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Microwave diagnostics to measure internal magnetic fluctuations, intermediate-k density fluctuations, and flows on NSTX-U[1] T. L. RHODES, N. A. CROCKER, S. KUBOTA, W. A. PEEBLES, UCLA — New microwave diagnostics are being installed on the NSTX-U spherical tokamak that will address a range of important physics topics including multi-scale turbulence and transport, energetic particles, and pedestal turbulence and flows. These multi-radial point diagnostics include (a) Doppler backscattering for intermediate-k density fluctuations ($\tilde{n}$) and flows and (b) cross-polarization scattering for internal, localized magnetic fluctuations. Doppler backscattering has significant measurement capabilities and is able to measure $\tilde{n}$ levels, mean and fluctuating flow, sheared flows, GAMs, ELM and EHO activity (with wavenumber range $k_\theta \rho_s$ =0.5–10, spatial and temporal resolutions $\Delta r \leq 1$cm and $\Delta t \leq 1\mu$s). Cross-polarization scattering measurements of internal magnetic fluctuations cover an even broader wavenumber range ($k_\theta \rho_s \sim 0.2$–17) with high time and space resolutions ($\Delta r \sim 1$cm, $\Delta t = 1\mu$s). Important and interesting instabilities addressed include microtearing, ITG, TEM, KBM, lower-k ETG, and kinetic Alfvén waves.

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