Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Ferromagnetic Pairing Ground States on Two-Coupled Chains
AKINORI TANAKA, Ariake National College of Technology — Recently, ferromagnetic superconductivity was discovered in $ZrZn_2$, UGe_2 and URhGe. Microscopic explanation of this phenomenon is a challenge in theoretical physics, but the problem is rather subtle and difficult, since we have to treat rotational symmetry breaking of spin and electron-pair condensation simultaneously. At the present stage, it is expected that a simple concrete model exhibiting both ferromagnetism and electron-pair condensation, even if it has somewhat artificial aspects, will shed some light on understanding of mechanisms of ferromagnetic superconductivity. Here we report an extended Hubbard model on two chains which has fullypolarized pairing ground states. The Hamiltonian consists of intra-chain electron-hopping, on-site repulsion, inter-chain charge attraction and inter-chain ferromagnetic interaction terms. The following is shown in our model. In the case where the on-site repulsion term is vanishing, the model has degenerate ground states in which electrons form spin triplet pairs, and thus the ground states exhibit electron-pair condensation but do not exhibit ferromagnetism. When the on-site repulsion is added, the model has the unique (up to spin degeneracy) ground state in which ferromagnetism and electron-pair condensation coexist. We also present an extension of the model to higher dimensional cases.

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Date submitted: 19 Nov 2007 Electronic form version 1.4