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Observation of electron phase space holes during magnetic reconnection experiments in the Versatile Toroidal Facility[1] W. FOX, M. PORKOLAB, J. EGEDAL, N. KATZ, A. LE, A. VRUBLEVSKIS, MIT PSFC — We report recent observations of nonlinear electrostatic fluctuations, identified as electron phase space holes, excited during spontaneous reconnection events on the VTF experiment[1]. Electrostatic fluctuations are observed by small, high-bandwidth, impedance-matched Langmuir probes. Among a large number of wave phenomena, we observe narrow, large-amplitude, positive potential spikes, identified as electron holes. With arrays of such probes we have observed the speed and shape of these propagating structures. The parallel and perpendicular sizes are roughly equal, approximately 1-2 mm (50-100 λ_D, or 5-10 ρ_e). Finally, we will present studies of the relationship between the holes, reconnection electric fields, and creation of energetic particles by the reconnection process. The latter are studied with a novel electron energy analyzer which integrates 7 grid/collector pairs into a small, 1.5 cm area. Our interpretation is that the holes arise from velocity-space instability in the energetic electron population.
[1] J. Egedal, *et al.*, PRL **98**, 015003 (2007).

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