

Prospects of Photon Science at DESY

Edgar Weckert
DESY, Notkestrasse 85, 22603 Hamburg, Germany

Researchers using synchrotron radiation for their experiments experience exciting times these days at DESY. The VUV and soft X-ray free electron laser FLASH has been operating for users since 2005. The high-energy, low emittance synchrotron radiation source PETRA III has just started regular user operation for the first beamlines. And finally, the construction work for the underground buildings of the European XFEL is well under way since the beginning of 2009, for which DESY will build and operate the accelerator.

FLASH after its most recent upgrade is operating at 1.2 GeV maximum electron energy and capable of producing SASE – FEL light down to 4.45 nm wavelength. It is providing the means for a number of groundbreaking experiments in various disciplines e.g. like highly charged ions and experiments in the strong field regime, coherent diffractive imaging of non-translation periodic nano-objects like clusters or biological cells, and for warm dense matter studies. Many of these experiments touch new grounds and lack proper theoretical descriptions so far. New experimental possibilities for pump – probe experiments evolved recently by the installation of an undulator for far infra-red radiation generated from the same electron bunches as the soft X-ray pulses and thus inherently being synchronized on the fs level. An extension of FLASH called FLASH II has recently been approved. This will add a second FEL undulator as well as a second experimental hall to the FLASH facility providing also the opportunity to explore new FEL schemes like HHG or HGHG seeding.

In July 2007 the construction work for the transformation of the 2304 m circumference storage ring PETRA into a 6 GeV, 1 nmrad synchrotron radiation source (PETRA III) has started. Meanwhile the new storage ring is finished and commissioning is ongoing. The construction of the experiments is in an advanced stage with about half of the beamline hutches already finished. Meanwhile almost all beamlines are close to completion and regular user operation has started at the first three beamlines. The experiments being set up at PETRA III do mainly focus on high brilliance applications in the hard X-ray regime. The planning for a future extension of PETRA III has started already.

A major milestone has been achieved for the European XFEL project: since January 2009 the construction work for the underground buildings is ongoing. Calls for tender of the main components are under preparation or have been sent out. For the XFEL, first user experiments are expected for 2014/2015.

In addition to the photon sources DESY and its partners also intend to establish various research laboratories on site for strengthening in-house research as well as user support in the field of FEL-, nano- and materials science as well as structural biology.