

HIGH BRILLIANCE.

PETRA III beamlines P08 and P09 are in full swing

The first beamlines to start operation at the new low emittance storage ring PETRA III at DESY were P08, the high resolution diffraction beamline and P09, the resonant scattering and hard X-ray photoelectron spectroscopy beamline. Since summer 2010 both beamlines serve users from all over the world.

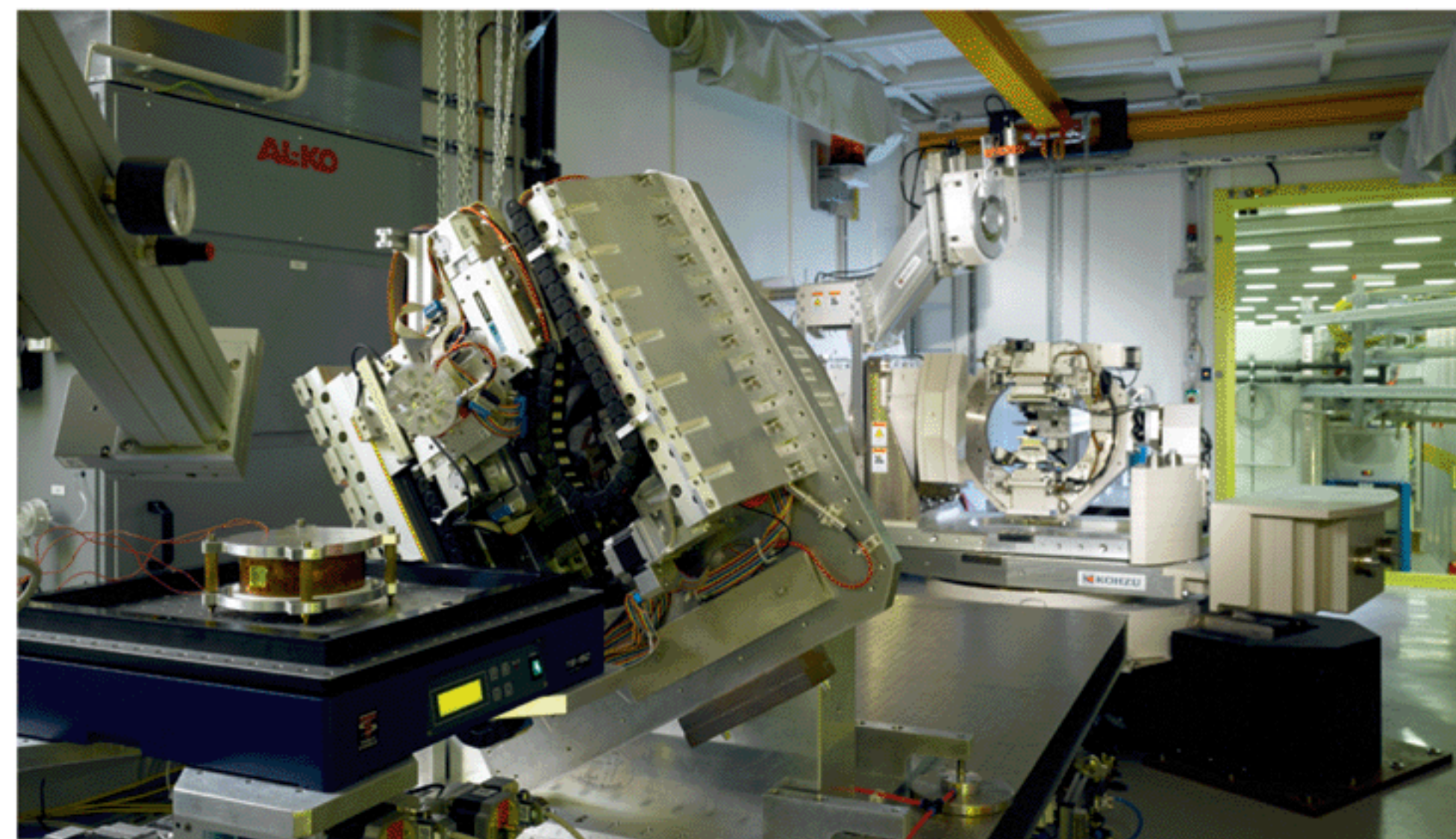
P08 is using the brilliant beam from a two meter undulator—in a high beta straight section to perform diffraction experiments with ultimate resolution in combined reciprocal and real space. This means that extraordinary high q-resolution is achieved even at a 20 μm focal spot size at the sample.

To generate a very parallel beam (divergence of the order of 1 microrad or below) or a microfocus a flexible arrangement of compound refractive Be lenses is available. In addition to the high heatload Si (111) monochromator a post-monochromator using Si (311) or Si (511) reflections is used to reduce the bandwidth incident on the sample. The post-monochromator serves two more purposes:

- Deflecting the beam upwards by 1.25 m to separate the monochromatic beam from the beam of P09 which is the twin beamline in this canted undulator section.
- Suppressing higher harmonics.

The experimental hutch is equipped with two customized diffractometers. A six axis high precision diffractometer is used for investigations of hard and soft condensed matter (Fig. 1) whereas a second diffractometer setup called LISA, installed in collaboration with University of Kiel, is dedicated to scattering and diffraction off liquid surfaces and interfaces. A selection of detectors is available together with sample environment for high and low temperatures and high pressure.

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Beam parameters of P08

- flux [cts/s]: $\sim 1 \cdot 10^{12}$
- hor. x ver. beamsize [FWHM μm^2]: 600 x 300
- hor. x ver. divergence [FWHM μrad^2]: 8 x 1
- energy bandwidth [$\Delta E/E$]: $5 \cdot 10^{-6}$

P09 is dedicated to resonant diffraction from single crystalline samples. In addition to the standard high heat-load monochromator with Si (111) or (311) crystals, a polarizer based on diamond phase plates is used to provide circular or variable linear polarization. A pair of flexible mirrors provide horizontal and vertical focusing as well as higher harmonic suppression for the energy range of 2.7 to 24 keV. The beamline features three experimental hutches (70 to 100 m from the source point) accommodating the following instruments:

- A high precision psi-diffractometer with in-vacuum polarization analyzer combined with refractive lenses.
- A heavy load diffractometer with polarization analyzer, installed to accommodate a cryo magnet with up to 14 T (to be commissioned in summer 2011).
- A hard X-ray photoelectron spectrometer for an incident range from 3-15 keV (photons) and 0-12 keV (electrons).

