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Modeling Results for 28 GHz Heating and Current Drive in the National Spherical Torus Experiment Upgrade (NSTX-U)[1] G. TAYLOR, N. BERTELLI, R.A. ELLIS, S.P. GERHARDT, PPPL, R.W. HARVEY, CompX, J.C. HOSEA, F. POLI, PPPL, R. RAMAN, Univ. of Washington, A.P. SMIRNOV, Lomosov Moscow State Univ. — A megawatt-level, 28 GHz electron heating system is being planned to heat non-inductive (NI) start-up plasmas and to provide radially localized electron heating and current drive during H-mode discharges in NSTX-U. NSTX-U will operate at axial toroidal fields of up to 1 T and plasma currents, I_p, up to 2 MA. Development of fully NI plasmas is a critical long-term NSTX-U research goal that supports the design of a Fusion Nuclear Science Facility. 0.6 MW of 28 GHz electron cyclotron (EC) heating is predicted to increase the central electron temperature ($T_e(0)$) of low density NI plasmas generated by Coaxial Helicity Injection (CHI) in NSTX-U from 10 eV to 400 eV in about 20 ms. The increased $T_e(0)$ will significantly reduce the plasma current decay rate of CHI plasmas, allowing the coupling of fast wave heating and neutral beam injection. Eventually 28 GHz electron Bernstein wave (EBW) heating and current drive will be used during the I_p flat top in NSTX-U H-mode discharges when the plasma is overdense. This paper will present numerical RF simulation results for 28 GHz EC and EBW heating and current drive for NSTX-U discharges and a conceptual design for the 28 GHz heating system.

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