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Relativistic description of the interaction of electron Bernstein waves with electrons[1] A.K. RAM, PSFC, MIT, J. DECKER, CEA, Cadarache, France — In the electron cyclotron range of frequencies (ECRF), Bernstein waves (EBW) are useful in spherical tokamaks (NSTX) and stellarators for imparting external wave energy and momentum to electrons. Previous theoretical studies on ECRF X and O modes have noted the importance of including relativistic effects in the propagation and damping of these waves. We find that, in order to properly describe EBWs and their interaction with electrons, a relativistic treatment is necessary. Relativistic effects are found to be important for temperatures which are routinely attained in present day laboratory fusion plasmas. A description of the changes in wave propagation characteristics and in the exchange of momentum and energy between EBWs and electrons will be discussed. For steady state, high-β operation of NSTX type spherical tokamaks non-inductive current drive is needed. ECRF waves can generate currents either by the Ohkawa or by the Fisch-Boozer schemes. We will elucidate the two current drive schemes as applied to NSTX. Results from two coupled codes, one which solves the fully relativistic plasma dielectric tensor (R2D2) and the other which solves the drift kinetic equation for electrons (DKE), will be presented.

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