DEVELOPMENT OF PULSE OXIMETRY FOR APPLICATION IN MEDICINE

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Patients suffering heart failure need examination of the cardiovascular system, the blood and heart function. To improve the quality of life of these patients, control devices must be mobile and autonomous. Direct human condition is usually estimated as following vital parameters: the pulse, blood pressure, respiratory rate, temperature and oxygen saturation. are characteristics of heart and lung function. Pulse frequency can be obtained in several ways: by measuring blood pressure and oxygen saturation. Pulse oximetry was chosen for developing device based on noninvasive spectrophotometric method for measuring oxygen saturation in arterial blood with light and shock pulse.[1-2]

At the Applied Physics department of TPU layout of reflectance pulse oximeter was designed. The device consists of an optical transmitter and the receiving part of the system data acquisition and processing.

Figure 1 - Appearance of the optical sensor

The principle of saturation measurements is measuring reflected light emission signals with two wavelengths of light (red and infrared). This signal will represent the pulse signal because the blood moves within the artery with pulses, increasing the diameter of the artery and thereby increasing absorption. Oxygen saturation is determined by the functional dependence of the signals between the two wavelengths [3-4] .

The ratio between the normalized transmission coefficient for red (r) light TN, r and infrared (ir) light TN, varies only as a function of absorbers in the arterial blood (component AC) that is independent from the optical path length. As a result we have

$$R_{OS} = \frac{\ln T_{N,SYS,r}}{\ln T_{N,SYS,ir}} = \frac{A_r}{A_{ir}}$$

for arterial blood, where Ar - absorption of red light;

Air - absorption of infrared light variable component of AC [5-7].

Verification of the device was performed as follows. The device was attached to the forehead of a volunteer using elastic band. Then oxygen saturation was measured during normal breathing and apnea followed within 30s. The measurement results are given in Figure 1: the single breath decreases blood oxygen saturation , which leads to a decrease in the readings .

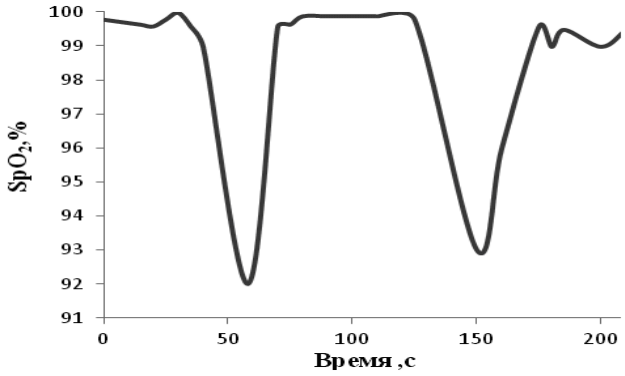

Figure 2 - Typical view of the presence of hypoxia

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