

Aperture Array MID frequency Consortium: AAMID

MFAA Science

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SKA: The Survey Machine

- HI in the nearby Universe
 - Mass function, formation and evolution of galaxies
- HI in the distance Universe
 - signature of baryon acoustic oscillations (BAO), telling us the history of accelerated expansion and the nature of Dark Energy
- Detection and identification of nearly all the pulsars in the Galaxy
 - Exotic binary systems to test General Relativity in the strong field
 - Isolated pulsars for use in the Pulsar Timing Array (detection of gravitational waves, possibly a gravitational wave background)
- Transient phenomena such as "Fast Radio Bursts"

- HI survey: Intensity Mapping
 - Sensitivity and sky coverage are much more important than angular resolution.
- Pulsars
 - Sensitivity and sky coverage are most important. Multiple pulsars can be distinguished within a single beam by dynamics
- Transient phenomena such as "Fast Radio Bursts"
 - Nothing replaces Field of View

System Requirements

- Need requirements across the band and not just one number for the whole band (e.g. Field of View)
- Discussion with Mario Santos (UWC) Phil Bull (Oslo → JPL) for cosmology requirements. Now have a definition of requirements as a function of frequency for Cosmology
- Jess Broderick has had discussions with ASTRON colleagues and others (Oxford: Fender, Mooley; Curtin: Anderson).
- Work ongoing: SysReq document led by Andre Gunst

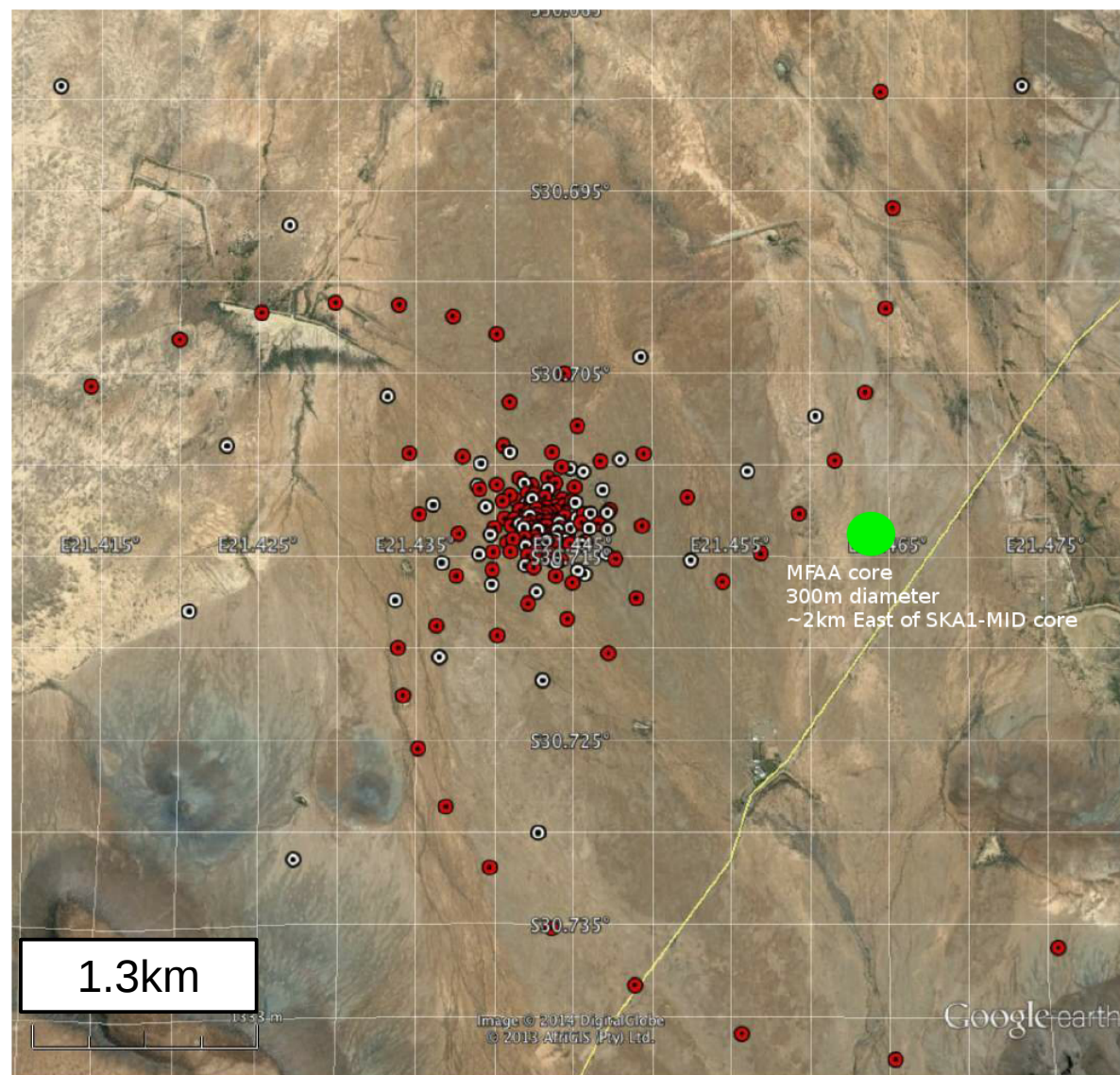
MFAA Demonstrator in Karoo

- Main goal: technical demonstrator
 1. Polarization performance
 2. Operations in Karoo (environment, etc)
 3. Calibration, longish baseline (~few 100 m)
 4. Science operations
- Considerable interest from the science community
 - 3000m² surface is direct competitor to Parkes, but with 100x larger FoV.
 - MFAA demonstrator will be the top FRB instrument
 - Cosmology intensity mapping: lots of interest, especially if we can do short baselines (~few 10's m)

MFAA Architecture

- MFAA will be built on the site which already has SKA1-MID and associated infrastructure
- MFAA architecture proposal should include SKA1-MID and not propose an entirely independent instrument
 - Processing requirements for 100 sq. deg. FoV with high angular resolution (outer stations) is prohibitive.
 - Makes sense to have SKA with MFAA core and dishes in outer stations
- SKA1-MID=3% SKA waiting to be married to MFAA

SKA1-MID inner core with MFAA



MFAA is seen to be too expensive

- Phil Diamond, 10 November 2015, “MFAA is years away from proving cost and power consumption requirements.”
- We have to publish documents which demonstrate otherwise!