Abstract Submitted
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Validation of X-ray Line Ratios for Electron Temperature Profiles in Tokamak Plasmas[1] ANDREW ROSEN, Tufts University, MATTHEW REINKE, JOHN RICE, AMANDA HUBBARD, JERRY HUGHES, MIT - Plasma Science and Fusion Center — X-ray imaging crystal spectroscopy (XICS) has been implemented on magnetic confinement fusion devices as a novel means of measuring local plasma temperature and flow profiles. At Alcator C-Mod, XICS allows for spatially-resolved, high spectral resolution measurements between 0.3 nm and 0.4 nm, enabling detailed analysis of He-like and H-like argon x-ray emission. Electron temperature profiles in the range of 0.5 keV $< T_e <$ 5.0 keV are computed from ratios of the n = 3 dielectronic satellites to the $1s^2$-1s2p resonance lines in He-like argon. These data are validated against existing measurements of Te from electron cyclotron emission and Thomson scattering. Line ratio data are analyzed via a tomographic inversion procedure, overcoming the traditional issue of data being averaged over the plasma cross-section. The implications of utilizing x-ray line ratios as valid local temperature diagnostics are not limited to Alcator C-Mod; plasma properties in future experiments as well as in astrophysical phenomena can also be investigated.

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