The Square Kilometre Array (SKA) NL Participation

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Credit: Michale Goh/ICRAR-Curtin

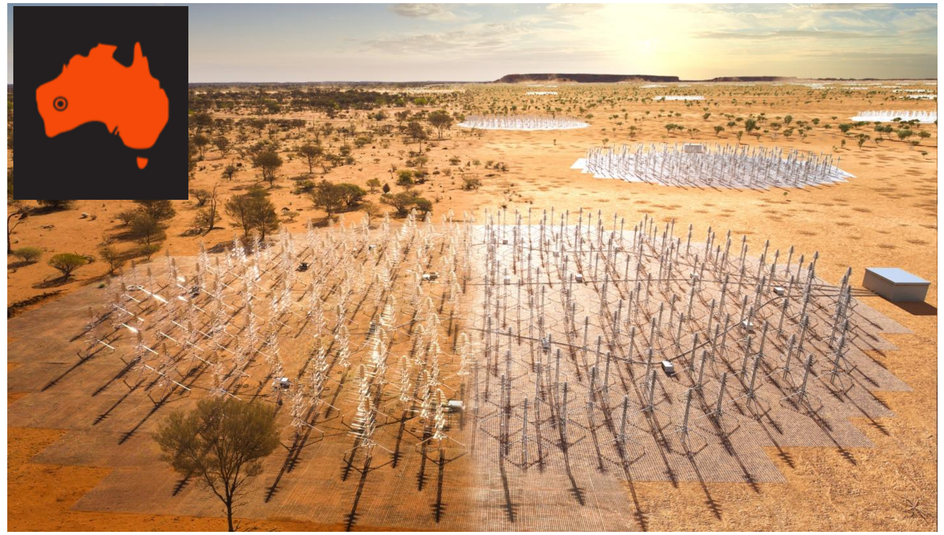
ASTRON
Netherlands Institute for Radio Astronomy

SKA Phase 1

3 sites (Australia, South Africa, UK) **2 telescopes (Low & Mid)** **1 Observatory**

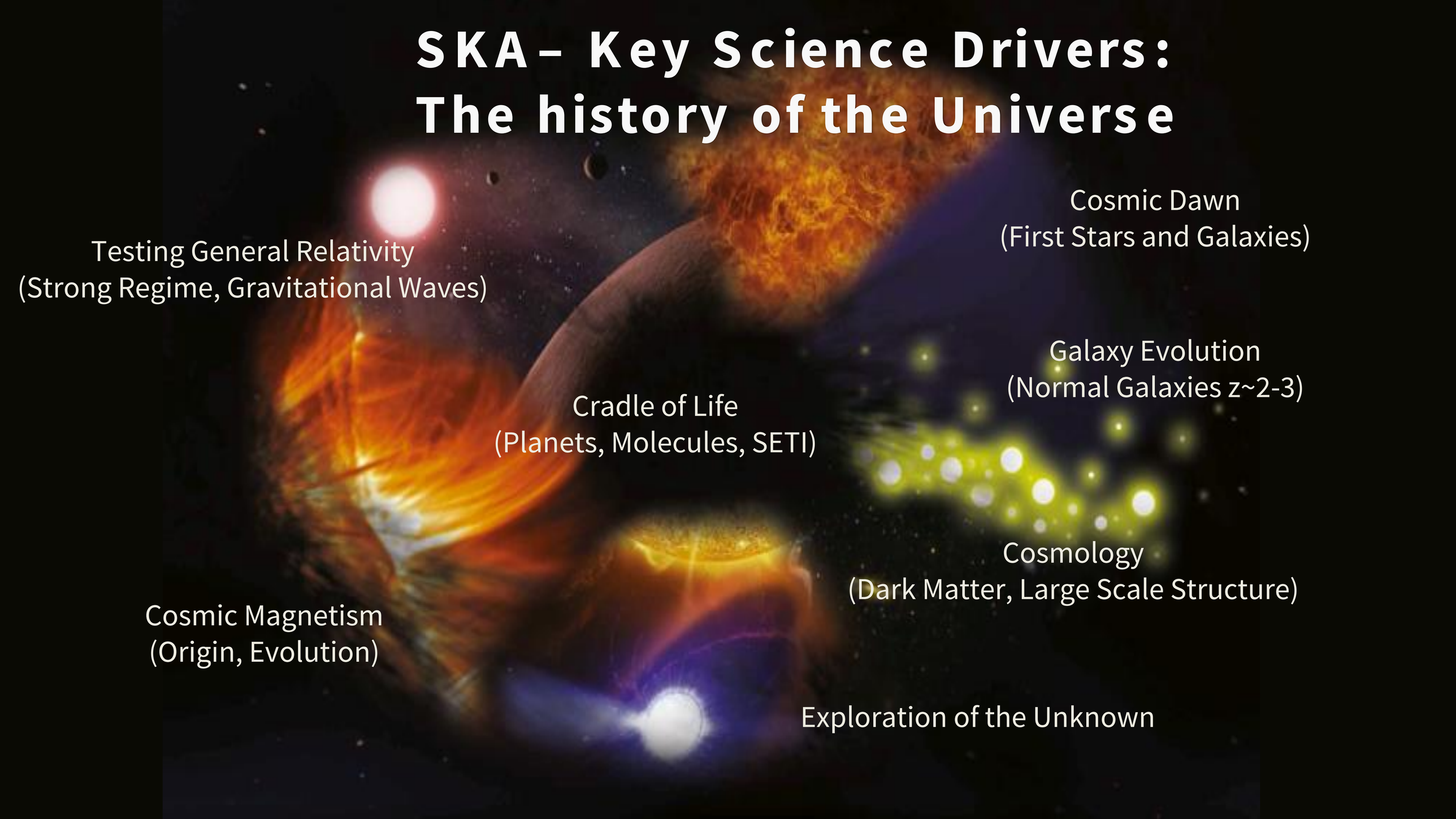
Construction 2021-2027/2028 Science commissioning from 2024

SKA1-Low
512 x 256 low frequency dipoles
50-350 MHz
65 km baselines
(11” at 110 MHz)
Murchison, Western Australia



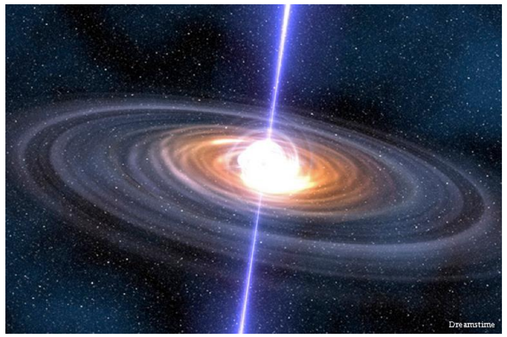
SKA1-Mid
133 x 15m + 64 x 13.5m MeerKAT
0.35 - 15 GHz
150 km baselines
(0.22” at 1.7 GHz; 34 mas at 15 GHz)
Karoo, South Africa

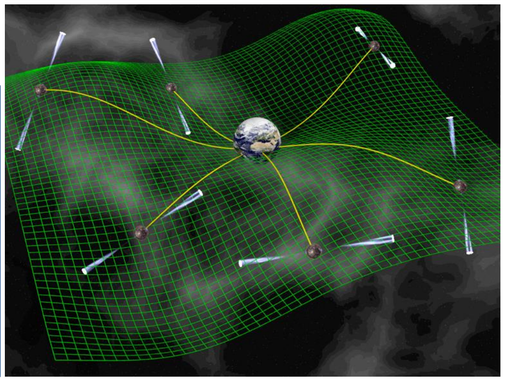
SKA– Key Science Drivers: The history of the Universe

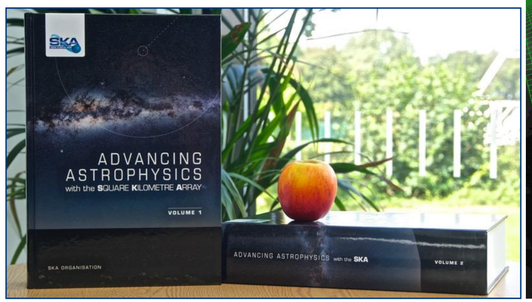


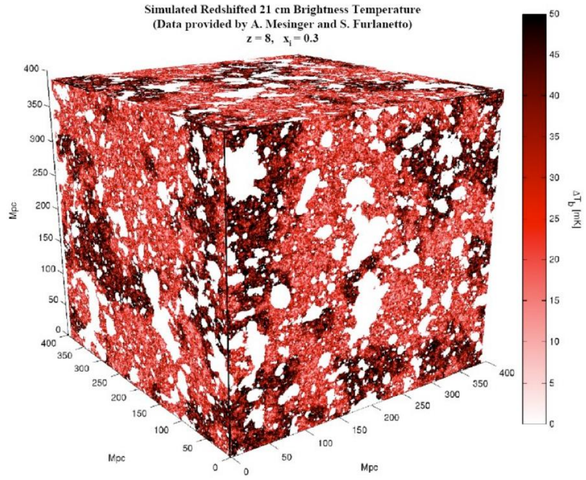
SKA Headline Science

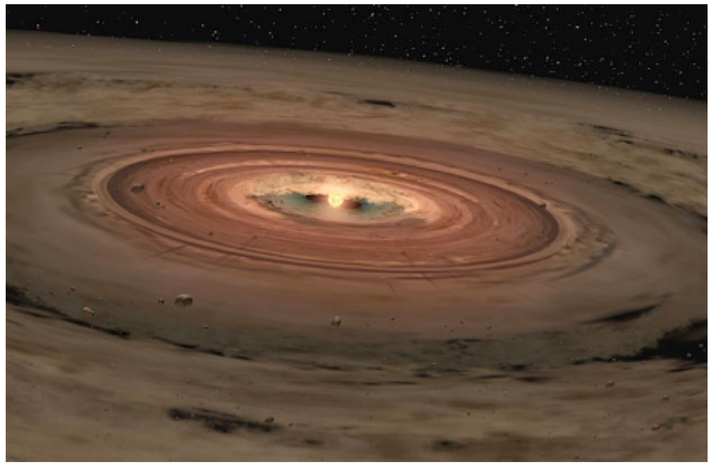
- Study of gravitational waves using Pulsars
- Formation of planets and cradle of life + SETI
- Formation of the first stars and galaxies in the Early Universe
- Observing Transient Phenomena
- Exploration of the Unknown











Founding Members Sign SKA Observatory Convention

Signing of SKA Convention by Oscar Delnooz (Ministry of Education, Culture & Science) 12 March 2019

SKA NL @SKA_NL

It's official: the Netherlands is the first country to ratify participation in the construction of the world's largest radio telescope, bringing the Square Kilometre Array (SKA) Observatory an important step forward. #SKAnews @SKA_telescope @MinOCW astron.nl/news-and-event...

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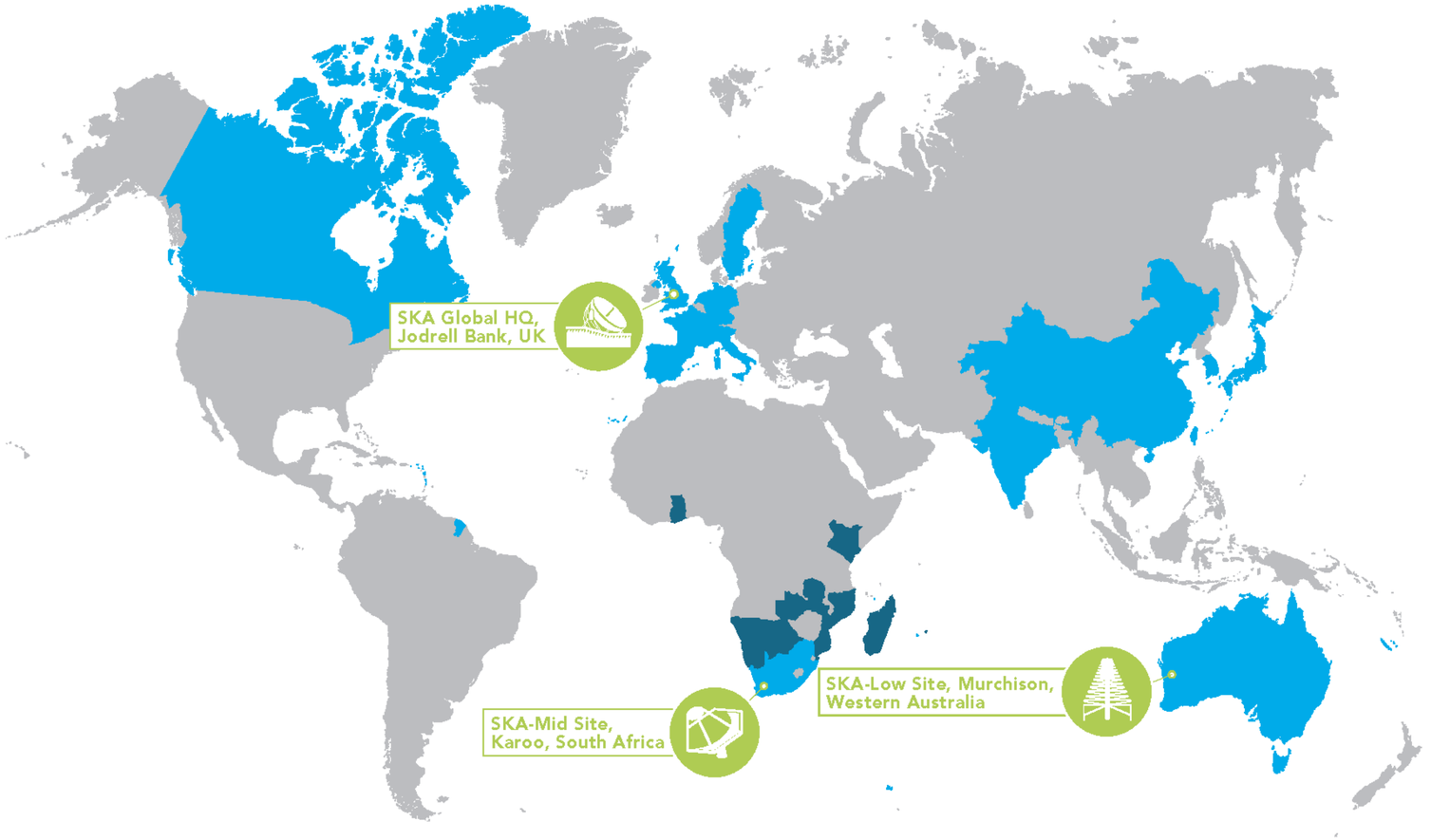

SKA Partners – includes Members of the SKA Organisation – precursor to the SKAO –, current SKAO Member States*, and SKAO Observers (as of June 2021)

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African Partner Countries

SKAO Member States:

- Australia
- China
- Italy
- Netherlands
- Portugal
- South Africa
- Switzerland
- United Kingdom

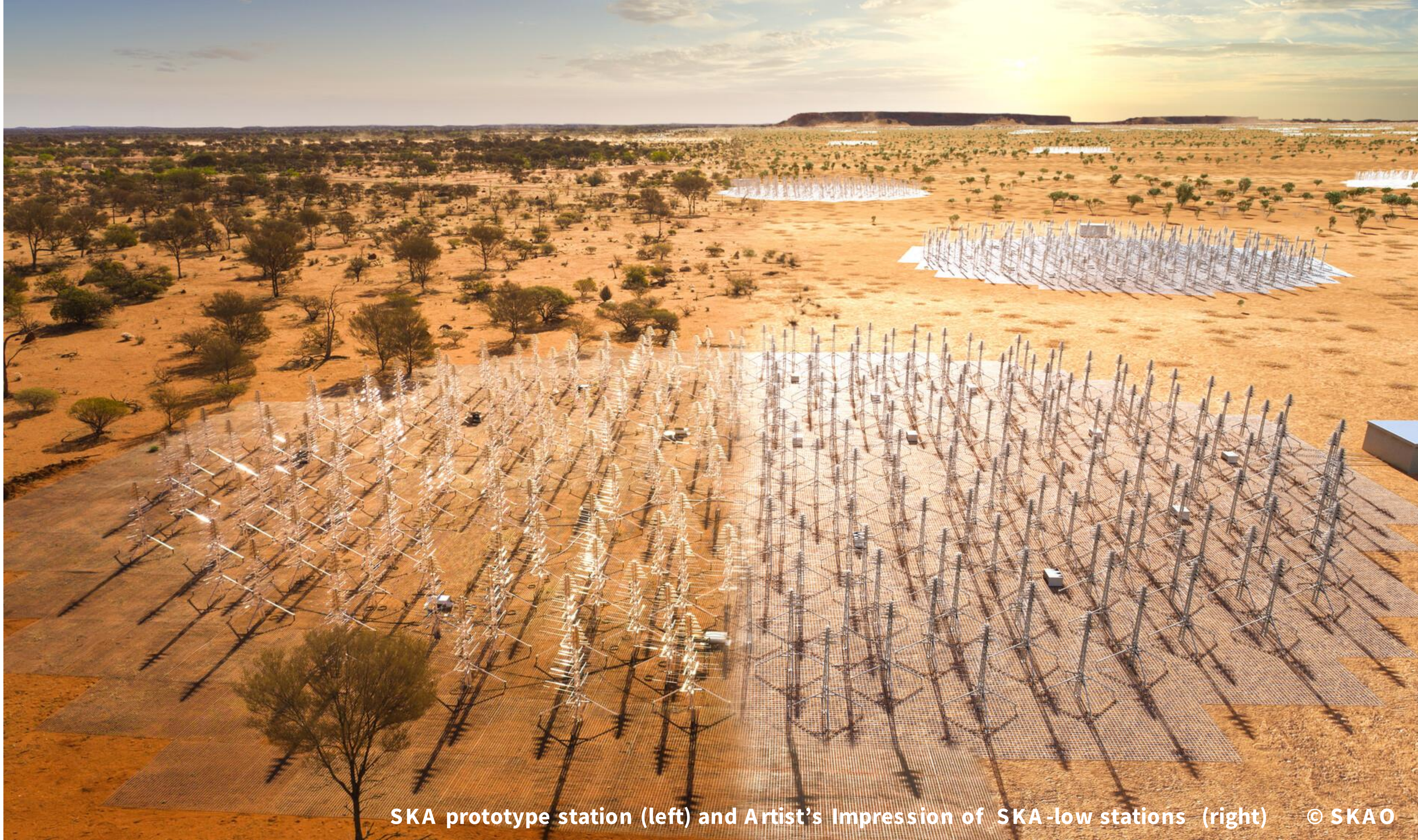
Joining soon:

- Canada
- France
- Germany
- India
- Spain
- Sweden

Joining later:

- Japan
- South Korea

Status: April 2022



SKA prototype station (left) and Artist's Impression of SKA-low stations (right) © SKAO

Artist’s Impression of SKA dishes (left) and MeerKAT dishes (right)

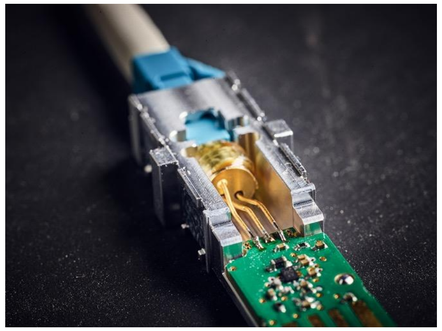
Project Timeline

	SKA LOW		SKA MID	
AA0.5	6 stations	February 2024	4 dishes	June 2024
AA1	18 stations	February 2025	8 dishes	September 2025
AA2	64 stations	February 2026	64 dishes	July 2026
AA*	xxx stations^{+}	February 2027	yyy dishes^{+}	June 2027
Operations Readiness Review		May 2027		August 2027
Formal End of Construction		July 2028		July 2028

AA* scope set by current funding commitments & expectations
Not all elements affected in the same way

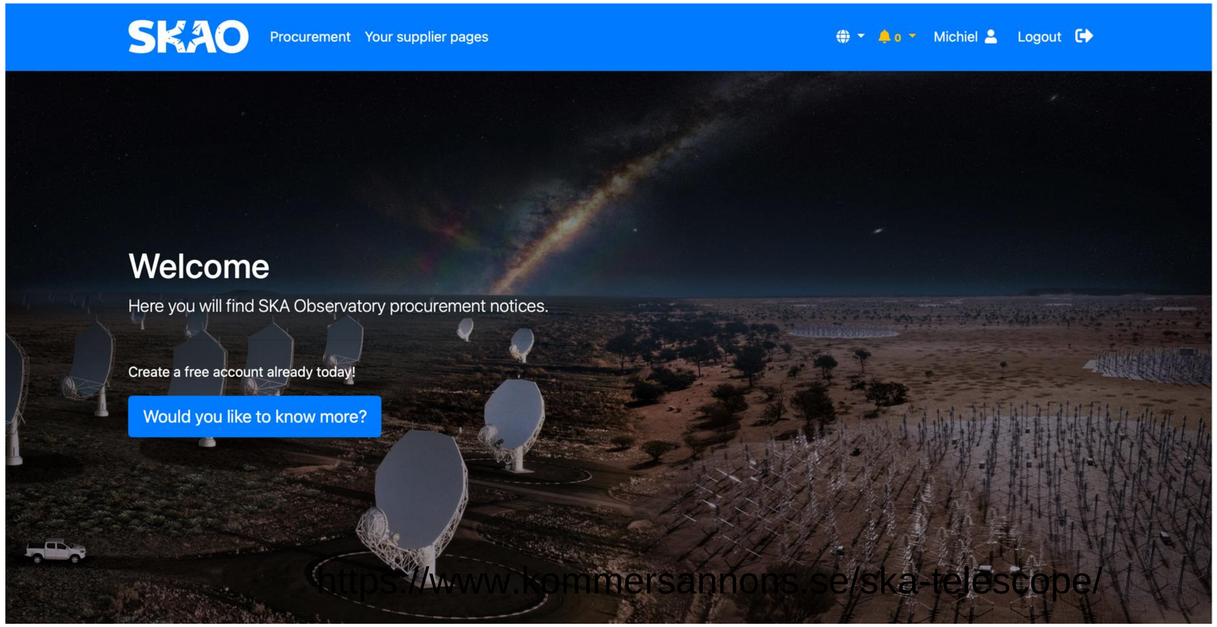
Netherlands contribution to SKA Design

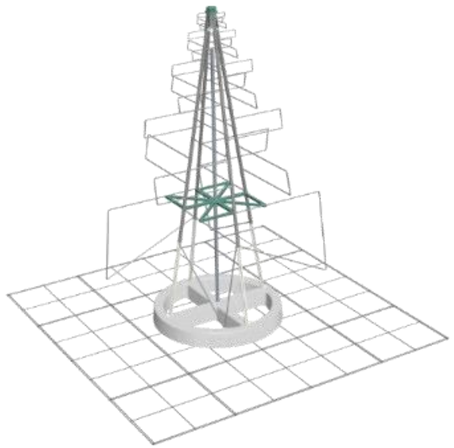
- Design & Prototyping SKA-Low stations
- SKA-Low Correlator + Beamformer
- Science Data Processing
- Timing & VLBI (JIVE)
- Active community of future SKA users at ASTRON and Universities of Amsterdam, Groningen, Leiden, Nijmegen

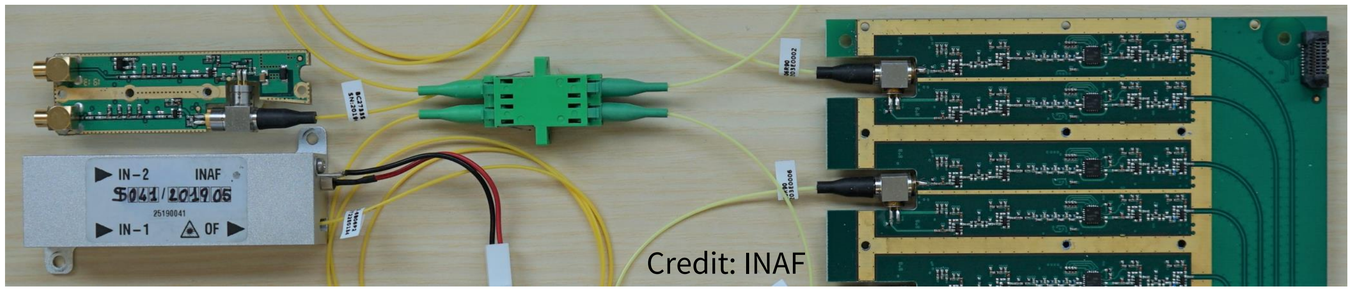


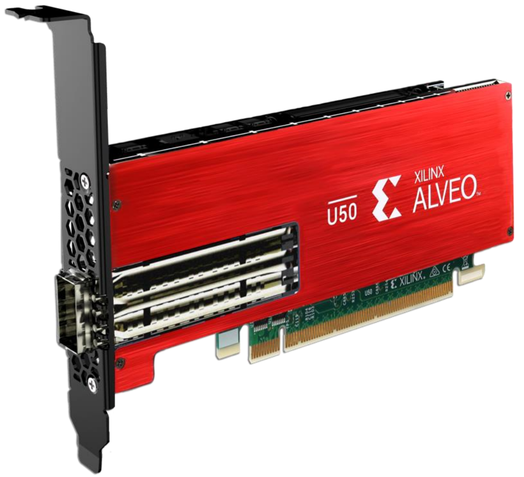
NL construction participation

1. **Science Data Handling & Processing** √
   - Astronomical calibration & imaging software
   - ASTRON & 3 SW Companies (CGI, S&T, TriopSys)
2. **Central Signal Processor, CSP-Low (NL Lead)** √
   - Correlator / beamformer for SKA-Low
   - NL Company to lead integration and delivery of CBF, PSS, PST & LMC
3. **SKA Low Field Node -** Q4 2022
   - Part of SKA-Low antenna station design
   - NL to deliver ~50% of RFoF modules (65.000; dual pol)
4. **Assembly, Integration & Verification - SKA-Low, AIV**
   - Details to be decided







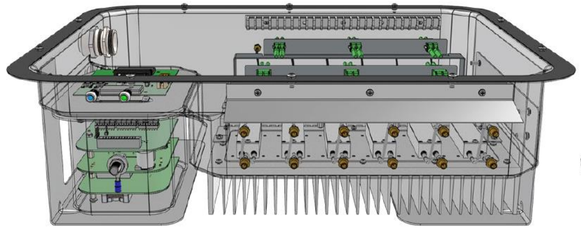


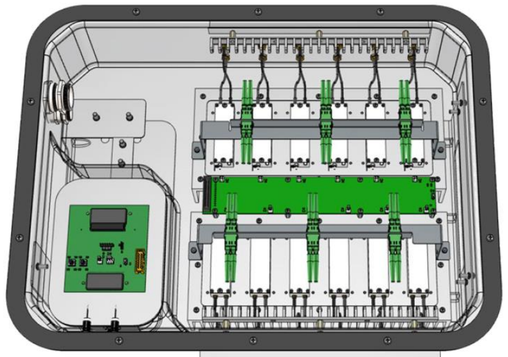
Upcoming construction contract – RFoF

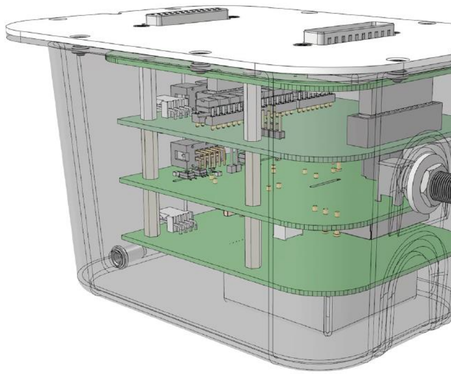
- Producing 50% of the required SKA1 Low Front End Modules (~65,000)
  - Transmit RF signal of each antenna (dual polarisation) over fibre
  - Italy to provide design, China to provide lasers (in kind)
  - Aiming for early run in NL towards AA0.5 and beyond

- Anticipated Timeline
  - Industry briefing - Summer 2022
  - Qualification of suppliers - August 2022
  - Invitation to tender - September/October 2022
  - Early run (4 stations) - Q1 2023 (optional)
  - Delivery of first run (2 stations) - Q3 2023
  - Further deliveries (~12 stations per month) - 2024-2027

Transmitter Module Characteristics:
Dual laser module, single fiber output
Wavelength 1270 & 1330 nm
Power Consumption Tx: less than 2 Watt
Bandwidth: 50 – 350 MHz
Optical Output Power: ~0dBm
Noise Figure: Lower than 13dB
-1 dB Compression: More than -41dBm
IIP2: Higher than -16 dBm
IIP3: Higher than -28 dBm
Operational Temperature: -10 to 70°C







Interested?

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