



SPECIFICATION

Test Mass In Situ Cleaning Procedure

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1 Introduction

Although this document is written as a general in situ cleaning procedure for test mass optics, it is motivated by the need to clean residue from the perimeter of a central alignment window in a First Contact™ (FC) layer which has been observed in imaging of the H1 ETMy HR surface with Arm Length Stabilization (ALS) system green light (see [LHO elog entry #15479](#)).

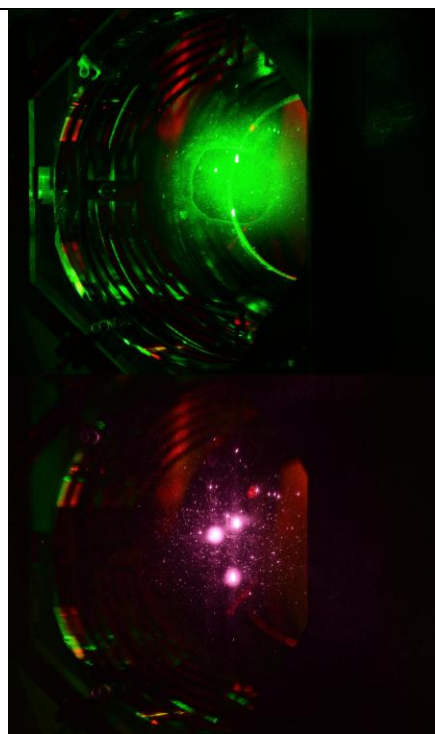


Image with the PCal camera with ALS green laser light resonant in the arm cavity. Residue at the perimeter of central alignment layer is clearly visible. There are also three large bright scattering locations.

Image with the PCal camera with infrared laser light resonant in the arm cavity. The three large bright scattering locations are apparent.

Note that the practice of creating a thin alignment layer/region in the FC (see [T1200198](#)) is now obsolete.



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2 Related Documents

- [LIGO-E1000079](#): First Contact Brush and Pour Application and Removal Procedure
- [LIGO-E1100439](#): General Optics Cleaning Procedure
- [LIGO-T1200321](#): Guidelines on Protecting the Cavity Optics in Chamber
- [LIGO-T1200198](#): First Contact Application Layer Scenarios
- [LIGO-T1300687](#): Guidance on Top Gun Ionizing Air Gun System – From Gas to Gun
- [LIGO-E1201035](#): aLIGO Chamber Entry & Exit Guidelines
- [LIGO-T1100406](#): Quad cartridge installation procedure check list
- [LIGO-E1100810](#): Arm Cavity Baffle Installation/De-installation Procedure
- [LIGO-D1400060](#): LED ring layout aka The Green Lantern
- [LIGO-E070304](#): Updated LIGO Optics Cleaning Specification Used in iLIGO and eLIGO (with acetone, not methanol)
- [LIGO-E0900047](#): LIGO Contamination Control Plan
- [LIGO-E1300399](#): Contamination Control Supplies and Clothing
- [LIGO-E1101037-v8](#): section 4.2.2: aLIGO BSC ISI/Quad Installation Procedure
[N.B.: Although [E1101037](#) has been deprecated in favor of [E1200344](#), the BSC-ISI lock/unlock procedure is not given in E1200344.]

3 Procedure

The procedure is defined in the flowchart below which is consistent with the written steps below. The written steps give some more detail, such as procedure references.

- 1) Perform entry steps of [E1201035](#)
- 2) Lock the ISI per section 4.2.2 of [E1101037-v8](#)
- 3) Lock the TM per [T1100406](#)
- 4) Swing back the ACB per procedure in section 7.2 of [E1100810](#)
- 5) Install the Green Lantern (GL) illumination system on the ETM (see [D1400060](#))
- 6) Visually inspect the TM HR face with the GL switched on and take photographs
- 7) If the HR surface contamination is visible by eye, then skip to step 16), otherwise continue with step 8)
- 8) Swing forward the ACB per procedure in section 7.4 of [E1100810](#)
- 9) Image the TM HR surface with the PCal camera using the GL illumination
- 10) If the HR surface contamination is visible with the PCal camera & GL illumination, then skip to step 15), otherwise continue with step 11)
- 11) Illuminate the HR surface on-axis with a green laser pointer expanded with a plano-convex lens and take PCal camera images



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- 12) If the HR surface contamination is visible with the PCal camera & expanded laser pointer, then skip to step 15), otherwise continue with step 13)
- 13) Call a meeting with COC and Systems to discuss the situation.
- 14) Unless the result of the discussion revises the procedure, continue
- 15) Swing back the ACB per procedure in section 7.2 of [E1100810](#)
- 16) Use the Top Gun ionizer to remove dust particles per [T1300687](#)
- 17) If needed use Absorbond Series swabs to remove large dust particles by touching and pulling off (not dragging) the particles away.
- 18) Apply FC with a brush over the entire HR face per [E1000079](#). Keep a close watch on, and re-direct with the brush, any drips plus use clean room wipes as drop cloths to protect the structure from potential drips. (There is no need to use the FC spray guard assembly.)
- 19) Allow the FC to dry for at least 4 hours
- 20) Peel the FC while spraying the optic with the TopGun ionizer per [T1300687](#)
- 21) Inspect the HR surface with the appropriate method:
 - By eye with GL illumination
 - PCal camera image with GL illumination
 - PCal camera image with expanded green laser pointer illumination
 - If there is no inspection method which reveals the contamination, then skip to step 27)
- 22) If the FC brush cleaning is somewhat effective, but residue remains, then repeat FC brush cleaning; go to step 15)
- 23) If the FC brush cleaning was not effective, then proceed with drag wipe cleaning using acetone and Berkshire lens tissue per E070304 (but not with methanol, only acetone)
- 24) Re-inspect the HR surface with the appropriate procedure
- 25) If neither the FC brush cleaning nor drag wiping procedure is effective, then call a meeting with COC and Systems to discuss the situation.
- 26) Unless the result of the discussion revises the procedure, continue
- 27) Uninstall the GL illumination system
- 28) Swing forward the ACB per procedure in section 7.4 of [E1100810](#)
- 29) Unlock the ISI per section 4.2.2 of [E1101037-v8](#)
- 30) Unlock the TM per [T1100406](#)
- 31) Take quick TM SUS transfer functions to assure that the TM suspension is free (no rubbing)
- 32) Perform exit steps of [E1201035](#)



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