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Energy levels, lifetimes, wavelengths, weighted oscillator strengths and transitions rates of He-like Zr

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In recent years, there have been extensive studies, both experimental and theoretical of helium isoelectronic sequence [1, 2, 3]. In this work, energy levels, wavelengths, weighted oscillator strengths, transitions rates, lifetimes have been calculated for the lowest 71 odd and even parity states arising from the $1s^2$ and $1snl$ $(n = 1 - 6, 0 \leq l \leq n - 1)$ configurations of He-like Zr.
The calculations were performed using the Multiconfigurational Dirac-HartreeFock (MCDHF) [4], followed by the Relativistic Configuration Interaction (RCI) methods. For the accuracy of our results, we have implemented parallel calculations using a Flexible Atomic Code (FAC) [5] by introducing the Relativistic Many-Body Perturbation Theory (RMBPT) method. Transition probabilities are reported for all E1, E2, M1 and M2 transitions. Breit interactions and quantum electrodynamics effects were included in the RCI calculations.
Comparisons were made with other available theories reported in the literature [6, 7, 8, 9]. A good agreement between them has been found, which confirms the reliability of our results. The present complete and consistent results can be used to facilitate the identification of many observed spectral lines in astrophysical and plasma fusion.

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