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Ferromagnetism in spin-1/2 Bose and Fermi gases confined by elongated potential[1] SHINTARO TAKAYOSHI, ISSP, MASAHIRO SATO, RIKEN, SHUNSUKE FURUKAWA, University of Toronto — Internal degrees of freedom in many-body systems generally provoke a variety of phenomena, as electron spins in solids generate various magnetic structures. As the simplest system with internal degrees of freedom we study one-dimensional two-component (pseudospin-1/2) Bose/Fermi gas, which could be realized by using ultra-cold atoms. If a strong repulsion is introduced between two components, the spontaneous population imbalance (i.e., ferromagnetism) is expected to appear. However, it is known that the existent weak- and strong-coupling theories cannot capture the nature of the imbalanced phase and the ordering. We have thoroughly studied them [1] by combining numerical approaches (exact diagonalization and infinite time-evolving block decimation) with some analytic methods in an efficient manner. It is shown that (i) the universality class of the ferromagnetic transition drastically changes from a first order to an Ising type when an inter-component hopping is introduced, and (ii) the imbalanced phase has a gapless "charge" mode and a gapped "spin" one. [1] S.Takayoshi, M.Sato, and S.Furukawa, arXiv:0911.3157.

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Shintaro Takayoshi
Institute for Solid State Physics, University of Tokyo

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