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Core Density Turbulence in the HSX Stellarator[1] C.B. DENG, D.L. BROWER, UCLA, D.T. ANDERSON, F.S.B. ANDERSON, A. BRIESEMEISTER, S. KUMAR, K.M. LIKIN, J.N. TALMADGE, University of Wisconsin-Madison —
Density fluctuation measurements on the HSX stellarator reveal broadband turbulence that correlates with plasma density gradient and flow. For quasi-helically symmetric plasmas, significant increases in the turbulent density fluctuations are observed when plasma heating location is moved from on-axis to inboard high-field side. Measurements show that the plasma flow velocity also decreases significantly for off-axis heating. In addition, as the electron-cyclotron-resonance-heating power is decreased, core density fluctuations rise while the plasma parallel flow is reduced. When HSX is operated without quasi-helical symmetry, both plasma flow and turbulence characteristics are little changed. No sensitivity to electron temperature gradient is observed. Increased fluctuation amplitude correlates with both increasing density gradient and reduced flow, suggesting a causal relation. In addition to improved neoclassical confinement, quasi-helical symmetry can also lead to increased flow (and flow shear) in the direction of symmetry along with reduced fluctuations and anomalous transport.

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