

Title: Silicon Micro Devices and Systems for Healthcare Applications.

Abstract. Silicon-based devices and systems play a key role in the decentralization trend taking place in healthcare sector. Actually, silicon material offers several advantages for creating technological advancements in smart medical devices. It combines significant physical properties (such as good electrical, thermal and photo conductivity) with important technological aspects including consolidated production technologies, industrialization processes and integration of “intelligence on board” through microelectronic circuitry.

Among the several medical application fields both the molecular analysis of nucleic acids and the control of physiological parameters represents two of most important sectors, where miniaturized devices enabling portable analysis in Point-of-Care (PoC) format can give relevant improvement in the clinical utility.

In this contribution, miniaturised silicon systems of the above mentioned classes of devices are presented. In particular, the new generation of genetic PoCs based on micro electrochemical cells are described, addressing the challenge to detect nucleic acids without any amplification step (PCR free) and using electrical transduction. Finally, a miniaturized physiological probe integrating a silicon photomultiplier (SiPM) sensor for the detection of driver drowsiness through PhotoPlethysmography (PPG) signal is presented.