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Abstract

Device-to-Device (D2D) communications are considered as a keystone of the fifth generation wireless technology (5G). This new approach is very promising in terms of energy and spectrum efficiency. However, the integration of such communications in a typical cellular network increases inevitably the amount of interference. Several researches propose to lower the interference thanks to either sharing the cellular spectrum intelligently, or using non-cellular bands for D2D links. In this paper, we focus on the latter opportunity, and consider that the D2D communications are used with millimeter waves (mmWaves).

For what comes to modeling a D2D-enabled (D2D-e) network, many works propose to use stochastic geometry so as to evaluate the impact of interference and noise on the various links. In this work, we aim to analyze the SINR and the average data rate of Outband D2D links for user equipments (UEs) with conventional omnidirectional antennas and with various directional mmWave antennas: patch antennas, horn antennas and uniform linear array antennas. Analytical and empirical evaluations of the Signal-to-Interference-plus Noise Ratio (SINR) are made with stochastic geometry. We propose to discuss the advantages and drawbacks of directional mmWave antennas in Outband D2D for various antenna designs, and their interest in various environments.

Keywords: Device-to-device communication, heterogeneous networks, directional antennas, millimeter wave communication, stochastic geometry.