Sapphire Substrate, Coating Effect on Mechanical Q, R&D

AUTHOR:	CHECKED:	DATE	APPROVALS		
			DCN NO.	REV	DATE
G. Billingsley		02-15-02	E020252-00	A	02-15-02

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 sapphire. These sapphire 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-D020041 Substrate, Coating Effect on Mechanical Q, R&D

Requirements

Physical Configuration

According to
LIGO-D020041 Substrate, Coating Effect on Mechanical Q, R&D

Material

A-Axis Sapphire, Hemlite

Part and Serial Number

None

Registration Mark

None

Side and Bevel Polish

Sides and Bevels 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 Point defects

An 80/50 or better scratch/dig finish on both sides.

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Surface 1, measured over the central 80% diameter

Figure: Flat.
Figure Error: $\sigma_{rms} <$ 63 nm rms
Microroughness: $\sigma_{rms} <$ 0.1 nanometers
Measured at the center of the substrate.

Surface 2, measured over the central 80% diameter

Figure: Flat.
Figure Error: $\sigma_{rms} <$ 300 nm rms

Root mean square standard deviation (σ_{rms}) values are calculated from the phase maps that are to be provided with each substrate. 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.

Table 1 Certification Data Requirements

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

Format: All Data shall be delivered according to Table 1.