Design of Wearable Multi-resonance Folded Dipole Antenna for FM Reception Using Conductive Textile

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Recently, the demands of wearable smart textiles are expanding with the active research of near field communication (NFC), health care monitoring and body area network (BAN) (Shea T, Smart Fabrics 2007). Types of Wearable smart textiles are generally classified into the metal painting, the coating on the fabrics or the insulated metal wire (J.C.G. Matthews and G. Pettitt, EuCAP 2009. 3rd European Conference, pp.273-277). This paper used Metal Composite embroidery Yarns (MECYs) for FM reception antenna.

If the antenna is designed on the cloths, the resonance frequencies of antennas were lowered by 15 ~ 25% and the spacing of clothes and the human body change resonance frequency (T. Kellomaki, J. Heikkinen and M. Kivioski, EuCAP 2006). Hence, the FM antenna needs to maintain approximately 87 ~ 130MHz wide bandwidth for a marginal design, although FM broadcast band ranges 87 from 107MHz. In this paper, the new antenna structure based on the folded dipole antenna with five resonances [shown in Figure 1] is proposed. The measurement result on free space shows 77.5 ~ 111.5 MHz in 5-dB bandwidth, and the result with the effect of body shows the bandwidth 81 ~ 115MHz. Moreover, there is a difference of bandwidth about 1 ~ 2 MHz between the wearer`s postures. Figure 2 shows the radiation pattern in free space, which is similar to the ordinary folded dipole antenna. Maximum gain of antenna is -0.68dBi in free space. The effects of human body to radiation patterns are different from wearer`s postures, but they show the trend of omnidirectional patterns. We will present the details of the antenna design. Also, the measured performance of proposed antenna near a body will be shown and discussed.

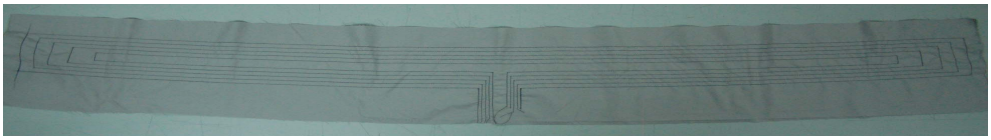

Figure 1. Fabrication of wearable multi-resonance folded dipole antenna

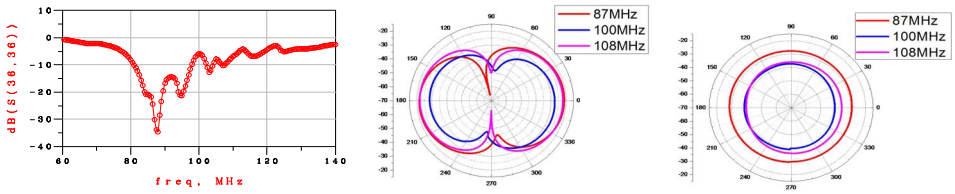

Figure 2. Return losse and Radiation pattern of antenna(free space)