

Abstract Submitted
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Modeling of Simultaneous Interaction of Fast Ions with Multiple Fast Waves (FWs) in Tokamaks¹ M. CHOI, R.I. PINSKER, V.S. CHAN, General Atomics, C.M. MUSCATELLO, UC-Irvine — In recent moderate to high harmonic FW heating and current drive experiments in DIII-D, a synergy effect was observed when the 6th harmonic 90 MHz FW is applied to the plasma being heated by neutral beams and the 4th harmonic 60 MHz FW. Measured neutron rate and stored plasma energy from the two combined FWs were much stronger than the sum of those from separate 4th and 6th harmonic FWs. Theoretically, this can occur at the presence of a large population of fast ions satisfying $k_{\perp} \rho \geq 1$ (k_{\perp} is the perpendicular wave number, and ρ is the fast ion Larmor radius). Preliminary investigation using a 5-D finite-orbit Monte-Carlo code ORBIT-RF coupled with 2-D full wave code AORSA suggests that preheating beam ions with the 60 MHz FW produces a large fast ion population above beam injection energy, which may allow significant damping of 90 MHz FW on beams tails. For quantitative comparison of theory with experiments, ORBIT-RF is upgraded to model simultaneous interaction of fast ions with multiple FWs. Computed synthetic FIDA signals and neutron reaction rates will be compared with measured quantities.

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