A research data management workflow for applied plasma science

Markus M. Becker[1,*], Ihda Chaerony Siffa[1], Hans Höft[1], Fabian Hoppe[2,3], Detlef Loffhagen[1], Nick Plathe[1], Harald Sack[2,3], Volker Skwarek[4], Tabea Tietz[2,3], Simon Tschirner[4], and Laura Vilardell Scholten[1]

[1]Leibniz Institute for Plasma Science and Technology (INP), Felix-Hausdorff-Straße 2, 17489 Greifswald, Germany
[2]FIZ Karlsruhe – Leibniz-Institut für Informationsinfrastruktur GmbH, 76344 Eggenstein-Leopoldshafen, Germany
[3]Karlsruhe Institute of Technology (KIT), Institute AIFB, 76133 Karlsruhe, Germany
[4]Hochschule für Angewandte Wissenschaften Hamburg (HAW Hamburg), Berliner Tor 5, 20099 Hamburg, Germany

*E-mail: markus.becker@inp-greifswald.de

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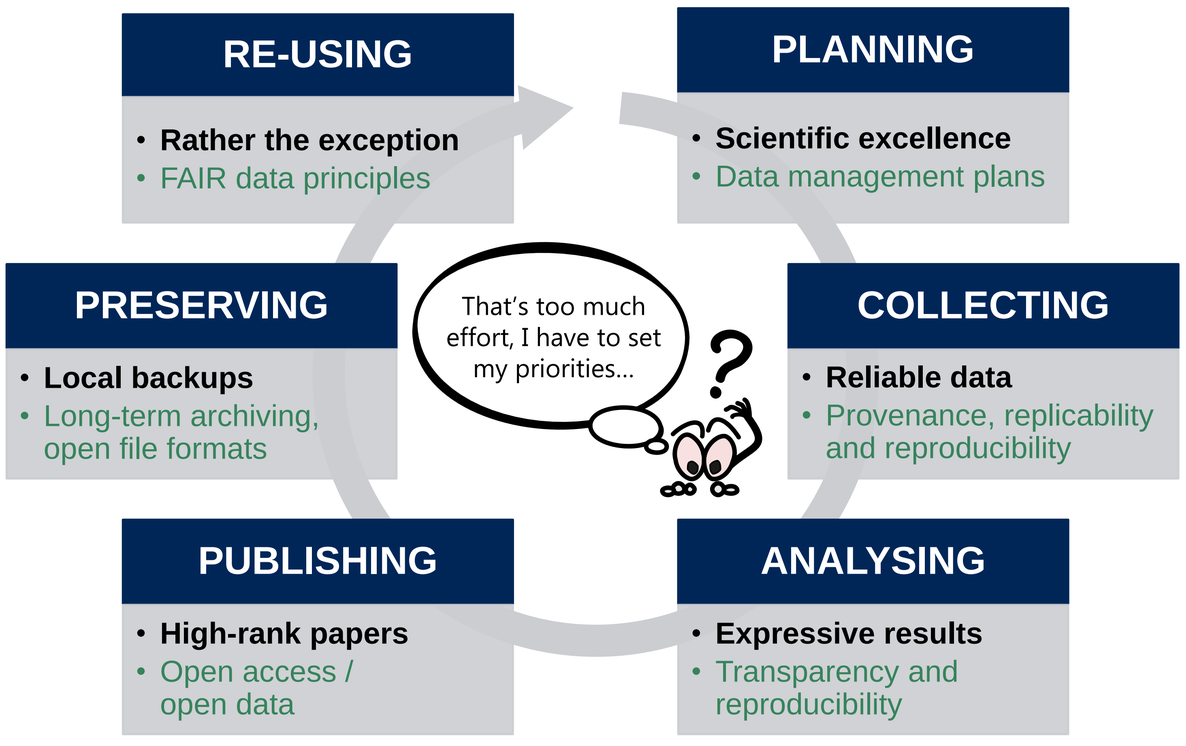
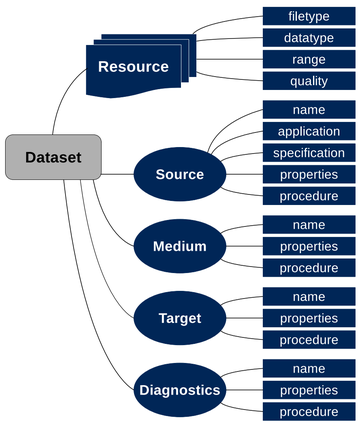
MOTIVATION

- Research data management (RDM) according to the FAIR data principles (Wilkinson 2016) poses new challenges to research processes and complements the primary goals of researchers in plasma science:



FIRST STEPS AND FUTURE REQUIREMENTS

- The plasma metadata schema, Plasma-MDS (Franke 2020) provides core elements for the uniform documentation of data in plasma science.
- Efforts are ongoing to build a common knowledge graph for plasma technology, which facilitates the implementation of the FAIR data principles.
- New workflows and implementations of data management tools are now required in the different labs to balance effort and benefit of RDM, see https://nfdi4phys.de.

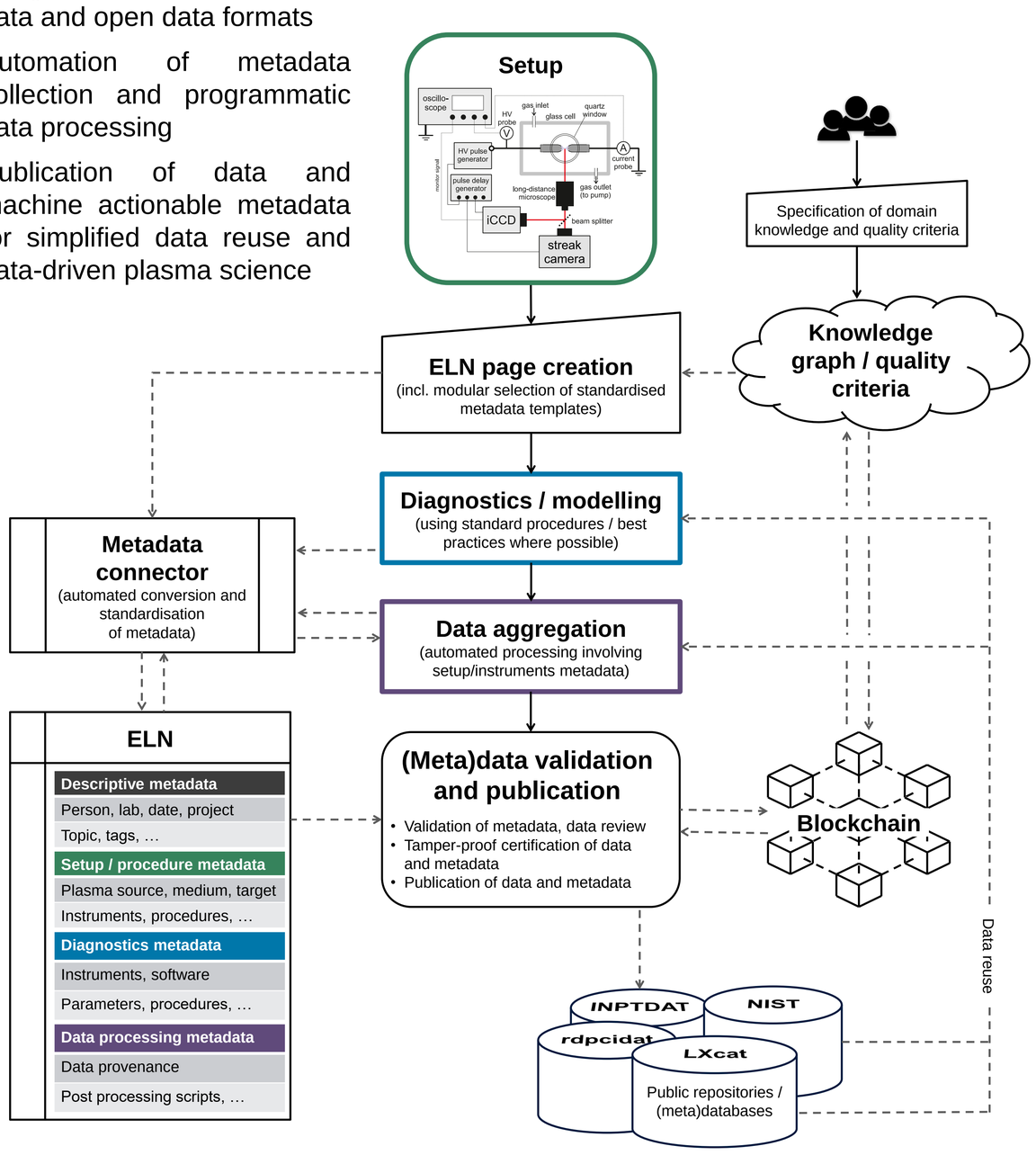


GLOSSARY OF RDM TOOLS

- The **FAIR data principles** are guidelines to improve the Findability, Accessibility, Interoperability, and Reuse of digital assets.
- **Electronic lab notebooks (ELN)** are designed to replace paper lab notebooks and bring several advantages such as automated import/export of information.
- **Blockchain** technology provides a basis for tamper-proof time-stamping and certification of research data, hypotheses and methods.
- **Ontologies** serve to create a formal representation of entities in a knowledge graph.
- A **knowledge graph** is a semantic network of real-world entities, like research domains, authors, instruments, and datasets and defines the relationship between them.

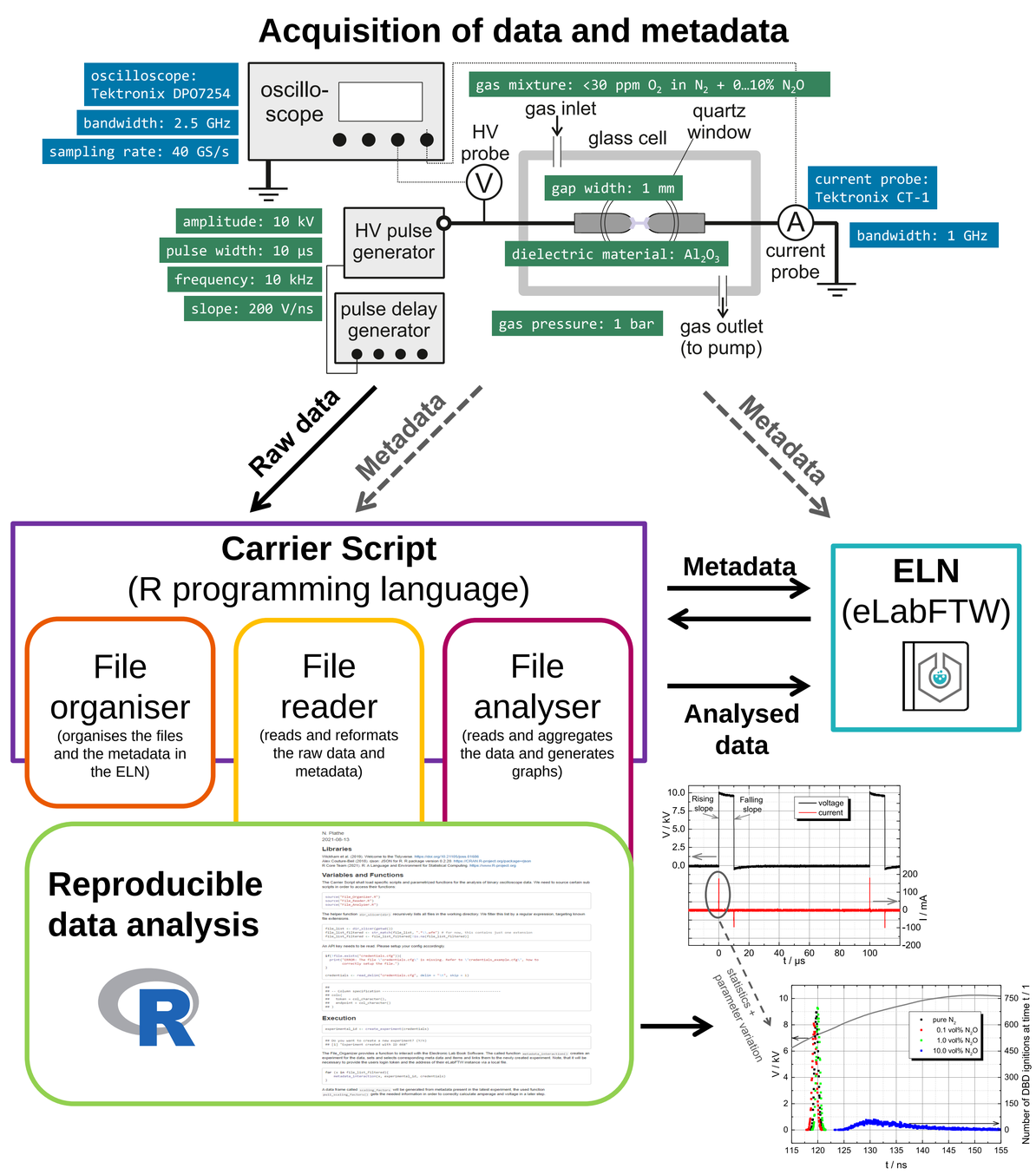
RESEARCH DATA MANAGEMENT WORKFLOW

- Usage of standardised meta-data and open data formats
- Automation of metadata collection and programmatic data processing
- Publication of data and machine actionable metadata for simplified data reuse and data-driven plasma science



WORKFLOW IMPLEMENTATION FOR DBD LAB

- Current measurements with large statistics are used to characterise pulsed dielectric barrier discharges (DBD) at atmospheric pressure.
- Here, the proposed workflow particularly supports the automated and reproducible aggregation of thousands of single-shot measurements.



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RDPCIDAT data platform, https://rdpcidat.rub.de.
LXCat plasma data exchange project, https://lxcat.net.
eLabFTW, https://www.elabftw.net.
R: A language and environment for statistical computing, https://www.R-project.org/.

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