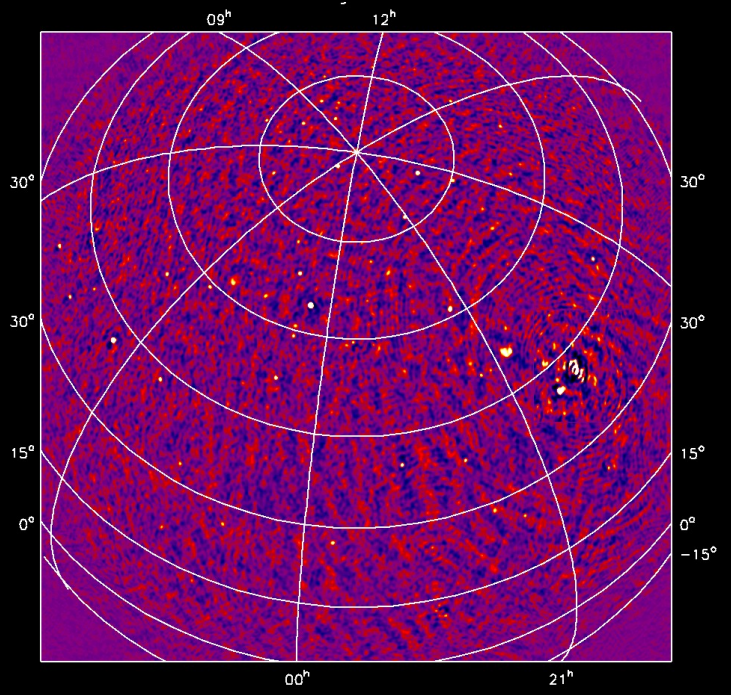
Technical Status of LOFAR

André W. Gunst



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Contents

- LOFAR architecture in a nutshell
- What is done
- What is not done yet

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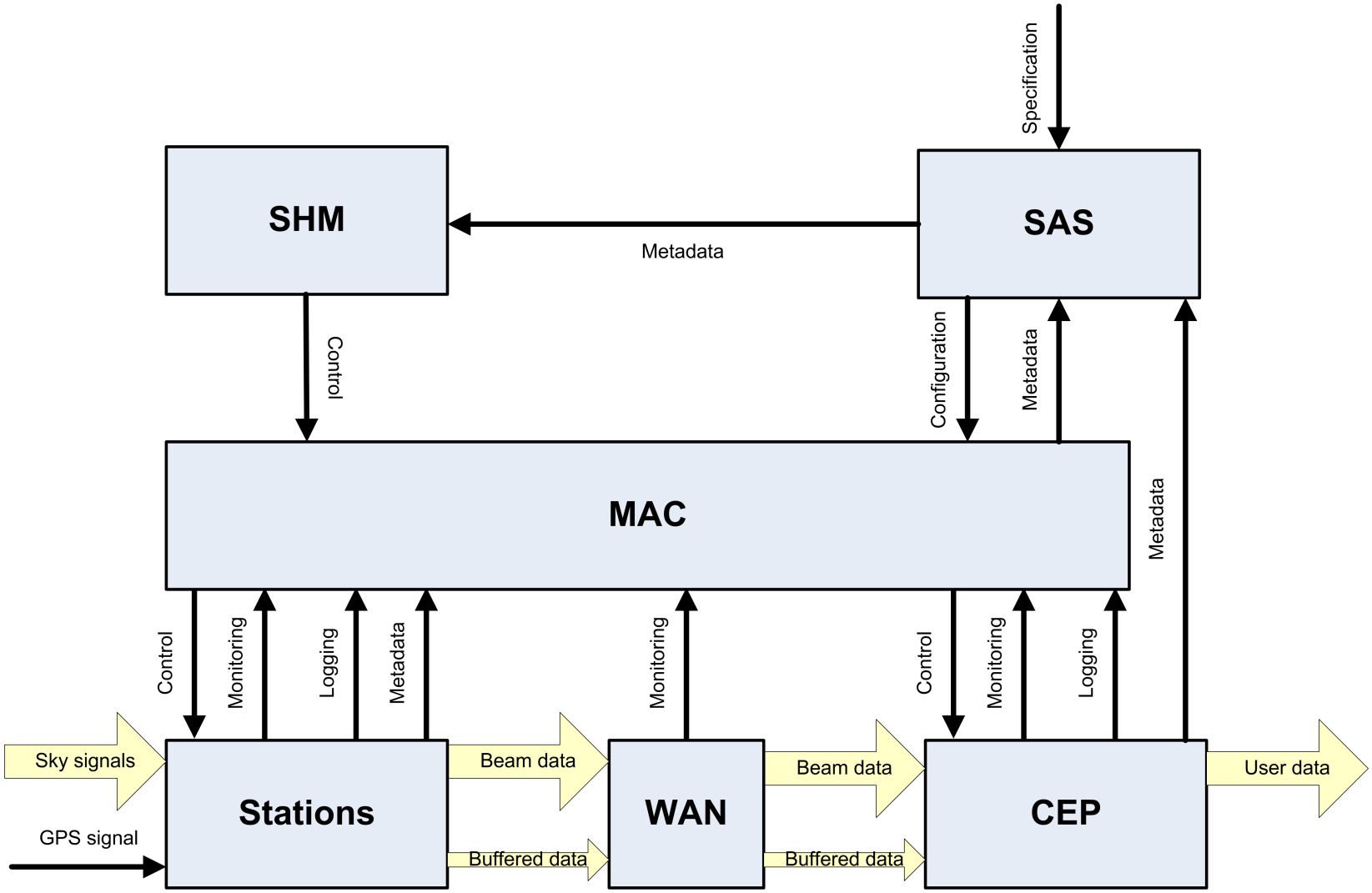
Top level architecture



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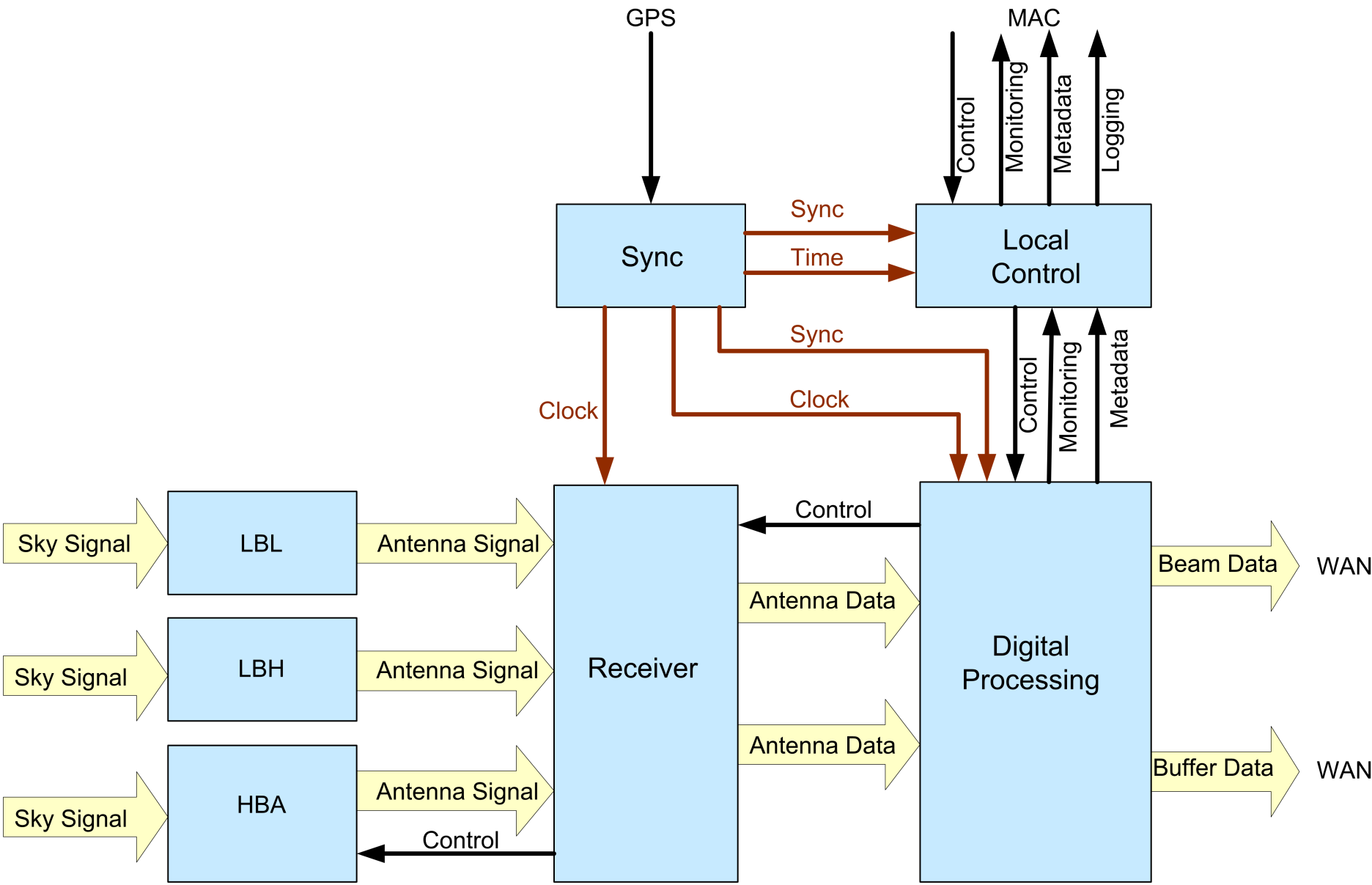
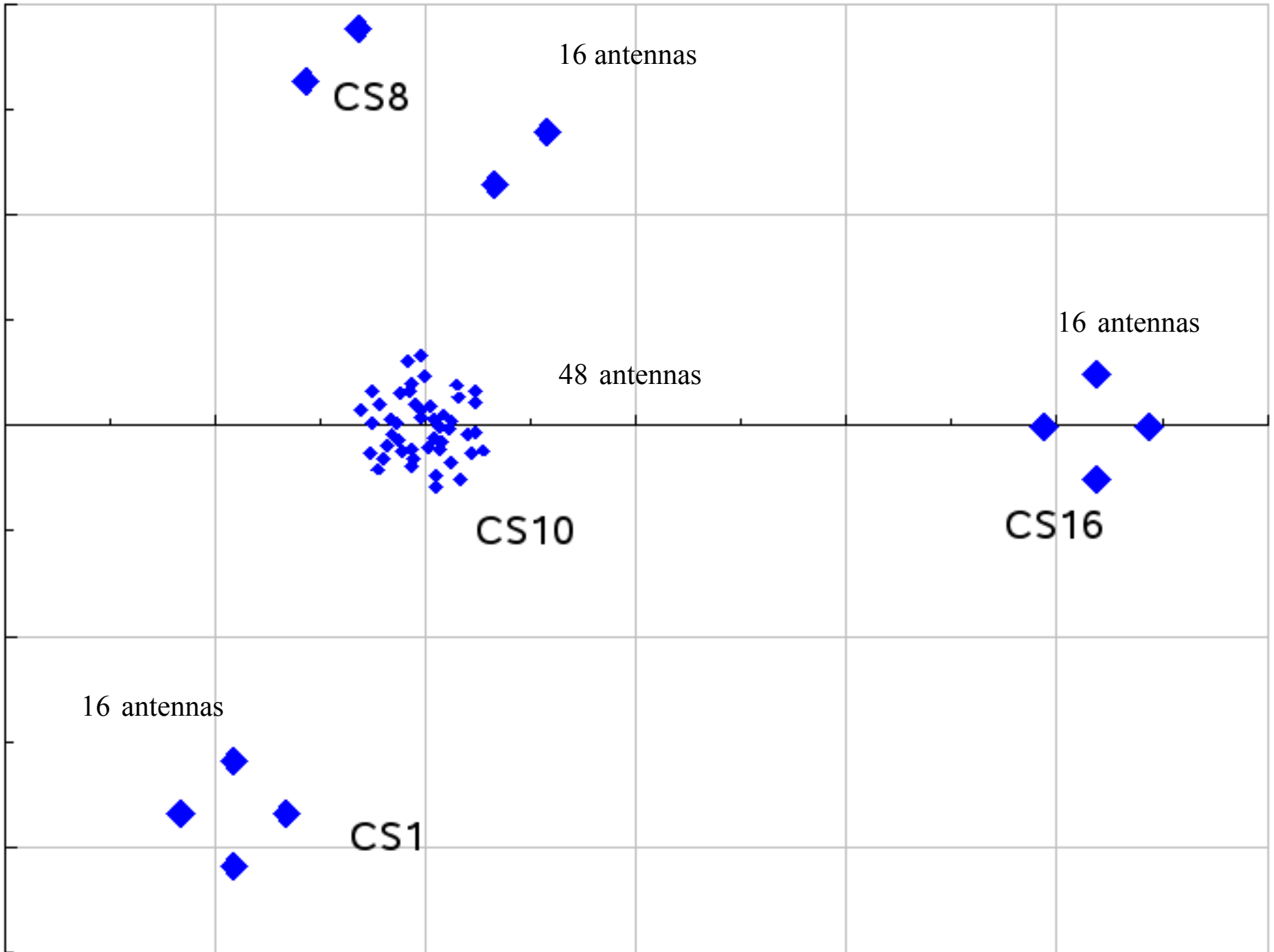
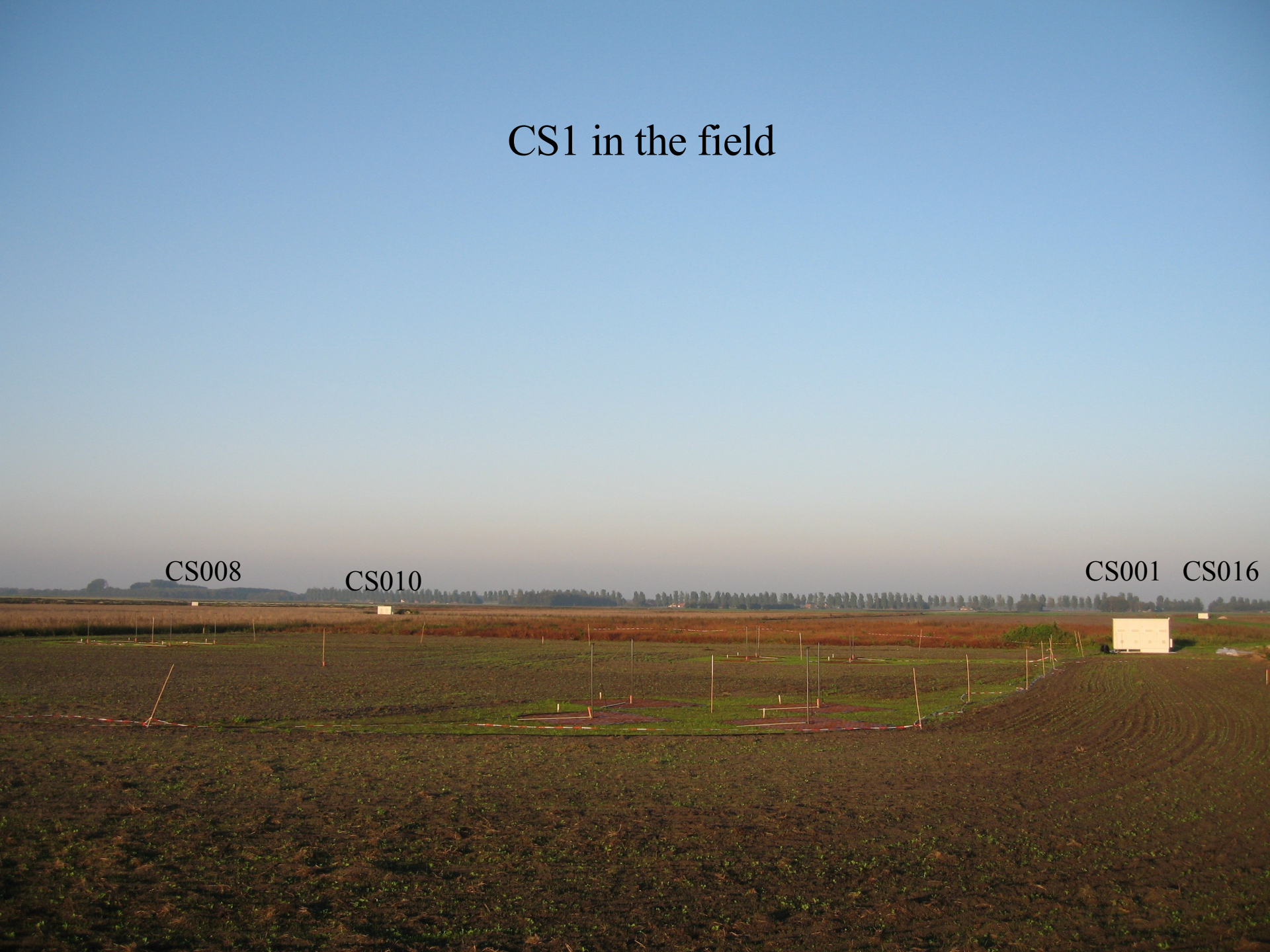
Station architecture



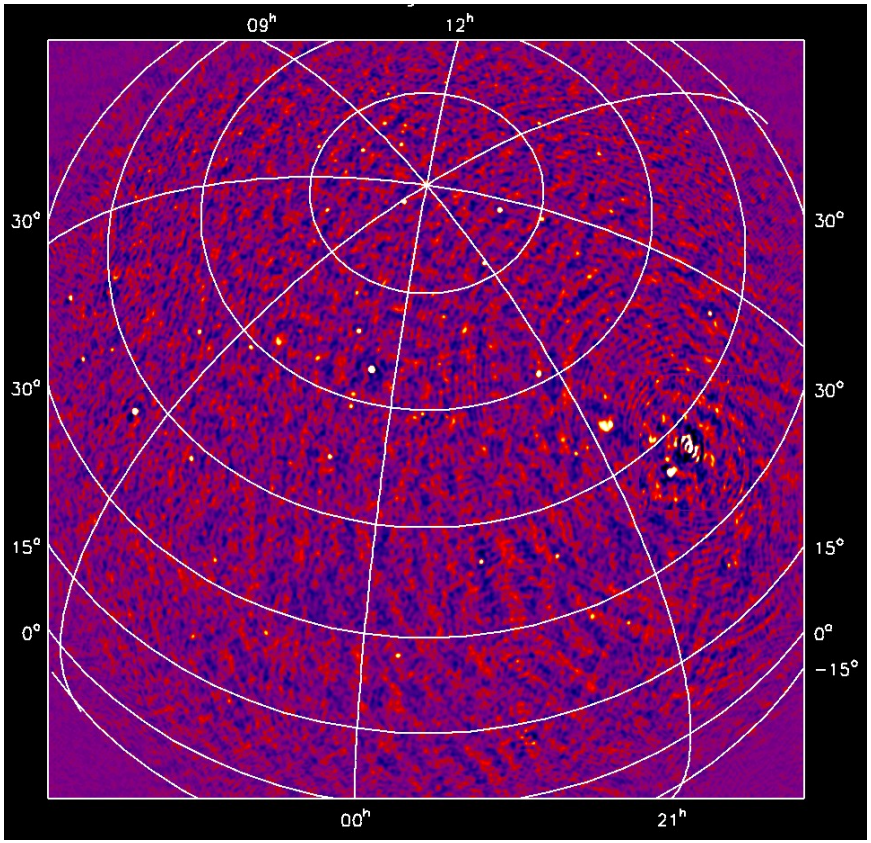

16 antennas
CS8
16 antennas
48 antennas
CS10
16 antennas
CS16
16 antennas
CS1

CS1 in the field



CS1 conclusions

- Pipeline from antenna to calibrated result works and resulted in “cleaned” images



Excluding: HBA, TBB, full calibration, full bandwidth, multiple beams, real core stations, robustness, …
Including: bugs and issues

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Bandwidth (WAN)

- Each uStation (of 4 per station) can transport maximal:
  - 49 subbands @ 160 MHz
  - 39 subbands @ 200 MHz
- This scales up for one station to
  - 30.63 MHz @ 160 MHz (985 Mbps)
  - 30.47 MHz @ 200 MHz (990 Mbps)

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Bandwidth (CEP)

- To use resources efficiently the current CEP bandwidth for each uStation (of 4) is limited to
  - 48 subbands @ 160 MHz
  - 36 subbands @ 200 MHz

- This scales up for one station to
  - 30.00 MHz @ 160 MHz
  - 28.13 MHz @ 200 MHz

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Other Characteristics

- Number of beams: 1 (goal is 8)
- Number of microstations: 16 (goal is 24)
- All fields equiped with Low Band Antennas

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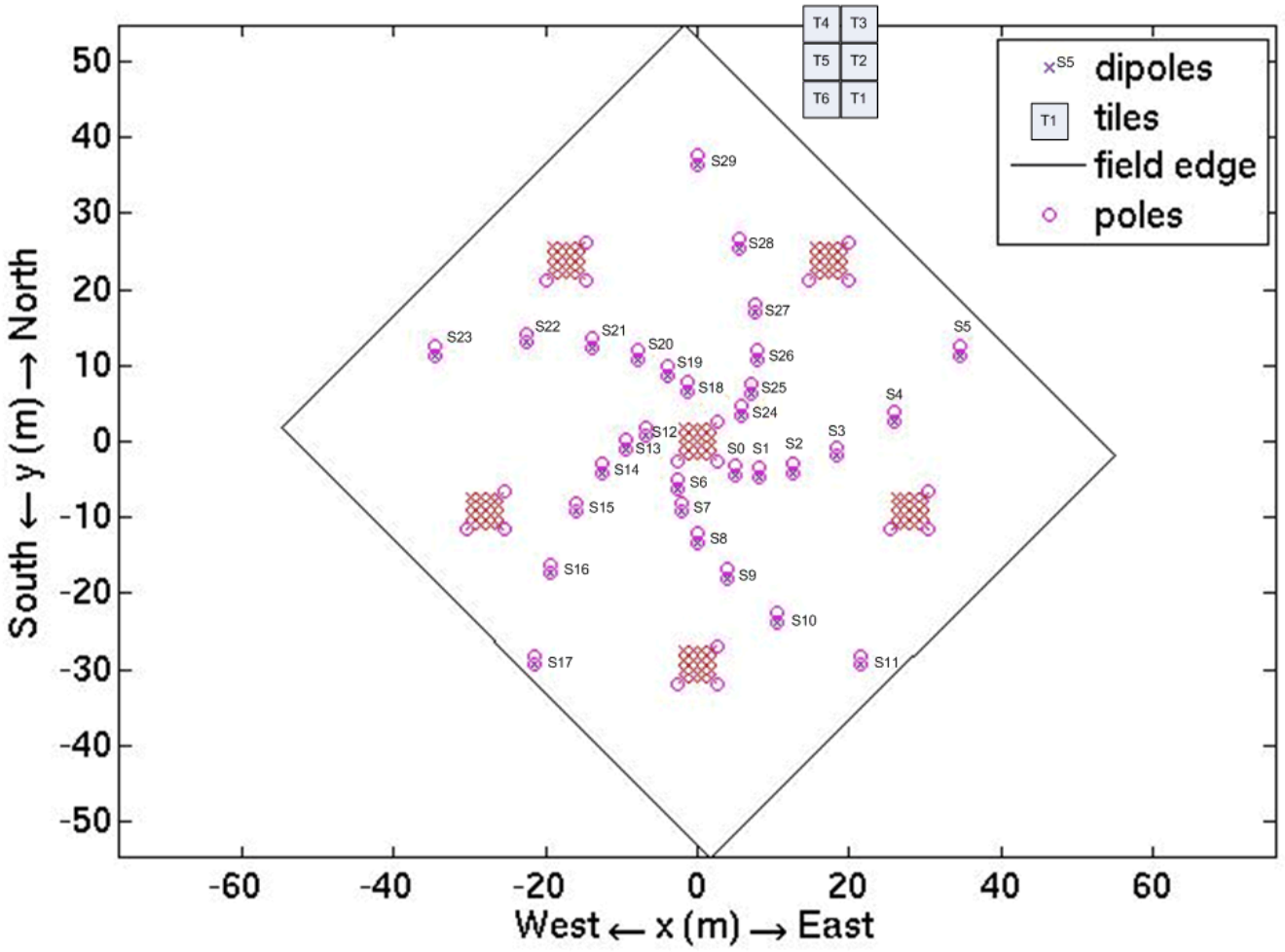
- Currently in the field



- Reliability/lifetime problem
  - Front end units break if the humidity increases
  - This can be reproduced in the lab
  -
- Power must be optimized (1 W ➔ 237 kW)
- Cost must be reduced (1 Euro ➔ 237 kEuro)

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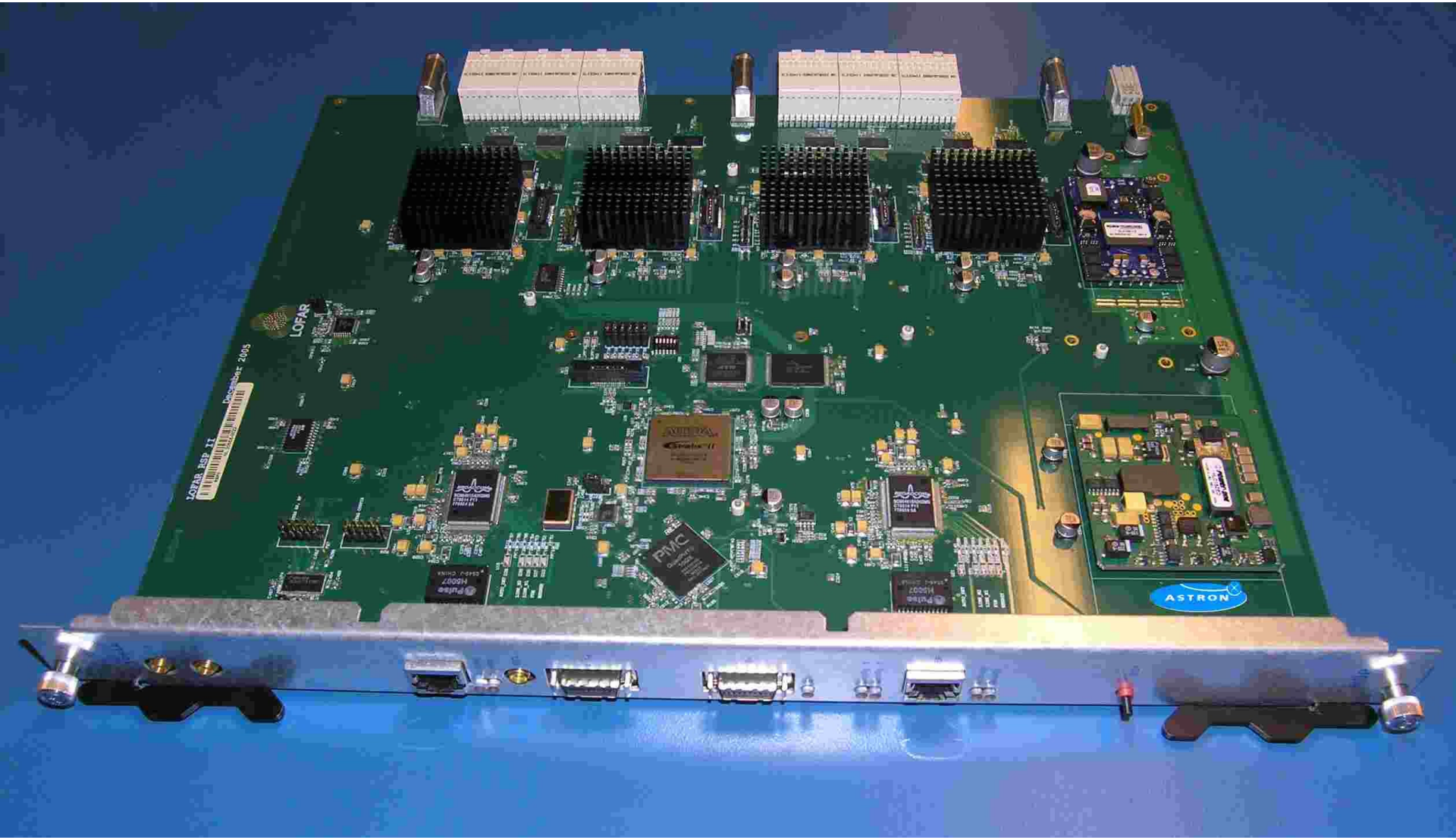
Remote Station Processing Status



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RSP Status (hardware)

- Currently 25 (new) RSP boards are tested (of 48)
- All interfaces are tested and work

- Four RSP boards are installed at CS001

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RSP Status (firmware)

- In 6.2 version (only installed at CS010) holes in cross correlation matrix are solved
- RSP3 firmware has a bug which cannot be reproduced easily (probably due to unproper initialization)
- Remote firmware update of RSP3 in progress

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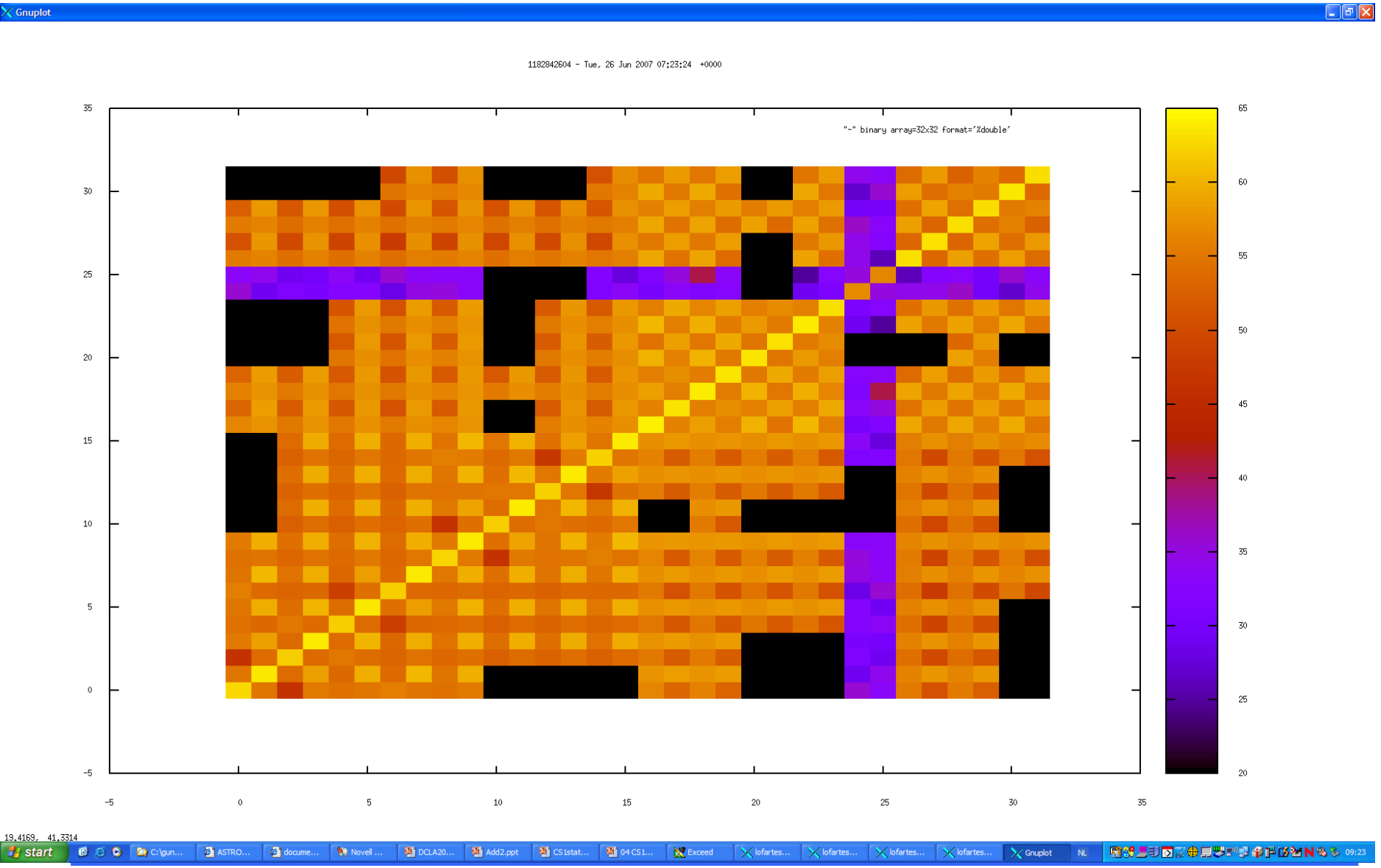
Cross correlation matrix of CS008



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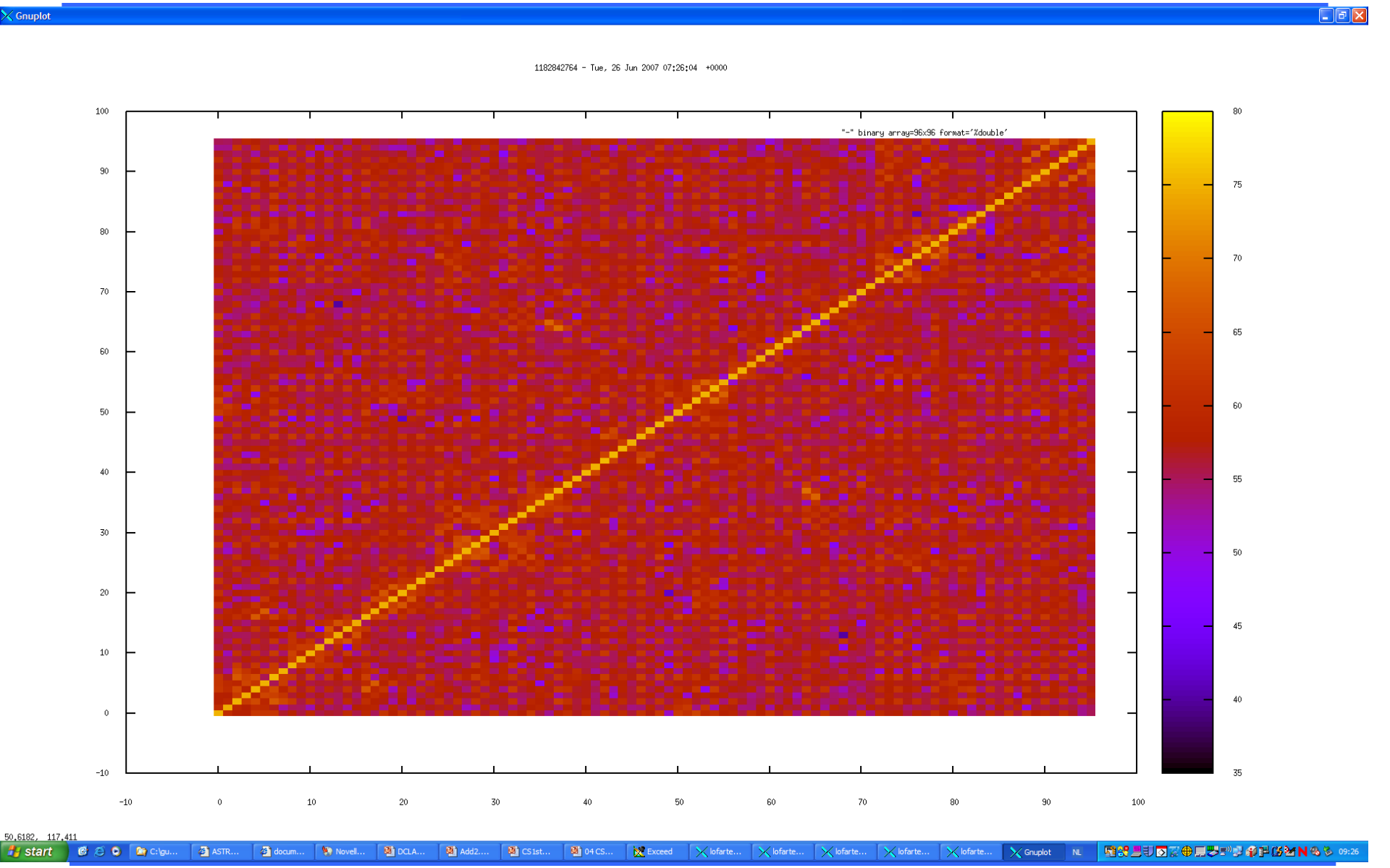
Cross correlation matrix of CS010



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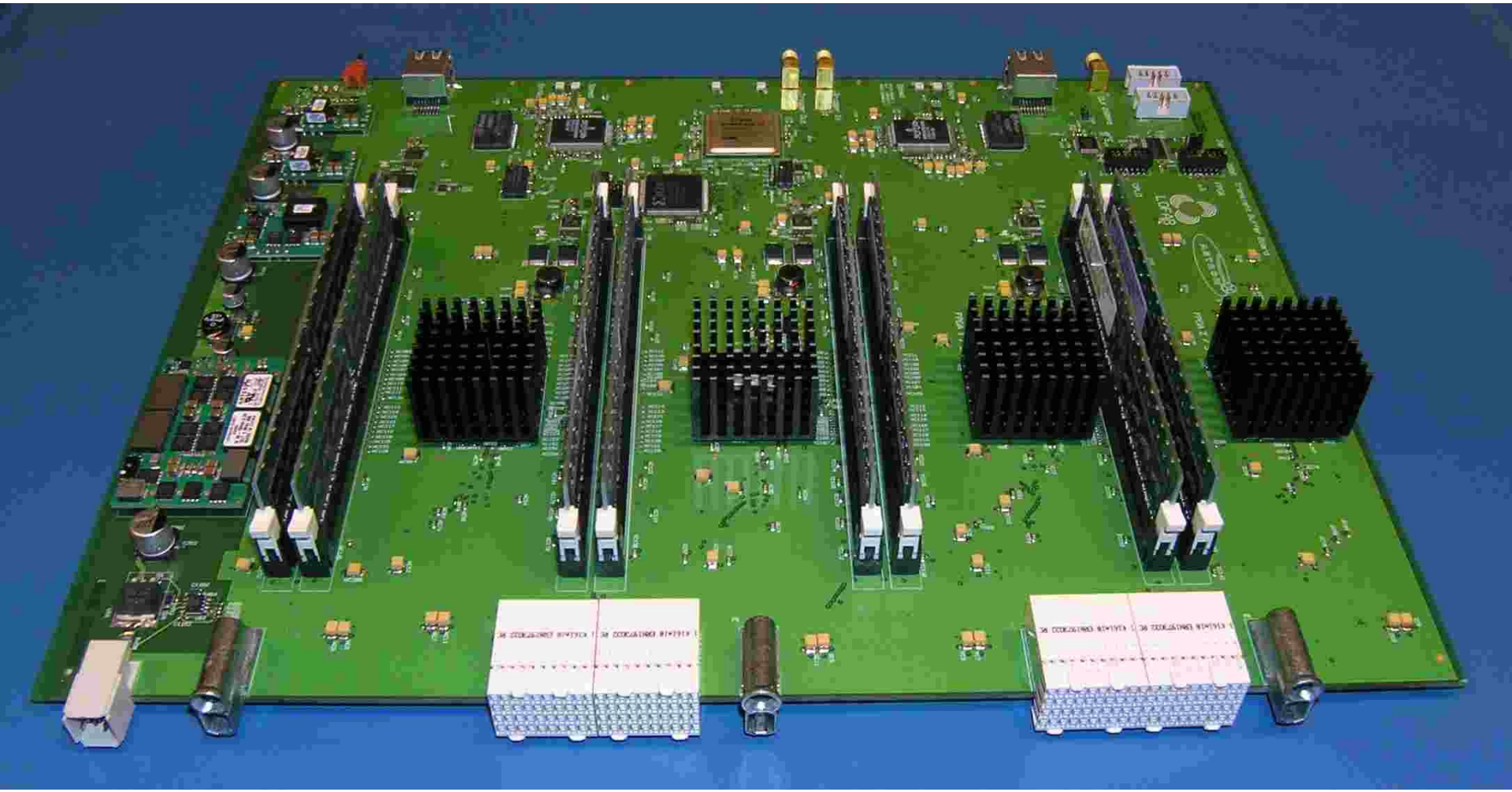
Transient Buffer Board Status



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TBB Status (hardware)

- Currently two (new) TBBs in the lab (of 12)
- All interfaces are tested
- The 1 Gigabit output interface is not working yet

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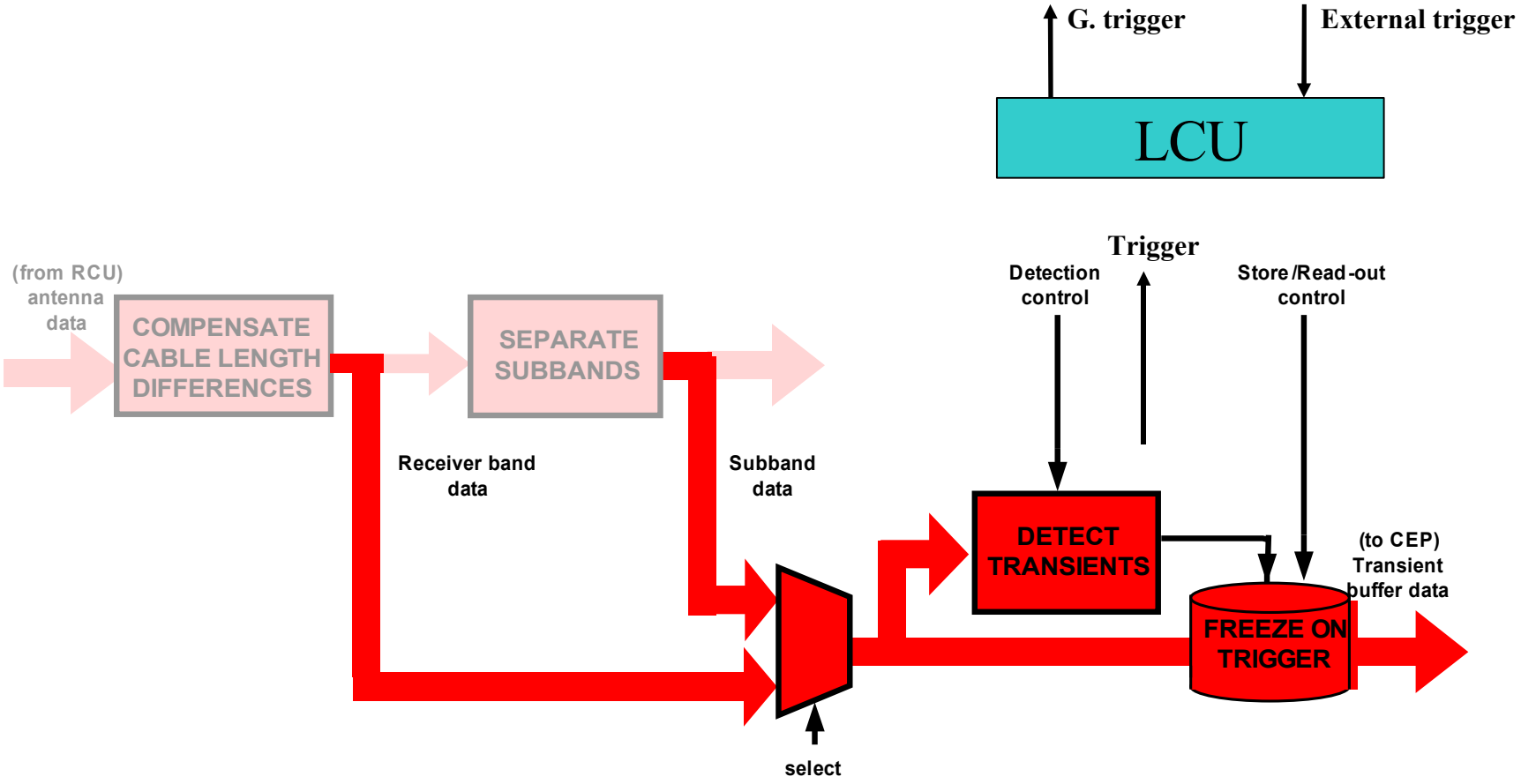
TBB status (firmware and driver software)



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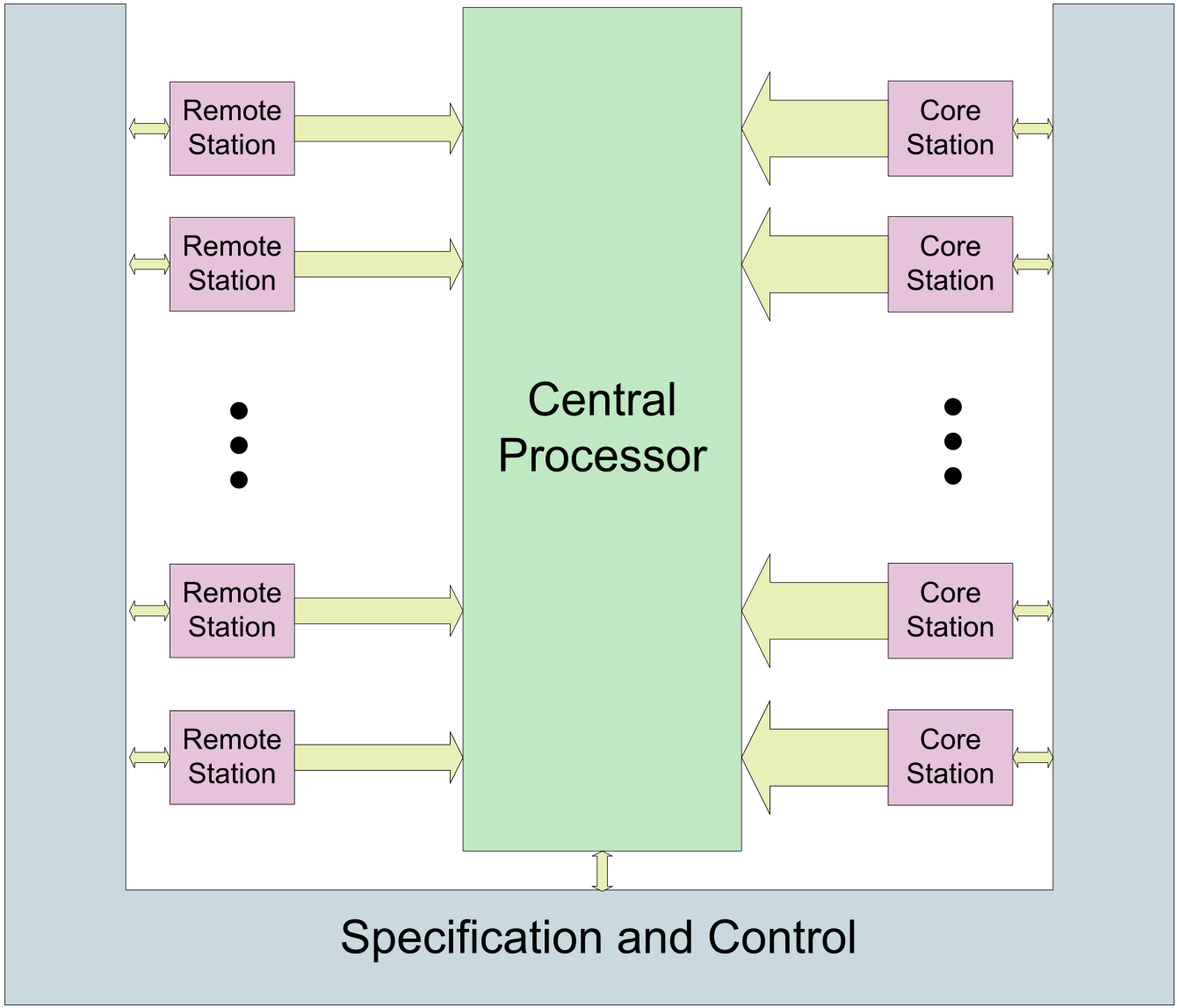
Core Stations



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The Problem for the EOR mode

- Bandwidth too high for BG/L

➔ Reduction necessary of station data

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Signal Processing Data Path

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Solution: reduce the number of bits (16 ➔ 4)

- Performance impact minimized solution
  - implement part of CEP processing in the field (expensive)
- Architectural impact minimized solution
  - reject or attenuate complete subbands incl. RFI
- Both cases: upgrade of remote station hardware necessary (Core Station Processing board)
- EOR mode requires all six racks of BG/L

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Conclusions

- Processing pipeline works from antenna to dataproduct
- Engineering not finished yet
- TBF: HBA, TBB, core station, lots of software development
- Issues which pop up during commissioning needs to be solved

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The End (of this talk)

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