Power Distribution of Device-to-Device Communications in Underlaid Cellular Networks

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Abstract

Device-to-device (D2D) communications have recently emerged as a novel transmission paradigm in wireless cellular networks. D2D transmissions take place concurrently with the usual cellular connections, and thus, controlling the interference brought to the macro-cellular user equipment (UE) is of vital importance. In this letter, we consider the uplink transmission of a tier of D2D users that operates as an underlay for the traditional cellular network. Using a network model based on stochastic geometry, we derive the equilibrium cumulative distribution function (CDF) of the D2D transmit power. Considering interference-limited and relatively lossy environment cases, closed-form equations are derived for the power CDF. Finally, a tight closed-form upper-bound for the derived power distribution is proposed, and the analytical results are validated via simulation.