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THOR Turbulence Electron Analyser: TEA

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Turbulence Heating ObserveR (THOR) is the first mission ever flown in space dedicated to plasma turbulence. The Turbulence Electron Analyser (TEA) will measure the plasma electron populations in the mission's Regions of Interest. It will collect a 3D electron velocity distribution with cadences as short as 5 ms. The instrument will be capable of measuring energies up to 30 keV. TEA consists of multiple electrostatic analyser heads arranged so as to measure electrons arriving from look directions covering the full sky, i.e. 4 pi solid angle. The baseline concept is similar to the successful FPI-DES instrument currently operating on the MMS mission. TEA is intended to have a similar angular resolution, but a larger geometric factor. In comparison to earlier missions, TEA improves on the measurement cadence. For example, MMS FPI-DES routinely operates at 30 ms cadence. The objective of measuring distributions at rates as fast as 5 ms is driven by the mission's scientific requirements to resolve electron gyroscale size structures, where plasma heating and fluctuation dissipation is predicted to occur. TEA will therefore be capable of making measurements of the evolution of distribution functions across thin (a few km) current sheets travelling past the spacecraft at up to 600 km/s, of the Power Spectral Density of fluctuations of electron moments and of distributions fast enough to match frequencies with waves expected to be dissipating turbulence (e.g. with 100 Hz whistler waves).