Status of the PETRA III extension EXAFS beamline P65.

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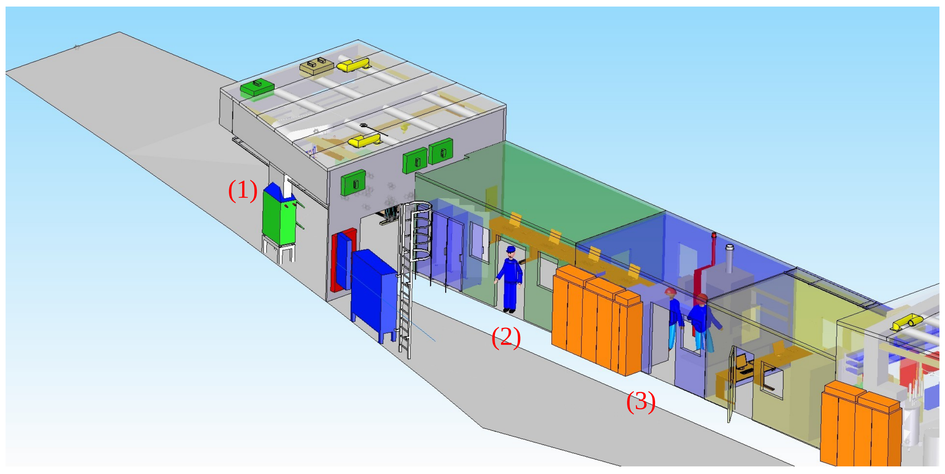
PETRA III extension: Beamline P65

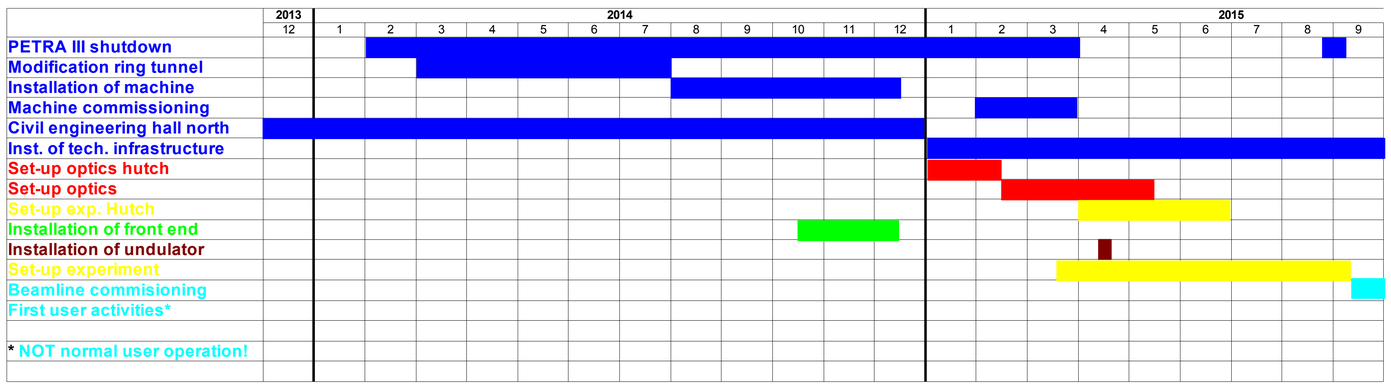
Beamline specifications:

- Millimetre sized beam spot on sample
- No focusing mirrors
- Short 11 periods undulator source
- Photon flux > 10^{11} s^{-1}
- Energy range: 4 – 44 keV
- Easy to handle standard operating procedures for inexperienced users
- Complementary to P64 (see poster by W. Caliebe et al.)
- Large experimental (2.5 * 1.2 m²) table with standard EXAFS set-up
- Ample space for specialised in-situ set-ups
- Infrastructure for problematic gases
- Temperature stabilised to +/- 1° C
- Detectors: Ionisation chambers, PIPS, energydispersive semi-conductor detectors
- Sample preparation lab shared with beamline P64.
- Fume hut, glove box, lab benches and equipment for sample preparation like an analytical balance and pellet press



CAD-drawing of PEX beamline P65, (1) experimental hutch, (2) control hutch, (3) Sample preparation lab (shared with P64)

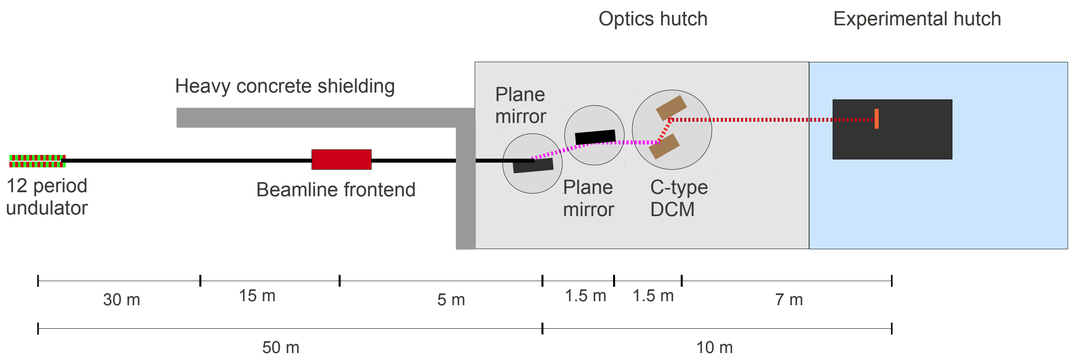
Timeline



In short:

- Start of regular user operation February 2016
- Schedule determined by experimental and optics hutch construction
- Beamline design phase finished
- Mirrors and undulator delivered
- Double crystal monochromator currently re-assembled, will undergo final (final successful) vacuum test in February 2015

Beamline set-up

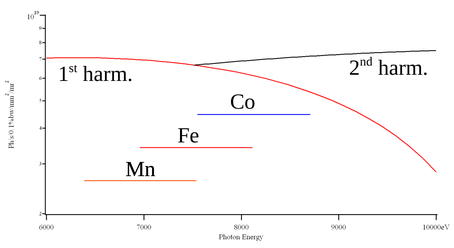


Main parameter:

- Source: Short 11 periods undulator
- 2 plane mirrors for higher harmonics rejection and power load reduction
- Water cooled C-type double crystal monochromator (DCM)
- Short distance between DCM and sample for improved stability

Source:

- Period length: 32.8 mm
- Number of periods: 11
- Minimum magnetic gap: 9.5 mm
- K_{max}: 2.7 (Magnetic gap 10.05 mm)
- Undulator gap and DCM will be scanned in a continuous mode, the anticipated times per scan are between 1 and 5 min.
- DCM and undulator gap scans will be synchronised
- Synchronised gap scans already successfully tested at beamline P06, deviation between undulator and DCM energy < 2 eV at 9 keV

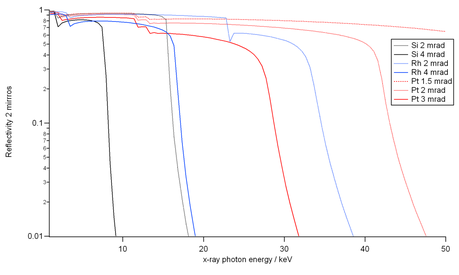


Overlap between 1st and 3rd harmonic in the scan region of Mn, Fe and Co EXAFS

Mirrors:

2 plane mirrors

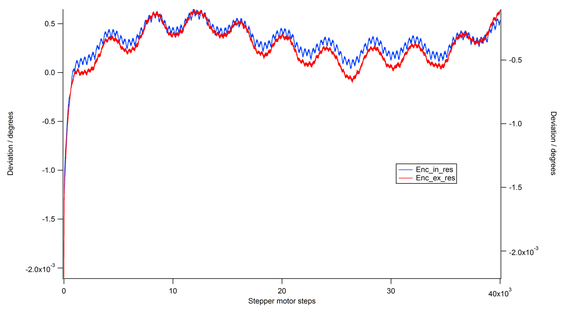
- 3 optical surfaces each (Si, Rh, Pt)
- Variable angle of incidence, 1.5 – 4.5 mrad for effective higher harmonics suppression
- First mirror (water cooled) acts as low pass filter to reduce power load of 1st DCM crystal



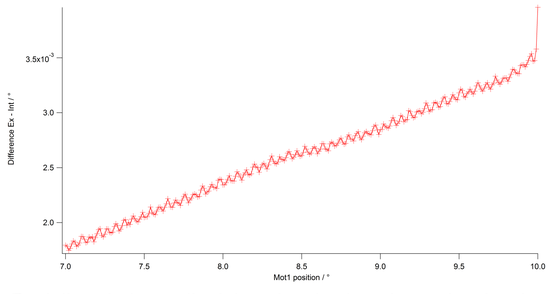
Cumulated reflectivity of 2 mirrors with different coatings and variable angle of incidence as they will be used for beamline P65

Double crystal monochromator:

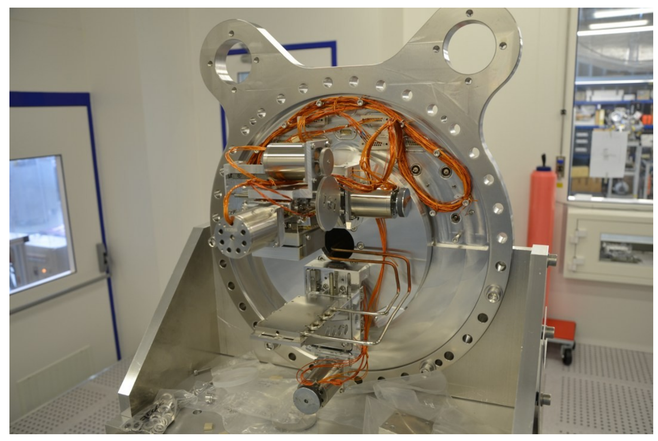
- Water cooled
- Si 111 and 311 crystal pairs (2.4 – 44 keV)
- Maximum acceptable power load: 2 W / mm²
- Power load limits tested during measurements in September/October 2012 at DORIS III beamline BW1
- Renishaw encoder on the Bragg-axis



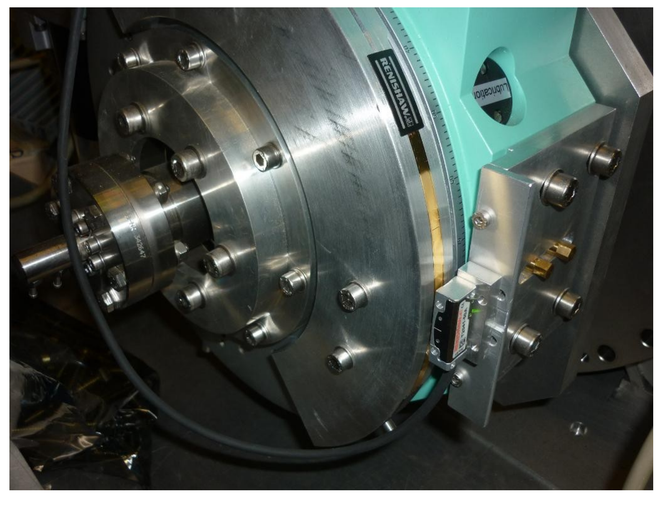
Scan of the Huber 420 goniometer, positions from the internal (blue) and external (red) encoder.



Deviations between the internal and external encoder signal.



Assembly of the DCM in the clean room



Renishaw encoder mounted outside of the vaccuum tank