PAST, PRESENT & FUTURE OF THE HELMHOLTZ ALLIANCE ‚PHYSICS AT THE TERASCALE‘

P.Mättig
Scientific Coordinator
Bergische Universität Wuppertal

Midterm of the Alliance

The Alliance started in July 2007 for 5 years ➔
end of 2009 first half completed

Nov 31 – Dec, 1: international high level evaluation of our Alliance under auspice of Helmholtz Gemeinschaft

- **What has the Alliance achieved?**
- **What are the plans for the second half?**
- **How can the Alliance structures be sustained?**

Nota bene:
Very positive response by Helmholtz Gemeinschaft
concerning the next 5y funding plan of DESY and FZ Karlsruhe

Focus this time: which mechanisms needed to continue close cooperation of DESY and universities

Reminder: how the Alliance came to life, main ideas

Concept of the Alliance had to be developed within a short time scale and constraints
- **Combining mutual strengths of universities & research centres**
- **institutions should work together on equal basis**
- **complementary to other funding schemes (e.g. Verbundforschung)**

➔ **new structures to be developed, no blue print available**
an experiment:
partners contribute own resources, receive additional Alliance funds,
➔ **build instruments to be used by whole Alliance**

Alliance ‚Physics at the Terascale' unique in bringing together in a framework
- **2 Helmholtz Centres (DESY, FZ Karlsruhe)**
- **18 Universities**
- **1 Max Planck Institute**

Funds 25 M€ for 5 years ➔ end of 2012

A look across the borders

Countries with ‚central labs': RAL (UK), NIKHEF (NL), ...
Distributed research labs: INFN (Italy), IN2P3 (France)

➔ important asset in contributions to HEP

Germany: no central lab for German particle physics
BUT: DESY with large infrastructure, expertise engineering, accelerators, ...
GridKa at FZK
A huge amount of expertise in universities with dedicated infrastructure

no overall framework to close ‚gaps' of general and strategic importance (Monte – Carlo, engineering, Grid tools, ...)

➔Alliance to develop networks and commonly used infrastructure:
improve visibility of German HEP
strengthen contributions in international collaboration

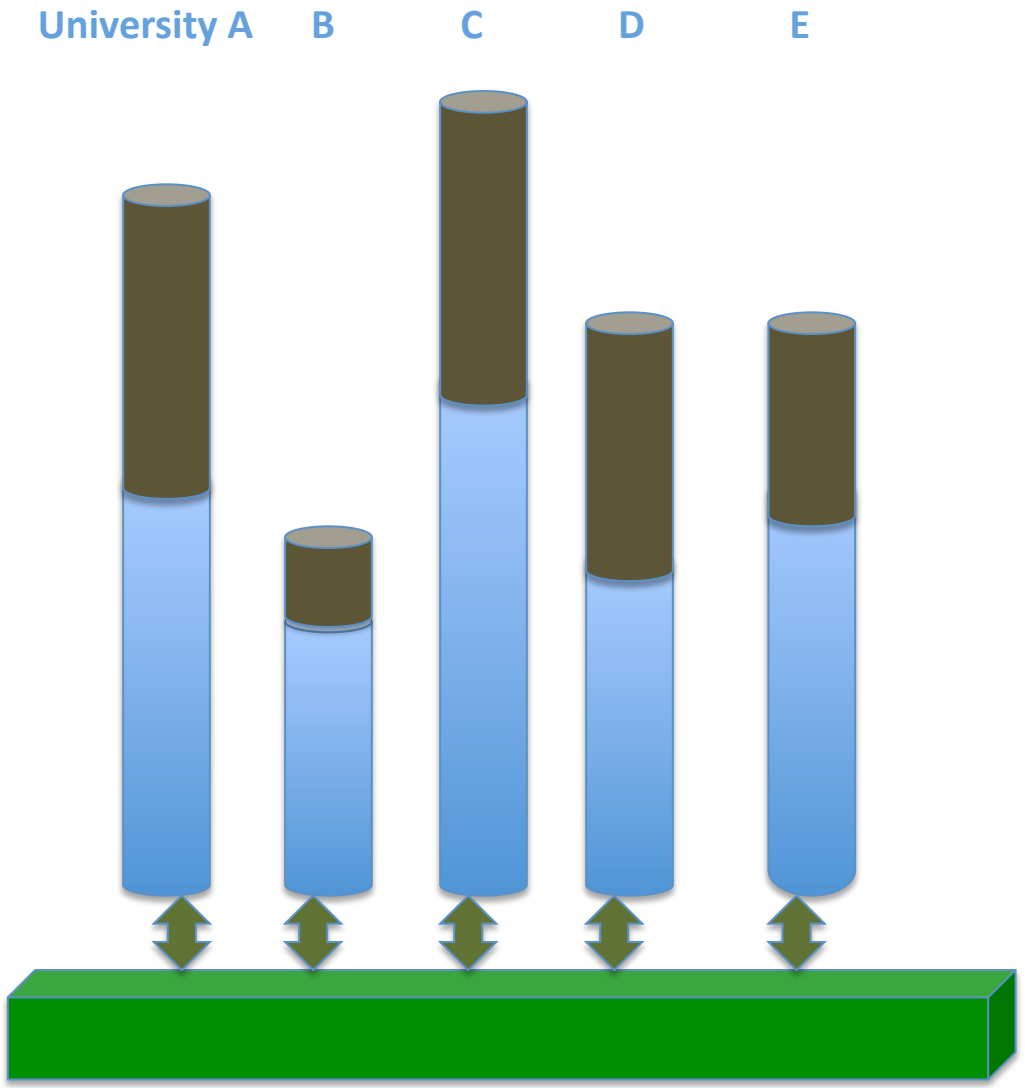
Note: Alliance is PART of international effort

Complementary to other funding (view from universities)

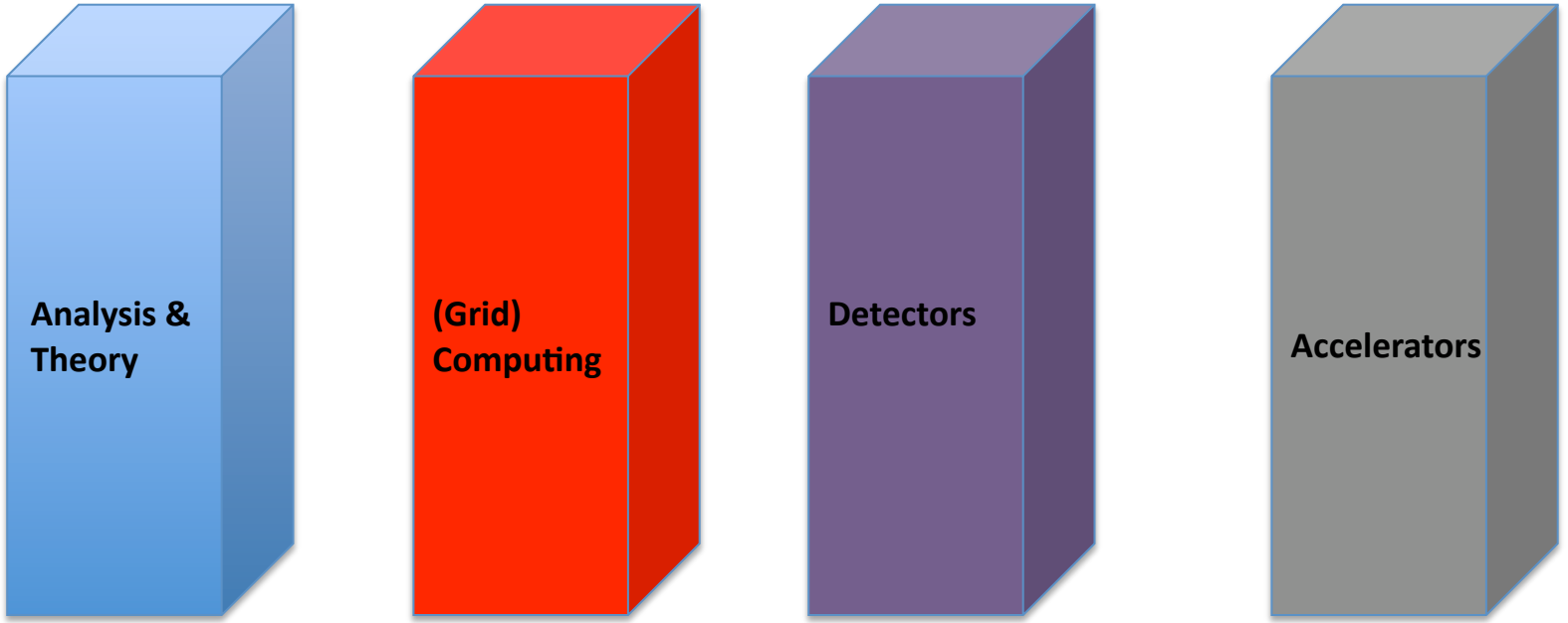
Verbundfoschung:
Project funding
(no infrastructure)

Basic contribution at
Universities

Alliance funds
‚orthogonal‘



4 Research Pillars & 4 instruments



Schools, Workshops & Networks
Infrastructure for common use
Projects of future importance
Fellowships and investigator groups

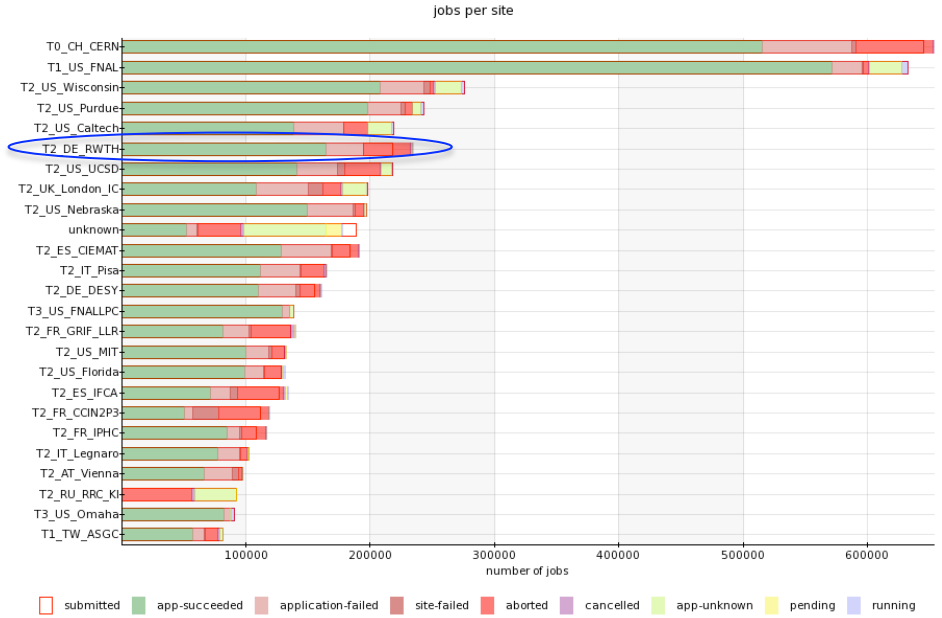
After 30 months: how did the Alliance do?

- **12 Schools with in total 1000 participants**
  Analysis centre @ DESY central for organising schools & workshops
  developing strong expertise in MC, pdfs and statistics

- **German Tier 2 centers provide a significant amount of MC production in Germany**

Example
Aachen in CMS

Similar for ATLAS

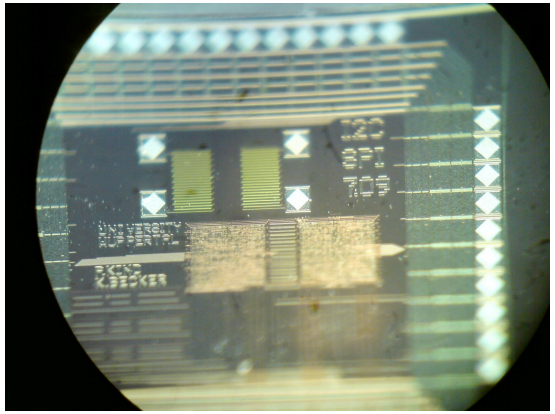


(Without Alliance no Tier 2s at universities!)

After 30 months: how did the Alliance do?

-Detector physics: by now infrastructure and personnel in place
(chip design, test beams, sensor qualification)

Micro chip for ATLAS pixel slow control in Wuppertal based on work @ Alliance infrastructure in Bonn



- Accelerator physics: education and bringing together

Alliance after a short time highly accepted in German particle physics
More and more bottom → up initiatives
- **Workshops**
- **Schools**
- **also Infrastructure**

Example: recent funding call

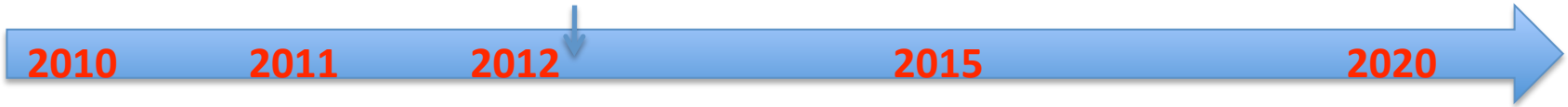
Some 800 K€ funds available ➔ call for proposals along following criteria:

- Fostering collaboration among different institutes,
- cover subjects of long – term and general importance of particle physics in Germany
-Develop infrastructure of major interest to many groups of German particle physics

Funding requests of 2.5 M€
Step 1: evaluation by project boards
Step 2: final evaluation and prioritizing (between research pillars) by management board
In total some 40 Alliance members involved in decision process

Funded: Calculations for Monte – Carlo generators, Statistics, Grid/Analysis tools, common infrastructure for detector development, test facilities

The physics landscape until 2012 and beyond



LHC provides first results and proceeds to highest energies:

LHC discovery
Upgrade of LHC
decision process for High Energy e^+e^-
Super – B factories

Commissioning, first physics@LHC

Intense activities to explore discovery
implication for new projects

Grid faces reality check: many users, chaotic use - structure

Grid is mature
New distributed computing paradigm?

Detector R&D/building: LHC phase I
R&D for LHC phase II, Linear Collider

Construction/installation of Phase II detectors
..... of LC detectors

Continous R&D on LHC upgrade, Linear Collier, new acceleration techniques

ALLIANCE NEEDED UP TO 2012 ..... AND BEYOND !!!

OUR VIEW SUBMITTED TO HGF & EVALUATION BOARD

Directions in Analysis + Theory

Assure efficient German contribution to LHC physics, eventually ➔ linear collider

-establish the Analysis Centre as the central hub for issues of general interest in HEP that are not sufficiently covered at German universities and to create reliable user support structures;

-to continue the training programme in response to the needs of the users

- to pursue and publish research topics related to the core activities of the Analysis Centre and relevant for the LHC analysis, e.g. the open-source NNLO PDF project, new fitting packages, Monte Carlo tuning, new theoretical approaches for parton showers, and Monte Carlo generators based on non-collinear factorization;

- to establish a close collaboration between the German experimental and theoretical HEP communities by means of Analysis working groups, expert and topical workshops;

- to further the physics studies for a future linear collider

Directions in Grid Computing

Efficient Grid computing in era of LHC data, shaping the future of HEP computing

-Contribute significantly to the CMS and ATLAS computing in the data taking phase

-Provide a computing environment for a competitive German contribution to physics analysis

-Continue support for the integration of resources at universities into the common computing infrastructure

-Develop tools for Grid operation and usage for the LHC Grid, in particular in the areas of data management, virtualisation and monitoring.

-Secure a strong involvement of the German particle physics community in shaping the future of HEP computing

-Also beyond 2012: make sure universities are part of Grid infrastructure, tool development

Directions in Detector Physics

Detector R&D for LHC phases I+II & Linear Collider, construction and integration

- **Broad use of the Alliance infrastructure for internationally visible detector projects**
- **Full integration of newly funded Alliance infrastructure to make them available to all partners**
- **Expansion of the training program**
- **Enhance cooperation and exchange through topical workshops**
- **Adaption of the Alliance infrastructure to the needs of the coming detector projects**

Beyond 2012:

To remain internationally at the forefront of R&D, continued investments into state-of-the-art infrastructure is necessary as well as long term perspectives for the technical staff. It also requires that the VLDT infrastructure and personnel should meet the evolving demands from developing R&D activities. New kind of infrastructure should be funded if a clear need from several universities and projects at the Terascale can be identified, as well as a strong commitment together with existing high class expertise at the host institute.

Directions in Accelerator Physics

Broaden education & expertise in Germany, contribute to future accelerators
note: limited funding in view of needs
Young Investigator Group @ Hamburg!

- **Extend accelerator courses at universities**
- **Develop in collaboration with universities a curriculum for accelerator courses with the aim to acknowledge credit points in the master study program.**
- **Promote research projects between universities and DESY and CERN for PhD and diploma studies.**
- **Organise topical workshops in accelerator physics.**
- **Identify crucial research projects for accelerator research towards the highest energies.**

Beyond 2012:
Depending on first results of the LHC a decision for the next high energy collider will be prepared (ILC or CLIC). The aim of the Alliance is to help to establish a network of accelerator physics.
The future of High Energy Physics depends on the availability of technologies that are capable of mastering accelerating gradients of 1 GV/m or more. The Alliance will organize topical workshops and encourage interdisciplinary research projects between particle physicists and for example laser and plasma physicists.

Accompanying measures

Strengthen collaborative tools and allow flexibility for strategic development of field in Germany

-**Maintain Fellowships** for collaborative instruments (e.g. Analysis Centre) with higher visibility
- **Young Investigator groups** should be funded if tenure track perspective @ university Better support
- Continue successfull **equal opportunity** measures
- **Guest scientists 'of the German community', interim professorships**

Maintain the **management structure**:

- Expert panels on strategic planning the standing of German HEP in the international framework
- Overall structure to be German HEP partner in EU applications etc.
- Strong link (but different tasks) to KET (political representation)

Expand to include HEP in ist broadness

Summary

Mid-term of Alliance!

Within only 30 months established a new framework for doing research in Germany complementing and strengthening the DESY base-funds and BMBF Verbundforschung for universities

-Instruments of Alliance in place and working
-Alliance has contributed to collaborative spirit, enhancing visibility of German HEP in international field

The Alliance is needed for the challenges of LHC data and the future projects
➔ our wish to continue beyond 2012
with appropriate funds for DESY, FZ Karlsruhe and Universities

Instruments will have to be developed further
➔ allow for flexibility and new initiatives