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**Interpretation of the charge exchange neutral energy spectrum of C-2W** GABRIEL PLAYER, RYAN CLARY, SEAN DETTRICK, SERGEY KOREPANOV, RICHARD MAGEE, TAE Technologies, Inc., BRADLEY NICKS, BRIAN FOX, University of California, Irvine, TOSHIKI TAJIMA, TAE Technologies, Inc., 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. Diagnosis of fast ions, which are born from neutral beam injection and responsible for current drive and plasma heating, is critical for understanding the FRC behavior. Neutral Particle Analyzers (NPAs) are used to measure the energy spectrum of fast ions that charge exchange on background or beam neutrals and are lost from the plasma. The fast ion energy spectrum can be reconstructed by modeling the spatial distribution of fast ions and neutral particles. We present measurements made with both an electromagnetic and electrostatic NPA—the electromagnetic NPA provides isotopic separation of beam and bulk plasma species, while the lighter electrostatic NPA can be steered with a 2-axis gimbal to access a wide range of pitch angles. Forward modeling of the spectra with a hybrid MHD-Monte Carlo code is used to examine the collisional processes of fast ion slowing down on electrons and charge exchange loss. Non-collisional ion acceleration by a beam-driven wave, similar to that observed on C-2U [2], is also observed in C-2W and modeled with a particle-in-cell code. [1] H. Gota *et al,* Nucl. Fusion **59,** 112009 (2019) [2] R. M. Magee *et al*, Nature Physics **15** (2019)

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