

Design of Dermis Impedance Electrode with Finite Element Model

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Abstract

In order to monitor the hydration level of the deep layers of the skin, we use bioimpedance spectroscopy via a set of four electrodes in direct contact with the skin, two current carrying (CC) and two pick-up (PU) electrodes.

Using a finite elements model on COMSOL Multiphysics allowed us to gain a better understanding of the electric current path and potential distribution in the various skin layers. Thus this tool was particularly helpful in the process of electrode design.

It has been demonstrated in previous studies that the penetration depth of the electric current in biological tissues depends on both frequency and the interval (LCC) between the current carrying electrodes. Those are the two parameters we investigated simultaneously in order to optimize the electrodes layout. In this work, we will present the sensitivity study that imparted the contribution of each layer of the skin to the measured transfer impedance, according to the various electrodes geometries described. These calculations are coupled with a parametric analysis of LCC.