14:00 - 14:05	**WELCOME**	
The LOFAR Radio Observatory: status and future work		
14:05 - 14:25	R. F. Pizzo	*LOFAR Observatory Overview and feedback from 3rd LOFAR Users Meeting*
14:25 - 14:40	M. Brentjens	*The LOFAR Technical Working Group*
14:40 - 14:55	J. Annyas	*LOFAR Development Roadmap*
14:55 - 15:10	E. Orru'	*The Calibration and Imaging Tiger Team 2*
15:10 - 15:25	R. C. Vermeulen	*Using LOFAR now, soon, and later*
15:25 - 15:55	**Coffee Break**	
Users experience & feedback		
15:55 - 16:05	A. Bonafede	*The LOFAR Users Committee: update activities and feedback*
16:05 - 18:30	***Discussion between Users and RO: Users experience (proposals, observations, data reduction, ...)***	

LOFAR OVERVIEW AND FEEDBACK FROM 3rd LOFAR USERS MEETING

R. F. Pizzo

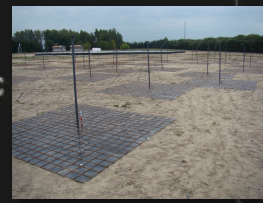
ASTRON

Bologna, June 23rd 2017

LOFAR

ARRAY STATUS

International LOFAR Telescope (ILT)



- ***50 operational stations completed***
- ***38 NL stations, 12 international stations***
- ***1 new station in Ireland (IE613) – completion in 2017***
- ***1 new station funded in Latvia (completion by end 2019)***

Birr

Chilbolton

Dutch stations

LOFAR Core (NL)

Onsala

Norderstedt

Potsdam

Jülich

Effelsberg

Tautenburg

Bałdy

Borówiec

Łazy

Unterweilenbach

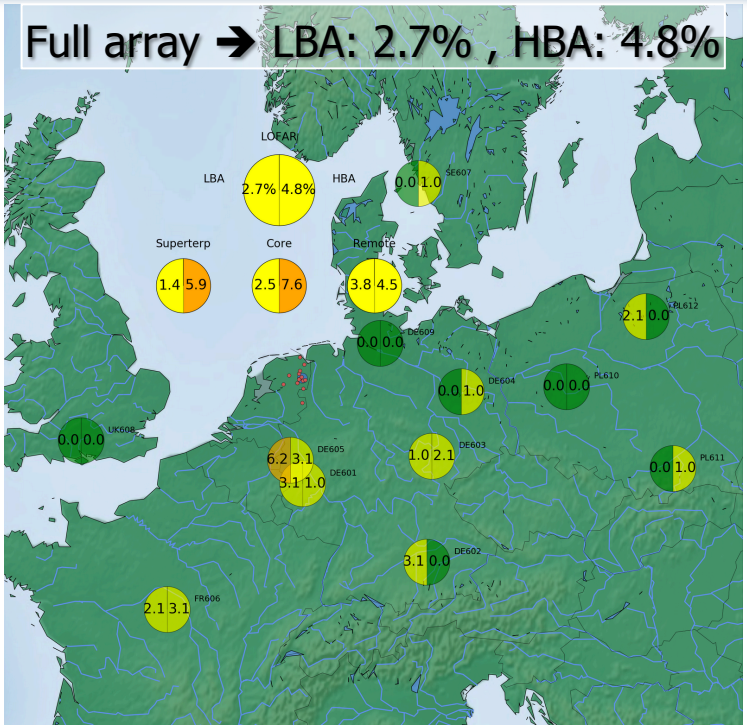
Nançay

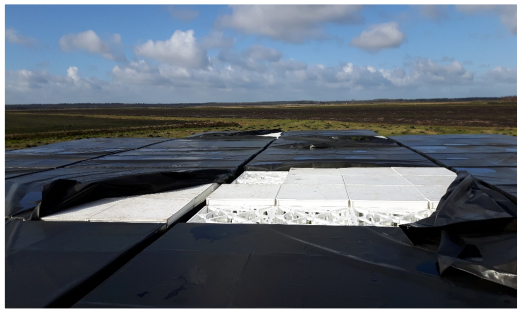
LOFAR

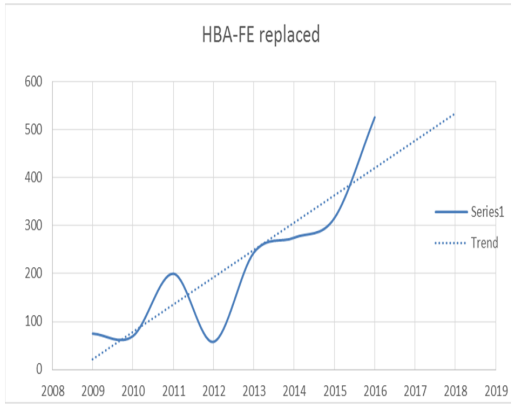
ASTRON

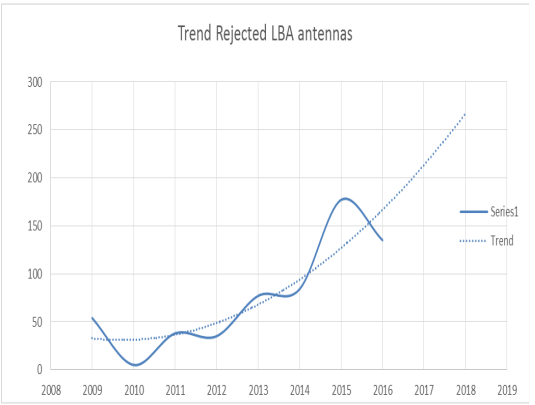
Netherlands Institute for Radio Astronomy

SYSTEM HEALTH









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

- Current status available at
  https://proxy.lofar.eu/array_status/
- Maintenance season ended in October – 1200 HBA and 200 LBA repair actions performed.

STATION CALIBRATION

LOFAR

ASTRON

Station	LBA Sparse Even [a]	LBA Sparse Odd [a]	LBA Outer [a]	LBA Inner	HBA Low	HBA Mid	HBA High
CS001	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	11-02-15
CS002	20-04-17	21-03-17	07-04-17	21-09-15	11-02-14	23-12-15	24-02-15
CS003	20-04-17	21-03-17	07-04-17	21-09-15	11-02-14	23-12-15	24-02-15
CS004	20-04-17	21-03-17	07-04-17	21-09-15	11-02-14	23-12-15	19-02-15
CS005	20-04-17	21-03-17	07-04-17	21-09-15	11-02-14	23-12-15	19-02-15
CS006	20-04-17	21-03-17	07-04-17	13-07-15	11-02-14	21-01-16	19-05-14
CS007	20-04-17	21-03-17	07-04-17	21-09-15	11-02-14	23-12-15	24-02-15
CS011	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
CS013	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-02-15
CS017	20-04-17	21-03-17	07-04-17	13-07-15	19-02-15	23-12-15	24-02-15
CS021	20-04-17	21-03-17	19-05-16	05-09-14	19-02-15	13-01-16	19-02-15
CS024	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-05-14
CS026	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-02-15
CS028	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
CS030	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-02-15
CS031		21-03-17	19-05-16	05-08-14	19-02-15	23-12-15	24-02-15
CS032	20-04-17	21-03-17	07-04-17	13-07-15	19-02-15	23-12-15	24-02-15
CS101	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
CS103	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
CS201	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-02-15
CS301	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
CS302	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	19-02-15
CS401		21-03-17	07-04-17	27-06-12	19-02-15	23-12-15	24-02-15
CS501	20-04-17	21-03-17	07-04-17	21-09-15	19-02-15	23-12-15	24-02-15
RS106	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS205		21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS208	20-04-17	21-03-17	07-04-17	22-07-14	20-12-16	01-05-17	04-11-15
RS210	20-04-17			21-09-15	04-11-15	01-05-17	20-12-16
RS305	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS306	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS307	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS310	20-04-17			21-09-15	20-12-16	01-05-17	21-01-16
RS406	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS407	20-04-17			21-09-15	20-12-16	01-05-17	20-12-16
RS409		21-03-17	07-04-17		20-12-16	01-05-17	20-12-16
RS503	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS508	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
RS509	20-04-17	21-03-17	07-04-17	21-09-15	20-12-16	01-05-17	20-12-16
DE601				01-05-17	20-12-16	01-05-17	20-12-16
DE602				01-05-17	20-12-16	01-05-17	20-12-16
DE603				01-05-17	20-12-16	01-05-17	20-12-16
DE604				01-05-17	20-12-16	01-05-17	20-12-16
DE605				13-07-15	20-12-16	01-05-17	20-12-16
FR606				01-05-17	20-12-16	01-05-17	20-12-16
SE607				01-05-17	20-11-16	01-05-17	20-12-16
UK608				01-05-17	20-12-16	01-05-17	20-12-16
DE609				01-05-17	20-12-16	01-05-17	20-12-16
PL610					20-12-16	01-05-17	20-12-16
PL611				01-05-17	20-12-16	01-05-17	03-02-16
PL612				01-05-17	20-12-16	01-05-17	20-12-16

- Current status

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

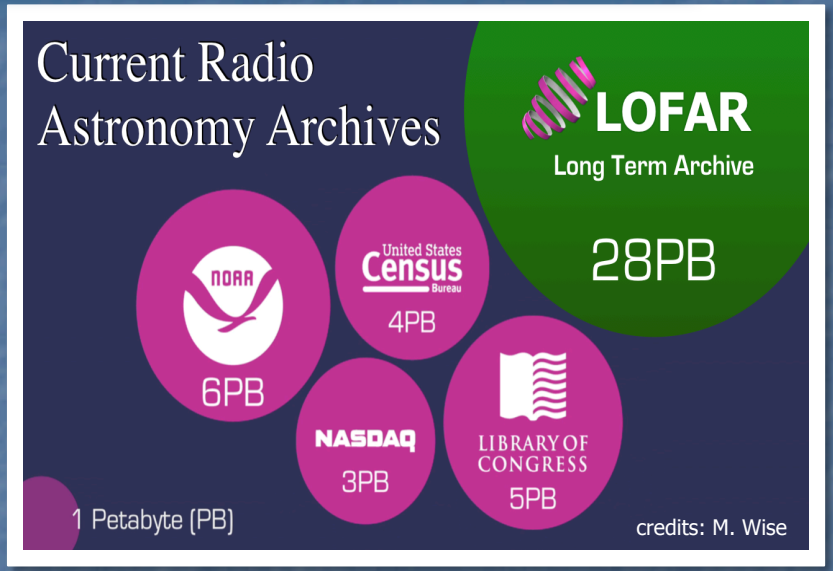
- Contact points: (M. van der Wiel+ observers)
- Significant progress made since last year meeting:
  - regular updates
  - tables LBA sparse being finalized
- Station calibration still competing with Cycle operations
- New station calibration method to be finalized: Holography.
  - It will be worked on from October (S. ter Veen)
  - It will make both data collection, handling and reduction (much) easier!

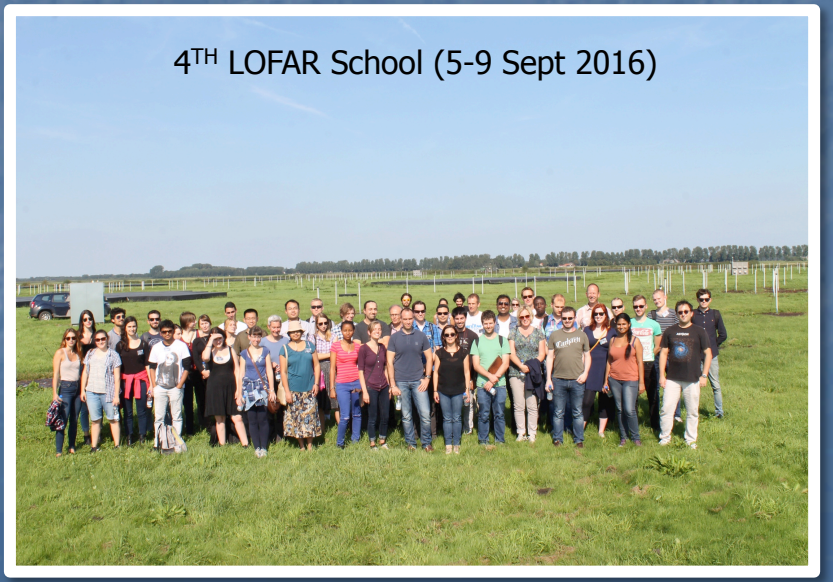
ACHIEVEMENTS AND ISSUES

MAIN OPERATIONAL ACHIEVEMENTS…SO FAR

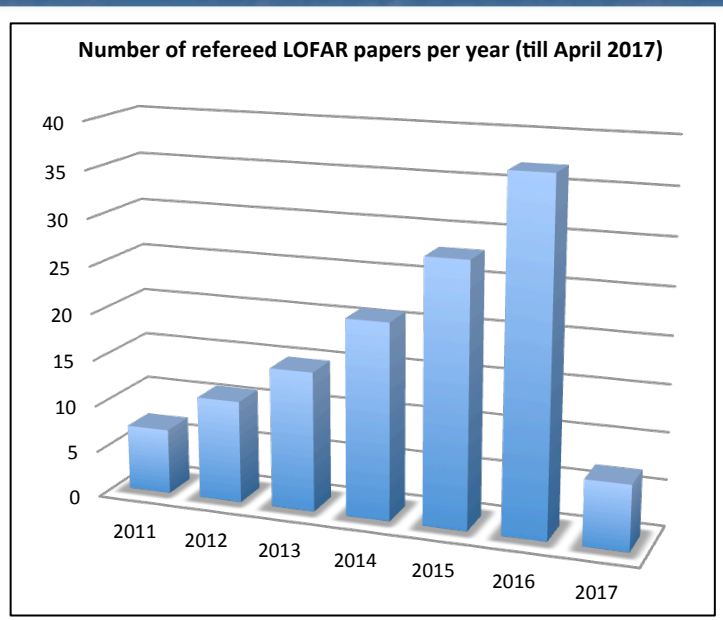
ASTRON

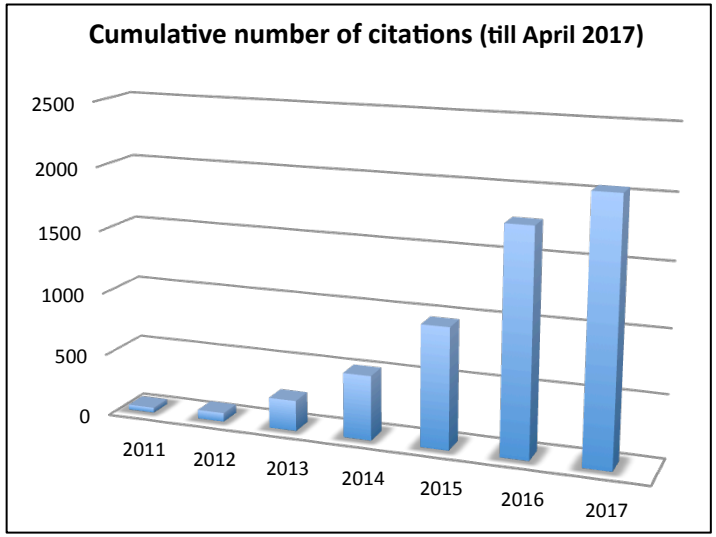
- Completed the 8th operational Cycle
- 15000 hours successfully observed in support to 260 projects
- Replaced two operational clusters and a correlator (CEP4 replaced CEP2 in Dec 2016)
- Grown the array with more stations, hardware and capabilities
- Ingested > 28 PB (!) of data in the Long-term archive (visibilities, images and BF data) - yearly growth 7 PB/year. Largest astronomical data collection to date.
- Supported an ever growing community: 550+ people
- Brought the instrument closer to our users:
  - 60 Busy Weeks
  - LOFAR Schools (200+ participants)

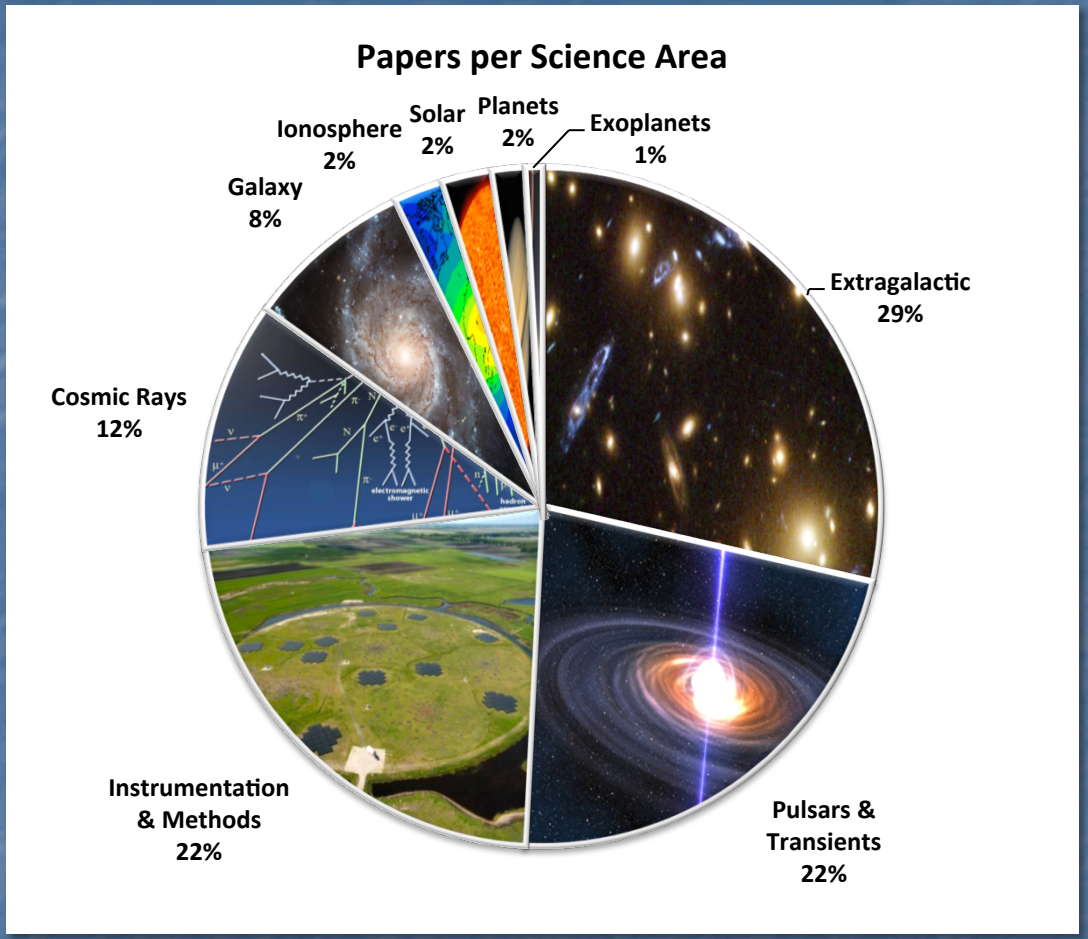




LOFAR SCIENCE OUTPUT







- 126 refereed
- 87 unique first authors
- 555 unique authors

MAIN OPERATIONAL ISSUES

LOFAR

ASTRON

I. Ingest system instability-> long ingest queue -> CEP2 full

II. CEP2 was end of life -> now replaced with CEP4

III. CEP4 commissioning demanded significant resources -> observing delays

now mitigated

IV. CEP4 data losses – still causes failures to various BF observations

V. Data quality monitoring relies on insufficient tools

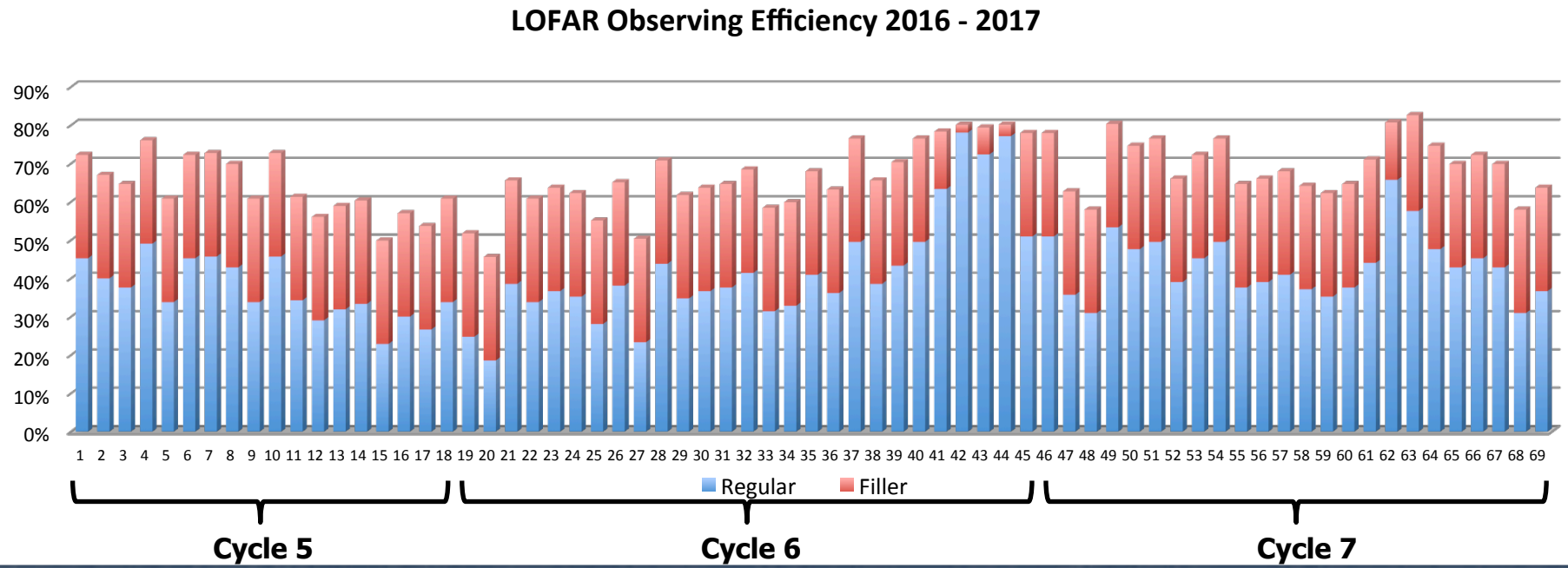
VI. Preparing and supporting Cycle, DDT, and commissioning observations still remain *very manual procedures*, which put a *significant* burden on the Science Operations & Support group (and also inevitably lead to human errors). *These routines still await significant automation.*

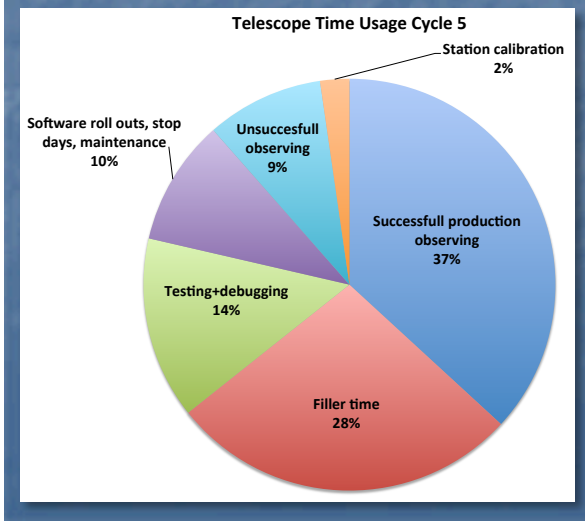
IMPROVEMENTS IN THESE AREAS WILL DELIVER HIGHER OBSERVING EFFICIENCIES

CHALLENGE AHEAD: IMPROVE LOFAR OBSERVING EFFICIENCY

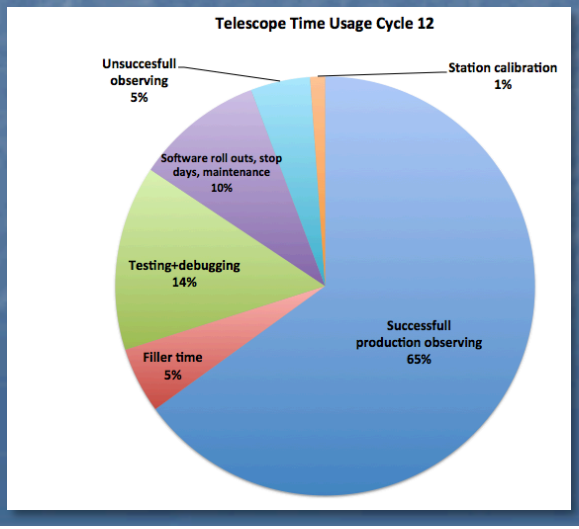
LOFAR

ASTRON





2 years



- Efficiency: fraction of time dedicated to successful production observations: regular (Cycle, DDT, commissioning) + filler (almost no RO resources involved, etc…)
- Fluctuated between 56-83%
- Lower efficiency caused by instability of the system -> we need more robustness and automation

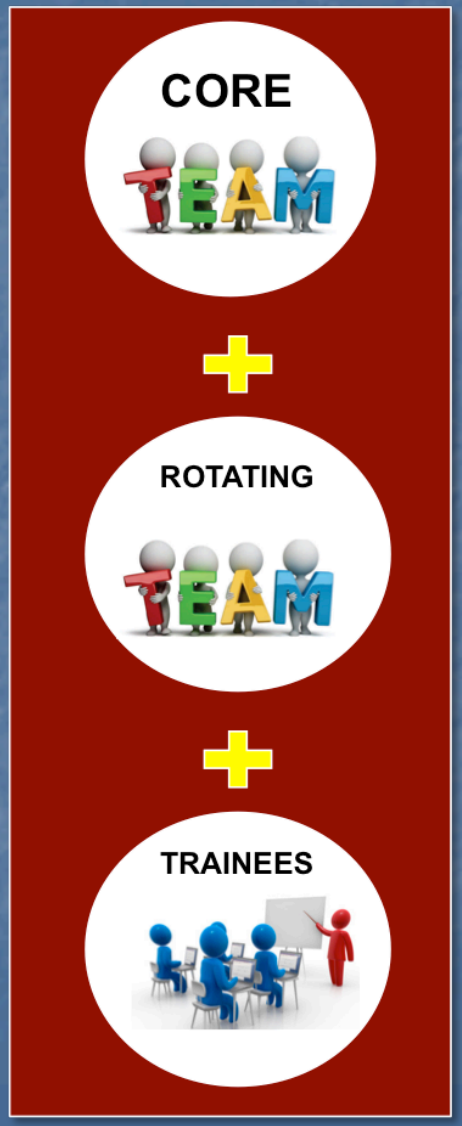
SCIENCE OPERATIONS

SCIENCE OPERATIONS – NEW GROUP STRUCTURE

LOFAR

ASTRON

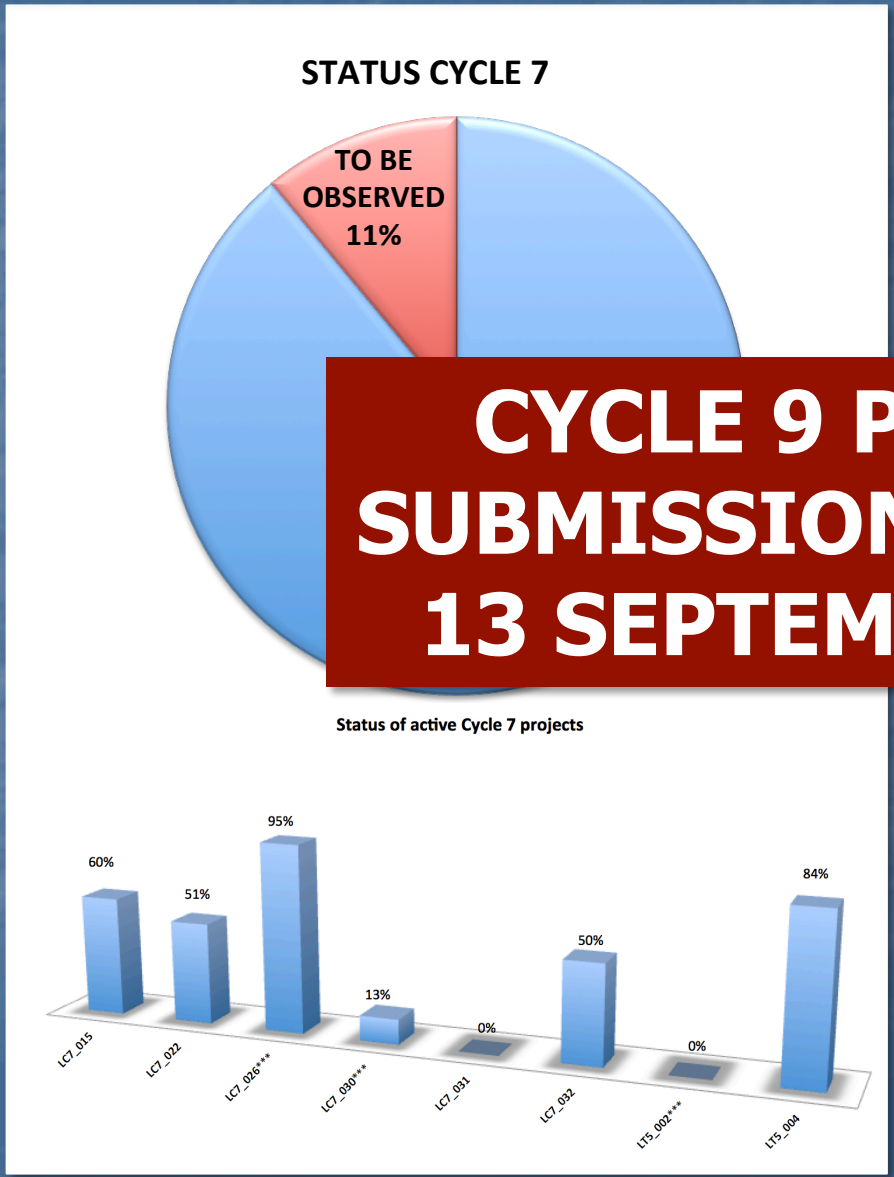
- Group name: Science Operations & Support -> SOS
- Address: sos@astron.nl
- Group with 3 components:
  - 'Core team' – 4 FTE's: permanent – ensure continuity to LOFAR Science Operations
  - rotating component: 4 FTE's – temporary
  - trainees (1-2 per year; sharing knowledge about how to operate a massive array)

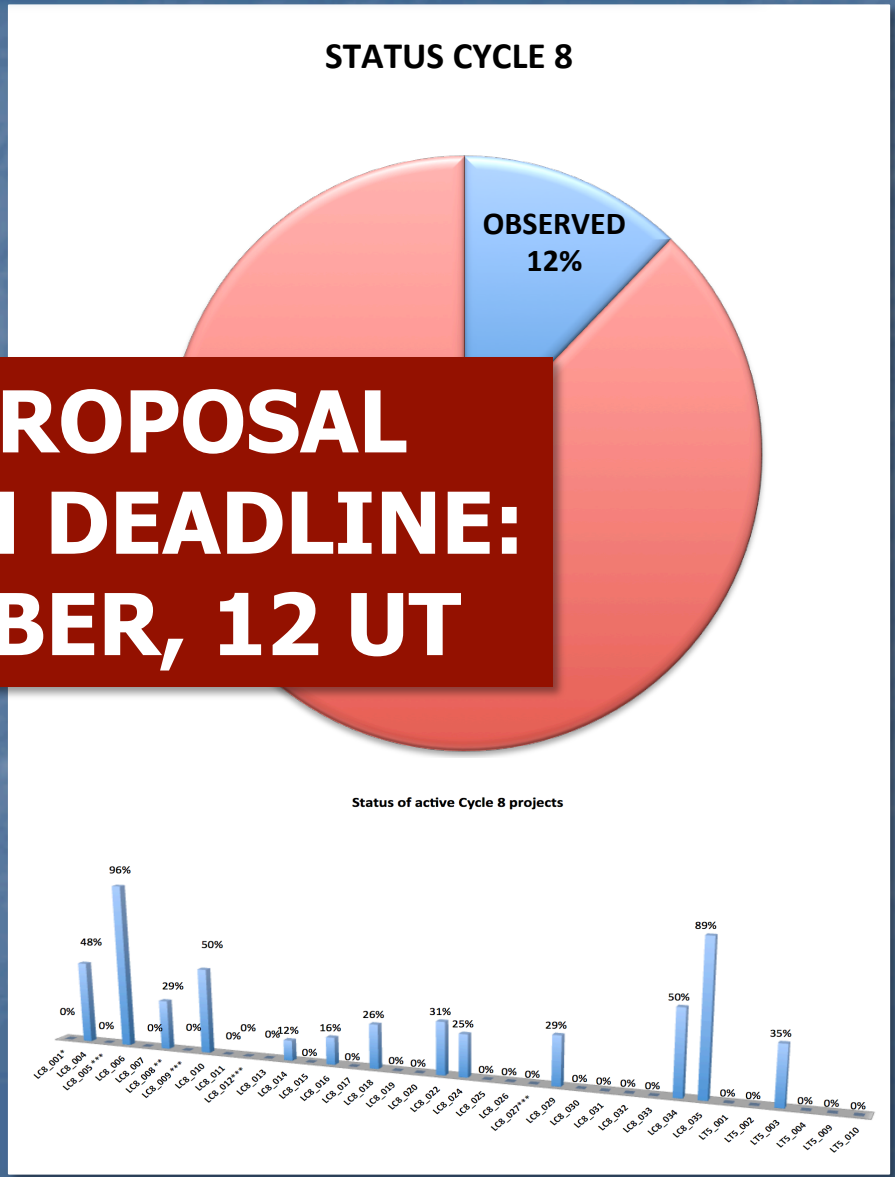


CYCLE 7 & 8 OBSERVING PROGRAMS

LOFAR

ASTRON





CYCLE 9 PROPOSAL SUBMISSION DEADLINE: 13 SEPTEMBER, 12 UT

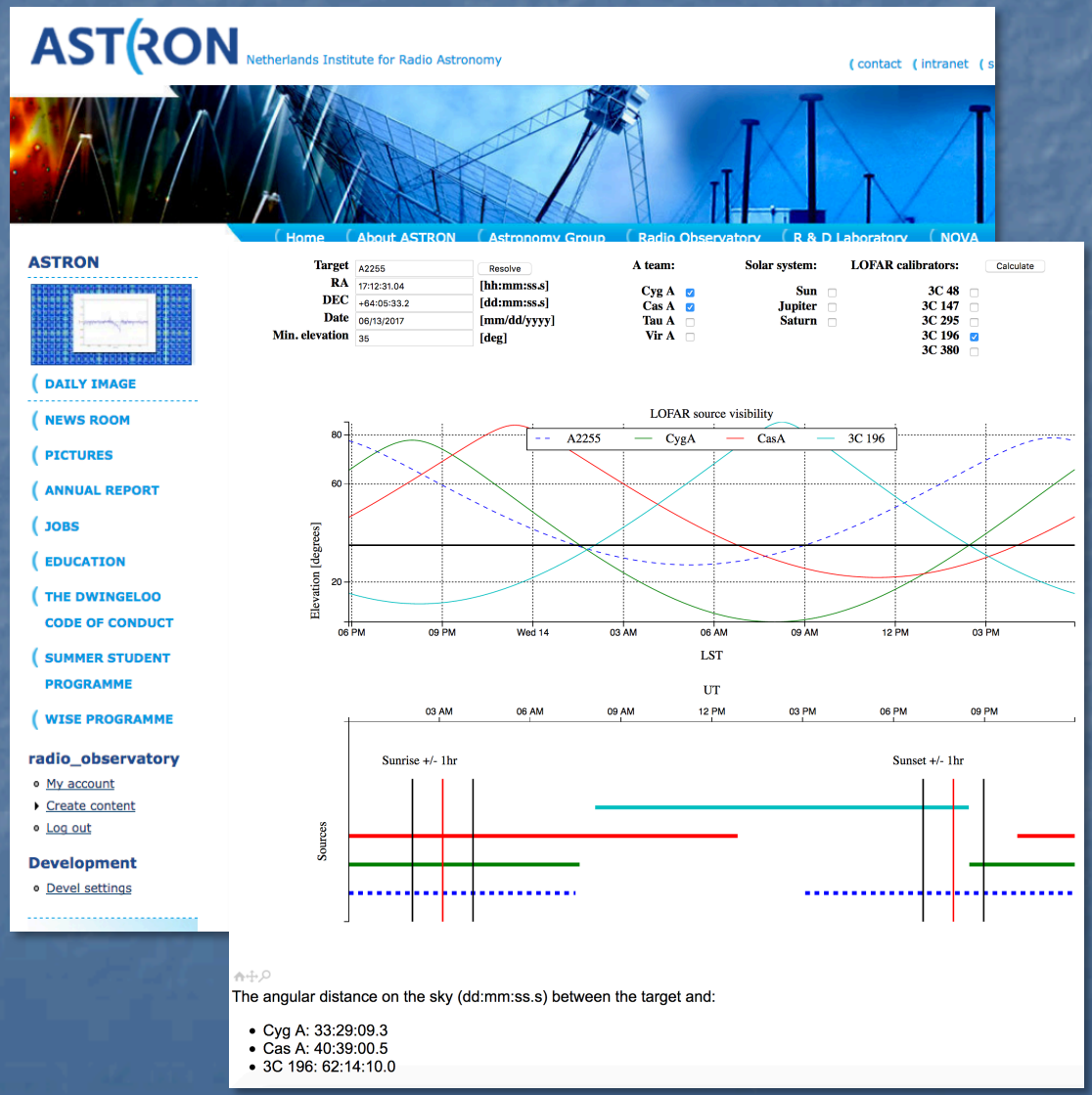
EXPLOITING LTA PROCESSING RESOURCES

LOFAR

ASTRON

- Goal: make LTA processing resources available to users under a LOFAR umbrella allocation
- Since June 2016, RO is engaged in a discussion with SARA & its expert users. More recently Juelich and Poznan also involved.
- Current status: it is possible to access SARA without the need for GRID certificate to perform pre-processing
- Next step:
  - make pre-factor available in the LTA
  - Explore processing resources at Juelich and Poznan

TOOLS



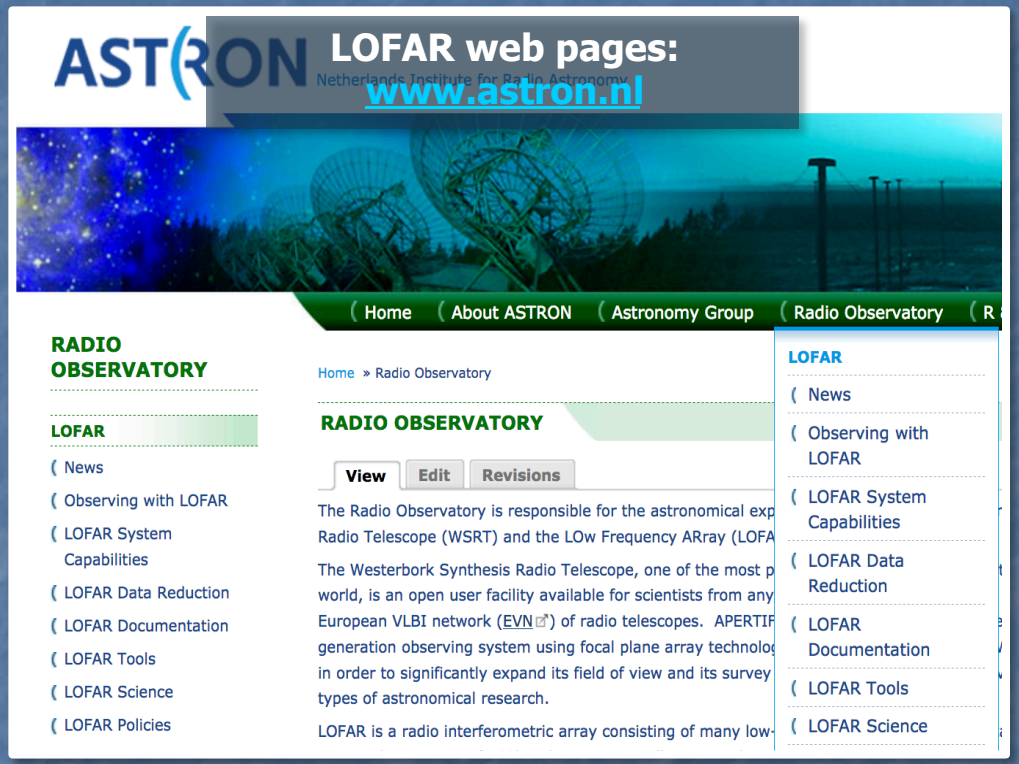
- LOFAR calculators:
- Computes the visibility of a particular target as seen from the LOFAR super-terp as well as its angular distance from the A-team sources

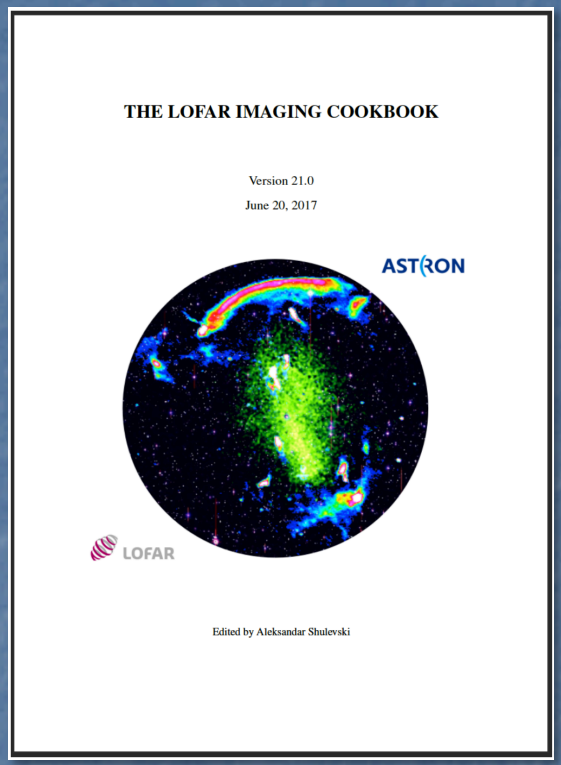
LOFAR TARGET VISIBILITY CALCULATOR

DOCUMENTATION

LOFAR

ASTRON





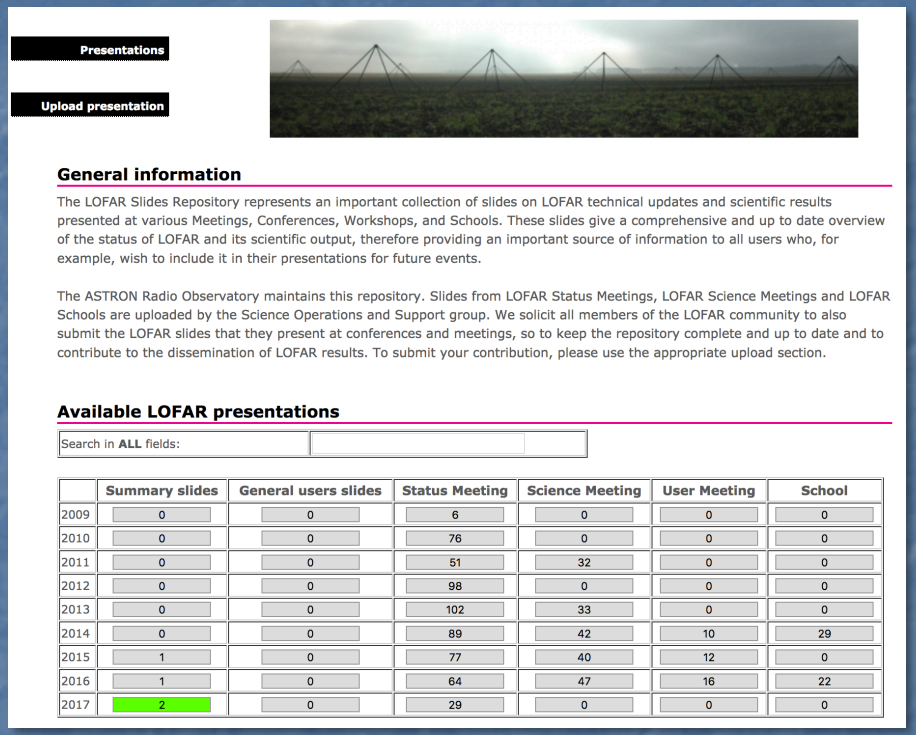
- New structure
- More user-friendly – info is easier to find

- New layout where tutorials take a central stage
- Informative content concerning reduction tools online

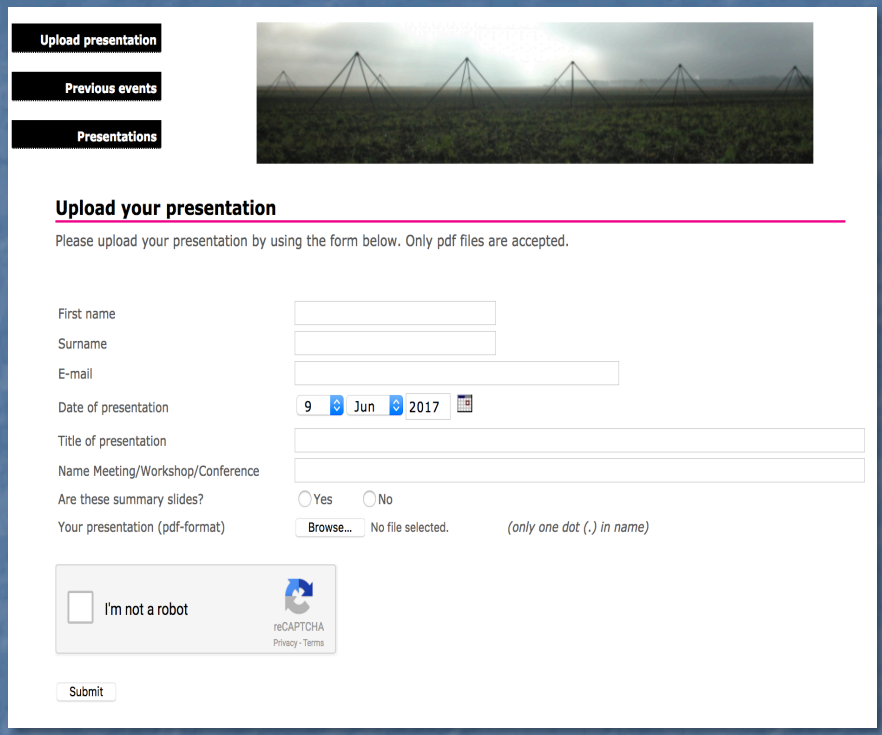
LOFAR SLIDES REPOSITORY

LOFAR

ASTRON



	Summary slides	General users slides	Status Meeting	Science Meeting	User Meeting	School
2009	0	0	6	0	0	0
2010	0	0	76	0	0	0
2011	0	0	51	32	0	0
2012	0	0	98	0	0	0
2013	0	0	102	33	0	0
2014	0	0	89	42	10	29
2015	1	0	77	40	12	0
2016	1	0	64	47	16	22
2017	2	0	29	0	0	0

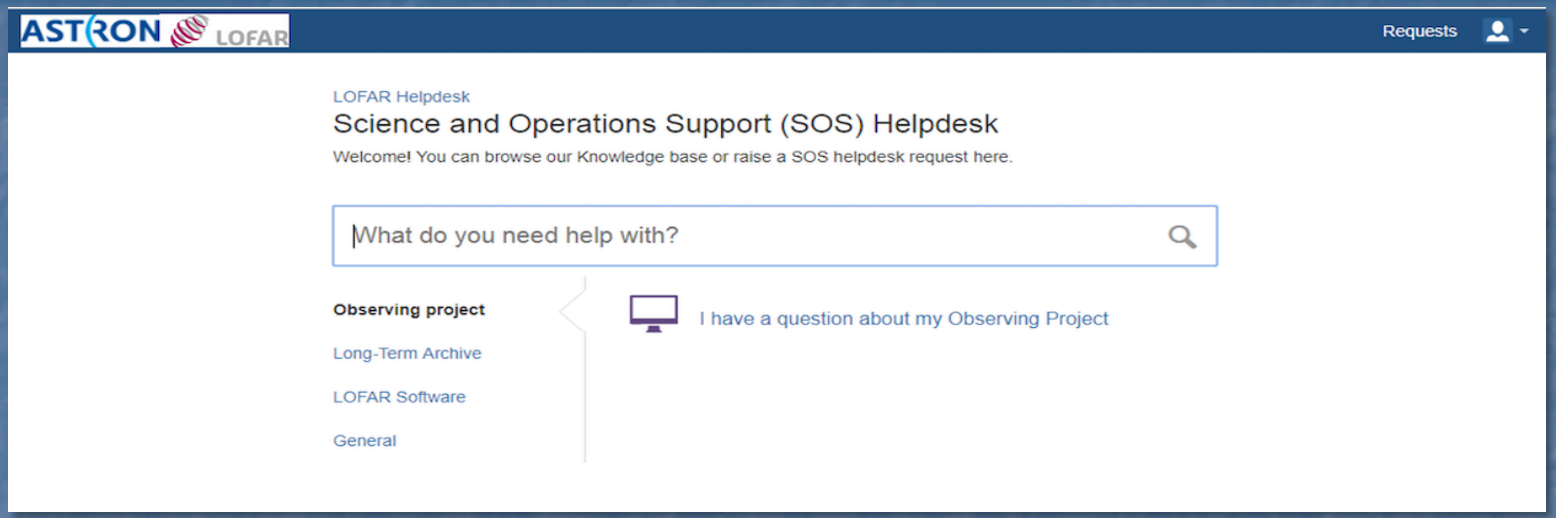


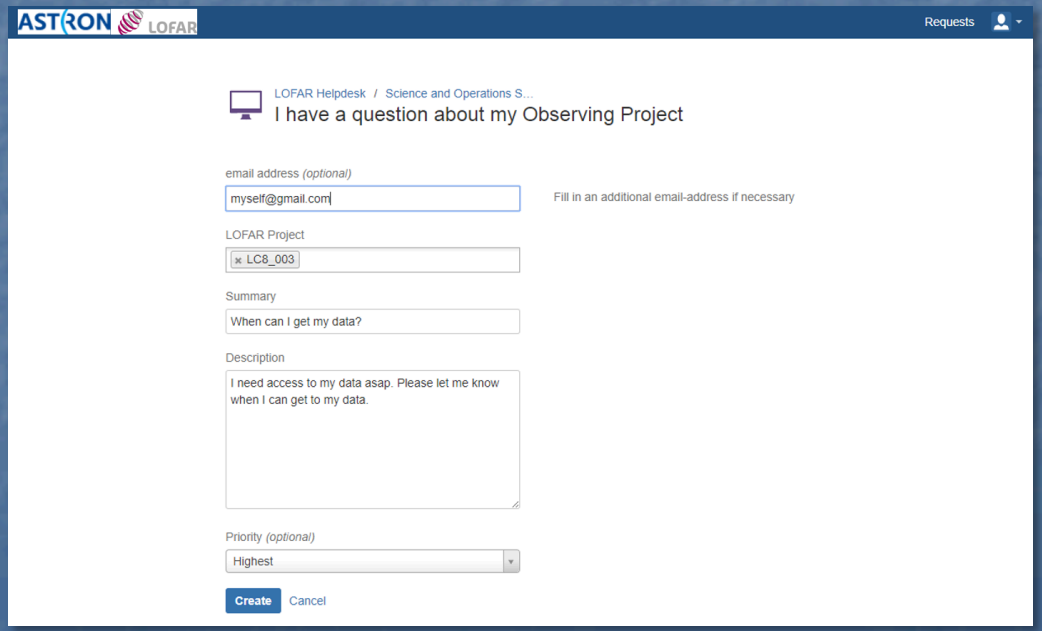
- Unique repository for LOFAR slides from LSM's, Schools, LOFAR Science & Users Meetings
- Repository of user's slides about LOFAR science

LOFAR

JIRA

ASTRON

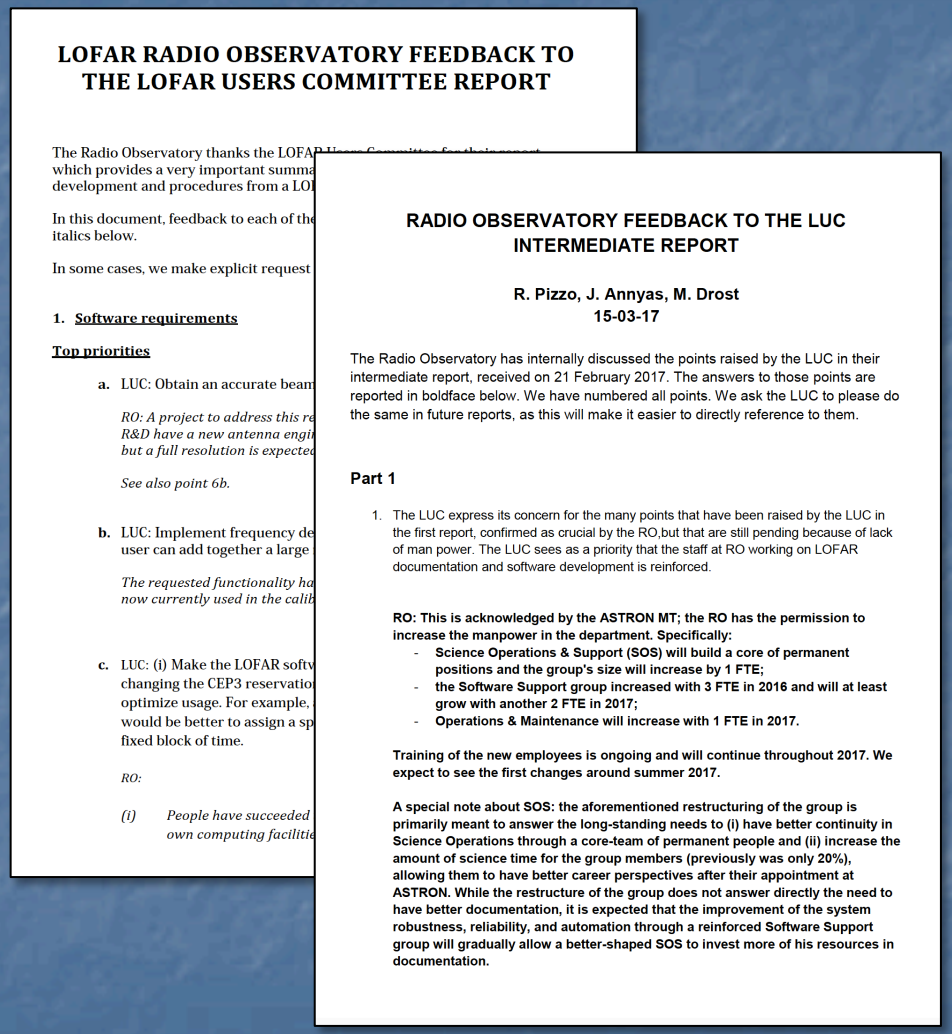




- Issue tracking system
- Main communication channel between users and Radio Observatory
- Helpdesk for user support
- FAQ & documentation

FEEDBACK FROM 3RD LOFAR USERS MEETING

LUC REPORTS



LOFAR RADIO OBSERVATORY FEEDBACK TO THE LOFAR USERS COMMITTEE REPORT

The Radio Observatory thanks the LOFAR Users Committee for their report which provides a very important summa
development and procedures from a LO

In this document, feedback to each of the
italics below.

In some cases, we make explicit request

1. **Software requirements**

Top priorities

a. LUC: Obtain an accurate beam

*RO: A project to address this re
R&D have a new antenna engi
but a full resolution is expected*

See also point 6b.

b. LUC: Implement frequency de
user can add together a large

*The requested functionality ha
now currently used in the calib*

c. LUC: (i) Make the LOFAR softw
changing the CEP3 reservatio
optimize usage. For example,
would be better to assign a sp
fixed block of time.

RO:

*(i) People have succeeded
own computing facilitie*

RADIO OBSERVATORY FEEDBACK TO THE LUC INTERMEDIATE REPORT

R. Pizzo, J. Annyas, M. Drost
15-03-17

The Radio Observatory has internally discussed the points raised by the LUC in their intermediate report, received on 21 February 2017. The answers to those points are reported in boldface below. We have numbered all points. We ask the LUC to please do the same in future reports, as this will make it easier to directly reference to them.

Part 1

1. The LUC express its concern for the many points that have been raised by the LUC in the first report, confirmed as crucial by the RO,but that are still pending because of lack of man power. The LUC sees as a priority that the staff at RO working on LOFAR documentation and software development is reinforced.

RO: This is acknowledged by the ASTRON MT; the RO has the permission to increase the manpower in the department. Specifically:
- **Science Operations & Support (SOS) will build a core of permanent positions and the group's size will increase by 1 FTE;**
- **the Software Support group increased with 3 FTE in 2016 and will at least grow with another 2 FTE in 2017;**
- **Operations & Maintenance will increase with 1 FTE in 2017.**

Training of the new employees is ongoing and will continue throughout 2017. We expect to see the first changes around summer 2017.

A special note about SOS: the aforementioned restructuring of the group is primarily meant to answer the long-standing needs to (i) have better continuity in Science Operations through a core-team of permanent people and (ii) increase the amount of science time for the group members (previously was only 20%), allowing them to have better career perspectives after their appointment at ASTRON. While the restructure of the group does not answer directly the need to have better documentation, it is expected that the improvement of the system robustness, reliability, and automation through a reinforced Software Support group will gradually allow a better-shaped SOS to invest more of his resources in documentation.

- LUC reports in May 2016 and Jan 2017, followed by RO reactions
- Feedback on 'common user' experiences, needs, and desires
- It should assist in synthesizing conlcusions from the Users meetings

FROM 3RD LOFAR USERS MEETING – SYSTEM ENHANCEMENTS

Responsive Telescope		By Oct. 2017; see J. Annyas' talk
Make TBB mode operational		Will follow responsive telescope
Commissioning of Tied Array mode for total power spectroscopy		See M. Brentjens' talk

FROM 3RD LOFAR USERS MEETING – PROPOSING, OBSERVING, PROCESSING

LOFAR ASTRON

NorthStar improvements (tutorials added, bugs solved)	✓	Improved User's experience during submissions
Change CEP3 reservation and access procedure	✓	Reservation now 8 weeks and CPU hours allocation will be enabled in near future
Better models for element and station beams		Analysis by R&D in progress – see M. Brentjens' talk
Installation LOFAR software at external computing facilities	✗	Did not get high priority

FROM 3RD LOFAR USERS MEETING – LTA

Scripts to interact with LTA	✓	For searching the LTA and get status staging
Improve download speeds from LTA	✓	Slow speed were related to firewall at SARA
Automatic notifications about completed ingest jobs	✓	Very close to completion
Ease of access and searchability of LTA		LTA survey done – list of improvements awaits implementation
User Ingest		ST1 user ingest in final phase of completion. General user ingest mechanism will follow

THANKS !