power Supply Cutoff on Overtemperature 57.02.02.09 Analog rack mechanical assembly
		57.02.03 Line Length Correction (LLC) rack assembly	57.02.03.00 General 57.02.03.01 Rack RF cabling/distribution 57.02.03.02 Rack DC and AC wiring



Level 1	Level 2	Level 3	Level 4
			57.02.03.03 Rack monitor and control (M&C) wiring
			57.02.03.04 Optical fiber cables (intra-rack only)
		57.02.04 Bins in analog rack	
			57.02.04.00 General
			57.02.04.01 Analog bin assembly
		57.02.06 Analog shielded module housing	
			57.02.06.00 General
			57.02.06.01 Analog module assembly
		57.02.07 DTS bin in digital rack	
			57.02.07.00 General
			57.02.07.01 DTS bin assembly
		57.02.08 Sub-Array Switch (SAS) rack assembly	
			57.02.08.00 General
			57.02.08.01 Rack RF cabling/distribution
			57.02.08.02 Rack DC and AC wiring
			57.02.08.03 Rack monitor and control (M&C) wiring
			57.02.08.04 Optical fiber cables (intra-rack only)
		57.02.09 Photonic Reference Distribution (PRD) rack assembly	
			57.02.09.00 General
			57.02.09.01 Rack RF cabling/distribution
			57.02.09.02 Rack DC and AC wiring
			57.02.09.03 Rack monitor and control (M&C) wiring
			57.02.09.04 Optical fiber cables (intra-rack only)
		57.02.10 Laser Synthesizer (LS) rack assembly	
			57.02.10.00 General
			57.02.10.01 Rack RF cabling/distribution
			57.02.10.02 Rack DC and AC wiring
			57.02.10.03 Rack monitor and control (M&C) wiring
			57.02.10.04 Optical fiber cables (intra-rack only)
		57.02.11 Master Laser (ML) rack assembly	
			57.02.11.00 General
			57.02.11.01 Rack RF cabling/distribution
			57.02.11.02 Rack DC and AC wiring
			57.02.11.03 Rack monitor and control (M&C) wiring
			57.02.11.04 Optical fiber cables (intra-rack only)
		57.02.12 Master laser distribution rack assembly	
			57.02.12.00 General
			57.02.12.01 Rack RF cabling/distribution
			57.02.12.02 Rack DC and AC wiring
			57.02.12.03 Rack monitor and control (M&C) wiring
			57.02.12.04 Optical fiber cables (intra-rack only)
		57.02.13 Low frequency reference rack assembly	
			57.02.13.00 General
			57.02.13.01 Rack RF cabling/distribution
			57.02.13.02 Rack DC and AC wiring
			57.02.13.03 Rack monitor and control (M&C) wiring
			57.02.13.04 Optical fiber cables (intra-rack only)
		57.02.14 Low Frequency Reference Distribution (LFRD) rack assembly	
			57.02.14.00 General
			57.02.14.01 Rack RF cabling/distribution
			57.02.14.02 Rack DC and AC wiring
			57.02.14.03 Rack monitor and control (M&C) wiring
			57.02.14.04 Optical fiber cables (intra-rack only)
		57.02.20 Line Length Correction (LLC) subrack assembly	
			57.02.20.00 General
			57.02.20.01 Subrack bin
			57.02.20.02 Subrack backplane assembly
		57.02.21 Sub-Array Switch (SAS) subrack assembly	
			57.02.21.00 General
			57.02.21.01 Subrack bin
			57.02.21.02 Subrack backplane assembly
		57.02.23 Laser Synthesizer (LS) subrack assembly	
			57.02.22.00 General



Level 1	Level 2	Level 3	Level 4
			57.02.22.01 Subrack bin 57.02.22.02 Subrack backplane assembly
	57.03 Power Supplies PS		
		57.03.00 General	57.03.00.00 General
		57.03.01 230VAC-48VDC power supply in digital rack PSD LRU	57.03.01.00 General 57.03.01.01 Monitor interface RS232/AMBSI-1 57.03.01.02 PSD LRU assembly
		57.03.02 DC-DC power supply temporary LRU	57.03.02.00 General 57.03.02.01 Power supply monitor circuit board
		57.03.03 230VAC-pentaVDC power supply in analog rack PSA LRU	57.03.03.00 General 57.03.03.01 Monitor interface RS232/AMBSI-1 57.03.03.02 PSA mechanical assembly 57.03.03.03 PSA auto-relay subassembly
		57.03.04 Penta-VDC distributor PSAD LRU	57.03.04.00 General 57.03.04.01 Circuit board 57.03.04.02 PSAD LRU mechanical assembly
		57.03.05 Voltage regulator assemblies	57.03.05.00 General 57.03.05.01 +15V 3A Regulator VREG+15 57.03.05.02 +5V 3A Regulator VREG+5 57.03.05.03 15V 1A Regulator VREG 15 57.03.05.04 +/- 15V 1A Sequenced Regulator VREG15SEQ 57.03.05.05 5V 1A Regulator VREG 5
		57.03.06 Power supply PSD distributor PSDD	57.03.06.00 General
		57.03.07 Power supply for LLCs PSLLC LRU	57.03.07.00 PSLLC General 57.03.07.01 Monitor interface RS232/AMBSI-1 57.03.07.02 PSLLC mechanical assembly
		57.03.08 Power supply distributor for LLC PSLLCD	57.03.08.00 PSLLCD General
		57.03.09 Power supply bench test stand PST	57.03.09.00 PST General 57.03.09.01 PST Analog bin 57.03.09.02 PST Resistive loads & leads 57.03.09.03 PST Test rack 57.03.09.04 PST Solder station 57.03.09.05 PST Tools and case 57.03.09.06 PST Work bench 57.03.09.07 PST Altitude chamber 57.03.09.08 PST Laptop computer & peripherals 57.03.09.09 PST LabView software 57.03.09.10 PST Oscilloscope & differential probes 57.03.09.11 PST Digital multimeter 57.03.09.12 PST AC wattmeter 57.03.09.13 PST Clip-on AC/DC ampere meter 57.03.09.14 PST Temperature probe & meter 57.03.09.15 PST Fan tachometer 57.03.09.16 PST load bank
	57.04 Cables external to racks		
		57.04.00 General	57.04.00.00 General
		57.04.01 Cables between analog and digital racks	57.04.01.00 General 57.04.01.01 Coax IFP to DTX, baseband 2 4 GHz 57.04.01.02 Cable LORR to ABM, TE 48 msec RS422 57.04.01.03 Cable LORR to DGCK, 125 MHz
		57.04.02 Cables between analog rack and front end rack	



Level 1	Level 2	Level 3	Level 4
			57.04.02.00 General
			57.04.02.01 Coax front end to IFP, 4-12 GHz IF
			57.04.02.02 Coax LORR to LPR, 25 MHz
			57.04.02.03 Coax FLOOG to front end, 20-45 MHz
			57.04.02.04 Coax LORRD 125 MHz to water vapor radiometer WVR
		57.04.03 Cables between analog rack and Antenna	
			57.04.03.00 General
			57.04.03.01 230 VAC cable to analog rack
			57.04.03.02 LO Fiber cable to antenna pad vault
		57.04.04 Cables between digital rack and Antenna	
			57.04.04.00 General
			57.04.04.01 230VAC cable to digital rack
			57.04.04.02 DTS fiber cable to antenna pad vault
		57.04.05 Cables between central LO racks and AOS TB	
			57.04.05.00 General
			57.04.05.01 230VAC cable to central LO racks
		57.04.06 Cables between central LO racks and correlator	
			57.04.06.00 General
			57.04.06.01 Coaxial cable CRG to ALMA B correlator, 125 MHz
			57.04.06.02 Coaxial cable CRG to ACA correlator, 125 MHz
		57.04.07 MFS rack external output cables	
			57.04.07.00 General
			57.04.07.01 Coaxial cable to CRD, 5MHz
			57.04.07.02 Cable to ARTM, monitor
58 Back End Antenna Article test stand AAT			
	58.00 General		
		58.00.00 General	
			58.00.00.00 General
	58.01 AAT Labview software		
		58.01.00 General	
			58.01.00.00 General
	58.02 AAT rack and associated metal		
		58.02.00 General	
			58.02.00.00 General
	58.03 AAT pseudo FE		
		58.03.00 General	
			58.03.00.00 General
	58.04 AAT fiber optic spools and bin		
		58.04.00 General	
			58.04.00.00 General
	58.05 AAT cables with connectors		
		58.05.00 General	
			58.05.00.00 General
	58.06 AAT computer (LabView with CAN Interface Card)		
		58.06.00 General	
			58.06.00.00 General
59 BE Reviews, documentation			
	59.00 General		
		59.00.00 General	
			59.00.00.00 General
	59.01 BE PDR		
		59.01.00 General	
			59.01.00.00 General
	59.02 BE CDR		
		59.02.00 General	
			59.02.00.00 General
60 64 antenna correlator			
	60.00 General		
		60.00.00 General	
			60.00.00.00 General
	60.01 Station rack assembly		
		60.01.00 General	
			60.01.00.00 General



Level 1	Level 2	Level 3	Level 4
		60.01.01 Station rack	
		60.01.02 Station card	60.01.01.00 General
		60.01.03 FIR filter card	60.01.02.00 General
		60.01.04 6U bin power supply card	60.01.03.00 General
		60.01.05 Station control card	60.01.04.00 General
		60.01.06 Distribution paddleboard type1	60.01.05.00 General
		60.01.07 Tunable Filter Bank Card	60.01.06.00 General
			60.01.07.00 General
			60.01.07.01 Prototype Card
			60.01.07.02 Delay Implementation
			60.01.07.03 FIR Implementation
			60.01.07.04 Pre series Card
			60.01.07.05 Production Card
			60.01.07.06 CPLD Implementation
	60.02 Correlator rack assembly	60.02.00 General	
		60.02.01 Correlator rack	60.02.00.00 General
		60.02.02 Correlator Card	60.02.01.00 General
		60.02.03 Long term accumulator card	60.02.02.00 General
		60.02.04 Final adder card	60.02.03.00 General
		60.02.05 Quadrant control card	60.02.04.00 General
		60.02.06 Distribution paddleboard type2	60.02.05.00 General
		60.02.07 9U bin powersupply card	60.02.06.00 General
		60.02.08 Mezzanine power supply card	60.02.07.00 General
			60.02.08.00 General
	60.03 Data Port Interface assembly	60.03.00 General	
		60.03.01 DPI interface box	60.03.00.00 General
		60.03.02 DPI card	60.03.01.00 General
		60.03.03 DPI power supply	60.03.02.00 General
			60.03.03.00 General
	60.04 Power rack assembly	60.04.00 General	
		60.04.01 Power rack	60.04.00.00 General
		60.04.02 Power supplies	60.04.01.00 General
			60.04.02.00 General
	60.05 Cables	60.05.00 General	
		60.05.01 Data	60.05.00.00 General
		60.05.02 Communications	60.05.01.00 General
		60.05.03 Power	60.05.02.00 General



Level 1	Level 2	Level 3	Level 4
61 Two antenna correlator	60.06 Test facility	60.05.04 Clock and control	60.05.03.00 General
			60.05.04.00 General
		60.06.00 General	60.06.00.00 General
		60.06.01 Station card test fixture	60.06.01.00 General
		60.06.02 CC/LTA test fixture	60.06.02.00 General
		60.06.03 SCC test fixture	60.06.03.00 General
	61.00 General	61.00.00 General	61.00.00.00 General
	61.01 Two antenna correlator rack assembly	61.01.00 General	61.01.00.00 General
		61.01.01 Two antenna correlator rack	61.01.01.00 General
		61.01.02 Station card	61.01.02.00 General
		61.01.03 FIR filter card	61.01.03.00 General
		61.01.04 6U bin power supply card	61.01.04.00 General
		61.01.05 Station control card	61.01.05.00 General
		61.01.06 Distribution paddleboard type1	61.01.06.00 General
		61.01.07 Correlator Card	61.01.07.00 General
		61.01.08 Long term accumulator card	61.01.08.00 General
		61.01.09 Quadrant control card	61.01.09.00 General
		61.01.10 Distribution paddleboard type2	61.01.10.00 General
		61.01.11 9U bin powersupply card	61.01.11.00 General
		61.01.12 Mezzanine power supply card	61.01.12.00 General
		61.01.13 Power supplies	61.01.13.00 General
		61.01.14 Final adder card	61.01.14.00 General
	61.02 Data Port Interface assembly	61.02.00 General	61.02.00.00 General
		61.02.01 DPI interface box	61.02.01.00 General
		61.02.02 DPI card	61.02.02.00 General
		61.02.03 DPI power supply	61.02.03.00 General
	61.03 Cables	61.03.00 General	61.03.00.00 General
		61.03.01 Data	61.03.01.00 General
		61.03.02 Communications	61.03.02.00 General



Level 1	Level 2	Level 3	Level 4
62 ACA Correlator	62.00 General	61.03.03 Power	61.03.03.00 General
		61.03.04 Clock and control	61.03.04.00 General
		62.00.00 General	62.00.00.00 General
		62.90.00 General	62.90.00.00 General
70 Computing	70.00 General	70.00.00 General	70.00.00.00 General
		70.02 Computers, Communications	70.02.00.10 Computer hardware
		70.02.00 General	70.02.00.20 Communications equipment
			70.02.00.30 General software
		70.05 Management	70.05.00.00 General
		70.10 Science Software Requirements	70.10.00.00 General
		70.10.00 General	
		70.15 High Level Analysis	70.15.00.00 General
		70.15.00 General	
		70.20 Software Engineering	70.20.00.00 General
		70.20.00 General	
		70.20.10 Coding Standards	70.20.10.00 General
		70.25 Common Software	70.25.00.00 General
		70.25.00 General	
		70.30 Executive Software	70.30.00.00 General
		70.30.00 General	
		70.35 Control Software	70.35.05.00 General
		70.35.05 General	
		70.35.10 Common Hardware	70.35.10.00 General
			70.35.10.01 AMBSI 1
			70.35.10.02 AMBSI 2
			70.35.10.03 ALMA M&C Bus
			70.35.10.04 AMBSI 2 Tester
			70.35.10.05 AMB Backpanel
			70.35.10.06 Ethernet Controlled Power Strip
			70.35.10.07 Receiver Cabin Ethernet Switch
			70.35.10.08 GPS
			70.35.10.09 GPS Antenna
			70.35.10.10 Array Control Computer (ACC)
			70.35.10.11 Antenna Bus Master (ABM)
			70.35.10.12 Array Real Time Machine (ARTM)
			70.35.10.13 DTS M&C Computer (DMC)
		70.35.20 Antenna Hardware	70.35.20.00 General
		70.35.25 Front End Hardware	70.35.25.00 General
		70.35.30 Back End Hardware	



Level 1	Level 2	Level 3	Level 4
		70.35.30.00 General	
		70.35.35 Correlator Hardware	
			70.35.35.00 General
		70.35.40 Misc. Hardware	
			70.35.40.00 General
		70.35.50 Meetings	
			70.35.50.00 General
			70.35.50.01 Weekly Coordination Meetings
		70.35.60 Software Packages	
			70.35.60.00 General
			70.35.60.01 Master Controller
			70.35.60.02 Array Controller
			70.35.60.03 Manual Controller
			70.35.60.04 Device
			70.35.60.05 Monitor
			70.35.60.06 Operator
			70.35.60.07 State Model
		70.35.70 Technologies	
			70.35.70.00 General
			70.35.70.01 CAN
			70.35.70.02 AMBSI
			70.35.70.10 CORBA
			70.35.70.11 XML
			70.35.70.20 C++
			70.35.70.21 Python
			70.35.70.22 Java
	70.40 Correlator Software		
		70.40.00 General	
			70.40.00.00 General
	70.42 ACA Correlator Software		
		70.42.00 General	
			70.42.00.00 General
	70.45 Pipeline Software		
		70.45.00 General	
			70.45.00.00 General
	70.50 Archiving		
		70.50.00 General	
			70.50.00.00 General
	70.55 Scheduling		
		70.55.00 General	
			70.55.00.00 General
	70.60 Observing Preparation and Support		
		70.60.00 General	
			70.60.00.00 General
	70.65 Off line Data Processing/Analysis		
		70.65.00 General	
			70.65.00.00 General
	70.70 Data Reduction User Interface		
		70.70.00 General	
			70.70.00.00 General
	70.75 Telescope Calibration		
		70.75.00 General	
			70.75.00.00 General
	70.80 Integration, Test and Support		
		70.80.00 General	
			70.80.00.00 General
	70.85 Observatory Operations Support		
80 System Engineering	80.00 General		
		80.00.00 General	
			80.00.00.00 General
		80.00.01 ACA	
			80.00.01.00 General



ALMA Project

ALMA Product Tree

Doc #: ALMA-80.03.00.00-001-O-LIS

Date: 2007-06-08

Status: DRAFT

Level 1	Level 2	Level 3	Level 4
	80.01 System Engineering Management	80.01.00 General	80.01.00.00 General
		80.01.01 ACA	80.01.01.00 General
	80.02 Configuration Management	80.02.00 General	80.02.00.00 General
	80.03 Product Tree Structure	80.03.00 General	80.03.00.00 General
	80.04 System Design and Analysis	80.04.00 General	80.04.00.00 General
		80.04.01 Project Block Diagram	80.04.01.00 General
		80.04.02 End to End Modeling	80.04.02.00 General
		80.04.03 System Budgets	80.04.03.00 General
		80.04.04 ACA	80.04.04.00 General
	80.05 Project Standards	80.05.00 General	80.05.00.00 General
		80.05.01 EMC Standards	80.05.01.00 General
		80.05.02 Environmental Standards	80.05.02.00 General
	80.06 Change Request Procedures (void)	80.06.00 General	80.06.00.00 General
	80.07 ICD Management	80.07.00 General	80.07.00.00 General
	80.08 RAMS	80.08.00 General	80.08.00.00 General
		80.08.01 ACA	80.08.01.00 General
	80.09 Design Review Policies and Procedures	80.09.00 General	80.09.00.00 General
	80.10 Requirements	80.10.00 General	80.10.00.00 General
		80.10.01 ACA	80.10.01.00 General
	80.11 Product Assurance	80.11.00 General	80.11.00.00 General
		80.11.01 Product Assurance Process Descriptions	80.11.01.00 General
			80.11.01.01 ALMA Main Array
			80.11.01.02 ALMA Compact Array
	80.12 Computerised Maintenance Management System	80.12.00 General	80.12.00.00 General
	80.90 System Engineering Design Reviews	80.90.00 General	80.90.00.00 General
	80.95 System Engineering Meetings	80.95.00 General	



Level 1	Level 2	Level 3	Level 4
83 Prototype System Integration	83.00 General	83.00.00 General	80.95.00.00 General
	83.01 Management	83.01.00 General	83.00.00.00 General
			83.01.00.00 General
85 System Integration	85.00 General	85.00.00 General	85.00.00.00 General
	85.01 Management	85.01.00 General	85.01.00.00 General
	85.90 System Integration Design Reviews	85.90.00 General	85.90.00.00 General
90 Science	90.00 General	90.00.00 General	90.00.00.00 General
	90.01 ASAC Documents	90.01.00 General	90.01.00.00 General
	90.02 Configuration	90.02.00 General	90.02.00.00 General
	90.03 Calibration	90.03.00 General	90.03.00.00 General
		90.03.01 Amplitude	90.03.01.00 General
		90.03.02 Phase	90.03.02.00 General
		90.03.03 Total Power	90.03.03.00 General
		90.03.04 Other	90.03.04.00 General
	90.04 Imaging	90.04.00 General	90.04.00.00 General
		90.04.01 Simulation	90.04.01.00 General
		90.04.02 Techniques	90.04.02.00 General
	90.05 Site Characterization	90.05.00 General	90.05.00.00 General
		90.05.01 NRAO container	90.05.01.00 General
			90.05.01.01 Photovoltaic system
		90.05.02 ESO container 1	90.05.02.00 General
			90.05.02.01 Photovoltaic system
		90.05.03 ESO container 2	90.05.03.00 General
			90.05.03.01 Photovoltaic system
		90.05.04 Radiosonde container	90.05.04.00 General
			90.05.04.01 Photovoltaic system
		90.05.05 Container Network Systems	90.05.05.00 General



Level 1	Level 2	Level 3	Level 4
			90.05.05.01 Computer Network
			90.05.05.02 Communications Network
		90.05.06 225 GHz tipping radiometer	
			90.05.06.00 General
		90.05.07 11.2 GHz interferometer	
			90.05.07.00 General
		90.05.08 183 GHz radiometers	
			90.05.08.00 General
		90.05.09 Submm tipping radiometer	
			90.05.09.00 General
		90.05.10 Frost point hygrometer	
			90.05.10.00 General
		90.05.11 Weather stations	
			90.05.11.00 General
			90.05.11.01 Davis
			90.05.11.02 Monitor Sensors
			90.05.11.03 Other weather instruments
		90.05.12 Radiosonde equipment	
			90.05.12.00 General
		90.05.13 Other instruments	
			90.05.13.00 General
			90.05.13.01 Lightning detector
			90.05.13.02 Surveillance camera
			90.05.13.03 GPS receivers