

Abstract Submitted  
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**Diagnosing metastable populations in fusion edge plasmas using collisional-radiative modeling constrained by experimental observations<sup>1</sup>**

CURTIS JOHNSON, DAVID ENNIS, STUART LOCH, Auburn University, CONNOR BALLANCE, NICOLE DUNLEAVY, Queen's University Belfast, JEROME GUTERL, GA — The erosion of neutral tungsten at the plasma boundary is diagnosed in the Compact Toroidal Hybrid (CTH) experiment with a high-resolution spectrometer and a new Langmuirprobe allowing for simultaneous electron temperature, density and W spectral measurements. This data is used to constrain collisional-radiative modeling with ColRadPy, which suggests that neutral tungsten emission is dominated by non-steady-state metastable populations over a wide range of plasma conditions. Inferred non-steady-state metastable populations are presented using W I spectral lines near 260 nm. High-resolution tungsten spectra from CTH plasmas are compared to modeled emission using W I R-matrix excitation data and exchange classical impact parameter (ECIP) ionization constrained by Teand nefrom Langmuir probe measurements. The addition of a Chodura sheath for modeling fusion relevant divertor conditions and CTH plasmas suggest changes of the W relative metastable fraction by up to 50% when compared to modeling with no sheath, underlining the importance of understanding metastable effects when diagnosing W emission in fusion edge plasmas.

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