Proceedings of the IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI 2012), Hong Kong and Shenzhen, China, 2-7 Jan 2012

Influence of the Auditory Canal Number of Segments and Radius Variation on the Outer Ear Frequency Response

Tshegofatso Thejane, Fulufhelo V. Nelwamondo *Member, IEEE*, Jacoba E. Smit, Tshilidzi Marwala *Senior Member, IEEE*

T. Thejane is with the Council of Scientific and Industrial Research, Pretoria, South Africa and the Department of Electrical and Electronic Technology, University of Johannesburg, Johannesburg, South Africa (email: TThejane@csir.co.za).
F. V. Nelwamondo, is with the Council of Scientific and Industrial Research, Pretoria, South Africa and the Department of Electrical and Electronic Technology, University of Johannesburg, Johannesburg, South Africa.
J. E. Smit is with the Council of Scientific and Industrial Research, Pretoria, South Africa
T. Marwala is with the Department of Electrical and Electronic Technology, University of Johannesburg, Johannesburg, South Africa.

ABSTRACT: A lumped transmission line model of the auditory canal is modified to study the influence of the number of segments used and the variation of the radius on the outer ear frequency response. A new second order polynomial is used to map the radius to the length along the narrow part of the auditory canal. The results found are compared to other literature results and expected theoretical results. The study shows that both an increase and decrease in the number of segments of the ear canal results in a distortion in the frequency response. The results obtained when using the radius-length mapping function show that the response found closely correlates with other literature results. The optimum representation of the frequency response was found when four number of segments and the radius-length mapping function were used. The use of a third order polynomial to further improve the relationship between the radius and the length of the ear canal is suggested for future research work.