N. Narahari, Noise cancellation in headphones for audiometry, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 2005.

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*Abstract* - Audiometric tests involve presentation of sound stimuli, often using headphones, in order to quantify hearing thresholds and speech discrimination. The objective of this project is to develop a noise canceling headphone, so that headphone based audiometry can be carried out without the need for an acoustically isolated cabin. In this application, test stimuli are presented for short intervals and there is a need for high attenuation of ambient noise inside the headphone earcup. It is proposed to use feedforward adaptive noise cancellation using LMS algorithm, for reducing the background noise in the earcup without affecting the stimulus. It uses a reference microphone outside the earcup, and an error microphone inside the earcup, and the output of the adaptive filter is added as anti-noise to the stimulus input to the headphone transducer. The inter-stimulus duration is used for tuning the adaptive filter, and the filter coefficients are kept frozen during the stimulus presentation. A numerical simulation of the technique was carried out using Matlab for various noises. Real-time implementation is carried out on ADSP BF533 based DSP board with multiple input and output channels. Noise reduction of about 25 dB is achieved for tone swept over 200 Hz to1.5 kHz. Owing to limitations in sampling rate, and processing speed of the DSP board, broadband noise cancellation was not effective.