LOFAR Commissioning Plans

LOFAR Technical Status Meeting
19 May 2009

Michael Wise

Commissioning Activities

Hardware:

- validation of hardware functionality
- establishing hardware reliability (e.g. MTBF)
- characterizing performance and stability

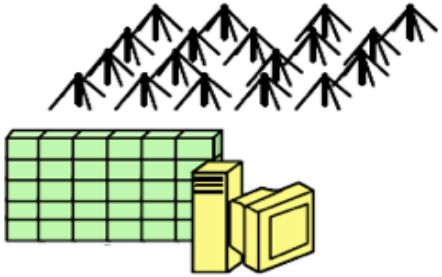
Software (SAS/MAC, SHM, OLAP, Science pipelines):

- testing of software modules/features
- testing interfaces to various databases
- testing of integrated pipelines
- profiling and benchmarking of components and pipelines

Astronomical:

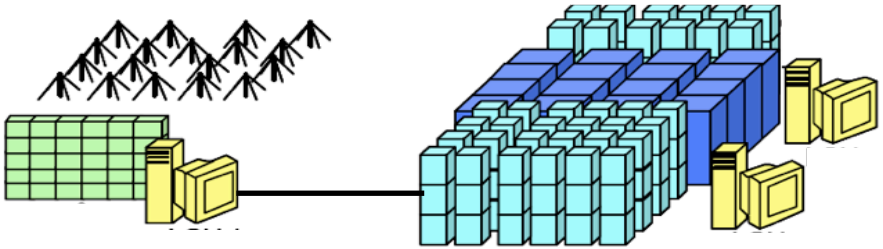
- use of scheduling tools
- testing of observing modes
- establishing and validation of a 20-200 MHz flux density scale
- determine astrometric accuracy
- determine performance figures (noise, image fidelity, dynamic range)

Station Testing



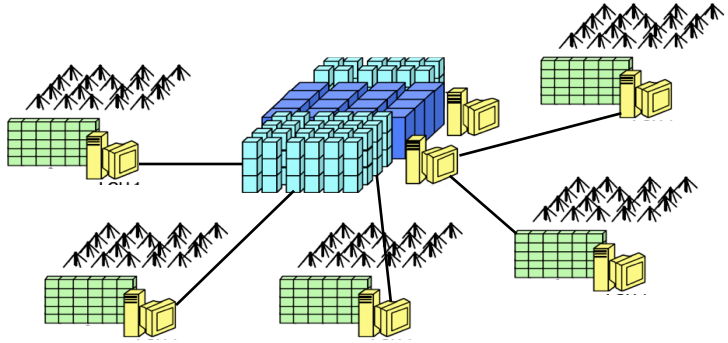
Station Validation

- basic hardware tests
- checks individual antenna performances
- checks basic functionalities and interconnections



Station Connection

- verifies station remote access
- station (RSP) – CEP interface
- station (TBB) – CEP interface
- Navigator – station interface
- MAC/SAS/SHM – station interface

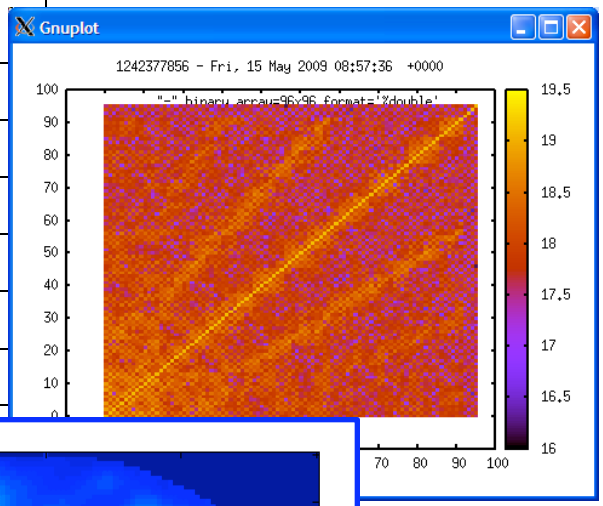


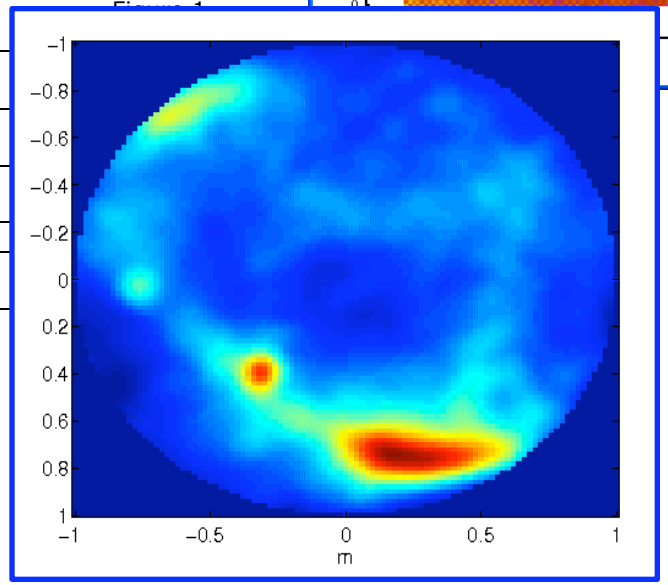
Observatory Verification

- verifies station for array operations
- astronomical commissioning
- final approval for science readiness

Acceptance Test CS302

number	test description	passed/failed
4.1.1	The interface between the RCU's and RSP boards should pass the Built In Self Test (BIST). All BISTs should work at 200 MHz clock frequency.	passed
4.1.2	The internal ring between the FPGAs on the RSP board and TBB board should pass the BIST.	passed
4.1.3	The external ring link should pass the BIST (loopback mode) on all digital boards.	passed
4.1.4	The LCU Ethernet link should pass the BIST (loopback mode) on all digital boards.	passed
4.1.5	The CEP output link should pass the BIST (loopback mode) on all digital boards.	passed
4.1.6	The RSP – TBB connection link should pass the BIST.	passed
4.2.1	The ring between all RSP boards should pass the BIST. This test is invoked via the LCU.	passed
5.1.1	Plots of the station beam formed data will be included in the acceptance test report.	
5.1.2	Plots of the station correlator output will be included in the acceptance test report	
5.2.1	Plots of the subband statistics will be included in the acceptance test report.	
5.3.1	The received noise should be higher then the receiver input noise	
5.4.1	The HBA tile test results	
5.5.1	The number of GPS satellites should be more then five. The Rubidium clock should be in sync.	

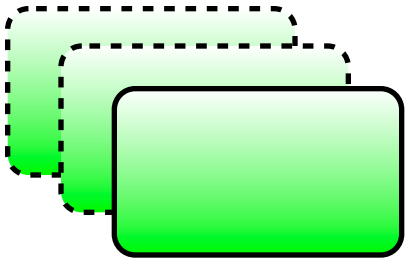




Software Testing

Unit tests:

- needed for each software component
- minimal developer level testing



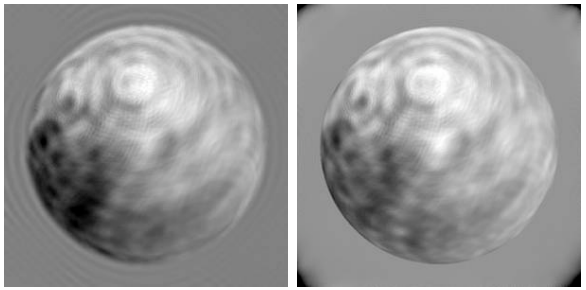
Regression test suites:

- needed for each major software component
- designed to verify component functionality
- repeated for each release of component

Integration tests:

- needed for each pipeline
- verifies components function in pipeline

Regression Tests



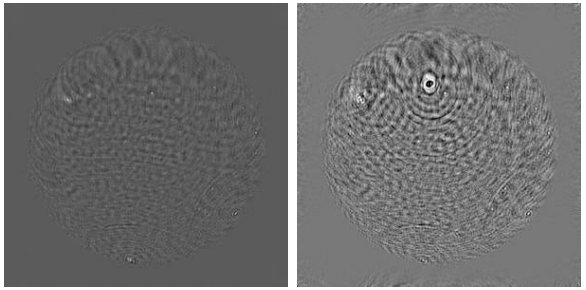
Images of L4086_SB10 (compressed by DPPP) uncalibrated data with aips++ (left) and cimager (right).

2) Image corrected data and see if image looks like psf.

Result: Imaged compressed, calibrated data of 3463_SB1 from Pandey. 1 channel, 2800 integrations. cimager finished in 17 minutes for 1024×1024 image, and other parameters as default. aips++ imager finished in 10 minutes with similar parameters.

Qualitatively, the images from both algorithms show compact sources like the psf. The images look similar except for large negative source in cimager image at the declination of Cas A. The RA of the negative source and Cyg A are about 12h different than expected; this is the same positional error seen in the uncalibrated data.

Quantitatively, the brightnesses are roughly a factor of two higher in cimager than in aips++. Presumably this is a definition issue?



Images of L3463_SB1 calibrated data with aips++ (left) and cimager (right). The cimager has a strange negative artifact at the declination of Cas A. Although coordinates are not shown, the RA coordinates are rotated by 12h in cimager, but not aips++.

3) Test range of imaging parameters.

a) For maxsupport=512. Crash with this error:

CIMAGER Testing Wiki

```
==========================================================================
Test Worksheet
==========================================================================

( Note: please copy completed reports to /data/testing/LOFARSOFT_1.0/Worksheets )
(       with the following naming convention:                              )
(                                                                          )
( <toolname>.<user_id>.<test_id>.<counter>.reg  ex. CS1_IDPPP.wise.001.001.rep  )
(                                                                          )

Tool Name : CS1_IDPPP
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Date : 2009-05-14
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Tester : M. Wise
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LOFARSOFT Version : 1.0 (beta)
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Tool used was located in: /app/lofar/renting/CS1_IDPPP.
This location is a symbolic link to: /app/lofar/builds/svn12100/CS1_IDPPP.
Compilation date seems to be 2008-11-04.
No version number available.


Platform :
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Tests were executed on lioff022.

  o Base systems:
    -------------
        _X_ Kubuntu Linux 7.10
        ___ Redhat Linux 8.0
        ___ Mac OS X 10.5.7
        ___ Mac OS X 10.4.10

Were bugs found and reported? (if Yes, summarize):  _X_Yes ___No
------------------------------------------------------------------

A fatal error occurs when attemtping to further compress a LOFAR MS which had been
previously compressed with CS1_IDPPP. The error seems to be related to missing
columns in the input compressed MS.
```

Testing worksheets

Preparation Tasks

- Absolute flux scale
- Ionospheric issues
  - *GPS – MIDAS 4D?*
  - *Refraction – TEC relation*
- Polarization issues
  - *WSRT polarized beam*
  - *Polarized source models*
  - *Polarization issues for EU baselines*
- GSM issues
  - *Initial GSM*
  - *GSM for EU baselines*
- Determination of uv-taper for imaging
- Determination of station taper (HBA)
- RFI statistics
- Preparation for MSSS
  - *Target field, pointing schemes, frequency span, sub-band selection, etc.*
  - *Data quality checks, dry runs, etc.*

System Characterization

LOFAR 1-5:

- Detection of fringes
- Investigation of closure phases
- Determination of final LOFAR bandpass
- Dealing with drifting clocks
- Investigation, modeling, and testing of station beams
- TBB commissioning tests

LOFAR 6-20:

- Tied array beam-forming using 2 or more Core stations
- Validation of the Tied array beams
- Validation of ionospheric model / approach
- Scheduling of observations
- Frequency switching between LBA and HBA
- Rapid position switching (for Calibration purposes)
- Multi-beam (mosaic) processing
- Determination of delay and phase offsets in the super-station
- Absolute timing for Tied array observations

Working Groups

Beam Modeling — **Johan Hamaker**, Sarod Yatawatta, Stefan Wijnholds, Michiel Brentjens, Ronald Nijboer

Ionosphere — **Jan Noordam**, Huib Intema, Ger de Bruyn, Anna Scaife, Bas van der Tol, Joris van Zwieten, James Anderson

Polarization — **Marijke Haverkorn**, Goerge Heald, Michiel Brentjens, Ger de Bruyn, James Anderson

GSM/LSM — **John Swinbank**, Bart Scheers, Niruj Mohan, Sarod Yatawatta, Ger van Diepen, Michael Wise

Data Quality & Monitoring — **V. N. Pandey**, Jason Hessels, Evert Rol, Mamta Pandey, Fabien Batejat, Jan Noordam, Michael Wise

Long Baselines — **John Conway**, **James Anderson**, Jean-Mathias Grießmeier, Hans-Rainer Kloeckner, Philippe Zarka, Annette Haas, Anna Scaife, Michiel Brentjens, Jan Noordam, Ger de Bruyn

Busy Weeks®

- Pulsar I: Nov. 17-21, 2008 (HBA tracking)
- Pulsar II: Mar 2-6, 2009 (Initial TAB tests)
- TBB I: Mar 30- Apr 3 (Basic data-taking, LCU trigger)
- Pulsar III: Jun 2-6, 2009 (BF data writer, TAB tests)
- *Imaging I: late June* (End-to-end pipeline tests)
- *Ionosphere I: July, 2009* (TBD)
- *Imaging II: August* (MSSS dry runs)

Schedule one for your group today!

*Registered trademark, Ben Stappers (2008)

Planning Status

Current plan includes:

- Station acceptance
  - *Procedure defined from placement to observatory handover*
  - *Observatory check-out procedure being defined*
  - *Tied to roll-out schedule*
- Software testing
  - *Functional testing broken down by major components*
  - *Pipeline integration test suites need to be defined*
  - *Defines pipeline roll-out schedule*
- System Characterization
  - *Initial inventory of tasks through LOFAR20 (Phase 1+2)*
  - *Working groups defined*
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Still needs ⇒ Additional tasks through LOFAR36
Incremental plan for long-baselines
KSP-specific projects

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Commissioners

Long baseline & long baselines

KSP-specific projects