

## **LIGO-T050055-00-D**

### **Tests to evaluate the effects of cleaning methods in optical absorption at 1064 nm**

Three different methods for cleaning coated optics were tested to observe cleaning effects on optical absorption.

Absorption was measured by photothermal common path interferometry at Stanford University by Volodymyr (Vlad) Kondilenko.

The tests were conducted on 1" dia. x 1/4" thick mirrors that have been coated about a year ago.

They were kept between two "fluoroware" caps, sealed with Teflon tape and stored in a plastic box.

We performed the same cleaning procedure, twice on the same mirror, and, two different mirrors were tested for each cleaning solution.

Every mirror was tested first "as it came out of the box".

The mirrors under test were not removed from the holder between measurements to ensure that the subsequent measurements were taken as close as possible on the same spot.

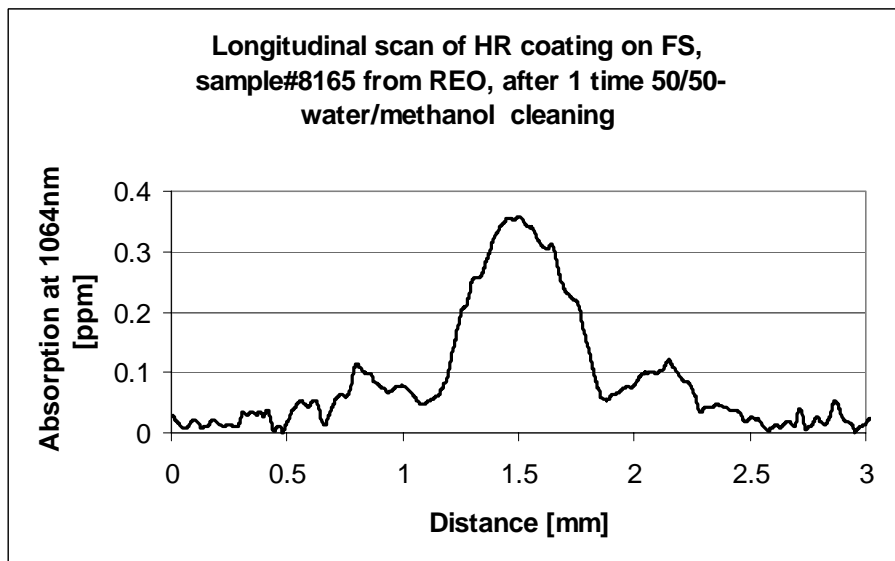
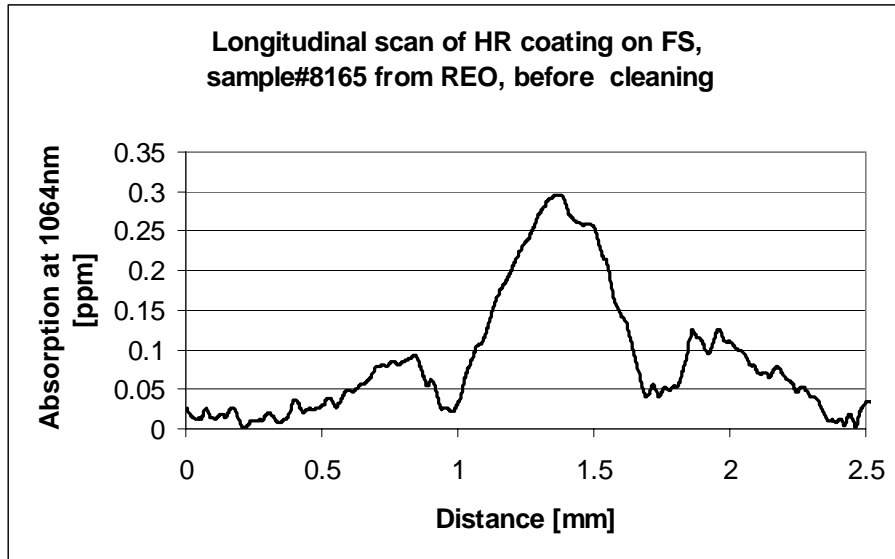
The cleaning solutions tested are the ones being considered for wiping Adv. LIGO optics.

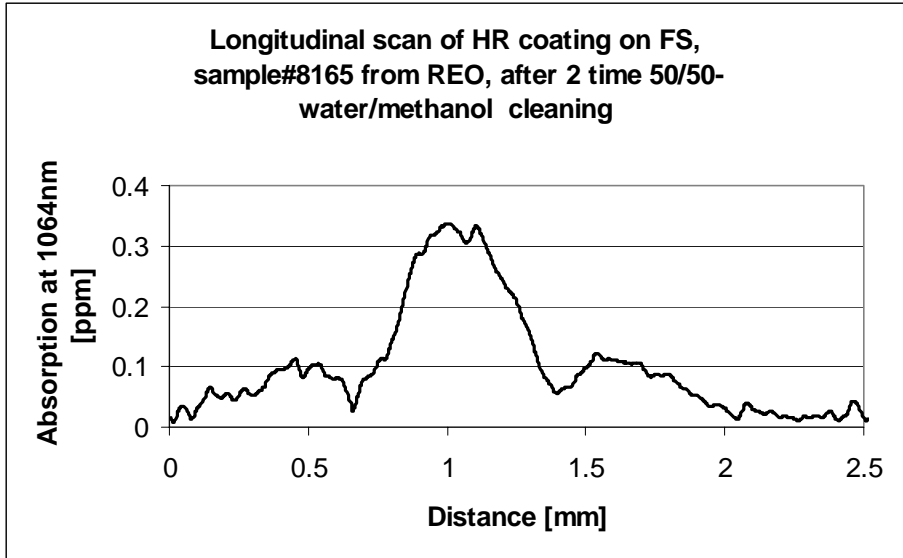
Wiping, until now, is the cleaning method of choice. The techniques are being refined at this time.

# TEST 1

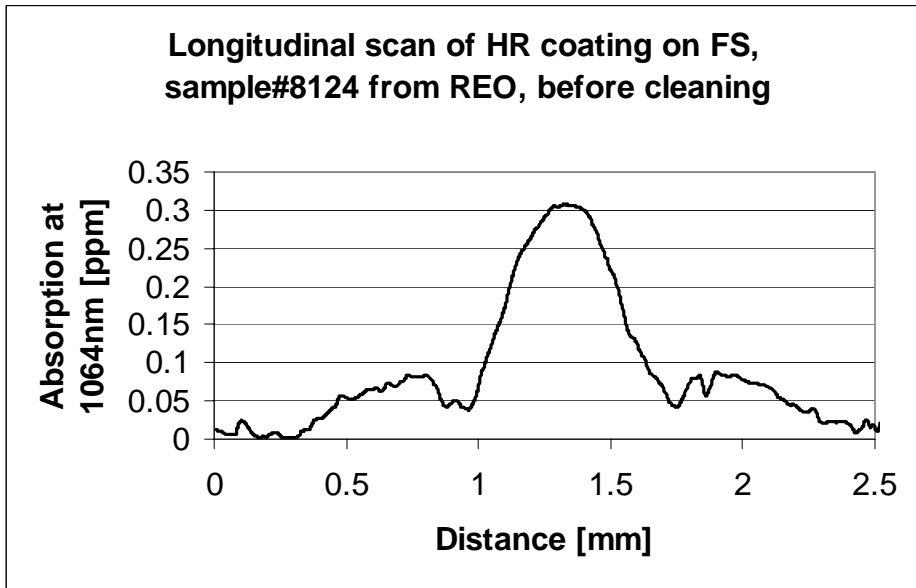
## Water and methanol mix

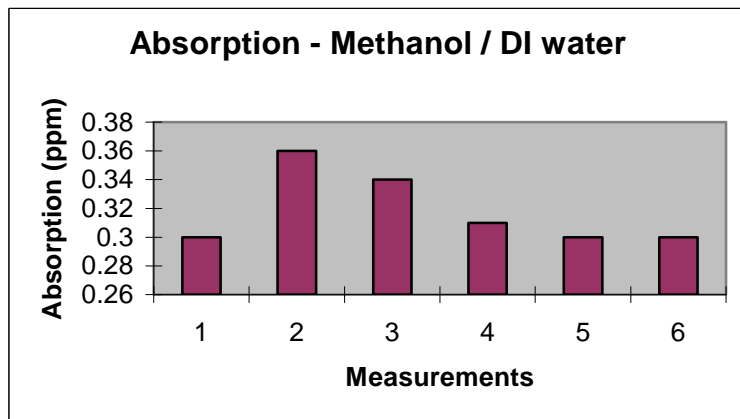
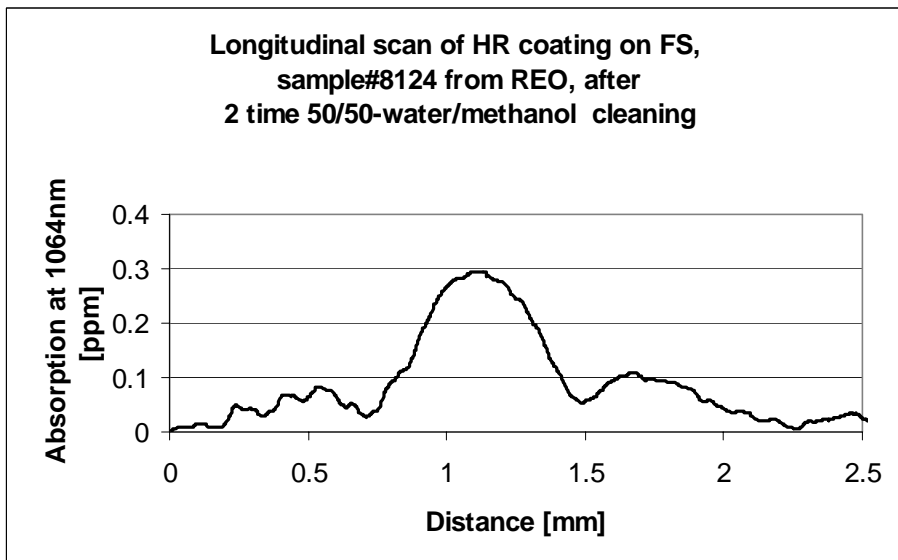
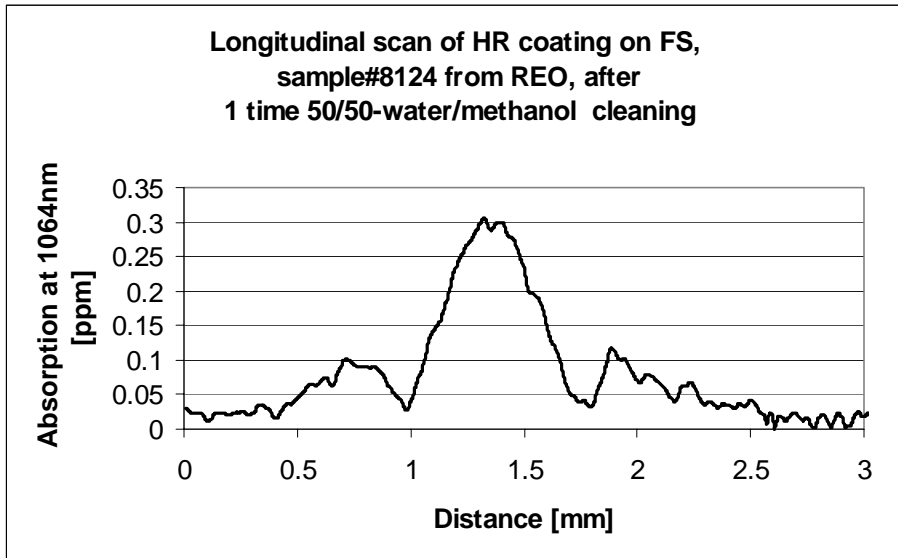
A 50/50 solution of methanol/DI water was used to wipe clean the coated surfaces. Final wipe was with methanol.





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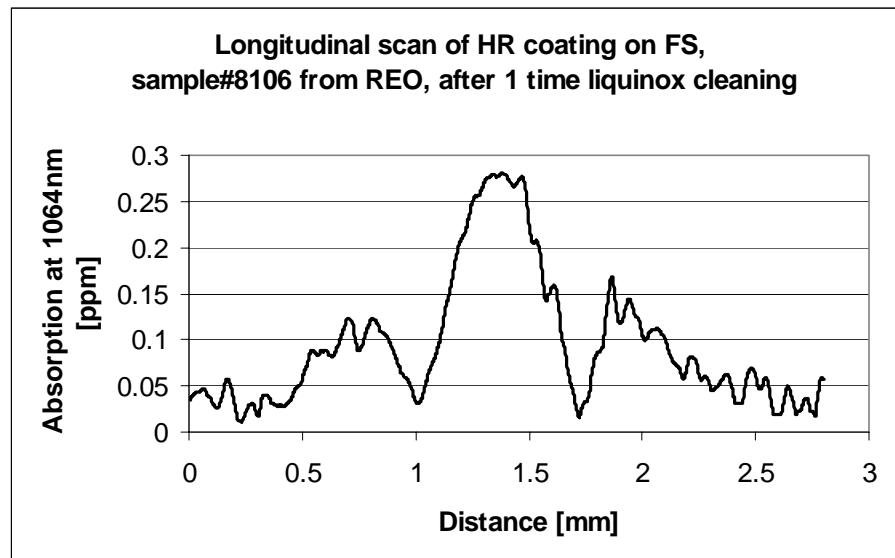
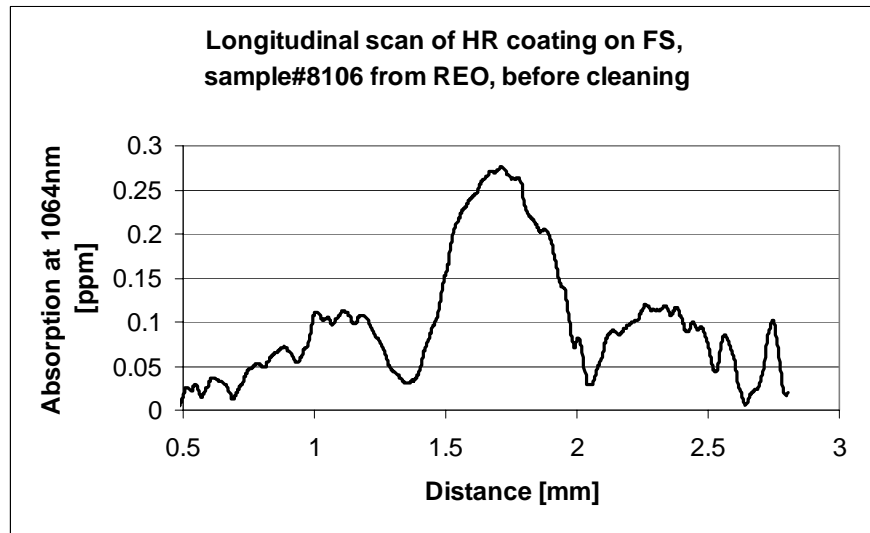
## TEST 2

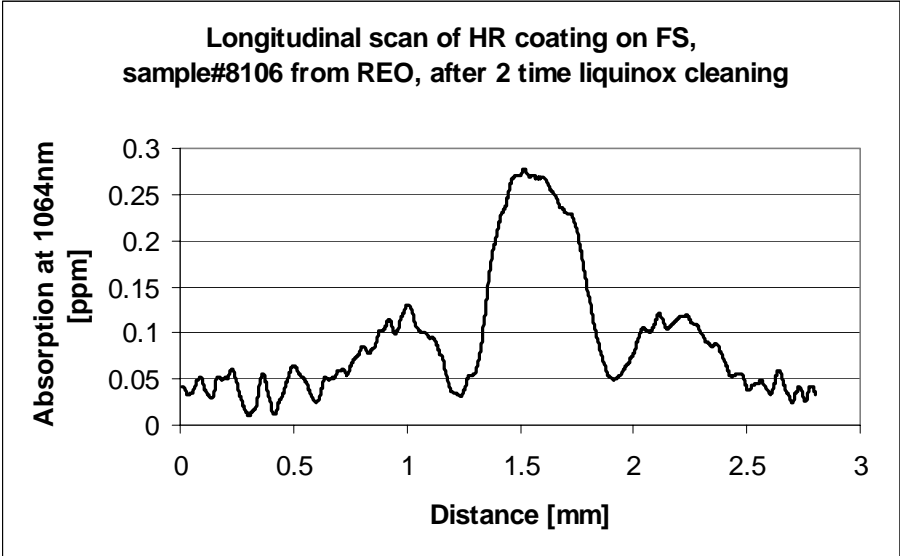
### Water and Liquinox

A 2% Liquinox detergent was mixed with DI water

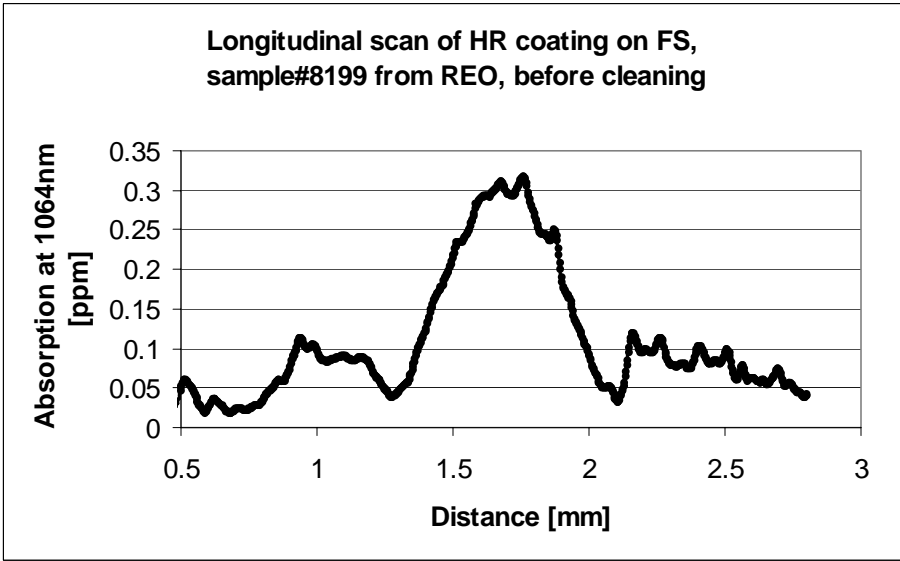
Wiped the coating with an Alpha10 wipe wetted with Liquinox solution

Wiped 4 times with an Alpha 10 wipe wetted with DI water. Changed the wipe every time. Final wipe with methanol.

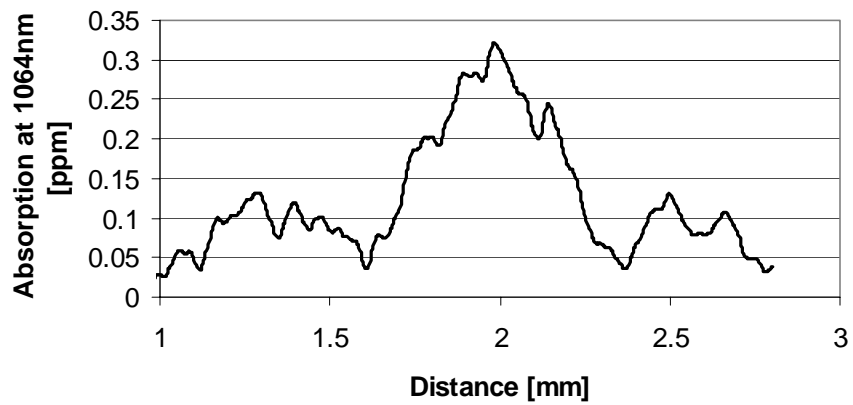




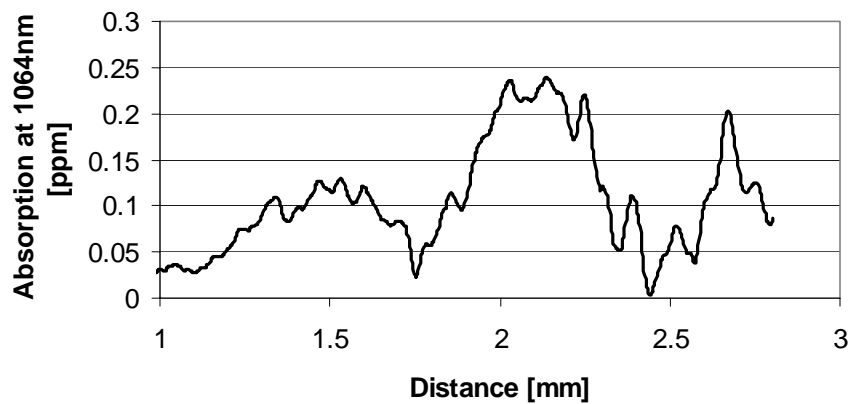
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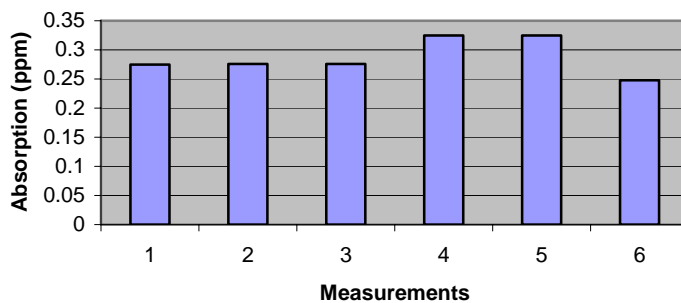
**Longitudinal scan of HR coating on FS,  
sample#8199 from REO, after 1 time liquinox cleaning**



**Longitudinal scan of HR coating on FS,  
sample#8199 from REO, after 2 time liquinox cleaning**



**Absorption - Liquinox Solution**

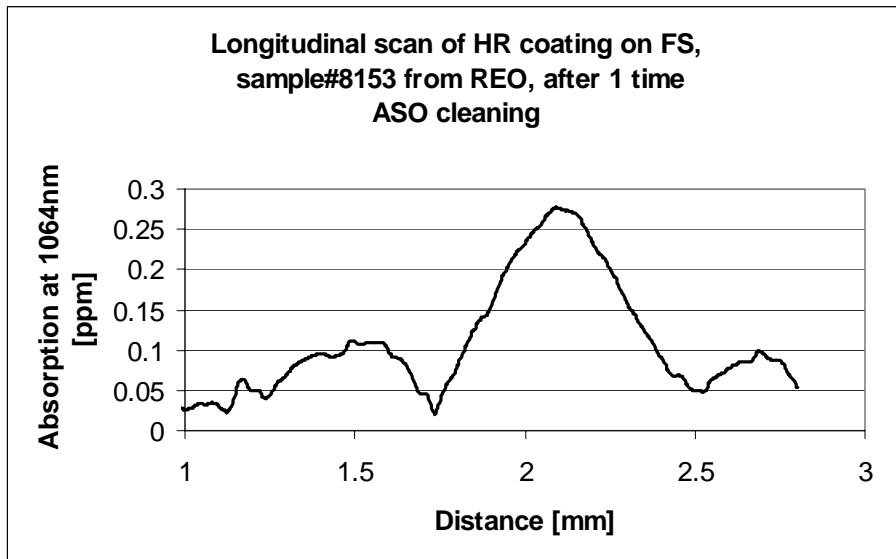
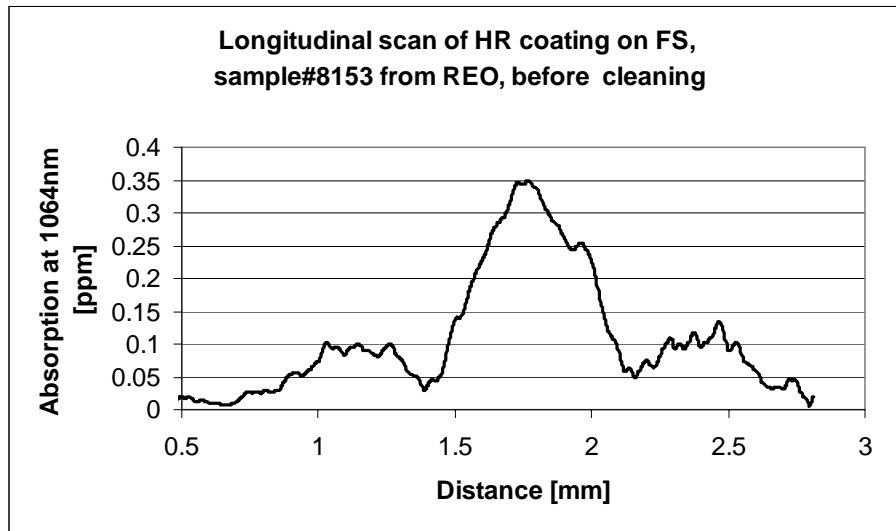


# TEST 3

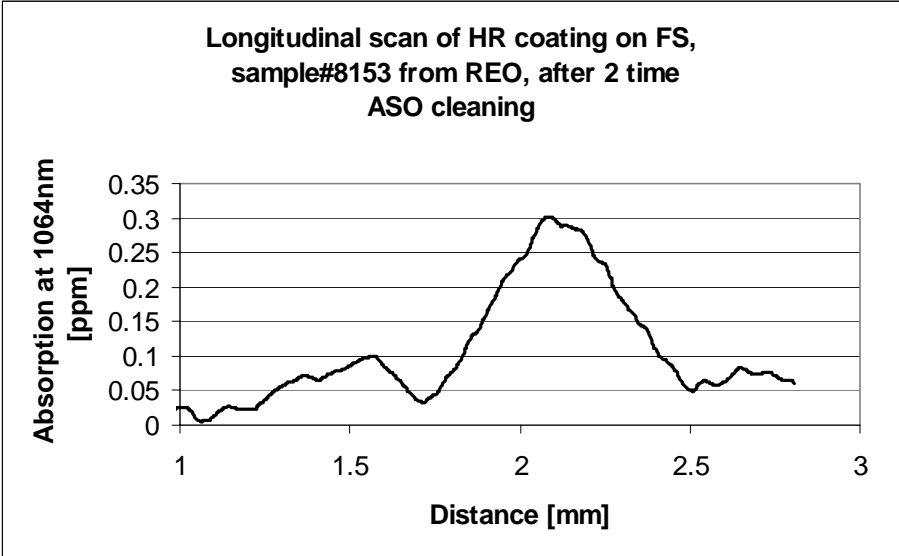
## ASO Solution

The ASO solution was developed by ARKANSAS SKY OBSERVATORY.

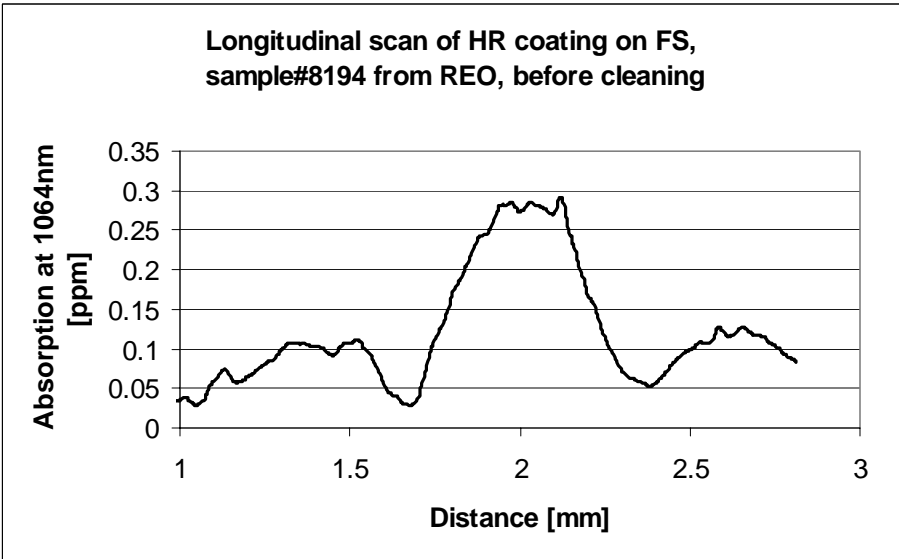
Wiped the coated surface 3 times with an Alpha10 wipe wetted with the ASO solution.  
Final wipe with methanol.

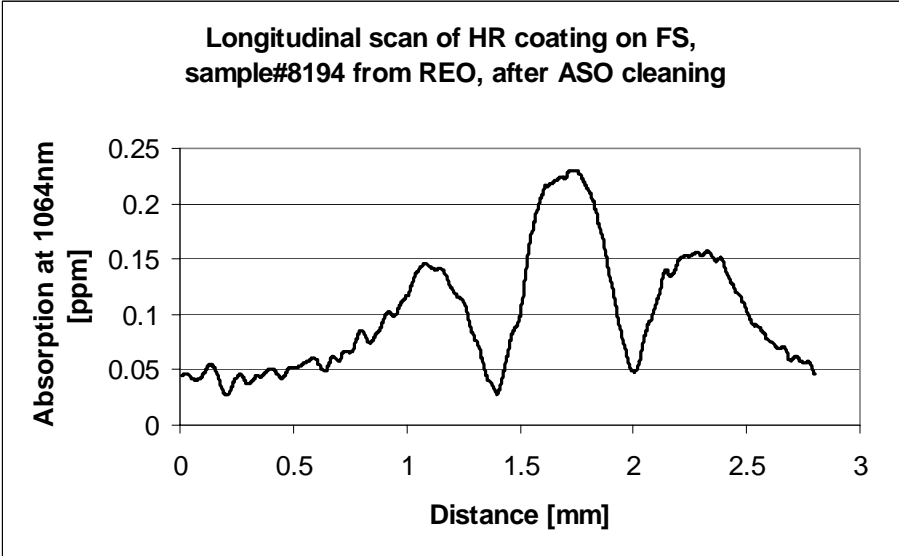




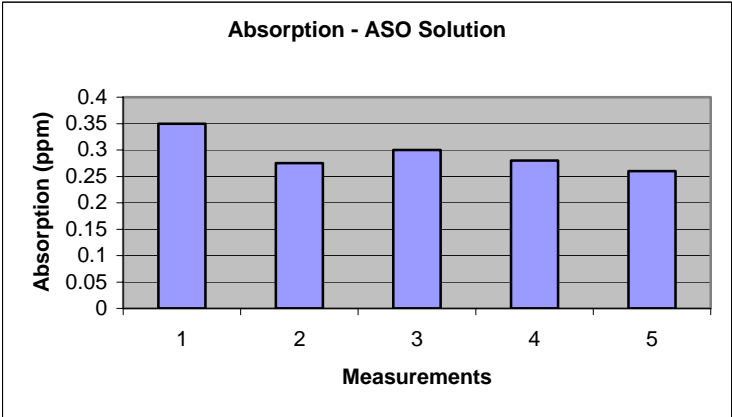


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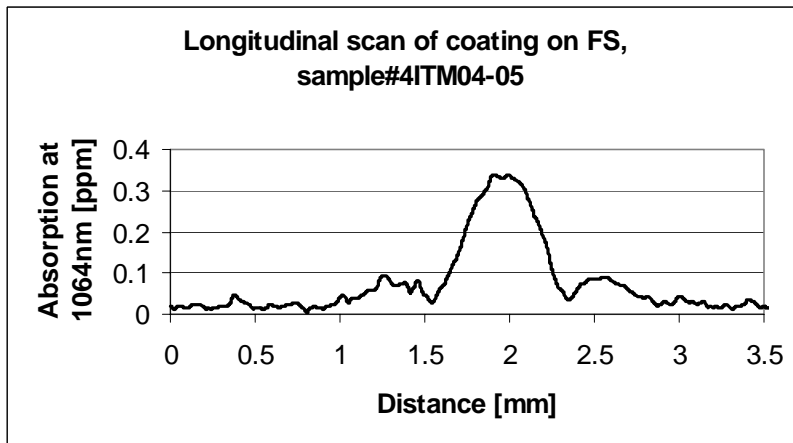
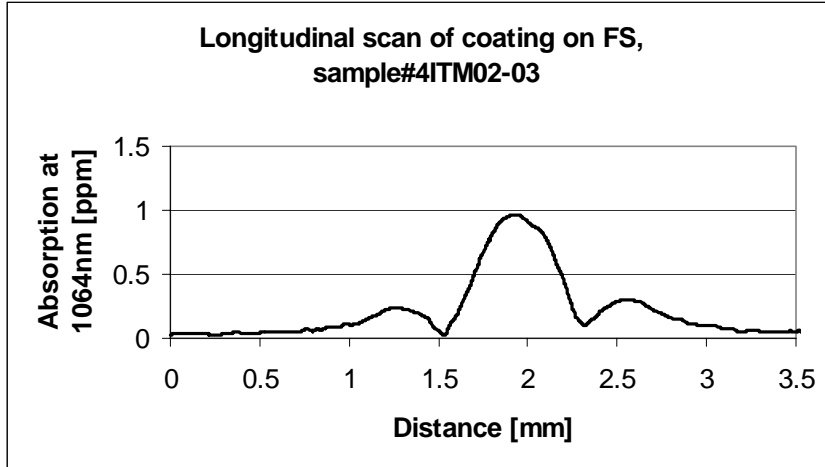


**A second cleaning on this substrate was omitted.**



## Other absorption measurements

Also, measured for absorption at the same time were the coating witness plates from the coating runs of 4ITM02-03 and 4ITM04-05



These plates were wiped with the ASO solution twice and a final methanol wipe before the absorption measurements were taken.

The plates have been stored in plastic boxes for long periods of time, have been handled in numerous occasions by different people at Caltech and at the sites.

**TO BE NOTED:** All absorption measurements were taken on coated surfaces free of particles.