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Spin-incoherent Luttinger liquid of one-dimensional spin-1 Bose gas HSIANG-HUA JEN, Institute of Physics, Academia Sinica, Taipei 11529, Taiwan, SUNGKIT YIP, Institute of Physics and Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan — A plethora of studies on one-dimensional (1D) quantum systems involve their ground state properties such as spatial and momentum distributions, quantum magnetism in a spinor Bose gas, and low-energy excitations in the Luttinger liquid model. A spinful quantum system in the spin-incoherent regime also provides a new avenue for studying 1D quantum many-body systems. Spin-incoherent Luttinger liquid (SILL) forms a different universality class from the Luttinger liquid, where the temperature is large enough that the degenerate spin configurations emerge while low enough that charge excitation is forbidden. In the SILL regime of a 1D spin-1 Bose gas, we investigate its many-body properties in Tonks-Girardeau limit in a harmonic trap. With zero magnetic field in the sector of $S_z = 0$, we derive the density matrix for the three individual components of the spin-1 Bose gas(spin-up,down,and 0). The momentum distributions are broadened compared with the spinless Bose gas and in the large momentum limit follow the asymptotic $1/p^4$ dependence but with reduced coefficients. While the density matrices and momentum distributions differ between different spin components for small N, at large N they approach each other. We show these by analytic arguments and numerical calculations up to N=16.

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