

# **Blood Oxygen Level Measurement with a Chest-Based Pulse Oximetry Prototype**

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In conjunction with ECG analysis, additional information about a patients blood oxygen level can produce safer diagnosis of any disturbance of cardiac rhythm. Reduction in blood oxygen levels can be associated with decrease in heart rate (bradyarrhythmia) or with significant reduction of a hearts pumping efficiency as a result of a myocardial infarction. Furthermore, a drastic fall in blood oxygenation could be a sign of a cardiac arrest episode. Currently, most blood oxygen measurement devices (Pulse Oximeter SpO<sub>2</sub>) require the placement of an optical sensor arrangement either on the finger, toe, earlobe or forehead. These particular positions can induce motion artefact. A previous study has revealed that the upper sternum area is most suitable for chest-based SpO<sub>2</sub> monitoring. This paper presents a prototyped novel chest-based Pulse Oximetry system, and reports on test results from comparative trials with a commercially available finger-based Pulse Oximetry system using several human subjects. The system was iteratively optimised through adjustment of optical component alignment (angular position, component distance, photo-sensitive area etc.) and through fine-tuning of LED intensity and receiver sensitivity. This work is significant and timely as it provides compelling evidence that SpO<sub>2</sub> measurements from the chest offer a genuine commercial solution for bedside and ambulatory vital-signs monitoring. Results of extensive testing clearly indicate that this system correctly records SpO<sub>2</sub> variations from the chest for a range of adult test subjects and has been optimised to minimise signal distortion due to wearer motion. Comparison to the reference finger-based SpO<sub>2</sub> system emphasises the prototypes commercial potential. In conclusion, we have shown SpO<sub>2</sub> can be successfully measured on the upper sternum and the quality and repeatability of measurements are comparable to commercially available finger-based systems. This system offers reduced motion artefact due to positioning and also facilitates integration of SpO<sub>2</sub> measurement into chest-mounted ECG monitoring systems.