DESY.

Planung Teilchen und Astroteilchenphysik.

Joachim Mnich

KET Jahresversammlung
Bad Honnef, 22. November 2008

HELMHOLTZ GEMEINSCHAFT

DESY News

Professor Helmut Dosch takes the Chair of the DESY Directorate

Professor Helmut Dosch will become the new Chair of the Directorate of the Research Centre DESY. Solid-state physicist Helmut Dosch, born in Rosenheim, Bavaria, is at present Director of the Max Planck Institute for Metals Research in Stuttgart and professor at the University of Stuttgart. On 1 March 2009, he will replace Professor Albrecht Wagner as Chair of the DESY Directorate who has served as DESY Director since 1999.

“DESY is a brand name standing for top research worldwide. With the new accelerator facilities which are currently built in Hamburg, DESY will shed light on so far unexplored dimensions in nanospace and will continue to play a leading role in the international top league of large-scale research,” explains Helmut Dosch. “Particularly, we will further strengthen the collaboration with CERN and the University of Hamburg and create a magnet for junior scientists.”

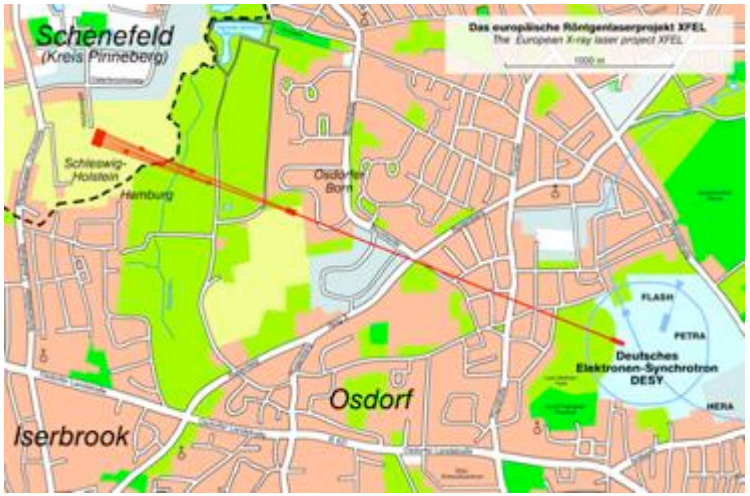
Professor Helmut Dosch, born in 1955, obtained his doctorate and habilitated at Ludwig Maximilian University, Munich. He worked as a scientist at the Institute Laue-Langevin (Grenoble), Cornell University (New York) and at the universities of Mainz and Wuppertal before becoming director of the Max Planck Institute for Metal Research and at the same time chair for Experimental Solid State Physics at Stuttgart University. Dosch is internationally renowned for the research of solid-state interfaces and nanomaterials with synchrotron radiation.

> **Assumption of office: March 1st, 2009**

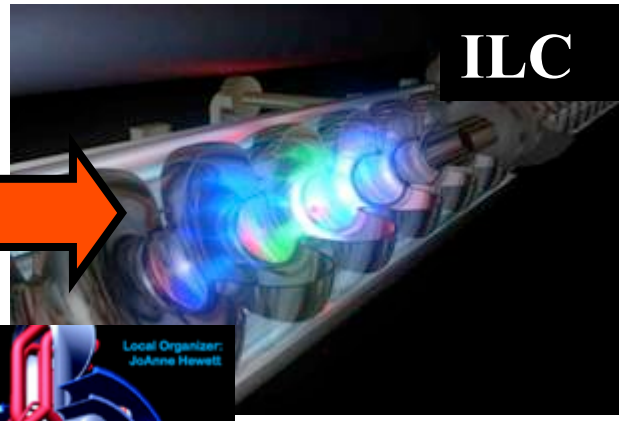
PETRA III and European XFEL

- **PETRA III**
  - **Project almost completed**
  - **On time and on budget**
  - **First beam early 2009**

- **European XFEL**
  - **Civil engineering call for tender completed**
  - **Start construction soon**
  - **XFEL company foundation early 2009**



DESY Long-term Strategy in Particle Physics



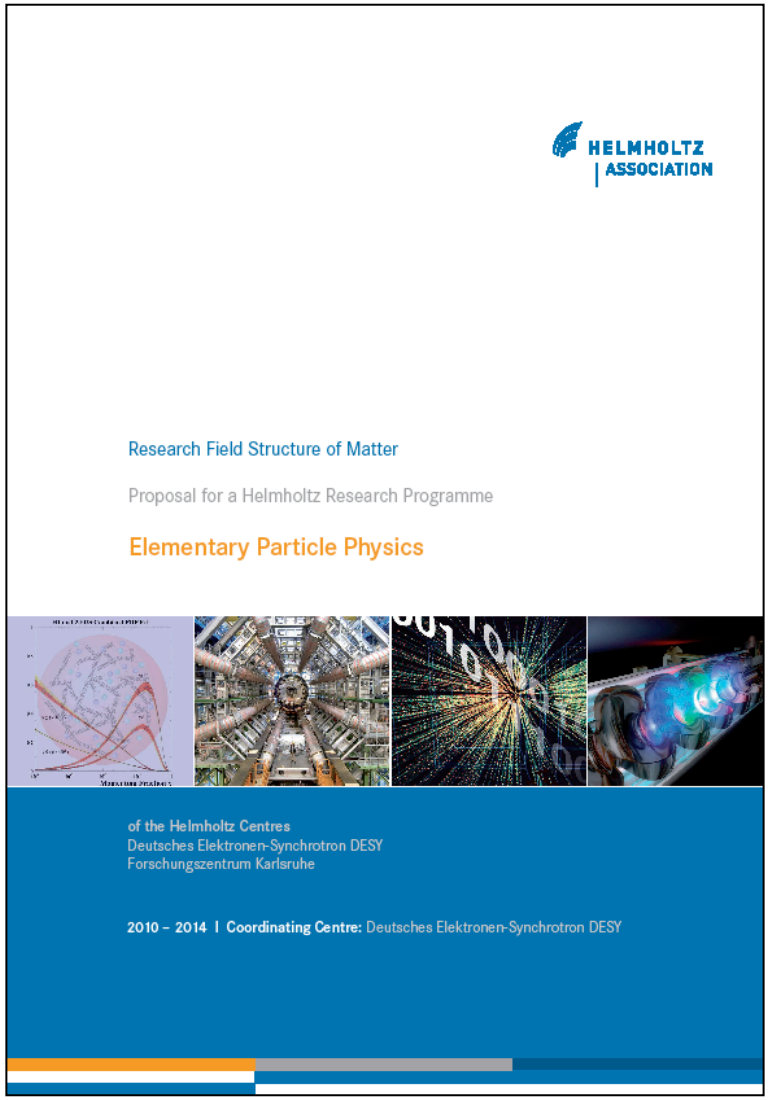
- Accelerators
- Detectors
- Physics

+ support through strong theory group

+ computing infrastructure

+ testbeam & other infrastructures

DESY Five Years Planning (PoF) 2010-14



- Programme Elementary Particle Physics
- Seven programme topics
  - **HERA**
  - **LHC**
  - **Preparation for a future lepton collider**
  - **Theoretical particle physics**
  - **Experimental facilites**
  - **Large-scale faility GridKa**
  - **Large-scale facility DESY Grid centre**
- Valuable input received from
  - **DESY advisory boards (WA, PRC, ESC)**
  - **German community (KET)**
  - **European community (ECFA)**
- Many thanks!!!

Helmholtz Alliance „Physics at the Terascale“

- **DESY programme based on Alliance**
  - **Central theme of the proposal!**

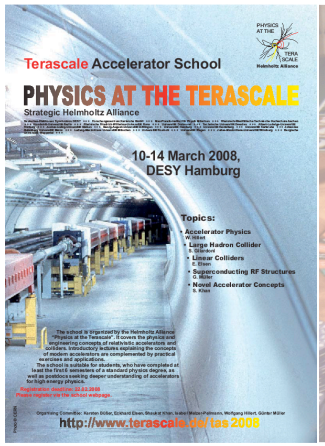
- **Sustain Alliance structures and instruments is primary goal**
  - **Additional funds requested as of mid 2012 to sustain structures at DESY: Analysis Centre, NAF, Detector Lab**

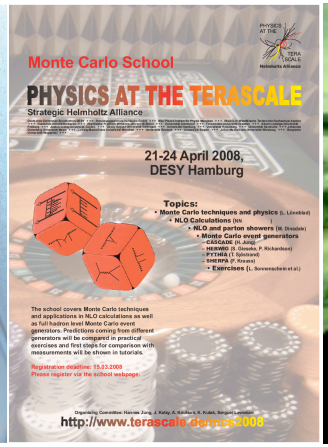
- **Alliance progress at DESY in 2008**
  - **Setup Analysis centre: appointment of leader and MC group leader**
  - **NAF: prototype operational, upgrading according to schedule**
    initial investment funded through BMBF Sondermittel
  - **LHC-b Tier-2: being set up at Zeuthen**
  - **Detector laboratory:**
    appointment of two engineers
    improvement of testbeam (also EUDET)

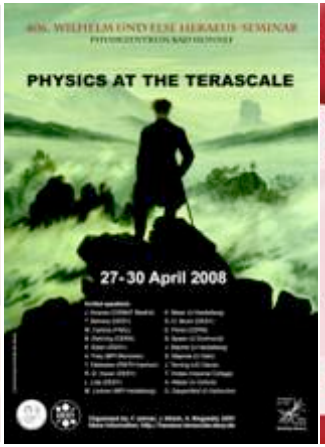
Helmholtz Alliance „Physics at the Terascale“

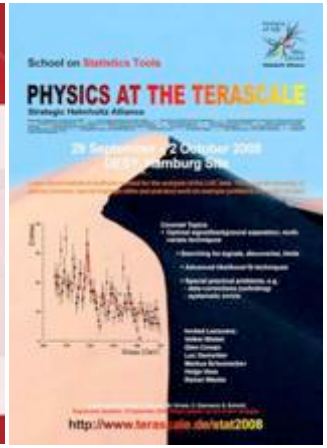
> Schools and Workshops in 2008

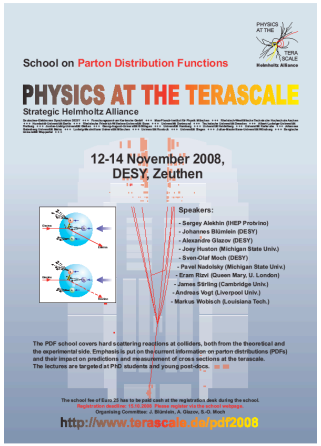
- 10. - 14.03. Accelerator School (DESY)
- 21. - 24.04. Monte Carlo School (DESY)
- 27. - 30.04. Heraeus Seminar „Physics at the Terascale“ (Bad Honnef)
- 8. - 12.09. GridKa School (Karlsruhe)
- 29. - 2.10. Statistics School (DESY)
- 12. - 14.11. School on Parton Distribution Functions (DESY)









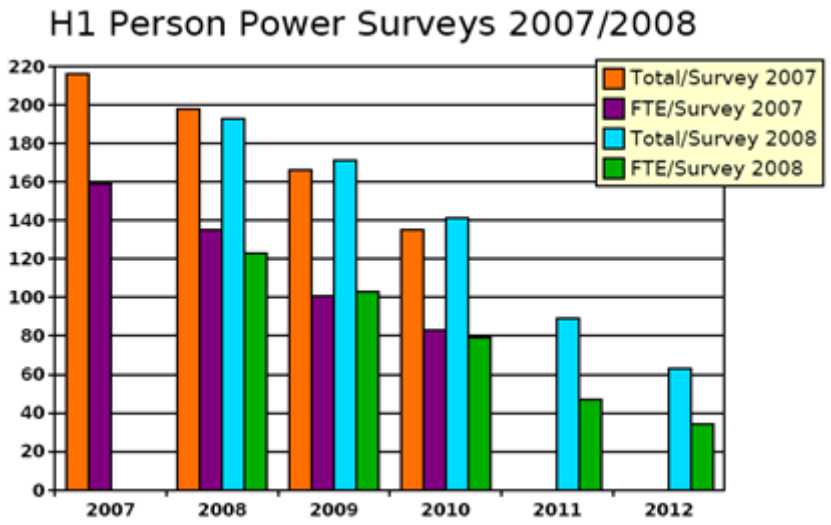


HERA

> **Exploit unique physics potential of HERA**

> **Sustain analysis efforts until 2014 together with collaborating institutes**

- **decreasing time profile**



> **Important input to the LHC:**

structure of the proton

> **DESY support for**

- **combination of the experiments**
- **long-term availability of HERA data**

HERA: Recent Physics Results

Combination of PDF results
Note: HERA I only!

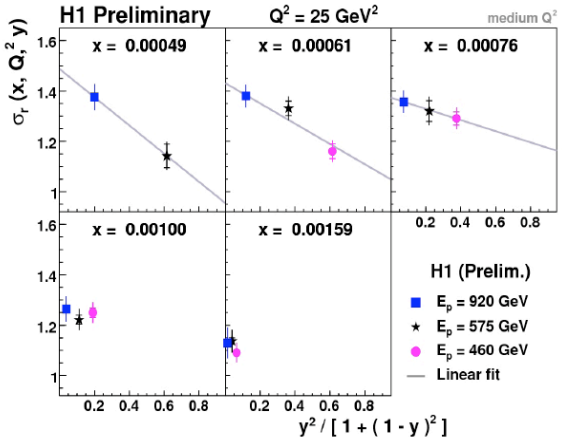
> Combination of HERA experiments

- Large potential to improve results,

  e.g. pdf

> Low energy run: measurement of F_L

- Directly sensitive to gluon density
- H1: published result



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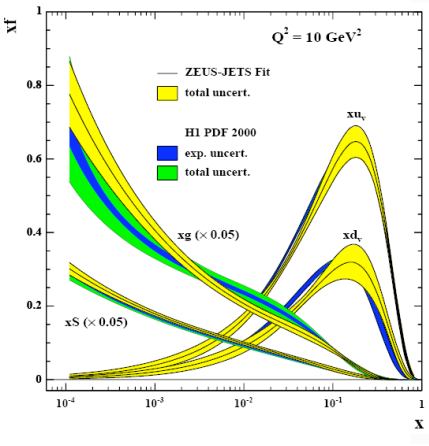
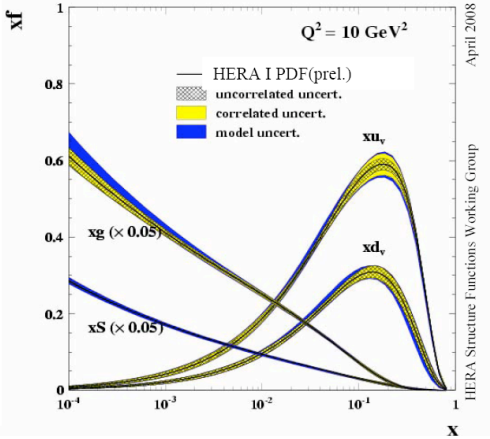


H1 and ZEUS Combined PDF Fit

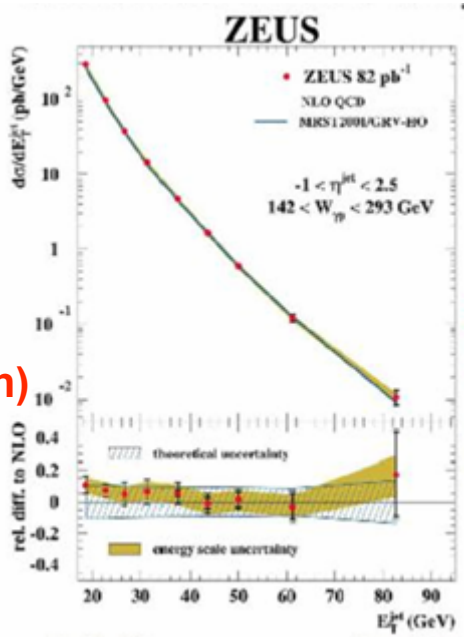


> Measurement of α_s

- ZEUS:

α_s = 0.1223 ± 0.0001(stat)
± 0.0022(sys) ± 0.0030(th)

- Needs NNLO QCD!



DESY Participation in LHC

- **Focus of world-wide particle physics for the coming years**
  - strong DESY participation in two experiments ATLAS and CMS
  - increase DESY involvement
- **Physics analysis**
  - Standard Model processes (QCD, top physics)
  - Higgs and SUSY
- **Contributions to baseline detectors**
  - technical coordination
  - trigger & DAQ
  - software & computing
- **Detector upgrades:**
  - R&D in close collaboration with German groups (Alliance)
    - main projects: ATLAS pixel & CMS tracker
    - plus a few smaller projects

LHC: Recent developments

> **Two new Helmholtz Young Investigator Groups established in 2008**
  - **ATLAS and CMS/HERA**

> **CMS remote centre**
  - **inaugurated October 2008**
  - **DESY & Uni HH participating regularly in CMS DQM shifts**

> **ILC remote control centre**
  - **for CALICE testbeam at FNAL**
  - **used by German and other European groups**

Future Lepton Collider (ILC)

- **Accelerator: supra-conducting RF technology**
  - **Use FLASH and exploit synergy with European XFEL**

- **Projects:**
  - **ILC Management: maintain strong role in GDE**
  - **High current operation**
  - **Pushing and establishing acceleration gradient**
  - **Beam dynamics**
  - **Positron source and polarisation**
  - **Novel particle acceleration schemes**

- **Launch of FP7 Programme** Hi-Grade
  - **Cavity R&D**
  - **ILC management aspects, siting**

Future Lepton Collider (ILC)

- **Detector: maintain leading & coordinating role in Europe**
  - **ILD detector concept**
  - **European project office (if co-funded)**
- **Continue detector R&D projects**
  - **HCAL (→ CALICE)**
  - **TPC**
  - **Pixel vertex detector**
  - **Forward calorimeter**
- **Develop generic aspects**
  - **collaboration with alternative LC designs**

    detector & accelerator, EU projects
  - **application for LHC**

    example: FCAL → CMS beam condition monitor
  - **synergy with photon science (IEEE satellite workshop)**

Example: EUDET TPC with US endplate in KEK magnet at DESY

Theoretical Particle Physics

- **Maintain and develop a strong theory group with a broad spectrum**
  - **Collider Phenomenology**
  - **Particle Cosmology and Unification**
  - **Lattice Field Theory (NIC)**
  - **String Theory**
- **Deeply rooted in experimental programme**
  - **Analysis Center of HGF Alliance, SFB**
- **Integrated with local Universities (theory & exp. groups)**

- **Shapes theoretical particle physics in Germany & beyond**
  - **lectures, schools, workshops, ...**
- **Pillar of theoretical particle physics in Europe & beyond**
  - **conferences, fellows, networks,..**

Experimental Facilities

> **Unique feature of DESY in Germany:**

all infrastructures to support large experiments

- **from development to construction & operation**
- **i.e. testbeam, engineering, integration, computing, analysis centre, ...**

> **Own programme topic in proposal**

- **fully integrated in LHC & ILC activities**
- **support common projects with Universities**
- **restructuring technical support of HEP experiments at DESY**

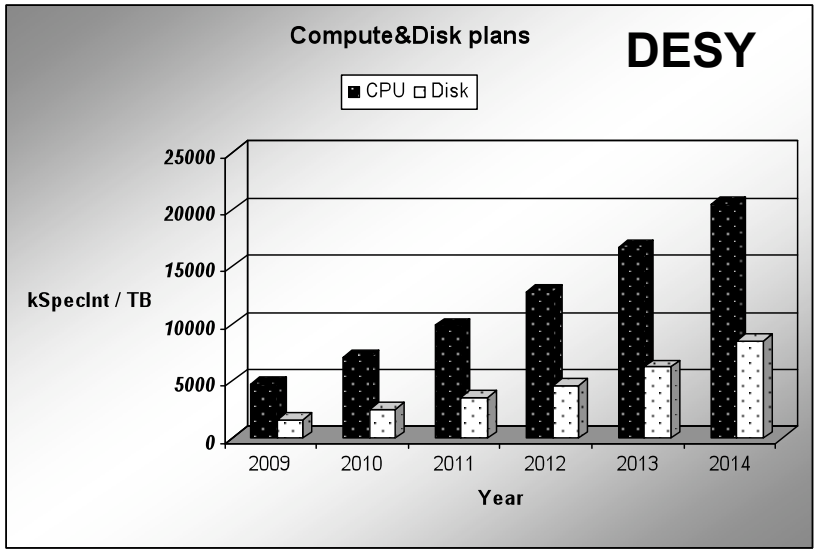
> **DESY contribution to HGF Alliance**

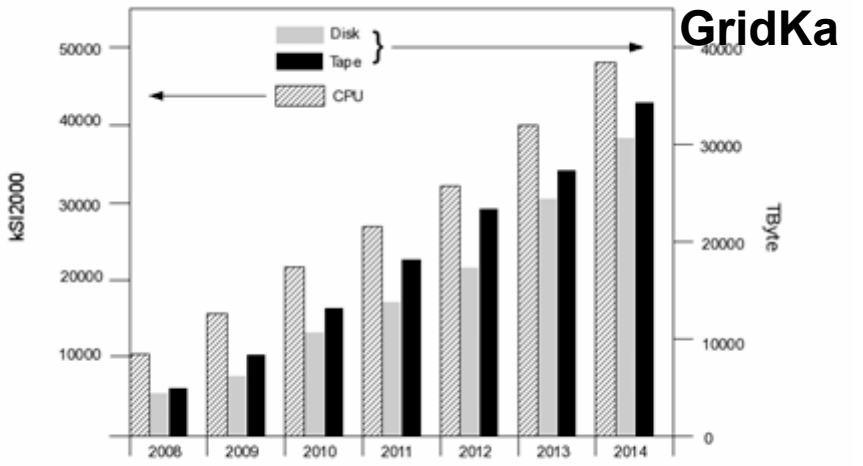
underline importance of its long-term sustainability

DESY Grid Centre and GridKa

- DESY Tier 2 Centres and National Analysis Facility (NAF)
  - will be accounted as large facility (LK II) à la GridKa
- Tier 2 for ATLAS, CMS and LHCb
  - and other VOs (HERA, ILC, IceCube,…)
  - develop capacity according to plan (additional resources needed)
- NAF: computing tool of Analysis Centre
- Development of Grid Software

  → dCache
- Synergy with photon science
- GridKa is also part of the HGF Particle Physics Programme
  - see Volker's talk





Combined CPU, disk and tape resources for LHC and non-LHC experiments as well as the national grid initiative D-Grid, planned at GridKa.

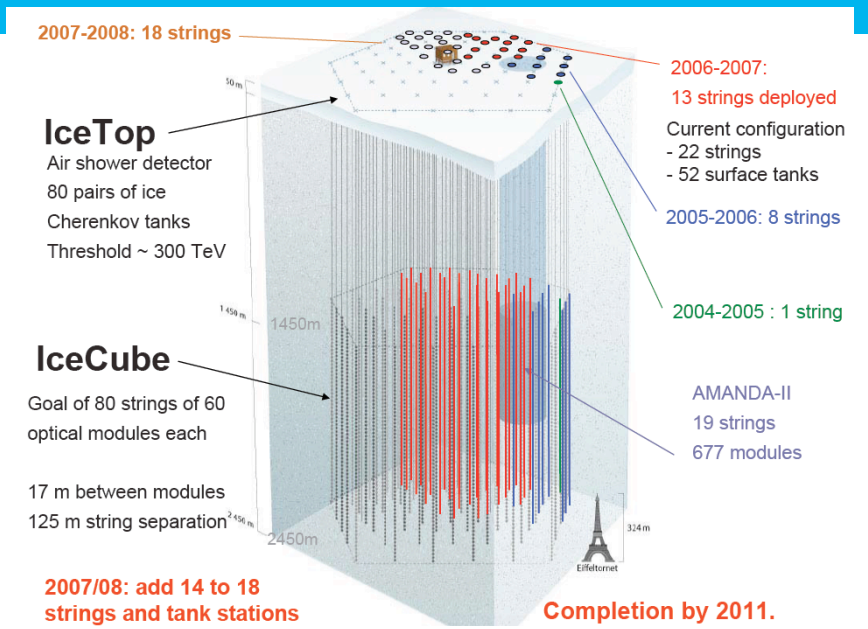
Astroparticle Physics

> **Present and future activities**

- **IceCube in full swing**
- **50% of detector**
- **installed & operational**

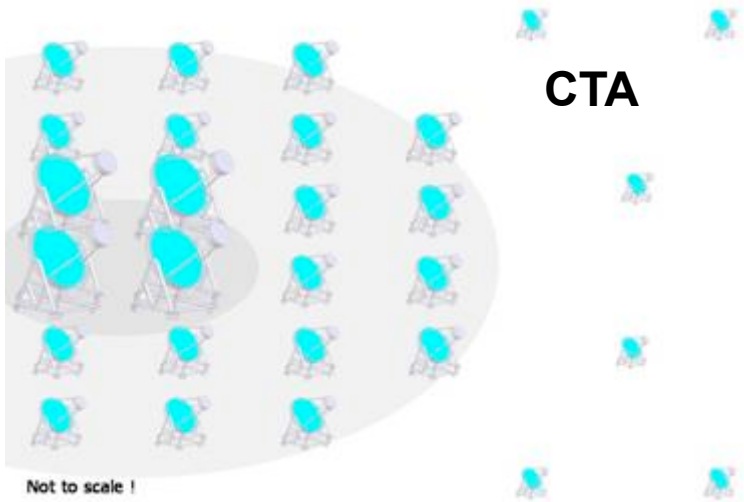
> **DESY hardware activity**

- **DOM production completed in September 2008**
- **1200/4800 assembled at Zeuthen**



Astroparticle Physics after 2010

- **Multi-messenger approach**
  - complement high energy neutrino astronomy with high energy gamma ray astronomy
- **IceCube**
  - complete constrcution antartic summer 2010/11
  - analysis at DESY, e.g.
    - search for astrophysical sources
    - WIMPs and other exotic particles
    - spectrum & composition of cosmic rays
- **Cerenkov Telescope Array (CTA)**
  - Preparation through MAGIC
  - HGF Yong Investigator Group
- **Participation in prototype phase**
  - design & optimization
  - contribution to array operation centre
  - plans for construction phase to be worked out later



50-100 telescopes
- Large dishes: low energy
- Small dishes, 10 km² area: low-flux, high energies

50-jähriges DESY Jubiläum

> **DESY Gründung am 18.12.1959**

> **DESY feiert sein 50-jähriges Jubiläum in 2009**

- **Festveranstaltungen:**

  von der Auftaktveranstaltung März 2009 bis zum zentralen Festakt Januar 2010

  Kolloquia, Tag der offenen Tür, …
- **Wissenschaftliche Veranstaltungen**

  Photon 2009 (März)

  Lepton Photon August 2009
- **XFEL Grundsteinlegung, PETRA III Inauguration**
- **Broschüre, Film, …**