



Evidence for fast Fermi acceleration at the Martian bow shock

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Spikes of energetic electrons up to ~ 1.5 keV are detected by the MAVEN orbiter around Mars. The spikes usually appear following a rotation of the interplanetary magnetic field (IMF). We show that they emanate from a narrow region at the tangency point of the IMF with Martian bow shock. The examination of the pitch angle distribution indicates that these spikes are associated with electrons moving sunward. The 3-dimensional angular measurements from MAVEN-SWEA detector show that for these spikes the values of phase-space density values are maximum on a ring centered about the IMF. There is no clear evidence that the radius of the ring is energy dependent. These features demonstrate for the first time that Mars acts as a fast magnetic mirror which can reflect solar wind electrons to produce high energy electron bursts. A quantitative analysis is carried out and a higher bound of the cross-shock potential of Mars bow shock is estimated.