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Observation of electron holes and lower-hybrid turbulence during magnetic reconnection experiments on VTF[1] W. FOX, M. PORKOLAB, J. EGEDAL, N. KATZ, A. LE, MIT PSFC — We report a detailed study of electrostatic turbulence observed during magnetic reconnection experiments on the Versatile Toroidal Facility (VTF) [1], including identification of modes, exploration of instability mechanisms, and studies of correlation with the reconnection events and electron energization. Electrostatic fluctuations are observed by arrays of small, high-bandwidth, impedance-matched Langmuir probes. Broadband fluctuations are found, including lower-hybrid (LH) waves and higher-frequency Trivelpiece-Gould (TG) waves. Strong nonlinear turbulence, consisting of large-amplitude, positive-potential spikes identified as electron phase-space holes, is also observed [2]. We believe that the LH modes are driven unstable by steep electron temperature gradients, while TG and electron holes arise from bump-on-tail instability of high energy electrons. In both cases, it is believed that the modes arise as a consequence of electron energization by the reconnection events.
[1] J. Egedal, *et al.*, *PRL* **98**, 015003 (2007).
[2] W. Fox, *et al.*, *PRL* **101**, 255003 (2008).

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