

DESY Strategy

11th Pisa Meeting on Advanced Detectors



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DESY
26 May 2009

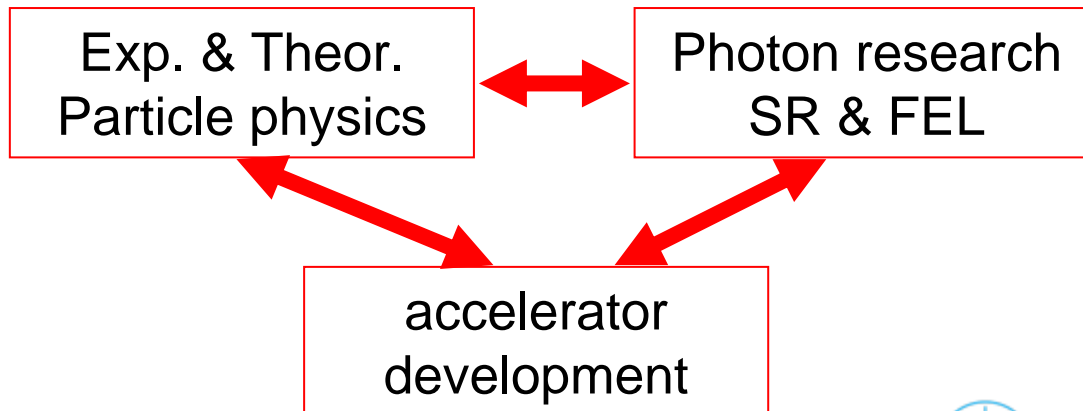
Fundamental Research at DESY

> DESY has a long successful history in three areas of basic science and high technology :

- Particle physics
- Research with X-rays (synchrotron radiation, FEL) and
- Accelerator development.

> Future:

- Photon science new light sources PETRA III, FLASH, European XFEL
- Accelerator: superconducting RF technology (TESLA)
- Particle Physics: After end of HERA no HEP accelerator in Germany **major challenge!**



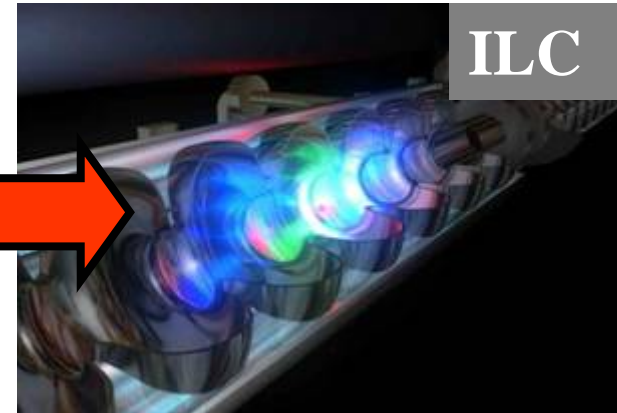
Long-term Strategy in Particle Physics



HERA



LHC



ILC

Structure of the proton

Explore the Terascale

Precision physics

Contributions to

- > **Accelerators**
- > **Detectors**
- > **Physics**

on an international scale

Supported by

- > **Strong and broad theory group**
- > **Computing infrastructure (KIT and DESY)**
- > **Testbeam & other infrastructures**

Helmholtz Alliance „Physics at the Terascale“



> Network of complementary excellence between

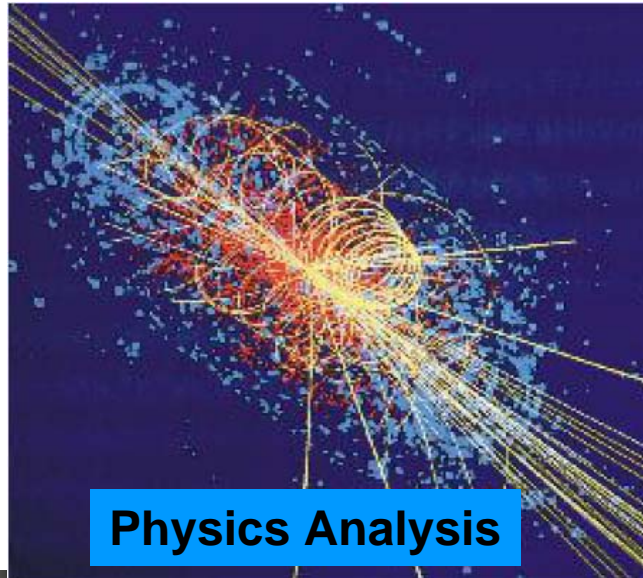
- 2 Helmholtz centres
- 19 German universities and
- 1 Max Planck-Institute



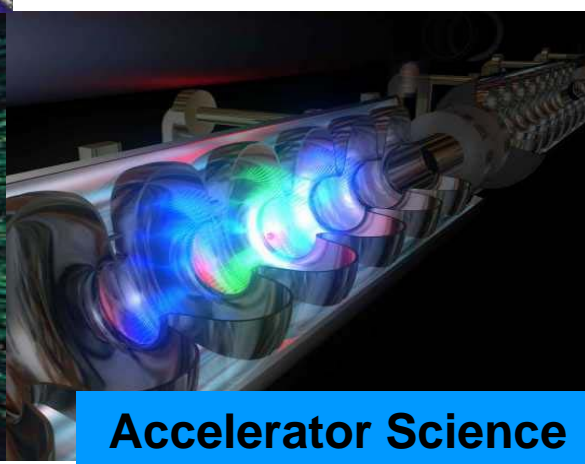
- > Project duration 2007 - 2012
- > Restructuring particle physics in Germany

Helmholtz Alliance „Physics at the Terascale“

**Particle Physics at the
Energy Frontier**



**Instrumentation at the
Technology Frontier**



- > **DESY is the central institute of the Helmholtz Alliance**
 - Contributes to all key structures and instruments
- > **Unique feature of DESY in Germany:
provides all infrastructures to support large experiments**
 - From development to construction, operation and analysis
i.e. testbeam, engineering, integration, computing, analysis centre, ...
- > **Starting participation in LHC detector upgrades**

In close collaboration in particular with German universities

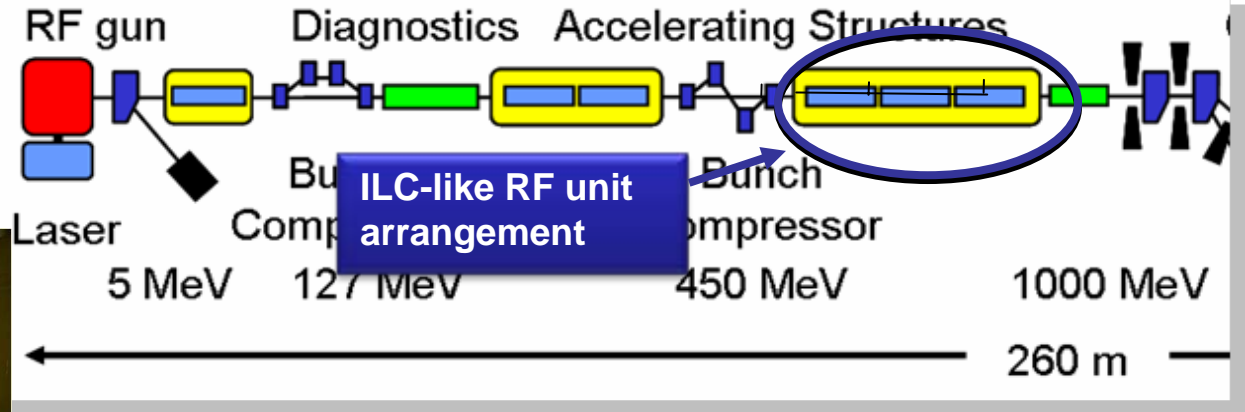
 - ATLAS pixel detector
 - CMS tracker




ILC Accelerator: Exploiting Synergy with XFEL & FLASH

> Example:

Operation of TTF/ FLASH with ILC-like beam parameters: 9mA experiment

→ Unique opportunity at DESY because of TTF/ FLASH

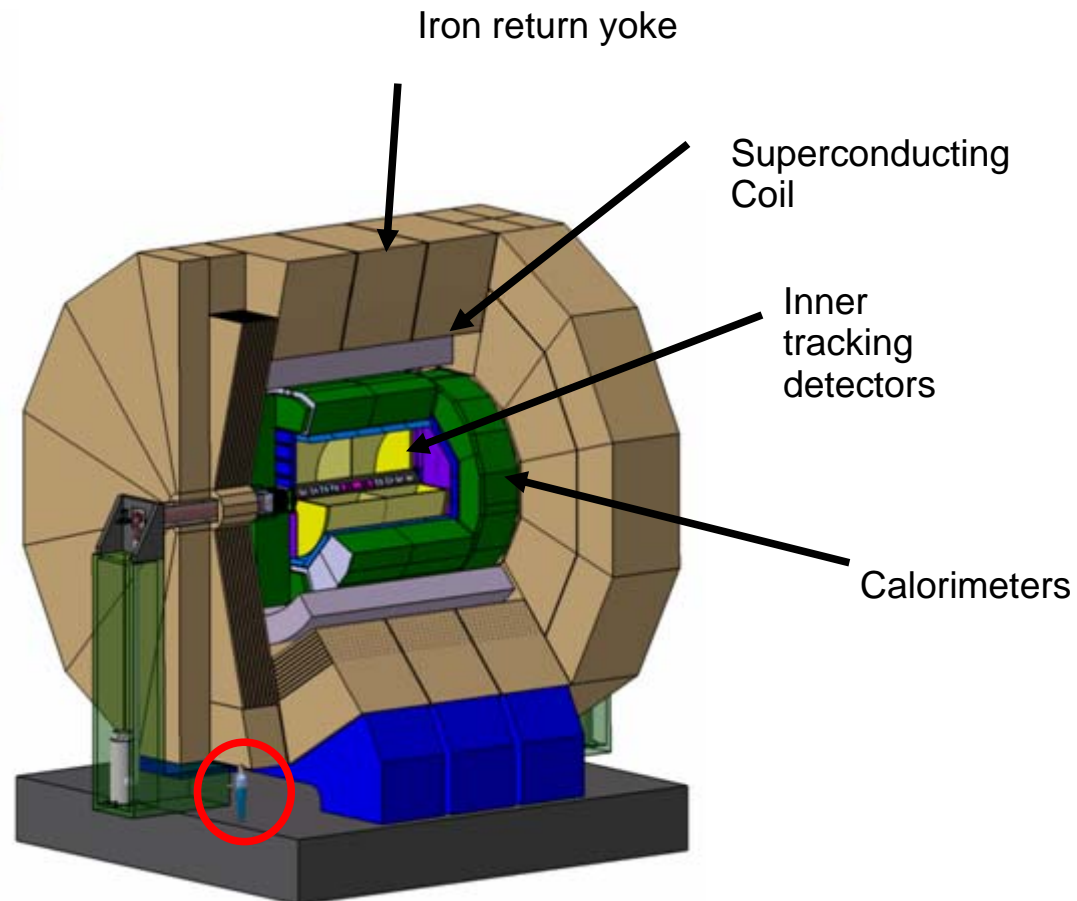
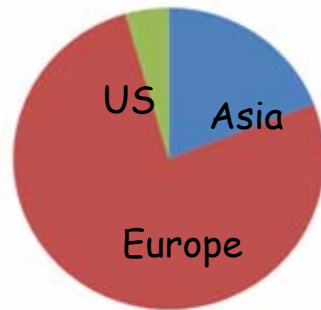


					FLASH experiment
Bunch charge	nC	1	3.2	1	3
# bunches		3250*	2625	7200*	2400
Pulse length	μ s	650	970	800	800
Current	mA	5	9	9	9

> Future: XFEL in many aspects a 10% prototype of the ILC

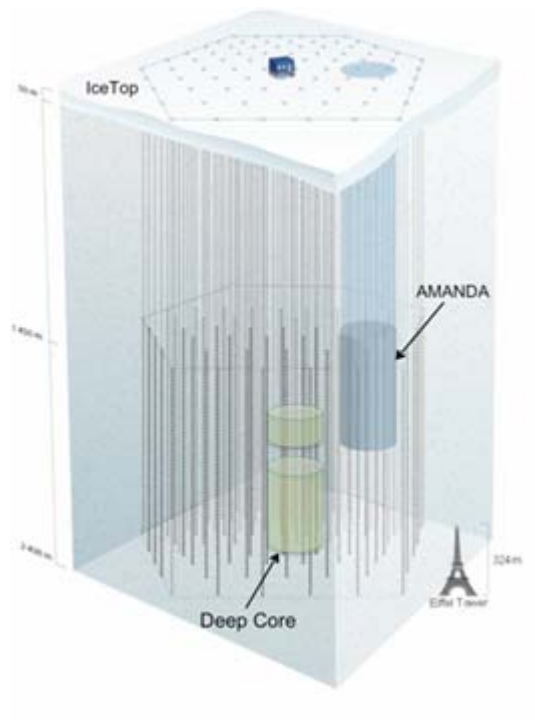
ILC: ILD Detector Concept

- > Letter of intent for the ILD Detector:
698 signatories from 149 institutes
Strong contribution from DESY



> IceCube

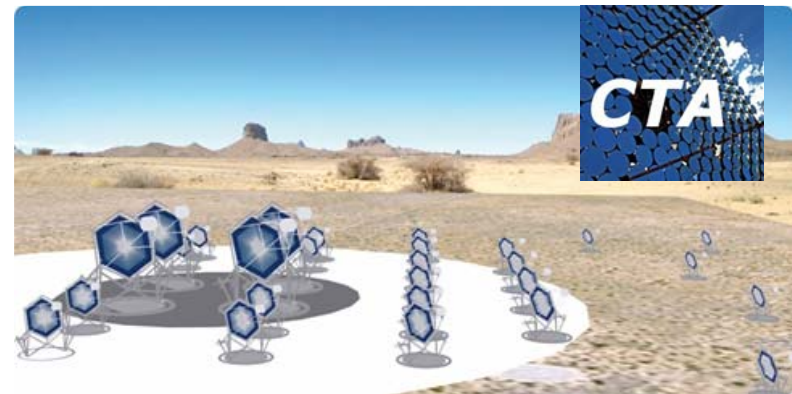
- Almost $\frac{3}{4}$ installed in 2008/09
- $\frac{1}{4}$ of Digital Optical Modules produced at DESY



> Future: Cerenkov Telescope Array CTA

> DESY works on

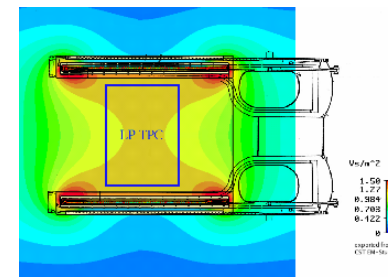
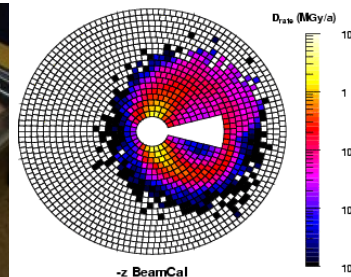
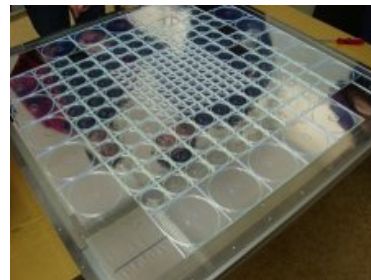
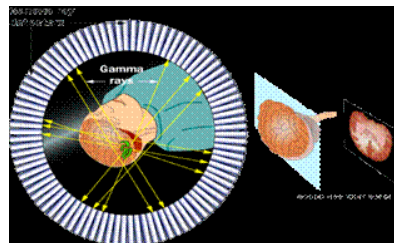
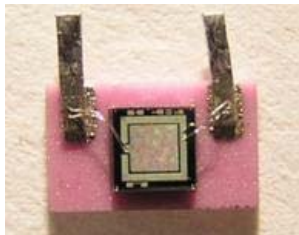
- 12 m telescope prototype
- Drive and control and safety system
- Fast read-out system based on domino ring sampler
- HV concept for camera
- Timing studies for background suppression
- Trigger optimization



Generic Aspects of Detector R&D

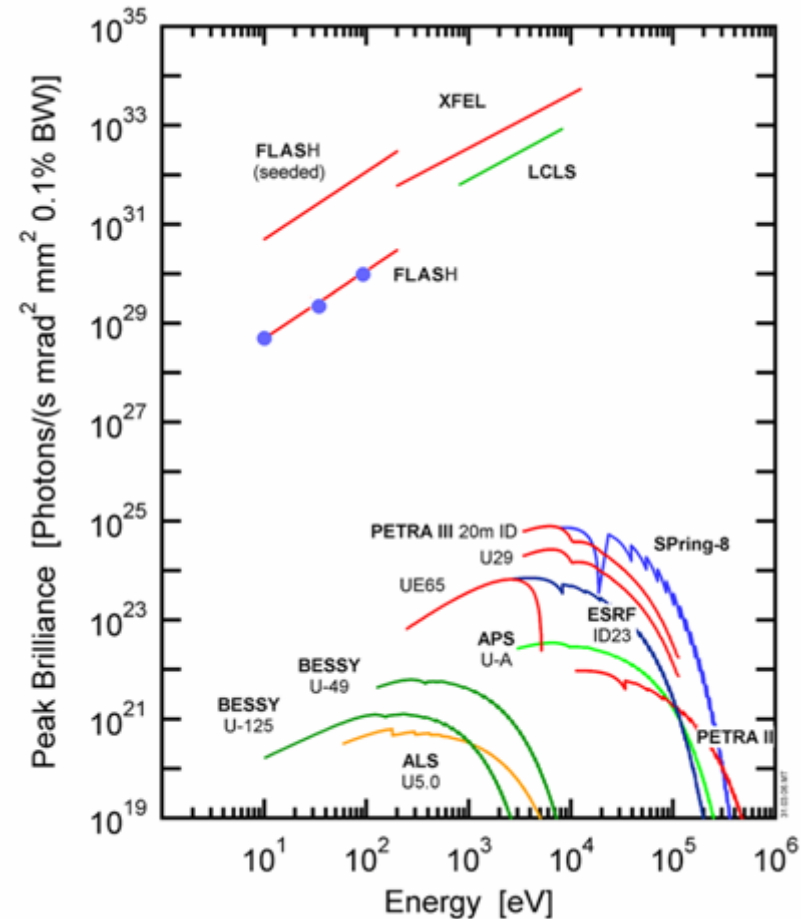
- R&D for Silicon-Photomultipliers
 - spin-off to medical applications (PET)
- R&D for high precision vertex detector technologies
 - applications in other projects (MAPS @ STAR, DEPFET @ SuperBelle)
- development of a finely segmented hadronic calorimeter and forward calorimeter
 - advance fundamental knowledge of hadron shower
 - spin-off to beam instrumentation
- development of a highly efficient time projection chamber
 - application to T2K, RD51 at CERN
- strong role in the development of software and reconstruction tools for the ILC

*key issues to validate
Particle Flow*



Synergy with Photon Science

- > **New, brilliant photon source like FLASH, PETRA III and the XFEL need advanced detector technologies**
 - **Example pixel detectors**
 - **Requirements on data acquisition and processing (computing) are becoming similar to particle physics**



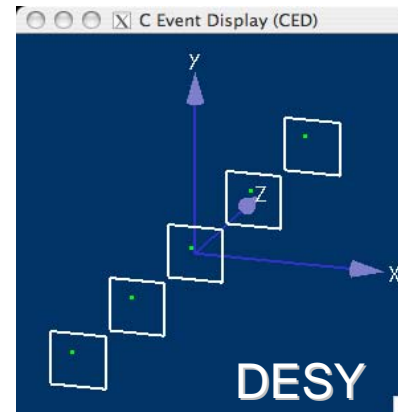
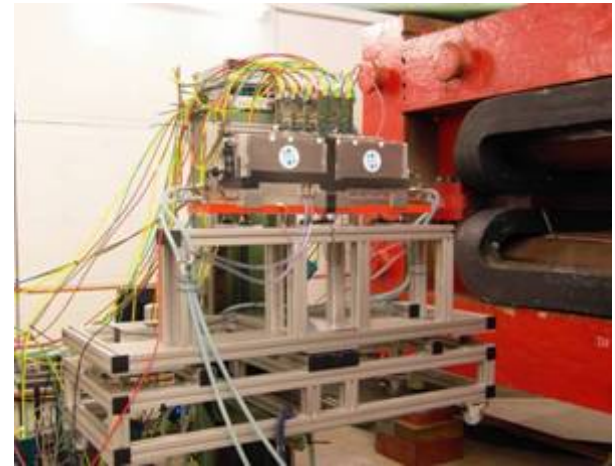
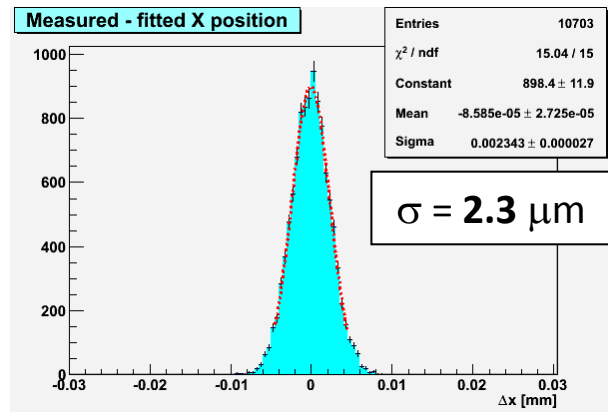
Backup



> EUDET beam telescope

- 6 layers of Monolithic Active Pixel Sensor (MAPS) detectors
- DEPFET and ISIS pixel detectors for validation
- DAQ system

Phase 1: "Demonstrator"



ILC Calorimeters

- > **CALICE collaboration**
 - DESY: analog HCAL
- > **From prototypes in testbeam**

to ILC calorimeter

