Product Breakdown Structure (PBS)

020.10.20.00.00-0004-DSN

Status: Released

PREPARED BY		ORGANIZATION	DATE
P. Kotzé		ngVLA, NRAO	25/4/2024

APPROVALS	ORGANIZATION	SIGNATURES
P. Kotzé, Systems Engineer	ngVLA, NRAO	Pieter Kotzé Pieter Kotzé (Apr 25, 2024 14:09 MDT)
R. Selina, Project Engineer	ngVLA, NRAO	Rob Selina (Apr 25, 2024 14:40 MDT)
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RELEASED BY	ORGANIZATION	SIGNATURE
W. Esterhuyse, Project Manager	ngVLA, NRAO	

Change record

Version	Date	Author(s)	Section(s)	Reason
1	2021-04-13	T. Kusel		Initial Draft, following review by all IPTs.
2	2021-05-21	T. Kusel		Added: WVR enclosure; Glycol Pipes
3	2021-06-28	T. Kusel		Updated the CSP breakdown and DBE description based in input from Omar
4	2021-08-28	T. Kusel		Updated Cryo breakdown based on inputs from Denis
5	2021-11-12	T. Kusel		Updated ATF section based on updated AE Block Diagrams
6	2021-12-10	T. Kusel		Updated AE section to align with latest AE Block Diagrams
7	2022-01-10	T. Kusel		Updated HIL section to synchronize product numbers with HIL product tree
8	2022-01-28	T. Kusel		Added Column S to indicate which parts of the structure are to be baselined for CDR
9	2022-02-17	T. Kusel		Updated BMR part of the structure
10	2022-03-30	T. Kusel		Updated time and frequency reference parts of the structure based on inputs from B.Shillue Added item classifications Added location classifications
A	2022-04-22	T. Kusel		Update based on the RIDS of the internal pre-CDR review. First released version.
A.1	2022-07-25	T. Kusel		Changes incorporating feedback from CDR and CM system implementation. Changes from Rev A to B indicated in Columns U&V
B	2022-07-25	T. Kusel		Prepared for release
C	2022-11-02	M. Archuleta		Antenna Electronics Test Items switched back to 020.02.15 and SBA moved back to 020.02.17; sub-items re-entered (020.02.15.01.00 and 020.02.15.01.01). CDR Baseline version
D	25/4/2024	P. Kotzé		Incorporates changes due to ECR-0002 and ECR-0005. Addition of Long Baseline Antenna. Corrections and updates after DBE CSP LRT sub-systems CoDRs. Removal of duplicate virtual items. PBS Export from ALIM for NSF CoDR.

PBS Item Classes

Level	PBS Item class	ALIM	Description
1	Facility	sys	Complete operational capability including prime equipment, support equipment, facilities, training systems, etc.
2	System	sys	Combination of subsystems
3	Subsystem	phys	Identified as a particular level in the PBS, below the System, allocated a set of requirements from the system and interfacing with other subsystems (N^2 diagram)
4	Component	phys	Assembly or grouping of Parts
5	Part - procured	phys	Leaf level item - Procured COTS parts
5	Part - manufactured	phys	Leaf level item - Manufactured parts (mechanical, cables, etc.)
5	Part - coded	phys	Leaf level SW items

PBS Item Types	System	Subsystem	Component	Part
Functional	y	y	y	
Mechanical			y	y
Mechatronic			y	y
Electronic			y	y
Electrical			y	y
Fibre Optic			y	y
SW/FW			y	y
Computing			y	y
Cabling			y	y
Piping			y	y
Infrastructure			y	y

Explorer

- Explorer
  - Configuration Management
    - 020.01.00.00.00 - (01) - ngVLA Telescope System / Sub-System PBS (Prime Equipment)
      - 020.01.00.00.00 - ngVLA Telescope System
        - 020.01.00.00.00 - (01) - ngVLA Telescope GENERIC (Prime Equipment)
      - 020.12.00.00.00 - Main Antenna System
        - 020.25.00.00.00 - Main Antenna (ANT)
          - 020.25.00.00.00 - (01) - Main Antenna
            - 020.25.00000 - (01) - mtex Antenna System
            - 020.25.21100 - (01) - ANT Pedestal
              - 020.25.21110 - (01) - Lower Pedestal
              - 020.25.21130 - (01) - Upper Pedestal
              - 020.25.21610 - (01) - Foundation Hardware & kit
              - 020.25.23140 - (01) - Azimuth Cable Wrap
            - 020.25.21200 - (01) - ANT Turnhead
              - 020.25.22210 - (01) - Turnhead Structure
              - 020.25.23110 - (01) - Azimuth Bearing
              - 020.25.23120 - (01) - Azimuth Gearbox
              - 020.25.23210 - (01) - El Bearing
              - 020.25.23220 - (01) - El Gearbox
              - 020.25.23240 - (01) - El Cable Wrap
              - 020.25.23250 - (01) - El Buffers
              - 020.25.23260 - (01) - El Stow pins
              - 020.25.23270 - (01) - Lubrication
            - 020.25.21300 - (01) - ANT El Rotating Assembly (reflector)
              - 020.25.22300 - (01) - Elevation Center Structure
                - 020.25.22320 - (01) - Elevation Counter Weights
                - 020.25.22321 - (01) - Elevation Trim Weights
                - 020.25.22330 - (01) - Elevation Center Frame
                - 020.25.23222 - (01) - Elevation Section Gears
              - 020.25.22410 - (01) - Main Reflector Panels
              - 020.25.22415 - (01) - Panel Adjusters
              - 020.25.22420 - (01) - Back up structure (BUS)
              - 020.25.22450 - (01) - Subreflector assembly

- 020.25.22440 - (01) - Subreflector BUS
- 020.25.22451 - (01) - Subreflector
- 020.25.22452 - (01) - Subreflector Extension
- 020.25.22455 - (01) - Subreflector Hexapod
- 020.25.22460 - (01) - Boom arm
- 020.25.22465 - (01) - Feed Indexer System
- 020.25.22475 - (01) - WVR Mounting
- 020.25.24000 - (01) - Reflector Miscellaneous
  - 020.25.23500 - (01) - Cable Routing Equipment
  - 020.25.23600 - (01) - Lightning Protection / Grounding
  - 020.25.23700 - (01) - Glycol routing Equipment
- 020.25.40000 - (01) - ANT Electronics, Drives, Servo & Metrology
  - 020.25.41000 - (01) - Main Antenna Electronics Drive Cabinet
    - 020.25.41100 - (01) - EMI Enclosure
    - 020.25.41200 - (01) - EMI Filters
    - 020.25.41300 - (01) - Servo Power Distribution
    - 020.25.41400 - (01) - NRAO Equipment
      - 020.25.41410 - (01) - Back End Electronics
      - 020.25.41420 - (01) - Backup Battery
      - 020.25.41430 - (01) - Rack Air Handler
    - 020.25.41500 - (01) - Drive System
      - 020.25.41510 - (01) - Azimuth Motors
      - 020.25.41520 - (01) - Elevation Motors
      - 020.25.41530 - (01) - Feed Indexer Actuator
      - 020.25.41540 - (01) - Amplifiers
      - 020.25.41550 - (01) - Motor EMI Filters
    - 020.25.41600 - (01) - Control System
    - 020.25.41700 - (01) - Safety System
    - 020.25.41800 - (01) - Emergency Cutoff Fire Alarm System
  - 020.25.42000 - (01) - I/O System
    - 020.25.42100 - (01) - Azimuth I/O Box
      - 020.25.42110 - (01) - Az EMI Enclosure
      - 020.25.42120 - (01) - Az EMI Filters
      - 020.25.42130 - (01) - Az Main Encoder
      - 020.25.42140 - (01) - Az Safety Encoder
      - 020.25.42150 - (01) - Az I/O Electronics
    - 020.25.42200 - (01) - Elevation I/O Box
      - 020.25.42210 - (01) - El EMI Enclosure
      - 020.25.42220 - (01) - El EMI Filters

- 020.25.42230 - (01) - El Main Encoder
- 020.25.42240 - (01) - El Safety Encoder
- 020.25.42250 - (01) - El I/O Electronics
- 020.25.42300 - (01) - Feed Indexer I/O Box
  - 020.25.42310 - (01) - Feed EMI Enclosure
  - 020.25.42320 - (01) - Feed EMI Filters
  - 020.25.42330 - (01) - Feed Main Encoder
  - 020.25.42340 - (01) - Feed Limit Switches
  - 020.25.42350 - (01) - Feed I/O Electronics
- 020.25.43050 - (01) - Metrology
- 020.25.43100 - (01) - Thermal Sensor System
  - 020.25.43110 - (01) - Ambient Temperature Sensors
  - 020.25.43120 - (01) - Structural monitoring temperature sensors
- 020.25.43200 - (01) - Tiltmeter Assembly
  - 020.25.43210 - (01) - Tilt EMI Enclosure
  - 020.25.43220 - (01) - Tilt EMI Filters
  - 020.25.43230 - (01) - Tiltmeter
  - 020.25.43240 - (01) - Tilt I/O Electronics
- 020.25.44040 - (01) - Pedestal Heat Exchanger
- 020.25.45040 - (01) - Safe to Approach Cabinet
- 020.25.46040 - (01) - Software and Configurations
  - 020.25.46100 - (01) - Contol System Software
  - 020.25.46200 - (01) - Safety System Configurations
  - 020.25.46300 - (01) - Drive System Configurations
- 020.25.46400 - (01) - Miscellaneous
  - 020.25.46410 - (01) - Antenna Software Simulator
  - 020.25.46420 - (01) - Development Tools
  - 020.25.46430 - (01) - Licenses
- 020.25.47030 - (01) - Ant Power Distribution
  - 020.25.47100 - (01) - 480V Distribution
  - 020.25.47200 - (01) - 480V to 208V Transformer
  - 020.25.47300 - (01) - 208V Distribution
- 020.25.48000 - (01) - Ant Fiber Distribution
- 020.25.49000 - (01) - Ant Cables
- 020.25.50000 - (01) - ANT Miscellaneous
  - 020.25.51000 - (01) - Alignment Devices
  - 020.25.52000 - (01) - Special Transport Equipment
  - 020.25.53000 - (01) - Special Installation Equipment
- 020.30.00.00.00 - Antenna Electronics

- 020.30.00.00.00 - (01) - Antenna Electronics
  - 020.30.00.01.00 - (01) - Integrated FE assembly
    - 020.30.00.01.01 - (01) - IFEA internal cabling
  - 020.30.00.02.00 - (01) - SA501 Band 5-6 IRD/LO module
    - 020.30.00.02.02 - (01) - SA501 internal cabling
    - 020.30.00.02.04 - (01) - SA501 voltage regulator board A
    - 020.30.00.02.05 - (01) - SA501 voltage regulator board B
    - 020.30.45.59.00 - (01) - SA501 power & control module (HIL supplied)
    - 020.30.60.60.20 - (01) - SA501 cold plate (EEC supplied)
  - 020.30.00.03.00 - (01) - SA502 Band 1-4 IRD/LO module
    - 020.30.00.03.02 - (01) - SA 502 internal cabling
    - 020.30.00.03.04 - (01) - SA501 voltage regulator board A
    - 020.30.00.03.05 - (01) - SA501 voltage regulator board B
    - 020.30.45.60.00 - (01) - SA502 power & control module (HIL supplied)
    - 020.30.60.60.30 - (01) - SA502 cold plate (EEC supplied)
  - 020.30.00.04.00 - (01) - Integrated Aux enclosure
  - 020.30.00.05.00 - (01) - Integrated Back-end rack
- 020.30.05.00.00 - (01) - Front End (FED)
  - 020.30.05.10.00 - (01) - Band 1 Front End
    - 020.30.05.11.00 - (01) - F501 Band 1 Front End Receiver
    - 020.30.05.12.00 - (01) - F511 - B1 Noise diode module
  - 020.30.05.20.00 - (01) - Band 2 Front End
    - 020.30.05.21.00 - (01) - F502 - Band 2 Front End Cartridge
    - 020.30.05.22.00 - (01) - F512 - B2 Noise diode module
  - 020.30.05.30.00 - (01) - Band 3 Front End - F503
    - 020.30.05.31.00 - (01) - F503 - Band3 Front End Cartridge
    - 020.30.05.32.00 - (01) - F513 - B3 Noise diode module
  - 020.30.05.40.00 - (01) - Band 4 Front End
    - 020.30.05.41.00 - (01) - F504 - Band 4 Front End Cartridge
    - 020.30.05.42.00 - (01) - F514 - B4 Noise diode module
  - 020.30.05.50.00 - (01) - Band 5 Front End
    - 020.30.05.51.00 - (01) - F505 - Band 5 Front End Cartridge
    - 020.30.05.52.00 - (01) - F515 - B5 Noise diode module
  - 020.30.05.60.00 - (01) - Band 6 Front End
    - 020.30.05.61.00 - (01) - F506 - Band 6 Front End Cartridge
    - 020.30.05.62.00 - (01) - F516 - B6 Noise diode module
  - 020.30.05.70.00 - (01) - Front End Support Electronics
    - 020.30.05.71.00 - (01) - B1 Front End Support Electronics
    - 020.30.05.72.00 - (01) - B2 Front End Support Electronics

- 020.30.05.73.00 - (01) - B3 Front End Support Electronics
- 020.30.05.74.00 - (01) - B4 Front End Support Electronics
- 020.30.05.75.00 - (01) - B5 Front End Support Electronics
- 020.30.05.76.00 - (01) - B6 Front End Support Electronics
- 020.30.05.77.00 - (01) - Cryostat A Power & Interface module
- 020.30.05.78.00 - (01) - Cryostat B Power & Interface module
- 020.30.05.80.00 - (01) - Cryostat A - SA500A
  - 020.30.05.81.00 - (01) - Cryostat A cold stage sensors
- 020.30.05.90.00 - (01) - Cryostat B - SA500B
  - 020.30.05.91.00 - (01) - Cryostat B cold stage sensors
- 020.30.10.00.00 - (01) - Cryogenic System (CRY)
  - 020.30.10.10.00 - (01) - Cryocooler system
    - 020.30.10.10.01 - (01) - Cryostat-A Refrigerator (Cold Head)
    - 020.30.10.10.02 - (01) - Cryostat-B Refrigerator (Cold Head)
    - 020.30.10.10.03 - (01) - Cold head sleeve Dewar A (TBC)
    - 020.30.10.10.04 - (01) - Cold head sleeve Dewar B (TBC)
    - 020.30.10.11.00 - (01) - Cold head VFD Controller (F523)
    - 020.30.10.12.00 - (01) - Cold head VFD Driver (F521)
    - 020.30.10.13.00 - (01) - Cryostat VFD Cabling
    - 020.30.10.14.00 - (01) - Cryostat A&B temperature sensors
    - 020.30.10.15.00 - (01) - Cryostat A&B heater elements(tbc)
  - 020.30.10.20.00 - (01) - Helium system
    - 020.30.10.21.00 - (01) - Helium Compressor
    - 020.30.10.22.00 - (01) - Helium Pressure Regulator Assembly
    - 020.30.10.23.00 - (01) - Helium Pressure regulator cabling
    - 020.30.10.24.00 - (01) - Helium Supply tank
    - 020.30.10.25.00 - (01) - Helium buffer tank
    - 020.30.10.26.00 - (01) - Helium distribution
    - 020.30.10.27.00 - (01) - He Compressor VFD Electronics
    - 020.30.10.28.00 - (01) - He Compressor VFD Cabling
    - 020.30.10.29.00 - (01) - Helium Compressor Inverter(tbc)
  - 020.30.10.30.00 - (01) - Vacuum system
    - 020.30.10.31.00 - (01) - Vacuum Pump
    - 020.30.10.32.00 - (01) - Vacuum Pump driver (F524)
    - 020.30.10.33.00 - (01) - Vacuum pump drive cabling
    - 020.30.10.34.00 - (01) - Vacuum distribution
    - 020.30.10.35.00 - (01) - Front End Vacuum sensors & control
- 020.30.15.00.00 - (01) - Integrated Receivers & Digitizers (IRD)
  - 020.30.15.10.00 - (01) - T501 Band 1 IRD module

- 020.30.15.21.00 - (01) - T502-A Band 2-1 IRD
- 020.30.15.22.00 - (01) - T502-B Band 2-2 IRD
- 020.30.15.31.00 - (01) - T503-A Band 3-1 IRD
- 020.30.15.32.00 - (01) - T503-B Band 3-2 IRD
- 020.30.15.41.00 - (01) - T504-A Band 4-1 IRD
- 020.30.15.42.00 - (01) - T504-B Band 4-2 IRD
- 020.30.15.43.00 - (01) - T504-C Band 4-3 IRD
- 020.30.15.51.00 - (01) - T505-A Band 5-1 IRD
- 020.30.15.52.00 - (01) - T505-B Band 5-2 IRD
- 020.30.15.53.00 - (01) - T505-C Band 5-3 IRD
- 020.30.15.54.00 - (01) - T505-D Band 5-4 IRD
- 020.30.15.61.00 - (01) - T506-A Band 6-1 IRD
- 020.30.15.62.00 - (01) - T506-B Band 6-2 IRD
- 020.30.15.63.00 - (01) - T506-C Band 6-3 IRD
- 020.30.15.64.00 - (01) - T506-D Band 6-4 IRD
- 020.30.15.65.00 - (01) - T506-E Band 6-5 IRD
- 020.30.15.66.00 - (01) - T506-F Band 6-6 IRD
- 020.30.15.67.00 - (01) - T506-G Band 6-7 IRD
- 020.30.15.68.00 - (01) - T506-H Band 6-8 IRD
- 020.45.12.06.00 - (01) - T504-E Band4 IRD (in WVR structure)
- 020.45.12.07.00 - (01) - T504-D Band4 IRD (in WVR structure)
- 020.30.25.00.00 - (01) - Digital Back End (DBE) (includes Data Transmission System)
  - 020.30.25.10.00 - (01) - D501 DBE Module
    - 020.30.25.10.10 - (01) - DBE FPGA Programming Image
    - 020.30.25.10.20 - (01) - DBE uBoot Boot loader
    - 020.30.25.10.30 - (01) - DBE Linux Software
    - 020.30.25.10.40 - (01) - DBE PCB Stack
    - 020.30.25.10.50 - (01) - DBE Fiber Optic Harness (and transceivers)
    - 020.30.25.10.60 - (01) - DBE Power Supply Cable Harness
    - 020.30.55.30.41 - (01) - ELR D501 DBE Module metalwork
- 020.30.35.00.00 - (01) - Antenna Time and Frequency (ATF)
  - 020.30.35.10.00 - (01) - L501 - Main LO module
    - 020.30.35.10.01 - (01) - L501 main LO module internal cabling
    - 020.30.35.10.02 - (01) - L501 M&C board
    - 020.30.35.10.03 - (01) - L501 Regulator board
    - 020.30.35.10.06 - (01) - L501 Frequency Receiver and Reflector
    - 020.30.55.30.11 - (01) - FEE L501 LO Module metalwork (in BMR structure)
    - 020.30.60.60.40 - (01) - L501 main LO module cold plate (in EEC structure)
    - 020.35.10.10.00 - (01) - L503 Reference Receiver and Timing module (in RTD structure)

- 020.35.10.10.02 - (01) - L503 Frequency Receiver Assembly
- 020.35.10.10.04 - (01) - L503 Timing Receiver Assembly
- 020.35.10.10.06 - (01) - L503 Timing Relay Transmitter
- 020.45.12.03.00 - (01) - L523 WVR Low LO & Timing module (in WVR structure)
- 020.30.35.20.00 - (01) - L504 - Band 2-1 LO
- 020.30.35.21.00 - (01) - L505 - Band 2-2 LO
- 020.30.35.30.00 - (01) - L506 - Band 3-1 LO
- 020.30.35.31.00 - (01) - L507 - Band 3-2 LO
- 020.30.35.40.00 - (01) - L508 - Band 4-1 LO
- 020.30.35.41.00 - (01) - L509 - Band 4-2 LO
- 020.30.35.42.00 - (01) - L510 - Band 4-3 LO
- 020.30.35.50.00 - (01) - L511 - Band 5-1 LO
- 020.30.35.51.00 - (01) - L512 - Band 5-2 LO
- 020.30.35.52.00 - (01) - L513 - Band 5-3 LO
- 020.30.35.53.00 - (01) - L514 - Band 5-4 LO
- 020.30.35.60.00 - (01) - L515 - Band 6-1 LO
- 020.30.35.61.00 - (01) - L516 - Band 6-2 LO
- 020.30.35.62.00 - (01) - L517 - Band 6-3 LO
- 020.30.35.63.00 - (01) - L518 - Band 6-4 LO
- 020.30.35.64.00 - (01) - L519 - Band 6-5 LO
- 020.30.35.65.00 - (01) - L520 - Band 6-6 LO
- 020.30.35.66.00 - (01) - L521 - Band 6-7 LO
- 020.30.35.67.00 - (01) - L522 - Band 6-8 LO
- 020.30.45.00.00 - (01) - Monitor and Control Hardware Interface Layer (HIL)
  - 020.30.45.50.00 - (01) - M500 Supervisor Computer (hardware only)
  - 020.30.45.51.00 - (01) - M501 Maintenance Computer (hardware only)
  - 020.30.45.52.00 - (01) - M&C Module Pedestal Rack (in HIL structure)
  - 020.30.45.54.00 - (01) - M504 EEC M&C module
  - 020.30.45.55.00 - (01) - M&C module Cryo Enclosure (in HIL structure)
  - 020.30.45.56.00 - (01) - M&C module Aux enclosure (in HIL structure)
  - 020.30.45.57.00 - (01) - M&C module FE Enclosure (in HIL structure)
  - 020.30.45.58.00 - (01) - M&C module WVR (in HIL structure)
  - 020.30.45.59.00 - (01) - SA501 power & control module (HIL supplied)
  - 020.30.45.60.00 - (01) - SA502 power & control module (HIL supplied)
- 020.30.50.00.00 - (01) - DC Power Supply System (PSU)
  - 020.30.50.01.00 - (01) - M507 Utility Module (FE Encl M&C/PSU)
    - 020.30.45.57.00 - (01) - M&C module FE Enclosure (in HIL structure)
    - 020.30.50.01.10 - (01) - M507 Utility Module PSU
    - 020.30.55.30.12 - (01) - FEE M507 Utility Module metalwork (in BMR structure)

- 020.30.60.60.50 - (01) - FEE Cold Plate, M507 Utility Module (in EEC structure)
- 020.30.50.02.00 - (01) - M506 Utility module (Aux Encl M&C/PSU)
  - 020.30.45.56.00 - (01) - M&C module Aux enclosure (in HIL structure)
  - 020.30.50.02.10 - (01) - M506 Utility Module PSU
  - 020.30.55.30.20 - (01) - AUX M506 Utility Module metalwork (in BMR structure)
  - 020.30.60.60.70 - (01) - AUX Cold Plate, M506 Utility Module (in EEC structure)
- 020.30.50.03.00 - (01) - M505 Utility module (Cryo/ECC encl)
  - 020.30.45.55.00 - (01) - M&C module Cryo Enclosure (in HIL structure)
  - 020.30.50.03.10 - (01) - M505 Utility Module PSU
  - 020.30.55.30.30 - (01) - CRY M505 Utility Module metalwork (in BMR structure)
  - 020.30.60.61.10 - (01) - CRY Cold Plate, M505 Utility Module (in EEC structure)
- 020.30.50.04.00 - (01) - M502 Utility module (Pedestal)
  - 020.30.45.52.00 - (01) - M&C Module Pedestal Rack (in HIL structure)
  - 020.30.50.04.10 - (01) - M502 Utility Module PSU
  - 020.30.55.30.43 - (01) - ELR D502 WVR Back End Module metal work
- 020.30.50.05.00 - (01) - Pedestal Battery
- 020.30.50.06.00 - (01) - M508 Utility Module (WVR)
  - 020.30.45.58.00 - (01) - M&C module WVR (in HIL structure)
  - 020.30.50.06.10 - (01) - M508 Utility Module PSU
  - 020.30.55.30.50 - (01) - WVR M508 Utility Module metalwork (in BMR structure)
  - 020.30.60.61.40 - (01) - WVR Cold Plate, M508 Utility Module (in EEC structure)
- 020.30.50.07.00 - (01) - P500 -48VDC Power sub-system
- 020.30.50.08.00 - (01) - DC Power cabling
- 020.30.55.00.00 - (01) - Bins, Modules & Racks (BMR)
  - 020.30.55.10.00 - (01) - Racks
    - 020.30.55.10.05 - (01) - ELR Electronics Rack
  - 020.30.55.20.00 - (01) - Enclosures
    - 020.30.55.20.05 - (01) - FEE Enclosure
    - 020.30.55.20.06 - (01) - FEE SA501 Band 5-6 IRD/LO Enclosure
    - 020.30.55.20.10 - (01) - AUX Enclosure
    - 020.30.55.20.20 - (01) - CRY Enclosure
    - 020.30.55.20.25 - (01) - WVR F507 Receiver Module Environmental Enclosure
    - 020.30.55.20.26 - (01) - WVR F507 Receiver Module RFI Enclosure
    - 020.30.55.20.27 - (01) - WVR M508 Utility Module Environmental Enclosure
  - 020.30.55.30.00 - (01) - ARCS Modules
    - 020.30.55.30.05 - (01) - ARCS Module Blank and Common parts
    - 020.30.55.30.10 - (01) - FEE SA502 Band 1-4 IRD/LO Module metalwork
    - 020.30.55.30.11 - (01) - FEE L501 LO Module metalwork (in BMR structure)
    - 020.30.55.30.12 - (01) - FEE M507 Utility Module metalwork (in BMR structure)

- 020.30.55.30.20 - (01) - AUX M506 Utility Module metalwork (in BMR structure)
- 020.30.55.30.21 - (01) - AUX F523 Cold Head VFD Controller Module metalwork
- 020.30.55.30.22 - (01) - AUX F521 Cold Head VFD Driver Module metalwork
- 020.30.55.30.23 - (01) - AUX F522 Vacuum Pump Driver Module metalwork
- 020.30.55.30.30 - (01) - CRY M505 Utility Module metalwork (in BMR structure)
- 020.30.55.30.31 - (01) - CRY Helium Pressure Regulator Electronics Module metalwork
- 020.30.55.30.40 - (01) - ELR M502 Utility Module metalwork
- 020.30.55.30.41 - (01) - ELR D501 DBE Module metalwork
- 020.30.55.30.42 - (01) - ELR L503 Reference Receiver and Timing Module metalwork
- 020.30.55.30.43 - (01) - ELR D502 WVR Back End Module metal work
- 020.30.55.30.44 - (01) - ELR M500 Antenna Supervisor Computer Module metalwork
- 020.30.55.30.45 - (01) - ELR M501 Maintenance Computer Module metalwork
- 020.30.55.30.46 - (01) - ELR M504 EEC Electronics Module metalwork
- 020.30.55.30.50 - (01) - WVR M508 Utility Module metalwork (in BMR structure)
- 020.TBD01 - (01) - ELR *Data Backhaul Repeater Equipment - Multiple modules in one bin
- 020.TBD02 - (01) - ELR *L502 Reference Distribution Equipment - Multiple modules in one bin
- 020.30.55.40.00 - (01) - ARCS Bins
  - 020.30.55.40.01 - (01) - ARCS Bin blank and common parts
  - 020.30.55.40.05 - (01) - FEE Bin
  - 020.30.55.40.10 - (01) - AUX Bin
  - 020.30.55.40.15 - (01) - CRY Bin
  - 020.30.55.40.20 - (01) - ELR Bin 1
  - 020.30.55.40.21 - (01) - ELR Bin 2
  - 020.30.55.40.22 - (01) - ELR Bin 3
  - 020.30.55.40.23 - (01) - ELR Bin Data Backhaul Equipment
  - 020.30.55.40.24 - (01) - ELR Bin L502 Reference Distribution Equipment
- 020.30.55.50.00 - (01) - Cable Carrier
  - 020.30.55.50.01 - (01) - Front End Cable Carrier
- 020.30.60.00.00 - (01) - Electronics Environmental Control System (EEC)
  - 020.30.60.10.00 - (01) - Glycol Chiller Heater
  - 020.30.60.20.00 - (01) - ELR Electronics Rack Air Handler Unit
  - 020.30.60.30.00 - (01) - Glycol Pipes
    - 020.30.60.31.00 - (01) - FEE internal Glycol lines
    - 020.30.60.32.00 - (01) - AUX internal Glycol lines
    - 020.30.60.33.00 - (01) - CRY internal Glycol lines
    - 020.30.60.34.00 - (01) - WVR internal Glycol lines
    - 020.30.60.35.00 - (01) - GEN interconnecting Glycol Piping for all NRAO Equipment
    - 020.30.60.36.00 - (01) - GEN interconnecting Glycol Pipe insulation
    - 020.30.60.37.00 - (01) - GEN Valves for glycol lines

- 020.30.60.40.00 - (01) - Heat Exchangers
  - 020.30.60.41.00 - (01) - FEE Fan for heat exchanger
  - 020.30.60.42.00 - (01) - FEE Liquid to air heat exchanger
  - 020.30.60.43.00 - (01) - AUX Fan for heat exchanger
  - 020.30.60.44.00 - (01) - AUX Liquid to air heat exchanger
- 020.30.60.50.00 - (01) - Air flow management
  - 020.30.60.51.00 - (01) - ELR Rack air flow baffles
  - 020.30.60.52.00 - (01) - ELR Air ducting for Electronics Rack
- 020.30.60.60.00 - (01) - Cold Plates
  - 020.30.60.60.10 - (01) - FEE Cold Plate, FE Enclosure
  - 020.30.60.60.20 - (01) - SA501 cold plate (EEC supplied)
  - 020.30.60.60.30 - (01) - SA502 cold plate (EEC supplied)
  - 020.30.60.60.40 - (01) - L501 main LO module cold plate (in EEC structure)
  - 020.30.60.60.50 - (01) - FEE Cold Plate, M507 Utility Module (in EEC structure)
  - 020.30.60.60.60 - (01) - AUX Cold Plate, Aux Enclosure
  - 020.30.60.60.70 - (01) - AUX Cold Plate, M506 Utility Module (in EEC structure)
  - 020.30.60.60.80 - (01) - AUX Cold Plate, F523 VFD Control Module
  - 020.30.60.60.90 - (01) - AUX Cold Plate, F521 Cold Head VFD Driver
  - 020.30.60.61.00 - (01) - AUX Cold Plate, F524 Vacuum pump
  - 020.30.60.61.10 - (01) - CRY Cold Plate, M505 Utility Module (in EEC structure)
  - 020.30.60.61.20 - (01) - CRY Cold Plate Helium Compressor VFD
  - 020.30.60.61.30 - (01) - WVR Cold Plate, F507 RF Enclosure
  - 020.30.60.61.40 - (01) - WVR Cold Plate, M508 Utility Module (in EEC structure)
  - 020.30.60.65.00 - (01) - GEN Cold Plate Common Parts
- 020.30.60.70.00 - (01) - Dry Air System
  - 020.30.60.70.10 - (01) - Dry Air Unit
  - 020.30.60.71.00 - (01) - Dry Air piping
- 020.30.70.00.00 - (01) - Antenna Fibre Optic System (AFD)
  - 020.30.70.01.00 - (01) - FE Enclosure 12 Core Fibre connector & splice tray
  - 020.30.70.02.00 - (01) - FE Enclosure 36 Core Fibre connector & splice tray
  - 020.30.70.03.00 - (01) - Aux enclosure Fibre management unit
  - 020.30.70.04.00 - (01) - Cryo/ECC 12 core fibre connector/splice tray
  - 020.30.70.05.00 - (01) - Electr Rack circular 36 core MM fiber connector
  - 020.30.70.20.00 - (01) - Antenna Fibre Cabling
- 020.45.00.00.00 - (01) - Water Vapor Radiometer (WVR)
- 020.45.10.00.00 - (01) - WVR Antenna Assembly
  - 020.45.10.01.00 - (01) - WVR Antenna
  - 020.45.10.02.00 - (01) - WVR Antenna Mount
  - 020.45.10.03.00 - (01) - WVR Feed heater

- 020.45.12.00.00 - (01) - F507 WVR Receiver Assembly
  - 020.45.12.02.00 - (01) - F507 WVR RF front-end module
  - 020.45.12.03.00 - (01) - L523 WVR Low LO & Timing module (in WVR structure)
  - 020.45.12.06.00 - (01) - T504-E Band4 IRD (in WVR structure)
  - 020.45.12.07.00 - (01) - T504-D Band4 IRD (in WVR structure)
  - 020.45.12.08.00 - (01) - F507 WVR Front End Voltage Regulator board
  - 020.45.12.09.00 - (01) - F507 WVR Control Board
  - 020.TBD03 - (01) - F507 WVR Receiver Module RFI enclosure (in BMR structure)
  - 020.TBD04 - (01) - F507 WVR Receiver Module ENV enclosure (in BMR structure)
  - 020.TBD05 - (01) - WVR Cold Plate, F507 RF Enclosure (EEC structure)
  - 020.TBD06 - (01) - WVR Intermediate Coldplate (in EEC structure)
- 020.45.13.00.00 - (01) - M508 WVR Utility Module Assembly
  - 020.45.13.10.00 - (01) - WVR feed heater control relay
  - 020.45.13.20.00 - (01) - WVR M508 fibre management
  - 020.TBD07 - (01) - WVR M508 Utility Module Environmental Enclosure (in BMR structure)
  - 020.TBD08 - (01) - M508 WVR Utility Module (in PSU structure)
- 020.45.14.00.00 - (01) - D502 WVR Back-end Assembly
  - 020.45.14.10.00 - (01) - D502 WVR DSP board
  - 020.45.14.11.00 - (01) - D502 WVR DSP board 2.. (TBD number of boards)
  - 020.TBD09 - (01) - D502 WVR Back End Module (in BMR structure)
- 020.45.15.00.00 - (01) - WVR Delay Calibration Software
- 020.45.16.00.00 - (01) - WVR SBA Pedestal Assembly
  - 020.45.16.10.00 - (01) - WVR SBA Pedestal
  - 020.45.16.11.00 - (01) - WVR SBA Tracking Mount

- 020.13.00.00.00 - Total Power Antenna System (TPA)
- 020.27.00.00.00 - Total Power Antenna
  - 020.27.00.00.00 - (01) - Total Power Antenna
- 020.32.00.00.00 - TPA Electronics
  - 020.32.00.00.00 - (01) - TPA Electronics

- 020.35.00.00.00 - Reference Signals (LRT)
- 020.35.05.00.00 - LO Reference & Timing - Generation (RTG)
  - 020.35.05.00.00 - (01) - LO Reference & Timing - Generation (RTG)
- 020.35.05.20.00 - (01) - Maser and GPS Sources
  - 020.35.05.20.02 - (01) - Hydrogen Maser
  - 020.35.05.20.04 - (01) - Phase and Timing Synchronization
  - 020.35.05.20.06 - (01) - Timescale Receiver
  - 020.35.05.20.08 - (01) - GNSS Receiver
- 020.35.05.30.00 - (01) - Frequency Transfer Fixed Sources
  - 020.35.05.30.02 - (01) - Narrow Linewidth Laser

- 020.35.05.30.04 - (01) - Fixed Microwave Source
- 020.35.05.40.00 - (01) - Frequency Transfer Offset Sources
  - 020.35.05.40.02 - (01) - Tunable Source
- 020.35.05.50.00 - (01) - Time Transfer Sources
  - 020.35.05.50.02 - (01) - Timing Laser
  - 020.35.05.50.04 - (01) - Optical Modulator PSK
  - 020.35.05.50.06 - (01) - PN Code-1 Modulator
- 020.35.05.80.00 - (01) - LB antennas time and frequency reference system
  - 020.35.05.80.10 - (01) - Hydrogen Maser (TBC)
  - 020.35.05.80.20 - (01) - GPS receiver system (TBC)
  - 020.35.05.81.00 - (01) - Other parts are TBD
- 020.35.10.00.00 - LO Reference & Timing - Distribution (RTD)
  - 020.35.10.00.00 - (01) - LO Reference & Timing - Distribution (RTD)
    - 020.35.10.10.00 - (01) - L503 Reference Receiver and Timing module (in RTD structure)
      - 020.35.10.10.02 - (01) - L503 Frequency Receiver Assembly
      - 020.35.10.10.04 - (01) - L503 Timing Receiver Assembly
      - 020.35.10.10.06 - (01) - L503 Timing Relay Transmitter
    - 020.35.10.20.00 - (01) - Reference Distributor Rack
      - 020.35.10.20.02 - (01) - NLL Distributor
      - 020.35.10.20.04 - (01) - RF Distributor
      - 020.35.10.20.06 - (01) - 1PPS Distributor
    - 020.35.10.40.00 - (01) - Frequency Transmitter Rack
      - 020.35.10.40.02 - (01) - Frequency Transmitter
      - 020.35.10.40.04 - (01) - LO Reference
    - 020.35.10.60.00 - (01) - Timing Transmitter Rack
      - 020.35.10.60.02 - (01) - Time Transmitter
      - 020.35.10.60.03 - (01) - Time transmitter optical assembly
      - 020.35.10.60.04 - (01) - Time transmitter electronic assembly
      - 020.35.10.60.20 - (01) - Timing Controller
    - 020.35.10.70.00 - (01) - RTD central infrastructure
      - 020.35.10.70.02 - (01) - RTD fibre cabling - central processor building
    - 020.35.10.80.00 - (01) - RTD long-haul repeater station equipment
      - 020.35.10.80.02 - (01) - RTD long-haul repeater station amplifiers (BiDi EDFA)
      - 020.35.10.80.04 - (01) - RTD long-haul repeater station splice tray
    - 020.35.10.85.00 - (01) - RTD long-haul antenna repeater equipment
      - 020.35.10.85.02 - (01) - RTD long-haul antenna repeater (OEO Repeater)
      - 020.35.10.85.04 - (01) - RTD long-haul antenna amplifier (BiDi EDFA)
- 020.35.00.00.00 - (01) - Reference Signals (LRT)
- 020.40.00.00.00 - Central Signal Processor (CSP)

- 020.40.00.00.00 - (01) - Central Signal Processor (CSP)
  - 020.40.30.00.00 - (01) - Subband Processor (SBP)
    - 020.40.30.30.00 - (01) - Beamformer and Channelizer
      - 020.40.30.30.10 - (01) - B&C LRU
    - 020.40.30.50.00 - (01) - X-Engine
      - 020.40.30.50.10 - (01) - XE LRU
  - 020.40.50.00.00 - (01) - Pulsar Engine (PSE)
    - 020.40.50.10.00 - (01) - PSE Subband Processor LRU
      - 020.40.50.10.10 - (01) - PSE Processing Node
        - 020.40.50.10.11 - (01) - PSE Processing Node Hardware
        - 020.40.50.10.12 - (01) - PSE Processing Node FPGA Firmware
        - 020.40.50.10.13 - (01) - PSE Processing Node CPU Software
      - 020.40.50.10.20 - (01) - PSE LRU Hardware (rack mounted casing, motherboard, PSU, etc)
      - 020.40.50.10.30 - (01) - PSE LRU Software (M&C)
    - 020.40.50.20.00 - (01) - PSE Local Monitor and Control
    - 020.40.50.30.00 - (01) - PSE Local Network
    - 020.40.50.40.00 - (01) - PSE Cooling System
  - 020.40.70.00.00 - (01) - CSP Switched Fabric (CSF)
    - 020.40.70.10.00 - (01) - CSF Chassis Assembly
      - 020.40.70.10.10 - (01) - CSF Chassis Hardware
      - 020.40.70.10.20 - (01) - CSF Chassis Firmware
      - 020.40.70.10.30 - (01) - CSF Chassis Internal M&C Function
    - 020.40.70.20.00 - (01) - CSF Line Card
      - 020.40.70.20.10 - (01) - CSF Line Card Hardware
      - 020.40.70.20.20 - (01) - CSF Line Card Firmware
    - 020.40.70.30.00 - (01) - CSF Electro-optical transceiver
    - 020.40.70.40.00 - (01) - CSF Fiber-optic cabling
  - 020.40.90.00.00 - (01) - CSP Monitor and Control (CMC)
    - 020.40.90.10.00 - (01) - CMC Server Computer
    - 020.40.90.20.00 - (01) - CMC Local Device
    - 020.40.90.30.00 - (01) - CMC Network Switch
- 020.45.00.00.00 - Water Vapor Radiometer
  - 020.45.00.00.00 - (01) - Water Vapor Radiometer (WVR)
    - 020.45.10.00.00 - (01) - WVR Antenna Assembly
      - 020.45.10.01.00 - (01) - WVR Antenna
      - 020.45.10.02.00 - (01) - WVR Antenna Mount
      - 020.45.10.03.00 - (01) - WVR Feed heater
    - 020.45.12.00.00 - (01) - F507 WVR Receiver Assembly
      - 020.45.12.02.00 - (01) - F507 WVR RF front-end module

- 020.45.12.03.00 - (01) - L523 WVR Low LO & Timing module (in WVR structure)
- 020.45.12.06.00 - (01) - T504-E Band4 IRD (in WVR structure)
- 020.45.12.07.00 - (01) - T504-D Band4 IRD (in WVR structure)
- 020.45.12.08.00 - (01) - F507 WVR Front End Voltage Regulator board
- 020.45.12.09.00 - (01) - F507 WVR Control Board
- 020.TBD03 - (01) - F507 WVR Receiver Module RFI enclosure (in BMR structure)
- 020.TBD04 - (01) - F507 WVR Receiver Module ENV enclosure (in BMR structure)
- 020.TBD05 - (01) - WVR Cold Plate, F507 RF Enclosure (EEC structure)
- 020.TBD06 - (01) - WVR Intermediate Coldplate (in EEC structure)
- 020.45.13.00.00 - (01) - M508 WVR Utility Module Assembly
  - 020.45.13.10.00 - (01) - WVR feed heater control relay
  - 020.45.13.20.00 - (01) - WVR M508 fibre management
  - 020.TBD07 - (01) - WVR M508 Utility Module Environmental Enclosure (in BMR structure)
  - 020.TBD08 - (01) - M508 WVR Utility Module (in PSU structure)
- 020.45.14.00.00 - (01) - D502 WVR Back-end Assembly
  - 020.45.14.10.00 - (01) - D502 WVR DSP board
  - 020.45.14.11.00 - (01) - D502 WVR DSP board 2.. (TBD number of boards)
  - 020.TBD09 - (01) - D502 WVR Back End Module (in BMR structure)
- 020.45.15.00.00 - (01) - WVR Delay Calibration Software
- 020.45.16.00.00 - (01) - WVR SBA Pedestal Assembly
  - 020.45.16.10.00 - (01) - WVR SBA Pedestal
  - 020.45.16.11.00 - (01) - WVR SBA Tracking Mount
- 020.46.00.00.00 - Environmental Monitoring & Characterization System (MON)
  - 020.46.00.00.00 - (01) - Environmental Monitoring & Characterization System
    - 020.46.10.00.00 - (01) - Weather Stations
    - 020.46.20.00.00 - (01) - Atmospheric Phase Monitor
    - 020.46.30.00.00 - (01) - Cloud Monitor
    - 020.46.40.00.00 - (01) - Lightning Monitor
    - 020.46.50.00.00 - (01) - RFI Monitor
    - 020.46.60.00.00 - (01) - Remote Site Monitor
    - 020.46.90.00.00 - (01) - Satellite Holography System
- 020.47.00.00.00 - Short Baseline Antenna System (SBA)
  - 020.26.00.00.00 - Short Baseline Antenna
    - 020.26.00.00.00 - (01) - Short Baseline Antenna
  - 020.31.00.00.00 - SBA Electronics
    - 020.31.00.00.00 - (01) - SBA Electronics
- 020.48.00.00.00 - Long Baseline Antenna System
  - 020.28.00.00.00 - Long Baseline Antenna
    - 020.28.00.00.00 - (01) - Long Baseline Antenna

- 020.33.00.00.00 - LBA Electronics
- 020.50.00.00.00 - Computing & Software System (CSS)
  - 020.50.00.00.00 - (01) - Computing & Software System (CSS)
    - 020.50.05.00.00 - (01) - Proposal Management System (PMN)
    - 020.50.10.00.00 - (01) - Online Data Acquisition (ONL)
    - 020.50.15.00.00 - (01) - Science Data Processor (SDP)
    - 020.50.20.00.00 - (01) - Technical Infrastructure (TI)
    - 020.50.25.00.00 - (01) - Monitoring & Control System (MCL)
    - 020.50.30.00.00 - (01) - Science Data Archive (SDA)
    - 020.50.35.00.00 - (01) - Science Interface & Tools (SIT)
- 020.55.00.00.00 - IT Infrastructure
  - 020.55.20.00.00 - Fibre optic and data distribution system (FIB)
    - 020.55.20.00.00 - (01) - Fibre optic and data distribution system
      - 020.55.20.10.00 - (01) - Antenna M&C network switch (M503)
      - 020.55.20.12.00 - (01) - Antenna Pedestal SM Fibre Connector/Splice tray
      - 020.55.20.20.00 - (01) - Array fibre cabling (central processor building to antennas)
      - 020.55.20.30.00 - (01) - Array long-haul repeater Station
        - 020.55.20.30.10 - (01) - Array long-haul repeater station equipment Rack
          - 020.35.10.80.02 - (01) - RTD long-haul repeater station amplifiers (BiDi EDFA)
          - 020.35.10.80.04 - (01) - RTD long-haul repeater station splice tray
          - 020.55.20.30.11 - (01) - Array long-haul digital data link repeaters
      - 020.55.20.40.00 - (01) - Array commercial data links
      - 020.55.20.50.00 - (01) - Array astronomical data network - configuration
      - 020.55.20.60.00 - (01) - Central processor building optical fibre terminal connector/splice racks
      - 020.55.20.70.00 - (01) - Central processor building array data termination equipment (dark fibre)
      - 020.55.20.80.00 - (01) - Data networks central processor building to satellite processing centres
  - 020.55.40.00.00 - Operational IT systems
    - 020.55.40.00.00 - (01) - Operational IT systems
- 020.60.00.00.00 - Array Infrastructure (INF)
  - 020.60.00.00.00 - (01) - Array Infrastructure
    - 020.60.01.00.00 - (01) - Existing array facilities
    - 020.60.05.00.00 - (01) - Antenna foundations
    - 020.60.10.00.00 - (01) - Operation roads
    - 020.60.15.00.00 - (01) - Utility Trench
    - 020.60.20.00.00 - (01) - Fibre Utility
    - 020.60.25.00.00 - (01) - Electrical Utility
- 020.61.00.00.00 - Buildings (BLD)
  - 020.61.05.00.00 - Science Data Centre Building
    - 020.61.05.00.00 - (01) - Science Data Centre Building

- 020.61.10.00.00 - ngVLA Site Buildings
  - 020.61.10.00.00 - (01) - ngVLA Site Buildings
    - 020.61.10.10.00 - (01) - NSB Central Electronics Building
    - 020.61.10.20.00 - (01) - NSB Central Support Building
  - 020.61.15.00.00 - Science Operations Building
    - 020.61.15.00.00 - (01) - Science Operations Center Building
  - 020.65.00.00.00 - Operations Buildings
    - 020.65.00.00.00 - (01) - Operations Buildings
      - 020.65.10.00.00 - (01) - Maintenance Center Building
      - 020.65.20.00.00 - (01) - Repair Center Building
      - 020.65.30.00.00 - (01) - Array Operations Center Building
      - 020.65.40.00.00 - (01) - Remote Support Station buildings
  - 020.75.05.00.00 - Visitor Centre Building
    - 020.75.05.00.00 - (01) - Visitor Centre Building
- 020.02.00.00.00 - (01) - ngVLA Enabling Systems PBS
  - 020.02.05.00.00 - Training System
  - 020.02.10.00.00 - Development systems, facilies, tools & equipment
    - 020.02.11.00.00 - Telescope system AIV equipment
    - 020.02.12.00.00 - Telescope system CSV equipment, facilities & tools
    - 020.02.13.00.00 - Antenna System test equipment
    - 020.02.14.00.00 - Main Antenna Prototype test equipment & infrastructure
      - 020.02.14.00.00 - (01) - Main Antenna Prototype test equipment & infrastructure
      - 020.02.14.10.00 - (01) - Main Antenna Prototype Test Electronics (APTE) (MSIP - specific)
        - 020.02.14.15.00 - (01) - APTE Front End
          - 020.02.14.15.01 - (01) - X-band feed horn
          - 020.02.14.15.02 - (01) - Q-band feed horn
          - 020.02.14.15.03 - (01) - Front End Radome
        - 020.02.14.20.00 - (01) - APTE Environmental Control
          - 020.02.14.20.01 - (01) - FE Heat Exchangers and Fans
          - 020.02.14.20.02 - (01) - AUX Heat Exchangers and Fans
          - 020.02.14.20.05 - (01) - FE Glycol pipes and hoses
          - 020.02.14.20.06 - (01) - AUX Glycol pipes and hoses
        - 020.02.14.25.00 - (01) - APTE Vacuum System
        - 020.02.14.30.00 - (01) - APTE Helium System
        - 020.02.14.35.00 - (01) - APTE Bins, Racks & Modules
          - 020.02.14.35.01 - (01) - FE Enclosure
          - 020.02.14.35.02 - (01) - Aux Enclosure
          - 020.02.14.35.05 - (01) - Electronics Rack
          - 020.02.14.35.10 - (01) - FE Bin

- 020.02.14.35.11 - (01) - MSIP DTS Bin
- 020.02.14.35.15 - (01) - FE Cable Carrier
- 020.02.14.35.20 - (01) - P301 Module
- 020.02.14.35.21 - (01) - L304 Module
- 020.02.14.35.22 - (01) - L305 Module
- 020.02.14.35.23 - (01) - F317 Module
- 020.02.14.35.24 - (01) - M301 Module
- 020.02.14.35.25 - (01) - L300 Module
- 020.02.14.35.26 - (01) - L301 Module
- 020.02.14.35.27 - (01) - L302 Module
- 020.02.14.35.28 - (01) - T304 Module
- 020.02.14.35.29 - (01) - T305 Module
- 020.02.14.35.30 - (01) - D302 Module
- 020.02.14.35.31 - (01) - D304 Module
- 020.02.14.35.32 - (01) - Optical Mux Module
- 020.02.14.35.50 - (01) - Carbon Panel Test Enclosure
- 020.02.14.40.00 - (01) - DTS
- 020.02.14.45.00 - (01) - APTE Antenna Fibre Distribution
- 020.02.14.70.00 - (01) - Main Antenna Prototype M&C Software
- 020.02.14.80.00 - (01) - Main Antenna Prototype Infrastructure
- 020.02.15.00.00 - Antenna Electronics test equipment
  - 020.02.15.10.05 - (01) - OCS Cryogenic System Prototype
  - 020.02.15.10.10 - (01) - RIX ThermoAcoustic-Stirling Cooler
- 020.02.16.00.00 - Computing & SW Development Support Subsystem (DSS)
- 020.02.17.00.00 - SBA Antenna test equipment
- 020.02.18.00.00 - LBA Antenna test equipment
- 020.03.00.00.00 - (01) - ngVLA User Systems PBS
  - 020.03.05.00.00 - Science User Systems
  - 020.03.10.00.00 - Community User Systems
    - 020.03.11.00.00 - Visitor centre outfit
  - 020.03.20.00.00 - Technical Operations and Support system
    - 020.03.21.00.00 - Telescope Operator Systems
      - 020.55.15.00.00 - Operations IT Systems
        - 020.55.15.00.00 - (01) - Operations IT Systems
    - 020.03.22.00.00 - Safety and Security Systems
    - 020.03.23.00.00 - Maintenance & Support Systems
      - 020.03.23.10.00 - (01) - Maintenance & Support Software Subsystem (MMS)
      - 020.03.23.20.00 - (01) - Maintenance & Support equipment
      - 020.03.23.30.00 - (01) - Maintenance Communication System

- Document Management
  - Bulk Document Import - Last 24 hours
  - 020 - (01) - ngVLA Project - Management Document Structure
    - 020.05 PM - Project Management
    - 020.10 SE - Systems Engineering
    - 020.19 SCI - Science Support
    - 020.25 ANT - Antenna IPT Mgt
    - 020.30 AE - Antenna Electronics IPT Mgt
    - 020.35 LRT - Reference & Timing Signals IPT Mgt (LRT)
    - 020.40 CSPT - CSP IPT Mgt
    - 020.50 CSW - Computing & SW IPT Mgt
    - 020.60 INF - Infrastructure IPT Mgt
    - 020.70 SD - Site Development (Land Acquisition & Regulatory Compliance)
    - 020.75 BI - Broader Impacts
    - 020.76 EPO - Education and Public Outreach IPT Mgt
    - 020.80 SSHE - Safety, Security, Health & Env Mgt
    - 020.85 OPS - Operations IPT Mgt
  - NEWDOCS - New Documents since specified data
- Locations
  - ANT.G - Generic Main Antenna
    - ANT. SHE.G - Antenna shelter - Generic Main Antenna
    - ANT.AUX.G - Auxilliary Enclosure - Generic Main Antenna
    - ANT.ELE.G - Elevation assembly - Generic Main Antenna
    - ANT.FED.G - Front End - Generic Main Antenna
    - ANT.PED.G - Pedestal - Generic Main Antenna
    - ANT.PED.REP - Pedestal - Main Antennas used as repeater stations
    - ANT.WVR.G - Water Vapor Radiometer - Generic Main Antenna
    - ANT.YOK.G - Yoke area - Generic Main Antenna
  - ANT.PRT - Prototype of Main Antenna
  - BLD.AOC - Array Operations Center Building
  - BLD.CEB - Central Electronics Building
  - BLD.CSB - Central Support Building
  - BLD.MNT - Maintenance Center Building
  - BLD.REP - Repair Center Building
  - BLD.ROS - Remote Operations Station Building
  - BLD.SDC - Science Data Center Building
  - BLD.SOC - Science Operations Center Building
  - BLD.VIC - Visitor Center Building
  - ENV.G - Generic Environmental Monitoring Site

- ENV.ATM.G - Generic Atmospheric Phase Monitor
- ENV.CLD.G - Generic Cloud monitor
- ENV.LGH.G - Generic Lightning monitor
- ENV.RFI.G - Generic RFI monitor
- ENV.WTH.G - Generic Weather Stations
- MOB.G - Mobile locations
- NET.REP.G - Generic Repeater Station
- SBA.G - Generic Short Baseline Antenna
  - SBA.AUX.G - SBA Auxilliary Enclosure - Generic
  - SBA.FED.G - SBA Feed Indexer - Generic
  - SBA.PED.G - SBA Pedestal - Generic
  - SBA.SHE.G - SBA shelter - Generic
  - SBA.WVR.G - SBA Water Vapor Radiometer - Generic
  - SBA.YOK.G - SBA Yoke area - Generic
- STE.CP - Central Array Site
  - STE.MID.01 - Mid baseline spiral #1
  - STE.MID.02 - Mid baseline spiral #2
  - STE.MID.03 - Mid baseline spiral #3
  - STE.MID.04 - Mid baseline spiral #4
  - STE.MID.05 - Mid baseline spiral #5
  - STE.SA.01 - Spiral Arm #1
  - STE.SA.02 - Spiral Arm #2
  - STE.SA.03 - Spiral Arm #3
  - STE.SA.04 - Spiral Arm #4
  - STE.SA.05 - Spiral Arm #5
- STE.LBS.G - Generic Long Baseline Station Site
  - STE.LBS.01 - Long Baseline Station Site #1
  - STE.LBS.02 - Long Baseline Station Site #2
  - STE.LBS.03 - Long Baseline Station Site #3
  - STE.LBS.04 - Long Baseline Station Site #4
  - STE.LBS.05 - Long Baseline Station Site #5
  - STE.LBS.06 - Long Baseline Station Site #6
  - STE.LBS.07 - Long Baseline Station Site #7
  - STE.LBS.08 - Long Baseline Station Site #8
- TPA.G - Genereric Total Power Antenna
- Support
  - EMSS - EMSS Antennas
  - MTEX - Mtex Antennas
  - NAOJ - National Astronomy Observatory of Japan (NAOJ)

- NRAO - National Radio Astronomy Observatory
  - NGVLA - ngVLA Project Organization
    - NGV.AE - Antenna Electronics IPT
      - NGV.AE.AFD - Antenna Fibre Optic Distribution
      - NGV.AE.BMR - Bins, Racks & Modules
      - NGV.AE.CRY - Cryogenics
      - NGV.AE.EEC - Environmental Control System
      - NGV.AE.FE - Front End
      - NGV.AE.HIL - Monitor & Control interface layer
      - NGV.AE.IRD - Integrated Receiver Digitzer
      - NGV.AE.MON - Environmental Monitoring System
      - NGV.AE.PSU - DC Power Supplies
      - NGV.AE.WVR - Water Vapor Radiometer
      - NGV.AE-LEAD - Antenna Electronics IPT Lead
    - NGV.ANT - Antenna IPT
      - NGV.ANT-LEAD - ngV LAIPT Leads
    - NGV.BI - Broader Impacts IPT
    - NGV.CSPT - CSP and Reference Signals IPT
      - NGV.CSPT.ATF - Antenna Time and Frequency
        - NGV.CSPT.ATF-LEAD - Antenna Time and Frequency Lead
      - NGV.CSPT.CMC - CSP Monitor and Control
      - NGV.CSPT.CSF - CSP Switched Fabric
      - NGV.CSPT.DBE - Digital Back End
        - NGV.CSPT.DBE-LEAD - Digital Back End Lead
      - NGV.CSPT.PSE - Pulsar Engine
      - NGV.CSPT.RTD - LO Ref & Timing Distribution
      - NGV.CSPT.RTG - LO Ref & Timing Generation
      - NGV.CSPT.SBP - Sub-band Processor
      - NGV.CSPT-LEAD - CSP and Reference Signals IPT Lead
    - NGV.CSS - Software and Computing IPT
      - NGV.CSS-LEAD - Software and Computing IPT Lead
    - NGV.EPO - Education & Public Outreach IPT
    - NGV.FIB - Fibre and Data networks IPT
    - NGV.INF - Infrastructure IPT
    - NGV.OPS - Operations IPT
    - NGV.PM - ngVLA Project Management
      - NGV.PM-LEAD - ngV LAIPT Leads
    - NGV.PO - ngVLA Project Office
    - NGV.SCI - ngVLA Science Team

- NGV.SCI-LEAD - ngVLA Science Team Lead
- NGV.SD - Site Development IPT
- NGV.SE - Systems Engineering IPT
  - NGV.SE.CM - Systems Engineer-CM
  - NGV.SE-LEAD - Systems Engineer Leads
- NGV.SSHE - Safety, Security, Health & Env Mgt
- NRC - National Research Council Canada (NRC)
- OCS - Oxford Cryo Systems

020.10.20.00.00-0004-DSN-ngVLA PBS_unsigned

Final Audit Report 2024-04-25

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Status:	Signed
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