MS50-O1 Beamlines and Optics at PETRA III. Horst Schulte-Schrepping, *Deutsches Elektronen-Synchrotron, Notkestr. 85, 22607 Hamburg, Germany*
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The status of the photon beamlines and optics at PETRA III at DESY will be presented. The stable basis for all beamline components is provided by a granite girder system (CVD diamond screens, filter systems, high power slit systems, beam position monitors). The design of major optical components, i.e. mirror systems and liquid nitrogen cooled high heatload monochromators, will be discussed. The goal of a 1% top-up operation with 100mA and the 1 nmrad emittance operation of PETRA III has been achieved and is provided in the user runs. The beamline and optics concepts proved to be robust and versatile. The canted undulator scheme with a 5mrad separation between two undulator beamlines at PETRA III gives additional constraints and the optical systems dealing with these constraints will be discussed. Especially, the technical design and mechanical engineering of the large offset monochromator systems (LOM) at the beamlines P03 and P08 will be presented. Additionally, an update on the current developments of further optical systems will be given.

Keywords: crystal optics; synchrotron radiation; synchrotrons

MS50-O2 MX at third generation synchrotrons: better data from real crystals Clemens Schulze-Briese,[a] Marcus Mueller,[a] Sandro Waltersperger,[b] Meitian Wang,[b] *[a]DECTRIS Ltd., Switzerland, [b]Swiss Light Source at Paul Scherrer Institut, Switzerland*
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High brightness undulator radiation beamlines had and still have a tremendous impact on the development of modern protein crystallography [1]. Micro-crystallography, high resolution data collection on mega-dalton complexes as well as data collection from crystal sub-volumes were enabled by the extreme brightness of these beamlines and benefited from complementary developments of beamline optics, goniometry, robotics, detectors and software. The down side of the exceedingly high flux densities and very small beam cross-sections are severe radiation damage frequently impeding phasing experiments [2] and high sensitivity to any instabilities of beam, goniometry or sample mounting. Filters are typically the only tool to adjust the flux density to levels suitable with the collection of complete data at oscillation speeds low enough to not compromise data quality. A more appropriate way to adjust the flux density is to reduce the angular divergence or to focus the beam on the detector or beam stop. Experimental results obtained with both strategies will be presented and the consequences for low resolution data collection will be discussed. On the other hand hybrid-pixel detectors such as the PILATUS [3] are ideally suited to exploit the full potential of high brightness undulator radiation in the collection of optimal data from challenging crystals. Rapid diffraction based alignment of thin needles or plates as well as grid scans for the location of microcrystals rely on high frame rates [4]. Shutter-free continuous data acquisition is the fastest way to collect data and hence optimizes the throughput. The combination of noise-free counting and high frame rates with a low divergence beam allows the data quality to be improved by optimal fine-phi-slicing [5]. The absence of any detector noise enables the collection of high redundancy data at low dose rates, a data collection strategy which is of particular benefit in phasing experiments. The excellent point-spread-function of the pixel detector gives rise to optimal signal-to-noise ratio resulting in highest resolution data, when the beam size is minimized on the detector surface. Finally, in-situ room temperature crystallography opens up a new route for efficient data collection fragile virus crystals. Examples of the various strategies and techniques will be presented.

The limited rate capability is considered to be a shortcoming of photon counting detectors in some synchrotron applications. The recently introduced instant retrigger technology effectively eliminates this problem by enabling local and global count rates of up to 10^7 photons/sec/pixel. Details of the technical implementation and examples for the application of this technology in novel experiments will be discussed in the second half of the presentation.

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Keywords: data quality; undulator radiation; hybrid pixel detectors