

**Big Science  
Business  
Forum  
2022**

## **SKA1 front end detectors and electronic: opportunities for construction**

Luca Stringhetti SKAO Head of Engineering  
5<sup>th</sup> October 2022 Granada



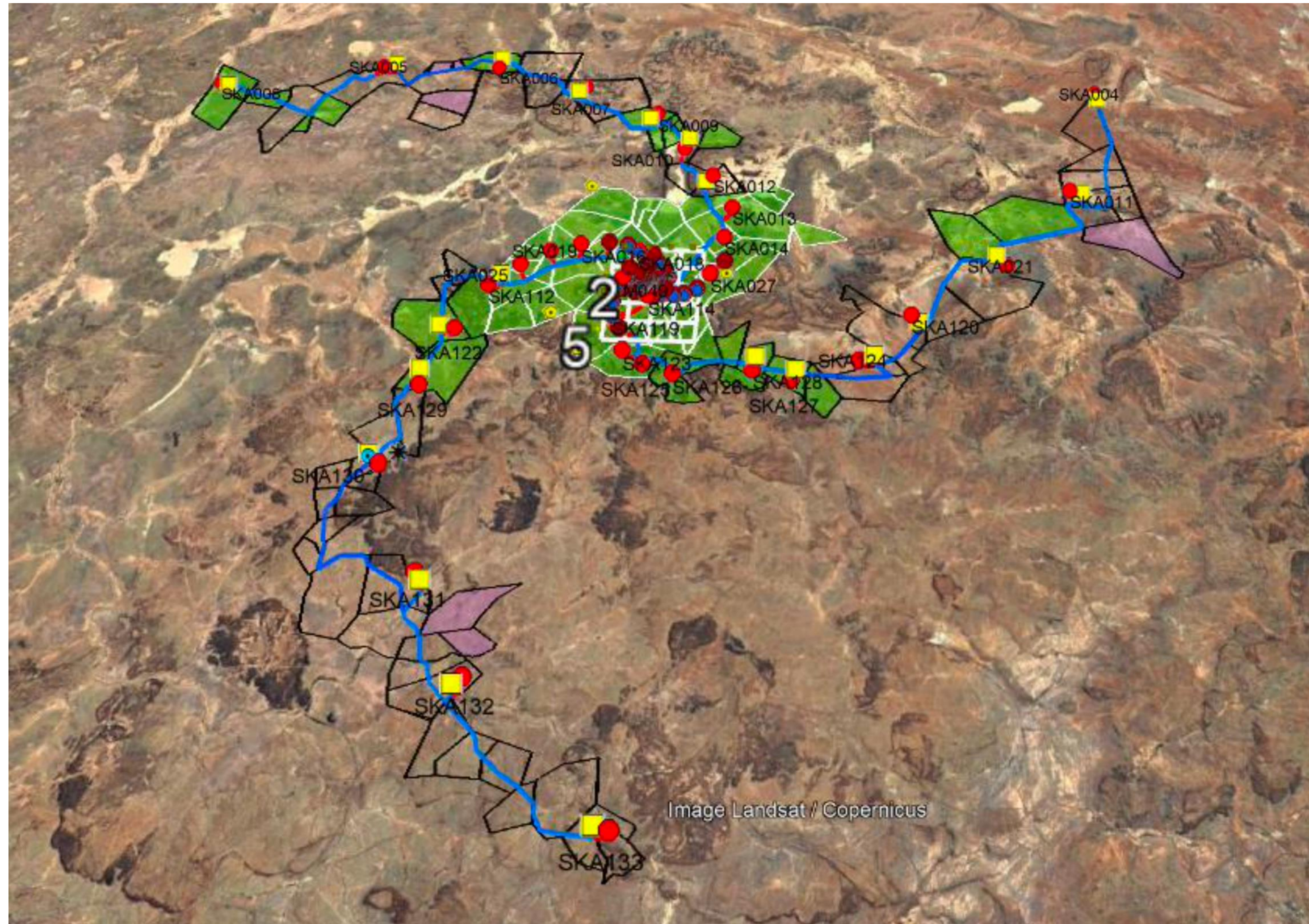
# SKA in a nut-shell (1/2)



- Will build the two largest telescopes on Earth, covering the frequency range 50MHz – 15.3GHz (ultimately 25 GHz)
- Located in radio-quiet zones in Australia and South Africa, HQ in UK
- Incorporating state-of-the-art technology from the front-end of the telescopes to the software used to generate science
- Cost: ~€2B for construction and operations over 2021 – 2030.
- Handling massive volumes of data, from 2Pb/s raw data → ~700 PB of scientific data accessed through a global network of *SKA Regional Centres* (basically distributed data centres to analyse science data)
- Recognise we are global citizens; maximise use of 'green' technology and sustainable power
- Working with local and indigenous communities; recognize we are guests on their land



# SKA in a nut-shell (2/2)



## Mid telescope

- 197 15 meter dishes
- 350 MHz – 15.3 GHz
- 170 km array diameter
- 6Tb/sec (out of correlator)

## Low Telescope

- 512 stations (256 log periodic antenna each)
- 50 MHz – 350MHz
- 70 km array diameter
- 6Tb/sec (out of correlator)



# Contract type summary

- Contracts can be in cash (directly paid by SKAO) or in-kind (paid directly by member country)
- Contracts are generally competitive and they follow well used best practice: market survey, Pre-qualification, tendering process.
- Fair work return is applied in SKAO, therefore specific contracts are assigned to countries (but open to competition inside the country itself)
- Contracts follow New Engineering Contract (NEC4) framework.  
(<https://www.neccontract.com/> )
- Tier1 contracts (contracts managed directly by SKAO) are assigned to members country or to countries that have special agreements with SKAO



Australia



China



Italy



Netherlands



Portugal



South Africa



Switzerland



United Kingdom



France



Spain



Canada



India



Sweden

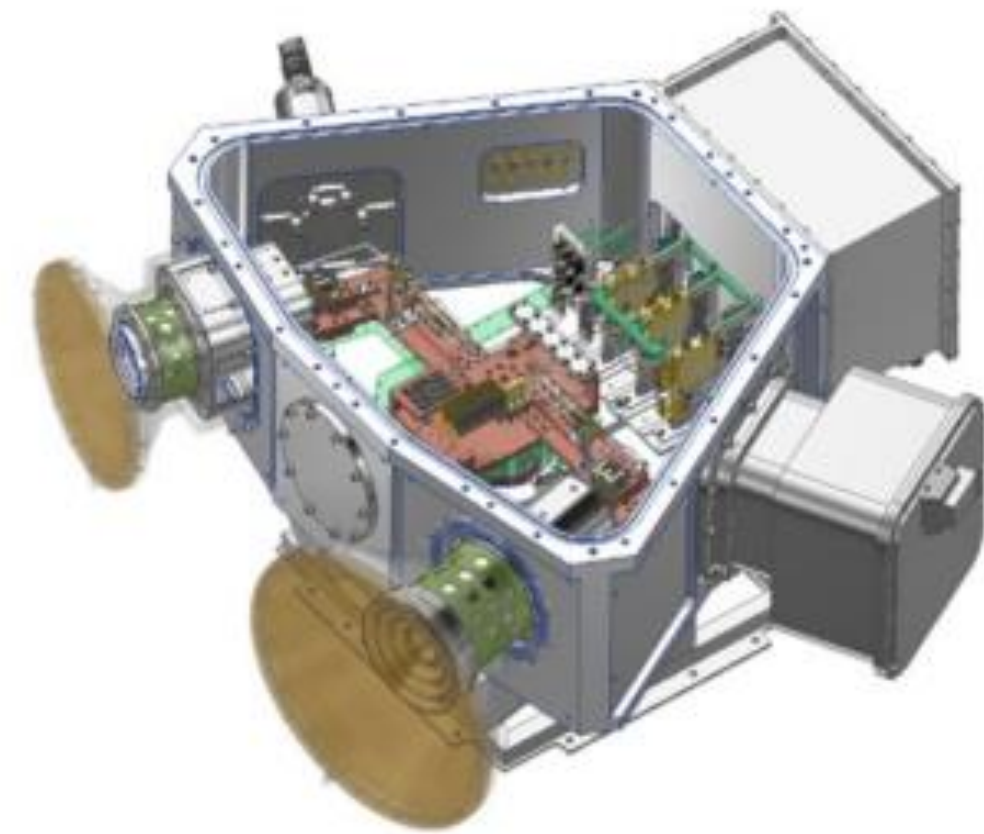
Fully members

Nearly there

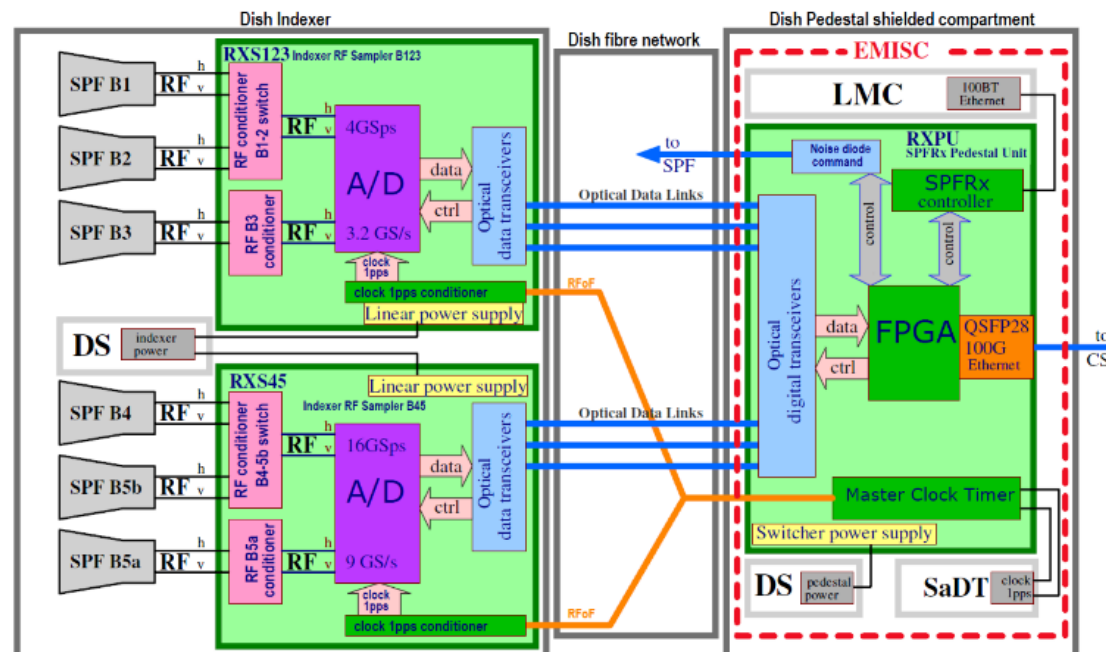
Agreements in place



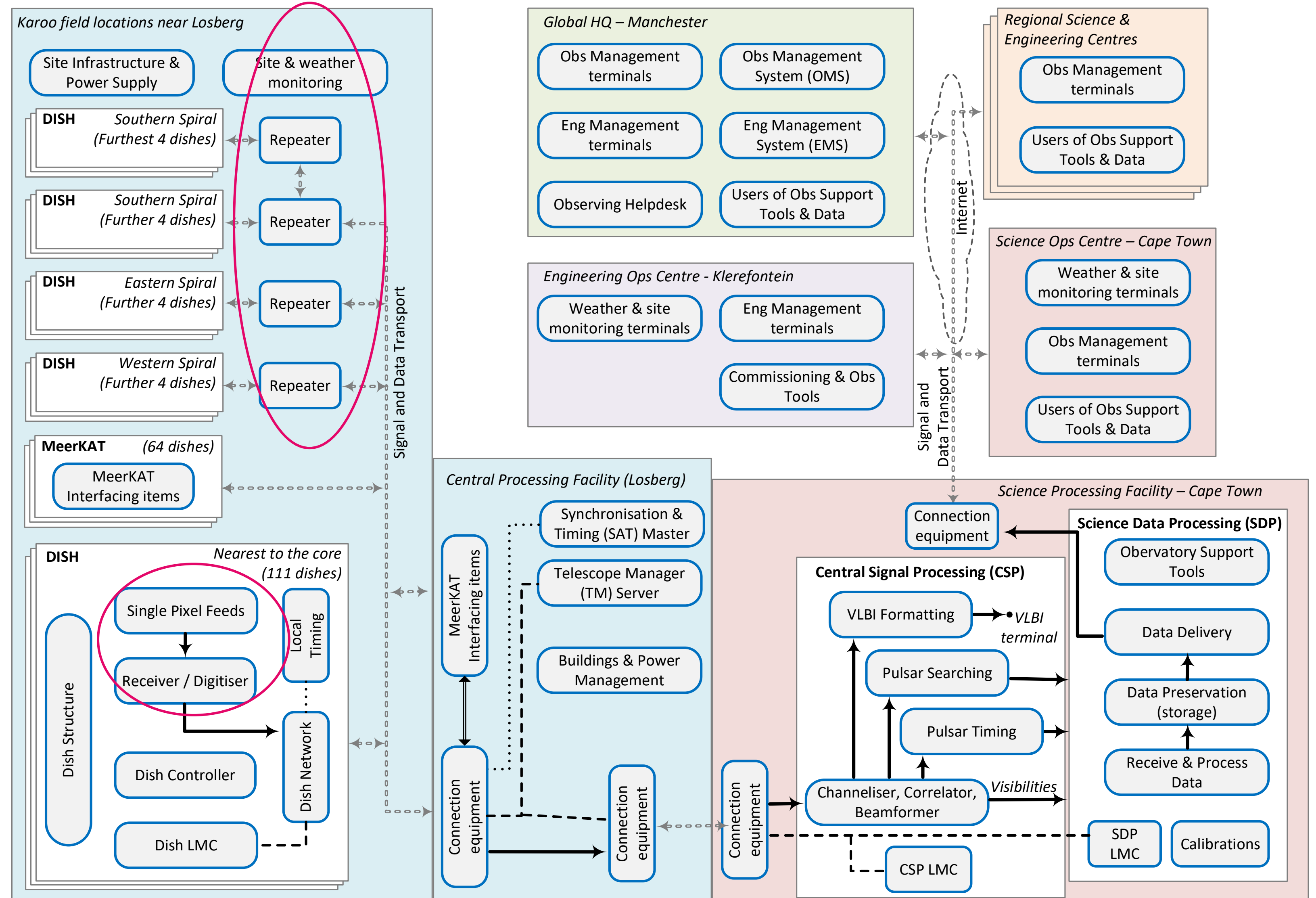
# MID Architecture (Detector and diagnostics)



~80 Band5 assembly



~124 Digitisers assembly



Rev 1 2021/07/05



# Mid Technology

- **Feed System :**
  - LNA for the Band 5 Feed
  - 80 feed systems to be acquired+ spare (Horn+OMT+LNA+electronic)
- **Receiver System :**
  - ADC and FPGA for the receiver. Baseline is direct digitisation of large band 4.6 - 15.4 GHz.
  - Stringent requirement is RFI
  - 124 units to be acquired + spare

Both Systems are exposed to harsh environment



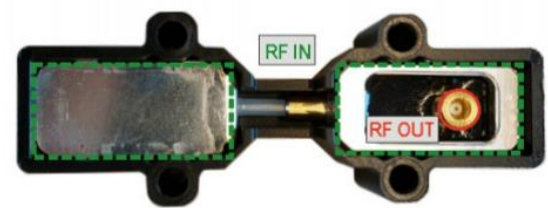
# MID Telescope tenders (2022-2026)

- Band 1, 2 (from 350MHz to 1760Mhz) and Receiver are running now for the first 80 elements (and 124 for SPFRx123)
- Band 5 From May 2023 (ITT)
- Receiver Band 5 from August 2023 (ITT)

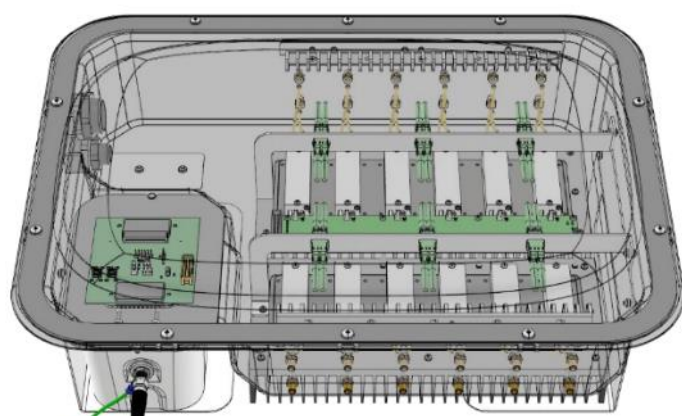
**~ 4Meuro/y between 2023 and 2025**



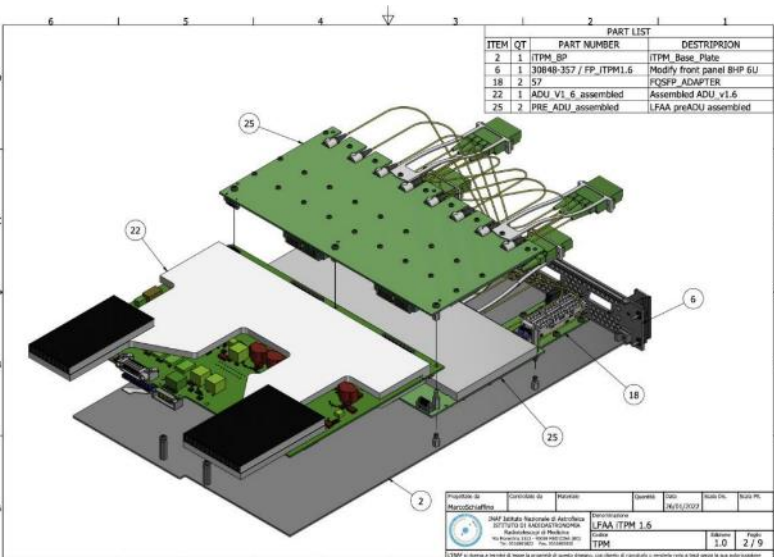
# LOW Architecture



155000 LNAs

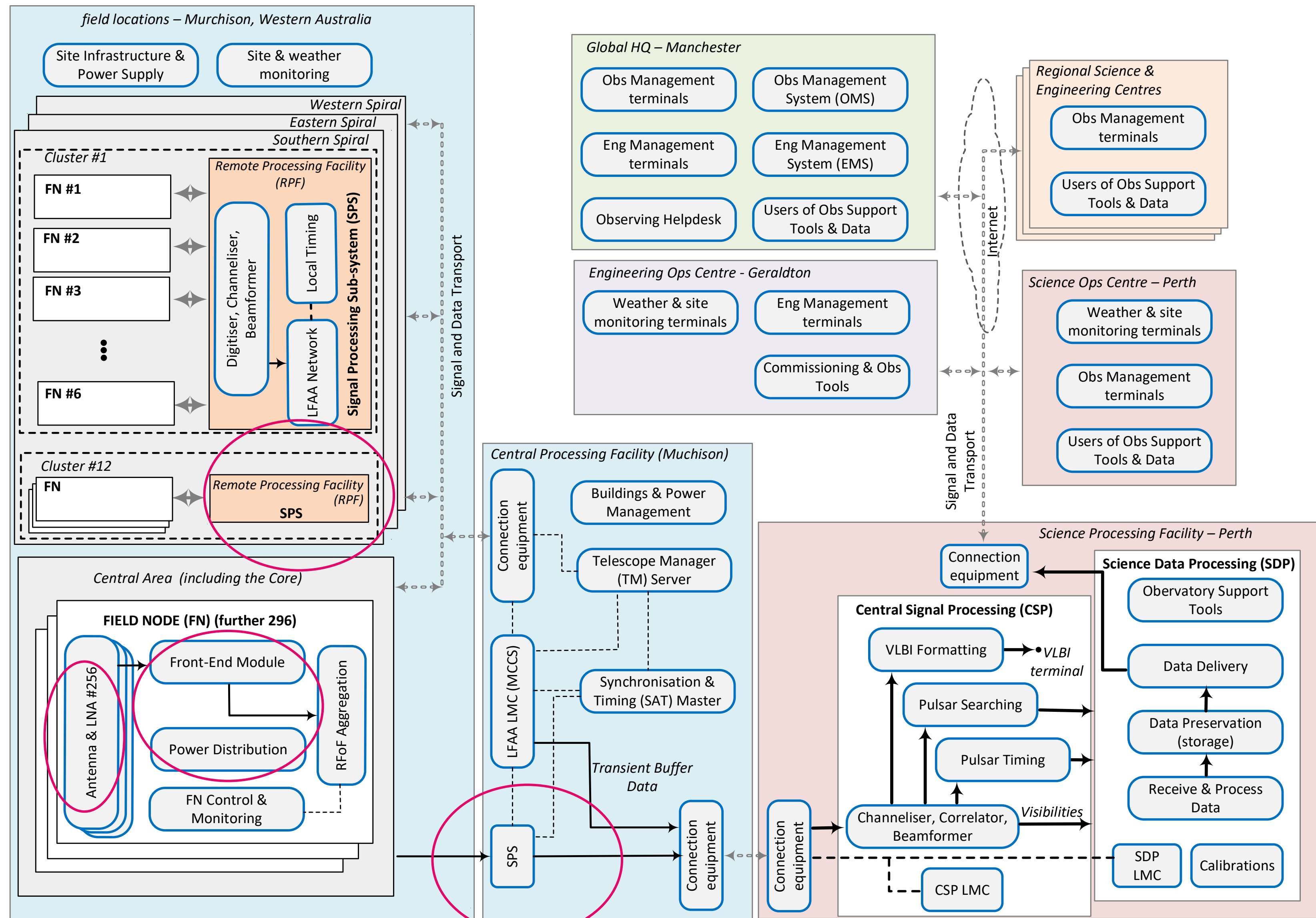
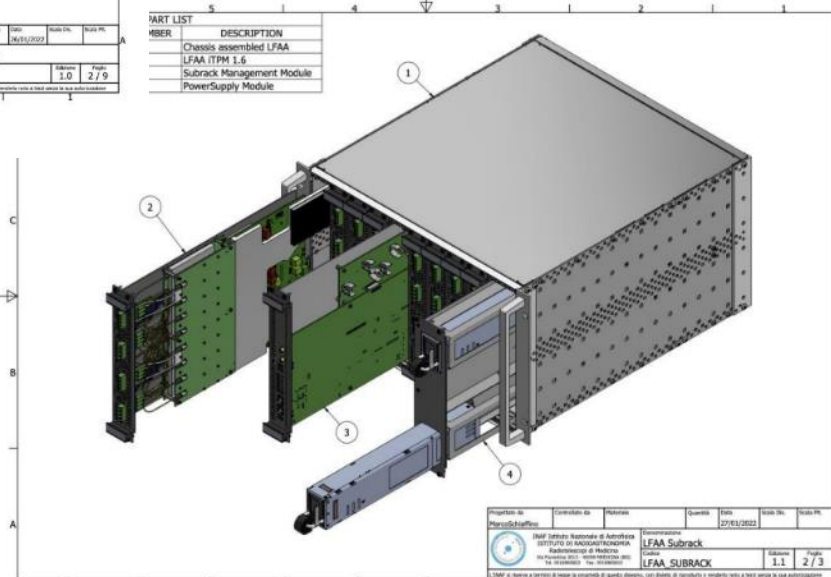


~8000 PASD Including 80000 FEM



~4800 Tile Processing Module

~600 Subracks





# LOW technology

- **PASD - Power And Signal Distribution**
  - Laser diodes for RF over Fibre, Power supply, conditioning monitoring.
  - The challenging requirement is environment and Radio Frequency Interference (RFI)
  - ~8000 units to be acquired
- **SPS – Signal Processing System (Subrack)**
  - SPS – ADC + Fast digital electronic circuitry (FPGA) ~600 unit to be acquired.



# LOW telescope Tenders

- PASD (Including Laser Diode) ASAP
- SPS Almost ready to go out with ITT

**~14Meuro/y between 2023 and 2024**



# Beyond 2026

- We need to complete the full Array
- We will launch the Observatory Development plan (In steady state it will fund studies and projects for 20M/y)
- We will be fully operational, from 2029, which means regular maintenance.
- We will be thinking about SKA2....

