Thoughts, comments, suggestions on SETI with the SKA

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• Requirements cf pulsars:

  – Wide range of frequencies (pulsars = propagation effects, SETI = transmitter frequencies).

  – Centralised collecting area. Ok for SETI.

  – Sub-arraying for SETI surveys.

  – Like pulsars, SKA_low usage in non-EoR times/seasons = “galactic time”.

• Could be implemented via “spigot” and real-time signal processing system from correlator to use some fraction of available data, a la V-FASTR experiment at VLBA (Trott et al. 2013, Wayth et al. 2012, 2011 etc).

• Voltage “spigot” could also be used from beamforming engine, for VLBI and SETI processing. Commensal/parallel use with pulsar timing? Cf MWA.
8 hrs of observations = 12 x 40 min blocks.
1230 – 1544 MHz in 64 MHz bands (32,768 channels per 64 MHz, ~2 kHz channels)

200 narrow-band signals and 22 broad-band signals survived correlation
None of the 222 signals were consistent with GL 581 position

All signals fall in Optus/Mobilesat/INMARSAT geostationary satellite frequency range and are consistent with spatial localisation of satellites.

Entirely non-imaging analysis.
Correlated data “spigot” implemented for V-FASTR at VLBA
Voltage capture “spigot” implemented at MWA:

All voltage data available via 10 Gbps switch at full rate for all antennas.

Data are transferred to Perth via 10 Gbps link for processing at Pawsey/Curtin computing facilities off-line.

- SETI
- FRB searches
- Pulsar searching/timing
- Detailed RFI characterisation
- Instrument diagnostics
• Challenges:
  – General beamforming challenge – need antenna-based corrections essentially in real-time, unless low duty cycle post-real-time beamforming is performed (save and process voltages post-observation). Sounds like this has been addressed in the requirements (Cornwell). Also, solved for LOFAR.

  – Data rates/volumes. Limits to duration of observations, off-line processing facilities, duty cycle of observations.
• **Solutions:**
  – Implement capabilities for full throughput spigots (in signal processing architecture: at voltage and correlator output levels) and initially use fraction of capability.

• **Conclusion:**
  – With spigots enabled, most of which exist already in the baseline design / requirements, SETI should be entirely feasible.

• **Recommendation:**
  – Strongly recommend defining spigot, defining interface to spigot, providing data transport options and assume SETI users will process data off-line and off-site and outside scope of SKA project and operational budget.