



League of European  
Accelerator-based  
Photon Sources

# LEAPS Data Strategy + Open Science

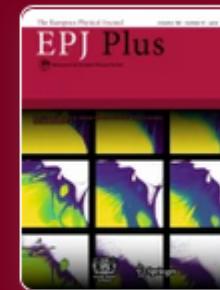
Andy Götz  
ESRF + EOSC-A

*On behalf of the LEAPS WG3*

# LEAPS data strategy

Regular Article | [Open access](#) | Published: 17 July 2023

Volume 138, article number 617, (2023) [Cite this article](#)



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Andy Götz , Erwan le Gall, Uwe Konrad, George Kourousias, Oliver Knodel, Salman Matalgah, Oscar Matilla, Darren Spruce, Ana Valceril Orti, Majid Ounsy, Thomas H. Rod & Frank Schluenzen

1920 Accesses 7 Citations 3 Altmetric [Explore all metrics](#) →

The continuous evolution of photon sources and their instrumentation enables more and new scientific endeavors at ever increasing pace. This technological evolution is accompanied by an exponential growth of data volumes of increasing complexity, which must be addressed by maximizing efficiency of scientific experiments and automation of workflows covering the entire data lifecycle, aiming to reduce data volumes while producing FAIR and open data of highest reliability. This paper briefly outlines the strategy of the League of European Accelerator-based Photon Sources user facilities to achieve these goals collaboratively in an efficient and sustainable way which will ultimately lead to an increase in the number of publications.

## [The European Physical Journal Plus](#)

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# Special issue on LEAPS in European Physical Journal Plus

Home > Collection

## Focus Point on Accelerator-based Photon Science Strategy, Prospects and Roadmap in Europe: a Forward View to 2030.



Participating journal: [The European Physical Journal Plus](#)

The League of European Accelerator-based Photon Sources (LEAPS) is an alliance of all synchrotron and free electron laser user facilities in Europe. These facilities are an essential element of the scientific landscape in Europe as well as worldwide, undergoing fast and profound changes of great relevance for the scientific community, the knowledge transfer to industry and the enhanced interaction with widening countries. It is the goal of LEAPS to contribute to a substantial societal impact. This focus point issue features the current status and future scientific strategy of LEAPS. The collection includes papers about most of the LEAPS members, along with two specific papers on the LEAPS general strategy and the critical aspect of data management and data driven solutions....

### LEAPS data strategy

Andy Götz, Erwan le Gall ... Frank Schluenzen

Regular Article | Open access | 17 July 2023 | Article: 617



European  
r-based  
irces

# LEAPS – Fact sheet



**19 facilities in 16 institutions**

more than 300 operating beamlines

more than 700 Mio € operation budget

**more than 24.000 users  
from all disciplines and industry**

free access to all academic users from all MS and worldwide

outstanding service to industry and innovation

more than 25.000 publications in the past 5 years

see **ALL LEAPS documents at**  
<https://leaps-initiative.eu/about/leaps-documents/>

# LEAPS – some figures



## THE LARGEST NETWORK OF RESEARCH INFRASTRUCTURES IN EUROPE CONTRIBUTING TO EUROPEAN GLOBAL LEADERSHIP

### A NETWORK OF SYNCHROTRONS AND FREE ELECTRON LASERS IN

**10** countries

**16** institutions

**19** facilities

LEAPS actively collaborates with Analytical Research Infrastructures in Europe (ARIE).

LEAPS facilities are open science pioneers.

### OUR ACTIVITIES IN NUMBERS

**>300** operating Experimental stations

**>30.000** user / year from all EU and beyond

**>1 million hours** beam time / year

**>7.000** publications / year

**55.000** Protein Data Bank entries supporting health industry

Materials for Energy  
Life-science – Pharmacy Food  
Information Technology  
Environment Materials

**FUNDING**  
(reference period 2021-2027)

**800M€** (yearly) operational budget

**1,6B€** (over this period) investments

**1,5B€** (over this period) upgrade programs (partly already funded)



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League of European  
Accelerator-based  
Photon Sources

# Six Working Groups and two Strategy Groups

## hundreds of people involved

### Technological + Networking

- **WG1 – Beamline technology**
- Detectors
- Optics and BL Instrumentation
- Sample Environment  
NEW: Photon Diagnostics
- **WG2 – Photon Sources**
- Compact Sources
- FEL Developments
- Storage Rings
- **WG3 – DATA management and software**

- **WG4 – Industry & innovation**
- **WG5 – User Services & Impact**
- **WG6 – Education, Training & Outreach**

### Strategy Groups

- **SG for Synchrotrons**
- **SG for FELS**

Each WG has representatives from all LEAPS members – One/two spokespersons appointed by the WG itself – Taking lead in LEAPS-INNOV

- Develop and periodically update a roadmap for key enabling technologies and an action plan for their specific fields in consultation with the SGs;
- initiate, support implementation and monitor joint projects in their field. This includes setting up new projects, i.e. writing proposals in reply to open calls by the EU;
- exchange knowledge between LEAPS Members, Associates, Partners and to external stakeholders;
- deal with any other issues identified by the GA which requires the specific expertise of the particular WG.

SGs support the GA in its strategic work such as the roadmap process



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## LEAPS Partners and Associates



Canadian  
Light  
Source

Centre canadien  
de rayonnement  
synchrotron



SESAME

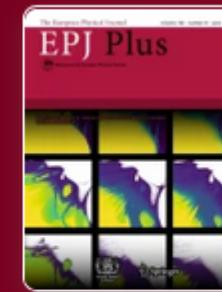


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# LEAPS data strategy

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The continuous evolution of photon sources and their instrumentation enables more and new scientific endeavors at ever increasing pace. This technological evolution is accompanied by an exponential growth of data volumes of increasing complexity, which must be addressed by maximizing efficiency of scientific experiments and automation of workflows covering the entire data lifecycle, aiming to reduce data volumes while producing FAIR and open data of highest reliability. This paper briefly outlines the strategy of the League of European Accelerator-based Photon Sources user facilities to achieve these goals collaboratively in an efficient and sustainable way which will ultimately lead to an increase in the number of publications.

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# Goals

1. Increasing efficiency of experiments
2. Open Science
3. Sustainability of solutions

## LEAPS Data Strategy - summary

1. Data are essential to science, even more so for producers of huge data like the LEAPS facilities → **a strategy for (raw+processed) data is essential**
2. The Paper proposes **twenty objectives in seven areas** that the LEAPS facilities management should endorse and adopt
3. Implementing the objectives will first and foremost serve the creators of the data, i.e., **experimental teams, to deal more efficiently with data they produce to do better science**
4. Data should adhere to the **FAIR principles** and **Open Science** practices to share them with the scientific community and to **maximize their reuse**
5. The data strategy aims to **minimize** the amount of **data which are not published** and thereby contribute to **improving the efficiency** in terms of **scientific publications** and **energy consumption** of the LEAPS facilities
6. Provide high quality data for AI/ML algorithms while ensuring sovereignty

# Increasing efficiency of experiments = Objectives

- [3.1] LEAPS facilities to setup a working group for sharing data processing and analysis software and workflows for existing codes and new algorithms.
- [3.2] LEAPS facilities to share development of new AI/ML-based data processing codes.
- [3.3] LEAPS facilities to continue the development a remote analysis platform.
- [3.4] LEAPS facilities to work closely with user communities to define common metadata and strategies for data formats, compression, and publication.
- [3.5] LEAPS facilities to harmonize their data policies in terms of scope and embargo period of data.



# Increasing efficiency of experiments = Status

- [3.1] LEAPS facilities to setup a working group for sharing data processing and analysis software and workflows for existing codes and new algorithms.
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- [3.5] LEAPS facilities to harmonize their data policies in terms of scope and embargo period of data.**

# LEAPS + EOSC = Objectives

- [4.1] LEAPS facilities to implement the FAIR principles for data → WIP
- [4.2] LEAPS facilities to commit to adopting and sustaining the outcomes of PaNOSC and ExPaNDS.
- [4.3] LEAPS facilities to participate in building the EOSC with the other EOSC science clusters.
- [4.4] LEAPS facilities to adopt the practices of Open Science.

# LEAPS – Open Science Projects

## EXPANDS

Since 2019, the European Open Science Cloud (EOSC) Photon and Neutron Data Service (ExPaNDS) project including, 10 LEAPS and LENS national facilities work together to make their data more open and FAIR. Many LEAPS partners have already adopted its main outcomes such as the FAIR data policy framework and self-assessment, the common metadata schema, the OAI-PMH endpoint for data catalogues or the PaN training platform.

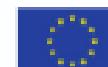
ExPaNDS



This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823852.

## PANOSC

The Photon and Neutron Open Science Cloud (PaNOSC) is a European project for making FAIR data a reality in 6 European Research Infrastructures (RIs), developing and providing services for scientific data and connecting these to the European Open Science Cloud (EOSC).



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823852.

# LEAPS + European Open Science Cloud (EOSC) –

## Outcomes of PaNOSC + EXPaNDS projects

1. **FAIR data policy** and DMPs.
2. **FAIR assessment** and common PID framework.
3. **Standardized metadata (NeXus/HDF5, PaN ontologies)**.
4. **Federated search API** for PaN data catalogues.
5. **Open data portal** for searching + downloading data.
6. **Community AAI UmbrellaId** → myAccessID
7. **JupyterLab notebooks** and **NeXus/HDF5** files visualization → H5Web
8. **Remote data analysis** with **VISA** + data analysis workflows → EWOKS.
9. **Simulation software** for experiments and data (Oasys, SIMEX, McStas)
10. PaN-training platform ([pan-training.eu](http://pan-training.eu))



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# LEAPS + EOSC = Status

- [4.1] LEAPS facilities to implement the FAIR principles for data → WIP
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# PaNOSC EOSC Node – on-going



## PaNOSC

Physical Sciences & Engineering

The PaNOSC (Photon and Neutron Open Science Cloud) EOSC Node federates data and services from Europe's photon and neutron research infrastructures.

It builds on the PaNOSC and ExPaNDS projects, integrating 11 facilities and their catalogues, AAI, VREs, training, and visualisation services. The Node will enhance FAIR data availability, enable AI/ML applications, and strengthen Open Science practices across domains. It connects with EOSC EU Node and other thematic/national nodes to maximise scientific and societal impact.

[EOSC Node | PaNOSC homepage](#)

<https://eosc.eu/building-the-eosc-federation/eosc-node-panosc/>



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# PaNOSC EOSC Node – home page

## Overview of PaNOSC Node Services

**Content Provider**

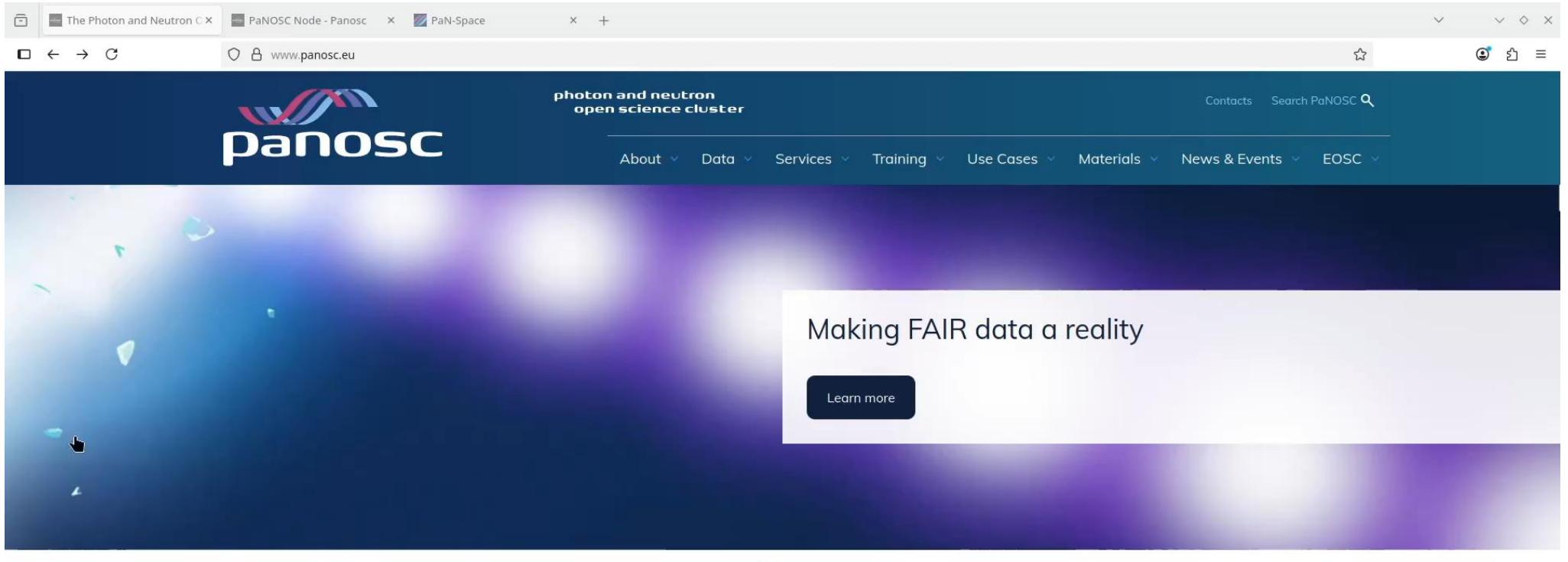
19 results found

Search

ESRF – European Synchrotron ... 4	<b>MAX IV Open Data Repository</b> The MAX IV Open Data Repository provides (Show more)	<b>AiiDAlab Quantum ESPRESSO app</b> AiiDAlab, a Jupyter-based web platform powered by the (Show more)	<b>PSI Data Portal</b> Find, access, and reuse public data acquired at (Show more)	<b>PaN-Finder</b> The PaN-Finder is a discovery portal that (Show more)	<b>PaN-Space</b> The PaNOSC User Space is an integrated online environment (Show more)
Helmholtz-Zentrum Dresden-R... 3					
Paul Scherrer Institute (PSI) 3		<b>MAX IV Metadata Catalogue SciCat</b> MAX IV SciCat is the metadata catalogue for (Show more)			
ESS – European Spallation Sou... 2					
MAX IV 2					
ALBA 1					
Deutsches Elektronen-Synchrot... 1	<b>Materials Cloud Archive</b> Open repository for research data relevant to (Show more)	<b>ESRF VISA Service</b> The ESRF VISA (Virtual Infrastructure for Scientific (Show more)	<b>Elettra Open Access Data Portal</b> Opendata Portal for the Elettra Sincrotrone Trieste (Show more)	<b>ALBA synchrotron Data Portal</b>	
Elettra 1					
Institut Laue-Langevin (ILL) 1					
PaNOSC 1					
<b>Keywords</b>					
PaNOSC 17					

<https://eosc.panosc.eu/>

# PaNOSC EOSC Node – preview



## The Photon and Neutron Open Science Cluster (PaNOSC)

The Photon and Neutron Open Science Cluster (PaNOSC) is the Science Cluster representing Photon and Neutron European Research Infrastructures (RIs), developing and providing services for its scientific community and connecting these to the European Open Science Cloud (EOSC).

Open Data



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# PaN Data Commons = Objectives

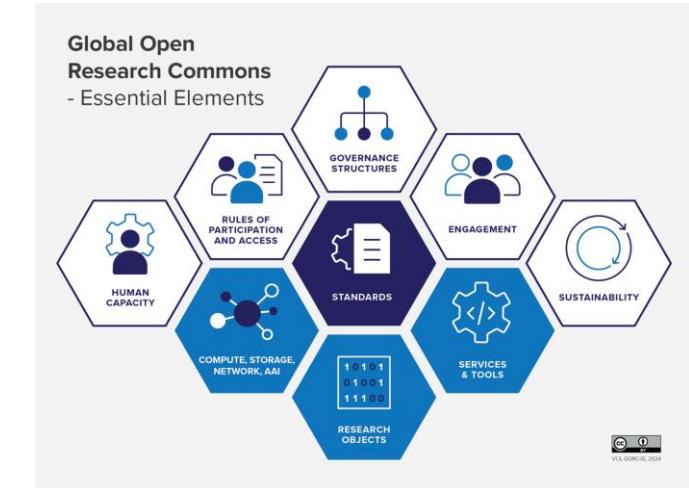
- [5.1] LEAPS facilities to implement the **PaN Data Commons** based on a federated solution for searching and accessing open data.
- [5.2] LEAPS facilities to **link their data repositories** to the PaN Data Commons to expose open data according to the FAIR principles.
- [5.3] PaN Data Commons to **monitor** the number of searches, downloads and citations of data published.

# PaN Data Commons = Status

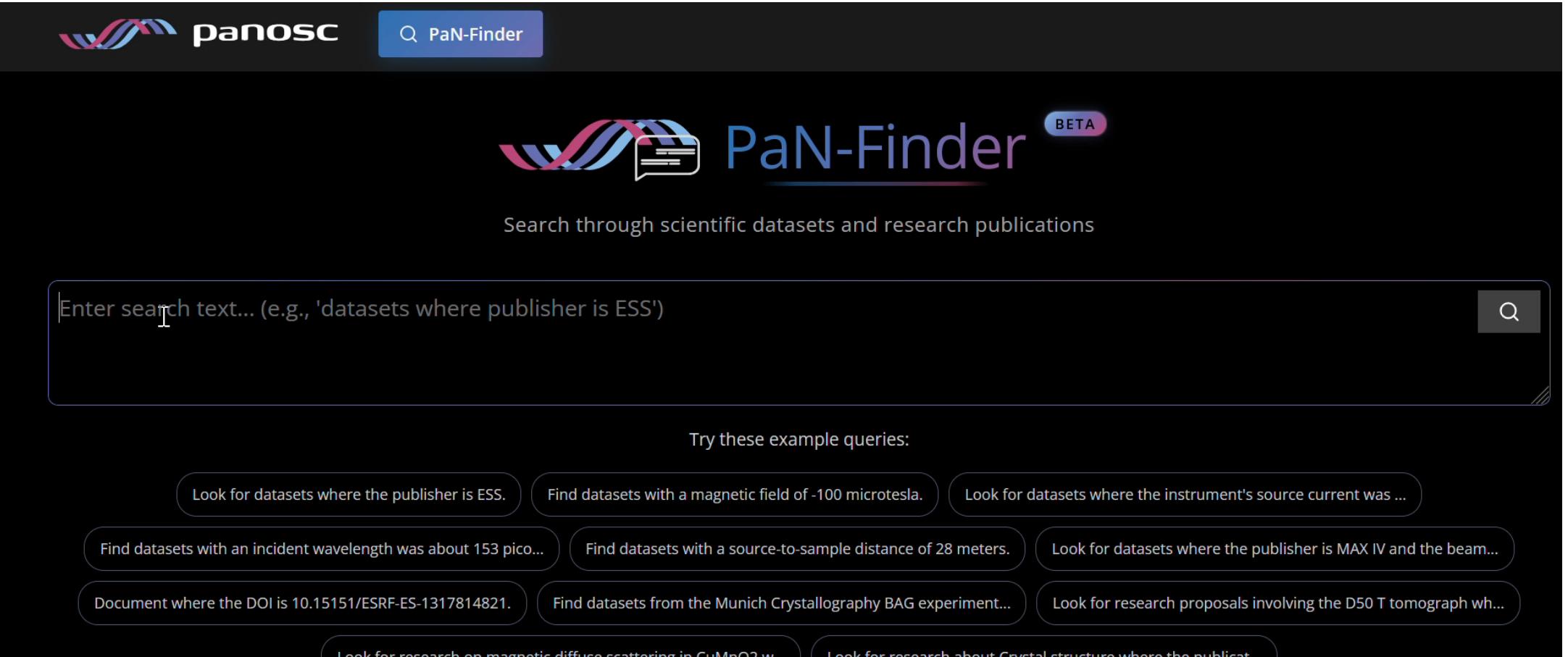
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# PaN-Finder – an AI search engine

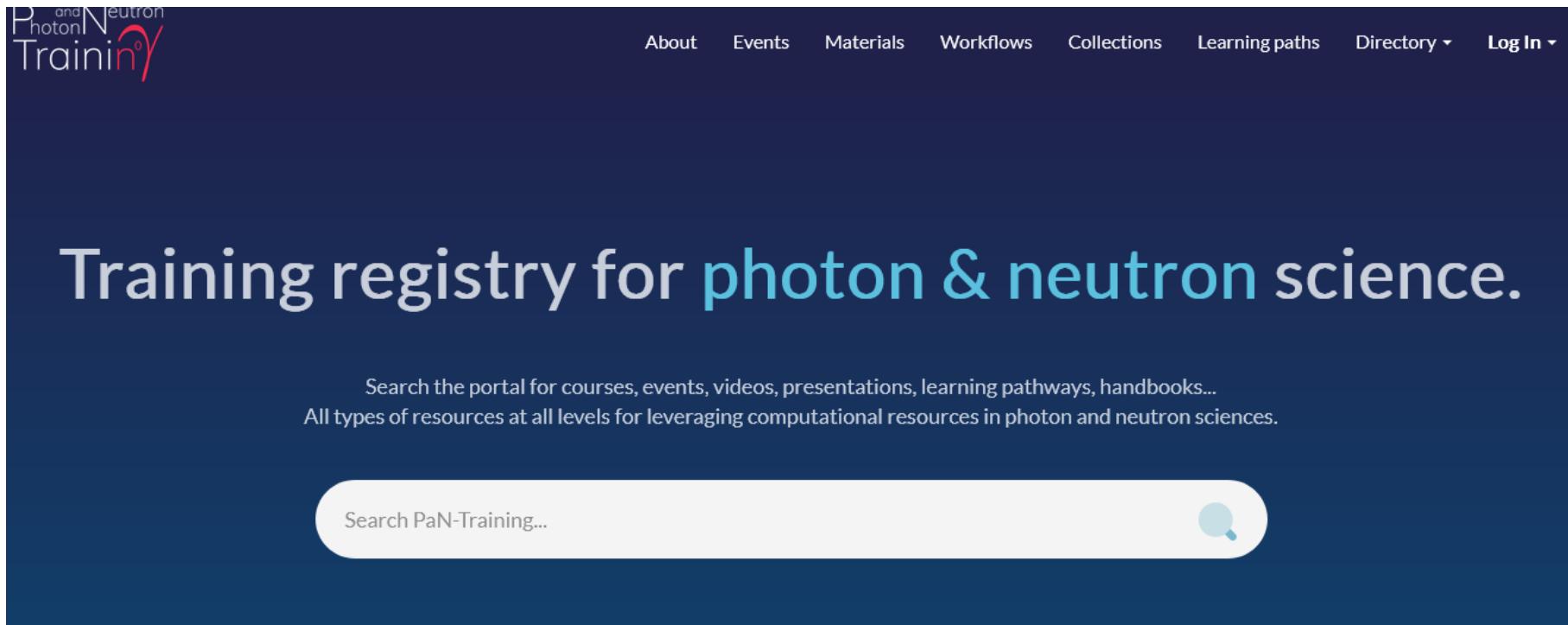


The screenshot shows the PaN-Finder search engine interface. At the top left is the panosc logo. Next to it is a search bar with the text "PaN-Finder". To the right of the search bar is a "BETA" badge. The main title "PaN-Finder" is displayed prominently with a wavy icon to its left. Below the title is the tagline "Search through scientific datasets and research publications". A large search input field is centered, with the placeholder text "Enter search text... (e.g., 'datasets where publisher is ESS')". To the right of the search input is a magnifying glass icon. Below the search input, there is a section titled "Try these example queries:" followed by a grid of nine rounded rectangular buttons, each containing a search query. The queries include: "Look for datasets where the publisher is ESS.", "Find datasets with a magnetic field of -100 microtesla.", "Look for datasets where the instrument's source current was ...", "Find datasets with an incident wavelength was about 153 pico...", "Find datasets with a source-to-sample distance of 28 meters.", "Look for datasets where the publisher is MAX IV and the beam...", "Document where the DOI is 10.15151/ESRF-ES-1317814821.", "Find datasets from the Munich Crystallography BAG experiment...", "Look for research proposals involving the D50 T tomograph wh...", "Look for research on magnetic diffuse scattering in CuMnO<sub>2</sub> w...", and "Look for research about Crystal structure where the publicat...".

<https://pan-finder.panosc.ess.eu/>

# Training + E-learning = Objectives

[6.1] LEAPS facilities should adopt the PaN-training portal as the **standard community platform** for sharing training and e-learning material on photon science → <https://pan-training.tesshub.hzdr.de/>



The screenshot shows the homepage of the PaN-Training portal. The header features the logo 'Photon and Neutron Training' with a stylized 'n' and 'γ'. The top navigation bar includes links for About, Events, Materials, Workflows, Collections, Learning paths, Directory, and Log In. The main title 'Training registry for photon & neutron science.' is prominently displayed in large white text. Below it is a search bar with the placeholder 'Search the portal for courses, events, videos, presentations, learning pathways, handbooks... All types of resources at all levels for leveraging computational resources in photon and neutron sciences.' A magnifying glass icon is to the right of the search bar. At the bottom, there are five cards showing statistics: 7 Upcoming Events, 286 Materials, 31 Workflows, 2 Learning Paths, and 19 PaN Services, each with a corresponding icon.



7  
Upcoming Events



286  
Materials



31  
Workflows



2  
Learning Paths



19  
PaN Services

# Sustainable Software = Objectives

- [7.1] LEAPS facilities will continue to maintain the common software catalogue of software for PaN facilities to actively promote common software [\[1\]](#)  
... as well as data processing methods and workflows
- [7.2] LEAPS facilities will set up official collaborative projects supported by formal MoUs to foster collaboration on specific outcomes of the PanOSC and EXPaNDS projects, e.g., VISA platform, FAIR data management, search APIs, data portal, data catalogues, DMPs, etc.
- [7.3] LEAPS facilities will continue the work launched in the frame of LEAPS-INNOV WP7 for data compression and reduction to develop common validated algorithms to help address the data deluge

# Sustainable Software = Objectives

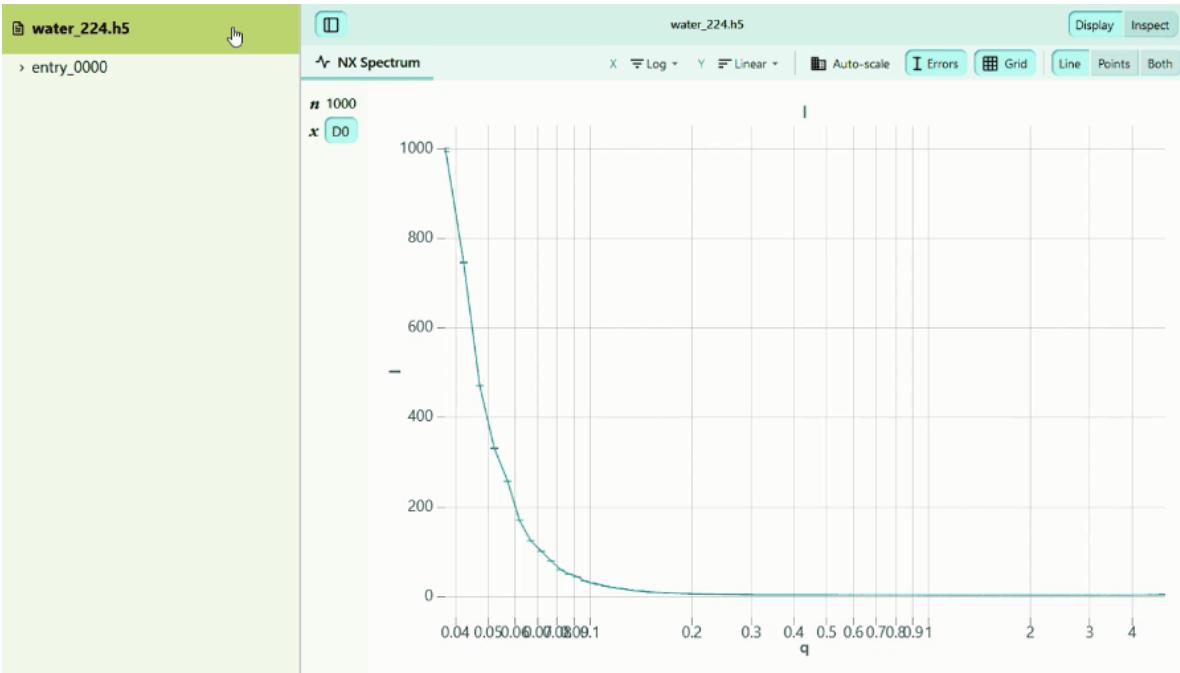
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[7.3] LEAPS facilities will continue the work launched in the frame of LEAPS-INNOV WP7 for data compression and reduction to develop common validated algorithms to help address the data deluge → hdf5plugin [3]

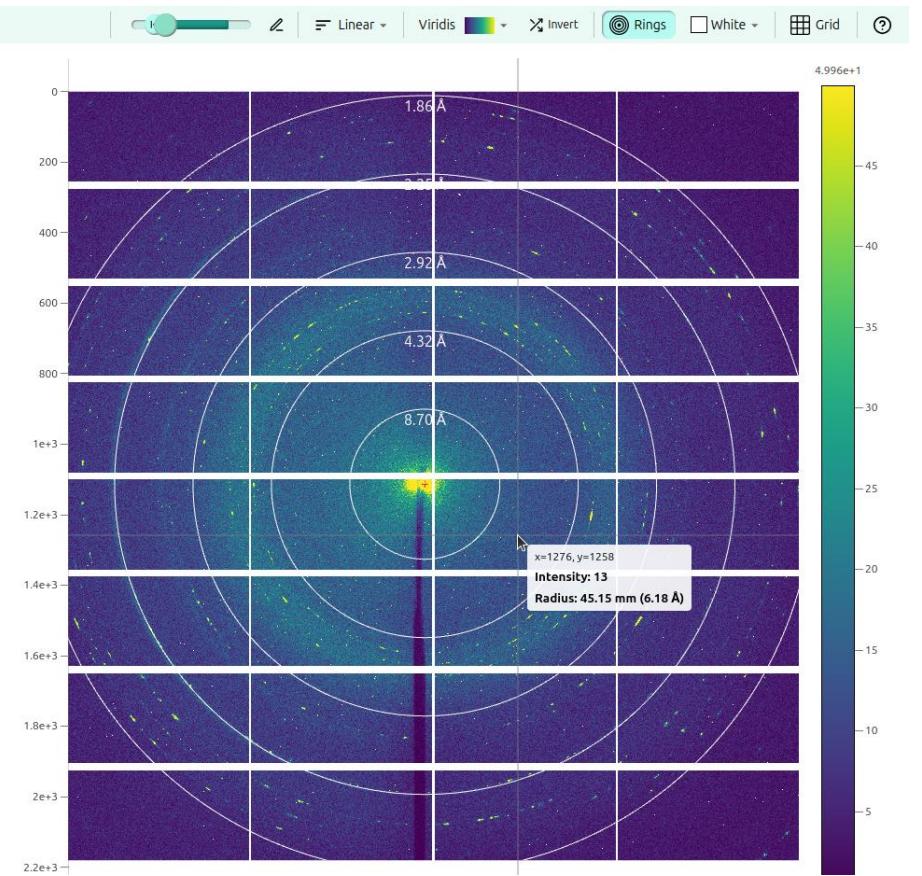
# H5Web Visualization Ecosystem



**H5Web Generic HDF5 file viewer**

- Integrated into **ESRF data portal (as a service)**, for viewing data in HDF5 files from experiments
- Available as **JupyterLab** and **VS Code extensions**, and soon as part of stand-alone web service, **myHDF5**, for viewing local and hosted HDF5 files

<https://github.com/silx-kit/h5web>



Used in various web applications at ESRF including:

- **Braggy**, diffraction image viewer (screenshot above)
- **Daiquiri**, beamline control and data acquisition software

**H5Web**

[H5Web](#) | 70,285 installs | 5 (11) | Free

# VISA – Virtual Remote Environment



## New compute instance

Please fill in the details below to create a new compute instance. For information about VISA please checkout the documentation.

### Computing Environment

Choose an environment



Desktop (Ubuntu 24.04)



Desktop (Ubuntu 20.04)

Choose hardware requirements

4 Cores

4GB memory

esrf.small

8 Cores

8GB memory

esrf.medium

8 Cores

16GB memory

esrf.large

16 Cores

32GB memory

esrf.gpu.a16

16 Cores

32GB memory

esrf.gpu.a40

16 Cores

62.5GB memory

esrf.large.memory

32 Cores

128GB memory

esrf.gpu.a40.xlarge

32 Cores

128GB memory

esrf.gpu.a16.large

32 Cores

256GB memory

esrf.xl.memory

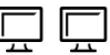
### Display Settings

Choose layout



Single screen

Default screen layout



Dual screen

Recommended for remote experiments



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# Climate Change + Green IT = Objectives

- [8.1] LEAPS facilities to reduce the volumes of data using innovative data compression schemes, e.g., by continuing the work started in the LEAPS-INNOV EC funded project.
- [8.2] LEAPS facilities to improve the remote operation solutions and to encourage their use to reduce travel to the facilities.
- [8.3] LEAPS facilities will measure their carbon footprint equivalent and take measures to reduce it with HW and SW suppliers.

# Climate Change + Green IT = Status

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# Estimated carbon footprint of experiment

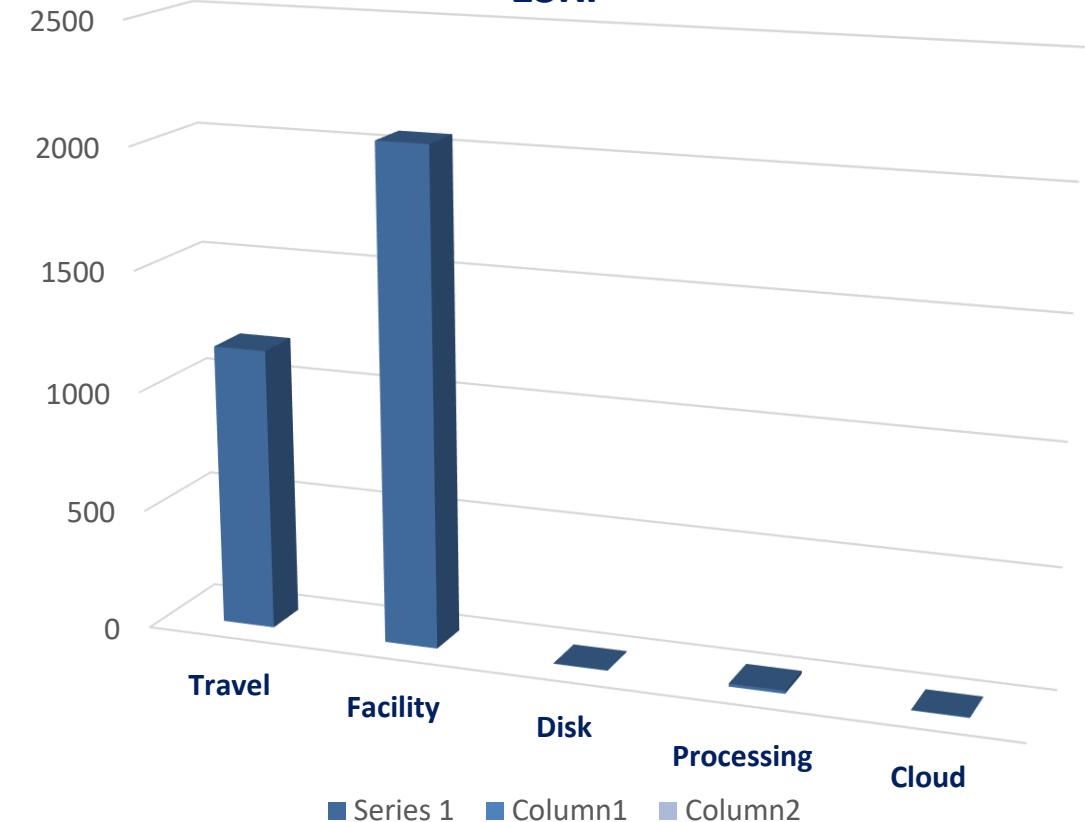
- User Travel = **1170 kg**
- Beamtime energy consumption = **2056 kg**
- Data stored on disk = **1.8 kg**
- Data processing on site = **12.6 kg**
- Cloud transfer = **2.3 kg**

CO<sub>2</sub>e per kWh in France = **75 g/kWh**

**TOTAL = 3.253 tons !**

**Sustainable Goal = 5 tons / human / yr**

Carbon footprint for 1 week experiment @ ESRF



# Carbon footprint of archiving data

- 200 GB Data archived on tape for 10 years  
(full tape library )  $\sim 13 \text{ g} * 10 \text{ yrs} = 130 \text{ grams}$

→ ARCHIVING raw data for 10 years  
 $4 \times 10^{-6}$  of CO<sub>2</sub> equivalent needed  
to acquire the raw data!



TAKEAWAY → TAKE CARE of DATA by making it FAIR!



# Climate Change + Green IT = Indicators

- Percentage of remote/mail-in experiments (travel footprint)
- Data center efficiency (PUE)
- Energy/carbon footprint of Data Analysis Workflows
- Energy/carbon footprint of Data Storage including data compression/decompression
- Data reuse

→ CO2 calculation to be started in next 2 years

# Sharing know-how = Objectives

[9.1] Establishing a centralized sustained web portal to present and list all LEAPS IT collaborations → <https://leaps-wg3.desy.de/>

## LEAPS working group 3 on Information Technology

WG3 gathers LEAPS experts on topics around FAIR data management and open science. The aim of the WG is to share best practices and recent developments at the different partner facilities to keep a community approach on the road to FAIRer science we all need to take.

The WG is currently chaired by Paul Millar (DESY) and Majid Ounsy (SOLEIL).

To get in [contact](#), please write us.

### Members

Who are the people behind LEAPS WG3?

### Outcomes

The PaN toolbox for open science we keep developing and further adopting.

### Current work

The current focus of the working group, in particular the special interest groups and projects.

### Open data

Catalogue of public and curated data repositories in the PaN community.

### Funding

Funding opportunities for the PaN community at the moment or in a foreseeable future.

### Meetings

A link to the Indico page containing minutes from previous meetings and next dates.



LEAPS First Plenary Meeting, Hamburg, Germany, 12-14 Nov. 2018

## ■ Hardware &amp; Control

10%

## ■ Control Systems

42%

## ■ Data Analysis

22%

## ■ Management Information Systems

26%



## Tango · 1999

Distributed control systems,  
supervisory control and  
data acquisition

## MxCube · 2005

Software platform for macromolecular  
crystallography experiments

## IcePAP · 2007

Motor control system for high  
resolution position applications

## ISPyB · 2009

Information System for Protein  
CrystallographY Beamlines

## 1994 · EPICS

Distributed control systems to operate  
particle accelerators, telescopes and other  
large experiments

## 2000 · areaDetector

Application for controlling area 2-D  
detectors, including CCDs, pixel array  
detectors, and online imaging plates

## 2005 · LIMA

Library for image acquisition, unified  
control of 2D detectors

## 2008 · Sardana

Tango based control system for instrument  
control and data acquisition

## Collaborations Participants



# Sharing know-how = Objectives



## Software Catalogue · 2011

PaNdata software catalogue is a database of software used mainly for data analysis of neutron and photon experiments



## 2011 · ICAT

PaNdata meta-data management system for large facilities virtual labs



## umbrellaID · 2011

PaNdata federated identity system for users of large neutron and photon facilities to access experimental information, remote control, data and in a close future centralized data analysis



## #EM · 2013

Fast 18 bit isolated electrometer for synchrotron applications – continuous scan, sample by sample real time calculations, etc.



## 2013 · silx

Python packages for data assessment, reduction and analysis applications at synchrotron radiation facilities



## 2015 · PandABox

Position and acquisition processing platform

10

8

6

4

2

1990

1995

2000

2005

2010

2015

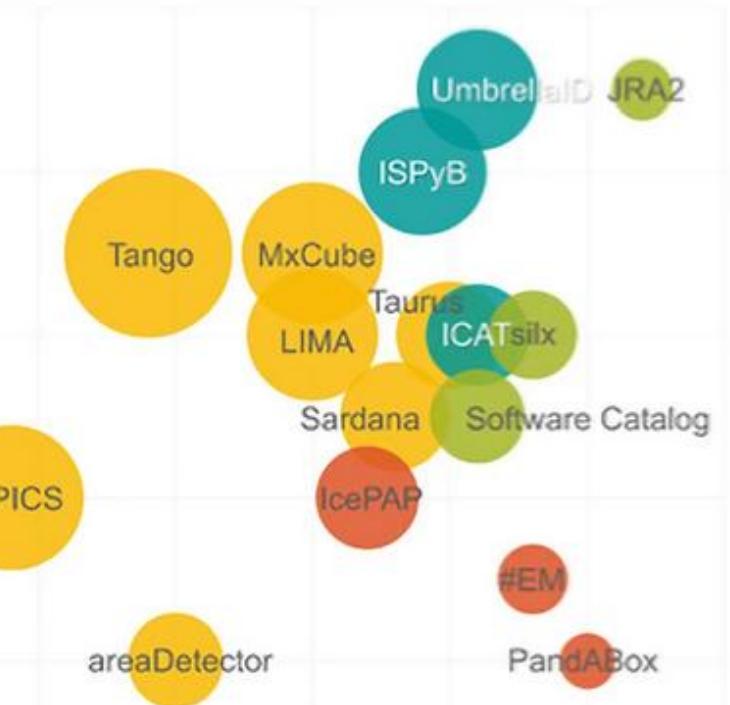
2020

X

Y

Size

## Collaboration Trends



collaboration start

# participating institutions

years existing · # participants

# Example of FAIR data – Human Organ Atlas



**HOA** EXPLORE SEARCH HELP

## The Human Organ Atlas

### Imaging the body from micron to whole organ scale

Human tissue is inherently hierarchical with cells, tissues and organs organised into intricate structures at many levels.

The Human Organ Atlas bridges cellular and whole organ scales with **images of whole intact organs at 8-20 µm resolution** and region of interest **zooms at 1 µm**.

These images are released openly to allow exploration and reuse, with the hope that they will provide new insights into our biological makeup in health and disease.

Want to learn more about the technique, the wider project or project related opportunities? Visit the [Hierarchical Phase-Contrast Tomography project page](#). Want to learn more about access to scan your own samples? Visit the [Human Organ Atlas Hub](#).

24 donors 53 organs 294 datasets

#### Latest news

**COVID-19 affected lung data release**  
[Go to article](#) | published the 19/06/2025

Today we have released more datasets from the lungs of donors affected by COVID-19. These datasets complement those used in previous studies using data in the Human Organ Atlas, showing how COVID-19 affects the lungs (Ackermann et al. 2021, Ackermann et al. 2022). The new datasets come from 6 different donors, and add over 6TB [...]

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#### The Atlas in images

#### FAIR principles

project is dedicated to sharing its results with the community by making the data findable, accessible, interoperable, and re-usable - the FAIR principles formalised by [Wilkinson et al.](#)

**Sources of trusted processed data are the real gold – the new golden standard?**

HOA

Organs: Brain, Colon, Heart, Kidney, Liver, Lung, Pancreas, Spleen, Testis

Trusted data in standard formats is essential for data re-use by other communities

Challenges and opportunities:

- Dealing with the data avalanche (raw data and compression)
- Implementation of targeted data pipelines
- Acceptance by facilities and user community
- ML/AI is everywhere
- Cyber security

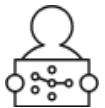
<https://human-organ-atlas.esrf.fr/>

Page 30

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36

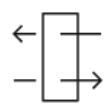
# What are the Advantages of a Data Strategy?



**Make informed decisions** - A data strategy provides a structure for using data-driven insights to inform decisions regarding business strategies, operations, planning, investments and more.



**Launch AI initiatives** - Applications, and especially generative AI, typically require large amounts of clean, reliable and accessible data to build, train and refine. A data strategy helps enforce data quality and data governance standards to provide trusted data for these initiatives.



**Increase productivity** - Data strategies can help accelerate productivity by identifying operational bottlenecks, inefficient processes, redundancies and opportunities for automating workflows.



**Reduce costs** - A data strategy can help reduce costs by increasing the efficiency of data storage and processing. It can also help protect data against costly breaches or regulatory compliance violations. According to the IBM Cost of a Data Breach Report, the average breach costs USD 4.88 million.



**Innovate** - A data strategy can yield data-driven insights into the latest trends both in and outside of the business. Organizations can use these insights to help develop innovative new products or services to take advantage of emerging market opportunities.



**Outperform competitors** - Data strategies help organizations harness real-time business intelligence as a strategic asset. Stakeholders can use this information to react more quickly and effectively to the latest competitive trends and tactics.

Credits: <https://www.ibm.com/think/topics/data-strategy>



**LEAPS**

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# Conclusions

1. **Increasing efficiency of experiments** → progressing to deal with **HUGE** data volumes (1 imaging experiment can produce ~1 PB / week)
2. **Open Science** → EOSC is leading the adoption of Open Science e.g. PaNOSC EOSC Node, OSCARS financing Open Science proposals
3. **Sustainability of solutions** → the adoption of the data strategy as part of the services offered by LEAPS facilities is the best (only?) way to ensure long term

# Resources

1. Götz, A., le Gall, E., Konrad, U. *et al.* **LEAPS data strategy**. *Eur. Phys. J. Plus* **138**, 617 (2023). <https://doi.org/10.1140/epjp/s13360-023-04189-6>
2. B. M. Murphy, A. Götz, C. Gutt, C. McGuinness, H. M. Rønnow, A. Schneidewind, S. Deleddah and U. Pietschd, ***FAIR data – the photon and neutron communities move together towards open science***, in IUCrJ, 2024, DOI: <https://doi.org/10.1107/S2052252524011941>
3. <https://www.leaps-initiative.eu/resource/leaps-technology-roadmap-2025/>
4. <https://leaps-wg3.desy.de/>
5. <https://panosc.eu>



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*“The strength of LEAPS lies in its staff and users, hailing from all European countries, beyond those which host the facilities.”*



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