LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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Advantages of cleaning optics with Red First Contact

Garilynn Billingsley, Margot Phelps

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This is an internal working note
of the LIGO Laboratory.

California Institute of Technology
LIGO Project – MS 18-34
1200 E. California Blvd.
Pasadena, CA 91125
Phone (626) 395-2129
Fax (626) 304-9834
E-mail: info@ligo.caltech.edu

Massachusetts Institute of Technology
LIGO Project – NW22-295
185 Albany St
Cambridge, MA 02139
Phone (617) 253-4824
Fax (617) 253-7014
E-mail: info@ligo.mit.edu

LIGO Hanford Observatory
P.O. Box 159
Richland WA 99352
Phone 509-372-8106
Fax 509-372-8137

LIGO Livingston Observatory
P.O. Box 940
Livingston, LA 70754
Phone 225-686-3100
Fax 225-686-7189

http://www.ligo.caltech.edu/

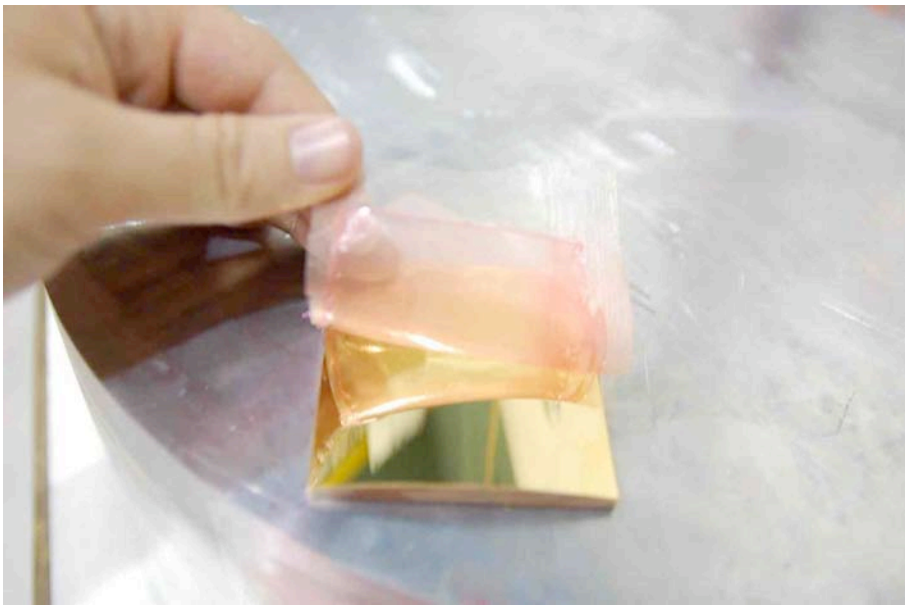
1 Introduction

The purpose of this document is to recommend that the project adopt Red First Contact in place of clear First Contact for cleaning optics.

2 Advantages of using Red First Contact

Using red First Contact has a few advantages over clear First Contact. One being that red First Contact is more viscous, making it much easier to apply to a vertical optic. Also, the red color is much easier to see than the clear, making drips and gaps in coating easy to spot and clean off.

Most importantly, the red polymer can be used to clean gold coatings like the ESD and the CP barrel. The clear version of First Contact does not work on gold surfaces, the polymer adheres too strongly to the gold and it does not come off. Any optic that has any gold on it would have to be cleaned with Red first contact.

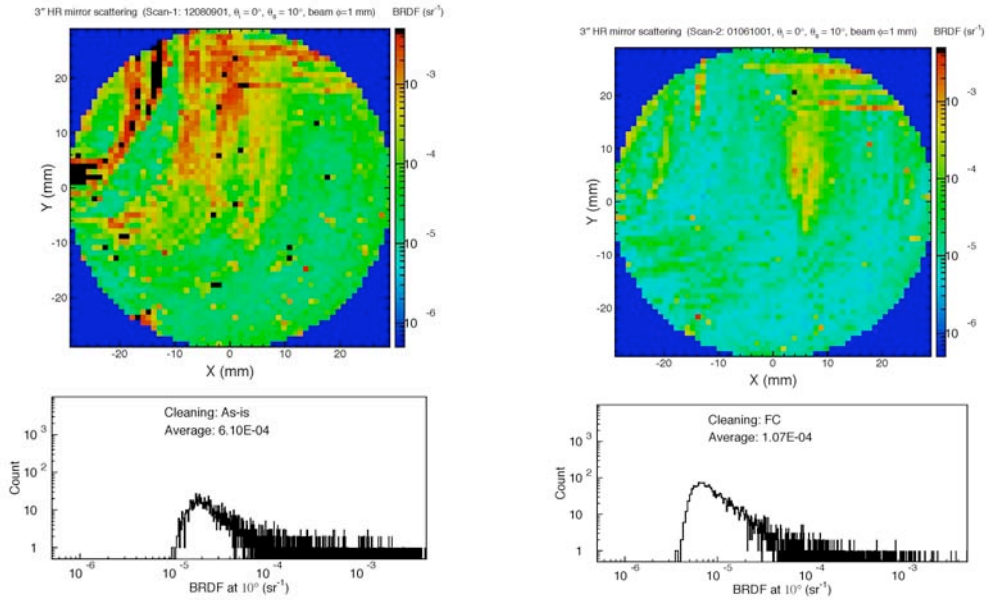


Gold Coated slide cleaned with Red First Contact and PEEK mesh

3 Performance of Red First Contact as a cleaning agent

In addition to the advantages listed above, the following raster scans compare how well the clear and red versions of first contact clean optics. Scan 1 and 2 show the difference in BRDF before and after one cleaning with clear first contact.

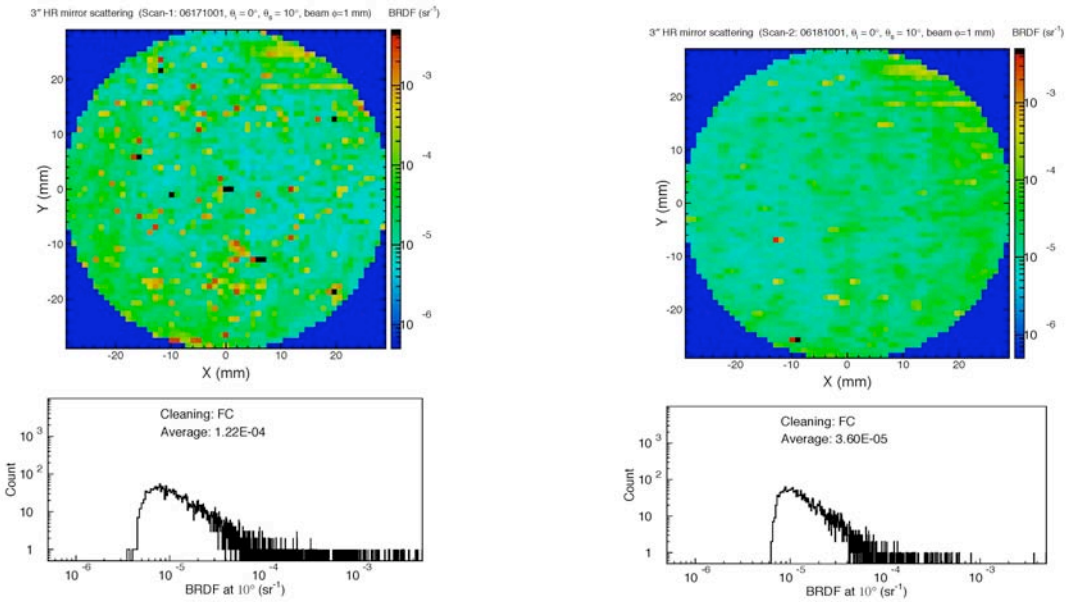
Raster Scans of optic cleaned with Clear First Contact



On the left is a scan of an optic before it was cleaned. The average brdf value is 6.10×10^{-4}. On the right is the same optic after it was cleaned once with clear first contact, it's average value is 1.07×10^{-4}. Successive cleanings with clear first contact seemed to improve the BRDF at around the same rate.

The next two scans show the same optic as above, the scan on the left is the result of the optic sitting unprotected in the CASI chamber for a couple weeks, then on the right after being cleaned with red first contact.

Raster scans of optic cleaned with Red First Contact



On the left is the same optic as was used above for the clear first contact tests. It sat around collecting big dust particles for a couple weeks in the CASI system, which resulted in an average BRDF of 1.22×10^{-4} . On the right is the BRDF after cleaning it with red First Contact, its average value was 3.6×10^{-5}.

Given the advantages of the red first contact listed above, and that the CASI results that show a comparable performance of the red First Contact, Core Optics recommends the project adopt the red version for cleaning optics.