Energy Transfer between Dipolar-coupled Magnetic Disks by Stimulated Vortex Gyration

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Coupled oscillations exist in many forms in nature. Popular examples are coupled pendulums and capacitively-coupled inductor-capacitor resonators. Coupling between different oscillatorsresults in energy transfer between them. Based on the concept of coupled oscillators, we explored a new type of energy transfer between physically separated magnetic nanodisks. A possible energy transfer between two coupled vortex-state disks was experimentally observed using time-resolved soft X-ray microscopy[1,2]. The rate of energy transfer from one disk to the other was deduced from the two normal modes' frequency splitting caused by dipolar interaction. The interaction strength and the energy transferrate are tunable by manipulating the relative vortex polarization in both disks as well as the separation distance between the two oscillators. We are going to presentdirect experimental observationsof energy transfer and the collective normal modes in coupled vortex oscillators, and interdistance dependences. The stimulated vortex gyration demonstrated in this work is a robust means of efficient energy transfer and information-signal transport between physically separated magnetic disks, and provides for the advantages of low-energy-dissipation signal transmission and low-power signal input. This work was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (No. 20110000441).

References

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