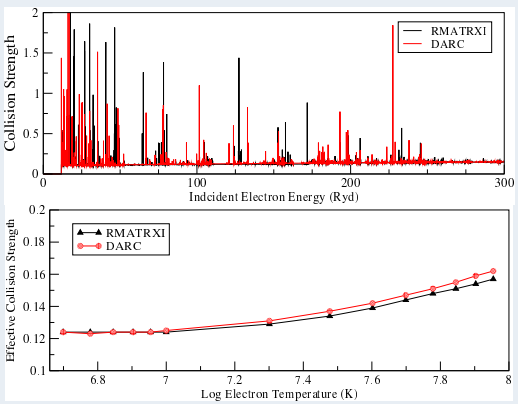
Atomic Data for Nuclear Fusion

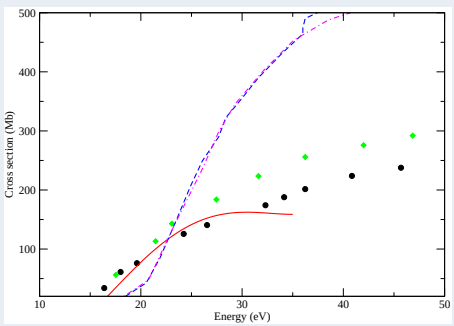
Michael Turkington QUB

Motivation

- Molybdenum and Tungsten are candidates for lining plasma facing components in tokamaks and fusion experiments (ITER, JET, DIII-D)
- Both have favourable physical properties such as high melting points and low sputtering rates
- Inevitably any PFC will be subject to erosion, which can lead to power loss or quenching of the fusion plasma. The effects of this erosion must be characterised.

Excitation & Ionisation

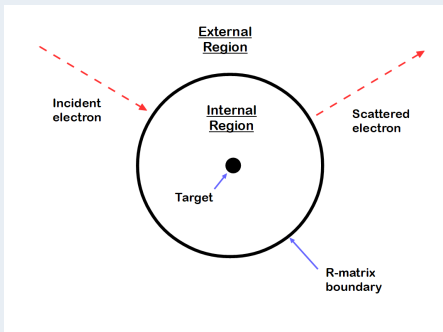




(Left) Excitation from the ground state of W^{63+}, comparing different scattering codes. (Right) Ground state ionisation of Mo^{+}.

Methodology

- In our research cluster, we produce accurate atomic structure data using codes like CIV3, GRASP and AUTOSTRUCTURE
- This feeds in the R-matrix scattering codes. The R-matrix method is defined by its subdivision of configuration space into an 'internal' (N+1)- electron region, and an 'external' N-electron region.



Outlook

- We will derive $\mathcal{PEC}$s and $\mathcal{SXB}$ ratios to derive new impurity diagnostics
- The work will be extended to more low-charge ions for both W and Mo