# The Case for Aperture Arrays

- The SKA science case is transformational: e.g. EoR; HI for BAOs/DE/ν-mass; Pulsar timing for Gravity
- full SKA collecting area can be delivered with ~250 ~60m diameter AA stations, and operated at affordable costs (Alexander et al. 2010)
- AA astronomical performance enabled by processing power giving ~10 (PAF)-100 (WBSPF) higher survey speeds (BAOs) and widely-separated beams (Pulsar Timing)
- High Dynamic Range capable: unblocked aperture, no moving parts, ionospheric monitoring etc
- Extended parameter space: `exploration of the unknown', plus upgrade paths and industrial

# The Challenges of Aperture Arrays

- Will be limited to ~1.4 GHz by cost scaling as $\nu^{2+\alpha}$ (so dishes needed too)
- Dynamic range and polarization performance being proven by LOFAR/MWA/AAVP
- Trade-offs of sensitivity and dynamic range being simulated: e.g. dense versus sparse debate becoming quantitative

# Aperture Arrays in Phase-1

- Phase-1 must do world-ranked science:
  - Next step EoR requires >10xLOFAR AA-lo, giving a superb general facility
  - Pulsar high precision timing requires dishes; so both technologies needed on site
- Phase-2 is a further step change in science capability: AA-mid enables bulk of SKA science, e.g. history of HI between z~10 and z~0.1 and delivers new transformational science (BAOs, dark energy, neutrino mass etc)
- Modest Phase 1 SKA in SKA-mid AAs can detect same *P(k)* as ASKAP, and provide proof-of-concept for both science and technology