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Constraining $Z_{\text{eff}}$ and Particle Diffusion using X-ray Spectroscopy on MST\textsuperscript{1} J.D. LEE, A.F. ALMAGRI, J.K. ANDERSON, B.E. CHAPMAN, J.S. SARFF, University of Wisconsin-Madison, R.W. HARVEY, CompX — The X-ray spectroscopy diagnostic on MST consists of six SXR detectors and six HXR detectors capable of measuring photons in the energy range 3 – 25 keV and 10 – 60 keV, respectively. The detectors can be installed on any of 17 ports viewing a poloidal cross-section, with tangency radii from $r/a = 0.87$ inboard to $r/a = 0.84$ outboard. Measurements have been made in enhanced confinement plasmas with plasma current of $\sim 400$ kA, electron density of $\sim 0.6 \times 10^{19}$ m$^{-3}$, and electron temperature of $\sim 1200$ eV. Measured spectra are used to constrain radial profiles of $Z_{\text{eff}}$ and $D_r$ by comparison with spectra calculated from CQL3D, a Fokker-Planck solver [R.W. Harvey and M.G. McCoy, “The CQL3D Fokker-Planck Code,” General Atomics (2011)]. The plasma equilibria required for CQL3D are produced by the reconstruction code MSTfit. Minimization is performed using a custom parallel simplex algorithm on a 248 core cluster.

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