

**Progress Report on
“Investigating the Light Scattering Properties of
LIGO Materials”**

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My project is the study of the scattering of various LIGO material samples to choose one for use as beam dumps and baffles in the interferometers. For this purpose, I have designed and built the BRDF measuring apparatus.

Last month, I completed designing the apparatus using the method of paraxial optical rays and ray matrices (ABCD) as well as geometric optics. The set up was designed such that the 1064nm YAG laser would be modulated by an AOM at 1 KHz. A beam splitter would reflect a part of the beam to a beam dump and transmit the rest to pass through a half-wave plate and finally shine on the surface of the sample. The light scattered by the sample would be steered by the beam splitter to a lens. The iris in front of the lens determines the solid angle of the scattered light. This light would then be detected by a detector with another iris in front of it to exclude any ambient light coming towards it. A lock-in amplifier would be used to exclude any light noise and detect the light modulated at 1 KHz only.

Following the design from last month, I built the apparatus aligning all the components precisely. Alignment took quite a bit of time. As it is usual for researches, we faced a problem with our AOM. We were not getting an amplitude modulated beam as expected. Despite a week long effort of trying to figure out and fix the problem, the problem still existed. So, we had to drop the idea of using an AOM and switch to the method of a rotating chopper wheel. The chopper worked well and we got a good modulation. The use of chopper now changed the alignment of the laser. So, I had to make alignments over again. The next step was to get the lock-in amplifier to work. It was working well against light noise. After getting it calibrated, I was all set to take the measurements of the actual samples.

I have taken a few initial measurements for the experiment. Because of the time constraint, my mentor decided that we take measurements of two samples only. After that, I will work on my final technical paper and presentation. Now, my project is coming to an end and I am glad that working daily with my mentor helped me in successful completion of my project.