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Coexistence of antiferromagnetism and superconductivity induced by Pauli-paramagnetic pair breaking KAZUSHI AOYAMA, Young Researcher Development Center, Kyoto University, RYUSUKE IKEDA, Department of Physics, Kyoto University — The heavy-fermion material $CeCoIn_5$ is a spin singlet d-wave superconductor with a strong Pauli-paramagnetic pair-breaking (PPB) effect. In the case with a magnetic field parallel to the basal plane of this material , there exists a distinct high field and low temperature (HFLT) superconducting (SC) phase in which a Fulde-Ferrell-Larkin-Ovchinnikov vortex lattice may be realized as a result of the strong PPB. Recently, it has been clarified that an antiferromagnetic (AFM) order exists inside the HFLT SC phase in spite of the absence of AFM order in the nonsuperconducting state [1]. Considering that AFM and SC orders are competing with each other in zero field, it is surprising that the AFM ordering is enhanced in the SC state. We theoretically study the stability of an AFM order in a d-wave and paramagnetic superconductor. We show that the PPB enhanced strongly by increasing the magnetic field induces an AFM order inside the SC phase and that, in contrast to the competitive nature of AFM and SC orders, the induced AFM order is not localized in vortex cores but coexistent with the SC order [2]. [1] M. Kenzelmann et al., Science 321, 1652 (2008). [2] K. Aoyama and R. Ikeda, arXiv:1107.5577.

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