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SKAO Regional Centre United Kingdom

Intro to VLBI with the SKAO

DR JACK F. RADCLIFFE

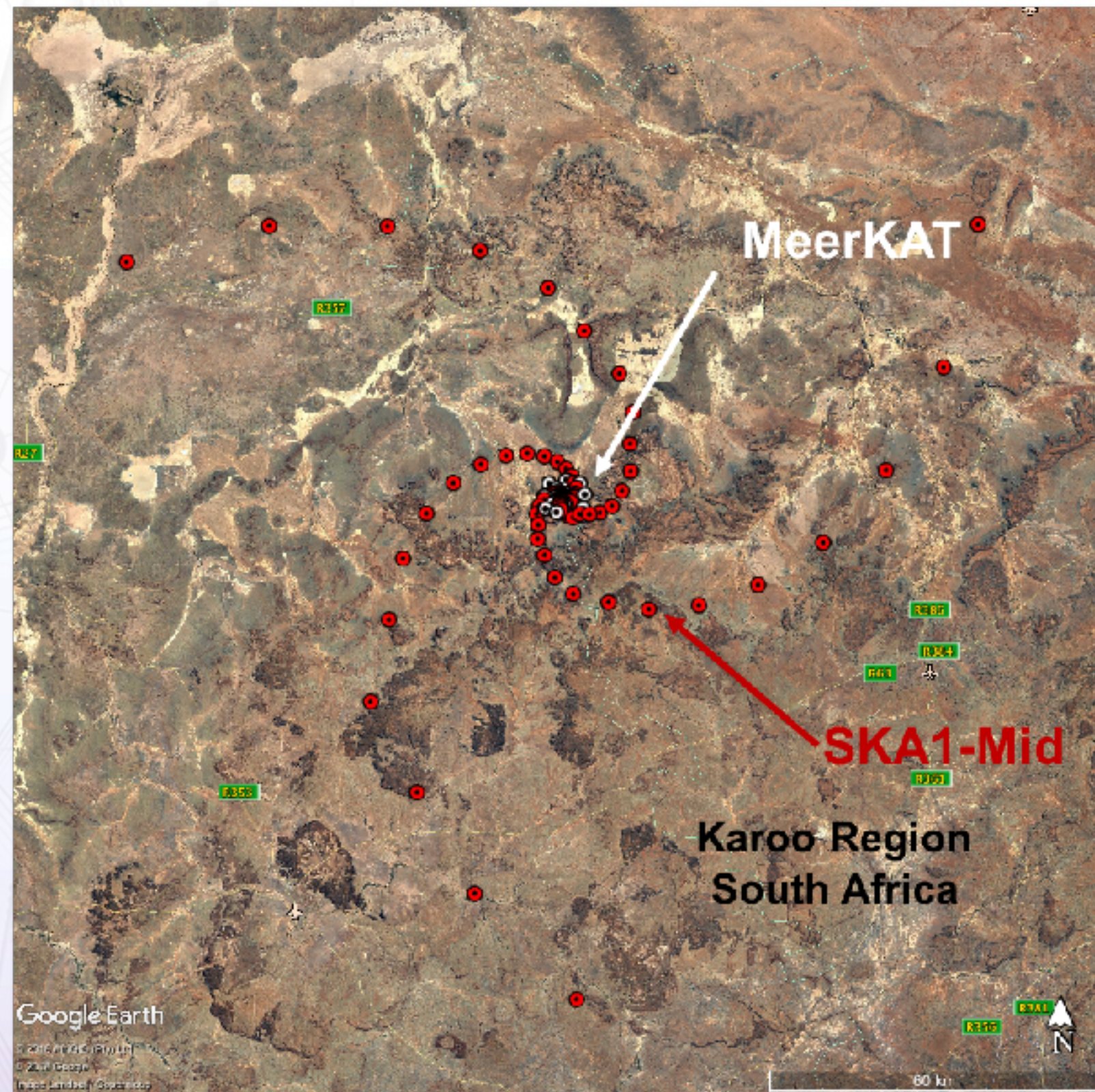
SCIENCE COMMUNITY DIRECTOR AT THE UK SKA REGIONAL CENTRE
CO-CHAIR SKA-VLBI SCIENCE WORKING GROUP

SFXC workshop 2025 – 23/09/2025

What is the Square Kilometre Array

- One observatory, two telescopes, three sites

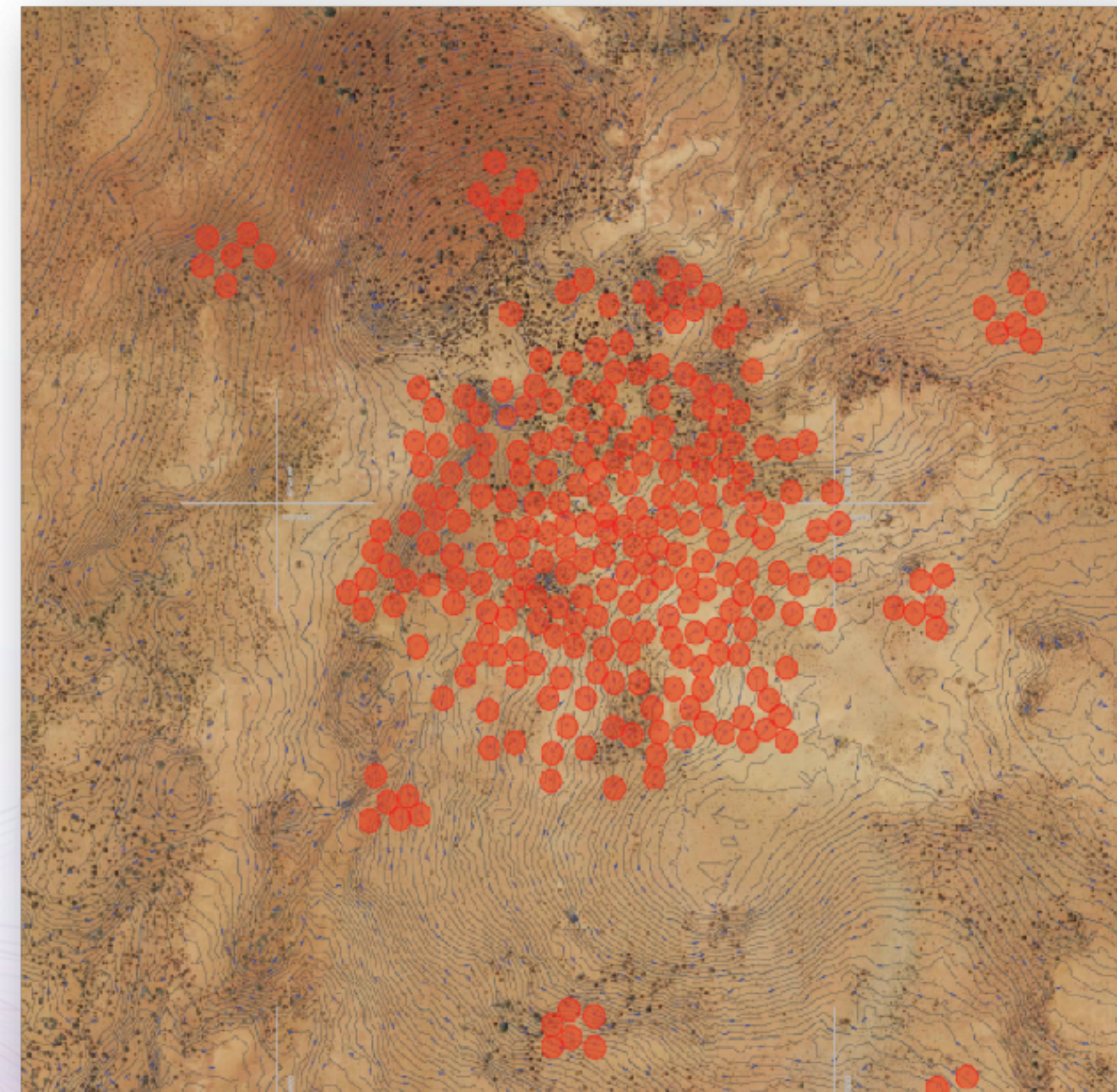
SKA1-MID - 133 15m SKA dishes and 64 13.5m Meerkat dishes at the Karoo site in South Africa



0.35-15 GHz
150 km
baseline

SKAO HQ - Manchester, UK

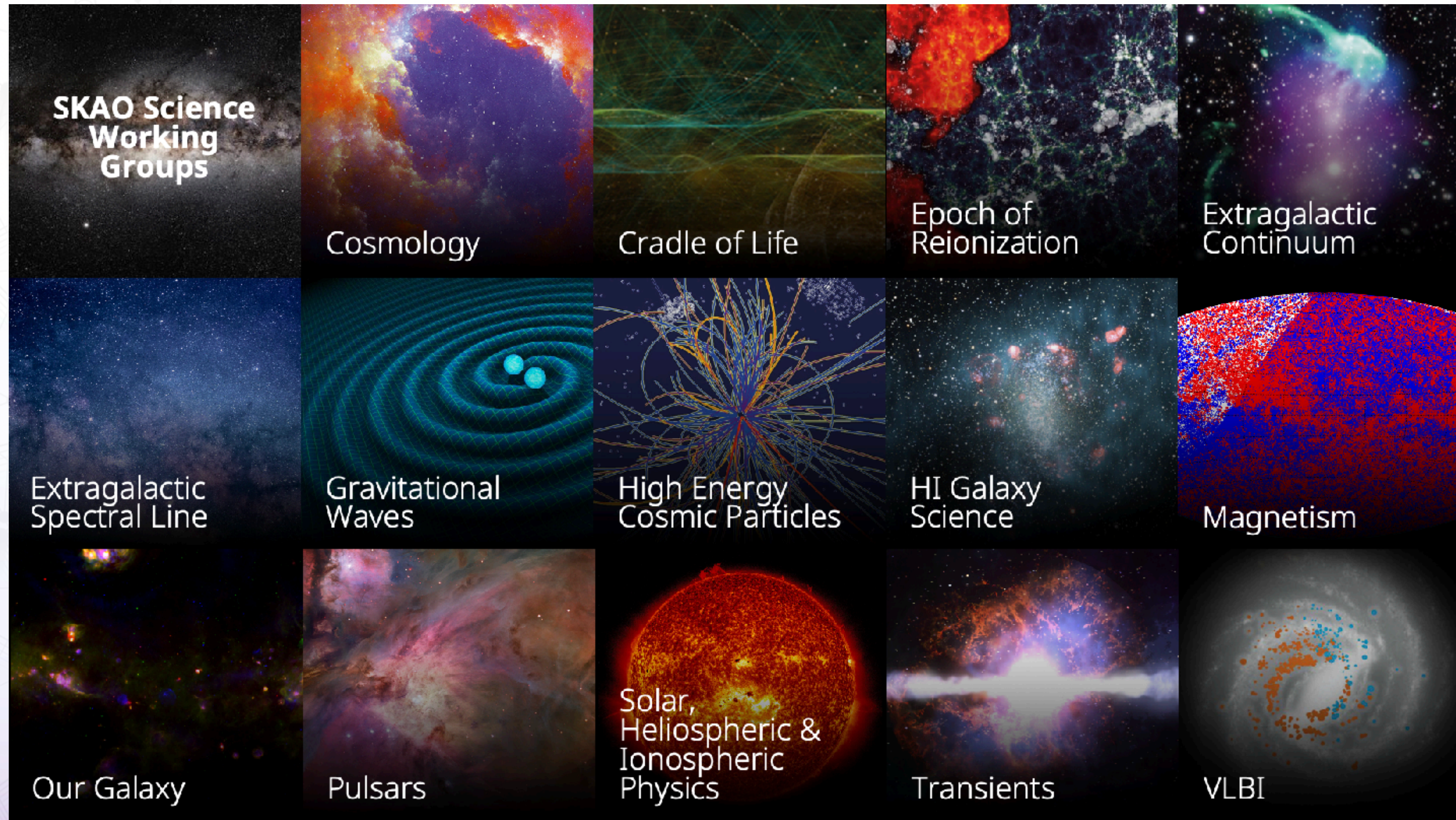
SKA1-LOW - 131,072 dipole antennas distributed across 512 aperture array stations of 256 antennas each. Located in the Murchison Radio-astronomy Observatory, Western Australia.



50-350 MHz
70 km
baseline

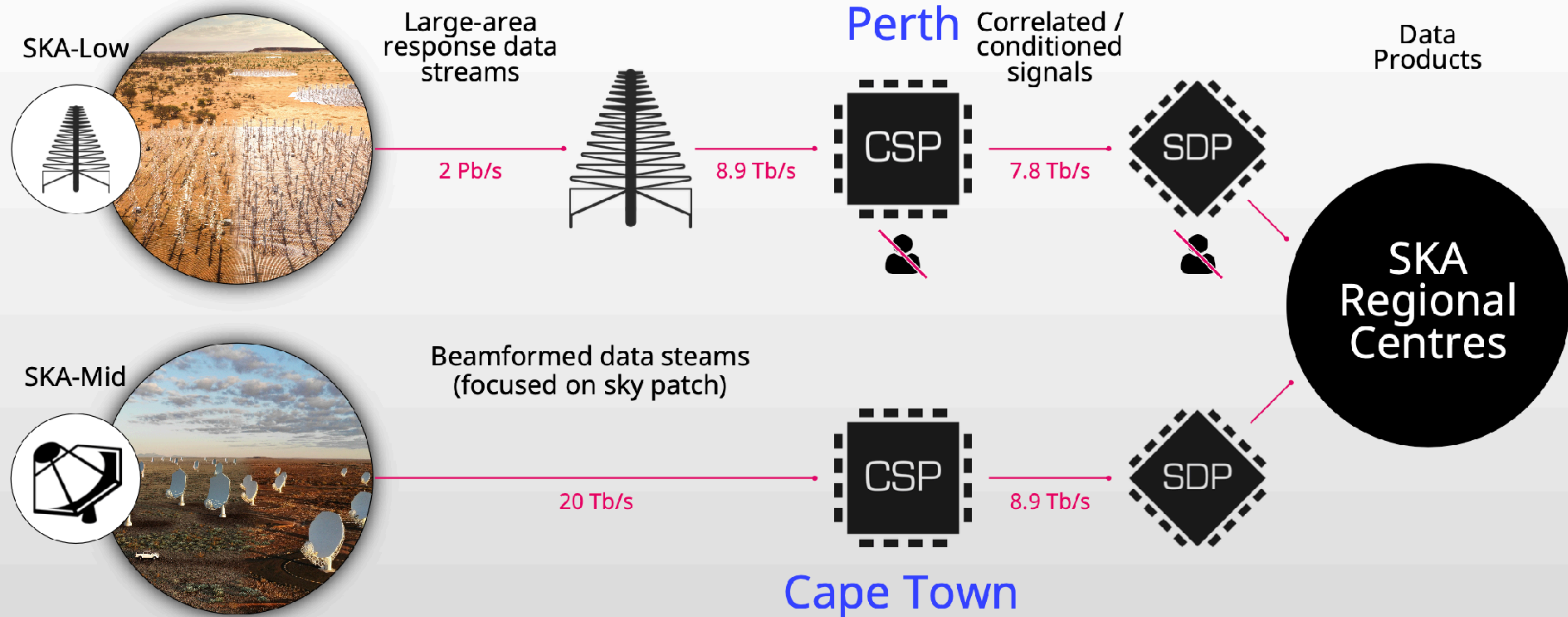
SKAO science drivers

Slide courtesy SKAO/Phil Diamond

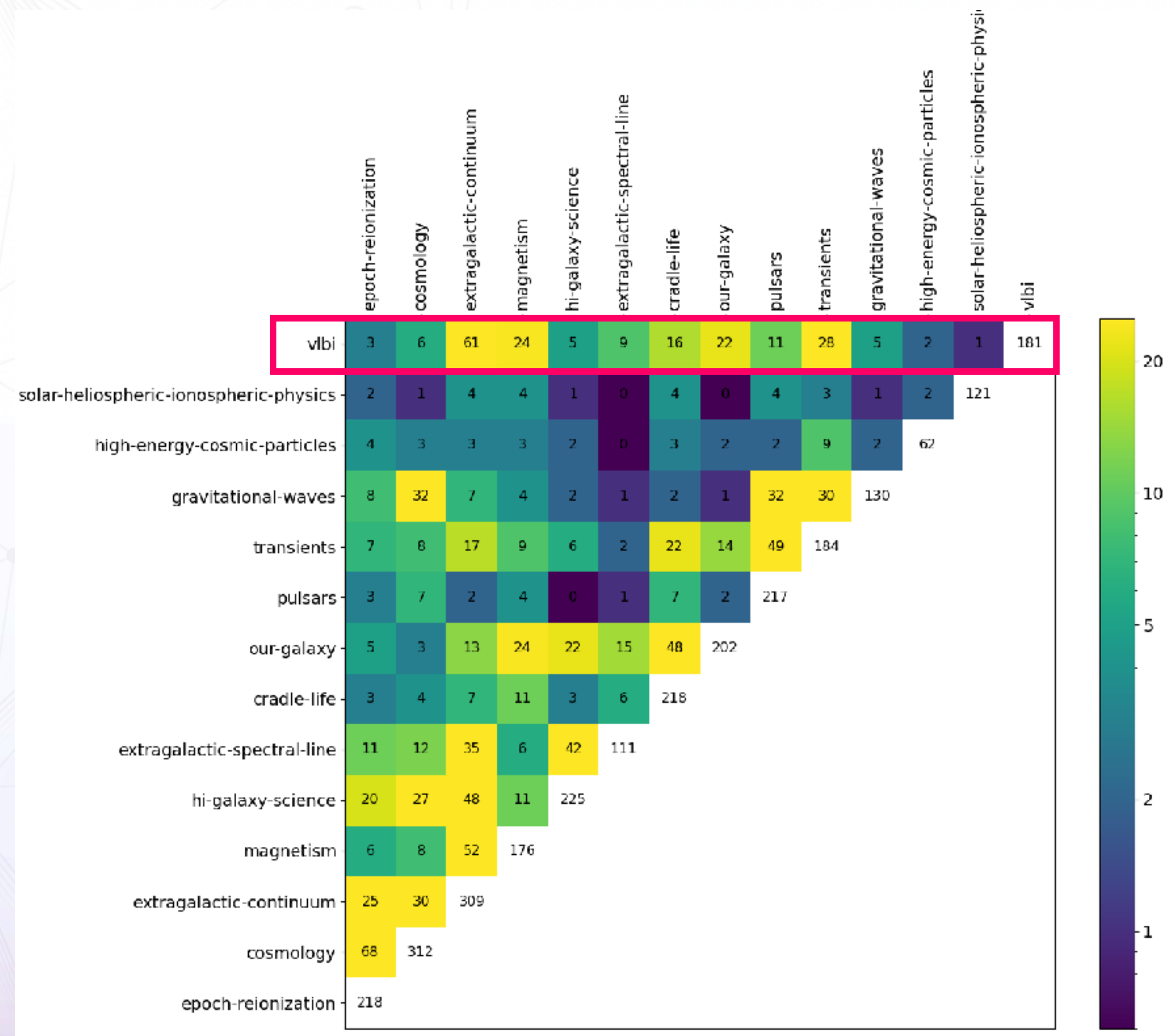


From telescope to user - SRCNet

Slide courtesy SKAO/Phil Diamond

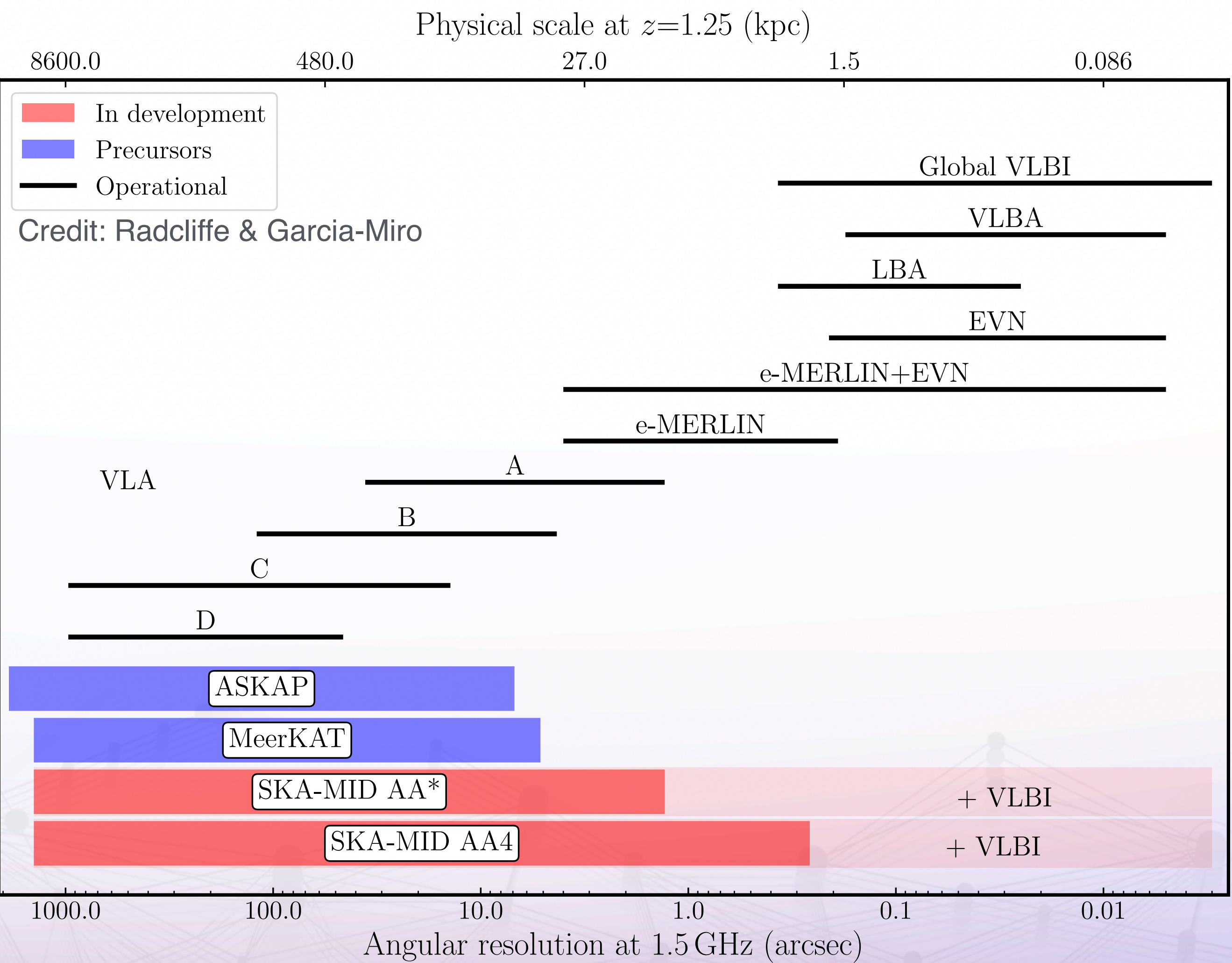


Importance of VLBI

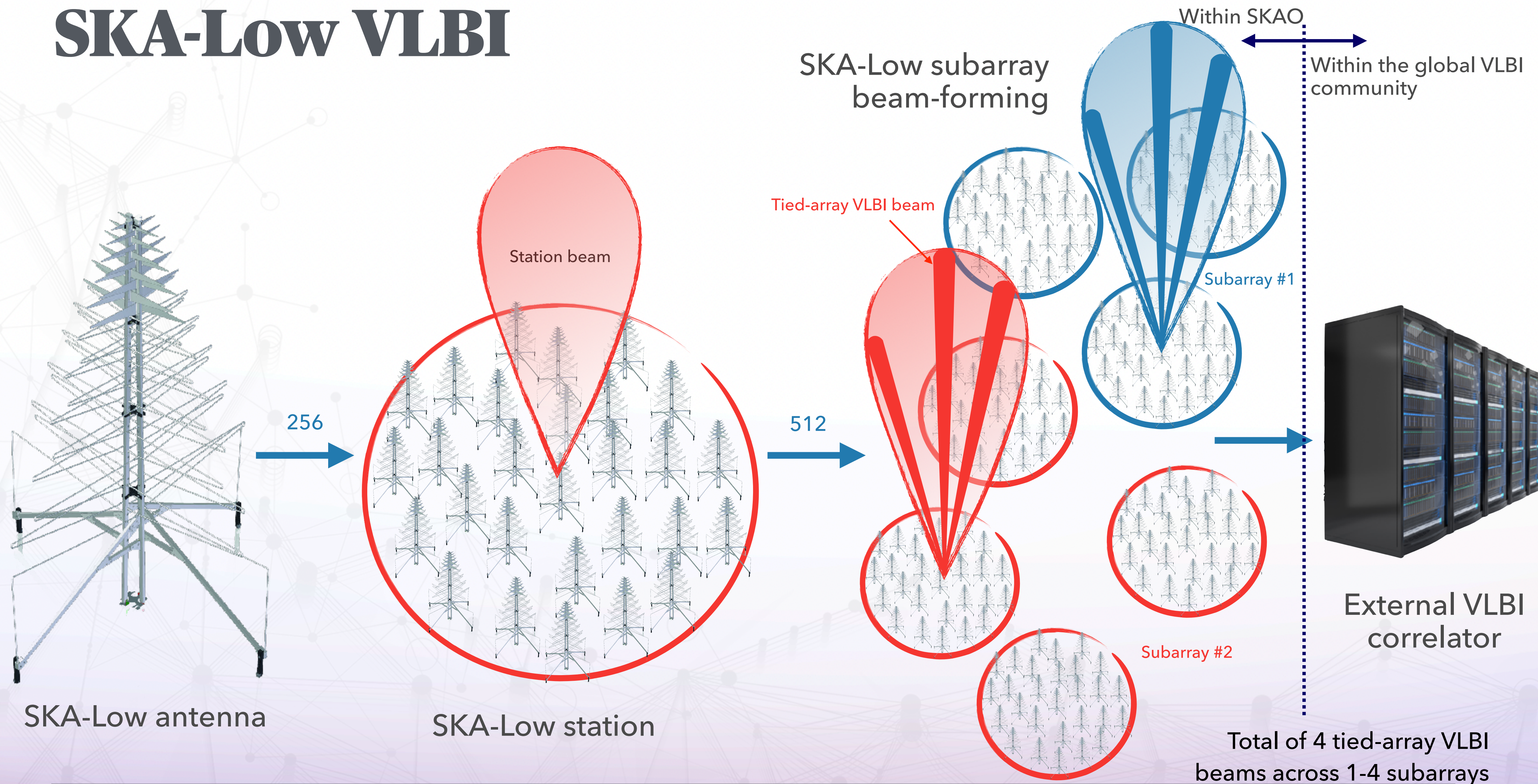


Credit: W. Williams (SKAO)

For an example, see talk by Baczko - Thursday 09:50 P4

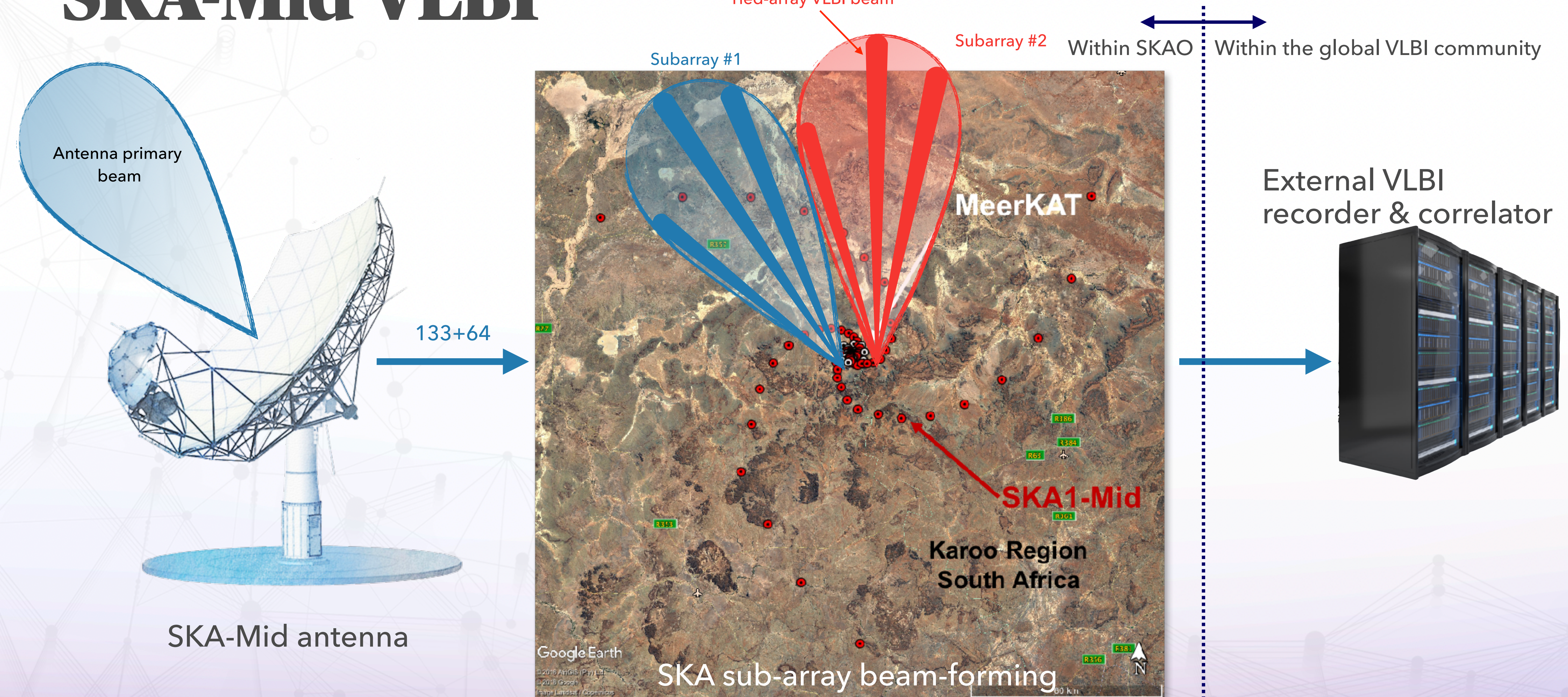


SKA-Low VLBI



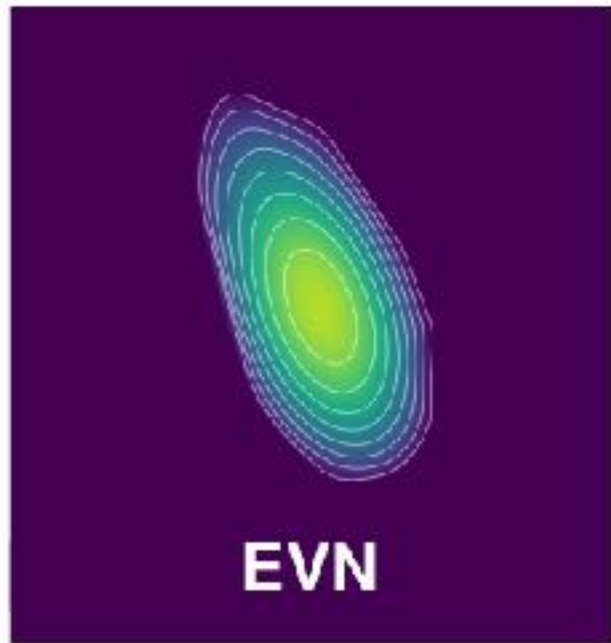
SKA-Mid VLBI

16 subarrays with max 16 tied-array beams per subarray
Limited to a **total** of 46(?) tied-array beams across all subarrays



MeerKAT-VLBI

Illustration: Benito Marcote, JIVE.
Image credits: MeerKAT image ©SARAO; EVN map image ©Paul Boven, JIVE (satellite image: Blue Marble Next Generation, courtesy of NASA Visible Earth).



Summary

- Very Long Baseline Interferometry (VLBI) produces some of the highest angular resolution images possible which are currently **unobtainable** with the SKAO.
- It has key applications in many areas, including galaxy evolution, cosmology, jet physics, star-formation, astrometry, geodesy, transients and much more.
- SKAO will provide a boost in sensitivity in the Southern Hemisphere, especially when combined with the new and upcoming VLBI telescopes across the world.
- Lots of work still to be done to make SKA-VLBI a reality, more emphasis on SKA-Low needed. Operational models with external arrays, correlation, calibration needs coordination between SKAO and VLBI institutes.

Next up – how we will implement and incorporate SKAO at the correlator.