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Skyrmion-induced bound states in a superconductor[1] SERGEY S. PERSHOGUBA, Nordita, Center for Quantum Materials, KTH Royal Institute of Technology, and Stockholm University, Roslagstullsbacken 23, S-106 91 Stockholm, Sweden, SHO NAKOSAI, Condensed Matter Theory Laboratory, RIKEN, Wako, Saitama, 351-0198, Japan, ALEXANDER V. BALATSKY, Institute for Materials Science, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA — We consider a superconductor proximity coupled to a two-dimensional ferromagnetic film with a skyrmion texture. We predict the skyrmion bound states (SBS) that are induced in the superconductor, similar to the well-known Yu-Shiba-Rusinov (YSR) states. Using the T-matrix calculations and numerical modeling we calculate the spin-polarized local density of states in the superconductor in the vicinity of the skyrmion. The SBS wavefunctions have spatial power-law decay. Presence of the SBS suggests the mechanism by which superconductivity could facilitate an effective long-range interaction between skyrmions when their SBS wavefunctions overlap.

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