[CS01] Spectral Properties of Hα Threads Constituting A Quiescent Filament

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The basic building block of solar filaments/prominences are thin threads of cool plasma. We have investigated the spectral properties of velocity threads, which may be a cluster of even thinner density threads moving together, by analyzing a sequence of H images of a quiescent filament taken at Big Bear Solar Observatory with the Lyot filter being successively tuned to the wavelengths of −0.6, −0.3, 0.0, +0.3, and +0.6 Å from the centerline. Our main findings are as follows: a velocity thread is typically characterized by a narrow Doppler width, a moderate value of optical thickness, and a spatial width (FWHM) of about 1.2″ or less. Each spatial resolution element typically contains several velocity threads --- six threads in the spine of the filament and four threads in the barb. Two threads in both the spine and the barb have line-of-sight velocities of ±16 km/s, and the other threads are stationary. Assuming the direction of the flows is mainly horizontal, we obtain a new picture of the filament fine structure: plasma in one thread moves at a horizontal speed of about 30 km/s in one direction, probably along the thread, and plasma in another thread moves at about the same speed in the other direction, while plasmas in the remaining threads are at rest.

[CS02] The Optical Design and the Tolerance Analysis of the FISS (Fast Imaging Solar Spectrograph) for NST

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We are developing the Fast Imaging Solar Spectrograph (FISS) for New Solar Telescope (NST) which will be installed at Big Bear Solar Observatory in a few years. In this talk, we describe the optical design and the tolerance analysis of the FISS. The FISS has a Littrow configuration consisting of a slit, an Echelle grating and an off-axis parabolic mirror, and in the dual mode, can observe Hα line and Ca II IR line simultaneously. In the tolerance analysis, the performance changes and the sensitivity of each component are analyzed. When a compensator is not utilized, the performance of the FISS is out of the nominal criteria. However, the thickness adjustment of the last surface as a compensator makes it possible to keep its performance in the given tolerance budget. The compensation effect of the compensator is also verified using the inverse sensitivity analysis applied to the FISS with the extended error range.