

Lecture 4 (Signal error estimation and skin resistance)

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SIMULATED ELECTRONICS OF BIOLOGICAL SYSTEMS

RECORDING ELECTRODES

- ✗ They have two functions:
 - + Pick up bioelectric events
 - + Stimulate tissues for bioelectric impedance measurements or electrotherapy.
- ✗ Types
- ✗ Factors affecting electrode choice
 - + Comfortable for the patient to wear for long periods
 - + Does not produce any artifacts
 - + Application convenience

ELECTRODE-TISSUE INTERFACE

- ✗ Electrolyte or electrode paste importance
- ✗ Metal-Electrolyte Interface
 - + Electrical (Helmholtz) double layer
 - + Half Cell potential
 - + Electrode Offset potential
 - + The interface capacitance and resistance values depend on current density, temperature, type and concentration of the electrolyte and metal type.
 - + Warburg equivalent circuits
 - + Polarization capacitance and resistance
 - + Faradic Leakage resistance

ELECTRODE- TISSUE INTERFACE

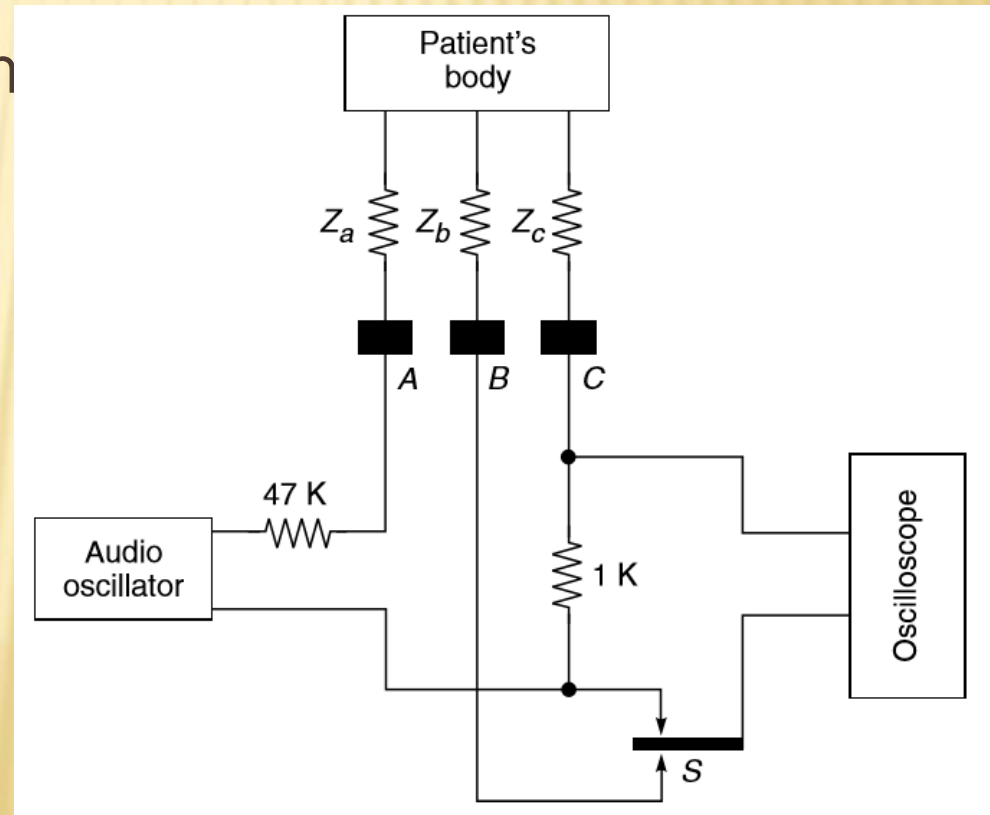
- ✗ Electrolyte-skin interface
 - + Contact potential—factors affecting it
 - + Capacitance and resistance developed sources
- ✗ How to overcome interface potentials ? Or why does the skin impedance has to be as low as possible? Or why does the input impedance of the measuring device should be as high as possible?
- ✗ As the frequency increases the electrodes impedance decreases.

POLARIZATION

- ✖ Polarized or non reversible electrodes
- ✖ Non-polarized or reversible electrodes
- ✖ The reason non-polarizable electrodes have become for Intensive care and stress testing units.

SKIN CONTACT IMPEDANCE & MOTION ARTEFACTS

- ✖ Skin contact impedance
- ✖ Miller's method for measuring skin contact impedance
- ✖ Motion artefacts
- ✖ How to overcome motion effects.



SOURCES OF NOISE IN LOW LEVEL MEASUREMENTS

- ✗ Electrostatic and electromagnetic coupling to AC signals.
 - + Sources (proportional to.., inversely proportional to)
 - + How to overcome them?
- ✗ Proper Grounding
 - + Ground loop
 - + System ground
 - + Signal ground
 - + How to remove ground loops

BIOFEEDBACK

- ✖ Biofeedback technique
- ✖ Examples of physiological process used in biofeedback
- ✖ Electrodermal activity
 - + Difference between Basal and Galvanic skin responses
 - + Circuit used to measure them

