



SKA SWG Update

Robert Braun, SKAO Science Director

20 July 2021



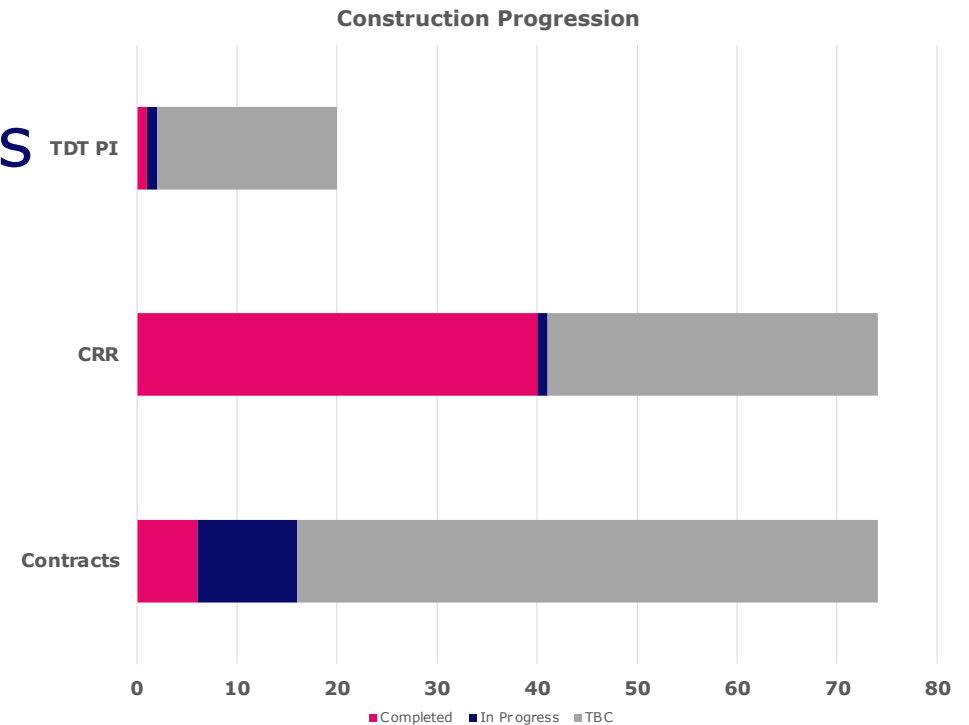
SKA Science Update

- Construction is underway!
- SWG Terms of Reference
- SKA Low Station Layouts
- AOB



Construction Progress

- Successful kick-off to construction contracting!
- Software Program Increments
- Contract Readiness Reviews
- Contracts Awarded



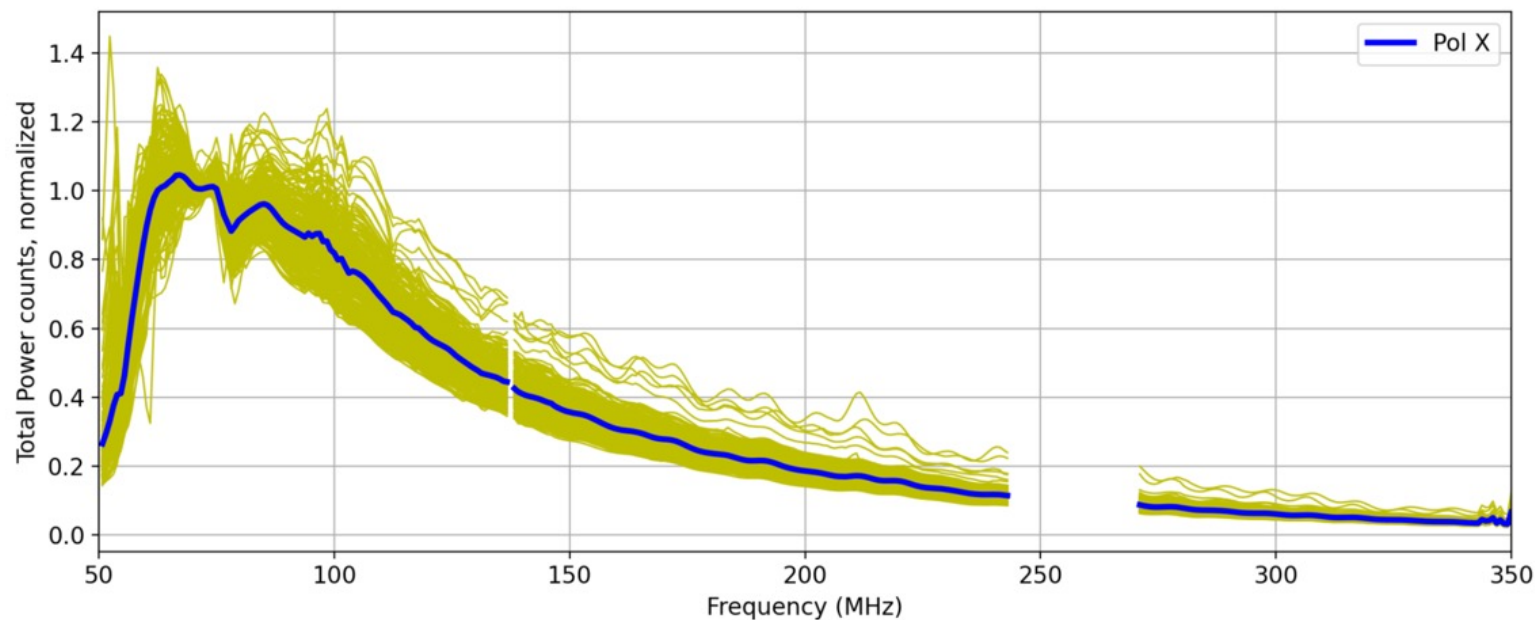
SWG Terms of Reference

- Periodically updated to reflect evolving role of the SWG in progression from design, through construction, commissioning and finally operations
- <https://astronomers.skatelescope.org/wp-content/uploads/2018/11/SWG-ToR-21Nov2018.pdf>
- All SWGs are (and have always been) open to new self-nominations from prospective members who satisfy the criterion of being accredited researchers in a relevant field of astrophysics and we actively encourage new membership
- Please do all you can to stress openness and promote diversity in all its forms within the SWG membership



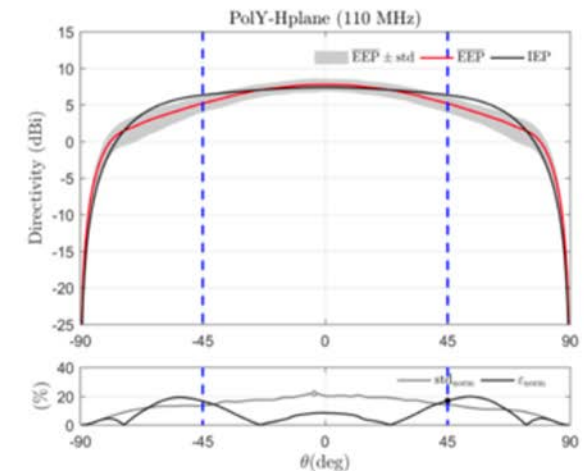
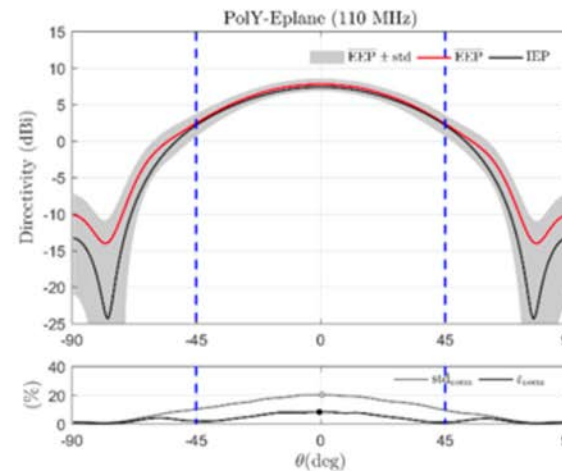
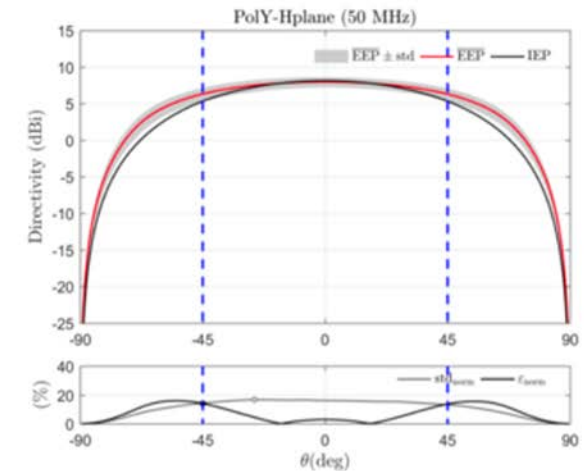
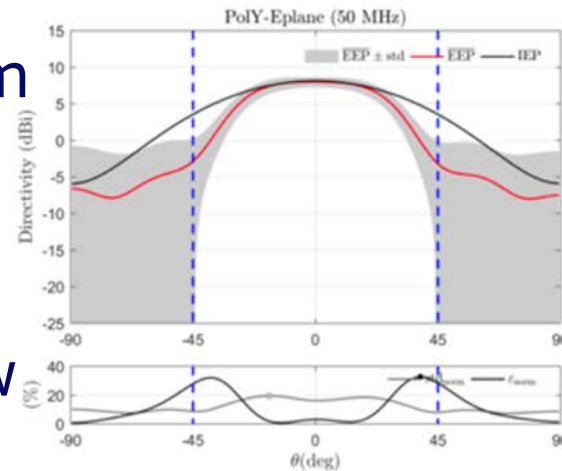
SKA Low Station Layouts

- Current pseudo-random layouts used for AAVS stations showing resonance issues at 77 (and 55) MHz due to proximity of nearby antennas (R. Subrahmanyam, April 2021)
- Concern since global Cosmic Dawn signature near 78 MHz



SKA Low Station Layouts

- Current pseudo-random layouts used for AAVS stations showing great diversity of embedded element patterns below 100MHz (SKA-TEL-SKO-0001099, P. Bolli et al., April 2020)
- Possible complication for station calibration

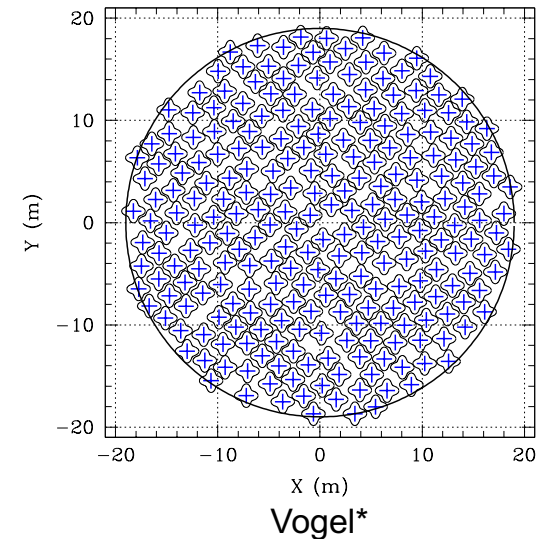
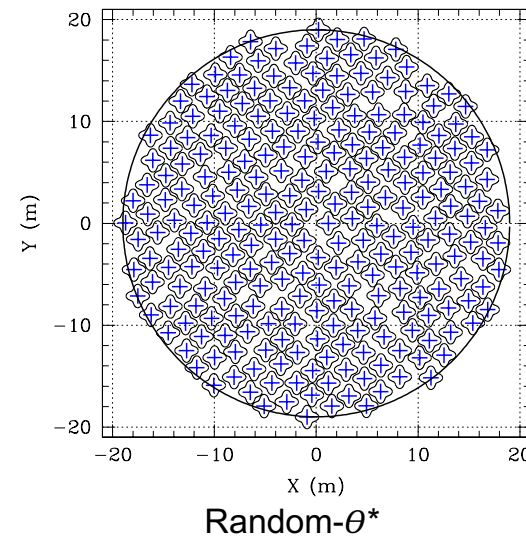
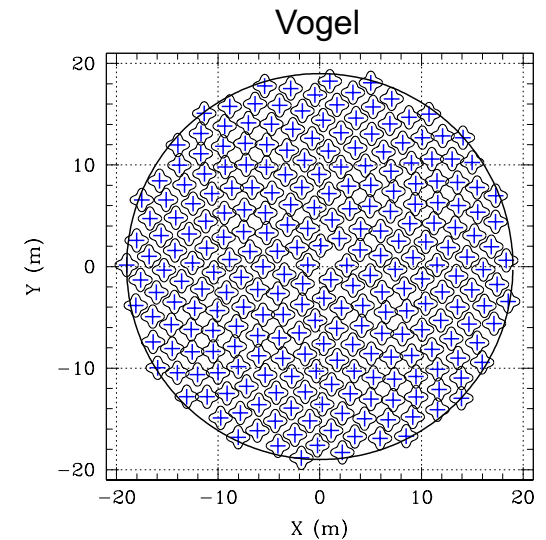
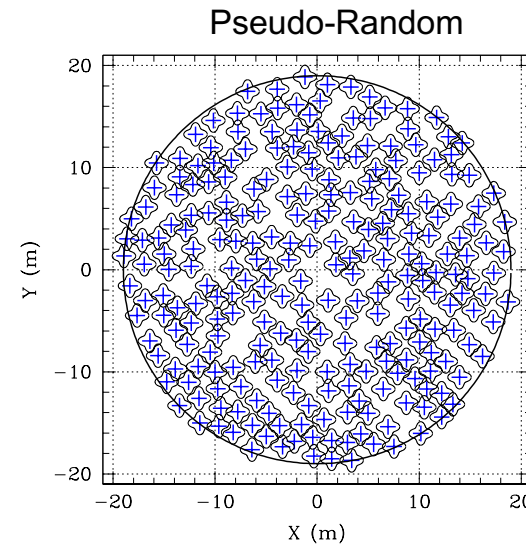


SKA Low Station Layouts

- Exploration of alternate station layouts underway
- Vogel “sunflower” layout is appealing
- Defined by uniform areal density and maximal azimuthal diversity for all n

$$r = c\sqrt{n}$$

$$\theta = n \times (3 - \sqrt{5}) \times 180^\circ$$

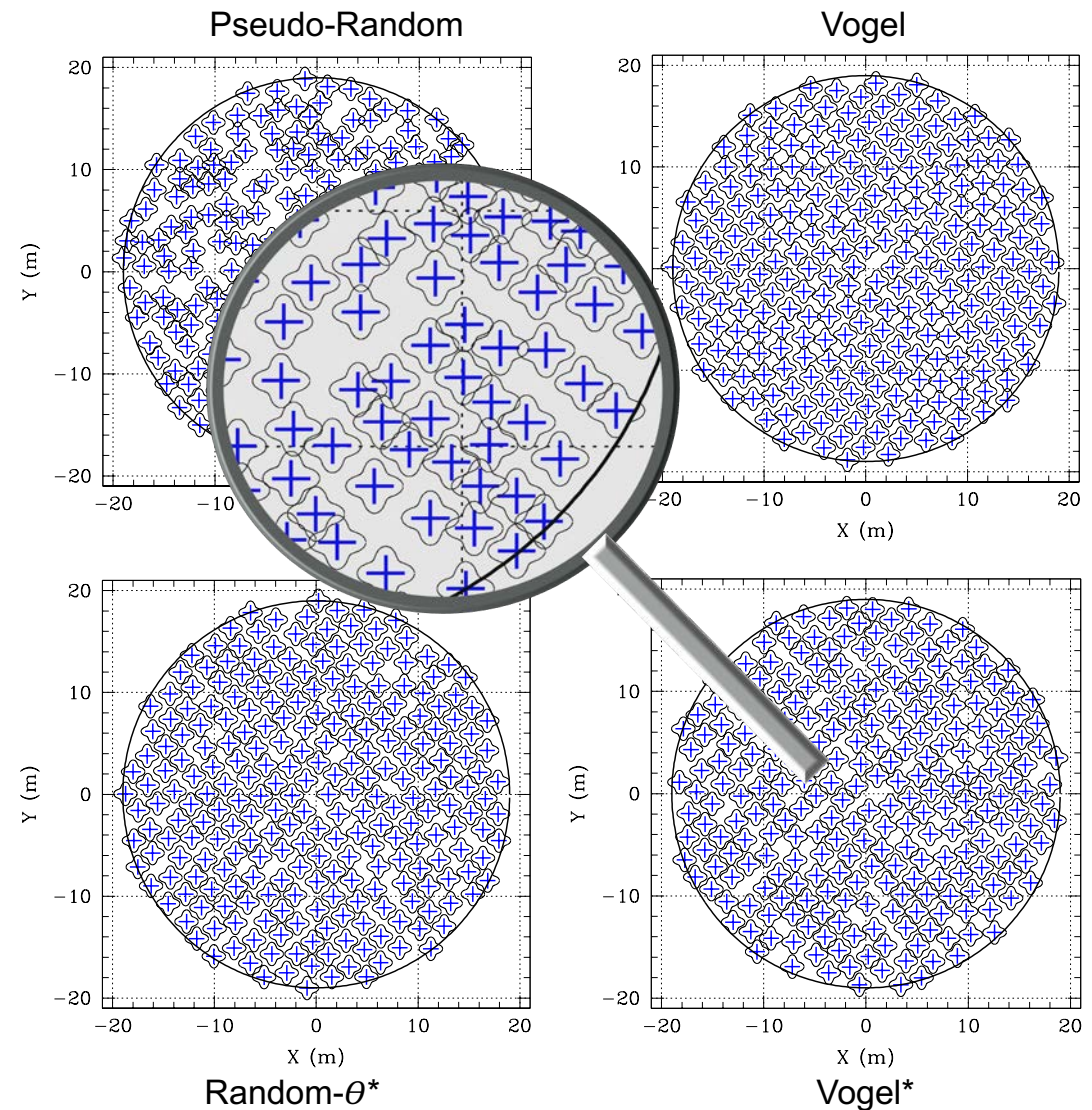


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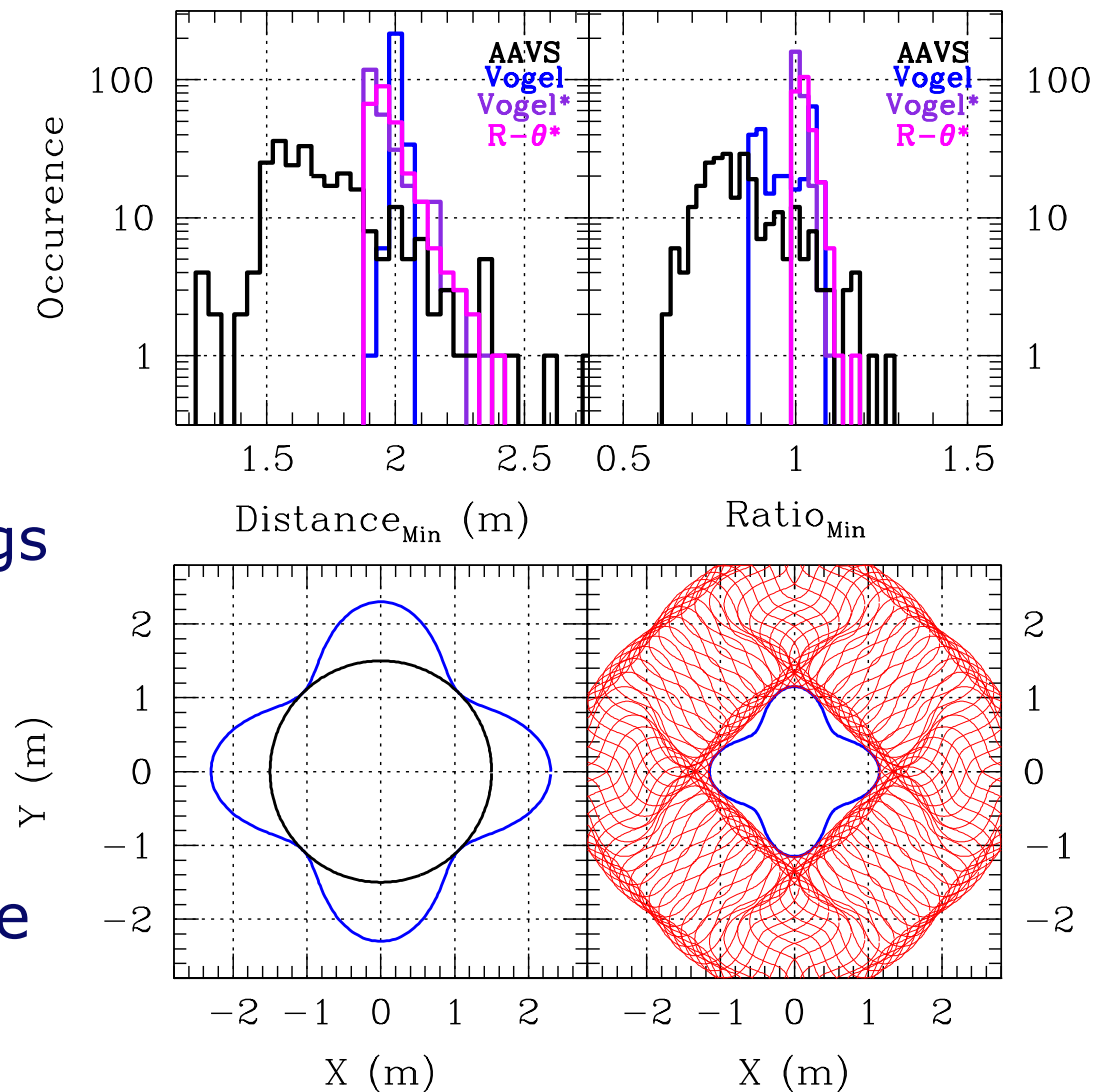
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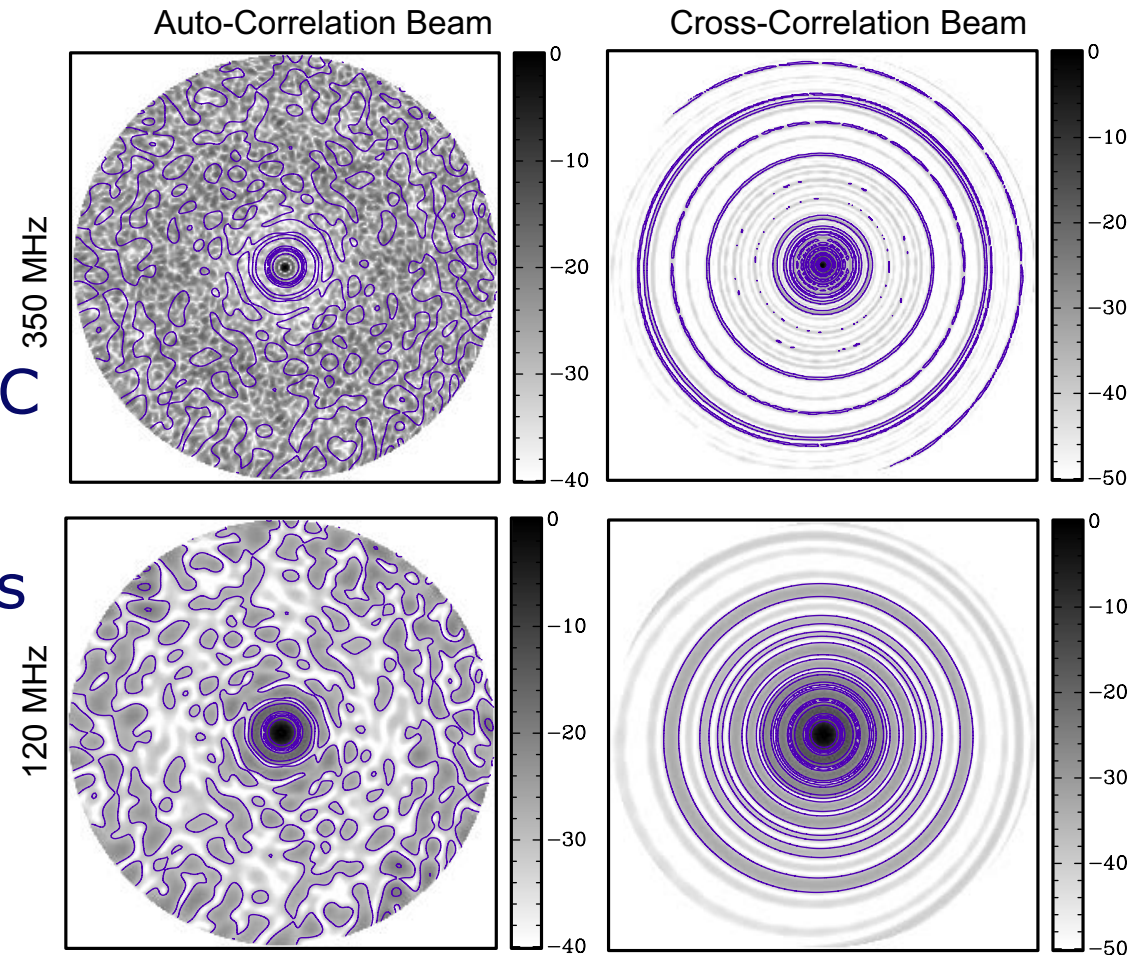
SKA Low Station Layouts

- Exploration of alternate station layouts underway
- Vogel “sunflower” layout is appealing
- Much larger antenna spacings
- Gives significant adherence to EM-footprint avoidance
- Two other designs: $R-\theta^*$, Vogel* designed for complete EM-footprint avoidance



SKA Low Station Layouts

- Comparison of auto- and cross-correlation station beams
- AAVS has slightly superior AC beam at high ν
- Vogel has superior CC beams at all ν , superior AC at low ν
- Vogel* is slightly degraded from Vogel but still superior to AAVS

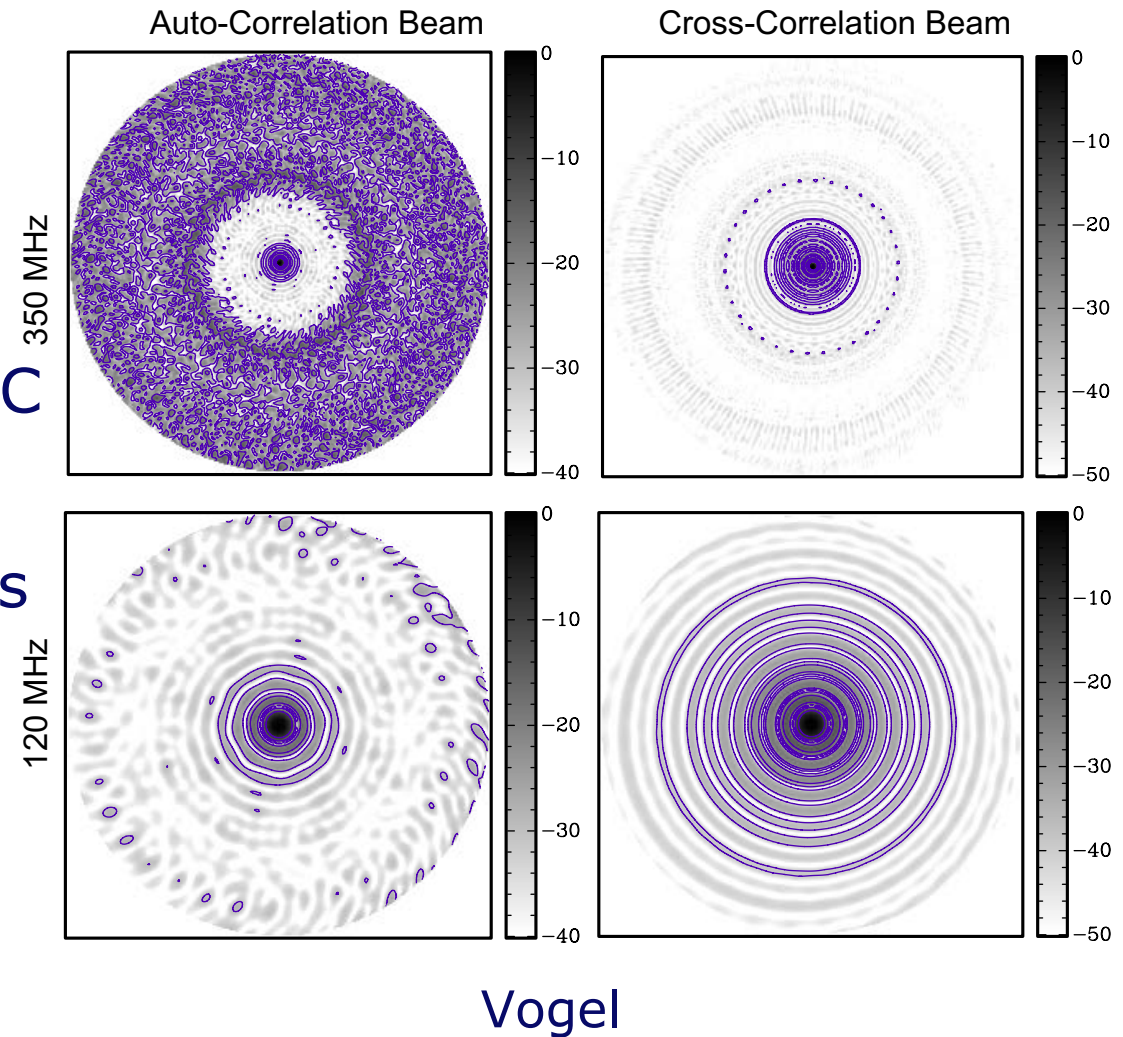


Pseudo-Random



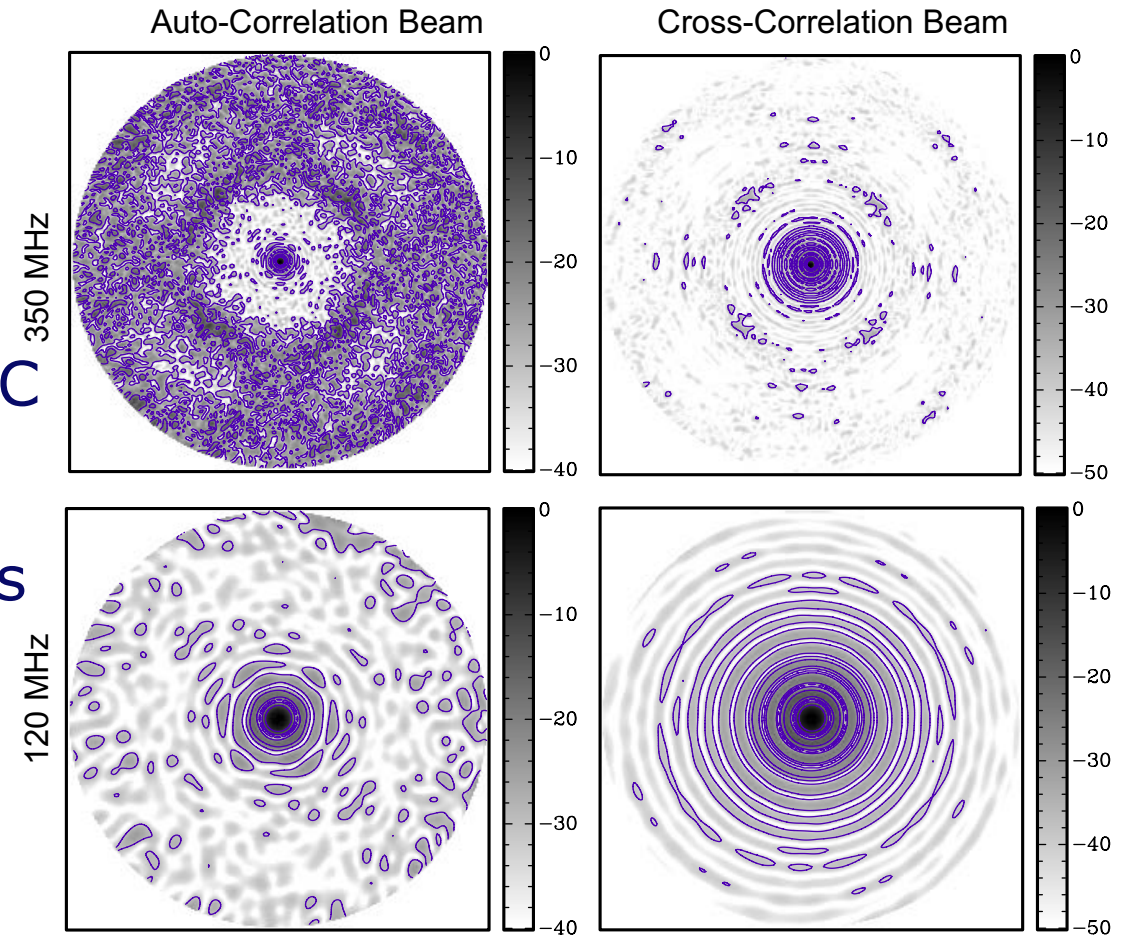
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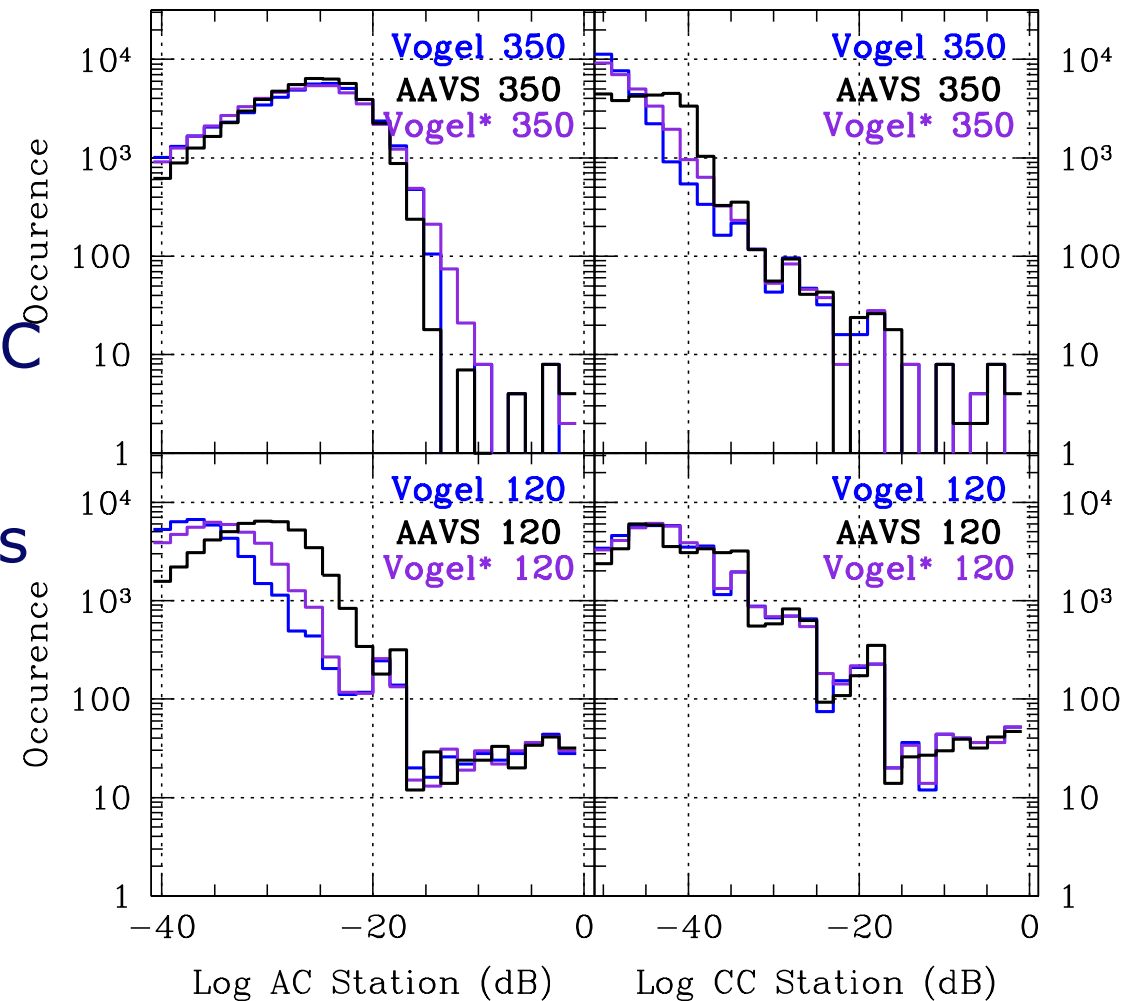


Vogel*



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SKA Low Station Layouts

- EM simulations underway exploring both resonance avoidance and EEP diversity (P. Bolli, 2021)
- Early indications are encouraging
- Engineering Change Proposal will follow ...



Any Other Business

- ...???



Thank you

*We recognise and acknowledge the
Indigenous peoples and cultures that have
traditionally lived on the lands on which
our facilities are located.*



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