Figure 6 shows the design of PET-PEDOT fabric ECG sensor on a smart garment.

Figure 6. Design and Assembly of PET-PEDOT Based ECG Sensor on Garment

PEDOT coated conductive PET fabric sensors were sewn at these sensing points and the connection paths were provided by lock-stitch machine with electrically conductive yarns. Three snaps were located at the right bottom side of garment to connect with the electronic module (Figure 6).

In general, an ECG signal is composed of several wave pieces. Each cardiac cycle begins from a P-wave and continues until the next P-wave. Each ECG signal has four main intervals: RR, PR, QRS and QT. The P-wave, the first wave of the ECG, provides an electric current passing through the atrium. During normal atrial depolarization, the main electrical vector directs from the spreads of the right atrium to the left atrium. This turns into the P-wave on the ECG (Haghdoost et al., 2015).

Figure 7 shows the heart rate signal transfer from smart garment to a smart phone via a portable ECG module. The ECG signals were recorded and displayed on computer (with specific longitudinal and transverse dimensions) to compare the performance of the reference electrode sensors and PEDOT coated PET fabric ECG sensors for a human with normal heart activity.

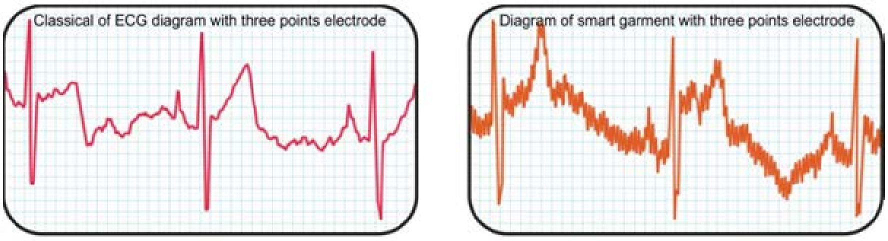

Figure 7. Heart Rate Signal Transfer From Smart Garment to a Computer Via Portable ECG Module

AD8232 ECG monitor perceived the electrical activity of a human heart via PET-PEDOT fabric sensor in this design. Then the signals were amplified and filtered. The received data as signals was transferred to a computer through a USB connection. The results of flexible PET-PEDOT fabric sensor showed an acceptable agreement with the result of commercial reference electrode means that there was applicability of receiving of cardiac signals through PET-PEDOT fabric sensors on garments (Figure 7).

4. CONCLUSION

The aim of this study is to present a conductive polymer-based a smart garment to detect the electrical activity of a human heart for electrocardiogram (ECG) monitoring. For this purpose a textile based sensor was produced by in-situ polymerization of 3,4-ethylenedioxythiophene on polyethylene terephthalate woven fabrics. The electrical activity of the human heart was sensed by PET-PEDOT conductive polymeric fabric sensor on a smart garment. AD8232 ECG monitor was used as signal analysis integration for electrocardiogram monitoring. AD8232 ECG monitor perceived the electrical activity of a human heart via PET-PEDOT fabric sensor and received data as signals was transferred to a smart phone through a USB connection successfully. The ECG monitoring results of PET-PEDOT fabric sensors showed a feasibility deal with the result of commercial reference electrodes.

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