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Structure and Scaling Properties of Zero-Mean-Frequency Zonal Flows and Geodesic Acoustic Modes in DIII-D,[1] G.R. MCKEE, R.J. FONCK, D.J. SCHLOSSBERG, M.W. SHAFER, University of Wisconsin-Madison, C. HOLLAND, G.R. TYNAN, University of California-San Diego, K. HALLATSCHEK, Max-Planck Institut fur Plasmaphysik — Zonal flows, including the zero-mean-frequency (ZMF), spectrally broad residual flows and the oscillatory geodesic acoustic mode (GAM), are observed in the core of DIII-D plasmas. These flows have been identified using a high-sensitivity, 2D measurement of the density turbulence and its velocity-field using BES. The ZMF zonal flow peaks near zero frequency and exhibits a width of $\Delta f \sim 10$ kHz, a long poloidal wavelength but short radial correlation length (a few cm). This velocity spectrum is dominated near the edge of the plasma by the GAM, while the ZMF zonal flow dominates deeper in the plasma core. The GAM amplitude peaks near $r/a = 0.9 - 0.95$ and is a strong function of the safety factor, q_{95}. Furthermore, the GAM frequency deviates increasingly from the theoretically predicted value (c_s/R) as the GAM is more strongly damped at lower q. This may suggest stronger coupling to and damping on sound waves.

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