Acoustomyographic sensor realization

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1. INTRODUCTION

This paper presents an idea of acoustomyographic (AMG) sensor realization. The acoustomyographic signal is one of the mechanomyographic signals measured as sound vibration coming from a muscle during its contraction [1]. A simple way to build an AMG sensor and a calibrating test-bed is described.

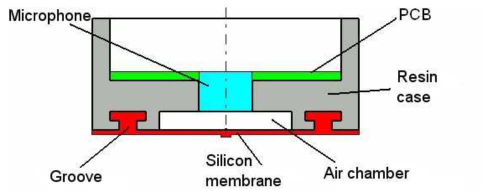
2. TEST-BED

The sensor consists of a Panasonic MCE2000 electret microphone (with a flat frequency range of 20-20kHz), high and low-pass filters (with a range of 8.4Hz-100Hz) and a gain amplifier (k=22), all integrated in one PCB. The microphone was modified according to Linkwitz [3]. The microphone is quite linear, but the built-in FET amplifier stage is not optimally configured. The modification allows to increase SPL (Sound Pressure Level) to improve performance.

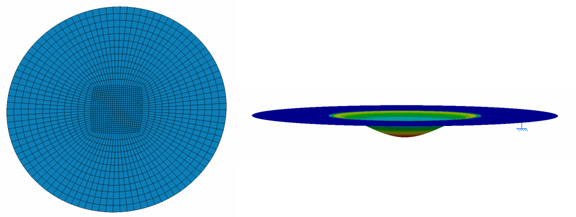
Various specifications of the AMG sensor were analyzed. One of them are the acoustic air chamber parameters. Similar research for the same cylindrical air chamber height and diameter had been done by Silva [2]. Twenty specimens were prepared. The case and the air chamber made of resin had a height of 2, 4, 6, 8 and 10mm. For each height there were four specimens with a diameter of respectively 7, 10, 13, 16mm. A schematic of the AMG sensor is shown in fig. 1 a).

The finite-element method (FEM) were used to find the optimum parameters of the driven silicon membrane conducting mechanical vibrations from the muscle. The findings are shown in fig. 1 b). The air chamber was 2mm high and 13mm in diameter and the silicon membrane was 0.1mm wide.

The calibration circuit includes an MPXV5004 pressure sensor and an electromagnetic vibration stimulator. The test-bed is used to investigate all the AMG sensor characteristics (e.g. gain trace). The measured signals were recorded using a National Instrument PCX 6221 A/D card.



a)



b)

Fig. 1. a) Schematic of AMG sensor; b) FEM model of silicon membrane with first harmonic vibration frequency of 49.5Hz.

3. CONCLUSIONS

The AMG sensor will be applied in a prosthesis control system.

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4. REFERENCES

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