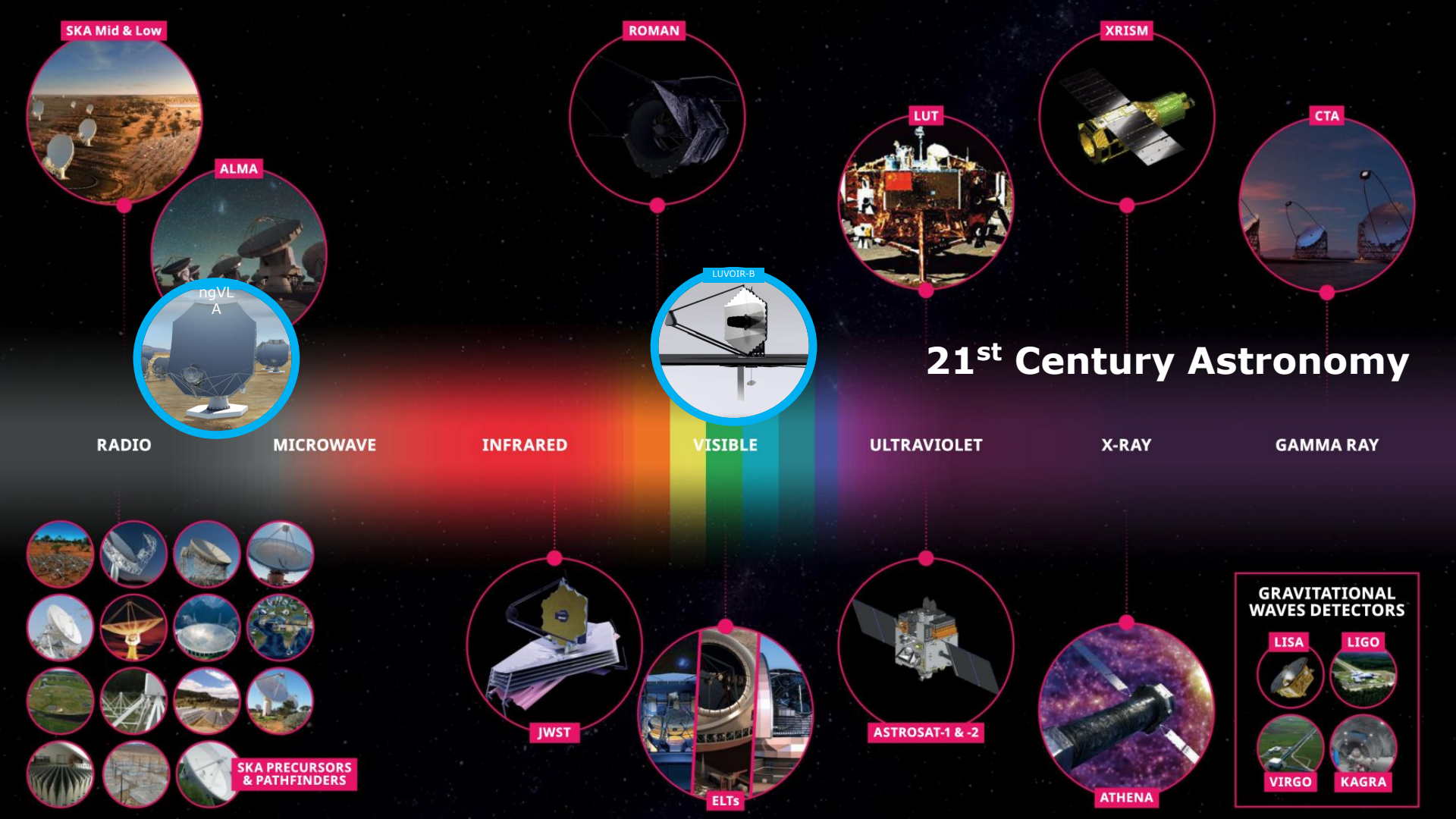
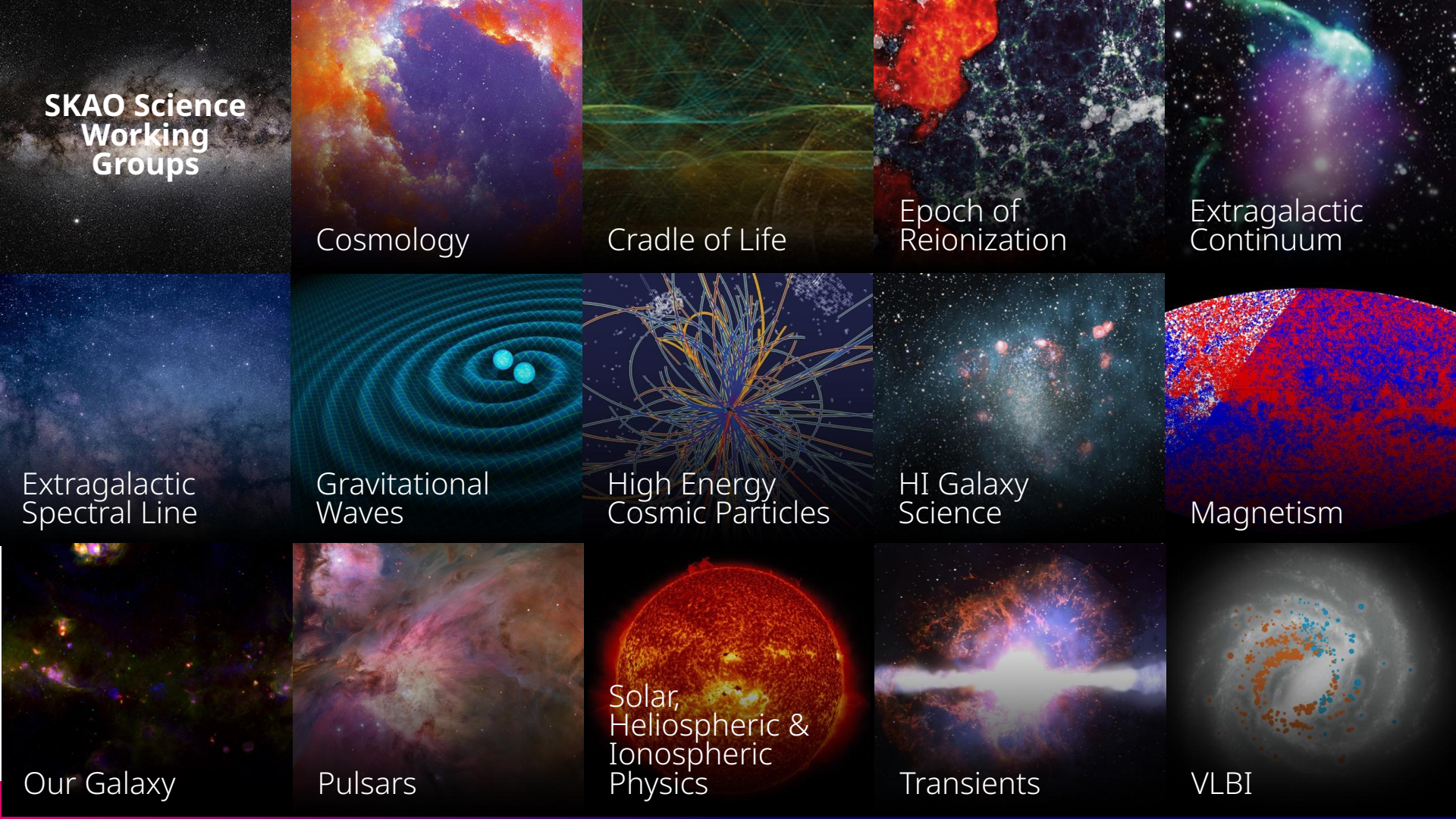
SKA Observatory update

Mathieu Isidro, Communications and Outreach Manager

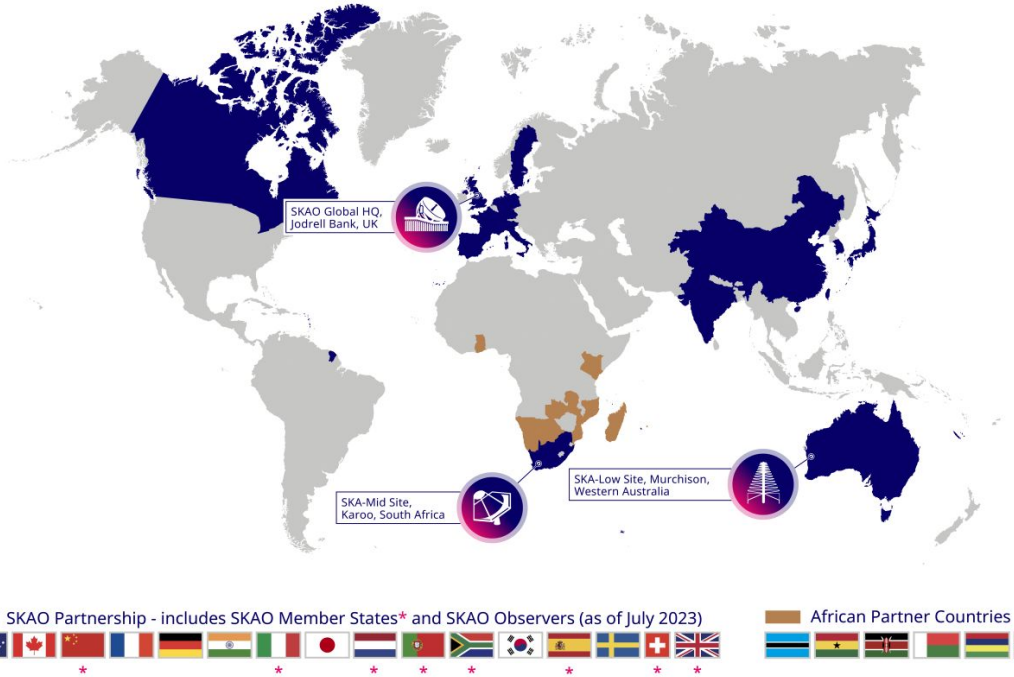
Swiss SKA Days, 6 September 2023


SKA Mid & Low
ALMA
ngVLA
ROMAN
LUVOIR-B
LUT
XRISM
CTA
21st Century Astronomy
RADIO
MICROWAVE
INFRARED
VISIBLE
ULTRAVIOLET
X-RAY
GAMMA RAY
SKA PRECURSORS & PATHFINDERS
JWST
ELTs
ASTROSAT-1 & -2
ATHENA
GRAVITATIONAL WAVES DETECTORS
LISA
LIGO
VIRGO
KAGRA

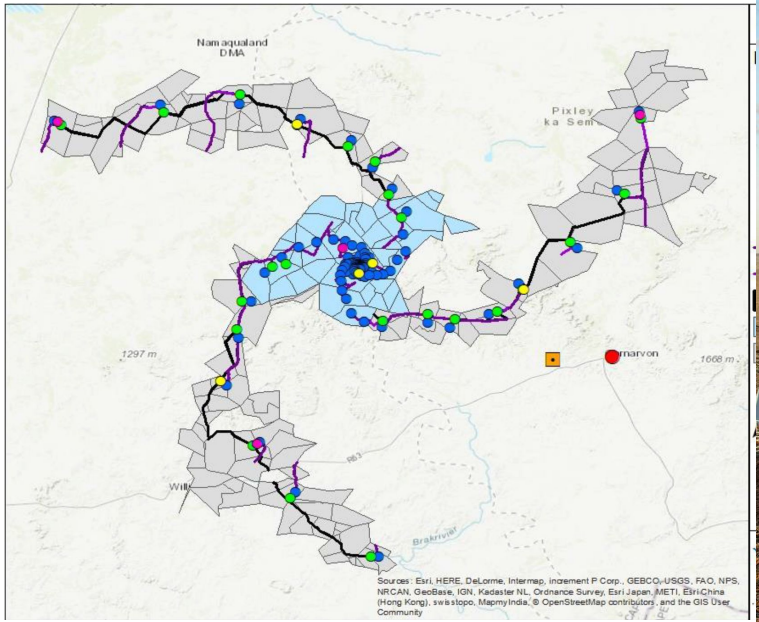

SKAO Science Working Groups
Cosmology
Cradle of Life
Epoch of Reionization
Extragalactic Continuum
Extragalactic Spectral Line
Gravitational Waves
High Energy Cosmic Particles
HI Galaxy Science
Magnetism
Our Galaxy
Pulsars
Solar, Heliospheric & Ionospheric Physics
Transients
VLBI

The SKA Observatory - a global partnership

- **16 countries**, including 9 full members
  - 11 of G20
  - 6 of the G7
  - 3 of the BRICS
- plus 8 African partner countries
- 5 continents
- North-South and East-West collaborations
- 17 time zones from Vancouver to Sydney



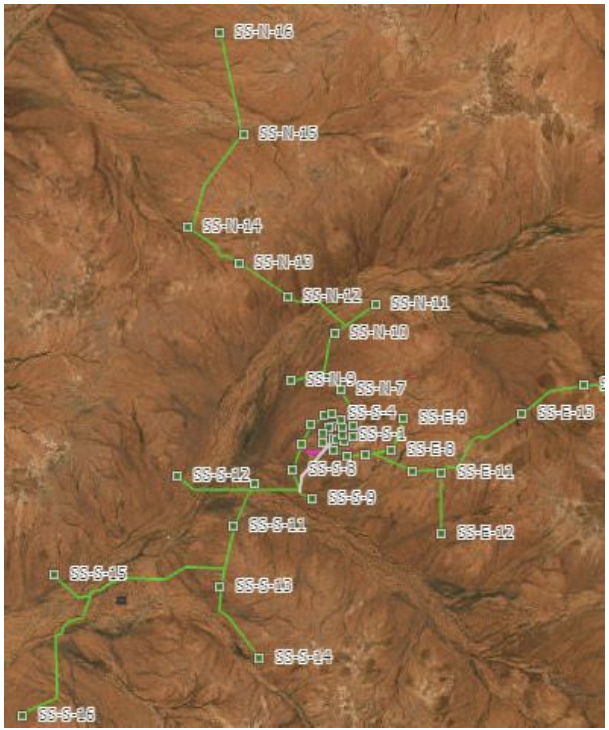
SKA-Mid telescope in South Africa



150 km extent

197 dishes (including 64 MeerKAT)
Frequency range: 0.35 – 15.4 GHz (goal of 25GHz)

SKA-Low telescope in Australia



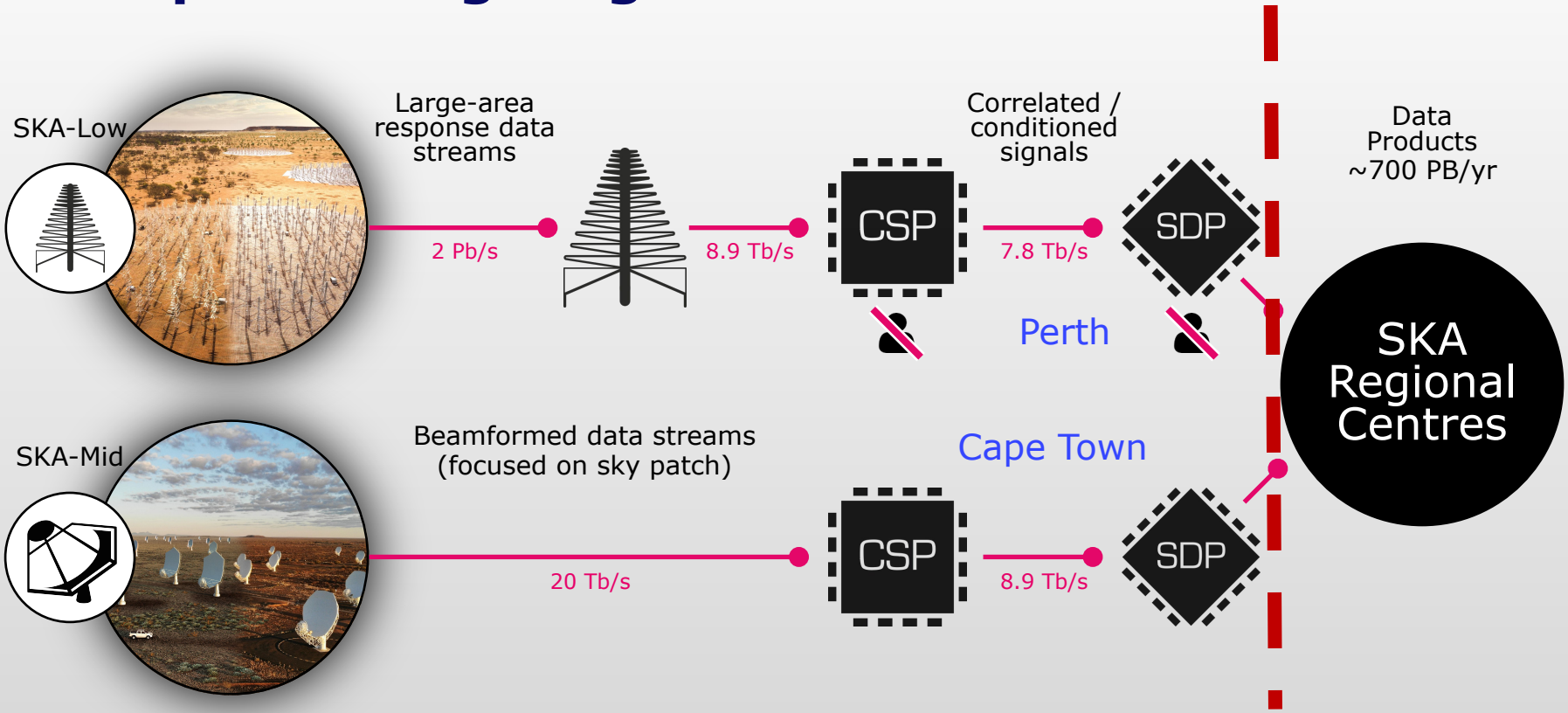
74 km extent

512 stations, each of 256 antennas
Frequency range: 50 – 350MHz

Regional Centre Network - data processing stages

SRC | Net

SKAO Regional Centre Network



SKA Observatory timeline up to now

- 2013-2019: telescope design phase + institutional framework
- March 2019: SKAO treaty signed by 7 countries
- Jan 2021: SKAO born
- June 2021: SKAO Council approves start of construction activities
- July 2021: Construction activities began
- 5 Dec 2022: Site Construction Commencement Ceremonies
- August 2023: 69 contracts awarded to date, €562M committed

Construction timeline and 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.

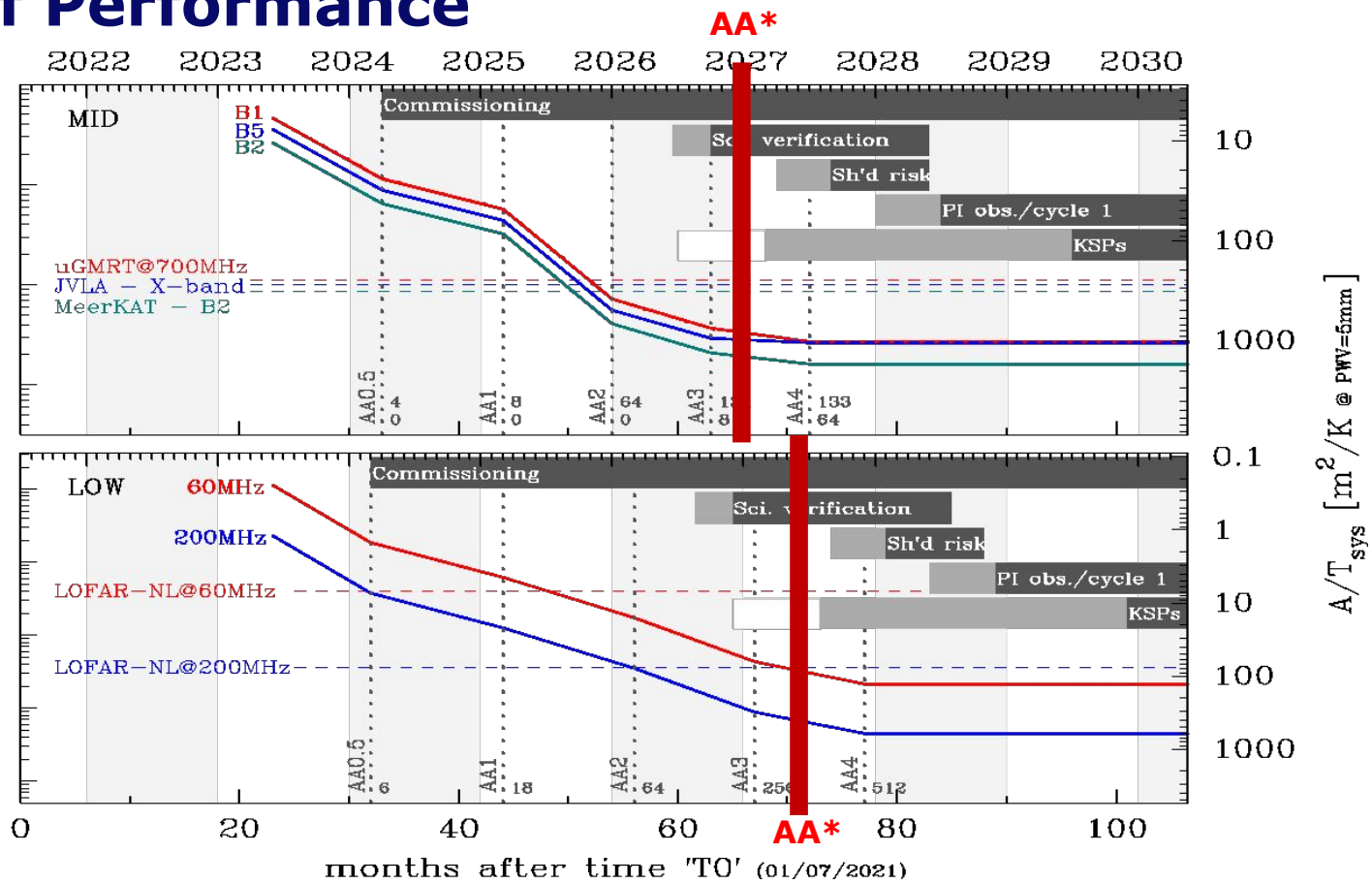
Milestone Event (earliest)		SKA-Mid (end date)	SKA-Low (end date)
AA0.5	4 dishes 6 stations	2025 Jan	2024 Nov
AA1	8 dishes 18 stations	2026 Jan	2025 Nov
AA2	64 dishes 64 stations	2027 Jan	2026 Oct
AA*	144 dishes 307 stations	2027 Oct	2028 Jan
Operations Readiness Review		2028 Jan	2028 Apr
End of Staged Delivery programme		2028 Jul	2028 Jul
AA4	197 dishes 512 stations	TBD	TBD

Dates from Integrated Project Schedule Version July 2023

First data release to the community expected in 2026/27 (for science verification)

Evolution of Performance

With AA*, SKAO becomes **the most powerful radio observatory on Earth**



Anticipated Science Performance: https://arxiv.org/abs/1912.12699

Credit: Mark Sargent

November 2022 - Indigenous land use agreement signed

- Indigenous Land Use Agreement (ILUA) signed between the Wajarri Yamaji, Australian federal and West Australian governments and CSIRO commits Australia and SKAO to a range of broad obligations including:
  - Assisting with education opportunities
  - Promoting Wajarri culture, heritage and art
  - Help develop small Wajarri businesses
  - Promoting employment and traineeship opportunities to Wajarri people
  - Actively providing contracting opportunities to Wajarri companies

- Wajarri community has gifted the site the name **Inyarrimanha Ilgari Bundara** - Sharing the Sky and Stars

December 2022 - Construction Commencement Ceremonies

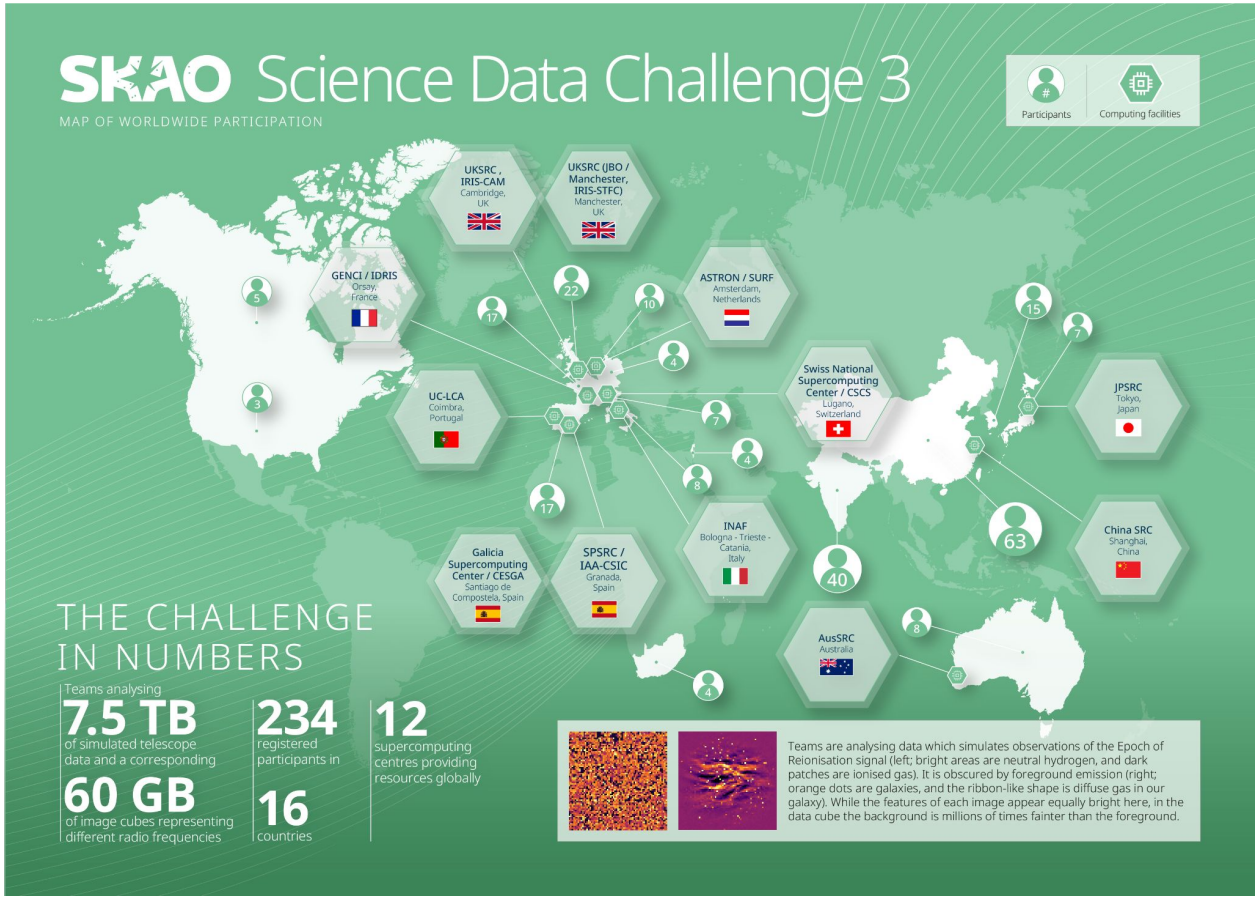
- 5 quasi-simultaneous events organised to marke the official start of on-site construction
- Support from local communities key
- Opportunity to bring together & thank stakeholders - government, industry, local community, staff, partners, etc.
- Partners inc. Switzerland also marked the event
- Global media footprint

May 2023 - SKAO-NRAO Science meeting in Canada

- Joint meeting with US NRAO in Vancouver, Canada to discuss scientific & operational synergies between SKA and ngVLA telescopes
- Close to 300 participants from 21 countries
- 60+ talks

2023 - SKAO Science Data Challenge 3

- 234 participants
- 33 teams
- 16 countries
- 12 supercomputers supporting - inc. CSCS in Switzerland



SKAO member state updates

- January 2023 - The **Canadian** government announced its intention to join the SKAO
- March 2023 - The **German** government announced its intention to join the SKAO with a €21M commitment
- April 2023 - **Spain** joined the SKAO as its 9th full member with a €41M commitment
- Further progress expected in coming months

Influencing astronomical environment sustainability

- Interference from satellite constellations & use of the radio spectrum (WiFi, 5G, GPS, etc.) threatens ground-based astronomy

- SKAO participates in UN ITU (based in Geneva) and UN COPUOS in Vienna

- Active in development of policies and technical interventions around risks from satellite constellations

- Together with US partners, SKAO has established a joint centre of expertise under the IAU to coordinate technical and policy lobbying & develop mitigations

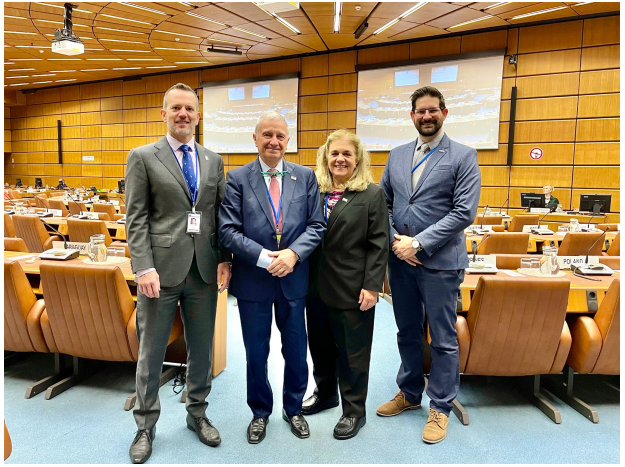
Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference

CPS

IAU NOIR Lab SKAO

New observations confirm unintended emissions from satellite constellations

NEWS
by Mathieu Isidro on 05 July 2023



Establishing the SKA Observatory in Australia and South Africa

- In recent months, several SKAO facilities have been established in the two host countries:
  - Science Operations Centres (Cape Town, Perth)
  - Engineering Operations Centre (Geraldton, Klerefontein)
  - Construction camps being prepared in Australia and South Africa

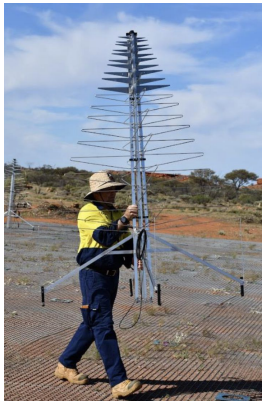
SKAO teams in South Africa and Australia

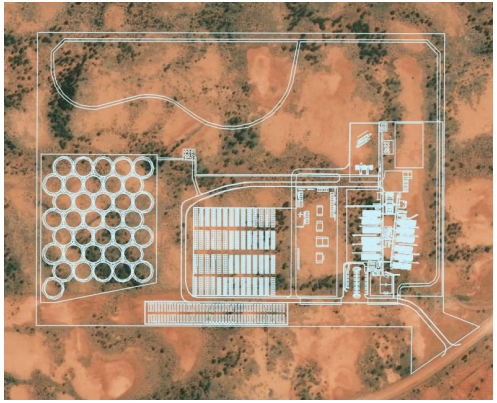
- SKA-Mid staff in South Africa: currently ~40, eventually ~150
- SKA-Low staff in Australia: currently ~43, eventually ~150.
- Staff in the UK: currently ~165, eventually ~175

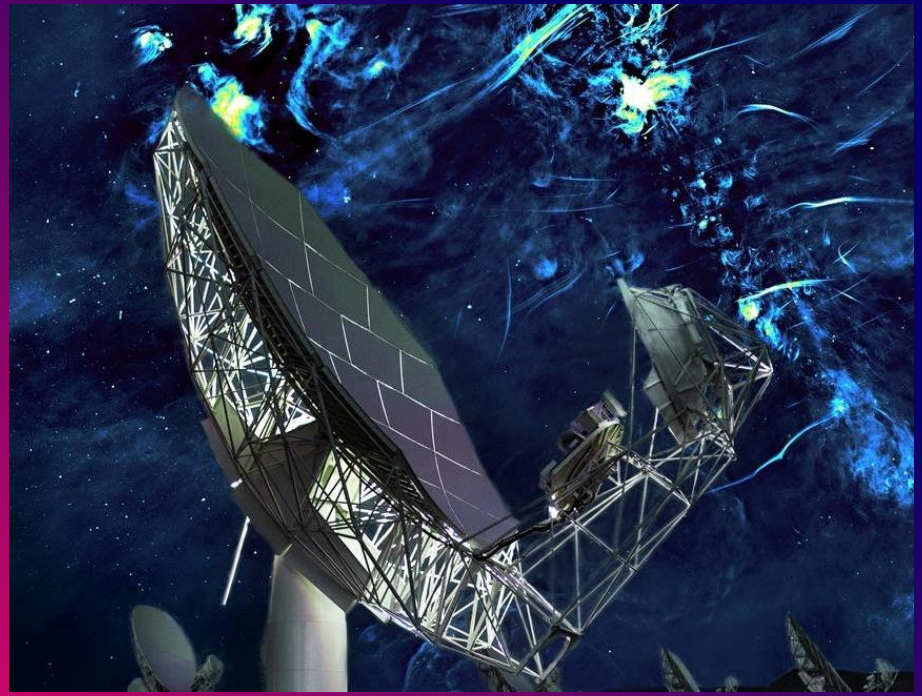
SKA-Mid on-site construction status

SKA-Mid – construction of first dishes

SKA-Low on site construction status







SKAO

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

www.skao.int