

Mirrors for synchrotron beamlines Specifications for the

General Description

Four mirror x-ray mirrors for usage in a beamline BL07 on 450 MeV, 100 mA Indus-1 synchrotron. One of these mirrors would be collimating mirror. Second mirrors would have plane geometry. third mirror will be plane type and fourth will be of ellipsoidal type. The mirrors will be operated under ultra-high vacuum (UHV) conditions.

2. Scope of Supply

Present purchase procedure is for the four nos. of mirrors for collimation and focusing purpose. The supply includes the design, fabrication and testing of mirrors..

2A. The mirrors

The Gold coated mirrors to reflect/focus the synchrotron radiations of energy up to 2 KeV conforming to the specifications as stated in the technical.

Mirrors Specifications:

Annexure 1: Toroidal mirror

<i>a) Mirror</i>	
Substrate	
Surface geometry	: toroidal
Material	: Ohara ClearCerem CCZ/zerodur/Si
Length	: 350 mm
Width	: 50 mm
Clear aperture	: 350 x 50 mm ²
Thickness	: 40 mm
Shape	: Toroid
Meridional Radius	: 530000 mm
Sagittal Radius	: $\rho=303.735 (\pm 0.05)$ mm
Position	: Upward
Coating	: Au (50 nm) over 5nm Cr
Roughness	: less than 3 Å rms
Surface quality	:
Tangential Slope errors	: less than 5 μ rad rms
Spatial sampling	: 2 – 100 mm
Sagittal slope error	: 10 μ rad rms
Spatial sampling	: 2-45 mm
Microroughness	:
MSFR (mid spatial frequency roughness)	: 0.3 nm (rms)
Spatial sampling (ZYGO 10x)	: 5 – 800 μ m
Vacuum	: $\sim 1 \times 10^{-10}$ torr or UHV compatible

Annexure 2: Plane mirror1

a) Plane Mirror	
Substrate	
Surface geometry	: plane
Material	: Ohara ClearCerem CCZ/Zerodur/Si
Length	: 350 mm
Width	: 50 mm
Optical surface	
Clear aperture	: 350 x 50 mm ²
Thickness	: 40 mm
Shape	: Plane
Meridional Radii	: R > 2 km
Sagittal Radius	: >500 m
Position	: downward
Coating	: Au(50 nm) over 5 nm Cr
Roughness	: 3 Å rms
Slope errors	:
- Tangential	0.5 µrad rms
- Sagittal	0.5 µrad rms
Microroughness	: 0.3 (rms)
MSFR (mid spatial frequency roughness)	: 5µm - 800 µm
Vacuum	: 1× 10 ⁻¹⁰ torr or UHV compatible

Annexure 3 : Plane mirror2

<i>a) Plane Mirror</i>	
Substrate	
Surface geometry	: plane
Material	: Ohara ClearCerem CCZ/Zerodur/Si
Length	: 500 mm
Width	: 50 mm
Useful width	: 50 mm
Thickness	: 50 mm
Shape	: Plane
Meridional Radius	: R >2 km
Sagittal Radius	: >500 m
Position	: upward
Coating	: Au(50 nm) over 5 nm Cr
Roughness	: less than 3 Å rms
Slope errors	:
- Tangential	0.5 µrad rms
- Sagittal	0.5 µrad rms
Microroughness	: 0.3 (rms)
MSFR (mid spatial frequency roughness)	: 5µm - 800 µm
Vacuum	: 1×10^{-10} torr or UHV compatible

Annexure 4: Ellipsoidal mirror

<i>a) Mirror</i>	
Substrate	
Surface geometry	: rot. Ellipsoid
Material	: Ohara ClearCerem CCZ/Zerodur/Si
Length	: 320mm
Width	: 50 mm
Clear aperture	: 300x 50 mm ²
Thickness	: 50 mm
Shape	: ellipsoid
Major- halfaxis A	: 39930 mm
Minor- halfaxis B	: 378.366 mm
Entrance arm l ₁	: 78360 mm
Exit arm l ₂	: 1500 mm
Grazing angle	: 2.0 deg
Eccentricity xm	: 384317.7± 5mm
Position	: Upward
Coating	: Au (50 nm) over 5nm Cr
Roughness	: less than 3 Å rms
Surface quality	:
Tangential Slope errors	: 10 µrad rms
Spatial sampling	: 2 – 100 mm
Sagittal slope error	: 15 µrad rms
Spatial sampling	: 2-45 mm
Microroughness	:
MSFR (mid spatial frequency roughness)	: 0.5 nm (rms)
Spatial sampling (ZYGO 10x)	: 1 – 170 µm
Vacuum	: ~1× 10 ⁻¹⁰ torr or UHV compatible

5. General conditions:

Supplier to specify

- § Test results on the shape of the mirror, roughness, slope errors
- § Test results on the resolution and repeatability of mirror motions
- § Test results on the leak rate
- § Baking compatibility
- § Vacuum test including RGA test
- § beam in - beam out flange distance
- § Supporting structure area
- § Weight

Mirror Installation Environments

- Temperature : 20±5 °C
- Humidity : Upto 60%
- Power options : 230V 50Hz Single phase or Three phase
- Power Fluctuations : ±10%

Warranty

§ Warranty period of 12 months from the date of final acceptance at the site.

Documentation & other supplies

Following documentation in English language should be provided

- § Full test reports on the shape of the mirror, roughness and slope errors
- § Full test reports on the resolution and repeatability of mirror motions
- § Full test reports on the leak rate.

Acceptance Criteria and Rejection Criteria:

The vendor should provide us the test reports of mirror detail mentioned below as per specifications. Item will be rejected if not as per the specifications.

- Slope error of all mirrors shall be performed by means of LTP or interferometer or any other approved technique and properly specified in the test report. Slope error shall be measured along the whole mirror active surface and both meridional and sagittal slope profile shall be reported in the report.
- Roughness tests shall be performed by means of interference microscope, or atomic force microscope or any other approved instrument. The roughness tests shall be measured in at least 15 randomly distributed points of the mirror active surface. The obtained roughness profile shall be included in test report.
- The measurement of both radii and dimensions with the mentioned accuracy should be included in test report.
- The measurement of coating thickness should be also included in the test report.
- All the items shall be brand new from reputed manufacturers procured from their authorized agents/principals.
- Used materials/ recycled items/ repaired items will not be acceptable and will be rejected.

Factory testing

Testing certificates should be provided with all the parameters.

Packaging and forwarding

Supplier should take care of proper packaging of the mirrors preferably in inert gas media in order to ensure the quality of the mirrors.

Installations

Installation of the mirrors will be carried out by us.

References

§ A list of the references with the contact details where such a mirror system has already been installed should be provided.