

Matter and Technologies



Matter and Technologies: Annual Meeting 2025, GSI

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HELMHOLTZ

We research new and leverage emergent technologies to find solutions for current challenges and create new opportunities with accelerators, detectors and data for the science of today and tomorrow.

Driven by science and driving science.

Matter and Technologies – the only program for technology research.

Overarching scientific goals

- New concepts in **acceleration and accelerators** – from largest to smallest systems.
- New concepts in **sensing and detection** – make the invisible visible.
- New disruptive concepts in **data-driven research and data science**.

Transforming research to meet future challenges

- Support technological sovereignty
- Sustainability, energy efficiency and digitalization
- Resilience of infrastructure and science

**Hightech Agenda
Deutschland**

Matter and Technologies

One Program – 7 centers: Accelerators – Detectors - Data

MT Student Retreat 2024

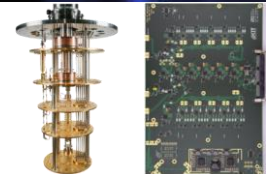
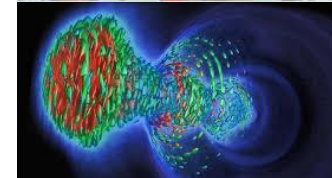
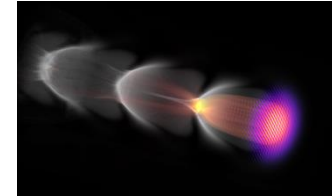
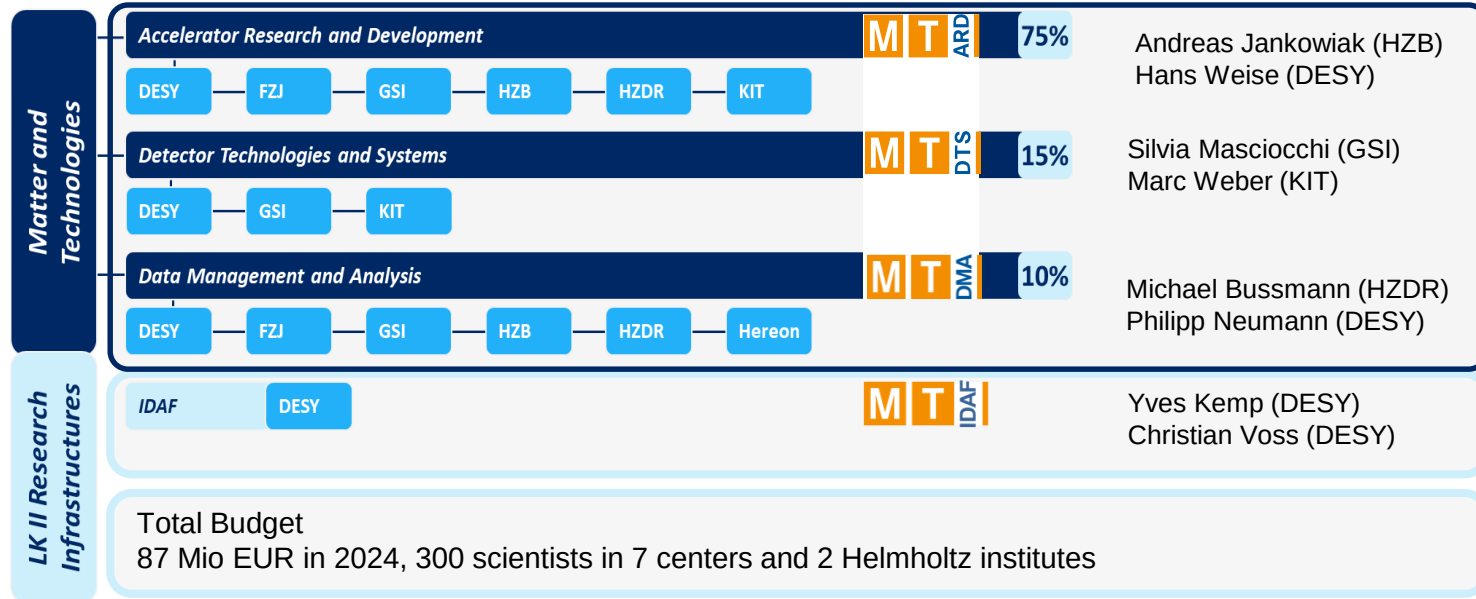


2024 annual meeting at HZB



Matter needs Technologies

Helmholtz Matter and Technologies (MT) program (PoF IV)



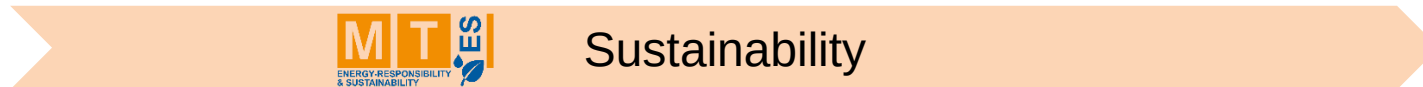
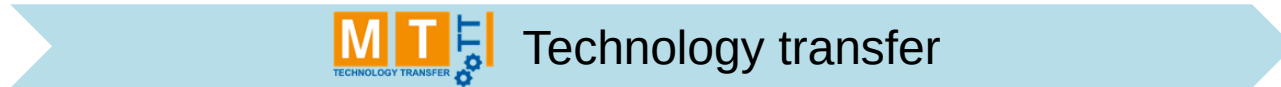
One program, three topics, common infrastructure.
We research technologies driven by science and driving science.

Matter and Technologies

Technologies for science & society: initiating the life cycle



From first ideas... ... to prototypes & demonstrators,... ... to implementation... ...and to exploitation in science.



Changes and new opportunities

Matter and Technologies en route towards PoF V

What we learned from the review:

- All center reviews were very positive towards MT
- The MT mission has been fully accepted and supported
- Key to the program's success is a long-term R&D strategy and constant infrastructure improvements

Central remarks:

- *Central detector technology platform as a missed opportunity in PoF IV*
- *Digitalization in all areas of Helmholtz Matter*



Scientific Reviews 2025

MT was very successful in the scientific reviews 2025

Impressive results of MT in the center evaluations

- only grades “outstanding” / “excellent”

**Strong support in center evaluations
for MT mission**

Grades for categories

- **Scientific achievements and impact**
- **Originality and innovative potential**
- **International standing and competitiveness**

MT	Excellent / Outstanding / Excellent
ARD	Excellent / Outstanding / Excellent
DTS	Outstanding / Excellent / Excellent
DMA	Outstanding / Outstanding / Excellent

Taking up the challenge....



Our Vision



Advanced optical technologies as key enablers for scientific breakthroughs



Pathways toward (commercial) applications (e.g., inertial confinement **fusion**)



Increased Visibility

Strengthen and increase visibility of optical and fusion technologies across Helmholtz and beyond



Collaboration

Foster closer collaboration between activities across different programs



Integration

Link fusion activities with broader optical technology development

MCT – Technologies for Fusion Energy and Frontiers of Optics

with spokespersons: Malte Kaluza (GSI/HI Jena) and Matthias Fuchs (KIT)



**Highest Power &
High-Energy Lasers**



**Diagnostics &
Sensors**



**Silicon
Photonics**



**Advanced
X-ray Optics**



**Magnet
Technologies**



**Tritium Technologies
& Targets**



**Simulations,
Data & Controls**

**These innovation areas will have major impact on our facilities and
Germany's technological sovereignty in research and innovation.**

Key Technology Areas

MCT – Technologies for Fusion Energy and Frontiers of Optics

Matter and Technologies

On the road to PoF V



MT mission remains driving science by cutting-edge development of key technologies driven by the science of our field

Transforming research to meet future challenges

- technological sovereignty, sustainability, energy efficiency, digitalization, resilience of infrastructure & science

Timeline for Scientific Evaluation of Helmholtz Matter 2026

- Dec 2025: Finalization of written Proposal
- Strategic Evaluation in Berlin: 26. – 29. May 2026

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