

Minutes of the Core Optics Subgroup, 5/3/01

9 am PST US/Europe meeting

CIT: Jordan , Gari, Gary, Ricardo, Helena, Dennis

MIT: Gregg

Glasgow: Norna

Stanford: Roger, Marty, Sheila

UF: Dave

1) Coating Status (Gary, Helena, Jordan)

Gary reported on his visit with the Virgo/EGO folks at Cascina in April. A draft agreement of a MOU/contract for mechanical loss studies was developed. LIGO is waiting on a response from V/E on the latest version of the draft.

Jordan will visit SMA-Virgo in June to discuss/fine tune the mechanical loss studies and develop a plan for attacking the coating absorption problem. Substrates will be delivered to France in July.

Coating samples from SMA-Virgo will be sent to Stanford for absorption measurements. Samples from both the large and small coating chambers will be measured. Jean-Marie Mackowsky is reporting 0.8 ppm average absorption loss in 15 mm samples – uniformity characterization underway (JMM expects ~ 10% uniformity without the use of compensating coatings; better if masks are used).

MLD is very interested in the coating absorption/mechanical loss problem. Gary Dabelle and Tony Lauderbach are coming up with their plan for attacking these problems.

The downturn in the telecom market has apparently affected REO's business – they have expressed much more interest in doing coatings for Advanced LIGO. LIGO's response was cool – some LIGO I business, but no commitments for AdL. In Gary's words, "LIGO should not be subject to the business cycle". .

2) Sapphire polishing (Gari)

Not much new:

BFG – still insisting on spot polishing for side 2 only. An order for a BFG attempt is in the works.

CSIRO – has bid on three different approaches: coating compensation, ion beam etching, and fluid polishing. LIGO will pursue.

3) Sapphire Absorption (Roger)

Alex has measured a Heraeus SV SiO₂ sample: 2-3 ppm/cm bulk and 0.1- 2 ppm surface. Different SV samples show varying absorptions: Do we know the history of this sample? Also, Corning glass shows ~1/2 absorption of the SV glass.

Jordan reports that a high temp. annealing oven is expected at Crystal Systems by end of May.

The Stanford hydrogen bake oven is up and running (up to 1400 C). Some sapphire windows have been processed; waiting on Alex for absorption measurements. The 10W Lightwave laser is en-route to Stanford.

Ricardo reported on the SIOM sapphire efforts in China. They are seeking high purity graphite/molybdenum crucibles for their ovens as a way of improving sapphire purity. Some expensive ones have been found...

A call to the core opticians: Stanford is seeking a highly absorbing SiO₂ piece (2-3% absorption loss at 1064 nm) for use as a calibration sample.

4) Q measurements (Sheila)

Q measurements on a coated LIGO 1 optics have been performed (not the same mass that was reported on last month). The same three modes (a fundamental and two harmonics) that showed high Qs in the uncoated mass were measured; Q's were near (two slightly lower, one greater) than the uncoated mass. Possible loss due to attachments. Sheila felt that enough effort had been expended on looking at LIGO 1 optics because 1) they're LIGO 1, 2) they're bulky and tough to handle, 3) they has different polishers. Given that the first fused silica optics from Mindrum will be available soon, there was general concensus.

In order to plan the upcoming Q tests, Jordan queried Sheila and Gregg about turn around times for measuring Q's on the small pieces. Shiela: 1 wk/sample. Gregg: 2 wks/sample. Duty cycle will not be 100 %, though...

5) Thermophysical properties of sapphire (Jordan)

Nothing new to report.

6) Wrap up, upcoming deadlines (Gary)

- Cost estimates for Advanced LIGO subsystems will be done over the next two months for the upcoming NSF MRI submission.
-
-

6:30 pm Telecon

CIT: Gari

UWA: David Blair, Ju Li, Darren Paget

David's group is currently working on a national research facility proposal which is due next week, their aim is to join Adv. LIGO as a full partner. Their deliverable will be the output optics.

David reports success measuring suspension pendulum Q. Their method is to measure ringdown over several days, at this time they also measure the seismic component (of right phase.) They find correlation is nearly perfect. They can therefore subtract out the seismic drive and clean up the ring down curve (all major deviations.) They can now do the ring down in 1/2-1 day, whereas it used to be 4-5 days. The exponential correlation coefficient of the data is .45 for uncorrected data and .94 for corrected data. The student running the experiment is Darren Paget. He is using a geophone to monitor seismic noise at the location of the pendulum. He then uses Labview to process the signal and to track the pendulum.

A current question is "can you put small cuts in sapphire w/o compromising Q?" They would like to use a dovetail suspension method. This has a small (5mm) niobium structure in the attachment which has a high pressure point contact. Neither CSI nor Inseco have been willing to quote doing a dovetail. Blair et. al. are currently living with in-house production, but can't get good polish on inner surfaces.

Does anyone know of any location that has diamond wire machining facility? Please contact D. Blair.

Regarding the Optics to be supplied by LIGO, they won't be ready to use any optics until this time next year. At that time they will use preliminary optics first, which are to be supplied by UWA. David anticipates that they will know more after meeting with Dave R. and Jordan at the Amaldi conference. The sizes are ~1/2 Ad LIGO TM size, they may have to compromise spot sizes so that they are not as big as the planned L2 sizes. He anticipates 100-150mm dia. x 100mm thick MC mirrors, similar to Adv. LIGO, but the mode cleaner would be no longer than 12 m long.