



# SKA SWG Update

Robert Braun, SKAO Science Director

19 July 2022



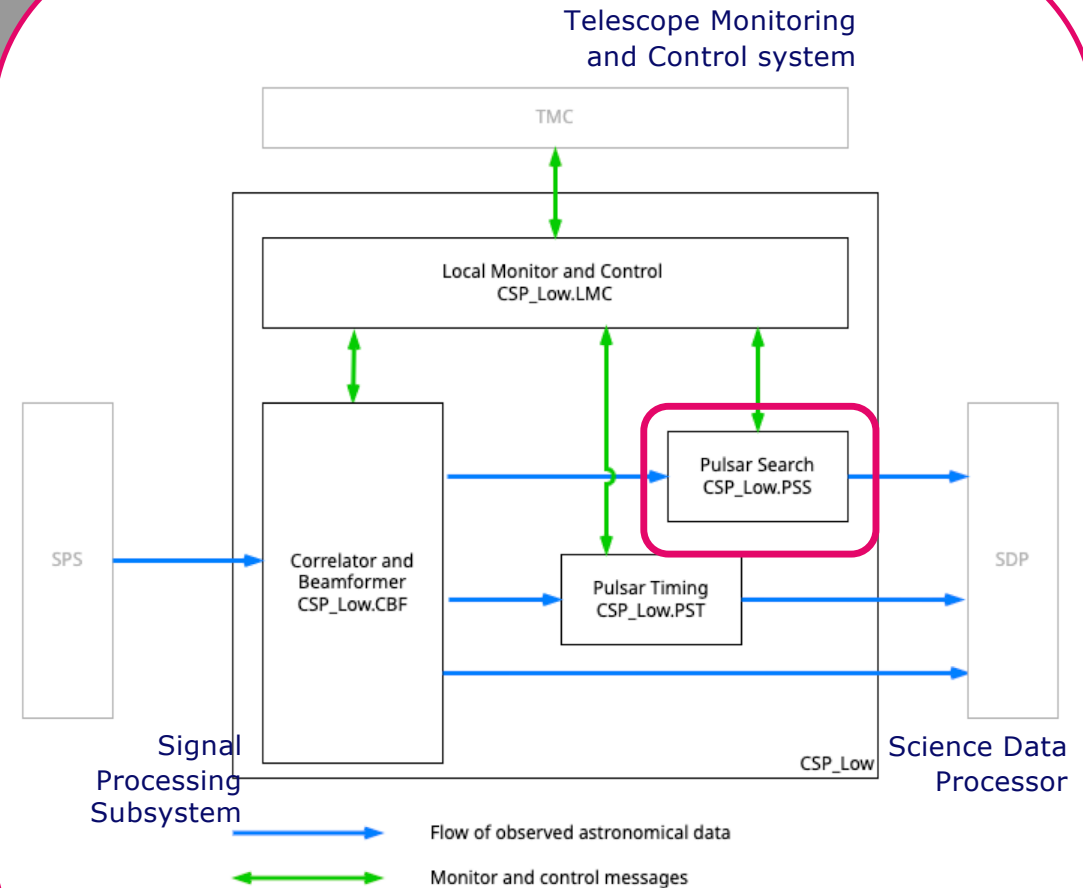
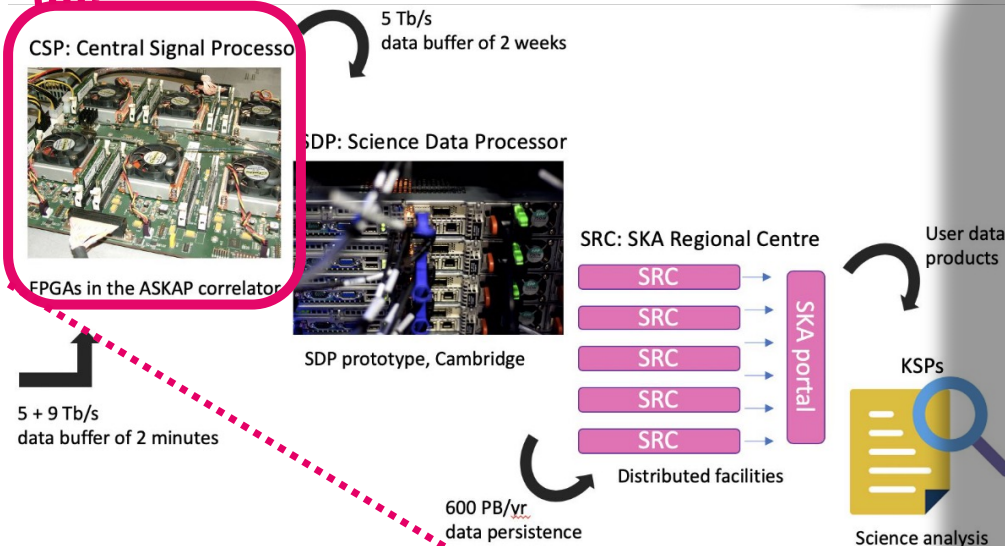
# SKA Science Update

- New SKAO Scientist
  - Welcome to Wendy Williams!
- Pulsar Search Sub-element Architecture Review (Philippa)
- SKA-Low Layouts and Antenna Orientation
- AOB





# Pulsar Search Sub-element (PSS) *architecture review*

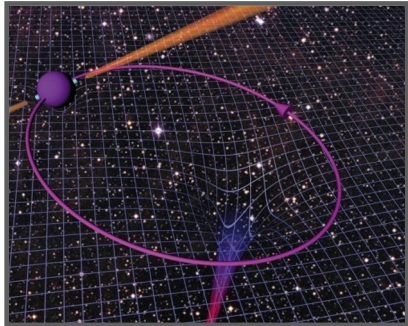


## Central Signal Processor

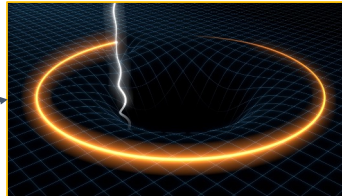
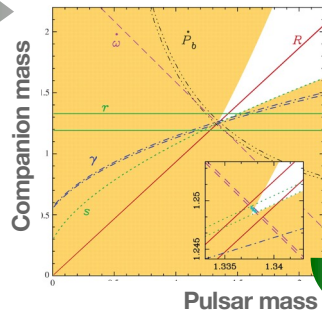


# High Priority Science facilitated by the PSS

Discovery of highly accelerated pulsar binaries:  
e.g. pulsar-black hole binary



Subsequent pulsar timing will allow us  
to test gravity theories to their limit



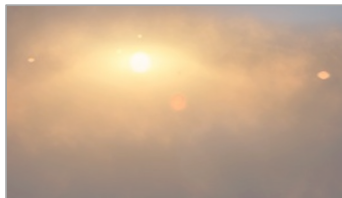
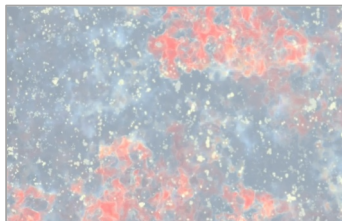
Strong-field tests of gravity using pulsars and  
black holes



Galaxy evolution,  
cosmology and dark  
energy



The origin and  
evolution of cosmic  
magnetism



Transient detection: e.g. Fast  
Radio Bursts (FRBs),  
Rotating Radio Transients

(RRATs)



Probing



The cradle of life

Flexible design to enable  
exploration of the  
unknown

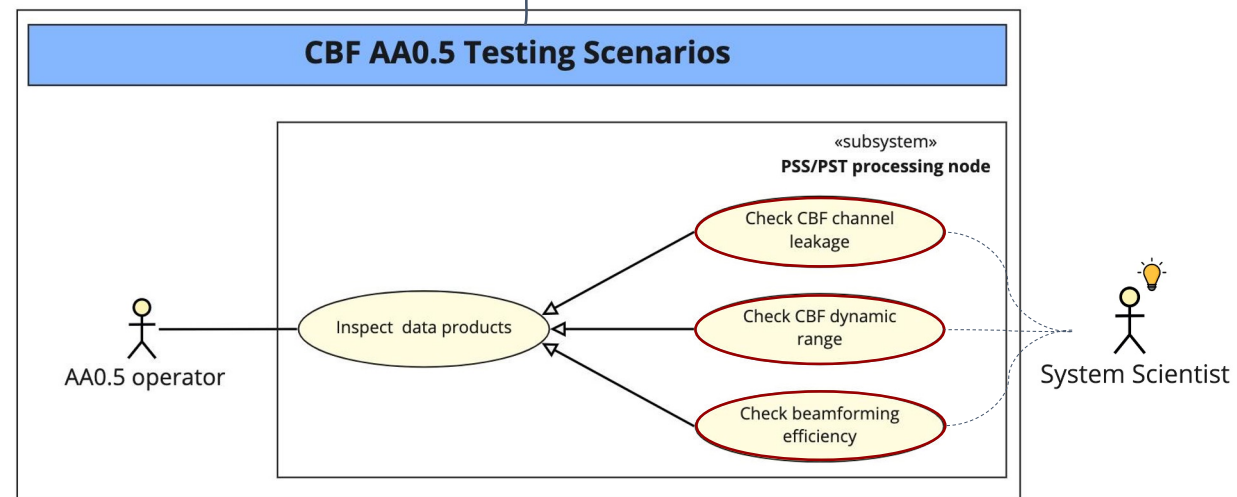
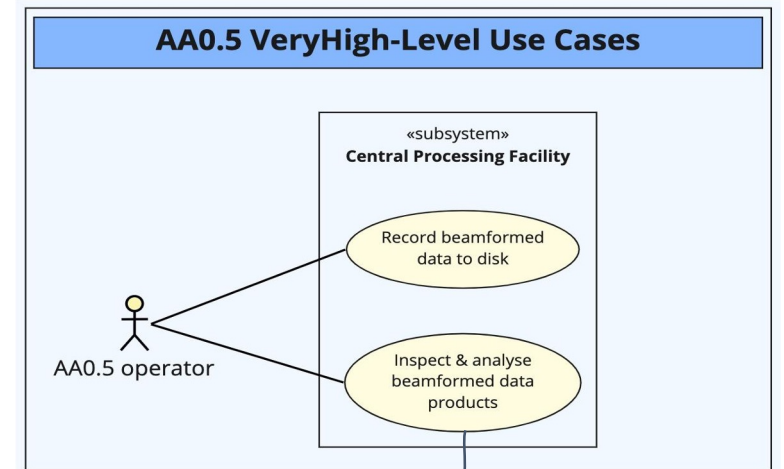
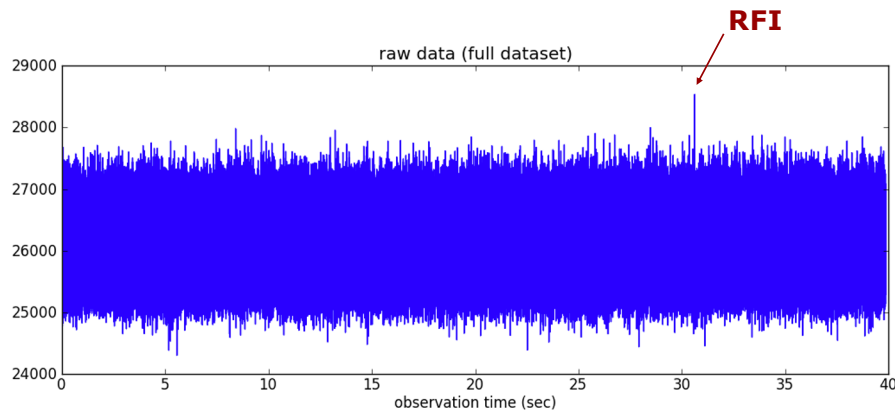




# The PSS role in SKA commissioning

PSS is critical to the science goals of the telescope, but it is also a powerful tool for testing and verifying telescope functionality in commissioning:

- **Verify beam-forming capabilities** of the telescope at AA0.5–AA1
- **Test telescope performance and low-level RFI environment with high-precision in the time-domain**, and reveal deleterious artefacts to which other techniques are not sensitive.



# Pulsar Search Sub-element (PSS) architecture review

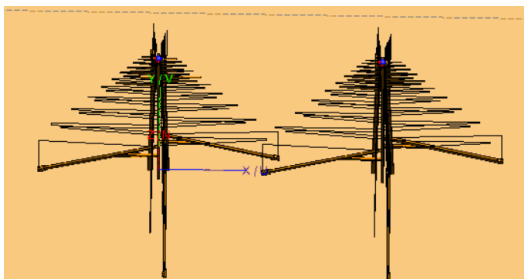
- PSS development follows an iterative 'build-measure-learn' cycle
- Test architectural assumptions at regular intervals and make improvements
- Approaching AA0.5 is an opportunity to evaluate the PSS architecture, last reviewed at SKA Critical Design Review (2019)
- Stakeholders identify some key non-functional aspects of the PSS system for analysis: performance, efficiency, availability, cost, modifiability, system sizing
- The result of this analysis is captured in a list of gaps, trade-offs, risks, opportunities, and issues collected during the review meeting
- Report is being finalised



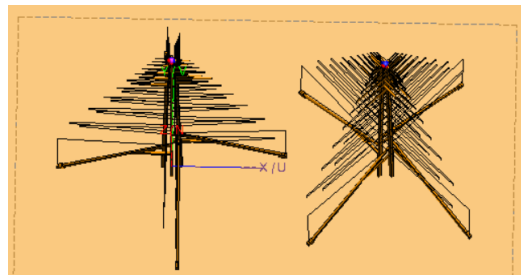


# SKA-Low Station Layouts and Antenna Orientation

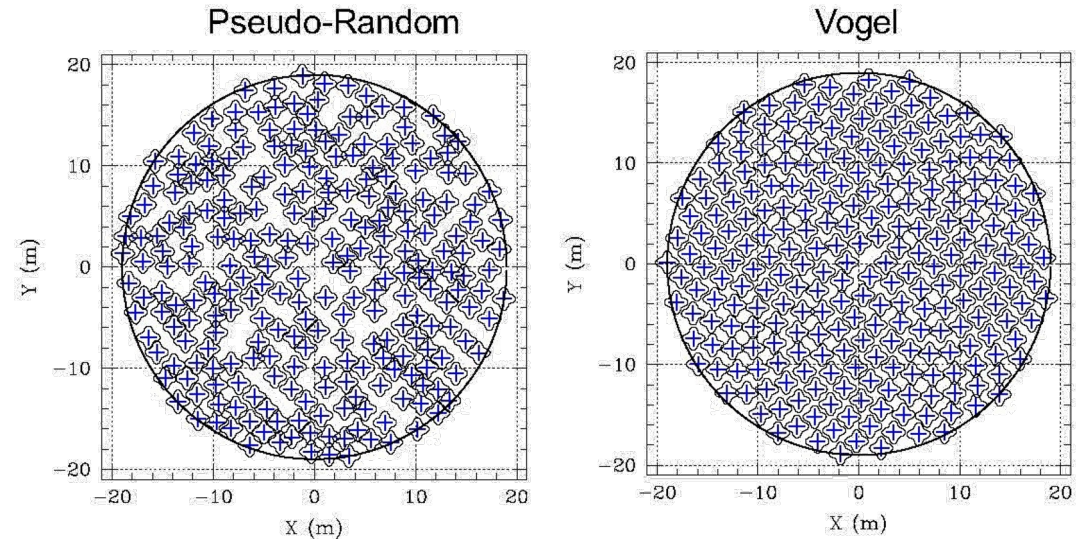
- Recall issue of bandpass resonances and EEP variability of AAVS station layout
- Have begun exploring alternate “Vogel” layout with larger minimum antenna separations (2m rather than 1.5 – 2m)
- Now also exploring antenna orientation diversity



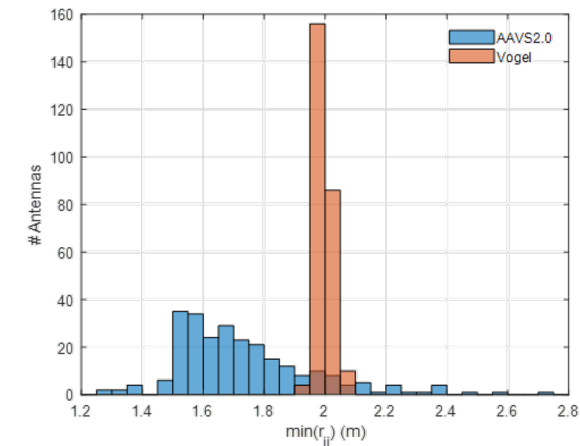
Non-rotated



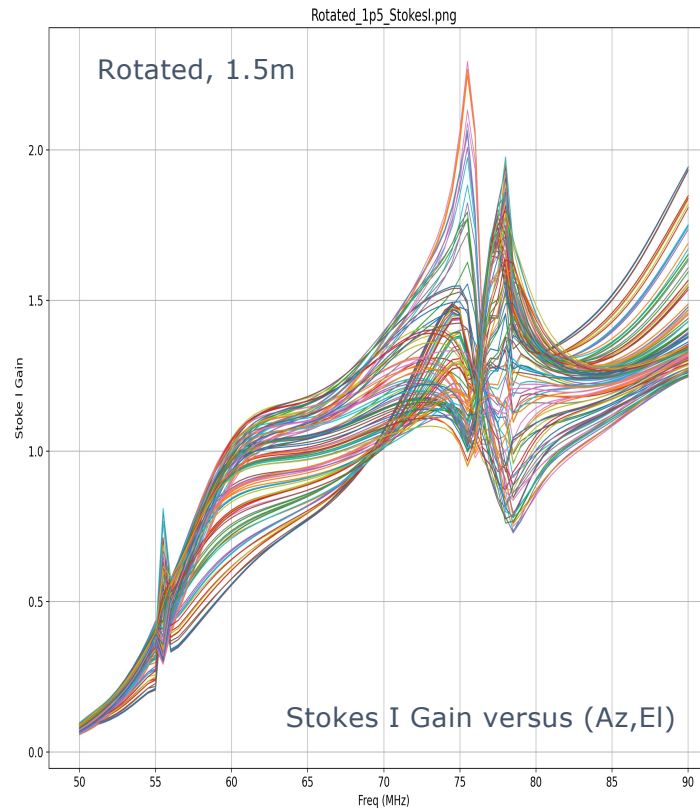
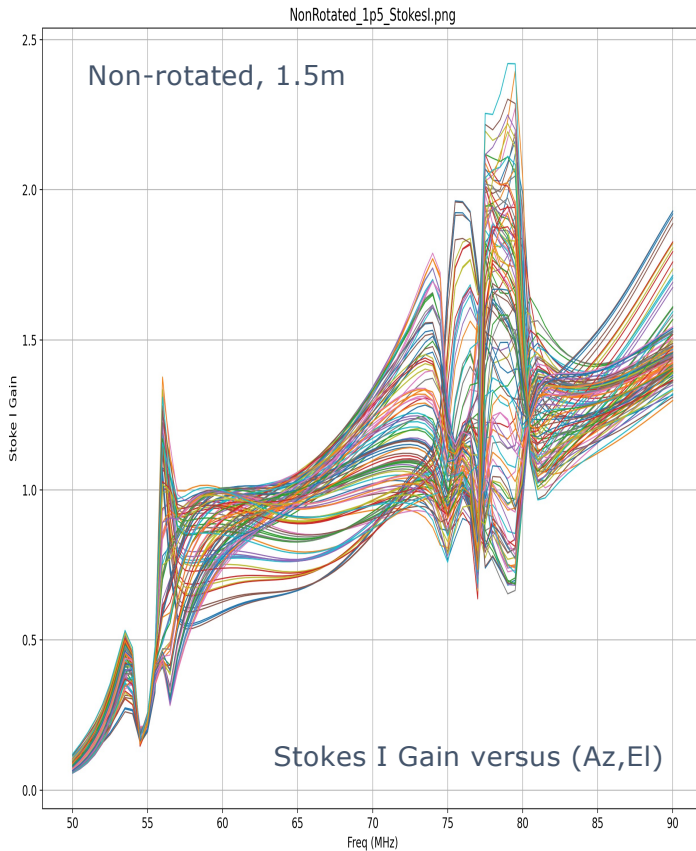
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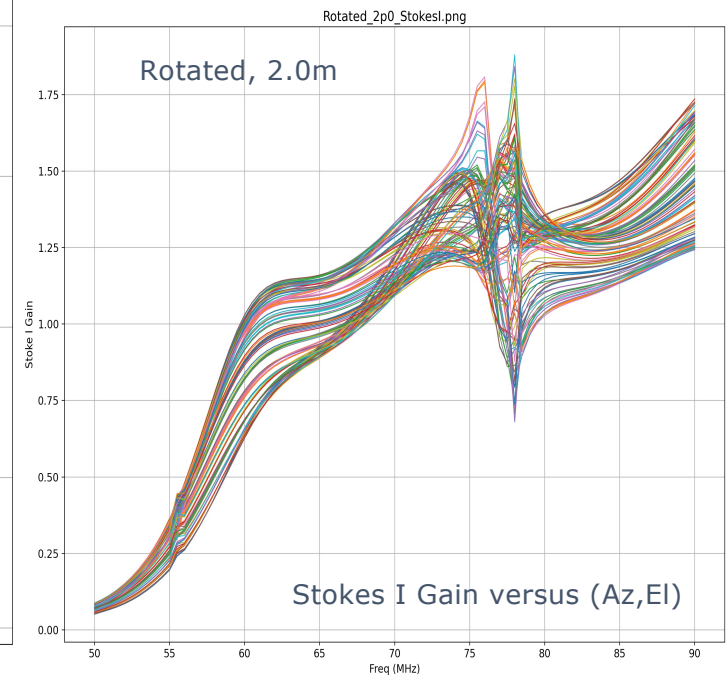
SKA-Low Station Layouts Revisited, SKAO-TEL-0001829



# SKA-Low Station Layouts and Antenna Orientation



*2 Antenna EM Simulations: Pietro Bolli  
Gain versus (Az, El): Ravi Subrahmanyam*



- Both antenna orientation diversity and increased nearest neighbour distance contribute to major improvement of bandpass smoothness and azimuthal polarisation symmetry





# Any Other Business

- Upcoming meetings
  - “Coordinated Surveys of the Southern Sky”, now mid-November (!), details to follow
  - “SKA/ngVLA Science Meeting”, 2023 Q2, venue and dates being finalised now
  - ...
- News from SWG Chairs?



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



[www.skao.int](http://www.skao.int)