

Program PNI

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- 1. Program PNI within the Helmholtz Association**
- 2. Strategic perspective for DESY PNI facilities**
- 3. Proposal for major investment projects**
- 4. Strategy for in-house research**



15 National Research Centres

2.1 billion € budget

24 000 employees

Research fields

Energy

Earth and Environment

Health

Key Technologies

Structure of Matter

Transport and Space

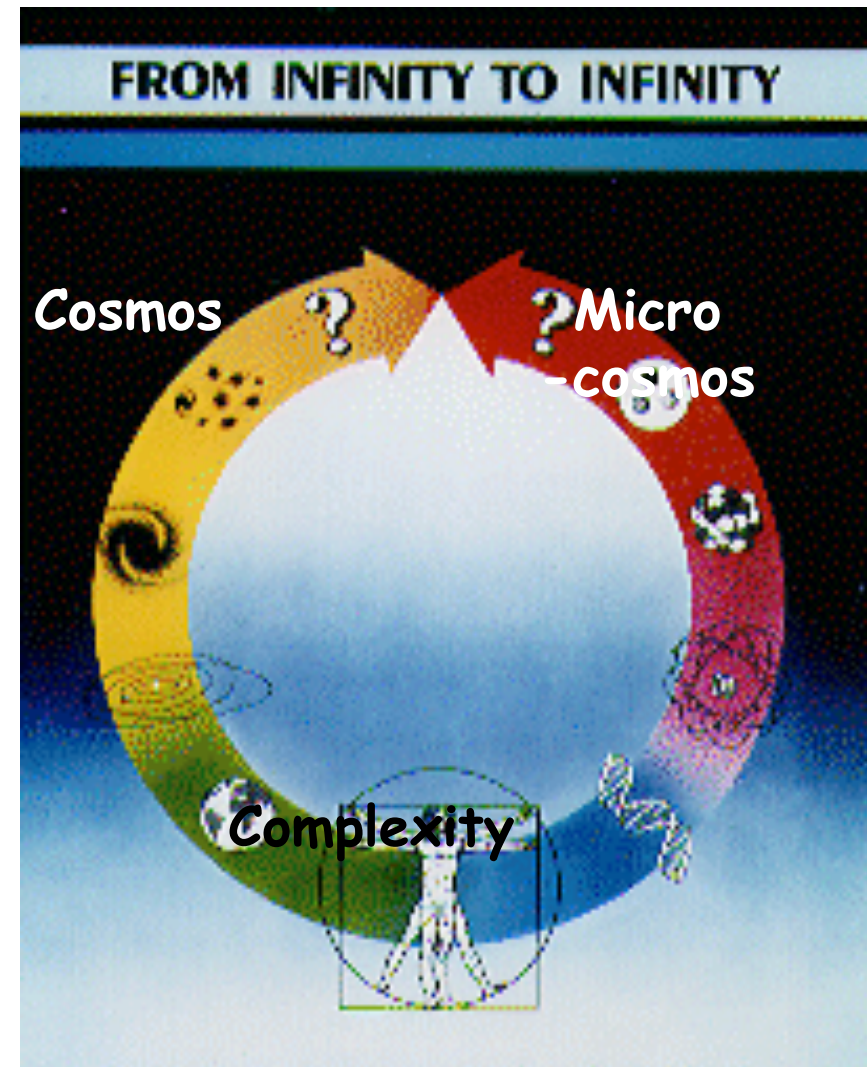


5 Programmes:

- *Elementary Particle Physics*
- *Astroparticle Physics*
- *Physics of Hadrons and Nuclei*
- *Condensed Matter Physics*
- *Large Scale Facilities for Research with Photons, Neutrons and Ions (PNI)*

Scientific goals:

- *Understanding of the fundamental properties of **Nature**, from **cosmic** to **subatomic** scales*
- *Investigation of matter in the universe and of matter and materials on earth*
- *Design, construction and operation of novel **facilities**, which open new possibilities in science*



„From the infinitely small via the infinitely complex to the infinitely big“

- Base budget increase in the research field 'Structure of Matter' is about 1.4%.
- Evaluation of the programs: **every 5 years (next: spring 2009)**
- In addition research centers can apply for major investments (Ausbau-Investitionen, >2.5 M€) in a competitive manner
 - science driven projects
 - building of infrastructure projects
 - up-coming projects: evaluation this time within the strategic evaluation in spring 2009
- HGF-'Impuls- und Vernetzungsfond' (collaboration with universities)
 - junior research groups (250k€/a, 5(6) years),
 - virtual institutes (250k€/a, 3 year) **(abolished since 2008)**
 - Helmholtz alliances (~M€/a, large scale collaborations)
 - calls and evaluation almost every year

- **until full user operation of PETRA III (2010):**
 - ➔ **operation of DORIS III in the present configuration with gradual adaptation to user demands and requirements**
- **after 2010 until end of next PoF period (2010-2014):**
 - ➔ **complementary operation of DORIS III and PETRA III**
 - ➔ **significant reduction of the number of DORIS III beamlines to 9 wiggler and about 8 bending magnet beamlines (from 37 beamlines at present)**
 - **shifting highly requested experimental techniques from bending magnets to wigglers**
 - **closing down of most bending magnet stations except a few**
 - **keeping the present total staffing at DORIS, i.e. doubling the staff per beamline**
- **until 2013/2014:**
 - ➔ **evaluation of the user demand for 'DORIS III' - photon beams**
 - ➔ **decision either of continued operation of DORIS III or construction of equivalent experimental possibilities at PETRA III**

Photon Science at DESY

DORIS III Midterm Review

Report 2007







HELMHOLTZ
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Helmholtz Research Programme

Photon Science at DESY

DORIS III Midterm Review

Supplement Report 2007








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Comment by the review panel:
*„Quality of science is very good in some areas
 unique and excellent”*

- Executive Summary
- Introduction
- Status of DORIS III Operation
- PETRA III
- **Common Operation of DORIS III and PETRA III**

- Examples of current
- Publications related to research at DORIS III in peer-reviewed journals (2004-2006)

Ullrich Pietsch, Friso van der Veen, Christian Vettier

Operate PETRA III in parallel with a reduced number of DORIS III beamlines in the next HGF funding period 2010-2014.

To be revisited in the frame of the strategic Helmholtz evaluation in 2009 including PETRA III, DORIS III, BESSY II and ANKA, as well as ESRF and other European storage ring facilities.

The best joint operation mode would be one in which the research groups operating PETRA beamlines also take charge of the complementary beamlines at DORIS. These groups should keep the beamlines at both facilities up to date and refer the users to the facility that suits their research purpose best.

In this spirit DESY will follow the advice to

*Many thanks to
PSC and EWR*

"Make DORIS part of PETRA"

- The PETRA III beamlines were selected according to make optimum use of the small emittance and the high brilliance.
- The presently foreseen configuration of PETRA III opens totally new fields for photon science at DESY but it is not able to serve all successful experiments carried out at DORIS III like e.g.
 - standard EXAFS
 - materials science with large high energy beams
 - large volume high pressure research
 - chemical crystallography
 - standard SAXS
 - ...
- Strategy: DESY plans to provide these techniques also in future to its user community:
 - within the frame 'Make DORIS part of PETRA'
 - extend the capabilities at PETRA accordingly (technical studies on going at present)

- **Finishing the construction, commissioning and operation of PETRA III**
- **Target: deliver more than 5000h beamtime per year to the users**
- **Provide:**
 - **state of the art personal support at the beamlines, 4-5 persons**
 - **complex sample and laboratory environment for optimum use of the beamlines**
 - **appropriate data handling and computing support for data evaluation**
- **Investigate possible extensions of experimental possibilities for new undulator and bending magnet beamlines**



Extensions with out major changes of the storage ring lattice:

- **2 damping wiggler sections**

- large beam high energy applications
- constant energy side stations using Laue type monochromators
- bending magnet stations

- **2 (3) additional straight sections**

- long insertion devices, possibility for very long beamlines, (canted undulators)
- bending magnet stations

- **several places for bending magnet beamlines**

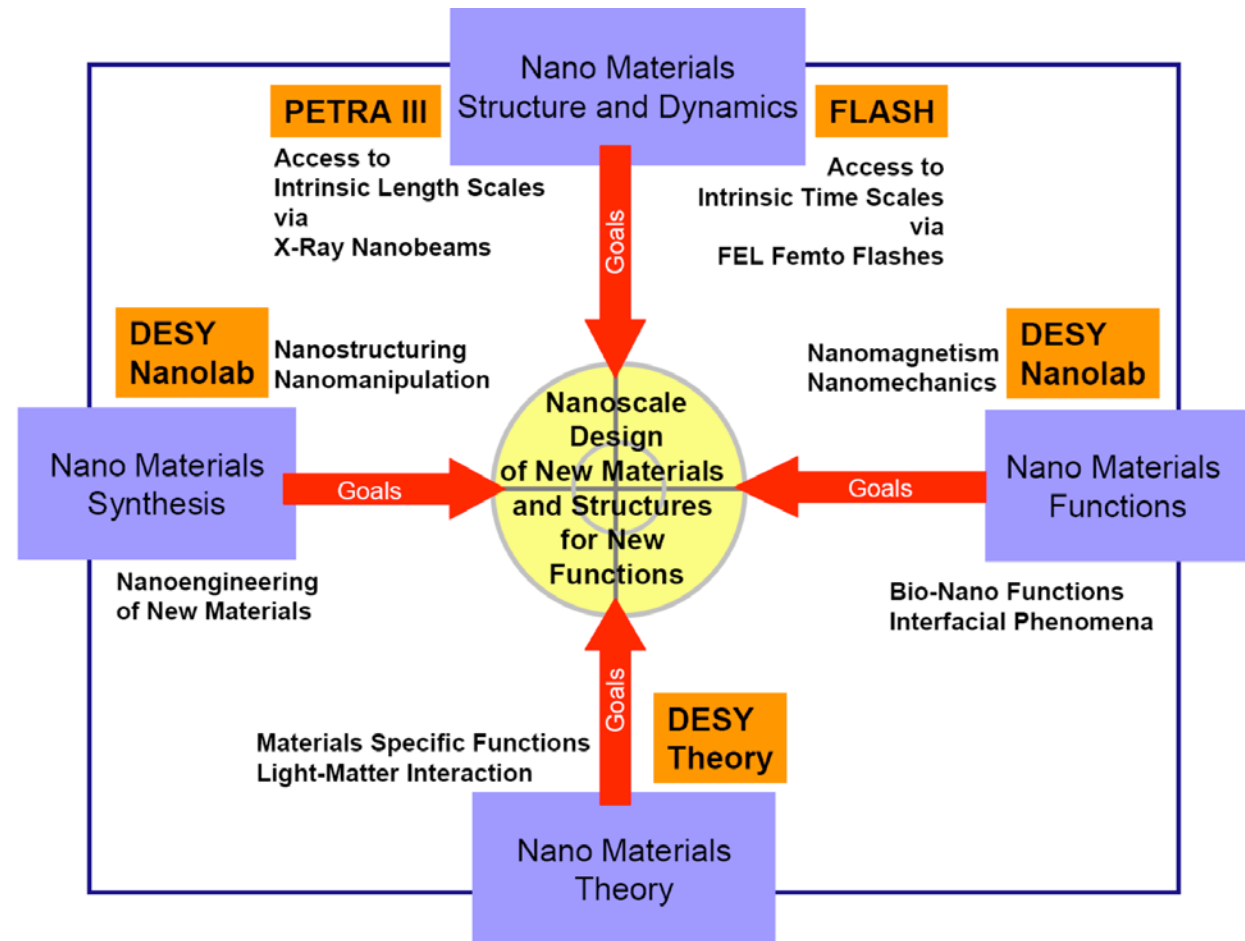
- ideal for e.g. absorption spectroscopy

→ **2 additional wiggler beamlines with several experiments each**

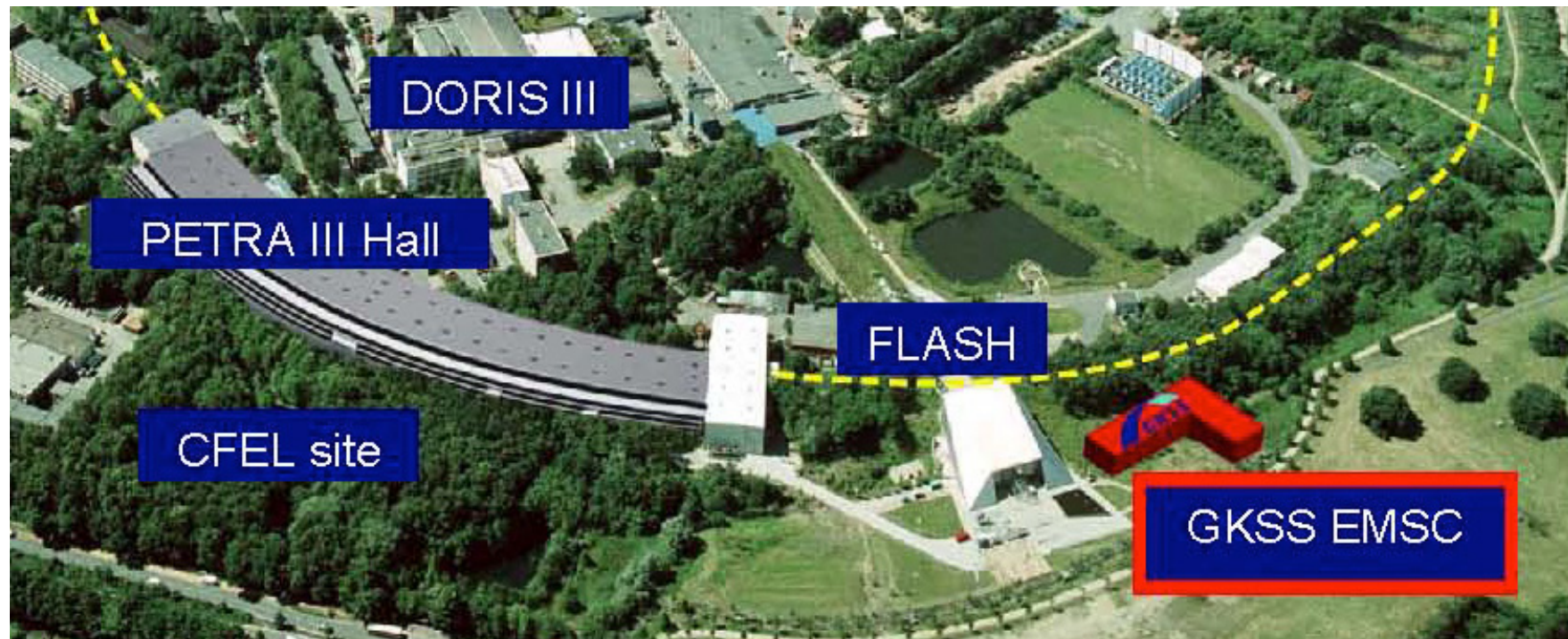
→ **2-4 additional undulator beamlines**

→ **4-12 additional bending magnet beamlines**

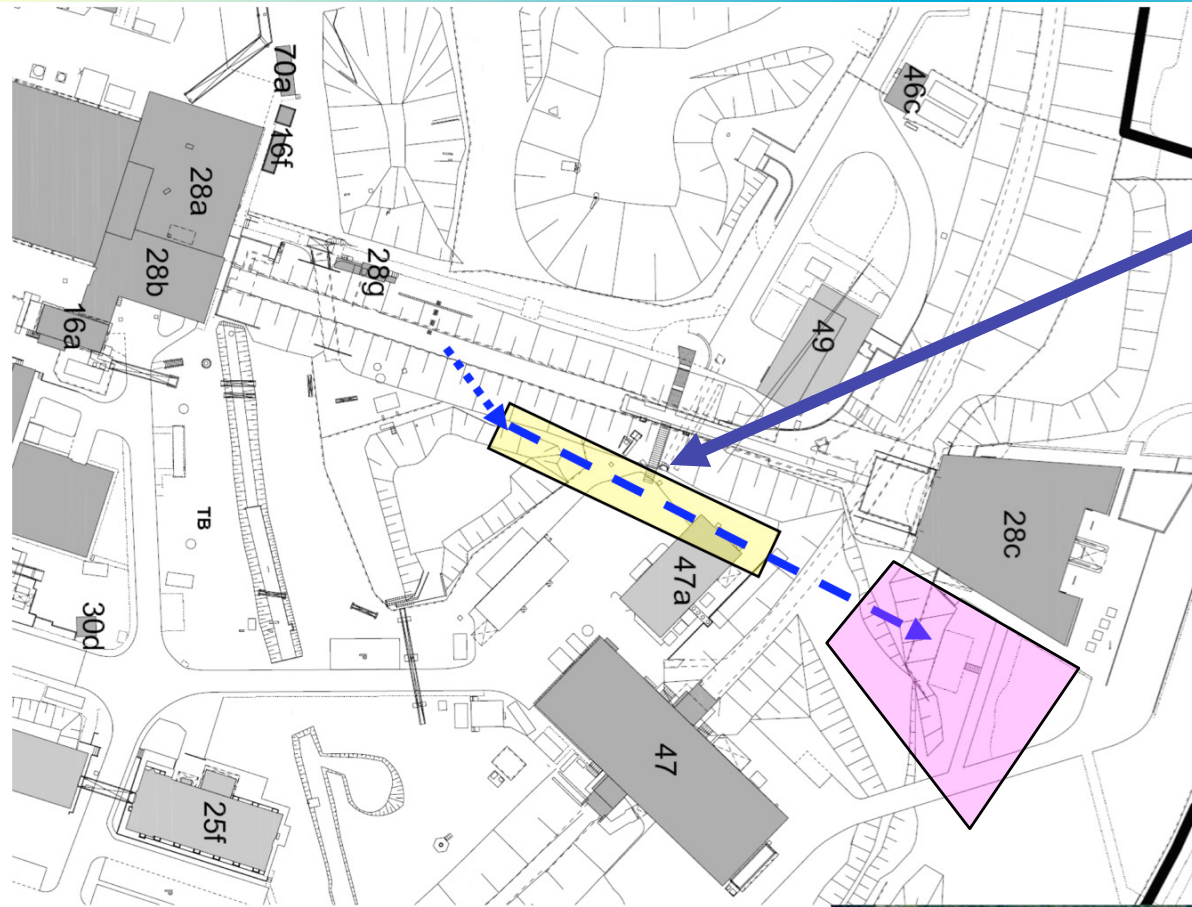
- **Center for structure and dynamics on the nano-scale**
- Installations to support users in the preparation and handing of nano-scale samples
- Provision of complementary analysis methods
- Establishment of own inhouse expertise
- **Total investment: 5.5 M€**
- incl. **2 M€** civil eng.



- Center for engineering materials science (GKSS)
- Provision of an infrastructure for effective research in this field
- Complementary provision of SR and neutrons through GKSS access to reactor sources
- Total investment: **9.5 M€**



- Expansion of the user program at the VUV-FEL FLASH by continuous development of the installation with respect to improved stability and better synchronization to pump lasers.
- Design, construction and operation of a second FEL line at FLASH employing HHG and cascaded HGHG seeding principles (FLASH II) in collaboration with BESSY/HZB for further developments of FEL techniques and increasing the user capacity at FLASH.
- Continued development of high brilliance and low emittance electron guns for FELs at the PITZ test facility in Zeuthen accompanied by a R&D program aiming for the improvement of accelerator driven light sources.



2nd FEL beamline



Enables quasi-simultaneous
operation at 2 wavelengths

Enhances user capacity by
factor 2

- **Improvement of the FLASH RF-System**
 - part of the FLASH RF-system is already 10 years old and was not designed for especially the present purpose
 - → new system components will improve reliability of the FLASH linac
 - total investment: **6 M€**

- **FLASH II:**
 - total investment: **~28.8 M€**

- 2D-pixel detector development
 - VUV energy range
 - hard X-ray energy range
- More efficient detection schemes
- Total investment: **5.2 M€**

Diode Detection Layer

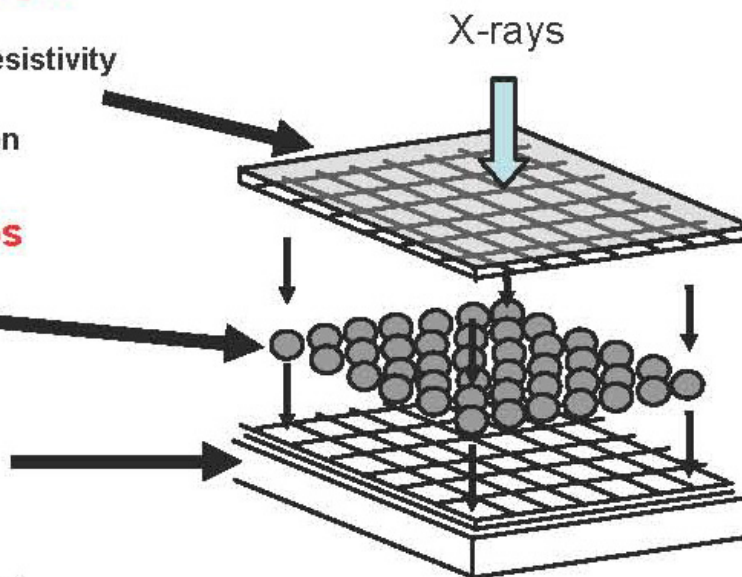
- Fully depleted, high resistivity
- Direct x-ray conversion

Connecting Bumps

- Solder or indium

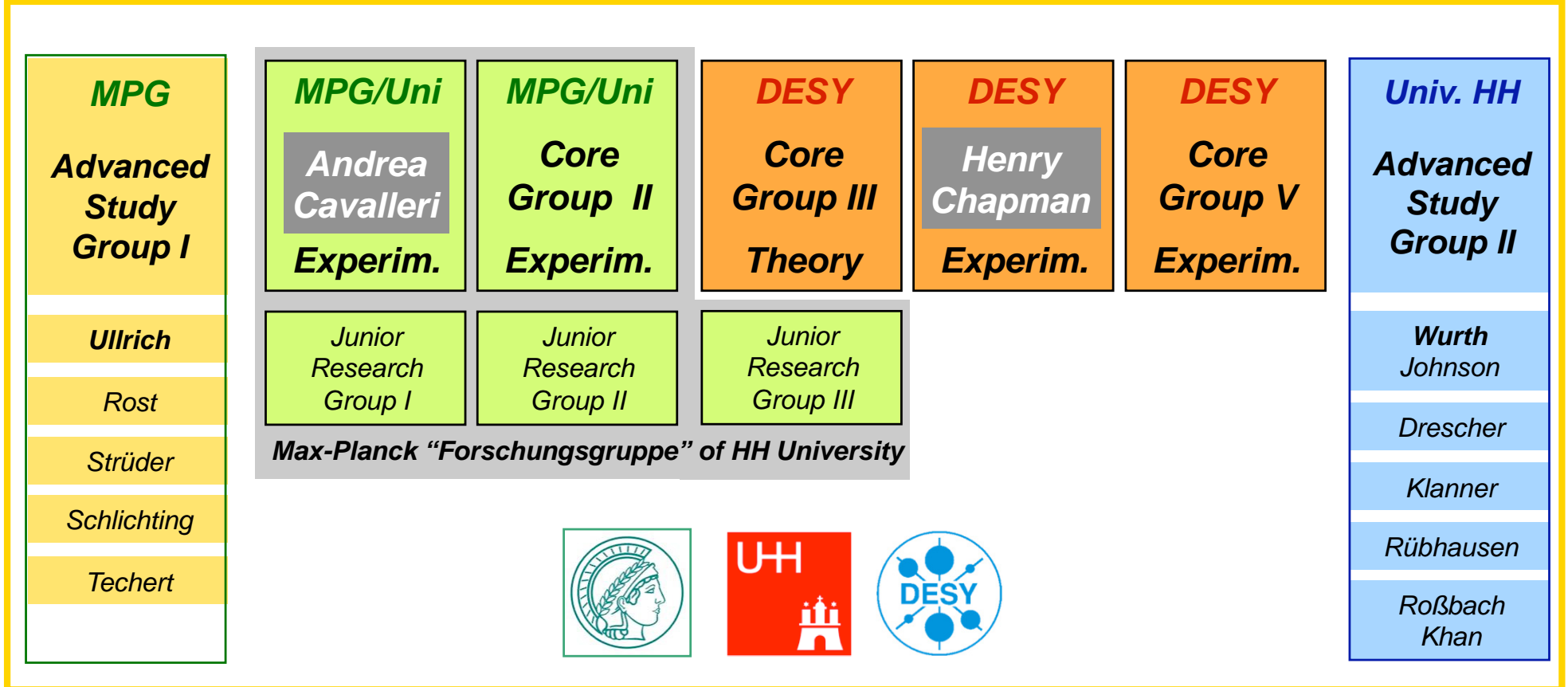
CMOS Layer

- Signal processing
 - Signal storage & output
- Gives enormous flexibility!*



- **Installation of the Centre for Free Electron Laser Science (DESY with the Max-Planck Society and the University of Hamburg) as a basis for the German utilization of FELs in particular the XFEL.**
- **Expansion of the life science activities on the DESY campus by the creation of a Centre for Structural Biology together with the Research Field "Health" headed by HZI.**
 - **main support for this activity:**
 - **space for a building**
 - **organization of the operation of a beamline**
- **Establishing a computing platform at DESY consisting of high capacity computing, visualization, mass storage and (GRID-enabled-) software development to cope with the high data rates expected at PETRA III, FLASH and XFEL.**

Center for Free-Electron Laser Science (CFEL)
MPG, DESY, and University of Hamburg



In 2010 a new building available for ~300 people, annual budget ~15 M€



Ziel:

- Etablierung einer Plattform für Strukturbiologie am DESY
- Federführung: **HZI**
 - R. Balling
 - D. Heinz
- Zusammenarbeit mit allen strukturbiologischen Einrichtungen in Hamburg und im norddeutschen Raum
- Direkter und schneller Zugang zu den Experimentiermöglichkeiten an **PETRA III**
- Zukünftige Entwicklung in Hinblick auf die Möglichkeiten, die der **XFEL** bietet
- DESY-Beitrag: 1. Gelände, 2. Betrieb einer StruBio-Strahlführung



- **DESY plans to further increase its inhouse activities in photon science**
- **Different fields are:**
 - **CFEL (Single particle imaging, fs-chemistry/physics, photon-matter interaction, ...)**
 - **DESY-FS (soft/hard condensed matter, AMO, instrumentation and method development, materials science, chemistry, environmental/geo-science, biology, ...)**
 - **Photon-Detectors**
 - **PITZ, Zeuthen machine R&D**
- **Aim: 10% of the DESY budget for DESY-FS inhouse research**

- **XFEL will be organized as a GmbH**
- **DESY will be the main contributor**
 - **construction and operation of the XFEL linac**
 - **provision of infrastructure**
- **further involvements especially of DESY-FS is under discussion**

The End