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Fast-ion charge-exchange losses in C-2W ERIK M GRANSTEDT, S.A. DETTRICK, M.E. GRISWOLD, D.K. GUPTA, T. ROCHE, R.J. SMITH, K. ZHAI, AND THE TAE TEAM, TAE Technologies, Inc. — In TAE Technologies' current experimental device, C-2W (also called "Norman")[1], record breaking, advanced beam-driven field reversed configuration (FRC) plasmas are produced and sustained in steady state utilizing variable energy neutral beams (15–40 keV, total power up to 20 MW), advanced divertors, end bias electrodes, and an active plasma control system. Beam injection produces large-orbit fast ions that sample both the core FRC and the surrounding axisymmetric mirror plasma, where they can be lost via charge-exchange with neutrals. Since collisional energy transfer from fast ions is a primary heating source for the bulk plasma, their spatial and velocity distribution affects the overall power balance and understanding fast ion loss is critical. Balmer-α emission measured with filtered high-speed cameras is used with DEGAS2 neutral particle modeling to reconstruct the neutral distribution consisting of a cold population from wall recycling and a non-axisymmetric warm population generated from beam capture (via charge-exchange with the bulk plasma). Monte Carlo modeling is then used to estimate the rate and distribution of fast ions lost by charge-exchange, which is compared to bolometer measurements.

[1]H. Gota, et al. Nuclear Fusion 59, 112009 (2019)

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