**High Fidelity Probe of Optical Scatter from Point Defects**

To further increase LIGO’s sensitivity at lower frequencies and effectively implement optical squeezing future upgrades, it is important to understand the noise sources and optical losses well. Scattered light from the surface of test masses/cavity mirrors is one such critical noise source that limits our sensitivity below 30Hz. It reduces the power circulating in the Fabry-Perot cavities leading to a lower signal to noise ratio and might also couple back into the main beam tube introducing a random phase noise. This project focuses on in-situ studies of scattered light in the LIGO 40m prototype, using an existing camera system that is being used to monitor the beam spot on the mirrors/test masses. During this project, we installed a digital CCD camera (GigE camera) attached to a suitable telescopic lens, into the camera system and obtained images of a cavity mirror at a given large angle. By performing a radiometric calibration of the GigE camera, we were able to measure the power of scattered light at a certain large angle to the main beam using these images. We also obtained High Dynamic Range (HDR) images of cavity mirrors, using which we can extract a great deal of information about point defects of the mirrors. With the infrastructure that has been set up, we further aim to study the sources of scattering - point defects and other surface imperfections, estimate the optical loss due to scattering and characterize the random phase noise introduced due to scattered light. And thereby, gain an overall understanding of the effects of scattered light in the LIGO interferometers.