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Supersymmetry and Goldstino-like Mode in Bose-Fermi Mixtures
YUE YU, ITP, Beijing, KUN YANG, National High Magnetic Field Laboratory and Florida State University — Supersymmetry is assumed to be a basic symmetry of the world in many high energy theories, but none of the super partners of any known elementary particle has been observed yet. We argue that supersymmetry can also be realized and studied in ultracold atomic systems with a mixture of bosons and fermions, with properly tuned interactions and single particle dispersion. We further show that in such non-releativistic systems supersymmetry is either spontaneously broken, or explicitly broken by a chemical potential difference between the bosons and fermions. In both cases the system supports a sharp fermionic collective mode similar to the Goldstino mode in high-energy physics, due to supersymmetry. We also discuss possible ways to detect this mode experimentally.

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