UWB Textile Antennas for Wearable Applications

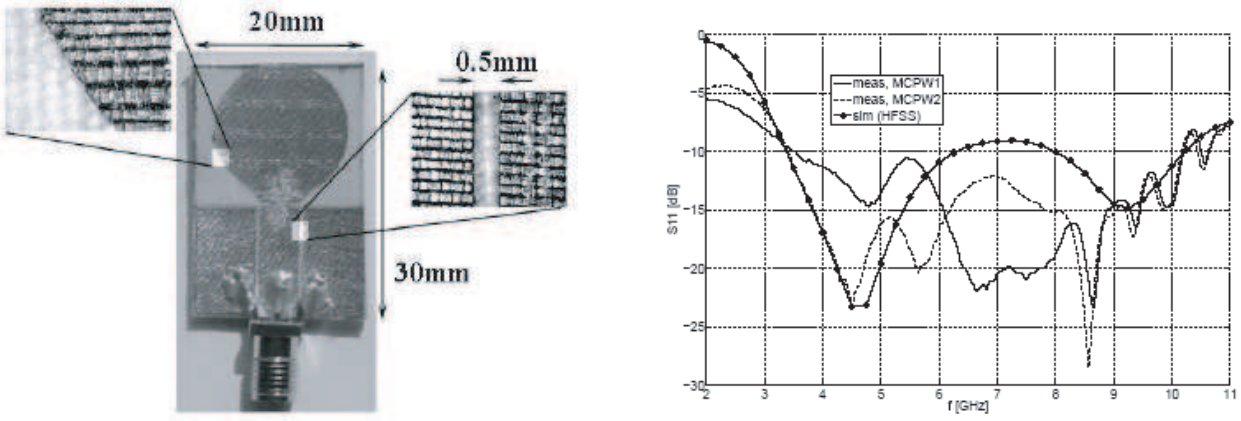
M. Klemm and G. Troester
Swiss Federal Institute of Technology, Switzerland

Wearable computing is a new, fast growing field in application-oriented research. Steadily progressing miniaturization in microelectronics along with other new technologies enables wearable computing to integrate functionality in clothing allowing entirely new applications. Integration in textiles ideally combines such requirements since clothing offers unobtrusiveness, a large area and body proximity. However, such electronic devices have to meet special requirements concerning wearability. Ultra-wideband (UWB) is an emerging wireless technology, recently approved by FCC. In low/medium data-rate applications, like wearable computing, UWB offers low-power operation and extremely low radiated power, thus being very attractive for body-worn, battery-operated devices.

In this paper we present new ultra-wideband (UWB) textile antennas for wearable applications. These antennas are made entirely of textiles. As a conductor we have used metalized textile with the surface resistivity of 0.1 Ω/sq., which offer low ohmic losses. As the dielectric substrate, very thin (0.5 mm) textile with dielectric constant 2.6 (extracted from measurements). This textile dielectric was chosen due to a relatively high dielectric constant and a small thickness. Prior textile antennas (e.g., [Klemm, EuMW 2004]) were usually composed of dielectric materials with ε_r only slightly higher than 1, and thicknesses of 4–6 mm. Therefore, a new feature of our antennas is that they could be easily integrated directly into clothing, rather than being attached.

We have realized different types of thin UWB textile antennas, both in microstrip and coplanar (CPW) techniques. To our best knowledge, these are the first CPW-fed textile antennas reported in the open literature.

Due to the limited space, in Fig. 1(a) we present only one example of the manufactured UWB textile antenna: CPW-fed textile UWB disc monopole antenna. In Fig. 1(b) we compare measured (two prototypes) and simulated return loss (RL) characteristics, which agree relatively well. Both measured antennas have RL below 10dB from 3.4 GHz to 10.2 GHz.



(a) (b)

Figure 1: The CPW-fed UWB disc monopole antenna: a) photo, b) Measured (two realizations) and simulated return loss characteristics.