# SDC Operations: Achievements, Past & Future Challenges

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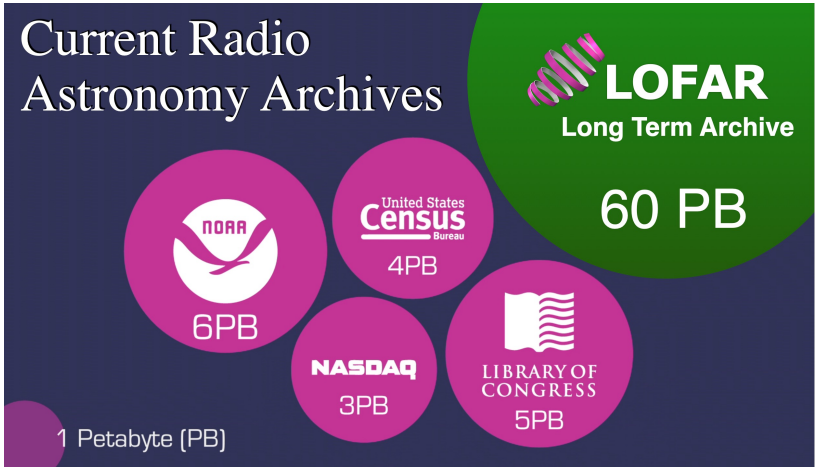
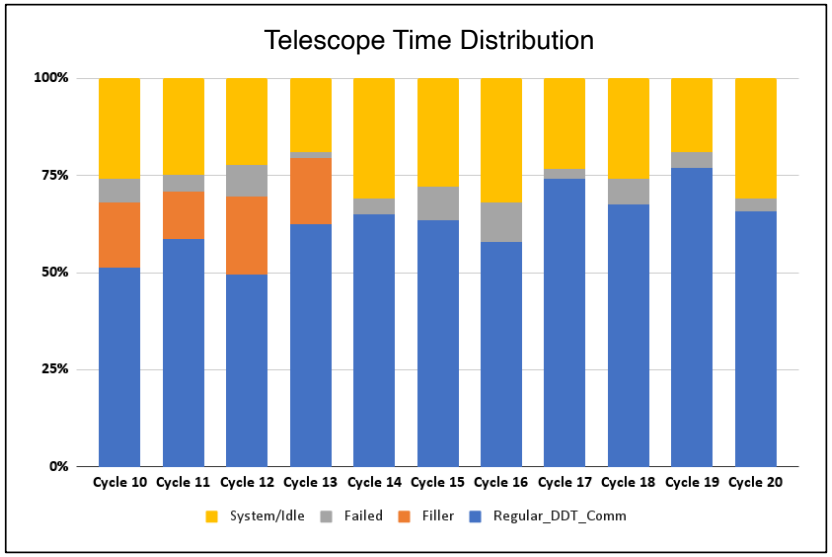
LOFAR

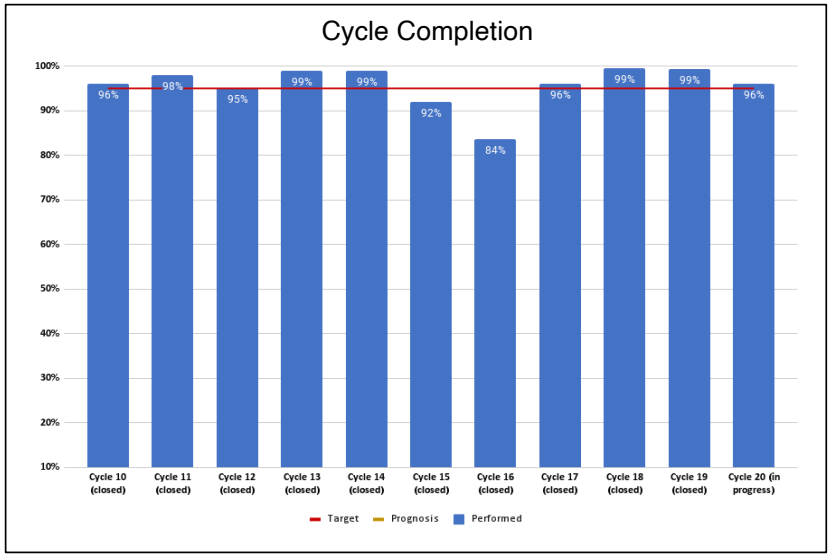
# Achievements

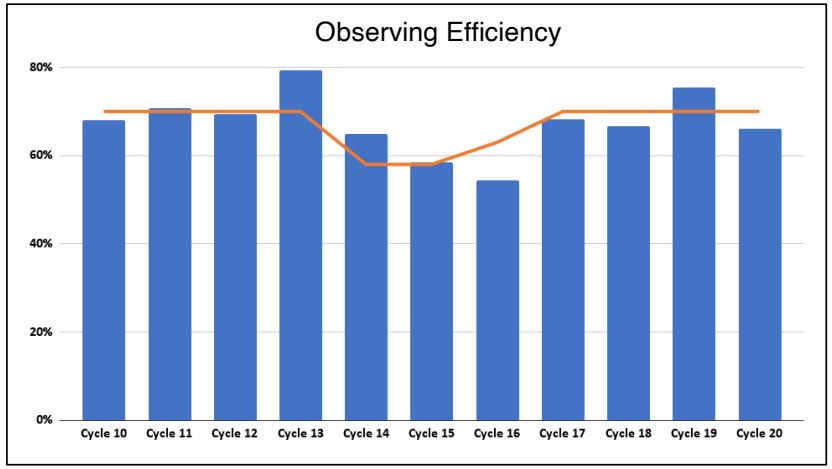
- Completed 21 operational Cycles
- ~65000 hours successfully observed – >70% operational efficiency
- Operating a massive array growing in size and capabilities
- 60 PB (!) in the LTA- Largest astronomical data collection to date.
- Supported an ever-growing community
- Brought the instrument closer to our users:
  - LOFAR Schools (400+ participants)
  - 60 Busy Weeks
  - Traineeships




# Observatory Performance

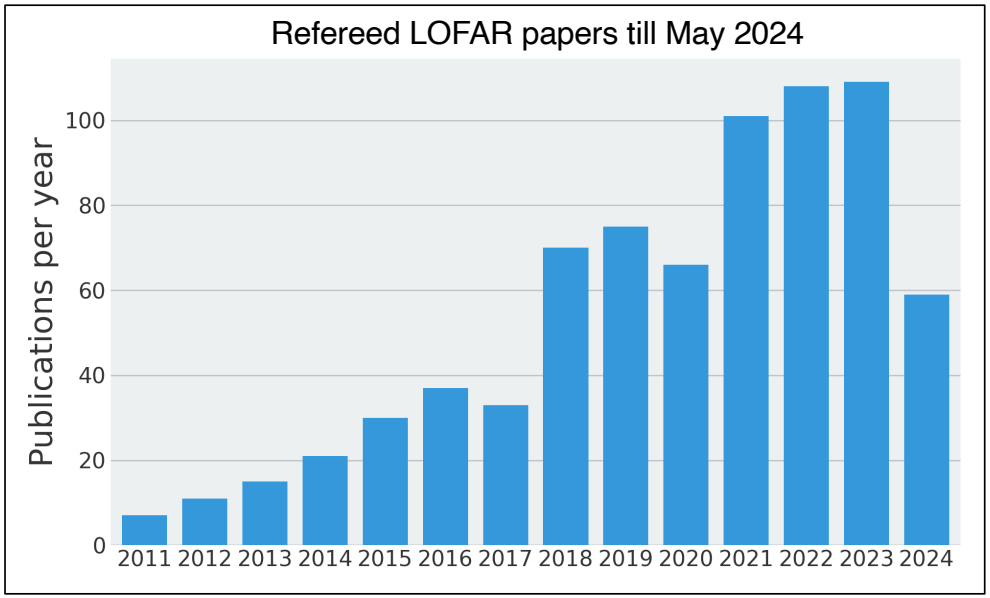


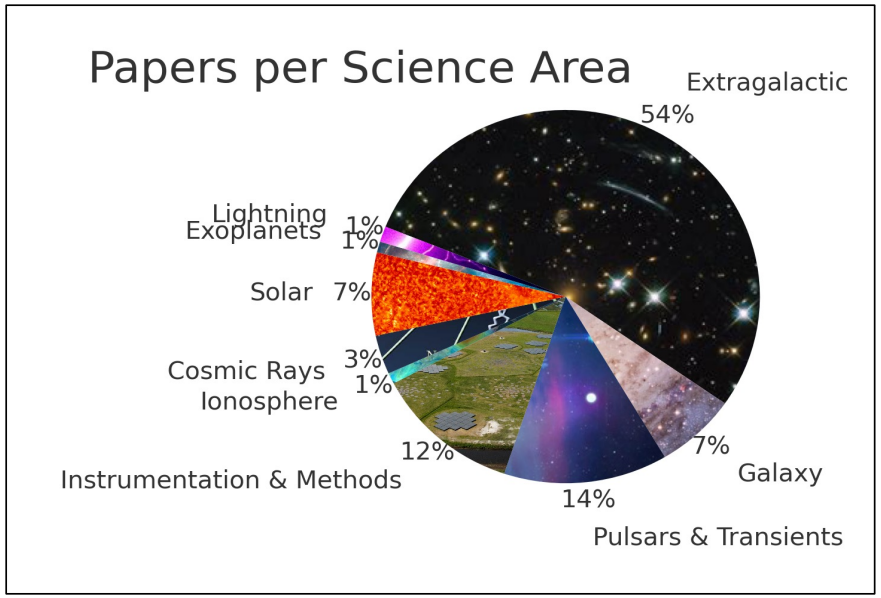




- Target efficiency: 70%
- Target completion: 95%
- Cycle 20: 96% completed - 66% efficiency

# Lofar Science Output

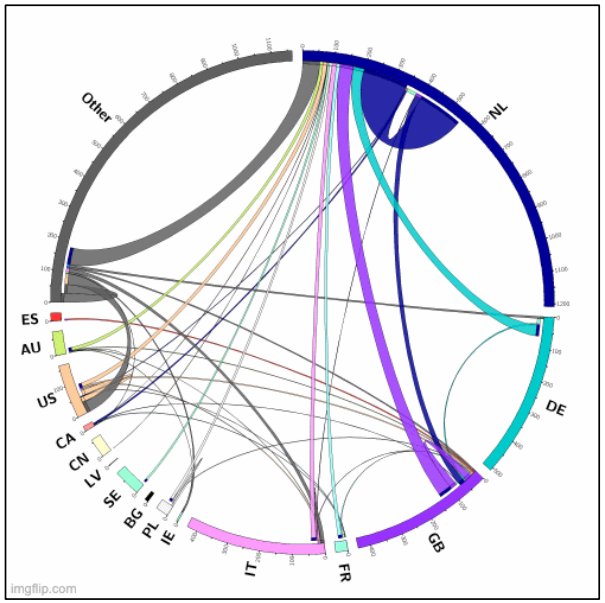


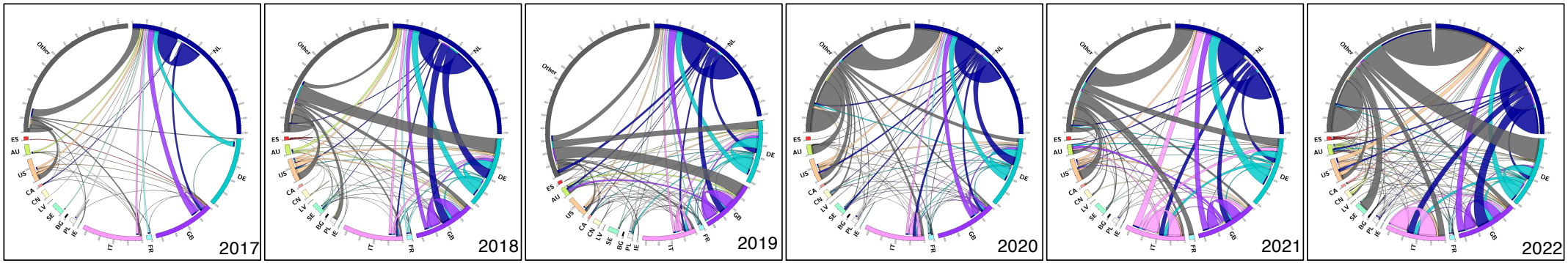




- 742 refereed publications
- Publication rate: 2 papers per week – top 10% of all astronomical facilities

# Community Evolution

- Measuring the success of LOFAR: shape of the LOFAR community and evolution of international collaborations.
- LOFAR's community spans the entire World and expanded by over a factor of 3 in the period 2017-2022.
- Evolution of collaborations: chord plots obtained by analysing the LOFAR publications over the period 2017-2022.
- Between 2017 and 2022 there was a factor of 7 increase in collaborations.

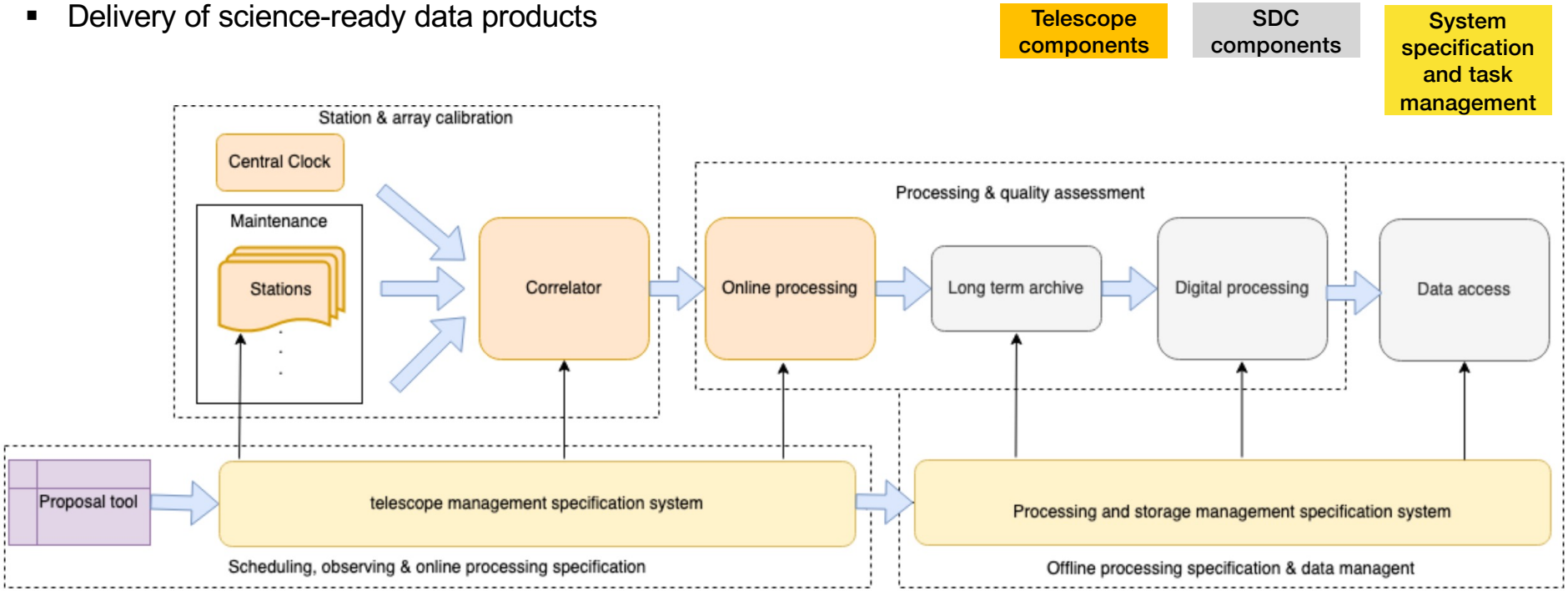



*Plots courtesy of J. Dempsey*

# LOFAR2.0: New Challenges

- LOFAR2 will:
  - Double the number of active LBA antennas
  - Realize simultaneous HBA and LBA observations
  - use the Megamode – interferometric and TAB data products at the same time
  - Delivery of science-ready data products

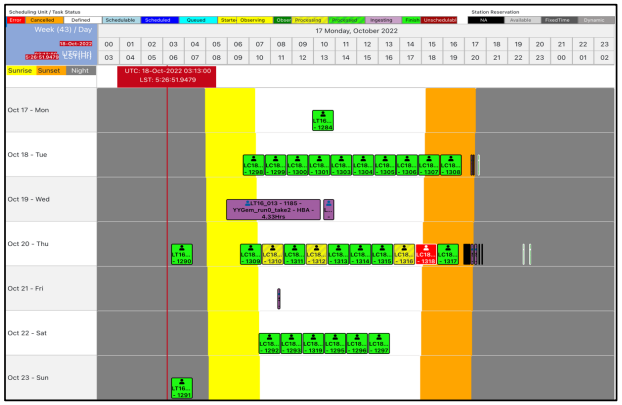


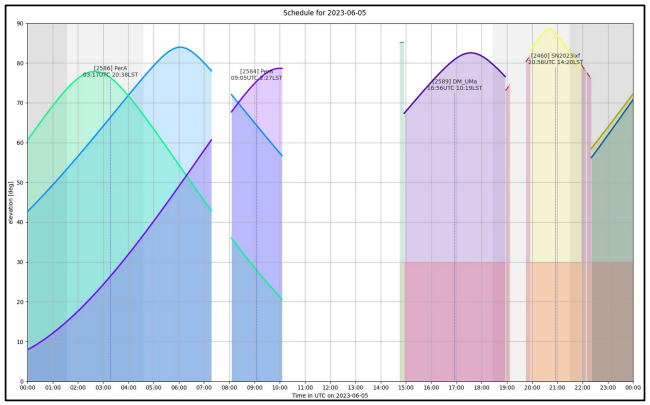

*See also next talks for complementary info on station & array calibration*

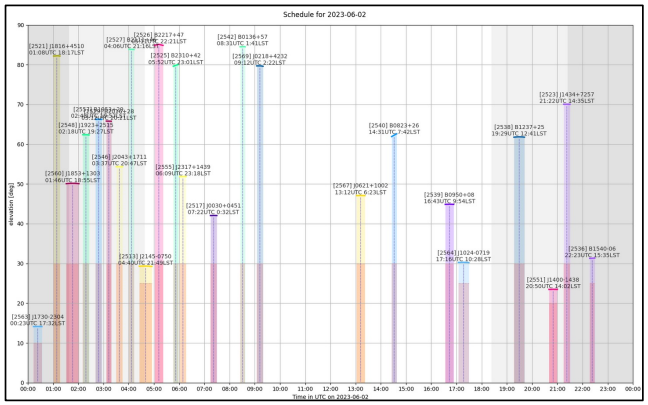
# Scheduling & observing: TMSS Now Runs The Show

- More efficient LOFAR operations
- Dynamic scheduling
- Improved adaptability and maintainability of software

- TMSS running the full Cycle 20 observing program – public schedule here
- Dynamic scheduler: schedule observations automatically based on constraints
- Further enhancements:
  - system reacting to external events (solar activity, ionospheric conditions, etc.)
  - More automation in data acceptance & data quality assessment
  - Specification -> interaction with proposal submission tool



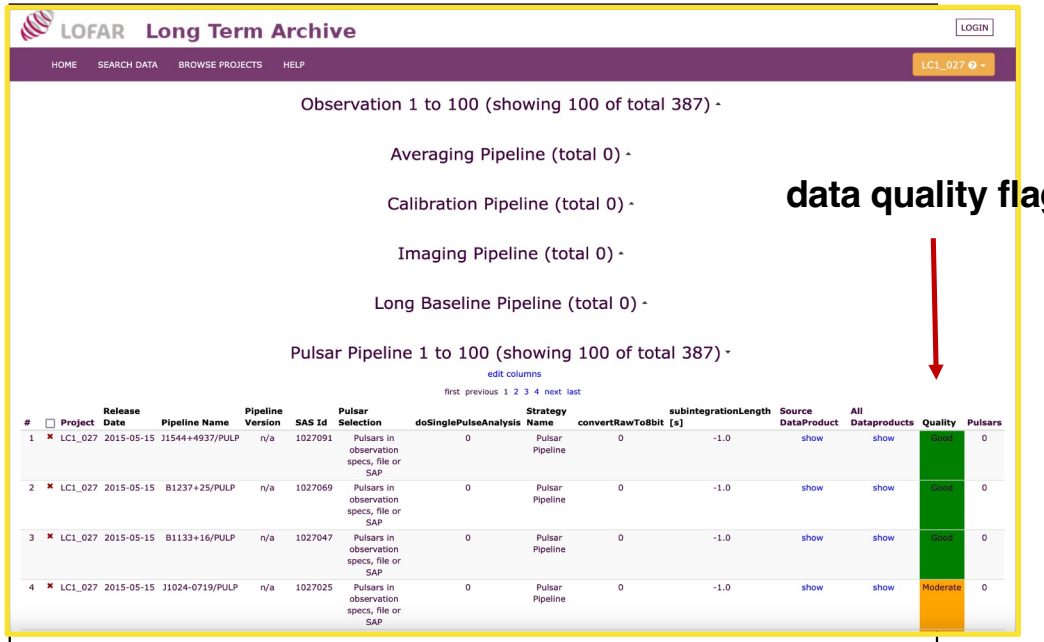




*Images courtesy of the TMSS team*

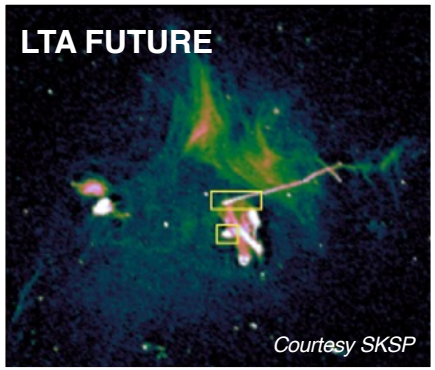
# Proposing: New Proposal Management Tool

- NorthStar successor needed for LOFAR2
- Analyzed tools adopted at other major astronomical facilities
- New tool under development (inspired by Hedwig, adopted at EAO)
- It will:
  - Support proposal creation and experiment specification
  - Support review process
  - Transfer technical specs of allocated projects automatically to facility management systems (LOFAR & SDC)
  - Integrate with FAAI


# Generating Science-Ready Data Products: LTA Ops

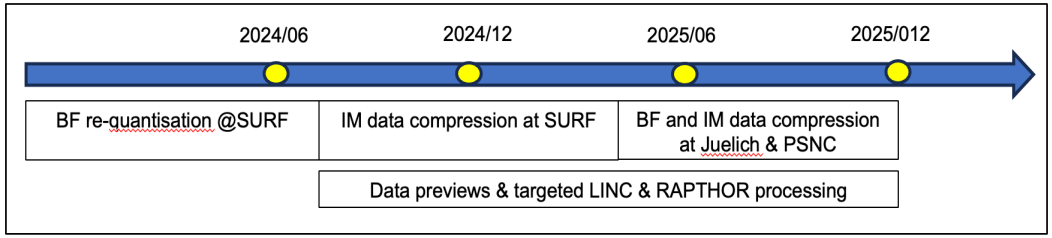



**data quality flag**





- New operational area compared to LOFAR1
- Will run workflows currently under development
- LDV:
  - Reduce data volume at the LTA to reduce operational costs
  - Streamline data processing operations at the LTA
  - Prepare ASTRON for LOFAR2 Large Programs
- LDV Operations started early 2023
  - Current focus: BF data processing (re-quantization) – IF data compression following this year. Savings so far: ~4PB PB + introduction of data quality flag
- Further valorisation of portions of the archive through data previews (*marriage* with LOFAR2.0 commissioning)




*LDV timeline*

# Preparing the Infrastructure for LOFAR2.0: Data Life Cycle & Early LOFAR Cycle data Retirement

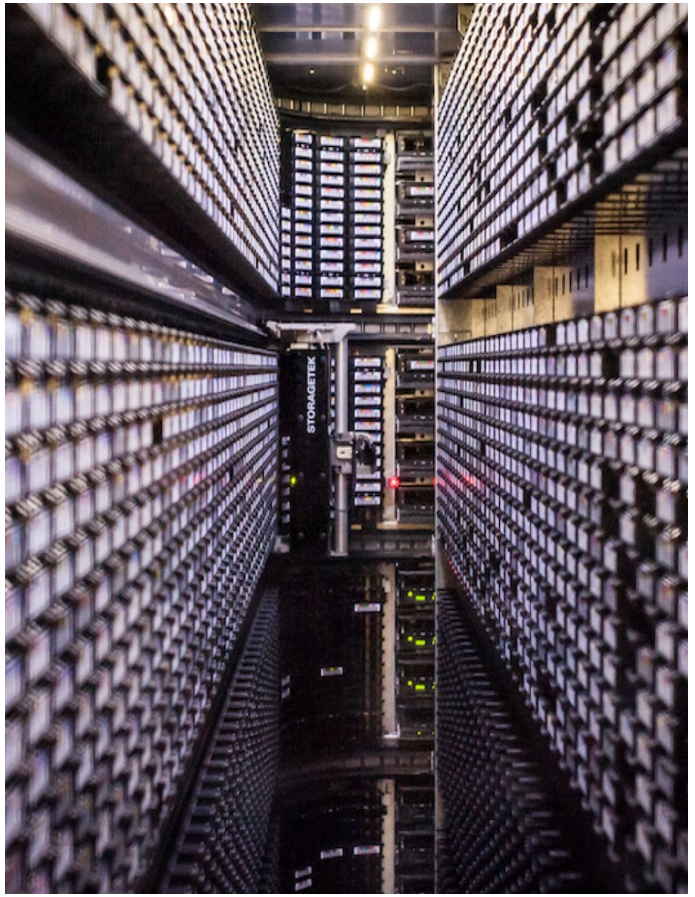
| Product type | Example | Retention period |
|---|---|---|
| Raw | unprocessed vis. | Not retained |
| Instrumental | Flagged, compressed vis. | 18 months |
| Intermediate | Direction-independent vis | 18 months |
| Advanced | Images, cubes | Indefinite |
| Special cases | Unique observations | For discussion |

- LOFAR2 will generate considerably more data than LOFAR1: ~70 PB intermediate + ~30 PB advanced
- Data challenge outstrips current affordable solutions
  - Early LOFAR Cycle data (Cycle 0-6) retirement:
    - In progress
  - ILT-board approved a data life cycle:
    - Advanced data products (images, cubes, catalogues) kept indefinitely
    - Intermediate data products will be retired after a period (~18 months), based on available resources
    - Exceptions to be considered in exceptional cases
- Shift of paradigm: trust observatory pipelines

# Data Access: Improving the LTA performance

Towards more stability of data staging and downloading:

- Dutch (SURF) and German (Jülich) LTA data centres are ready to support more performant and reliable data access, offering a.o. WEBDAV and token-based authorization.
- Poznan just upgraded their environment to support this as well.
  - Verification and final configuration changes underway
- After completion, we will start offering new access methods through an upgraded stager service (StageIt)
  - Enhanced functionality for automated and interactive user staging requests
  - Instructions will be shared with the community



Thanks – questions?