



# Liquinox Cleaning Procedure for aLIGO optics

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		see LIGO DCC record Status

## 1 Objective

This cleaning procedure is applicable to optics that have residue that can only be removed by water based cleaning. This procedure depends heavily on the quality of DI water used, which is why it was abandoned as the aLIGO cleaning procedure for ground glass, in favor of a Freon wipe (see procedure E1200266).

DI water sources and tubing can easily get contaminated with bacteria and other organic residues that can leave cloudy and/or spotty particulates on optical surfaces. A buildup of bacteria may not show up as a difference in the resistivity of the water, which makes it difficult to identify or test for.

This procedure must be performed in a cleanroom while suited up in cleanroom garb (a minimum of boot covers, frock, bouffant cap, facemask, cleanroom gloves).

### SAFETY NOTES:

Chemical splash goggles shall be worn when using the ion gun to dry off methanol.

The ion gun should be de-energized by disconnecting from the power source for at least 5 minutes prior to the use of the gun to ensure that the gun is de-energized. The ion gun should be kept unplugged at all times when using around any flammable solvents such as methanol, isopropyl alcohol or acetone.

## 2 Applicable Documents

- E1000128 First Contact FTIR, 2010
- E1100439 General Optics Cleaning Procedure
- E1200010 FTIR Results of Liquinox Cleaning Procedure
- E1200266 Ground Glass Freon wipe procedure



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### 3 Materials

DI water source

Spectroscopic grade methanol and isopropanol

Ansell Edmont Latex gloves, AccuTech Ultra Clean 91-300

Liquinox

Ion gun AND filter, Terra Univeral Part#2005-55 or equivalent

Chemical splash goggles

Glass beaker

Deep glass petri dish

Glass dropping bottle

UHP nitrogen gas cylinder for use with ion gun

Lint-free Berkshire lenswipes, 9''x9''. VWR part number 52847-150

### 4 Procedure

1. Making the Liquinox solution: Make a new solution each time optics are cleaned, base the quantity of solution made on how many optics you have to clean. Assume 500mL is made. Fill a clean glass beaker with DI water and enough Liquinox to make a 1% Liquinox solution.
2. Set optic into an empty clean glass beaker.
3. Cover all ground glass surfaces with isopropanol.
4. Let soak for a minimum of 10 minutes.
5. Gently lift optic out of IPA, transfer to sink and drive off the IPA with DI water.
6. Keep DI water source running at all times.
7. Thoroughly wet a lens tissue with the Liquinox solution.
8. Scrub the ground glass barrel with the lens tissue. Take great care NOT to let the liquinox solution dry on the optical surfaces. It will be very difficult to get off once dry. If it looks like it is starting to dry put it under the water source.
9. Keep a low flow of DI water going in the sink, and keep the optic under the flow of water at any time you are not wiping with Liquinox. Repeat this step at least 2 times using a fresh lens tissue every time, for a total of three wipes.
10. Rinse under running DI water while gently wiping the surface with a new lens tissue to remove traces of detergent. Also rinse and check your gloves for detergent.
11. Allow DI water alone to run on the surface for at least 10 seconds. If there is still liquinox on the optic you will feel it, it feels very slippery.
12. Put on splash goggles. Everyone involved in the cleaning must wear them. If it is easier to put them on before this step do this, but they are not necessary to wear until now.
13. Make sure ion gun is unplugged. Point gun at floor and test pressure. If the pressure is too high, adjust it.
14. Spray spectroscopic methanol all over the optic to drive off the DI water.



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15. Dry by blowing straight at the optical faces with dry, filtered UHP nitrogen. When both faces look dry work on the barrels. Angle the gun so that methanol does not get splashed back onto the clean optical faces. Dry for at least a minute.
16. Inspect optics for streaks. If streaks are observed, drag wipe with methanol from a dropping bottle and re-inspect.

NOTE: It is very useful to have a bright light source during steps 3-7 of this procedure; you will be able to see any streaks caused by liquinox, water, or methanol left on the surface and correct for them. Use a barlight or an LED flashlight.