

# Physics at the Terascale

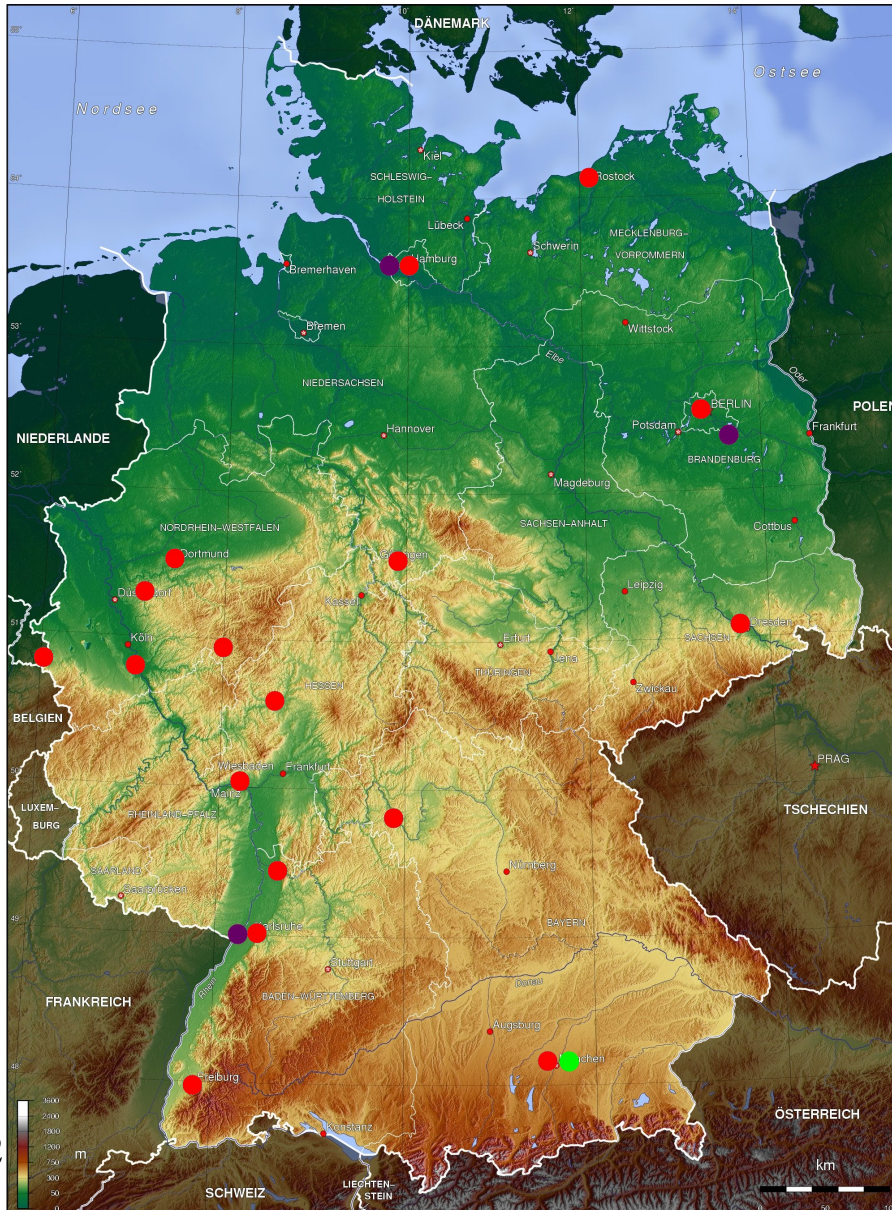
Ties Behnke, DESY

Strategic Helmholtz Alliance  
"Physics at the Terascale"

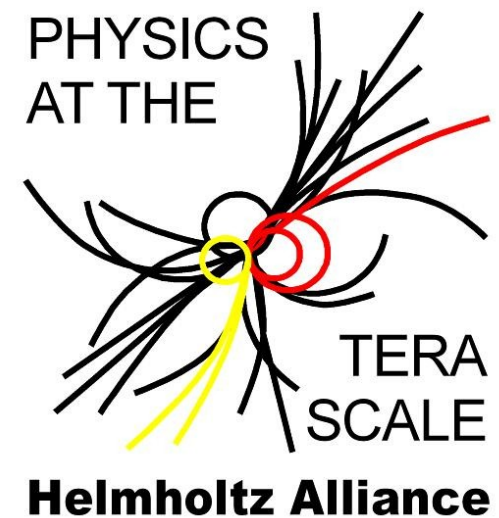
An Alliance of  
2 national research centers (DESY, Karlsruhe)  
17 universities  
1 Max Planck Center (Munich)

Helmholtz Alliance

# Where: Members of the Alliance



- Universities
- HGF Center
- MPI Munich



# Goals of the Alliance

Scientifically:

Help the German HEP community to optimally contribute to and profit from the international large projects in High Energy Physics to explore physics at the Terascale

Structurally

Improve the level of cooperation between Universities, Universities and laboratories, and between different experiments  
Install a powerful HEP network in Germany on all levels  
(physics - detector - computing - accelerator)

# Funding basic research in Germany

Germany has a federal system:

research is primarily funded by the different states,  
the federal state only fund research  
"which is in the national interest"

Funding sources:

- Universities
- federal (CERN and DESY projects)
- Other sources

Funding common development projects / common infrastructures was  
difficult in the past: Helmholtz Alliance



Example for federal funding:  
ATLAS and CMS projects  
receive federal funds  
(FSP101 and FSP 102)  
focused on experiments

# The Alliance

Develop common infrastructures

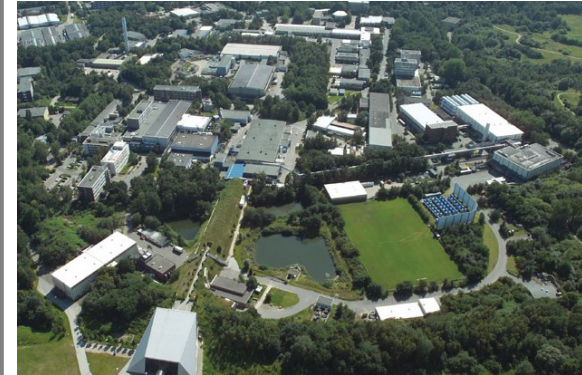
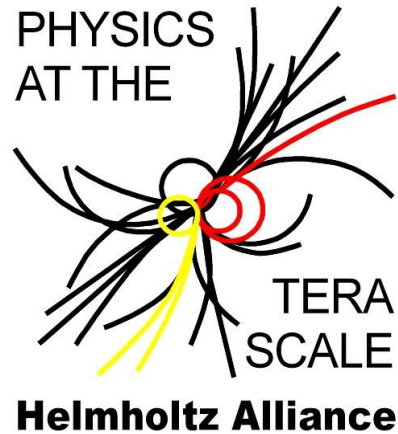
- Common technical infrastructures (not only at the laboratories)
- Common analysis infrastructures (Computing, but also know-how)
- Common strategic goals (e.g. future projects, detector developments)
- Join resources to change the landscape (e.g. increased training in accelerator)

The Alliance **DOES NOT MEAN**  
a nationwide "HEP laboratory" with many different locations

The Alliance **DOES MEAN**  
sharing resources more efficiently, networking the partners

without giving up independence.

# The Alliance: Nationwide Coherence in HEP



## Universities:

- special infrastructure
- specialized expertise
- scientific diversity
- young blood

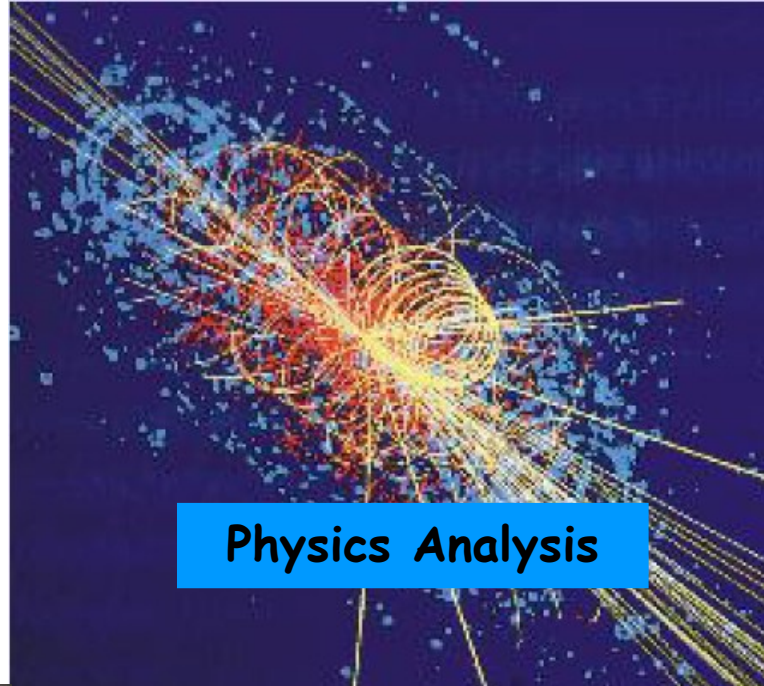
## Helmholtz Centres:

- large infrastructure
- general engineering
- strategic research
- long-term support



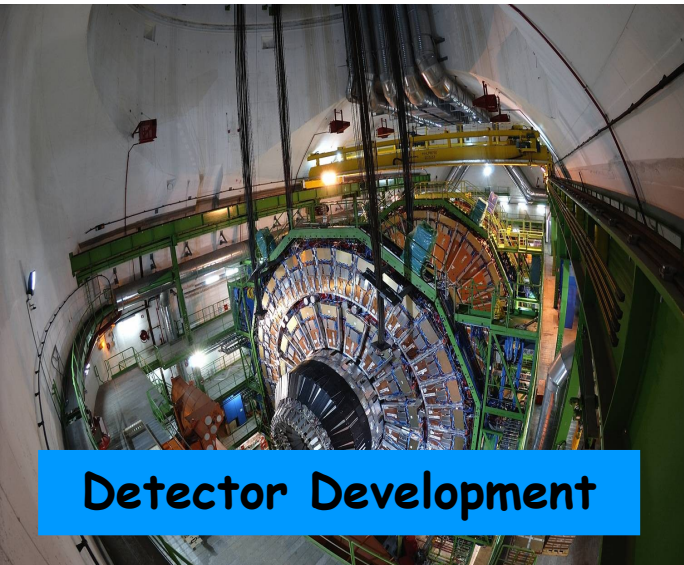
# Alliance: Key Elements

Particle Physics at the  
**Energy Frontier**



Physics Analysis

Instrumentation at the  
**Technology Frontier**



Detector Development



GRID Computing



Accelerator Science

# Physics at the Terascale

	Physics Analysis	Grid Computing	Detector Science	Accelerator Science
Scientific Goals	<b>Data Analysis</b> <ul style="list-style-type: none"> <li>• Understanding LHC Detectors</li> <li>• Physics at the LHC</li> <li>• The path to the ILC</li> </ul>	<b>Improved Grid</b> <ul style="list-style-type: none"> <li>• Virtualization</li> <li>• Application-driven monitoring</li> <li>• Development of NAF tools</li> </ul>	<b>ILC Detectors</b> <ul style="list-style-type: none"> <li>• Vertex Detector</li> <li>• Tracking</li> <li>• Calorimetry</li> <li>• Forward Detectors</li> </ul>	<b>Optimizing the ILC</b> <ul style="list-style-type: none"> <li>• Acceleration Technology</li> <li>• Sources</li> <li>• Beam Dynamics</li> </ul>
	<b>Analysis Tools</b> <ul style="list-style-type: none"> <li>• Algorithms and Techniques</li> <li>• Simulation Tools</li> </ul>			
	<b>Theory/Phenomenology</b> <ul style="list-style-type: none"> <li>• Monte Carlo Generators</li> <li>• Precise Predictions</li> <li>• New Models</li> </ul>			
Work Packages	<b>Analysis Network</b> <ul style="list-style-type: none"> <li>• Alliance Working Groups</li> <li>• Monte Carlo Group</li> <li>• Virtual Theory Institute</li> </ul>	<b>Virtual Computing Centre</b> <ul style="list-style-type: none"> <li>• Tier 2</li> <li>• National Analysis Facility</li> <li>• High performance network</li> </ul>	<b>Virtual Detector Lab</b> <ul style="list-style-type: none"> <li>• VLSI &amp; Electronics</li> <li>• Support Sensor Design &amp; Characterization</li> <li>• Detectors Systems Support</li> </ul>	<b>Advancing Accelerator Science</b>
	<b>Analysis Centre at DESY</b>	<b>R&amp;D on Grid Tools:</b> <ul style="list-style-type: none"> <li>• Mass storage</li> <li>• Collaborative &amp; Interactive tools</li> <li>• User friendliness</li> </ul>		
	<b>Training and Exchange</b>	<b>Grid Training</b>	<b>R&amp;D Projects</b>	
18.7.2	<b>Backbone Activities</b> Management – Young Investigator Groups - Fellowships – Equal Opportunities – Outreach – Interim Professorships			



# How to do something new

New structures need

people/ positions

long term structures

tenure track positions

co-funding from partners

establishing new areas of work at Universities which are in the interest of the Alliance

sustainability

continuation beyond the end of the Alliance in 2012

All this fit well  
with the call for  
a HGF Alliance  
in 2007 by the HGF

# Funding

Distribution of HGF funds across research topics and backbone activities

Matching funds

Contribution from Unis, DESY, FZK: 48 M€

Helmholtz Request [kEUR]

Backbone  
0933,00

Analysis  
8002,00

Accelerator  
1247,00

Grid Comp.  
7708,00

Detector  
7109,00

Total HGF contribution 25M€

Personnel: 15 M€ / 25M€

# Funds and Infrastructure

- Helmholtz funds mainly for
  - young researchers (theory and experiment) and collaborative efforts assuring long-term coverage
  - creation of shared infrastructures for computing and detector R&D
  - develop accelerator science
- **At least 23 of the Alliance funded positions will be turned into permanent positions by the universities and research centers!**

Topic	Type	Number	Women	Starting Date
Analysis	Scientist	1/1	1	01/12/2007
Grid	Scientist	3/3	0	01/02/2008, 01/04/2008
Detector	Scientist	3/6	0	Winter 2007/2008
	Technician	2/2	1	01/07/2007, 15/01/2008
	PhD	2/4	0	01/08/2007, 01/10/2007
Accelerator	PhD	2/2	0	01/07/2007
YIG	Leader	1/5	0	01/01/2008
Fellow	Theory	8/8	2	01/10/2008
	Experiment	4/8	1	Spring or summer 2008
	Detector	3/3	1	01/04/2008 or 01/07/2008
Backbone		2/2	1	01/10/2007, 01/04/2008



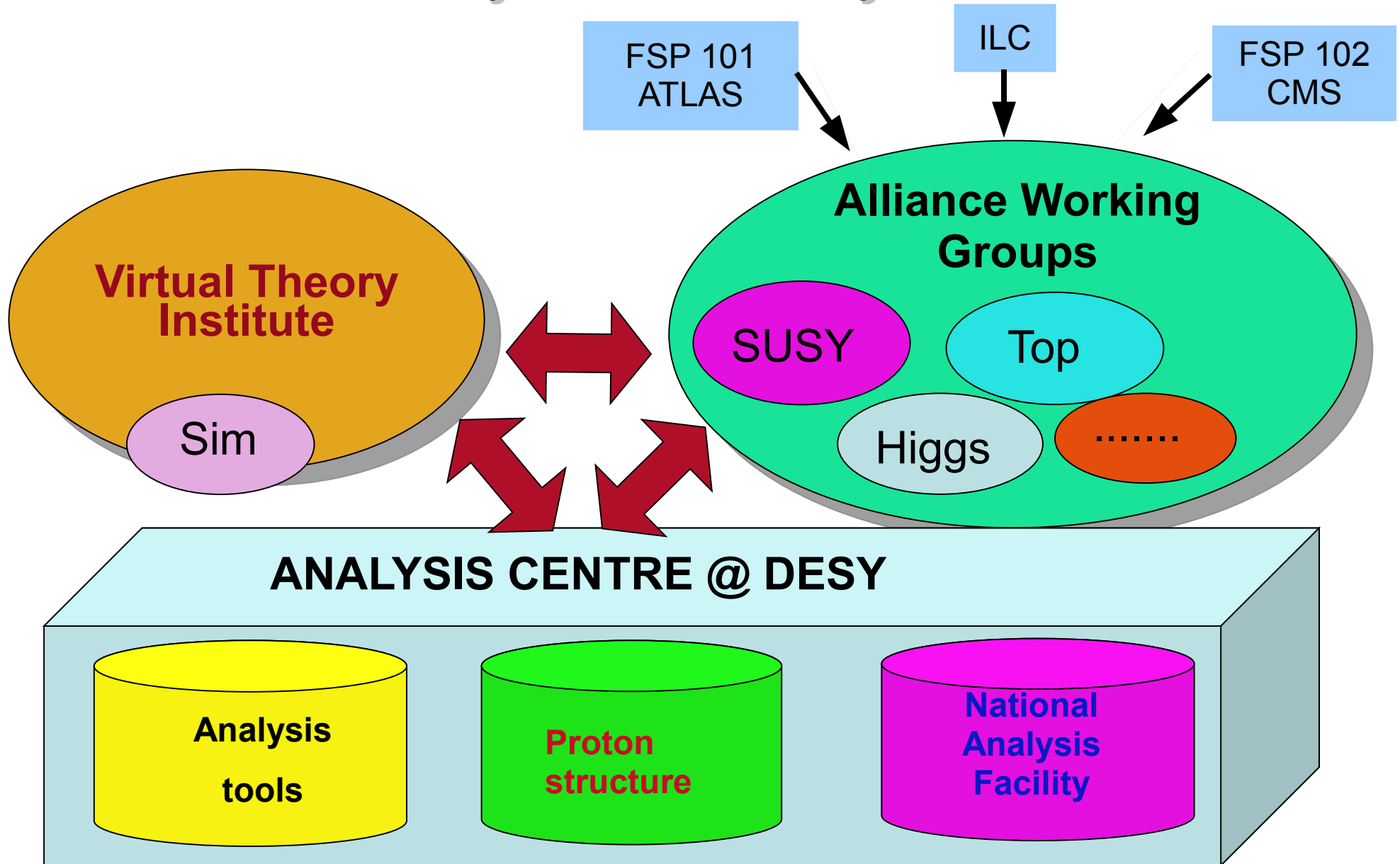
This by itself is a major effect of the HGF Alliance!

# Terascale events

Alliance started officially on July 1, 2007

Quite a number of events since the start of the Alliance

# Physics Analysis



# Analysis

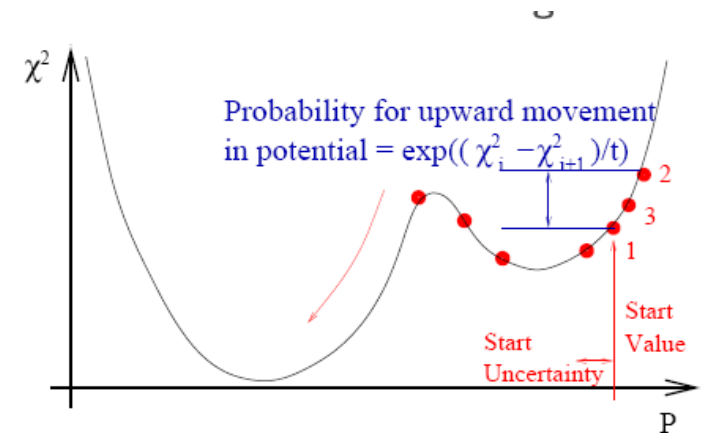
Virtual Theory Institute:

foster collaboration between different groups  
organize "virtual" seminars for all Alliance members

Analysis center at DESY

Example workshop on statics tools at DESY

Significant number of Alliance fellows  
have started to work (exp and theo)



# LHC workshops

## LHC-D (Managers: Menke, S.)

Events in this category:



Search

(more options)



▼ 2008

June 2008

03 - 04 [LHC-D workshop 2008: QCD and electroweak physics](#)



February 2008

08 - 09 [LHC-D Workshop 2008 - Topquark Physik \(III\)](#)



▼ 2007

October 2007

08 - 09 [LHC-D workshop 2007: Higgs Physics](#)



July 2007

05 - 06 [LHC-D workshop 2007: QCD and electroweak physics](#)



February 2007

22 - 23 [LHC-D Workshop 2007 - SUSY und BSM \(II\)](#)



January 2007

26 - 27 [LHC-D Workshop 2007 - Topquark Physik \(II\)](#)



26 - 27 [LHC-D Workshop 2007 - Topquark Physik](#)



22 - 23 [LHC-D Workshop 2007 - Higgs Physik \(II\)](#)



▼ 2006

October 2006

18 - 20 [Tutorial on QCD for LHC - KET LHC - D workshops](#)



16 - 17 [LHC-D workshop 2006: QCD and electroweak physics](#)



June 2006

### Tools

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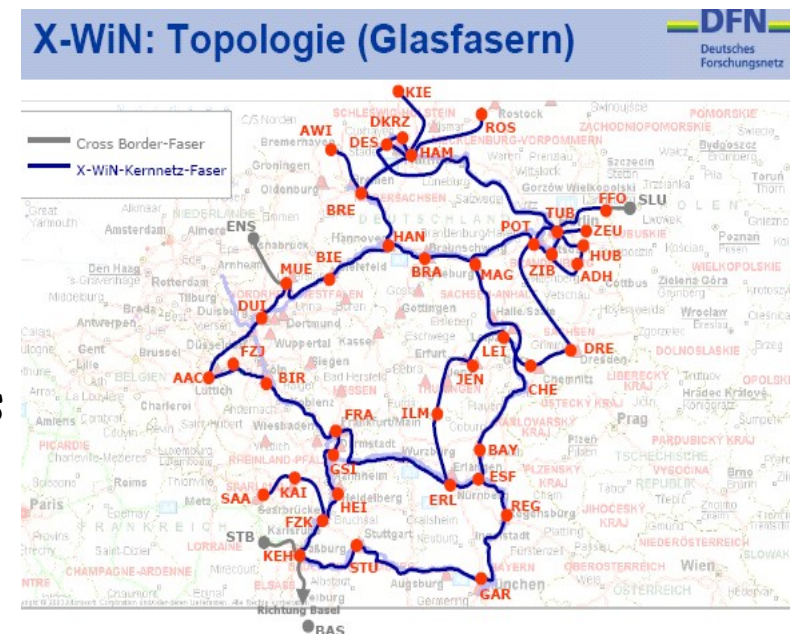
[Lecture](#)

[Meeting](#)

[Conference](#)

# Grid

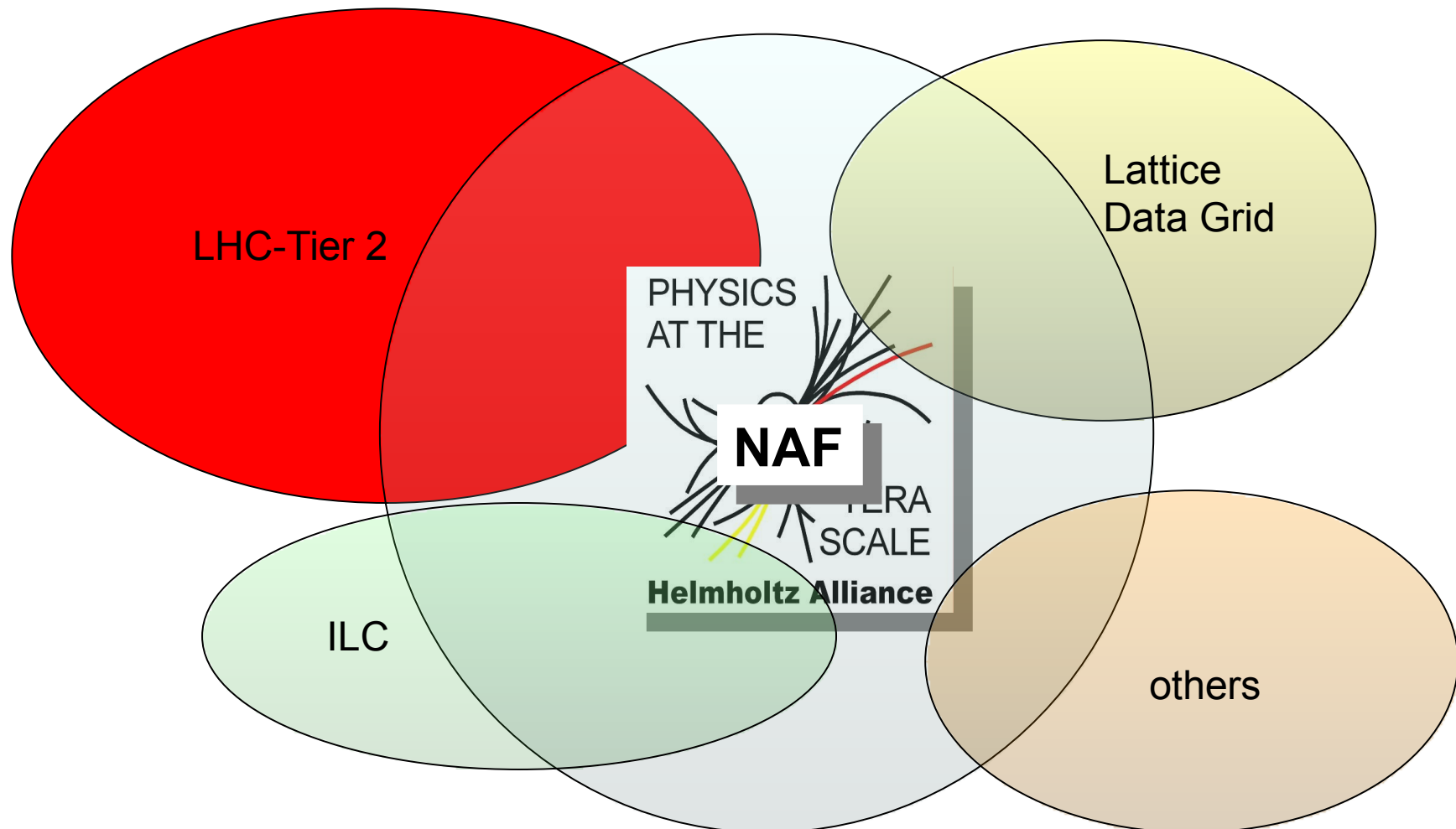
- Provide resources to make *Grid* in *Germany* competitive
  - Further boost for hardware through extra funds from the federal government
- Combine *Grid* expertise at FZK and DESY with universities
  - More Tier-2 responsibilities located at universities
- National Analysis Facility
  - Make the grid more accessible for the users
    - Desktop ↔ Grid
  - Provide computing power for *German HEP* community, including high priority analyses
  - ...





# National Analysis Facility

Managed via Virtual Organisations (VOs)



# Detectors

Goal: develop common infrastructures, make existing ones accessible to all partners:

Tool: Virtual Laboratory for Detector Technologies

- Build up infrastructure in Bonn, DESY, Heidelberg (AC, HH, KA) for use by all Alliance partners
  - Manpower
    - Build up and pool expertise
  - Hardware
    - Build up and pool facilities
- Geared to SLHC & ILC detector development
- Some funding for start-up projects

ASICS/ chip development

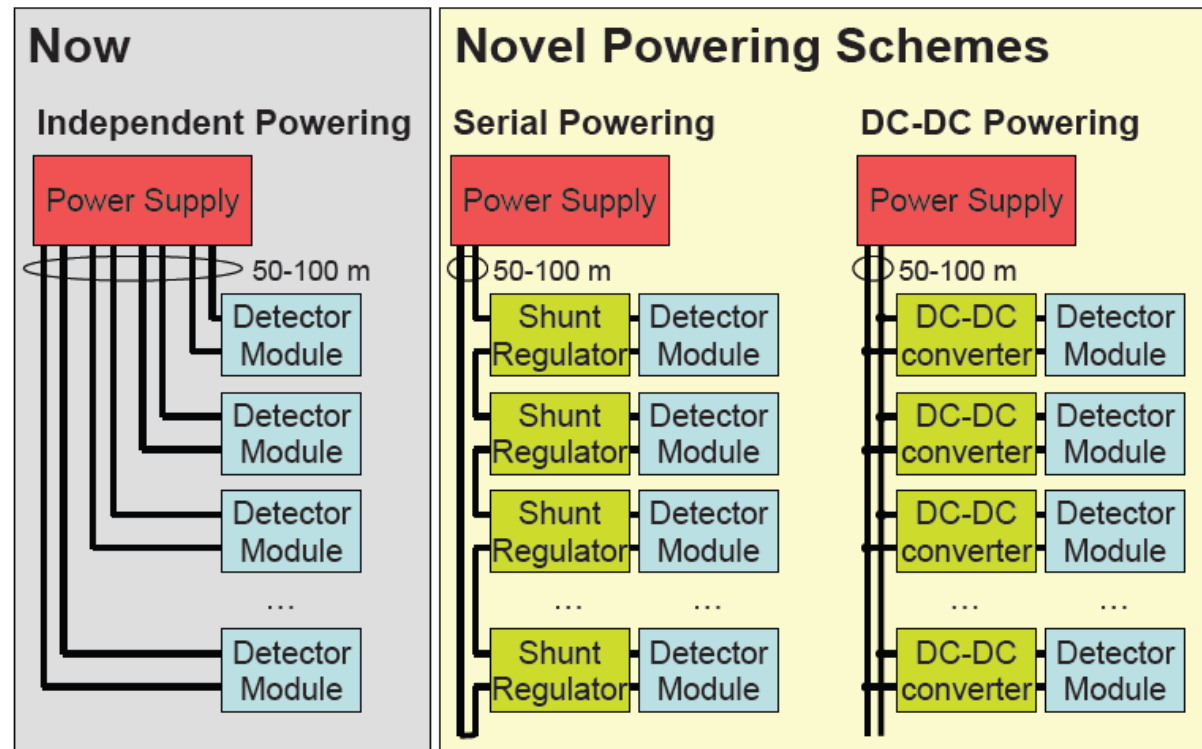


# New Projects

Focus: try to support promising new developments,  
try to maximize the synergies also between the big experiments/ projects

Example:  
novel powering concepts  
for LHC

are now pursued as a  
common technological  
project between  
ATLAS and CMS



# Accelerators

- Involve more university groups in accelerator research
  - Teaching + schools
  - Establish a Young Investigator Group for accelerator research
- Support PhD students

School met significant interest

already generated several potential thesis students



18.7.2008

# Summary

The Helmholtz Alliance "Physics at the Terascale" is an opportunity to help re-shape the HEP landscape in Germany

The Alliance networks and connects German Particle Physics at the Energy Frontier in one structure

We hope that the Alliance will help to improve collaboration within the German HEP community, and enable thus a stronger contribution to the worldwide HEP program

The Alliance wants to provide not only short term positions, but create sustainable, long term structures.

<http://www.terascale.de/>