Fast-Ion Profiles in MHD-Quiescent Plasmas


The fast-ion distribution is measured using the fast-ion $D_\alpha$ (FIDA) diagnostic [1,2], which has spatial resolution of $\sim 5$ cm, time resolution of $\sim 1$ ms, and energy resolution of $\sim 10$ keV. This paper focuses on the measurements under quiescent discharge conditions (i.e. in the absence of MHD activity and collective particle effects). A weighted Monte Carlo simulation code allows direct comparison of classical calculations of the fast-ion distribution function using either the TRANSP code or a Fokker-Planck code with the FIDA measurements. Pitch angle scattering and slowing down of fast ions are studied by varying the injection energy, beam angle, plasma density and electron temperature; the FIDA signals vary as classically expected in these MHD-quiescent plasmas. In addition, the fast-ion profiles are compared during co- and counter-injection of neutral beam. Neutral particle and neutron diagnostics corroborate the FIDA measurements.


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