**An Investigation on the Surface Wave Characteristics at 2.4 and 60 GHz for On-Body Communications**

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Over the past few years, body-centric wireless communication systems have attracted significant interest from both the academic and industrial community. The availability of low-cost miniaturized electronic components has led to the rapid growth of WBAN in various applications. In healthcare, BANs can provide cost-effective solutions for monitoring chronically ill patients, or non-invasive alternatives to traditional diagnosing techniques such as blood-glucose monitoring for diabetic subjects. The commercial electronics market has also been very responsive to demands from the field of sports and fitness. To sustain this enormous growth of wearable industry, it is necessary to develop reliable and efficient systems working at various frequency spectrums. Accurate knowledge of the communication channel in the vicinity of the human body will be an essential prerequisite in this regard. A wide amount of groundwork has already been carried out in terms of measurement and simulation for analyzing the channel characteristics up to 10 GHz. It is observed that creeping waves significantly influence the on-body communication channels, especially in the shadowed regions. However, characterization of such wave components at V band is by no means a trivial task. The objective of this work is to perform comparative investigation on the on–body channel characteristics at narrow band and V Band regions of microwave spectrum.

To carry out the surface wave characterization, an in-house FDTD software investigation has been used for the numerical study. Firstly at 2.4 GHz a homogeneous realistic phantom has been adopted in the simulation domain. To obtain the signal strength at NLoS locations the transmitter has been placed perpendicular to the body and at the left side of the waist. The receivers are considered at different locations along the waist in the shadowing region. Similar setup has also been used at 60 GHz. To identify the creeping wave, phase velocity is determined using the phase constant (rad/cm).

It is observed that the phase velocity at 2.4 GHz is lower than the light velocity which indicates that in this region propagating wave acts as a 'slow surface wave' However at millimeter wave spectrum, losses increase notably and the signal transmission at NLoS locations are negligible. Hence communication in NLoS usually requires repeaters or depend on the reflections from other scatterer. Therefore efficient ways need to be developed to enhance creeping wave transmission particularly for shadowing regions. At millimeter wave frequencies thickness of textile layers are comparable to the operating wavelength. Hence effects due to the presence of textile layers are investigated to strengthen the signal. A detailed analysis of the measured and simulated results will be shown during the final presentation.