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[ ] Theory [x] Experiment

Electron Cyclotron Current Drive at High Electron Temperature on DIII-D,* C.C. Petty, T.C. Luce, J. Lohr, R. Prater *GA,* M.E. Austin, *U. Texas-Austin*, R.W. Harvey, *CompX* – Electron cyclotron current drive (ECCD) is a key ingredient for driving off-axis current on ITER for suppression of MHD instabilities and to improve the plasma confinement properties. The ECCD effectiveness is strongly dependent upon the electron temperature. Most experimental tests of ECCD on present day devices have been at electron temperatures an order of magnitude lower than expected on ITER; thus, there remains a need to validate ECCD theory in ITER temperature regime. Recent experiments on DIII--D have measured the ECCD efficiency for co and counter injection in low density plasmas with radiation temperatures (T_{rad}) from electron cyclotron emission (ECE) above 20 keV (similar experiments have been done on JT-60U). The radiation temperature is generally higher than the Thomson scattering temperature, indicating that there is a significant population of non-thermal electrons that is largest for counter injection, less for co injection, and smallest for radial injection. The ECCD efficiencies measured in these low density plasmas are contrasted with higher density plasmas that had no signs of non-thermal electrons, and are compared to theoretical calculations from the quasi-linear CQL3D Fokker-Planck code.

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