SKAO

37th TANGO Community Meeting
Welcome

Marco Bartolini

Welcome TANGO community !

Our numbers

Thanks everyone

We have **100 people** registered for the event and **38 contributions** from the community.

In the spirit of a community meeting, we tried our best to give space to all talks, as a result talks are a bit tight, thanks for sticking to the time allocated.

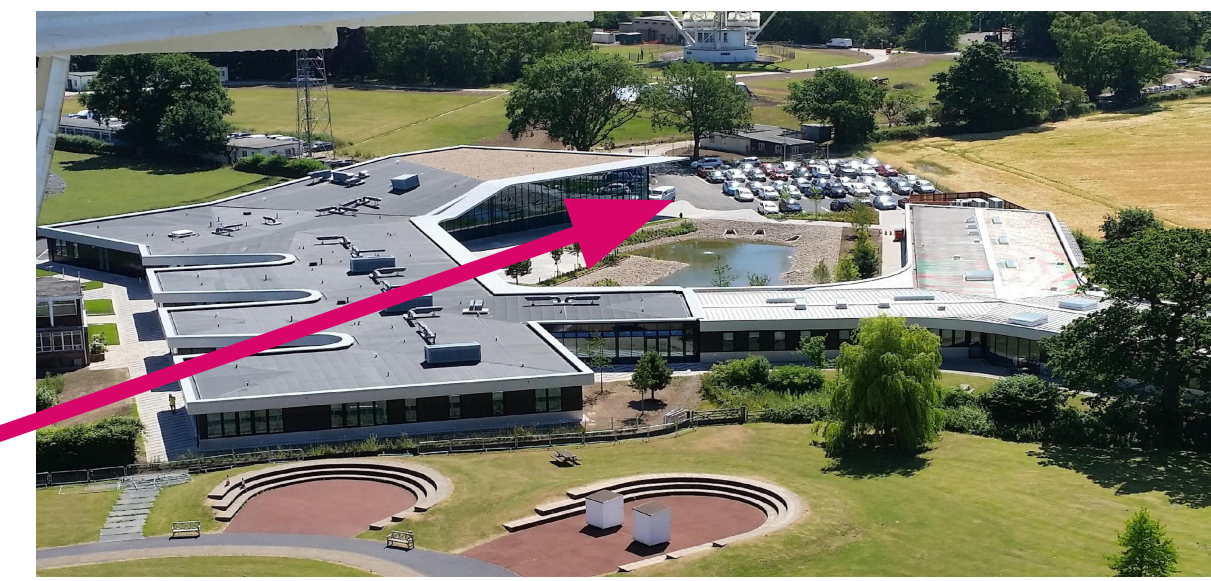Let's use social events and slack for offline discussions!

Health and Safety at SKAO HQ

- If the **Fire Alarm** sounds – **Evacuate** to the main **car park** and await further instruction, do not leave the site
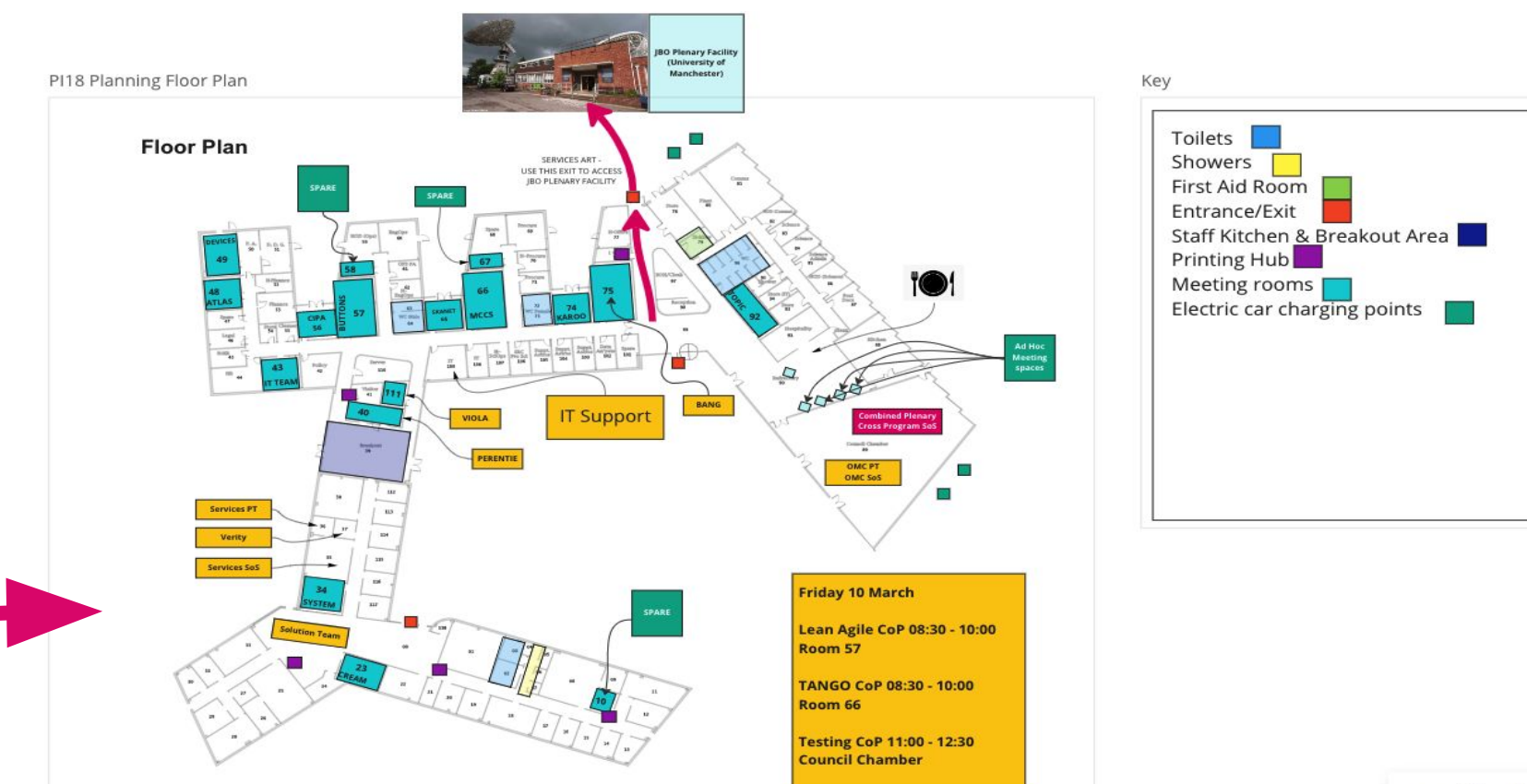
  - No **Fire Alarm Drills** are planned at SKAO HQ this week

Assembly Point – Main SKAO Car Park

- For **First Aid** requirements, please contact reception

- **COVID Lateral Flow Tests** are available at reception, if you feel unwell please do test

- **Rest rooms** are adjacent to the main reception desk

- **No smoking** inside or around the perimeter of the building

- **Mobile phone use** is allowed **only within** the **SKAO HQ building**, WIFI calling is preferred. **Mobile phone usage outside of the building is STRICTLY PROHIBITED**

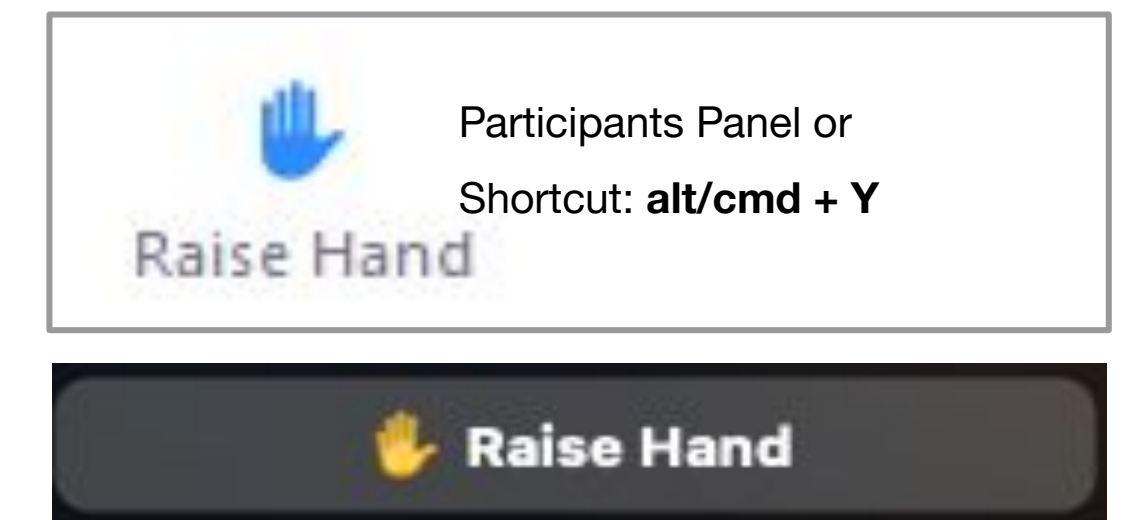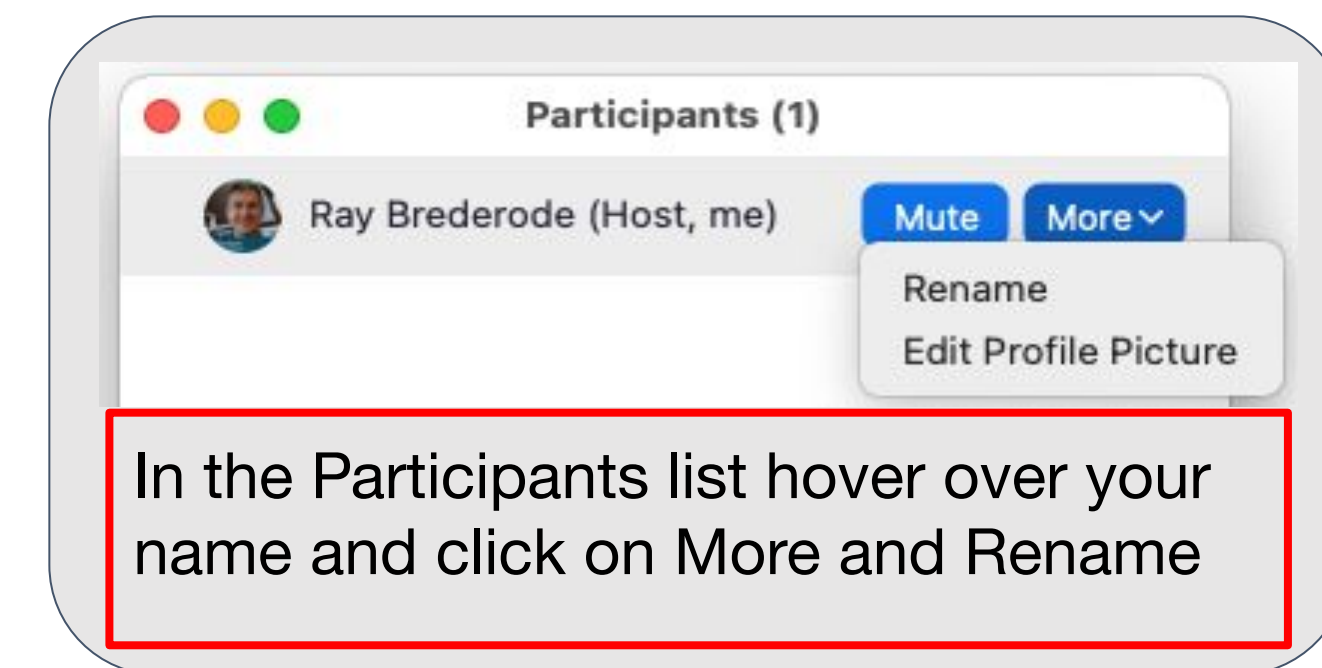Use **SKAO HQ Floor Plan** to orient yourself

Working Agreements

Remember it's a **hybrid** meeting:

- Raise **physical hand** to ask questions (present)
- Raise **virtual hand** to ask questions (zoom)
- One conversation at a time
- Assume positive intent when unsure
- Be present
- Respect the timeboxes
- Stay **muted** to minimise background noises

All sessions are subject to the SKA Code of Ethics and Conduct.

Participants (1)

Ray Brederode (Host, me)   Mute   More

Rename
Edit Profile Picture

In the Participants list hover over your name and click on More and Rename

Participants Panel or
Shortcut: **alt/cmd + Y**
Raise Hand

Raise Hand

Digital Coordinates

Zoom

All plenary meetings will use the same zoom room ([link](#)):

 ID: 619 661 2423 PASS: 855663

When presenting, share your presentation via zoom

Indico

[Conference website](#) , remember to upload your presentation!

Slack

[#37th-tango-meeting-2023](#) on TANGO slack

Miro

[Feedback board](#) and [workshop ideas](#)

Breaks and food

Lunch and Coffee breaks will be served in the HUB area, next to the council chamber, at the right of the reception.

Catering for the meeting is provided in the **buffet area** with the glass doors, all the tables can be used.

Transports

- Pickup at 08:15 from the Wilmslow lodge car park (Map link) and 08:30 from the Traffods Arms in Alderley Edge (Map link) and return at 17:00 from SKAO HQ
- Social Dinner at the Giggling Squid (Map Link) in Alderley Edge, pickup at 18:30 from Wilmslow. Walking distance from Alderley.
- Thursday morning transports to the SKAO HQ, our reception can help arranging TAXIs to the airport.

Social Events

First Light Pavillion

- We will walk straight from here today at 15:30
- Meet at the reception at 15:30, some umbrellas will be available
- Need to go there directly sharp after the end of our session

Social Dinner

- The Giggling Squid in Alderley Edge
- Walking distance from within Alderley
- Pickup at 18:30 from the Wilmslow Lodge

Program
Detailed view on INDICO

Workshops on Thursday morning

- **No** fixed agenda, **open format**
- **Not** a training event
- Aim for **brainstorming** and **discussion**, with active participation
- We expect your proposal on MIRO and we'll announce Wednesday evening the themes for the Thursday morning
- Up to 3 workshops can run in parallel
- Some ideas have already been collected:
  - Documentation
  - IDLv6
  - Operations, obsolescence, software updates
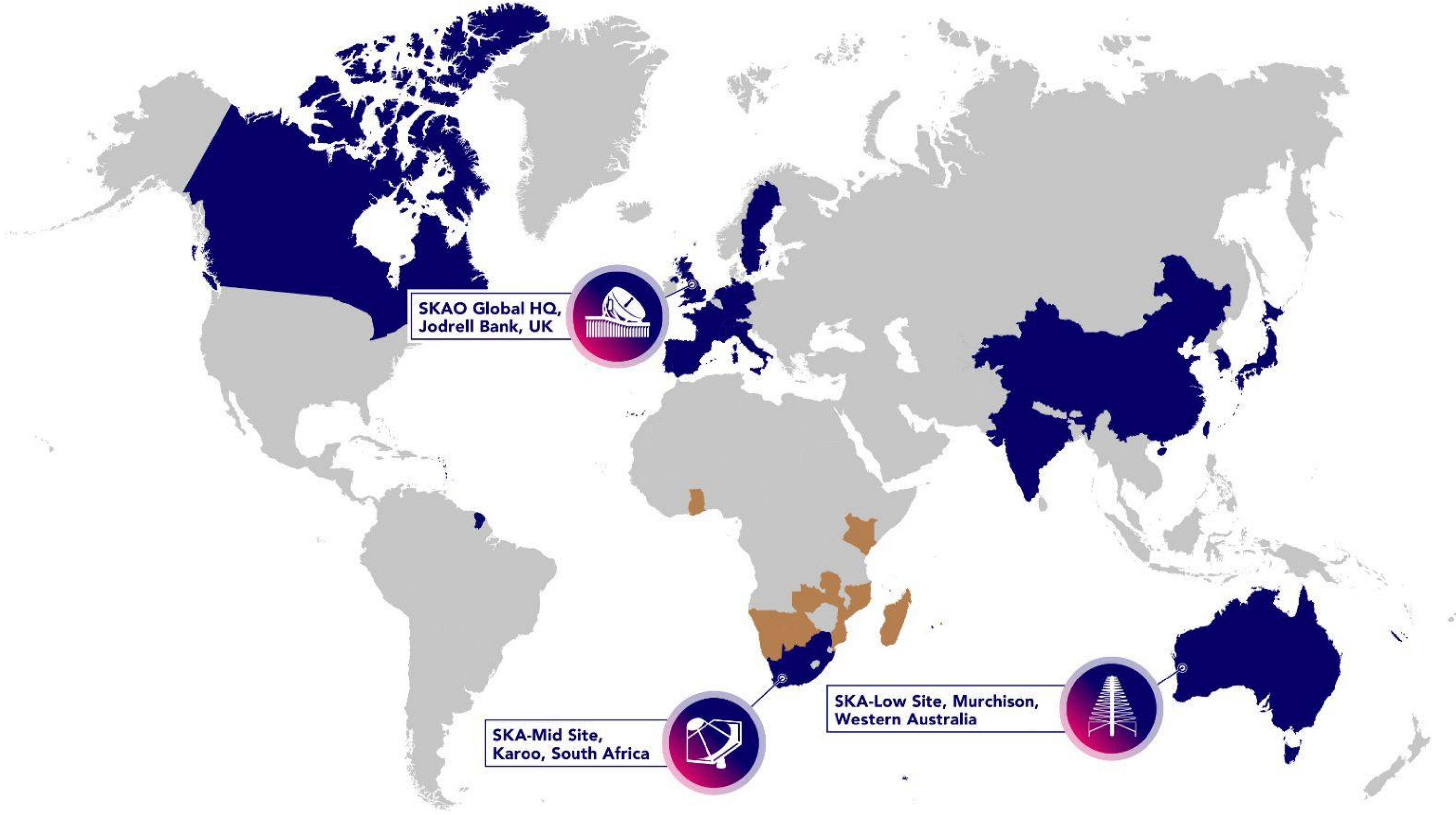 - Feedback session on TANGO adoption
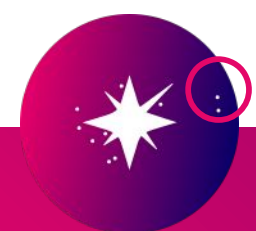
SKAO update

SKAO Mission

. "The SKAO's mission is to build and operate cutting-edge radio telescopes to transform our understanding of the Universe, and deliver benefits to society through global collaboration and innovation."

One Observatory, Two Telescopes

SKAO Global HQ, Jodrell Bank, UK

SKA-Mid Site, Karoo, South Africa

SKA-Low Site, Murchison, Western Australia

SKAO Partnership - includes SKAO Member States* and SKAO Observers (as of June 2022)

African Partner Countries

Botswana
Johannesburg
Swaziland
Lesotho
South Africa
~600km
Cape Town
SKA site:
Remote
Radio Quiet
Altitude: ~1000m

Perth

Membership April 2023

The Square Kilometre Array Observatory (SKAO)

An inter-governmental organization, governed by a treaty. SKAO was born on 4th February 2021.

Full membership (8)

Australia, China, Italy, Netherlands, Portugal, South Africa, Switzerland, UK

Accession stage (4)

Spain (Imminent; articles deposited in London)
Germany (Jul 2023; funding provided)
Canada (Nov 2023; funding provided)
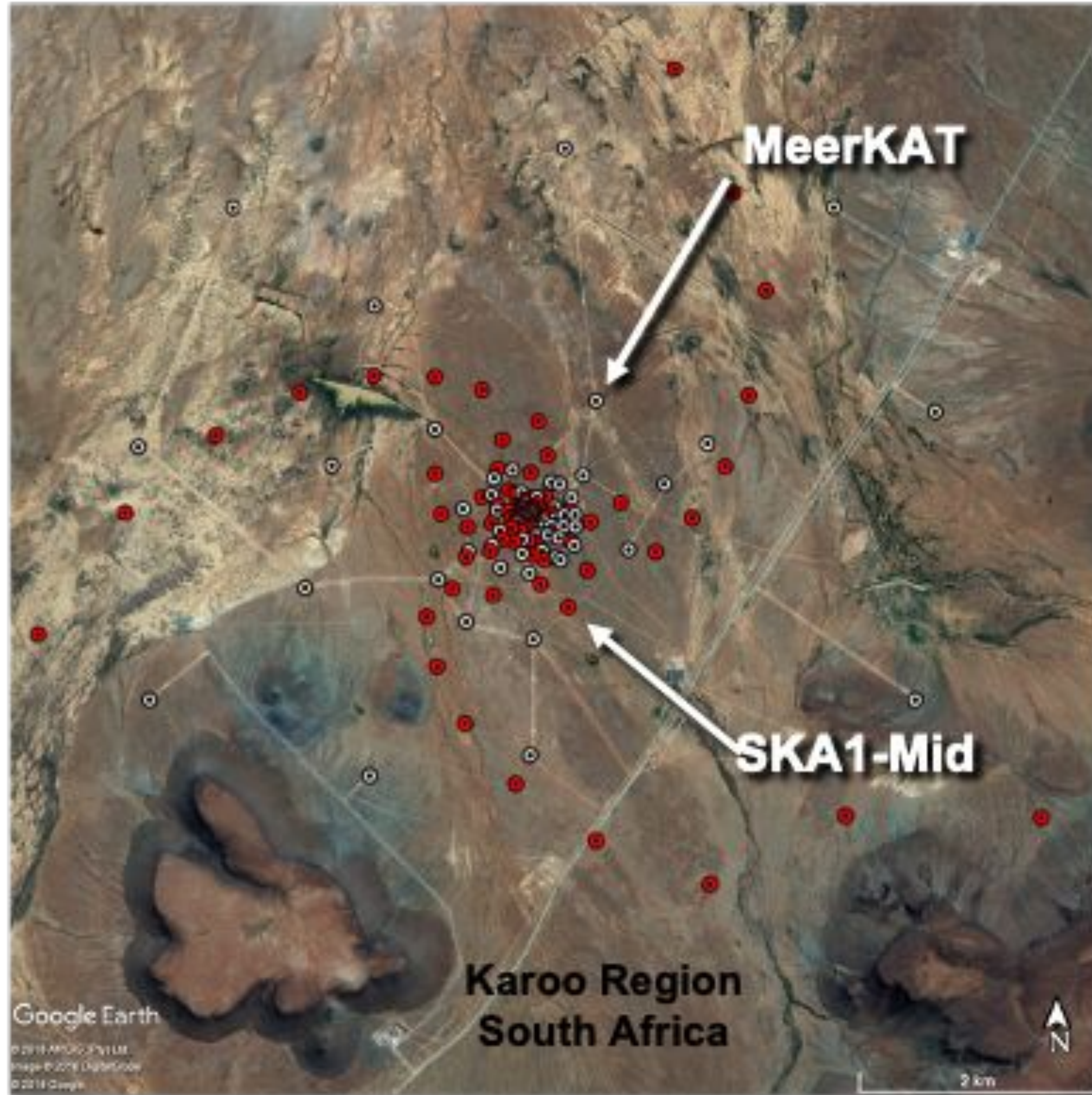France (Dec 2023; internal process)

Interim agreements (2+2)

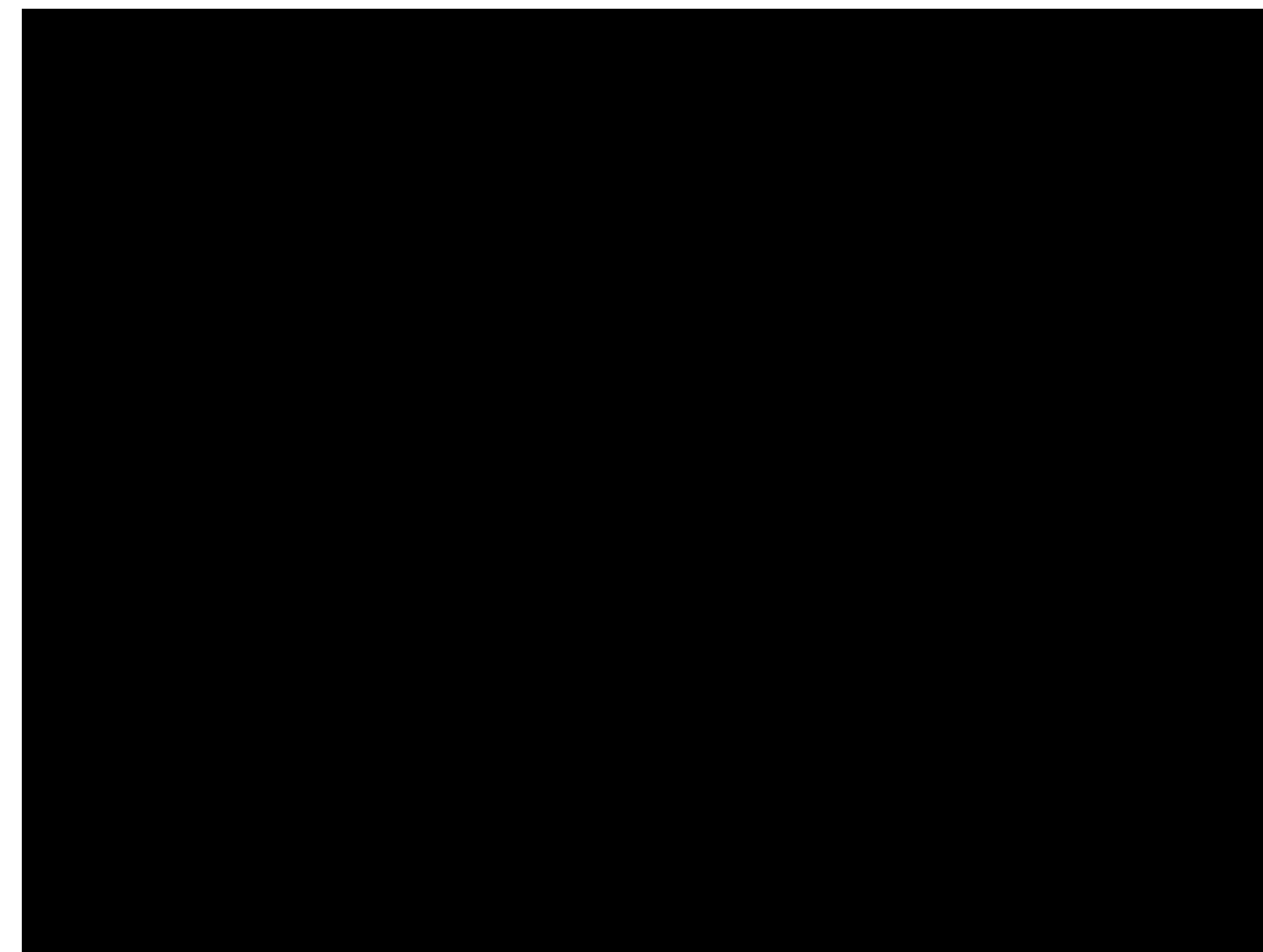India, Sweden (+ Canada, France)

Early stages (2)

Japan, South Korea

SKA MID Telescope

Karoo Region South Africa

★ **133** SKA 15m dishes

★ **64** MeerKAT 13.5m dishes

★ Maximum baseline **150 km**

★ 3 logarithmic spiral arms

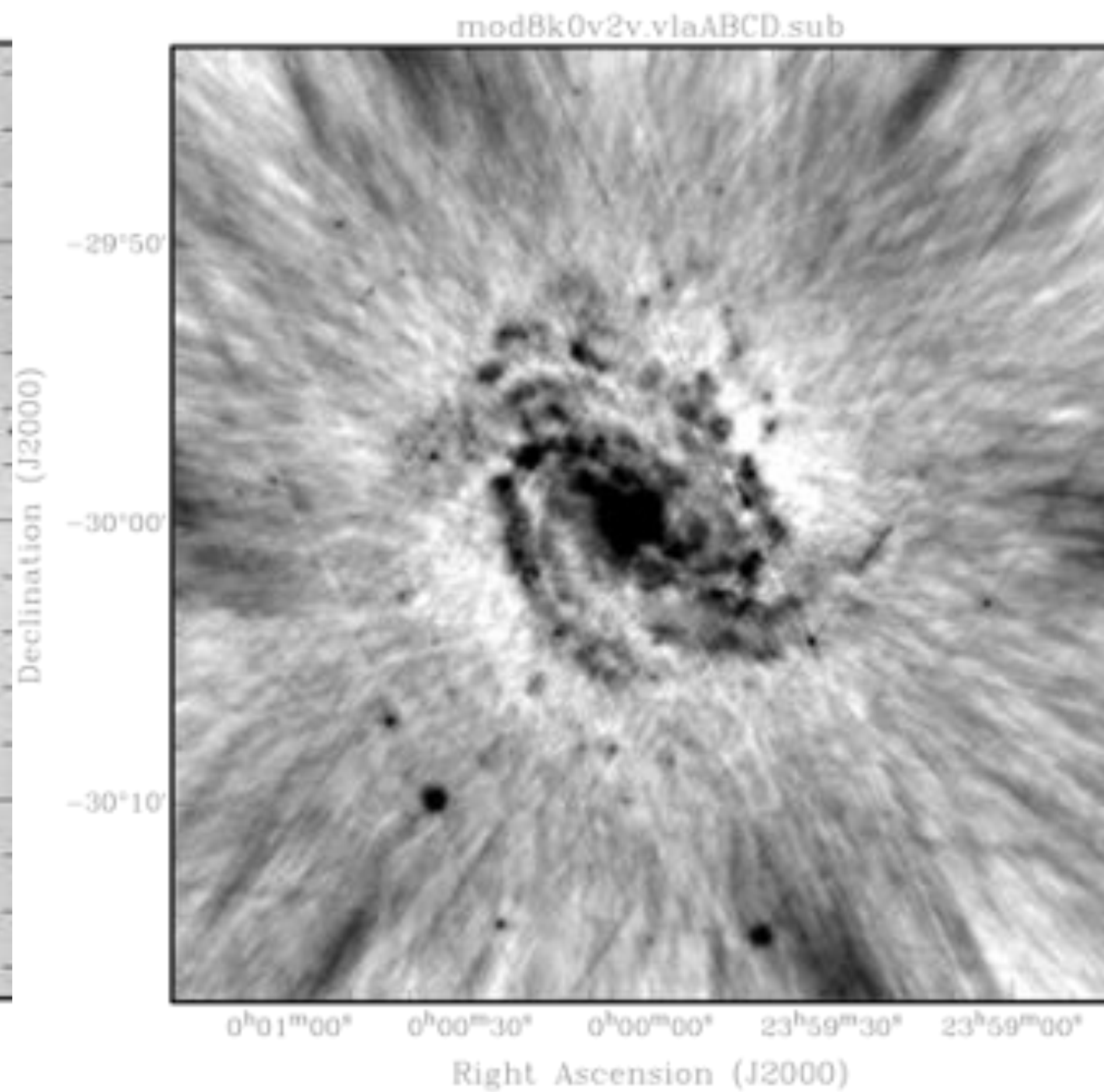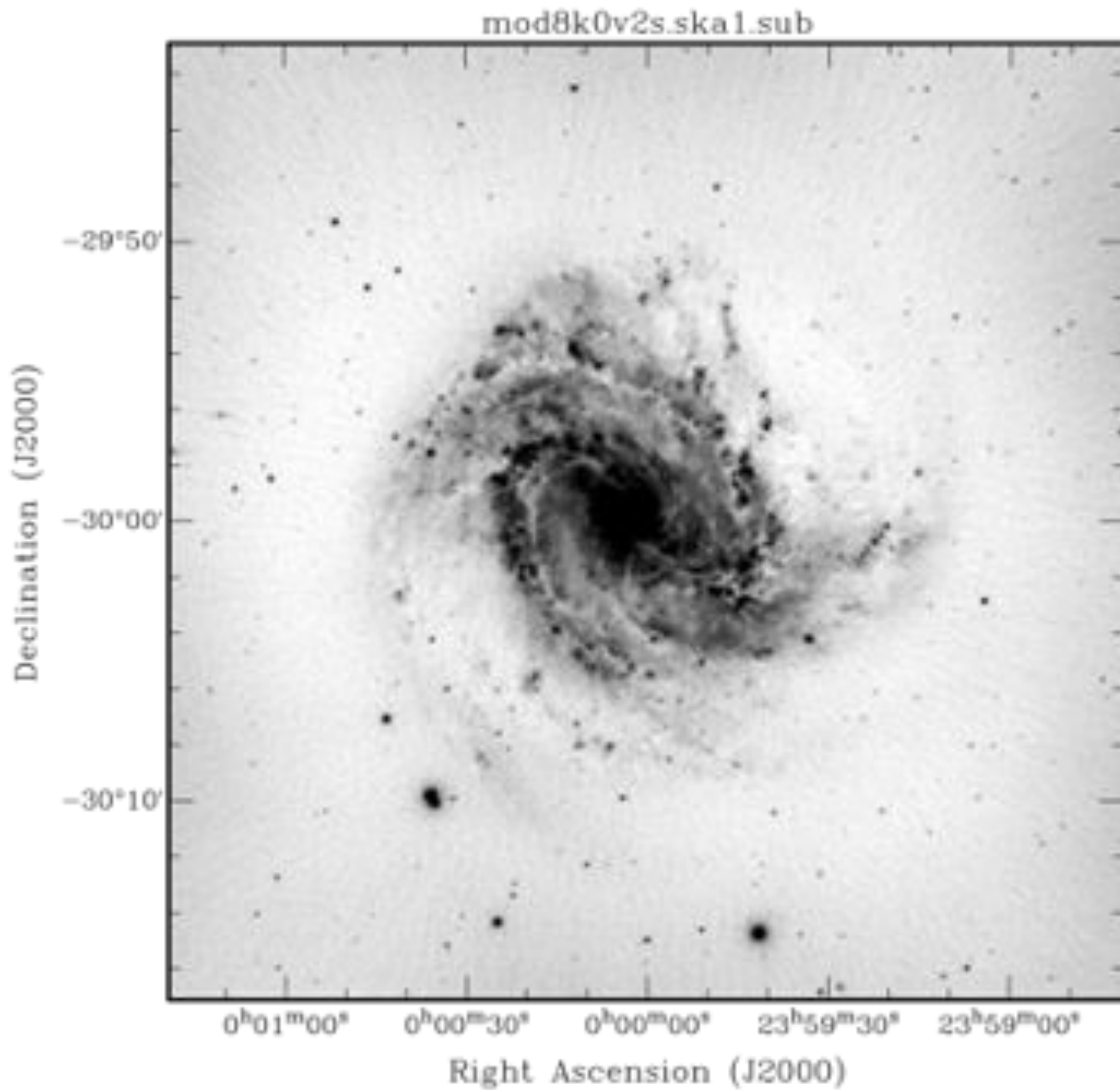★ ~ 50% within ~2 km randomly distributed

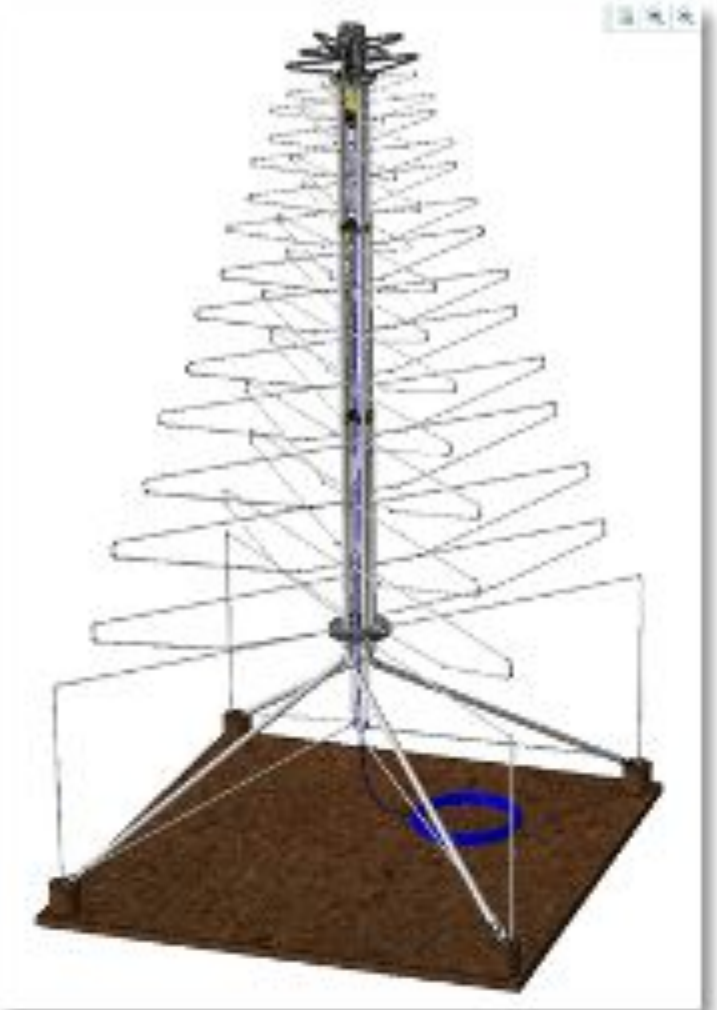First on-site dish prototype April 2019

MeerKAT antennas in the Karoo

SKA MID Image Quality Comparison
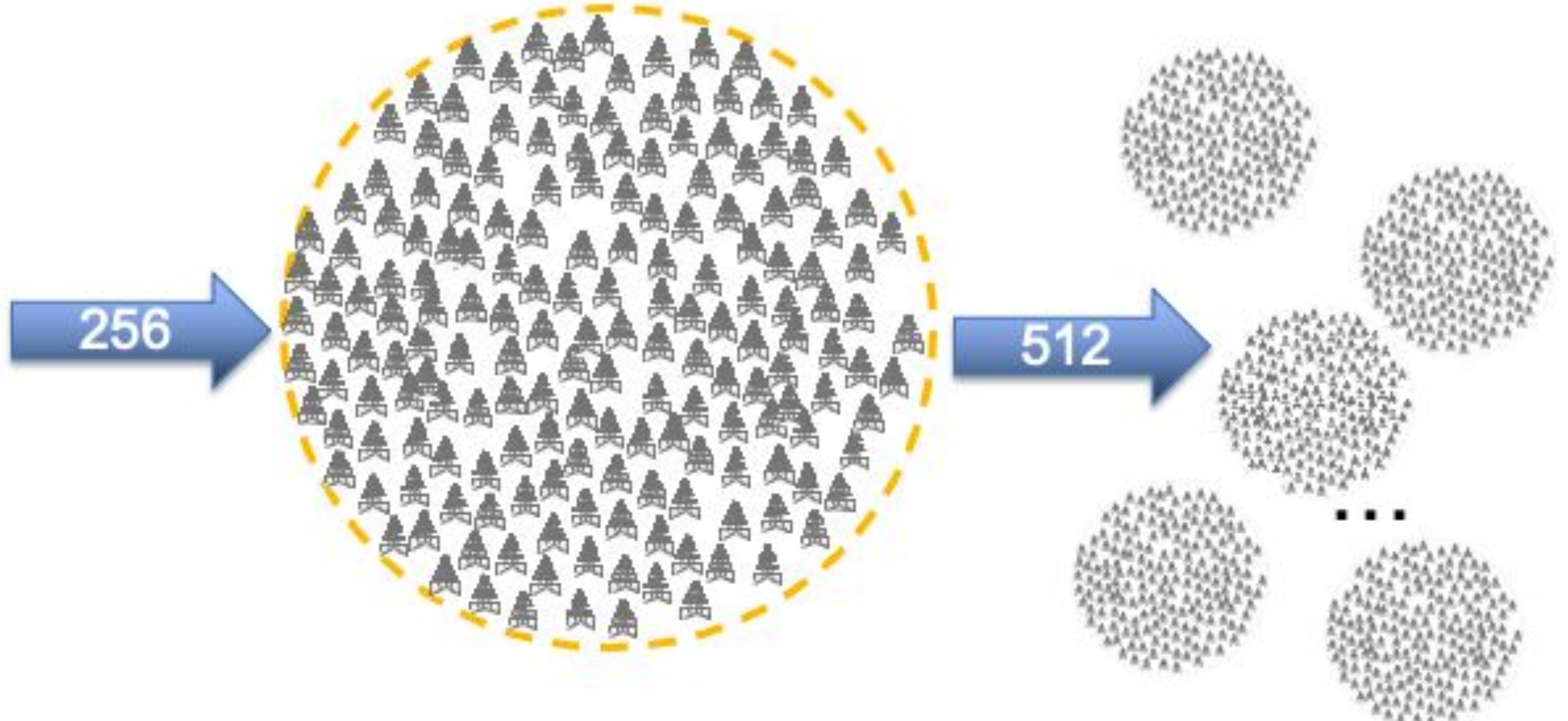

mod8k0v2s.ska1.sub

mod8k0v2v.vlaABCD.sub

★ Between 10 and 100 times the image fidelity of current facilities

★ Single "dirty" SKA1-Mid snap-shot compared to combination of four "dirty" snapshots, one in each of JVLA A+B+C+D

SKA LOW Telescope

SKA1-Low
Antenna/Receptor

Antenna Beam

SKA1-Low
"Station"

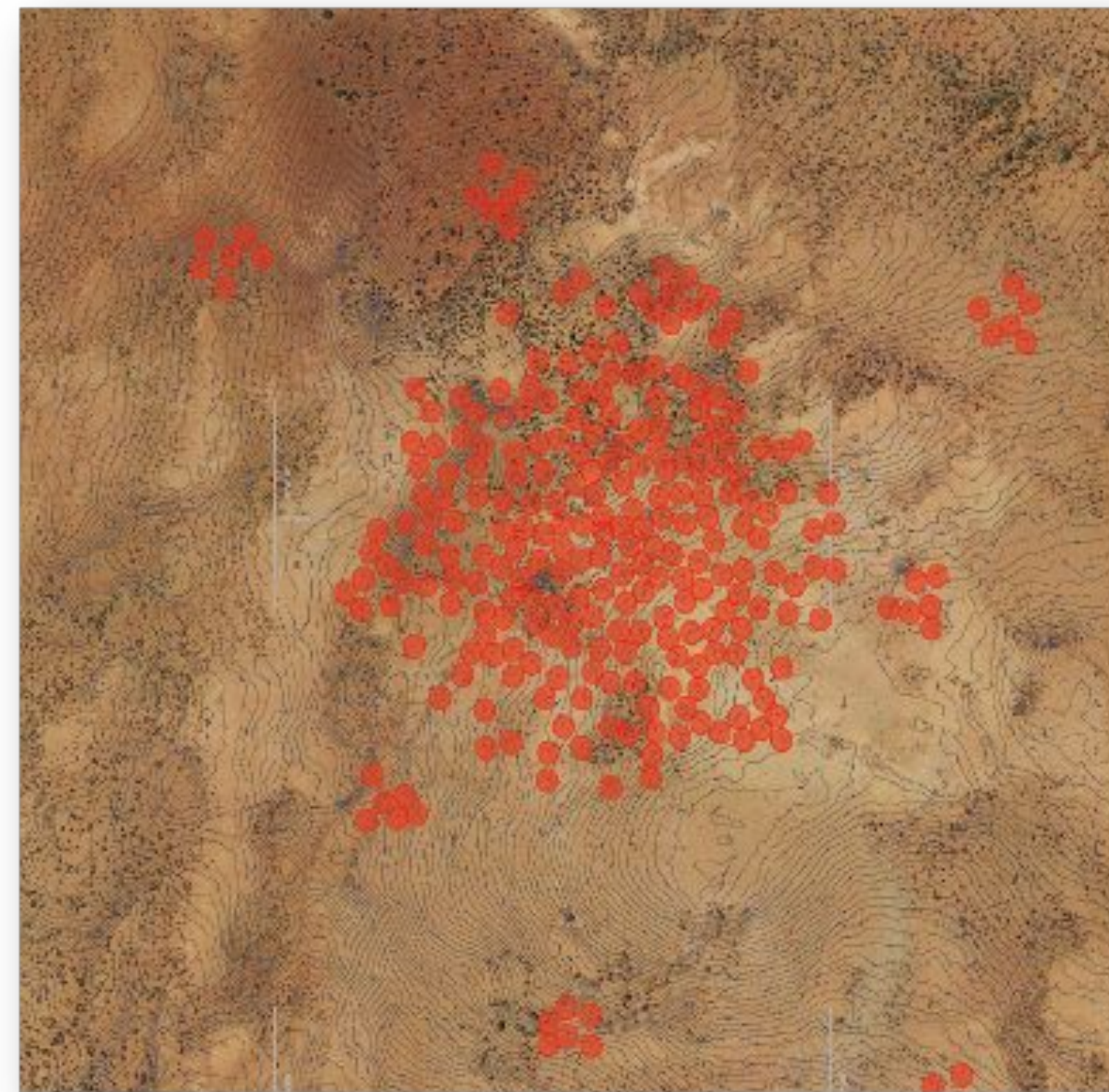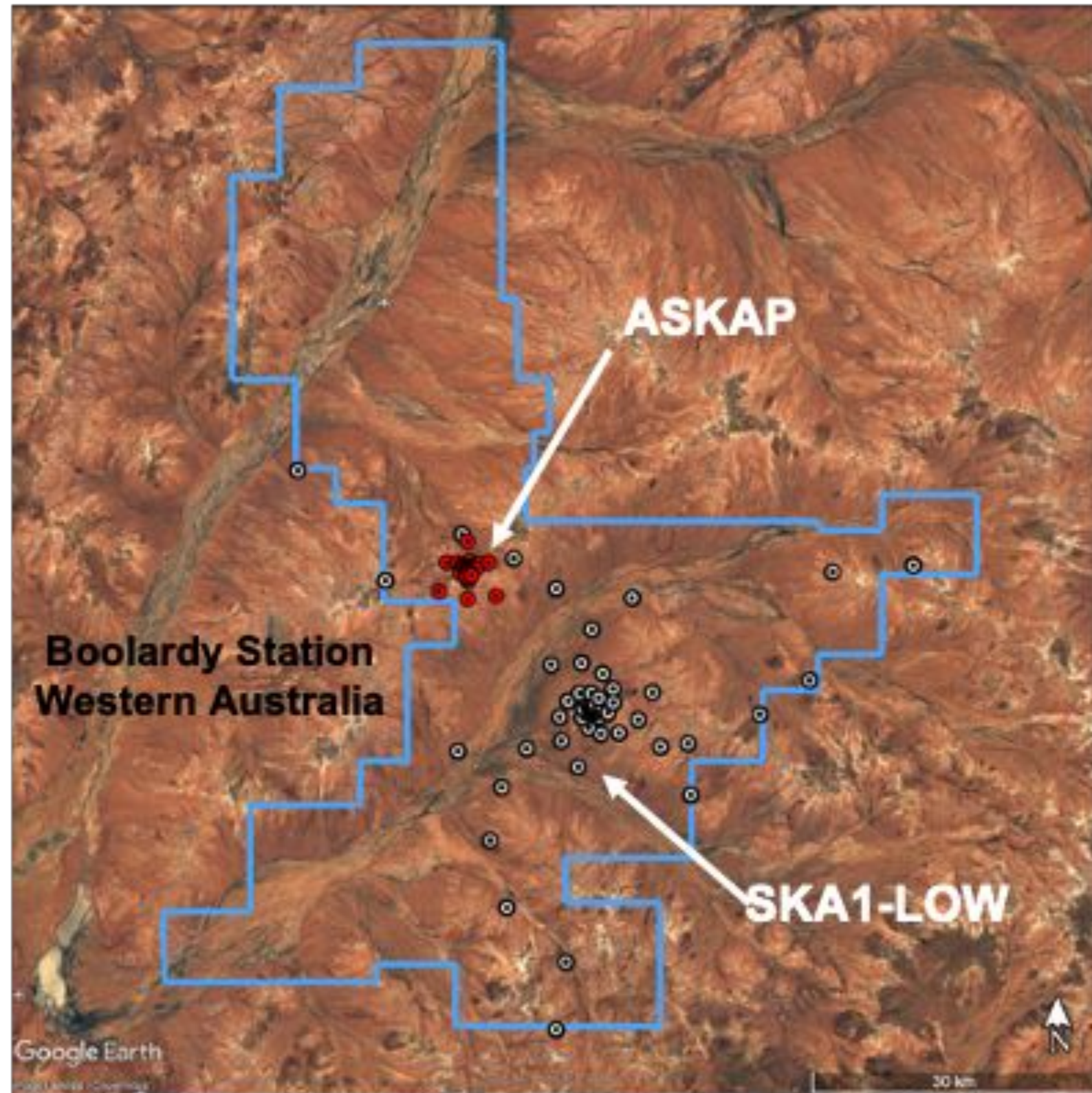**Station Beam**

SKA1-Low
"Array"

**Correlation and
Tied-array Beams**

★ 512 aperture array stations
★ Maximum baseline 65 km
★ 3 modified spiral arms
★ ~ 50% within ~1 km randomly distributed
★ Others in clusters of 6 stations arranged randomly over an area 100 to 150 m in diameter

★ 256 antennas per station
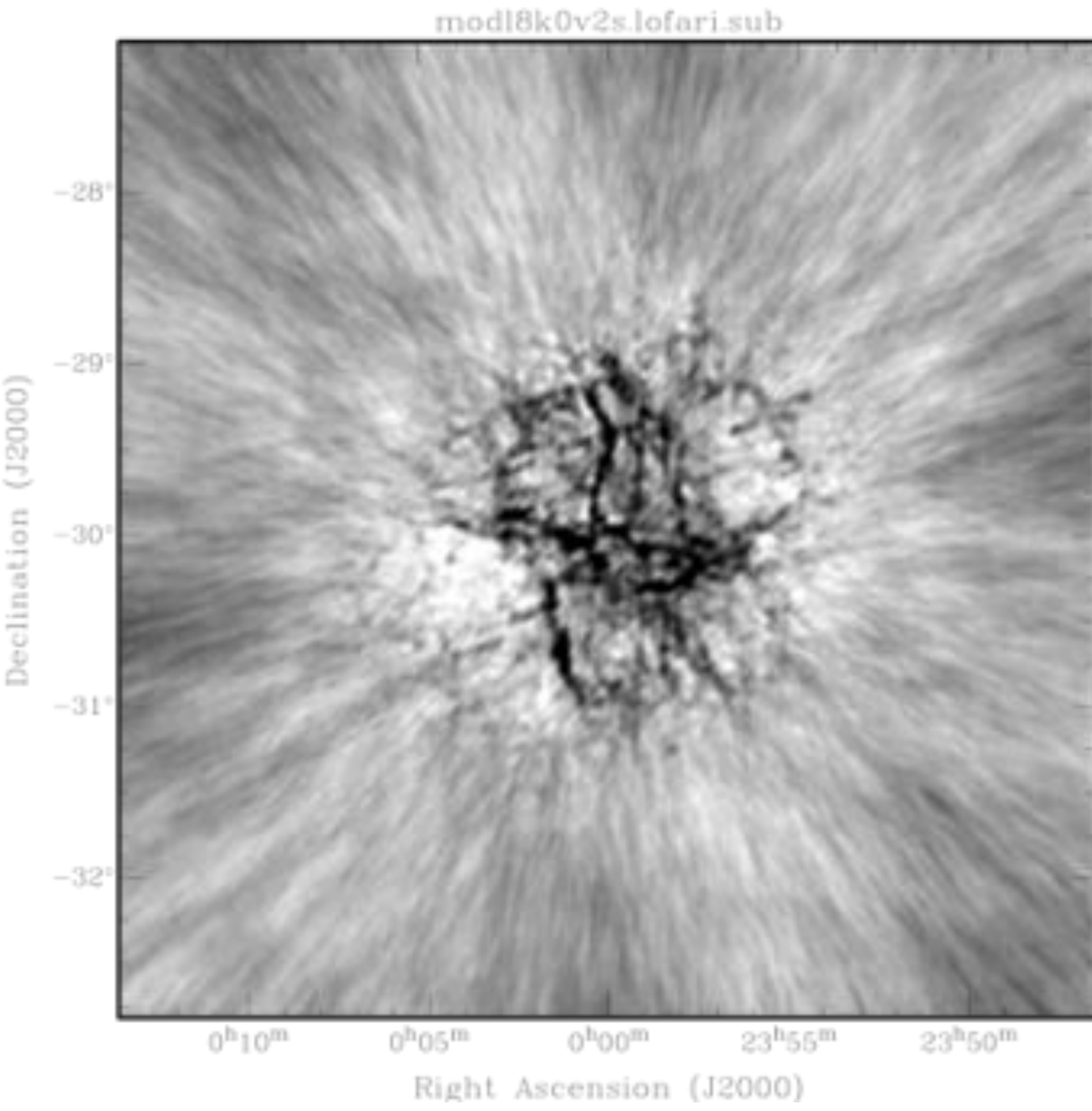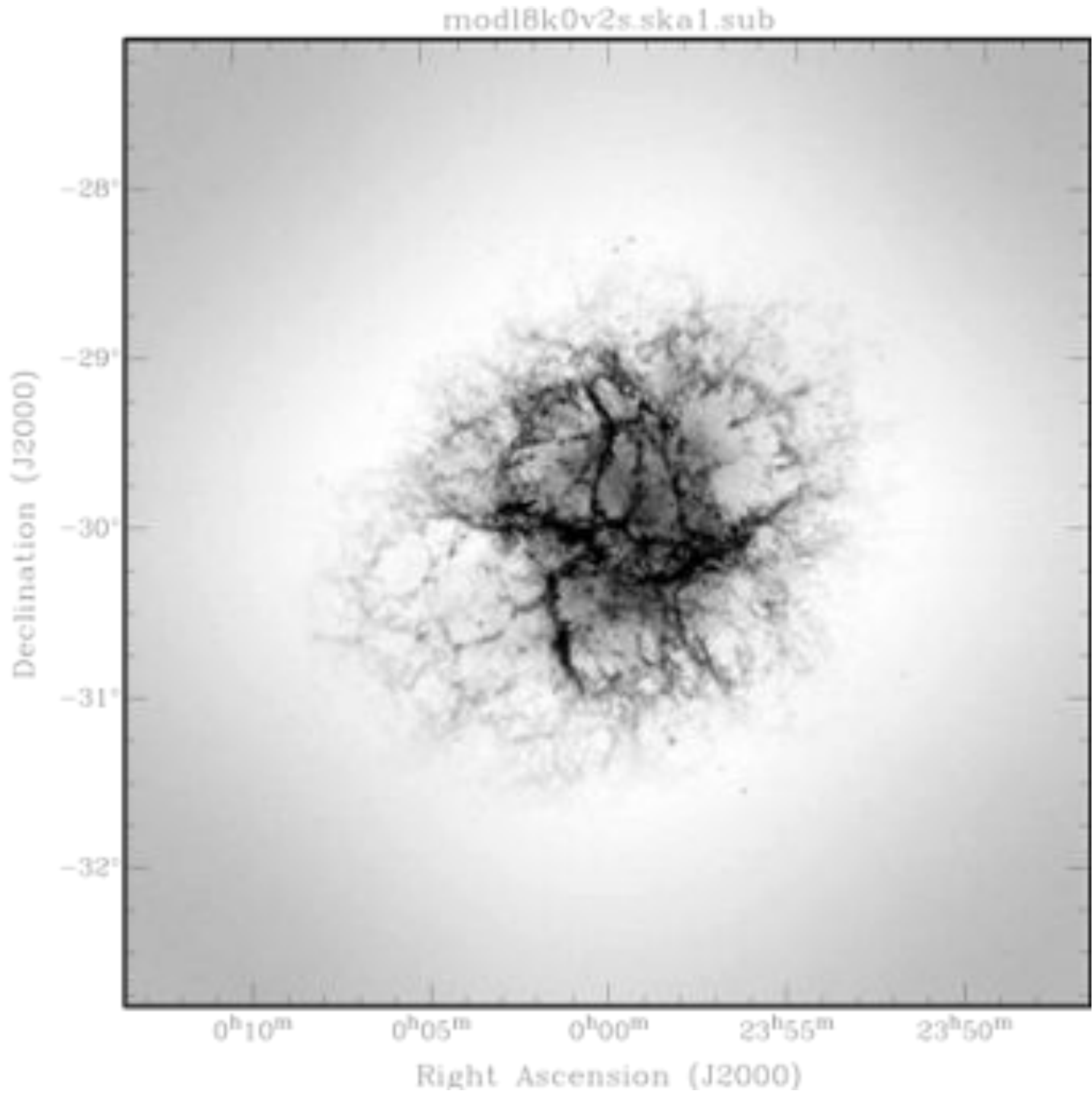★ 38m station diameter

SKA LOW Telescope

- ★ 512 aperture array stations
- ★ Maximum baseline 65 km
- ★ 3 modified spiral arms
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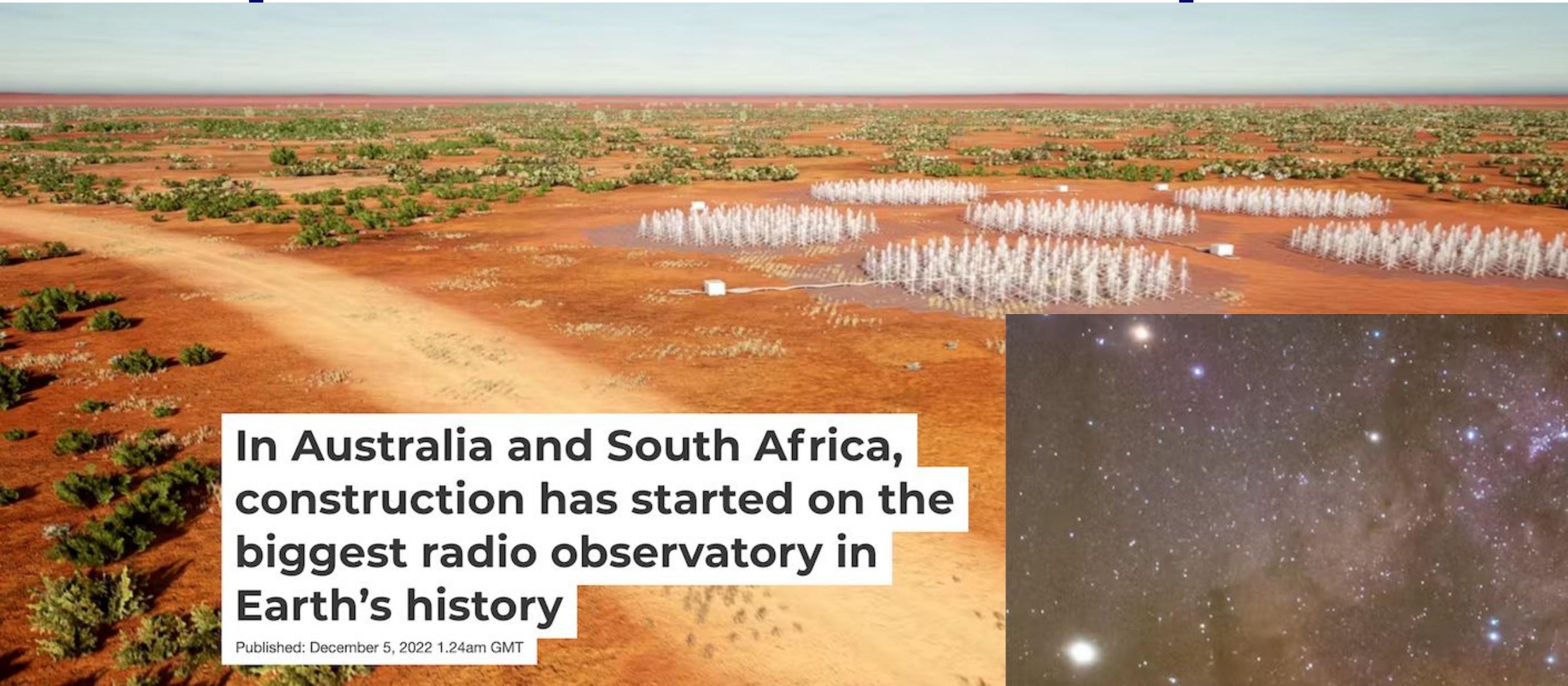- ★ 256 antennas per station
- ★ 38m station diameter

SKA LOW Image Quality Comparison

★ Between 10 and 100 times the image fidelity of current facilities

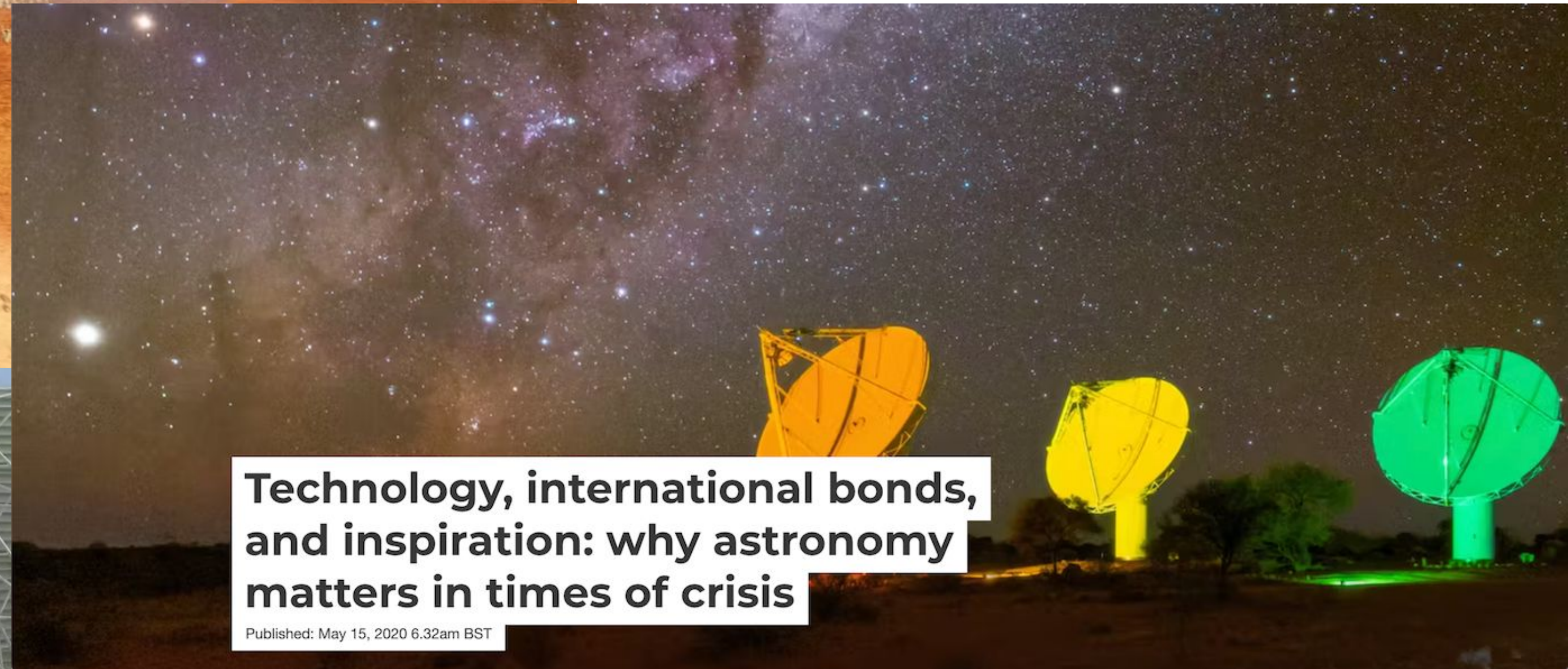★ Single "dirty" SKA1-Low snap-shot compared to LOFAR "dirty" snapshot

Perspective: SKAO Anticipation

In Australia and South Africa, construction has started on the biggest radio observatory in Earth's history
Published: December 5, 2022 1.24am GMT

Technology, international bonds, and inspiration: why astronomy matters in times of crisis
Published: May 15, 2020 6.32am BST

How the SKA telescope is boosting South Africa's knowledge economy
Published: May 30, 2018 2.28pm BST

Construction Strategy

- **Target**: build the SKA Baseline Design (197 Mid dishes; 512 Low stations: AA4)

- Not all funding yet secured, therefore following Staged Delivery Plan (AA*)

- Develop the earliest possible working demonstration of the architecture and supply chain (AA0.5).

- Then maintain a continuously working and expanding facility that demonstrates the full performance capabilities of the SKA Design.

| Event	MID	LOW
Construction Approval	2021 Jul	2021 Jul
Integration Test Facility start	2023 Jan	2023 Feb
AA0.5 Integration and Verification start	**2024 Jul**	**2024 Jul**
AA0.5 end	**2025 Jan**	**2024 Nov**
AA1 end	2025 Dec	2025 Nov
AA2 end	2027 Jan	2026 Oct
AA* end	2027 Oct	2028 Jan
Operations Readiness Review (handover to Operations)	2028 Jan	2028 Apr
End of construction (including contingency)	2028 Jul	2028 Jul

First data release to the community expected around AA2 (currently 2026/27) for commissioning and verification
Planned schedule contingency has also been used to manage global and observatory impacts.

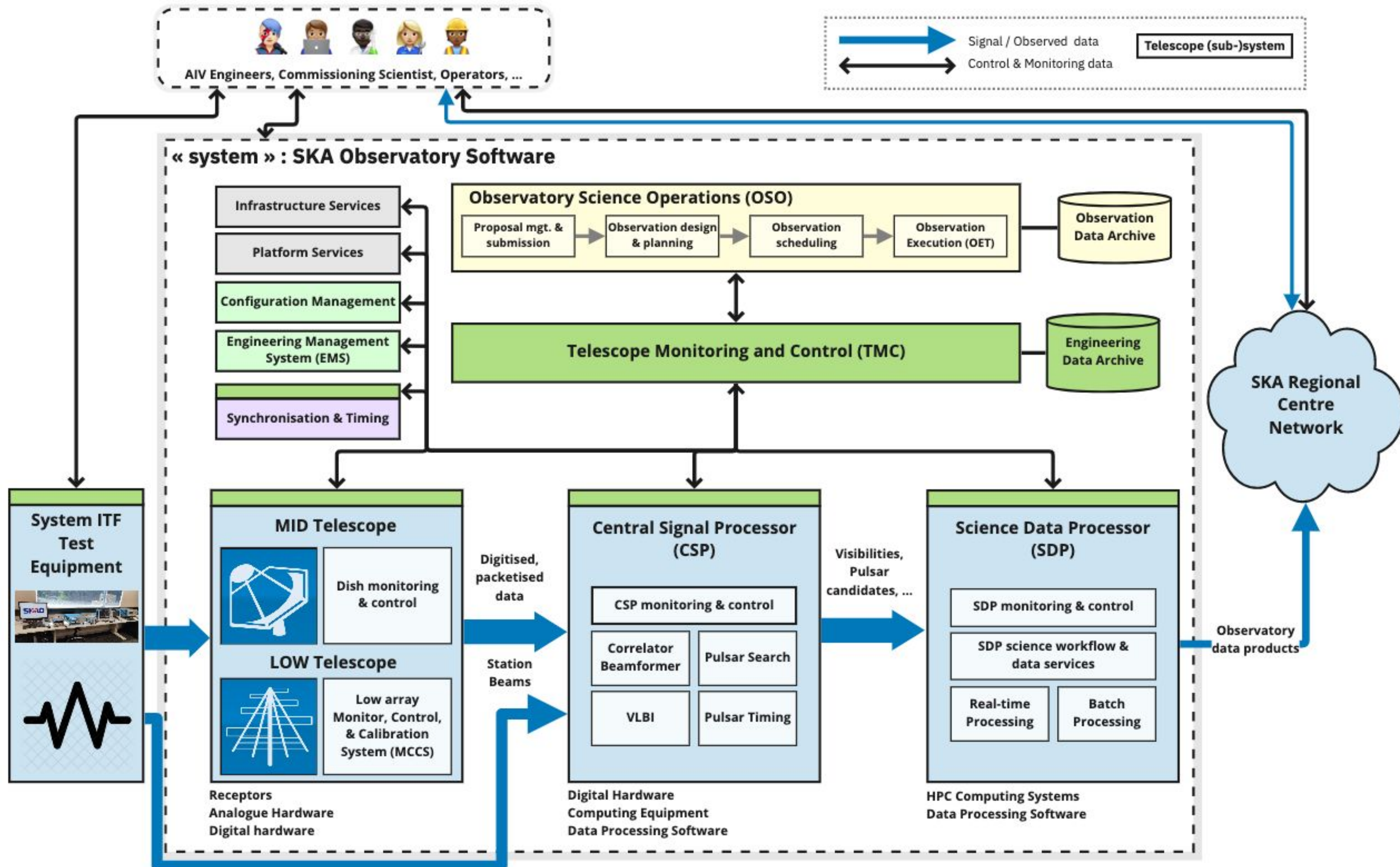# Operations Context
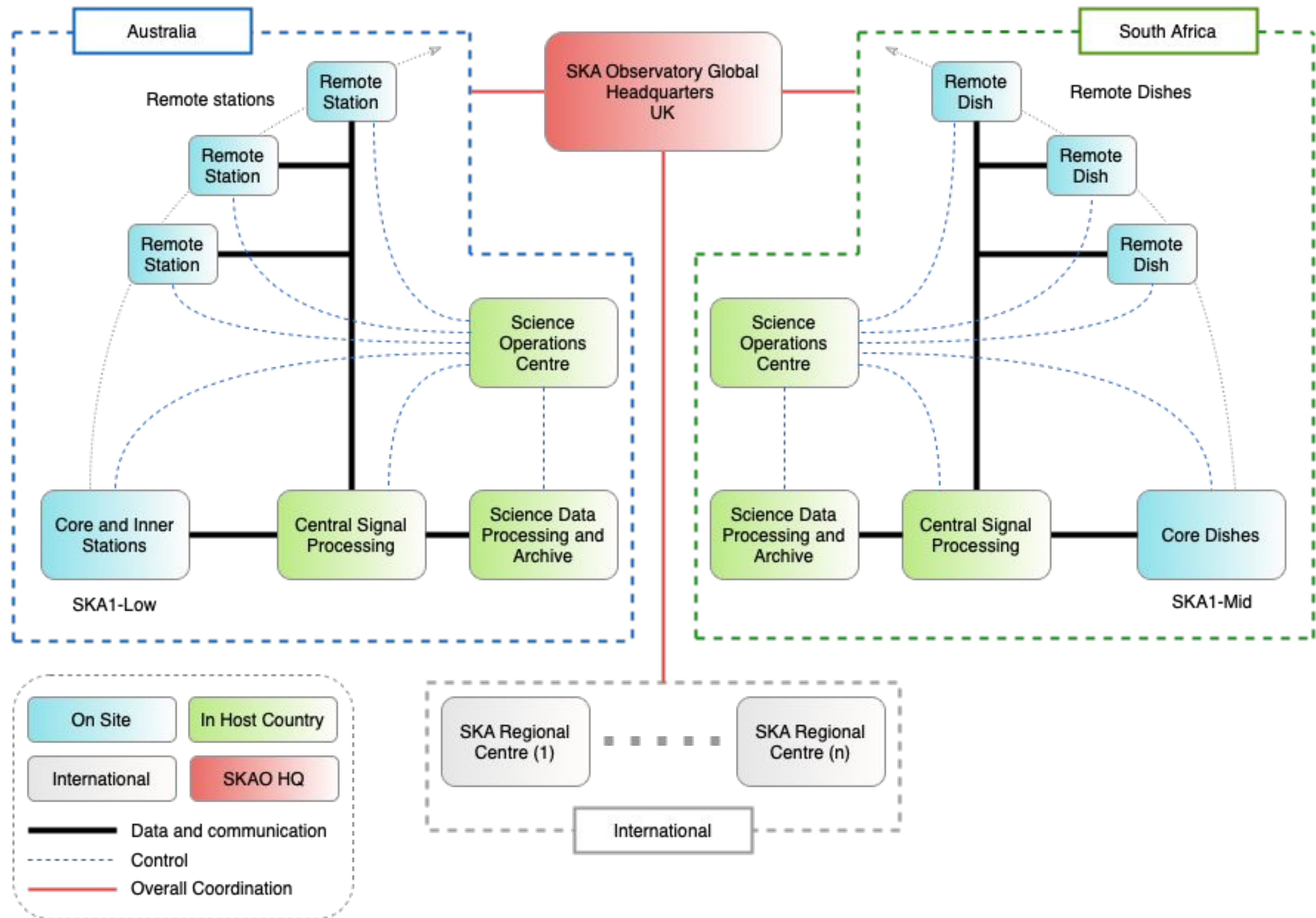
SKA Data Flows
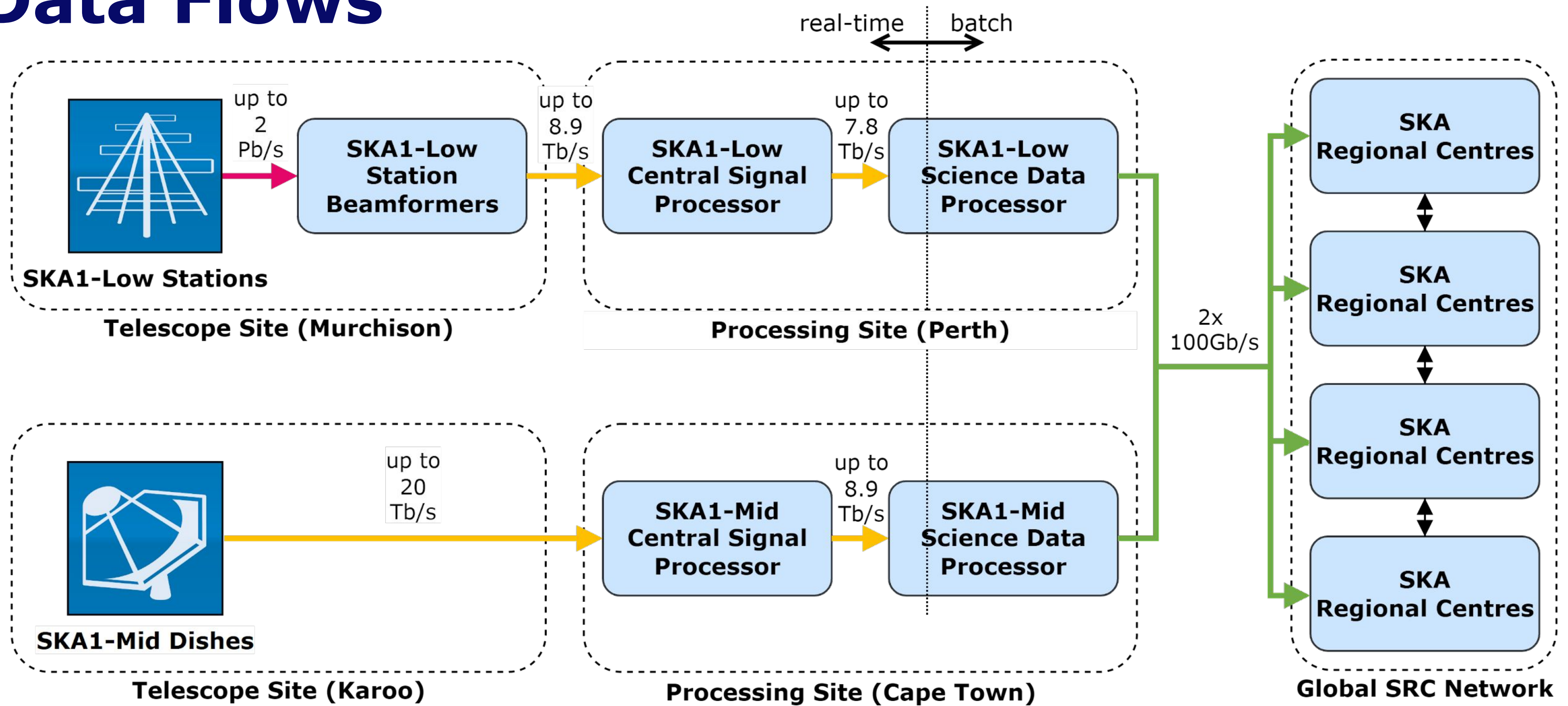
Different computing models at different stages

- Real-time processing to lower data rates

- Storage and "big data" batch analysis

SKA Software - Key components

Telescope Control System

The role of the Telescope Control System may be classified in the three key areas:

- ❏ Instrumental monitor and control
- ❏ Observation configuration, execution and monitoring
- ❏ Support for sub-arraying

Implementation is based on the

TANGO controls framework ㅜ∆NG⊙.

LOW and MID Telescopes - NOW - Telescope Monitoring and control

- Subarray creation and resource allocation
- Control of CSP & SDP Observing State transitions to allow a typical 'imaging scenario' in Cloud environment
- TMC/OSO scripting command time-out and recovery to appropriate previous state.
- Engineering Data Archive (EDA) ready for use
- Initial monitoring and control dashboards available
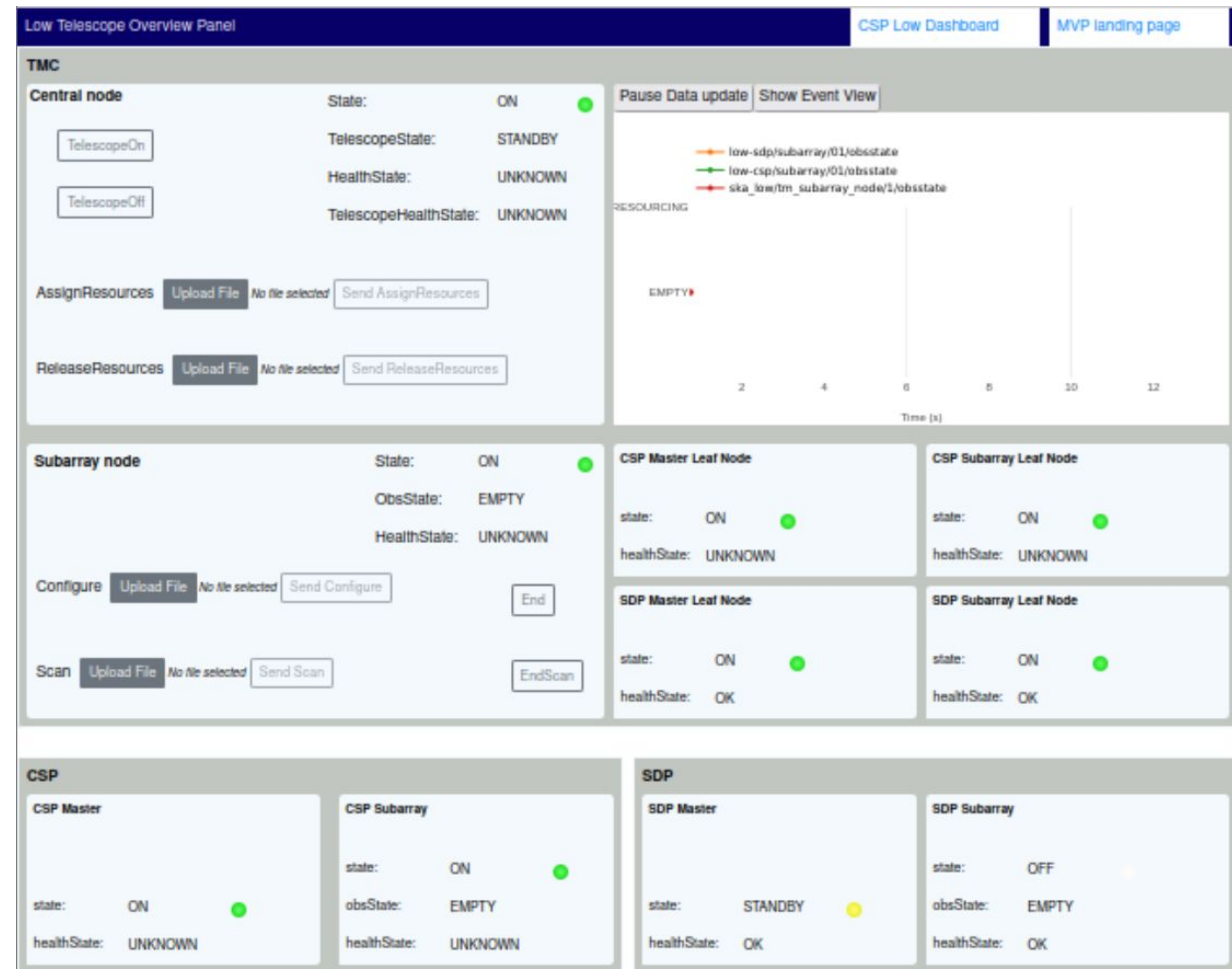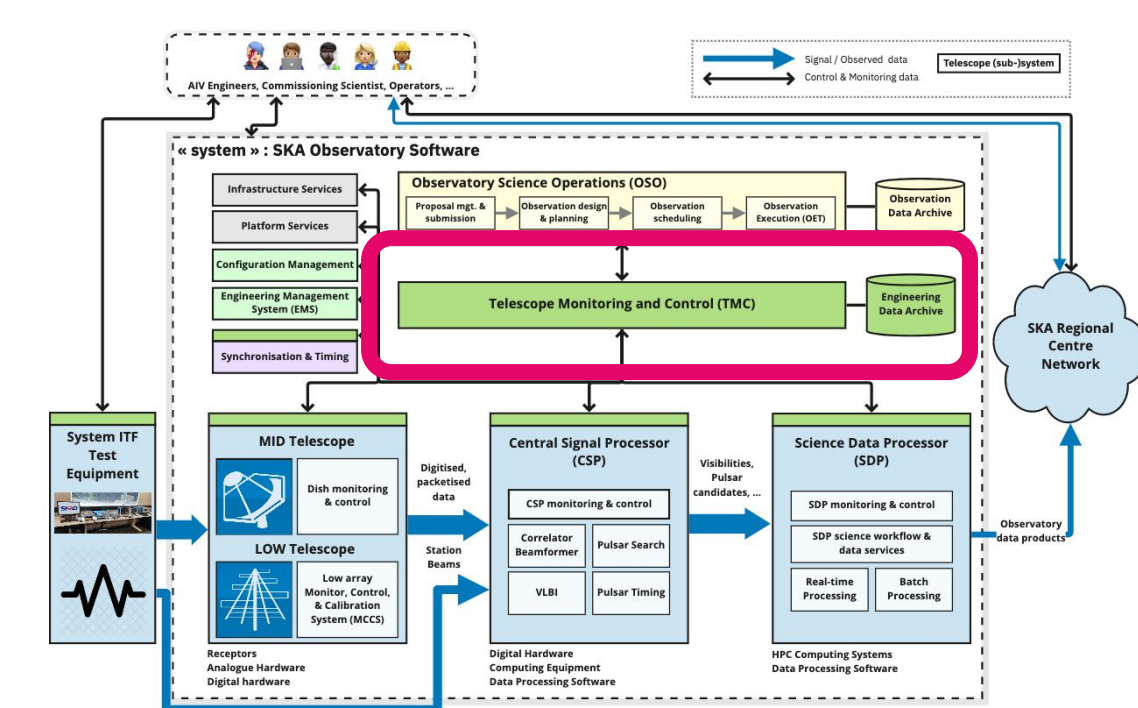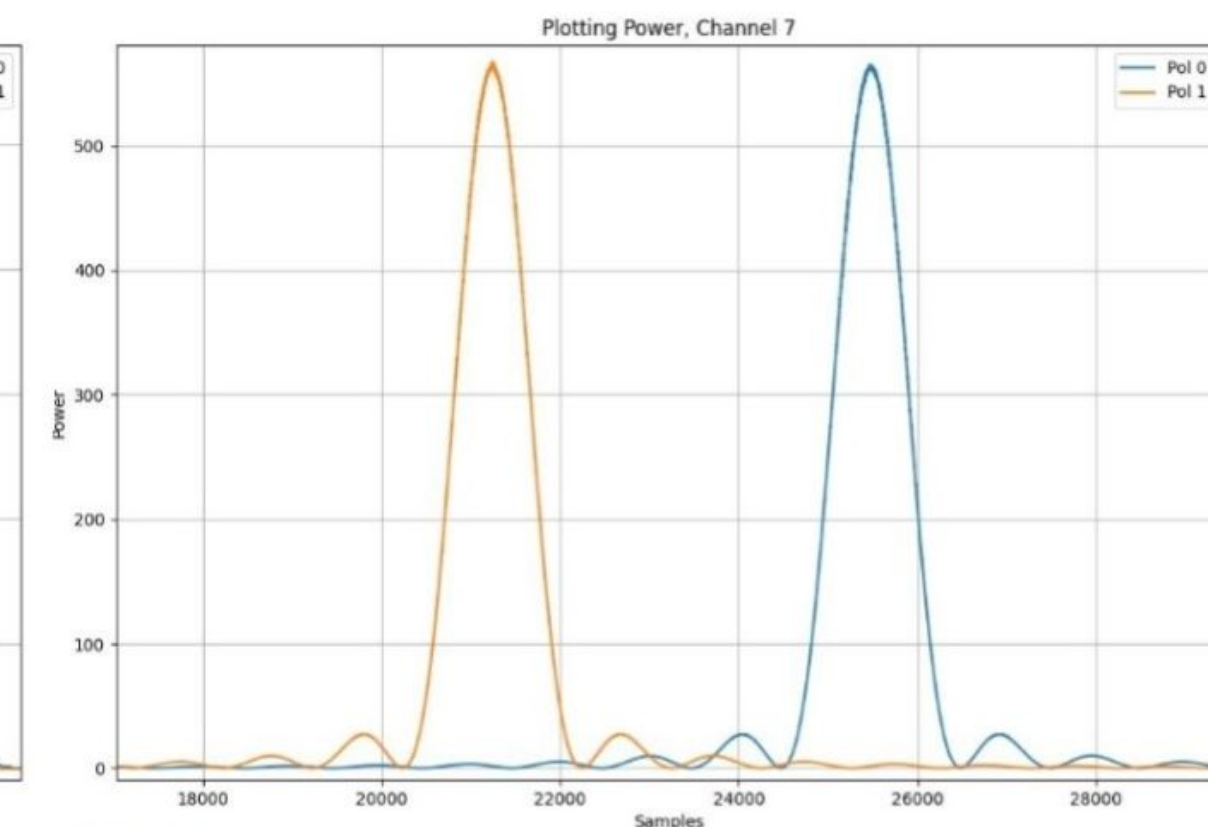
LOW Telescope - NOW - MCCS

- Focus on enabling station level verification
- Data acquisition to file allows capture of data for offline processing
- TPMs can create beams with simulated data
- TANGO device hierarchy in MCCS software to monitor and control hardware
- Basic TPM monitoring points available in MCCS and simple dashboards demonstrated
- Devices for monitoring of Smart Boxes developed in MCCS (Modbus drivers to connect to actual hardware in progress)
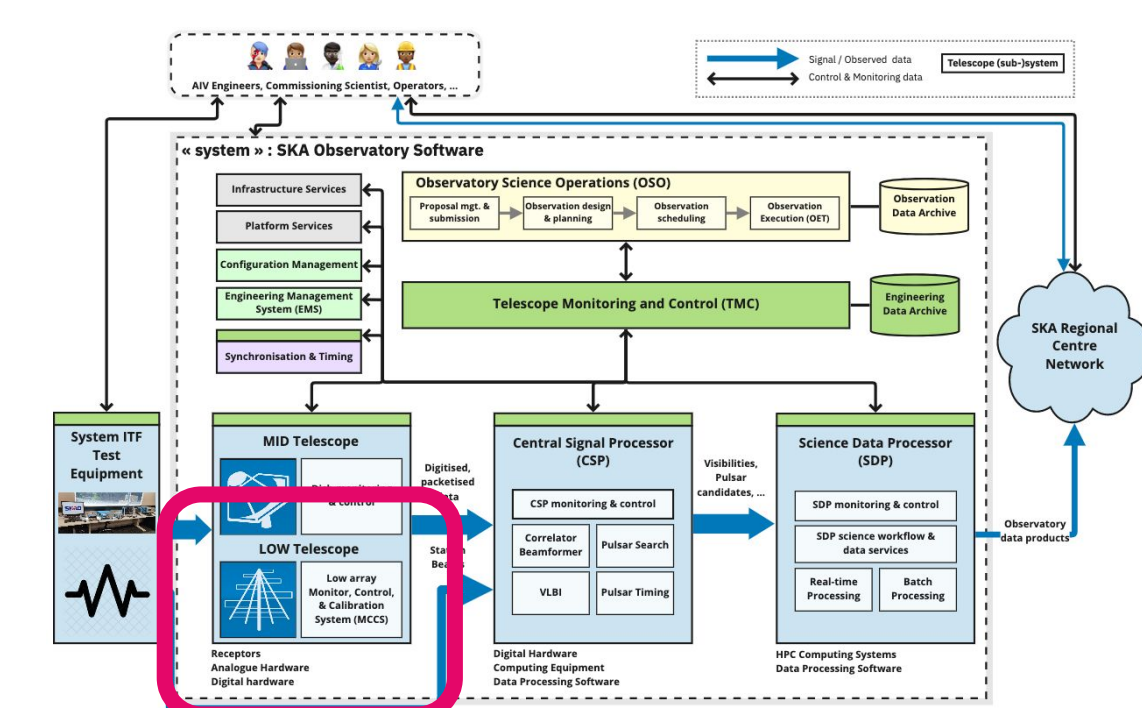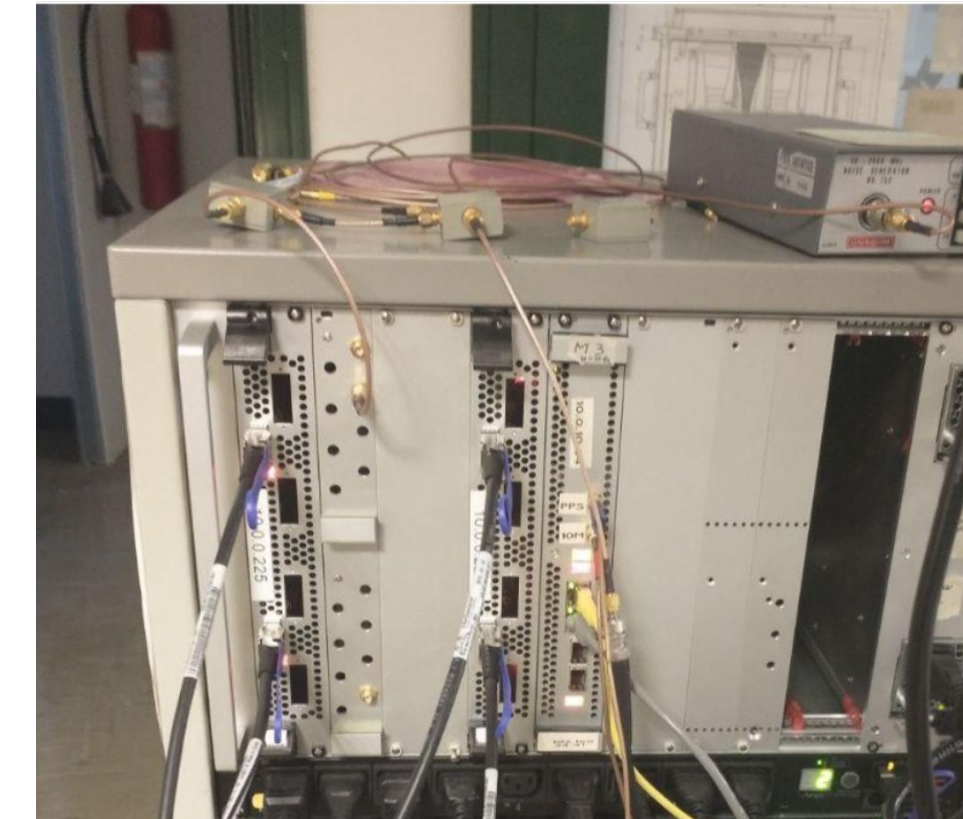
Test execution - results
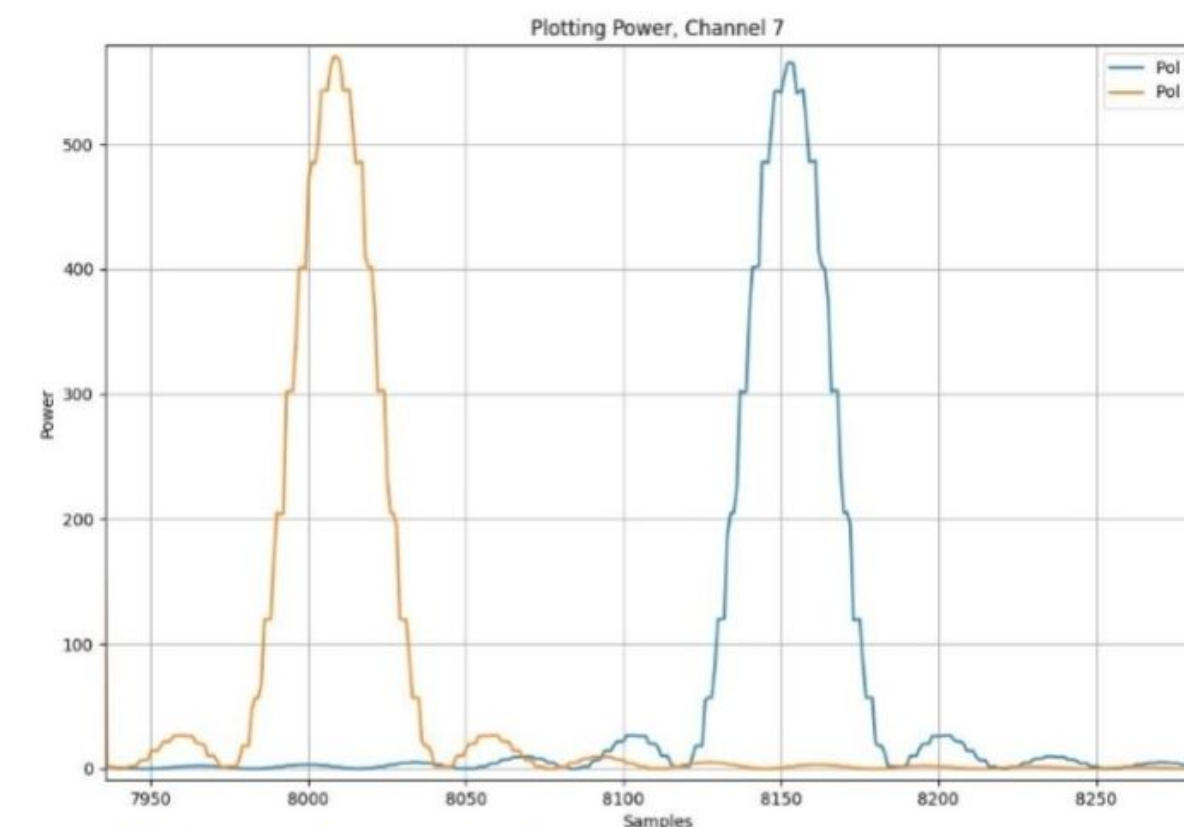
Discrete pointing scan
Orange: zenith beam
Blue: +22 degree beam
Pointing step: 2.5% geometric delay

Drift scan:
Delay rate: ~1.1 arcmin/second
Samples: 0.283s total power integration

LOW Telescope - NOW - PSI Integration

By the end of the PI we are able to demonstrate a working LOW integrated signal chain consisting of:

Test signal → CBF correlator → SDP signal → Measurement Sets

This is commanded using simple scripts connecting to the low-level control interfaces (CSP LMC and/or CBF LMC and SDP LMC). **DP DEMO 18.2**

PI17 Demo Advancing the integration of the LOW CBF with the control system and verifying control interfaces

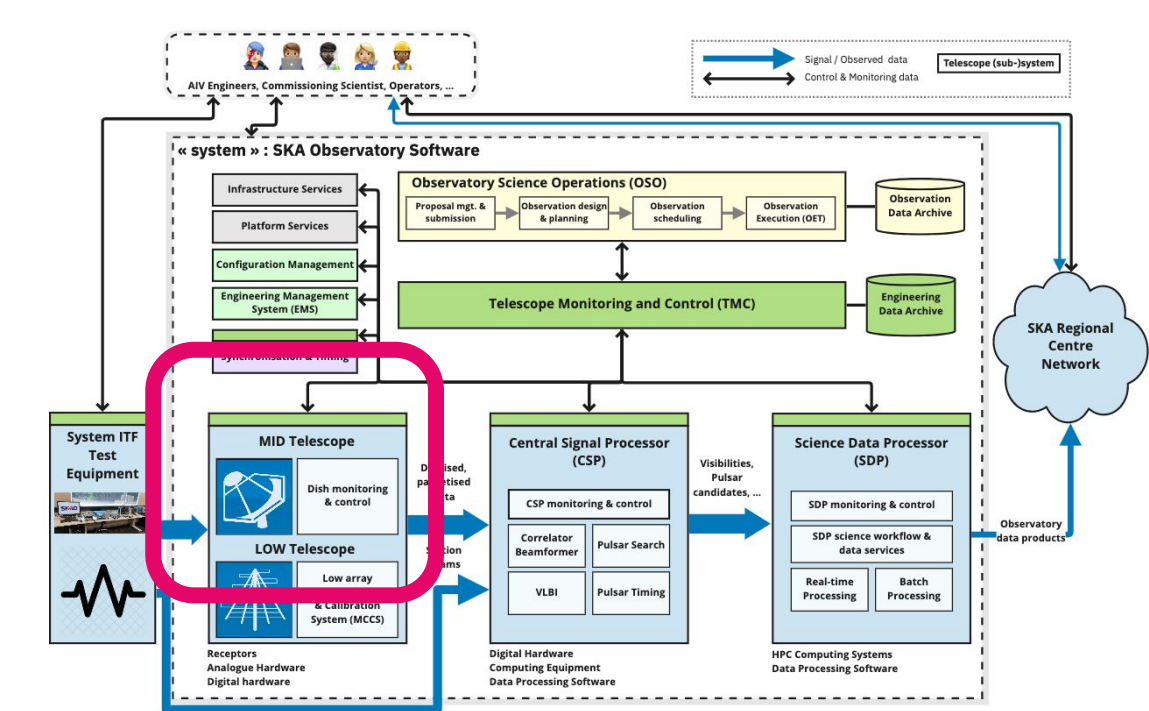Advances in the development of the Interface with Pulsar Processing
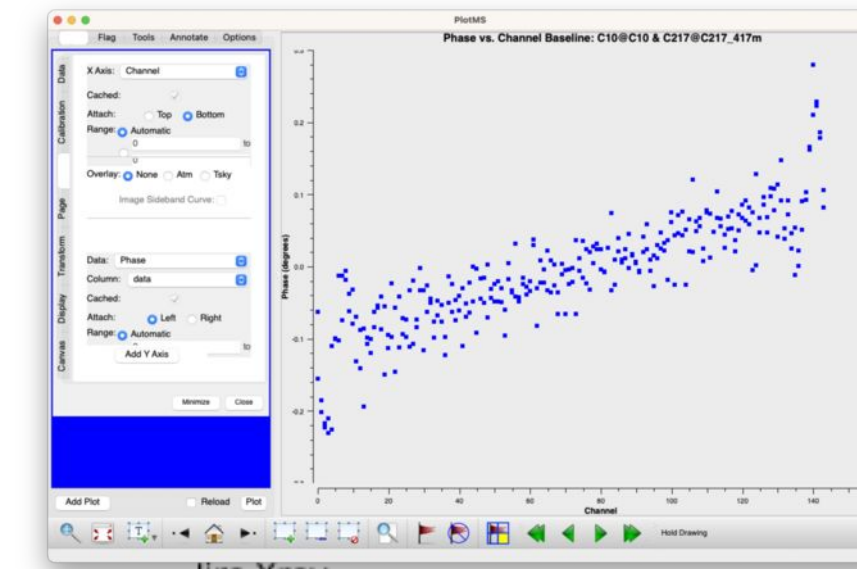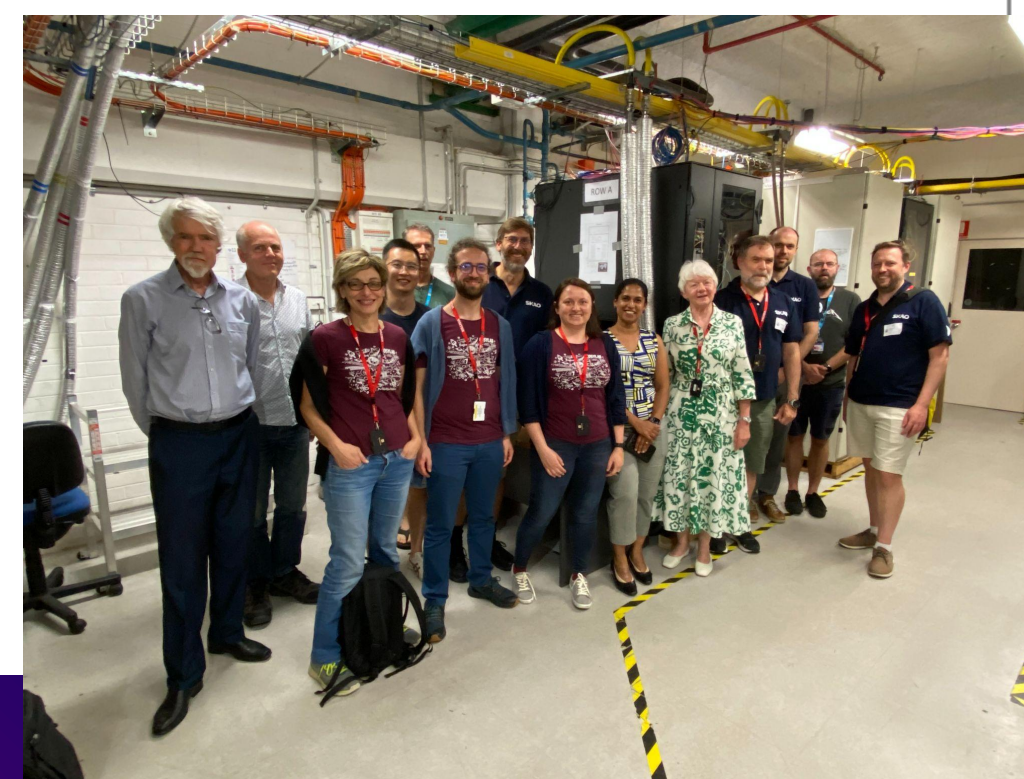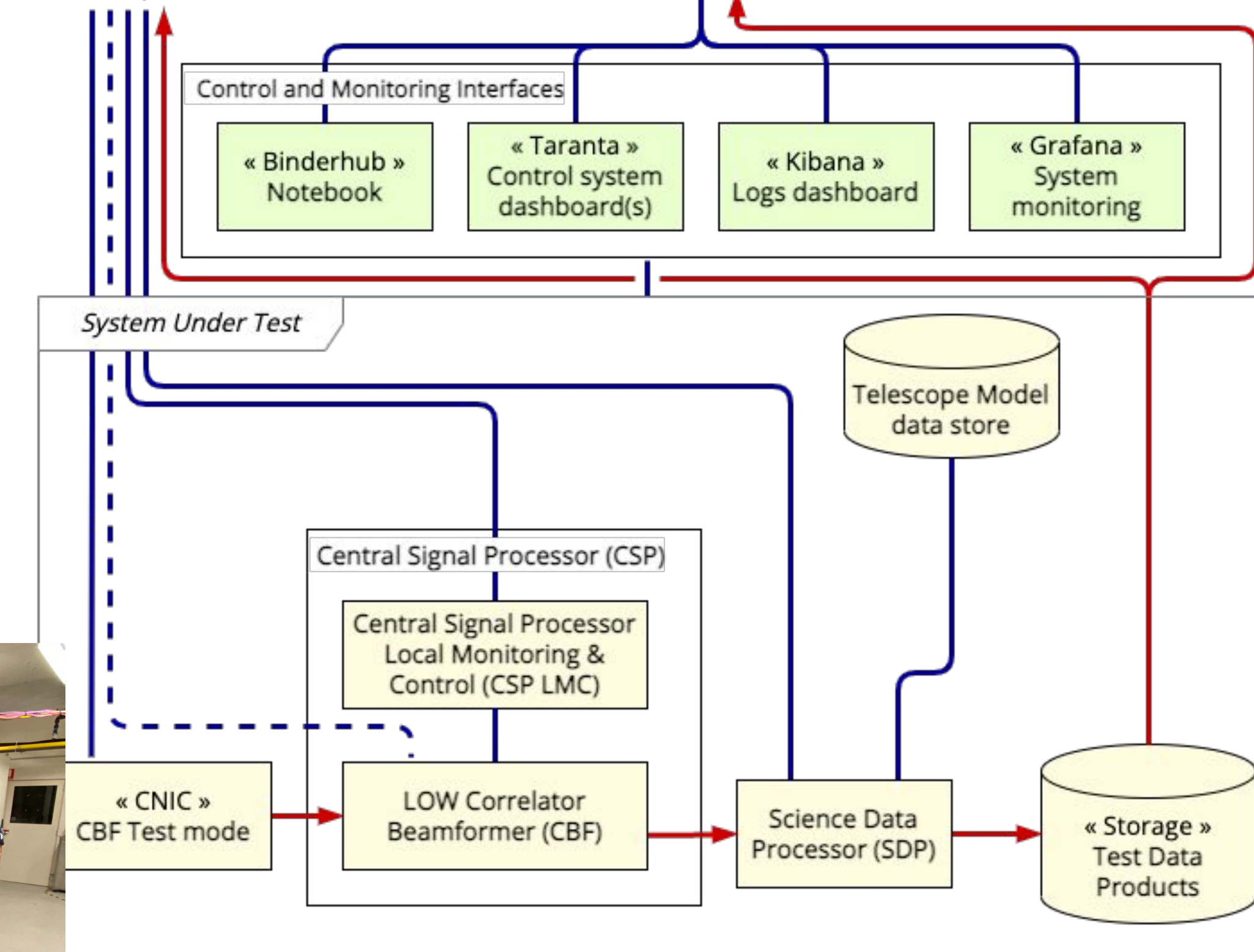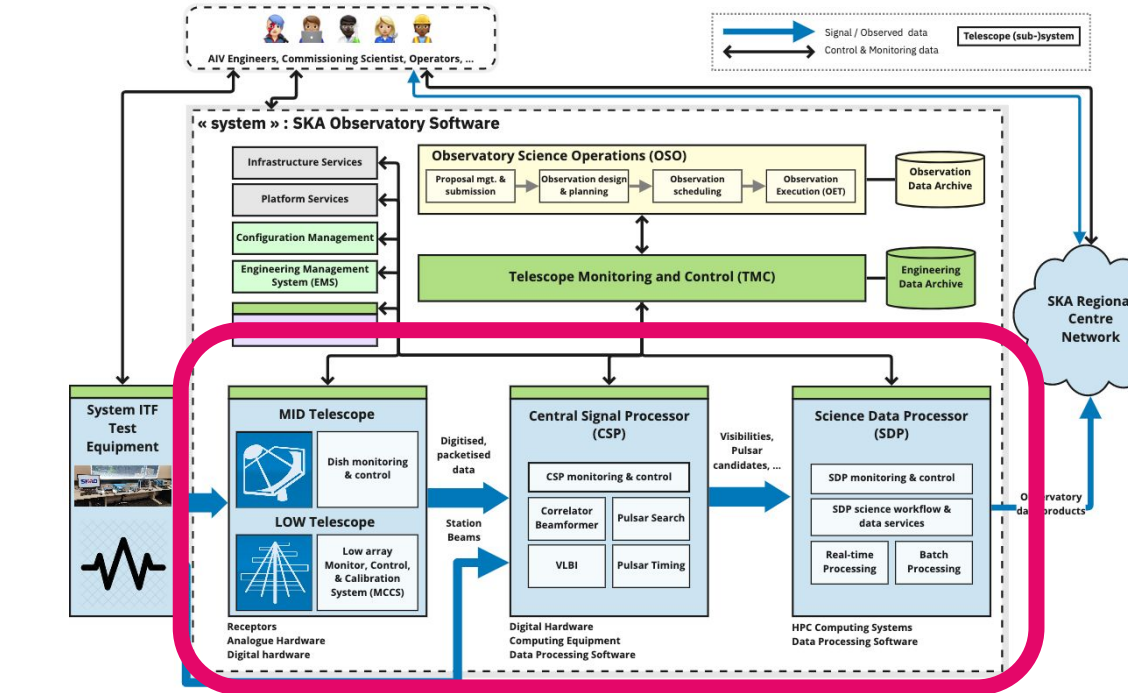
MID Telescope - Now - Dish LMC

- Dish LMC control of SPFRx (end of PI18) at MID PSI.
- Dish LMC forward logs from SPFRx to SKA logging
- Dish LMC modes SetStandbyLPMode, SetStandbyFPMode, SetOperateMode, SetStowMode, ConfigureBand2 and Track available
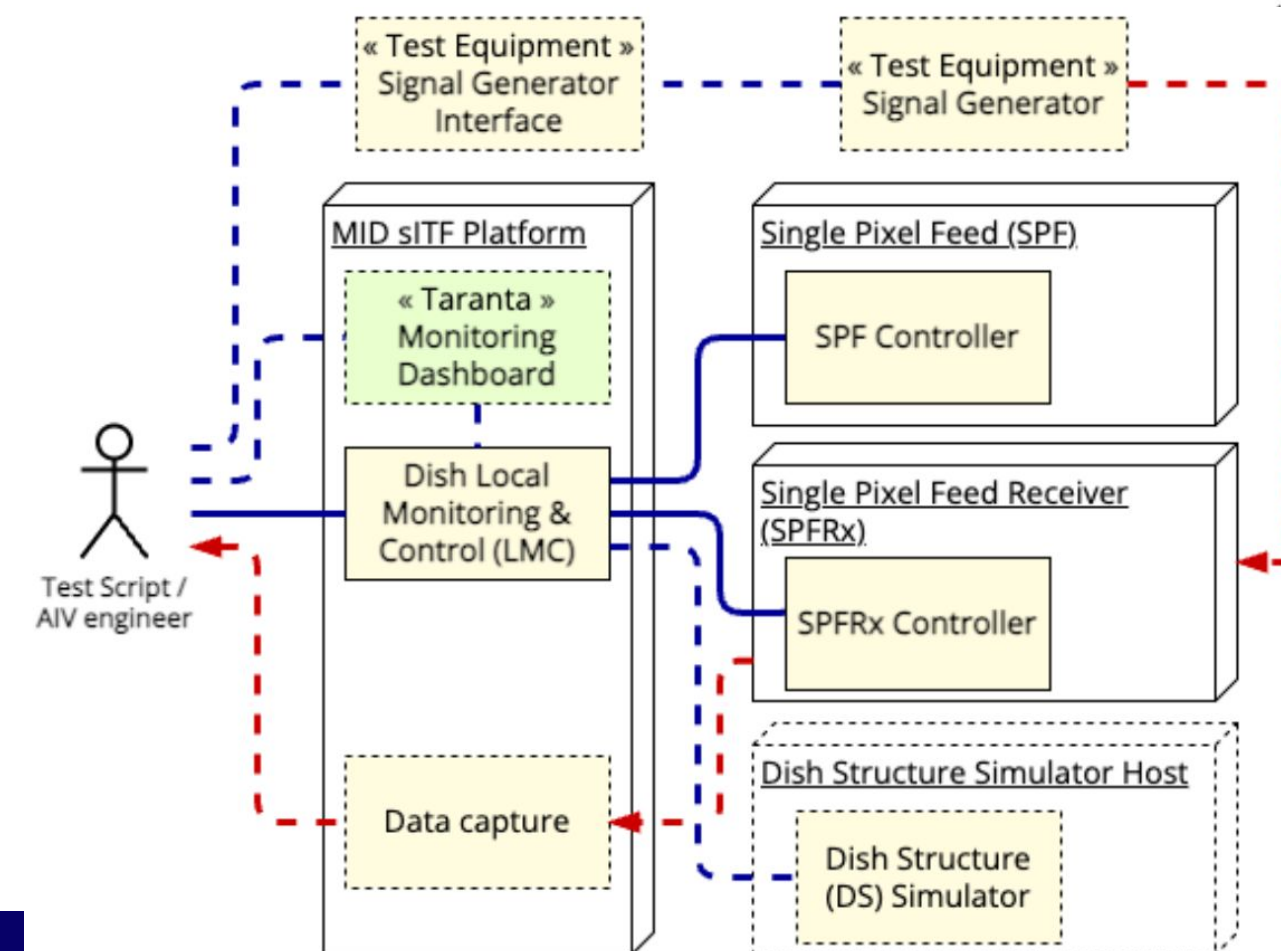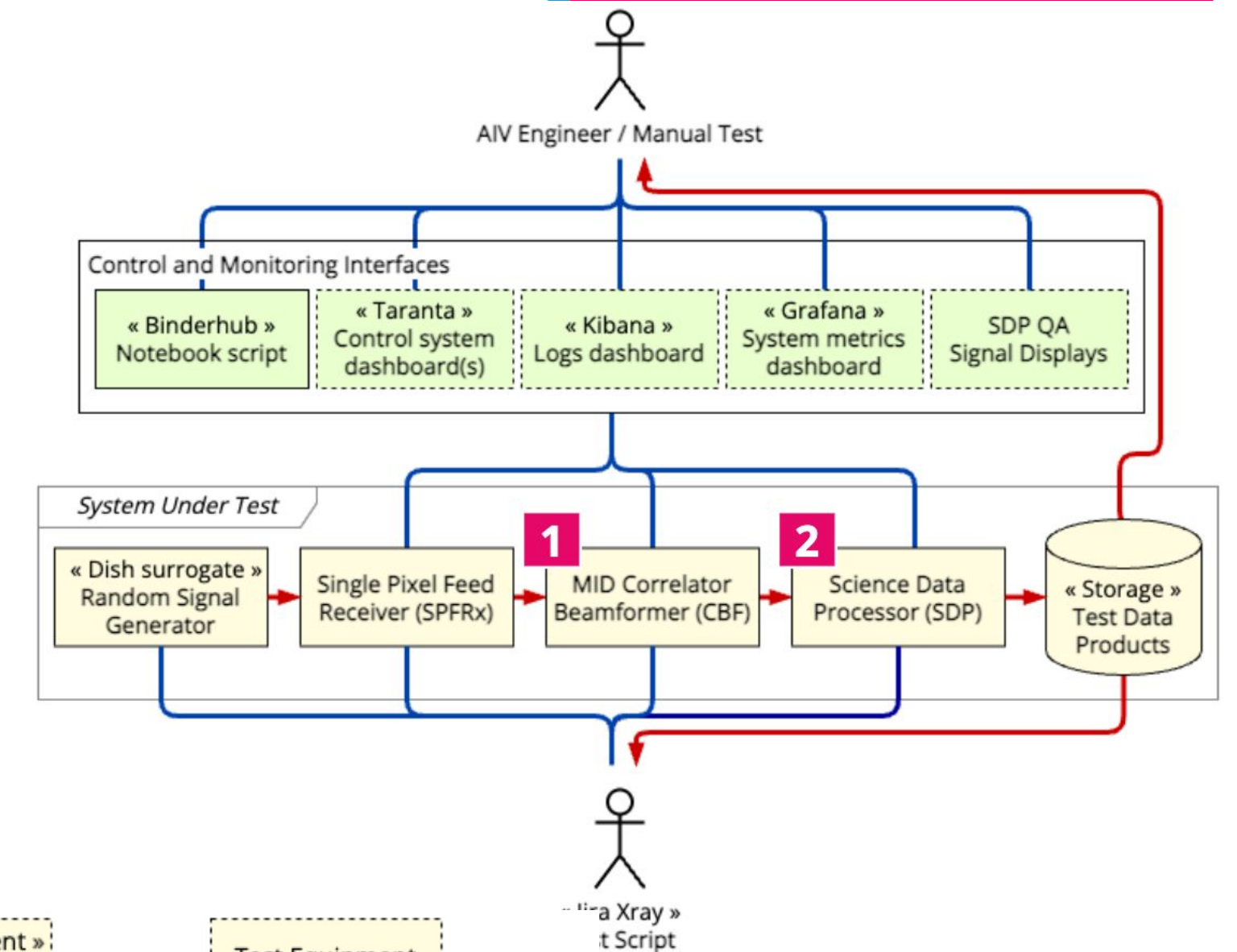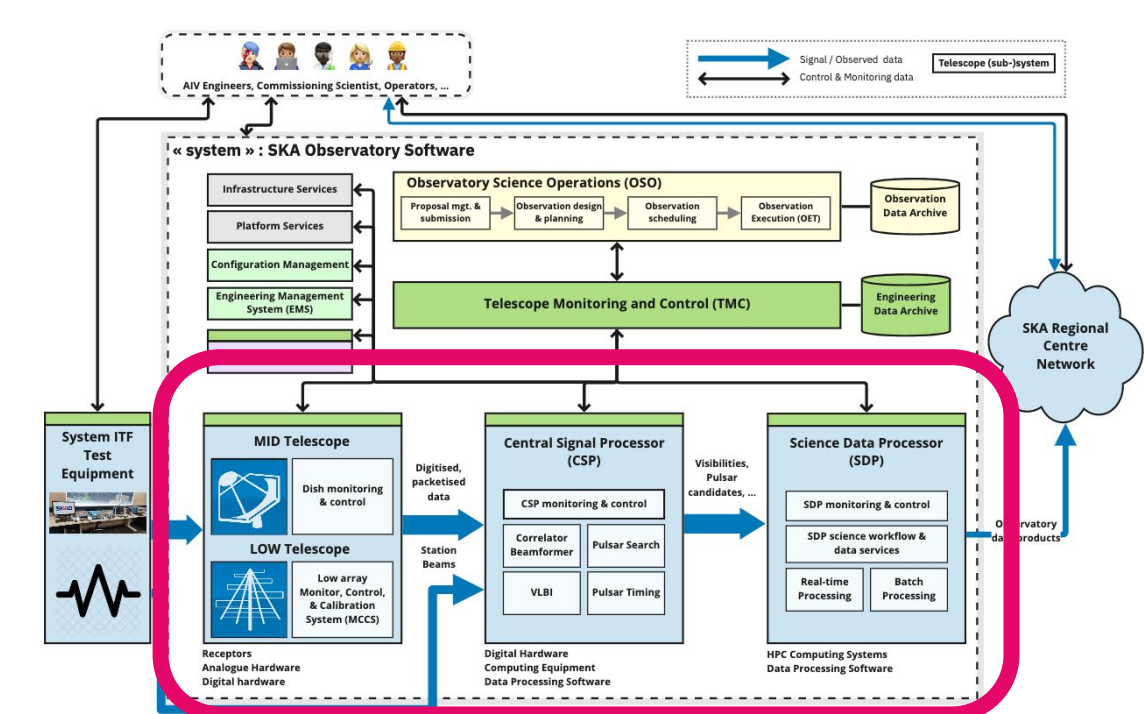- Dish LMC dashboard available

MID Telescope - NOW - PSI Integration

Testing of the **MID signal chain** consisting of

   Test signal → SPRFx → MID CBF → SDP → Measurement Sets

has been demonstrated at the MID PSI by use of a minimal direct control of signal chain components.

Integration of **Dish LMC** with **SPFRx Controller**

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

SKAO