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Local compressional and global Alfvén eigenmode structure on NSTX and their effect on core energy transport[1] NA CROCKER, UCLA, EV BELOVA, RB WHITE, ED FREDRICKSON, NN GORELENKOV, PPPL, K TRITZ, JHU, WA PEEBLES, S KUBOTA, UCLA, A DIALLO, BP LEBLANC, PPPL — A novel method for localized absolute reflectometer measurements of density fluctuations δn using a synthetic diagnostic has provided new insight into CAE & GAE amplitude, structure, and associated energy transport in NSTX spherical torus. The new technique is more accurate than previous analysis producing substantially different amplitudes. CAE & GAE activity has been shown to correlate with core anomalous electron thermal transport in high-power beam heated NSTX plasmas [Stutman PRL09] making these measurements of significant interest. High frequency modes (17–33% f_{ci}) are identified as GAEs & CAEs in a 6 MW beam heated plasma. The synthetic diagnostic allows direct testing of HYM, a leading CAE & GAE stability code that predicts substantial transport via CAE-KAW coupling [Belova PRL15]. Measured GAE structures show edge peaks, and are broad & flat in the core with $\delta n/n \tilde{} 10^{-5}$–$10^{-4}$. In contrast, CAEs have broad core peaks with $\delta n/n \tilde{} 10^{-4}$–$10^{-3}$. The GAE measurements are used with theory for mode induced stochastization of electron drift orbits [Gorelenkov NF10] to predict the core electron thermal diffusivity (χ_e), which shows the low amplitudes cannot explain the high χ_e. The theory has been modified to include the CAEs, preliminarily showing negligible increase. Linear HYM simulations show GAE structures similar to those above.

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