Fading Modelling in Dynamic Off-Body Channels

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Abstract:

This paper presents an off-body fading channel model for Body Area Networks (BANs) in indoor environments. The proposed model, which is based on both simulations and measurements in a realistic environment, consists of three components: mean path loss, body shadowing, and multipath fading. Seven scenarios in an indoor environment (a medium-size room with furniture, mostly consisting of wooden tables and chairs) have been measured: five were static (three standing and two sitting) and two dynamic (walk in a fixed place and real walk). The mean path loss component is modelled as a log function of distance, the path loss exponent being in the range between 0 .4 and 1.6, while a statistical perspective is taken for the other two components, i.e., body shadowing is found to be well modelled by a Lognormal Distribution, and multipath fading by Rice or Nakagami-m Distributions, depending on body motion characteristics. The correlation between the selected distributions and empirical data is not lower than 0.95, typically being greater than 0.98. This model takes the statistical influence of various parameters and features present in BANs into account, such as body influence, placement of the wearable antennas, user orientation in the environment, dynamism of the BAN scenario, and propagation conditions.