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Novel internal measurements and analysis of ion cyclotron frequency range fast-ion driven modes in DIII-D[1] NA CROCKER, UCLA, GH DEGRANDCHAMP, UCI, SX TANG, UCLA, KE THOME, GA, JB LESTZ, UCI, EV BELOVA, PPPL, AI ZALZALI, RO DENDY, U. Warwick, WA PEEBLES, K BARADA, R HONG, TL RHODES, G WANG, L ZENG, UCLA, WW HEIDBRIN, UCI, DIII-D TEAM — Novel measurements and analysis of fast-ion driven modes in the ion cyclotron frequency range in DIII-D are presented, including local internal density fluctuations ($\tilde{n}$) obtained via an array of Doppler Backscattering systems. Two types of modes are excited simultaneously by co-current neutral injection via the more tangential of the two beamlines: 1) Alfvn eigenmodes (AE) at $f \sim 0.4 f_{ci}$, identified as global AEs (GAE) driven by Landau resonance with the fast ions, and 2) modes at low harmonics of f_{ci}, identified as collective ion cyclotron emission (ICE). Multiple aspects of theory for the underlying instabilities are validated. For instance, the GAE observations are compared with analytic theory and simulation via the HYM hybrid MHD code. Also, observations of ICE $\tilde{n}$ in both core and edge test prevalent theories for spatial localization of ICE and are compared to simulations via the EPOCH PIC code, which uses a locally uniform approximation.

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