



## RT/Duroid 5880-based Hook slotted multi frequency low profile patch antenna for WBAN applications

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### ABSTRACT

A triple band RT/Duroid 5880-based hook slotted Antenna for Wireless Body Area Network (WBAN) is investigated in this paper. This antenna can be used for On-body and Off-body communication; it provides wireless link between the wearable devices on the body and away from the body for WBAN users like patients, sports persons, soldiers and firefighters. The fabricated Low profile Patch antenna operates in RF Band, ISM Band and C Band in 1.87 GHz (Upper), 2.45 GHz (Lower) and 5.71 GHz (Upper) respectively. The hook slot designed on the patch antenna is used to improve the performance of antenna in view of WBAN applications. The proposed antenna is fabricated using RT/Duroid 5880 of permittivity 2.25 and tangent delta 0.0004 which is viable to use in wearable and On-body communications. Analysis of the proposed antenna is done by Simulation and fabrication results and their comparison. The low profile antenna performs maximum reflection coefficient value  $-25.73$  dB, directivity 2.86 dBi, 3.39 dBi and 4.59 dBi at 1.8 GHz, 2.45 GHz and 5 GHz respectively, maximum gain 2.85 dB and 1.67 w/Kg SAR levels over 1 g of mass average.

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### 1. Introduction

Wireless Body Area Network is the recent field which is attracting researchers and investigators to design wireless paradigm for patients, athletes and defence personals. Appropriate antenna design for Wireless Body Area Network is a challenging task due to the presence of lossy human body [1,2]. The exposure of the electromagnetic energy on the human body in terms of Specific Absorption Rate is also a current field of attraction for researchers. Many enthusiastic investigators proposed various designs of Antennas for Wireless Body Area Network (WBAN). Narrowband operations are not sufficient for body area network devices to utilize the band efficiently in terms of some properties; high speed data rate, robust transmission, multipath propagation, long battery life and multi users operations [3,4]. Hence wideband or multi band antennas are required to make body area network more viable way of communication.

Since last few decades' worldwide interoperability for microwave access (WI-Max) operate at 2.5 and 5.5 GHz band is very much popular because of its services. Mohammad Tariq Islam et al. observed 625 mm<sup>2</sup> slot ring antenna, this antenna is using a capacitive patch and analyzed for WLAN/Wi-Max operations [5]. Coplanar Waveguide fed slotted patch antennas of surface area 690 mm<sup>2</sup> operating in 2.4–2.63, 3.23–3.8 and 5.15–5.98 GHz bands by Cao Y.F. et al. [4,6], and 625 mm<sup>2</sup> to cover 2.14–2.85, 3.29–4.08 by M. Ali et al in 5.02–6.09 GHz bands [7] have been developed. These mentioned antenna investigations are of multi band patch antennas. Likewise the above fruitful work the researchers have always a good scope of miniaturized and conformable antennas which can provide desirable radiation pattern for making the wireless body area network more efficient and viable [8,9].

Based on the mentioned previous works Hook slotted multi frequency patch antenna is investigated here that is designed on RT/Duroid 5880 substrate to achieve low electrical loss and uniform electrical properties over frequency. Electrical parameters of refined RT/Duroid 5880-based Hook slotted multi frequency patch antenna is critically investigated here for WBAN applications. Hook slotted multi frequency patch antenna is proposed here as multi frequency antenna that is applicable for on/off body

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