

Dual-cantilever magnetometry

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We have designed and realized dual-cantilever magnetometry system, in which coupling magnetic forces between the two cantilevers can be switched on/off by external magnetic field. The coupling is realized by two ferromagnetic ellipses, located each one on one of the cantilevers. One of the ellipses is “narrow”, and shows only single-domain magnetic state independently on the external field applied; the second one is “wide”, and shows also closure-domain state. In such configuration, the interacting force between the cantilevers can be attractive, repulsive, or is switched off when the closure domain state appears in the wide ellipse. The coupling between the ellipses directly corresponds to the phase-shift of the vibrating cantilevers. In this sense, the phase-shift of the dual-cantilever can be used to read the magnetic state of the ellipses. In this work we present the fabrication of the dual-cantilever magnetometer, micromagnetic simulations of the magnetic state of the ellipses, and we interpret the experimental results achieved.