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Netherlands Institute for Radio Astronomy

LOFAR 2.0 commissioning: status, challenges, plan

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LOFAR family meeting 2024

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Commissioning

Formally...

- Bring already developed, constructed, and validated systems into production

In our case... mix of:

- Deployment
- Station commissioning
- Observatory commissioning
- Development
- Research

Organisation

Three main areas

Telescope : Cees Bassa
Operations : Manu Orrú and Bernard Asabere
Pipelines : Tim Shimwelll and Marco Iacobelli

How to participate

- Contact one of the above people
- Follow along:
  - https://support.astron.nl/confluence/display/L2COM/
  - Lofar status meetings

Broader context

- AIVV
- User community
- LOFAR development programme
- Science Data Centre development programme
- SKA

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Status

- Last day of LOFAR 1.0: past Friday
- Requirements and telescope functions fully described in Polarion system
- Many tests for those requirements as yet unspecified.
- Most requirements/tests not yet assigned to array releases
- One LOFAR 2.0 station: CS001
  - Can use all LBAs and HBAs simultaneously
  - Is reasonably well phase-calibrated
  - Can produce basic diagnostics plots
  - Beamforms successfully (phew. . .)
  - Is on new clock system
  - Can correlate and beam-form with LOFAR 1.0 stations
  - Can be controlled and inspected through Jupyter notebooks

Challenges

- Same experts typically do at least two of “deployment”, “commissioning”, “development”, or “research”
- Timeline: Ready for shared risk / science verification early 2026
- Severely restricted storage time for raw/intermediate data products
- Pipelines mostly in development or even research phase: e.g. rapthor performance behind DDFacet/KillMS, LBA cal active research.
- Severely constrained correlator- and pre- and post-processing capacity between Sep 2024–Q2 2025
- Station validation and calibration = series production:
  - twice a week instead of once every few years
  - . . . during solar maximum
  - . . . while conducting other commissioning tests
- Cannot possibly verify *all* reqs (L0–L5): there are many hundreds.

Objective

Ensure there is a LOFAR 2.0 system at the beginning of 2026, that can achieve most of the objectives of most of the long term proposals, with a processing wall-clock time that is within a factor of a few of the time-on-sky at a processed data product quality that is similar to the scientific state-of-the-art of LOFAR 1 data products produced in Q1 2023, with a minimum of human intervention between proposal submission and retrieval of the final data products from the archive.

How

- Focus on L0/L1 requirements from DUPLLO
- Have you involved in testing requirements that are crucial for your science
- Good enough = done
- Provide developer triage support on time-scales of hours
- Develop comprehensive automated suites of observations and pipelines to test key functionality
- Operate telescope as “normally” as possible
- Collect (on-boarding) manuals, and memos describing procedures, instrument properties, or issues at https://support.astron.nl/confluence/display/L2COM/

When

2024

- Array releases A (1) , B (3), C (4)
- Record final full-array reference data
- Station & array calibration
- Form station commissioning team and -process
- Automate station tests
- Pipeline research and development (CWL porting, performance, figuring out algorithms/processes, etc)

2025 Q1&Q2

- Array releases D (38), E (all): Major station deployment
- Deployment CEP6 and new correlator
- Proposal management
- Observation management
- Data management
- Pipeline commissioning