

# Four-electrode measurement of transfer bioimpedance

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The four-electrode (tetrapolar) method is often used in bioimpedance measurements to avoid the influence from electrode polarization impedance or the impedance of the dry epidermis. When using this method, it is important to be aware of some features of the four-electrode system, that in some cases are totally contra-intuitive. The four-electrode system makes the measured object a two-port network where the excitation typically is an electric current and the response a voltage. Hence, the transfer function is by definition an impedance which is a measure of the transfer function of the network, reflecting properties both of the passive electrical properties of the tissue and of the geometrical placement of the electrodes. This is illustrated by the fact that when placing e.g. the voltage pick-up electrodes very far from the current injecting electrodes, no voltage will be measured. This means that the transfer impedance is zero, but the impedance of any volume of the tissue is not zero and hence the tissue is not superconducting. Furthermore, there will be sub-volumes with negative sensitivity in the measured object, which will give a negative impedance contribution to the measured transfer impedance. The four-electrode system will be discussed in detail in this talk.