

CHARA TECHNICAL REPORT

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OPLE Cart Mirror Specifications & Requirements

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1. INTRODUCTION AND GENERAL INFORMATION

The CHARA Array will employ five 1-m size, alt-azimuth style telescopes at a site on Mount Wilson in southern California. The telescopes will be housed separately and operated remotely from a central laboratory. Light from each telescope will be directed by subsequent flat mirrors through vacuum pipes to additional optics and instrumentation at the central laboratory.

This document describes specifications for manufacture of the mirrors for the optical path length equalizers (OPLE) of the CHARA Array. The information and specifications provided herein are intended to enable prospective suppliers (hereafter called vendors) of polished mirrors to respond to an ITB. It is expected that these specifications will become part of any contract for mirror blank purchase that may result from the ITB.

2. THE REQUIRED OPTICS

Optical components are required to meet the specifications given in Sections 3 and 4 in the following quantities.

1. Five (5) concave, parabolic mirrors, cut to size, with test documentation.

The acceptance testing of the first mirror must be completed prior to GSU accepting delivery of the additional four mirrors. Quoted prices to be f.o.b. delivery point including shipment costs to the CHARA Array site in California, and the mirrors must be packed in containers suitable for protecting them from damage during shipment. Vendors are required to provide a firm completion date for the first mirror, assuming that an award will be made within 30 calendar days from the bid opening date. The mirrors are to be delivered no later than the first week in June of 1997.

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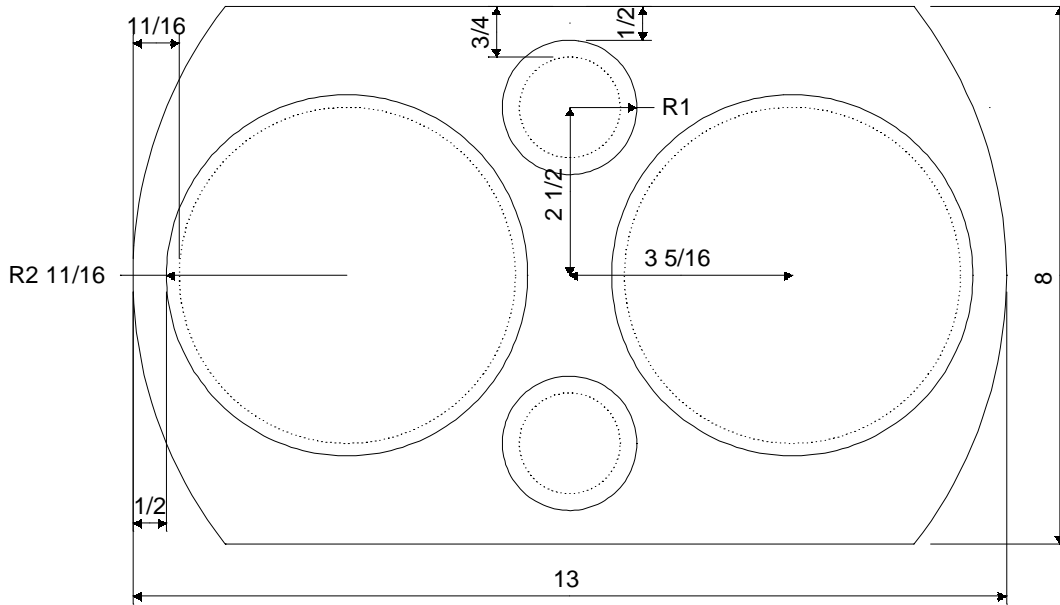


FIGURE 1. The mirror size and beam usage for the OPLE mirrors. The dotted lines represent the nominal beam positions while the solid lines show the sizes of the holes cut into the OPLE front plate. Dimensions are in inches.

3. MIRROR BLANK MECHANICAL CHARACTERISTICS AND MATERIAL PROPERTIES

General specifications are given here for blanks required for the CHARA Array OPLE cart mirrors.

Vendors are required to procure mirror blanks that meet the requirements of Table 1 and are therefore required to include information with this bid concerning the mirror blanks the vendor intends to provide.

The size and beam usage of the mirror is shown in Figure 1. The mirror is to have a diameter of $12\frac{1}{2}$ – 13 inches (vendor selected) and cut along the top and bottom to 8 inches. The dotted lines in Figure 1 show the nominal beam usage of the mirror while the solid lines show the corresponding holes in the front plate of the OPLE cart. Since the real beam positions can not be known until an optical alignment has been completed the optical surface specifications set out in Section 4 will be based on the hole sizes, rather than the beam sizes.

Table 1 sets out the mechanical characteristics of the mirrors.

4. MIRROR SURFACE SPECIFICATIONS

The polished mirror surfaces shall be a concave paraboloidal surface of revolution with a focal length of 42 inches and conforming to the requirements set out in Table 2. The RMS optical specifications will be satisfied over the clear aperture of the mirrors. The clear

OPLE MIRROR SPECIFICATIONS

TABLE 1. Mechanical Characteristics

Total quantity	5
Diameter	$12\frac{1}{2} - 13 \pm 0.010$ inches (vendor selected)
Height	$8 +0.00 / - 0.020$ inches (see Figure 1)
Focal length	$42 \pm 1\%$ inches
Thickness	$2 +0.00 / - 0.05$ inches
Coefficient of thermal expansion	$\leq 1.5 \times 10^{-7} \text{ } ^\circ\text{C}^{-1}$ (-10° to 25°C)
Stress condition	≤ 15 nm/cm

TABLE 2. Surface Specifications

Surface figure (RMS @ 633 nm)	$\frac{1}{70}$ waves ($\frac{1}{35}$ wavefront)
Surface figure (P-V @ 633 nm)	$\frac{1}{20}$ waves ($\frac{1}{10}$ wavefront)
Surface quality	60/40
Surface quality	60/40
Distance of optical vertex from blank axis of symmetry	≤ 0.04 inch
Coating	None
Clear aperture	Solid lines in Figure 1

aperture of the mirrors is defined as the areas corresponding to the faceplate holes as shown in Figure 1.

4.1. Optical Testing

Optical surface testing for acceptance purposes shall be done with interferometric testing equipment, or equipment with similar performance approved by CHARA, capable of resolving errors at least 50% smaller than the surface deviation specification given above, and capable of resolving the surface to spatial scales of 2 mm. These tests shall be performed after cutting of the top and bottom sections of the mirror.