



SPECIFICATION

RTS Scanner modification

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Scope

The X-Y optical scanner known as the reflection, transmission, scatter (RTS) scanner requires modification in order to support a variety of optic sizes planned for use in Advanced LIGO.

Applicable Documents

RTS Scanner Drawing package – no control number available

Requirements

Sizes

Sizes of Advanced LIGO mirrors to be measured on this device range in diameter from 256mm to 350mm. The range in thickness is from 60mm to 200mm. See Table 1 for a complete list of optic sizes and clear apertures.

All mirror mounts should be designed such that the mirror is centered on the baseplate in the Y(most constrained) direction.

The original design was to accommodate an optic of 250mm x 100mm thick. The scatter measurement function relies on the surface of the optic under test being at the same height as a 100mm thick optic in the original mount. New mirror mounts should place the top surface at the same height.

Table 1. Optic sizes for Advanced LIGO

	Recycling Mirror	Beamsplitter	Fold Mirror	Test Mass
Baseline Optic size (mm)	265 x 100	350 x 60	350 x 118	314 x 130
Fall back optic size (mm)				340 x 200
Clear Aperture (Dia - 20 mm)	245	330	330	294 (320 fallback)



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Wedge

The maximum wedge used in LIGO 1 was $2^{\circ} 24'$, it is anticipated that wedges in the Advanced LIGO design will not be any larger than in LIGO 1. Still, it would be prudent for the mount modification to allow for a wedge of up to three degrees.

Weight

The maximum weight for an Advanced LIGO mirror is 40 kg.

Adjustment

The mirror tilt must be adjustable using fine adjust screws. In combination with the mounting structure the adjustment must provide for leveling the top surface of the mirror, accommodating the wedge of each mirror.

Mount design should not limit the existing range of travel of 220mm x 500mm

The mirror mount should provide for rotation of the optic about its optical axis. A rotation scale is required. Provision for fine adjustment is desired.

Transmission

The mount for each size optic should allow transmission over the clear aperture diameter found in the mirror sizes table.

Optic Interface

The only material to contact the optic in the mount should be Teflon. A minimal contact footprint is desired. The contact footprint should not extend beyond one centimeter from the outer diameter of any mirror. There is no constraint on how much of the outer diameter of the mirror may be contacted.

New mount design may close the existing “C” design.

Safety restraint

The safety restraint should hold the mirror in place during movement of the X-Y stage. A low step appears sufficient for this purpose.

Other interface

The new mount should be compatible with the ergonomic optic handler designed for the Advanced LIGO optics.



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Schedule

Mounting for the 40kg sapphire optics, 314mm x 130mm is the highest priority and will hopefully be accomplished by early September, 2003. Mounting for other optics will not be required until January of 2004 at the earliest.

The RTS scanner is currently in high demand. The baseplate may need to be duplicated rather than modified in order to maintain functionality of the instrument. The decision to duplicate or modify the baseplate can be delayed until fabrication of the new mount begins.