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Theoretical hyperfine splittings of heliumlike Be-7,9 ions for future studies of nuclear properties

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The hyperfine structures of the 2^3S_1 and 2^3P_J states of $^7\text{Be}^{2+}$ and $^9\text{Be}^{2+}$ are investigated within the framework of the nonrelativistic quantum electrodynamics, including relativistic and radiative corrections up to order $m\alpha^6$. The uncertainties of the calculated hyperfine splittings are on the order of tens of ppm, and for $^9\text{Be}^{2+}$ our results improve the previous theoretical and experimental values by at least two orders of magnitude. The improved sensitivity of the hyperfine splittings of $^7,9\text{Be}^{2+}$ to the nuclear Zemach radius and electric quadrupole moment opens the way to future measurements to extract the atomic physics values of these two nuclear properties to an accuracy of 5% or better.

Keyword-1

hyperfine structure

Keyword-2

relativistic and QED effect

Keyword-3

nuclear properties

Authors: Dr CHEN, Ai-Xi (Zhejiang Sci-Tech University); Dr ZHANG, Pei-Pei (Wuhan Institute of Physics and Mathematics); Dr SHI, Ting-Yun (Wuhan Institute of Physics and Mathematics); YAN, Zong-Chao

Co-authors: Dr DRAKE, G. W. F. (University of Windsor); Dr QI, Xiao-Qiu (Zhejiang Sci-Tech University); Dr ZHONG, Zhen-Xiang (Wuhan Institute of Physics and Mathematics)

Presenter: YAN, Zong-Chao

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