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Static and Dynamic Properties of Magnetic Antivortices in Asteroid-Shaped Permalloy Nanomagnets ALI TAHA HABIBOGLU, VEDAT KARAKAS, MUSTAFA METE, AHMET COSKUNER, YEMLIHA BILAL KALYONCU, AISHA GOKCE, OZHAN OZATAY, Bogazici University, ANNA GIORDANO, MARIO CARPENTIERI, University of Calabria, GIOVANNI FINOCCHIO, University of Messina, FEDERICA CELEGATO, CNR Institute of Materials for Electronics and Magnetism, PAOLA TIBERTO, INRIM Istituto Nazionale di Riccerca Metrologica — Patterned nanomagnets display unconventional spin configurations like vortex, anti-vortex, bubble, which have unique static and dynamic properties. Such micro-magnetic structures are potentially applicable to ultrafast memory, rf oscillators and detectors. Studies on magnetic thin films containing vortex structures exhibit interesting behavior under external field and/or current bias like polarity switching, core displacement and core gyration with high frequencies inside the nanomagnet. In this study, we report on our investigation of stable antivortex formation conditions and the subsequent magnetic field/dc current driven excitations in 2x2μm^2 Permalloy based asteroid geometry devices which exhibit an anti-vortex pair nucleation at the center. The Magnetic Force Microscopy images show that the antivortex pair can be rotated around the center by an external magnetic field. We obtain a high frequency (GHz) signal measured via anisotropic magneto-resistance effect (AMR) under constant dc current-bias which triggers antivortex pair gyration around the center of the device through spin transfer torque. We study the dynamic response of the structure as a function of current and field to assess utilization of the device as a practical on-chip microwave oscillator.

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