

Spin superfluidity in YIG films

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Recently it was suggested that spin supercurrents analogous to supercurrents in superfluids are possible in the magnon BEC observed in yttrium-iron-garnet (YIG) magnetic films under strong external pumping. Bozhko *et al.* [1] declared experimental detection of spin supercurrent in a decay of the magnon condensate in YIG. Here we analyze possibility of spin superfluidity in YIG films. From topology of the equilibrium order parameter in YIG one must not expect energetic barriers making spin supercurrents metastable. However, some small barriers of dynamical origin are possible nevertheless. The critical phase gradient (analog of the Landau critical velocity in superfluids) is proportional to intensity of the coherent spin wave (number of condensed magnons). The conclusion is that although spin superfluidity in YIG films is possible in principle, the published claim of its observation [1] is not justified. A byproduct of the analysis is revision of the widely accepted spin-wave spectrum in YIG films after properly taking into account the magnetostatic and exchange boundary conditions on film surfaces.

References:

[1] D. A. Bozhko *et al.*, *Nat. Phys.* **12**, 1057 (2016)