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Theory of Magnon Drag in Ferromagnetic Bilayers[1] TIANYU LIU, GIOVANNI VIGNALE, Department of Physics and Astronomy, University of Missouri, Columbia, MICHAEL E. FLATTÉ, Optical Science and Technology Center and Department of Physics and Astronomy, University of Iowa — We introduce and study theoretically a novel drag effect that we expect to occur in ferromagnetic bilayer systems. A steady spin-wave (magnon) spin current propagating in one layer (the active layer) induces an inhomogeneous distribution of magnons in the other layer (the passive layer) through the magnetic dipole-dipole interaction. There are significant differences between this effect and the ordinary and well-studied Coulomb drag in electronic bilayers. First, the particles in questions are bosons, and their number is not conserved (this is at variance with systems of bosonic atoms, where number is conserved). Second, it becomes essential to take into account, besides magnon-magnon scattering, processes in which two magnons in one layer merge to produce a magnon in the other, or a magnon in one layer decays producing two magnons in the other. In analogy to the theory of Coulomb drag we calculate the interlayer transport coefficients (relating, for example, the temperature gradient in one layer to the spin current in the other) for different experimental configurations.

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Tianyu Liu
Department of Physics and Astronomy, University of Missouri, Columbia

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