

Abstract Submitted  
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**Resolving the non-equilibrium MSE spectrum and its application at Alcator C-Mod**<sup>1</sup> IGOR BESPAMYATNOV, WILLIAM ROWAN, KENNETH LIAO, The University of Texas at Austin, OLEKSANDR MARCHUK, Institut of Energieforschung-Plasmaphysik, Julich, Germany, YURI RALCHENKO, National Institute of Standards and Technology, ROBERT MUMGAARD, ROBERT GRANETZ, Massachusetts Institute of Technology — The high-resolution MSE spectrum has been thoroughly measured in the Alcator C-Mod tokamak using high-throughput polarization-corrected optics and an f/1.8 holographic imaging spectrograph. The measurements have been done with a 50 keV/u diagnostic neutral beam in Alcator C-Mod high-density Ohmic plasmas covering the parameter range:  $n_e = \{0.6-1.3\} \times 10^{20} \text{ m}^{-3}$ ,  $B_T = 4-6 \text{ T}$  at  $T_e = 0.4-2.5 \text{ keV}$ . Multiple Stark components were resolved with application of the advanced constrained multi-line spectral fit. Measured ratios of Stark spectral components  $\sigma_1/\sigma_0$ ,  $\pi_4/\pi_3$  and  $\Sigma\sigma/\Sigma\pi$  were compared to an  $n$ -resolved statistical and a  $nk\ell$ -resolved collisional radiative model (Marchuk, PPCF, 54, 2012). Results showed a clear deviation from  $n$ -resolved model and good agreement with  $nk\ell$ -resolved model. The comparison results were extrapolated toward 100 keV/u and 500 keV/u ITER beams (Bespamyatnov, NF, submitted). Here we present an extended analysis of the MSE spectral measurement and spectral fitting and attempt to employ the extracted line ratios for the measurement of the magnetic field line pitch angle. Feasibility of using spectral MSE as a supporting or complimentary diagnostic to the MSE polarimetry will also be assessed.

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