

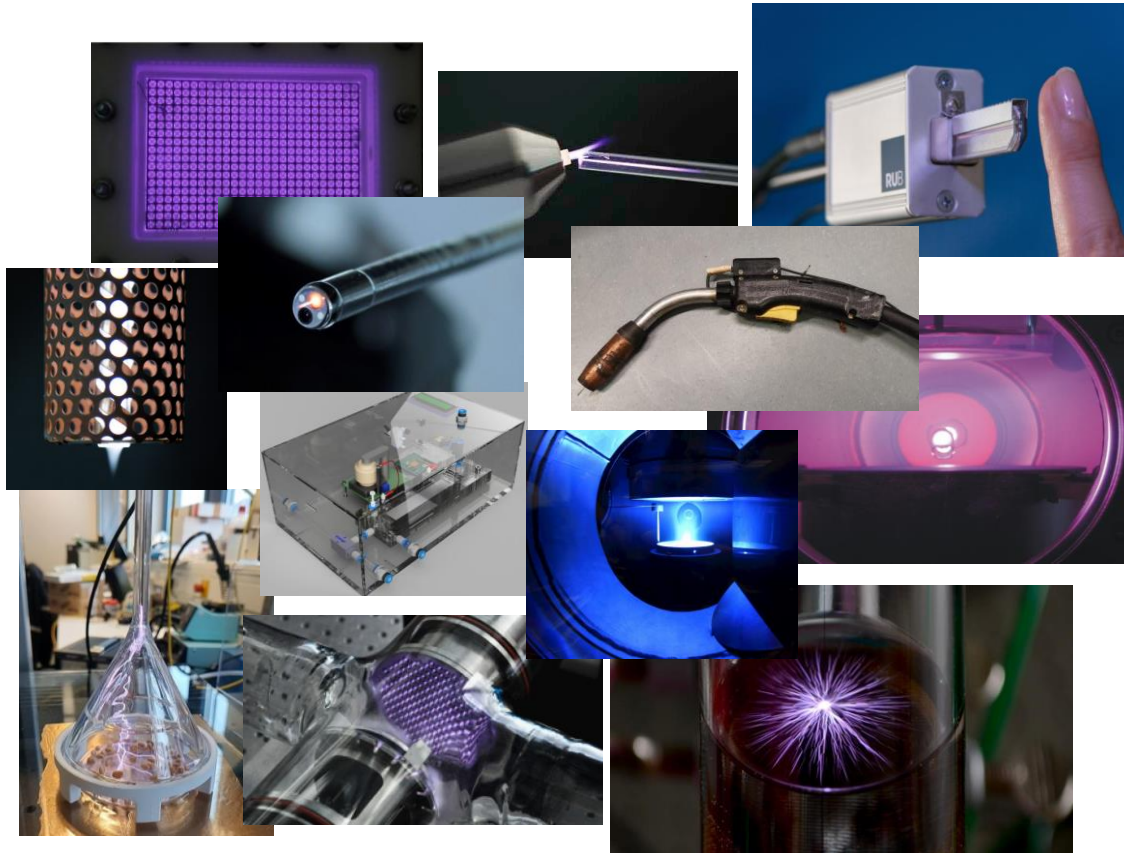
Development of a research data management infrastructure for plasma technology

Markus Becker

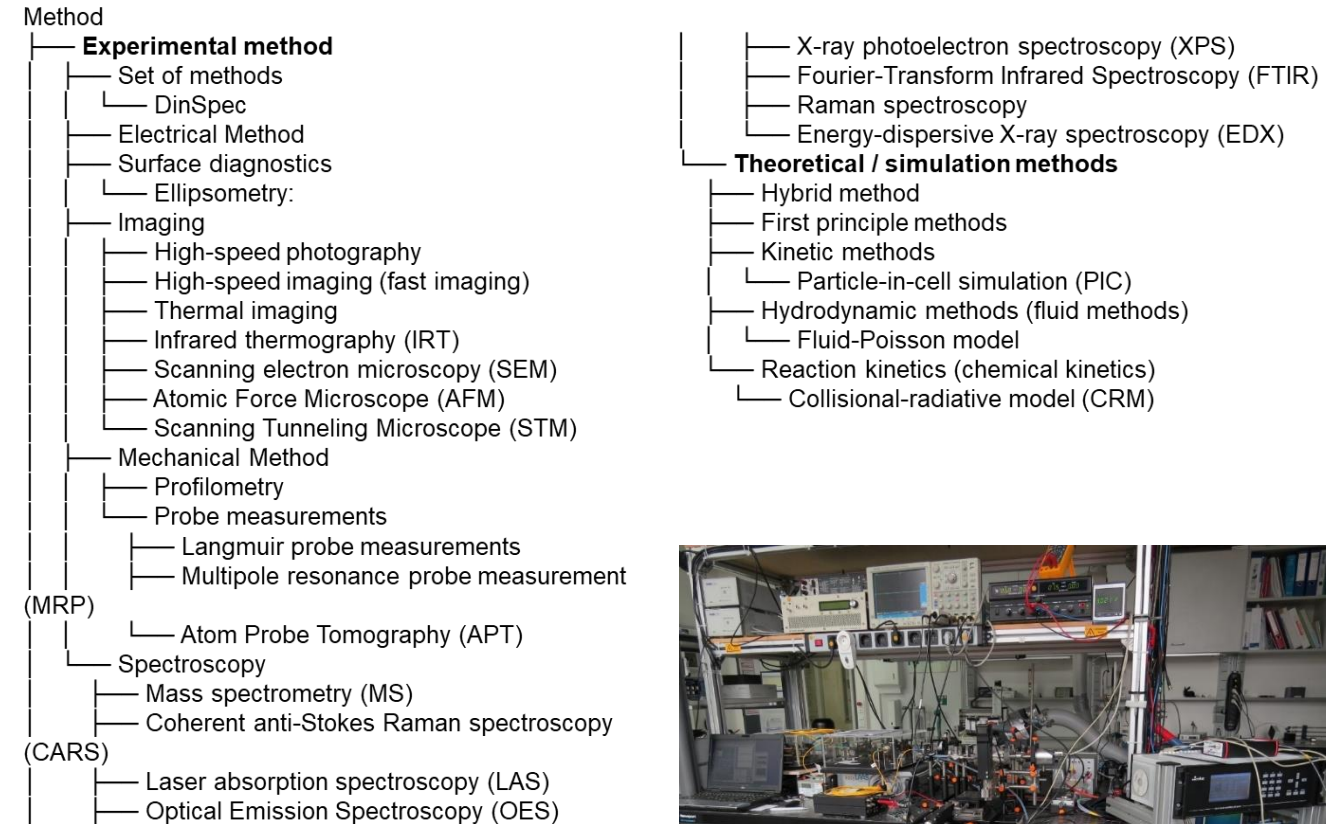
Round-Table „Forschungsdatenmanagement“
2021-05-20, virtual

Challenges for research data management

Diversity of plasma sources

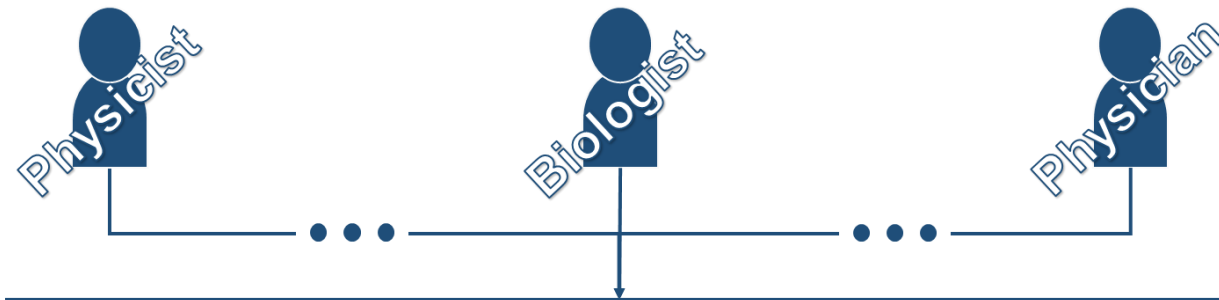


Diversity of methods

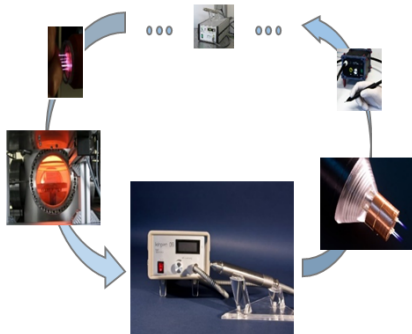


Interdisciplinarity of research fields like plasma medicine

InPT-Dat concept (project at INP from 2017 to 2019)



InPT-Dat data platform



- Storage and sharing of research data
- Reference to corresponding publications
- Content indexing and full-text search
- Direct linking and visualisation of data records
- Directory of plasma sources and applications

Benefit

- Version-safe long-term archiving of research data according to the guidelines of good scientific practice.
- Simplified reuse of interdisciplinary research data, especially for researchers from other fields.
- Merging of heterogeneous research data from different fields of science → generation of new scientific findings.

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and Research

Approach:

1. Subject specific metadata schema
2. Institutional data platform

What are Metadata? What are they for?

Stil

- ☐ Straight (gerades Bein)
- ☐ Loose Fit
- ☐ Skinny (enganliegendes Bein)
- ☐ Slim (schmales Bein)
- ☐ Tapered (schmal zulaufendes Bein)

Weitere

Bundweite (Inch)

24	25	26	27	28
29	30	31	32	33
34	35	36	37	38
39	40	41	42	43

Beinlänge (Inch)

27	28	29	30	31
32	33	34	35	36
37	38			

Farbe

Marke

- ☐ Levi's
- ☐ Diesel

Suchergebnis auf Amazon.de

Stil: Straight (gerades Bein) | Loose Fit | Skinny (enganliegendes Bein) | Slim (schmales Bein) | Tapered (schmal zulaufendes Bein) | Weitere

Filtern nach

Versandoption (Was ist das?)

- ☒ prime
- ☐ Kostenlose Lieferung ab EUR 29 Bestellwert

Kollektion

- ☐ Frühjahr/Sommer 2018
- ☐ Herbst/Winter 2017

Neuheiten

- Letzte Woche
- Letzter Monat
- Letzte 3 Monate

Stil

- ☐ Straight (gerades Bein)
- ☐ Loose Fit
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- ☐ Slim (schmales Bein)
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32	33	34	35	36
37	38			

Farbe

Marke

- ☐ Levi's
- ☐ Diesel

Metadaten helfen Ihnen, relevante Objekte zu finden.
e.g. Men – Jeans – Waist – Length – Label

Red Bridge Herren Jeans Hose Basic Stretch
EUR 39,90
Nur noch 1 Stück auf Lager - jetzt bestellen.
★★★★★ 1

ESPRIT Herren Slim Jeans
EUR 42,64 EUR 49,99 prime
Nur noch 19 Stück auf Lager - jetzt bestellen.
★★★★★ 1

A. Salvarini Designer Herren Jeans Hose Basic Stretch
Jeans Hose Regular Slim
EUR 34,90 EUR 79,90 prime
★★★★★ 119

TOM TAILOR Herren Jeanshose
Jeans 1/1 Marvin Straight
ab EUR 35,40 prime
★★★★★ 97

MERISH 5-Pocket Denim Jeans
Herren Slim Fit Used Design

Rock Creek Herren Jeans Hose
Denim Stretch Regular Fit

A. Salvarini Designer Herren
Jeans Hose Jeanshose Regular

JACK & JONES Herren Jeanshose
ab EUR 31,82 prime
★★★★★ 78

Levi's Herren Jeans 511 Slim Fit
ab EUR 36,21 prime

What are Metadata? What are they for?

- Data about data / object.
- Compressed information.
- Help to filter objects out of a pool.

- Metadata answer core questions about an object, like
 - Who? – Author/Creator/Institution
 - What? / Why? – Title/Abstract
 - When? – Date submitted/accepted/published
 - Where? – Journal/Identifier (DOI/URL)

Dublin Core: The core standard of metadata

1. Identifier
2. Format
3. Type
4. Language
5. Title
6. Subject
7. Coverage
8. Description
9. Creator
10. Publisher
11. Contributor
12. Rights
13. Source
14. Relation
15. Date

ETH zürich

Research Collection

Start → Theses → Doctoral Thesis → Trefferanzeige

Browsen

- Organisationseinheiten
- Publikationstypen
- Autoren

Publizieren

- Neue Publikation

Statistik

- Downloads nach Land
- Beliebteste Publikationen
- Beliebteste Autoren

Investigation of the magnetic and magnetoelectric properties of orthorhombic REMnO₃ thin films

Download

- Abstract (Adobe PDF, 261.3Kb)
- Fulltext (Adobe PDF, 55.52Mb)

Rechte / Lizenz

In Copyright - Non-Commercial

Persistent Identifier

http://hdl.handle.net/20.500.11850/79083

Open access

Autor(in)

Bator, Matthias

Datum

2013

Typ

Doctoral Thesis

Publikationsstatus

published

Externe Links

Suchen via SFX

Beteiligte

Referent: Wokaun, Alexander

Referent: Lippert, Thomas

Verlag

ETH

dc.contributor.author	Bator, Matthias
dc.contributor.author	Wokaun, Alexander
dc.contributor.supervisor	Lippert, Thomas
dc.date.accessioned	2017-08-30T13:04:36Z
dc.date.available	2017-06-11T03:49:01Z
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dc.date.issued	2013
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dc.identifier.doi	10.3929/ethz-a-009770997

Subject specific metadata standards

- <http://www.dcc.ac.uk/resources/subject-areas/physical-science>

Physical Science

Materials Science Geography Geology Geoscience Crystallography Solar physics Astrophysics Molecular biology Multi-disciplinary Biochemistry Meteorology Space science Remote Sensing Chemistry Nuclear and Particle Physics Physics Bioinformatics Astronomy

Metadata Standards

AVM - Astronomy Visualization Metadata

A standard defining discovery metadata for fully rendered astronomical imagery.

CIF - Crystallographic Information Framework

An extensible standard file format and set of protocols for the storage of crystallographic and structured data.

CSMD-CCLRC Core Scientific Metadata Model

A study-data oriented model that captures high-level information about scientific studies and the data they produce, primarily tailored for the physical sciences.

FITS - Flexible Image Transport System

Used by the astronomy community to originally describe telescope images, but is now a family of standards to describe multi-dimensional data including spatial, spectral and temporal dimensions and the distortions that may be present.

No standard exists for plasma physics

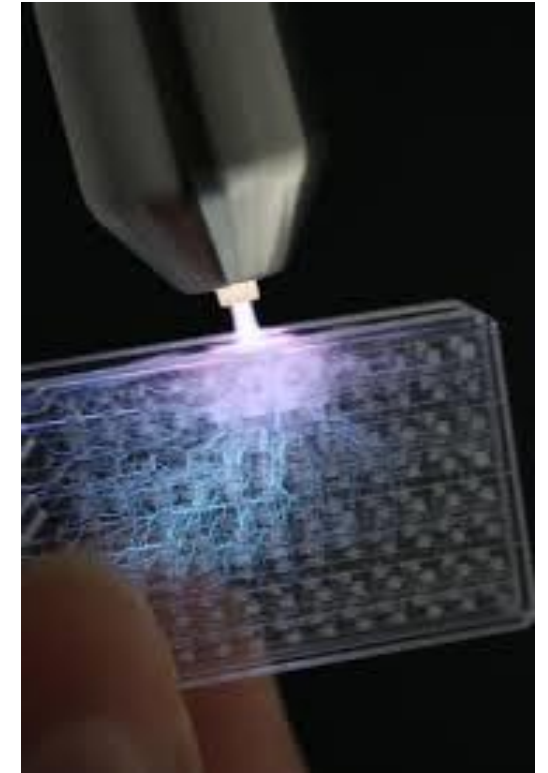
- IVOA - Resource Metadata for the Virtual Observatory

Collection and service metadata

Apache Point Observatory, Sloan 2.5-m Telescope	
Five-band clocked CCD camera	
Coverage.Spatial	PositionInterval FK5 145.17 -1.25 235.9 1.25 PositionInterval FK5 250.71 52.15 267.0 66.29 PositionInterval FK5 350.43 -1.25 359.99 1.17 PositionInterval 0.0 -1.25 56.37 1.17
Coverage.RegionOfRegard	0.0001
Coverage.Spectral	Optical
Coverage.Spectral.Bandpass	u', g', r', i', z'
Coverage.Spectral.MinimumWavelength	400.e-9
Coverage.Spectral.MaximumWavelength	850.e-9
Coverage.Temporal.StartTime	1999-12-25
Coverage.Temporal.StopTime	2001-07-15
Coverage.Depth	3.e-6
Coverage.ObjectDensity	6.e4
Coverage.ObjectCount	2.e7
Coverage.SkyFraction	0.01

Development of a general concept

- Plasma
 - ... is generated by a plasma **source**
 - ... is operated with/in a **medium**
 - ... is sometimes used to treat a **target**
- **Diagnostics** (experimental and/or computational methods) are used to study the plasma, medium and/or target
- Stored research data (**resources**) are often useless without information about the whole process
- Application and specification of the plasma would help to find relevant data sets



Plasma source (APPJ, COST-Jet, kINPen)



Metadata field

plasma.source.name

plasma.source.application

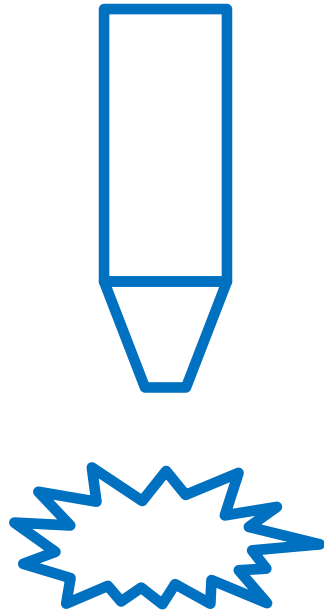
plasma.source.specification

plasma.source.properties

plasma.source.procedure



Plasma medium (air, Ar, O2)



Metadata field

plasma.source.name

plasma.source.application

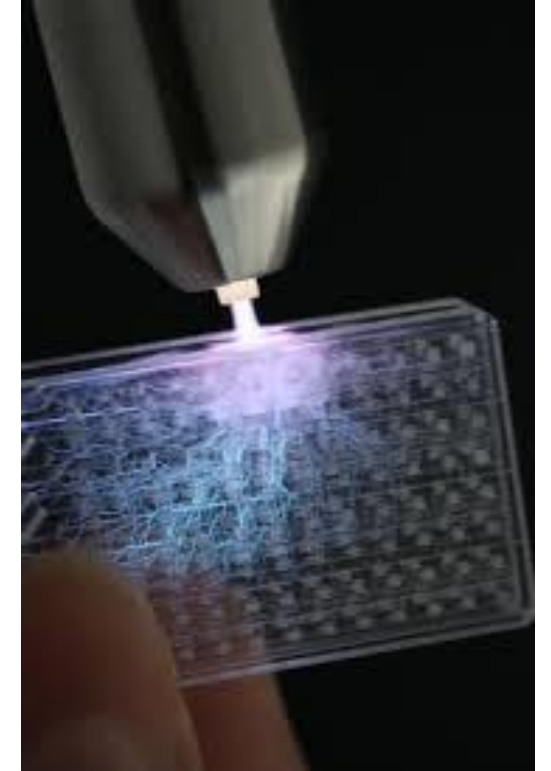
plasma.source.specification

Metadata field

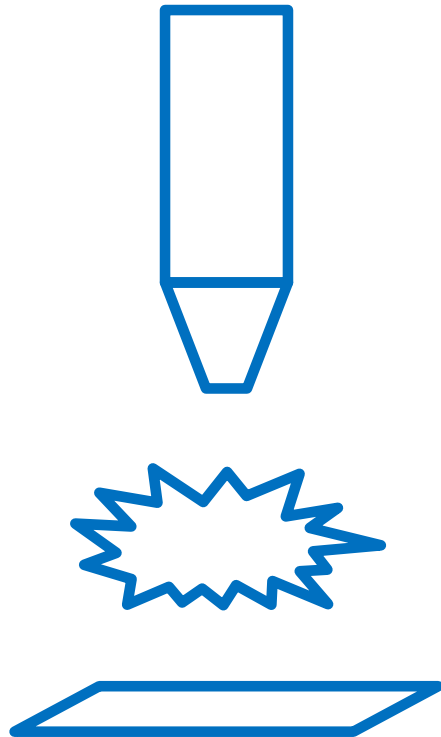
plasma.medium.name

plasma.medium.properties

plasma.medium.procedure



Plasma target (silicon wafer, E. coli, distilled water)



Metadata field

plasma.source.name

plasma.source.application

plasma.source.specification

Metadata field

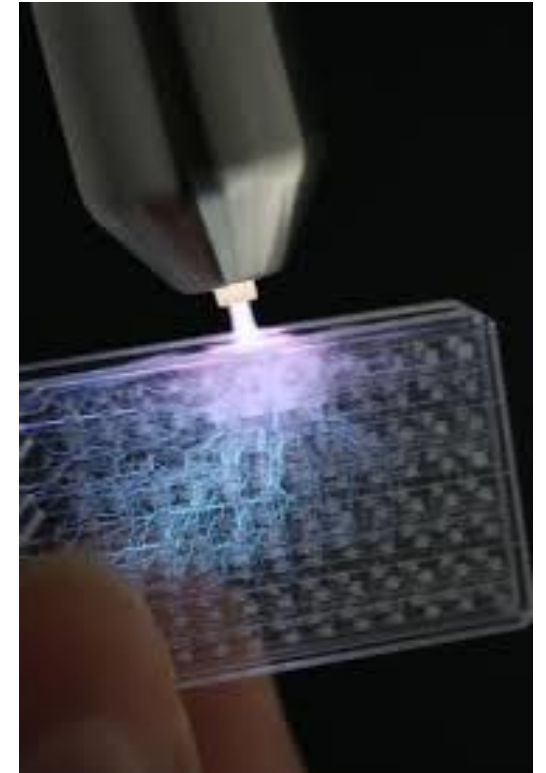
plasma.source.name

Metadata field

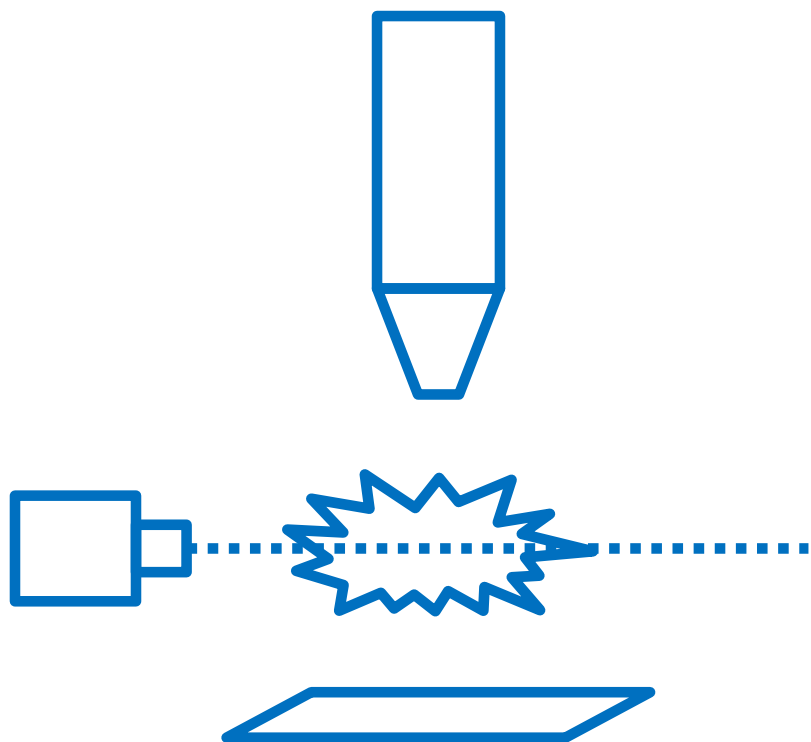
plasma.target.name

plasma.target.properties

plasma.target.procedure



Diagnostics / modelling / simulations (OES, XPS, PIC-MCC)



Metadata field

plasma.source.name

plasma.source.application

plasma.source.specification

Metadata field

plasma.s

Metadata field

plasma.diagnostics.name

plasma.diagnostics.properties

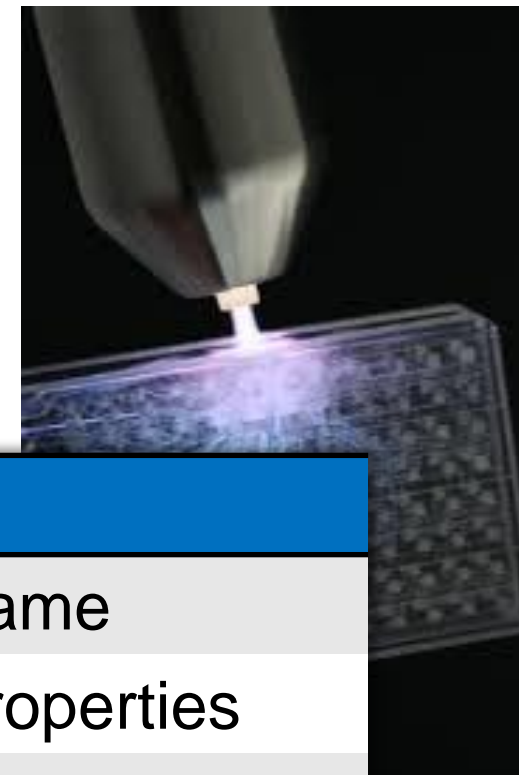
plasma.diagnostics.procedure

Metadata

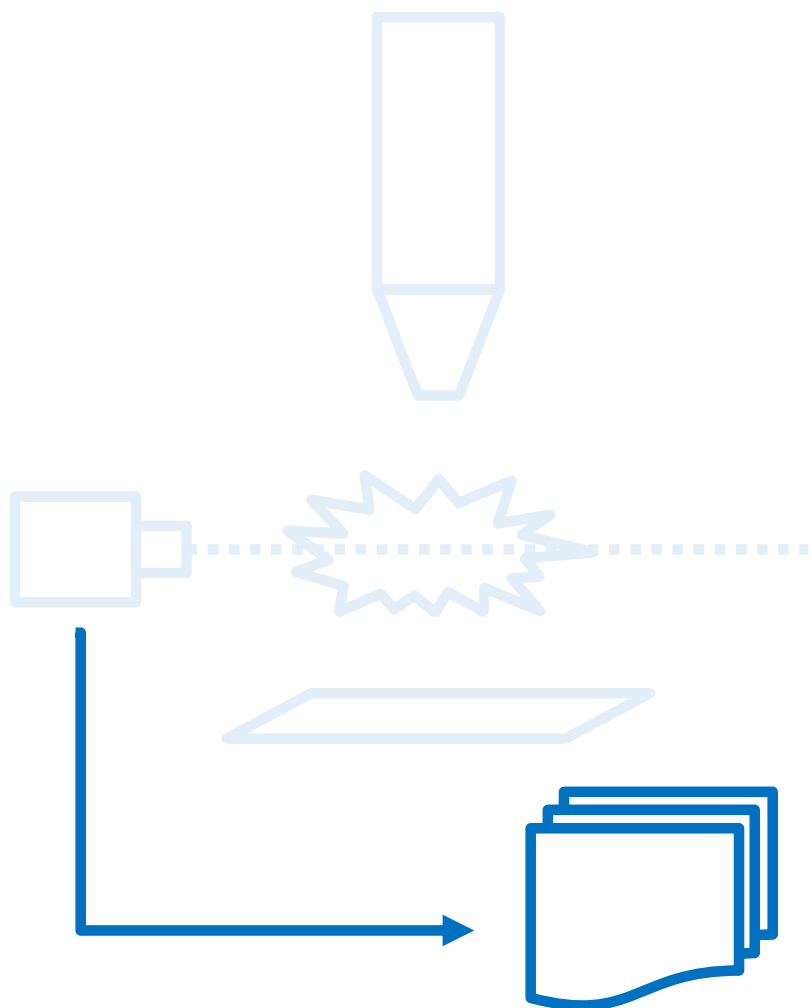
plasma.t

plasma.t

plasma.target.procedure



Resource (data file)



Metadata field

plasma.source.name

plasma.source.application

plasma.source.specification

Metadata field

plasma.s

Metadata field

plasma.resource.filetype

plasma.resource.datatype

plasma.resource.range

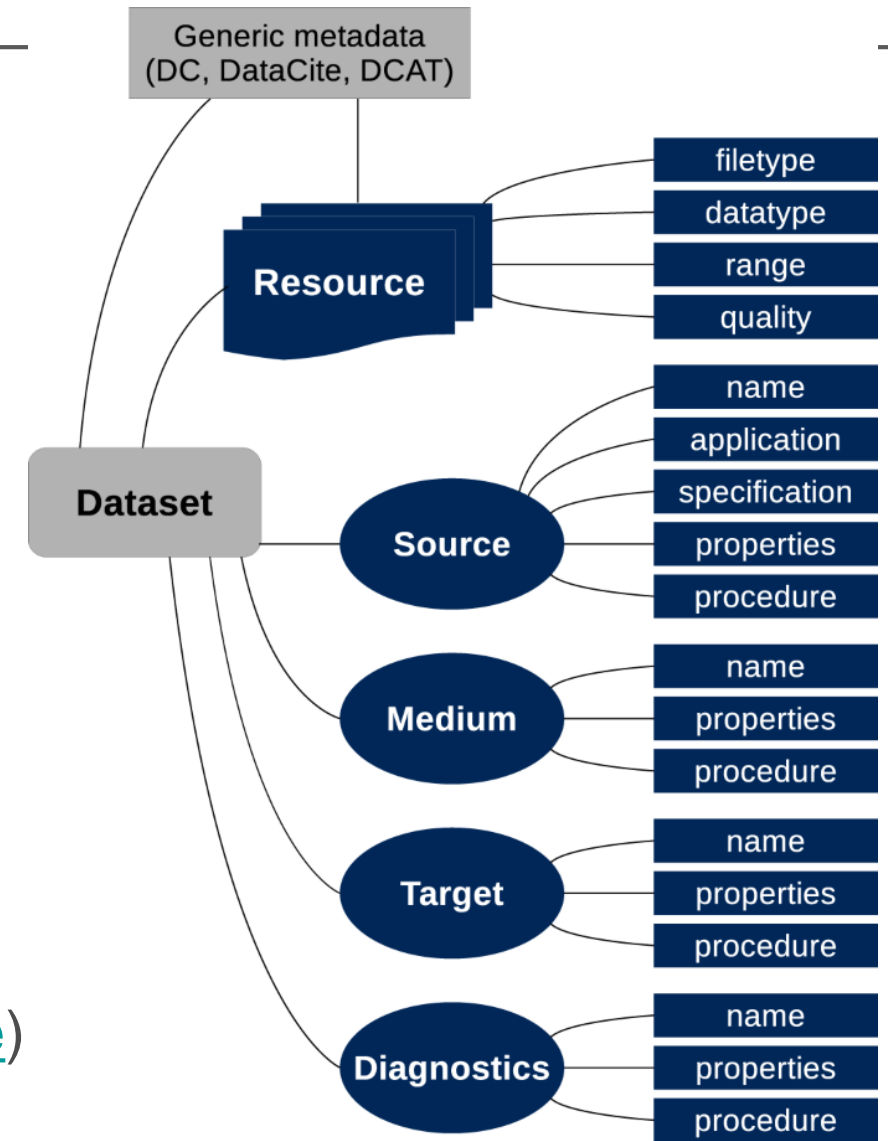
plasma.resource.quality



Plasma metadata schema

Plasma-MDS

- Disciplinary metadata schema for plasma science
- Metadata fields for description of
 - plasma source
 - plasma medium
 - plasma target
 - diagnostics / modelling / simulations
 - resources (data)
- Research data repositories implementing Plasma-MDS at INP (<https://www.inptdat.de>) and RUB (<https://rdpcidat.rub.de>)



INPTDAT – The Data Platform for Plasma Technology

Powered by Leibniz Institute for Plasma Science and Technology

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Home / Plasma Medicine / Search

Content Type

- Patent (18)
- Plasma Source (3)
- Dataset (2)

Topic

- Plasma Medicine
- Plasma Chemical Processes (3)
- Decontamination (2)
- Materials / Surfaces (1)

Application

- Plasma Source
- Plasma Specification
- Tags
- Group
- Author
- Technology Readiness Level
- Resource Datatype
- Resource Filetype
- License

23 results

Search

Sort by Date changed Order Descending Apply Reset

Device for the plasma treatment of human, animal or plant surfaces, in particular of skin or mucous membrane areas

INP Plasma Medicine

The invention relates to a device for the treatment of free-form areas and zones of human or animal skin areas or plant surfaces by means of cold atmospheric-pressure plasma. The core of the device is a specific, preferably gas-permeable,...

Device for the planar treatment of areas of human or animal skin or mucous membrane surfaces by means of a cold atmospheric pressure plasma

INP Plasma Medicine

The invention relates to a device, preferably a collar, for treating areas of human or animal skin or mucous membrane with a cold atmospheric pressure plasma by creating a dielectrically hindered surface discharge, comprising at least one...

Method for classification of platelet aggregation

INP Plasma Medicine

The invention relates to a method for detecting a platelet object and for determining a number of platelets in the platelet object in a sample, a platelet object having at least one platelet. In particular, the sample comprises whole blood. At...

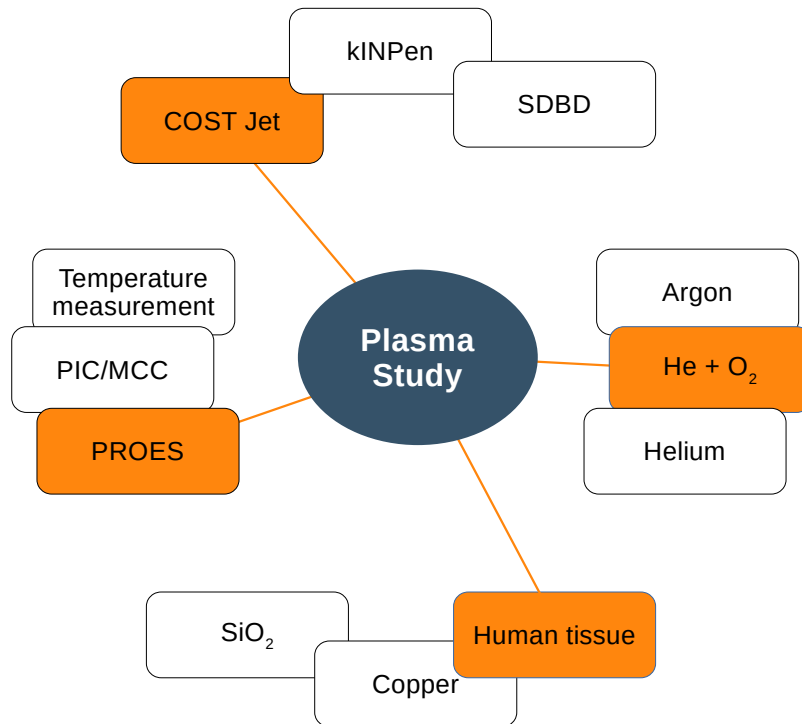
- Data publications with DOI for linking of journal paper and data set

17. Zhang G, Goett G, Uhrlandt D, Lozano Ph, Sharma R (2020).
A simplified voltage model in GMAW, INPTDAT
<https://doi.org/10.34711/inptdat.146>

- Linking of data sets, patents and plasma sources
- Plasma-MDS for uniform annotation of data
- Facetted search for data filtering
- External data sets can be included in the catalog (automated exchange of metadata between related repositories in preparation)
- The source code is on Github:
<https://github.com/plasma-mds/inptdat-platform>

Next step: modular refinement of metadata

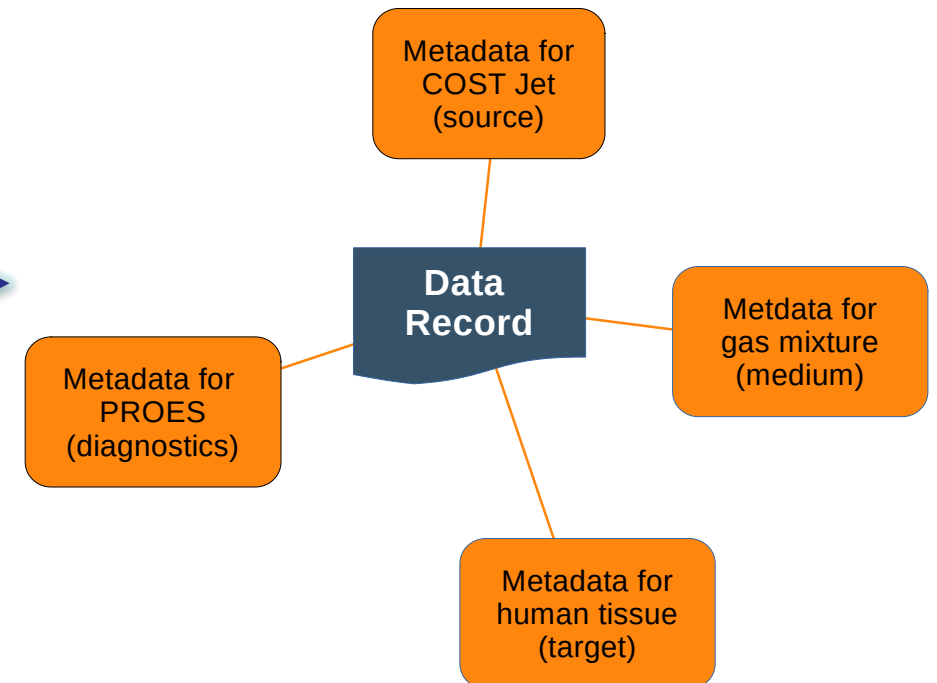
Metadata modules for different devices, methods, substrates etc.



Selection according to
given requirements



Individual compilation of data
documentation templates



QPTDat concept (joint project from 2019 to 2022)



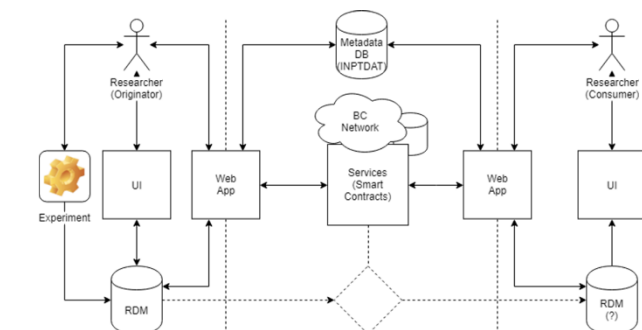
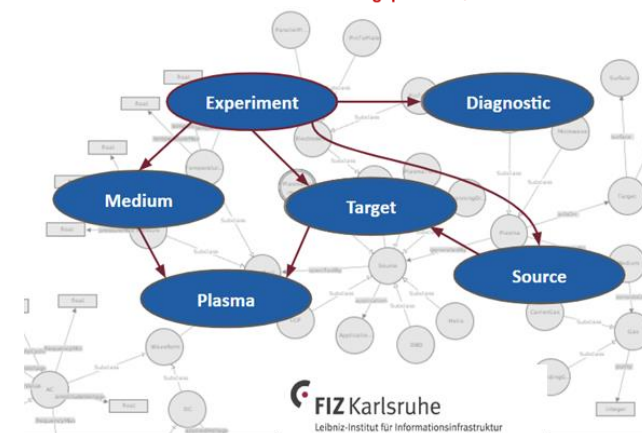
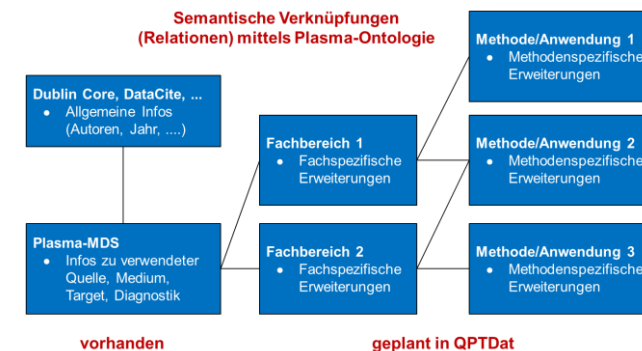
Metadata modules
and quality criteria for
reference cases



Ontology and knowledge
graph for semantic
linking

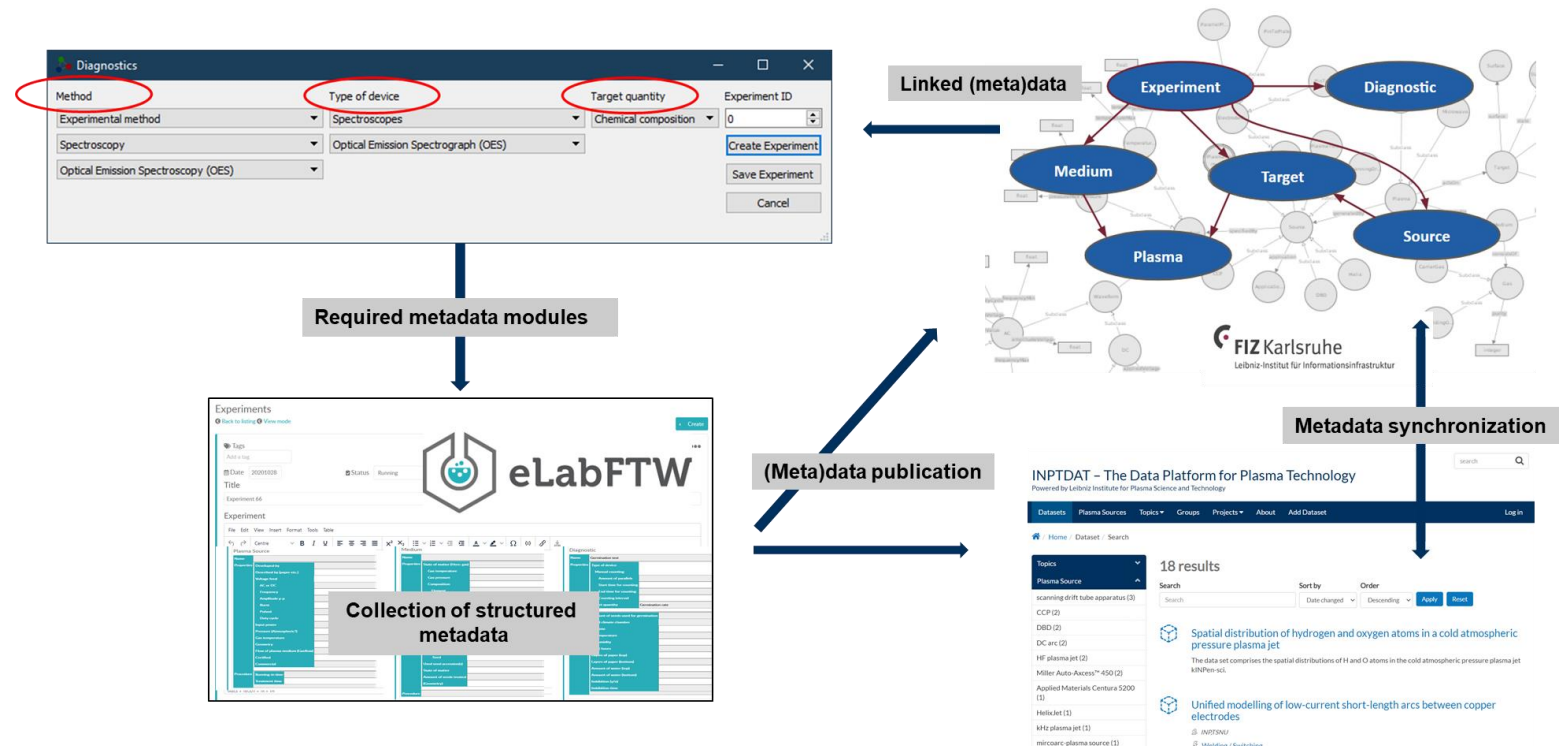


Blockchain for data
certification and
reputation monitoring



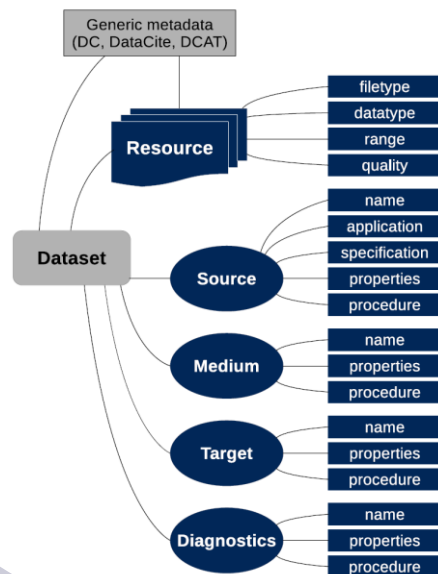
Community involvement

- Github repository as a starting point for broader development of joint concepts: <https://github.com/plasma-mds/plasma-metadata-schema>
- Development of metadata modules and related templates for electronic lab notebooks (eLabFTW)
- The knowledge graph will provide the basis for automated processes and simplified data annotations in the long-term.



Conclusion and outlook

Development of
metadata schema
and data platform



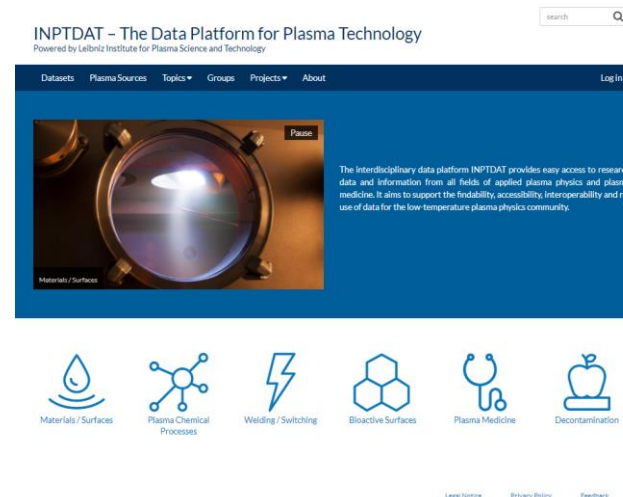
InPT-Dat

QPTDat

NFDI4Phys

Knowledge graph + Blockchain
for implementation of quality
criteria and RDM workflows

Community wide
RDM tools and
standards



<https://www.inptdat.de>



<https://rdpcidat.rub.de>

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