Contribution ID: **55** Type: **not specified**

Calculations of atomic structures and electron impact excitation cross sections of B-like Xe^{49+}

Atomic parameters of highly charged ions (HCI) are primely important for plasma control and diagnostics. A large amount of atomic data is needed to develop new spectral diagnostics for studying magnetic fusion plasma. Xenon, a rare gas, has been widely used in diagnosing tokamak fusion plasmas, for example, in ITER [1]. The temperatures in these magnetic fusion devices can go up to 25 keV, producing all possible highly charged states of Xe ions and hence necessitating the atomic data for highly charged xenon ions.
Recently, studies on calculating the atomic parameters of various HCIs of xenon have been reported. However, there is a scarcity of extensive results for boron-like Xe. In fact, the NIST ASD has no results for energies and transition lines for boron-like Xe. Motivated by the significance of atomic data of various ions of Xe in plasma physics, we aim to carry out an extended calculation to provide atomic parameters for boron-like Xe ions.
In the present study, the energies, electric dipole (E1) transition parameters, hyperfine interaction constants, Lande gJ and isotope shifts factors are calculated for the 213 levels of boron-like Xe ions using the multi-configuration Dirac-Hartree-Fock (MCDHF) theory. The levels under consideration include $1s^2 2s^2 nl$, $1s^2 2p^2 nl$, and $1s^2 2s2pnl$, where n: 2-5 and l: s, p and d, and are referred to as the multireference (MR) set. Calculations are done independently on even and odd states. A restrictive active space (AS) approach is used to monitor the convergence of the wave function. Active spaces (virtual orbitals) from n = 4 to n = 9, with l = s, p, d, and f are considered. The effect of electron correlations is studied by performing two different calculations in core-core and core-valence correlations. The significance of including the QED (self-energy and vacuum polarization) effects and Breit interactions on the atomic structure parameters is also analyzed. Our results agree well with the previous theoretical and experimental results wherever available. Having established the accuracy of the ionic wavefunctions, we further study electron impact excitation of Xe^{49+} using relativistic distorted wave approximation. The effective collision strengths are obtained from the calculated cross sections and assuming Maxwellian distribution of electrons'energy. Most of the present results are reported for the first time, and we hope these results will benefit plasma physics studies.

Presenting Author

Lalita Sharma

Presenting Author Affiliation

Indian Institute of Technology (IIT) Roorkee

Presenting Author Gender

Female

Country

India

Presenting Author Email Address

lalita.sharma@ph.iitr.ac.in

Primary author: SHARMA, Lalita (IIT Roorkee)

Co-authors: Ms RATHI, Shikha (IIT Roorkee); Mr SAHOO, Aloka (IIT Roorkee)

Presenter: SHARMA, Lalita (IIT Roorkee)

Session Classification: Poster Session