Influence of Human Body and Indoor Scenarios in On-Body Wireless Communication Systems

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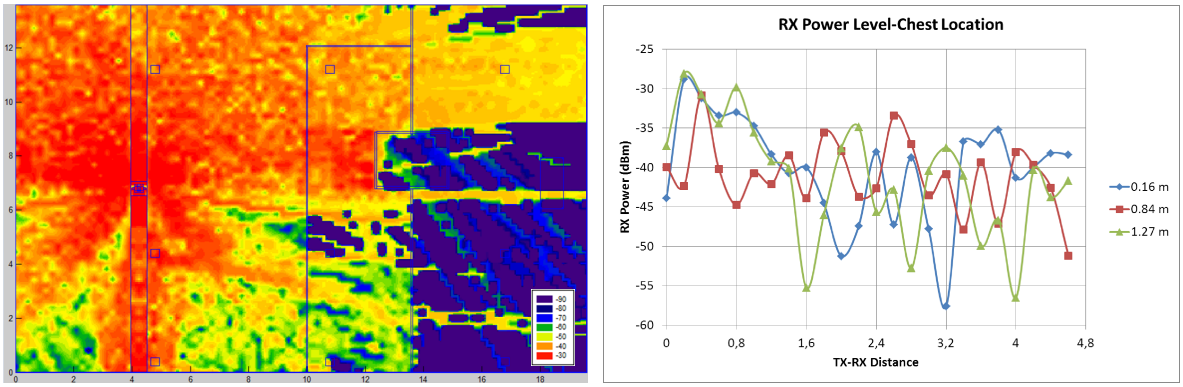
The use of wireless communication systems in close interaction with the human body is being steadily adopted, mainly due to the existence of more economical and smaller transceivers, as well as by increasing operational lifetime with techniques such as energy harvesting. There is a wide range of application for such on-body communication systems, such as monitoring of health constants for chronic patients, monitoring of athletes in training and competition, location of children and elderly or data fusion for defense related operations, to name a few. One of the main aspects in the operation of these devices is the interaction with the human body, as well as with the surrounding environment and the impact this has on the overall performance of the established wireless links. In this work, the influence of the human body interacting on an indoor scenario on Personal Area Network devices (such as Bluetooth or ZigBee) is analyzed. In order to perform such analysis, an in-house 3D Ray Launching simulation code has been employed, in which a complex indoor scenario as well as a simplified human body model, including layers of dispersive materials (i.e., skin, muscle, bone and internal organs) are considered. The results obtained clearly state the dependence of total losses with the location of the on-body wireless transceiver, located in different positions such as chest, head or limbs as well as with the relative position of the human body within the indoor scenario. These results can aid in radioplanning tasks related with on-body wireless devices, locating the transceivers in the optimal positions in terms of energy consumption as well as of communication link capacity.



(a) (b)

Figure 1:. a) Estimation of RX power level for an on-body wireless transceiver operating in 2.4GHz, located in the central part of the chest b) Received power level as a function of distance for different heights within the indoor scenario.