

Smart Wearable Fabric Antennas for Sensing Applications and Communications with Implantable Sensors.

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The field of wearable electronics has seen major technical development in the past 20 years. The industry is expected to grow from \$14 billion currently to \$34 billion by 2020 where smart watches account for 50% of the said market. These include telemetry gathering technologies such as respiratory and heart rate, blood pressure monitoring systems and more. The apple watch, in particular, can track heart rate, develop workout regimes and collect real-time health data however, industry is swiftly moving ahead towards developing smarter wearable devices that can be integrated in everyday clothing. Examples of such include ‘Myontec Intelligent Clothing’ which comprises of form-fitting athletic wear with integrated sensors capable of tracking muscle health and movement using the principles of electromyogram. Other examples include ‘SupaBra’ which records heart rate using embedded sensors, in real-time and conveys data via Bluetooth to a user’s phone for fitness and workout tracking. Although such devices/wearables are becoming more mainstream, they lack conformity and practicality due to bulky design attributed to integrated sensor technology.

The need for unified wearable devices i.e. sensors that are built within fabric substrates is apparent. In this study, we present a novel antenna design manufactured on fabric substrates capable of sensing applications i.e. with and without implantable sensors, multiple wear usability and machine washable. A new antenna topology fabricated on fabrics via screen printing technique using commercially available conductive and non-conductive inks will be presented. Design rules for the novel antenna topology will be presented along with production guidelines when using conductive inks on fabric substrates. Fabric antenna communication capabilities with implantable sensors (In-vitro) will be explored. A link-budget analysis along with antenna performance before and after usability and machine washing will also be presented.