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Intrinsic p-wave pair amplitude in a trapped ultracold s-wave superfluid Fermi gas YUKI ENDO, DAISUKE INOTANI, RYO HANAI, YOJI OHASHI, Keio University — We theoretically discuss the possibility that an unconventional p-wave Cooper-pair amplitude is induced in the ordinary s-wave superfluid Fermi gas. Using a Hubbard model, we numerically show that such a phenomenon really occurs, when both the spatial and (pseudo) spin inversion symmetries of the system are broken. In an ultracold Fermi gas, this situation is shown to be realized, when two spin states (that describe two atomic hyperfine states contributing to s-wave Cooper pairs) feel different trap potentials. Thus, in this situation, when the s-wave pairing interaction is suddenly changed to a p-wave one by using the Feshbach resonance technique, at least just after this tuning, the p-wave superfluid Fermi gas is expected to be realized (which is characterized by the superfluid order parameter given by the product of the p-wave pair amplitude and the p-wave pairing interaction). In this talk, we also clarify the optimal condition to obtain the p-wave pair amplitude in the BCS-BEC crossover region, using the BCS-Leggett strong-coupling theory.

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