Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Orbit Tomography: A Method for Determining the Population of Individual Fast-ion Orbits from Experimental Measurements L. STAGNER, W.W. HEIDBRINK, Univ of California - Irvine — Due to the complicated nature of the fast-ion distribution function, diagnostic velocity-space weight functions are used to analyze experimental data. In a technique known as Velocity-space Tomography (VST), velocity-space weight functions are combined with experimental measurements to create a system of linear equations that can be solved. However, VST (which by definition ignores spatial dependencies) is restricted, both by the accuracy of its forward model and also by the availability of spatially overlapping diagnostics. In this work we extend velocity-space weight functions to a full 6D generalized coordinate system and then show how to reduce them to a 3D orbit-space without loss of generality using an action-angle formulation. Furthermore, we show how diagnostic orbit-weight functions can be used to infer the full fast-ion distribution function, i.e. Orbit Tomography. Examples of orbit weights functions for different diagnostics and reconstructions of fast-ion distributions are shown for DIII-D experiments. This work was supported by the U.S. Department of Energy under DE-AC02-09CH11466 and DE-FC02-04ER54698.

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Date submitted: 12 Jul 2017 Electronic form version 1.4