

Noninvasive Glucose Monitoring With a Multisensor System Under Different Conditions – What to Expect

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A non-invasive Multisensor device for continuous glucose monitoring, based on dielectric spectroscopy, combined with additional sensors for optical, sweat/moisture and temperature measurement has been developed. The motivation for the multisensory device is based on the understanding that various temporal fluctuations of the properties of skin, can introduce significant perturbations to the actual glucose related measurement.

In the course of this development, several experimental clinical studies have been performed to a) investigate the performance of the concept in the individual development steps b) verify on the impact of the introduced miniaturization steps c) test the concept under increasingly more demanding experimental conditions and c) repeat a standard experiment to compare and benchmark the individual development steps with each other.

Within a period of four years conditions have been taken from highly controlled to nearly unrestricted daily life experimental conditions. At the same time individual sensors have been stepwise merged onto one substrate, arriving at a fully integrated Multisensor device with the dimensions of 54 x 64 x 14 mm. Typically, the Multisensor is attached to the upper arm with an elasticated arm band. Sensor signals are transmitted via Bluetooth to either a computer or a Pocket PC. In the meantime several hundred study days have been performed within different development steps. Results will be shown from these development steps as well as from different experimental conditions. Effects and challenges will be illustrated and discussed according to the findings in these studies. Furthermore, an outlook will be given on how to address these challenges and what steps are needed for this system to move from a miniaturized concept to a prototype level that can then eventually move towards clinical validation.