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A novel Supra-Thermal Ion Spectrometer for Heliospheric (STISH) missions

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Recent studies have revealed that suprathermal particles that have energies of a few times the solar wind plasma energy up to 100s of keV/q may significantly contribute as seed particles for acceleration either close to the Sun in solar energetic particle (SEP) events [Mewaldt et al., 2001], locally at 1 AU in energetic storm particle (ESP) events [Desai et al., 2003], and in Corotating Interaction Regions (CIRs) [Mason, 2000]. However, owing to a lack of high sensitivity measurements in this energy range, both the origin and the dynamical properties of these suprathermal particles are largely unknown at this time. In addition, the effects of the inherent variability of the suprathermal ions on the accelerated ion populations are also completely unknown. It is therefore important to make high-time resolution measurements of the composition and the angular distributions of this particle population throughout the heliosphere. In order to address these scientific goals, we have developed a novel instrument - the Supra-Thermal Ion Spectrometer for Heliospheric (STISH) Missions - that

can measure the composition and angular distributions of suprathermal ions between $\sim$3 - 150 keV/e at high temporal resolution on the order of $\sim$ 1 minute. In particular, STISH will bridge the energy gap and complement existing plasma and energetic particle instruments by using an innovative energy-per-charge disperser with state-of-the-art position sensitive time-of-flight (TOF) measurements. In this paper we describe the design and development of our new instrument that drastically improves upon the sensitivity (by a factor of 10) of prior measurements in this energy range.