Radio Frequency Interference Mitigation at the Chicago URSI-GA 2008

XXIX General Assembly, URSI
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"JF session – RFI, problems and solutions"
"J poster session observatory reports"
"Multiple session solar power satellites"

Albert-Jan Boonstra

ASTRON
Netherlands Institute for Radio Astronomy

LOFAR

NWO
Netherlands Organisation for Scientific Research

JF session “RFI, problems and solutions

Joint session: radio astronomy (J) – wave propagation and remote sensing (F)
Some observations

- There were 10 talks, ~ half from J, half from F commission
- About 6 talks on detection in t-f domain, and excison for
  - spaceborne radiometers (Norway/Australia/USA test flights)
  - solar radio telescope (FASR)
  - real-time systems, mainly showing experimental results
  - mostly based on detection using kurtosis (4th moment of signal), works best for low duty cycles (DC), for DC=0.5 kurtosis does not work
  - and on detection in small t-f windows (e.g. pusled radar signals)
- A talk by R.Athreya (NCRA, India) on removing RFI by detecting fringe periods in uv data which differed from the natural fringe rates
  - interesting results, ad-hoc method, comparison to spatial filtering?
- A talk by K.Warninck (BY, USA) on RFI canceling in PAFs, using tracking of the PAF element interferometric phases. Using a polynomial fit effectively increases the integration time.

JF session “RFI, problems and solutions

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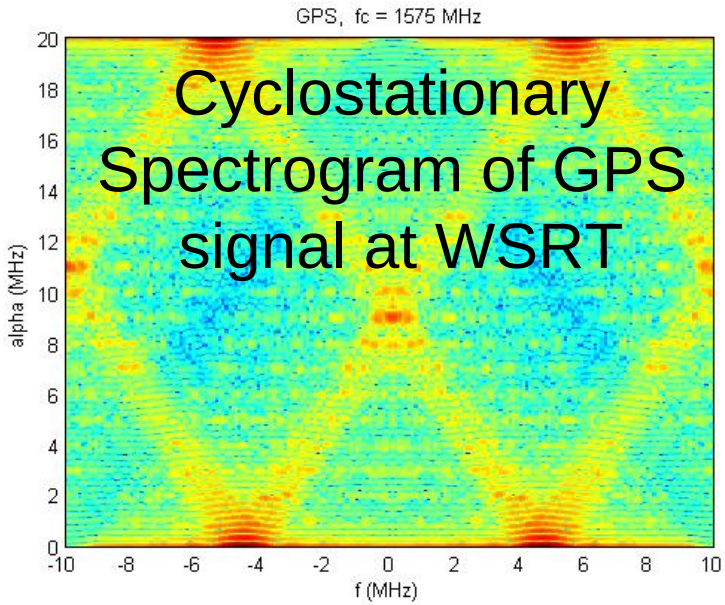
Some observations

- A talk by Rym Feliachi (Univ. Orelans France) on the status of the RFI mitigation systems at Nancay (real-time L-band blanker), and on cyclostationary beamforming

Cyclostationary beamformer, both simulations & WSRT data
Rym Feliachi & Rodolphe Weber

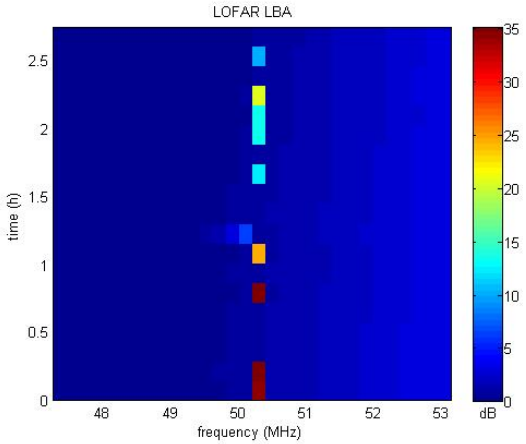
Other track, following work of Stephanie Bretteil:
• use cyclostationary correlator parallel to conventional one for spectrum subtraction
Investigation of applicability in LOFAR & SKA

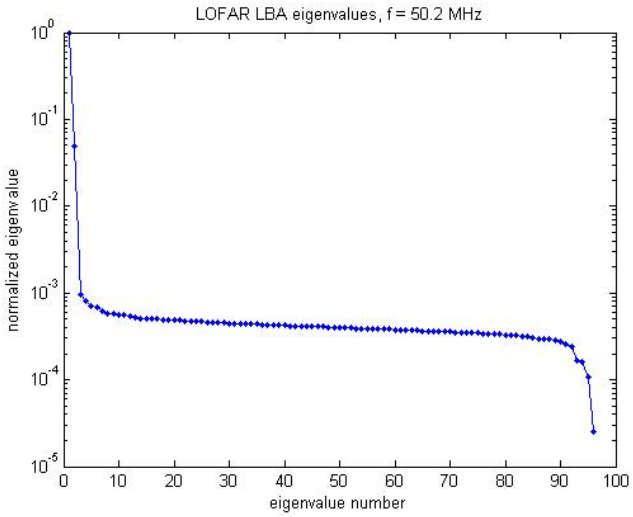
“blind” version of approach of Ellingson et al using satellite receivers



JF session “RFI, problems and solutions

LOFAR spatial filtering, LBA station at 50.2 MHz – A.J.Boonstra





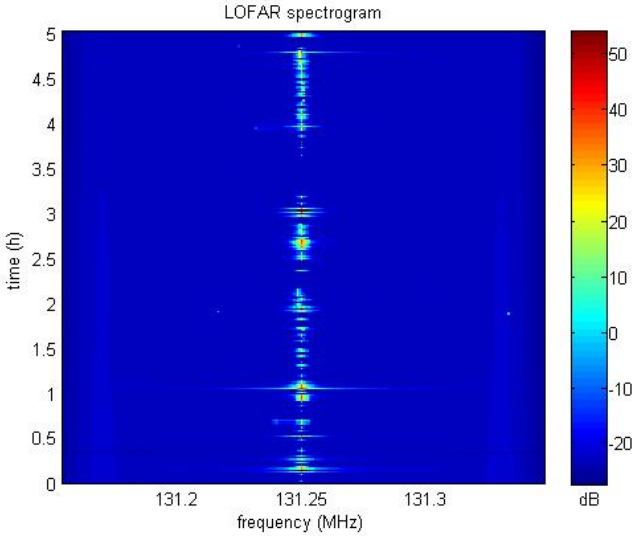
LBA station eigenvalues @ 50.2 MHz (upper)

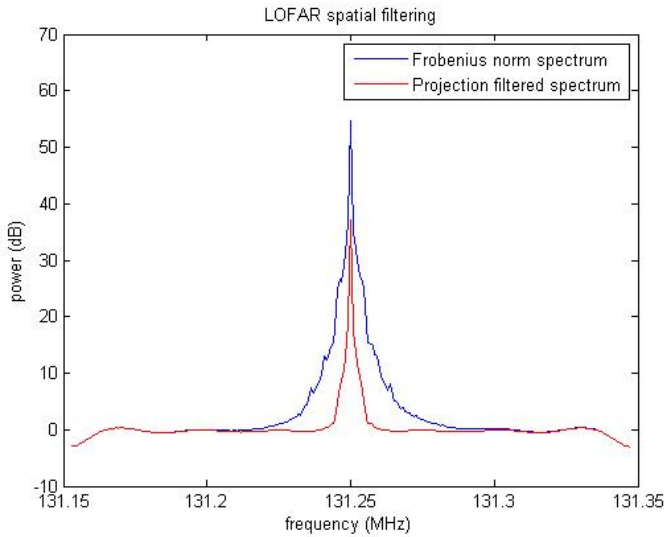
LBA station spectrogram (upper left) and same data after spatially filtering, based on first time slot at 50.2 MHz (lower left)

After one hour a second transmitter at a different direction emerges

JF session “RFI, problems and solutions

LOFAR spatial filtering, HBA station at 131.25 MHz – A.J.Boonstra





Fixed spatial projection filter estimated from and applied to first 60 s integration time (right)
- 16 dB suppression, one subspace dimension removed
- 38 dB suppression after two dim. Removed (not shown)
- 4 dB supp using spatial filet of first time 60 s slot (not shown)

Air traffic band: moving transmitter or strong changes in propagation

Maybe (if sufficient space left in FPGA) use spectral notch to allow 4-bit coding in the presence of stong RFI?

Poster and solar power sessions

- LOFAR RFI mitigation strategy implementations (Bentum et al, ASTRON)
- Effect of DAB/DVB on radio astronomy (Clegg, NSF, USA)
- Solar power satellites (Japanese and US groups)