# Fractional order Cole model of bioimpedance of the human skin: new results

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In this paper, electrical impedance measurement data and fractional calculus have been utilized for modeling bioimpedance properties of human skin. In relation to our experimental in vivo conditions, structure and complexity of the human skin, we suggested that bio-electrical behavior of the human skin can be described by the series layer Cole model based on modified fractional distributed-order based on the Caputo-Weyl fractional derivatives. The equivalent total impedance $\underline{Z}_c(\omega)$ of this new electric circuit is given by the next equation:

$$\underline{Z}_c(\omega) = R_\infty + (R_0 - R_\infty) \int_{0+}^{1} \frac{p(\alpha)\mathrm{d}\alpha}{1 + (j \cdot \omega \cdot \tau_\alpha)^\alpha}$$

The impedance spectrum was measured in a finite frequency range up to 100kHz. Our proposed modified Cole model much better fit to experimentally curve in given frequency range in compare to existing Cole models. The fitting is done using Levenberg-Marquardt nonlinear least squares.