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Measurement of the dynamical dipolar coupling in a pair of magnetic nanodisks using a ferromagnetic resonance force microscope

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Abstract

We perform a spectroscopic study of the collective spin-wave dynamics occurring in a pair of magnetic nanodisks coupled by the magnetodipolar interaction. We take advantage of the stray field gradient produced by the magnetic tip of a ferromagnetic resonance force microscope to continuously tune and detune the relative resonance frequencies between two adjacent nano-objects. This reveals the anticrossing and hybridization of the spin-wave modes in the pair. At the exact tuning, the measured frequency splitting between the binding and antibinding modes corresponds to the strength of the dynamical dipolar coupling Ω. This accurate ferromagnetic resonance force microscope determination of Ω is measured versus the separation between the nanodisks. It agrees quantitatively with calculations of the expected dynamical magnetodipolar interaction in our sample.

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