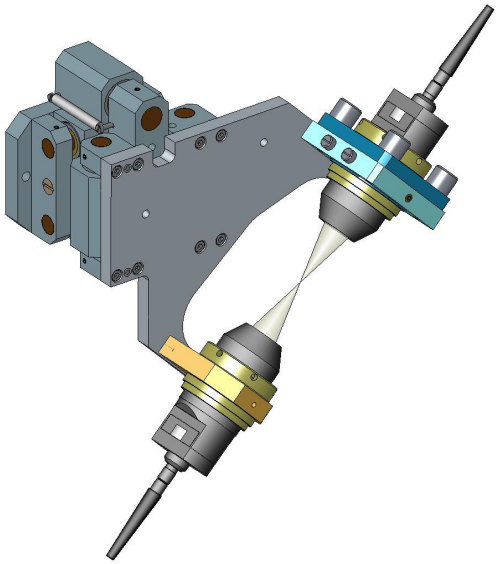
MicroSpecrophotometer lens setups*

Preliminary, February 2008

Absorption and fluorescence spectrometry are effective techniques used to track specific structural changes in macromolecular crystals exposed to X-ray radiation. A typical application in macromolecular crystallography is the monitoring of the radiation-induced damage that occurs during standard X-ray data collection. In addition, the setup can be used to accurately deliver laser light to the crystal in order to influence intermediate states, activate cage compounds, and even create highly specific damage sites for phasing. Different setups built around a mirror objective lens are proposed for beamline in-situ spectrometry applications:

MS1-DL

Dual lens setup[1]



For absorption spectrometry

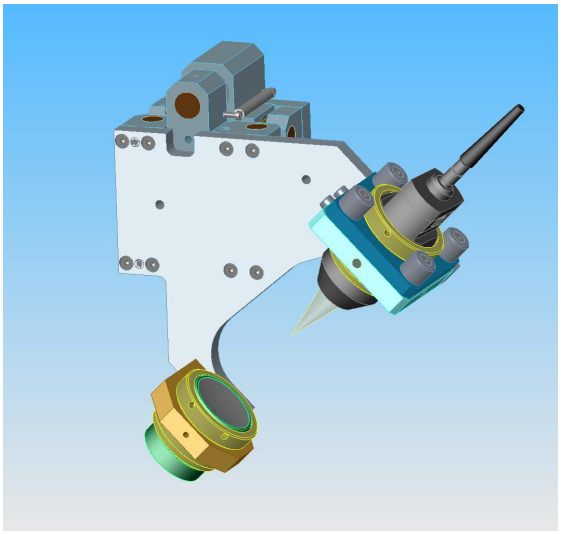
- Two lenses with optional filters for sample illumination and light collection
- Lenses support with pre-alignment mounts
- XYZ fine alignment stage
- Compatible with MD2M Diffractometers

Additional equipment

- SMA optical fibres 50-600 µm core (E.g. Ocean Optics P100-2-SR)
- Light source (E.g. Ocean Optics deuterium + halogen lamps, DH2000)
- CCD spectrophotometer (E.g. Ocean Optics HR2000 with software)
- Windows computer with USB2 for spectrophotometer control

MS1-SLM

Single lens setup with mirror[1]



For absorption spectrometry

- One lens with optional filter for sample illumination
- One spherical mirror for light collection
- Lens/mirror support with pre-alignment mounts
- XYZ fine alignment stage
- Compatible with MD2 and MD2M Diffractometers

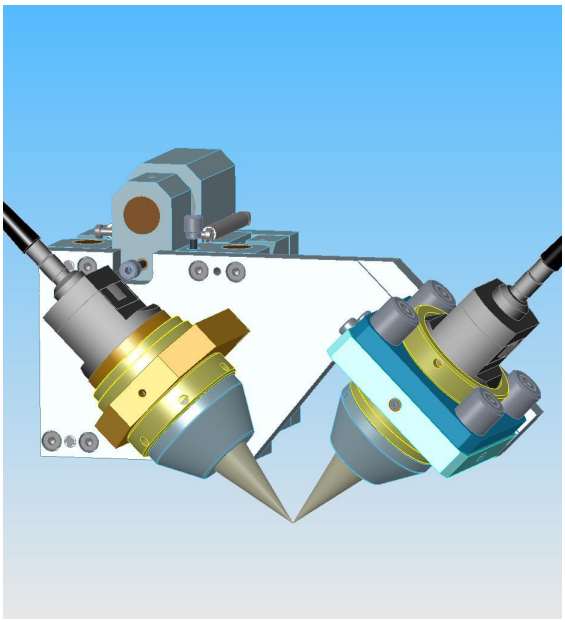
Additional equipment

- 1 x SMA bifurcated optical fibre
- Light source (E.g. Ocean Optics deuterium + halogen lamps, DH2000)
- CCD spectrophotometer (E.g. Ocean Optics HR2000 with software)
- Windows computer with USB2 for spectrophotometer control

**Technical information subject to change without notice **Under development*

MS1-DL90**

Setup with two lens at 90 Degrees[1]



For UV fluorescence

- Two lenses with optional filters for sample illumination and fluorescence collection
- Lens support with pre-alignment mounts
- XYZ fine alignment stage
- Compatible with the MD2 and MD2M Diffractometers

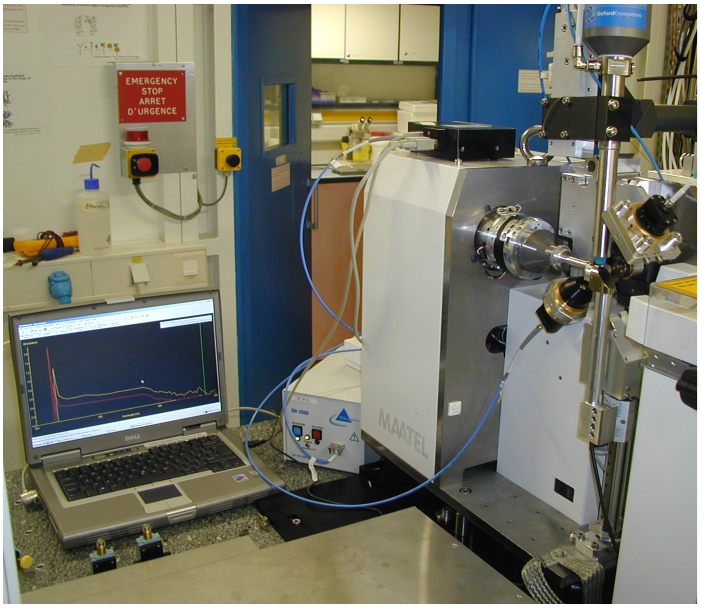
Additional equipments

- 2 x SMA optical fibres 100-600 µm core (e.g. Ocean optics UVP200-2-UV/SR)
- Excitation laser source. Experiment dependant. (e.g. 266nm 2mW)
- CCD spectrophotometer (E.g. Ocean Optics HR2000 with software)
- Windows computer with USB2 for spectrophotometer control

1-Note: In all setups, face-on single lens fluorescence measurements are possible using a bifurcated fibre and an appropriate laser and cutoff filter.

MS1-DL

installed on a MD2M Diffractometer



MD1-DL installed at the ESRF ID14-4 beamline

- Lens setup doesn't affect the minimum detector distance
- Compatible with the Roentec X-Flash 1000 fluorescence detector
- Compatible with the SC3 sample changer
- Compatible with Oxford Cryosystems Cryostream

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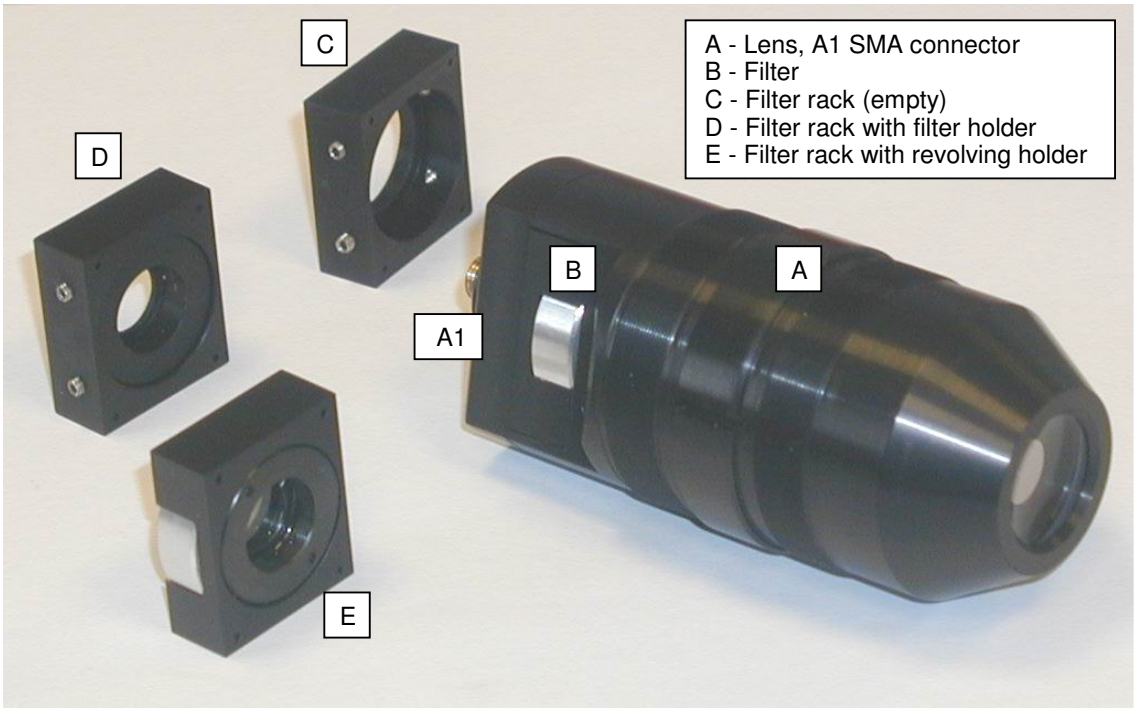
Main specifications*

Each optical element of the MS1-xx is constructed with mirrors and UV grade glass for large spectrum light transmission, and is mounted on an adjustable support. The relative alignment of the optical elements can be made off-line. A high precision and high stability XYZ table allows for in-situ alignment with the samples.

Mirror lenses (Sample illumination and light collection lenses)



- Wide transmission spectrum mirror lens
- Outside diameter: 40 mm
- Working distance: 35 mm
- Front lens diameter: 17 mm
- Front optics material: UV grade fused silica
- Light injection/collection: directly in an optical fibre plugged on the SMA connector
- Magnification/Demagnification ratio: 4 (e.g. 25 µm spot at sample position with a 100 µm core fibre)
- Transmission spectra**:** 250nm-3 µm
- Numerical Aperture: 0.22 (0.055 at the SMA side)
- Front mirror obstruction: 20% of the useful area (N.A. 0.1)
- Light efficiency: about 23% measured at 440 nm with a 200 µm core / 0.22 N.A. fibre (light Intensity at sample / light intensity at output of the injection fibre)
- Light filtering:
  - Filter port: compatible with the filter racks
  - Filter rack: filter support with optional revolving support (polariser orientation). Accepts 1/2" diameter filters (up to 3/4" on request) and 5 mm thickness (up to 8 mm on request).
  - Filters: on request, glass coloured filters, interferential filters, polarisers...

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Mechanical Support

- Relative alignment of the lenses/mirror:
  - Distance: fine pitch and stop nuts on each lens.
  - Radial adjustment: sliding plate and XY, fine pitch screws and lock screws on one lens
- Alignment with the sample: high precision High Stability manual XYZ translation stage
  Alignment range: 2 mm in XYZ directions
  Resolution: <1 µm

General dimensions

See MS1-DL_Annex1.pdf

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