

	LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY		E2100300 -v1
	SPECIFICATION		Drawing No Rev. Group
			Sheet 1 of 2
Blank Material, Silicon Test Mass (ETM/ITM), 40m Mariner			

Authors	Date	Document Change Notice, Release or Approval
C. Wipf		See DCC record

Applicable Documents

LIGO-D20xxxxx-v1 Mirror Blank Drawing, Silicon Test Mass (ETM/ITM), 40m Mariner

Requirements

Physical dimensions	Right circular cylinder: 150 mm × 150 mm ∅, per LIGO-D20xxxxx-v1
Clear aperture	Central 30 mm diameter
Material	Monocrystalline silicon, float zone (Topsil FZ-HiTran or equivalent)
Dopants	Undoped; best effort for minimal residual dopant contamination
Resistivity	> 30 kΩ cm; radial variation and striation ± 20% in clear aperture
Interstitial oxygen	< 10 ¹⁶ /cm ³
Micro defects	Voids only; density < 10 ³ /cm ³
Bubbles/inclusions	Total cross section in clear aperture is < 10000 square micrometers No bubbles > 100 micron diameter; disregard bubbles < 10 micron diameter
Crystal orientation	Flat surfaces of cylinder aligned with {100} crystal plane, ±1°
Index homogeneity	≤ 2.5 × 10 ⁻⁶ peak-to-valley; ≤ 5 × 10 ⁻⁷ peak-to-valley in clear aperture
Birefringence	≤ 5 nm/cm; ≤ 1 nm/cm in clear aperture
Final shaping	Performed using a grit size progression ending with a 320 or smaller grit tool
Defect depth	< 0.5 mm on any surface or corner
Serial number	Serialized as TMXX, where XX increments starting at 01



SPECIFICATION

Blank Material, Silicon Test Mass (ETM/ITM), 40m Mariner

Specification	Method	Inspection Frequency	Data Delivered
Physical dimensions	Inspection	100%	Certification
Material	Process control Material certification	100%	Certification
Dopants	Process control Material certification	100%	Certification
Resistivity	Process control Material certification	100%	Certification
Interstitial oxygen	Process control Material certification	100%	Certification
Micro defects	Process control Material certification	100%	Certification
Bubbles/inclusions	Infrared imaging	100%	Hand sketch indicating location and dimensions
Crystal orientation	Process control Material certification	100%	Certification
Index homogeneity	Interferometric measurement	100%	Inspection report included with certification
Birefringence	Infrared polariscope	100%	Inspection report included with certification
Defect depth	Visual inspection	100%	Certification
Serial number	Visual inspection	100%	Certification

Table 1: MEASUREMENT MATRIX: FREQUENCY AND METHOD