

Research Data Management at HZDR with HELIPOINT

HELIPOINT HELmholtz Scientific
Project W ORkflow PlaTform 

Stefan E. Müller, Thomas Gruber, Guido Juckeland, Oliver Knodel, Mani Lokamani, David Pape, Martin Voigt

Helmholtz-Zentrum Dresden-Rossendorf - Department of Information Services and Computing

DPG Spring Meeting - Göttingen,
March 31, 2025

DRESDEN
concept



HZDR
HELMHOLTZ ZENTRUM
DRESDEN ROSSENDORF

The Helmholtz-Zentrum Dresden-Rossendorf (HZDR)

■ About 1500 employees

- ~ 680 scientists

■ Research sites:

- main site in Dresden-Rossendorf
- additional sites in Grenoble, Freiberg, Görlitz, Leipzig and Schenefeld

■ Research fields:

- Energy, Health and Matter

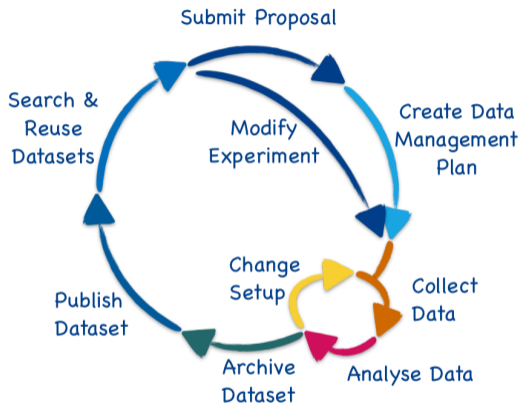
■ Research facilities

- ELBE - Center for High-Power Radiation Sources
- Dresden High Magnetic Field Laboratory (HLD)
- Ion Beam Center (IBC)



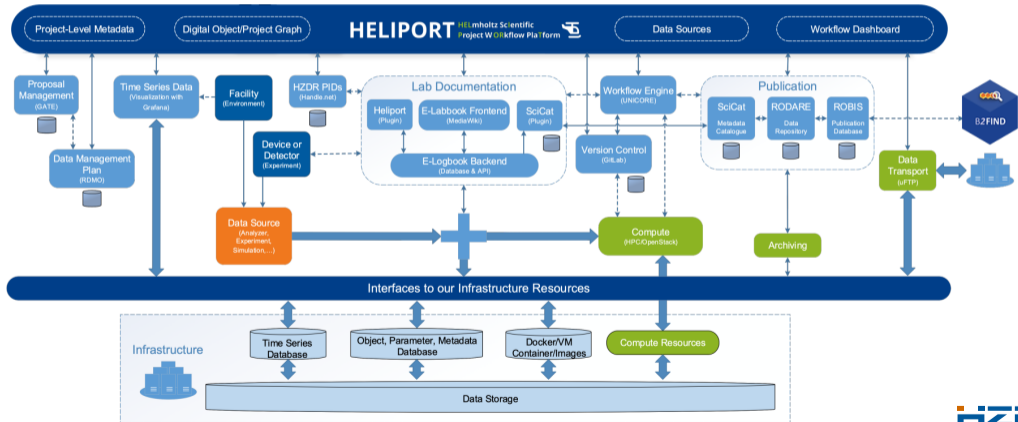
End-to-End Digital Data Lifecycle

- Many tools to support the individual steps of the different research experiments:
 - Electronic lab notebooks
 - Interactive analysis
 - **FAIR publication** of data sets (HZDR's **RODARE** repository)
 - Scientific **workflow** management
 - **Handle** (PID) generation and management
- Uniform and smooth access to and **between** all services and systems is necessary
- Documentation of all the linked resources is essential to create a **comprehensible** and **FAIR** data lifecycle
 - In accordance with the **HZDR Data Policy**



HELIPORT as an overarching guidance system

There is a need to support the entire experiment with reliable **interconnected tools** to enable **FAIR** science. Underlying IT infrastructures are complex, documentation may be missing (lack of time), and often scientists may not know which services are available at facilities and how to use them. An **overarching system** guiding the scientists through the lifecycle of their research project is necessary.



The HELIPORT project

“The **HELIPORT** project aims at developing a platform which accomodates the **complete life cycle** of a scientific project and links all corresponding programs, systems and workflows to create a more **FAIR and comprehensible** project description.”

Features:

- Entry point for experiments and scientific projects
- User and group authorisation/management
- Overview of systems and devices involved in a scientific project
- Provision of metadata from proposal management system
- Registration of and access to site-internal file systems
- Automated transfer of metadata between involved systems/services
- Background data publication of datasets (e.g. **Zenodo, Rodare**)
- Integration of reproducible computational workflows
- HPC cluster access (**slurm, UNICORE**)
- Digital object and handle management with graph visualisation
- Timeline representing changes
- **HELIPORT** Web API
- Authentication via **Helmholtz ID**

Project members:



Funded by:



HELMHOLTZ
Metadata
Collaboration

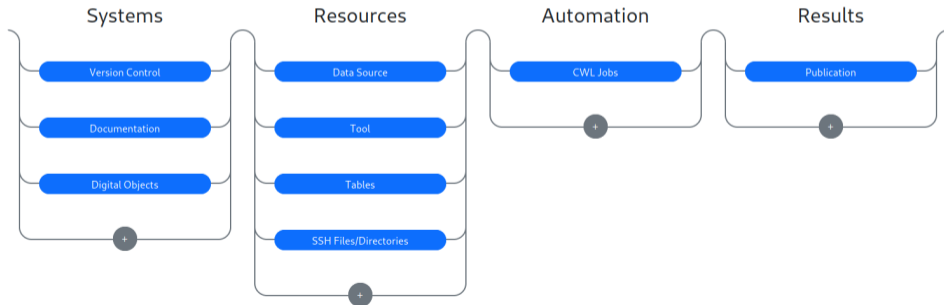
The HELIPOINT project

“The **HELIPOINT** project aims at developing a platform which accomodates the **complete life cycle** of a scientific project and links all corresponding programs, systems and workflows to create a more **FAIR and comprehensible** project description.”

Project members:



Funded by:



HELIPORT infrastructure

- **HELIPORT** web app is based on **Django**
 - **HELIPORT** communicates with various systems through **Web APIs**
 - Project-level metadata is stored in an SQL database and can be exported in various metadata schemes
- Computational workflows are managed in **HELIPORT** and executed on HPC clusters using **slurm** or **UNICORE**

HELIPORT Search About Docs muelle94

Remote Server Logins

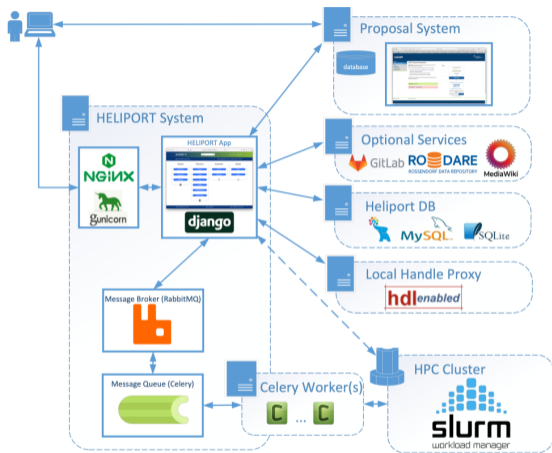
Logins added here can be used to access resources like files on remote servers or workstations.

ID	Type	Name		
25	authentication token	gitlab	Edit	Remove
82	ssh connection	uts	Disconnect	Edit Remove
15	ssh connection	muelle94	Disconnect	Edit Remove

Add a Login

Login Type: Choose a Login Type

- ssh connection
- username and password
- authentication token



HELIPORT interface to Proposal Management System

■ Automated transfer of project metadata from beamtime proposal management system into **HELIPORT**

- Title, Authors, Description
- Beamtime schedule
- Research facility used

HZDR

HZDR Proposal Management

GATE

- Proposal management
- Login
- Registration
- Lost password
- Lost username

You have logged out from proposal management system.
For user with institutional Login: Please close your browser if you want to logout of Shibboleth completely.

HZDR GATE is the general access tool to the research infrastructures (RI) at HZDR, offering access to external user.

Users are kindly required to register in HZDR GATE in order to be able to

- submit a proposal for beamtime at CHMTEC-INFRA, DRACO, ELBE, ISC or RADGATE.
- participate in accepted experiments
- provide user feedback and to submit experimental reports
- publish data resulting from experiments at an RI at HZDR.

A template for project descriptions for beamtime requests at ELBE or DRACO is available following this link.

New Users: Registration

Lost password Lost username

Login

Login via umbrellaID

umbrella
umbrellaID

or

GATE Login

or

Institutional Login via Shibboleth

HZDR
HELMHOLTZ-ZENTRUM
DRESDEN REGIONALSCHE

Helmholtz-Zentrum Dresden-...

Or select your organization from the list below

Please select your org: **Continue**

gELBE beamtime 21102205-ST

GATE Connection

Tags

Project Timeline

Object Graph

Project

Gate Project

GATE-ID	2205
Title	Tests of the detector system for the Stopping Target Monitor of the MUZE experiment in a high flux pulsed gamma beam (Resubmission of 20101909-ST due to COVID pandemic)
Proposer	Mueller, Dr. Stefan (FWCC) - 7394 (Owner of Project "gELBE beamtime 21102205-ST")
Abstract	The gELBE pulsed gamma beam, with narrow pulses set to about 600 kHz repetition rate - the choice of the ELBE CW mode with micropulses at 406 kHz or 812.5 kHz is ideal in our case- is the unique facility in the world suited to study the performance of the Stopping Target Monitor detector of the MuZe Experiment. The STM monitor has the crucial role to normalize the charged lepton flavor muon conversion rate in the MuZe experiment. The ability to operate at high rate in presence of background is crucial. We have at ELBE the unique possibility to validate the final methodology that will be employed by the STM detector.
Proposal	21102205-ST
Restricted	no
Responsible Experimentalist	Mueller, Dr. Stefan (FWCC) - 7394
Local Contact	Schwengner, Dr. Ronald (FWKK) - 938

Project list

- The owner of a project is typically the corresponding beamline scientist, the project proposer acts as a manager and can add additional project members
- Tags and sub-projects including inheritance are possible in the project list

HELIPORT

Search

About Docs muelle94

Project List

Project Name	Last Modified	Owner	
EPOS 23203274	Nov 30, 2023	Ferrari, Dr. Anna (FWKH) - 5161	Open
Semantic x-Lab	Jul 11, 2023	Voigt, Martin (FWCC-D) - 141575	Open
▶ gELBE Projects gELBE	Oct 20, 2023	Mueller, Dr. Stefan (FWCC) - 7394	Open
Cyclotron Update 2023	Jan 24, 2024	Mueller, Dr. Stefan (FWCC) - 7394	Open
SATIF15	May 15, 2023	Mueller, Dr. Stefan (FWCC) - 7394	Open
SOTA on Uncertainties	Jan 31, 2024	Pape, David (FWCC) - 139658	Open
HELIPORT	May 23, 2023	Voigt, Martin (FWCC-D) - 141575	Open
Digital Twin Showcase	Dec 01, 2023	Voigt, Martin (FWCC-D) - 141575	Open
presentation AAA	Nov 28, 2023	Voigt, Martin (FWCC-D) - 141575	Open
My Simulation Project	May 31, 2022	Voigt, Martin (FWCC-D) - 141575	Open

[Create Project](#)

< < 1 2 > >

Systems: Documentation and Code Repositories

The “Systems” section is typically used to refer to all internal and external systems or services which are used:

- Electronic Lab Notebooks (Mediawiki, Hedgedoc, Google-Docs,...)
- GitLab, Github, Workflowhub, ...
- Authentication via pre-defined Login-method (ssh, token, username and password)



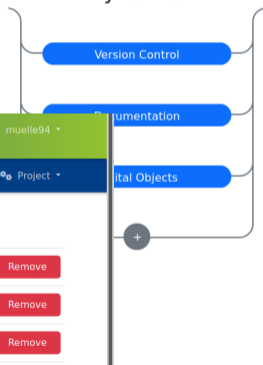
Systems: Documentation and Code Repositories

The “Systems” section is typically used to refer to all internal and external systems or services which are used:

- Electronic Lab Notebooks (Mediawiki, Hedgedoc, Google-Docs,...)
- GitLab, Github, Workflowhub, ...
- Authentication via pre-defined Login-method (ssh, token, username and password)



Systems



The screenshot shows the 'Documentation' page in HELIPORT. It features a search bar, navigation links (About, Docs, muelle94), and a breadcrumb trail: gELBE beamtime 21202619-ST > Documentation. Below the navigation are links for Tags, Project Timeline, Object Graph, and Project. The main content is a table with three columns: ID, Description, and System. Each row has 'Open', 'Edit', and 'Remove' buttons.

ID	Description	System	Open	Edit	Remove
26	Run logbook	HedgeDoc	Open	Edit	Remove
23	Preparation and Requirements	HedgeDoc	Open	Edit	Remove
55	New Cloud folder (Password: .)	Other	Open	Edit	Remove

Systems: Documentation and Code Repositories

The “Systems” section is typically used to refer to all internal and external systems or services which are used:

- Electronic Lab Notebooks (Mediawiki, Hedgedoc, Google-Docs,...)
- GitLab, Github, Workflowhub, ...
- Authentication via pre-defined Login-method (ssh, token, username and password)



Systems

Version Control

Documentation

Digital Objects

HELIPORT About Docs muelle94

Home > gELBE beamtime 21202619-ST > Version Control Tags Project Timeline Object Graph Project

Version Control

ID	Name	View →	Edit	Remove	
32	▲ Alex Keshavarzi's github repo (use branch McrDev)	View →	Edit	Remove	
33	♥ TRCprocess	View →	Open	Edit	Remove

Add a Source Code Repository

HZDR GitLab Other New


< 1 2 ... > ☆

S FWCC / statistics-collector
Collects data from different sources and prepares it for further usage in statistical analysis. Mainly aimed to help with creating the relevant statistics for the yearly report but also extendable for different use-cases. Current status: Import Open

Data resources

- Folders and files in site-internal filesystems can be registered in **HELIPORT** as **data source**
- Each **project member** has read-only access to the files and folders using the stored login credentials of the **HELIPORT** project
- The provenance of the data sets generated from an experiment is entirely comprehensible

The screenshot shows the HELIPORT web interface. At the top, there is a navigation bar with the HELIPORT logo, a search bar, and user information (About, Docs, muelle94). Below the navigation bar, the breadcrumb trail indicates the current location: gELBE beamtime 21202619-ST > SSH Files/Directories. The main content area is titled "SSH Files and Directories" and contains a table with the following data:

ID	Name	Login	Path	
36	 /bigdata /GATE21202619ST/Data	muelle94	/bigdata/GATE21202619ST/Data	Open Edit Delete

Below the table, there is a section titled "Add a Data Source" with a warning message: "⚠ All members of this project will have read-only access to data sources added here! They will only be able to read the data at the specified path and its subdirectories. Please note that HELIPORT is a still a work in progress. Do not share sensitive data!". The form for adding a data source includes the following fields:

- Name**:
- Path**:
- Login**:
- Description**:

Data resources

- Folders and files in site-internal filesystems can be registered in **HELIPORT** as **data source**
- Each **project member** has read-only access to the files and folders using the stored login credentials of the **HELIPORT** project
- The provenance of the data sets generated from an experiment is entirely comprehensible

HELIPORT

Search

About Docs muelle94

gELBE beamtime 21202619-ST > SSH Files/Directories

Tags Project Timeline Object Graph Project

SSH Files and Directories

ID	Name	Login	Path	
36	/bigdata /GATE21202619ST/Data	muelle94	/bigdata/GATE21202619ST/Data	Open Edit Delete

Add a Data Source

⚠ All members of this project will have read-only access to data sources added here! They will only be able to **read** the data at the specified path and its subdirectories. Please note that HELIPORT is a still a work in progress. **Do not** share sensitive data!

Name

HELIPORT

Search

About Docs muelle94

gELBE beamtime 21202619-ST > SSH Files/Directories

/bigdata/GATE21202619ST/Data

Tags Project Timeline Object Graph Project

Select: All **Files** Directories

name, size or date

Select Pattern

/bigdata/GATE21202619ST/Data

- DSPEC_LaBr [Add Tag](#)
- HPGe_data [Add Tag](#)
- Oscilloscope_data [Add Tag](#)

Powered by HZDR, FZJ, HJG & <HMC> Member of Helmholtz Imprint Privacy Policy Terms of Use

HZDR

Integration in Overall Publication Workflow

Automated data publication with:

- Metadata from Proposal system
- Files and folders registered and selected in **HELIPORT**

The image illustrates the integration of HELIPORT into a publication workflow. It features several overlapping screenshots:

- HELIPORT Project Properties:** Shows metadata for a project titled "Phase-resolved Higgs response in superconducting cuprates". Fields include ID, URL, landing page, creation date, department, and title.
- HELIPORT Members and Contributors:** Lists project members with their names and affiliations.
- HELIPORT File Selection:** A "Second Day" view showing a list of files with checkboxes and "Add Tag" buttons.
- Workflow Diagram:** A central diagram showing the flow from "Systems" (Version Control, File Management, Documentation) through "Resources" (Data Source, S3 File/Credentials, UNCCORE Storages) to "Automato" (UNCCORE Jobs).
- RO DARE Article Page:** A screenshot of the published article "Phase-resolved Higgs response in superconducting cuprates" on the RO DARE website. It displays the title, authors, abstract, and a list of files for download.

Orange arrows indicate the flow of information from the HELIPORT interface to the final publication on the RO DARE website.

Sample information management for positron beamline

Provision of information on irradiation samples for HDZR's pELBE positron beamline via online form by users → re-use form data in **MediaWiki** and **HELIPORT**:

Positron Sample Helper

This is a tool to get necessary sample data as json file

Sample + Sample - Last Sample

Sample 1

Sample ID *	Sample Series ID	Owner
<input type="text" value="1Sample-1"/>	<input type="text" value="Eckampferm"/>	<input type="text" value="John Doe"/>
Sample Description	Local Contact *	
<input type="text" value="Energy documentation a lot"/>	<input type="text" value="Maximilian Müller"/>	
Sample Location	Project Name	Sample Parent
<input type="text" value="Duke-University"/>	<input type="text" value="HDZB-Test-Project"/>	<input type="text" value="Eckampferm"/>
<small>This is the current sample location, an important parameter if the sample is to be used at different locations or returned to its owner.</small>	<small>This could be the project name from your project survey, in case of doubt this can also be filled in by your local contact.</small>	<small>Leave empty if your sample is not created out of an other sample which should be listed.</small>
Sample Class Specification <input type="text" value="Thin Film"/>		

Side Description	Layer Count	Layer Material
<input type="text" value="back, length and width"/>	<input type="text" value="0"/>	<input type="text" value="Au/Pb (PVD)"/>
<small>For thin films, it's important to describe certain characteristics to distinguish between the front and back sides.</small>	<small>Number of layers between surface and substrate.</small>	<small>For layers[] from surface to substrate for each material[] use [], [IM], [IM], [IM], ..., [], [IM], [IM], [IM], [IM], ...</small>
Layer Thickness in nm	Layer Density in g/cm ³	
<input type="text" value="100.0"/>	<input type="text" value="1.971338"/>	
<small>Multilayers are separated by </small>	<small>Multilayers are separated by </small>	
Material	Thickness in µm	
<input type="text" value="Au, Pb, Cu"/>	<input type="text" value="0"/>	
<small>Multimaterial samples are separated by </small>	<small>Total sample thickness</small>	
Size, length and width (L, W), in mm	Mass in g	
<input type="text" value="10.0"/>	<input type="text" value="0"/>	
<small>Circular samples use L = W, e.g., 10 mm diameter = 10.0</small>	<small>Total sample mass</small>	

Treatment	Hazardous	Storage
<input type="text" value="annealed at 400°C"/>	<input type="text" value="radioactive, toxic, explosive"/>	<input type="text" value="atmosphere, heat, gas, cooling, darkness"/>
<small>Give some insights into the treatment of samples ex or in situ, if not applicable leave blank.</small>	<small>Multiple hazardous effects are separated by , if not applicable leave blank.</small>	<small>Multiple storage conditions are separated by , if not applicable leave blank.</small>

Sample information management for positron beamline

Provision of information on irradiation samples for HDZR's pELBE positron beamline via online form by users → re-use form data in **MediaWiki** and **HELIPORT**:

Positron Sample Helper

This is a tool to get necessary sample data as json file

Sample [+ Sample](#) [- Last Sample](#)

Sample 1

Sample ID*

Sample Description

Sample Location

This is the current sample location, an important parameter if the sample is in different locations or returned to its owner.

Sample Class Specification

Side Description

For thin films, it's important to describe certain characteristics

Layer Thickness in nm

Material

Size, length and width (L, W), in mm

Circular samples use L = W, e.g., 10 mm diameter = 10.0

Treatment

Give some insights into the treatment of samples ex or in situ, if not a

Main page
Best Practice
ELN (public)
How To
Recent changes

What links here
Related changes
Upload file
Special pages
Printable version
Permanent link

https://wiki.hzdr.de/wiki/FWKK:Cu43Cr-USTHB

Mueller, Dr. Stefan [Talk](#) [Preferences](#) [Watchlist](#) [Contributions](#) [Log out](#)

FWKK [Discussion](#) [Read](#) [Edit](#) [Edit with form](#) [Edit source](#) [View history](#) [More](#)

FWKK:Cu43Cr-USTHB

Creation Date 2022-11-14 14:40

Sample Owner

Sample Series ID Cu43Cr-USTHB

[Add Sample](#)

Sample	Layer Material	Layer Thickness	Substrate Material	Substrate Thickness	Notes
Cu43Cr-Init			Cu, Cr	700 µm	Initial
Cu43Cr-N20-T210-1h			Cu,Cr	700 µm	HPT N=20 T=210 t=1h
Cu43Cr-N20-T25			Cu,Cr	700 µm	HPT N=20 T=RT
Cu43Cr-N20-T550-1h			Cu,Cr	700 µm	HPT N=20 T=550 t=1h
Cu43Cr-N20-T850-1h			Cu,Cr	700 µm	HPT N=20 T=850 t=1h
Cu43Cr-N5-T210-1h			Cu,Cr	700 µm	HPT N=5 T=210 t=1h
Cu43Cr-N5-T25			Cu,Cr	700 µm	HPT N=5 T=RT
Cu43Cr-N5-T550-1h			Cu,Cr	700 µm	HPT N=5 T=550 t=1h
Cu43Cr-N5-T850-1h			Cu,Cr	700 µm	HPT N=5 T=850 t=1h

Category: FWKK:SampleSeries

Sample information management for positron beamline

Provision of information on irradiation samples for HDZR's pELBE positron beamline via online form by users → re-use form data in **MediaWiki** and **HELIPORT**:

Positron Sample Helper

This is a tool to get necessary sample data as json file

Sample **+** **-** **Use Sample**

Sample 1

Sample ID*
id-sample-1

Sample Description
Empty documentation and list

Sample Location
Dost-University

This is the current sample location, an important parameter if the same different locations or returned to its owner.

Sample Class Specification **Thin Film**

Side Description
Name, length and width

For thin films, it's important to describe certain characteristics

Layer Thickness in nm
100

Multilayers are separated by (|)
FWC|

Material
FWK

Multimaterial samples are separated by (|)
FWO

Size, length and width (L, W), in mm
10 | 8

Circular samples use L = W, e.g., 10 mm diameter = 10|10

Treatment
Irradiated at 400°C

Give some insights into the treatment of samples or in situ, if not a

Main page
Best Practice
ELN (public)
How To
Recent changes

Samples* FWOR
group
FWO
FWOR

Tools

What links here
Related changes
Upload file
Special pages
Printable version
Permanent link

FWKK Discussion

FWKK:Cu43Cr-USTH

Creation Date 2022-11-30 14:40
Sample Owner
Sample Series ID Cu43Cr-USTH

> Add Sample

Sample	Layer Material
Cu43Cr-Init	
Cu43Cr-N20-T210-1h	
Cu43Cr-N20-T25	
Cu43Cr-N20-T550-1h	
Cu43Cr-N20-T850-1h	
Cu43Cr-N5-T210-1h	
Cu43Cr-N5-T25	
Cu43Cr-N5-T550-1h	
Cu43Cr-N5-T850-1h	

Category: FWKK:SampleSeries

HELIPORT

Search

About Docs muelle94

pELBE beamtime

Tags Project Timeline Object Graph Project

Systems Resources Automation Results

Documentation

Data Sources
Tool
Workflow


CWL Jobs

Powered by HZDR, FZJ, HIJ & HMC Member of Helmholtz

Cite Imprint Privacy Policy Terms of Use

	Cu,Cr	700 µm	HPT N=5 T=210 t=1h
	Cu,Cr	700 µm	HPT N=5 T=RT
	Cu,Cr	700 µm	HPT N=5 T=550 t=1h
	Cu,Cr	700 µm	HPT N=5 T=850 t=1h

Conclusions

- The **HELIPORT** system allows to describe and collect metadata from services and systems involved in a scientific experiment from the initial proposal to the final publication and eventual data reuse
- This is very important to provide **FAIR** and **comprehensible** research projects
- **Metadata** is shared between services and systems by dedicated **interfaces** (APIs)
 - Sharing of sample information in online form with **MediaWiki** and **HELIPORT** for positron irradiation experiments
- New **HMC** project **Semantic x-Lab** :
 - Interlink information between various systems, research centers and research areas
 - Project partners: HZDR, GFZ, GSI

Resources



Website: heliport.helmholtz.cloud

Repository: codebase.helmholtz.cloud/heliport

The screenshot shows the HELIOPORT website. The main heading is "HELIPORT HELmholtz Scientific Project WORKflow PlaTform". Below it, a paragraph describes the guidance system HELIOPORT as a tool to make the entire life cycle of a project at the HZDR findable, accessible, interoperable and reusable according to the FAIR principles. A sidebar on the left lists various sections: API, data-management plan, documentation, data source, archive, publication, cost-estimation, digital-objects, shareables, and links. Below the main text, there is a section titled "Intuitive and structured user interface" with a small screenshot of the project graph interface.

The screenshot shows the HELIOPORT GitHub repository page. It displays the repository name "HELIPORT", project ID "1287", and statistics: 1,941 Commits, 5 Branches, 2 Tags, and 3.4 GiB Project Storage. A commit history section shows a bump of django from 4.2.4 to 4.2.5. Below the repository page is a workshop presentation slide titled "HELIPORT: A Portable Platform for FAIR {Workflow | Metadata | Scientific Project Lifecycle} Management and Everything". The slide lists authors: Oliver Knodel, Martin Voigt, Robert Ufer, David Pape, Mani Lokamani, Stefan E. Müller, Thomas Gruber and Guido Juckeland. It includes an abstract and an introduction section.

API doc: heliport.helmholtz.cloud/redoc/

