

Recent developments in ADAS and OPEN-ADAS: metals, influx and edge studies and web woes

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Since the last Data Centres Network meeting the focus for ADAS atomic data production has been on completing the dielectronic recombination (DR) calculations for tungsten and an increasing focus on data for other metals. Marker elements such as gold, innovative divertor concepts with liquid tin and quantifying the contribution of transition row elements to overall radiation motivate the upgrade of the existing baseline data.

The iso-nuclear set of tungsten DR data is not yet complete but the missing stages, W^{14+} - W^{29+} , are now bracketed with rates from a self-consistent calculation. Calculations are continuing but the open $4f$ shell configurations are dense in levels. Code developments for tungsten DR and ionization have enabled a much improved baseline for other metals and this has been exploited to produce data for gold, tin, copper and nickel. Optimizing the atomic structure, following a metric of converging total power, has improved data for the radiation aspect of the cooling curve.

Influx studies on tokamaks rely on high quality atomic data, principally for excitation and ionization rates. Data has been added to ADAS for tungsten ($W^0 - W^{4+}$), Rhenium (Re^0, Re^+) and gold (Au^0, Au^+), based on the optimization of atomic structure based on the core polarization techniques of the ASPECT group of the University of Mons. Although we expect this to be superseded by superior collisional calculations having good baseline quality data enables plasma modelling to advance.

The edge, divertor and SOL of tokamak plasmas is an interesting environment for atomic processes. Intermediate coupling resolved collisional-radiative data for argon has been demonstrated with ADAS codes and data. A new set of ion-impact data, a new ADAS dataclass, and a code for generating such data are being finalized. Thermal charge exchange between neutral hydrogen (or deuterium) and lowly ionized charge stages can act as a recombination process. Data for nitrogen via this process has been added.

The public web face of ADAS is OPEN-ADAS which makes available fundamental atomic data and fusion relevant derived data. A recent penetration test, run by the University of Strathclyde which hosts the service, uncovered a number of vulnerabilities. The web code was overhauled and the service is now delivered over https. Keeping up with the quickly evolving nature of the web is a challenge and more stringent rules on data provenance will affect data providers.