What I Have Done for LIGO

Richard Kirian
Mentor: Eric Black

My summer LIGO project at Caltech involved the calibration of an apparatus to measure non-Gaussian excess noise in silicate bonds. I made much progress in the calibration, perhaps not as much as hoped for, but given the time constraint and a few unexpected problems I believe I was productive and successful.

Throughout my ten weeks, I learned the appropriate theory (especially control theory) and took a four week machine shop course in order to prepare for my tasks. I disassembled the optics, shadow sensor, and electronics shelves and rebuilt or reorganized essentially everything, making alterations when necessary to keep noise down to a minimum. I took data (transfer functions and electronic noise) on each of the components of the servo loop. I also designed and machined a mass fixture to create shear stress on our test samples. By the end of the program, the noise data had been analyzed and was shown to fit our noise model very well; nearly all of the external noise sources had been tracked down and eliminated. At present the apparatus is ready to have the calibration samples removed and the real sampled swapped in.