Mode-Cleaner Optics: Mariner40m
Fused Silica Beamsplitter

APPROVALS	DATE	REV	DCN NO.	BY	CHECK
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CHECKED:					
APPROVED:					

1 Description

Flat 50/50 beamsplitters IBS coated @ 2050nm

1.1 Quantity

- 2x 75mm diameter x 25mm thick optics
- Enough 1" diameter x 6mm thick optics to fill up remaining space in coating run.

2 Material

Corning HPFS 7979 OA (high purity fused silica)

- Homogeneity: ≤ 1 x 10-6 peak to valley at λ = 632.8 nm, within the 85% clear aperture

3 Dimensions

Diameter: 75.0 mm +0.00/– 0.1 mm
Thickness (at edges): 25.0 mm ± 0.075 mm
Chamfers: minimal to prevent chipping (goal of < 0.25 mm width)

4 Surface Roughness & Quality

Sides 1 & 2

- 75mm diameter optics:
  - super-polished, less than 1 Angstrom RMS over central 30 mm diameter.
  - Only commercial polish quality outside 30mm diameter (with best effort toward super-polish)
- 1" diameter optics: commercial polish

Edges and Bevels: Commercial-polish

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5 Surface Figure

Side 1: Over central 30 mm diameter, deviation from sphere: $< \lambda/20$ PV at 632.8 nm

Surface Errors, Side 1

All specified quantities refer to the physical surface of the optic.
The following root mean square standard deviation (σ_{rms}) values are calculated from the phase maps which are to be provided with each optic. σ_{rms} is defined as the square root of the mean of the square of each pixel value. Known bad pixels are excluded from this calculation.

Low Spatial Frequency Band: $\leq$ 4.3 cm $^{-1}$
With piston, tip, tilt, power (best fit spherical surface) and astigmatism removed over the central 30 mm diameter aperture:
σ_{rms} <5 nanometers

High Spatial Frequency Band: 4.3 - 7,500 cm $^{-1}$
σ_{rms} < 0.4 nanometers

Measured at the following locations:
1. The center of the mirror substrate.
2. Four positions equally spaced along the circumference of a centered, 30 mm diameter circle.

Table 1 Certification Data Requirements

Specification	Test Method	Frequency of Inspection	Data Delivered
Physical Dimensions	Visual Inspection	100%	Diameter, Thickness, Bevel dimension, Wedge angle.
Side and Bevel Polish	Visual Inspection	100%	Inspection Report included with Certification
Scratches and Point defects	Visual Inspection	100%	Hand sketch including scratch/pit dimensions
Surface Figure	Interferometry	100%	Surface Map
Surface Errors - Low Spatial Frequency	Interferometry	100%	Surface Map
Surface Errors - High Spatial Frequency	High resolution Surface Map	100%	Surface maps for 3 central locations. Numerical values included with Certification

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Orientation: For the purpose of full surface phase maps the substrate shall be oriented such that the point of minimum thickness shall be at the top center of the data.

Format: All Data shall be delivered according to Table 1. In addition to the hard copy an electronic data set of the phase maps shall be delivered in either ASCII or Vision.OPD format.

6 Coating definitions (2 in total)

All coatings should cover at least central 85% diameter.

BS45 (Side 1)

- Description: 50/50 beamsplitter at 45 degrees
- Central Wavelength: **2050nm**
- Angle of incidence: 45° +/- 0.5°
- Ion Beam Sputtered coating
- Primary Requirement:
- R = 50% +/- 0.5% for **s**-polarization
- T = 50% +/- 0.5% for **s**-polarization
- Stretch goal: tolerance of +/- 0.1%

AR45 (Side 2)

- Description: Anti-reflection coating for 45 degrees
- Wavelength: **2050nm,** Angle of incidence: 0°, Ion Beam Sputtered coating
- Requirement:
- R < 0.1%, for **s**-polarization
- Stretch goal: R<100ppm

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7 Deliverables

"Nominally Flat" is defined as absolute value of ROC > 6000m

- **Name: "BS-75"**
  - Qty 2
  - 75mm diameter x 25mm thick
  - Side 1: Nominally flat, BS45 coating
  - Side 2: Nominally flat, AR45 coating, 0.5 deg wedge
  - Arrow engraved on barrel at thickest part of wedge point to Side 1

- **Name: "BS-25"**
  - Qty: as many as can fill a single coating run
  - 1" diameter x 6mm+/- 1mm thick
  - Side 1: Nominally flat, BS45 coating
  - Side 2: Nominally flat, AR45 coating, 0.5 deg wedge
  - Arrow engraved on barrel at thickest part of wedge point to Side 1

- **Spectrophotometry data** for coatings (in form of CSV file of measured values, not a processed plot)
  - AR45: measured reflection at 45° AOI (both polarizations)
  - BS45 coating: measured reflection and transmission at 45° AOI (both polarizations)

8 Serial numbers and marks

- Each optic shall be laser engraved on the barrel of the optic for in-vacuum use — **no pencil marks shall be present**

8.1 (for 75mm diameter optics)

- Unique serial markings are presented below:
  - "E2100258-v1-BS SN01 - 2050nm"
  - "E2100258-v1-BS SN02 - 2050nm"

8.2 (for 75mm diameter optics)

- Generic serial markings for 25mm diameter optics:
  - "E2100258-v1-BS - 2050nm"