Abstract Submitted
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Edge Turbulence Studies in Alcator C-Mod with Phase Contrast Imaging and BOUT++[1] E.M. DAVIS, M. PORKOLAB, P. ENNEVER, N. TSUJII, J.W. HUGHES, MIT PSFC, X.Q. XU, LLNL — Energy confinement in tokamaks is believed to be strongly controlled by plasma transport in the edge region just inside the last closed magnetic flux surface. A first principles understanding of these edge processes requires effective coupling between experiment and theory. Phase Contrast Imaging (PCI) is a mature Alcator C-Mod diagnostic using a type of internal interferometry to measure $\int \tilde{n}_e dl$. C-Mod's thirty-two chord PCI beam collects data from both the plasma core and edge, making it well-suited for edge turbulence studies. The Boundary-plasma Turbulence (BOUT++) code is capable of nonlinear fluid boundary turbulence analysis in a general geometry. Using experimentally measured profiles as input, BOUT++ calculations show that typical C-Mod EDA H-modes are ideal MHD stable, but become linearly unstable when the pedestal resistivity is included ($S < 10^9$). The computed resistive ballooning mode growth rate in such shots is shown to scale approximately as $\eta^{1/3}$, consistent with theory. Inclusion of nonlinear effects allows comparison of the calculated turbulence spectrum with PCI measurements. The results and implications of these comparisons will be discussed.

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