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Electron Impact Excitation of W^40+ to W^43+ Ions: Cross Section and Polarization

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Tungsten has been planned to be used in the diverter region of International Thermonuclear Experimental Reactor (ITER) as it has the highest heat load capacity, highest melting point and more other favourable physical properties among the metals. Distinct ionic states of tungsten are predicted to be present from divertor to core of the ITER device. Thus, to understand the radiation emissions coming from the diverter region plasma, detailed and complete set of atomic data of electron impact excitation cross sections of various ionized tungsten ions in the wide energy range is required. In fact, such data are prime input in the plasma modeling. In addition to electron impact excitation there is also probability of photon emissions from the decay of these electron these excited states. Hence it may be important to study the linear polarization of photons emitted from these excited states to add to the understand the diagnostics of the ITER plasma.

Recently Ralchenko *et al.* [1] measured spectral lines in the range 12-20 nm and Utter *et al.* [2] measured spectral line in the range 4-8 nm coming from the charged states of tungsten ions produced in the electron beam ion trap (EBIT) facility at the Gaithersburg and Livermore respectively. In the light of these experiments, we have identified some lines in Se-like W^{40+} to Ga-like W^{43+} tungsten ions and calculated the electron impact excitation cross sections for the corresponding fine structure transitions. We found that there are no theoretical or experimental data of cross section and polarization are available in the literature for such lines. In order to describe the electron impact excitation, process we used fully relativistic distorted wave theory. Using these cross sections and density matrix theory, we further calculated polarization of the emitted photons as a result of decay of the electron from excited states. The detailed results of the cross sections and polarizations for various transitions in different ions will be presented in the conference.

References:

1. Yu Ralchenko et al., 2007, J. Phys. B **40**, 3861
2. S. B. Utter, P. Beiersdorfer, and E. Trabert 2002, Can. J. Phys. **80**, 1503

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Author: Ms SHUKLA, Neelam (IIT Roorkee)

Co-authors: Prof. SRIVASTAVA, Rajesh (Indian Institute of Technology (I.I.T.) Roorkee); Mrs DAS, Tapasi (University of Engineering & Management, Kolkata-700160, India)

Presenter: Ms SHUKLA, Neelam (IIT Roorkee)

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