LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO

SPECIFICATION

E0900140   V3

Drawing No   Rev.   Group

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Advanced LIGO End Reaction Mass Coating Specification

			APPROVALS		
AUTHOR:	**CHECKED:**	**DATE**	**DCN NO.**	**REV**	**DATE**
R. Dannenberg	G. Billingsley	5/11/09	E0900132-x0	V1	5/11/09
R. Dannenberg	G. Billingsley	10/15/09	E0900359	V2	10/15/09
M. Phelps	G. Billingsley	10/07/10	E1000565-x0	V3	10/07/10

Name	ERM
Applicable Documents	
Blank Specification	N/A
Polish Specification	E080089-B
Polish Drawing (Fabricate From)	D080116-B
General to Surfaces 1 & 2	
Figure Change Before / After Coating	N/A
Optical Performance Uniformity	On both surfaces, the specified single surface reflectance or transmittances at the specified wavelengths must be maintained over a 160 mm diameter aperture.
Coating Deposition Method	Ion Beam Sputtered
Coating Area	To Bevel

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Witness Sample Durability Testing	On one witness piece per run, coating to resist: 1. Adhesion test per MIL-C-48497A 4.5.3.1 Adhesion (snap tape). 2. MIL-C-4.5.3.2 Humidity (120F 95% RH for 24 hours), combined with before/after reflectance & transmittance spectrophotometer scans from 350 - 2500 nm in about 1 nm increments, marking the specimen ensure the same area is scanned. The scans will be provided in an Excel spreadsheet as columnar data. There should be no measureable spectral shift. 3. MIL-C-4.5.3.3 Moderate Abrasion (cheesecloth rub).
Surface 1	*ARROWS ON OPTIC SIDE POINT TO SURFACE 1*
Coating Type	Antireflection
Angle of Incidence	Normal
Reflection at 1064 nm	< 1000 ppm
Transmission matching between parts at 1064 nm	N/A
Reflection at 532 nm	< 1000 ppm
Thermal Stability at 532 nm	N/A
Thermal Stability at 1064 nm	N/A
Coating Materials	N/A
Surface Electric Field 1064 nm	N/A
Thermal Noise	N/A

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Absorption at 1064 nm	N/A
Scratches and Point Defects	Surfaces shall appear transparent with no grey, scuffs or scratches visible to the naked eye when viewed in normal room light against a black background. Surface quality to be 80/50 scratch/dig as per (ML-PRF-138308) Refer to E080089 for further information.
Surface 2	
Coating Type	Antireflection
Angle of Incidence	Normal
Reflection at 1064 nm	< 1000 ppm
Reflection at 532 nm	< 1000 ppm
Surface Electric Field at 1064 nm	N/A
Thermal Stability at 532 nm	N/A
Thermal Stability at 1064 nm	N/A
Coating Materials	N/A
Absorption at 1064 nm	N/A
Scratches and Point Defects	Surfaces shall appear transparent with no grey, scuffs or scratches visible to the naked eye when viewed in normal room light against a black background. Surface quality within clear aperture to be 80/50 scratch/dig as per (ML-PRF-138308) Refer to E080089 for further information.
Additional Deliverables	
Witness Samples	SURFACE 1 & 2: Two 1-inch witness samples per run required + as many 1 inch witness pieces that can be fit additionally

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	per run (provided by vendor).
Layer Thicknesses Information	For all layers in the design, measured thickness data from the deposition for each run, designed thicknesses, and measured indices of refraction at both 1064 nm and 532 nm for both coating materials (based on individual layers).
Surface 1 Spectral Scans	On a representative witness piece for each run, spectrophotometer scans of reflectance and transmission of Surface 1 (AR coating) from 350-2500 nm before it is coated, between Surface 1 and Surface 2 coating, and after coating is completed. All spectrophotometer data to be provided in Excel spreadsheet format with columnar data in increments of approximately 1 nm.
Surface 2 Spectral Scans	All samples from the durability tests and data, including transmittance and reflectance spectrophotometer scans of the representative coating on each side in an Excel spreadsheet with columnar data spaced by approximately 1 nm from 350 - 2500 nm.
Durability Test Data & Samples	On a representative witness piece for each run, spectrophotometer scans of reflectance and transmission of Surface 2 (AR coating) from 350-2500 nm before it is coated, between Surface 1 and Surface 2 coating, and after coating is completed. All spectrophotometer data to be provided in Excel spreadsheet format with columnar data in increments of approximately 1 nm.