Abstract for an Invited Paper
for the DAMOP06 Meeting of
The American Physical Society

**Computational Atomic and Molecular Physis for Transport Modelling of Fusion Plasmas**[1]

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Various computational intensive non-perturbative methods are used to calculate the electron-atom, electron-molecule, and ion-atom collision processes found in high temperature fusion plasmas. The collision cross sections are benchmarked against approximate perturbative methods and experimental measurements. The baseline collision rate coefficients involving thousands of excited atomic levels are converted to generalized rate coefficients for ground and metastable atomic levels by solving collisional-radiative equations in the quasi-static equilibrium approximation, see H P Summers and M G O'Mullane in "Nuclear Fusion Research," (Springer, 2005), 399-413. The derived ionization balance and radiative power loss coefficients are then used in fusion plasma modelling codes to study Li and Be transport at DIII-D and to study W wall erosion at ASDEX-Upgrade and JET. These tokamak studies are testing critical design issues for ITER.

[1]In collaboration with S D Loch, Auburn Univ., C P Ballance and D C Griffin, Rollins College, and T Minami and D R Schultz, ORNL. Supported in part by grants from the U. S. Department of Energy.