

Full Bandwidth Observations of Ionospheric Scintillation

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KAIRA – The LOFAR Station in the Arctic



So what is there to gain in the Arctic?

At this time, the company of LOFAR Station Builder Extraordinaire Derek McKay-Bukowski and a bonkers Finn called Juha Vierinen...

Both in the company of a mad Welshman...

All asking the question, "So, just what can you do with a LOFAR station that's not connected to LOFAR?!?"

Take 96 LBA Dipoles, 96 HBA Tiles and 96 RCUs...

- Low-level commands available at station level allow input to each RCU from either an LBA dipole or an HBA tile.
- Specific RCUs can be specified to have LBA or HBA inputs.
- Nothing to stop different ranges of RCUs having different inputs at the same time...
- When beams are specified, can also specify range of RCUs to use and range of beamlets and subbands to use.
- This all means that you are not restricted to only LBA or HBA: You can have both!

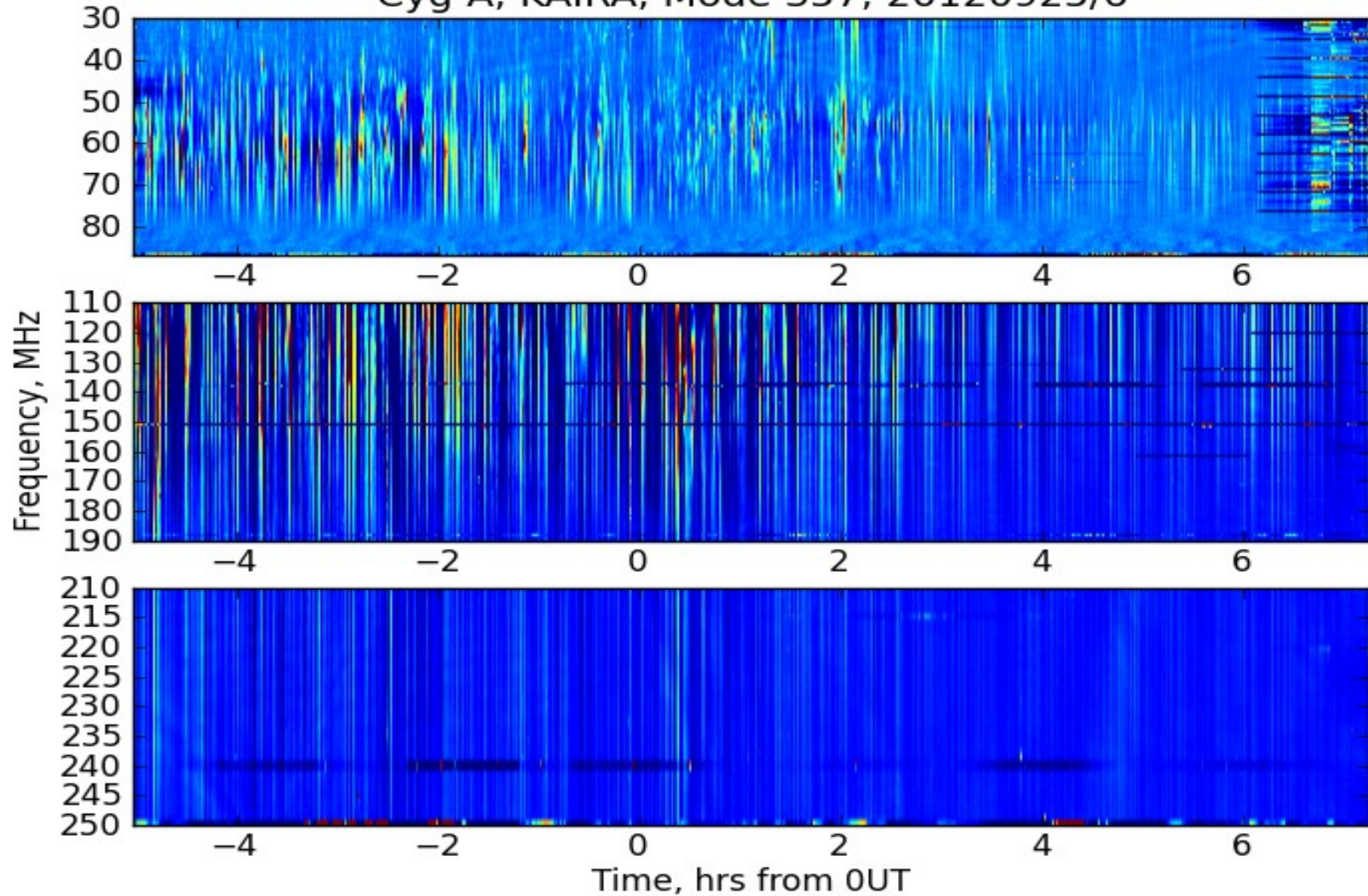
Mode “357”

- A third of the LBAs in mode 3 (10-90 MHz)
- A third of HBAs in mode 5 (110-190 MHz)
- A third of HBAs in mode 7 (210-270 MHz)
- Specify beams such that all available subbands are spread over the three modes.

- Caveats:
 - Need to take care to power up HBAs gradually (as is done by station script).
 - Sensitivity is seriously reduced.
 - Spread of subbands results in gaps between them.

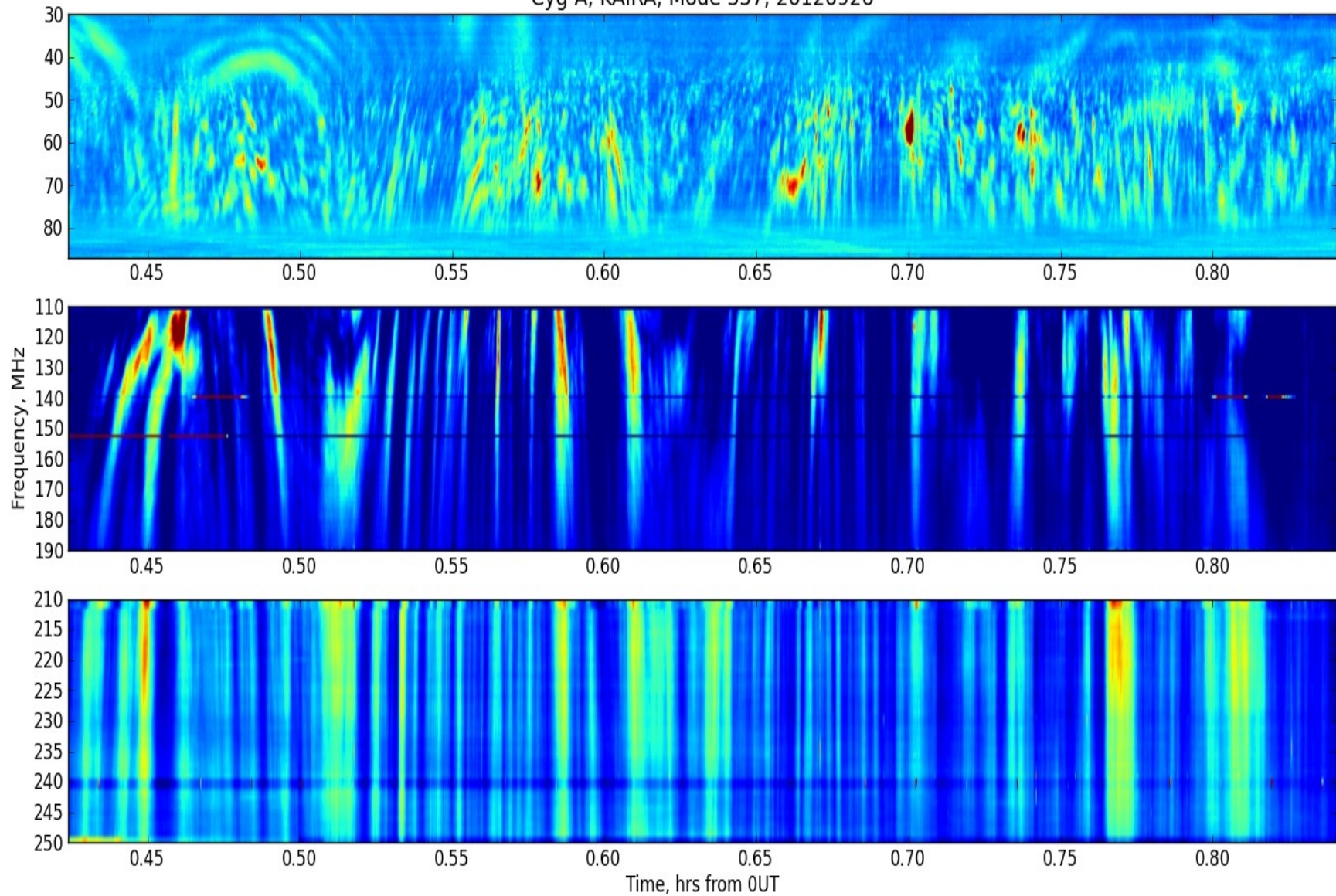
KAIRA - 20120925

Cyg-A, KAIRA, Mode 357, 20120925/6



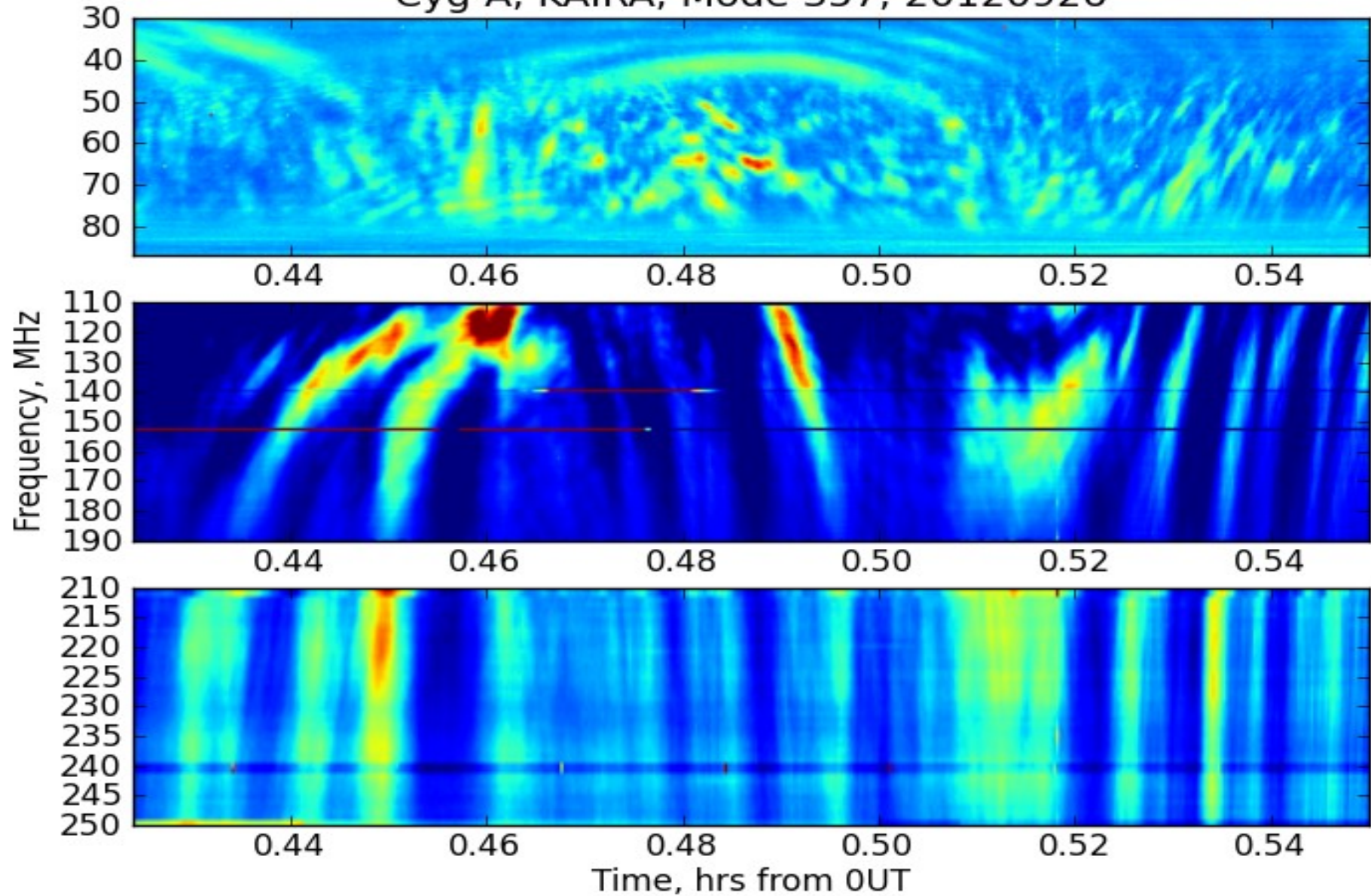
KAIRA - 20120925

Cyg-A, KAIRA, Mode 357, 20120926

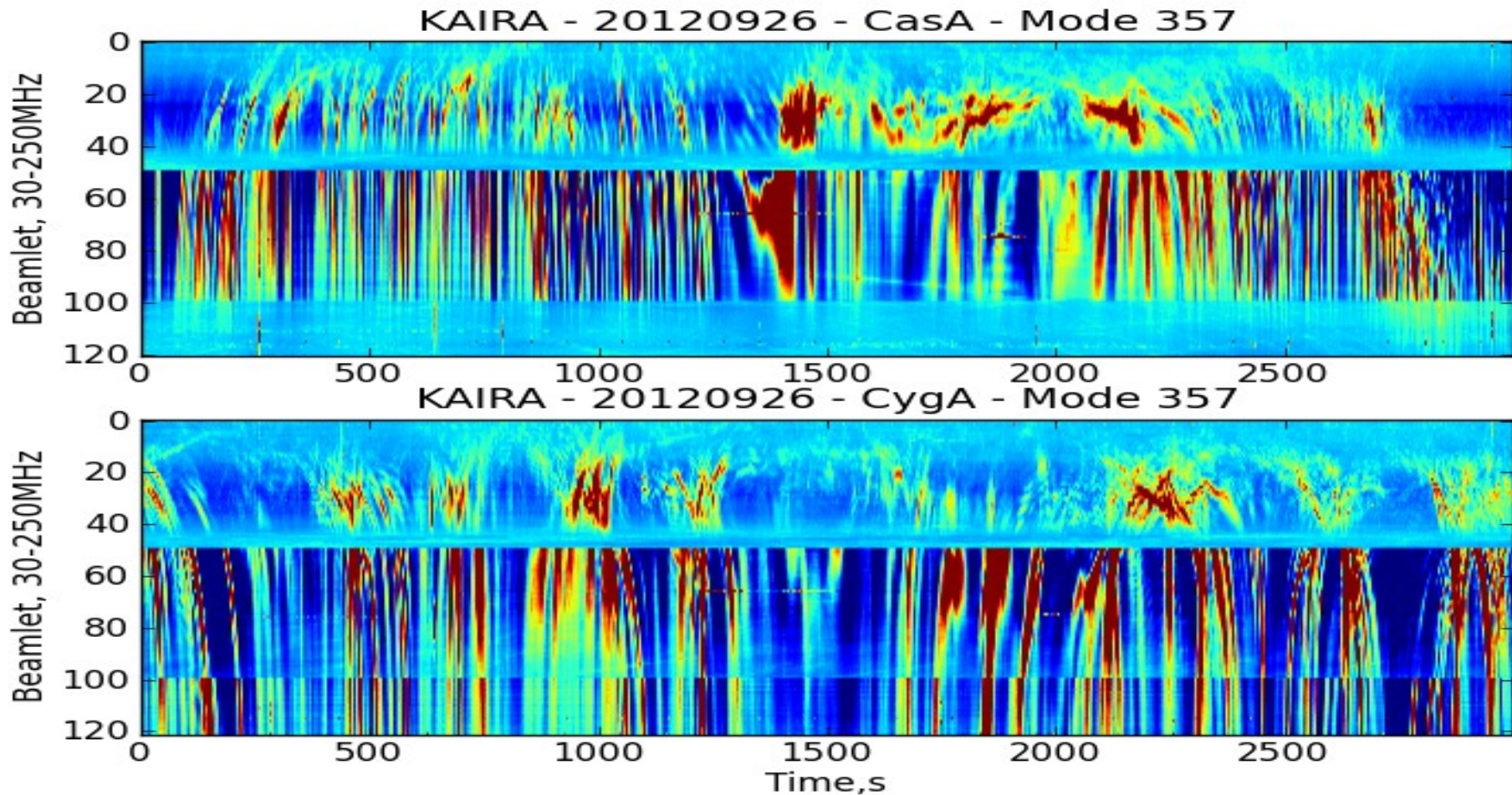


KAIRA - 20120925

Cyg-A, KAIRA, Mode 357, 20120926

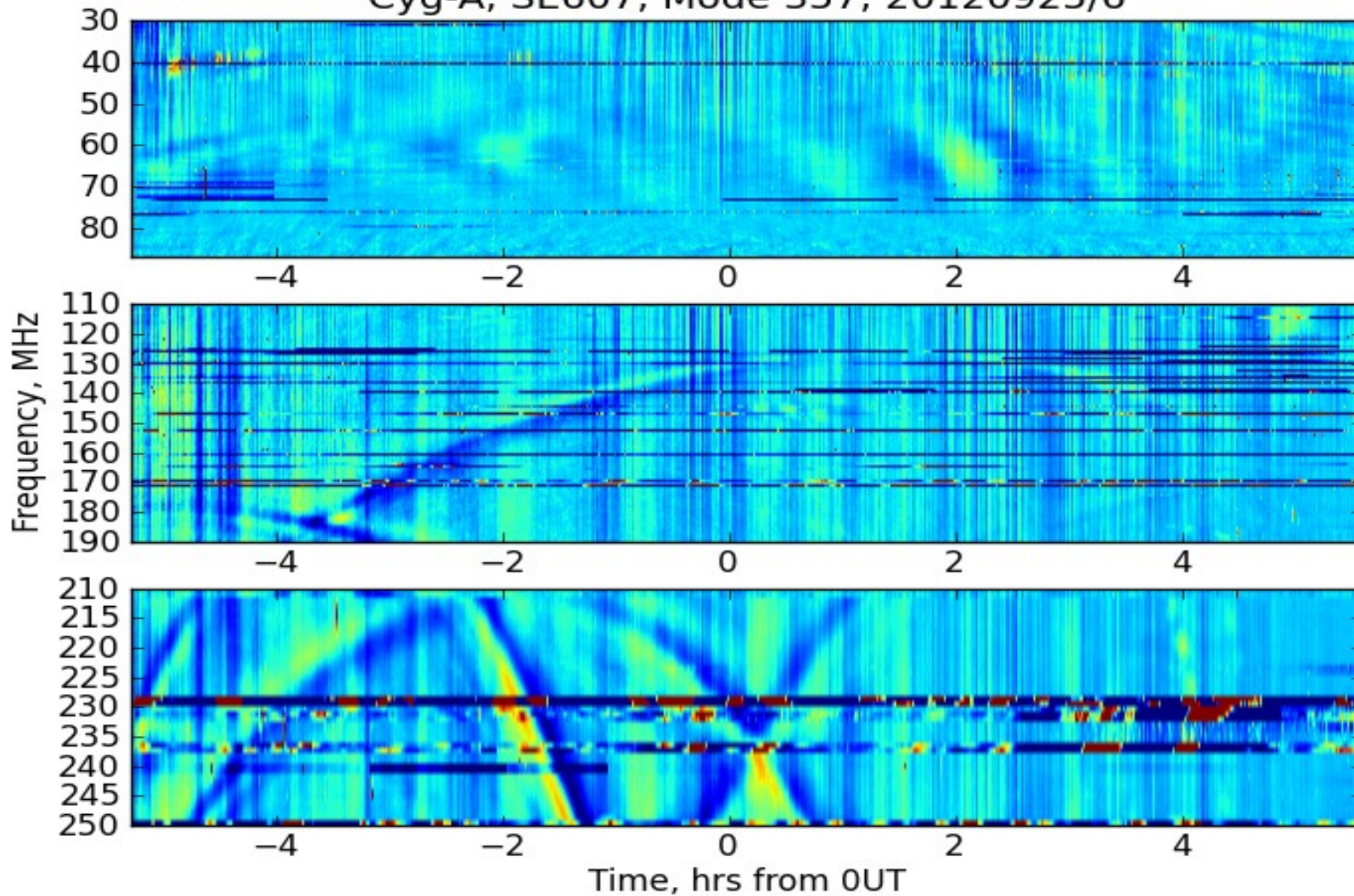


Mode "35577"?!?



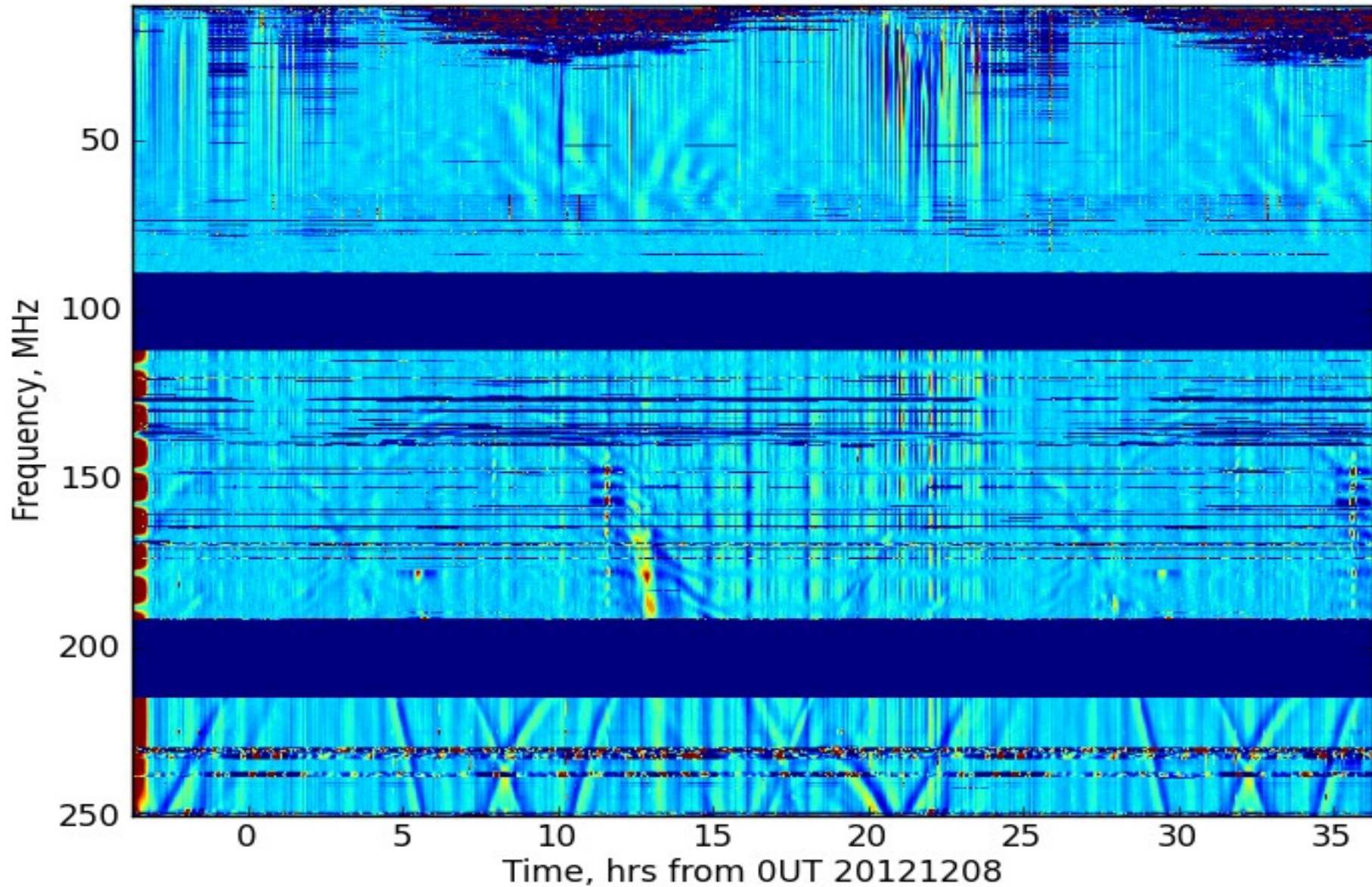
- Split the HBAs further and you can have the analogue beams pointing in different directions.

Cyg-A, SE607, Mode 357, 20120925/6



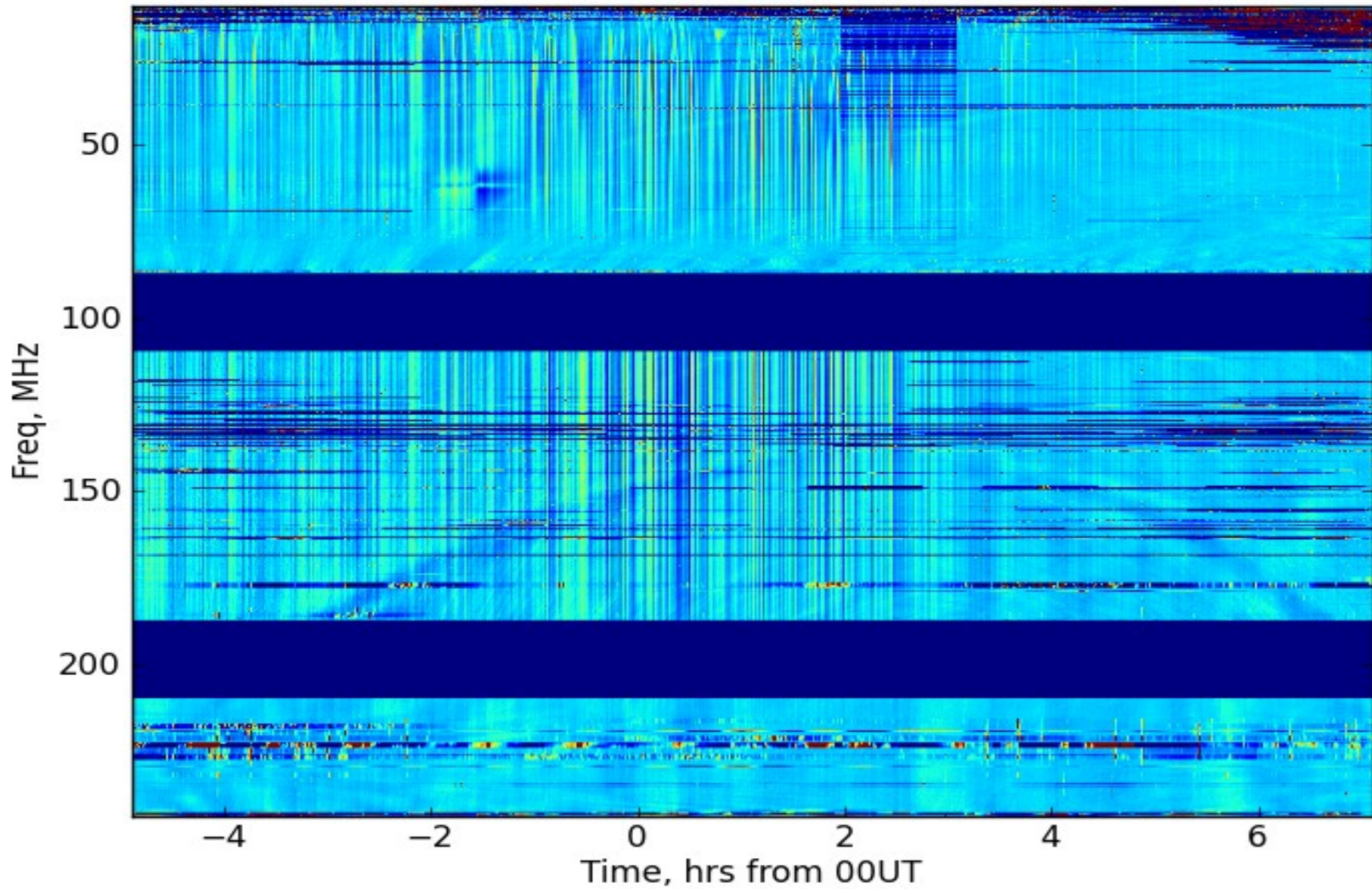
Over a Few Days...

Cas-A, SE607, Mode 357, 20121207-9



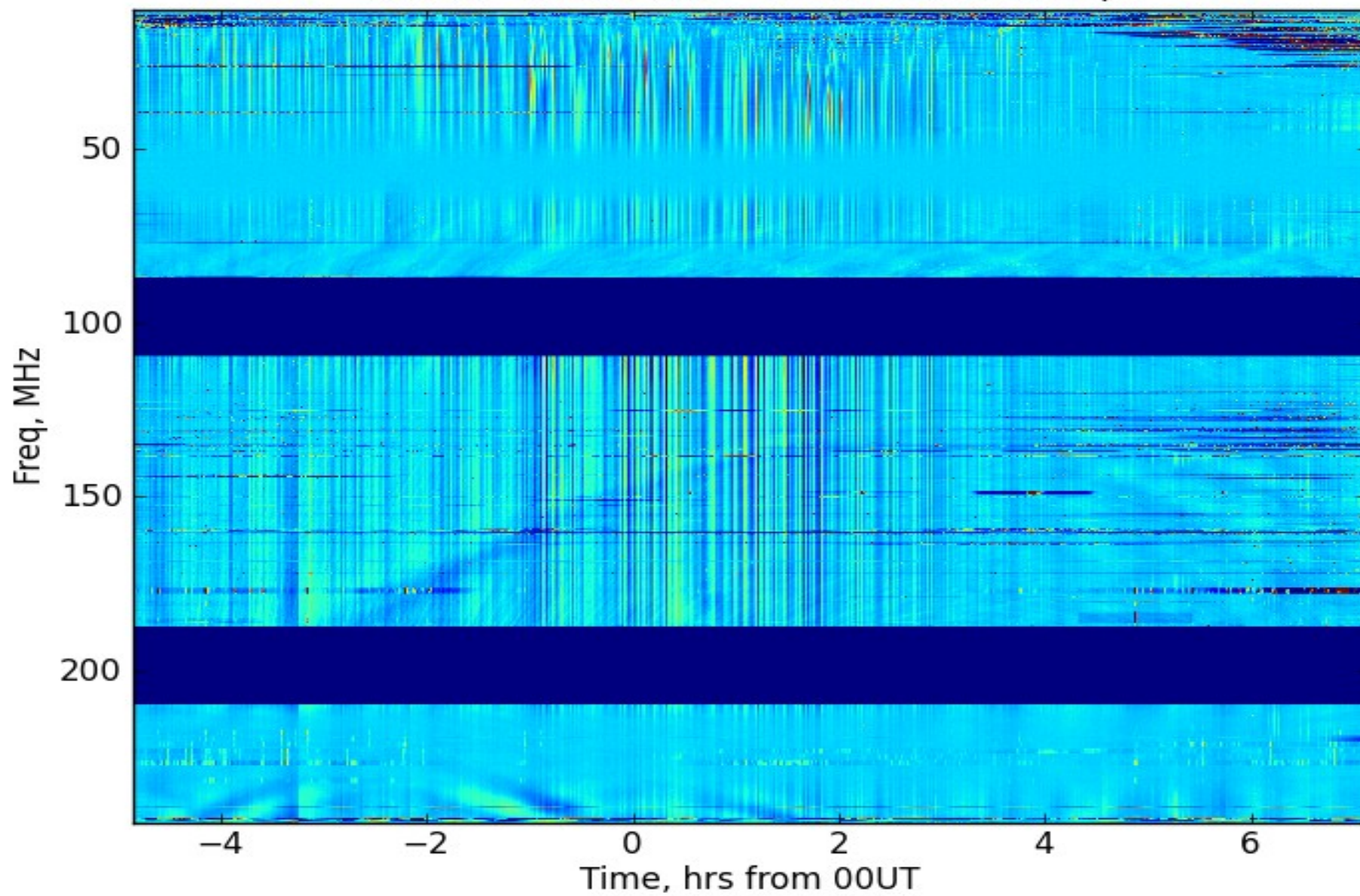
8-bit LOFAR Data

RS508 - Mode 357 - 8-bit - 20121108/9



4-bit LOFAR Data

RS509 - Mode 357 - 4-bit - 20121108/9



- Possible to use single LOFAR stations in a mode which combines LBA and HBA elements and tiles.
 - Loose sensitivity
 - Need to spread subbands over used bandwidth
- Also possible to use different parts of HBA array to “point” in different directions.
- Ionospheric scintillation seen most of the time over all international stations.
 - Probable that only more intense periods affect imaging.