



Statistical behavior of Langmuir wave packets observed inside the electron foreshock of Saturn

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We present a statistical study of Langmuir wave packets in the Saturnian foreshock using Cassini Wideband Receiver electric field waveforms. We analyzed all foreshock crossings from 2004 to 2012 using an automatic method for the identification of Langmuir wave signatures. Observed waveforms exhibit a shape similar to Langmuir solitons or monochromatic wave packets with a slowly varying envelope. This is in agreement with a variety of previous observations of Langmuir waves in the terrestrial foreshock and associated with Type III radio bursts. We determined the peak amplitude for all wave packets, and found the distributions of amplitude appeared to follow a power law with $P(E) \propto E^{-2}$. We confirm that the most intense electron plasma waves are observed near the foreshock boundary. We estimated the energy density ratio to be about one order below previously reported values at Saturn. Finally, we discuss the properties of the Langmuir wave packets at different locations in the foreshock.