Abstract Submitted
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Generation of Non-Inductive H-Mode Plasmas with 30 MHz Fast Wave Heating in NSTX-U[1] G. TAYLOR, N. BERTELLI, S. P. GERHARDT, J. C. HOSEA, D. MUELLER, R. J. PERKINS, F. M. POLI, J. R. WILSON, PPPL, R. RAMAN, Univ. of Washington — A Fusion Nuclear Science Facility based on a spherical tokamak must generate the plasma current (I_p) with little or no central solenoid field. The NSTX-U non-inductive (NI) plasma research program is addressing this goal by developing NI start-up, ramp-up and sustainment scenarios separately. 4 MW of 30 MHz fast wave power is predicted to ramp I_p to 400 kA, a level sufficient to avoid significant shine-through of 90 keV ions from neutral beam injection. In 2010, experiments in NSTX demonstrated that 1.4 MW of 30 MHz high-harmonic fast wave (HHFW) power could generate an I_p = 300 kA H-mode discharge with a NI I_p fraction, f_{NI}, around 0.7 at the maximum axial toroidal field ($B_T(0)$) in NSTX of 0.55 T. NSTX-U is a major upgrade of NSTX that will eventually allow the generation of plasmas with $B_T(0)$ up to 1 T. Full wave simulations of 30 MHz HHFW heating in NSTX-U predict reduced FW power loss in the plasma edge as $B_T(0)$ is increased. HHFW experiments this year aim to couple 3 – 4 MW of 30 MHz HHFW power into an I_p = 250 – 350 kA plasma with $B_T(0)$ up to 0.75 T to generate a f_{NI} = 1 H-mode plasma. These experiments should benefit from the improved fast wave coupling predicted at higher $B_T(0)$ in NSTX-U.

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