



MCP-2007



MCP-based detector at FLASH for wavelength range down to 5 nm

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Dedicated for:

- Search SASE
- Characterization of radiation
- Desirable to control radiation intensity during user's run

Four iterations for MCP-based detector up to now:

- MCP detector at TTF FEL, Phase I (2000-2002, RAFEL, good performance)
- MCP detector at TTF FEL, Phase I (2001-2002, dedicated, bad performance due to strong gamma-background)
- MCP detector at FLASH (2004-, wavelength range down to 13 nm (good performance)
- MCP detector at PGM beamline (2006-, good performance)

New design (planned for installation in August, 2007)

- MCP-2007: wavelength range down to 5 nm

Detector Unit F2
(apertures, detectors, mirror)

**Intensity + beam profile
+ diffraction (coherence)
+ deflection into spectrometer**

Detector Unit F1
(apertures + detectors)

**Intensity + beam profile
+ double slits (coherence)**

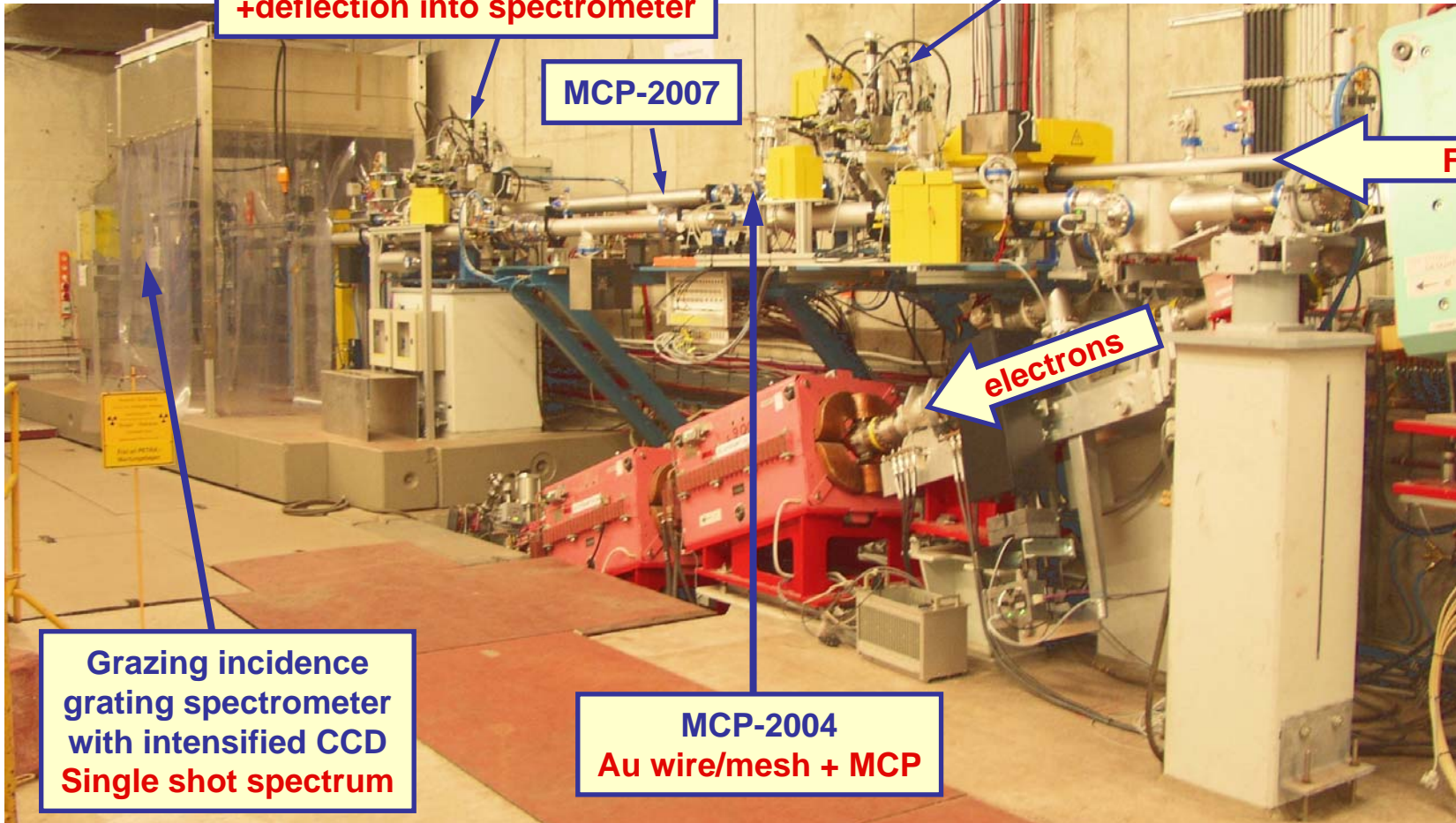
MCP-2007

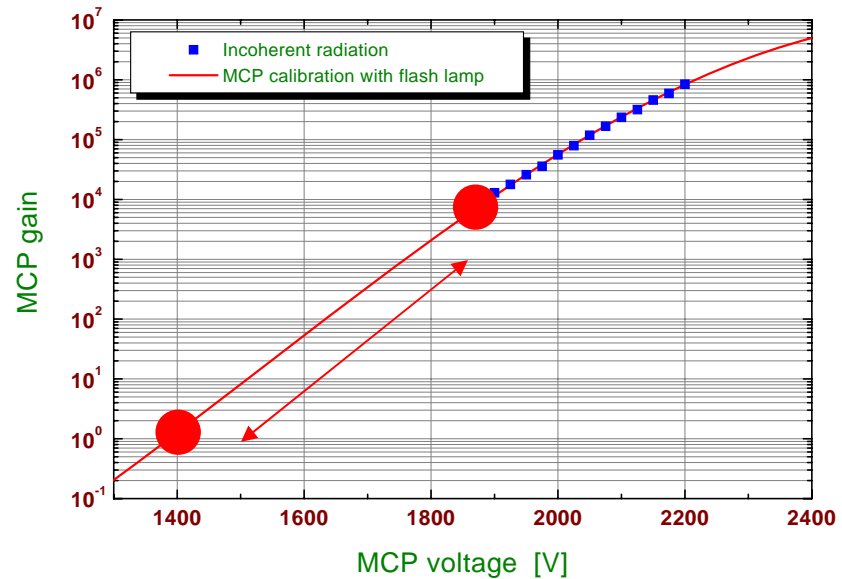
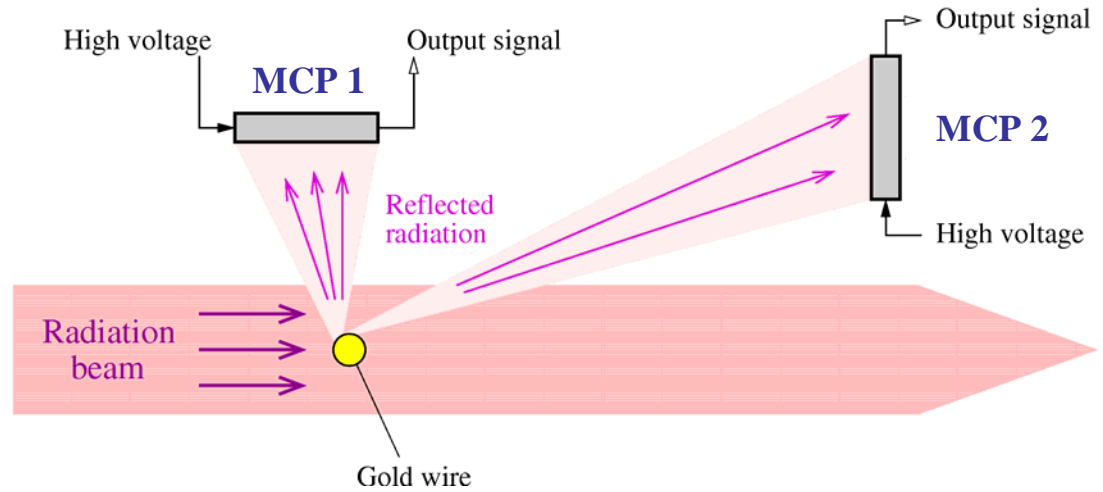
FEL

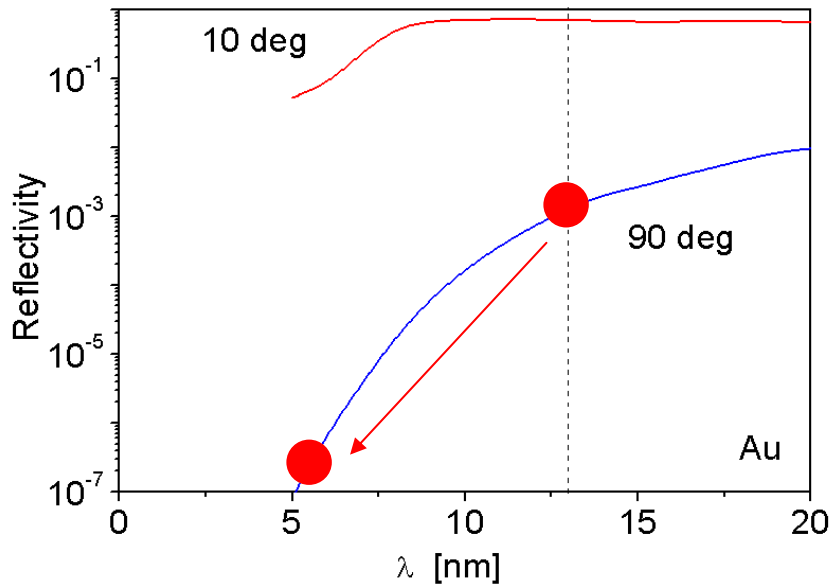
electrons

**Grazing incidence
grating spectrometer
with intensified CCD
Single shot spectrum**

**MCP-2004
Au wire/mesh + MCP**







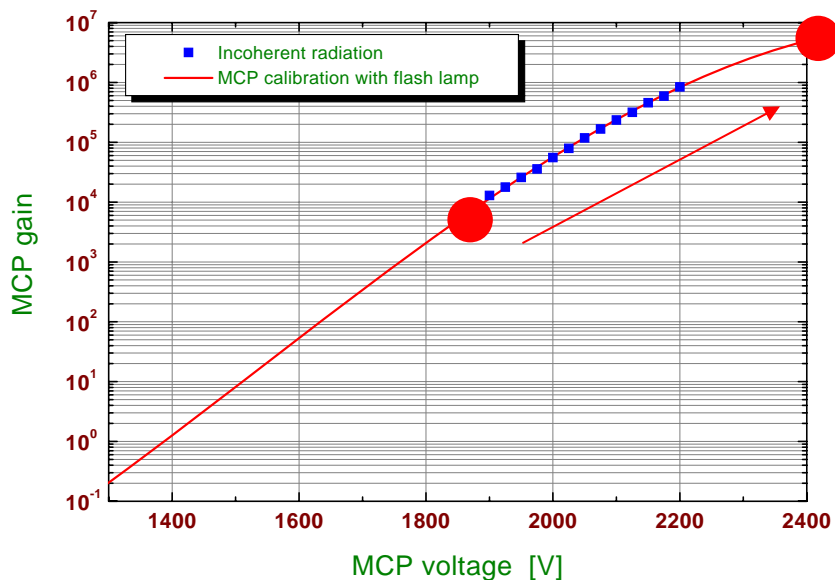
- *MCP-2004 demonstrated good performance for SASE characterization and reliable detection of SASE radiation on top of background with minimum wavelength about 13 nm.*

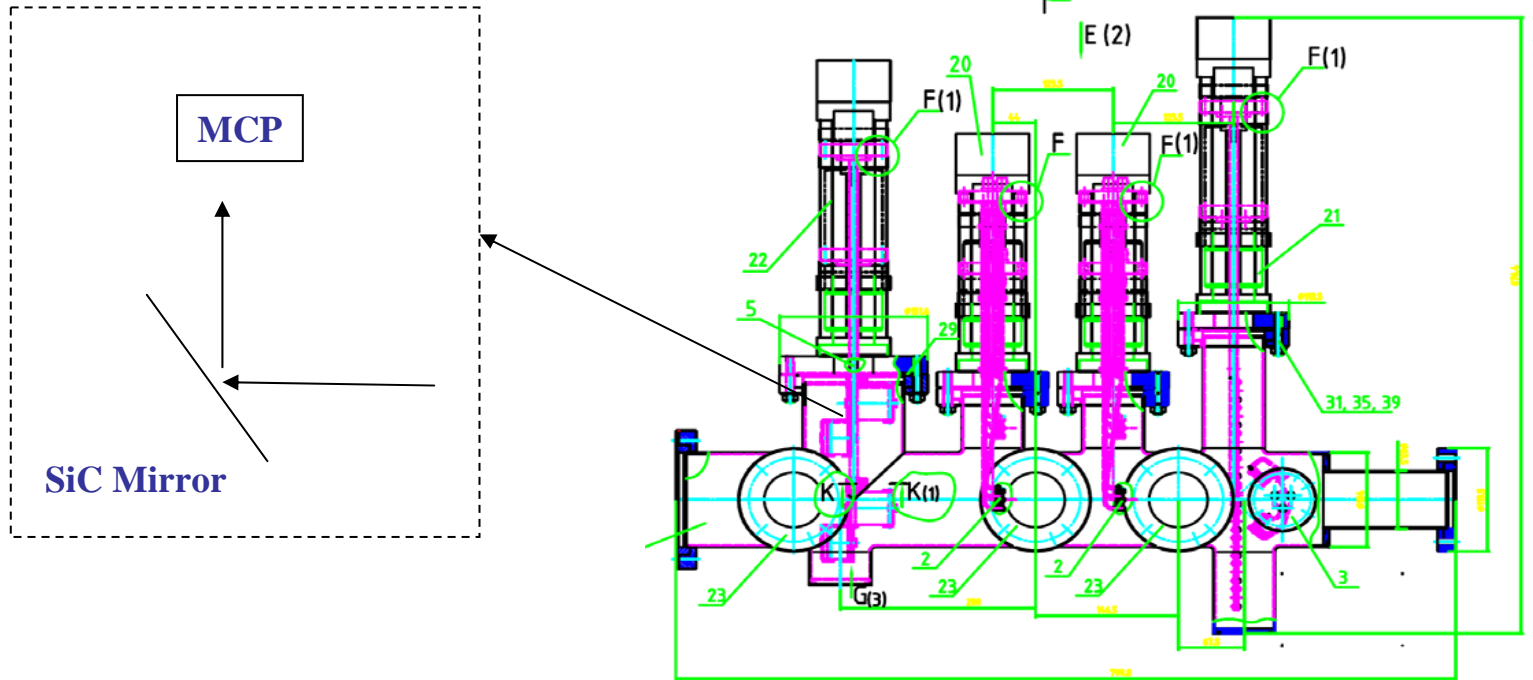
- *Main limitation for detection of SASE above spontaneous emission (around 10 nm) is due to:*

Drastical decrease of reflectivity → increase of HV → higher gamma background (beam losses in the undulator and dump area).

- *At 13 nm wavelength useful (photon) and background (gamma) signals become to be comparable at HV about 2000 V.*

- *Detection of short-wavelength radiation requires dedicated design.*





- Best features of MCP-2004 are conserved: large and small-angle MCP detectors; duplication of MCP-detectors
- Number of targets will be increased to 5:
- Gold mesh identical to that of MCP-2004
- Two Cu meshes with 65 and 80% transmission
- Au wire will be replaced by Cu grid with 92% transmission
- Mesh-attenuator with 2% transmission
- An MCP unit operating at lower HV will be added for reliable detection of short-wavelength radiation



MCP-2007: Present status



- *General design is finished*
- *In-vacuum parts (target holders) and electronics is manufacturing in Dubna, delivery is expected in April/May.*
- *Ordering of components and manufacturing of main vacuum chamber at DESY is expected to start in end of March / beginning of April.*