



LOFAR OVERVIEW AND FEEDBACK FROM 1st LOFAR USERS MEETING

R. F. Pizzo

➤ Operational status

- Array
- Achievements and issues

➤ Science Operations

- Cycle operations – Cycle 2 & 3 statistics
- Observing efficiency
- Cycle 4 & and forthcoming deadlines

➤ Feedback to users from 1st LOFAR Users Meeting

ARRAY STATUS

International LOFAR Telescope (ILT)



Chilbolton



Dutch stations



Onsala



Unterweilenbach



Łazy

- 47 operational stations completed
- 38 NL stations, 9 international stations
- 3 new stations coming in Poland

Dutch stations

LOFAR Core (NL)

Norderstedt

Potsdam

Jülich

Effelsberg

Tautenburg

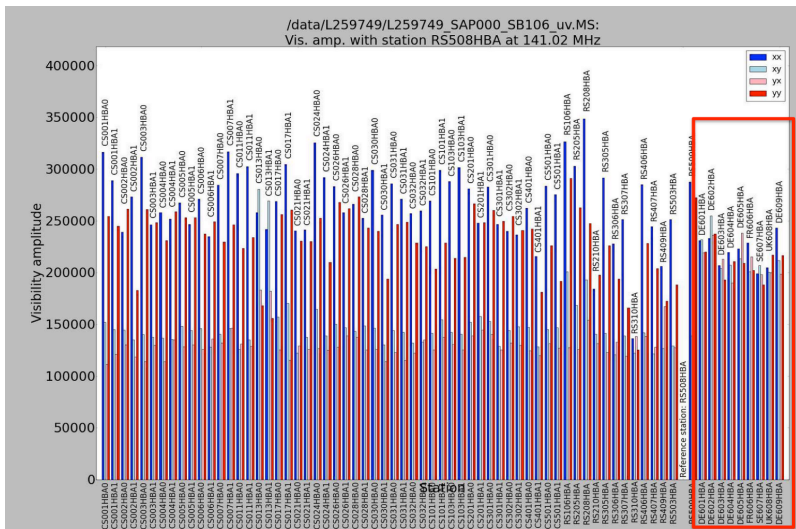
Borówiec

Baldy

Nançay

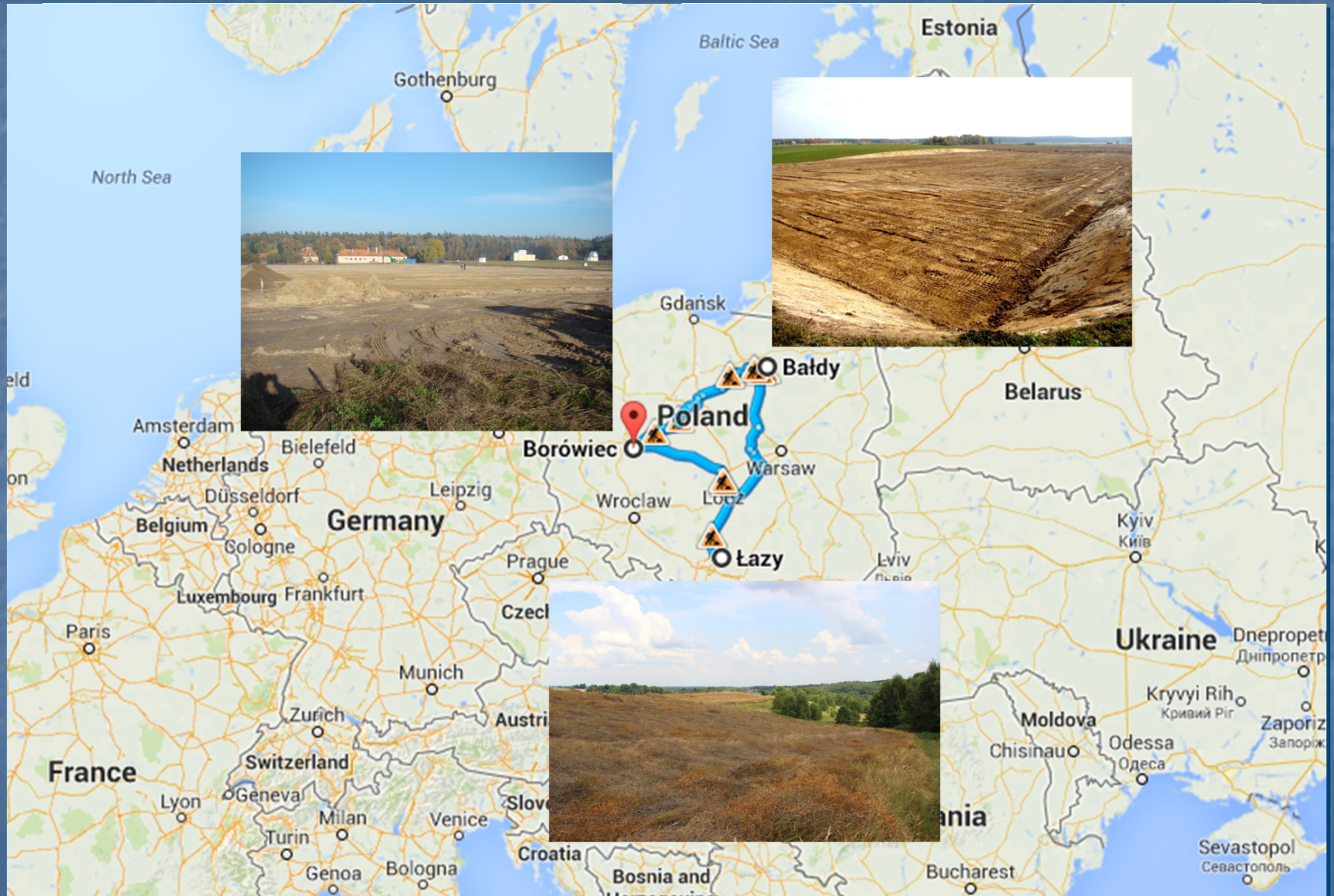


STATION ROLL OUT: HAMBURG

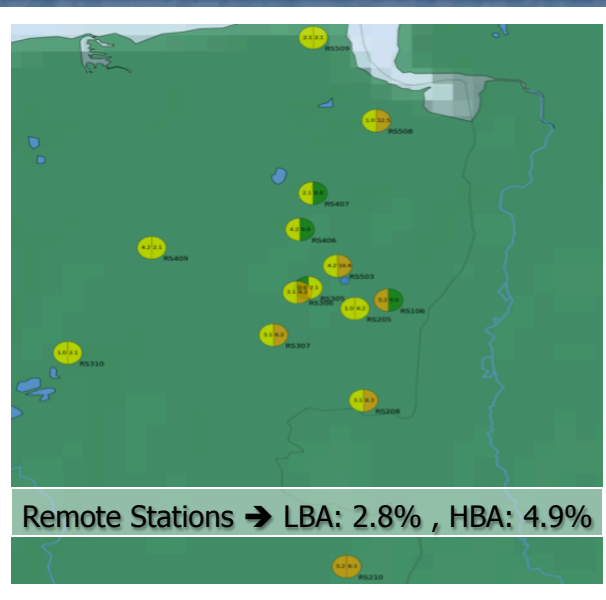
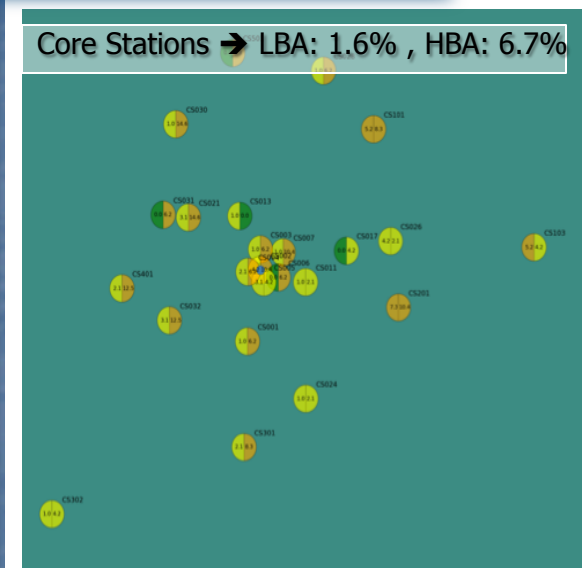
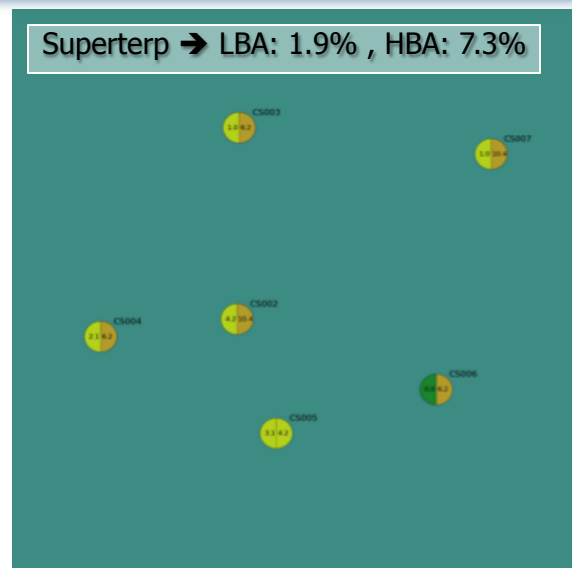
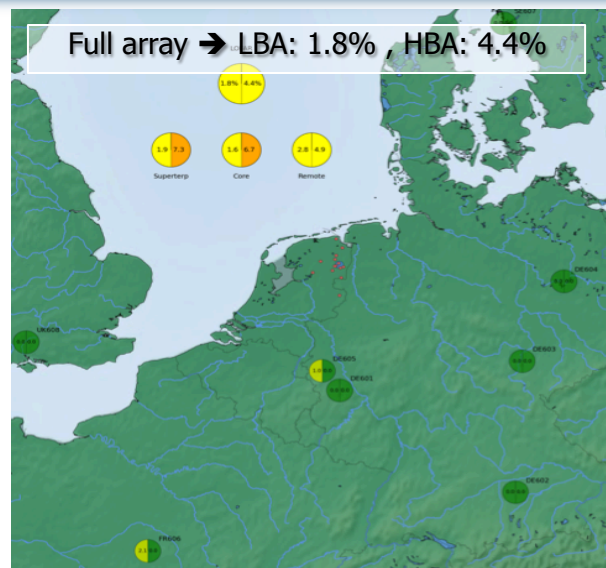


- Station handed over to operations at the end of 2014 (RFI sources preventing optimal station calibration in the LBA)
- Station fully operational since Feb 4th
- Visibility amplitude for all the stations participating to the first successful test run involving a record **71 LOFAR antenna fields** ! (see ASTRON daily image 11 February)

STATION ROLL OUT: POLAND



ANTENNA ELEMENTS STATUS



All operational
< 5% not operational
< 15% not operational
> 15% not operational

- Current status available at https://proxy.lofar.eu/array_status/
- Maintenance in progress

STATION CALIBRATION

Station	mode 1/2	mode 3/4	mode 5	mode 6	mode 7
CS001	08-06-12	19-05-14	19-02-15		11-02-15
CS002	17-09-14	27-05-14	11-02-14		24-02-15
CS003	17-09-14	19-05-14	11-02-14		24-02-15
CS004	17-09-14	27-05-14	11-02-14		19-02-15
CS005	17-09-14	19-05-14	11-02-14		19-02-15
CS006	17-09-14	19-05-14	11-02-14		19-05-14
CS007	17-09-14	19-05-14	11-02-14		24-02-15
CS011	17-09-14	05-08-14	19-02-15		24-02-15
CS013	17-09-14	05-08-14	19-02-15		19-02-15
CS017	17-09-14	05-08-14	19-02-15		24-02-15
CS021	17-09-14	05-08-14	19-02-15		19-02-15
CS024	17-09-14	05-08-14	19-02-15		19-05-14
CS026	17-09-14	05-08-14	19-02-15		19-02-15
CS028	17-09-14	05-08-14	19-02-15		24-02-15
CS030	17-09-14	05-08-14	19-02-15		19-02-15
CS031	01-10-12	05-08-14	19-02-15		24-02-15
CS032	17-09-14	05-08-14	19-02-15		24-02-15
CS101	17-09-14	05-08-14	19-02-15		24-02-15
CS103	17-09-14	21-03-12	19-02-15		24-02-15
CS201	17-09-14	29-11-12	19-02-15		19-02-15
CS301	17-09-14	29-11-12	19-02-15		24-02-15
CS302	25-10-12	29-11-12	19-02-15		19-02-15
CS401	17-09-14	15-10-12	19-02-15		24-02-15
CS501	17-09-14	29-11-12	19-02-15		24-02-15
RS106	17-09-14	22-07-14	20-04-15		24-02-15
RS205	17-09-14	12-11-13	20-04-15		24-02-15
RS208	17-09-14	12-11-13	20-04-15		24-02-15
RS210	17-09-14	22-07-14	11-02-14		24-02-15
RS305	17-09-14	22-07-14	20-04-15		24-02-15
RS306	18-07-12	22-07-14	20-04-15		24-02-15
RS307	17-09-14	22-07-14	20-04-15		24-02-15
RS310		22-07-14	20-04-15		19-02-15
RS406	17-09-14	12-11-13	20-04-15		24-02-15
RS407	17-09-14	22-07-14			
RS409	17-09-14		20-04-15		24-02-15
RS503	17-09-14	22-07-14	20-04-15		24-02-15
RS508	17-09-14	11-02-14	20-04-15		19-02-15
RS509	17-09-14	27-06-12	20-04-15		24-02-15
DE601		11-11-14	20-04-15		19-02-15
DE602		29-01-15	20-04-15		29-01-15
DE603		03-10-13	20-04-15		24-02-15
DE604		03-10-13	03-10-13		20-04-15
DE605		26-10-12	03-10-13		19-02-15
FR606		22-07-14	20-04-15		24-02-15
SE607		22-07-14	20-04-15		24-02-15
UK608		22-07-14	03-10-13		24-02-15
DE609		03-04-15	03-04-15		03-04-15

➤ Current status

<http://www.astron.nl/radio-observatory/astronomers/current-status>

➤ Significant progress made since last year meeting

➤ Station calibration still competing with Cycle operations

➤ Contact points: (L. Cerrigone + observers)

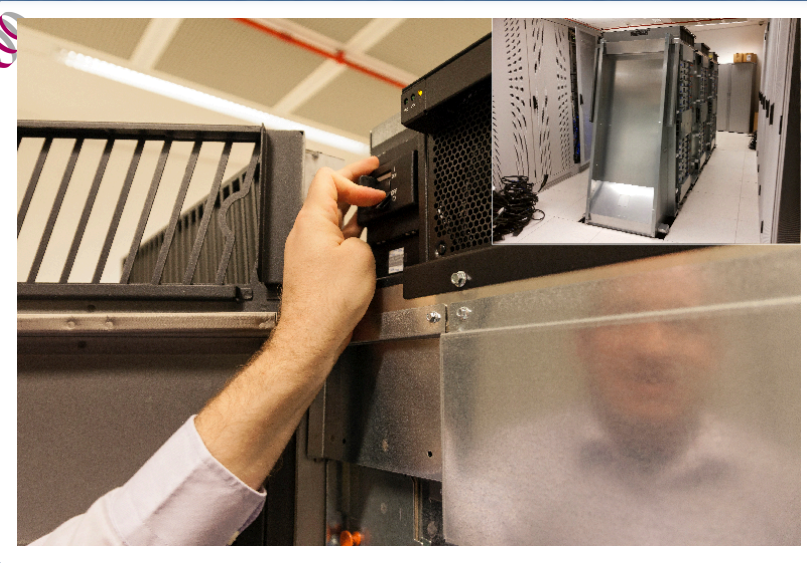
➤ New station calibration methods to be explored that may make both data collection, handling and reduction (much)

➤ TBB measurements (O. Wucknitz)

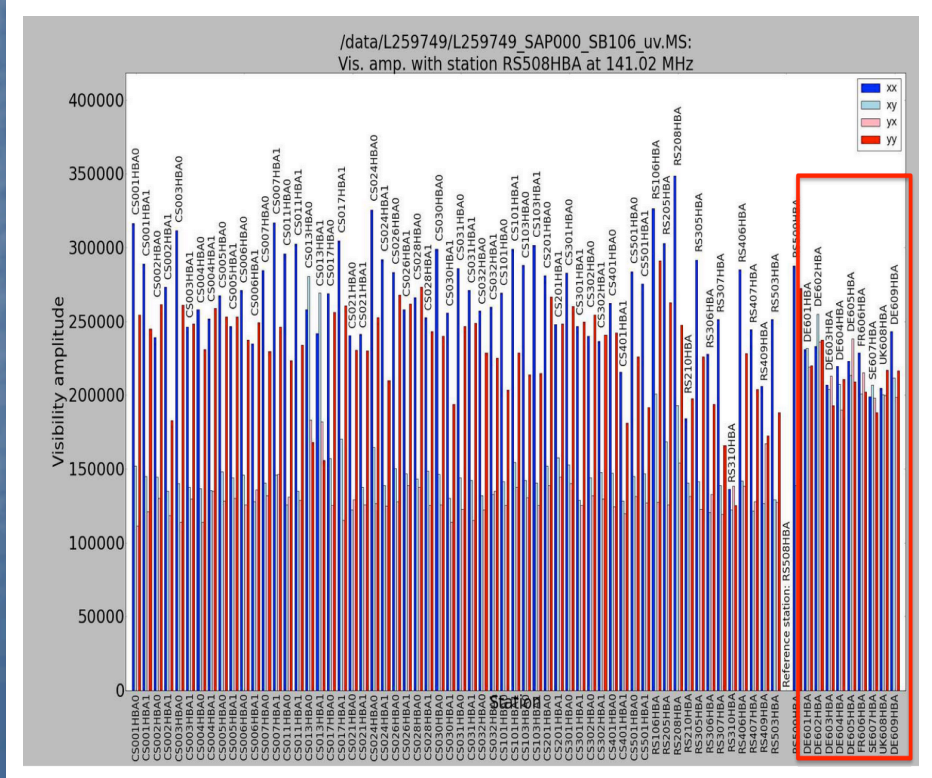
➤ Holography (M. Brentjens + summer student)

ACHIEVEMENTS AND ISSUES

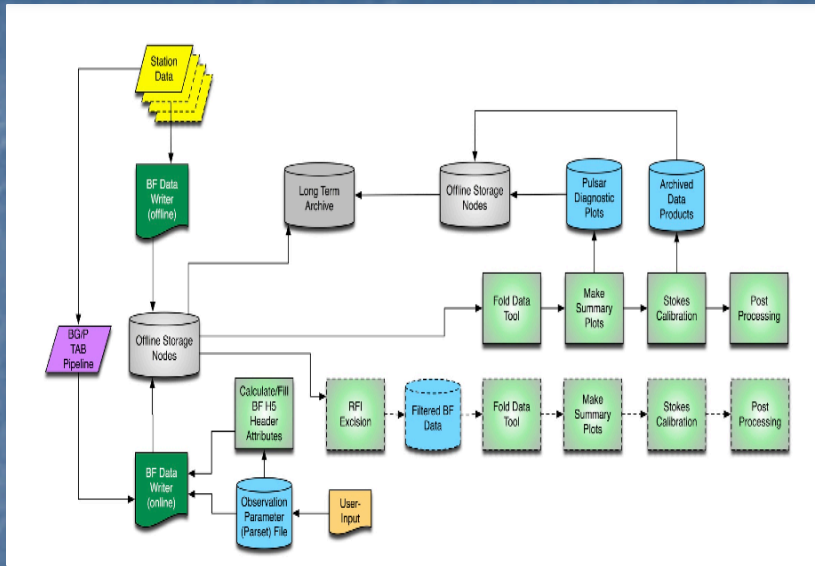
OPERATIONAL ACHIEVEMENTS 2014-2015



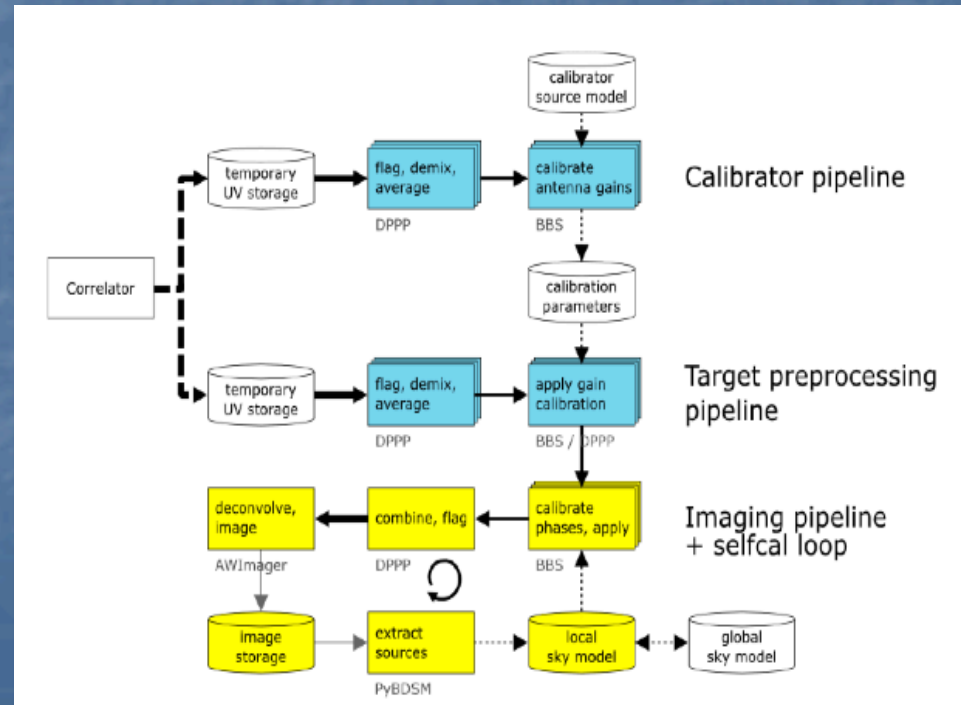
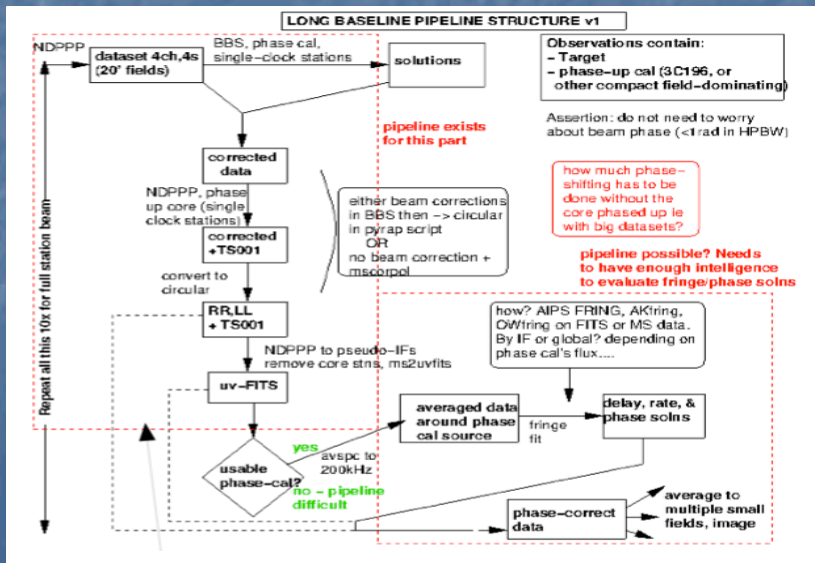
- COBALT successfully replaced the BG/P
- Support of commensal observations (BF+IM)
- International stations connectivity issues fully solved
-> All international stations (including also DE609) can fully and successfully participate to LOFAR observations



OPERATIONAL ACHIEVEMENTS 2014-2015



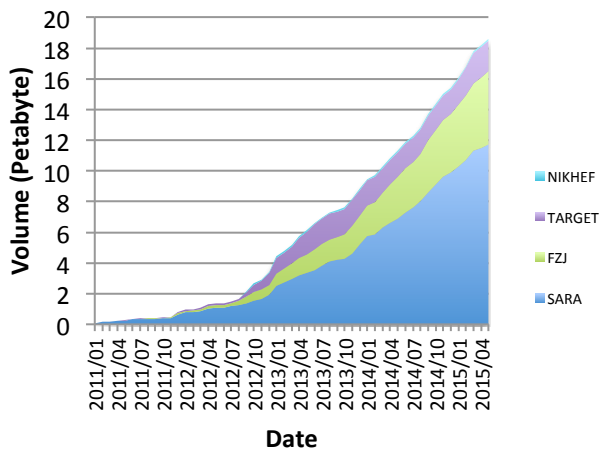
- Pulsar pipelines integrated in RO software and successfully run through the central system
- Long baseline pipeline being commissioned and characterized (LOBOS)
- Selfcal pipeline being commissioned and characterized (major bug recently discovered)



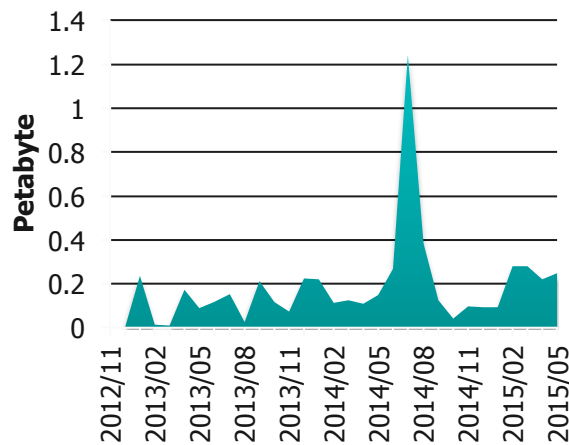
OPERATIONAL ACHIEVEMENTS 2014-2015



Data Stored in the Long Term Archive



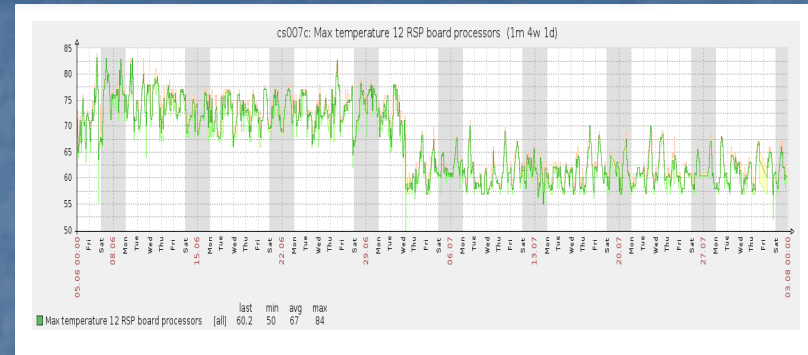
Staged Data



- CEP3 (new commissioning cluster) installation – 21 working nodes used by 120 users spread over 32 projects
- LOFAR Data School – November 2014
- ~ 19 PB of data in the LTA; LOFAR data made public as of March 2nd 2015

OPERATIONAL ISSUES

- I. Several Dutch stations suffered from the **warm summer temperatures** -> several imaging and BF runs were postponed
 - Hardware improvements implemented at all NL stations -> expected improvement coming summer
- II. **Ingest system instability**-> long ingest queue -> CEP2 (production cluster) full
- III. **CEP2 instability** -> severe swapping caused by high memory demand of NDPPP
- IV. **Accidental data deletion on Monday 18 August**: while trying to manually delete raw Pulsar data on CEP2, a larger data deletion command was unintentionally issued on the cluster -> **better data management tools required**
- V. Preparing and supporting Cycle, DDT, and commissioning observations still remain *very manual procedures*, which put a *significant* burden on the Science Support group (and also inevitably lead to human errors). *These routines still await significant automation.*



DATA QUALITY INSPECTION



- A few data quality issues affected LOFAR data during the past year:
 - incorrect values being written to the WEIGHT_SPECTRUM column of interferometric COBALT data (affected period: 19 Mar till 31 Oct 2014)
 - Incorrect information on broken tiles and antenna elements stored in MS's (affected period 26 Jan – 25 Feb 2015)
 - Polarization leakage in Beamformed data (affected period 12 Jul 2014 – 21 Jan 2015)

➤ Only in very few cases re-observations were needed

➤ Issue description, discussion, solutions given at

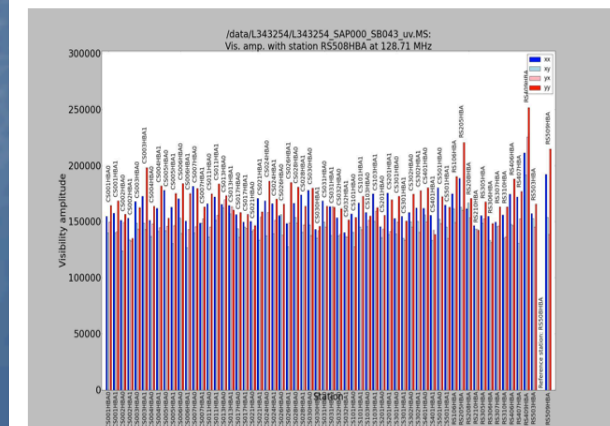
<http://www.astron.nl/radio-observatory/observing-capabilities/depth-technical-information/system-notes/system-notes>

➤ Better 'automatic' quality checks for the data need to be developed.

- More info to be added to **validation plots** (dynamic spectra, pipeline plots, etc...)
- Plots to be linked to projects and saved in e.g. the LTA

The screenshot shows the LOFAR Radio Observatory website. The navigation bar includes links for Home, About ASTRON, Astronomy Group, Radio Observatory, and R & D Lab. The main content area is titled 'SYSTEM NOTES' and lists various observing modes and technical information. A list of system notes is visible, including:

- Wrong information in antenna tables of LOFAR Measurement Sets
- Incorrect values in the WEIGHT_SPECTRUM column of interferometric COBALT data
- Incorrect information about broken tiles and antenna elements LOFAR Measurement Sets (March 2015)
- Polarization leakage in beam formed data (July 2014-January 2015)



SCIENCE OPERATIONS

Home About ASTRON Astronomy Group Radio Observatory R & D Laboratory

RADIO OBSERVATORY

LOFAR

(LOFAR Newsletters
 (Subscribe to LOFAR news
 (Observing Proposals
 (Asking for time
 (LOFAR Data Policy
 (Observing and processing policies
 (Observing Capabilities
 (LOFAR Tools
 (Cycles
 (Weekly schedule
 (LOFAR MSSS
 (Station Status
 (LOFAR Science
 (Publications and Authorship Policy
 (Roll-out status
 (LOFAR Wiki

WSRT

(Astronomers
 (Weekly schedule
 (Observation status
 (Apertif
 (Apertif - EOs

GENERAL

(PC pages
 (Special projects
 (People

VISIT US

(Female Visitor Programme

radio_observatory

Home » Radio Observatory » Observing Capabilities » In depth Technical Information

(Summary (LOFAR in its initial operations phase
 (In depth Technical Information (LOFAR Cookbooks

LOFAR TECHNICAL INFORMATION

View Edit Revisions

LOFAR, the Low frequency Array, is a next-generation electronically steered phased array radio telescope. LOFAR's capabilities are revolutionising the astronomical capabilities in the 10-240 MHz range.

These web pages describe the general signal path, major observing modes, and their post processing options from the perspective of the potential user. In some instances, some modes are noted as being "Expert Mode": These are generally modes which require more manual intervention than the regular modes and are offered only to users who are familiar with them from their own commissioning work.

A more detailed description of the LOFAR array can be found in van Haarlem et al. 2013 (<http://arxiv.org/abs/1305.3352>)

Major Observing modes

- [Interferometric mode](#)
- [Beam formed mode](#)
- [Commensal Beam Formed and Imaging mode](#)
- [Direct storage mode](#)

Signal Path

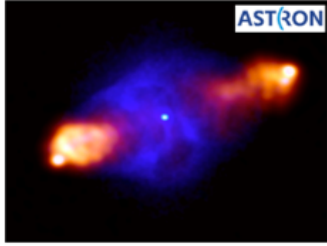
[Antennas Description](#)
[Station Description and Configuration](#)
[Array Configuration](#)
[Imaging Capability and Sensitivity](#)
[Frequency and Subband Selection](#)
[Beam Definition](#)
[Data quality inspection](#)

System notes

NEW PAGES IN PROGRESS...

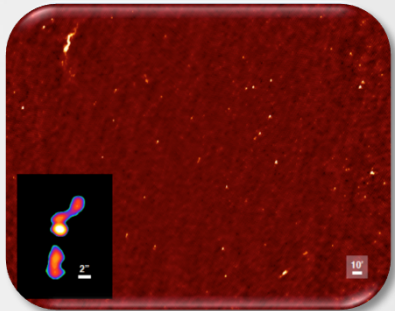
**THE LOFAR IMAGING COOKBOOK:
 Manual data reduction with the imaging pipeline**

Version 16.0
 February 24, 2015



Edited by Roberto F. Pizzo

Low Frequency Radio Astronomy and the LOFAR Observatory



Lectures from the Third Data Processing School

Plus:

LOFAR Wiki → www.lofar.org/wiki

LOFAR Bulletins → <http://www.astron.nl/radio-observatory/lofar-newsletters/lofar-newsletters>

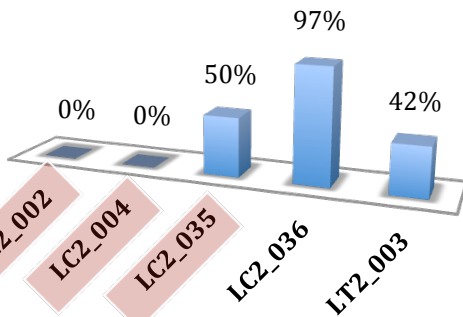
LOFAR Status Meetings → http://www.lofar.org/operations/doku.php?id=public:lsm_new:start

CYCLE 2, 3, 4 OBSERVING PROGRAMS

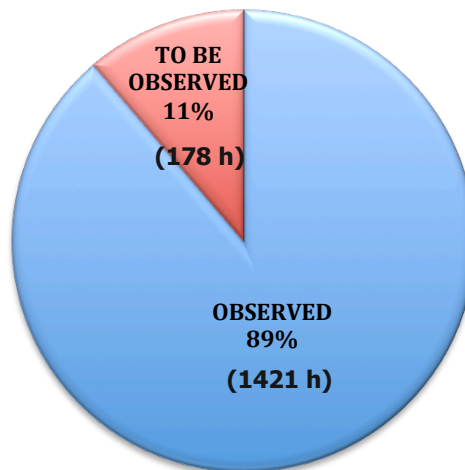
STATUS CYCLE 2



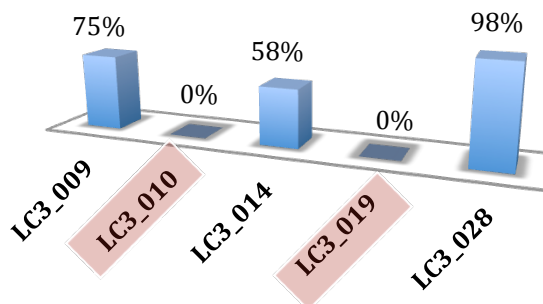
Status of Cycle 2 projects



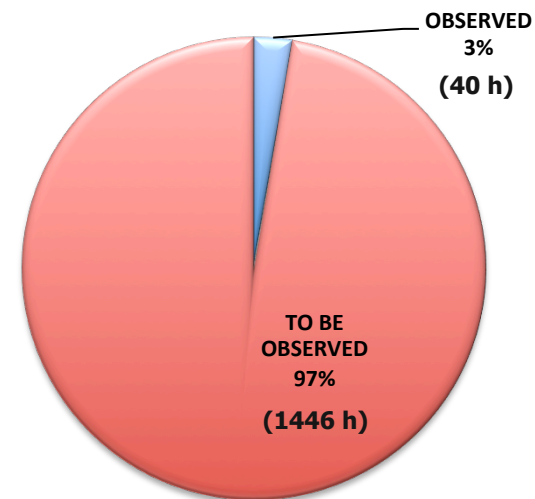
STATUS CYCLE 3



Status of Cycle 3 projects



STATUS CYCLE 4

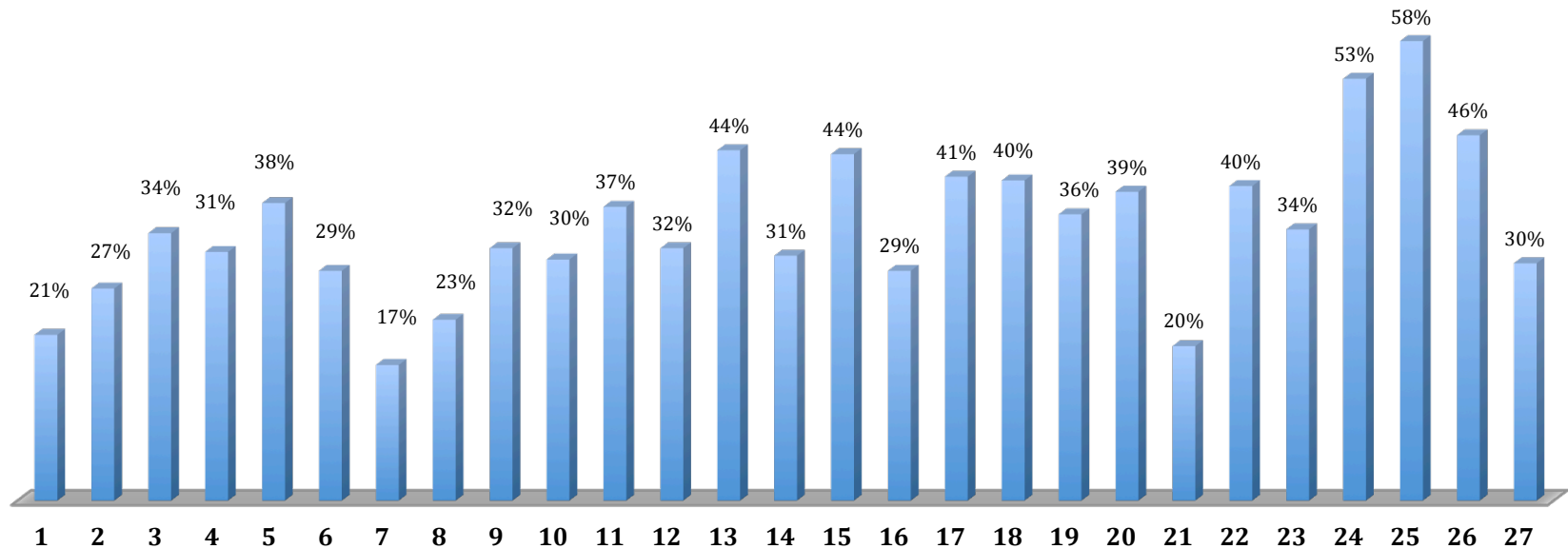


➤ Cycle 4 Allocations:

<http://www.astron.nl/radio-observatory/cycles/cycle-4-final-allocations/cycle-4-final-allocations>

OBSERVING EFFICIENCY

Observing efficiency Cycle 3



➤ **Average ~ 35%** (as expected, comparable to previous Cycles)

➤ **Issues:**

- System robustness (LTA instability, Pipeline instability, ...)
- Manual procedures...

NEXT IMPORTANT DEADLINES

➤ Cycle 5:

- Proposal call: July
- Proposal submission deadline: early September
- Semester will run from 15 November 2015 till 14 May 2016
- Open time > 20% ? (exact fraction to be decided by ILT board)

FEEDBACK FROM 1ST LOFAR USERS MEETING

LOFAR USERS MEETING 2014 – KSP's COMMON POINTS



➤ Common points (therefore given higher priority):

- Concerns on **connectivity of international stations** -> *now solved*
- **IM+BF mode in COBALT** should be implemented -> *done*
- **Dialogue needed between KSP's and CITT** -> *implemented tiger team 'advisory group' (see Dijkema's presentation)*
- Better **characterization** needed -> *done for Cycle 3 & 4 proposal submission deadlines (statistical approach adopted)*
- Concerns on progress with **station calibration** -> *progress made; more to come*
- Need for updated **documentation** -> *in progress; (i) new pages to be delivered by Cycle 5 proposal call; (ii) LOFAR DATA Book to be published this year*
- **NorthStar** -> *niggles remain with data calculator -> further development done for Cycle 4 deadline; some issues remain which are being addressed in view of Cycle 5 deadlines*
- **MoM & use of LTA cumbersome** -> *difficult to check observing/processing setups -> see H. Hotlies' talk*



LOFAR USERS MEETING – SPECIFIC POINTS

➤ EoR KSP:

- Data transfer issues due to **problems with Target**: *system bypassed during Cycle 3; to be used for regular production ingests during Cycle 5*
- **RCU mode 6** (160 – 240 MHz): *looked into in detail. Switching between 200 – 160 MHz still results in system crashes. Competition with Apertif development (see H. Holties' talk)*
- **Rotate CS013** to originally planned orientation: *no labor could be spared so far, as we were focusing on improving the state of the HBAs generally, which leads to an overall improved sensitivity. Next 2 months: understand/investigate the best way to perform the rotation*



➤ Surveys KSP:





- SB number to frequency converter: *prototype available*
<https://proxy.lofar.eu/rtsm/tests/>
- **Documentation**: example of good/bad inspection plots, list of RFI's contaminated SB's -> *tutorial available*





<http://www.astron.nl/radio-observatory/observing-capabilities/depth-technical-information/data-quality-inspection/data-qu>

LOFAR USERS MEETING – SPECIFIC POINTS

➤ Transients KSP:

- integration **Pulsar pipeline** in RO operations 
- Stability of stations, particularly with **oscillating tiles**, is a major concern: *successful monitoring campaign ongoing in between Pulsar runs* 
- Request of **online RFI flagging**, which would allow rejection of single stations: currently not prioritized (LDM) 
- Writing out data as **8, 4, 2, 1-bit samples**: currently not prioritized (LDM) 

➤ Magnetism KSP:

- **PPS tuning for DE601** needs fixing: *done (M. Brentjens)* 
- **Dipole beam** needs updating: *ongoing under the TWG (see M. Brentjens' talk)* 

LOFAR USERS MEETING – SPECIFIC POINTS

➤ Solar KSP:

- *See common points*

➤ Cosmic Rays KSP:

- **Weather station** has been installed at the core – proper way should be found to share data; *data now available through a virtual server*
- TBB should be used in parallel with all observations: *this is being done*
- **TBB mode** is 'expert' mode. Expertise exists completely outside RO: *on the radar of 3R. TBB mode will become operational and fully supported by RO*
- Allow **combined LBA/HBA observations** – *parallel observing to be implemented under the scope of the 3R project*



THANKS !