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**Chirping Modes Destabilized by Thermal Ions and Their Impacts on High Ion Temperature Plasmas in DIII-D Tokamak** XIAODI DU, General Atomics - San Diego — In a plasma having reactor-relevant ion-temperature of ˜20 keV, it is observed that thermal ions play crucial roles in destabilizing the n=1, low-frequency Magnetohydrodynamic instabilities with bursting and chirping characters. These characters are commonly viewed as a signature of energetic particle driven modes. Each bursting event leads to a decrease of the central bulk ion temperature by ˜1 keV and limits the maximum achievable ion temperature. The instabilities are excited, when bulk Ti exceeds certain threshold and the stability of the mode is not sensitive to the change of the neutral beam combinations. The internal mode structure moves, expands and shrinks radially in a short bursting time window of ˜1 ms, exhibiting a non-perturbative feature which is previously reported for EP-driven instabilities [1,2]. Doppler backscattering measurements of density fluctuation reveals that, during each burst, the multiple perturbation harmonics appears sequentially from ˜50 kHz to ˜1 MHz as an ascending order in frequency and then disappears sequentially as a descending order. The resonance conditions, especially the possible resonant interactions between the multi-frequency coherent perturbations and thermal ions will be discussed.

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