Three-Dimensional Modeling of MIMO Mobile-to-Mobile Amplify-and-Forward Relay Fading Channels

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Abstract:

This paper proposes a three-dimensional (3-D) geometry-based three-cylinder scattering model for multiple-input–multiple-output (MIMO) mobile-to-mobile (M2M) fading channels in single-relay dual-hop amplify-and-forward (AF) cooperative networks. In the transmission links from the source mobile station to the destination mobile station via the mobile relay station, double-bounce non-line-of-sight (NLOS) propagation conditions are considered. Based on the three-cylinder scattering model, a 3-D reference model for narrowband MIMO M2M relay fading channels is derived, with the assumption of an infinite number of local scatterers surrounding the three mobile stations. From the reference model, general analytical and exact closed-form solutions are provided for the four-dimensional (4-D) space-time correlation function (STCF), under non-isotropic scattering conditions. Numerical calculations demonstrate the theoretical derivations. The reference channel model provides a useful framework for designing and testing future MIMO M2M cooperative communication systems.