NUCLEAR SIZE AND CORE POLARIZATION

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We study the charge radii of exotic nuclei through nuclear calculations and isotopic-shift (IS) evaluations. The former ones are performed in the framework of the **DCM** and the **BDCM** [1] for nuclei with odd and even numbers of valence particles, respectively. These nuclear models take fully into consideration the correlation between valence particles as well as between valence and core particles. Consequently, our calculations can reveal features due to the strong correlation between the valence and the core polarized states. We will present the results obtained for the helium, lithium, and berilium isotopes. To check the reliability of the model, we have carried out isotopic-shift calculations by applying the eDCM to the electron subspace and calculating the field- and phase-shift, which characterize the isotopic-shift theory, in suitable electronic transitions. We have found that eDCM leads naturally to component of e^-e^+ pair in the three-electron wave functions of the lithium isotopes and two-electron wave funtions of the berillium isoptopes. It is well known that in the isotopic-shift theory the e^-e^+ pair contributes to isotopic-shift via the boiling of the QED vacuum mechanism [2]. The apperance of the e^-e^+ pair demonstrates, therefore, the good physics of the eDCM and lend confidence on the calculated nuclear charge radii. Additionally to the test performed on the charge radii calculated in the DCM and BDCM, we investigate the effect of the ground state core polarizations on the IS theory. The newly calculated terms may shed a new light on the charge radii especially for nuclei at the limits as ^{11}Li.

References

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