

Field-Aligned Electron Pulsations and Magnetospheric Waves

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The Electron Drift Instruments (EDI) on the Cluster spacecraft are often operated in a mode that measures 500 eV electrons in two opposite directions simultaneously. These two directions are switched between parallel and perpendicular to the magnetic field every eighth of a second. In the burst mode, accumulations are made 128 times a second lasting 1/512 second. Spectrograms made using wavelet techniques covering the frequency range of 0.001 to 64 Hz reveal cases of pulsations in many frequency bands. A closer examination of an event reported earlier (Runov, 2004) reveals pulsations in the PC5 up to and past the PC1 frequency bands, and individual 2ms accumulations a factor of two higher than their neighbors less than 8ms away. One possible explanation of such a fast pulse would be the perpendicular motion of a filament past the spacecraft. Even if such a filament were only one gyro-diameter thick, it would require flows much higher than observed in order to arrive and leave in less than 8ms. Another explanation could be a field-aligned 100 km long bunch of electrons passing the spacecraft. Still another explanation could be gyrophase bunching into long helical threads or guiding-center bunching into long tubes.

Runov, A.; Asano, Y.; Voros, Z.; Nakamura, R.; Baumjohann, W.; Balogh, A.; Reme, H.; Paschmann, G.; Quinn, J.; McIlwain, C. Cluster magnetotail probe during an isolated substorm on 13 September 2002; PA0044, ICS-7, March 2004.