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Profiles of Fast Ions Accelerated by High-Harmonic Fast-Wave Heating in NSTX[1] E. RUSKOV, D. LIU, W. HEIDBRINK, M. PODESTA, UC Irvine, R. BELL, E. FREDRICKSON, J. HOSEA, S. MEDLEY, PPPL, R. HARVEY, CompX — Combined neutral beam injection and 30-MHz high-harmonic fast-wave (HHFW) heating accelerate deuterium fast ions in the National Spherical Torus Experiment (NSTX). With 1.1 MW of HHFW power, the neutron rate is about two times larger than in comparison discharges without this source of plasma heating. A fast-ion tail above the injection energy is observed on a conventional E||B neutral particle analyzer (NPA), on a 4-chord solid state neutral particle analyzer (SSNPA) array, and on a 16-channel fast-ion D-alpha (FIDA) diagnostic. At some angles, neutral particle analyzers can detect neutrals at twice the injection beam energy. The spatial profile of the accelerated fast ions measured by the D-alpha diagnostic is much broader than in conventional tokamaks, presumably due to the multiple resonance layers and large orbits in a spherical tokamak. In addition, compressional Alfven eigenmode activity is much stronger during HHFW, probably due to the bump-on-tail fast-ion velocity distribution which enhances the instability drive. The fast-ion distribution function calculated by the CQL3D Fokker-Planck code is compared with experimental data.

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