Update on atomic data and population models for hydrogen and tungsten

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Hydrogen and tungsten present different challenges to atomic data provision and subsequent collisional-radiative modelling. Advances in hydrogen, as the arguably most studied system, are incremental. But not all quantities required for fusion modelling are known to the same level of precision. Although some energy levels are known to 1 part in 9, the known precision for other processes is much poorer, eg electron impact ionization from excited levels is likely ~20%. The choice of tungsten as a plasma facing material for magnetic fusion plasmas has invigorated the study of tungsten via spectroscopy, ab initio data calculations and exploration of finite density effects. It is a more complex space than hydrogen and the precision is lower but significant progress has been made.

We survey the updates to hydrogen and tungsten data since the first meeting in 2021. Model advances at low temperatures, less than 0.2eV, are shown to be important in order to model divertor behaviour. Opacity effects and the contribution of reflections to the observed emission are also essential for a full understanding. The range of tungsten data and measurements has improved. High resolution spectra from EAST and WEST are extended to more ionization stages and further complementary EBIT experiments to unambiguously identify individual ions, and to benchmark uncertainty quantification for excitation data, are desirable. Unfortunately, there has been little advance in measuring, or calculating, data for ionization from neutral tungsten which was identified as the major missing process.