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Experimental analysis of coupling between Compressional Alfvén Eigenmodes and Kinetic Alfvén Waves in NSTX[1] Z DENG, NA CROCKER, UCLA, Y REN, EV BELOVA, PPPL — In NSTX, there exists an unexplained T_e profile flattening with increasing toroidal magnetic field, and neutral beam power. Core localized Compressional Alfvén Eigenmodes (CAEs) are a candidate cause. Simulations [Belova, PRL 2015] show that CAEs take energy from core energetic ions that would otherwise heat the electrons and deposit it in the edge via coupling with Kinetic Alfvén Waves (KAWs) at the Alfvén resonance location. However, this theory lacks experimental validation. To provide experimental support, we analyze high-k scattering measurements, which show signatures of CAE-KAW mode conversion. The spectrum of microwaves scattered from δn fluctuations with $k_r \rho_s$ ~1 shows large narrow peaks at typical CAE frequencies (f>~1 MHz), as expected. Corresponding peaks also appear at negative f, but their amplitudes can be much smaller, consistent with expectation for scattering. (Peaks could also result from index of refraction modulation by CAEs, but the peaks at positive and negative f would have equal amplitude.) To further test that the scattering peaks are caused by fluctuations associated with CAEs, we next make sure these peaks are coherent with corresponding CAE peaks in the magnetic fluctuation spectrum, as would be expected for mode conversion. Finally, we compare the location where KAWs are detected with the location of the Alfvén resonance. The results of the analysis seem to suggest that peaks in the high-k spectrum do indeed result from KAWs mode converted from CAEs.

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