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Modeling of X-Ray Bremsstrahlung and ECE Diagnostics with Non-Maxwellian Electron Distribution Functions in the HSX Stellarator[1]

J.W. RADDER, K.M. LIKIN, J.N. TALMADGE, D.T. ANDERSON, G.M. WEIR, HSX Plasma Lab, University of Wisconsin — The five-dimensional Fokker-Planck code, GNET [1], is used to model the electron distribution function for electron cyclotron heating (ECH) in the HSX stellarator. GNET solves a linearized drift kinetic equation in three-dimensional magnetic geometry, allowing simulation of HSX magnetic configurations with and without quasihelical symmetry. A routine was developed to calculate X-ray bremsstrahlung radiation spectra with electron distribution functions calculated with GNET. For non-Maxwellian distributions in HSX plasmas, the radiation transport equation is solved to find ECE spectra. Numerical simulations predict hotter plasma temperatures in QHS than Mirror modes, which is attributed to improved confinement of high energy particles in a quasisymmetric magnetic geometry. Comparisons will be made to ECE and X-ray spectra measurements for 2nd-harmonic X-mode (0.5 Tesla) and 1st-harmonic O-mode (1.0 Tesla) plasmas.

[1] S. Murakami, et al, Nuclear Fusion, v. 40, n. 3Y, pp.693-700, 2000.

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