

Updates on the electron-impact excitation and ionization of the near-neutral stages of Tungsten

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A summary will be given as to the progress of electron-impact excitation and ionization work using the parallel DARC (Dirac Atomic R-matrix Codes) for neutral and singly-ionized Tungsten. The electron-impact excitation for neutral Tungsten [1] has been compared with observations taken at the CTH (Compact Toroidal Hybrid) experiment at Auburn University and reported in Johnston et al 2019[2].

Collisional Radiative (CR) modeling or the generation of a synthetic spectrum requires a meta-stable approach to the analysis, yet simple line ratios have been ascertained that have predicted CTH temperatures. Combined with ground and excited state ionization cross sections it is hoped that these may be used to provide SXB ratios or a theoretical determination of the impurity influx from Tungsten from plasma facing components, though there are outstanding issues.

The electron-impact excitation of WII (Dunleavy et al , in preparation) shall follow the same approach followed for neutral Tungsten. Ideally, from an experimental perspective it is beneficial to have spectral lines from different ion stages emitting within wavelength window.

References

- [1] Dirac R-matrix calculations for the electron-impact excitation of neutral tungsten providing noninvasive diagnostics for magnetic confinement fusion
R. T. Smyth et al, (2018) *Phys. Rev. A* **97**, 052705

- [2] Advances in neutral tungsten ultraviolet spectroscopy for the potential benefit to gross erosion diagnosis
C A Johnson et al, (2019) *Plasma Phys. Control. Fusion* **61** 095006