Fitting of spectrometer parameters for precise wavelength calibration

F. SCOTTI, R.E. BELL, Princeton University — A prototype high-throughput lens-based visible spectrometer is being developed as a general-purpose tool to study plasma discharges in visible wavelengths. The stigmatic imaging with the f/1.8 200 mm lenses will allow many spectra to be stacked vertically. The curvature of the emission lines in the focal plane increases with slit height and changes with wavelength. A precise wavelength calibration is desired to accurately determine wavelengths of all spectra on a 2D detector using only the grating angle as input. A stepping-motor controlled sine-drive is used to adjust grating position. Techniques are being developed to aid in the alignment of each spectrometer component: lenses, grating, sine drive, slit, and detector. All the parameters in the grating equation as well as slit orientation and focal plane tilt are determined by using multiple calibration spectra and regression methods. Ne, Ar, and Hg pen lamps are used to produce calibration spectra. The reproducibility of the calibration and effects of temperature on the wavelength accuracy will be tested. Supported by U.S. DOE Contract DE-AC02-76CH03073.