

# A pulsar telescope?

- Science is Basic Physics: GR tests, EoS, GWs
  - Sgr A\* Pulsars: need 1 pixel at 10+ GHz
  - MSP/Exotics Searches: need survey speed
  - Precision Timing: need 1 pixel, good poln, multi freq

*All three need southern sky and big  $A_{\text{eff}}/T_{\text{sys}}$*
- MeerKAT and FAST will be good (but enough?)
- SKA might be great, but given other Key Science Projects, it will take lots of money, time, risk and many compromises...

# Pulsars with the SKA

- SKA pulsar capabilities are highly dependent on its design, and the current one is sub-optimal!
- Data rates and computational demands are huge:
  - Several TB/sec and tens of PFLOPS for beam-forming and real-time searching (this is because of LNSD)
  - That is for only 20% of collecting area in usable core!
- Over-designed for PSRs: don't need high-freqs (>3 GHz), long baselines(?), good image fidelity, ...
- High-precision timing: doesn't need large FoV (only 1 source per beam) but does need *lots* of observing time (is that reasonable to expect?)

# SKA Sensitivity within 1 km

- Phase 1 (WBF / WBF+PAF):
  - 1000 / 550  $\text{m}^2\text{k}^{-1}$  @ 500-5000 MHz, less to 10 GHz
- Phase 2 (WBF / WBF+PAF):
  - 2400 / 1400  $\text{m}^2\text{k}^{-1}$  @ 500-5000 MHz, less to 10 GHz

For reference:

Arecibo: 880  $\text{m}^2\text{k}^{-1}$  < Factor of ~4

GBT: 220  $\text{m}^2\text{k}^{-1}$  < Factor of ~3

Parkes: 80  $\text{m}^2\text{k}^{-1}$

FAST will have a sensitivity ~2x Arecibo...

# Why not build our own?

- If we give up Sgr A\*, we only need 0.3-3 GHz and can use “cheap” antennas
  - Use 2:1 BW receivers with low  $T_{\text{rcvr}}$  (two of them?)
- Two main concepts (two telescopes?):
  - LNSD concept that is maximally compact (ATA-like)
    - Capabilities “expand” w/ time (computing, # dishes)
  - SNLD large (100-300m) but simple antennas (GBT-like, Canadian LAR-like, cylindrical antennas)
    - Use separately or phased
    - Need serious multibeaming for search speed...
- Where do you put it? SKA non-site?
- Non-traditional funding is a possibility