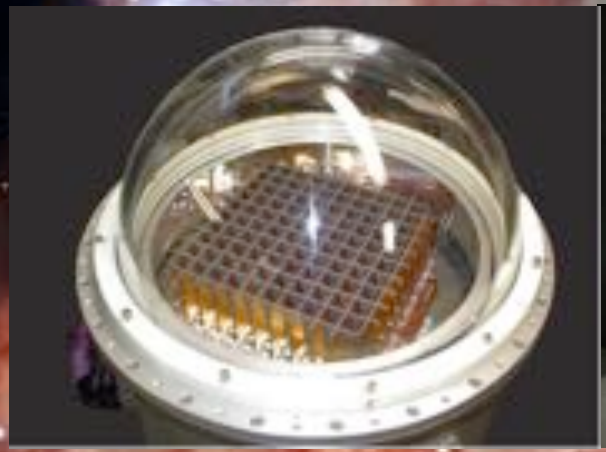

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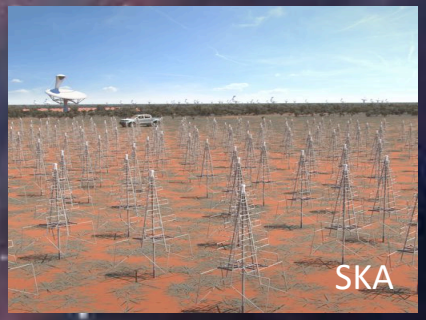
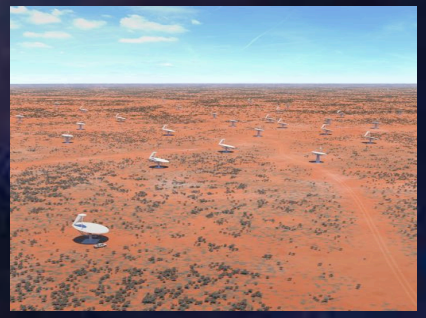
PAFs and the future of radio astronomy


Direttore, INAF-IRA
Head, Section II (Radio Astronomy) INAF Science Directorate





http://www.skatelescope.org

At low frequencies, Tsys dominated by the sky. => Multiplex advantage for FoV is efficiently achieved at low cost.

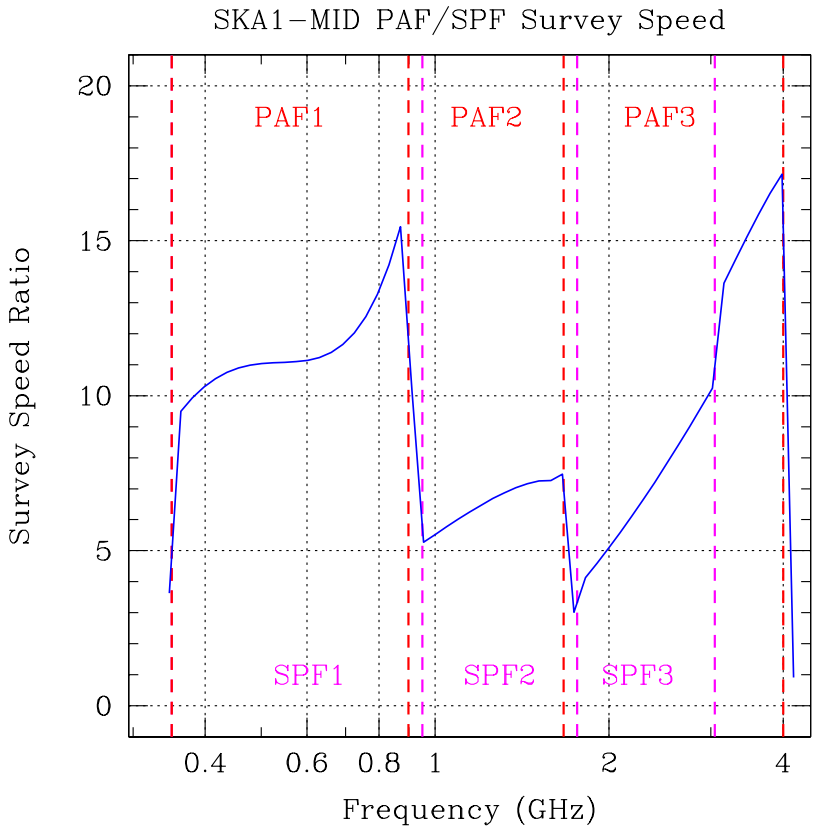
At higher frequencies, not so straight-forward.

Uncooled PAFs need to be attached to large collecting areas for best effect.

- Parkes, Effelsberg, GBT, FAST, SRT etc.
- Good science applications (FRBs, IM, HI surveys etc);
- Good testing/development environment.

Benefits for interferometers less clear at current capabilities. Probably require cooling to be really competitive in long-term (SKA development program – CSIRO et al.)

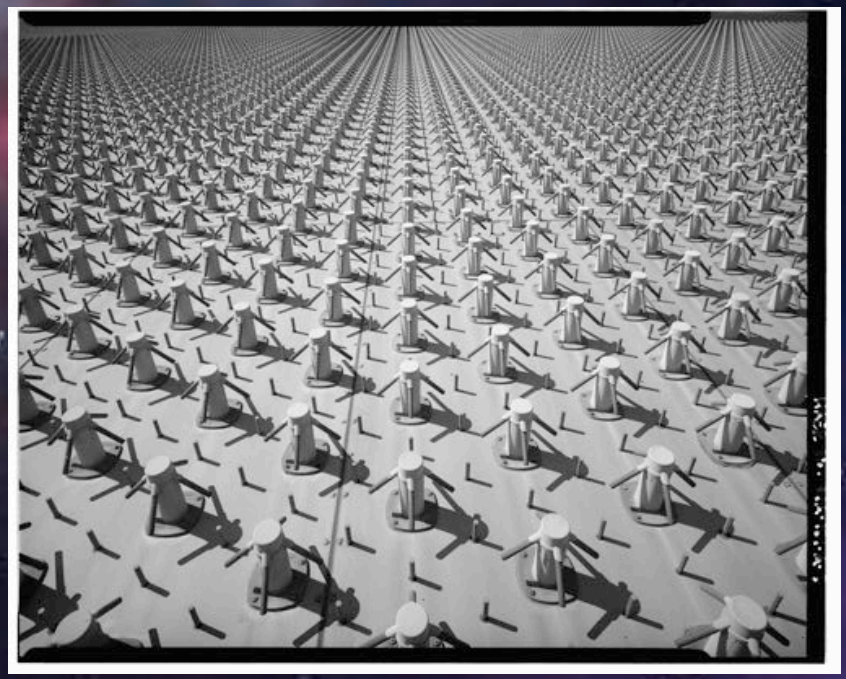
Cooled PAFS require more development, but are probably more tractable at higher frequencies (>2.3 GHz) where the physical packages are smaller.



Robert Braun (SKAO)

EMBRACE (ASTRON and partners)

AN/FPS-120, Alaska (USAF)



SKA Mid Frequency Aperture Array (MFAA) prototypes in South Africa

Summary

- PAFs are an exciting development for radio astronomy in general, with a critical mass of effort being applied around the world;
- The niche(s) for this technology is likely to evolve over time:
  - Frequencies > 500 MHz currently most scientifically effective on large single dishes (e.g. Parkes, GBT, FAST, Effelsberg). Aperture arrays very effective below 500 MHz (e.g. LOFAR/MWA) – will always be the case;
  - PAFs will probably be most effective on interferometers when cooled (perhaps first at higher frequencies) and/or deployed on very large scale interferometers (SKA-mid);
    - APERTIF and ASKAP occupy interesting parts of parameter space, but need to evolve beyond current capabilities to have a long-term impact;
    - An SKA PAF development program, led by CSIRO, will play a major role in that outcome.
  - Ultimate evolution may be to aperture arrays at mid frequencies – many cost and signal processing hurdles to jump first.
- Exciting times ahead. Looking forward to discussion at this meeting!!