

# Atomic structure and Spectroscopic study of EUV and SXR transitions in Na- like ions.

Avnindra Kumar Singh<sup>1</sup>, Mayank Dimri<sup>1,2</sup>, Dishu Dawra<sup>1,2</sup> & M. Mohan<sup>2</sup>

1. Department of Physics, Deen Dayal Upadhyaya College, University of Delhi, Delhi-110078

E-mail: [avni.physics@gmail.com](mailto:avni.physics@gmail.com)

2. Department of Physics & Astrophysics, University of Delhi, Delhi-110007

E-mail: [drmanmohan.05@gmail.com](mailto:drmanmohan.05@gmail.com)

## ABSTRACT

In the present work, the spectroscopic study of atomic parameters of Na-like ions are examined and diagnosed in an extensive and detailed manner by using several different accurate methods which takes account of all kinds of multi-electron correlations & relativistic effects. We have presented energy levels of lowest 150 levels and radiative data for electric dipole (E1), electric quadrupole (E2), magnetic dipole (M1) and magnetic quadrupole (M2) transitions within Extreme Ultraviolet (EUV) and Soft X-ray (SXR) range from ground state within lowest 150 levels. We have matched our results with theoretical and experimental results available in literature only for few lowest levels and found good agreement with them. We have also discussed discrepancies with them. Further, due to insufficiency of atomic data from configuration interaction method (CIV3) for higher excited states due to excitation from core, we have carried out similar parallel calculation by employing fully relativistic codes GRASP, GRASP2K and distorted wave flexible atomic code (FAC) to check the reliability and authenticity of higher excited states. Our calculated energy levels with all theoretical methods match well with each other. We believe that our presented data may be beneficial in future for comparisons and identification of spectral lines, in Plasma Modelling and in Fusion and Astrophysical plasma research.

**ACKNOWLEDGMENTS:** This work is done under the project, “Study of Atomic Processes for Multi-Charged Ions for Plasma Diagnostics” which is being sponsored by SERB, Department of Science and Technology, Govt. of India.

Avnindra Kumar Singh is thankful to SERB-DST for providing the financial support. Mayank Dimri is also thankful to DST for assisting him as junior research fellow.

**Keywords:** Energy levels, radiative data, spectroscopic parameters, transition wavelength