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First direct observation of runaway electron-driven whistler waves in tokamaks[1] D.A. SPONG, ORNL, W.W. HEIDBRINK, UC-Irvine, C. PAZ-SOLDAN, General Atomics, X.D. DU, UC-Irvine, K.E. THOME, ORISE, M.A. VAN ZEELAND, C. COLLINS, General Atomics, A. LVOVSKIY, ORISE, R.A. MOYER, UC-San Diego, D.P. BRENNAN, C. LIU, PPPL, E.F. JAEGER, C. LAU, ORNL — Whistlers are electromagnetic waves destabilized by energetic electrons and are observed in natural plasmas, such as planetary ionospheres. Recent experiments on the DIII-D tokamak at low density demonstrate the first direct observation of whistlers in tokamaks, with 100 to 200 MHz waves excited by runaway electrons (REs) in the multi-MeV range. The whistlers are correlated with RE intensity and the frequency scaling is consistent with a whistler dispersion relation. Fluctuations occur in discrete frequency bands, and not a continuum as would be expected from plane wave analysis. An RF absorption model has been applied, indicating a set of discrete cavity modes are formed as a result of the bounded, periodic nature of the plasma. The instabilities are stabilized with increasing magnetic field, as expected from the anomalous Doppler resonance. Whistler amplitudes show intermittent predator-prey cycles, which can be interpreted as wave-induced scattering of REs. These features have connections to ionospheric plasmas and open possibilities for active control of tokamak REs.

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