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Exotic Structures of Odd-A Carbon Isotopes in the Deformed Relativistic Mean-Field Theory

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Abstract: We study contributions of the pion meson and spatial component of the omega meson in the odd-A carbon isotopes. The pion and spatial omega provide small attractions in odd-A nuclei, giving rise to considerable influences on the single-particle energies rather than the bulk properties such as total binding energies, and root-mean-square (rms) radii. The $\pm\Omega$ (spin) splittings, arising from the spatial omega, are large in ^{11}C and ^{13}C and drop as the isospin rises in odd-A carbon isotopes. As an isovector, the pion can shift slightly the relative potential depth of neutron and proton, contrary to the role of the rho meson. There is a general trend that both the pion and spatial omega fields reduce with the rise of isospin in the isotopic chain. From the normal nucleus to halo nucleus, an abnormal drop of the pion or spatial omega field may occur, as can be seen in ^{19}C, ^{15}C, and ^{21}C.

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