Fast-ions on Alcator C-Mod: Comparisons between Simulation and Experiment for Equilibrium and Evolving Distributions.*

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Analysis of fast-ion distributions > 100 T_e is important for both ITER and a fusion reactor, as both will have a significant population of fusion-born alpha particles. Furthermore, energetic ions may display transport properties that differ from the bulk plasma. It is imperative to benchmark current simulation codes with measurements of highly energetic fast-ions on current devices. Experimental measurements on ICRF heated H-minority plasmas on Alcator C-Mod are performed with an upgraded Compact Neutral Particle Analyzer (CNPA). The CNPA consists of vertically-viewing photodiode detectors with viewing chords from r/a = ~0.18 to 0.6 and energies from 200 keV to 2 MeV. The CNPA measurements are compared to the output of a synthetic diagnostic that has been added to the Fokker-Planck solver CQL3D. CQL3D is coupled with the full-wave solver AORSA to evolve a self-consistent fast-ion distribution. Good agreement is obtained between simulation and experiment for fast ion distributions that are in equilibrium. However, there are discrepancies between the experimental and simulated results for the time-dependent evolution of the fast-ion distribution. The cause of this discrepancy is currently under investigation.

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