Experimental UWB Frequency Analysis for Implant Communications

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Abstract:

Implantable biomedical sensors with the ability to transmit wirelessly real-time physiological data to an external unit can enable better management of chronic diseases. The IEEE Standard 802.15.6-2012 specifies the implementation of implant communications within 402-405 MHz, which unfortunately allows low data transmission rates only. Ultra wideband (UWB) interfaces within 3.1-10.6 GHz offer a number of advantages at the expense of higher path losses. Efforts to characterize the implant UWB channel have been undertaken via computer simulations, but these may not capture completely the effects on the implant radio channel of multiple physiological funct ions. To overcome these limitations we provide insight into the frequency-domain behavior of the UWB implant channel within 3.1-8.5 GHz based on propagation measurements in a liquid phantom and a living swine. A thorough comparison of the relative received power in phantom-based and in vivo measurements for the in-body to on-body (IB2OB) and in-body to off-body (IB2OFF) channel scenarios are presented.