The RFI Measurement Campaign

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SPDO

Purpose

To do measurements of the RFI environment

- At the two proposed core locations at high sensitivity
- At a number (4 or more) representative remote station locations, with somewhat less sensitivity
- Include a fast ‘transient’ mode for brief, strong features

For the purpose of

- Getting radio interference information for the site selection process
- Getting practical RFI environment information for systems design

Responsibilities

Who and What:

- ASTRON
  data processing software, reporting software
- SKA SA
  RF, trailer infrastructure, integration, campaign
- CSIRO
  Digital spectrometer, data acquisition, campaign
- SPDO

  Overall coordination, final reports

Instrumentation

Receiver, infrastructure

- Modified receiver of the campaign of 2005
- Trx ~100-200K
- Noise source calibration (every 60 seconds)
- Mast with rotators (azimuth and polarisation)
- Logper antenna 80-3000 MHz
- Shielded cabinet
- Double shielded cabling
- Self-contained trailer

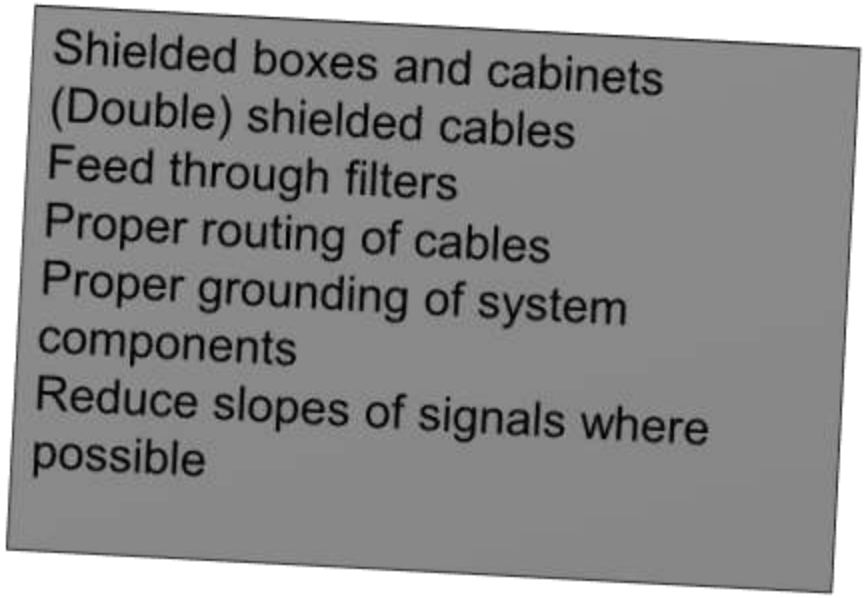
Instrumentation

Spectrometer:

- ROACH 1.3
- 10 bit ADC, CSIRO design
- 32k FFT in FPGA
- 70-2000 MHz in 9 bands
- ~30KHz resolution
- Transient capture mode, 1µs resolution

Cleaning up our act

- Getting rid of self-generated RFI has been a major undertaking
- Every trick in the EMC book is required to minimise the amount of self generated RFI, which is difficult because:
  - Sensitivity required
  - Low gain antenna used
  - Compactness of system



New RFI Campaign

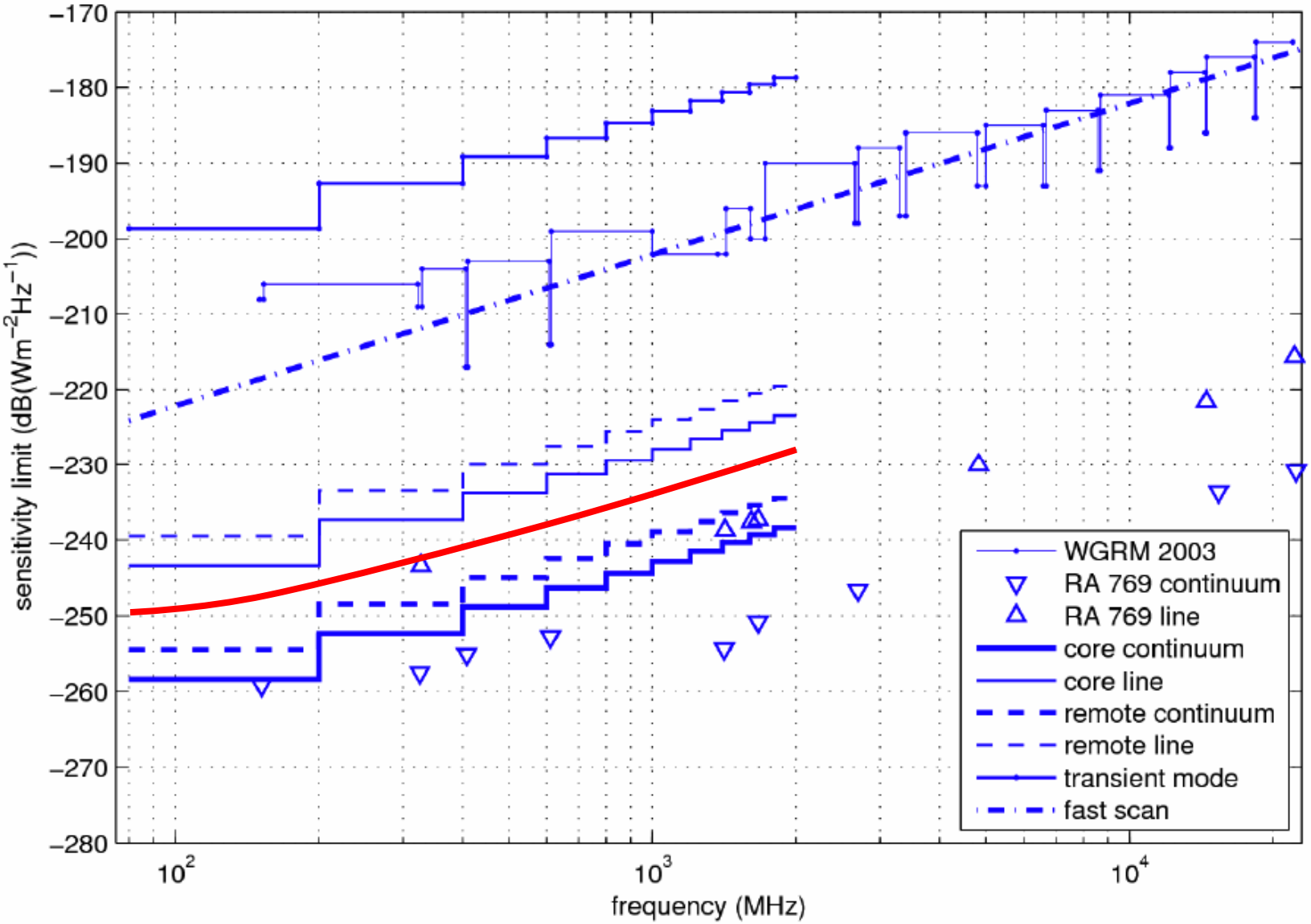
Status

- After major effort in reducing self-generated RFI and other artifacts, systems were tested in anechoic chamber.
- Hardware testing was completed in July, shipped to the sites.
- High sensitivity part of the campaign was carried out between mid August and mid September.
- There were some failed measurements that had to be repeated.
- Most of the data has been delivered to the SPDO.
- The quality of the data looks good.
- A small percentage of the data is affected by harmonic distortion because of excessive input signals. The resulting artifacts will be flagged or removed. This should not diminish the survey quality or sensitivity.

Status (cont)

- Data processing carried out so far with unofficial tools;
- Official processing package being developed
  - Calibration
  - Data presentation, graphs, statistics, occupancy
- Transient mode functionality remains to be completed – recent engineering results look promising, still needs validation.
- Next, those Transient Mode measurements must be carried out (~1 day duration)
- An issue is still the selection of 4 remote sites for RFI measurements:
  - Method for selection of remote sites, giving fair cross-section of remote environments for the two candidates.
  - Must be resolved very soon.

Campaign Sensitivity



The Campaign

Campaigns carried out in the Karoo (right) and at Boolardy (above).

Results

- Until the final reports have been made and reviewed, and permission is given to release the data, only a summary will be made available once processing has been done.

Unavoidable RFI

It is evident that receiver systems will have to deal with *unavoidable* types of RFI:

- Airborne
  - Comms
  - Narrow pulse & high power: nav/ATC (DME, SSR, …)
- Satellites
  - NOAA series
  - Iridium, GPS (L1, L2, L3), Galileo
  - Geostationary (broadcasting, FLTSATCOM, INMARSAT, GOES)
  - …

End