PROGRAM
Matter and Technologies
from PoF-III to PoF-IV

Anke-Susanne Müller, Ties Behnke
(MT Spokespersons)
We Research Technologies

Our Team...

> 400 FTE/y
> 80 Mio EUR/y
Research in *Matter* is bold and broad

- It relies on people and on advanced technologies

MT is a program for the future of *Matter* closely intertwined with MML and MU

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**Matter and Technologies**

**Technologies for Science**

- Accelerator science
- Detector science
- Data analytics

**Matter and Technologies**

- **Research & Development (R&D)**
  - Fundamental R&D
  - Research in technologies

- **Growth**
  - Prototyping
  - Designing systems
  - Scalability

- **Maturity**
  - Developing facilities
  - Building infrastructures
  - Applications

- **Finalization**
  - Decommissioning

**Other areas**

- **Tech Transfer**

**User communities**
Matter and Technologies
Technologies for Science

- Research in Matter is bold and broad
- It relies on people and on advanced technologies

MT is a program for the future of Matter closely intertwined with MML and MU

Accelerator science
Detector science
Data analytics

ARD
DTS
DMA
IDAF

R&D
• Fundamental R&D
• Research in technologies

Maturity
• Developing facilities
• Building infrastructures
• Applications

Finalization
• Decommissioning

User communities
The MT Structure in PoF-IV

Program Matter and Technologies (MT)
T. Behnke (DESY) | A.-S. Müller (KIT)

Topic Accelerator Research and Development (MT-ARD)
A. Jankowiak (HZB) | J. Osterhoff (DESY)
DESY, FZ, GSI* with HIM and HI Jena, HZR, HZDR, KIT

Topic Detector Technologies and Systems (MT-DTS)
M. Weber (KIT) | S. Masciocchi (GSI)
DESY, GSI* with HIM and HI Jena, KIT

Topic Data Management and Analysis (MT-DMA)
M. Bussmann (HZDR) | V. Gülzow (DESY)
DESY, FZ, GSI with HI Jena, HZB, HZDR, HZG

Subtopics:
- Subtopic 1: Advanced CW SF Systems
- Subtopic 2: New Concepts and Prototypes for Maximizing the Performance of Hadron and Electron Accelerators
- Subtopic 3: Advanced Beam Control, Diagnostics and Dynamics
- Subtopic 4: Ultra Compact, Novel Accelerators and their Applications

Subtopics:
- Subtopic 1: Detection and Measurement
- Subtopic 2: System Technologies
- Subtopic 3: Science Systems

Subtopics:
- Subtopic 1: The Matter Information Fabric
- Subtopic 2: The Digital Scientific Method
- Subtopic 3: The Digital Experiment and Machine

User Facility IDAF
C. Voss

ARD
DTS
DMA
IDAF

LK I
LK II

HELMHOLTZ
MT in numbers

Budget and people

**2021**

**Budget**

<table>
<thead>
<tr>
<th></th>
<th>ARD</th>
<th>DTS</th>
<th>DMA</th>
<th>IDAF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>kEUR</strong></td>
<td>60k</td>
<td>4k</td>
<td>2k</td>
<td>1k</td>
</tr>
</tbody>
</table>

**Scientific support**

- ARD: 250 FTE
- DTS: 150 FTE
- DMA: 100 FTE
- IDAF: 50 FTE

**Doctoral researchers**

- ARD: 200 FTE
- DTS: 100 FTE
- DMA: 50 FTE
- IDAF: 25 FTE

**Scientists**

- ARD: 150 FTE
- DTS: 75 FTE
- DMA: 25 FTE
- IDAF: 12.5 FTE
MT in numbers
from 2017 to 2021

we’ve grown!
People Matter
Visibility & Attractiveness of MT

Establish research into technologies as a recognized research activity in its own right
Create visibility and recognition for science and people

We are a diverse group of excellent and highly motivated people in MT

- Joint professorships in accelerator physics increased by a factor 3

Bar chart showing:
- Phd
- Postdoc
- Senior
- International scientists
- Before MT
- MT 2019
MT is an active community
- MT annual meeting
  - 300 people, 170 contributions
- Topical meetings
- Working groups

Fostering young talents
- Annual meeting as a forum for younger researchers
- Annual MT student retreat
- Dedicated topical schools
  - Scientific and technical
- Participation in graduate schools (DASHH, PIER, HEIBRIDS, KSETA, …)
Cooperation and Societal Impact
Adding New Dimensions to MT

Structure-building measures:
Adding specific networking measures

- Innovation Pool
- Matter Forum
- Initiative and Networking Fund (IVF)
- Cross-Cutting Activity (CCA)
- Technology Transfer (TT)
Cooperation and Societal Impact
Adding New Dimensions to MT

Structure-building measures:
Adding specific networking measures

Example: PLASMED X

Compact accelerator
Advanced detector
Medical imaging

Vision: Bring the technology to the hospital

Work supported by the BMBF Innovation Pool and Matter Forum

- Innovation Pool
- Matter Forum
- Initiative and Networking Fund (IVF)
- Cross-Cutting Activity (CCA)
- Technology Transfer (TT)
Innovation and Technology Transfer
Setting Standards

Example: MicroTCA* electronics

Necessity of scalability, modularity, availability

Seed money from Helmholtz

A worldwide success
Currently used by 55 laboratories and 12 partner companies

*Micro Telecommunications Computing Architecture
Innovation and Technology Transfer
Setting Standards

Example: MicroTCA* electronics

Necessity of scalability, modularity, availability

Seed money from Helmholtz

A worldwide success
Currently used by 55 laboratories and 12 partner companies

Development with transfer in mind:

- Install standards & common, transferable solutions
- Move from single-application solutions to systems

Implement transfer strategy based on center support structures with MT-specific monitoring

MT is living transfer in all its aspects, from commercialization to transfer by minds and joint supervision of doctoral researchers with industry

*Micro Telecommunications Computing Architecture
The PoF-IV Evaluation
Five Steps into the Future

Center level
Programme level

High level guidelines of the federal and state ministries:
- Non negotiable part
- Goals, to be defined in a dialogue with the funding agencies

The four dimensions of the evaluation:
- Objectives
- Work plan
- Scientific Quality and Resource planning
- Impact & Risks
# The PoF-IV Evaluation

## The Grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>outstanding</td>
<td>Extremely strong performance at the level of international leadership. Groundbreaking research with transformative impact and/or with high potential for significant societal impact. Essentially no weaknesses.</td>
</tr>
<tr>
<td>excellent</td>
<td>Very strong performance and innovative research at an exceptionally high international level. Significant impact on the field and/or potential for significant societal impact. Some negligible or minor weaknesses.</td>
</tr>
<tr>
<td>very good</td>
<td>Strong research at the level of national leadership. Considerable impact on the field. Several minor weaknesses</td>
</tr>
<tr>
<td>good</td>
<td>Overall performance at a nationally competitive level with solid potential for impact on the field. Several minor and at least one moderate weakness.</td>
</tr>
<tr>
<td>fair</td>
<td>Mediocre performance and unconvincing research approaches. Limited potential for relevant impact on the field. At least one major weakness.</td>
</tr>
</tbody>
</table>
The PoF-IV Evaluation

The Categories

<table>
<thead>
<tr>
<th>Funding category</th>
<th>Resource Plan</th>
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<tbody>
<tr>
<td>Matter and the Universe</td>
<td></td>
</tr>
<tr>
<td>Fundamental Particles and Forces</td>
<td>A Confirmed</td>
</tr>
<tr>
<td>Cosmic Matter in the Laboratory</td>
<td>C Confirmed</td>
</tr>
<tr>
<td>Matter and Radiation from the Universe</td>
<td>B Confirmed</td>
</tr>
<tr>
<td>Matter and Technologies</td>
<td></td>
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<td>Accelerator Research and Development</td>
<td>A Confirmed</td>
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<td>Detector Technologies and Systems</td>
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<tr>
<td>Data Management and Analysis</td>
<td>B Confirmed</td>
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<tr>
<td>From Matter to Materials and Life</td>
<td></td>
</tr>
<tr>
<td>Dynamics, Mechanisms and Control</td>
<td>B Confirmed</td>
</tr>
<tr>
<td>Quantum, Complex and Functional Materials</td>
<td>B Confirmed</td>
</tr>
<tr>
<td>Building Blocks of Life: Structure and Function</td>
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Funding Recommendations

The rationale for the assignment of the topics to the funding categories and the assessment of the resource plan is provided in detail in the topic sections.

### Funding Categories of the Topics

<table>
<thead>
<tr>
<th>Funding Category</th>
<th>Increase of budget in %</th>
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<tbody>
<tr>
<td>Category A (2021)</td>
<td>2.6</td>
</tr>
<tr>
<td>Category B</td>
<td>1.5</td>
</tr>
<tr>
<td>Category C</td>
<td>0.0</td>
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### Definition of funding categories

A: Outstanding in all four dimensions

B: Outstanding and excellent grades

C: >= One dimension very good or lower
The strong leadership of Helmholtz centers in particle accelerator R&D should be strongly and fully supported.

To proceed with the proposed milestones of the work programme (ARD1 to ARD 16).

To add a milestone on energy efficient R&D for future technical infrastructures and accelerator projects.

<table>
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<th>Goals</th>
<th>Work Program</th>
<th>Competences and Resources</th>
<th>Impact and Risks</th>
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<tr>
<td>Outstanding</td>
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The PoF-IV Evaluation

Recommendations - DTS

- Full support of the DDL proposal would retire the risk.
- Support sustainable career strategies, which ensure the availability of key technologists (e.g. ASIC engineers).
- Deliver on the program and milestones.

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<td>Outstanding</td>
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Program Matter and Technologies

Topic 2 – Detector Technologies and Systems
The PoF-IV Evaluation
Recommendations - DMA

- This very strong vision should come to a mature project.
- Continue with the present activities.

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The PoF-IV Evaluation

Our Results

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Increase of budget in % 

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Congratulations everyone! 9 out of 12 possible “outstanding” grades:
Our Way into the Next 7 Years

Our Vision

- Establish MT
  - Set up structures
  - Build up infrastructure

- Exciting Science
- Research infrastructures
- Common projects
- Vibrant community
- Working structures
- International visibility

- Make new accelerators happen
- Push the detection limits
- Master the data challenge