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The magnetospheric interaction of Dione in the view of energetic particles: Cassini MIMI/LEMMS results during the encounters D1-D3

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Low Energy Magnetospheric Measurement System (LEMMS) data are presented from the three Dione flybys of the Cassini spacecraft between 2005 and 2011. We observed absorption signatures in the fluxes of electrons with energies between 20 keV and several MeV. The signatures are dependent on the flyby geometry. The two downstream flybys D2 and D3 show clearly an asymmetry which becomes stronger for higher energies. The most prominent signature of this asymmetry is a much sharper flux drop-out at the Saturn-facing wake boundary consistent with particle tracing simulation results.
The absorption in higher-energy channels (several hundreds of keV) is more sporadic. Differences between the results of D2 and D3 are caused by the flyby distance and from the fact that during D2 the magnetosphere was very much disturbed in an ongoing injection event at that time.
The flyby D1 was slightly south and upstream of the moon partially crossing the magnetic flux tube. The result during that flyby is an absorption in the higher-energy channels with the size of the moon while the signature in lower-energy channels is only half of it. The reason is that only part of the flux tube was crossed by Cassini.
Energetic ion observation also show absorption features with an energy-dependent position relative to the geometrical moon's wake consistent with gyroradius effects.
We interpret the results as evidence of particle absorption at the moon but also an indication that energy dependent particle trajectories around the moon can cause features in the moon's wake.