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Progress on High Harmonic Fast Wave Heating and Current Drive on NSTX[1] P.M. RYAN, L.A. BERRY, E.F. JAEGER, J.B. WILGEN, ORNL, R.E. BELL, J.C. HOSEA, B.P. LEBLANC, C.K. PHILLIPS, G. TAYLOR, E.J. VALEO, J.R. WILSON, PPPL, H. YUH, Nova Photonics, THE NSTX TEAM
— The recent improvement of the 30 MHz HHFW heating efficiency at lower toroidal wavenumbers in helium plasmas [1] has been extended to deuterium operation at $B_T(0) = 0.55$ T on NSTX. The key to effective power penetration of the edge plasma is the reduction of the plasma density near the Faraday screen/first wall [2]. For deuterium plasmas, it was necessary to use lithium wall conditioning to control the density rise that often accompanies high power RF operation, particularly at the lower toroidal wavenumbers achievable with the 12-element phased-array launcher. The HHFW power deposition at $k_{||} = -8$ m^{-1} is comparable to that of $k_{||} = -14$ m^{-1}, and core heating at $k_{||} = -3$ m^{-1} has now been observed, albeit at lower efficiency. Central electron temperatures of 5 keV have been achieved in both deuterium and helium plasmas with 3.1 MW at $k_{||} = -14$ m^{-1} (-150^o relative phase shift). Central heating of NBI-driven H-mode plasmas has been observed for both $k_{||} = 14$ and 8 m^{-1}. [1] Hosea, J. et al, Physics of Plasmas 15, 056104 (2008) [2] Hosea, J. et al, poster at this conference

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