

# Design and Analysis of Flexible Cylindrical Dielectric Resonator Antenna for Body Centric WiMAX and WLAN Applications

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**Abstract**—This paper presents a flexible Dielectric Resonator Antenna made of polyester Resin which operates at 5.4 GHz for Wi-MAX and WLAN. Wearable material of indigo blue jeans is used as substrate for flexible DRA. The desired mode of  $HEM_{11}$  in cylindrical DRA is excited with the help of slot. Separate analysis of the DRA placed in free environment and close to human body is carried out. The performance of the antenna under both states: Free space and near body is investigated on the basis of antenna parameter. The proposed DRA has high gain of 5.41 dB and efficiency of 92%. The antenna has also high efficiency of 87% for near human body scenario.

**Keywords**—Dielectric Resonator, WLAN, VSWR, Return Loss.

## I. INTRODUCTION

Due to the immense social and medical applications, one of the ever green areas in application-oriented research is Body Centric Wireless Communication (BCWC) [1-4]. The most widely recognized and imperative applications include rescue, remote medicinal services, restorative and military applications. Antennas play out an essential and fundamental part in BCWC, their design and execution relies upon on-body transmitter quality and specifications and application situation. Wireless body range systems equipment especially flexible and wearable antennas, implantable antennas and RF equipment have gotten significant consideration in the near past. Critical change in properties of antennas has been accounted in literature, where antennas are embedded (implanted) on the human body [1]. Variety in the properties of UHF wearable antennas is analyzed in [1-4]. It is desirable to have omnidirectional radiation and adaptability in the performance of antenna in term of its S-Parameter, gain and efficiency for near to human body or on human body but these are the most challenging problems. Different techniques of additional garments, textile, wearable materials and wearable antennas have been reported in [5-9] to overcome these problems. Dual band Wearable button shape antenna is proposed in [10] for WLAN application. Different shapes and specification wise flexible worn antennas which operates at 2.4 GHz for Body centric communications has been reported in [11-13].

In this paper, the behavior of the flexible cylindrical DRA in the free space and for close to human body has been considered and analyzed. Human body phantom was designed in the simulation software HFSS utilizing reported

electromagnetic properties of human muscle fat and skin tissue [14]. Results obtained from the simulation of DRA in the free space and near to human are compared in the reported work. Simulated VSWR, return loss, Radiation Pattern, gain and directivity of the presented antenna under both scenarios is introduced and examined. Proposed antenna is of small size and also flexible with good results for near body communications. The antenna covers both the bands of the WiMAX and WLAN.

## II. PROPOSED DESIGN OF DRA

Dielectric Resonators act as antenna and has the ability to radiate in the absence of the outer conductive boundaries. The geometry of the proposed design is shown in the Fig. 1.

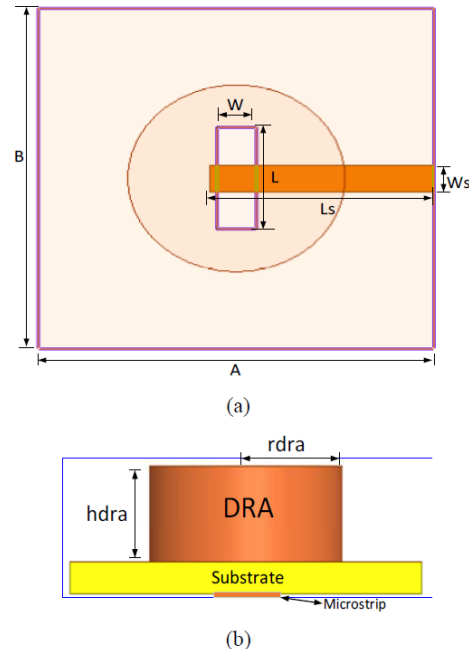


Fig. 1 Antenna Geometry (a) Top View (b) Side View