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Artifact tolerance test for capacitive wearable chest-belt electrocardiograph - Effect of electrode configuration (Article)

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Abstract

Electrocardiogram (ECG) provides useful information for the diagnosis of cardiovascular disease. In capacitive-coupled ECG sensing, electrostatic artifact and movement artifact become serious problems. In particular, low frequency components such as T wave of ECG are susceptible to the artifacts. To obtain clear ECG, high stability is required for the electrocardiograph using capacitive-coupled electrode. In this study, tolerance of capacitive wearable chest-belt electrocardiograph was tested for the electrostatic and movement artifacts. A constant electrostatic artifact was discharged repeatedly on three types of electrode having different shielding configurations, and their transient responses were compared in terms of deviation area, transient slope and recovery time. The results revealed the best tolerance of doubly-shielded five-layered electrode. The best performed five-layered electrode was used for exercise tolerance test. Then, detection rates of R-wave and T-wave of ECG, and standard deviation of base line of the recordings were calculated as tolerance indices and compared to those obtained by commercial disposable electrode. Although R-wave detection rate of the five-layered electrode decreased by 2.0%, the rate of T-wave was comparable to those of the disposable electrode. Furthermore, the standard deviation of the base line was significantly smaller than that of the disposable electrode ($p < 0.01$). © 2017 The Institute of Electrical Engineers of Japan.

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- 1 Binkley, R.F., Frontera, W., Standert, D.G., Stein, J.
Predicting the Potential of Wearable Technology
(2003) *IEEE Engineering in Medicine and Biology Magazine*, 22 (3), pp. 23-27. Cited 61 times.
doi: 10.1109/MEEMB.2003.1213623
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- 2 Zheng, Y.-L., Ding, X.-R., Poon, C.C.Y., Lo, B.P.L., Zhang, H., Zhou, X.-L., Yang, G.-Z., (—) Zhang, Y.-T.
Unobtrusive sensing and wearable devices for health informatics
(2014) *IEEE Transactions on Biomedical Engineering*, 61 (5), art. no. 6756983, pp. 1538-1554. Cited 178 times.
<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?reload=true&punumber=10>
doi: 10.1109/TBME.2014.2309951
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