Multi-scale, Multi-field Turbulence Response During Electron Cyclotron Heating (ECH)\(^1\) W.A. PEEBLES, T.L. RHODES, A.E. WHITE, G. WANG, J.C. HILLESHEIM, L. SCHMITZ, L. ZENG, E.J. DOYLE, University of California-Los Angeles, G.R. MCKEE, M.W. SHAFTER, University of Wisconsin-Madison, J.C. DEBOO, M.A. VAN ZEELAND, General Atomics — ECH at \(r/a \sim 0.4\) significantly modifies the electron temperature of LSN Ohmic plasmas with minimal effect on local ion temperature and electron density. A unique array of turbulence diagnostics was used to study the turbulence response across all turbulent scales \((0 < k \rho_s < 10)\) and for two distinct turbulent fields. At \(r/a \sim 0.6\), low-\(k\) electron temperature fluctuations increased significantly \((\sim 3)\) with ECH. In contrast, low and intermediate-\(k\) density fluctuations remained unchanged or reduced slightly. High-\(k\) \((\sim 35 \text{ cm}^{-1})\) density fluctuations, associated with the electron temperature gradient driven mode, increased by \(>30\%\). Interestingly, low-\(k\) density and electron temperature fluctuations were found to be locally correlated across the frequency range \(\sim 10\text{-}100 \text{ kHz}\). This unique data set can be utilized to rigorously test the turbulence physics inherent in nonlinear gyrokinetic turbulence codes.

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