Measurement-Based Small Scale On-Body UWB WBAN Channel Model

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Abstract:

This paper presents a generic small scale channel model for ultra wideband wireless body area network communications. It is based on static on-body measurements in an anechoic chamber by using a vector network analyzer within a 2-8 GHz bandwidth. Two antenna types are used for the examination: dipole and double loop. From the existing data, a generic average channel impulse response (CIR) was extracted resulting 11 and 12 resolvable paths for the dipole and the double loop antenna, respectively, when a dynamic range of 25 dB was used. The CIR envelopes were modelled by using the polynomial least squares (LS) fitting with orders one to five. The 5th order LS model was noted to follow the CIR envelope most precisely. The CIR decays slightly faster for the dipole antenna. The statistical properties of the CIR bins were solved by fitting the data for 17 continuous distributions and ranking them by using the second order Akaike information criterion. To model the CIR amplitudes exactly, four different distributions were needed for the dipole but for an approximate model Weibull and lognormal distributions suffice. For the double loop, all CIR bins follow the inverse Gaussian distribution. The distributions of the CIR bin indexes within the 25 dB dynamic range were found to follow the negative binomial distribution for both antennas.