



# Open Science and Data Management

EURO-LABS Advance Training School : Collaborative Software Development Practices

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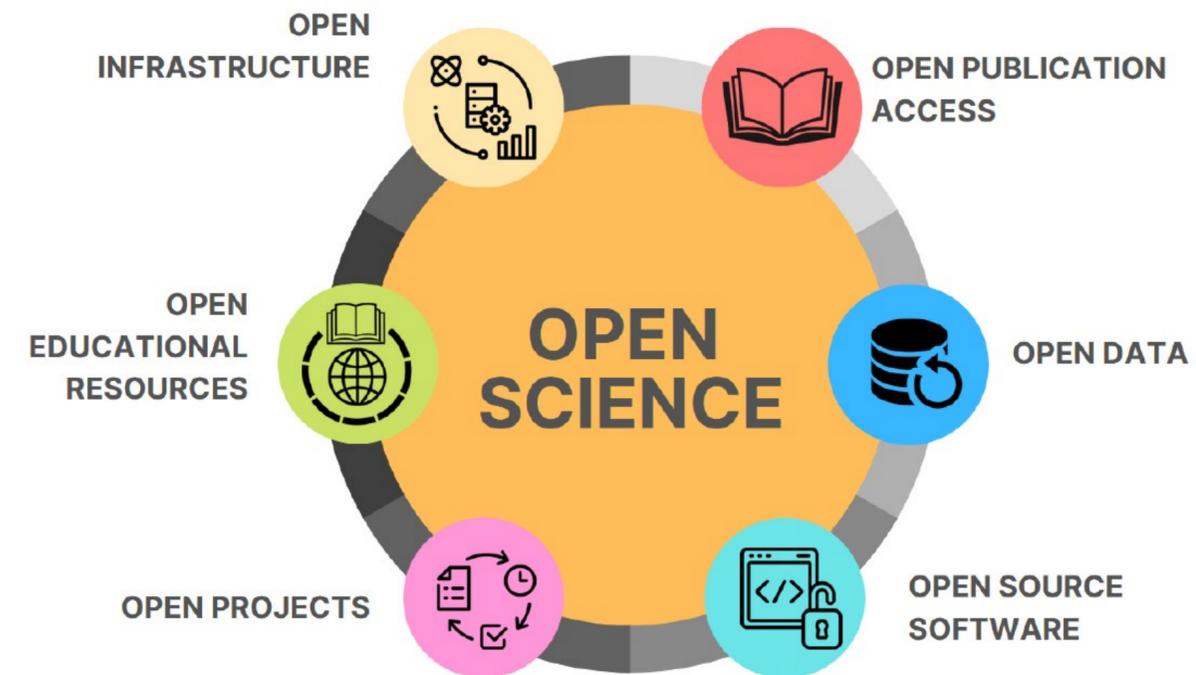
**Acknowledgments:** some slides are adapted from A. Lemasson, A. Mistry, C. Lange, Ö. Özkan, DORANum



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# What is Open Science ?

- By definition, science relies on the sharing of knowledge
- **Moving towards openness :**
  - Enabling research discoveries to be more **accessible** and **broadly reusable**
  - Offering new perspectives throughout the scientific research cycle (cross-domain, collaboration, etc.)
- This open culture of scientific endeavor is captured in the term “**Open Science**”
  - Defined by the concepts of **transparency, sustainability, transfer, collaboration** and **sharing**
  - Making public research outputs (+ infrastructures) available to the society and science industry for reuse and improvement
- Great, but challenging...
  - How to define Open Science **standards, practices, tools** and **dissemination** in a way to maximize the rewards and benefits for **researchers** ?
- Open Science practices requires a **shift** in research culture and practices :
  - Additional work and resources
  - **Support is needed from leadership**



# Why is Open Science important ?

## The benefits of Open Science ?

- **For the society :**

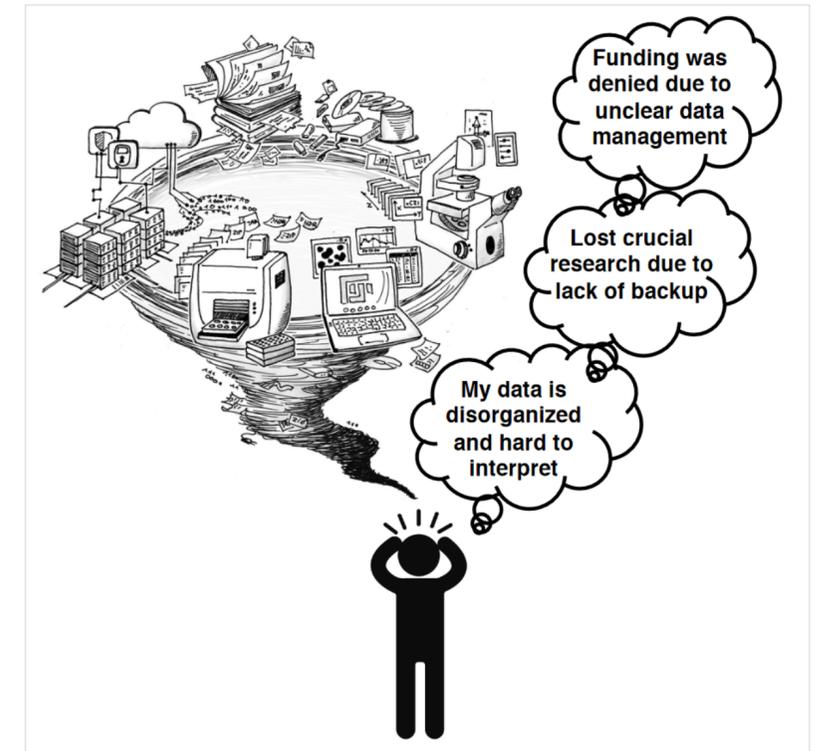
- Maximize the use of public funding : ensure research output are accessible and reusable with an ethical use
- Bolsters public confidence and trust in research (better guarantee against scientific fraud)
- Enhances technology transfer from research to industry : *e.g.* : [CNRS Innovation](#)

- **For science :**

- Fosters innovation by making it easier to share, collaborate and build on each other's work
- Improves transparency and reproducibility of research by making data and methods accessible
- Accessible data enhances pair-reviewing and relevant results
- Facilitates interdisciplinary research and cross-domain collaboration

- **For you** (as student, researcher, engineer) :

- More and more mandatory for scientific project to obtain fundings *e.g.* [Horizon Europe](#) and French National Research Agency (ANR) funding require OS practices
- Sharing data increases visibility and citability of your work
- Reduces duplication of efforts within your team / institute



## 4 main axes for Open Science:

- Open publications
- Open data
- Open softwares (source codes)
- Accessible infrastructures

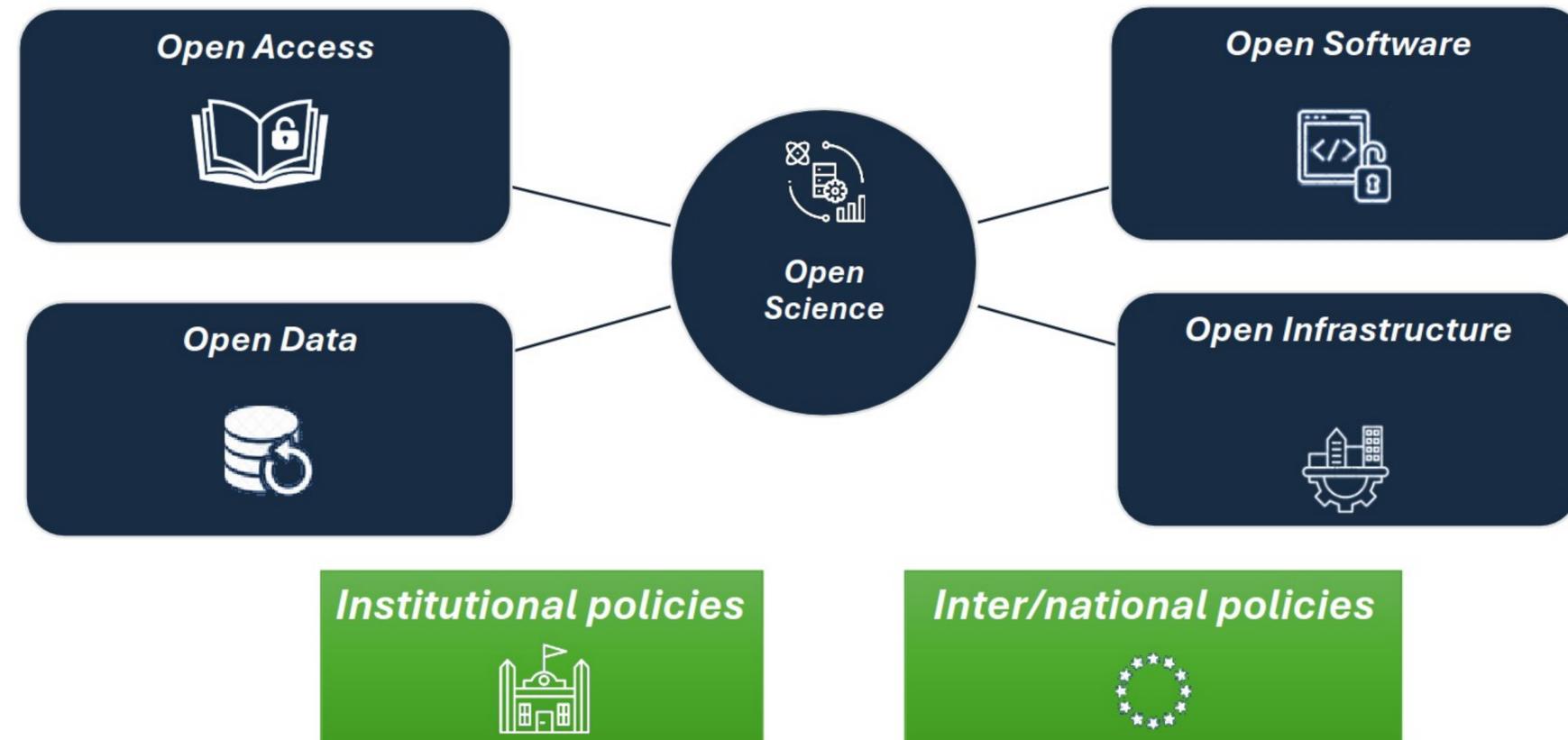
## A political context favoring Open Science :

- Numerous Open Science policies as broader statements
- Strategic plans :
  - From institutes (national policies)
  - At a european level (e.g. Horizon Europe, NuPECC, etc.)

## Fundings :

- UE now requires an open access to any data and publications financed by public fundings

## Pillars of Open Science



# Open Science Statements and Policies

Numerous Open Science policies and statements...

*Institutional policies*

*Inter/national policies*

... Chapters on Open Science included in Strategic Plans :

→ [NuPECC Long Range Plan \(2024\)](#)

See also Sh. Moradi and S. Abdi, Open science-related policies in Europe  
<https://doi.org/10.1093/scipol/scac082>



**CERN publishes comprehensive open science policy**

CERN's core values include making research open and accessible for everyone. A new policy now brings together existing open science initiatives to ensure a bright future based on transparency and collaboration at CERN.

3 OCTOBER, 2022 | By Naomi Dinmore



<https://openscience.cern/>

Horizon Europe Programme Guide (updated 2025)

<https://web.infn.it/openscience/>

Italian National Research Program (2021)

National Strategy for Open Science (2023)

Science Ouverte CNRS (2020)

Second French Plan for Open Science (2021)

Helmholtz Open Science Policy (2022)

4th National Action Plan (2023)

**Based on:**

- [European Strategy for Particle Physics \(2020\)](#)
- [UNESCO Recommendation on Open Science \(2021\)](#)

# Open is not enough : available ≠ usable

**Preconceived idea** : « Easy, a few files, a few servers and let's go ! »

**Experience from High Energy Physics (CERN – since 2008):**

« Openness alone does not guarantee reproducibility or reusability, so it should not be pursued as a goal in itself. »

[1] Chen, X. et al. Nature Phys. 15, 113–119 (2019). <https://doi.org/10.1038/s41567-018-0342-2>

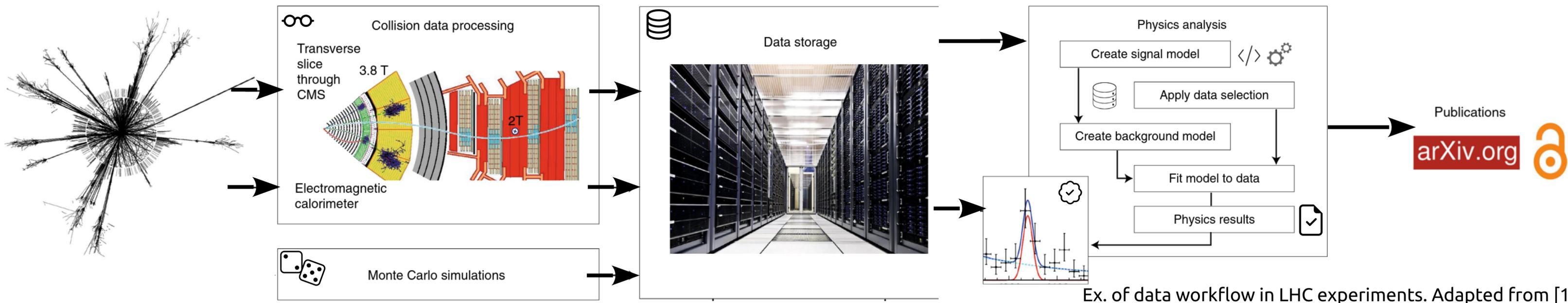
**Sharing data is not enough :**

- It is necessary to ensure the usability of the research in long term
- Access to data is not a prerequisite for reproducibility

« It is essential to capture the **structured information** about the research data analysis **workflow** and **processes** to ensure usability and longevity of the results. »

**Particularly true for HEP and nuclear physics :**

- Large amount of data (raw, processed, simulated)
- Various datasets and different running conditions (geometry, trigger, DAQ, ...)
- Many complexed analysis softwares involved (with sometimes crucial hidden details)



## Findable

- Use of **persistent Identifiers (PID)** : ensures unique and persistent identification of a dataset on the web.
- Data described by rich and explicit **metadata**.
- (Meta)data registered and indexed in a **searchable resource** : essential to enable data to be **discoverable**.



## Accessible

- Datasets are **retrievable** by their **identifier** using **open and standard protocols**.
- Metadata remain accessible, even when data is not available.

## Interoperable

- Data are described by a documented model of controlled vocabulary.
- This vocabulary is also described by FAIR-compliant metadata with a globally unique PID.
- Data should be machine-readable.
- Data include qualified reference to each other.

## Reusable

- Data are well-described so easily **usable** and **replicable**.
- Data are released with a clear and accessible data usage **licence**.
- (Meta)data meet **domain-relevant** community standards (common data type, template, vocabulary, ...).



Fig.: ARDC licensed under a CC BY 4.0 License

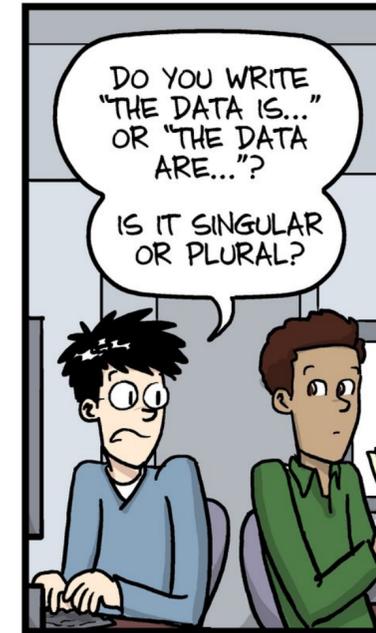
# What is data ?

## Forewords :

- Data is potential information that needs to be processed to make it accessible to human audience

## Data is any digital object :

- Experimental datasets (raw, processed, analyzed) ;
- Simulations (calculations results) ;
- Databases (Grafana, InfluxDB) ;
- Softwares (source code, workflow) ;
- Technical reports, publications, presentations, images, figures, ...
- Data Management Plans and metadata.



# Why should we care about Data Management ?

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## No dataset is perfect and self-explanatory :

- Too often rely on human / mental storage (*i.e.* short-term)
- Effective data management is crucial to interpret the results and their origin

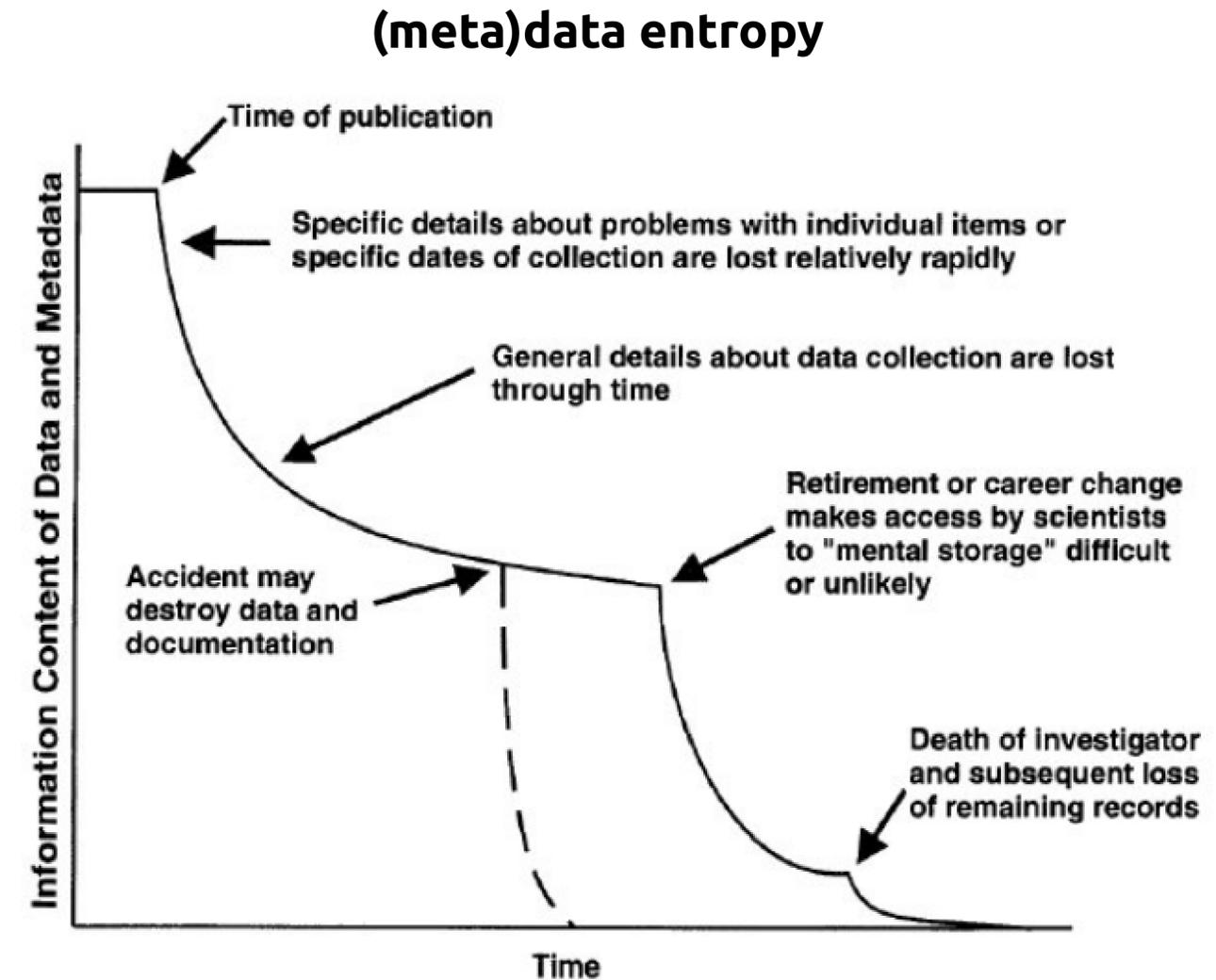


Fig.: W. K. Michener et al., Eco. App. 7 (1997)

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- Effective data management is crucial to interpret the results and their origin :
  - Need to consider the full data lifecycle
  - From **collection** to **processing, analysis** and **modeling**
  - Not only for for open data...

## Preservation and long-term management :

- Define Data Policy (access, sharing, curation, reuse, ...)
- Define what needs to be conserved (architecture, storage limitations)

## Benefits :

- Re-use opportunities, cross-domain research, enhanced visibility and citability



Fig.: Stages of research data lifecycle: collection, use and storage. Credits: [RDMWG](#), [Longwood Medical Area](#)

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**Keywords :** DMP, Data policies, Metadata, Version Control, storage and Data Repositories



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A Data Management Plan (DMP) is a research project document that helps in the process of ensuring that research data is handled correctly

## It describes :

- The data lifecycle of the project
- Data info (formats, size, generation method)
- Data storage, protection and curation
- Responsibilities of the involved parties (who/what?)

## Benefits :

- Communication tool for researchers
- Better internal management for your project (planning, curation, ...)
- IT/Resource cost estimation
- DMP is needed to enable FAIR-compliant data

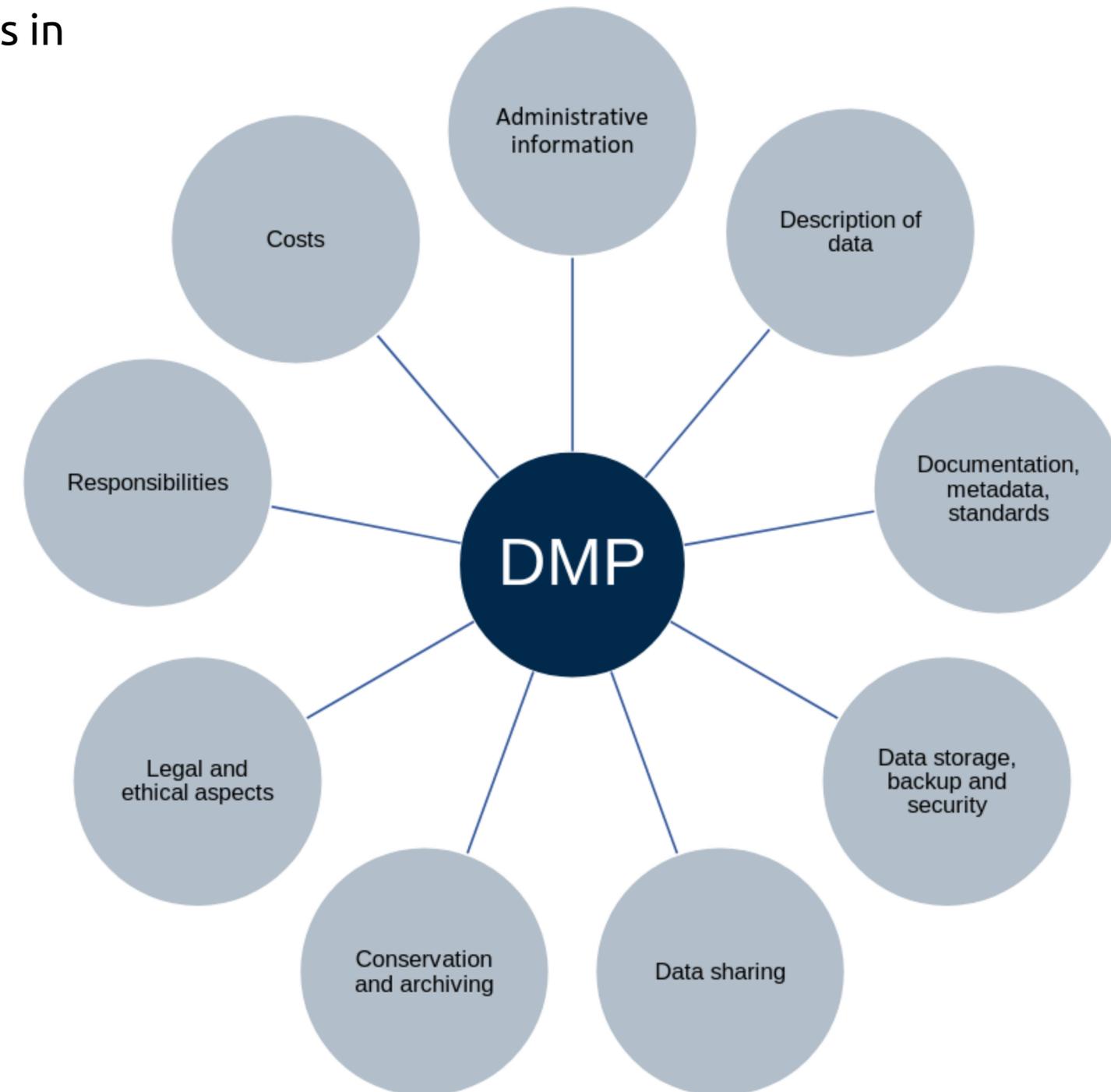
## Governement and funding bodies requirements :

- UE has generalized the use of DMPs for all [Horizon Europe](#) projects
- France ([ANR](#)), UK ([CRUK](#), WT, UKRI), Norway, Germany (DFG), ...

## BUT... Reluctance to fill DMP (seen as just more paperwork)

## Relevant DMP templates (also, ask your institutions!):

- CERN: <https://openscience.cern/index.php/DMP>
- IN2P3: <https://dmp.in2p3.fr/>
- GSI: <https://rdmo.gsi.de/>



See also: DoRANum.  
<https://doi.org/10.13143/37SS-M608>

# Metadata : data about data

## Forewords :

- Metadata are **structured data** that contains **information** about **characteristics of other data** (objects)  
→ Metadata gives a precise description of your data !

## Benefits :

- Metadata help you structure, organise and link all your datasets
- They help prepare dataset for sharing and interoperability  
→ FAIR-compliance of your datasets

## Several « types » of metadata :

- **Descriptive** metadata : used to **identify** and **describe** a resource  
→ *e.g.* : Title, Author, Subject, Identifier
- **Administrative** metadata : used to manage a resource  
→ *e.g.* : Rights, Licensing, Dates (resource creation, embargo, etc.)
- **Structural** metadata : outlines how a resource is organized and used  
→ *e.g.* : Relation between components

Single element	Definitions	Example of a specific element
Title	Name of the resource	Simple Dublin Core (1995)
Subject	Theme of the resource's content	
Description	Abstract, table of contents, etc.	
Creator	Main author of the resource	<p>Date Created, Date Copyrighted, Date Valid, Date Available, Date Modified, Date Accepted, Date Submitted, Date Issued</p> <p>Has Format (format transformation relationships involve one resource being derived from another) Is Version Of (version relationships involve one resource being a state or historical release of another resource by the same creator)</p>
Publisher	Entity responsible for disseminating the resource	
Contributor	Co-authors involved in developing the resource	
Date	Date created or made available	
Type	Type of content - image, sound, text, etc.	
Format	Format or size of the resource	
Identifier	Unique reference, DOI, URL, ISSN, etc.	
Source	Reference to a resource which the current resource was derived or created from	
Language	Original language of the resource	
Relation	Reference to a related resource	
Coverage	Spatial and temporal scope	
Rights	Information on rights associated with the resource	

Fig.: Example of metadata. Simple Dublin Core (15 elements). Progressively enriched with more than 40 elements (qualified Dublin Core). See <https://www.dublincore.org/>

PHYSICAL REVIEW LETTERS **134**, 162504 (2025)

## Probing Exotic Cross-Shell Interactions at $N=28$ with Single-Neutron Transfer on $^{47}\text{K}$

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 (Received 19 September 2024; revised 6 December 2024; accepted 12 March 2025; published 25 April 2025)

We present the first measurement of the  $^{47}\text{K}(d, p\gamma)^{48}\text{K}$  transfer reaction, performed in inverse kinematics using a reaccelerated beam of  $^{47}\text{K}$ . The level scheme of  $^{48}\text{K}$  has been greatly extended, with nine new bound excited states identified and spectroscopic factors deduced. Uniquely, the  $^{47}\text{K}(d, p)$  reaction gives access to nuclear states that are sensitive to the interaction of protons and neutrons in the widely spaced  $1s$  and  $fp$  orbitals, respectively. Detailed comparisons with SDPF-U and SDPF-MU shell-model calculations reveal a number of discrepancies between theory and experiment. Intriguingly, a systematic overestimation of

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- Title
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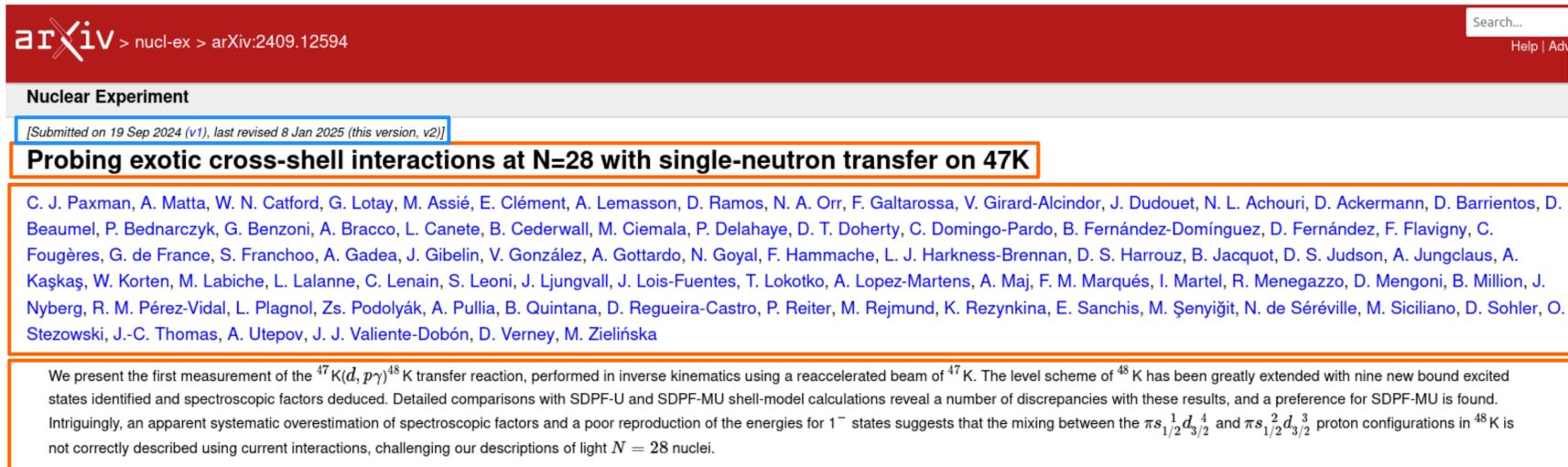
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### Probing Exotic Cross-Shell Interactions at $N=28$ with Single-Neutron Transfer on $^{47}\text{K}$

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We present the first measurement of the  $^{47}\text{K}(d, p\gamma)^{48}\text{K}$  transfer reaction, performed in inverse kinematics using a reaccelerated beam of  $^{47}\text{K}$ . The level scheme of  $^{48}\text{K}$  has been greatly extended, with nine new bound excited states identified and spectroscopic factors deduced. Uniquely, the  $^{47}\text{K}(d, p)$  reaction gives access to nuclear states that are sensitive to the interaction of protons and neutrons in the widely spaced  $1s$  and  $fp$  orbitals, respectively. Detailed comparisons with SDPF-U and SDPF-MU shell-model calculations reveal a number of discrepancies between theory and experiment. Intriguingly, a systematic overestimation of

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### Descriptive :

- Pub. Year
- Authour
- Title
- Publisher
- Persistent id.

### Administrative :

- Dates
- Rights
- Licensing

### Structural :

- Content
- Pages #
- Fig., Tab. #
- Related works

TABLE I. Properties of states observed in  $^{48}\text{K}$ . Excited state energies were determined using  $\gamma$ -ray transitions observed from states populated directly in  $(d, p)$  or in cascade decays. Associated branching ratios (BR) are listed. Experimental spectroscopic factors  $S_{\text{exp}}$  are shown in comparison with shell-model calculations using the SDPF-MU [45, 46] ( $S_{\text{MU}}$ ) and SDPF-U [44] ( $S_{\text{U}}$ ) interactions. Upper limits on  $S_{\text{exp}}$  have been established from the non-observation of proton peaks. See supplemental material for a full level scheme diagram.

$E_x$ [MeV]	$J^\pi$	$E_\gamma$ [MeV]	BR	$nl_j$	$S_{\text{exp}}^{\text{a}}$	$S_{\text{MU}}$	$S_{\text{U}}$
0.000	$1^-$	—	—	$2p_{3/2}$	0.24(5)	0.40	0.21
0.143(1)	$2^-$	0.143(1)	$\sim 100$	$2p_{3/2}$	0.42(8)	0.86	0.84
0.279(1) <sup>b</sup>	$2^-$	0.279(1)	$\sim 100$	$2p_{3/2}$	$< 0.03$	0.01	0.05
0.728(3) <sup>b</sup>	$3^-$	0.449(2)	$\sim 100$	$1f_{7/2}$	$< 0.04$	0.06	0.05
0.967(2)	$0^-$	0.967(2)	$\sim 100$	$2p_{1/2}$	0.26(5)	0.40	0.38
1.409(3)	$1^-$	1.130(3)	10(2)	$2p_{3/2}$	0.24(5)	0.35	0.54
		1.266(2)	63(2)				
		1.409(3)	28(1)				
1.978(4)	$1^-$	1.010(4)	5(1)	$2p_{1/2}$	0.50(10)	0.88	0.84
		1.836(3)	93(2)				
		1.979(3)	2(1)				
2.407(6)	$0^-$	0.997(4)	33(2)	$2p_{1/2}$	0.34(7)	0.56	0.58
		2.407(5)	67(7)				
2.908(8)	$2^-$	2.765(7)	$\sim 100$	$2p_{3/2}$	0.023(5)	—	—
				$1f_{5/2}$	0.06(1)	—	—
3.250(6)	$(3^-)$	2.971(4)	$\sim 100$	$1f_{5/2}$	0.06(1)	0.11	—
3.601(8)	$2^-$	2.193(3)	15(4)	$1f_{5/2}$	0.34(7)	0.47	0.50
		2.872(7)	38(7)				
		3.325(4)	22(5)				
		3.458(7)	12(4)				
		3.598(7)	12(4)				
3.792(8)	$(3^-)$	3.063(2)	12(4)	$1f_{5/2}$	0.16(3)	0.33	0.39
		3.516(7)	88(4)				
3.868(7)	$(2^-)$	3.727(6)	59(9)	$1f_{5/2}$	0.14(3)	0.18	0.21
		3.865(8)	41(9)				

<sup>a</sup> Systematic uncertainty of 20% has been applied, see text.

<sup>b</sup> State inferred from the  $\gamma$  decays of higher-energy excited states.

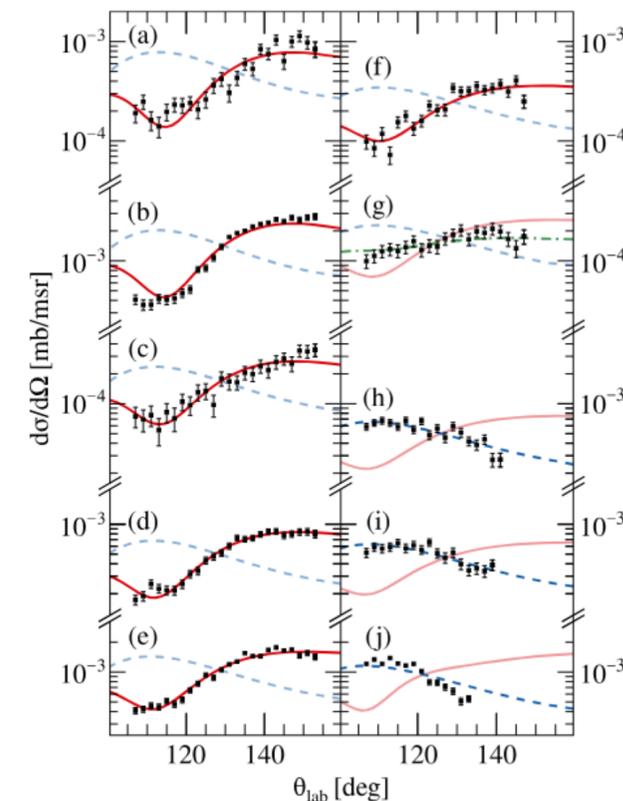


FIG. 2. Experimental differential cross sections for states observed in this work, with the scaled theoretical differential cross sections for  $\ell_p=1$  ( $\ell_p=3$ ) transfer in solid red (dashed blue) lines: (a) Ground state, (b) 0.143 MeV, (c) 0.967 MeV, (d) 1.409 MeV, (e) 1.978 MeV, (f) 2.407 MeV, (g) 2.908 MeV, (h) 3.601 MeV, (i) 3.792 & 3.868 MeV, (j) High energy multiplet. Only in the case of (g) was both  $\ell=1$  and  $\ell=3$  clearly required, with the best-fit shown in dot-dash green.

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...even available data and softwares!

## Metadata standards :

- A standard is a **blueprint** that a group of users have adopted as a **model**
- A standard relies on **vocabularies**
- A standard is recognised , standardised and used on a large scale
- A standard can be **specialised** to meet the needs of a discipline

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## Example of standards :

- **Dublin Core DCMT** (Generic resources of any type)  
→ <https://www.dublincore.org/specifications/dublin-core/dcmi-terms/>



accessRights	Property	<a href="#">More details →</a>
URI	<a href="http://purl.org/dc/terms/accessRights">http://purl.org/dc/terms/accessRights</a>	
Label	Access Rights	
Definition	Information about who access the resource or an indication of its security status.	
Comment	Access Rights may include information regarding access or restrictions based on privacy, security, or other policies.	
Range Includes	<a href="http://purl.org/dc/terms/RightsStatement">http://purl.org/dc/terms/RightsStatement</a>	
Subproperty of	<a href="http://purl.org/dc/elements/1.1/rights">Rights</a> (http://purl.org/dc/elements/1.1/rights) <a href="http://purl.org/dc/terms/rights">Rights</a> (http://purl.org/dc/terms/rights)	

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## Example of standards :

- **Dublin Core DCMT** (Generic resources)
- **DataCite** (Generic research datasets)  
→ <https://doi.org/10.14454/mzv1-5b55>

**I1: (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation**

→ Formal language with formal specification

**I2: (Meta)data use vocabularies that follow the FAIR principles**

→ Vocabulary with persistent identifiers

## 16. Rights

Obligation: Optional

Occurrences: 0-n

Definition: Any rights information for this resource.

The property may be repeated to record complex rights characteristics.

Allowed values, examples, other constraints:

Free text.

Provide a rights management statement for the resource or reference a service providing such information. Include embargo information if applicable.

Use the complete title of a license and include version information if applicable.

May be used for software licenses.

Examples:

- Creative Commons Attribution 4.0 International
- Apache License, Version 2.0

Sub-properties:

- [16.a rightsURI](#)
- [16.b rightsIdentifier](#)
- [16.c rightsIdentifierScheme](#)
- [16.d schemeURI](#)



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## Example of standards :

- **Dublin Core DCMT** (Generic resources)
- **DataCite** (Generic research datasets)  
→ <https://doi.org/10.14454/mzv1-5b55>

## I2: (Meta)data use vocabularies that follow the FAIR principles

→ Vocabulary with persistent identifiers

## Mapping from a standard to another one :

→ ex : DataCite to Dublin Core mapping



DataCite-Property	Dublin Core Qualified
<a href="#">1. Identifier</a>	<a href="#">dc.identifier</a>
<a href="#">1.a identifierType</a>	-
<a href="#">2. Creator</a>	<a href="#">dc.creator</a>
<a href="#">2.1 creatorName</a>	<a href="#">dc.creator</a>
<a href="#">2.1.a nameType</a>	-
<a href="#">2.2 givenName</a>	-
<a href="#">2.3 familyName</a>	-
<a href="#">2.4 nameIdentifier</a>	<a href="#">dc.creator.pid</a>
<a href="#">2.4.a nameIdentifierScheme</a>	-
<a href="#">2.4.b schemeURI</a>	-
<a href="#">2.5 affiliation</a>	<a href="#">dc.contributor</a>
<a href="#">2.5.a affiliationIdentifier</a>	<a href="#">dc.contributor.pid</a>
<a href="#">2.5.b affiliationIdentifierScheme</a>	-
<a href="#">2.5.c schemeURI</a>	-
<a href="#">3. Title</a>	<a href="#">dc.title</a>
Mapped by <a href="#">3.a titleType</a> :	

<https://datacite-metadata-schema.readthedocs.io/en/4.6/mappings/dublincore-qualified/>

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## Example of standards :

- **Dublin Core DCMT** (Generic resources)
- **DataCite** (Generic research datasets)
- **Darwin Core** (Biology datasets)  
→ <https://doi.org/10.1371/journal.pone.0029715>

Generic metadata



Biodiversity  
Information  
Standards  
TDWG

accessRights	
Identifier	<a href="http://purl.org/dc/terms/accessRights">http://purl.org/dc/terms/accessRights</a>
Definition	Information about who can access the resource or an indication of its security status.
Comments	Access Rights may include information regarding access or restrictions based on privacy, security, or other policies.
Examples	<p><i>not-for-profit use only</i> (string literal example)</p> <hr/> <p><a href="https://www.fieldmuseum.org/field-museum-natural-history-conditions-and-suggested-norms-use-collections-data-and-images">https://www.fieldmuseum.org/field-museum-natural-history-conditions-and-suggested-norms-use-collections-data-and-images</a> (URI example)</p>

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Domain-specific metadata



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- **Darwin Core** (Biology datasets)  
→ <https://doi.org/10.1371/journal.pone.0029715>

causeOfDeath	
Identifier	<a href="http://rs.tdwg.org/dwc/terms/causeOfDeath">http://rs.tdwg.org/dwc/terms/causeOfDeath</a>
Definition	An indication of the known or suspected cause of death of a dwc:Organism.
Comments	The cause may be due to natural causes (e.g., disease, predation), human-related activities (e.g., roadkill, pollution), or other environmental factors (e.g., extreme weather events).
Examples	<p>trap</p> <hr/> <p>poison</p> <hr/> <p>starvation</p>

## Metadata schemas :

- A FAIR-compliant metadata standard follows a schema
- Metadata schemas define the **structure** and **fields** for metadata
- Often built on a **standard**

**A standard defines what metadata to include**  
 → Field Elements (Creator, Title, subject, ...)

**A schema defines how metadata is structured and formatted**

- Relationship between fields
- Required/Optional fields, occurency
- Format (ex : Date : YYYY-MM-DD)
- Sub-properties (ex : Name : Last Name, First Name)
- Controlled vocabulary

### DataCite property

## 2. Creator

Obligation: Mandatory

Occurrences: 1-n

**Definition:** The main researchers involved in producing the data, or the authors of the publication, in priority order. For instruments this is the manufacturer or developer of the instrument. To supply multiple creators, repeat this property.

Allowed values, examples, other constraints:

May be a corporate/institutional or personal name. Note: DataCite infrastructure supports up to 10,000 names. For name lists above that size, consider attribution via linking to the related metadata.

Sub-properties:

- [2.1 creatorName](#)
  - [2.1.a nameType](#)
- [2.2 givenName](#)
- [2.3 familyName](#)
- [2.4 nameIdentifier](#)
  - [2.4.a nameIdentifierScheme](#)
  - [2.4.b schemeURI](#)
- [2.5 affiliation](#)
  - [2.5.a affiliationIdentifier](#)
  - [2.5.b affiliationIdentifierScheme](#)
  - [2.5.c schemeURI](#)

### DataCite sub-property

## 2.1.a nameType

Occurrences: 0-1

**Definition:** The type of name.

Allowed values, examples, other constraints:

Controlled List Values:

- Organizational
- Personal



## Metadata formats

- A **format** is a **digital representation** of a metadata standard
- It enables machines to read and exchange content
- Multiple formats : XML, JSON, ...

### JSON format (JavaScript Object Notation) :

- **Objects** are enclosed in **curly brackets** « {} »
- **Objects** contains a list of **key/value** pairs separated by **commas** « , »
- **Arrays** (collection of elements) are enclosed in **squared brackets** « [] »
- Data are stored in **"key" : "value"** pairs
  - **keys** are of type « string »
  - **values** must be **string, number, boolean, null, array or object**
  - **numbers** can be **integer or float**



```
{
  "name": "John",
  "age": 27,
  "employed": true,
  "hasCar": null,
  "parents": ["Anna", "Michael"],
  "pet": {
    "name": "Brutus",
    "species": "dog",
    "age": 7
  }
}
```

Credits: Helmholtz Metadata Collaboration (HMC)



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### XML format (eXtensible Markup Language) :

- Markup language with **tags** and **attributes** (similar to HTML)
  - « <tag attribute= > </tag> »
- More verbose with opening/closing tags
- All data are treated as **strings**
- More extensible than JSON but less human-readable

**More details in Charlie’s talk !**



```
<name>John</name>
<age>27</age>
<employed>TRUE</employed>
<hasCar>NULL</hasCar>
<parents>Anna</parents>
<parents>Michael</parents>
<pet>
  <name>Brutus</name>
  <species>dog</species>
  <age>7</age>
</pet>
```

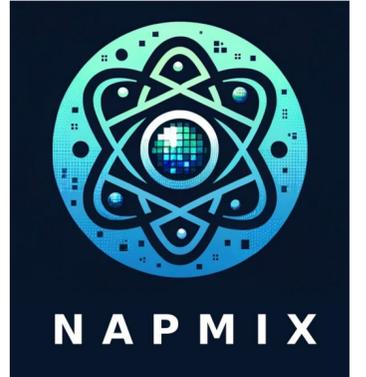
Credits: Helmholtz Metadata Collaboration (HMC)

## Challenge :

- Lack of unified metadata schema for nuclear physics datasets to ensure FAIR-compliance

## NAPMIX (Nuclear, Astro and Particle Metadata Integration for eXperiments):

- The NAPMIX project aims to create a cross-domain metadata schema tailored to nuclear, astro and particle communities
- Started in Dec. 2024 (2-years duration)
- European collaborative effort
- Principal Investigator : GSI Helmholtzzentrum für Schwerionenforschung GmbH
- More details [here](#)



## OSCARS funded project (open call)



## Output : Combination with EOSC services



### NAPMIX current status :

- Django-based backend and React-based frontend
  - Researcher, Dataset, Reaction and Project management
  - Admin function for users and raw data control
- Work in progress :
  - Automated ingestion from DataCite DOIs
  - API integration
  - New metadata fields integration
  - Schema versioning
- Spring 2026 NAPMIX Training Workshop (May/June)
- NAPMIX long-term direction ???
  - Persistent and versioned property IDs ???
  - NAPMIX metadata export and hosting ???

## Persistent Identifiers (PID) :

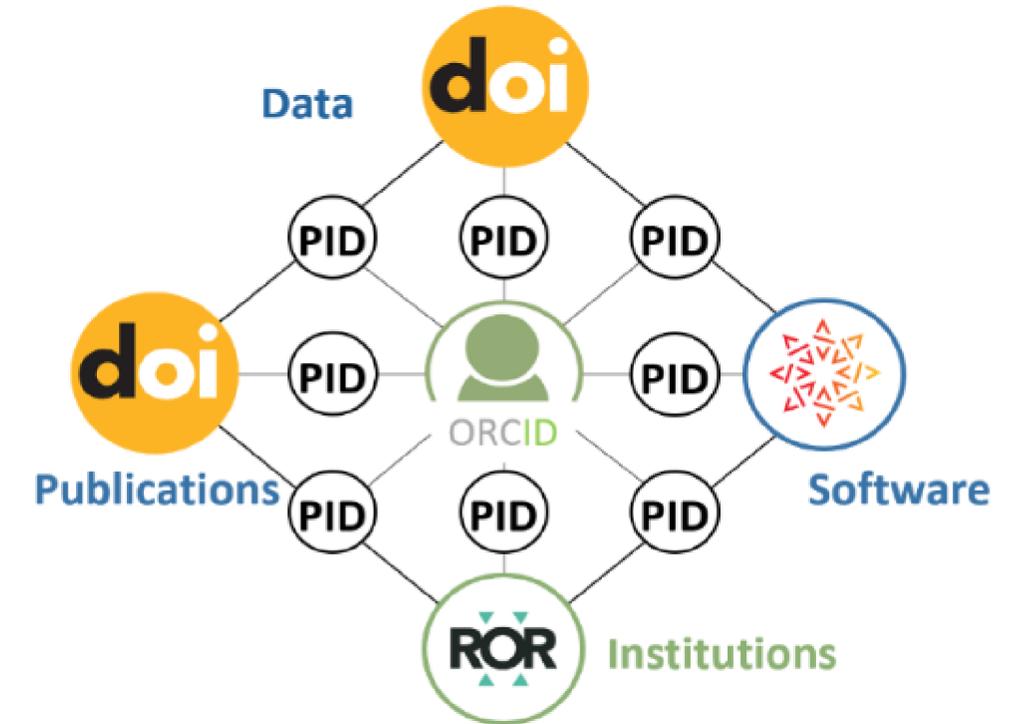
- A PID is a **unique long-lasting reference** to a digital object  
→ publication, person, organization and dataset

## Benefits of PIDs:

- Ensure **long-term accessibility and citability** of digital resources
- Facilitates the **sharing, referencing** and **reuse** of scientific production
- Designed to be **machine-readable** ()  
→ use open standard protocols (HTTP, API)  
→ citation tracking, data integration across platforms and link resolution
- **Metadata linkage** : often associated with rich metadata (title, author, etc.)

## PIDs are critical to support FAIR principles :

- **Findable** : make resources uniquely and persistently identifiable
- **Accessible** : ensure that resources remain accessible over time
- **Interoperable** : base on machine-readable standard formats, enable cross-referencing
- **Reusable** : allow clear attribution, use versioning and allow provenance tracking



Credits: [DORANum](#).

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→ publication, person, organization and dataset

## Benefits of PIDs:

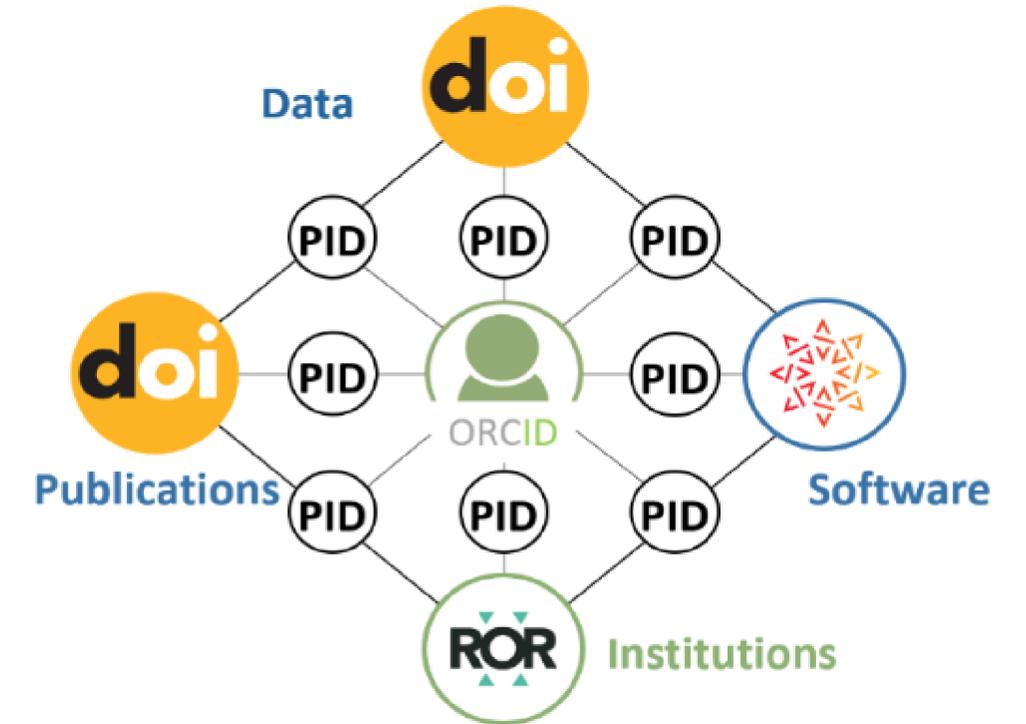
- Ensure **long-term accessibility and citability** of digital resources
- Facilitates the **sharing, referencing** and **reuse** of scientific production
- Designed to be **machine-readable** ()  
→ use open standard protocols (HTTP, API)  
→ citation tracking, data integration across platforms and link resolution
- **Metadata linkage** : often associated with rich metadata (title, author, etc.)

## PIDs are critical to support FAIR principles :

- **Findable** : make resources uniquely and persistently identifiable
- **Accessible** : ensure that resources remain accessible over time
- **Interoperable** : base on machine-readable standard formats, enable cross-referencing
- **Reusable** : allow clear attribution, use versioning and allow provenance tracking

## Two types of PID :

- **« Object » identifiers** : used for **publication, data** and **softwares**  
→ Allow to link a published article to associated dataset(s)  
→ *e.g.* : [DOI](#) (Digital Object Identifier), [SWHID](#) (SoftWare Hash Identifier)
- **« Contributor » identifiers** : used for researchers and institutes  
→ *e.g.* : [ORCID](#) (Open Researcher and Contributor ID), [ROR](#) (Research Organization Registry)



Credits: [DORANum](#).

## Organization

- Name
  - Other names
  - Type (Facility, ...)
  - Website
  - Other identifiers (Wikidata, GRID, ...)
  - Related organizations
- e.g. : <https://ror.org/042dc0x18>



## Researchers

- Full Name
  - Institutes
  - Education and qualifications
  - Works and publications identifiers
  - Peer review activity
  - Other identifiers (Scopus, ...)
- e.g. : <https://orcid.org/0000-0001-6498-0552>



## Publications

- DOI
  - Title, Pub. year
  - Authors
  - Keywords, Subjects
  - Publisher
  - Version, License, ...
- e.g. : <https://doi.org/10.48550/arXiv.2312.01763>



## Datasets

- DOI
  - Title
  - Authors and Contributors
  - Pub. Year
  - Version, License, ...
  - Related PIDs
- e.g. : [10.26143/ganil-2019-e789\\_18](https://doi.org/10.26143/ganil-2019-e789_18)



## Softwares

- Version
- Official : DOI
  - e.g. : <https://doi.org/10.5281/zenodo.7664901>
- Exact content : SWHID
  - e.g. :
- Release, Commit, ...
- License, ...



# Leveraging DOI, SWHID, ORCID and ROR

## Researchers



- Full Name
  - Institutes
  - Education and qualifications
  - Works and publications identifiers
  - Peer review activity
  - Other identifiers (Scopus, ...)
- e.g. : <https://orcid.org/0000-0001-6498-0552>

## Organization

- Name
  - Other names
  - Type (Facility, ...)
  - Website
  - Other identifiers (Wikidata, GRID, ...)
  - Related organizations
- e.g. : <https://ror.org/042dc0x18>



## Softwares



PID	Primary Use	Key Points	Context
DOI	Formal academic citation of a software	<b>Extrinsic identifier:</b> - assigned by centralized auth. (e.g. DataCite) - rich metadata	Official version release of a software
SWHID	Exact content of a software	<b>Intrinsic identifier:</b> - Calculated from the code content itself - No central auth.	Ensure access and reproducibility of a software source code

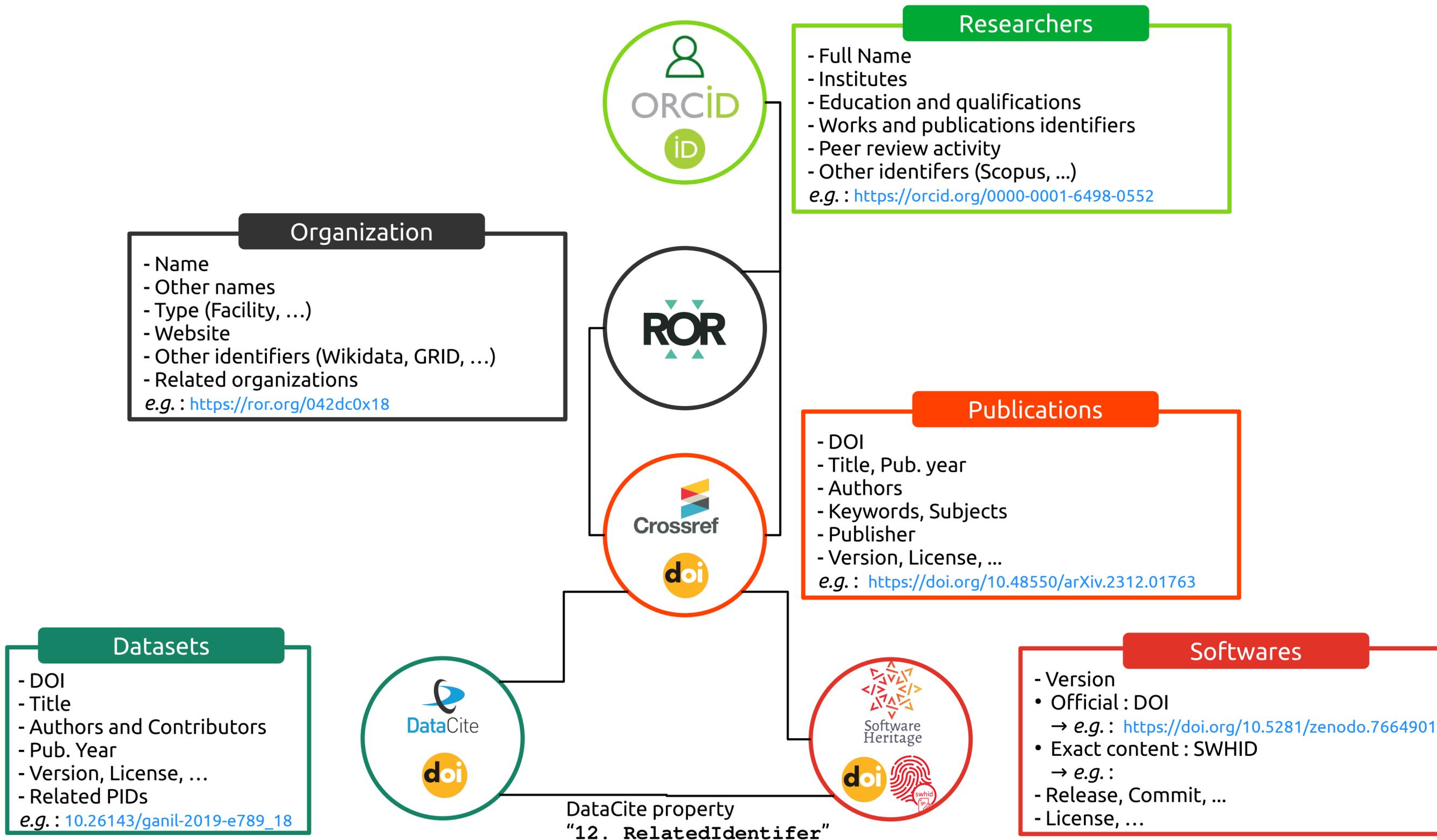
Tab. : DOI vs SWHID (My understanding...)

## Datasets

- DOI
  - Title
  - Authors and Contributors
  - Pub. Year
  - Version, License, ...
  - Related PIDs
- e.g. : [10.26143/ganil-2019-e789\\_18](https://doi.org/10.26143/ganil-2019-e789_18)

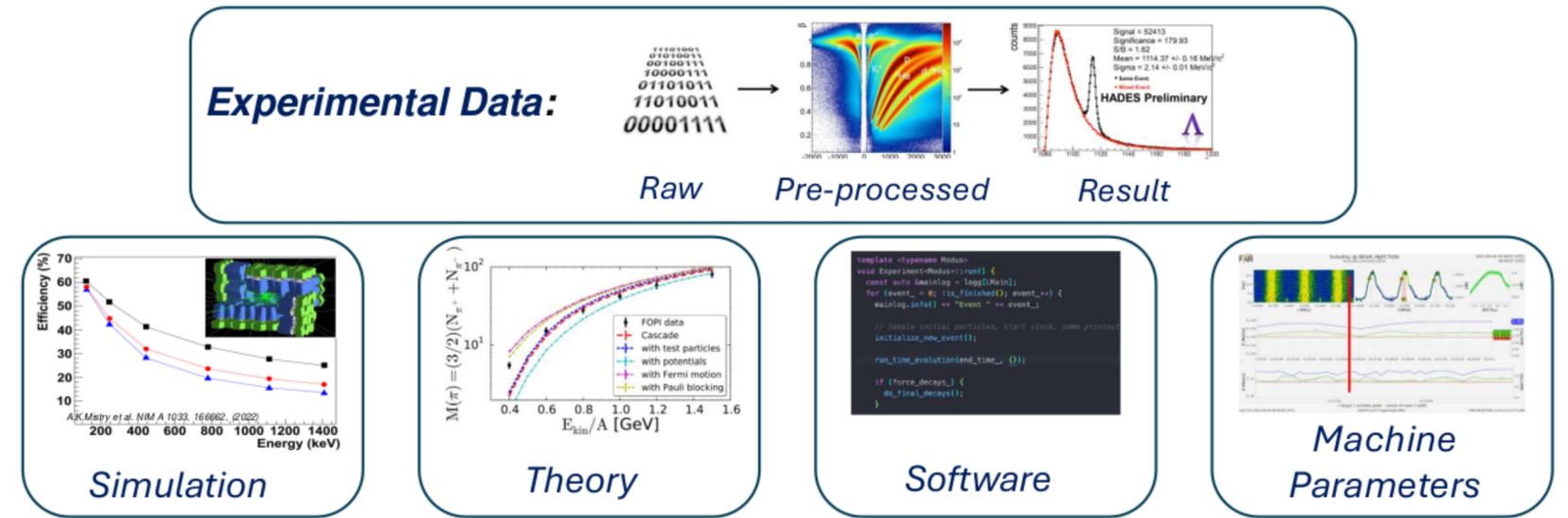


# Leveraging DOI, SWHID, ORCID and ROR

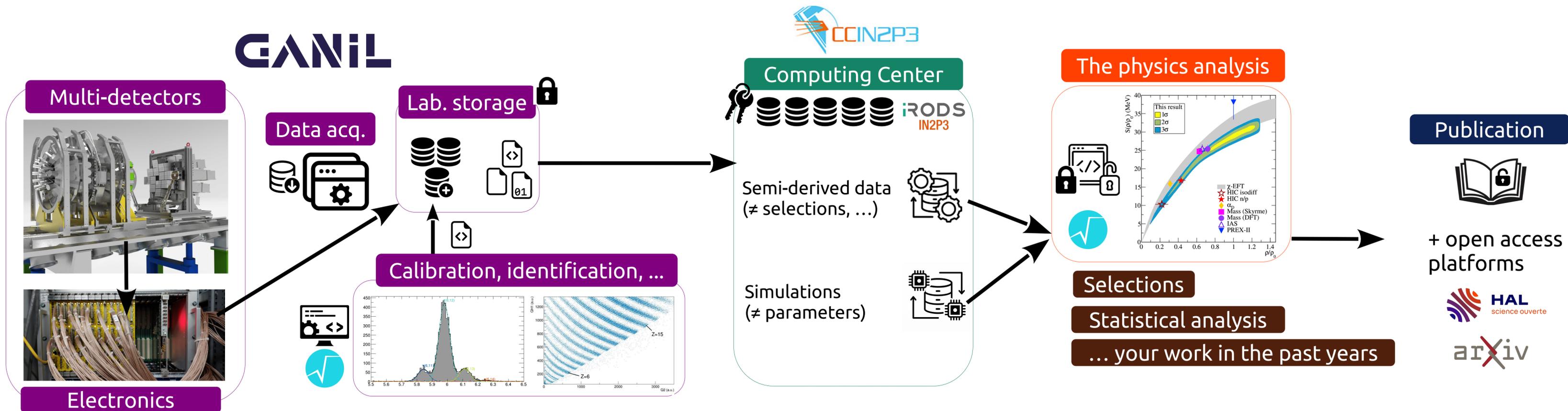


# Lifecycle of a nuclear physics dataset

- Research data/software can be rich and varied...
- Volumetry and formats can vary from one community/experiment to another...

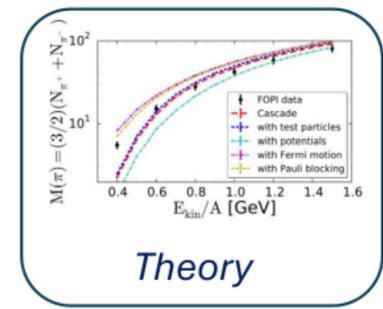
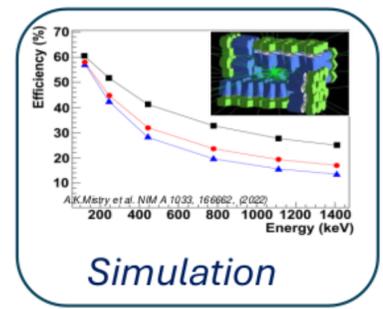
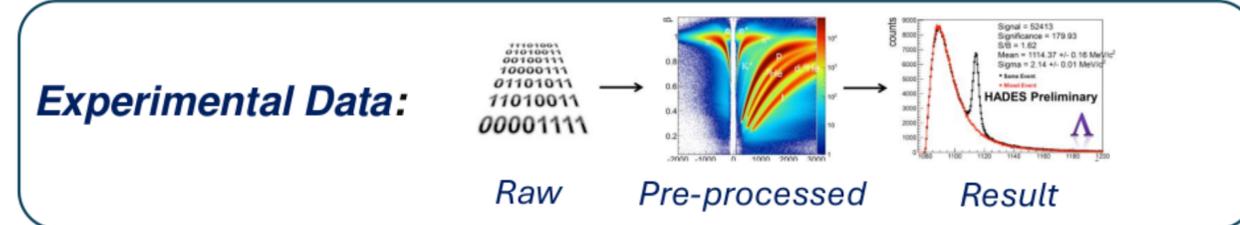


- **An example** : from raw data to publication...



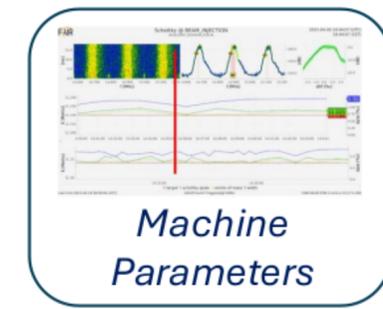
# Lifecycle of a nuclear physics dataset (2.0)

- Research data/software can be rich and varied...
- Volumetry and formats can vary from one community/experiment to another...

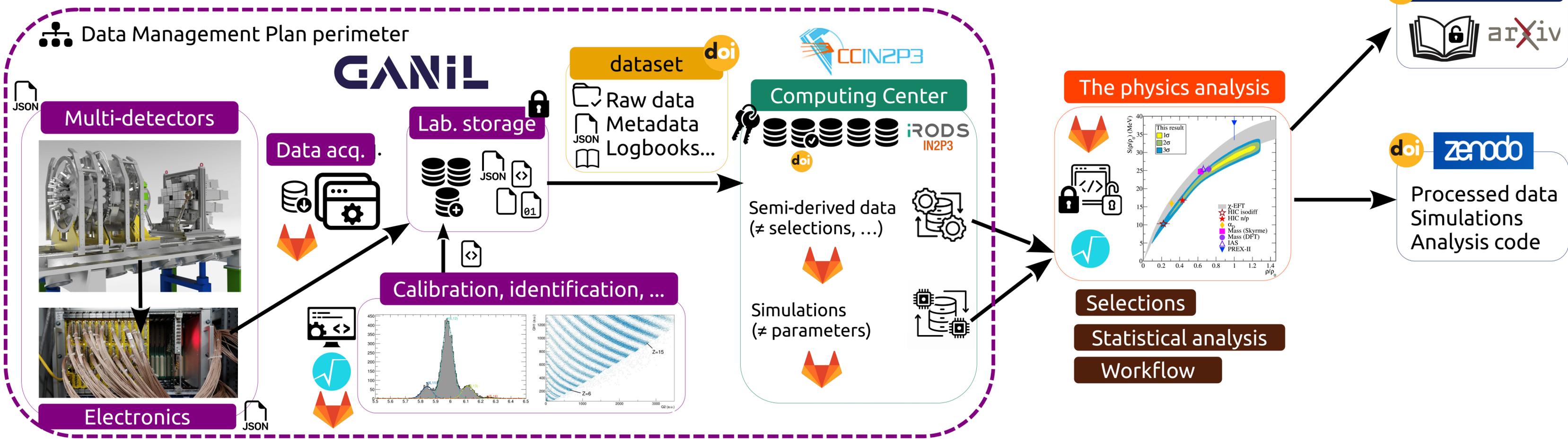


```
template <typename Module>
void Experiment::Module::run() {
  const auto &analysis = *app[Point];
  for (auto & e : *this->events) {
    analysis.info() << "Event " << event_id << endl;
    // Simulate initial particles, start clock, use physics
    initialize_new_event();
    run_time_evolution(end_time_, 0);
    if (force_decays) {
      do_final_decays();
    }
  }
}
```

Software



- **Another step forward** : include DMP(s), version control, PIDs and metadata !



## DOI submission for a GANIL experiment:

- Create a DOI for **each dataset** record (raw data)
- Responsibility of the **GANIL Data Manager**
- Using [DataCite REST API](#)  
→ DOI mint, update and verification

[Create DOI](#)

[Export DOI Metadata](#)

State	
<input type="checkbox"/> Findable	25
<input type="checkbox"/> Draft	13
<input type="checkbox"/> Registered	12
Resource Type	
<input type="checkbox"/> Dataset	50
Year created	
<input type="checkbox"/> 2025	13
<input type="checkbox"/> 2024	10
<input type="checkbox"/> 2023	4
<input type="checkbox"/> 2022	5
<input type="checkbox"/> 2021	8
<input type="checkbox"/> 2020	10
Repository	
<input checked="" type="checkbox"/> Grand Accélérateur National d'Ions Lourds	50
Prefix	
<input type="checkbox"/> 10.26143	50
Schema Version	
<input type="checkbox"/> Schema 4	47

## DataCite - <https://doi.datacite.org/>

Type to search. For example 10.4121/17185607.v1

Search

[Reset All](#)

50 DOIs

Sort by Date Updated ▾

### Proton-neutron interactions across the N = 28 shell closure via 47K(d,p) 48K, and implications for the most neutron-rich phosphorus Dataset

Wilton Catford, Adrien Matta,

Dataset published 2021 via GANIL, Large Heavy Ion National Accelerator, Caen, France

The experiment consisted in the measurement of one neutron transfert (d,p) and (d,t) from a 47K beam at 7A MeV. Measurement of the light p or t particle was carried out by the MUGAST silicon array, in coincidence with gamma-ray detected using the AGATA HPGe tracking array. In addition, detection of the fast heavy product of reaction is performed with VAMOS, allowing rejection of the non-direct reaction channel, e.g. fusion-evaporation on Carbon.

Created August 11, 2022 at 08:49:33 UTC. [Findable](#)



[https://doi.org/10.26143/ganil-2021-e793s\\_19](https://doi.org/10.26143/ganil-2021-e793s_19)

### Origin and competition between fission modes in pre-actinides Dataset

Antoine Lemasson, Christelle Schmitt, Igor Tsekhanovich, Andrei Andreyev,

Dataset published 2024 via GANIL, Large Heavy Ion National Accelerator, Caen, France

The goal of this experiment is to take advantage of the assets of the GANIL facility to obtain further insight into low-energy fission of pre-actinides. Fission of  $^{184}\text{Pb}$  was induced by fusion in inverse kinematics. The reaction  $^{124}\text{Xe}+^{60}\text{Ni}$  was used at near-barrier energy ( $E_{\text{Lab}}=4.07-4.29$  MeV/u) leading to a compound-nucleus excitation energy of  $E^*=24-32$  MeV. The different beam energies were obtained starting from 4.38 MeV/u beam thank to variable stripper foils thicknesses placed after CSS1. A moderate  $E^*$  is required to be able to evidence shell effects. The coincident measurement of the two fission products was achieved with the heavy-ion spectrometer VAMOS+ coupled to a second detection arm (SDA). The fragment entering VAMOS++ were uniquely identified in post-neutron mass A1 (after its cooling by neutron evaporation after scission), in nuclear charge Z1, and its velocity vector ( $v_1, \theta_1, \phi_1$ ) at the target position and kinetic energy E1 was measured. The SDA arm will provide

Created November 20, 2025 at 16:20:18 UTC. [Registered](#)



[https://doi.org/10.26143/ganil-2024-e851\\_21](https://doi.org/10.26143/ganil-2024-e851_21)

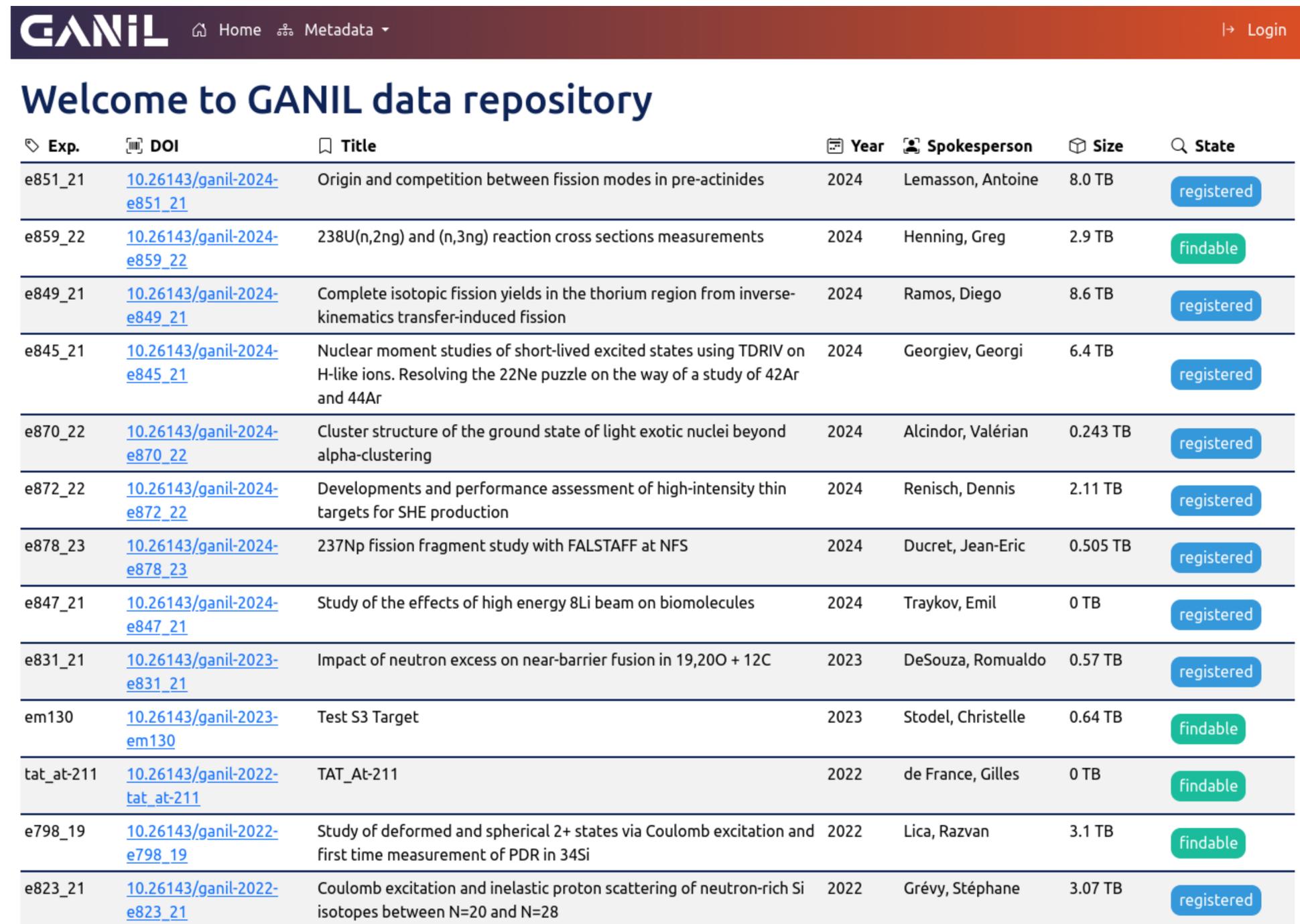
## DOI submission for a GANIL experiment:

- Create a DOI for **each dataset** record (raw data)
- Responsibility of the **GANIL Data Manager**
- Using [DataCite REST API](#)  
→ DOI mint, update and verification

## Landing page:

- Official persistent entry point for the DOI
- Provides essential metadata about the dataset
- Available on the [GANIL data repository](#)

GANIL dataset repository – <https://data.ganil-spiral2.eu>



The screenshot shows the GANIL data repository website. The header includes the GANIL logo, navigation links for Home and Metadata, and a Login button. The main heading is "Welcome to GANIL data repository". Below this is a table listing various datasets with columns for Experiment ID (Exp.), DOI, Title, Year, Spokesperson, Size, and State. Each row includes a button indicating the dataset's status (e.g., registered, findable).

Exp.	DOI	Title	Year	Spokesperson	Size	State
e851_21	<a href="https://doi.org/10.26143/ganil-2024-e851_21">10.26143/ganil-2024-e851_21</a>	Origin and competition between fission modes in pre-actinides	2024	Lemasson, Antoine	8.0 TB	registered
e859_22	<a href="https://doi.org/10.26143/ganil-2024-e859_22">10.26143/ganil-2024-e859_22</a>	238U(n,2ng) and (n,3ng) reaction cross sections measurements	2024	Henning, Greg	2.9 TB	findable
e849_21	<a href="https://doi.org/10.26143/ganil-2024-e849_21">10.26143/ganil-2024-e849_21</a>	Complete isotopic fission yields in the thorium region from inverse-kinematics transfer-induced fission	2024	Ramos, Diego	8.6 TB	registered
e845_21	<a href="https://doi.org/10.26143/ganil-2024-e845_21">10.26143/ganil-2024-e845_21</a>	Nuclear moment studies of short-lived excited states using TDRIV on H-like ions. Resolving the 22Ne puzzle on the way of a study of 42Ar and 44Ar	2024	Georgiev, Georgi	6.4 TB	registered
e870_22	<a href="https://doi.org/10.26143/ganil-2024-e870_22">10.26143/ganil-2024-e870_22</a>	Cluster structure of the ground state of light exotic nuclei beyond alpha-clustering	2024	Alcindor, Valérian	0.243 TB	registered
e872_22	<a href="https://doi.org/10.26143/ganil-2024-e872_22">10.26143/ganil-2024-e872_22</a>	Developments and performance assessment of high-intensity thin targets for SHE production	2024	Renisch, Dennis	2.11 TB	registered
e878_23	<a href="https://doi.org/10.26143/ganil-2024-e878_23">10.26143/ganil-2024-e878_23</a>	237Np fission fragment study with FALSTAFF at NFS	2024	Ducret, Jean-Eric	0.505 TB	registered
e847_21	<a href="https://doi.org/10.26143/ganil-2024-e847_21">10.26143/ganil-2024-e847_21</a>	Study of the effects of high energy 8Li beam on biomolecules	2024	Traykov, Emil	0 TB	registered
e831_21	<a href="https://doi.org/10.26143/ganil-2023-e831_21">10.26143/ganil-2023-e831_21</a>	Impact of neutron excess on near-barrier fusion in 19,20O + 12C	2023	DeSouza, Romualdo	0.57 TB	registered
em130	<a href="https://doi.org/10.26143/ganil-2023-em130">10.26143/ganil-2023-em130</a>	Test S3 Target	2023	Stodel, Christelle	0.64 TB	findable
tat_at-211	<a href="https://doi.org/10.26143/ganil-2022-tat_at-211">10.26143/ganil-2022-tat_at-211</a>	TAT_At-211	2022	de France, Gilles	0 TB	findable
e798_19	<a href="https://doi.org/10.26143/ganil-2022-e798_19">10.26143/ganil-2022-e798_19</a>	Study of deformed and spherical 2+ states via Coulomb excitation and first time measurement of PDR in 34Si	2022	Lica, Razvan	3.1 TB	findable
e823_21	<a href="https://doi.org/10.26143/ganil-2022-e823_21">10.26143/ganil-2022-e823_21</a>	Coulomb excitation and inelastic proton scattering of neutron-rich Si isotopes between N=20 and N=28	2022	Grévy, Stéphane	3.07 TB	registered

## DOI submission for a GANIL experiment:

- Create a DOI for **each dataset** record (raw data)
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- Using [DataCite REST API](#)  
→ DOI mint, update and verification

## Landing page:

- Official persistent entry point for the DOI
- Provides essential metadata about the dataset
- Available on the [GANIL data repository](#)

## Metadata:

- Generic DataCite metadata

## General Info

Field	Value
Experiment Number	e793s_19
Title	Proton-neutron interactions across the N = 28 shell closure via 47K(d,p) 48K, and implications for the most neutron-rich phosphorus
Spokeperson(s)	Wilton, Catford  Adrien, Matta 
Data Manager(s)	Adrien, Matta 
GANIL Scientific Coordinator	Diego, Ramos 
Collection Dates (dd-mm-yy)	Start: 10-03-2021 End: 17-03-2021
End of Embargo	17-03-2024
DOI	10.26143/ganil-2021-e793s_19
DOI State	<span style="background-color: #008000; color: white; padding: 2px 5px; border-radius: 3px;">findable</span>
Publication Year	2021
Publisher	GANIL, Large Heavy Ion National Accelerator, Caen, France
Data Curator	GANIL, Large Heavy Ion National Accelerator, Caen, France 
Hosting Institution	CC-IN2P3, IN2P3's Computing Centre, Villeurbanne, France 
Size	0.3 TB

## DOI submission for a GANIL experiment:

- Create a DOI for **each dataset** record (raw data)
- Responsibility of the **GANIL Data Manager**
- Using [DataCite REST API](#)  
→ DOI mint, update and verification

## Landing page:

- Official persistent entry point for the DOI
- Provides essential metadata about the dataset
- Available on the [GANIL data repository](#)

## Metadata:

- Generic DataCite metadata
- Enriched metadata (domain-specific)  
→ towards NAPMIX-like metadata

GANIL dataset repository – <https://data.ganil-spiral2.eu>

## Abstract

The experiment consisted in the measurement of one neutron transfert (d,p) and (d,t) from a 47K beam at 7A MeV. Measurement of the light p or t particle was carried out by the MUGAST silicon array, in coincidence with gamma-ray detected using the AGATA HPGe tracking array. In addition, detection of the fast heavy product of reaction is performed with VAMOS, allowing rejection of the non-direct reaction channel, e.g. fusion-evaporation on Carbon.

## Technical Info

<b>Setup</b>	MUGAST + VAMOS + AGATA
--------------	------------------------

## Beam(s)

Ion(s)	Charge state	Energy	Energy unit	Av. intensity	Intensity unit	Purity (%)	Accelerator	Production
47K	19+	7	MeV/u	1.e+5	pps	90	Radioactive	SPIRAL1

## Target(s)

Material	Thickness	Thickness unit	Sample phase	Type
CD2	0.34	mg/cm2	Solid	Compound

## Studied reaction(s)

Name	Projectile	Target
47K (7 MeV/u) + CD2 (0.34 mg/cm2)	47K(19+) @ 7 MeV/u	CD2 (0.34 mg/cm2)

## GANIL metadata schema is defined in GANIL DMP:

- Based on DataCite metadata schema
- ... Work in progress: NAPMIX-enriched metadata

Attribute [ DataCite ]	ID	Definition	Oc.	Ob. lvl [ M/R/O ]	Example
Identifier	1	DOI id.	1	M	10.26143/ganil-yyyy-exxx-yy
Creator	2	Spokeperson info	1-n	M	
givenName, familyName	2.2, 2.3	Full name of the Spokeperson	1,1	M	Bob, Kelso
nameIdentifier	2.4	ORCID or ISNI id.	0-n	R	<a href="https://orcid.org/0000-0001-6498-0552">https://orcid.org/0000-0001-6498-0552</a>
nameIdentifierScheme	2.4.a	nameIdentifier scheme	1	R	ORCID
schemeURI	2.4.b	namedentifier scheme URI	0-1	R	<a href="https://orcid.org/">https://orcid.org/</a>
affiliation	2.5	Institutional affiliation(s)	1-n	M	GANIL, GSI, ...
affiliationIdentifier	2.5.a	Aff. id.	0-1	R	<a href="https://ror.org/042dc0x18">https://ror.org/042dc0x18</a>
affiliationIdentifierScheme	2.5.b	affiliationIdentifier scheme	1	R	ROR
schemeURI	2.5.c	affiliationIdentifier scheme URI	0-n	R	<a href="https://ror.org">https://ror.org</a>
Title	3	Experiment title	1-n	M	Study of nuclei at GANIL
PublicationYear	5	Year the data was/will be made publicly released	1	M	2027 (YYYY)
Subject	6	Subject(s) of the exp.	1-n	M	FOS: Physical sciences
subjectScheme	6.a	Classification code	0-1	R	Fields of Science and Technology (FOS)
schemeURI	6.b	subject scheme URI	0-1	R	<a href="http://www.oecd.org/science/inno">http://www.oecd.org/science/inno</a>
valueURI	6.c	subject term URI	0-1	R	<a href="http://www.oecd.org/science/inno/123.pdf">http://www.oecd.org/science/inno/123.pdf</a>
Contributor	7	Organizational and Personnal contributors to the exp.	0-n	R	
contributorType	7.a	Type of contributor (CVL)	1	M	ResearchGroup or Researcher

## Purposes :

A platform to **centralize metadata** :

- For **nuclear physics** datasets
- Experimental, processed, simulated data
- For EURO-LABS RIs

A trusted **entry point** for **authenticated** users

Standardizing :

- Submission of metadata
- Cross-domain search

**Metadata-only** catalogue :

- Data stored at producer level (RIs)
- According to their own DMP, institutional policies

To go forward :

- An interface for future services of data lakes and high performance computing/analysis platforms

## Architecture :

- **InvenioRDM (v13 LTS)**
  - **Flask Python** framework (same than Zenodo)
  - Records versioning, preview and embargo
  - **Custom vocabularies**
  - Standard metadata schema (**DataCite**)
  - REST API
  - OAI-PMH protocol support
- **Support from CC-IN2P3** : OpenShift Kubernetes infrastructure (**OKD**)



<https://opennp.in2p3.fr>

Search



Laboratories



Data Sets



Softwares



Upload

## The GANIL e793s Dataset :

- Experiment performed at GANIL in 2021
- **Multi-instruments** (VAMOS++ - AGATA – MUGAST detection systems)
- **Multiple data and software layers**

This dataset led to the publication of :

- A journal article
- Processed data in open-access
- Software analysis codes in open-access

**Physical Review Letters**

Highlights Recent Accepted Collections Authors Referees Press About Editorial Team RSS

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GO MOBILE » | ACCESS BY GANIL

**Probing Exotic Cross-Shell Interactions at  $N = 28$  with Single-Neutron Transfer on  $^{47}\text{K}$**

C. J. Paxman<sup>1,\*</sup>, A. Matta<sup>2</sup>, W. N. Catford<sup>1</sup>, G. Lotay<sup>1</sup>, M. Assié<sup>3</sup>, E. Clément<sup>4</sup>, A. Lemasson<sup>4</sup>

Single-neutron transfer on 47K(d.p): Processed data of experiment e793s

Published September 11, 2024 | Version v1

zenodo Search records... Communities My dashboard

Ph DC Published September 11, 2024 | Version v1

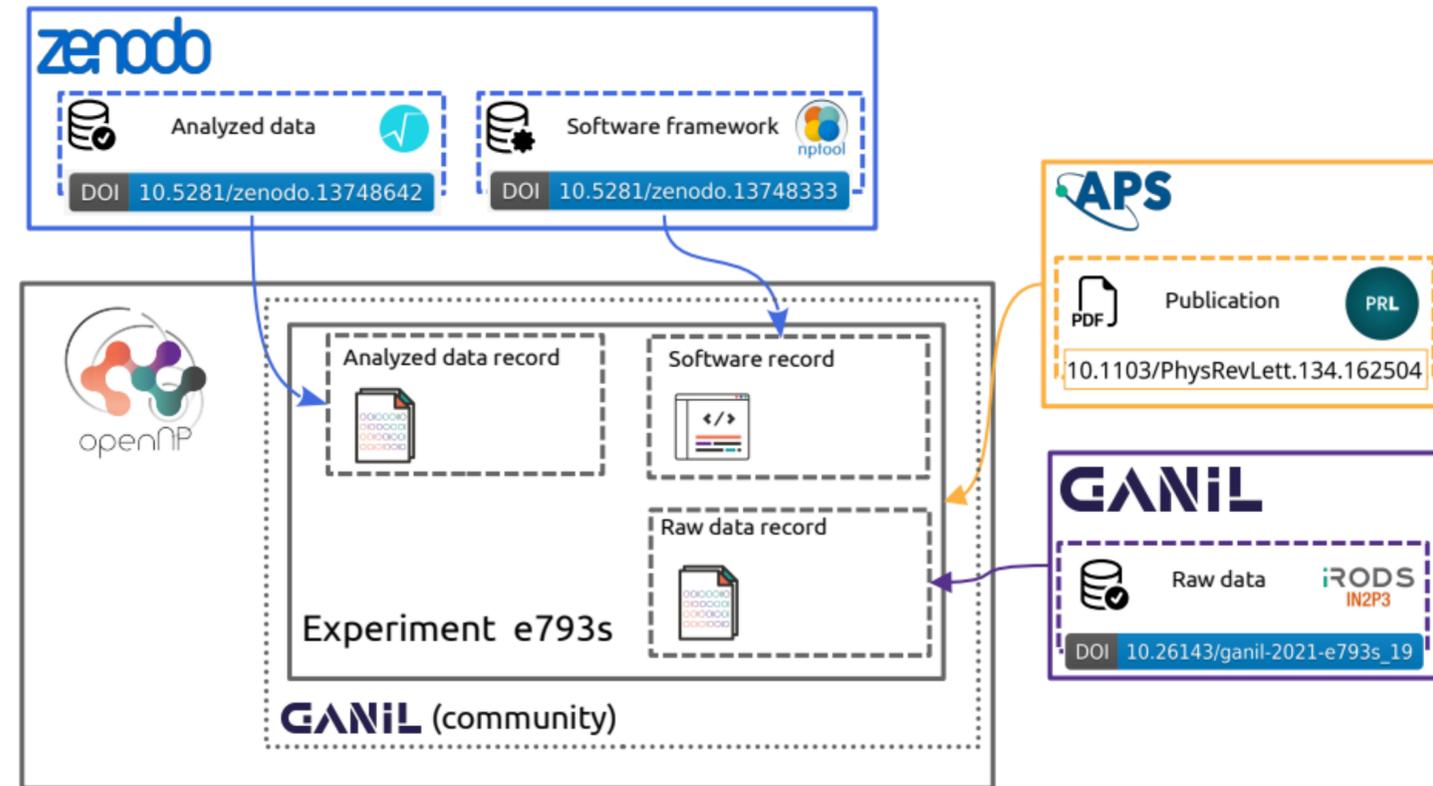
**Single-neutron transfer on 47K(d.p): nptool framework for the analysis of e793s**

Matta, Adrien<sup>1</sup>; Paxman, Charlie James<sup>1</sup>; Girard-Alcindor, Valérian<sup>1</sup>; Morfouace, Pierre<sup>2</sup>; de Sérerville, Nicolas<sup>3</sup>; FLAVIGNY, Freddy<sup>4</sup>; Labiche, Marc<sup>4</sup>; Shearman, Rob

This is a snapshot of the nptool framework used for the analysis of the experiment e793s (10.26143/GANIL-2021-E793S\_19), wherein the single-neutron transfer reaction 47K(d,p) was performed in inverse kinematics using a radioactive isotope beam.

For the most recent version of nptool, and to find the complete version history and author contribution, please see the repository: <https://gitlab.in2p3.fr/np/nptool>

Relation *	Identifier *	Scheme *	Resource type
Is derived from	6143/GANIL-2021-E793S_19	DOI	Dataset
Is compiled by	10.5281/zenodo.13748333	DOI	Software
Is referenced by	03/PhysRevLett.134.162504	DOI	Publication / Journal article



## Key point :

Use DataCite metadata to link records together (RelatedIdentifier property)

Users

Related works

Relation *	Identifier *	Scheme *	Resource type
Is derived from	6143/GANIL-2021-E793S_19	DOI	Dataset
Is compiled by	10.5281/zenodo.13748333	DOI	Software
Is referenced by	03/PhysRevLett.134.162504	DOI	Publication / Journal article

In short : zenodo is a good option (datasets and software records)...

## What is zenodo ?

- Launched in 2013 by CERN (as OpenAIRE project)
- A repository for European research datasets (originally)
- **InvenioRDM** architecture (**Flask**-based framework)

## Pros :

- Up to 50GB file uploads (and more upon request)
- Records versioning, preview and embargo
- Community management (collaboration)
- Standard metadata schema
  - compliant with **DataCite metadata schema**
  - ROR, ORCID support
- DOI assignment (mint)
- REST API (e.g. : import/export metadata)

Published January 15, 2026 | Version 1

Dataset Open

## <data/dev> school : Data Challenge EXILL-like dataset (Simulated)

Matta, Adrien (Producer)<sup>1</sup> ; Dudouet, Jérémie (Producer)<sup>2</sup>

Hide affiliations

1. CNRS Délégation Normandie
2. CNRS Délégation Rhône-Auvergne

This dataset is used within the EURO-LABS school on analysis reproducibility and collaborative software development.

It is a set of simulated data produced using various tools (GEF, Tkn, Geant4, STOGS) and simulated in spontaneous fission with gamma ray emission. Transitions are taken from tabulated tables except for a few nuclei for which "exotic transition" has been added by hand to emulate "new physics".

### Technical info

The dataset is made up of root data file and accompanying yaml metadata file containing the calibration and data taking informations.

### Files

Files (5.4 GB)		
Name	Size	Download all
cal_run1.yaml <small>md5:ff57e09bc0202d51ccd5899e76b07017</small>	46 Bytes	Download
cal_run10.yaml <small>md5:7bb696d741c27e2f697a6a08ac895cdc</small>	71 Bytes	Download
cal_run11.yaml <small>md5:6924689389921902104dee09939bb4cb</small>	71 Bytes	Download



Versions

Version 1  
10.5281/zenodo.18259896 Jan 15, 2026

Communities

EURO-LABS

Details

DOI  
DOI 10.5281/zenodo.18259896

Resource type  
Dataset

Publisher  
Zenodo

Rights

License  
Creative Commons Attribution 4.0 International

Citation

Matta, A., & Dudouet, J. (2026). <data/dev> school : Data Challenge EXILL-like dataset (Simulated) (Version 1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.18259896>

Style  
APA

Export  
JSON Export

Technical metadata  
Created January 16, 2026  
Modified January 16, 2026



In short : zenodo is a good option (datasets and software records)...

## What is zenodo ?

- Launched in 2013 by CERN (as OpenAIRE project)
- A repository for European research datasets (originally)
- **InvenioRDM** architecture (**Flask**-based framework)

## Pros :

- Up to 50GB file uploads (and more upon request)
- Records versioning, preview and embargo
- Community management (collaboration)
- Standard metadata schema
  - compliant with **DataCite metadata schema**
  - ROR, ORCID support
- DOI assignment (mint)
- REST API (e.g. : import/export metadata)

Published January 15, 2026 | Version 1

Dataset Open

Versions

Version 1	Jan 15, 2026
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DOI: [10.5281/zenodo.18259896](https://doi.org/10.5281/zenodo.18259896)

Communities: EURO-LABS

Details

Resource type: Dataset

Publisher: Zenodo

Rights

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Citation

Matta, A., & Dudouet, J. (2026). <data/dev> school : Data Challenge EXILL-like dataset (Simulated) (Version 1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.18259896>

Style: APA

Export

JSON Export

Technical metadata

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```

{
  "access": {
    "embargo": {
      "active": false,
      "reason": null
    },
    "files": "public",
    "record": "public",
    "status": "open",
    "created": "2026-01-16T08:17:18.651227+00:00",
    "custom_fields": {},
    "deletion_status": {
      "is_deleted": false,
      "status": "p"
    }
  },
  "files": {
    "count": 62,
    "default_preview": "cal_run1.yaml",
    "enabled": true,
    "entries": {
      "cal_run1.yaml": {
        "access": {
          "hidden": false,
          "checksum": "md5:ff57e09bc0202d51ccd5899e76b07017",
          "ext": "yaml",
          "id": "ad7d7ff6-6884-4008-aa9f-962f22f9c200",
          "key": "cal_run1.yaml",
          "links": {
            "content": "https://zenodo.org/api/records/18259896/files/cal_run1.yaml/content",
            "self": "https://zenodo.org/api/records/18259896/files/cal_run1.yaml"
          },
          "metadata": {},
          "mimetype": "application/octet-stream",
          "size": 46,
          "storage_class": "L"
        },
        "cal_run10.yaml": {
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            "hidden": false,
            "checksum": "md5:7bb696d741c27e2f697a6a08ac895cdc",
            "ext": "yaml",
            "id": "6cc80dc0-737b-49dd-9b1e-0c6537df3c13",
            "key": "cal_run10.yaml",
            "links": {
              "content": "https://zenodo.org/api/records/18259896/files/cal_run10.yaml/content",
              "self": "https://zenodo.org/api/records/18259896/files/cal_run10.yaml"
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              "mimetype": "application/octet-stream",
              "size": 71,
              "storage_class": "L"
            }
          }
        }
      }
    }
  }
}

```

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## Cons :

- Limited discipline-specific features
  - lack domain-specific metadata
  - no domain-specific advanced search features

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Dataset  Open

## <data/dev> school : Data Challenge EXILL-like dataset (Simulated)

Matta, Adrien (Producer)<sup>1</sup>  ; Dudouet, Jérémie (Producer)<sup>2</sup> 

Hide affiliations

1. CNRS Délégation Normandie
2. CNRS Délégation Rhône-Auvergne

This dataset is used within the EURO-LABS school on analysis reproducibility and collaborative software development.

It is a set of simulated data produced using various tools (GEF, Tkn, Geant4, STOGS) and simulated in spontaneous fission with gamma ray emission. Transitions are taken from tabulated tables except for a few nuclei for which "exotic transition" has been added by hand to emulate "new physics".

### Technical info

The dataset is made up of root data file and accompanying yaml metadata file containing the calibration and data taking informations.

### Files

Files (5.4 GB)		
Name	Size	Download all
cal_run1.yaml <small>md5:ff57e09bc0202d51ccd5899e76b07017</small>	46 Bytes	Download
cal_run10.yaml <small>md5:7bb696d741c27e2f697a6a08ac895cdc</small>	71 Bytes	Download
cal_run11.yaml <small>md5:6924689389921902104dee09939bb4cb</small>	71 Bytes	Download



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Communities

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Style APA

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## Open Science

### Open Science is:

- A transformative approach that emphasizes transparency, collaboration, and sharing across the research lifecycle.
- Its core principles are accessibility, sustainability, and transfer
- It aims to make research outputs available for reuse and improvement.

### Key points :

- Open publications, data, software and accessible infrastructures
- Numerous Open Science policies (institute, national and international)
- "Open" does not guarantee usability !

### Outlooks : The best has yet to come

- Requires a shift in research culture
- Requires training and promotion of good practices
- Coordination of the practices across domains
- Opportunity to develop new tools and infrastructures (Data Lakes, Analysis platforms, Metadata standards)
- Recognizing these activities as valuable contributions to research is essential for their long-term adoption and impact.

## Data Management

### Effective data management :

- Is critical for ensuring the usability, longevity, and reproducibility of research outputs.
- Involves organizing, describing, and preserving data throughout its lifecycle, from collection to analysis and archiving.

### Key practices :

- FAIR principles
- DMP : Document lifecycle, storage, curation and responsibilities
- PIDs : for long-term accessibility and citability
- Metadata : structured description to make data FAIR-compliant
- Domain-specific metadata to address community needs