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Nanomechanical Detection of Radio Frequency AC Susceptibility in Individual Thin Permalloy Elements DYLAN T. GRANDMONT, Department of Physics, University of Alberta, Edmonton, Alberta, Canada, JOSEPH E. LOSBY, LANCE C. PARSONS, FATEMEH FANI SANI, MARK R. FREEMAN, Department of Physics, University of Alberta, Edmonton, Alberta, Canada and National Institute for Nanotechnology (NINT), Edmonton, Alberta, Canada , GREGORY E. BRIDGES, KAVEH MOHAMMAD, ELHAM SALIMI, DOUGLAS J. THOMSON, Department of Electrical and Computer Engineering, University of Manitoba, Winnipeg, Manitoba, Canada — We report a new method for RF AC susceptometry in individual mesoscopic permalloy elements fabricated onto nanomechanical torque resonators. The technique involves the mixing of orthogonal AC magnetic field excitations to yield net magnetic torques at difference frequencies corresponding to torsional mechanical resonances. Simultaneous detection of both DC and frequency-dependent signatures through multi-frequency lock-in detection is possible, allowing for the separation of reversible responses as a function of field. The measurements can be conducted at room temperature with high applied fields, and extended to be sufficiently broadband to complement existing techniques for probing magnetization dynamics.

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