

First results from LBA monitoring

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LOFAR Status Meeting
Dwingeloo, 22 July 2009

Two 48 hour observations:

- LBA outer: started on 29 May 2009, 7:34:50 UTC
- LBA inner: started on 31 May 2009, 8:06:36 UTC

Both measurements:

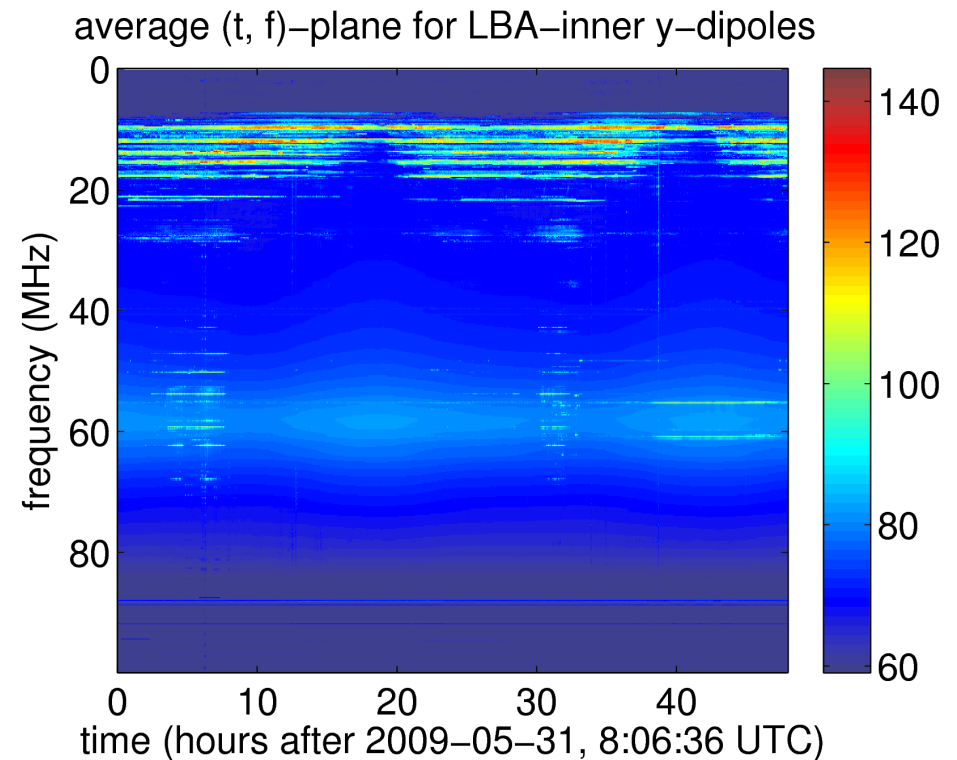
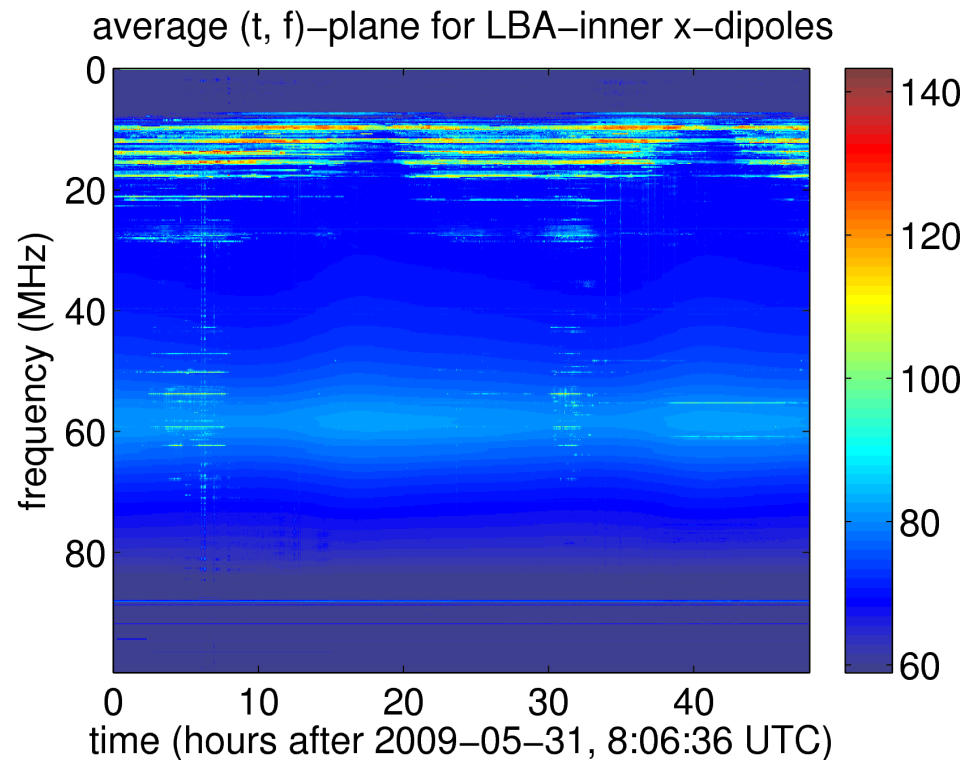
- 10 – 90 MHz filter (RCU modes 1 and 3 resp.)
- subband statistics integrated over 10s
- ACCs with 1s integration per subband

LBA inner: average dynamic spectrum

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average over all x-dipoles (left) and y-dipoles (right)

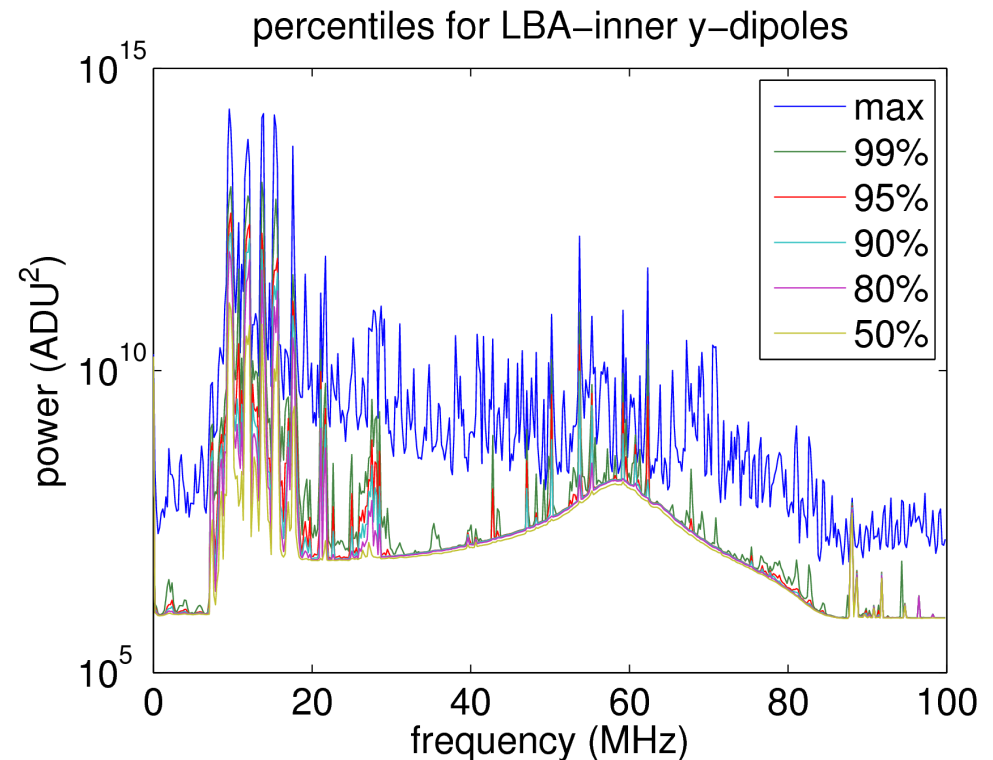
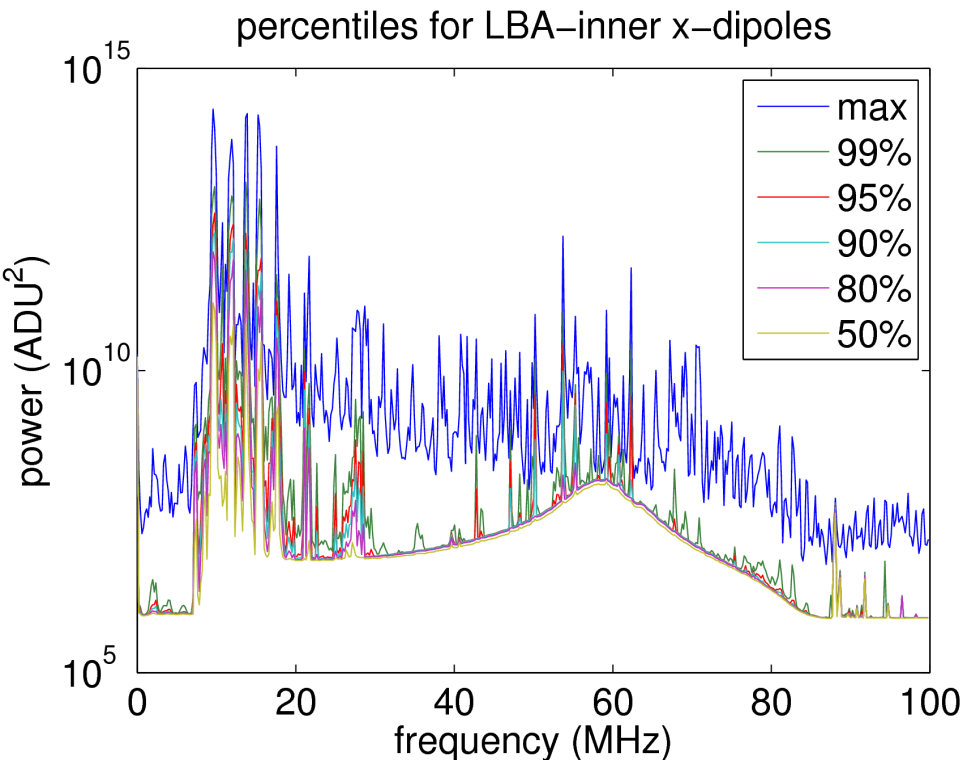
looks ok, but much low level RFI



LBA inner: RFI occupancy

RFI may occur in the entire band

Every subband affected at least 10% of the time!

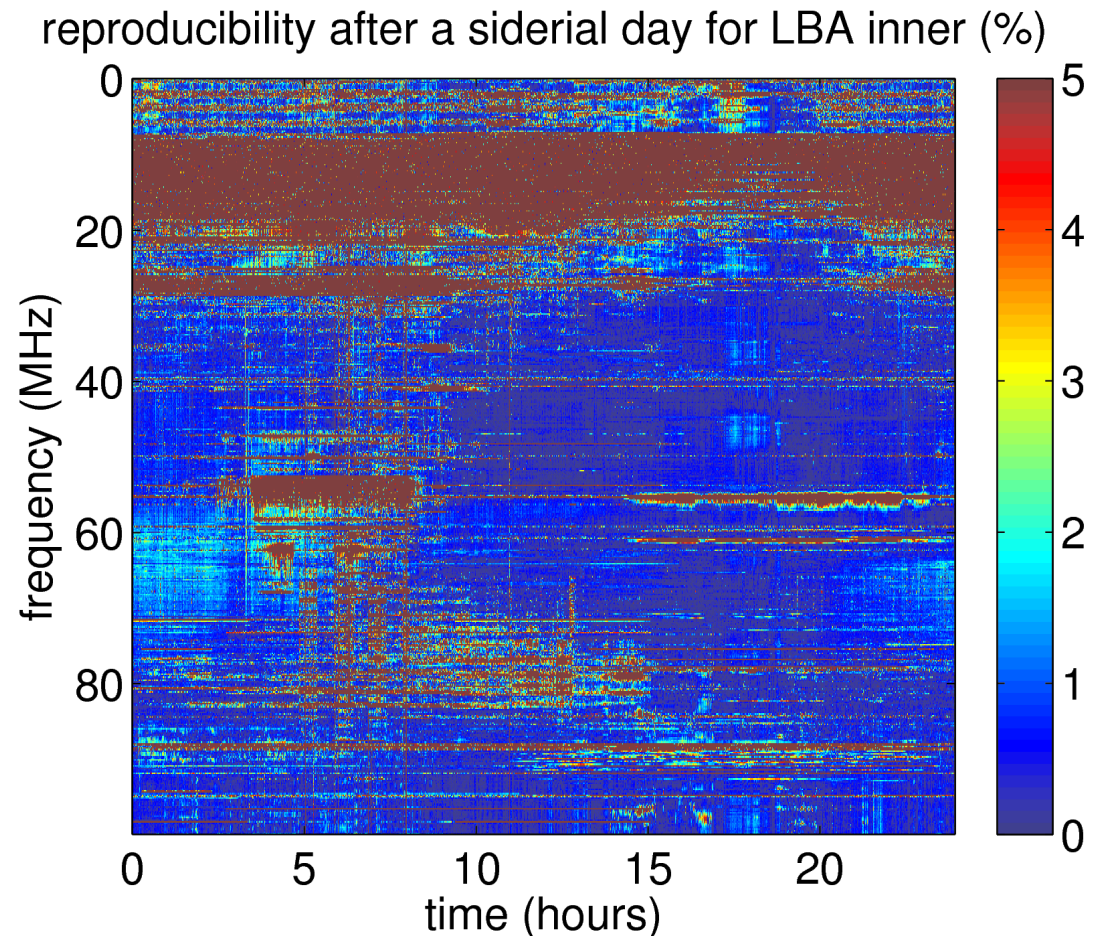


LBA inner: reproducibility (1)

reproducibility over time (after 24 h)

$$|x_1 - x_2| / (x_1/2 + x_2/2)$$

reproduces at 1% level
most differences at RFI



LBA inner: reproducibility (2)

reproducibility over elements (here: 0x and 1x)

$$(x_1 - x_2) / (x_1/2 + x_2/2)$$

1. differ near resonance

beam pattern variations

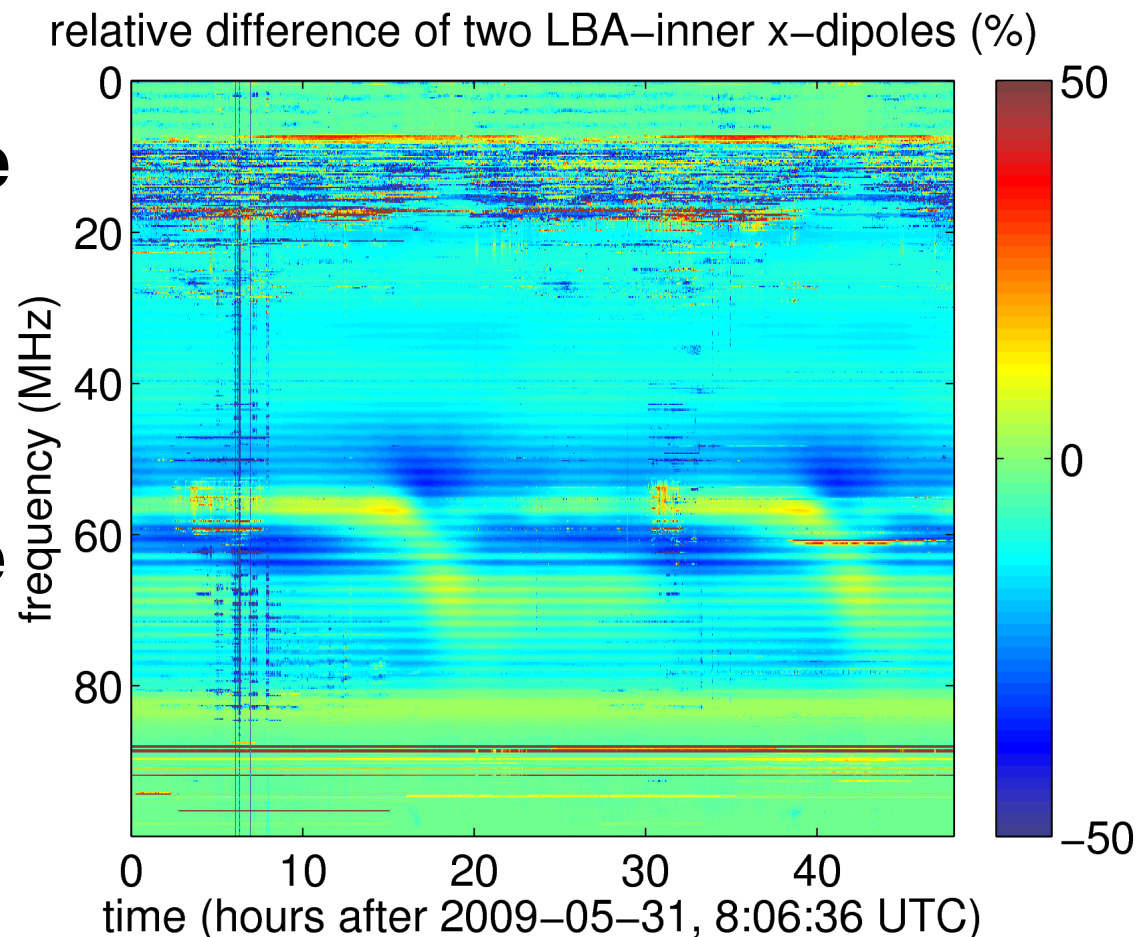
due to coupling?

2. 1.5 (or 3?) MHz ripple

intermods?

standing wave?

coupling effect?

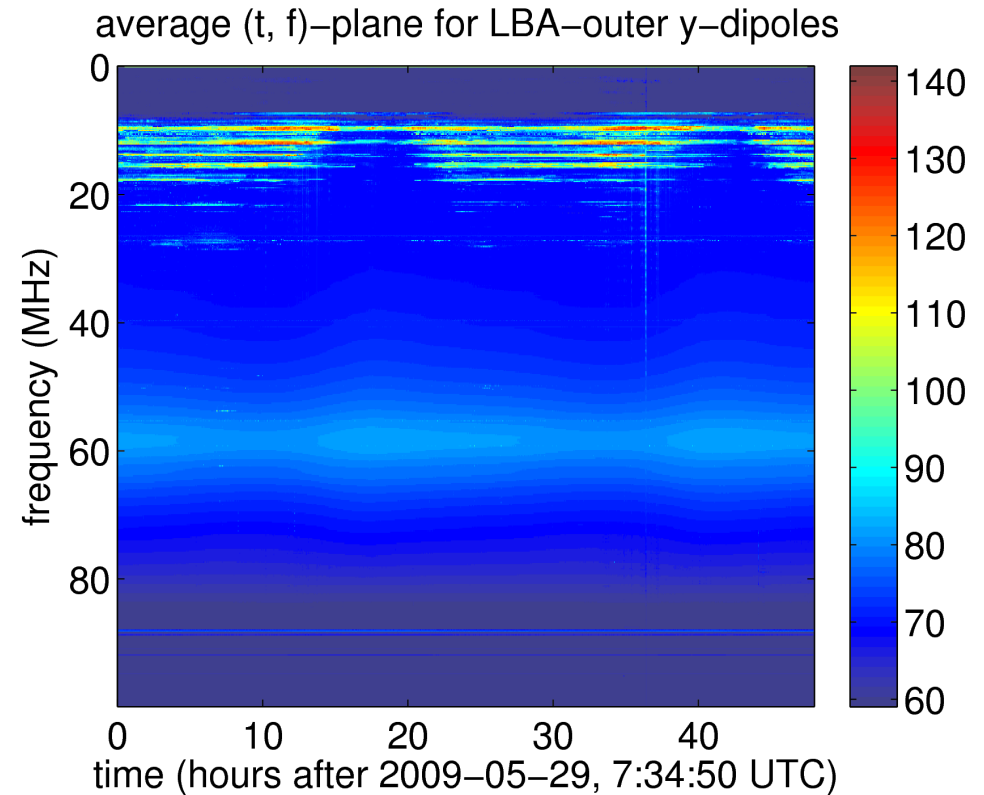
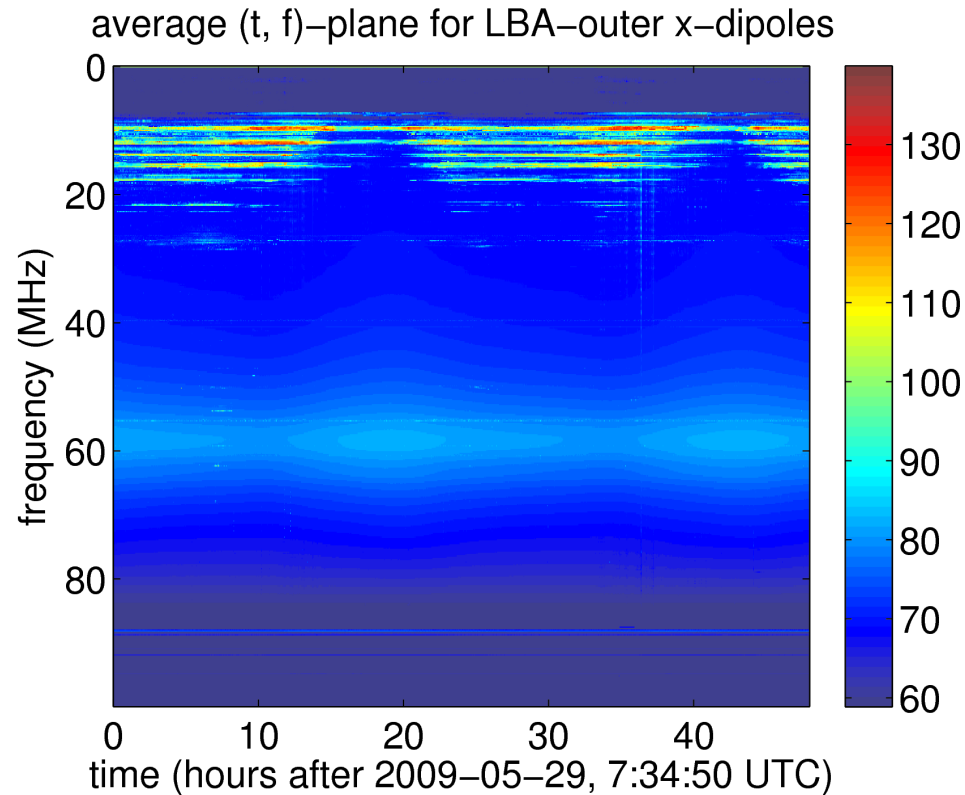


LBA outer: dynamic spectrum

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average over all x-dipoles (left) and y-dipoles (right)

spectrum looks cleaner than LBA inner spectrum

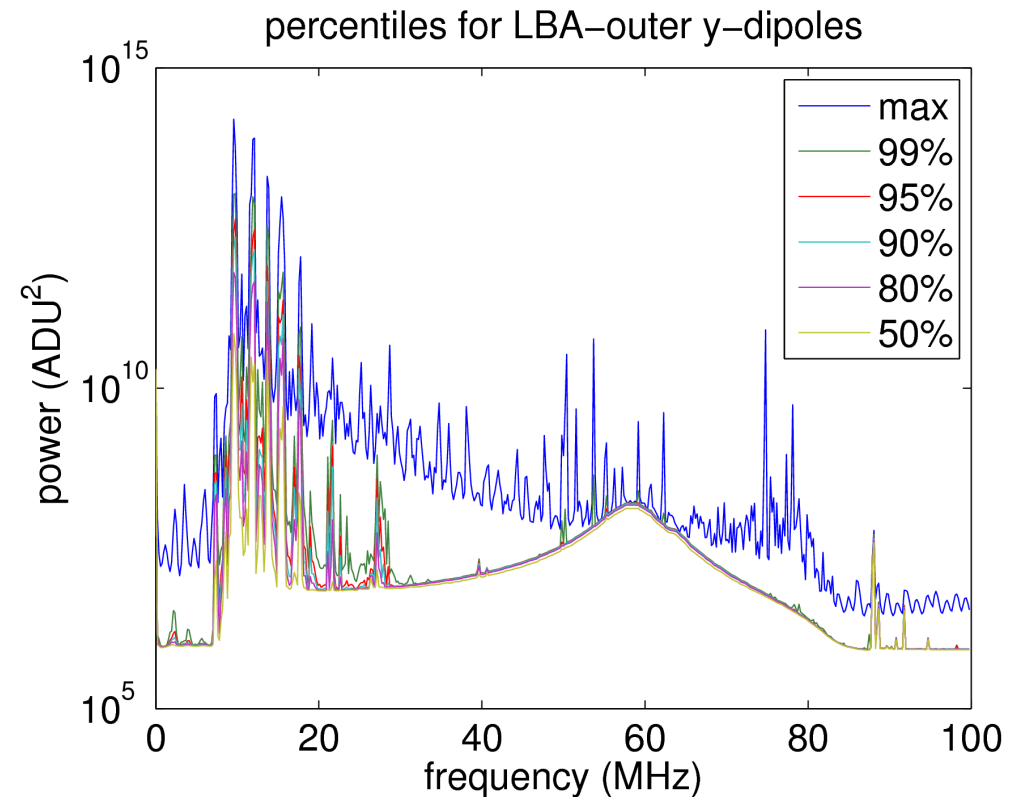
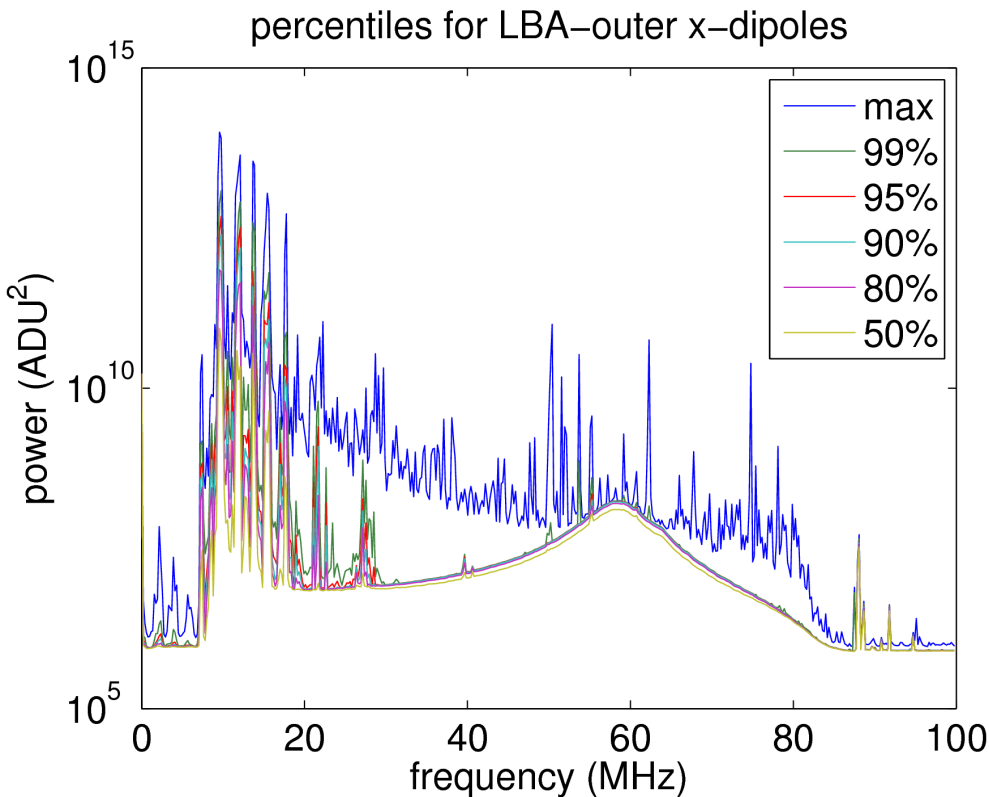


LBA outer: RFI occupancy

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RFI may occur in the entire band (raised by lightning?)

All subbands ok for 99% of the time

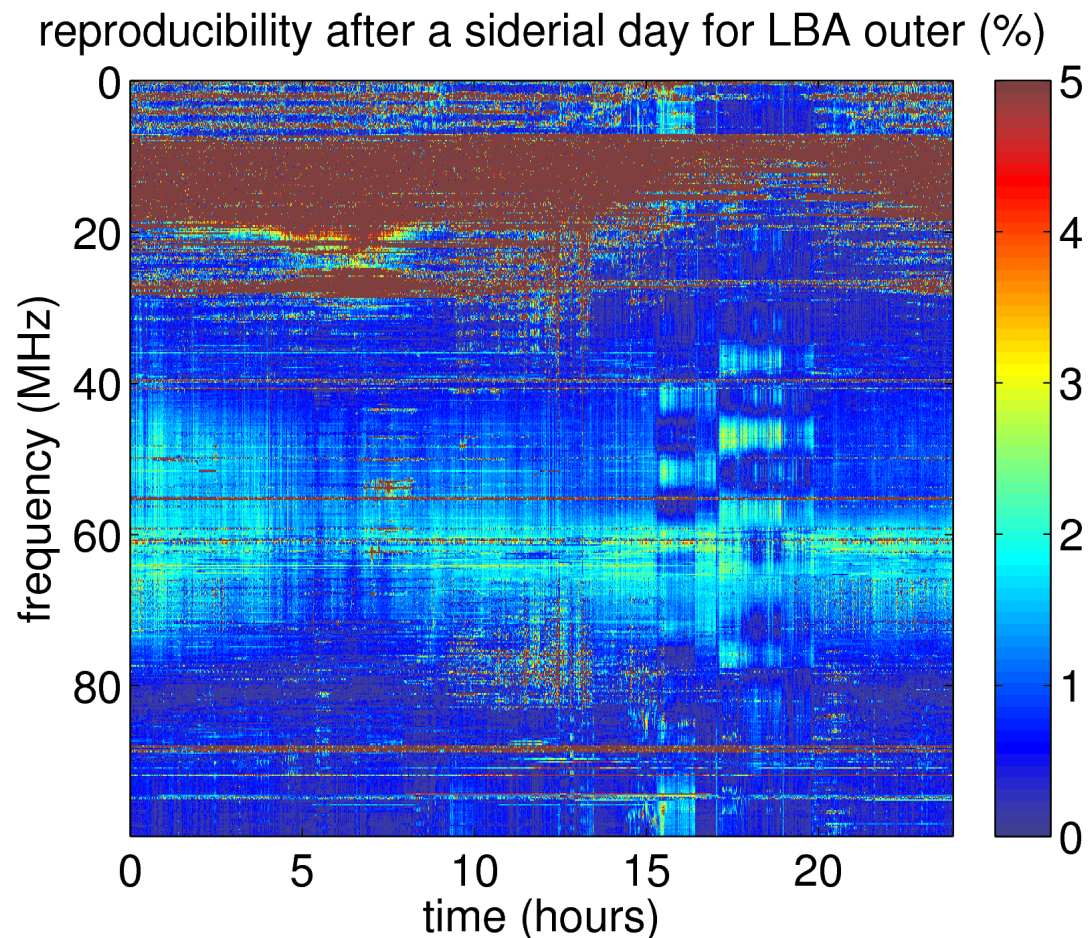


LBA outer: reproducibility (1)

reproducibility over time (after 24 h)

$$|x_1 - x_2| / (x_1/2 + x_2/2)$$

reproduces at 1.5% level
most differences at RFI



LBA outer: reproducibility (2)

reproducibility over elements (here: 0x and 1x)

$$(x_1 - x_2) / (x_1/2 + x_2/2)$$

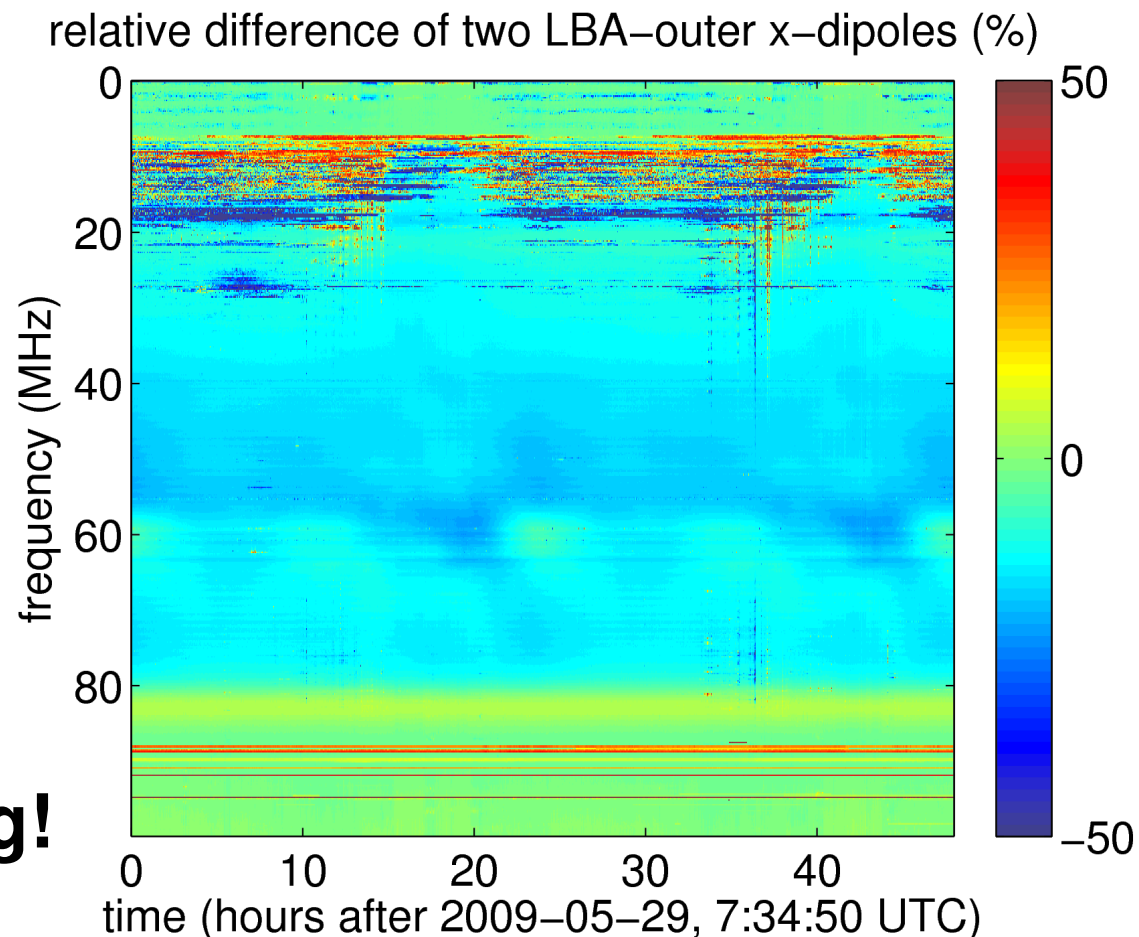
mostly gain difference

1.5 MHz ripple reduced

-> nice compared to

LBA inner

-> evidence for coupling!

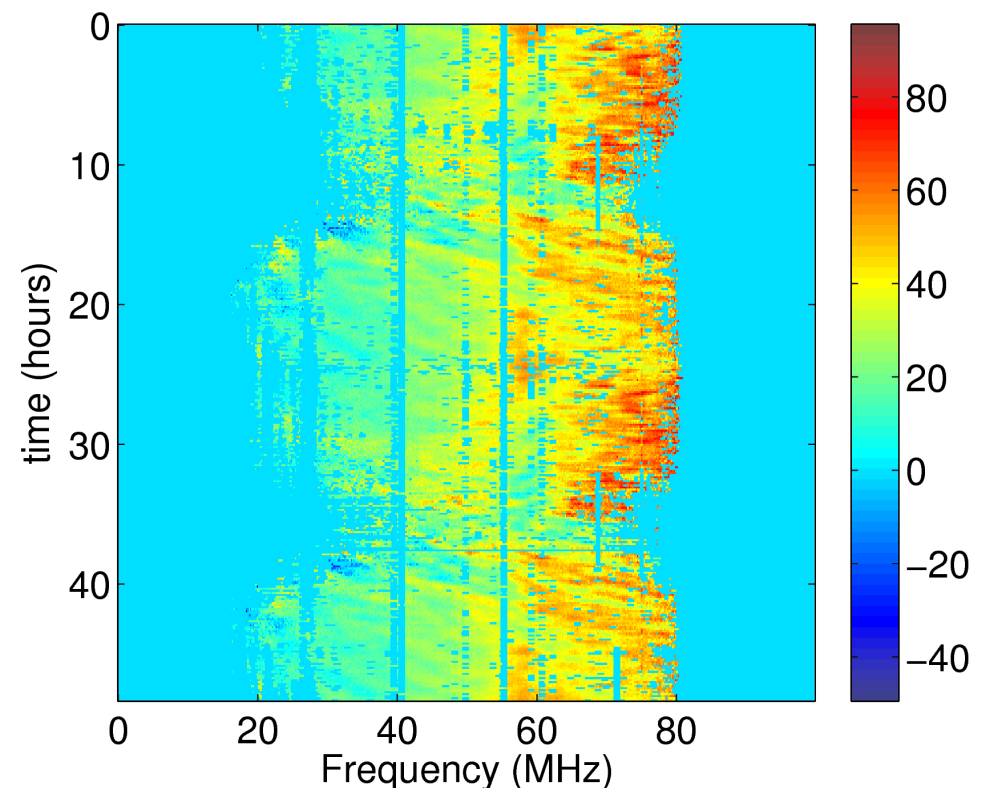
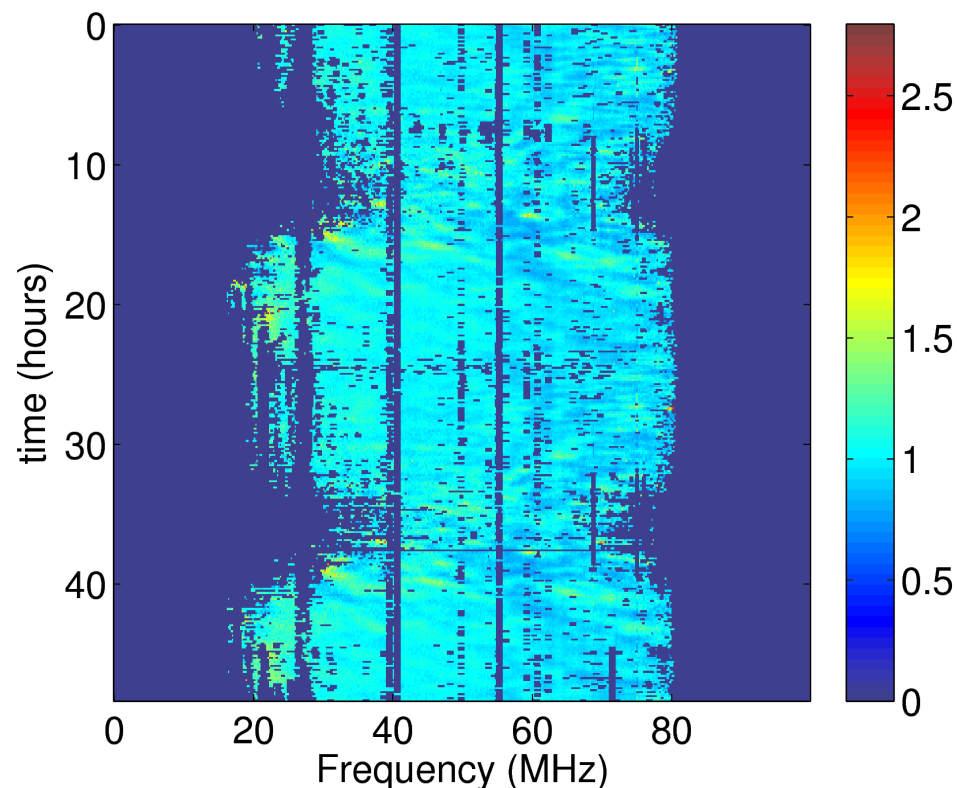


LBA outer: station calibration (1)

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Phase solution for 55y using 48y as phase reference

Flaggers work, but systematic features

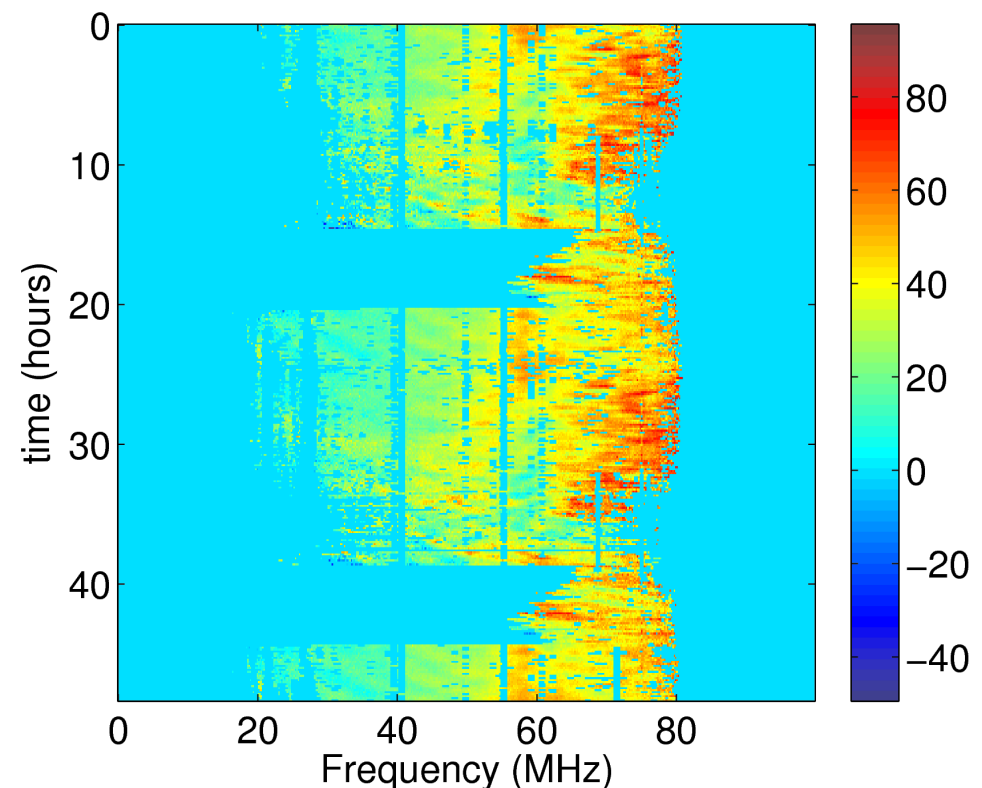
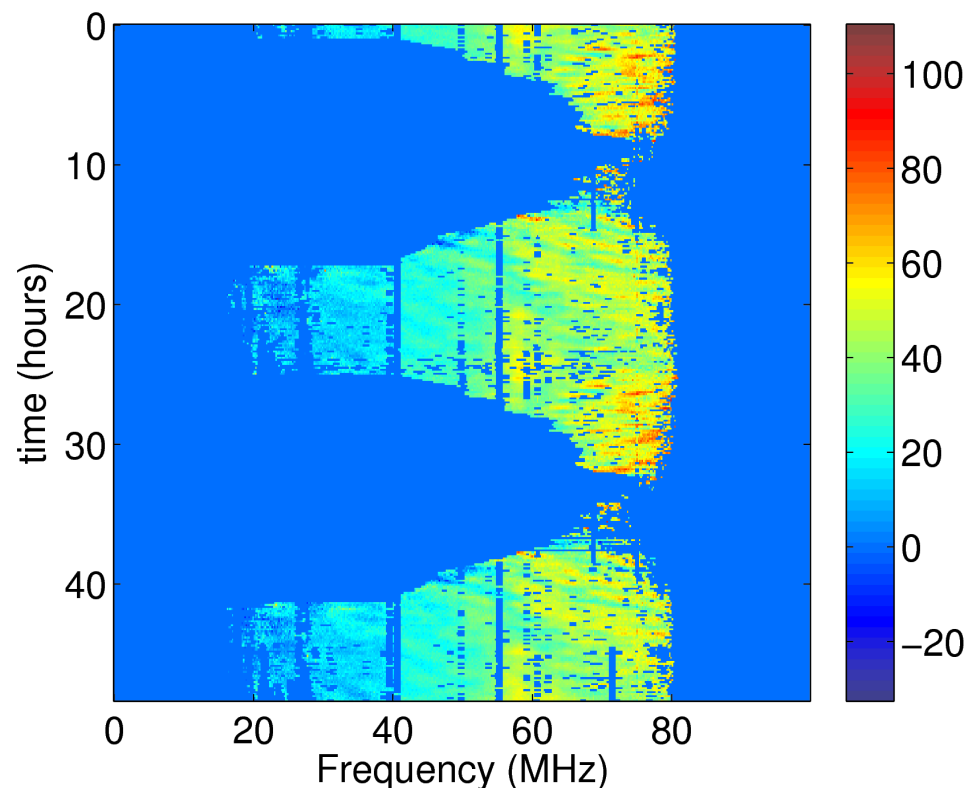


LBA outer: station calibration (2)

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Projection of Cas A and Cyg A (left) and Sag A (right)

Does not help -> sky model ok -> coupling effect?

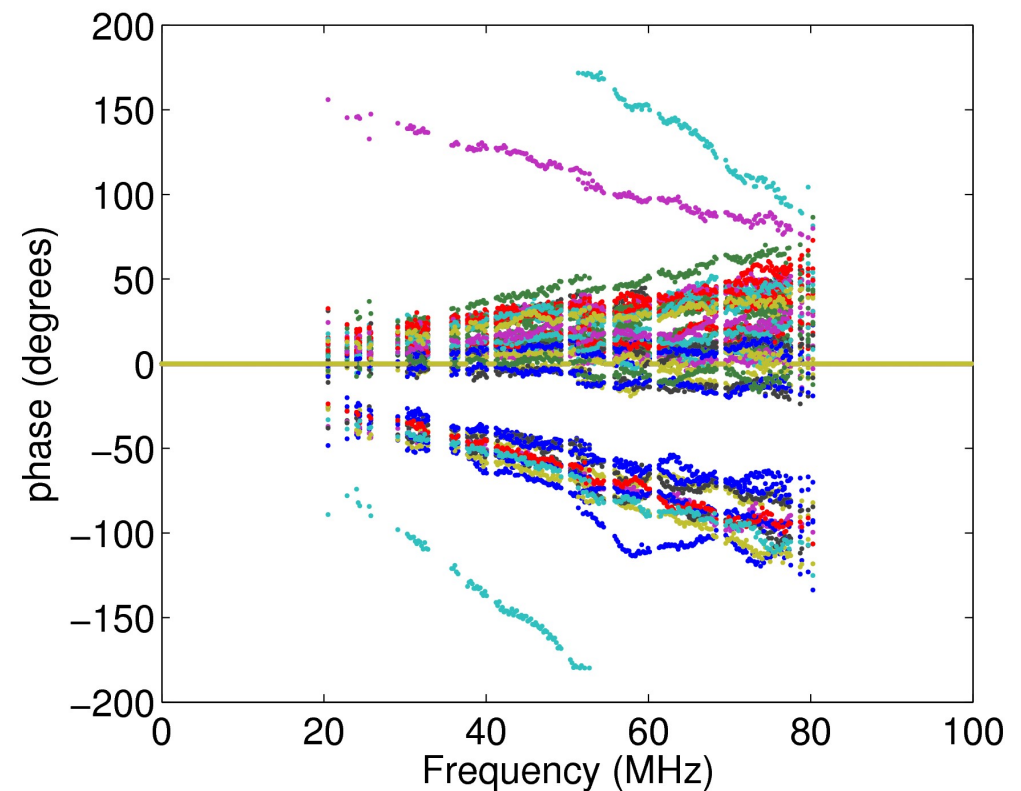
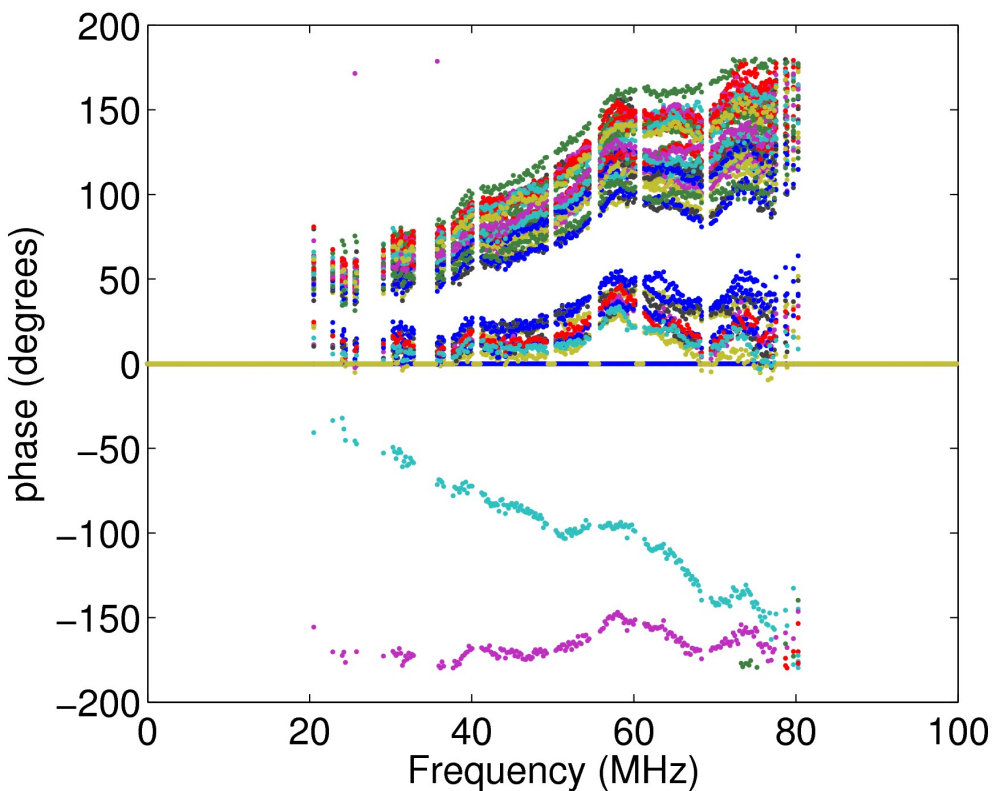


More evidence for coupling

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phase reference: 48y (left) and average phase (right)

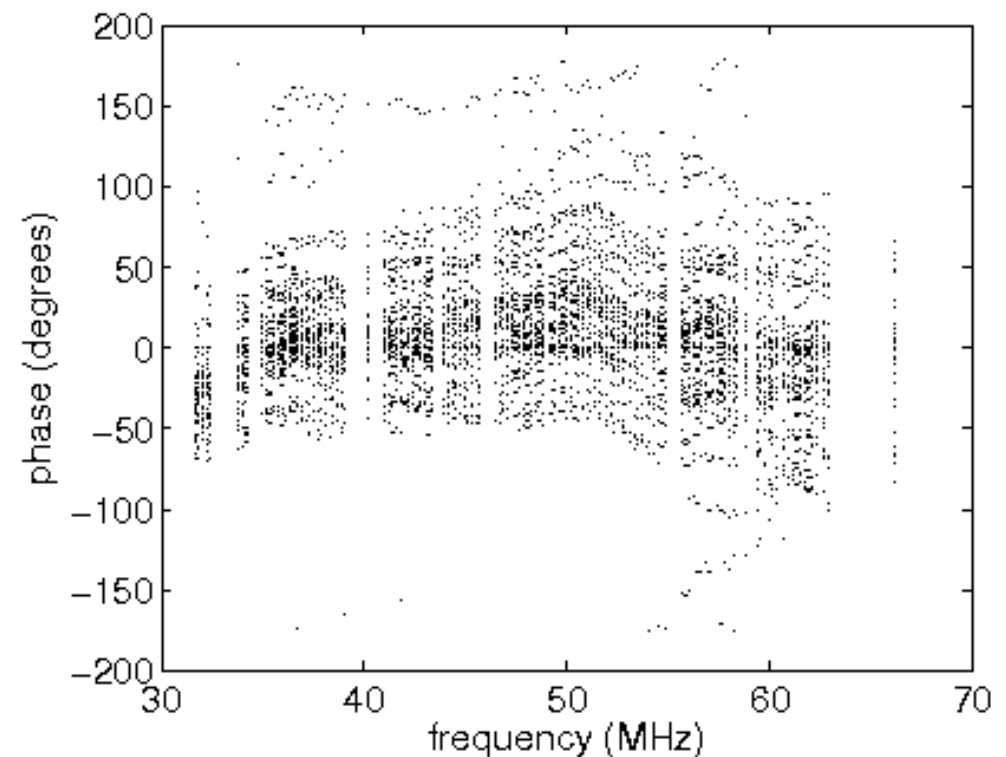
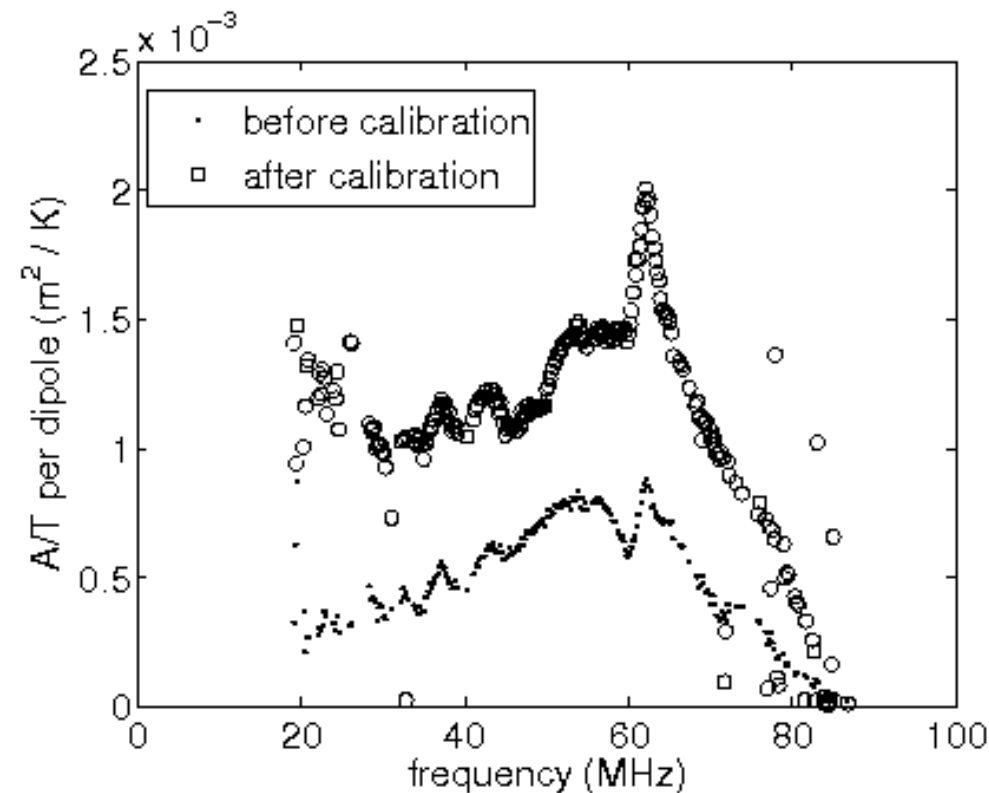
many elements show distinct features



Impact of phase differences

left: A/T of CS10 before and after calibration

right: typical phase solutions for CS10



Algorithm development

- finalize version 1.0 in Matlab, which implies
 - tuning of detection thresholds
 - fine tuning of algorithm (define v1.0)
 - decision on use of calibration (update vs. monitor)
- compile Matlab code to C++ shared library
- monitor calibration in first calibrated observations

commissioning and roll-out support

- support system tests, analysis of coupling, etc.

- **LBA calibration is in good shape**
 - consistent results
 - already used for system diagnosis
- **Evidence for mutual coupling**
 - disturbances stronger for inner than for outer array
 - evidence for fixed perturbations of dipole patterns
- **Many issues need further investigation, e.g.**
 - 1.5 MHz ripple
 - origin of delays suggested by phase behavior