icpm8
8th International Conference on Plasma Medicine
August 3~6, 2021 / Online Conference
ISPB 2021 10th International Symposium on Plasma Bioscience
Associated with 3rd Summer School on Plasma Medicine on August 2~3, 2021

A_1022 A Research Data Management Infrastructure for Plasma Medicine and Beyond

Laura Vilardell Scholten[1], Markus M. Becker[1], Steffen Franke[1], Fabian Hoppe[2,3], Detlef Loffhagen[1], Harald Sack[2,3], Volker Skwarek[4], Tabea Tietz[2,3], and Simon Tschirner[4]

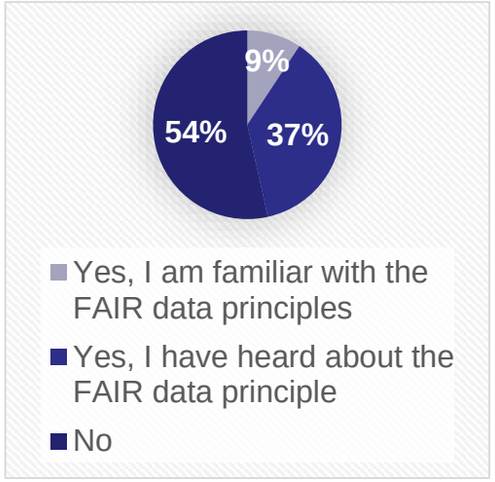
[1]Leibniz Inst. for Plasma Science and Tech. (INP), Germany, [2]FIZ Karlsruhe – Leibniz-Institut für Informationsinfrastruktur GmbH, Germany, [3]Karlsruhe Inst. of Tech., Germany, [4]University of applied sciences Hamburg (HAW), Germany

Current State of Research Data Management in Low Temperature Plasma Science (LTPS) and Aim of this Work

Current state (according to a survey on research data management in LTPS)

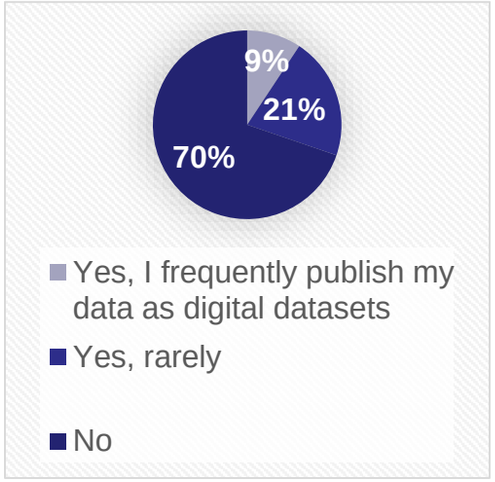
FAIR [1,2] data principles

Did you already know the FAIR data principles?



Open Science

Have you already published datasets?



(Meta)data storage

A lot of people in the community report that no standards are applied and that every single scientist is responsible to maintain their (meta)data

→ Data usage and understanding is bound to the presence of specific people

Aim

- Bring data in our community one step closer to being **FAIR** (**F**indable, **A**ccessible, **I**nteroperable, **R**eusable) [1,2]
- Proof of concept of a system to improve data management from lab to publication
- A knowledge graph as a starting point for a network of metadata specific for LTPS
- Propositions on how to evolve this knowledge graph together with the community
- Reputation monitoring and tamper-proof via blockchain technology

[1] M. D. Wilkinson et al., "The FAIR Guiding Principles for scientific data management and stewardship". Scientific Data 3, 160018 (2016).
[2] FAIR Principles, https://www.go-fair.org/fair-principles/.

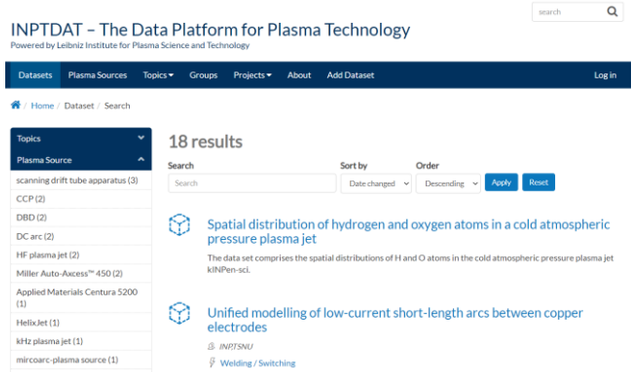
The Project QPTDat – Quality Assurance and Linking of Research Data in Plasma Technology

Research institutes of three different expertises got together to tackle the issue of **FAIR** data in plasma medicine and adjacent fields. The INP represents the plasma community within the project, FIZ contributes their knowledge in linking of data and the HAW makes the process safer and trackable via blockchain technology.

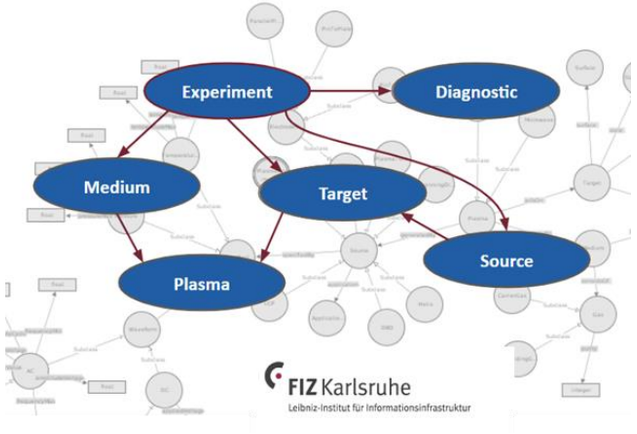
Together, the aim is to propose a system to bring data from the lab to well described and linked published data in a repository.

More information on:
https://www.inptdat.de/project-qptdat

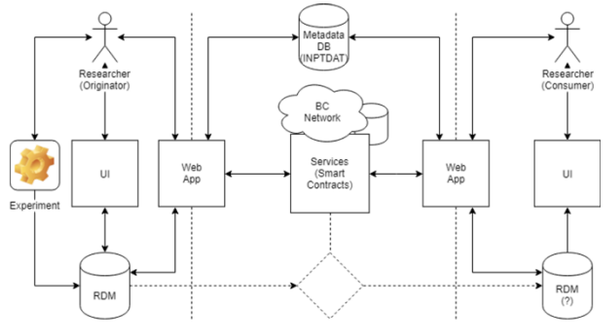
Quality criteria for INPTDAT



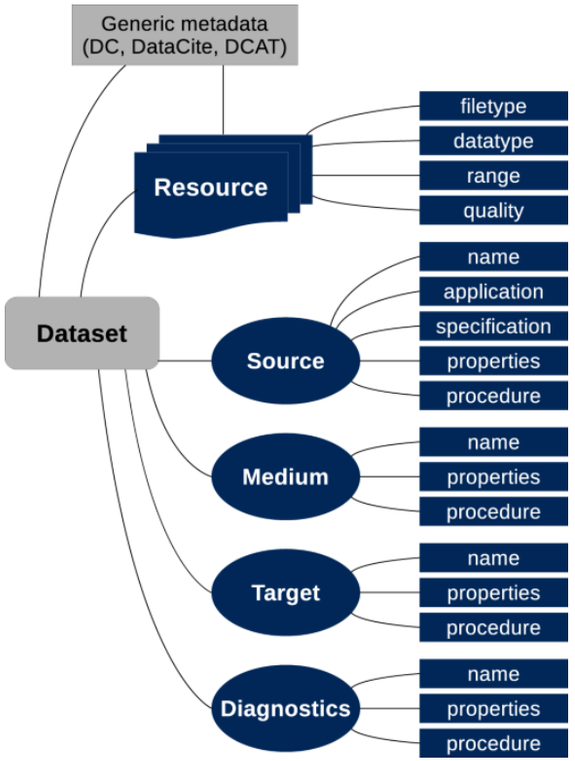
Knowledge graph and ontology development to enable FAIR research data management



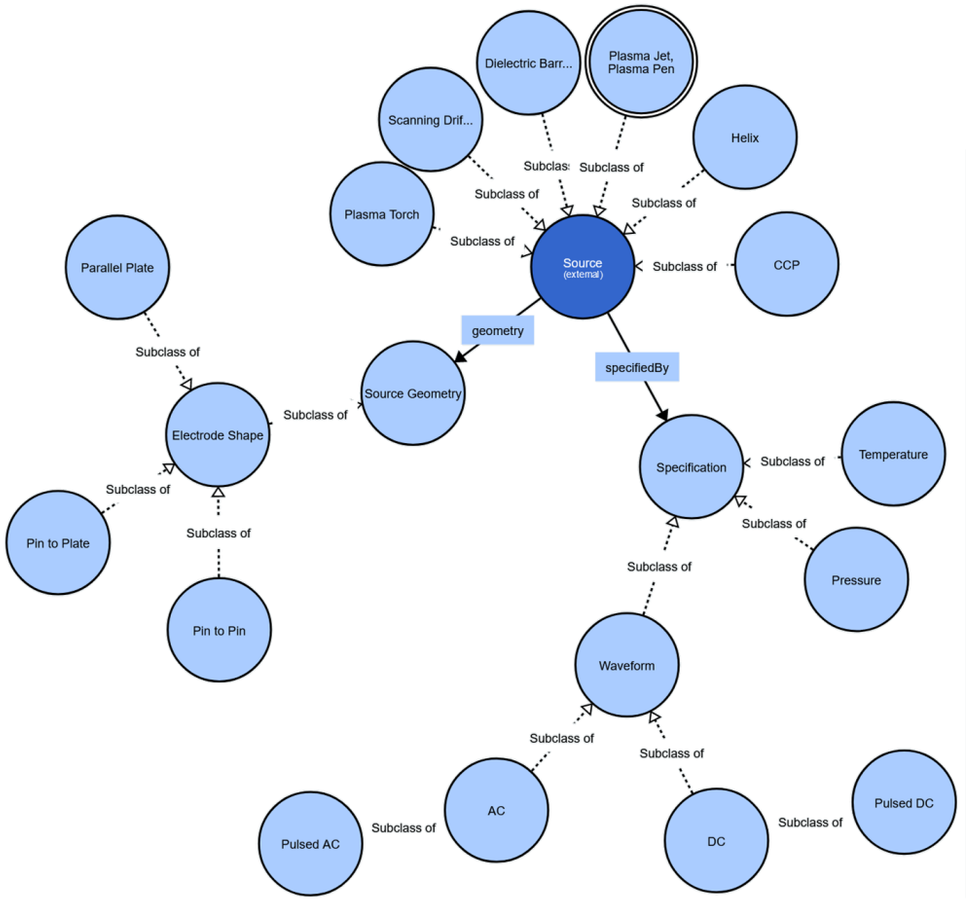
Blockchain protocol for quality control and reputation indices



Metadata Schema and Knowledge Graphs for Plasma Science



General Metadata Schema for Plasma Science [1]



First Draft of a Knowledge Graph for Plasma Sources

- Linked metadata specifically for plasma science (e.g. geometry of plasma source, target material)
- Logic searches become available (e.g. pressure ranges by values)
- The knowledge graph of metadata will be expandable by the community

[1] Franke, S., Paulet, L., Schäfer, J. *et al.* Plasma-MDS, a metadata schema for plasma science with examples from plasma technology. *Sci Data* **7,** 439 (2020).

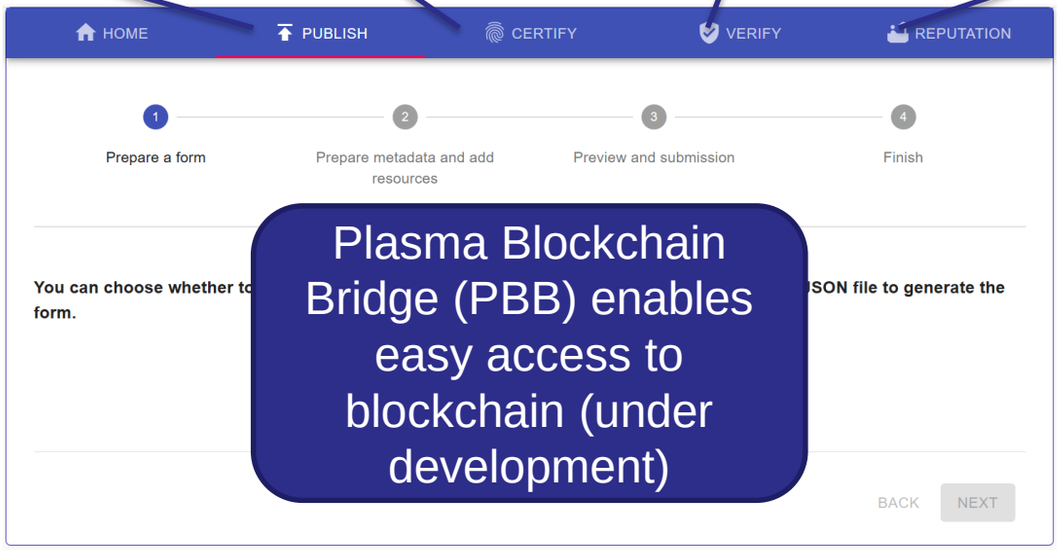
Blockchain for Research Data Management [1] – The Plasma Blockchain Bridge

- Preparation of metadata according to knowledge graph
- OR upload of meta(data) from electronic lab notebook
- Publication in data repository (e.g. https://www.inptdat.de/)

- Certification of data previous to publication
- Fingerprint of your data with saved date and owner

- Use fingerprint (“hash”) of data to check ensure consistency of data at different times (tamper-proof)
- Quality check of metadata

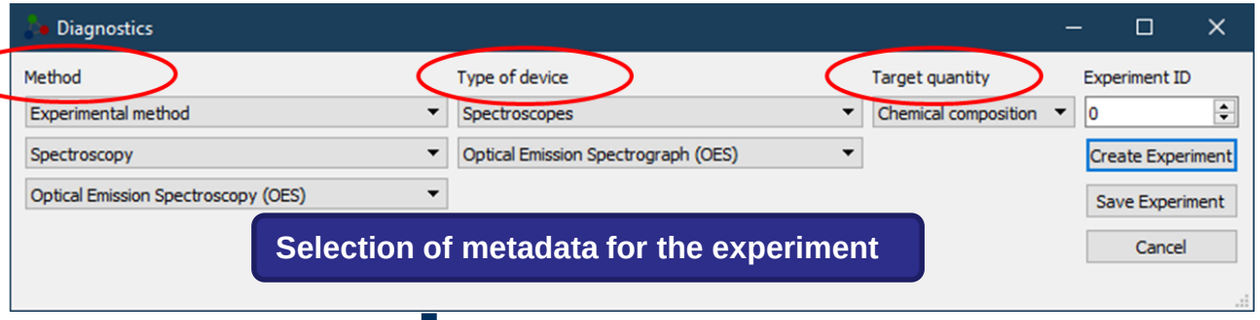
- Get reputation for data publications
- Reuse and cite data of colleagues to increase reputation



Plasma Blockchain Bridge (PBB) enables easy access to blockchain (under development)

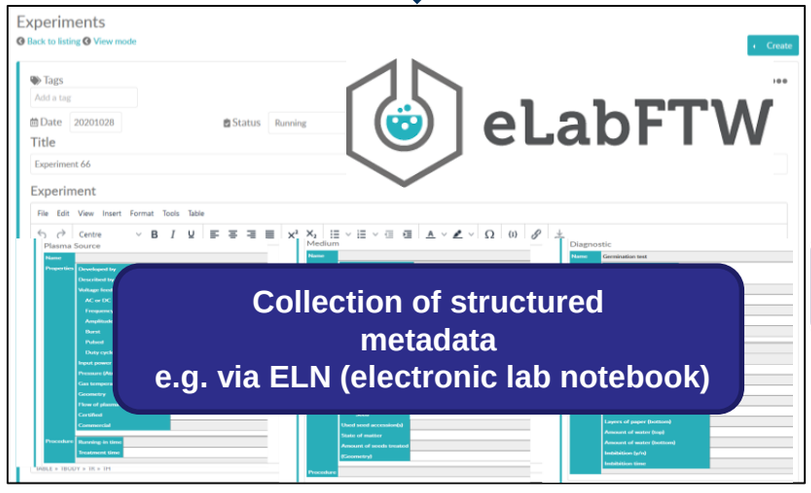
[1] Tschirner S., Röper M., Zeuch K., Becker M.M., Scholten L.V., Skwarek V. (2021) Fostering Open Data Using Blockchain Technology. In: Bisset Álvarez E. (eds) Data and Information in Online Environments. DIONE 2021. LNICST, volume 378. Springer, Cham.

Proposed System for Research Data Management in Plasma Medicine and Beyond



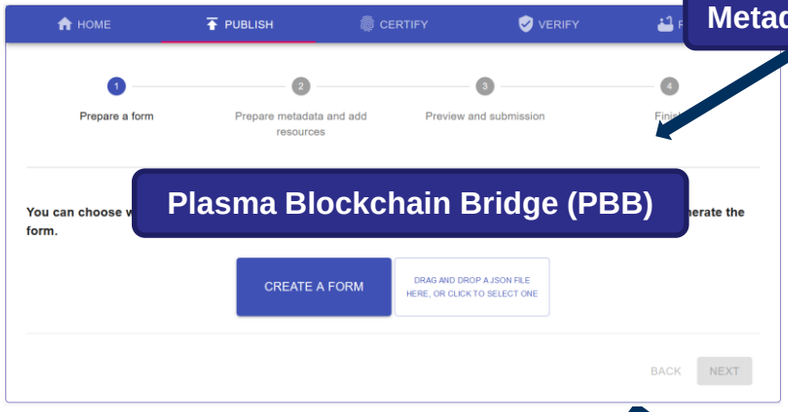
Selection of metadata for the experiment

Required metadata modules



Collection of structured metadata
e.g. via ELN (electronic lab notebook)

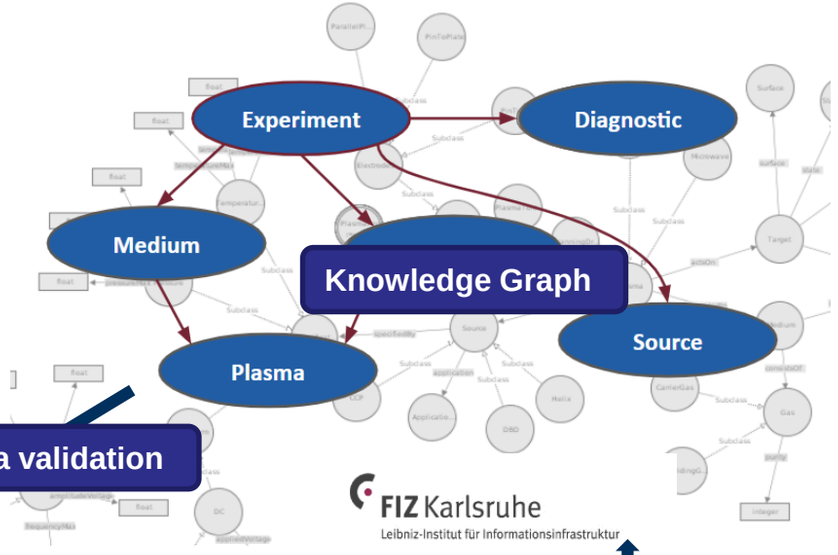
(Meta)data upload and verification



Plasma Blockchain Bridge (PBB)

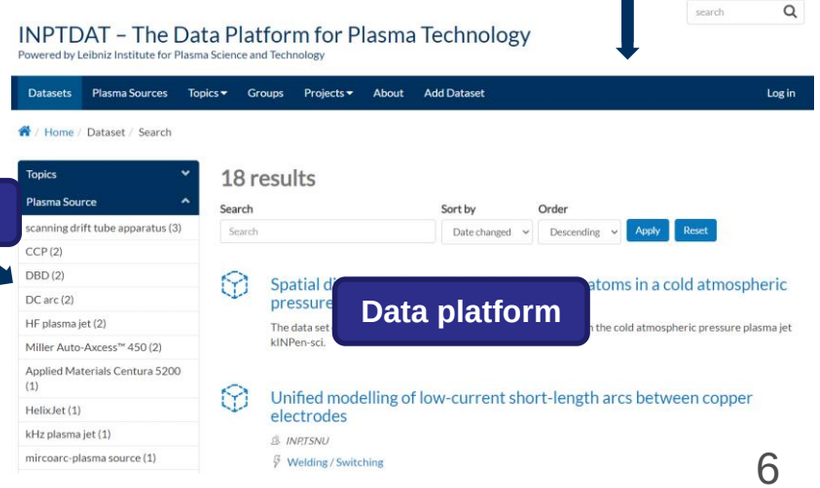
(Meta)data publication

Linked (meta)data



Metadata validation

Metadata synchronization



Data platform

Proposed System for Research Data Management in Plasma Medicine and Beyond

1. Before starting the experiment: Determine necessary metadata with help of the knowledge graph
2. Feed this information into an (electronic) lab notebook
3. Conduct the experiment and take all necessary metadata (options for future automation)
4. Store data and metadata alongside and get an individual key (hash) to save in the blockchain
5. When ready to publish: Data repository can handle metadata, get reputation with the blockchain reputation monitoring
6. Compare your data to others and draw new conclusions

→ More efficient research and more visibility for your own work!

Contact

Leibniz Institute for Plasma Science and Technology

Address: Felix-Hausdorff-Str. 2, 17489 Greifswald

Phone: +49 - 3834 - 554 300, Fax: +49 - 3834 - 554 301

E-mail: welcome@inp-greifswald.de, Web: www. leibniz-inp.de