

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Design and Characterization of an Optical Feedback-Controlled Microphone for Aeroacoustics Research¹ ELIOTT RADCLIFFE, AHMED NAGUIB, Michigan State University, MI-48824, WILLIAM HUMPHREYS, JR., NASA Langley Research Center, VA-23062 — An optical feedback-controlled microphone was designed and tested for potential use in phased “beam-forming” arrays used in aeroacoustics research. Optical sensing was employed as a means for measuring center displacement of a stretched thin membrane due to incident acoustic pressure. The membrane was constructed of PVDF which exhibits piezoelectric properties allowing actuation of the membrane in a feedback system. The latter was used to actively modify sensor parameters, most notably membrane stiffness, resonant frequency, and damping. Testing of a prototype microphone was performed using a plane wave tube calibrator. The results demonstrate that feedback control is an effective method for improving the microphone’s transient response, as well as for “self-tuning” and matching of microphone parameters in sensing arrays.

¹Supported by NASA GSRP grant NNX08AO07H.

Ahmed Naguib
Michigan State University

Date submitted: 30 Jul 2009

Electronic form version 1.4