Technology Transfer in Computing Systems

D3.23: Individual TTP23 abstract

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TETRACOM D3.23: Low power miniaturized contact-less BIOimpedance Measurement Device - BIOMeD

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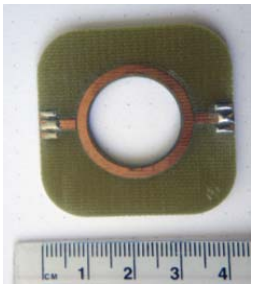
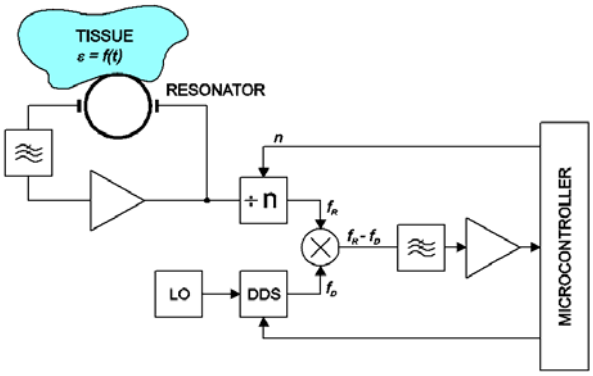
Human body or part of the body can be represented as distributed volume conductor. Spatial impedance variability can be measured to detect different physiological phenomena. Measuring chest impedance is one of the most popular techniques to detect respiration activity. The respiration and ECG are usually measured simultaneously. Impedance measurements can be implemented with several non-invasive measurement principles. Bioimpedance sensors can be integrated within other sensors (e.g. ECG electrodes can be used to measure impedance of the thorax) or as separate sensors for more specific measurements.

A contact-less bioimpedance measurement principle that the research group at Institut Jozef Stefan has conceived and validated, provides insight into tissue composition and water concentration variation, which can in turn be implemented in a new low power miniaturized medical device.





The basic idea stems from the permittivity measurement of electronic circuit substrate. A common procedure in this case is to design and fabricate a substrate with a given resonator structure. From the measured resonant frequency and known resonator geometry and substrate thickness, the dielectric constant can be calculated. Similar principle can be employed for bioimpedance measurement. In this case, the resonator is designed such that the resonant frequency lies within the range of the target object. When the resonator is placed in close proximity of the target object the resonant frequency changes. The changed value of the frequency reflects the dielectric properties of the target object. The measured frequency thus implicitly reflects biological and physiological processes within the target object. Consequently, this approach offers an innovative way to respiratory cycle monitoring of a patient.

The goal of this TTP is implementation of a demonstrator prototype of a contact-less bioimpedance measurement device for HYB as potential manufacturer. HYB business objective is to make benefit of an ever increasing demand for patient monitoring products by offering new innovative customer and patient solutions. The growth of patient monitoring devices is assumed to increase by 6 percent per annum world-wide. Potentially, a low cost of a resonator device opens opportunity to deliver disposable bioimpedance units attached to the readout electronic circuit providing attractive business opportunity.

In this regard, the following initial activities have been carried out in the TTP:

- development of a prototype of the low power contact-less bioimpedance circuit for measuring changes in dielectric properties of a observed tissue,
- evaluation of sensor functionality (i.e., testing sensor operation by measuring breathing).

Furthermore, a significant part of the TTP activities is also devoted to possible industrialization of the contact-less bioimpedance measurement device including:

- intended use,
- functional specification,
- in-depth patent search,
- list of applicable standards,
- risk management concept,
- manufacturing assembly and testing concept.

Developed demonstrator prototype and supported activities implemented in the frame of TTP are subject of the feasibility study required by HYB policy of introducing a new medical device in production.