



SPECIFICATION

Up-dated LIGO Optics Cleaning Specification
Used in iLIGO and eLIGO

Table with 8 columns: APPROVALS, DATE, REV, DCN NO., BY, CHECK, DCC, DATE. Rows include AUTHOR: H. Armandula, CHECKED: Betsy Bland, APPROVED:, and DCC RELEASE.

1. Objective

The objective of this specification is to define how to clean coated LIGO optics "in situ" as needed during eLIGO installation. The procedure defined here has been used in iLIGO drag wiping in-situ.

2. Applicable Documents

LIGO-T050055-00 Tests to evaluate the effects of cleaning methods in optical absorption at 1064 nm

3. Background

Important facts to remember:

- 1) To remove contaminants, the first step is to know the nature of the contaminant to be removed so one can select the appropriate solvent.
2) Rule of thumb: "like dissolves like"

Solvents and contaminants are polar and non-polar.

Polar compounds like inorganic salts and perspiration, per example, dissolve in polar solvents like water and alcohols.

Non-polar compounds like oils or waxes dissolve in organic solvents such as hexane, trichloroethane (TCA), however, these chemicals are highly regulated and not environmentally friendly. Recently they have been replaced by other effective cleaners, however, coated optics do not have this type of heavy, greasy contamination; on mirrors that have been coated and kept in proper storage, as well as optics suspended under high vacuum, one can expect to find only dust particles and perhaps a thin monolayer of hydrocarbon.

4. Equipment, Tools and Materials

Ionizing bar from Terra Universal 11"L with 2 emitters -Part# 2005-05A installed on the portable clean room.

Methanol 99.9 % pure min. by GC, maximum residue after evaporation: 1ppm.

Omnisolv™ - VWR # EM-MX0488

Lensx 90 - Lens Tissue, Berkshire - VWR # 52847-150.



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AccuTech Ultra Clean Powder Free 91-300C Gloves.

5. Procedure

The cleaning procedure for optics should be gentle.

- 1) Before cleaning the coated surface, slightly blow the optic with dry nitrogen utilizing an ionizing gun. This will remove large dust particles.
- 2) Wipe the bevel of the optic several times (3) with methanol to prevent contamination from the bevel to move to the coated mirror surface during wiping/drag wiping.
- 3) Drag wipe the optic surface with methanol:
Methanol is placed on the upper border of a LensX 90 wipe via a syringe, or other small volume, controlled, clean room compatible dispenser. The wipe is placed on the upper mirror surface and slowly dragged across the surface. Dragging slowly will allow the solvent to evaporate without leaving traces. Repeat this step as needed, such that streaks and contaminants have been removed when inspected.

Below is a picture of a small optic (3" in diameter) being drag wiped in-situ at the 40m.

