



MFAA Architecture & Design Trade-offs

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- Sensitivity (Aeff/Tsys)
- Field of View

Survey Speed

- Cost
- Power



IDFREQUENCY APERTURE ARRAY From science to technical (1)



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IDEFREGUENCY APERTURE ARRAY From science to technical (2)



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IDEFREQUENCY APERTURE ARRAY From science to technical (3)



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MFAA Architectural Concepts

- Antenna type
- Analog tile digital tile
- Analog beamforming all digital
- Centralized distributed architecture
- Sparse/irregular dense/regular





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Architecture demonstrated by ...



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Architecture (to be) demonstrated by ...



LFAA



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Regular Dense Performance



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Indeficiency Aperture ARRAY Irregular Sparse Performance



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Target AAMID Requirements

- Bandwidth: 450-1450 MHz
- (optical) Field of View: > 200 deg² @ 1 GHz
- Bandwidth beam product @ 1 GHz: 500*100 MHz deg²
- A/T > 10,000 m²/K
- Survey speed > $10^{10} \text{ deg}^2 \text{ m}^4/\text{K}^2$







Field of View



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AID-FREQUENCY APERTURE ARRAY







The Astronomers Dream ...









- Assumptions:
 - Processed FoV fixed
 - A/T fixed



Number of MFAA Stations Trade-off

- Large stations
 - small station beams
 - more digital beams required to synthesize the FoV
 - smaller amount of stations to correlate
- Small stations
 - large station beams
 - less digital beams required to synthesize the FoV
 - more stations to correlate
- Interesting fact
 - total data rate from MFAA to correlator is constant





Relations as function of Ns

- MFAA
 - Filterbank: constant
 - Beamformer: ~ Ns⁻¹
- Central Signal Processor
 - Filterbank: constant
 - Correlator: ~ Ns
- Science Data Processor (only driving ones)
 - Gridder: ~ Ns²
 - iFFT: Ns





- "Large FoV is great!", but not for free
 - MFAA trade-offs driven by SKA2 science trade-offs
- MFAA offers lots of flexibility
- Number of stations driven by processing costs





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