

The Effect of Transverse Shifts on the LIGO Interferometer (Simulation Study)

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This summer I worked on a computer simulation project that studied how transverse shifts to the optics would affect the LIGO interferometers. The LIGO interferometers have reached their designed sensitivity level which is greater than any other interferometer ever built. At this point, it is important to have a proper understanding of small perturbations that might still exist (until now these issues did not come to the forefront because other more critical problems needed to be solved in order to approach the expected designed level of sensitivity).

This project focuses on how possible existence of transverse shifts in either beam or optics would affect the alignment and sensitivity of these detectors. Two simulation tools are used for this purpose: The time domain simulation package called End-to-End (E2E) model and a static FFT code developed for LIGO. The results are analysed to look for changes in noise curves, recycling gain, beam intensity profiles etc for both the laser carrier frequency and sideband frequencies. The asymmetries in beam profiles are also looked at to evaluate the effect of such perturbations on alignment sensing.