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The realization of an artificial magnetoelectric heterostructure (FeCo/AlN) micro-beam resonator for ultra-high sensitivity magnetic sensing applications[1] STEVEN BENNETT, MARGO STARUCH, US Naval Research Laboratory, Materials Science and Technology Division, BERNARD MATIS, JEFFREY BALDWIN, US Naval Research Laboratory, Acoustics Division, SHU CHENG, KONRAD BUSSMANN, PETER FINKEL, US Naval Research Laboratory, Materials Science and Technology Division — It's becoming more and more crucial to develop high sensitivity magnetic sensors that are chip-based and cryogen-free. Recent advances in artificial multiferroics and magnetostrictive/piezoelectric materials have opened the door to novel micron-scale magnetic field tunable resonator devices [1]. Here we show how magnetostrictive FeCo can be grown in-situ on a piezoelectric AlN micro-beam with coupled heterostructural strain. The resulting magnetostrictive properties of FeCo produce a considerable resonance shift when placed in a magnetic field [2]. The piezoelectric AlN underlayer captures this signal at two regions of maximum planar strain in the first harmonic mode. Our results reveal FeCo beams with a considerable strain induced resonance shift in a DC magnetic field when driven with either a piezo-shaker, or a small AC field. Furthermore, we demonstrate how the use of a beam geometry, rather than a standard resonant cantilever, fundamentally achieves an increase sensitivity to magnetic fields. [1] E. Lage, *et. Al., Nature Materials* **11** (2012) [2] M. Staruch, *et. Al., Appl. Phys. Lett.* **107** (2015)

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