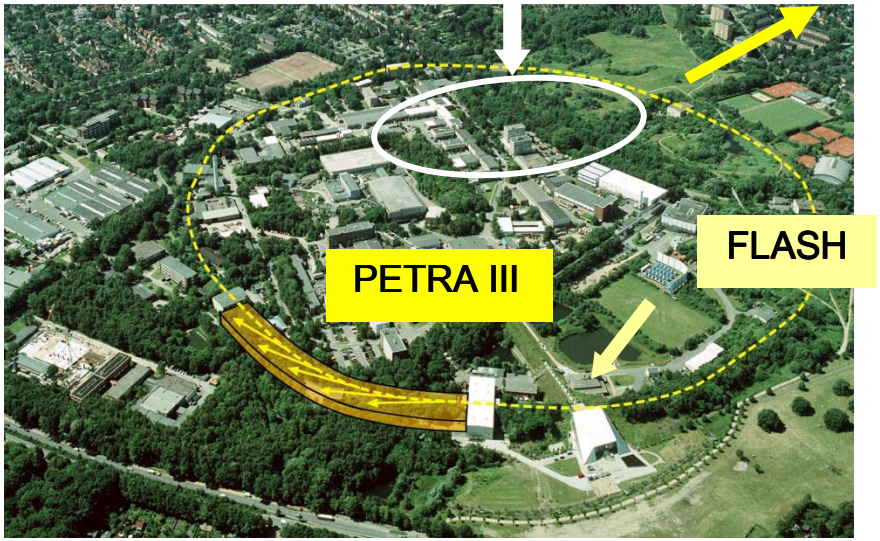
DESY 2011.

Zeuthen Cluster User Meeting



Ulrich Gensch
Representative of the Directorate

March 2011
Zeuthen

Ein Forschungs-zentrum der HELMHOLTZ GEMEINSCHAFT

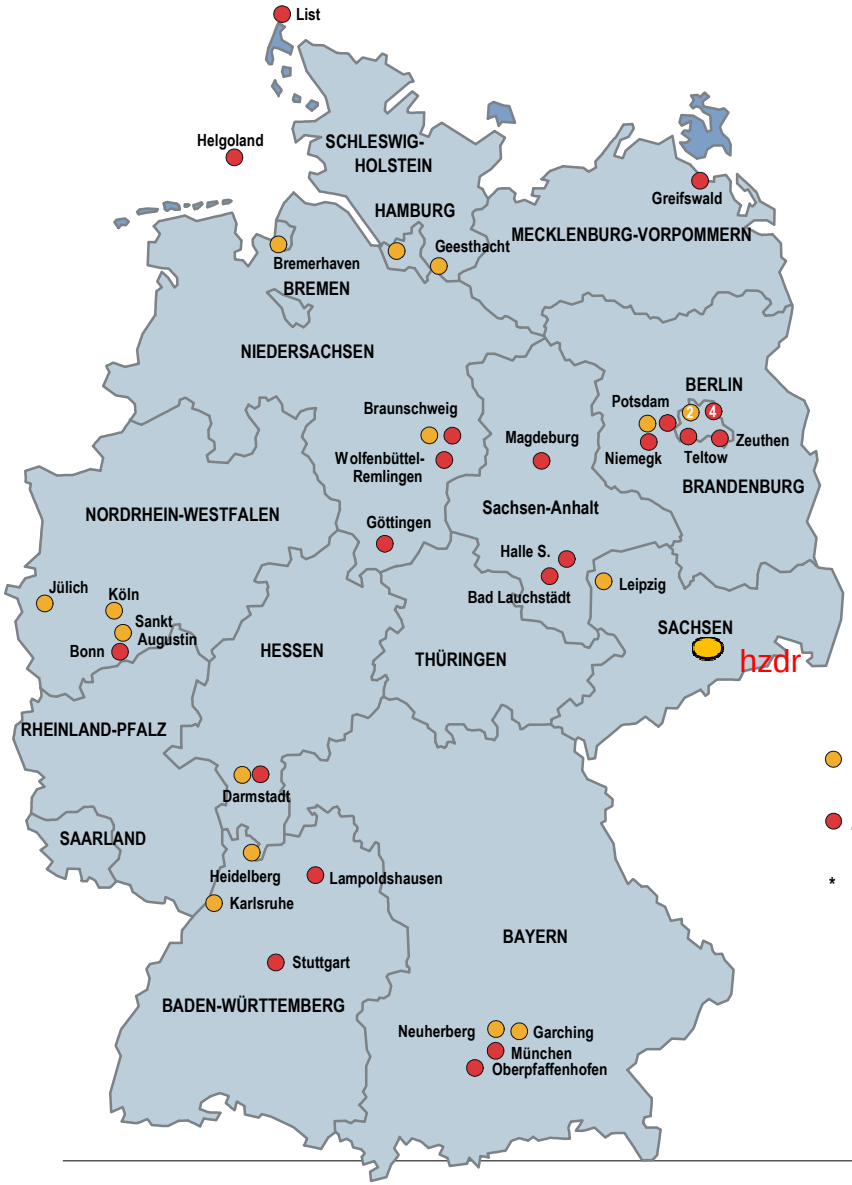
DESY

DESY OVERVIEW

DESY is one of the labs of the Helmholtz Gemeinschaft.
Activities are concentrated on the expolaration of the Structure of Matter.
DESY has two sites : Hamburg & Zeuthen

Funding :	programme oriented (POF) 5 year cycle; strategic review process
Base - Budget	170 M€ (2005) Funding 90/10 German Gov. / countries (Hamburg; Brandenburg) !
Staff	1600 at Hamburg and Zeuthen
Education	~ 100 PhD students; 100 fellows; > 100 apprentices
Users	3000 (1500 from abroad / 45 nations) > 2100 research with photons → national financed research center with strong international impact

DESY . Member of the Helmholtz Gemeinschaft



Research centers: 16 -> 17

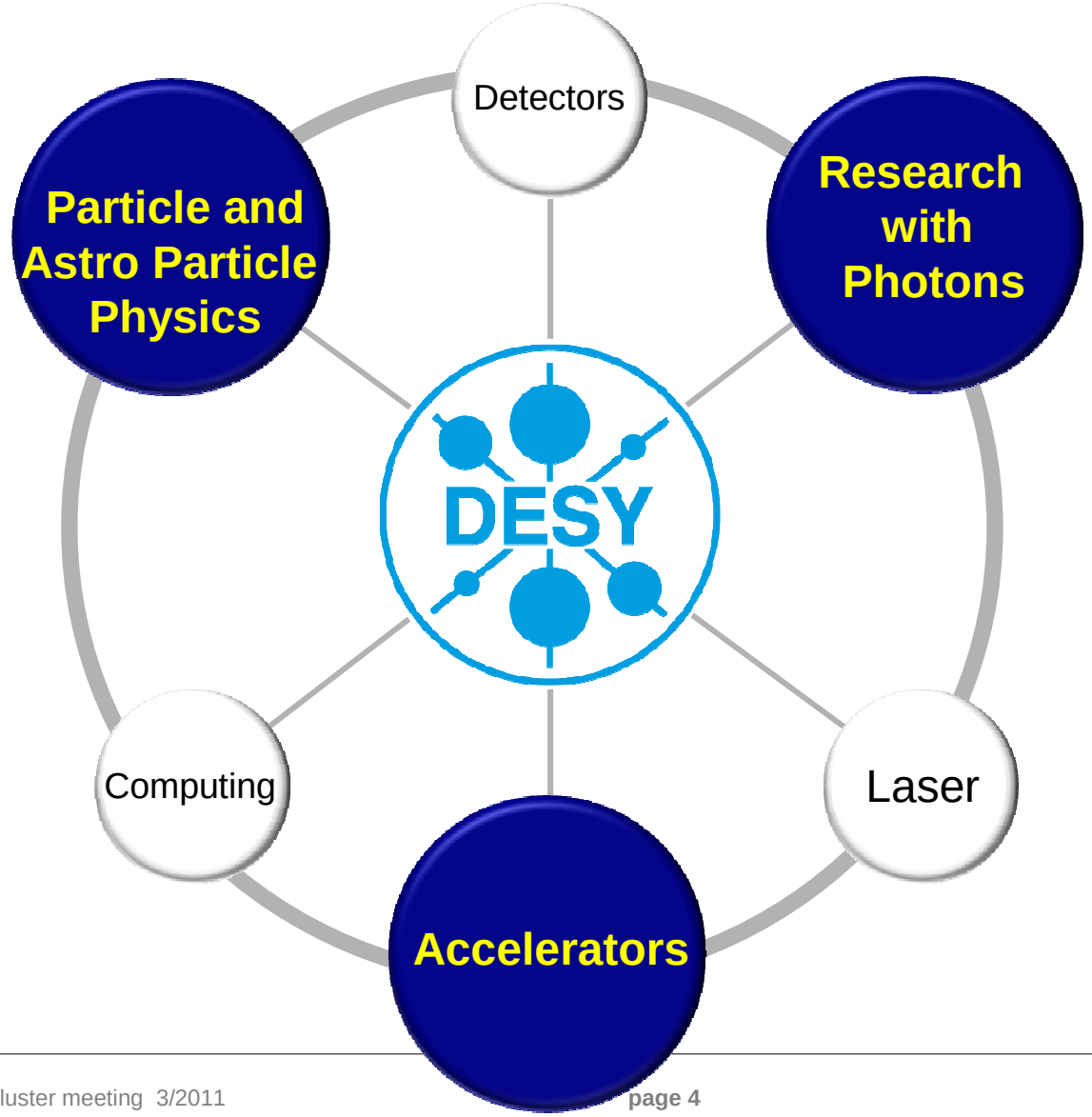
staff: ~ 24 000

budget ~ 2,2 **Mrd €**

Health
Energy
Earth and environmet
Key technologies
Structure of matter
Traffic and Space

DESY Core Competences

fast particles - brilliant light – structure of matter



DESY Research.

∞ small

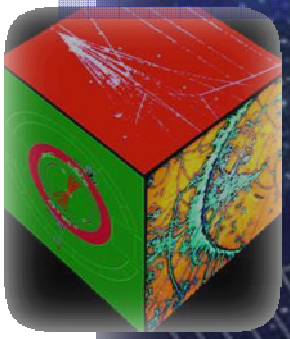
nano
Cosmos

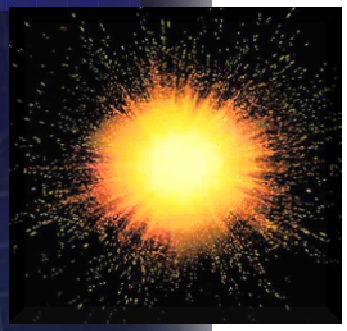
universe

∞ gro[illegible]

Elementary particles
Unification of forces

cosmology
Astrophysik

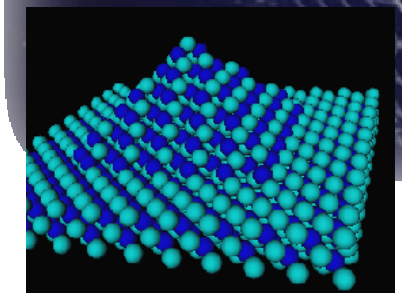




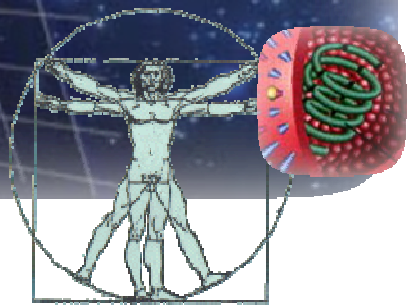
Structure and function
of matter

Condensed matter

∞ complex



Nano science, biology
Synchrotron radiation
X –ray laser/ FEL



Zeuthen Overview

Astro Particle Physics (Experiment & Theory)

high energy neutrinos and gammas from the universe

Baikal, **AMANDA, IceCube, MAGIC, CTA**.....

physics harvest at IceCube + MAGIC

Goal: leading lab in CTA & National Centre for AP

Very active in prep phase of the CTA experiment (physics, telescope design, trigger, electronics, computing..)

Particle Physics

Experiments at HERA & **LHC**

Theory

& Super-Computing for Lattice Gauge Theory

LHC activities of DESY ATLAS,CMS are site independent organized !

Accelerator R&D

Development of components (hw/sw) for FLASH & XFEL

Modulator Test Facility – MTF

FLASH & XFEL gun !

Photo Injector Test Facility, Zeuthen - PITZ

Visible contributions to FLASH & XFEL.

Goal

Extend/develop R&D Program.

Zeuthen history I : Theodor Fontane & Zeuthen

Hankel's Depot

"This cove became a harbor, stockyard, and depot for everything that came and went, and the place became known as Hankel's Depot because the fisherman who once lived there was named Hankel."
Theodor Fontane,
"Irrungen, Wirrungen"

"At Hankel's Depot on the Wendischen Spree (Dahme river), an Institute for Nuclear Physics built a new wing on the spot where a guest house once stood. Fontane regarded the guest house as his place of retreat in times of nervous emptiness."
Gordon A. Craig, "Theodor Fontane (Über Fontane)", 1994

Zeuthen history II

1940-45 Amt für Physikalische Sonderfragen (APS)

1950-62 Kernphysikalisches Institut (X, Miersdorf, Atom u. Kernphysik)
(Institute for Nuclear Physics)

> 1962 Institute for High Energy Physics of the Academy of Science

IfH involved in various HEP experiments at CERN, DUBNA, Protvino and DESY (up to 1969 and > 1984) !?

1990 – 91 Evaluation by the German Science Council,
very positive recommendations

⇒ Zeuthen should survive

⇒ Integrate into DESY

1992 IfH Zeuthen becomes part of DESY

HPC at Zeuthen, I

Triggered by

demands of Lattice gauge theory in 1980-ies

(far above capacity of standard computers)

HLRZ (1987) / *Höchstleistungsrechenzentrum*
FZJ, DESY, GMD
provide CPU power for Physics

NIC (2004) / *J.v. Neumann Institute for Computing*
FZJ, DESY, GSI (since 2005?)

today :
LQCD(power user), Astrophysics,
Condensed Mmatter, Chemistry….

NIC - for many years :

FZJ: large installations / CRAY, SGI, IBM, Bluegene…
DESY: dedicated machines

HPC at Zeuthen, II

first attempt during the 1980-ies with the development of a transputer based parallel computer

APE - highly performant for LQCD; sustained performance ~ 40-50%
custom designed hw; perfomance / price ratio good (in past)
developed by **INFN, DESY** , Orsay collaboration

- 1994 – start of the APE era
- Ape 50 → still in use, even in Brandenburg (e.g. used by plumbers..)

1994	APE100	- 50 Gflops
1999/2000	Apemille / 1999/2000	- 580 Gflops
2004	apeNext	- 2.5 Tflops

Apemille : dedicated computers for LQCD at DESY

Apemille: common development of INFN and DESY
stable operation since ~ 1999/2000
Access within the framework of (NIC)

- **Installation:**
  - 8 Crates + 2 Units + 2 Boards
  - 1104 Prozessoren
  - 583 GFlops peak
- **Operation:**
  - Stable production environment
    (O(3) hardware exchanges/year)
  - Usage 94-107%
    (with respect to 8 Crates)

UNIVERSITE PARIS SUD IX

apeNEXT

INFN

DESY

LATFOR/German Lattice Forum -> need 25 Tflops (DESY & GSI)!

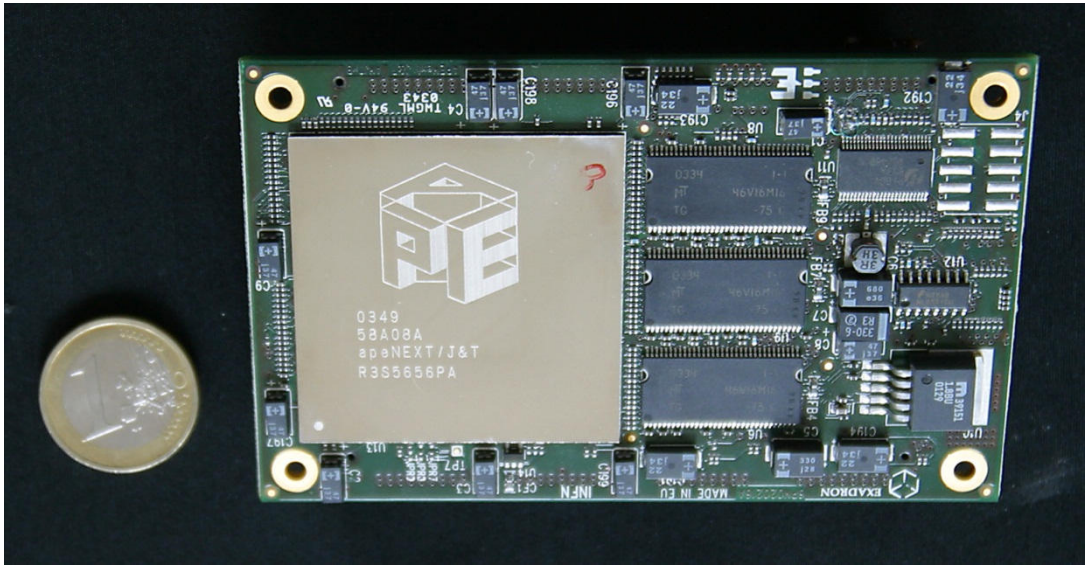
apeNEXT Design

New featurs:

asynchronous -> SPMD architecture

- prefetch queues for local and remote data
- 64bit double precision arithmetics

Processor	
clock	200 MHz
peak performance	1.6 Gflops
sustained performance	30-75% (typical applications)
arithmetics	(a*b+c) complex 64 bit
technology	1 custom chip, 0.18 µ
Network	
topology	3 dimensional, nearest neigthbour
technology	LVDS
bandwidth	200 Mbytes / sec
Price	0.5 Euro / Mflops (peak)



2003 testing 6 PB´s with physics code

12/2004 1.6 Tflops (0.8 DESY)

2005 2.5 Tflops (DESY)

HPC at Zeuthen, III

today

apeNext still in use and overbooked, fading out !

8 Blade systems(1024 cores) ~ 12 Tflops peak; shared usage by NIC and AT

at Zeuthen – long lasting exeprerience to operate parallel machines & codes

in addition to the user community from LQCD
there are now users from Astro Particle Physics + Photon science + accelerator physics

user meeting

improve communication
learn what the users want – nothing
more hw
improved service
access to NIC resources…