

**ETM TELESCOPE SECONDARY PARABOLIC MIRROR ADLIGO**

APPROVALS	DATE	REV	DCN NO.	BY	CHECK	DCC	DATE
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**1 SCOPE**

This is a specification for the ADLIGO ETM TELESCOPE SECONDARY PARABOLIC MIRROR. This convex parabolic mirror is part of an off-axis reflecting beam-reducing telescope.

**2 APPLICABLE DOCUMENTS**

MIL-C-675C

**3 REQUIREMENTS****3.1 PERFORMANCE CHARACTERISTICS****3.1.1 Mirror Fabrication****3.1.1.1 Front Surface, S1**

Effective focal length	-100.0 +/- 1.0 mm
Conic constant	-1.000 +/- 0.002
Tilt tolerance, reference to back surface (S2)	+/- 0.0083 deg
Clear aperture diameter	32 mm
Center displacement from optical axis	28.1 +/- 0.3 mm
Diameter	38.1 +0.0, -0.1 mm
Minimum edge thickness	21 +/- 1 mm
Surface irregularity	< 1/8 wave, peak to valley @ 633 nm over clear aperture
Surface finish	60/40
Surface roughness	< 100 Angstrom
Chamfer edges	0.5-1.0 mm, 45 +/- 10 deg

**3.1.1.2 Back Surface, S2**

Surface quality	fine ground, > 300 grit
Chamfer edges	0.5-1.0 mm, 45 +/- 10 deg

**3.1.1.3 Mirror Coating**

Front surface S1 only	
Wavelength	1064 nm
Polarization	S
Incidence angle	8 deg
Protected silver, reflectivity	>98%
Durability	per MIL-C-675C, Section 4.5.12

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## 3.2 DESIGN AND CONSTRUCTION

### 3.2.1 Materials

Substrate material Zerodur or equivalent

#### 3.2.1.1

## 3.3 QUALITY ASSURANCE/CONTROL

### 3.3.1 Identification

Parts shall be serialized according to paragraph 3.3.1.2.

#### 3.3.1.1 Optical Alignment Marks

Edge orientation mark shall be placed to indicate maximum edge thickness within rotational tolerance of 1 deg, as shown in figure 1: 0.24 +/- 0.1 mm wide x FULL BARREL LENGTH.

ADDITIONAL MARKING @ 90 Deg. intervals +/-2 Degrees, on barrel, and on back face (full diameter length) as shown in Figure:2

#### 3.3.1.2 Serial Number

A serial shall be etched, ground or sandblasted (ink marks shall not be allowed) on surface 2:

D0901565-vX S/N 001; where vX is the current drawing revision number and 001 is the sequential serial number, 001 – 999 in the order produced.

### 3.3.2 Quality Assurance Provisions

A first article shall be produced and inspected.

### 3.3.3 Purchaser Access

The purchaser will have escorted access to quality control facility during all quality acceptance procedures.

### 3.3.4 QA Approval

LIGO Quality Assurance reserves the right to inspect and approve vendor/fabricator QA plans and processes.

## 4 TEST PROCEDURES

The telescope mirror performance shall be verified by the following test procedures

### 4.1 WAVEFRONT DISTORTION

Interferogram of reflected wavefront across the clear aperture @ 633 nm wavelength

## 5 DOCUMENTATION

- Compliance Certification for items: 3.1, 3.2, 3.3, 4.
- Interferogram, see 4.1 Wavefront Distortion.



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## 6 ENVIRONMENTAL CHARACTERISTICS

The ETM Telescope will operate in a non-vibrational, ultra high vacuum environment, at 68 +/- 4 deg F.

## 7 HANDLING AND SHIPPING PROCEDURES

### 7.1 Cleaning

Approved cleaning procedures for UHV components are detailed in LIGO-E960022, Vacuum Compatibility, Cleaning Methods and Compatibility Procedures.

All optical surfaces shall be cleaned in accordance with good commercial practice. Nothing shall contact the optical surfaces after cleaning, except for lint-free lens tissue.

### 7.2 Packaging for Shipment

The cleaned optical components shall be protected with lint-free lens tissue. In addition, all components shall be placed in individual, sealed, clean polyethylene bags before shipping.

The shipping containers must ensure that the bag does not become punctured and that the parts are properly protected during transit.

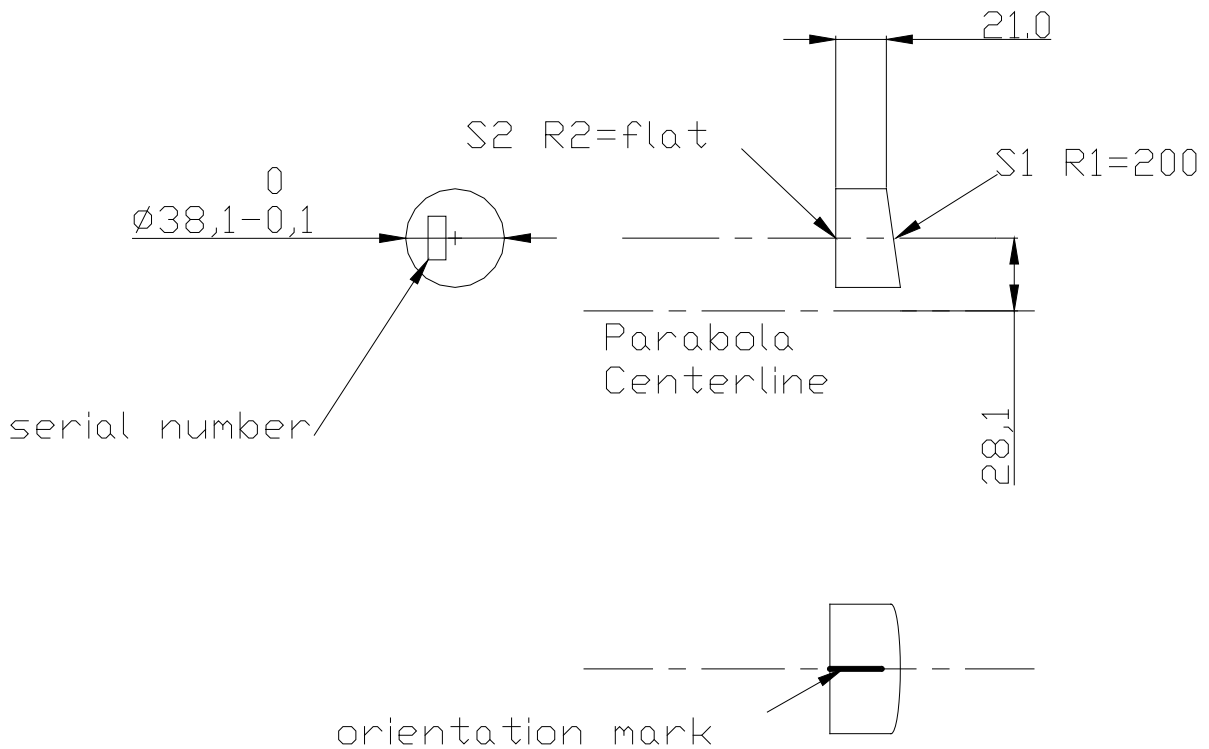
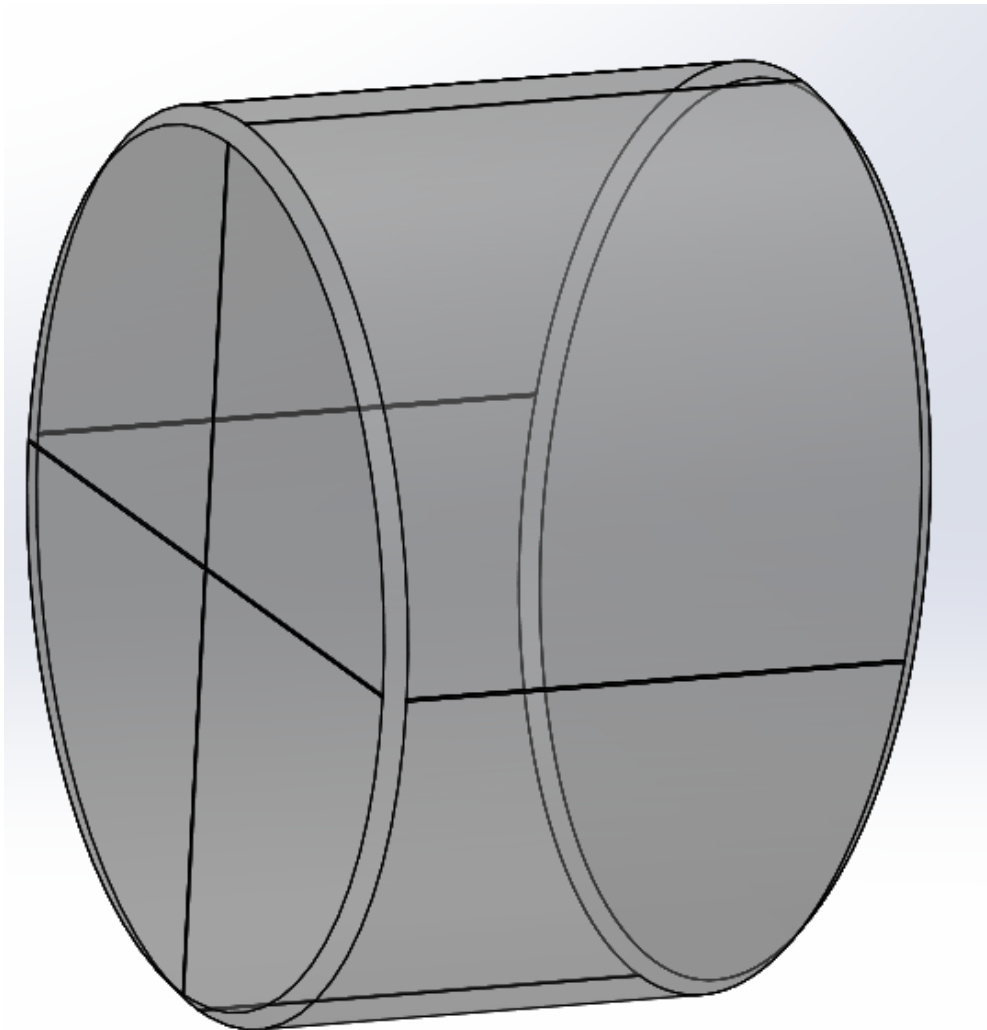


Figure 1: Mirror drawing, Edge Mark parabolic Secondary mirror per 3.3.1.1



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**Figure 2: Mirror drawing, Marking Parabolic Secondary Mirror per 3.3.1.1**