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HELPMI: Helmholtz Laser-Plasma Metadata Initiative

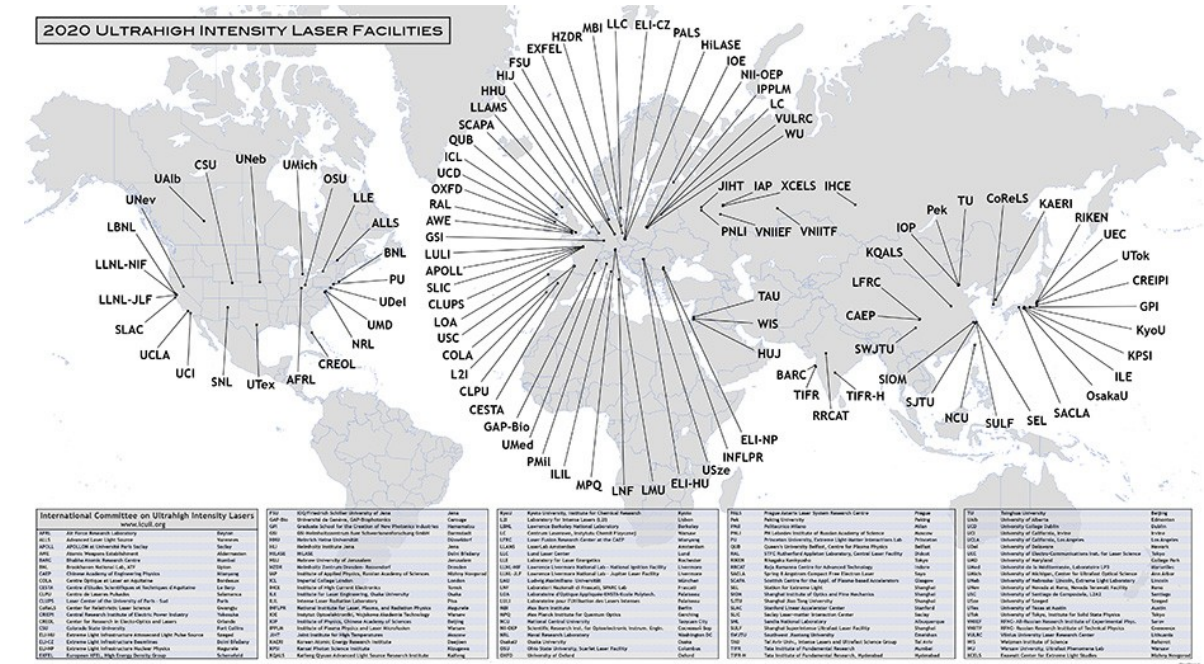
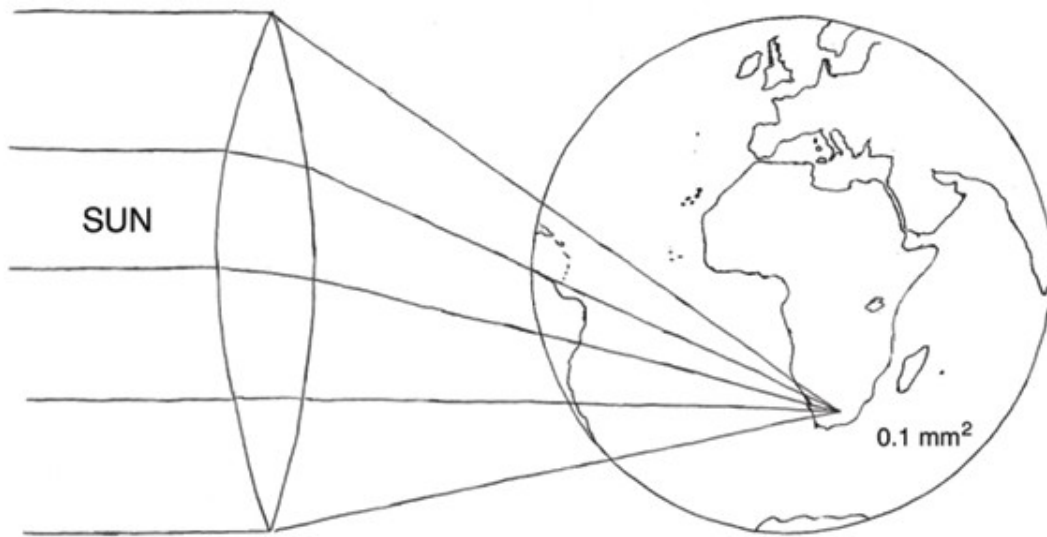


Who is our community?

HELPMI: ... Laser-Plasma ...

Ultra-intense lasers can transform plasmas into particle-accelerating structures

- Ultra-fast (fs-ps), Joule-kJ laser facilities: ICUIL.org
- Chirped pulse amplification (invented 1985, Nobel prize awarded 2018)



Schworer H. (2008). Particle acceleration with lasers. *S. Afr. J. Sci.* **104**, 299-304.

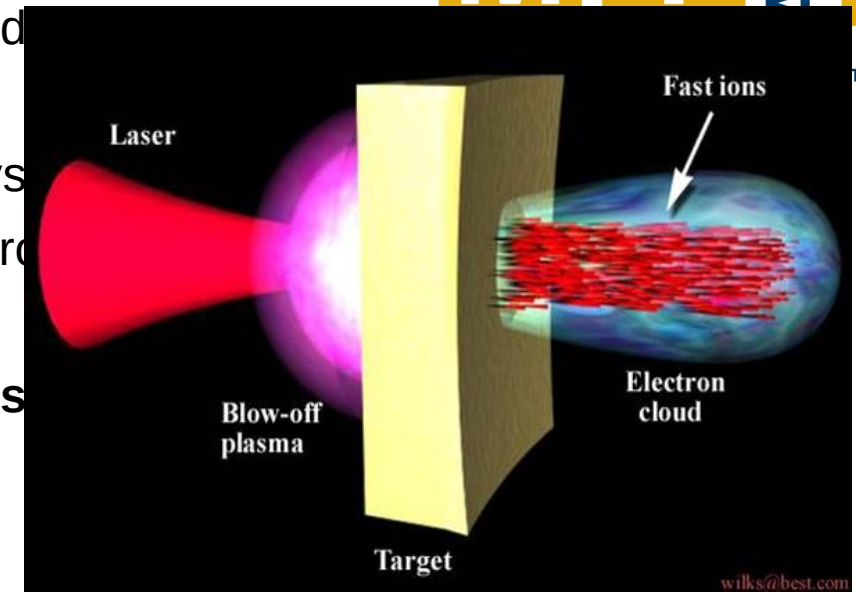
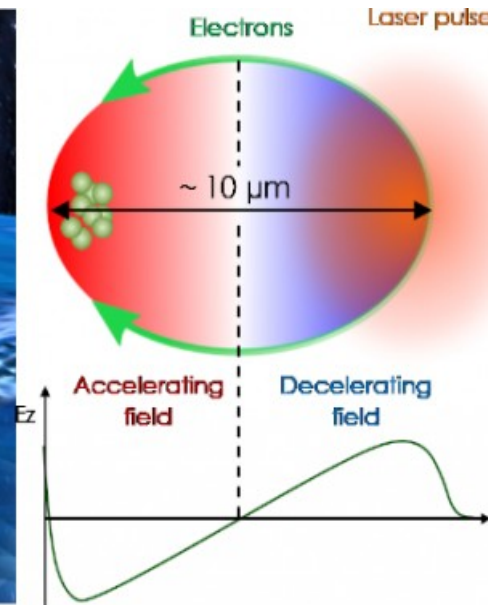
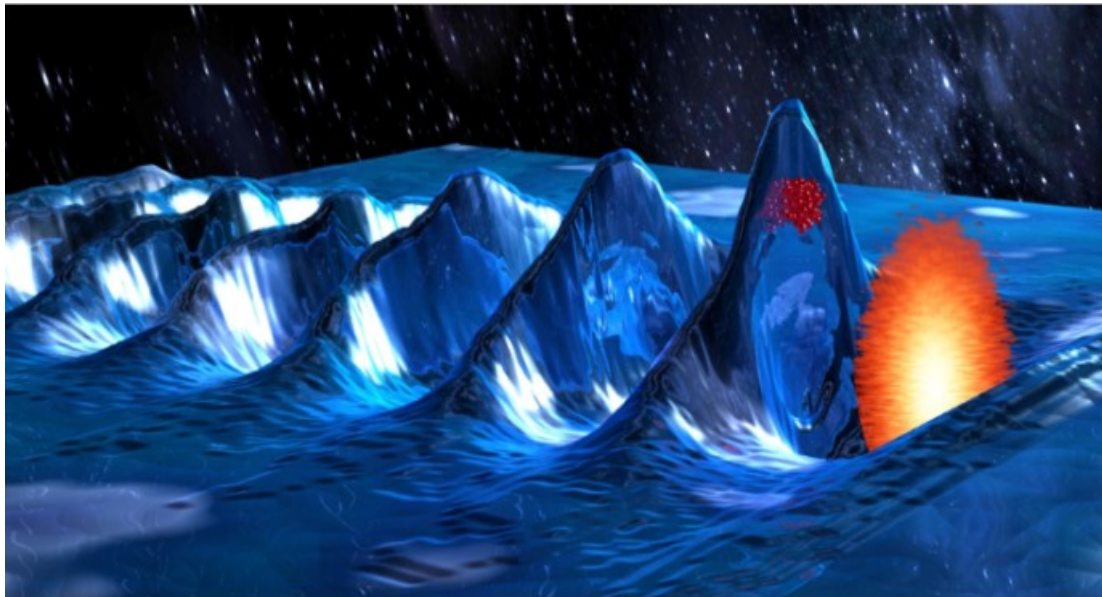
<https://www.icuil.org/activities/laser-labs.html>, [Interactive map](#)

Who is our community?

HELPMI: ... Laser-Plasma ...

Ultra-intense lasers can transform plasmas into particle-accelerating structures

- Electron acceleration and ion acceleration in high gradients, potentially reducing the accelerator's size
 - Inherent ultra-short time structure and thus high peak currents
- Accelerating structures are optically generated and transient



<https://loa.ensta-paris.fr/research/upx-research-group/laser-wakefield-acceleration-lwfa/>

Who are we?

HELPMI: Helmholtz Laser-Plasma ...

GSI

- High-energy laser system PHELIX, coupled with ion beam facilities of GSI
- Expertise in warm dense matter, high-energy density physics and energy-loss measurements

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- Operation of two independent laser systems, to be synchronized in future
- Expertise in laser-particle acceleration, high-resolution probing, X-ray physics and spectroscopy

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- Collaborations with large labs, e.g. for FEL (Soleil, FR), proton acceleration (J-Karen-P, JP), Radiobiology
- Developer of PIConGPU and main contributor to openPMD

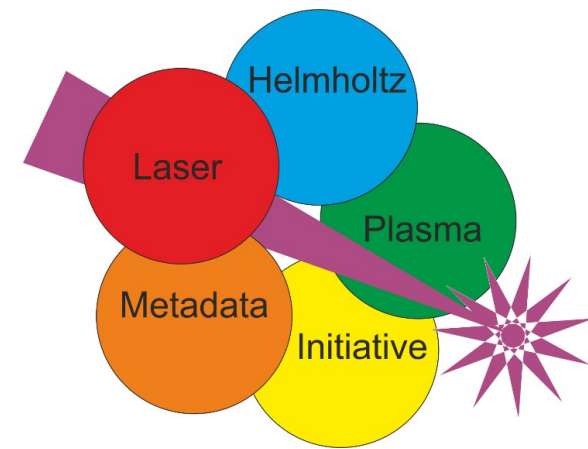


In total

6 laser systems (PHELIX, POLARIS, PEnELOPE, JETI, Draco, ReLaX, DiPOLE), 5 laser architectures (Nd:Glass, Yb:Glass, Yb:CaF₂, Yb:YAG, Ti:Sapphire), many in user operation

HELPMI main goals

HELPMI: ... Metadata Initiative



Develop F.A.I.R. data standard for LP community

- Develop vocabulary for laser-plasma experimental data
 - Human- and Machine-readable implementation, extensible for future developments
 - In close contact with laser-plasma community e.g. via workshops and project observers
- Extend existing openPMD standard and API towards experimental data
 - Make openPMD extensible
 - Adopt design of existing NeXus standard (from Photon-Neutron experimental community)
 - E.g. experiment geometry data, incremental analysis
 - Apply vocabulary and design features to openPMD
 - Possibly interchangeable/-operable with NeXus



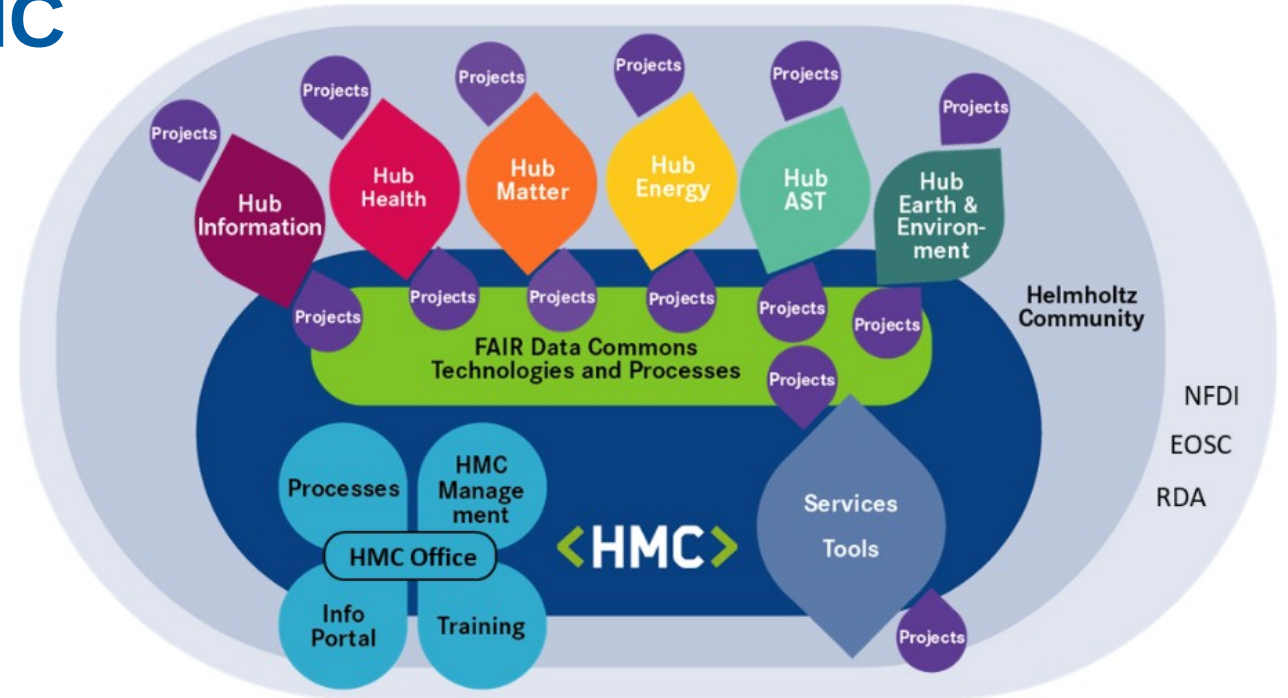
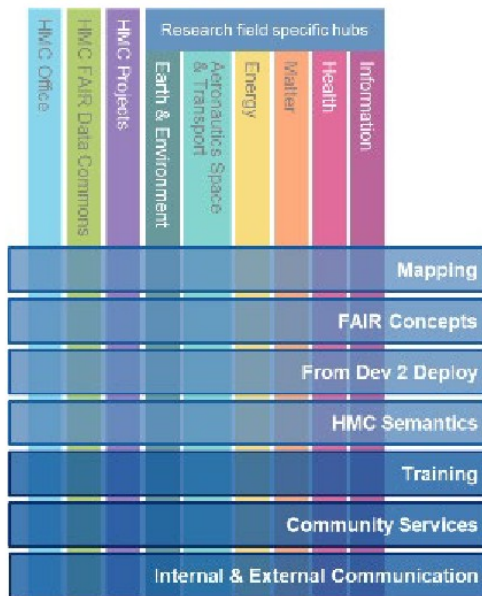
Generalized and F.A.I.R. data standard for whole LP community (simulations and experiments)

Connect with Photon and Neutron science community

Support from and link to HMC

Desired services

- Provision of website on national level
- Glossary hosting, validation
- Training and consulting



Interest in working groups of Cross-cutting topics

- FAIR Concepts: Glossary/Ontologies, Data formats
- HMC Semantics: Glossary/Ontologies
- Training and consulting
- Communication: Photon and Neutron science community, NeXus

HELPMI

We want to help the Laser-Plasma community with data and metadata

Extend openPMD, already used in worldwide LP community, towards experimental data

- Closer and easier exchange within community
- F.A.I.R. data

Open up towards Photon and Neutron science community

Helmholtz association is capable to support such service

