SWG Update

Tyler Bourke
Senior Observatory Scientist

22 July 2025

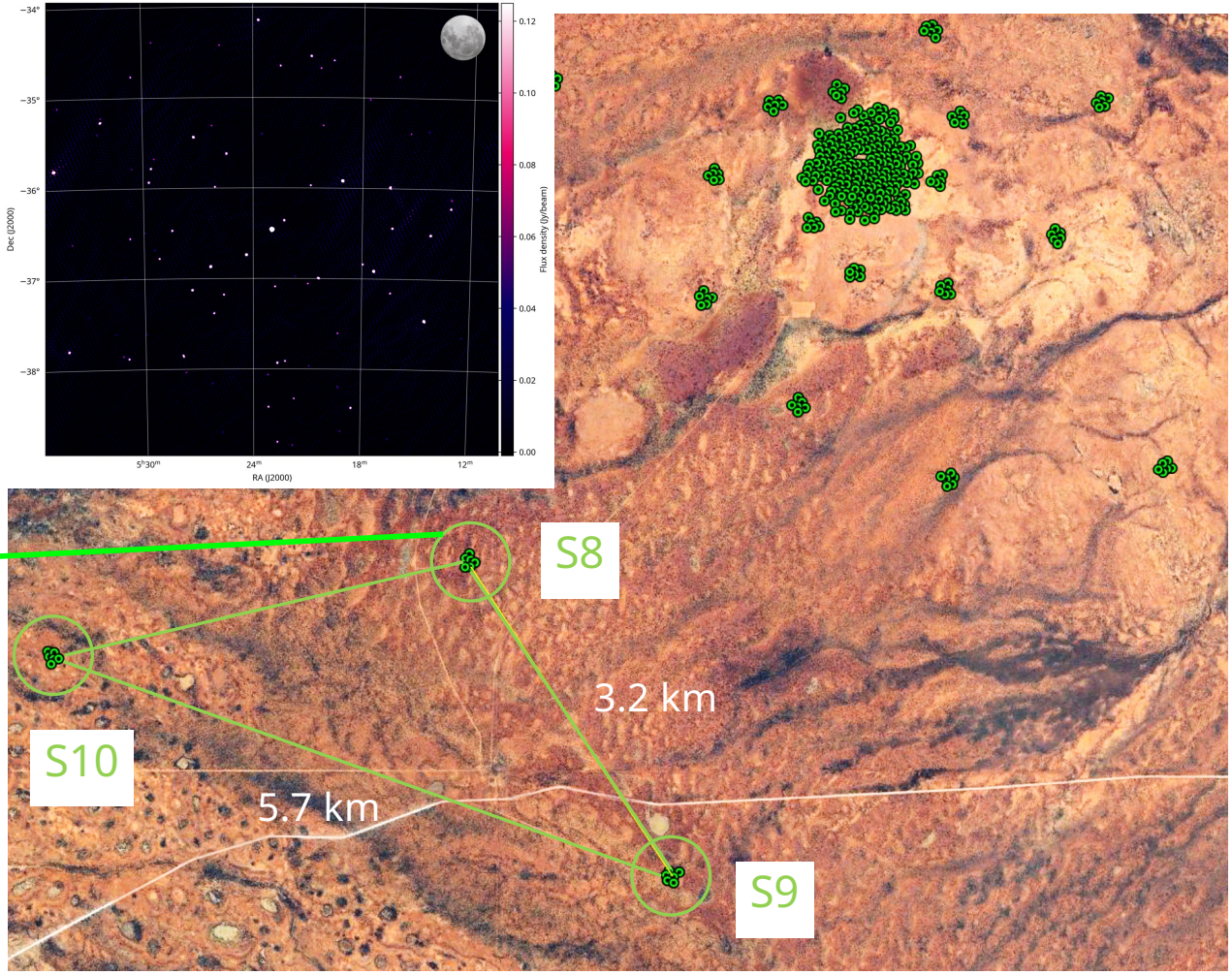
SKA Update for Science Users

- Construction Update
- SKA Science Meeting
- Advancing Astrophysics II
- Chief Scientist
  - Director-General
- Reminders
  - Other Science Meetings
  - Speaker Series
  - Jobs
- AOB

Construction Update – SKA-Low

SKA-Low AA0.5
Science Commissioning

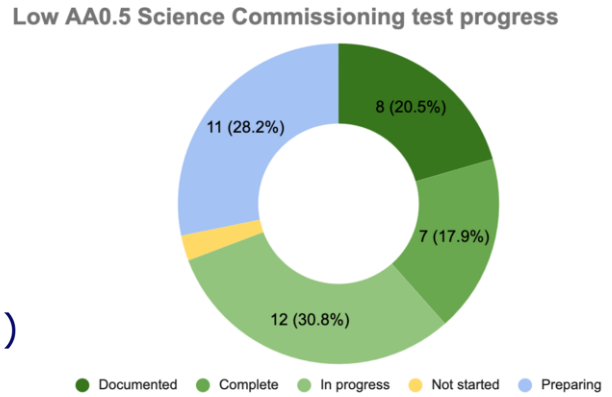
4 Stations
2 x S8
1 x S9, S10



Construction Update – SKA-Low

SKA-Low AA0.5

Science Commissioning - snapshot



Established set of ~40 commissioning tests for AA0.5 (defined and prioritised)
(2/3 complete or significantly advanced; developing AA1 and AA2 plans)

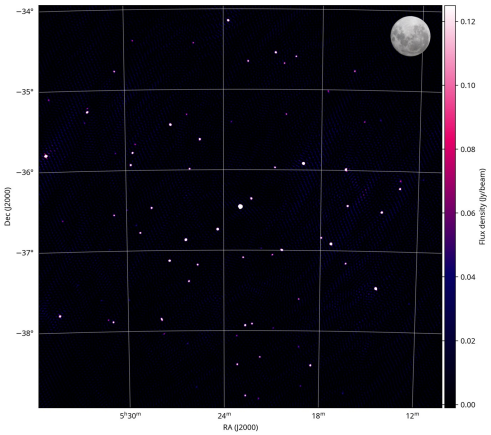
- **Fundamentals**: fringes/delays; closure; array calibration; cross calibration; quality of beams and bandpass; linearity; frequency accuracy and contiguity; RFI
- **Imaging**: full Stokes; sensitivity; stability of beams and bandpass; spectral line
- **Beamforming**: pointing; tracking; polarization alignment; sensitivity

Station Level outcomes so far:

- Good calibration solutions for each antenna within a station
- Per-antenna delays for pointing and tracking are fit for purpose
- Beam shape and sensitivity are approximately as expected
- > 50 know pulsars detected (lin/cir. pol)

Array Level outcomes so far:

- Interferometric fringes detected
- Per-station delays determined to be stable and match fibre lengths
- Closure phase verified (indicating that visibilities can be calibrated)
- First image produced!
- Initial tied-array beamforming tests are promising and ongoing



Construction Update – SKA-Low

SKA-Low AA2

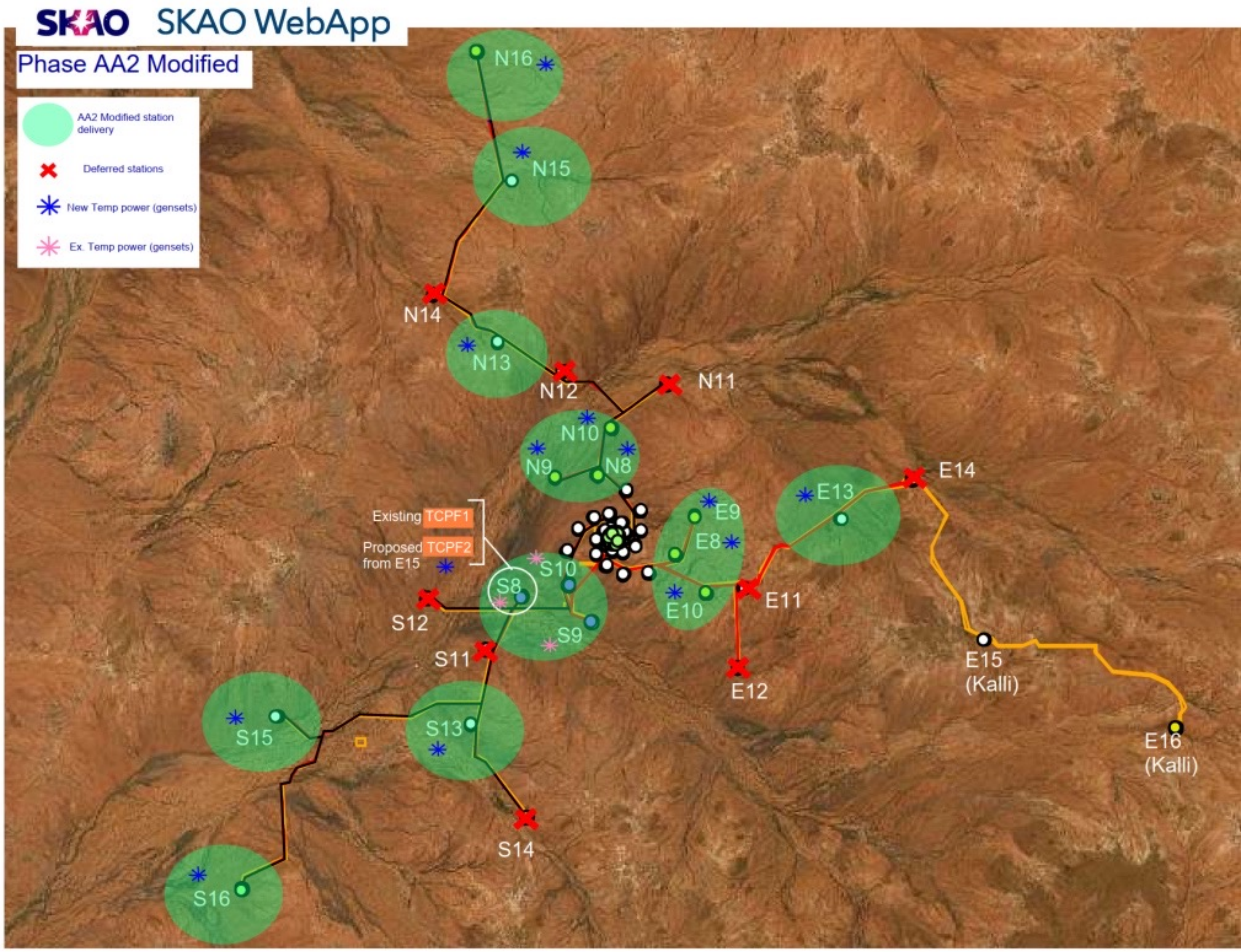
68 Stations

Modified layout due to delay in construction of Central Processing Facility (CPF)

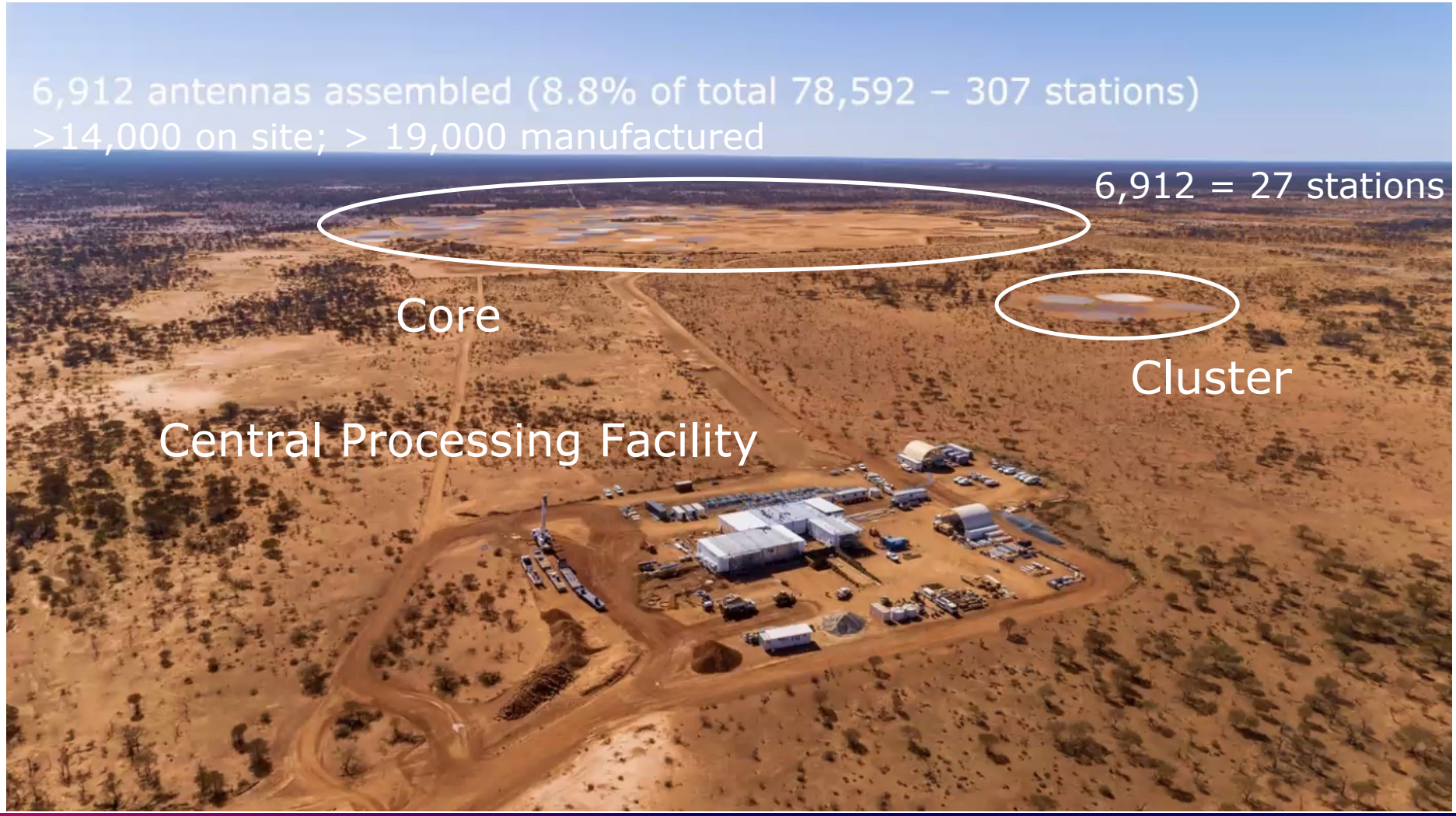
No stations integrated in the core until CPF available (~~AA2~~)

Science – pro: longer baselines earlier – con: no core tied-array beams (impacts pulsars/EoR)

Science Verification still on track starting early 2027



Construction Update – SKA-Low



Construction Update – SKA-Mid

SKA-Mid AA0.5

SKA063 – erected, can move with MeerKAT, photogrammetry underway

SKA001 – erected, **B2 installed and alive!**

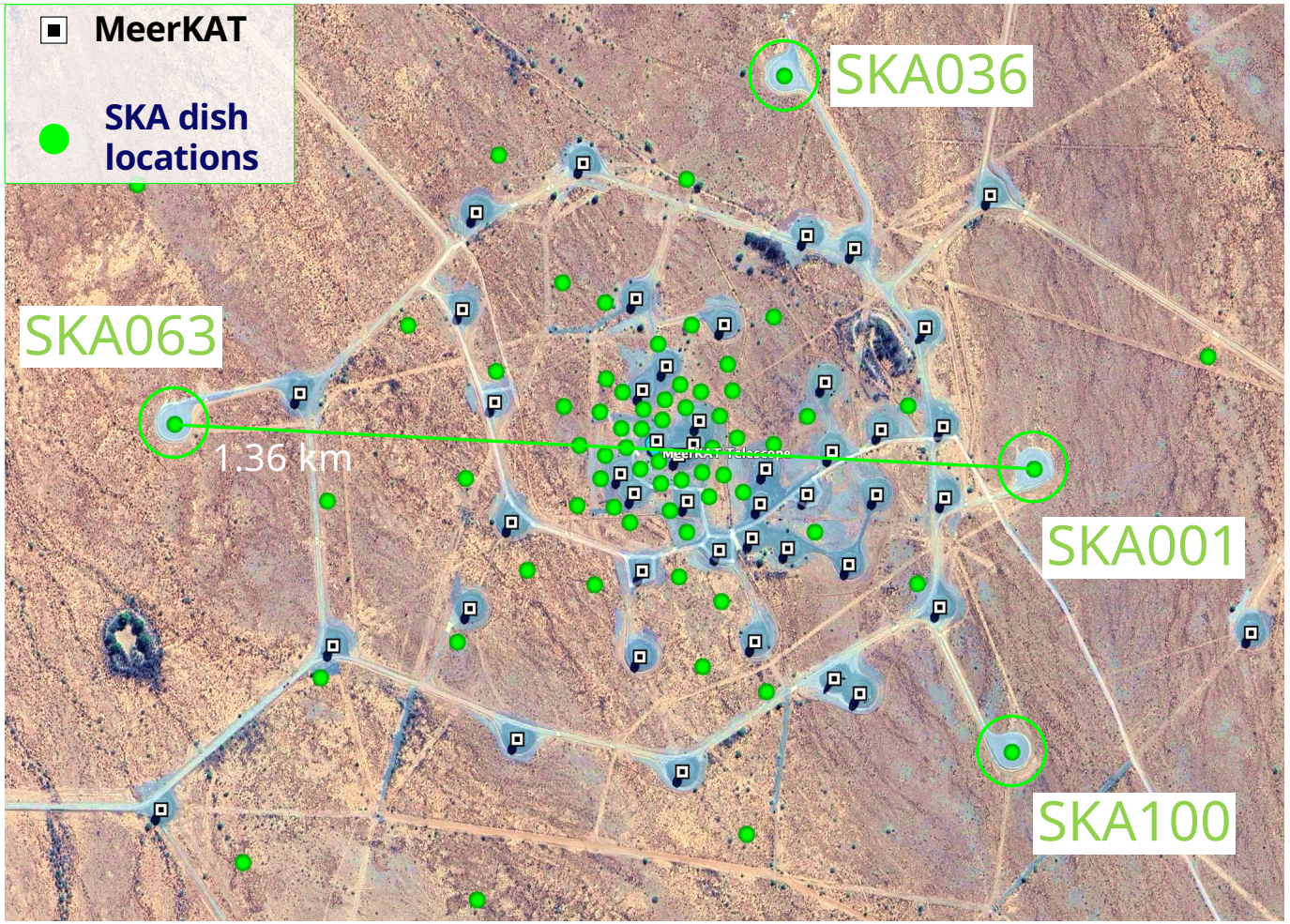
SKA100 – dish surface lifted

SKA036 – pedestal up

7 dishes on site, more on the way

2025 goal:

fringes with AA0.5



Construction Update – SKA-Mid

SKA001

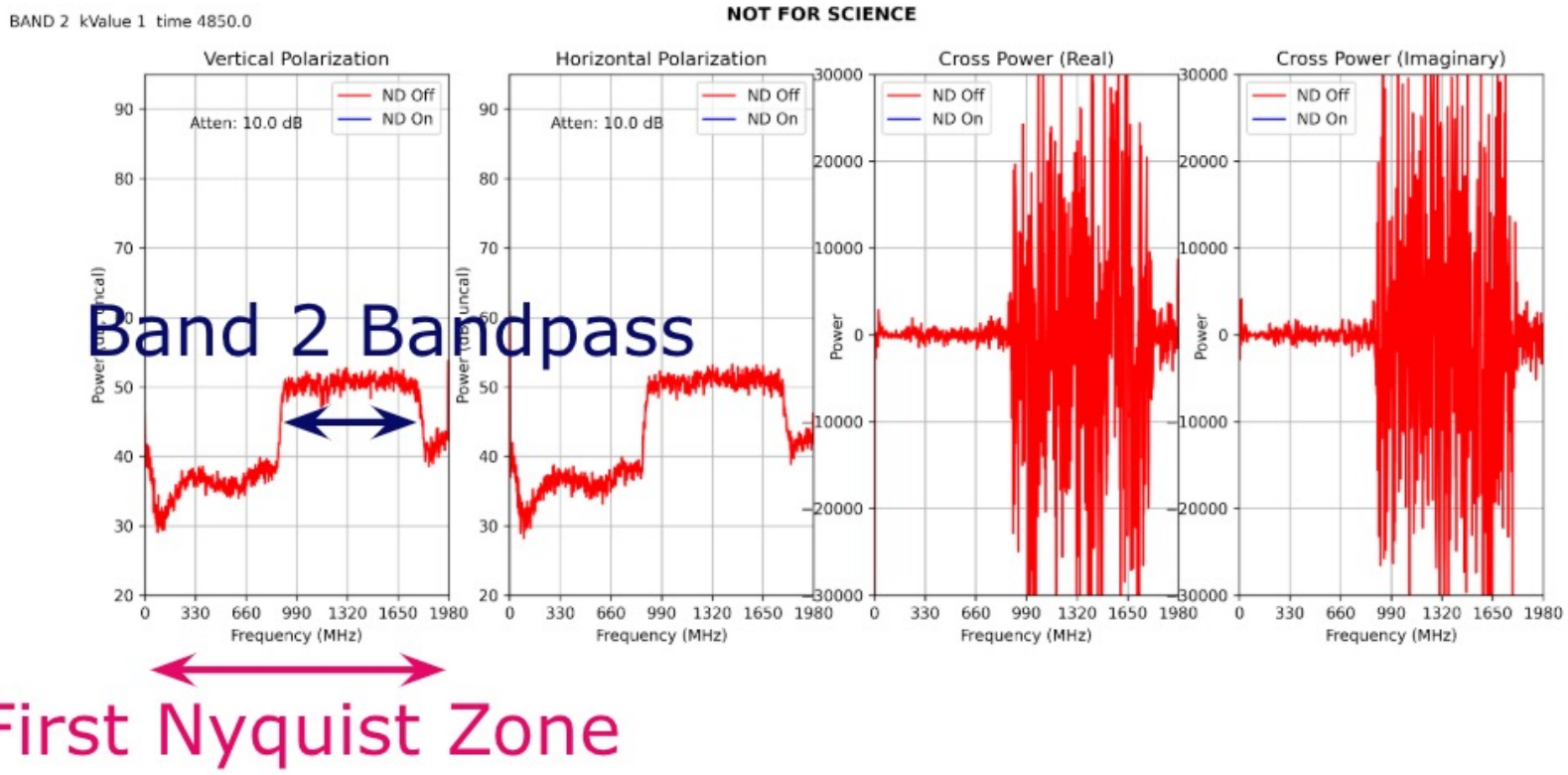
Band #2 installed

Vacuum and fibre splice box

1

Band 1 – pre-production units under construction
Band 5 – contract awarded; test units for AA0.5 in progress

Construction Update – SKA-Mid
Raw digitised data from SKA001

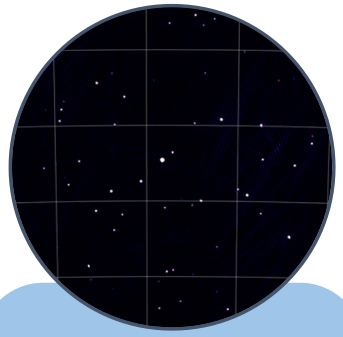


Raw data capture from the Band 2 Rx with the feed not in focus and the LNA turned off

Science Timeline – high level milestones

Construction

- Building antennas, dishes, roads etc!
- Followed by Assembly, Integration and Verification



Commissioning

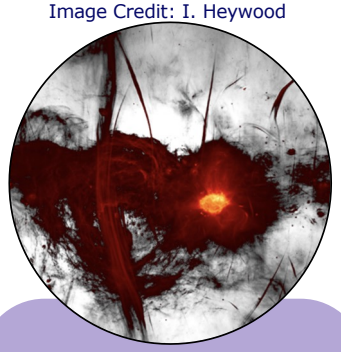
- SKAO activity
- Collaborative across system verification and science commissioning

Community involvement starts

Science Verification

- A full dress rehearsal of the end-to-end system for every mode of operation
- Once modes and pipelines are working, the community can submit target ideas
- Data will be publicly available for scrutiny
- Build trust and fostering an early science return

Image Credit: I. Heywood



Cycle 0

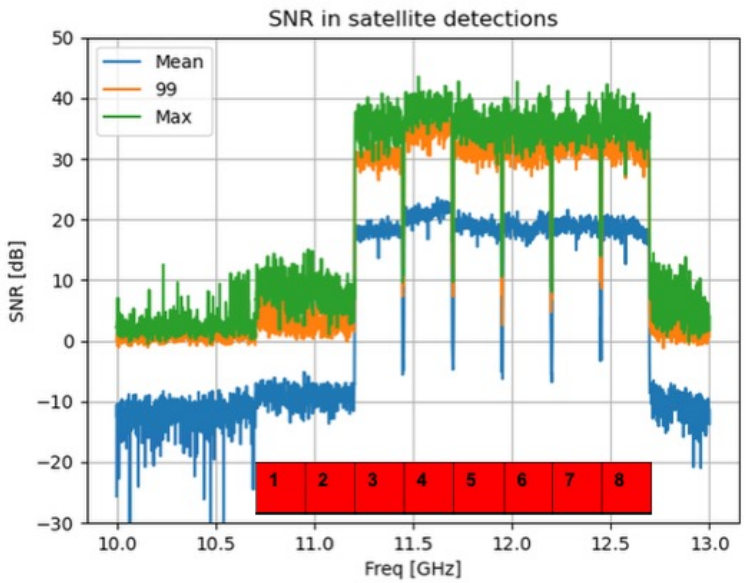
- Shared-risk PI projects
- SRCNet resources ready for user
- proprietary periods

Now | Now | First half 2027 | First half 2029 | 2030

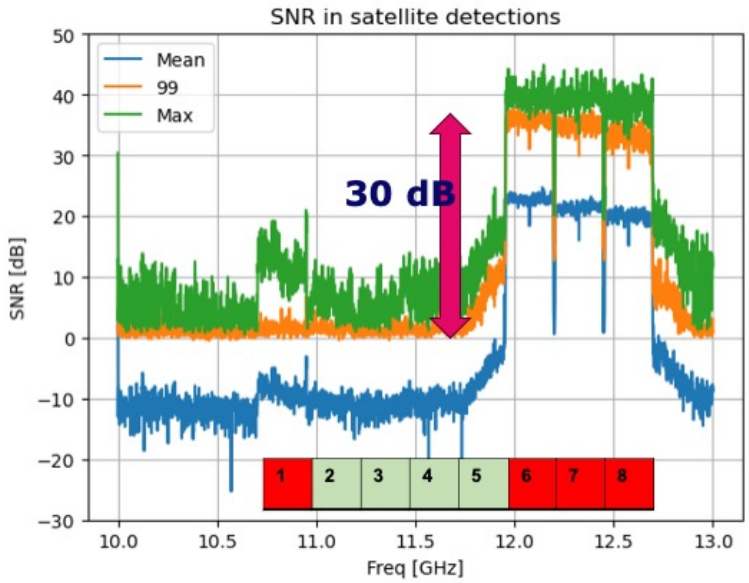
Now | Soon | First half 2029 | First half 2031 | 2032

Mid Band 5b satellite downlinks - Mitigation

BSA deactivated



BSA activated in CHs 2,3,4,5



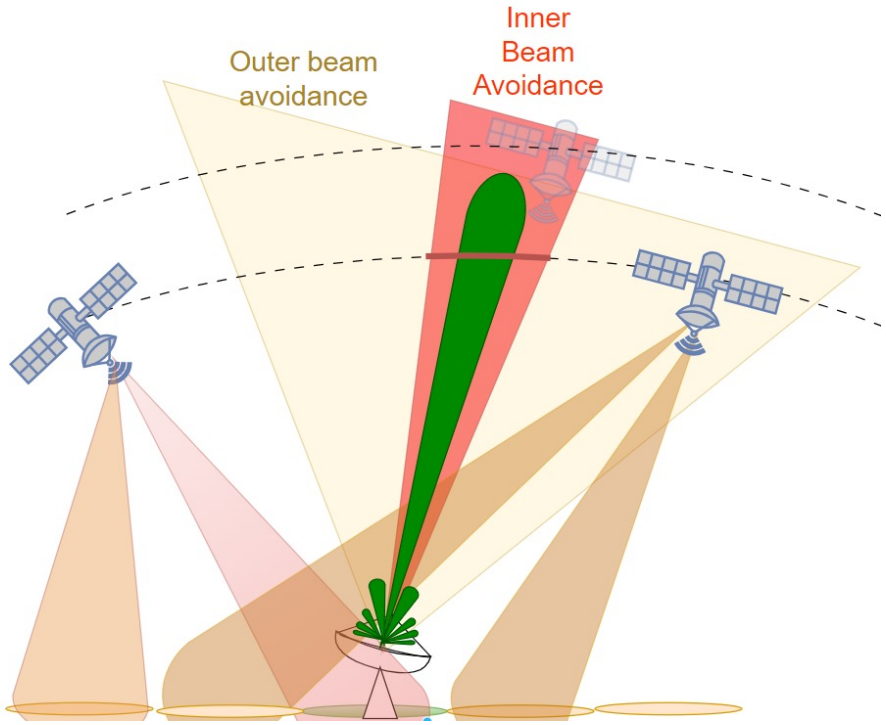
- Science will be possible (work in progress)
  - some loss of sensitivity, and bandwidth, between 10.7-12.7 GHz
  - some flexibility on which part of this band cannot be used at any given time
  - response is linear

BSA = Bore Sight Avoidance

Mid Band 5b satellite downlinks - Mitigation

Boresight avoidance (developed by Starlink and NRAO

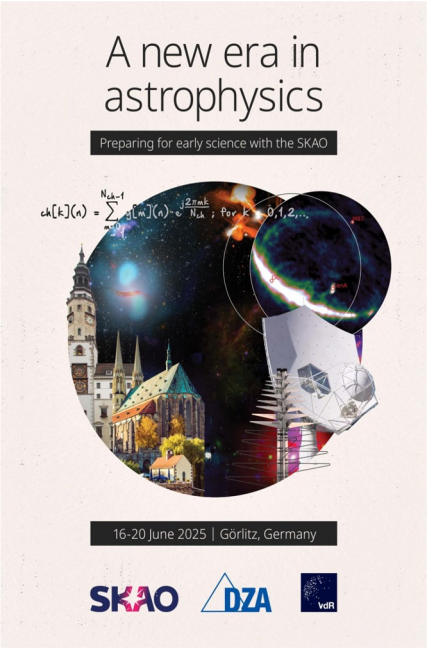
- Avoiding saturation of the receiver, then to minimize RFI
- Turn off transmissions / No beams towards the antennas
- Communication with satellite constellations (channel/time arrangement)
- Boresight Avoidance can attenuate RFI more than 30 dB /1000 times (tested in Onsala, Sweden). Suitable for constellations with many satellites.
- **Needs to be included as a licence condition**



Boresight avoidance scheme, satellite can turn off Tx when in inner beam and divert the beams away from the telescope in outer beam.

BSA = Bore Sight Avoidance

2025 SKAO Science Meeting
A New Era in Astrophysics



- A huge **thank you** to our community
  - To our SOC and SWG chairs; we are indebted to you for your support and efforts during the many months of planning and the week itself.
  - To all presenters for excellent talks and posters.
  - To all chairs and moderators over the week for helping sessions run smoothly and facilitating engaging and productive discussions.
  - Finally, thank you all attendees for being part of SKAOSci2025; the active engagement and contributions both in person and online were key to making the meeting a success.

2025 SKAO Science Meeting

- All talk recordings and slides are now available via the online programme:

  https://virtual.oxfordabstracts.com/event/73570/program

  (need to be registered and logged in)

- Thank you for completing the attendee survey; we will provide a summary at the next meeting

Updated SKAO Science Book

"Advancing Astrophysics II"

- An up-to-date coverage of the science questions that will be addressed by the *Design Baseline (AA4) SKA telescopes*.
- **Current status:**
  - 241 chapters planned for the book (link)
    - Identified following review and consolidation by SWG chairs of over 350 Expressions of Interest
- **Book structure:**
  - Organised into broad themes: traditional scale-based
  - Will include overview section from each SWG
- **Timeline (subject to refinement after Görlitz):**
  - Chapter submission deadline 30 September 2025 (confirmed)
    - Full Instructions for Authors and LaTeX template
  - Peer review round Q4 2025
    - Inviting SKAO community, relatively light touch
  - Further editing round Q1 2026
    - Editorial board: SKAO Scientific Services team and SWG co-chairs
  - Publishing April 2026
    - Beginning work with SKAO Comms team to investigate publishing options

Updated SKAO Science Book

"Advancing Astrophysics II"

- **References styling**
  - Chapter references are handled in the 'abbrvnat' bibliography style. The default behaviour of this style is to include in the bibliography all co-authors for each referenced article.
    - In order to save space where reference and author lists are long, we have created an optional modified version of the **abbrvnat style file**.
    - The modified version, 'abbrvnat-maxbibnames4.bst' is now included in the LaTeX template folder above, and limits the number of authors per reference to four, above which all but the first author will be replaced by the 'et al.' abbreviation. Article titles are also removed.
    - To apply the modifications to the bibliography, simply add the abbrvnat-maxbibnames4.bst style file to your LaTeX project and change the bibliographystyle{} command in your main .tex file to match.

Chief Scientist

- Prof Naomi McClure-Griffiths appointed
- Start date: 21st July 2025;
- Initially, she will be on secondment to SKAO from ANU on a 50% basis until her ARC Laureate grant has ended.
- Naomi is a distinguished astrophysicist and radio astronomer of > 20 years experience. Research focus is HI and magnetism in the Milky Way. Has published 215 papers and accumulated >12,500 citations.
- Member of SEAC since 2015; Chair of SEAC 2021-2025; Membership and chair of numerous other scientific advisory bodies.
- **Chief Scientist Role includes**:
  - Champion the scientific capabilities of the SKAO
  - Shape the Observatory science strategy, and be the primary face of science to the SKAO community (and Council and SEAC)
  - Co-ordinate the science priorities for the SKA Observatory Development Plan
  - Oversee an SKAO post-doctoral program

Next Director-General

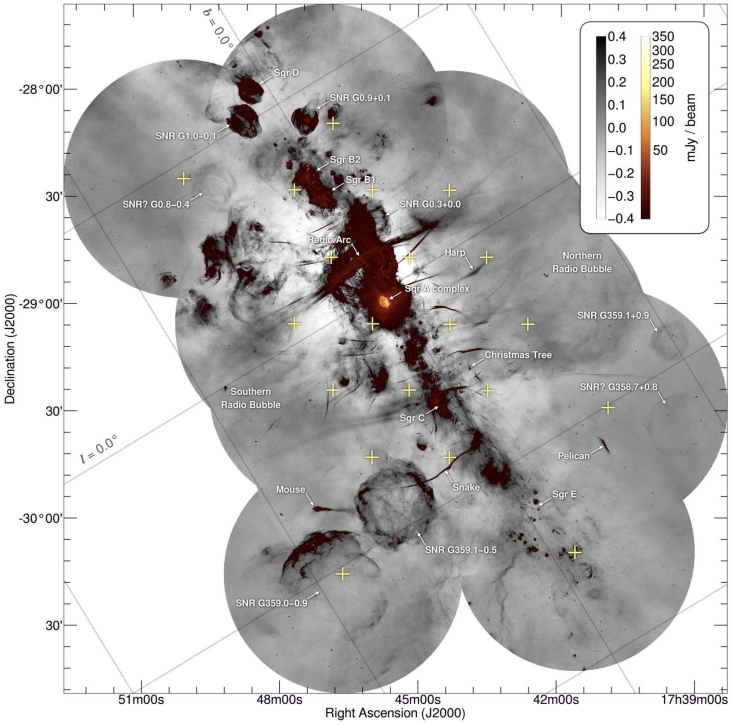
Professor Jessica Dempsey

- Director of ASTRON
- Previously Deputy Director of East Asia Observatory (Joint Astronomy Centre – JCMT & UKIRT)
- Starts June 2026

SKA-Mid Senior Commissioning Scientist

Dr Ian Heywood

- Joining from Oxford



Reminders

Science Meetings related to SKA

- PHISCC (Pathfinder HI Survey Co-ordination Committee) Workshop 2025
  2025 Sept 22-26, Cagliari, Italy
  https://sites.google.com/inaf.it/phiscc2025

- Pulsar 2025 (A conference in memory of Nichi D'Amico)
  2025 Sept 21-26, Sardinia, Italy
  https://sites.google.com/inaf.it/pulsar2025/

- SPARCS XII (SKA Pathfinder Radio Continuum Surveys)
  2025 Nov 3-7, Cairns, Australia
  https://sparcsconference.com/

- Fifth National Workshop on the SKA Project (Italian SKA workshop)
  2025 Nov 24-28
  https://indico.ict.inaf.it/event/3268/

- SALF (Science at Low Frequencies)
  2025 Dec 8-12, Orléans, France
  https://salfconference.org/

Presentations from most past SKAO-(co)led science meetings are available online

SKA Speaker Series

- SKA Speaker Series
  - series of interesting talks, accessible to all within the broader SKA community, covering a wide range of topics, from astronomy to physics, engineering, big data and computing, EDI, and more.
  - Encourage your SWG members to sign up to give a talk (and consider giving a talk yourself).
  - Talks recorded – all available for reviewing via the Speaker Series page (2020+) https://confluence.skatelescope.org/display/SKAQA/SKAO+Speaker+Series

SKA Speaker Series – Tuesday 29 July

SKAO

Speaker series

Spiral arms and meso-scale structure in galactic magnetism

Prof. Jeroen Stil

University of Calgary

The interstellar medium (ISM) of the Milky Way and other galaxies plays a role directly or indirectly in most science goals of the SKA. From the formation of stars and planets to discovery of pulsars to the evolution of galaxies, either the ISM itself, or its effect on the the detected signal, is pivotal to our science. The Physical conditions in the ISM are significantly affected by the presence of a magnetic field through the coupling of charged particles to the magnetic field. Polarization of diffuse synchrotron radiation and Faraday rotation are the most versatile probes of the strength and direction of magnetic fields on galactic scales. Yet, much remains unknown, or controversial, about the structure of the magnetic field in galaxies. I will discuss results from the THOR survey of the first Galactic quadrant and place in context new results from VLA S+C band polarimetry by the CHANG-ES survey of the edge-on spiral galaxy NGC 891, which is similar in size to the Milky Way. In both galaxies, spiral arms provide important geometric information for interpretation of the polarimetry. I discuss the observational evidence and how it may affect models of the magnetic field..

TUESDAY 29 JULY

11am UTC/GMT, 1pm SAST, 7pm AWST, 10pm AEDT

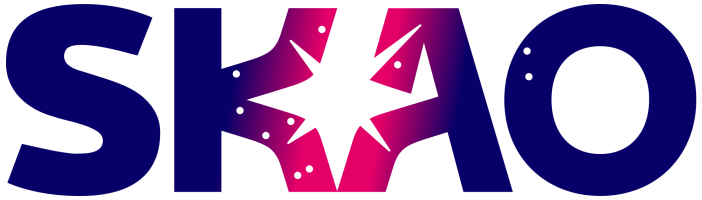
Click here to access the speaker series talk

Outreach & Engagement

- **CONTACT** is the SKAO magazine aimed at the entire SKA community
- Ideas for articles for CONTACT are always welcome (email science@skao.int). These include:
  - Let's Talk About (Feature length … science focussed)
  - Pathfinders & precursors. Short pieces on recent results
  - SKA-related events (e.g. SPARCS, etc)
  - any other news of SKA relevance (award/honours, job openings, …)
- Encourage your SWG members to sign up

SKA Positions

- SKAO positions (HQ Manchester UK, Australia-Low, South Africa-Mid) https://www.skao.int/en/opportunities/careers-opportunities
- SARAO employee SKA positions (Cape Town, Canarvon) https://www.sarao.ac.za/vacancies/
- CSIRO employee SKA positions (Perth, Geraldton) https://jobs.csiro.au/search/?q=astronomy&locationsearch



Any Other Business

- News from SWG Chairs?
- Updates from Precursors or pathfinders?

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
www.skao.int/en/science-users
science@skao.int