

Building SKAO, an International Collaborative Project

SWISS SKA DAYS 2022

C. Cesarsky, SKAO Council Chair

September 2022



The SKA project in numbers

€1.3
BILLION

CONSTRUCTION
COST (2021 €)

131,072
ANTENNAS

IN WESTERN AUSTRALIA

710
PETABYTES

OF SCIENCE DATA DELIVERED
TO SCIENCE USERS

€0.7
BILLION

FIRST 10 YEARS
OF OPERATIONS
COST (2021 €)

197
DISHES

IN SOUTH AFRICA
(INCLUDING 64
MEERKAT DISHES)

1 GLOBAL
NETWORK

OF DATA CENTRES TO DELIVER
SCIENCE-READY DATA PRODUCTS
TO END-USERS

8
YEARS

TO CONSTRUCT

16
COUNTRIES

PARTICIPATING IN 2021

50+
YEARS

OF TRANSFORMATIONAL SCIENCE

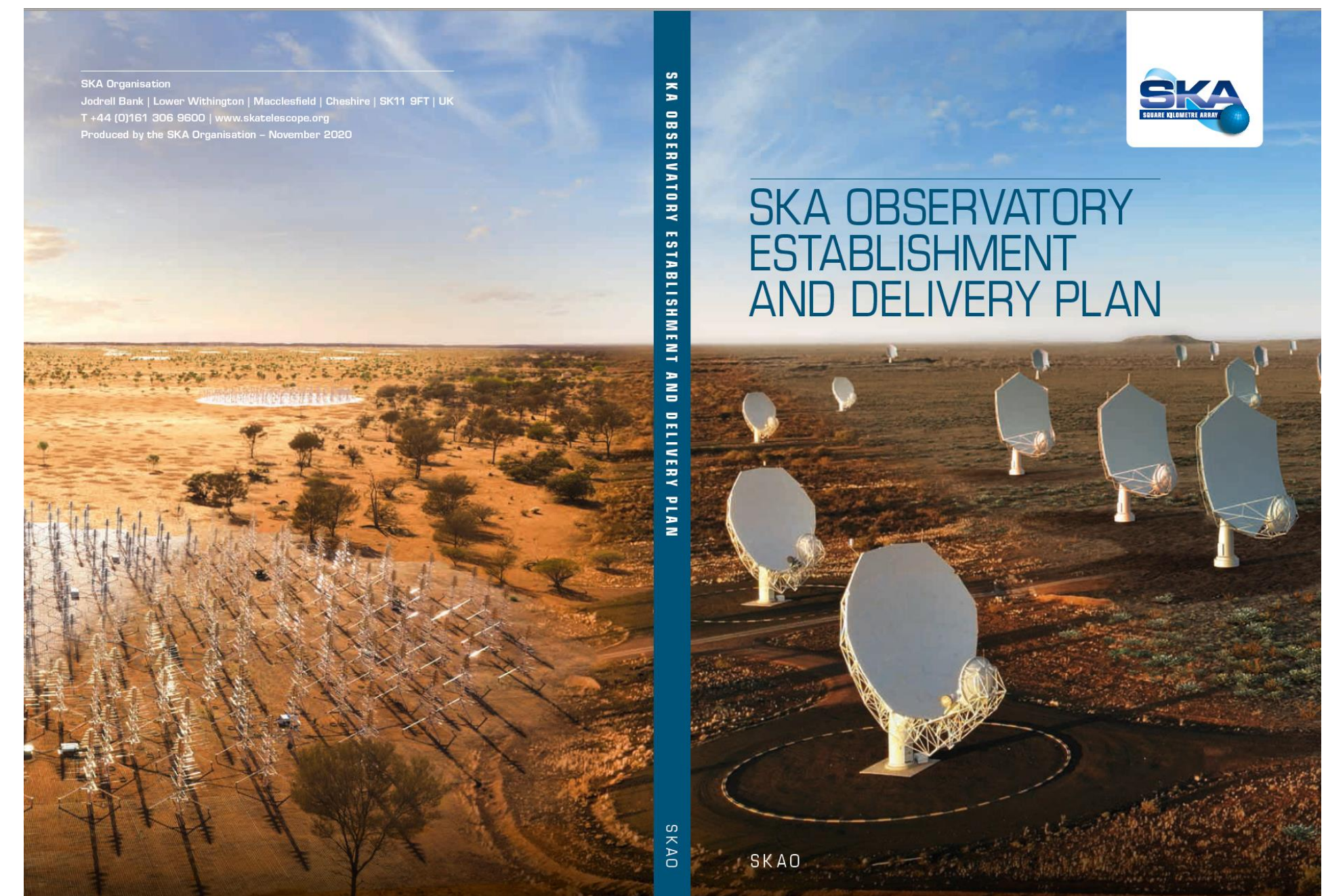
Delivering SKA Observatory

Feb 2021: SKAO born

June 2021: SKAO Council approved the Construction Proposal and the SKAO Establishment and Delivery Plan

July 2021: Construction activities began

Sept 2022: 42 contracts awarded, total cost ~€200M



Construction Photos



Construction Strategy

- Target: the SKA Baseline Design (197 Mid dishes; 512 Low stations)
- Not all funding yet secured, therefore follow Staged Delivery Plan
- First Milestone: Develop the earliest possible working demonstration of the architecture and supply chain (AA0.5).
- Then maintain a continuously working and expanding facility until achieve the baseline design.

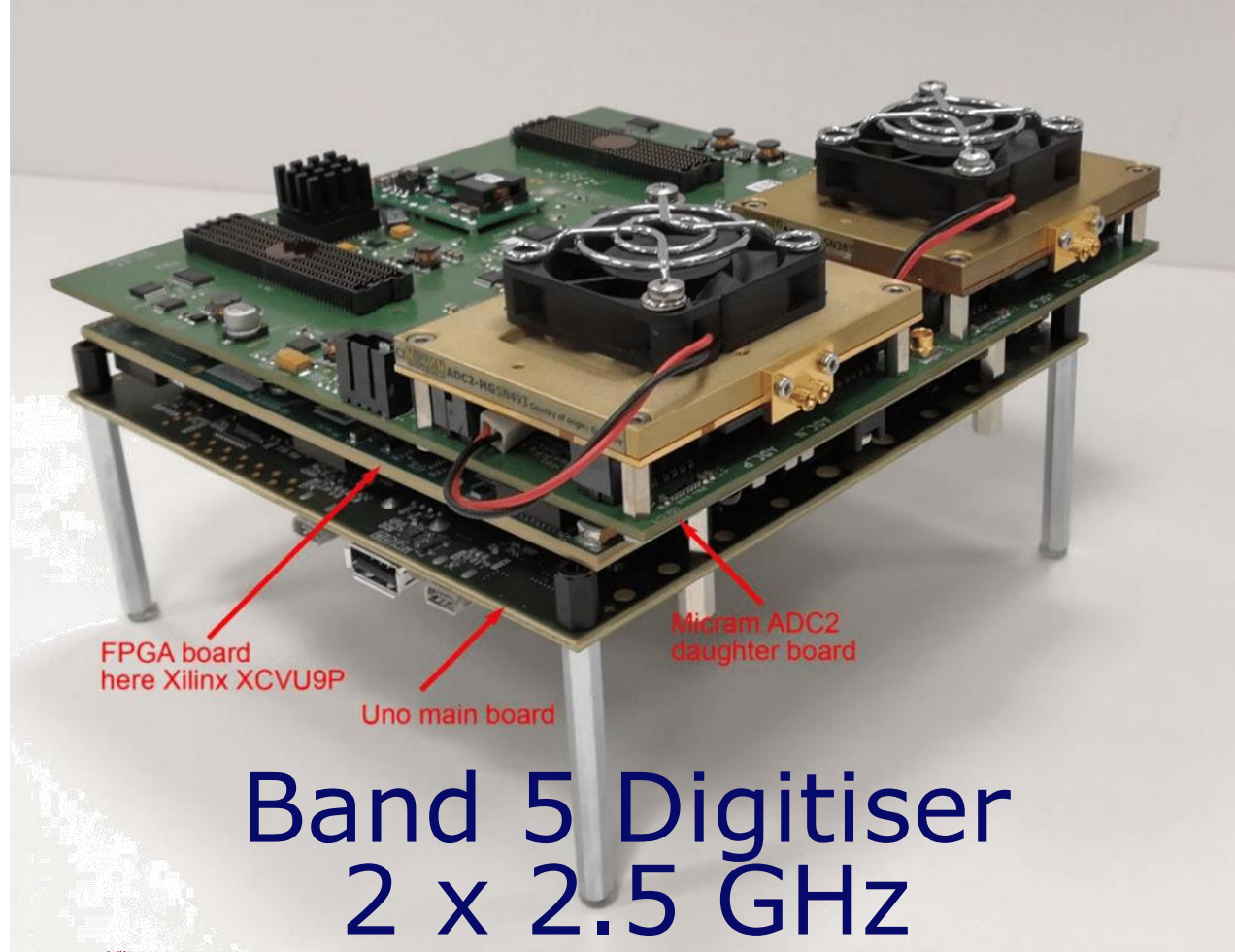
Milestone Event	SKA-Mid (date)	SKA-Low (date)
AA0.5	2024 Jul	2024 May
AA1	2025 Sep	2025 May
AA2	2026 Jul	2026 Jul
AA*	2027 Jun	2027 Aug
Operations Readiness Review	2027 Aug	2027 Oct
End of Construction	2028 Jul	2028 Jul



Recent Prototype and Construction Progress



Band 5a/5b feeds
5 – 15 GHz



FPGA board here Xilinx XCVU9P
Uno main board
Mitsumi ADC2 daughter board

Band 5 Digitiser
2 x 2.5 GHz



Improved dish stiffness and pointing



AAVS2



First SKA dish foundations





LOW – Italian Antenna Tenderer facilities visit





LOW Team visit ELEMMASTER in Italy



Meeting of SKAO LOW Team with ELEMMASTER Management





Production and testing facilities at ELEMASTER



Rack level testing of a railway management system at ELEMASTER



RF chamber at ELEMASTER





SPS - Sub rack delivered at GMRT in India

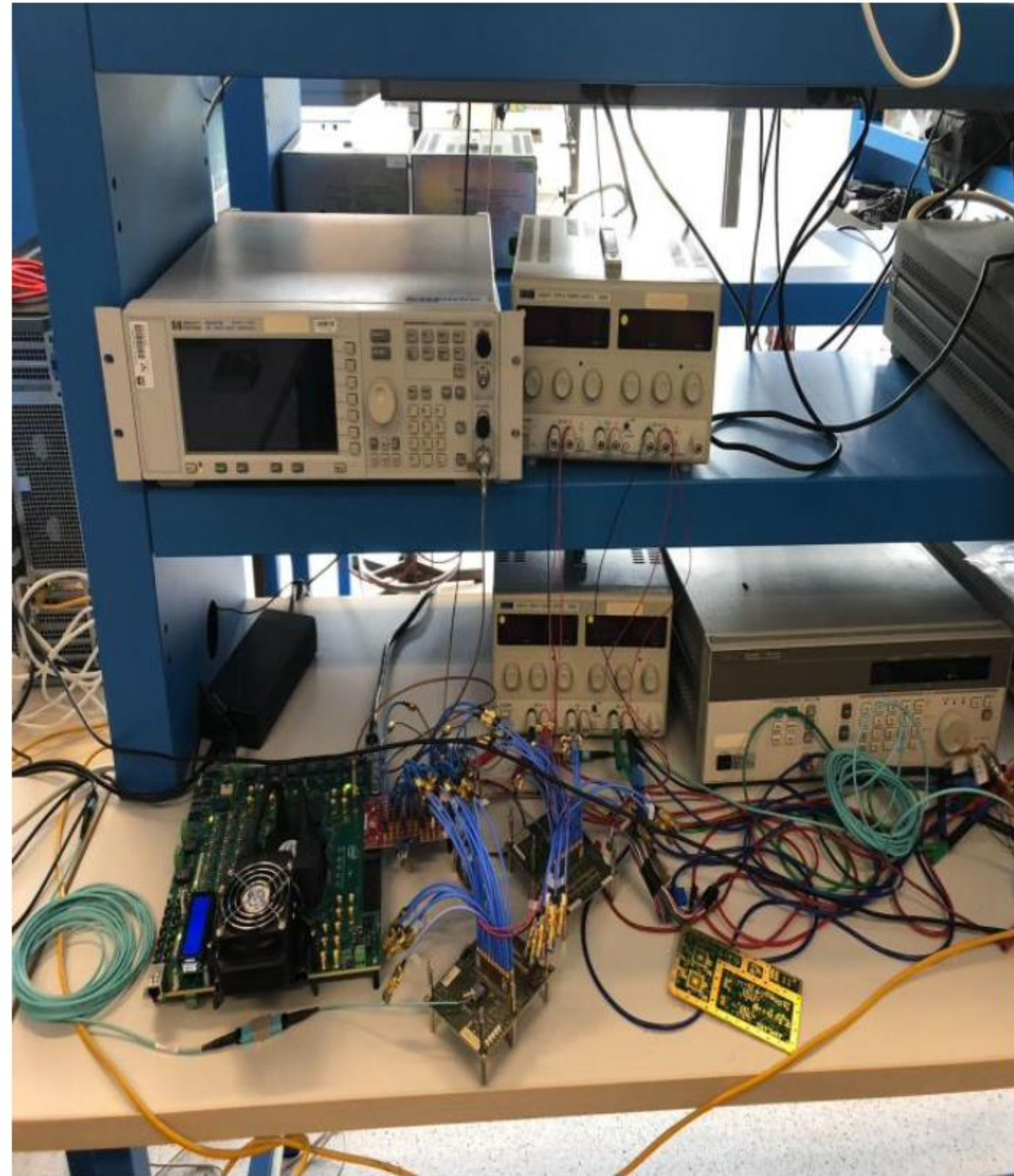
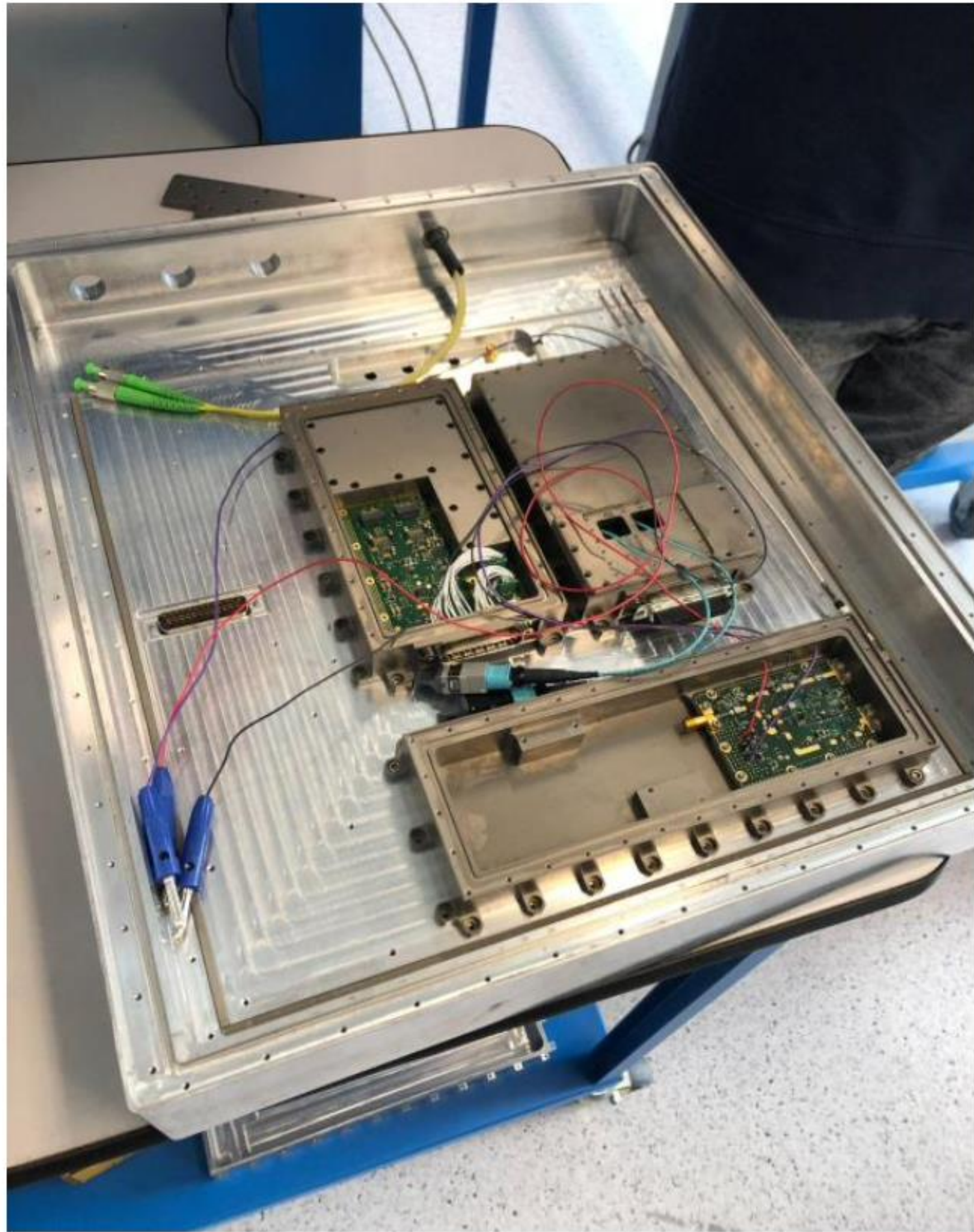




**MID TELESCOPE - SKAO at Laboratoire d'Astrophysique de Bordeaux (LAB)
FRANCE**

(From left, Ben Lewis (SKAO), Stephane Gauffre (LAB), Michel Perault (CNRS)
Shin'ichiro Asayama (SKAO), Robert Laing (SKAO))





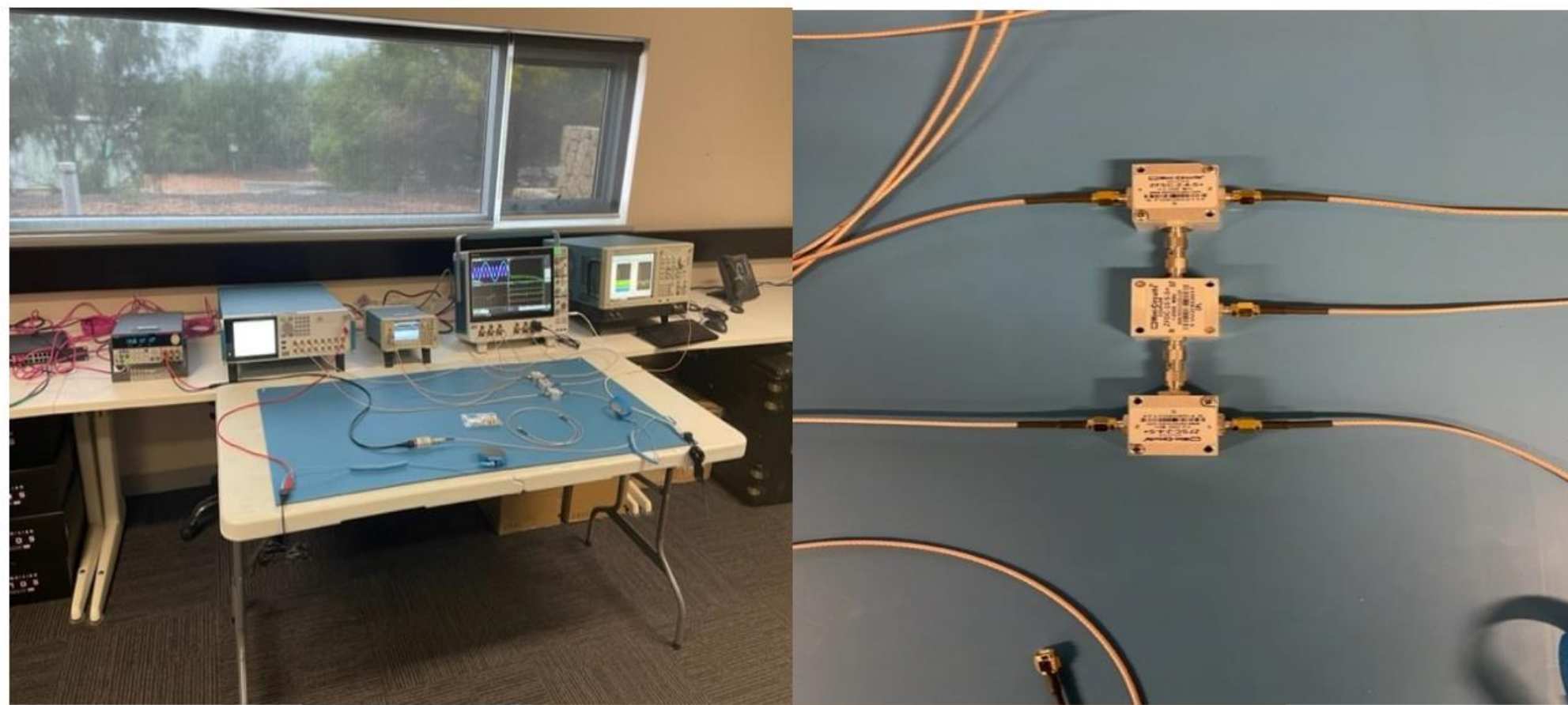
MID - RXS45 Prototyping activities at LAB





Meerkat Operator Demo
SKA HQ Staff were treated to a demonstration from the Meerkat telescope operating team in Cape Town.





During the **visit of the ITF Team** in Geraldton a recently equipped electronic laboratory was presented. The laboratory is equipped with the cutting-edge measurement equipment from the leading manufacturers, mostly Tektronix (oscilloscope, spectrum analyser, signal arbitrary generator) and Keysight (power supply).

The test laboratory meets all the basic ESD requirements (ESD mats equipped with ESD wrist bands with grounding). More equipment is planned to be purchased.

In this figure a sample test set up using directional couplers, splitters and attenuators is presented and all presented measurement equipment enables remote access through the stable ethernet connection (this means that the measurements can be conducted remotely when the DUT is physically connected).

The bottom picture presents two DELL servers used by the Viola Team.





During the **visit at Curtin University** in Australia a shielded FNDH box was presented in the EMC test facility. The FNDH box is a part of a PaSD contract and needs to meet demanding requirements related to the electromagnetic emissions, that is why it is tightly shielded.

During the Construction phase FNDH box will be placed near the antenna arrays and this is why proper shielding is a crucial aspect. The right picture presents the cover for the FNDH box with the copper finger stock which works as an electromagnetic gasket.



SKAO vehicles now in both Australia and South Africa



South Africa: interim SOC, Cape Town : architect's view of EOC in Klerefontein

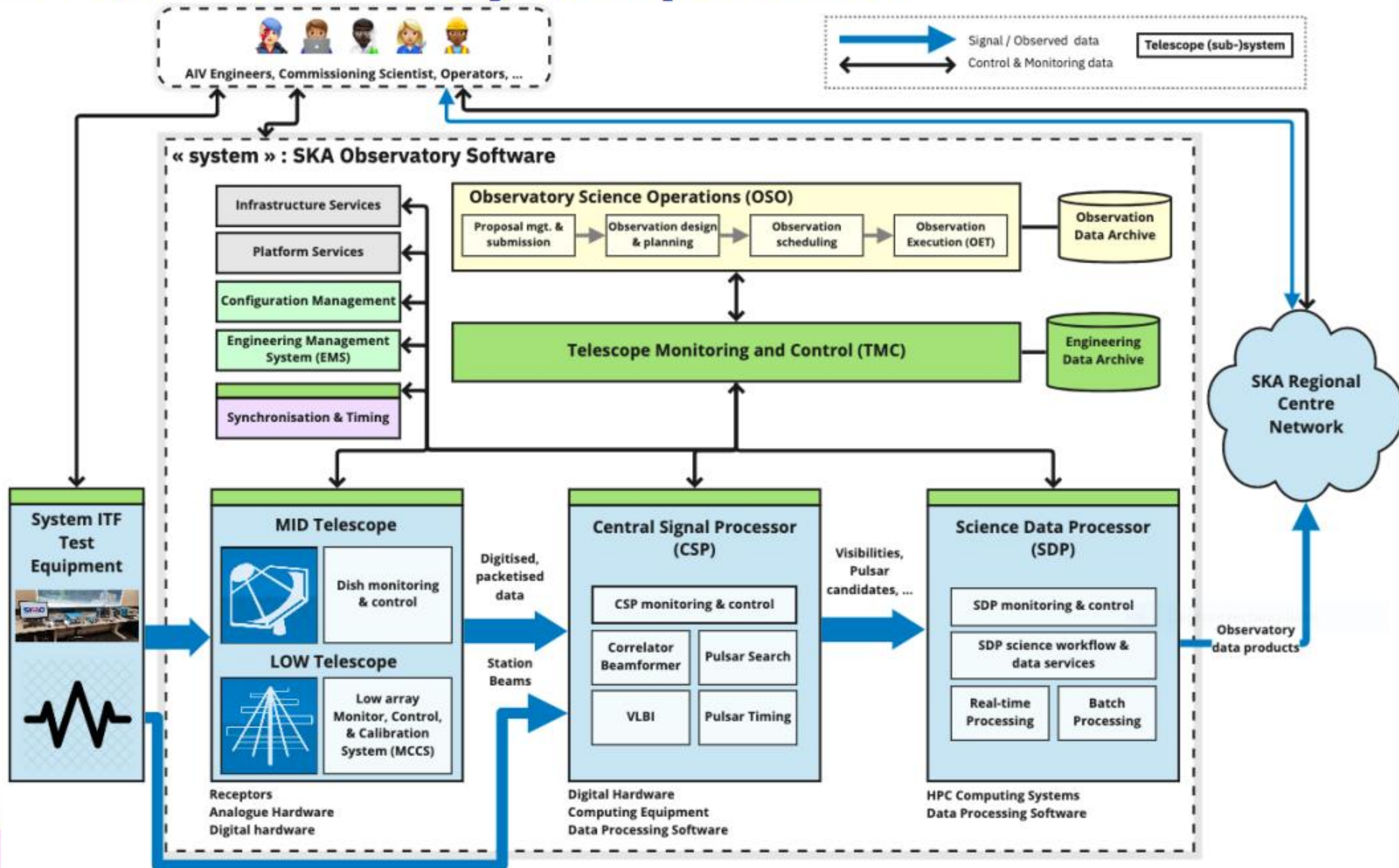
SOC: open mid-October



Australia: interim SOC, Perth : interim EOC in Geraldton

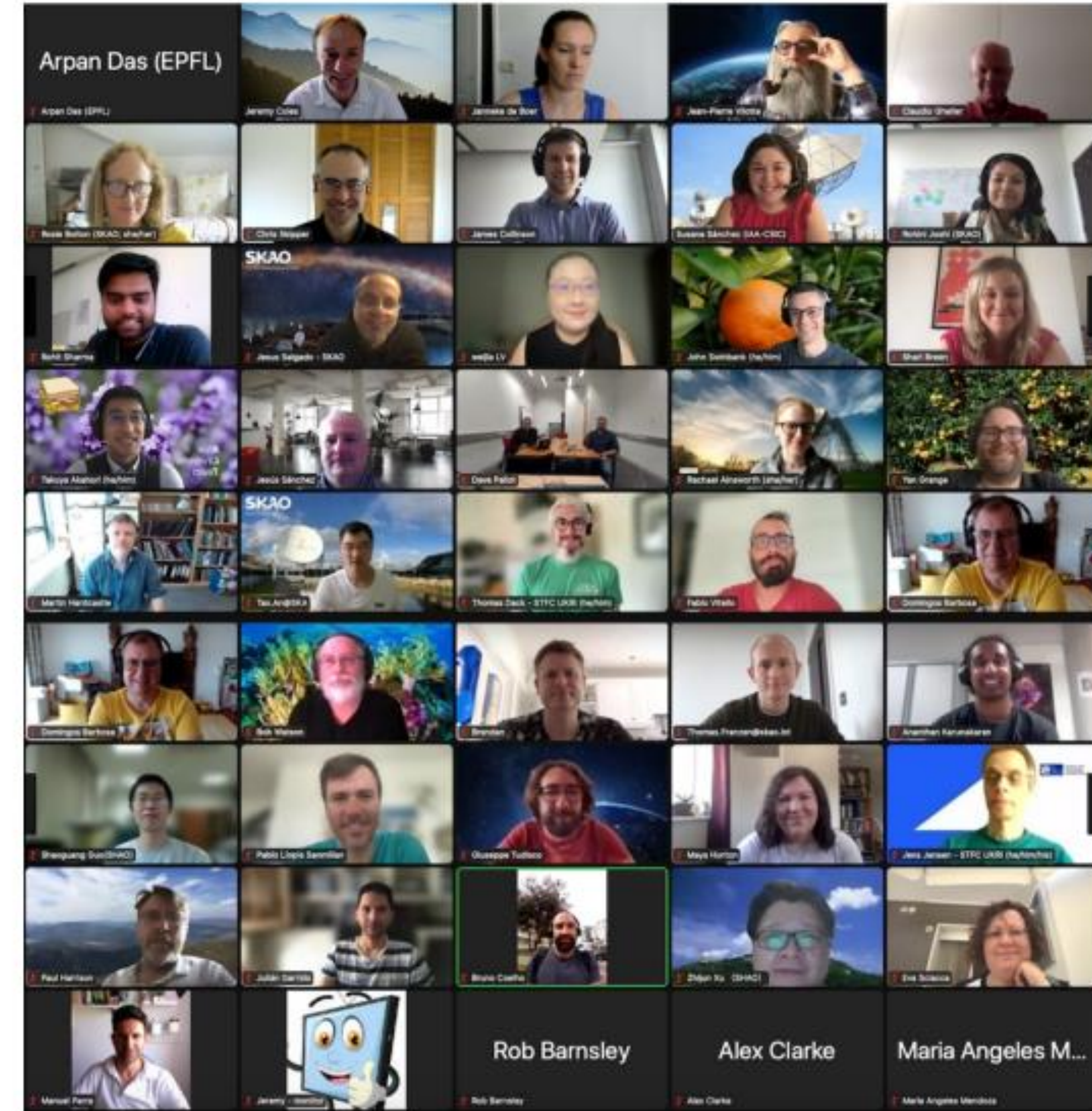


SKA Software - Key components



SRC Prototyping (June PI planning)

- Start of the Prototyping phase with a team of teams (50 developers, 20 observers) on the SRC ART
- Program Team: Rosie Bolton, Jeremy Coles, Jesus Salgado
- Science user engagement WG driving an improved understanding of the use cases



Current key challenges

- Impact of external factors (inflation, labour shortages, supply chains) on construction costs and schedules: working with Council and member states to mitigate
- Pace of engagement in some of aspiring Member governments, potential for misalignment with the construction schedule.
- Pressures on staff are unrelenting, especially in Programmes and Business-Enabling functions
- There is the standard list of items we watch and manage carefully, e.g.:
 - Residual design processes
 - Spectrum management, especially mega-constellations
 - Land access timescales
 - Stakeholder management (local and international)
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Summary

- Construction activities are proceeding at pace; residual design issues are being dealt with professionally and expeditiously
- Level of risk for the project has increased due to the global situation; mitigations are planned, but they require the commitment of additional resources from Members and the accession of new Members.
- SKAO presence in the site host countries is a major positive milestone
- SKAO's reputation and global visibility is growing substantially and positively.



*We recognise and acknowledge the
Indigenous peoples and cultures that have
traditionally lived on the lands on which
our facilities are located.*

SKAO

www.skao.int