

Abstract Submitted  
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**Fast imaging measurements and modeling of neutral and impurity density on C-2U** ERIK GRANSTEDT, B. DENG, S. DETTRICK, D.K. GUPTA, D. OSIN, T. ROCHE, K. ZHAI, Tri Alpha Energy, TAE TEAM<sup>1</sup> — The C-2U device<sup>2</sup> employed neutral beam injection and end-biasing to sustain an advanced beam-driven Field-Reversed Configuration plasma for 5+ ms, beyond characteristic transport time-scales. Three high-speed, filtered cameras observed visible light emission from neutral hydrogen and impurities, as well as deuterium pellet ablation and compact-toroid injection which were used for auxiliary particle fueling. Careful vacuum practices and titanium gettering successfully reduced neutral recycling from the confinement vessel wall. As a result, a large fraction of the remaining neutrals originate from charge-exchange between the neutral beams and plasma ions. Measured H/D- $\alpha$  emission is used with DEGAS2 neutral particle modeling to reconstruct the strongly non-axisymmetric neutral distribution. This is then used in fast-ion modeling to more accurately estimate their charge-exchange loss rate. Oxygen emission due to electron-impact excitation and charge-exchange recombination has also been measured using fast imaging. Reconstructed emissivity of O<sup>4+</sup> is localized on the outboard side of the core plasma near the estimated location of the separatrix inferred by external magnetic measurements.

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<sup>2</sup>M. Binderbauer, et al. Physics of Plasmas **22**, 056110 (2015)

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