

Suprasil Substrates for Coating Effect on Mechanical Quality Factor R&D

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DCC RELEASE							

Scope

The substrates defined by this specification are to be used in research to establish the effect of high performance dielectric coatings on the mechanical quality factor (Q) of fused silica Suprasil 311 SV.

These fused silica substrates have high intrinsic Q which should not be compromised significantly by material impurities, inhomogeneities, defects or processing steps which deviate radically from the processes used in full scale optics manufacturing.

Applicable Documents

LIGO-D010282-A Type A - Mechanical Q Suprasil Substrate

Requirements

Physical Dimensions per LIGO-D010282-A

Serial Number / None

Material: Fused Silica - Suprasil 311 SV

Side and Chamfer Polish

Sides and chamfers shall appear transparent with no gray, scuffs or scratches visible to the naked eye when viewed in normal room light against a black background.

Scratches and Dig Defects

Side 1 Superpolished to $< 1 \text{ \AA}$ RMS

Side 2 40/20 surface quality

Surface Figure and Low Spatial Frequency Error, measured over the central 60 mm diameter

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.

Surface 1: Nominally flat

Maximum rms surface figure error, $\sigma_{\text{rms}} < \lambda/10$ (where $\lambda = 633\text{nm}$)

Surface 2: Nominally flat



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High Spatial Frequency Band

Measured at two locations

Surface 1: $\sigma_{rms} < 0.1$ nanometers

Specification	Test Method	Data Delivered
Physical Dimensions	Visual Inspection	Diameter, Thickness, Bevel dimension, Parallelism
Side and Bevel Polish	Visual Inspection	Inspection Report included with Certification
Scratches and Point Defects	Visual Inspection	Inspection Report included with Certification
Surface Errors –Surface Figure and Low Spatial Frequency	Interferometry	Surface Map
Surface Errors – High Spatial Frequency	Atomic Force Microscope	Numerical values included with Certification

Table 1 : Required Deliverable Data