

Coating, Power Recycling Mirror, Type A, 40M RSE Experiment

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Applicable Documents

LIGO-D010101-A-D	Substrate, Power Recycling Mirror, 40M RSE Experiment
LIGO-E010099-B-D	Substrate, Power Recycling Mirror, 40M RSE Experiment

Requirements

Physical Configuration

Fabricate from

LIGO-D010101-A-D	Substrate, Power Recycling Mirror, 40M RSE Experiment
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Surface 1: HR Coating

Transmission: $6.5 \pm 0.7\%$

0° Angle of incidence

Coat full aperture

Surface 2: AR Coating

Reflection: <300 ppm

2.5° Angle of incidence, P polarization

Coat the full aperture

Surface 1 and 2

Coating to be centered at 1064 nm

Coating thickness uniformity: <0.1% over the central 30 mm diameter

Scatter: <15 ppm

Absorption: <1 ppm with a goal of 0.05 ppm at 1064 nm

Design for zero surface electrical field for the HR coatings

Surface Quality

Scratches and Point defects

There shall be no scratches, sleeks or point defects within the central 10 mm

The total area of scratches, sleeks and point defects within the central 30 mm diameter shall not exceed 500 square micrometers (width times length.)

The total area of scratches outside the central 30 mm diameter shall not exceed 5,000 square micrometers.

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Minimum Point Defect

Point defects which have a maximum dimension of 5 micrometers are disregarded.

Inspection Method

1. The surface is examined visually by two observers independently. The examination is done against a dark background using a three-bundle fiber-optic illumination system of at least 200 W total power. A 100% inspection of the surface is carried out. Pits and scratches down to 2 micrometers in width can be detected using this method of inspection. Any scratches that are detected will be measured using a calibrated eyepiece.
2. Further inspection will be done with a 6X eyeglass using the same illumination conditions, again with two observers. Sleeks down to 0.5 micrometers wide can be detected using this method. The surface will be scanned along one or two chords from center to edge, then at ten positions around the edge, and ten to fifteen positions near the center.
3. An inspection is then carried out with a dark field microscope with a similar sampling frequency as described in section 2.

NOTE:

The coating manufacturer to supply:

1. One 1" witness plate from each coating run
2. Spectrophotometer graphs of the reflectance and transmittance of the HR coating
3. Spectrophotometer graph of the reflectance of the AR coating