

ABSTRACT

Regular monitoring of cardiac electrical activity is an important step in the early detection of cardiovascular disorders. However, conventional electrocardiogram (ECG) devices cannot be used outside of healthcare facilities. This study aims to develop a portable ECG with a pre-chest electrode array integrated into a modified corset to improve user comfort. The system is designed using Ag/AgCl electrodes, a BioAmp EXG Pill module, and an Arduino Nano microcontroller connected to a laptop for signal acquisition, processing, and visualization.

Testing methods include comparing measurement results with a Multiparameter Simulator, direct testing on the body at five different locations, and evaluation on subjects with varying body sizes. The parameters analyzed include RR Interval, Heart Rate (HR), R amplitude, and Signal-to-Noise Ratio (SNR). Comfort testing was conducted on 32 respondents using a Likert scale questionnaire. Data was displayed and stored using Processing software and analyzed using Google Colab with Python libraries to calculate signal parameters and error rates relative to the reference.

Test results show that the device is capable of measuring RR Interval and HR with an error of $< 2\%$ compared to the Multiparameter Simulator. The R amplitude has a larger deviation (19% - 58%) influenced by various factors. The average SNR > 20 dB indicates fairly good quality, although channel 6 has a much lower value. Body size variation testing showed a decrease in R amplitude in subjects with larger body sizes. Comfort testing indicated that the device is lightweight, easy to install, and does not interfere with body posture. Overall, this portable ECG has the potential to be used for heart monitoring in healthcare facilities.

Keywords: ECG, portable, precordial electrodes, cardiac monitoring, comfort.