

Double Star Probe TC-1 measurements of microscopic Electron Dynamics near the Van Allen Radiation Belts

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Intense kHz waves generated by electron cyclotron resonance are often observed by the STAFF instrument on the TC-1 Double Star spacecraft. These electromagnetic waves, with frequencies below f_{ce} , are thought to be associated with the diffuse aurora (together with higher frequency electrostatic electron cyclotron harmonic waves). As part of the DWP instrumentation on board the Double Star Equator TC-1 spacecraft a particle correlator experiment operates which directly captures time series of electron counts provided by the PEACE HEEA sensor over the energy range from a few eV to 20 keV using high sampling frequencies (1.4 to 41 kHz). One novelty of the DSP correlator is that in addition to producing summed Auto-Correlation Functions (ACFs) from these time series it also has the ability to transmit successive compressed time series of the actual electron counts (individual time series being approximately of millisecond duration). These time series reveal individual electrons being detected with separations of the order of tens of microseconds and hence retain the phase as well as frequency information for the interaction of the electrons with the waves. Measurements are presented of the DSP TC-1 particle correlator data in conjunction with other DSP data for passes close to perigee which link wave emissions to microscopic bunching in the electron population.