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Design, Construction, and Implementation of a Solar Spectrograph for the National Student Solar Spectrograph Competition

A solar spectrograph is an instrument that takes incoming sunlight over a majority of the electromagnetic spectrum and separates the light into its constituent frequency components, or spectrum. The components are then sent to a detector that measures intensity, which reveals the location of spectral properties of the light such as absorption and emission lines. The National Student Solar Spectrograph Competition (NSSSC) is a Montana Space Grant Consortium sponsored competition where undergraduate student teams from across the country design, build, and implement a ground-based solar spectrograph to perform any solar related task and demonstrate their spectrographs for the competition in May 2012 in Bozeman, MT. Each team is given a 2,000 dollar budget to build their spectrograph, which cannot be exceeded and all spectrographs must follow regulations in the NSSSC guidelines. Our team is designing the spectrograph to be capable of imaging the sun across the visible spectrum using spatial filters and a standard photo detector rather than a traditional charge-coupled device due to budget limitations. The spectrograph will analyze the spectrum of small sections of the sun to determine how the spectrum varies across solar features such as the corona, active regions, and quiet regions, and recompile the data into wavelength specific images of the sun. In addition to solar imaging, the spectrograph will also analyze atmospheric absorption of the solar spectrum by comparing the measured spectrum to the theoretical spectrum calculated from the blackbody equation.