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Minimizing 1/f Noise in Magnetic Sensors Using MEMS Flux Concentrators ALAN EDELSTEIN, GREG FISCHER, U.S. Army Research Laboratory, MICHAEL PEDERSEN, WILLIAM BERNARD, MEMS Exchange, SHU-FAN CHENG, Naval Research Laboratory, EDMUND NOWAK, University of Delaware — The 1/f noise of new types of magnetoresistance sensors based on GMR and MTJ limits their sensitivities at low frequencies. Our approach for dealing with this problem is to shift the operating frequency to higher frequencies where the 1/f noise is much lower. The shift is accomplished by placing flux concentrators on MEMS flaps. Springs connecting the flaps are used to establish the proper normal mode. The motion of the MEMS structure, driven to oscillate at 15 kHz by electrostatic comb drives, modulates the field at the position of the sensor. The device was fabricated using SOI wafers, deep reactive ion etching (DRIE), and flip chip bonding. The motion of the permalloy on the MEMS flaps modulates the field by a factor of 2. Driving the motion only requires microwatts of power. Noise measurements indicate that the device is likely to increase the sensitivity of many magnetic sensors at low frequencies by orders of magnitude.

Alan Edelstein
U.S. Army Research Laboratory

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