Relativistic atomic structure calculations with application in fusion plasma

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In the meeting, I will present some of our recent works on relativistic atomic structure which are relevant to fusion plasma research. Fusion research requires accurate and reliable atomic data such as wavelength, energy levels, transition rates, oscillator strengths, etc. These atomic parameters are very fundamental keys for modelling and diagnosis of the plasma for the determination of densities, temperature, etc. in fusion plasmas.

In our work, we have calculated excitation energies or transition wavelengths, radiative rates, oscillator strength, line strength for fifteen Be like ions including Be-like W70+ , Ni24+ and Sn46+ [1-5]which are of particular interest for this project and also studied dependence of plasma parameters on plasma temperature and electron density for hot dense plasmas. The ratio of the intensities of spectral lines within HDP is calculated as a function of electron temperature. For the calculations of energy levels and radiative rates, we have used the multiconfiguration Dirac-Hartree-Fock(MCDHF) method employed in GRASP2K code[6]. The calculations are carried out in the active space approximation with the inclusion of the Breit interaction, the finite nuclear size effect, and quantum electrodynamics (QED) corrections. We have considered valence-valence, core-valence and core-core correlations in our calculations by taking single, double, triple and quartet (SDTQ) excitations. We have also assess the accuracy of our results and also compared our GRASP2K results with calculated excitation energies from FAC [7] and other theoretical, NIST and experimental results.

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