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Deformation of SU(4) singlet spin-orbital state due to Hund's rule coupling HIROAKI ONISHI, TAKASHI HOTTA, Advanced Science Research Center, Japan Atomic Energy Agency — It has been widely recognized that the interplay of spin and orbital degrees of freedom plays a crucial role in the emergence of novel magnetism in strongly correlated systems. In this context, a one-dimensional spin-orbital model with the highest SU(4) symmetry has been one of the subjects of much interests from a theoretical viewpoint, and the critical behavior of the SU(4) singlet ground state has been clarified. However, in a more realistic situation, the Hund's rule coupling should break the SU(4) symmetry. In the present work, by exploiting a density-matrix renormalization group method, we investigate a one-dimensional spin-orbital model in which the SU(4) symmetry is broken down to $\mathrm{SU}(2)_{\mathrm{spin}}\times\mathrm{U}(1)_{\mathrm{orbital}}$ due to the Hund's rule coupling (J). At $J = 0$, spin and orbital correlations coincide with each other with a peak at $q = \pi/2$, indicating the SU(4) singlet state with a four-site periodicity. On the other hand, with increasing J, the peak position of orbital correlation changes to $q = \pi$, while that of spin correlation remains at $q = \pi/2$. We will discuss in detail how the SU(4) singlet state is deformed by the Hund's rule coupling.

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