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Theory     Experiment

**Improvement of Current Drive Efficiency in Projected FNSF Discharges\***, R. Prater, V. Chan, A. Garofalo, *General Atomics* - The Fusion Nuclear Science Facility - Advanced Tokamak (FNSF-AT) is envisioned as a facility that uses the tokamak approach to address the development of the AT path to fusion and fusion's energy objectives. It uses copper coils for a compact device with high  $\beta_N$  and moderate power gain. The major radius is 2.7 m and central toroidal field is 5.44 T. Achieving the required confinement and stability at  $\beta_N \sim 3.7$  requires a current profile with negative central shear and  $q_{\min} > 1$ . Off-axis Electron Cyclotron Current Drive (ECCD), in addition to high bootstrap current fraction, can help support this current profile. Using the applied EC frequency and launch location as free parameters, a systematic study has been carried out to optimize the ECCD in the range  $\rho = 0.5 - 0.7$ . Using a top launch, making use of a large toroidal component to the launch direction, adjusting the vertical launch angle so that the rays propagate nearly parallel to the resonance, and adjusting the frequency for optimum total current give a high dimensionless efficiency of 0.44 for a broad ECCD profile peaked at  $\rho = 0.7$ , and the driven current is 17 kA/MW for  $n_{20} = 2.1$  and  $T_e = 10.3$  keV locally.

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