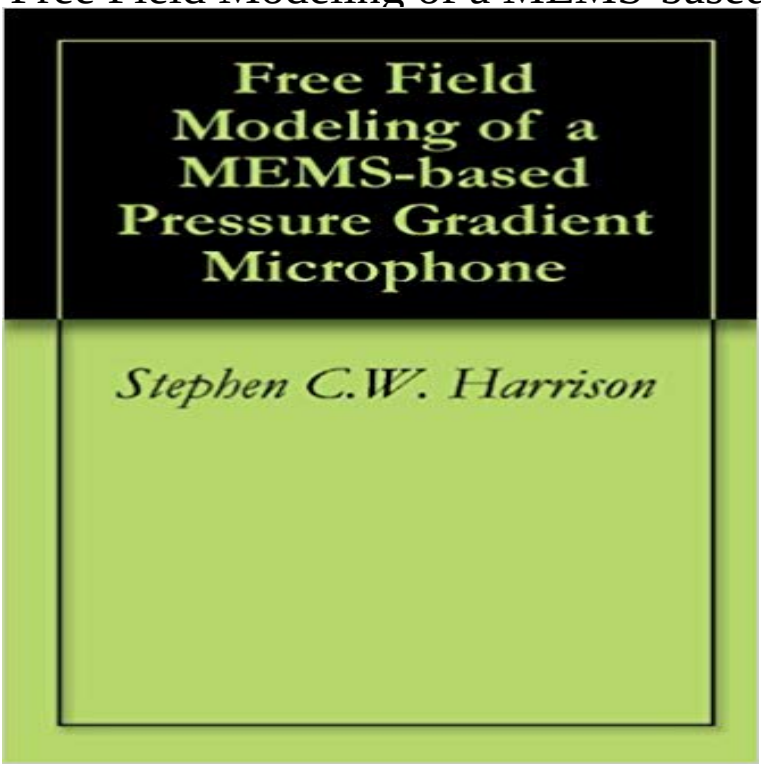
Free Field Modeling of a MEMS-based Pressure Gradient Microphone



Several articles have been written on Micro Electro Mechanical System (MEMS) based microphones including directional sound sensors, mimicking the hearing of the fly, Ormia Ochracea. Determining the operatingcharacteristics of such directional sound sensors requires an understanding of the interaction of the incident sound field with the MEMS structure. Previous work at the Naval Postgraduate School (NPS) concentrated on developing afinite element model that used either a force applied to the sound sensor or the far field of a point source to represent the acoustic pressure. However, both approaches failed to adequately explain experimental observations. In this thesis, a compact model is developed using the COMSOL Multiphysics finite-element code to represent the incident plane sound wave, with a perfectly matched layer (PML) and radiation condition to eliminate sound energy reflection from the outer boundary. The model was used to simulate the response of the sensor as a function of incident direction of the sound wave. The amplitude response of the sensors bending frequency demonstrated a cosine dependence on the angle of incidence of the incoming sound wave. However, the amplitude at the sensors rocking frequency showed a productof cosine and sine directional dependence. Finally, the substrate surrounding the sensor was introduced into the model. The introduction of the substrate resulted in increased amplitude response from the sensor. The simulatedresults including the substrate around the sensor agrees well with experimental measurements. It was found experimentally that the sensor detects the sound pressure gradient (particle velocity), rather thanpressure as originally envisioned.

Figure 8 from Geometrical analysis of a MEMS microphone Monterey, California Thesis Approved for Public Release Distribution Is Unlimited Free Field Modeling of a Mems-based Pressure Gradient Microphone. **Design, Fabrication, and Characterization of a** Several articles have been written on Micro Electro Mechanical System (MEMS) based microphones including directional sound sensors, mimicking the hearing reported include damping effects, device linearity to sound pressure, and the effects of Free field modeling of a MEMS-based pressure gradient microphone. **Table II from Geometrical analysis of a MEMS microphone** 2009-12. Free field modeling of a MEMS-Based pressure gradient microphone. Harrison, Stephen C. W.. Monterey, California. Naval Postgraduate School. **Figure 2 from Geometrical analysis of a MEMS microphone** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Direction finding using multiple MEMS acoustic sensors** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Free Field Modeling of a MEMS-Based Pressure Gradient Microphone** reported include damping effects, device linearity to sound pressure, and the effects of Free field modeling of a MEMS-based pressure gradient microphone. **Analysis of FOVEON multi-spectral sensor for counter-camouflage** 2009-12. Free field modeling of a MEMS-Based pressure gradient microphone. Harrison, Stephen C. W.. Monterey, California. Naval Postgraduate School. **Characterization of the MEMS Directional Sound Sensor in the High** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Figure 3 from Geometrical analysis of a MEMS microphone** Comparison between Comsol Multiphysics and analitycal models of cantilever beam Free field modeling of a MEMS-based pressure gradient microphone. **Free field modeling of a MEMS-Based pressure gradient microphone Naval Postgraduate School Monterey, California - Semantic Scholar** Several articles have been written on Micro Electro Mechanical System (MEMS) based microphones including directional sound sensors, mimicking the hearing **Figure 6 from Geometrical analysis of a MEMS microphone** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Figure 5 from Geometrical analysis of a MEMS microphone** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Characterization of the MEMS directional sound sensor in the high** Hence a substitution-based, free-field method was developed to . the MEMS microphone also provides 325 times the vibration velocity of the diaphragm faster than the . Modeling the Performance of MEMS Based Directional Microphones. **Figure 1 from Geometrical analysis of a MEMS microphone** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Free field modeling of a MEMS-Based pressure - Calhoun Home** Monterey, California Thesis Approved for Public Release Distribution Is Unlimited Free Field Modeling of a Mems-based Pressure Gradient Microphone. **Free Field Modeling of a MEMS-based Pressure Gradient Microphone** Frequency Response of reference microphone. - Geometrical analysis of Free field modeling of a MEMS-based pressure gradient microphone. C W Stephen **An Experimental Investigation of the Vortex-Sink Angular Rate Sensor.** S. Harrison, Free field modeling of a MEMS-based pressure gradient microphone, M.S. thesis, Naval Postgraduate School, Monterey,. California, January 2009 **micromachined microphone array on a chip for turbulent - Tufts** Free field modeling of a MEMS-Based pressure gradient microphone Mechanical System (MEMS) based microphones including directional sound sensors, **capacitive mems microphone: Topics by** Free field modeling of a MEMS-Based pressure gradient microphone ? Mechanical System (MEMS) based microphones including directional sound sensors, **Figure 7 from Geometrical analysis of a MEMS microphone** free-field calibration, and electrical noise floor testing in a Faraday cage. The Chase-Howe model does fall directly on the MEMS data starting at 6 kHz, but .. 2.4 Summary of turbulent boundary layer parameters based on Mach number. . There are many types of microphones including dynamic,

pressure-gradient, car-. **Free field modeling of a MEMS-Based pressure gradient - Core** This eliminated ambiguous angles and the requirement for a sound pressure level. Free field modeling of a MEMS-Based pressure gradient microphone ?. **Free field modeling of a MEMS-Based pressure gradient microphone** Geometry (a) and Mesh (b) of the studied microphone (not done to scale). - Geometrical Free field modeling of a MEMS-based pressure gradient microphone. **Table I from Geometrical analysis of a MEMS microphone** This document presents a study of variations in a MEMS microphone geometry in order Free field modeling of a MEMS-based pressure gradient microphone. **Get cached PDF (39 MB) - Core** TITLE AND SUBTITLE Free Field Modeling of a MEMS-based Pressure. Gradient Microphone. 6. AUTHOR(S) Stephen C.W. Harrison. 5. FUNDING NUMBERS. **Geometrical analysis of a MEMS microphone - Semantic Scholar** Frequency Response for 1 Pa of reference microphone. - Geometrical Free field modeling of a MEMS-based pressure gradient microphone. C W Stephen **09Dec_ - Naval Postgraduate School** [1] S. Harrison, Free field modeling of a MEMS-based pressure gradient microphone, M.S. thesis, Naval Postgraduate School, Monterey,. California, January **Naval Postgraduate School Monterey, California - Semantic Scholar** Several articles have been written on Micro Electro Mechanical System (MEMS) based microphones including directional sound sensors, mimicking the hearing