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The effective Bose-Fermi scattering length in spin-polarized Fermi superfluids[1] EDWARD TAYLOR, ALLAN GRIFFIN, University of Toronto, YOJI OHASHI, Keio University — The analysis of experiments done on the BEC side of a Feshbach resonance for spin-polarized Fermi superfluids is greatly simplified by realizing that the system can be described by a Hamiltonian for a Bose-Fermi mixture, where the bosons are diatomic molecules and the fermions are the remaining unpaired atoms. To do this, however, one needs an expression for the effective boson-fermion scattering length a_{BF} that includes many-body effects which become important close to unitarity. For two-body scattering *in vacuo*, Skorniakov and Ter-Martirosian (STM) showed in 1957 that the exact value is $a_{BF} = 1.18a_F$, a result also obtained recently by Brodsky and coworkers using a diagrammatic approach. We derive an expression for a_{BF} in the BEC region of a spin-polarized Fermi superfluid using an alternative path-integral treatment of quartic fluctuations, which gives the essential physics of a_{BF} is a simple manner and also allows us to include many-body effects. In the experimentally relevant regime outside the extreme BEC limit, we find corrections to the STM value arising from the fact that scattering occurs in a background gas of condensed Cooper pair bosons, and not in the vacuum.

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