

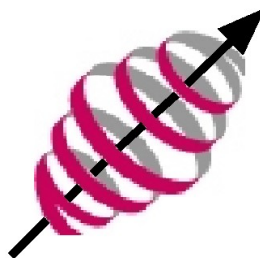
Effelsberg Ef RFI Update or, Bigger Brother: Monitoring the Police

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With Eva Juetten, from the Juelich station, M Kuniyoshi,
And I don't remember the names of the guys from the police,
but I'm sure they took down my name.

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LOFAR



MAX-PLANCK-GESELLSCHAFT

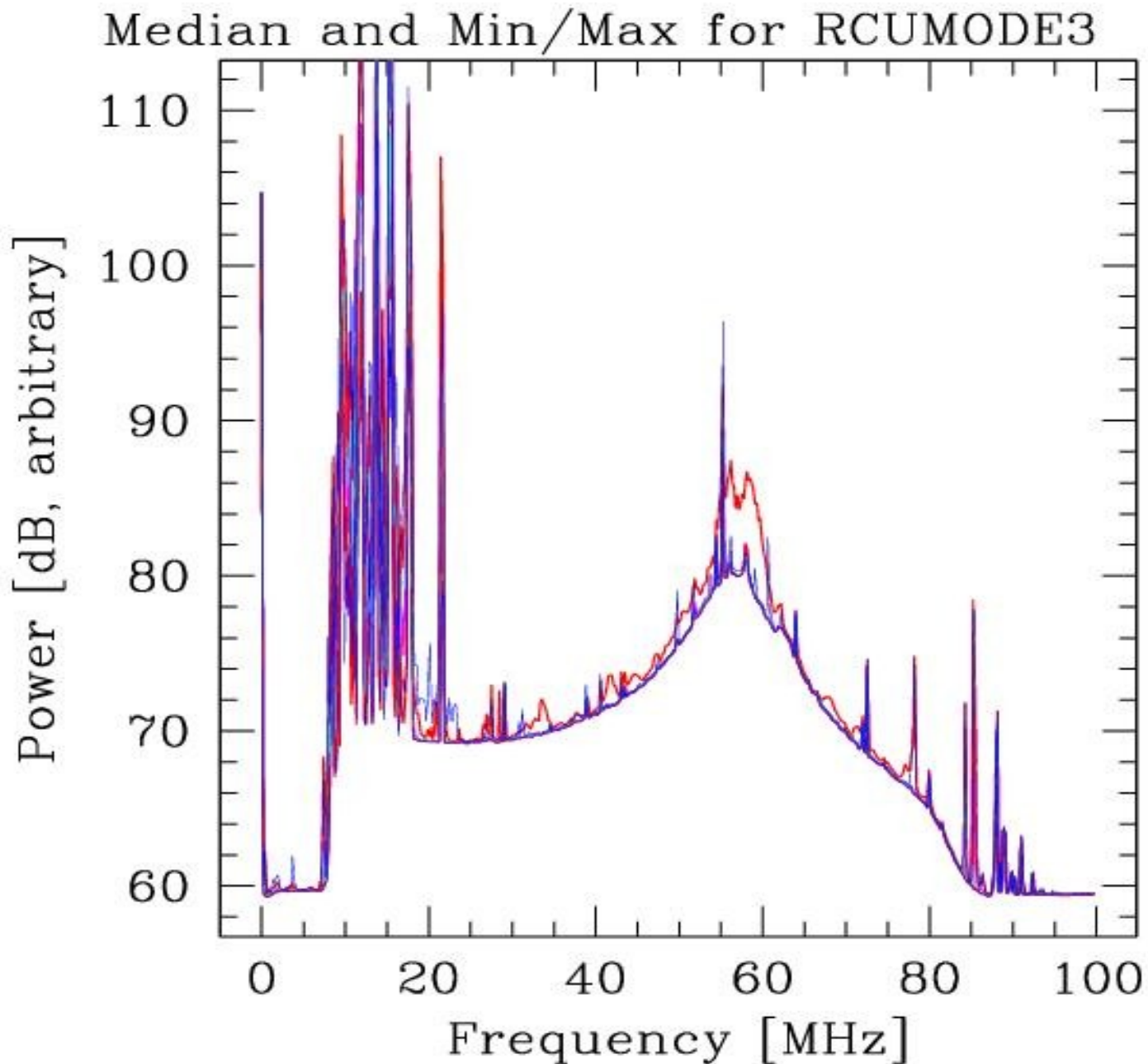


LOFAR

BPBOS (spelling?)

- Plan to install a police transmitter near the planned Juelich site
 - And increasingly around the rest of Germany, including Tautenburg, and eventually all of the other stations
 - And eventually the rest of Europe too, as far as I understand
- Digital transmitter near 400 MHz
 - Outside of LOFAR bands, but power level high, mostly worried about overloading the pre-amps
- On Monday, a mobile transmitter was brought to Effelsberg to test the effect on the LOFAR station (and the 100 m) at Effelsberg
 - Same power as fixed station (15 W)
- Set up ~ 30 m from LBA antennas, 100 m from HBA antennas

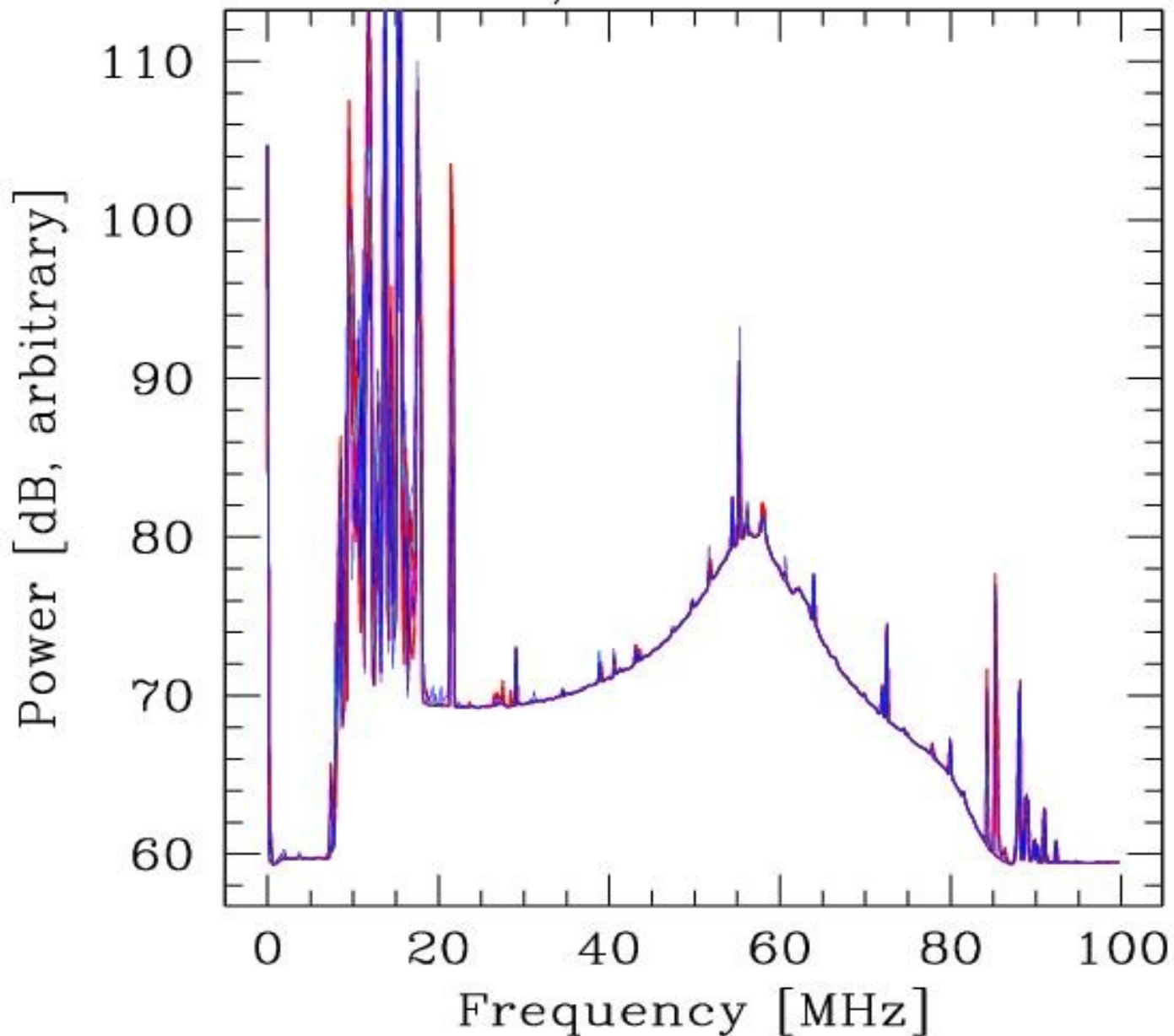
Initial Look



- Blue: transmitter off
- Red: transmitter on
- Some intermodulation seen when transmitter on

Initial Look: 2

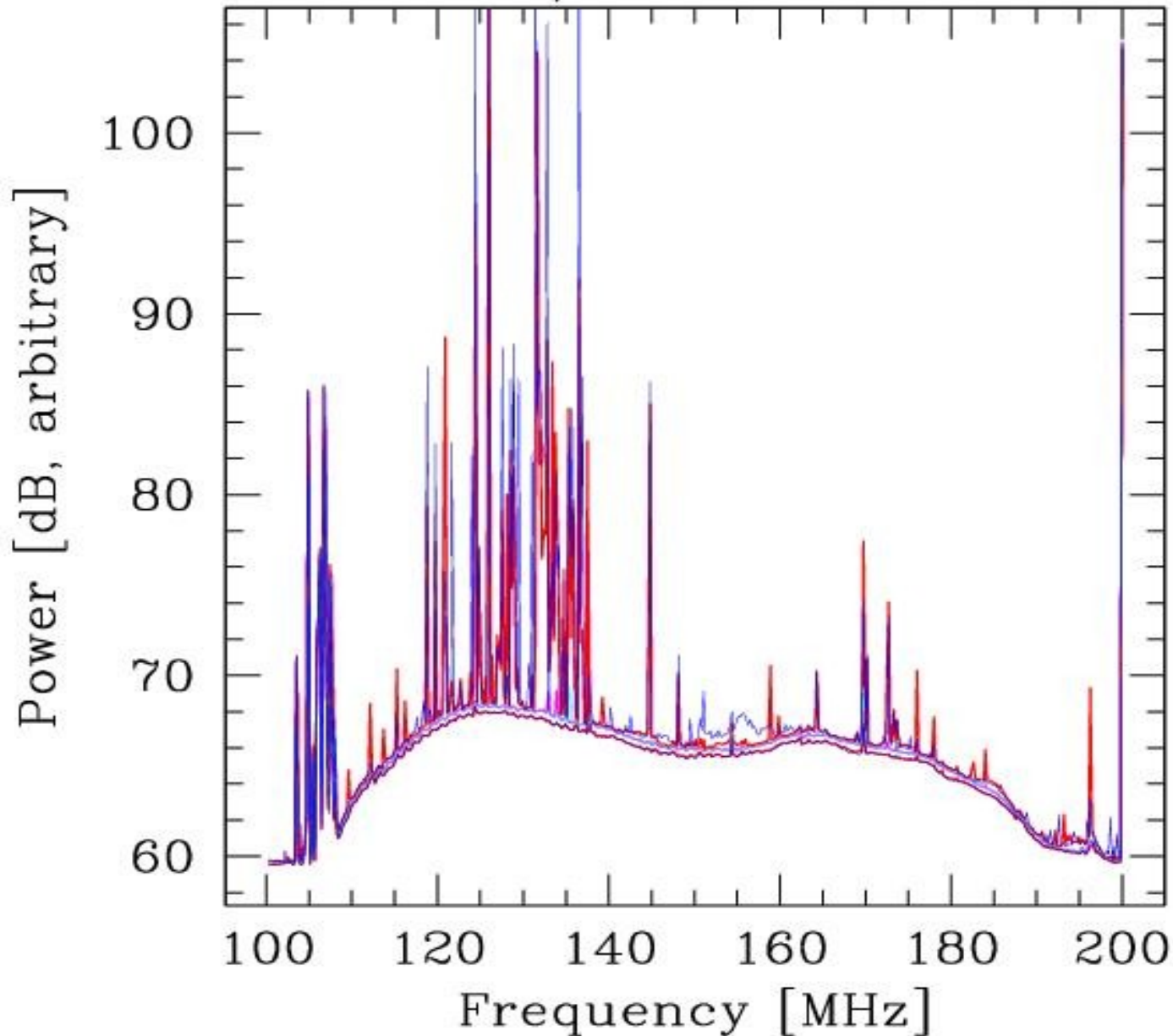
Median and Min10/Max90 for RCUMODE3



- Blue: transmitter off
- Red: transmitter on
- Discarding top and bottom 10% of samples eliminates problem
- Good flagger should be able to remove problem

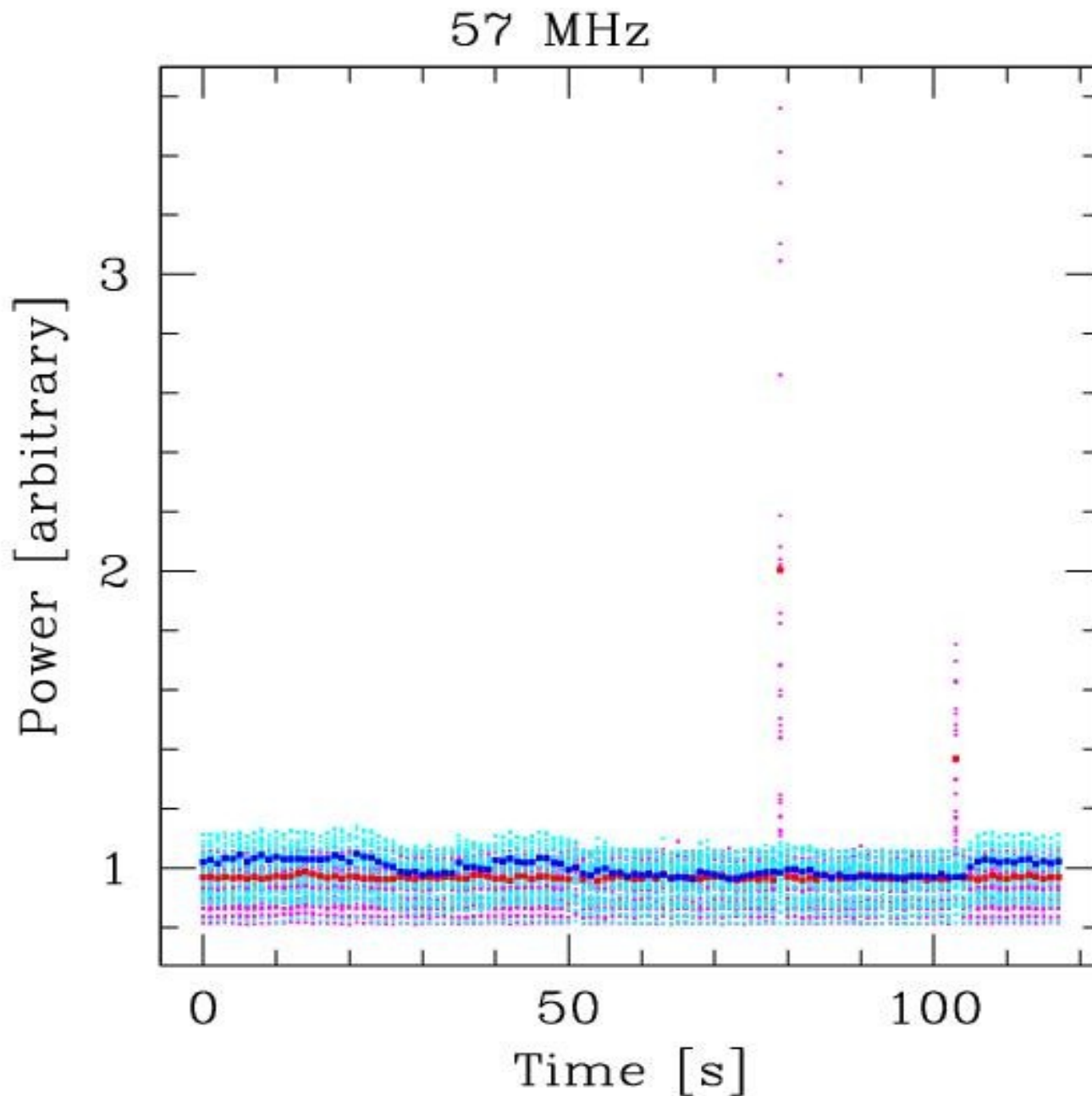
But...

Median and Min/Max for RCUMODE5



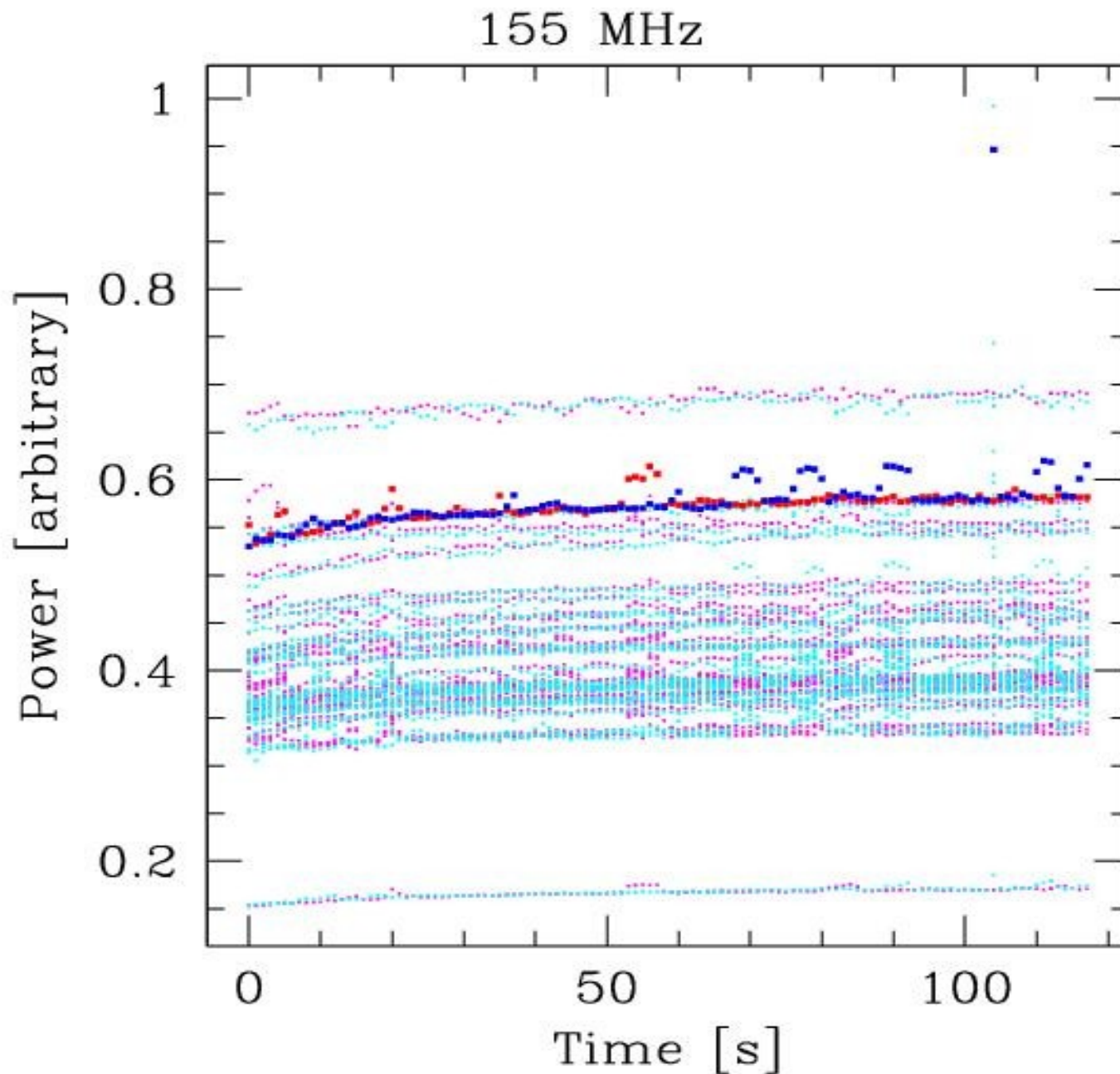
- **Blue:** transmitter off
- **Red:** transmitter on
- On closer examination last night, the problem sometimes shows up when the transmitter was off.

Look as a Function of Time



- Blue: transmitter off
- Red: transmitter on
- LBA data
- RCU 26 shown in darker color
- Spikes in power on < 1 s timescale

Look as a Function of Time



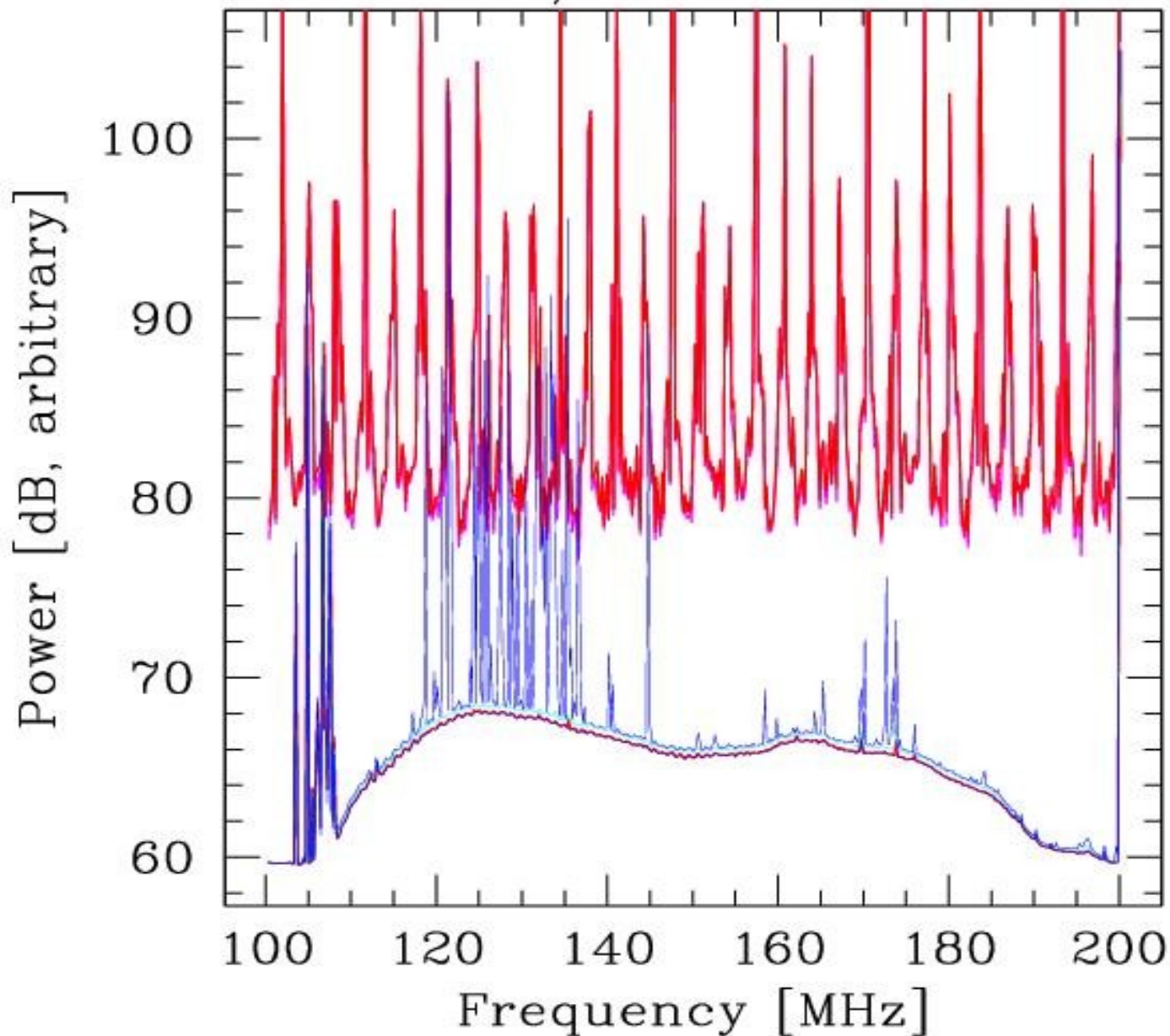
- Blue: transmitter off
- Red: transmitter on
- HBA data
- RCU 26 in darker color
- Spikes also show up when transmitter off

Police Transmitter Conclusions

- Transmitter shows no significant effect at this level of investigation
- No new significant lines
- Intermodulation seen at Effelsberg occurs $< 2\%$ of time
 - Appears not to be related to police transmitter
- So, such a transmitter at least 300 m from a LOFAR station should not be a problem

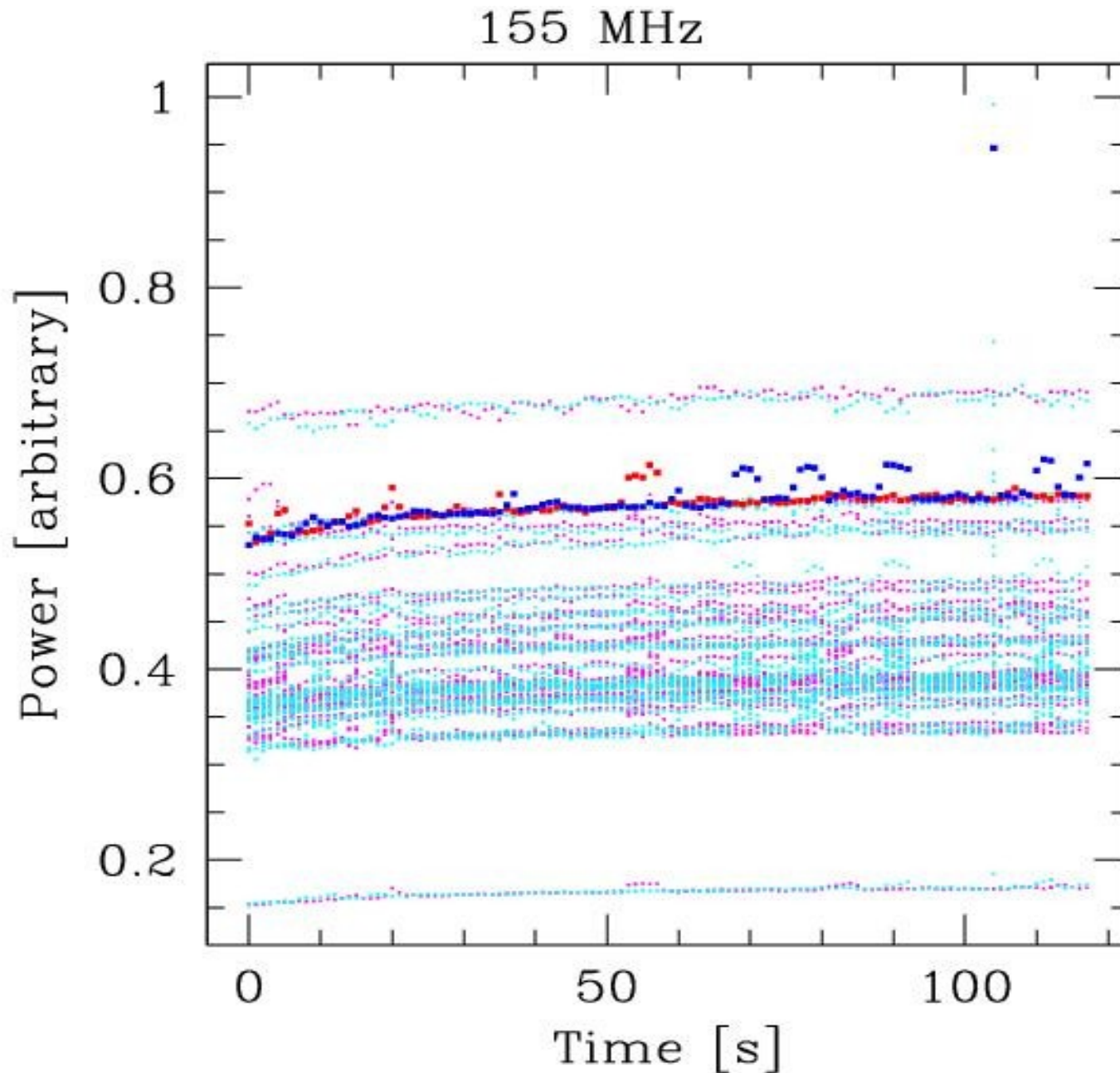
We Can Detect Other RFI Sources

Median and Min/Max for RCUMODE5



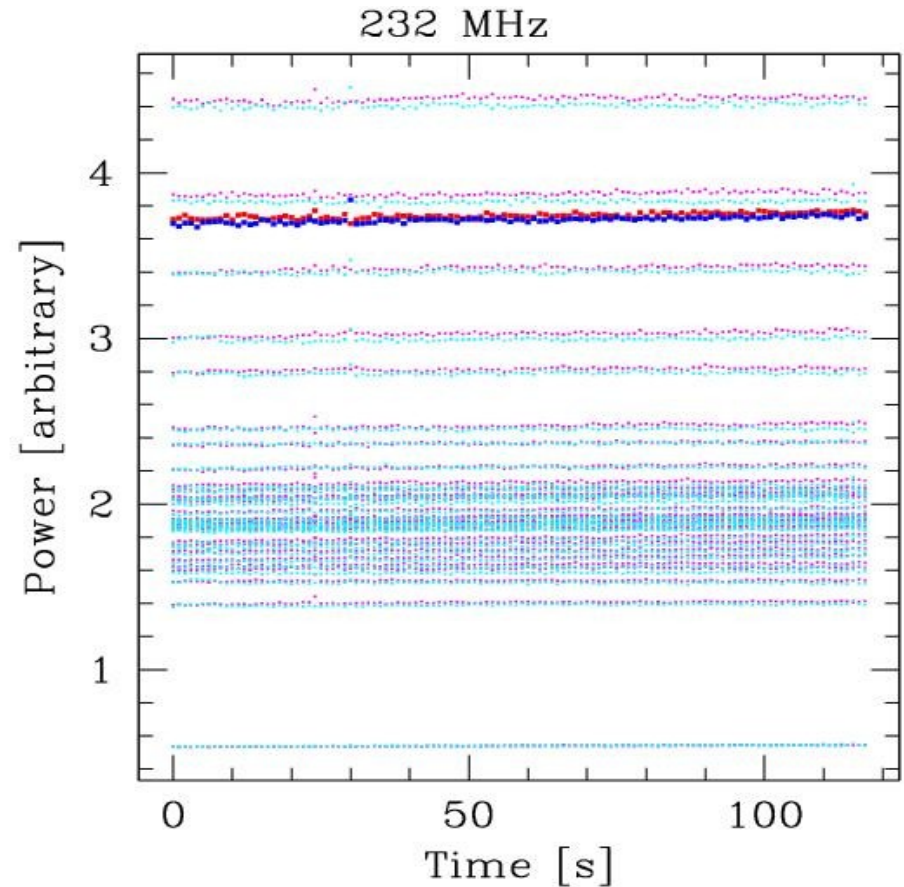
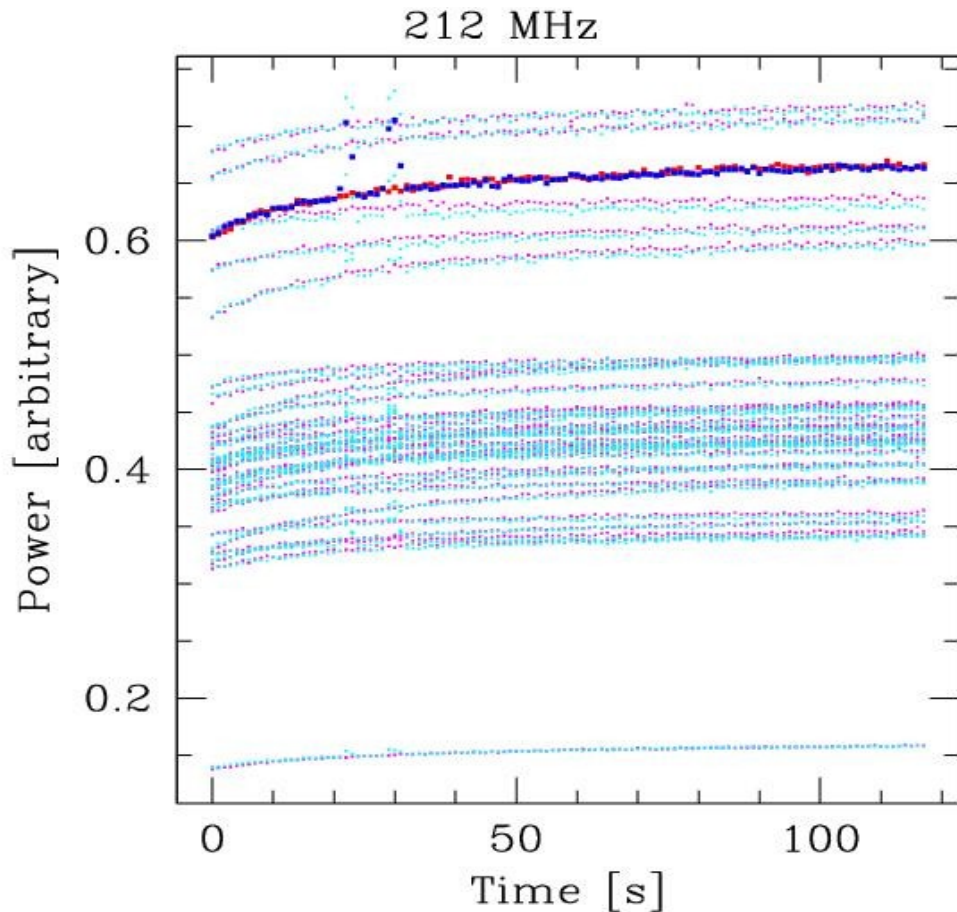
- Blue: transmitter off
- Red: transmitter on
- Effelsberg walkie-talkie communications system
- 170.xxx MHz hand-held devices
- Obviously need to be replaced

Closer Look at Time Plot



- Gain rises on all individual RCUs over 2 minute time window
- Observations started 10 s after system switched from LBA to HBA

Closer Look at Time Plot



- Happens also for RCU mode 6 (observations start 10 s after switching from RCU mode 0 to 6)
- For RCU mode 7, data were taken immediately after RCU mode 5 observations (2 minutes), with a 10 s delay after switching RCU modes. Effect less, but still present.



Conclusions

- RFI testing at Effelsberg successful
- Police transmitter not a problem
- Local communication system **is** a problem
 - Need to do further RFI tests at Effelsberg --- to be handed over to Masaya
- Switching between HBA and LBA results in short-term gain variation
 - Could be a problems for observations which need rapid switching