Collective effects and instabilities of magnon gases and condensates

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A magnon gas is a promising model system for the investigation of interacting bosonic particles and thus for correlated systems in general. Its potential is due to the wide controllability of the magnon-magnon interaction by change both of spectral properties and quantity of magnons. The most effective technique to control the magnon gas density is a microwave parametric pumping. The pumping role is manifold: it serves both as an energy source and as a strong disturbing factor in the spin-wave system. In my talk I will show three distinct effects caused by the influence of parametric pumping on a magnon gas.

The first phenomenon discussed is the storage and recovery of a microwave signal in a ferrite film. It is explained by competing interactions between different magnon groups amplified by parametric pumping.

In the second part I will focus on the behavior of a parametrically driven magnetic medium after the pumping source is switched off. This defines the important problem of pumping-free evolution of a non-equilibrium magnon gas. I will report on the first observation of the energy transfer in the magnon gas caused by the influence of the non-compensated field of the parametrically generated correlated magnon pairs. Finally, the free evolution of a Bose-Einstein condensate of parametrically injected magnons after shutdown of a pumping microwave field studied by means of time-resolved Brillouin light scattering spectroscopy will be demonstrated.