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Complete mapping of the spin-wave spectrum in a vortex-state nanodisk

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Abstract

© 2016 American Physical Society.We report a study on the complete spin-wave spectrum inside a vortex-state nanodisk. Transformation of this spectrum is continuously monitored as the nanodisk becomes gradually magnetized by a perpendicular magnetic field and encounters a second-order phase transition to the uniformly magnetized state. This reveals the bijective relationship that exists between the eigenmodes in the vortex state and the ones in the saturated state. It is found that the gyrotropic mode can be continuously viewed as a uniform phase precession, which uniquely softens (its frequency vanishes) at the saturation field to transform above into the Kittel mode. By contrast, the other spin-wave modes remain finite as a function of the applied field, while their character is altered by level anticrossing.

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