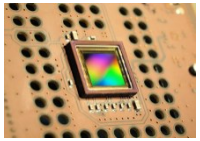
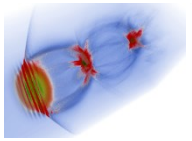
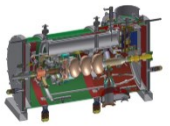

Matter and Technologies

A program in matter

Ties Behnke, program speaker

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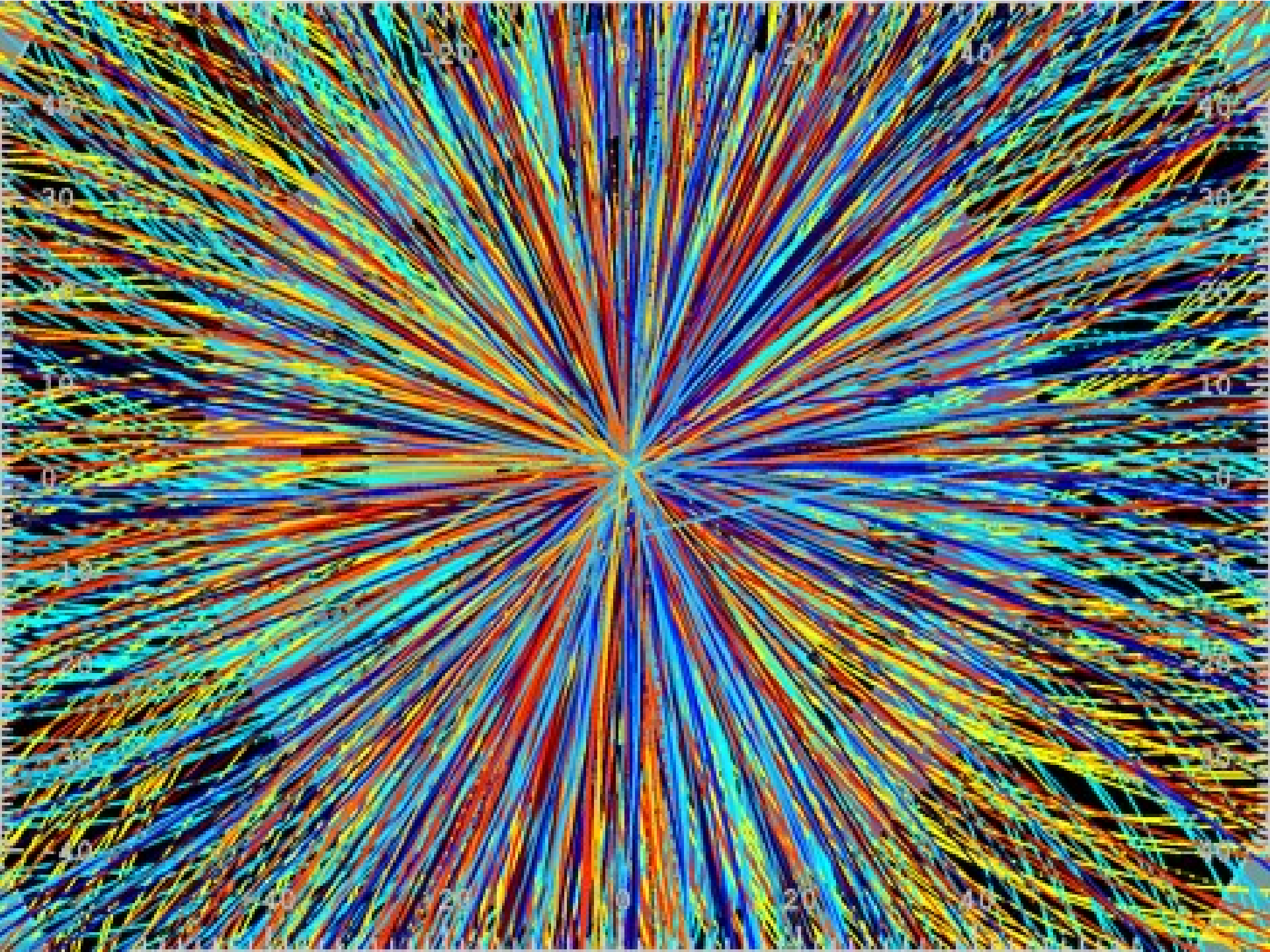
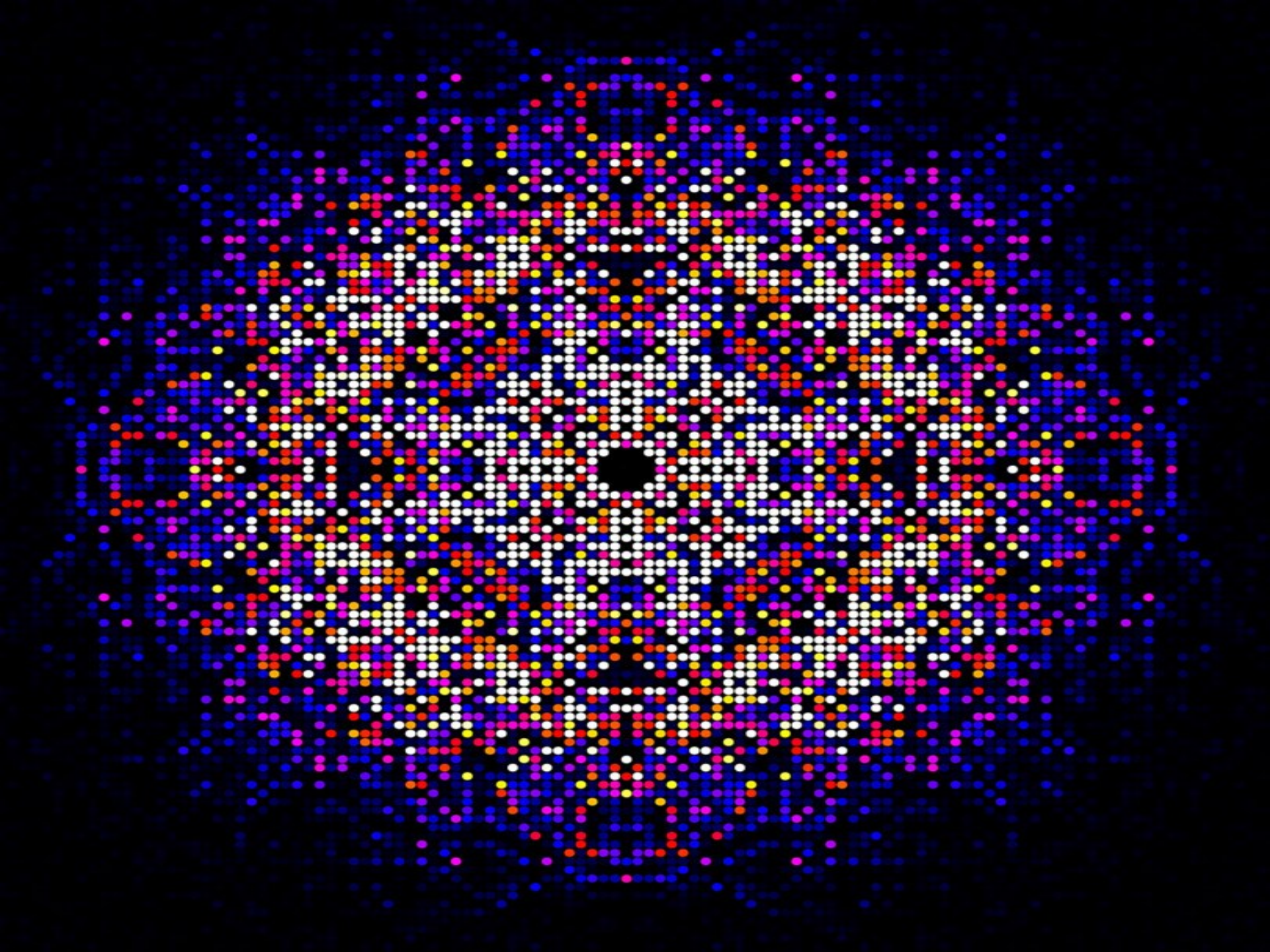
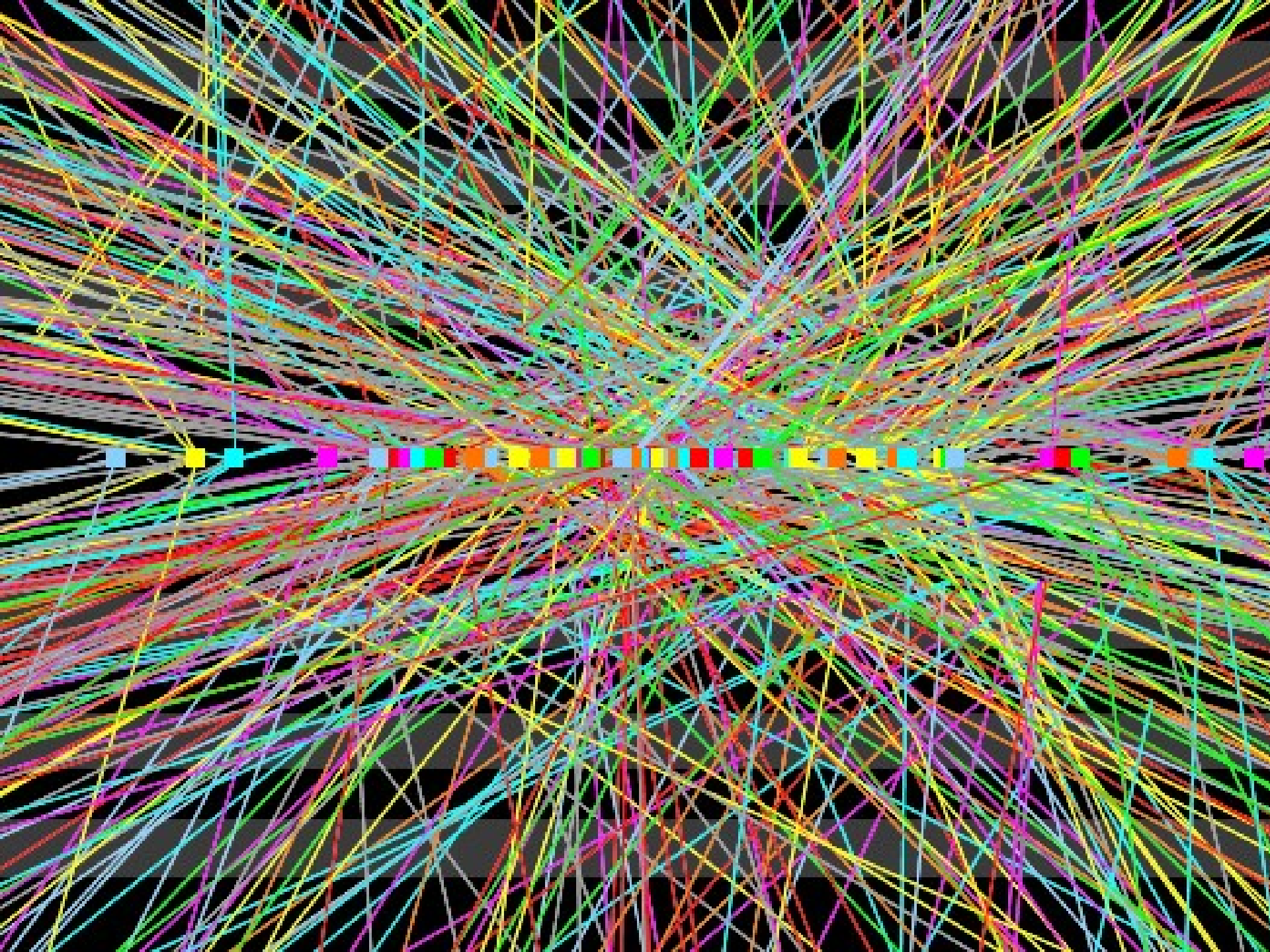
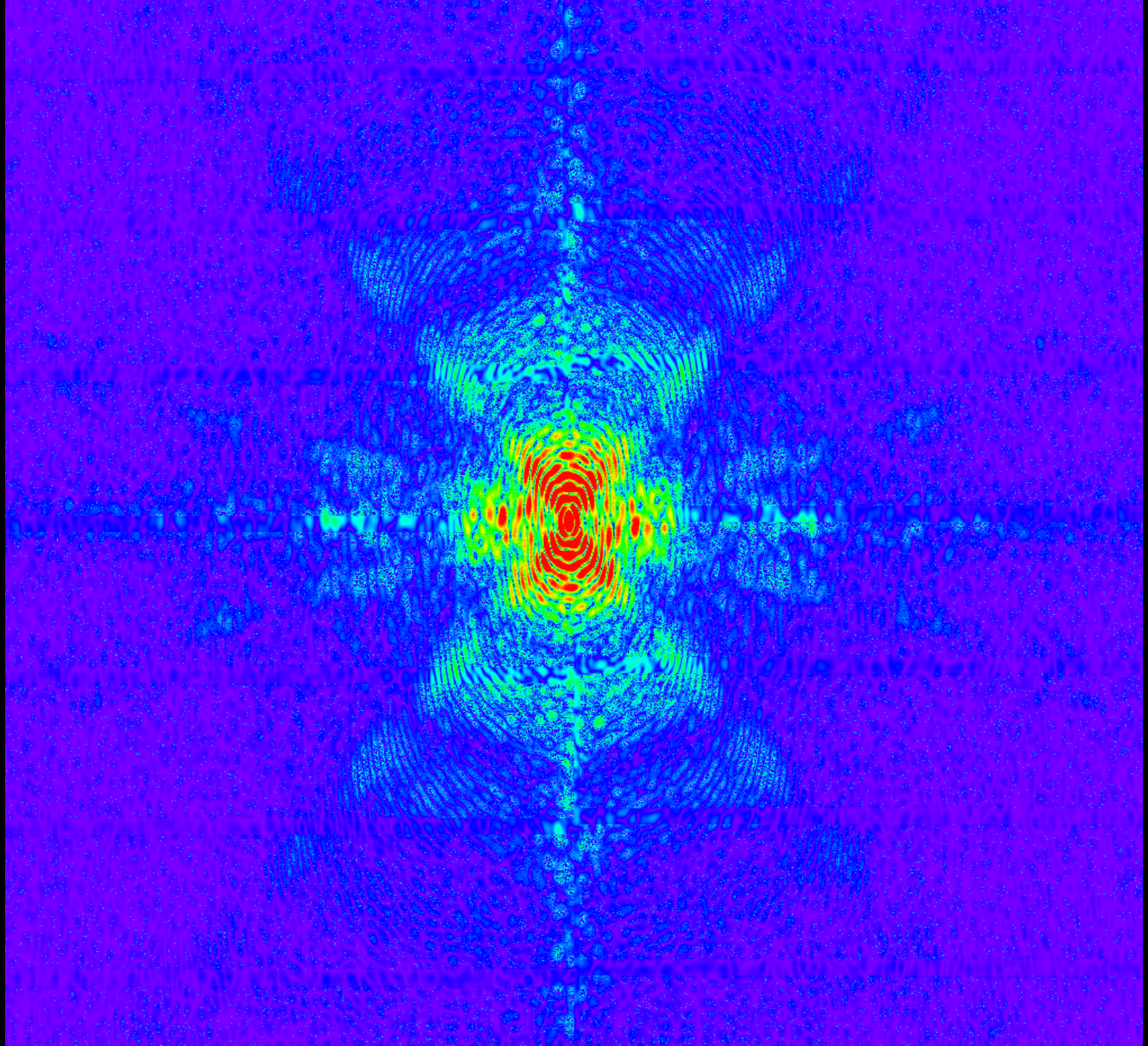


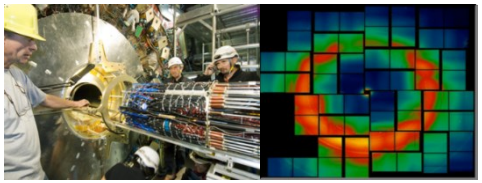






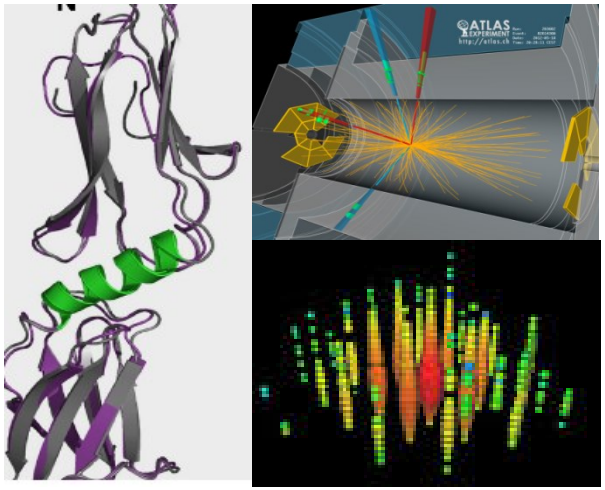
Matter – Technologies: Challenges

Matter: complex questions
complex methods



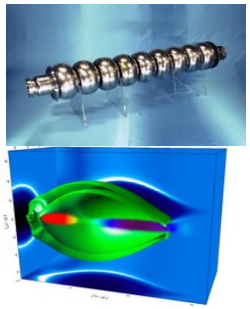
Accelerators:

We need
- High intensity
- High energy
- Reliability
- Compactness



Detectors

We need
- Granularity
- Information handling
- Fast readout
- Integration



Science Driven
Driving Science

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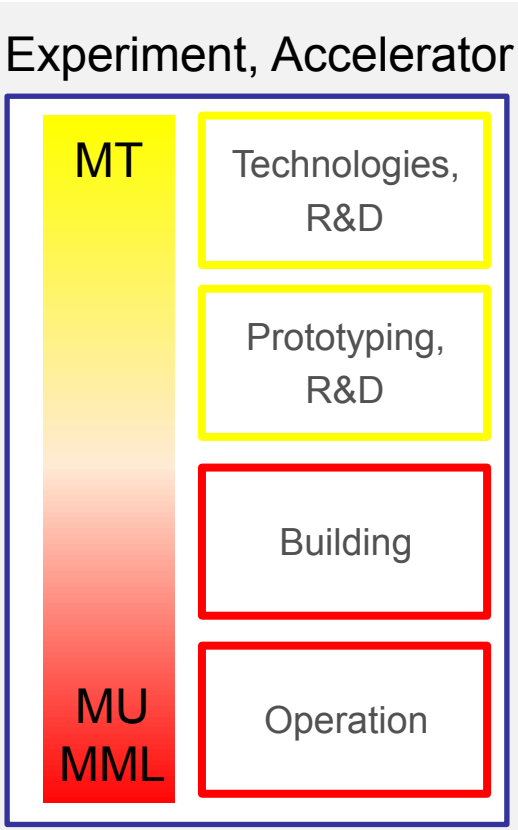
Matter and Technologies
Positioning ourselves

Matter and the Universe

From Matter to Materials and Life

Matter and Technologies

- Fundamental development of technology
- Allow the freedom to try new things
- Allow the freedom to try risky things
- But retain a close connection to the science to move in the right direction



Structure

Accelerator (ARD)

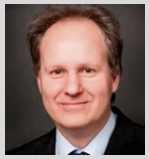
DESY, FZJ, GSI, HZB, HZDR, KIT

Reinhard Brinkmann, DESY

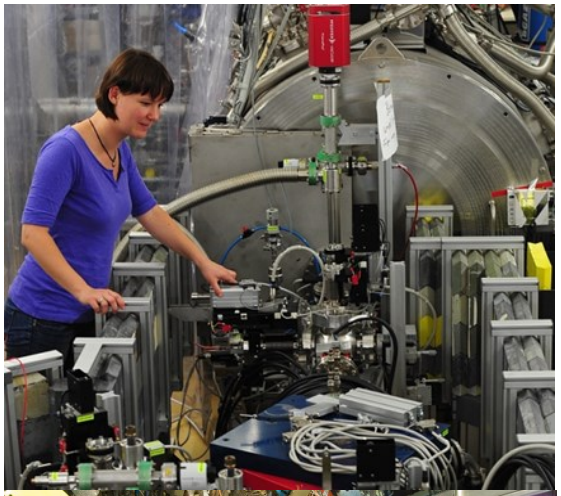
Detector technologies and Systems(DTS)

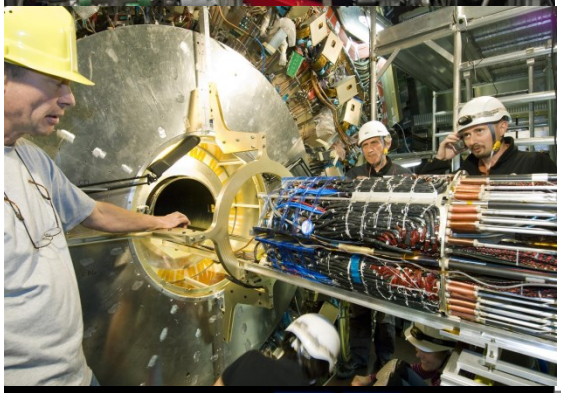
DESY, FZJ, GSI, HZDR, KIT

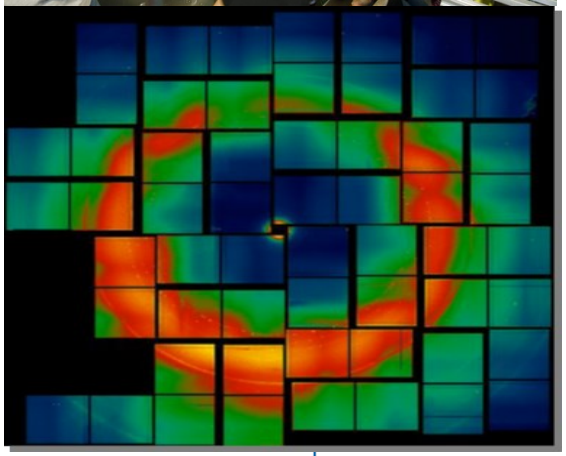
Marc Weber, KIT



Cross program activity “Computing, Large scale data handling and processing”







- Programme wide and topic-centered regular coordination meetings
- Coordination with matter management
- Coordination with center managements

Accelerators: Engines of Discovery

Accelerators are the engines of the research field “Matter”, they are engines of discovery

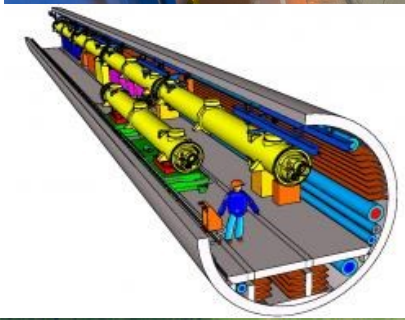
Helmholtz looks back at many decades of cutting edge accelerator research and facilities.

We design, we build, we participate in some of the worlds most advanced accelerator based facilities.

Challenges:

- Highest beam intensities
- Highest beam energies
- Highest brilliance
- Reliable, efficient operation

LHC



XFEL

FAIR

Superconducting RF technology

Concepts & tech. hadron acc.

ps & fs el. and photon beams

Novel acceler. concepts

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Topic ARD: Strategy

Superconducting RF:

- success story for Helmholtz:
  - >25 years of development (TESLA, TTF, XFEL, ILC, …)
  - The next challenge: CW operation with SCRF

Hadron Beams:

- Basis of FAIR, facility of the next generation

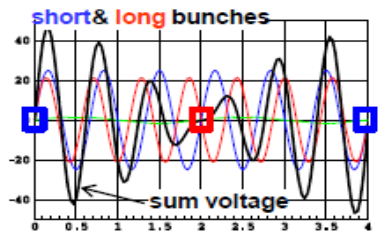
ps-fs beams:

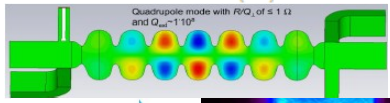
- Central to all topics,
- Sources/ Control/ monitoring

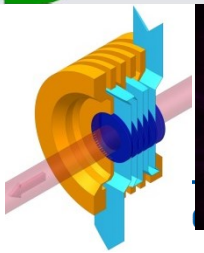
Novel Accelerator Concepts:

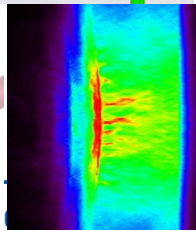
- Looking far into the future
- High risk, potentially large return on invest
- Helmholtz is positioning itself as a major international player

Strong synergy/ connection between topics









Detectors: Eyes of Discovery

Detectors are key to new discoveries

Helmholtz has been a key player in major experiments in the past and present, for a wide range of applications.

Challenges:

- Unprecedented photon and particle fluxes
- Highest spatial, temporal and energy resolution
- Highest sensitivity
- Dramatic increase in data rates and volumes

Enable technologies, develop novel concepts, design complex systems.
Make cutting-edge detectors affordable and exploit synergies.

Sensors, ASICs, Interconnects

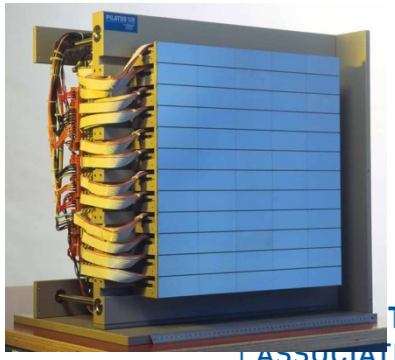
Data Transmission and Processing

Detector Systems

Experiments at collider and hadron facilities

CMS detector

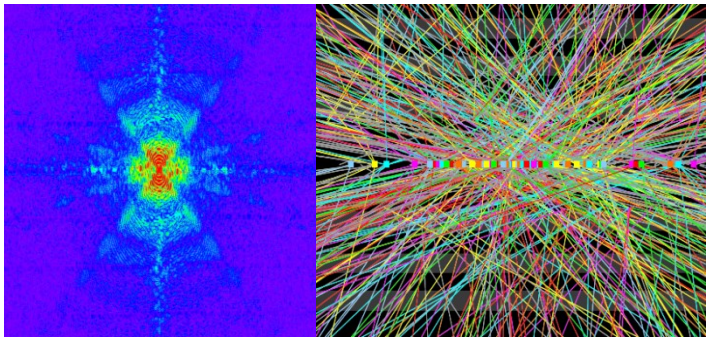
Experiments at Photon and Neutron Sources



Lambda detector

Topic DTS: Strategy

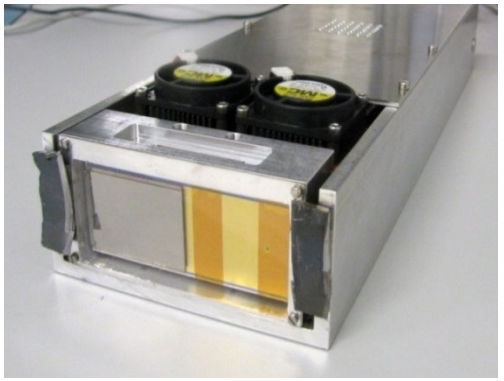
Highly pixelated systems
High rate systems



Develop building blocks for successful detector design:

- Sensors
- Structural materials
- Fast readout
- Fast processing
- System integration

ASIC development
Interconnect properties



Helmholtz-Cube with GaAs

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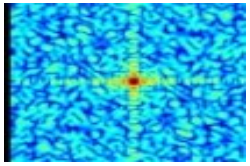
Networking

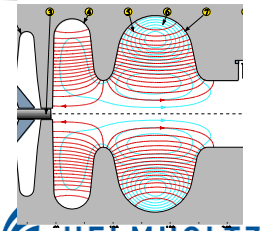
Development of large scale common infrastructures
- Distributed ARD test facility (funding proposal)
- Common development capacity for detector technology

Close links to the programmes MuU and MML in matter

Close links to Universities and other research centers are an integral part of the program
- Cooperation with universities
- Integration into alliances within Helmholtz
- Cooperation with international partners



LSDMA



Computing:
Participate in cross program activity on computing
- Recognize the outstanding importance of computing for the field

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Technologies and Society

Active effort to reach out to connect to other research areas and industrial applications.

concrete examples:

Readout ASIC to be used in PET probe for medical application

Project co-funded by European Commission

Accelerator application in industry

Training the next generation of scientists

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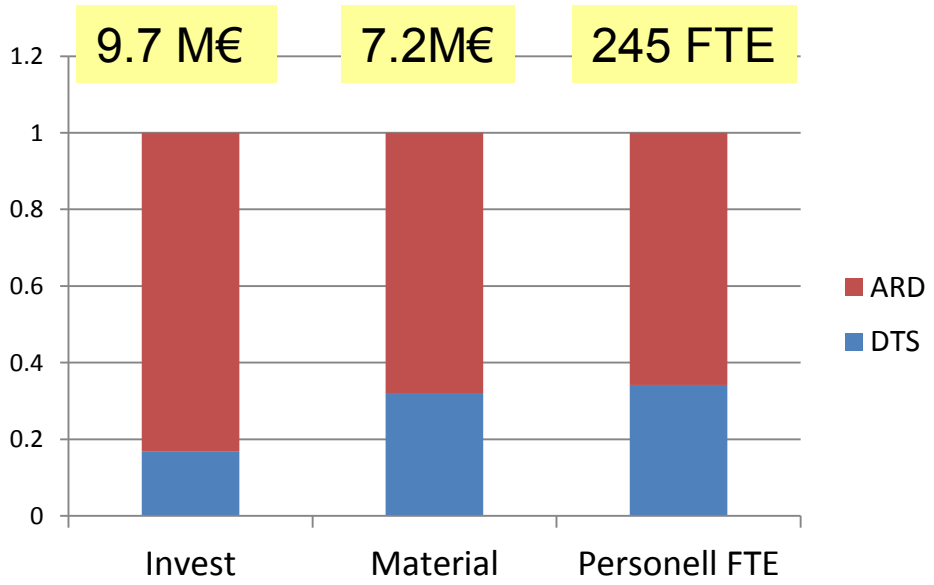
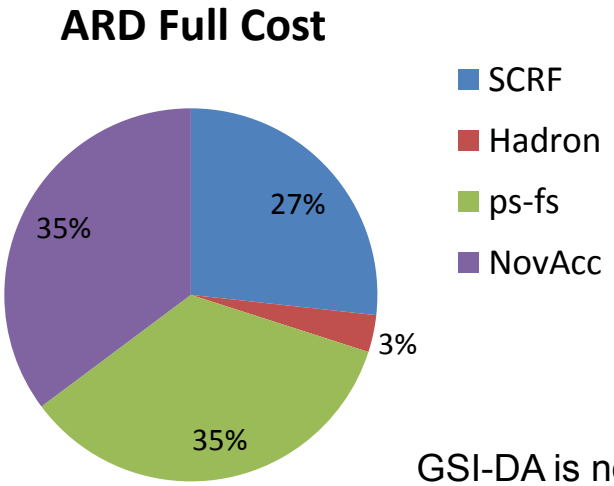
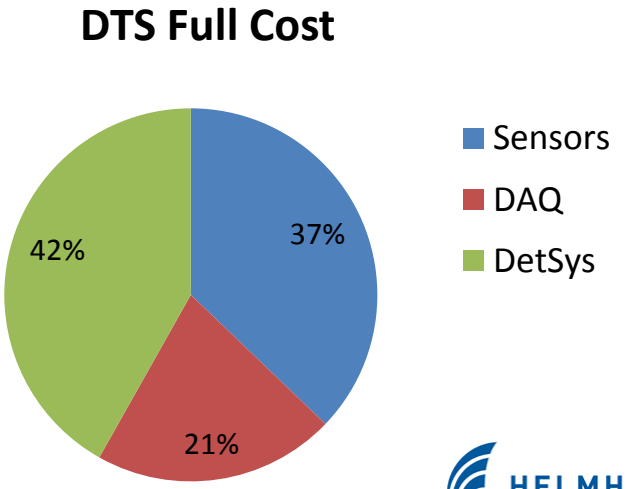
MT in numbers

Full cost numbers per year, based on average for 2015-2019

(excluding major invest)







GSI-DA is not part of the review

Summary

“Matter and Technologies” is a new program in matter.

It builds on the availability of cutting-edge facilities at the intensity and energy frontier within Helmholtz and is designed pave the way into the future.

Reinhard Brinkmann: Accelerator Research and Development

Marc Weber: Detector Technologies and Systems

Parallel sessions this afternoon:
ARD/ DTS with more detailed discussion and material on the scientific content.