[S08-6] Fast Imaging Solar Spectrograph: Scientific Objectives and General Characteristics

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We plan to construct a new astronomical instrument called Fast Imaging Solar Spectrograph (FISS). Its major scientific objective is to find answers to the fundamental questions about solar prominences --- like how they are structured, how they are formed, how they disappear or erupt. The instrument is a spectrograph with the capability of high spatial resolution (0.2″), high spectral resolution ($\lambda/\Delta\lambda > 10^5$), and moderate temporal resolution (<30 s). It will be attached to the 1.6 meter New Solar Telescope (NST) under construction at Big Bear Solar Observatory. By implementing active optics and adaptive optics, the telescope will achieve a diffraction-limited spatial resolution (0.1″ at visible wavelengths and 0.2″ at near infrared), allowing the acquisition of almost seeing-free data. FISS will operate simultaneously at a pair of two bands (for example Hα - He I 10830 lines or Hα - Ca II K lines) for integrated diagnostics.

[S09-1] The 21cm Background from the Cosmic Dark Ages and the Second-generation Star Formation

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We study the formation and its consequences of baryonic structure in the high redshift universe. We first use high-resolution cosmological N-body and hydrodynamic simulations of structure formation at high redshift ($z > 8$) to predict the signal of the 21 cm line radiation from neutral hydrogen gas in the cosmic "dark ages," before reionization. We predict that the largest contribution to the 21 cm signal is due to gas in collapsed minihalos. We also use the 1-D spherical, radiation-hydrodynamics code we have developed to study the radiative and hydrodynamic feedback effects of the "first stars" on their nearby halos. We find that the second-generation star formation, under certain circumstances, may be promoted as a result of radiation-induced implosion of minihalos in the vicinity of the first stars.