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Taking Ferromagnetic Resonance to Millikelvin Temperatures
HANS HUEBL, CHRISTOPH ZOLLITSCH, FREDRIK HOCKE, MATHIAS WEILER, MARTIN RADLMEIER, KARL NEUMAIER, SEBASTIAN T.B. GOENNENWEIN, RUDOLF GROSS, Walther-Meissner-Institut — Ferromagnetic Resonance (FMR) is a sensitive tool for the investigation of magnetic anisotropy and magnetization damping in thin magnetic films. Broadband FMR based on coplanar waveguide technology hereby is particularly attractive as it allows for the investigation of plain films as well as of single magnetic nanostructures. We here present broadband FMR data of 50 nm thick nickel and cobalt thin films, recorded at temperatures range from 4.2 K down to 50 mK. The excellent sensitivity of our setup allows for the detection of FMR with an incident microwave power of 100 fW at the base temperature of the dilution refrigerator. Our FMR measurements in Co and Ni reveal no distinct temperature dependence of the anisotropy and damping parameters in the temperature regime below 4.2 K, which appears consistent with the trend observed in measurements from room temperature down to 4.2 K. Our proof-of-principle experiments open the path for broadband FMR studies of magnetic anisotropy and magnetization damping at millikelvin temperatures a regime so far very scarcely explored. This project is financially supported by the Deutsche Forschungsgemeinschaft via SFB 631 and the Cluster of Excellence Nanosystems Initiative Munich (NIM).

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