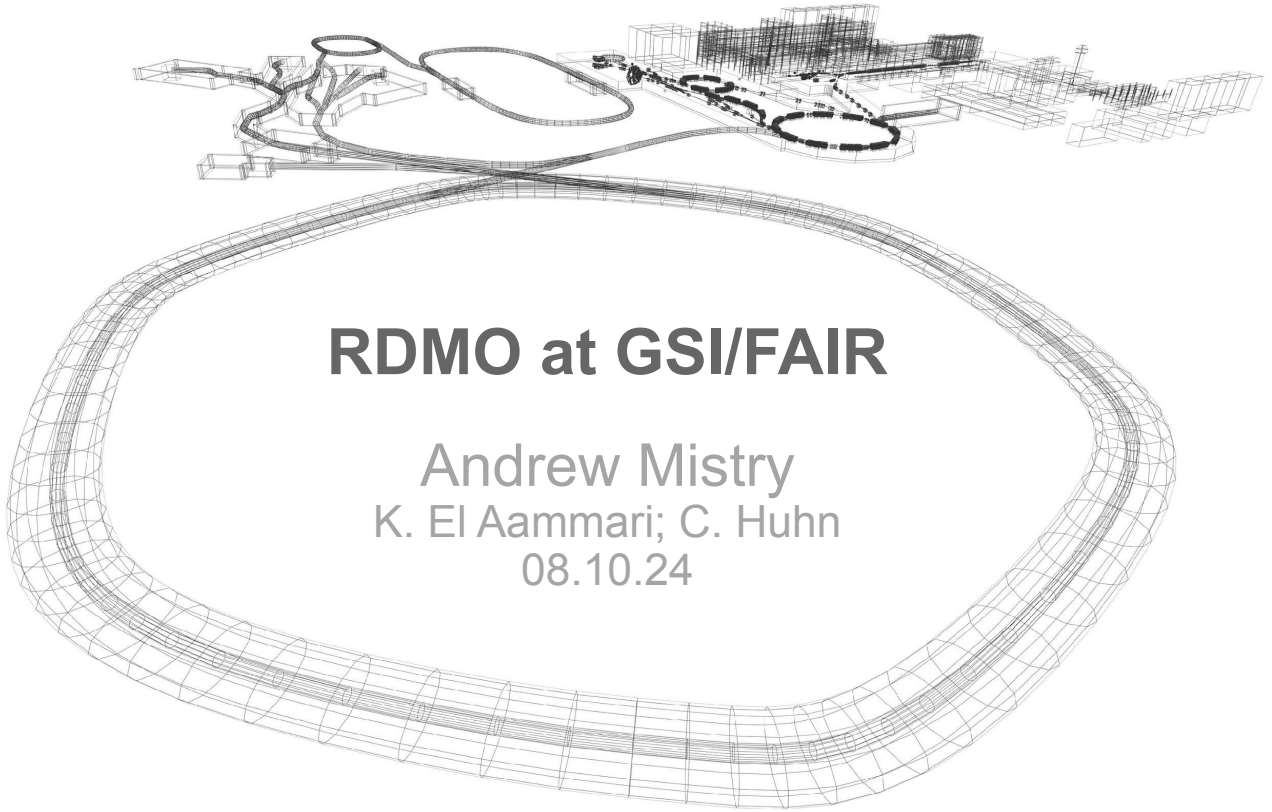


RDMO at GSI/FAIR

Andrew Mistry
K. El Aammari; C. Huhn
08.10.24

GSI Helmholtz Centre for Heavy-ion Research

Heavy-ion accelerator laboratory in Darmstadt, Germany with 1350+ employees & 700 external users

Who we are?

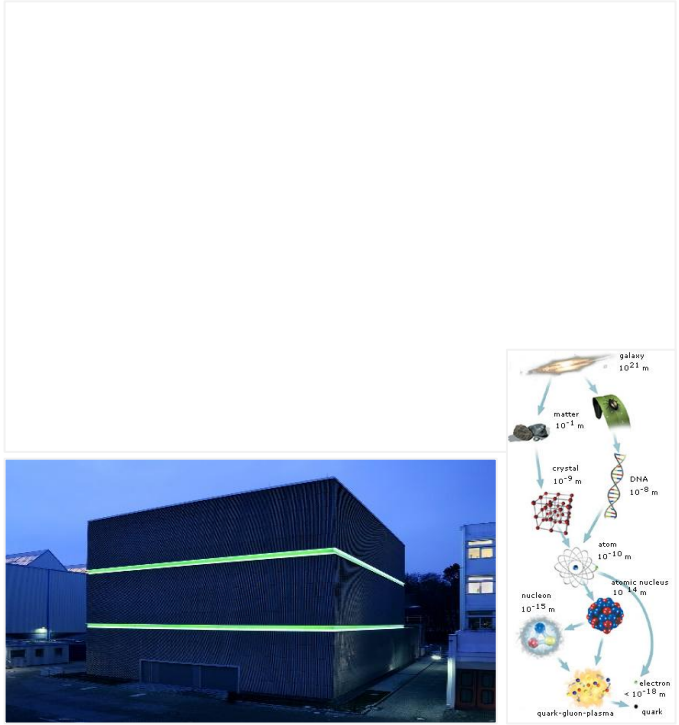
- Founded in **1969**
- **Elements H to U can be accelerated**

Past Achievements

- Discovering **six new elements**, **many exotic nuclei**
- Developing **a new cancer treatment**

Our Future

- First stage injector for the **FAIR facility**
- **Experiments continuing** (FAIR Phase-0)



Research Interests

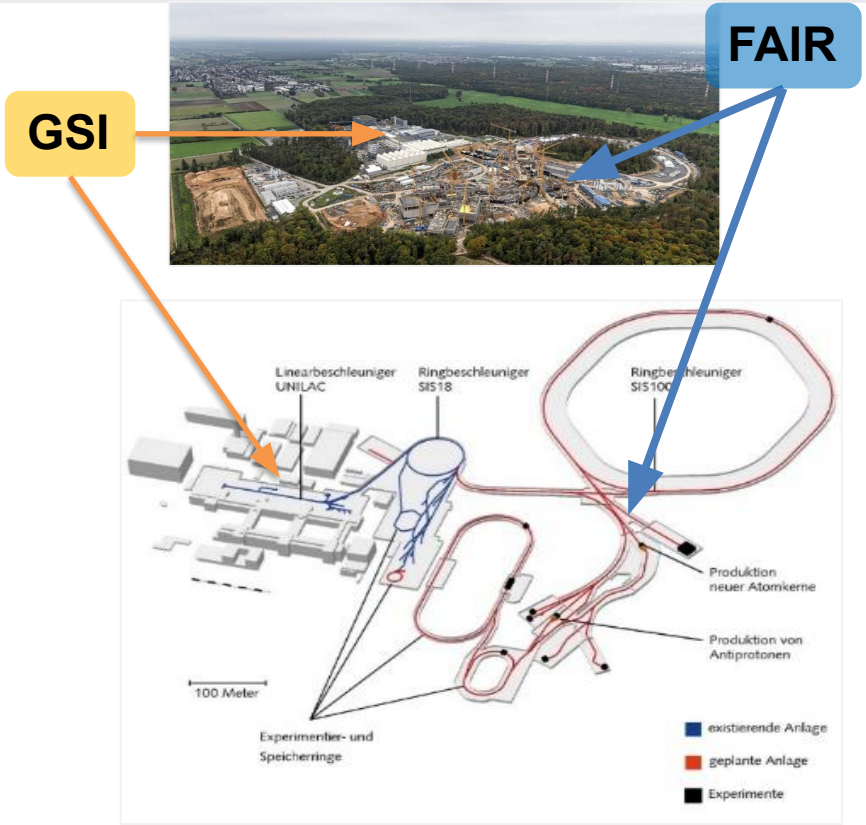
- Accelerator Physics
- Detector Development
- Atomic Physics
- Nuclear and particle Physics
- Plasma Physics
- Biophysics
- Materials Research
- High-Performance Computing
- Theoretical Physics

FAIR (Facility for Antiproton and Ion Research in Europe)

New accelerator facility

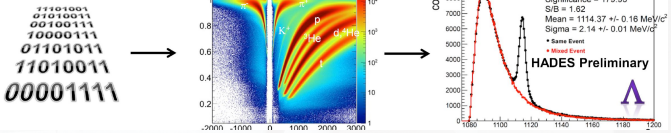
- **Top priority** for European Nuclear Physics Community
- **International**: 50 countries, 3000 researchers
- **Diverse community** from atomic to particle physics

- **'FAIR goes F.A.I.R.': commitment to open science**
- Towards the next generation "data challenge" Volume, Velocity, Veracity, Variety, and Complexity
- **~TB/s data rates,** online processing, ~5x10^5 cores
- Data stored to **disk 40+ PB/year**
- **Distributed computing** with a large user community
- **Data preservation and accessibility key to success**

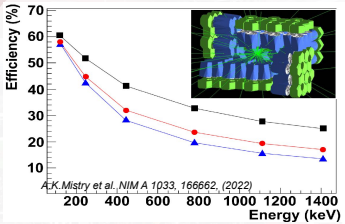


Research Data and Software at GSI: Rich and varied

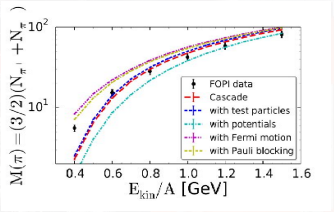
Experimental Data



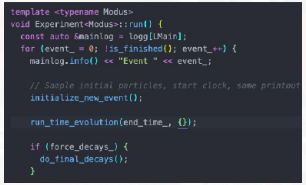
Raw Pre-processed Result



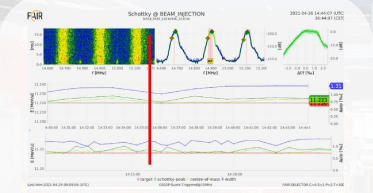
Simulation



Theory



Software

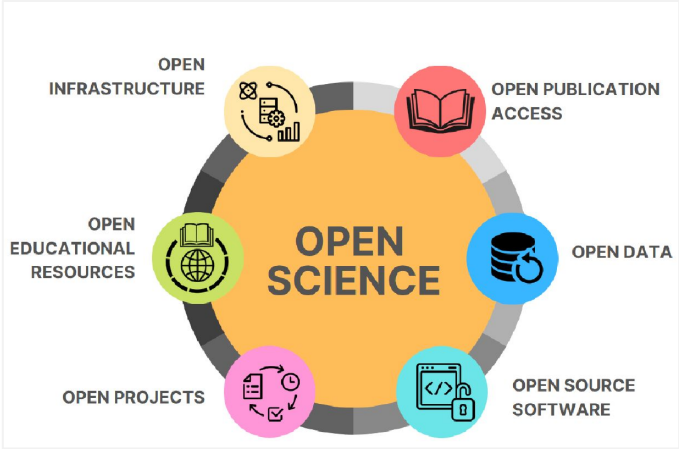


Machine Parameters

Research Area	Exp. Run Time	Raw Data	Calibrated Data	Simulations	Final Datasize
HADES	3 weeks	130TB	300TB	150TB	<1TB
Materials Science	~Minutes	~MB - GB	-	-	10MB
FAIR CBM	2 months	~20PB	-	-	4PB

Open Science @ GSI/FAIR: What do we want to achieve?

- **Open Access Publications** : Mandatory publication of Open Access articles
- **Research Data** : Publish research data in suitable repositories (F.A.I.R. Data)
- **Open Software** : Make open whenever possible (F.A.I.R. Software)
- **Open Infrastructure :** Open Projects in research and industry
- Develop an **Open Science Ecosystem** to combine everything



***Considerations*:**

- The steps and processes to achieve this are complex… Start smaller and work up
- Do not make it too '*general*', needs finer granularity and use-cases
- Aim to address **all researchers who use GSI/FAIR**: Students, Postdocs, PI's, Group leaders…

GSI/FAIR Involvement in External OS initiatives

	European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures: **Open Source Software Repository (OSSR) developer and maintainer**
	Nuclear Physics European Collaboration Committee: Participation and writing Open Science section of the LRP 2024
	European Open Science Cloud: GSI/FAIR both observer members, contribution and suggestions for EOSC Future
	EuroLabs: Work Package on Open, diverse and inclusive Science
	Particles, Universe, NuClei and Hadrons for the NFDI: Two Task areas; Developments on data portal, AAI, data lake and other infrastructure from GSI IT department and Research division
	Matter and Technology, Data Management and Analysis: IT contributions
	HGF Open Science: Members of the OS, software and POF IV indicators working groups
	Helmholtz Metadata Collaboration: Participation in HMC funded projects, links and connections to Matter division
	Exploring the Universe from Microscopic to Macroscopic Scales: Supporting Open Science area of the project (as well as other direct research areas)

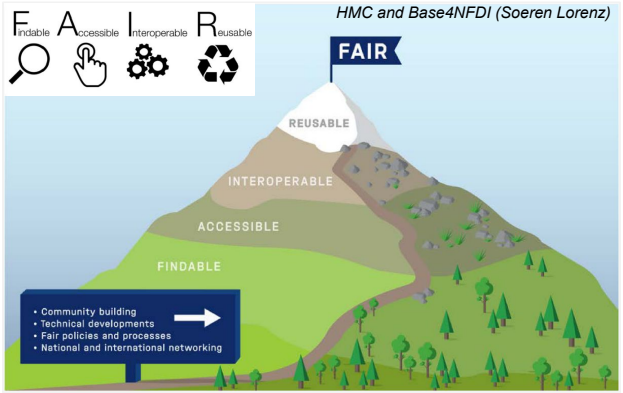
Open Research Data and Management

Research Data Management…

…encompasses all aspects of handling research data, from planning, its generation and processing to publication, long-term archiving, and eventual deletion, while adhering to the principles of good scientific practice.

Goals

- to ensure good RDM practices at GSI/FAIR;
- promote and assist researchers in publishing data;
- to aim (as best as reasonably possible) that data is published according to the Findable Accessible Interoperable and Reusable principles;
- develop the tools and infrastructure needed to do this.



FAIR Data is not an end goal

 continual process of improving practices and adapting research resources with technology innovations

Data Management Plans and Research Data Management

Living document

- Prepared at the start and follows the research data (RD) lifecycle throughout

Data management plans

- Communication tool for researchers
- Aids RDM project internal management
- Supports F.A.I.R.'ness of Research Data
- Useful for IT/Resource Cost estimates
- Funding body requirements

Contents include

- General data (Project name/PI, start and end of data taking…)
- RD information (Data type, size, scope, and generation method…)
- Overhead (Data protection, costs, project planning…)
- Achieving and reuse (repository selection, data to be published, metadata schema…)

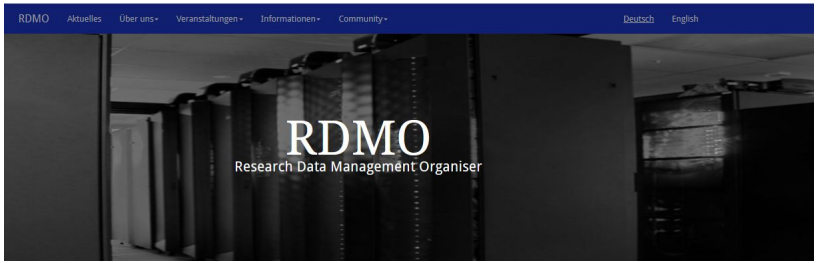
✔ **Goal : Make it easy for the users and encourage them to use it**

Data Management Plan Tool Evaluation

- **DMP tool**: e.g., DMPonline, DMPtool… but testers and own criteria tended towards…
- **RDMO** (**R**esearch **D**ata **M**anagement **O**rganiser):
  - Can be dynamic and versioned along life cycle
  - Offers multilingual support
  - Used by many other Uni's and centres
  - Can be locally installed

DMPONLINE

DMPTool
Build your Data Management Plan



Project Steps: Starting out

- Basic local version installed on VM
- Accessible on GSI LAN


RDMO testing: To Do

- Please fill issues on GitLab, *in particular on the GSI Data management plan questions*

https://rdmo.test.gsi.de/

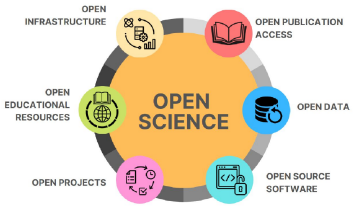
https://git.gsi.de/oswg/gsi-rdmo-testing

- Please also check and comment on my example answers (in the ‚views' section)
- Always available for a chat if you need help and I'd be happy to sit down and go through the DMP with you!

1

Thanks for your assistance

GSI/FAIR Open Science Working Group testing and feedback



Project Steps: Feedback

- Basic local version installed on VM (https://rdmo.test.gsi.de)
- Accessed on GSI networked computer
- GitLab, Feedback, Reporting

RDMO Report

General Question / Remarks:

- *When has this RDMO has to be filled? I think a lot of these questions require that one has already had contact to GSI members.*
- *It is not possible to see what questions still have to be answered or which entry has to be fully edited. I only see the progress bar showing that something is missing.*

Responsibilities:

- *For me, "Responsible department" sounds a bit strong. Maybe one could "weaken" it a little bit by changing it to "Related GSI / FAIR department" or "Local contact department"? Of course, this is just a personal preference.*

Research Data Management and Policies

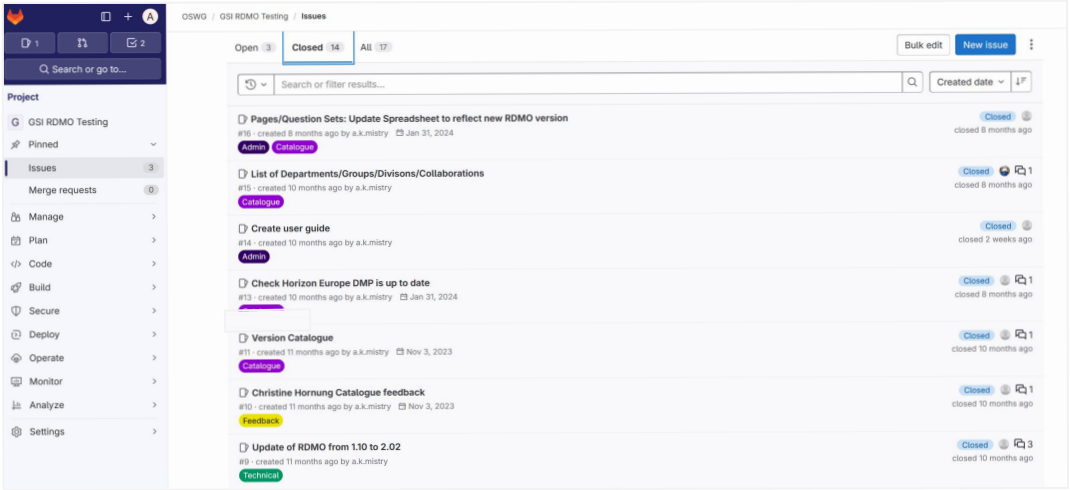
- *The link for Data Policy of AGATA does not work.*
- *Data Policy of Collaboration: Does this require a link? Otherwise, the text field might be a little bit to small.*

Data Set Collection

- *Is it up to the user to define what a data set is, or is it sort of pre-defined? E.g. is it a set of data from one detector, and only one? Or is it a sum of the whole project or sub-project? Setting up a data set for 10+ different detectors that maybe sometimes store different data types at once can be a little bit tedious.*

Data Storage and Archiving

- *Is there some information for all external users on how long data will be stored at GSI? If yes, maybe a link would be helpful. This is*



GSI/FAIR ‘General’ Catalogue

General Project Information

A Data Management Plan (DMP) is a comprehensive document that outlines how data are to be handled both during a research project and after the project is completed. This includes how research data will be collected, processed, stored, and shared during and after a research project. The plan typically includes information on the types of data to be collected, data storage, data security and access protocols, and plans for sharing and preserving the data. The goal of a data management plan is to ensure that the data is well-organised, properly documented, and accessible to the research team and other authorised users, while also protecting the privacy and confidentiality of any sensitive information. As far as possible, research data should follow the Findable, Accessible, Interoperable and Reusable (FAIR) principles , and this should be reflected in the Data Management Planning phases. The document can be updated throughout the project, and completed by one or more parties. Further information on research data publication can be found on the on the GSI Open Science Webpage, and in the GSI Instructions for Data/Software Uploads.

For further information, please see the GSI/FAIR Policy on Research Data Management and the GSI/FAIR Open Science Webpage

For comments, questions, and support please contact the Research Data Management Team open-science@gsi.de

Data Management Plan Version

Please give the version number of the DMP. e.g. v1

v1

Principal Investigator(s)

Name of the Principal Investigator(s) of the project

Please enter your entries line by line. You can add lines using the green button and remove them using the blue cross (×).

John Doe

+ Additional PI

Please provide your name

As the person filling out this plan

John Doe

Project Name

Give the name of the project. Can be e.g. experiment name

GSI Data Management Plan Template: Example Case 1_1 Beginning of Project

Project ID (optional)

Overview

Project: GSI Data Management Plan Template: Example Case 1_1 Beginning of Project
Catalog: GSI/FAIR Data Management Plan

Reload page
Back to my projects

Progress

58 of 58

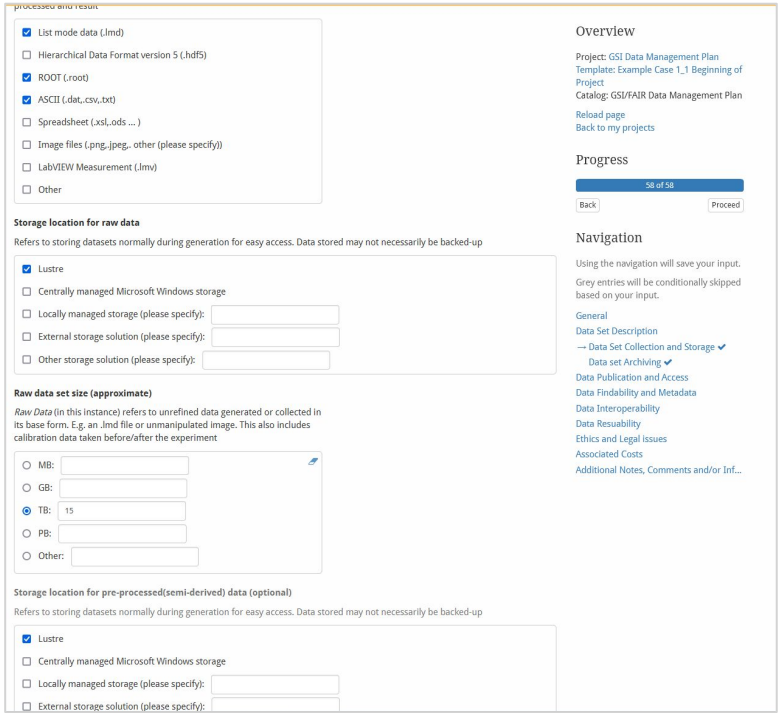
Back Proceed

Navigation

Using the navigation will save your input.

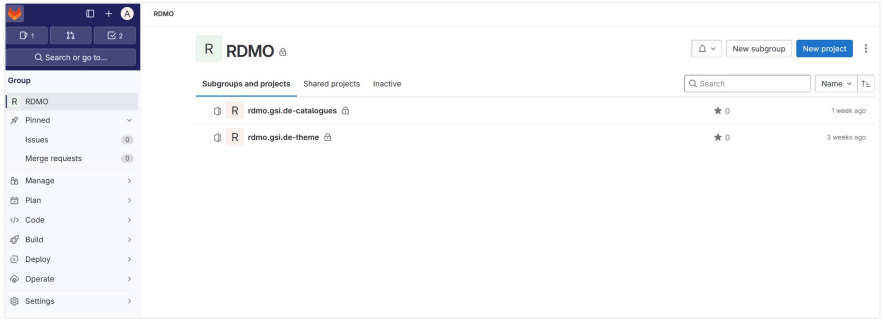
Grey entries will be conditionally skipped based on your input.

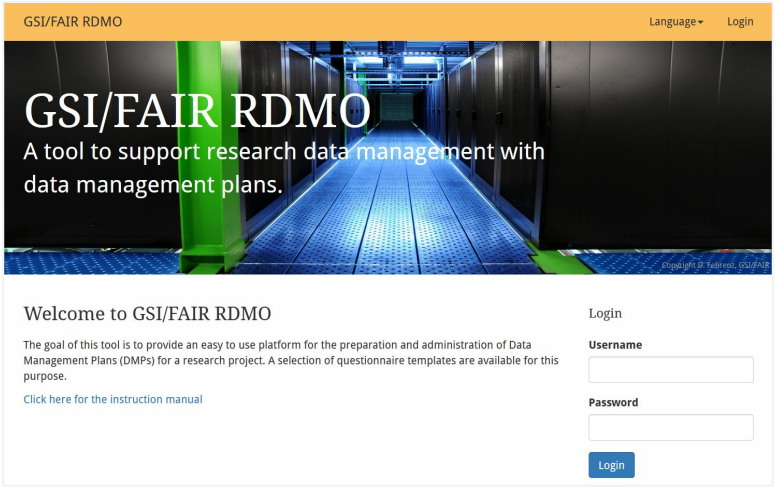
General
→ General Project Information ✔
Responsibilities ✔
Data Set Description
Data Publication and Access
Data Findability and Metadata
Data Interoperability
Data Resuability
Ethics and Legal issues
Associated Costs
Additional Notes, Comments and/or Inf...



Project Steps: Implementation and Management

- Currently running two versions: **production and testing**
- Connected to GitLab for automatic updating of themes
- Went live Feb 2024: Aimed at users of GSI/FAIR (AAI LDAP connection)
- GSI/FAIR tailored DMP catalogue available

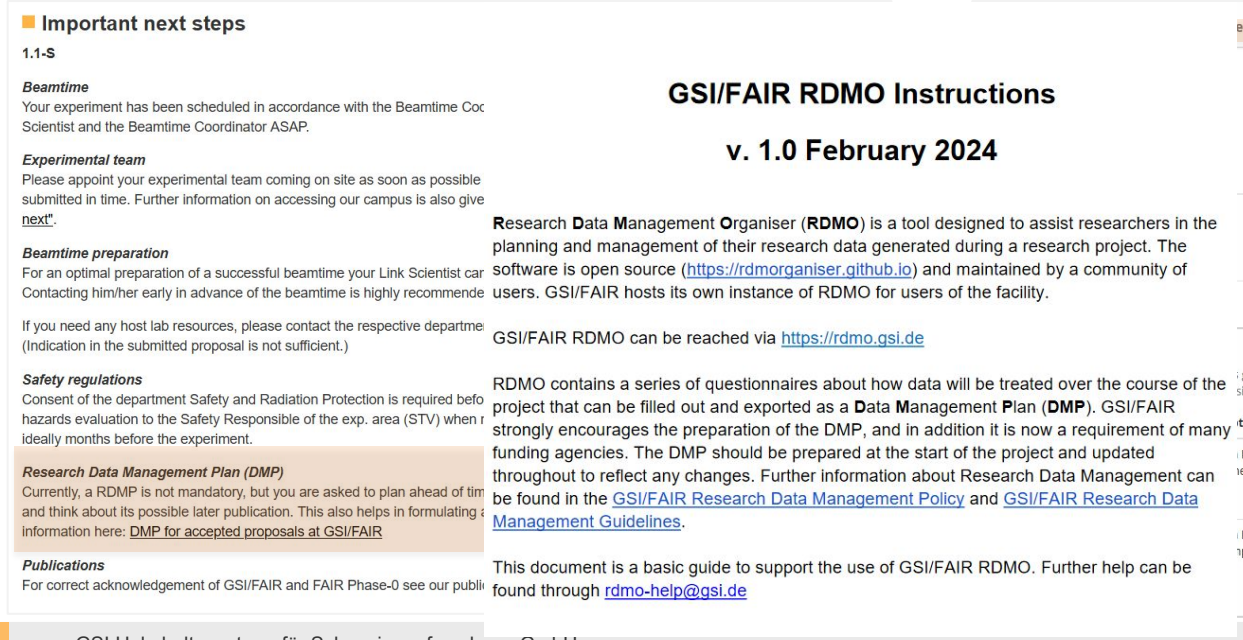




Project Steps: Uptake and feedback

- Now requested for all **accepted experimental proposals** to prepare a DMP via RDMO
- Work with researchers to **refine the catalogue** and encourage continuous usage

GSI Proposal management system



GSI/FAIR RDMO Instructions

v. 1.0 February 2024

Research **D**ata **M**anagement **O**rganiser (**RDMO**) is a tool designed to assist researchers in the planning and management of their research data generated during a research project. The software is open source (https://rdmorganiser.github.io) and maintained by a community of users. GSI/FAIR hosts its own instance of RDMO for users of the facility.

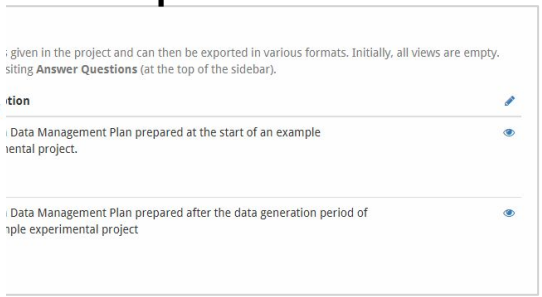
GSI/FAIR RDMO can be reached via https://rdmo.gsi.de

RDMO contains a series of questionnaires about how data will be treated over the course of the project that can be filled out and exported as a **D**ata **M**anagement **P**lan (**DMP**). GSI/FAIR strongly encourages the preparation of the DMP, and in addition it is now a requirement of many funding agencies. The DMP should be prepared at the start of the project and updated throughout to reflect any changes. Further information about Research Data Management can be found in the GSI/FAIR Research Data Management Policy and GSI/FAIR Research Data Management Guidelines.

This document is a basic guide to support the use of GSI/FAIR RDMO. Further help can be found through rdmo-help@gsi.de

RDMO Catalogue Questions

Examples



Next steps: Formatting and development

PDF templates formatting

Answers for *My first project*

General

General Project Information

Data Management Plan Version

v1

Principal Investigator(s)

Jane Doe

Please provide your name

Andrew Mistry

Project Name

My Experiment

Project ID

G-22-0123

Project Stage

Beginning

Project Start Date

Jan. 4, 2025

Project End Date

Oct. 4, 2026

Data Management Plan version date

Oct. 1, 2024

Does an external data management plan already exist for this project?

No

If an external data management plan already exists for this project, please upload here

Is there a collaboration based research data management policy for the project? If so please give details.

Yes

Provide a short description of the project

Responsibilities

Responsible GSI/FAIR department(s)

Responsibilities during the course of the project

Responsibilities after project completion

Data Set Description

Data Set Collection and Storage

Generated data category

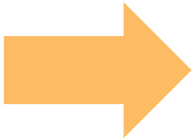
Data format(s)

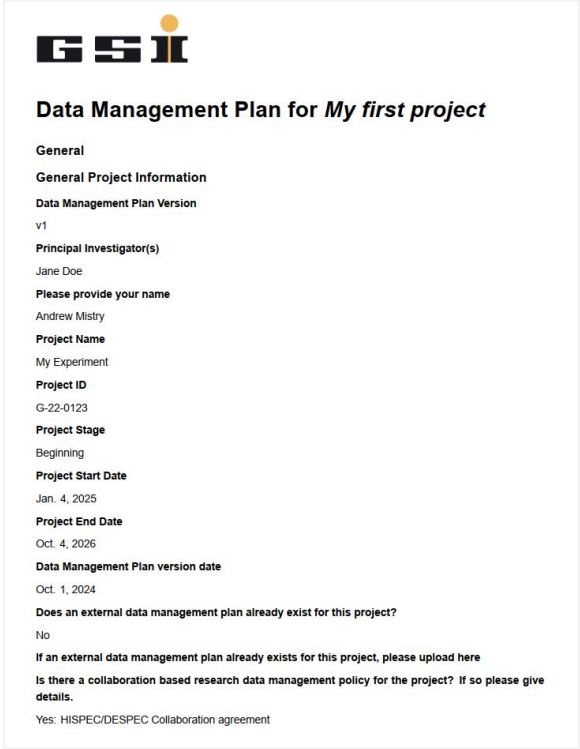
Storage location for raw data

Raw data set size (approximate)

Local RDMO instance:

- *Modified utils.py -> pandoc*
- *Added latex template*





Data Management Plan for *My first project*

General

General Project Information

Data Management Plan Version

v1

Principal Investigator(s)

Jane Doe

Please provide your name

Andrew Mistry

Project Name

My Experiment

Project ID

G-22-0123

Project Stage

Beginning

Project Start Date

Jan. 4, 2025

Project End Date

Oct. 4, 2026

Data Management Plan version date

Oct. 1, 2024

Does an external data management plan already exist for this project?

No

If an external data management plan already exists for this project, please upload here

Is there a collaboration based research data management policy for the project? If so please give details.

Yes: HISPEC/DESPEC Collaboration agreement

Possible to do this in an easier fashion (i.e. with an in-built latex template?)

Next Steps: Instrument Records

- Assigning **PIDs for Instruments/Infrastructure** currently hot topic
- Instrument record generation via RDMO?
- Possible to include **images/attachments in exported documents**?

Information | Files | Holdings

Physical Object GSI-2024-00534

FRS Ion Catcher

Dickel, T. (Corresponding author)* ; Plaß, W.*

2024
GSI Darmstadt

Darmstadt : GSI (2024) [10.15120/GSI-2024-00534]

Please use a persistent id in citations: doi:10.15120/GSI-2024-00534 doi:10.15120/GSI-2024-00534

Abstract: The FRS Ion Catcher is a set up which slows down exotic nuclei produced with high energies to perform high precision measurements almost at rest. The properties of the exotic isotopes help to study the structure of the nuclei or the origin of the elements in the universe. The setup is located at the fragment separator (FRS) of the GSI Helmholtz Centre for Heavy Ion Research in Darmstadt, Germany. The setup has been designed in collaboration with inter-national partners, e.g. KVI-CART Groningen, Justus-Liebig-University Giessen, Germany. The FRS Ion Catcher consist in a cryogenic stopping cell, an RFQ based beamline with im-proved capabilities and a Multiple-Reflection time-of-flight Mass Spectrometer (MR-TOF-MS). More details can be found in [1, 2]. 1. W.R. Plass et al. NIMB 317, 457-462 (2013)2. https://www-windows.gsi.de/frs-ion-catcher/

Note: 2010 -

Contributing Institute(s):

1. FRS / SFRS Experimente (FRS)

Research Program(s):

1. 612 - Cosmic Matter in the Laboratory (POF4-612) (POF4-612)

Experiment(s):

1. S482: Mean range bunching for experiments with stopped beams (POF3-612: HFS)
2. S468: Search for new neutron-rich isotopes and exploratory studies in the element range from terbium to rhenium (POF3-612: HFS)
3. S411: Commissioning of the First-Generation Cryogenic Stopping Cell for the Low-Energy Branch of the Super-FRS (POF3-612: HFS)
4. S530: Fission isomer studies with the FRS (Station: FRS)

Appears in the scientific report 2024

Database coverage:

The record appears in these collections:
Private Institute collections > KVGF > KRED > FRS
Document types > Other Resources > Physical Objects
Workflow collections > Public records
NUSTAR(MU) > FRS/SFRS
Publications database
Open Access

Linked articles:

Contribution to a book
Ebert, J. ; Dickel, T.* ; Plaß, W. R.* ; Ayet, S.* ; Dendooven, P. ; Diwisch, M. ; Estrade, A.* ; Farinon, F.* ; Geissel, H.* ; Greiner, F. ; Haettner, E. ; Jesch, C.* ; Kalantar-Nayestanaki, N. ; Knöbel, R.* ; Kurcewicz, J.* ; Lang, J. ; Moore, I. ; Mukha, I.* ; Hoctoro, C.* ; Petrick, M. ; Pfützner, M.* ; Pietri, S.* ; Prochazka, A.* ; Purushotaman, S.* ; Reifer, M. P. ; Rink, A.-K. ; Scheidenberger, C.* ; Takechi, M.* ; Weick, H.* ; Winfield, J.* ; Yavor, M. I.
First Mass Measurements of Projectile Fragmnets with a Multiple-Reflection Time-of-Flight Mass Spectrometer at the FRS Ion Catcher
Scientific Report 2012 Darmstadt : GSI Helmholtzzentrum für Schwerionenforschung, GSI Report 2013-1, 162 p. (2013)

Files

FRS Ion Catcher

Document version: v1

PID: 10.15120/GSI-2024-00534

Author:

Timo Dickel [ORCID (https://orcid.org/0000-0002-5965-8689)

Collaboration:

Mainly, but not exclusively Super-FRS EC

Host Laboratory/Laboratories:

GSI Helmholtz Centre for Heavy Ion Research [ROR: https://ror.org/02k8cbn47]

Years active:

2010 – present

Diagram/Photo/CAD:

Left: schematic of the setup. Right: Photograph of system at the final focal plane of the FRS, in the photo degrader system and downstream detectors before the CSC are missing, they also belong to the setup.

Station(s) of device during primary usage:

FRS HFS S4

Linked infrastructure:

SIS18, FRS

Device Webpage:

https://www-windows.gsi.de/frs-ion-catcher/

RDMO @ GSI/FAIR

- Next steps: Researcher Testing and Feedback
- Inclusion into the next round of proposal submissions
- Connection to other software/ ecosystems