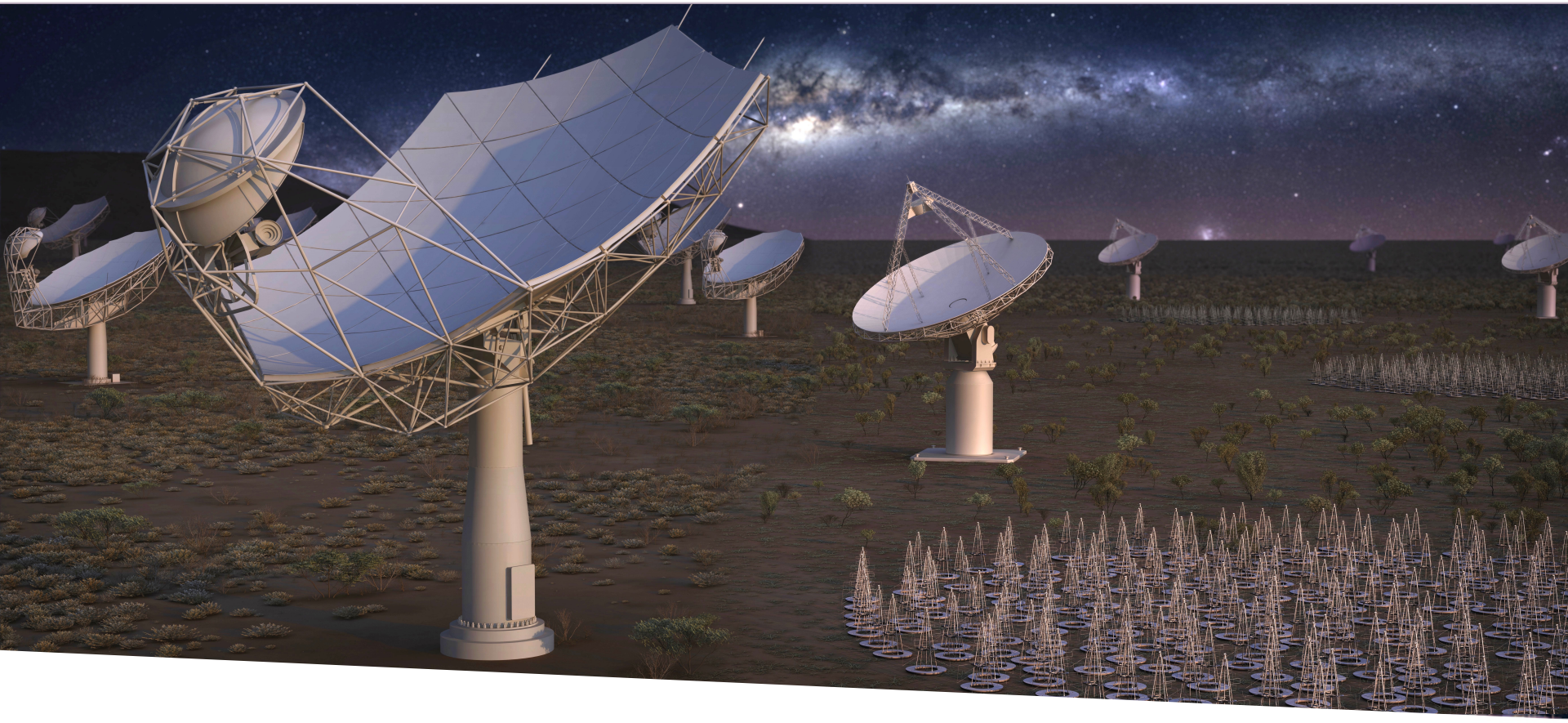
SKA Science Town Hall Wrap-up



Robert Braun, Science Director

19 May 2017

SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

How has preliminary order been determined?

- Minimise negative science impact, using the “High Priority Science Objectives” as indicative measure
  - Wide review and endorsement of the HPSOs
- Maximise straightforward re-instatement potential given additional funding
  - Recognise the anticipated refresh cycle for High Performance Computing and Pulsar Search hardware of 3 – 5 years
  - Recognise that centrally located resources (like the correlator) are more easily upgraded than some distributed resources, particularly with modular design
  - Additional feeds (given mature design) are easier to deploy than new dishes
  - Major infrastructure re-instatement work is both costly and disruptive

SKA Science Assessment Teams: Preliminary Conclusions

1. Impact on EoR/CD of changes to SKA1-Low maximum baseline length
   - Resources in place for effective assessment
   - Early indications may suggest that distinctions between B_{Max} = 65, 50 and 40 km are not extreme
2. Required timing accuracy to enable successful precision pulsar timing science
   - Clock precision (~4 ns) and redundancy for MID are vital
   - LOW requirements can likely be relaxed
3. Impact of SKA-Low antenna optimised frequency coverage
   - Major capability loss if low performance above 200 MHz
   - Biggest hits to Pulsar surveys (MSP yield), but also EoR tail, Solar, and continuum imaging (particularly in combination with a B_{Max} reduction!)

SWG/FG Preliminary Assessments

- Cosmology
  - Some concerns/questions over HPC reductions
  - Some risk to weak lensing from B_{Max} MID
  - Risk of “red-shift desert” if LOW frequency coverage reduced
- Cradle of Life
  - Concern over high resolution performance from B_{Max} MID
  - Significant concern over double hit to Band 5 (feed number plus BW)
- Epoch of Reionisation
  - Great concern over any reduction in core sensitivity
- Extragalactic Continuum
  - Concern over B_{Max} LOW, particularly in combination with frequency coverage
  - Significant concern over double hit to Band 5 (feed number plus BW)
- Extragalactic Spectral Line
  - Significant concern over double hit to Band 5 (feed number plus BW)
  - Question of how best to distribute a reduced initial Band 5 feed number deployment. Winners and losers with all options.

SWG/FG Preliminary Assessments

- HI galaxy Science
  - Concern over deepest HPC cuts
  - Concern over MID core cuts and Band 1 cut
- Magnetism
  - Concern over B_{Max} LOW, in combination with frequency coverage and BW
  - Concern over triple hit to Band 5 (feed number, plus BW, plus core vs arms)
  - Concern over LOW/MID core cuts
  - Concern over HPC and commensality
- Our Galaxy
  - Some concern over deep HPC cuts
  - Concern over triple hit to Band 5 (feed number plus BW, plus core vs arms)
- Pulsars
  - Serious concern over deep PSS cuts for both MID and LOW
  - Concern over Band 5 deployment only in arms
  - Concern over MSP yield for LOW antenna frequency range

SWG/FG Preliminary Assessments

- Solar, Heliospheric, Ionospheric
  - Concern over LOW frequency coverage or BW cuts
- Transients
  - Concern over Band 1 loss (FRB yield), Band 5 loss (high optical depth, angular resolution)
  - Some concern over PSS capabilities (beams, DMs)
  - Some concern over HPC and fast imaging pipeline
- High Energy Cosmic Particles
  - Serious concern over analogue BF
  - Concern over LOW core reduction, BW
- VLBI
  - Serious concern over Band 5 sensitivity for arms vs core deployment

Emerging Areas of Consensus/Contention

- Double hit to MID Band 5 (from feed number and BW) may be excessive
  - Explore methods of mitigation
- Double hit to LOW θ_{Min} (from B_{Max} and frequency performance) may be excessive
  - Explore methods of mitigation
- Need for careful consideration of optimal placement of any partial Band 5 feed deployment
  - Wide consultation needed to insure all issues taken into account
- Concern regarding deep PSS cuts
  - Explore prospects for mitigation

Next Steps

- Based on Town Hall input, SKAO critically reassess and consider adjustment of cost control measures
- Preliminary written reports from all SATs and SWG/FGs due on 1 June
- May ask Science Review Panel to advise
- Science & Engineering Advisory Committee review (23 June)
- Final written reports from all SATs and SWG/FGs due on 1 July
- Recommendation to SKA Board (19&20 July)
- Your role: engage constructively and widely communicate positive outcomes

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