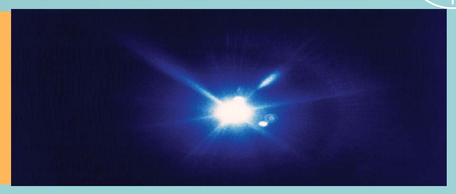
PETRA III



Hermann Franz, on behalf of the PETRA III Team

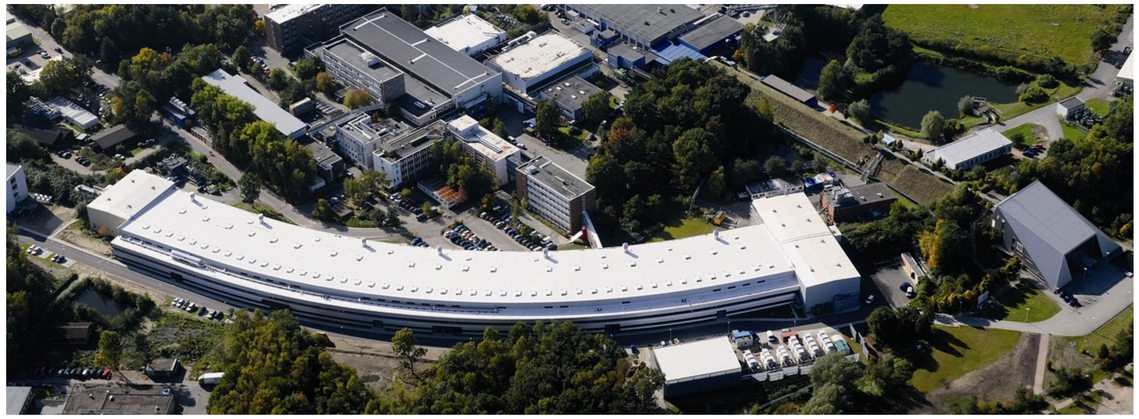
Introduction

Starting July 2007, the 2.3 km circumference storage ring PETRA was converted into a third-generation synchrotron radiation source – PETRA III. The installation of the storage ring was finished after only 18 month end of 2008. After technical commissioning stored beam was celebrated April 13 2009. In August 2010 regular user operation with design parameters commenced.

Via damping wigglers a very low emittance of **1.0 nmrad** is reached at a particle energy of 6 GeV. The machine runs at a stored current of 100 mA in top-up mode. In the new 10,000 m^2 experimental hall 14 undulator beamlines have been installed.

The selection of experiments was guided by the particular properties of the photon beams at PETRA III:

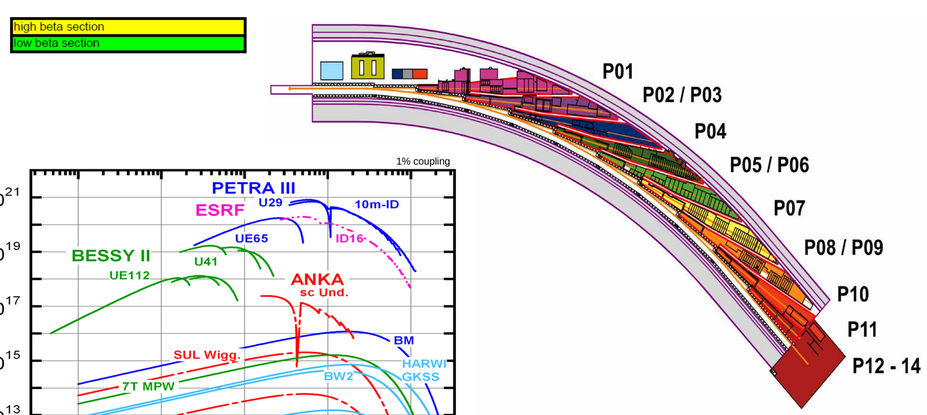
- Hard x-rays up to 100 keV and beyond
- High resolution in real and reciprocal space as well as in energy and time
- Coherence

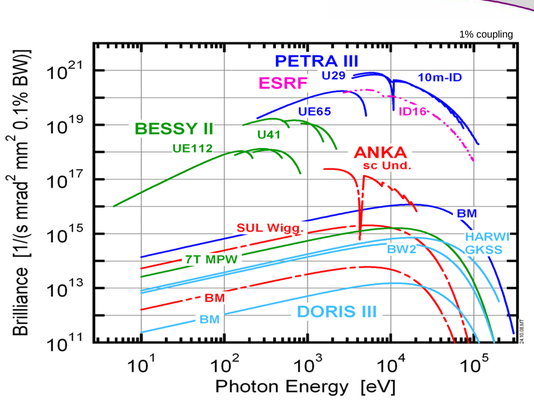


Aerial view of the PETRA III experimental hall on the DESY campus. The hall, 300 m long, covers one eighth of the ring. Two more halls are currently being planned and will be built in 2013.

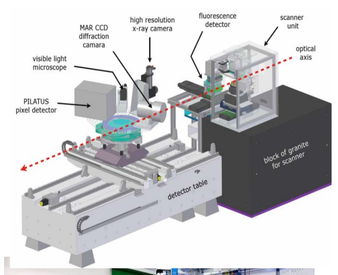
Number	Name	ID type	Energy range	Contact
P01	Dynamics beamline, IXS, NRS	10 m U32	5 - 40 keV	H.-C. Wille, DESY
P02	Powder and Extreme Conditions	2 m U23	20 - 100 keV	H.-P. Liermann, DESY
P03	Micro and Nano SAXS/WAXS	2 m U29	8 - 25 keV	S. Roth, DESY
P04	Variable Polarization XUV	5 m UE65 (APPLE II)	0.2 - 3.0 keV	J. Viefhaus, DESY
P05	Micro- and nano-tomography	2 m U29	8 - 50 keV	A. Haibel, HZG
P06	Hard X-ray nano probe, imaging	2 m U32	2.4 - 100 keV	G. Falkenberg, DESY
P07	High energy materials science	4 m U19 (IV)	50 - 300 keV	N. Schell, HZG
P08	High resolution diffraction	2 m U29	5.4 - 30 keV	O. Seeck, DESY
P09	Resonant scattering/diffraction, HAXPES	2 m U32	2.4 - 50 keV	J. Strempfer, DESY
P10	Coherence	5 m U29	4 - 25 keV	M. Sprung, DESY
P11	Bio imaging and diffraction	2 m U32	3 - 35 keV	A. Meents, DESY
P12	BioSAXS	2 m U29	4 - 20 keV	M. Rößle, EMBL
P13	Macro molecular crystallography I	2 m U29	5 - 35 keV	M. Cianci, EMBL
P14	Macro molecular crystallography II	2 m U29	5 - 35 keV	G. Bourenkov, EMBL

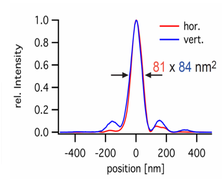
Experimental techniques of the 14 beamlines at PETRA III. Five beamlines are built and operated in collaboration with our partner institutions EMBL and HZG.

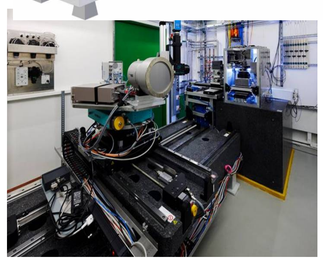


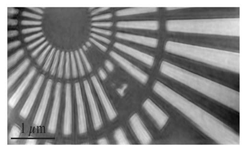


First results form the nano-probe beamline P06



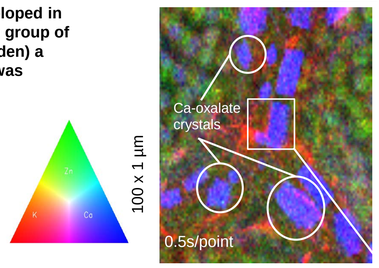






Using the set-up developed in collaboration with the group of Ch. Schroer (TU Dresden) a resolution of 80 nm² was achieved.

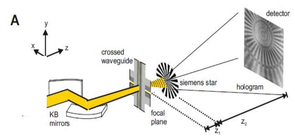
Investigation of ion transport in stomata from poplar leaves



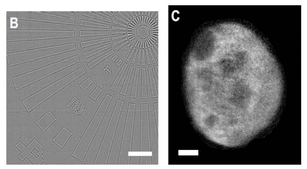
Collaboration Walter Schroeder (FZJ)

Imaging with a 10 nm beam at P10

Crossed wave guides serve as point source

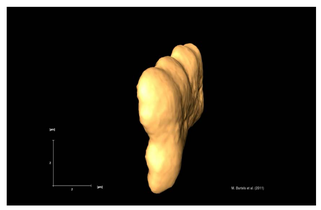


Beam profile reconstruction



***Reconstructed image of* d.radiodurans using the 10nm beam as point source.**

Resolution ca 70 nm



Collaboration Tim Salditt, Uni Göttingen