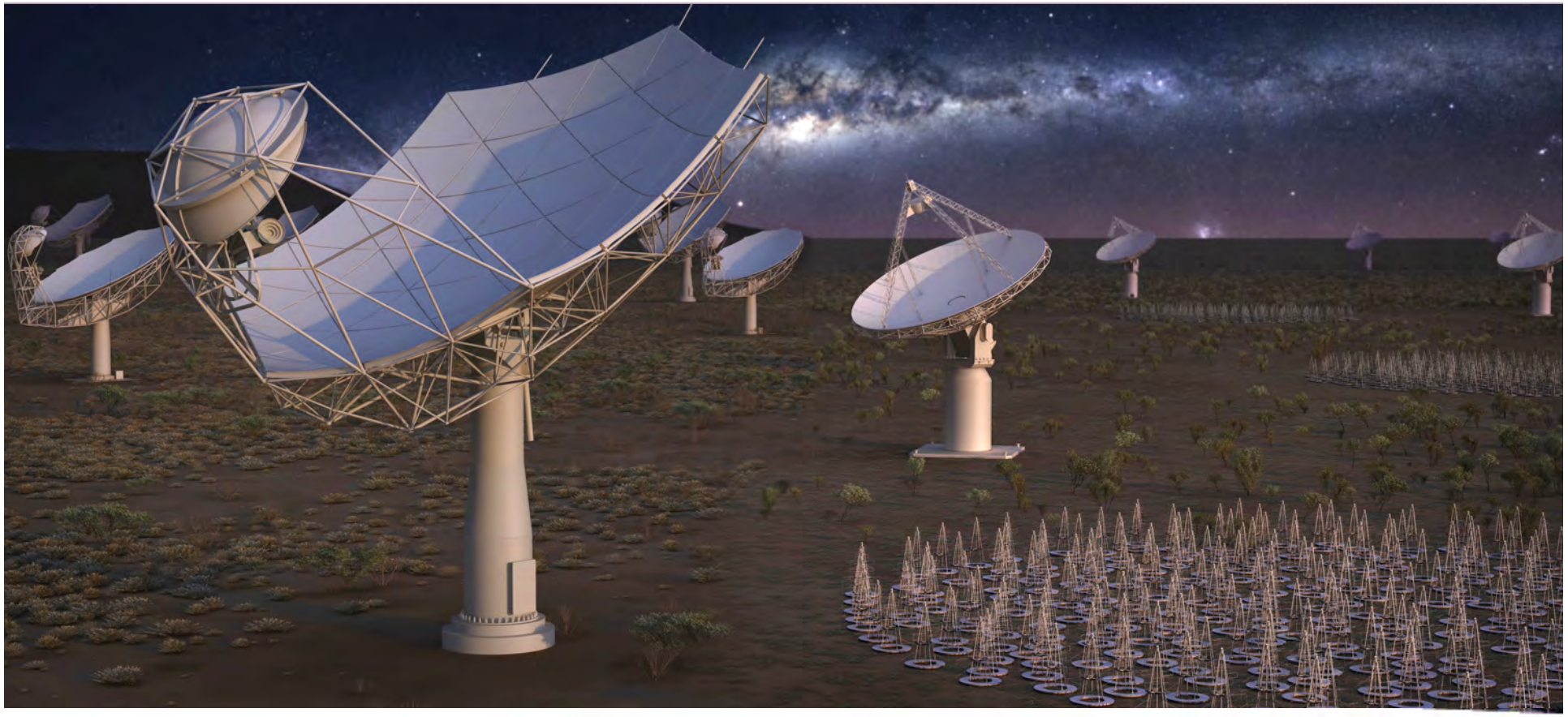
SKA Project and Science Update



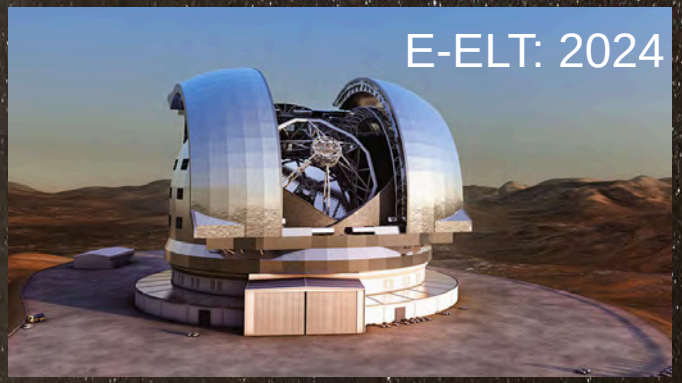
SQUARE KILOMETRE ARRAY

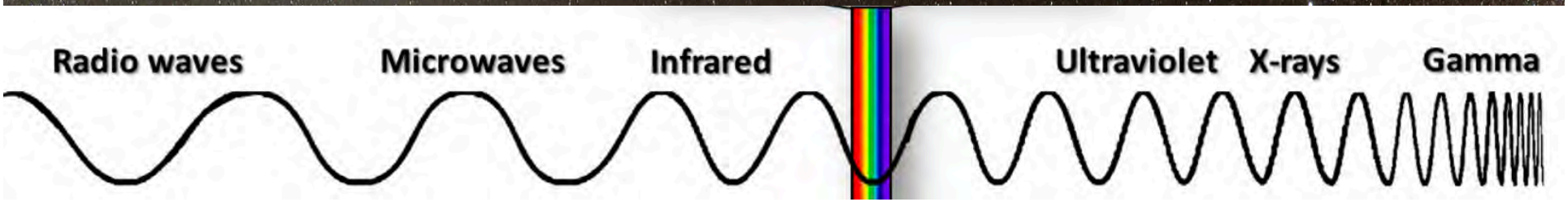
Exploring the Universe with the world's largest radio telescope

Robert Braun, SKA Science Director

12 February 2019

21st Century Observatories

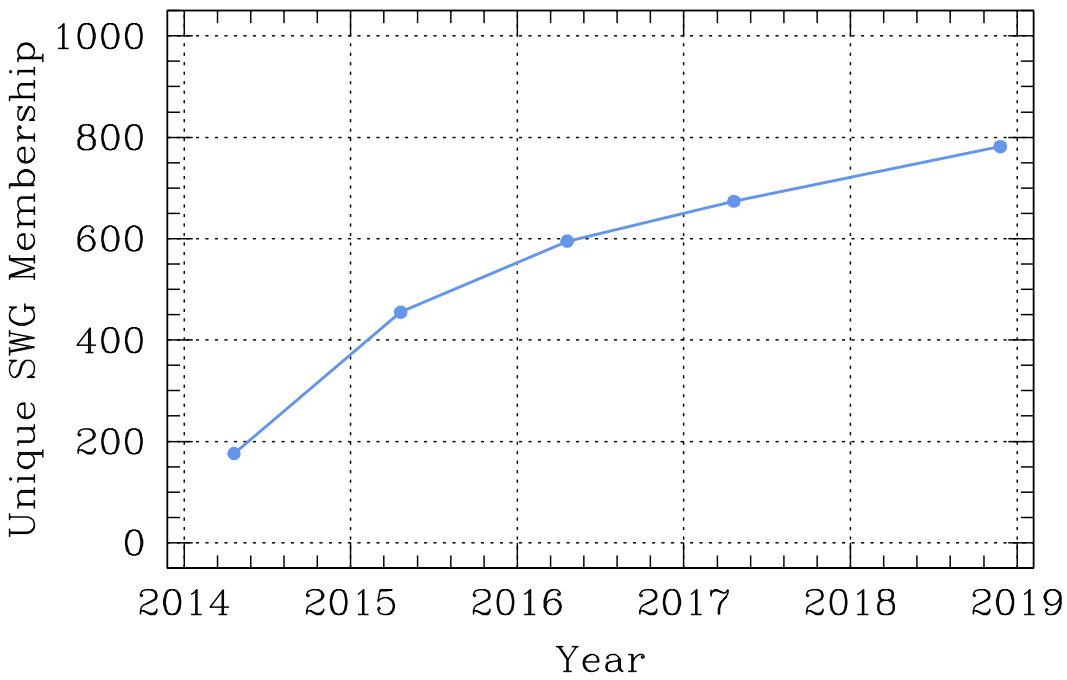




SKA– Key Science Drivers: The history of the Universe

Broadest science range of any facility on or off the Earth.

The SKA Science Community



(SKA @ 2019 AAS Seattle)

- SKA Science Working Group membership has grown by factor of four in the past 5 five years
- SKA Splinter Session at the 2019 AAS, > 100 attendees
- SKA 2019 Science Meeting and KSP Workshop, > 300 registrants

The SKA Observatory

SKA: A global Research Infrastructure

Members
Host Countries: Australia, South Africa, United Kingdom

Observers

African partner countries

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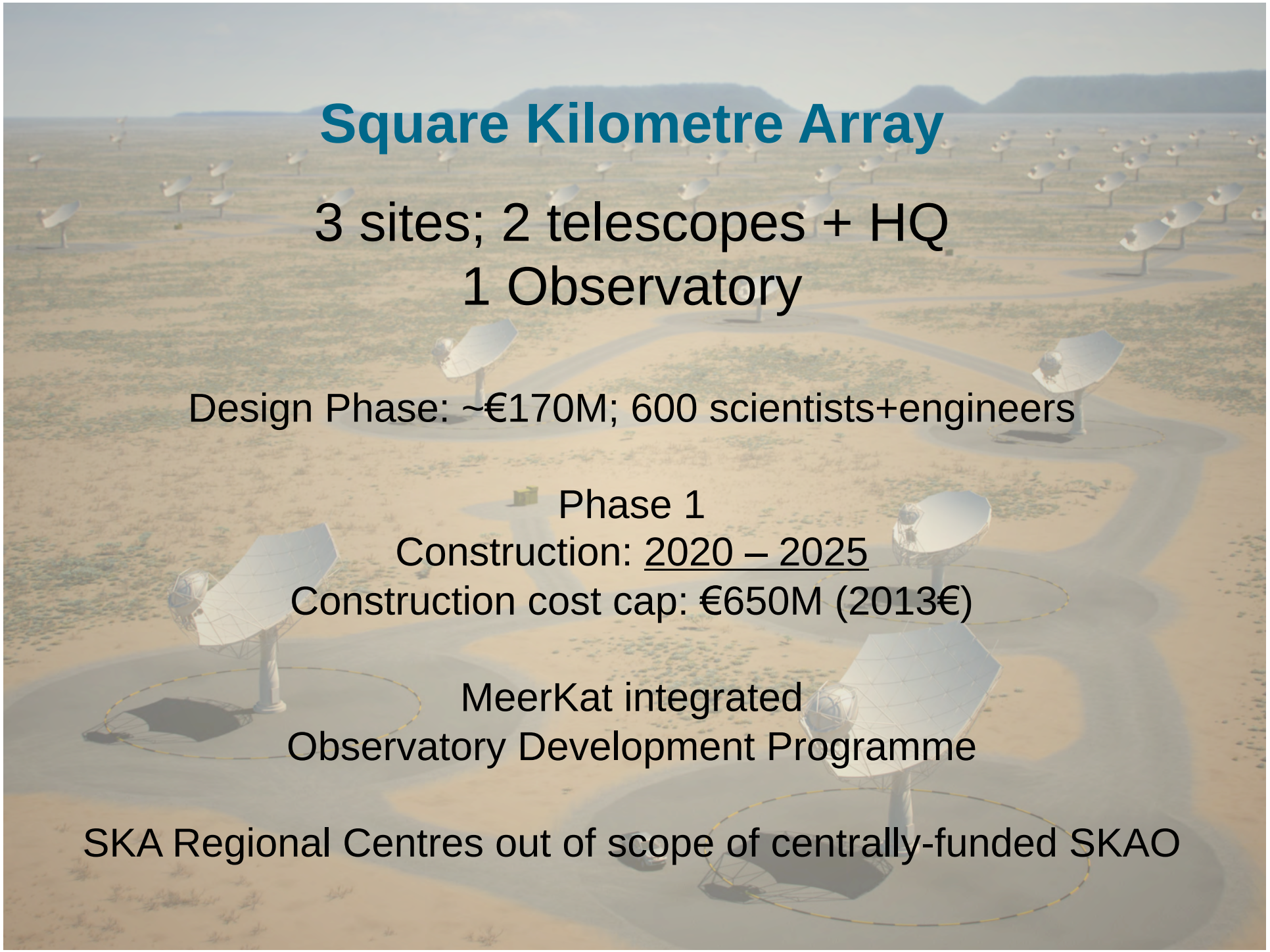
Negotiations to establish SKA Inter-Governmental Organisation.

Text of Convention and protocols now agreed
Initialing of documents completed

Ministerial signing ceremony 12 March 2019

Transition planning underway



Square Kilometre Array

3 sites; 2 telescopes + HQ
1 Observatory

Design Phase: ~€170M; 600 scientists+engineers

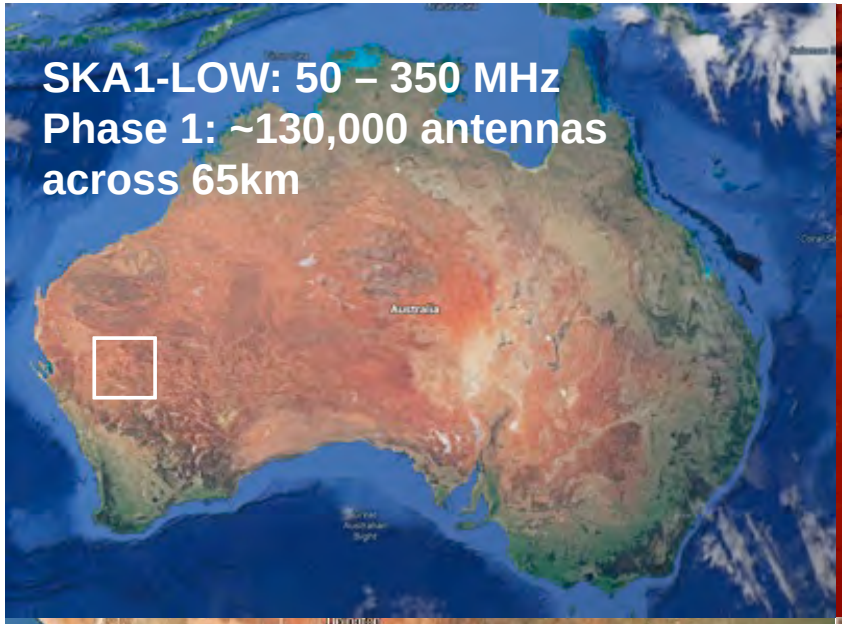
Phase 1
Construction: 2020 – 2025
Construction cost cap: €650M (2013€)

MeerKat integrated
Observatory Development Programme

SKA Regional Centres out of scope of centrally-funded SKAO

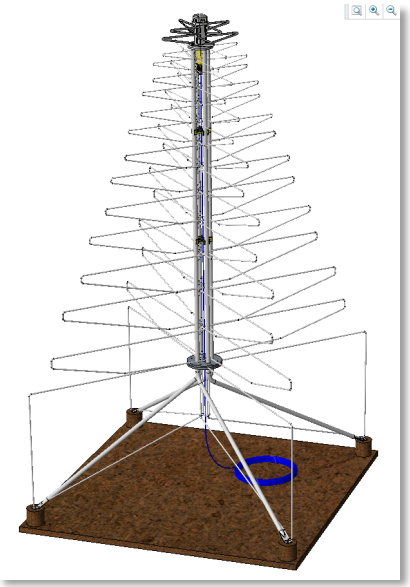
SKA HQ: Jodrell Bank, UK

SKA: Telescopes in AUS & RSA

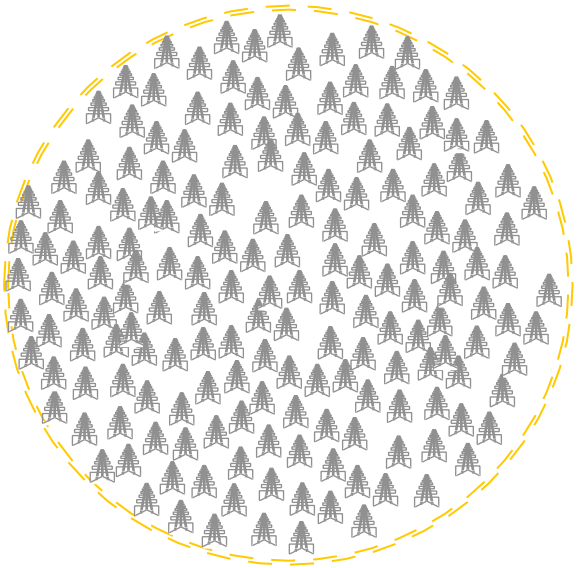


Construction: 2020 – 2025; Cost cap: €650M (2013€)

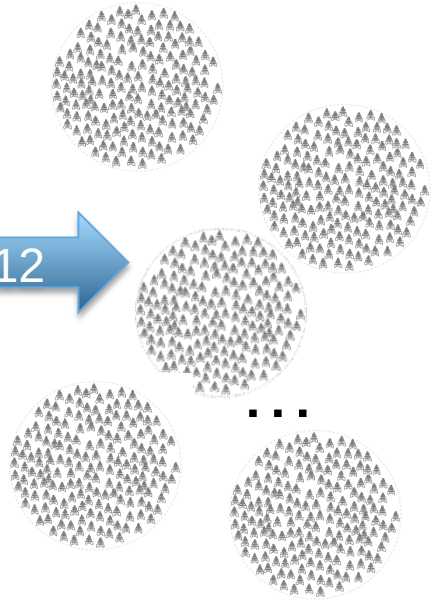
SKA1-Low: Array of Arrays



256



512



SKA1-Low
Antenna/Receptor

Antenna Beam

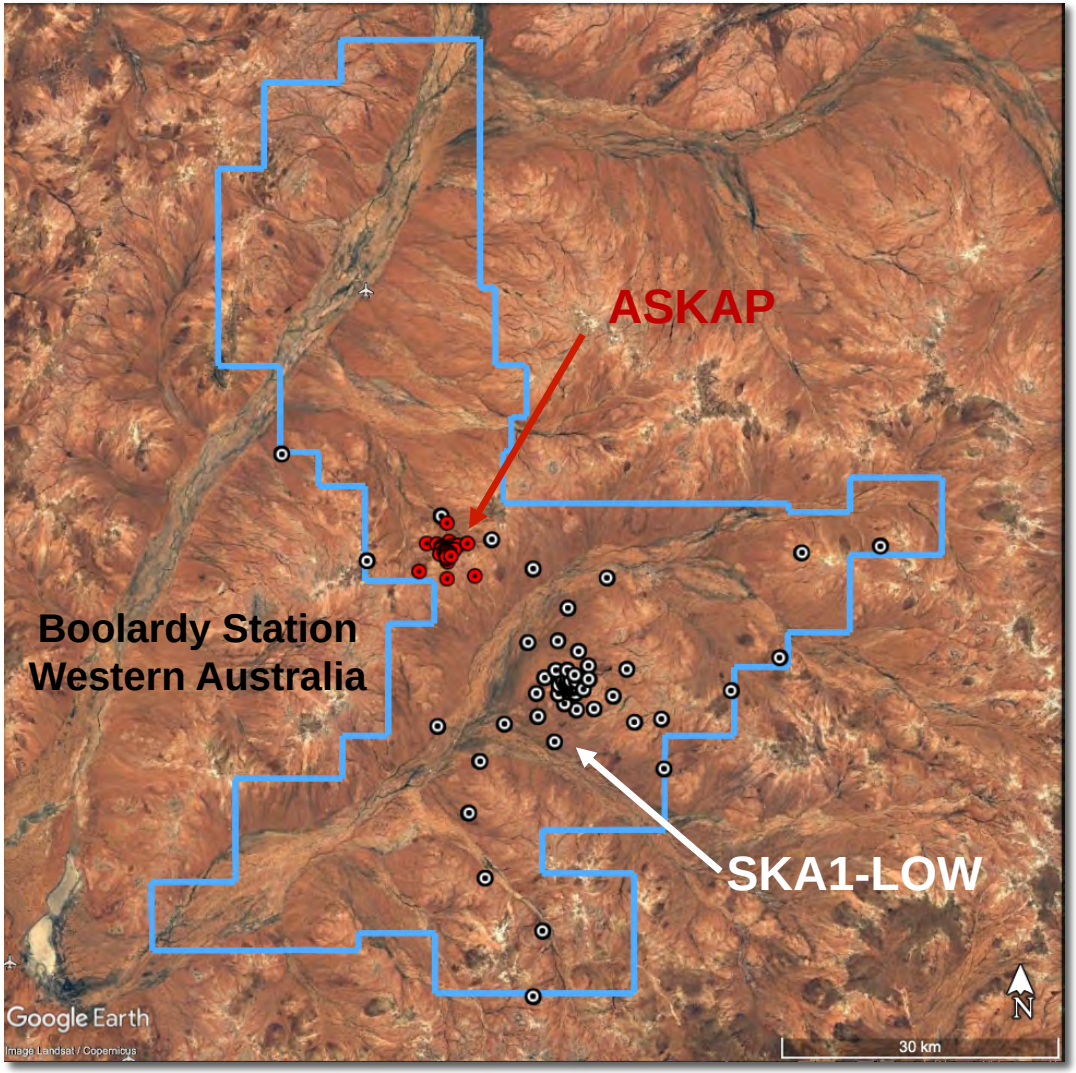
SKA1-Low
"Station"

Station Beam

SKA1-Low
"Array"

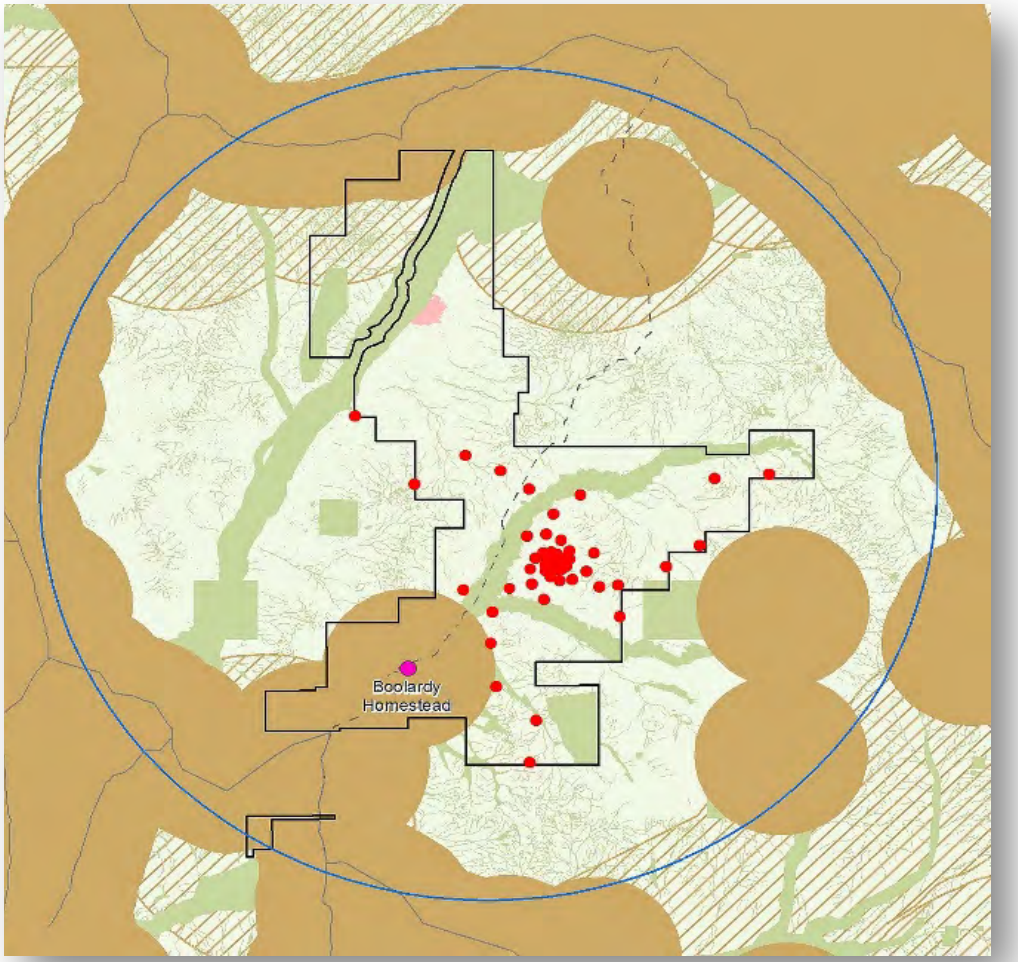
Correlation and
Tied-array Beams

SKA1 – Low: Layout



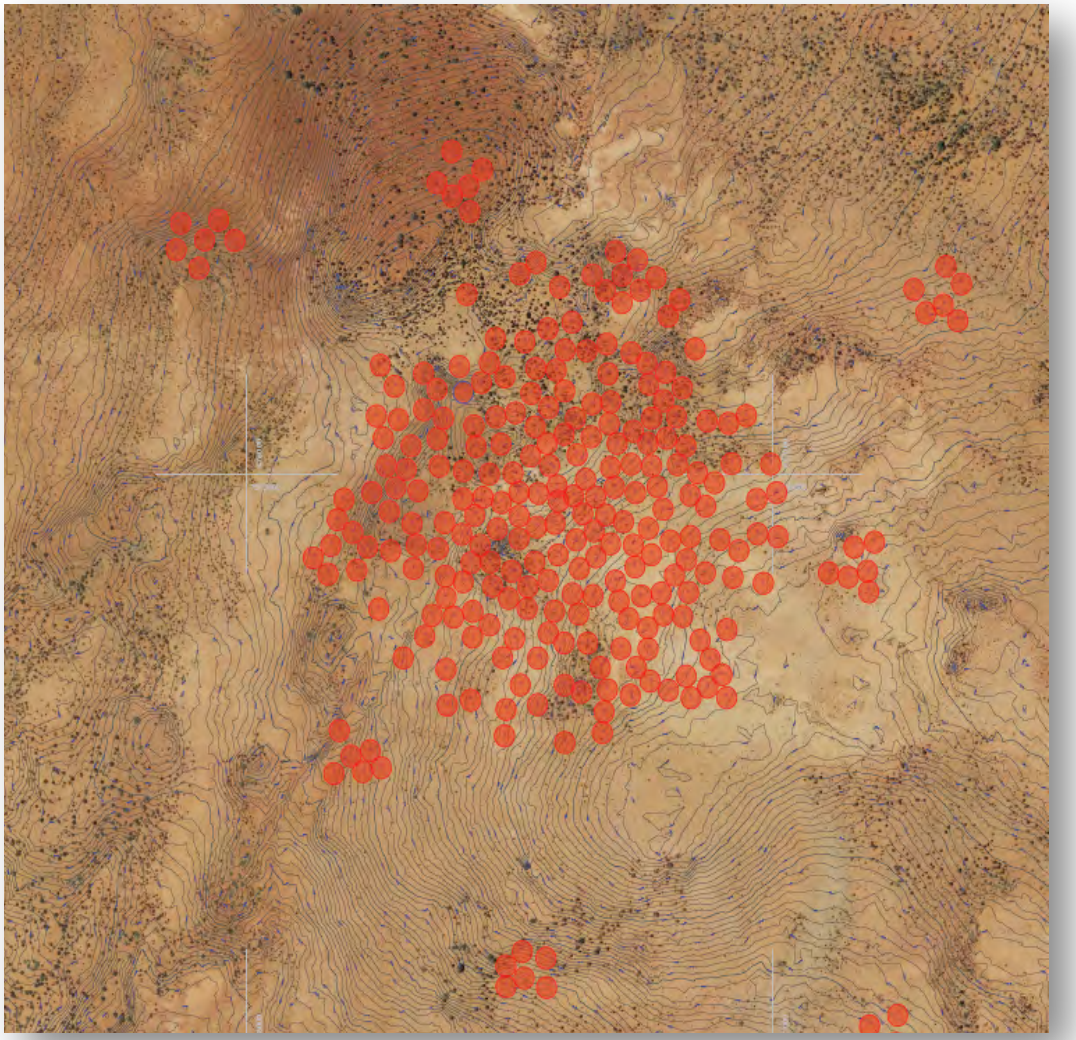
- 512 aperture array stations
- Maximum baseline 65 km
- 3 modified spiral arms

SKA1 – Low: Layout

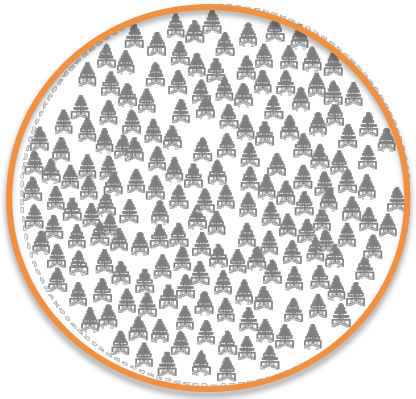


- 512 aperture array stations
- Maximum baseline 65 km
- 3 modified spiral arms
- Respect site constraints

SKA1 – LOW: Layout

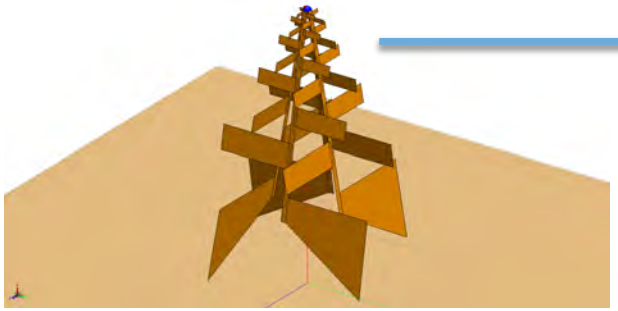


- 512 aperture array stations
- Maximum baseline 65 km
- 3 modified spiral arms
- Respect site constraints
- ~ 50% within ~1 km randomly distributed
- Others in clusters of 6 stations arranged randomly over an area 100 to 150 m in diameter

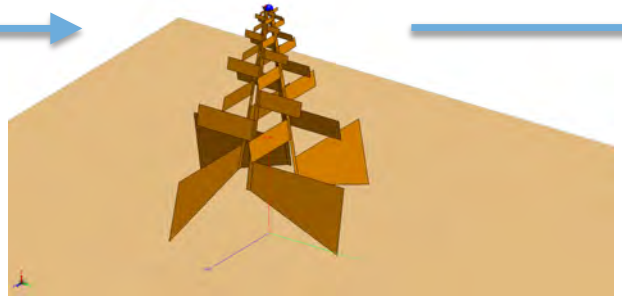


- 256 antennas per station
- 38m station diameter

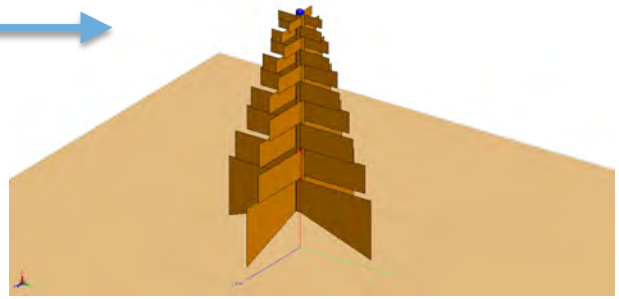
SKA1-Low Antenna Development



SKALA1-2: Open boom, 9 dipoles

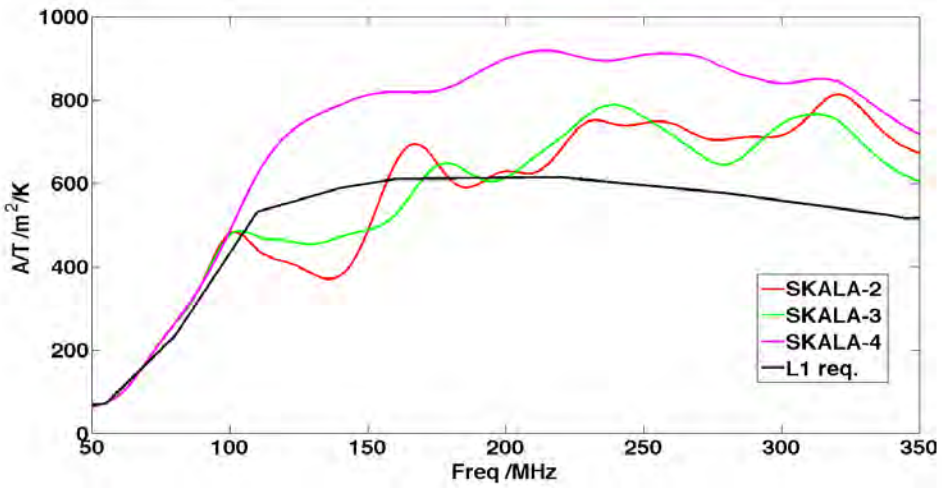


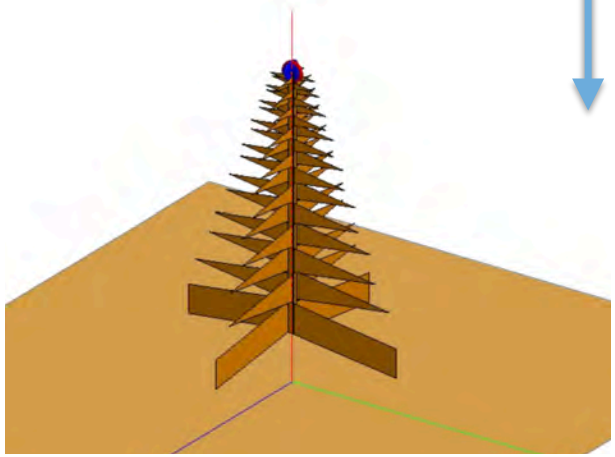
SKALA3: Open boom, 9 dipoles



SKALA4: Closed boom, 11 – 18 dipoles

- SKALA4 design for SKA1-Low antenna
  - Improved: sensitivity, smoothness, polarisation purity, beam shape





SKALA4: Closed boom, optimised