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Superfluidity of magnons in ferromagnetic films CHEN SUN, Texas AM University, THOMAS NATTERMANN, University of Cologne, VALERY POKROVSKY, Texas AM University, Landau Institute for Theoretical Physics — The magnon Bose-Einstein condensation in Yttirum Iron Garnet films at room temperature was discovered by the Münster experimental group (S.O. Demokritov) in 2006. Since the magnon condensate is coherent the natural question is whether the condensate is superfluid. Though the normal magnon density exceeds the condensate density in about 100 times, the velocity of the superfluid part is by 5-7 decimal orders larger than that of the normal part at the same field gradients. Thus, the spin current is dominated by the condensate, i.e. superfluid. A deeper obstacle is that the phase trapping is inconsistent with the free motion whose phase linearly depends on coordinate. The superfluidity can start only after submission of a finite (threshold) energy to the condensate by an external source. At energy close to threshold, the phase on long intervals of length remains close to the trapped values and changes by 2π on a comparatively short intervals (phase solitons). The superfluid velocity remains almost zero between solitons and acquires finite value inside solitons. Thus, the current and number of magnons are not conserved locally transferring the spin momentum to the lattice, but they are conserved globally. All these phenomena are due to the dipolar forces.

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