ACOUSTICS2008/2679
MEMS-based magnetic and electrostatic acoustic microspeakers

Michael Pedersen
Novusonic Corporation, P.O. Box 183, Ashton, MD 20861, USA

Acoustic microspeakers remains a challenging application area for MEMS technology. This is mostly due to the inherently low transduction factors normally achievable in MEMS technology. While established electromagnetic transduction principles may be adapted for MEMS technology, there are also other transduction methods, such as electrostatic, with high performance potential. In this paper, the design, fabrication, and testing of two different types of MEMS microspeakers is presented. Firstly, an electromagnetic microspeaker is shown consisting of a MEMS diaphragm with integrated moving and an external rare earth permanent magnet and yoke structure. Secondly, a novel MEMS electrostatic microspeaker based on rolling contact is presented. In this device, high transduction forces are achieved by the strong electrical field over a solid insulator, and the forces are translated to a MEMS diaphragm by an integrated cantilever structure. Measurements on the electromagnetic microspeakers show a sensitivity of 83 dB SPL/mW at 1 kHz in a B&K 4153 acoustic coupler. The resonance frequency of the 6mm diameter diaphragm was 3.2 kHz. Numerical simulations suggest that simple changes to the moving coil geometry and material may increase the sensitivity to 108 dB SPL/mW.