Future Ambitions

LTA Development Meeting

2026-07-01

ASTRON

Netherlands Institute for Radio Astronomy

GOALS

- Maximise the **scientific productivity** of LOFAR as an instrument
- Maximise the **scientific productivity** of the community as a whole
- Maximise the **accessibility** of LOFAR data to the widest possible audience
- Minimize the **environmental & financial impact** of our activities

AMBITION

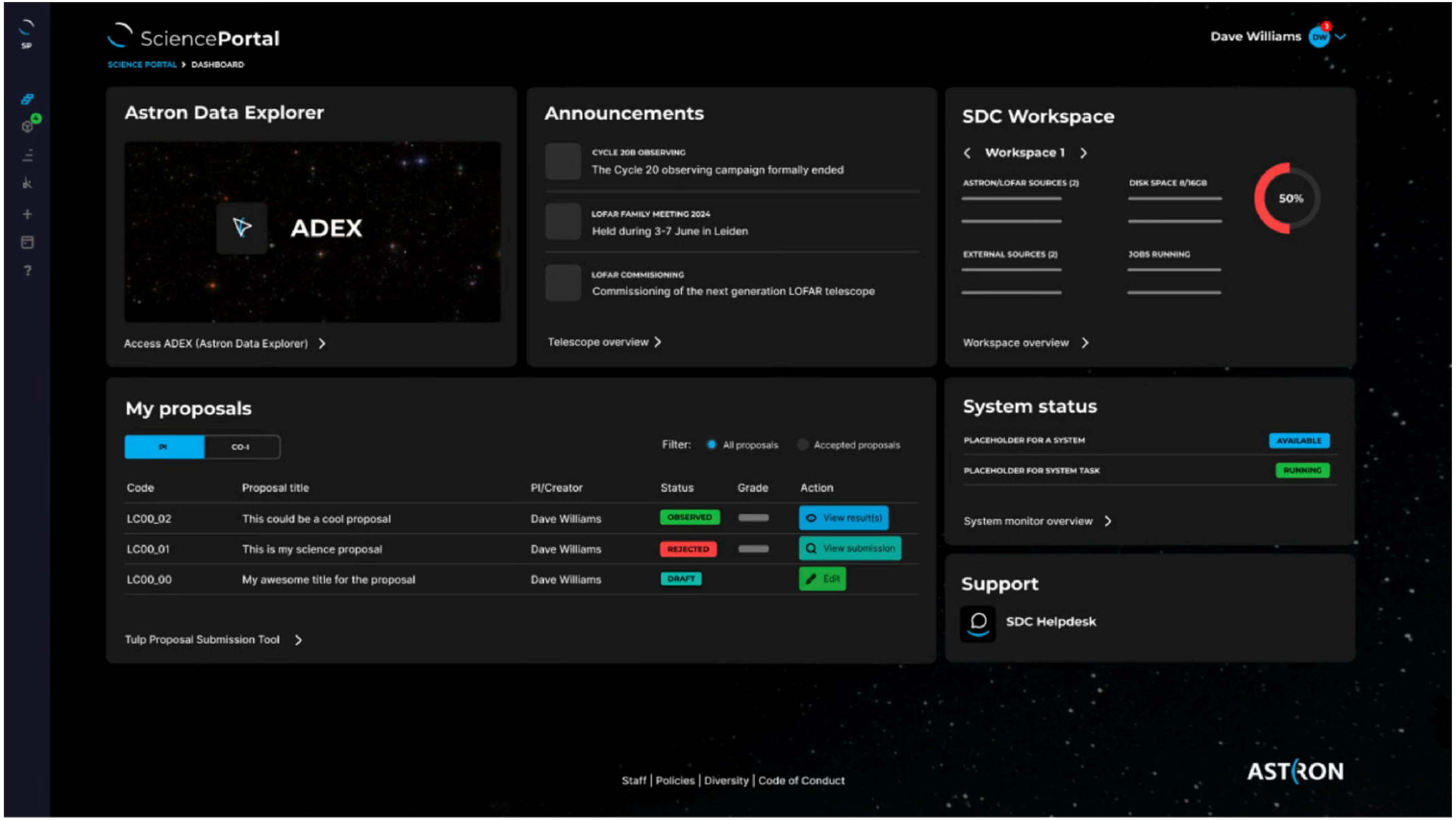
Our long-term aim (we aren't there yet)…

A "central hub" for access to and analysis of LOFAR data

Providing "advanced" data products together with the tools needed to analyse and understand them in a single, coherent, well structured location

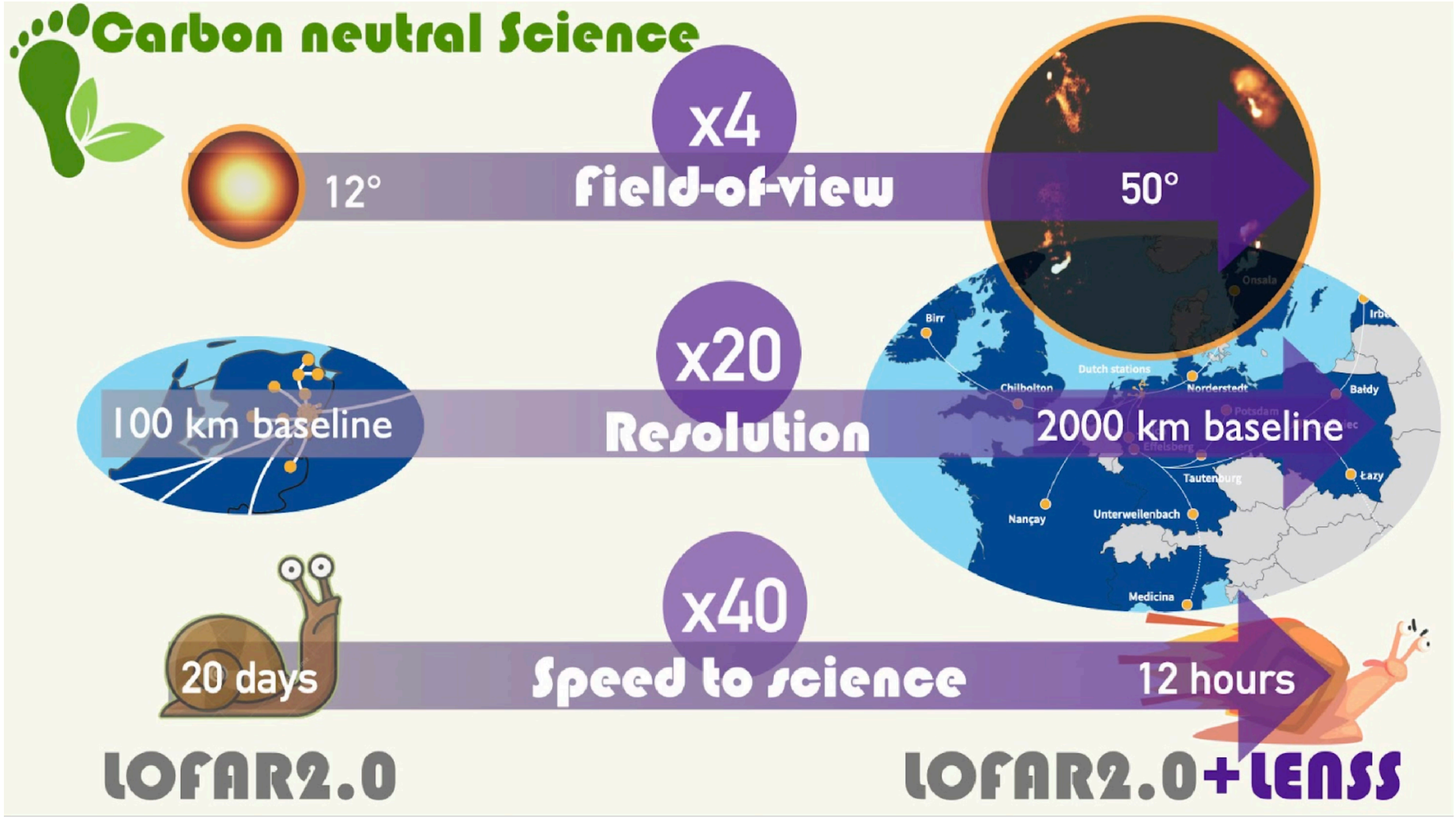
CAPABILITIES

INTERFACE & ACCESSIBLITY



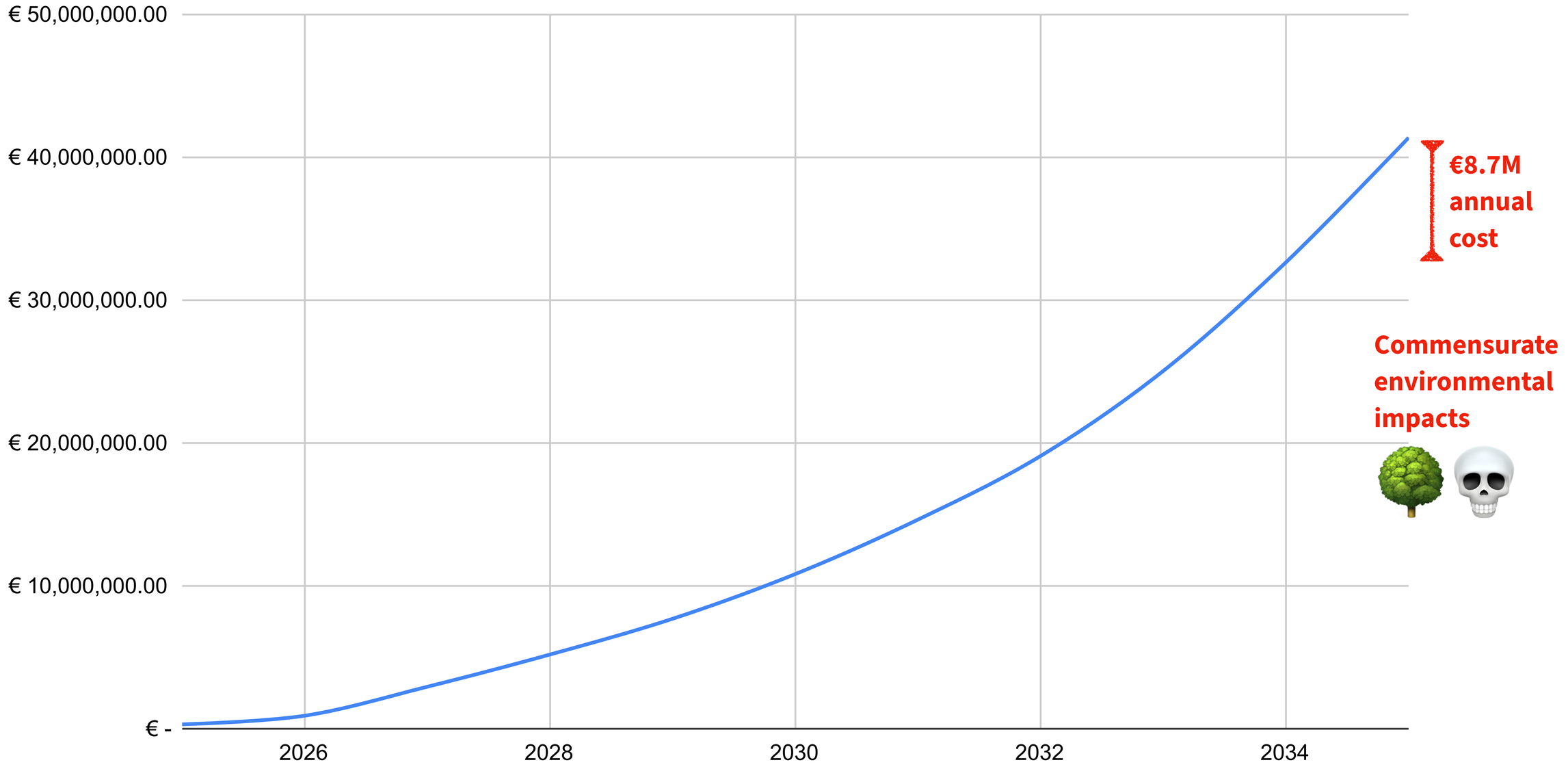
(Concept)

SPEED


Carbon neutral Science
x4
12°
field-of-view
50°
x20
100 km baseline
Resolution
2000 km baseline
Birr
Onsala
Dutch stations
Chilbolton
Norderstedt
Baldy
Potsdam
Effelsberg
Tautenburg
Łazy
Nançay
Unterweilenbach
Medicina
x40
20 days
Speed to science
12 hours
LOFAR2.0
LOFAR2.0+LENSS

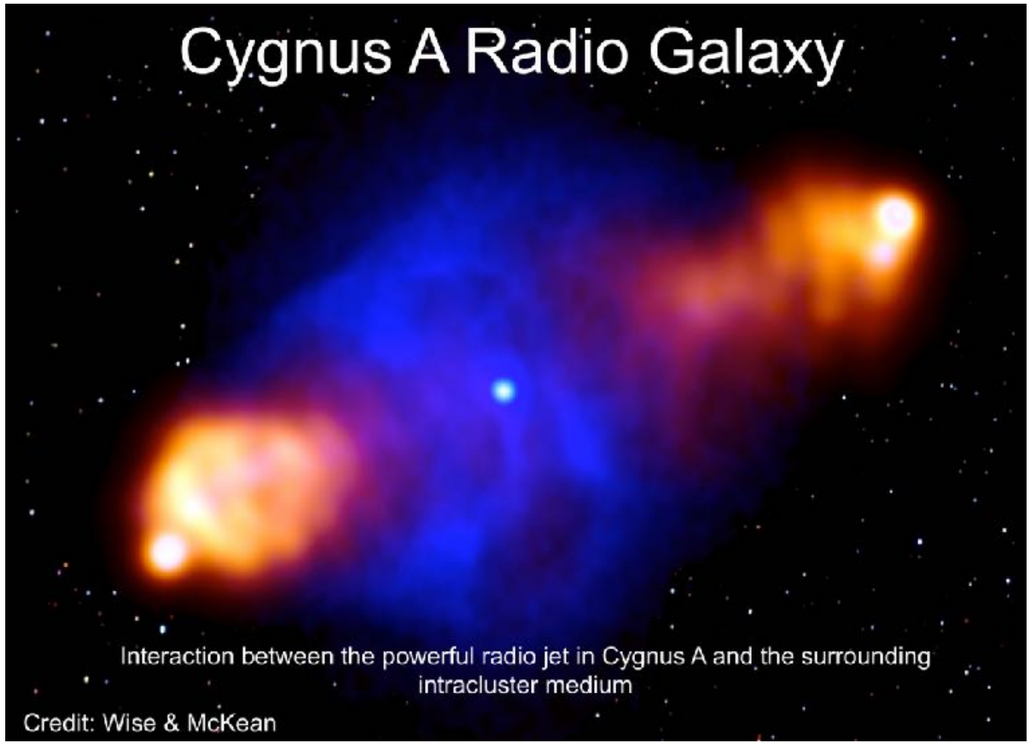
MONEY 💰

Cumulative Processing & Storage Cost, LOFAR-NL and NLSRC



NB not attempting to model the impact of AI on hardware prices

- If half my data lands in Jülich and half in Poznań, but I need to analyze it together, I have a problem.
- If I need to combine PB-scale LOFAR datasets with EB-scale SKA datasets, I have a *real* problem.
- If I need to combine LOFAR, SKA, ALMA, Rubin, E-ELT, Chandra, NewAthena...
  - ...even if all those projects have functional archives of their own, the bandwidth constraints are overwhelming.



CONVERGENCE?

SRC | Net

SKAO Regional Centre Network

Claude Science
Beta

← Cross-species Samosa

+ New

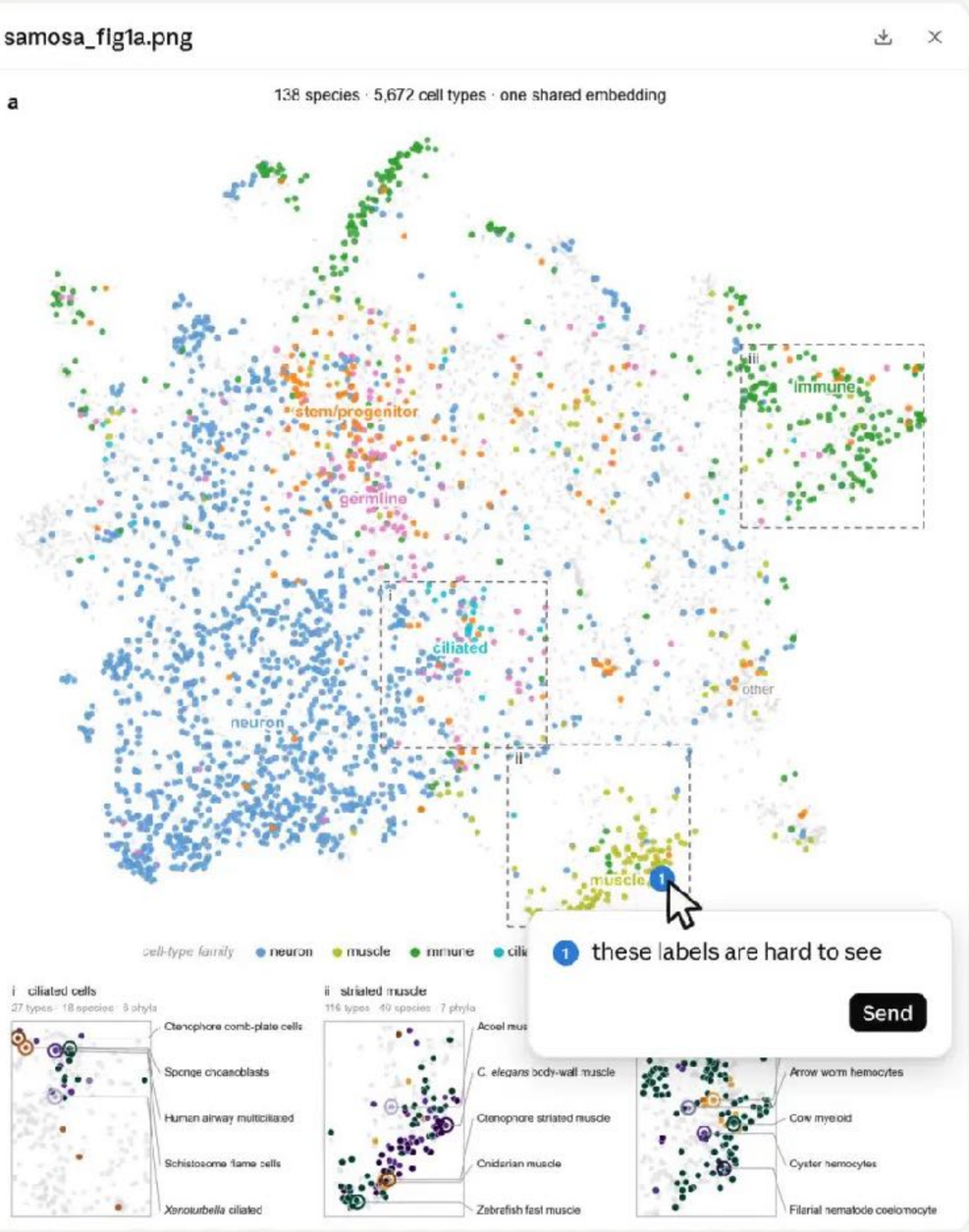
Customize

Files

Today

- Samosa Manuscript
- Samosa Editorial Review
- Samosa Model Training
- Samosa Benchmarking

samosa_fig1a.png



samosa_fig1a.png ‹ v2 ›

Code | Execution Log | Messages | Environment | Review

Download script

Inputs fig4_atlas_callouts.csv fig4_atlas_centroids_m138ea.csv

```
54
55  apply_nature_style()
56  mpl.rcParams['savefig.bbox'] = None
57  mpl.rcParams['font.sans-serif'] = ['Arial']
58  mpl.rcParams['font.family'] = 'sans-serif'
59
60  centroids = pd.read_csv(" fig4_atlas_centroids_m138ea.csv ")
61  boxes_df  = pd.read_csv(" fig4_atlas_inset_boxes.csv ")
62  callouts  = pd.read_csv(" fig4_atlas_callouts.csv ")
63
64  HERO = {"neuron":"#5b9bd5","muscle":"#bcbd22","immune":"#2ca02
65          "ciliated":"#17becf","germline":"#e377c2","stem/progen
66  PHYL_PAL2 = {"Ctenophora":"#7f3b08","Porifera":"#b15928","Plac
67               "Xenacoelomorpha":"#b2abd2","Chaetognatha":"#8073
68               "Ambulacraria":"#35978f","Cephalochordata":"#4ac0
69  TAG_ROMAN={'a':'i','b':'ii','c':'iii'}
70  INSET_NAMES={'a':'ciliated cells','b':'striated muscle','c':'
71  ITALIC_SPLIT={'Xenoturbella ciliated':('Xenoturbella',' cilia
72                'C. elegans body-wall muscle':('C. elegans',' b
73  TAG_COL='#2B2B2B'
74  halo=[pe.withStroke(linewidth=2.2,foreground='white')]
75  halo_thin=[pe.withStroke(linewidth=2.0,foreground='white')]
76
77  inset_info={}
78  for _,row in boxes_df.iterrows():
79      tag=row.tag; fam=row.family; x0,y0,w,h=row.x0,row.y0,row.w
80      inbox=centroids[(centroids.umap_x>=x0)&(centroids.umap_x<=
81      target=inbox[inbox.family==fam]
82      tx0,tx1=target.umap_x.min(),target.umap_x.max(); ty0,ty1=t
83      mx,my=0.05*(tx1-tx0),0.05*(ty1-ty0)
84      inset_info[tag]=dict(fam=fam,xlim=(tx0-mx,tx1+mx),ylim=(ty
85                           n_types=row.n_types,n_species=row.n_s
86
```

New Approaches

- Can you use a machine learning model to go from observation to paper without imaging?
- Can you build an AI system that automatically identifies high-value observations and deletes the rest?
- Can you provide every astronomer with a fleet of agentic “assistants” who help them with the grunt work?
- Will quantum/neuromorphic/photonic/... save the day?

SPECTRUM

- Horizon Europe
- Start: 2024
- Finish: June 2026
- €145k towards staffing at ASTRON
- SURF & FZJ were also partners

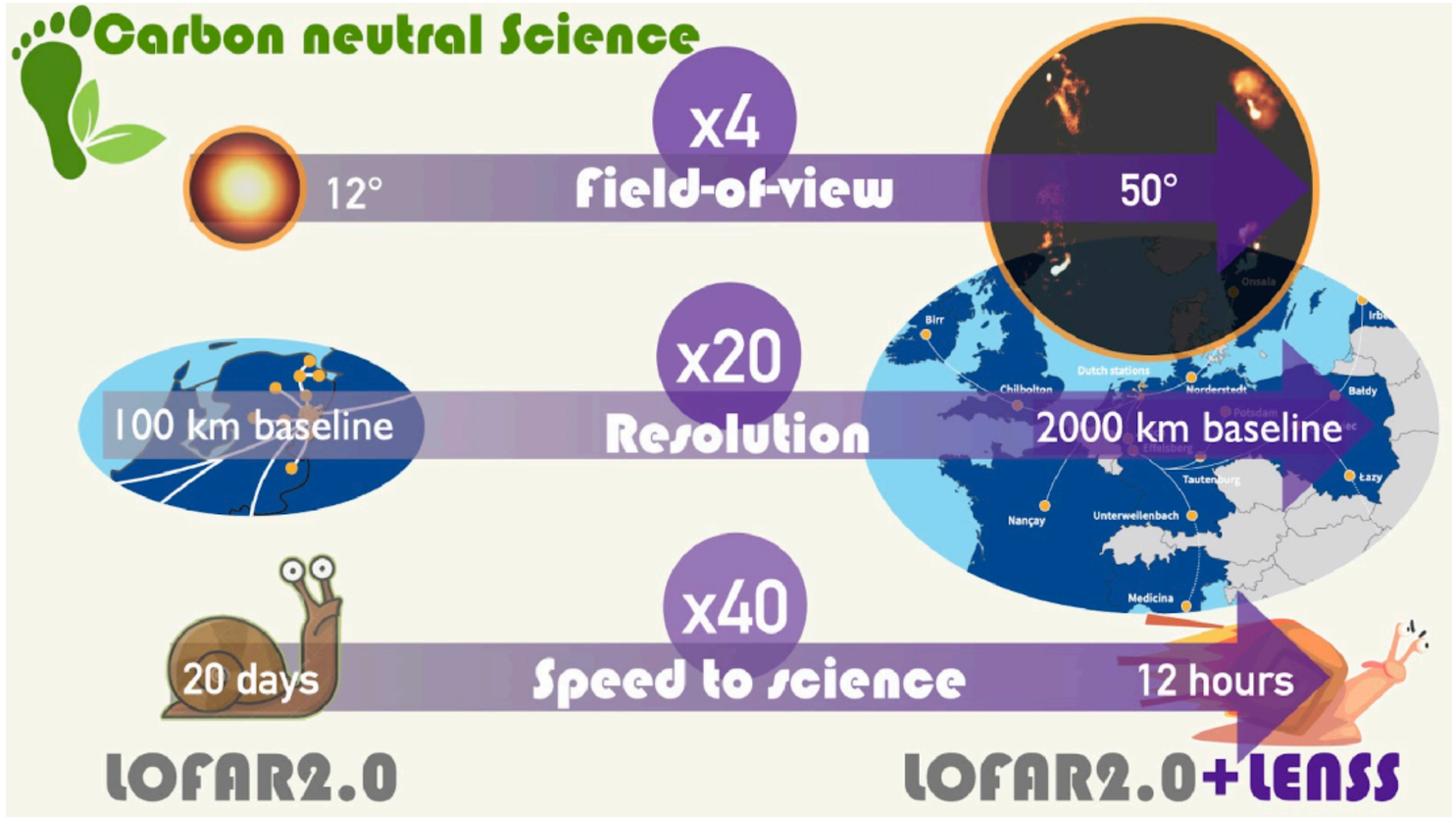
SPECTRUM is coordinated by EGI and has nine participating organizations.

Developed a “technical blueprint” and “strategic research and development agenda” for a “European Data and Compute Continuum” designed to meet the future needs of particle physics and radio astronomy. This is expected to inform future EC funding calls.

The project does not directly fund development work.

LENSS

- NWO Research Infrastructure
- Start: 2025
- Finish: 2030
- ~€2.5M towards “data centre & pipelines” staffing (plus more elsewhere)



SYNAPSE

- NWO Vernieuwingsfonds
- Start: 2026
- Finish: 2027
- €1M towards staffing at ASTRON

SYNAPSE is specifically targeted towards the convergence of SKA Science Data Processor and LOFAR data processing..

It supports the development of:

- A joint framework for data processing between LOFAR and SKA;
- Adaption of a couple of existing pipelines to that framework;
- Improvements to our execution environment to support the new framework.

In practice, this funds our involvement in the RADIO collaboration and our collaboration with SURF.

LoFAIR

- Open Science NL Infrastructure funds
- Start: 2026
- Finish: 2027
- €200k staffing at ASTRON; €50k at NL eScience Center.

LoFAIR is a collaboration with the NL eScience Center to increase the accessibility of LOFAR data and software by:

- Making the LOFAR archive fully FAIR-compliant;
- Integrating LOFAR software with NLeSC's Research Software Directory.

Implementation details will depend on the success and timing of the VOLTRON funds.

OSPREY

- Open Science NL Infrastructure funds
- Start: 2026
- Finish: 2020
- €1M staffing at ASTRON; €500k at University of Amsterdam.

OSPREY is a collaboration with the University of Amsterdam to bring an SRCNet-derived science platform to the Netherlands' scientific community, with use cases focused on radio and x-ray astronomy.

If VOLTRON is successful, this project will be an ideal complement. If VOLTRON is unsuccessful, this project will support a more limited form of LOFAR/SRCNet convergence.

VOLTRON

- Not yet funded; news expected soon.
- NWO Large-Scale Research Infrastructure
- Start: 2027
- Finish: 2031
- €1.5M towards staffing at ASTRON, €1M at SURF, €1M infrastructure

VOLTRON is the counterpart to SYNAPSE, focusing on converging LOFAR Data Systems with SRCNet.

This project includes development effort at ASTRON, but also funds to support that effort and to set up the first versions of NL-SRC at SURF.

MAESTRO-EU

- Not yet funded; just submitted.
- Horizon Europe (HORIZON-INFRA-2026-TECH-01-01)
- Start: 2027
- Finish: 2030
- €391k towards staffing at ASTRON

The project big-picture is development of a platform for agentic AI used in support of major research infrastructures.

Our role is to provide two use cases, one on radio astronomy data processing (in conjunction with SURF) and one on scheduling and QA.

CHEER

- Not yet funded; just submitted
- Horizon Europe (HORIZON-INFRA-2026-01-DEV-03)
- Start: 2027
- Finish: 2030
- €123k towards staffing at ASTRON

Developing a policy framework for interoperable “ACDCs” (Astronomy Computing & Data Centres) across Europe.

ASTRON's role is very small — effectively acting as a consultant. LOFAR, SKAO are there too. JIVE has a bigger role.

Question

- How do we best engage you in making this happen?