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# MeV electrons in Saturn's high-latitude, cusp region

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## Abstract

Saturn's electron radiation belts extend on average up to a dipole L-shell of 7. Their structure, however, is highly variable. The outer boundary of these belts has occasionally been observed to drop at L=4 (second half of 2011) or expand up to L=14 (early 2006). Electrons in these belts have considerable fluxes only up to few hundred keV. Energetic electrons above the MeV range are found at low L-shells, in the stable trapping region, as expected.

Beyond the belt's outer boundary, energetic electron spectra may reach up to about 300 keV during crossings Saturn's plasma sheet or at the high-latitude magnetosphere, especially when Cassini's MIMI/LEMMS detector is oriented along the magnetic field. MeV electron channels of LEMMS are typically at background levels.

However, during several high-latitude crossings of Saturn's magnetosphere (mostly in 2008), LEMMS data show evidence of MeV electrons. Fluxes of these electrons are so high that even cause a considerable penetrating radiation signal in various LEMMS channels. Duration of these events lasts from several minutes up to about an hour. Data on the angular distribution is limited, but it appears that these electrons are not concentrated only along the field-aligned direction, meaning that part of the electrons may remain trapped in the quadrapole configuration of Saturn's cusp. The episodic and transient character of these events indicates that these electrons are accelerated to MeV energies locally, similar to what has been observed at Earth.

Apart from presenting these unique LEMMS observations, we will also discuss the implications about the cusp as a universal source of radiation belt electrons in planetary magnetospheres, These observations may also be relevant for the upcoming Juno/JEDI observations at Jupiter.