DEVICE FOR RECORDING BIOSIGNALS

Serikbekova Z.K.
National Research Polytechnic University, Tomsk, Russia, Lenin Avenue, 30, 634050
e-mail: zarina_lg5@mail.ru

Muscles fibers of human being are able to produce electrical currents prior to muscle contractions. Such electric events cause potential differences on the skin. These differences can be measured with the surface electrodes, which convert the ion flows into observable voltage differences. These currents appear from the exchange of ions across muscle fiber membranes. Measurement of such signals is performed by using conductive electrodes on the skin surface or invasively [1].

To measure changes in EMG activity the special device is developed. The hardware can be divided into the next major parts: sensor/electrode, amplifier-filter circuit and actively driven ground circuit. As input stage INA116 instrumentation amplifier is used, configured for a gain of 50. The positive guard is also used to drive a shielding plate that minimizes electric field noise. Final band pass filtered amplifier consists of band pass filters with gain. The pass band of each amplifier can be changed by replacing the capacitors. Non-contact electrodes operate as coupling signals through a small capacitance (10's pF). The bottom plate of the electrode represents a solid copper, which together with the body forms a parallel capacitor to couple biopotential signals. The copper is insulated with soldermask, which allows the sensor to function as a dry contact electrode. The inner plane of the PCB and a ring around the sensing plate formed an active shield which protects the electrode from external interference. The device was tested in electrophysiological experiments. First of all, we tested it in the recording the surface EMGs signals.

The amplifier was developed for research purposes. In practice, electrophysiological recording is frequently impaired by electromagnetic noises. Compared to commercial amplifiers, it can work in noisy environment. Moreover, the driven shield input cancels the capacitance at the input. The developed device should be useful for both neuroscience education and research [2].

REFERENCE

1. Acharya R, Suri J, Spaan A and Krishnan S 2007 Advances in Cardiac Signal Processing (Springer Berlin Heidelberg, New York).

2. Korhonen I, Parkka J, Gils M 2003 Health monitoring in the home of the future. IEEE Eng. Med. Biol. Mag. 22 66-73.