3D mmWave MIMO Channel Modeling and Reconstruction for Street Canyon and Highrise Scenarios

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Abstract:
The use of millimeter-wave (mmWave) and full-dimensional multiple-input multiple-output (FD-MIMO) antenna systems for 3D wireless communication is being exploited for enhanced network capacity improvement in the ongoing fifth-generation (5G) deployment. For adequate assessment of competing air interface, random access channelization, and beam alignment procedures in mmWave systems, channel models for different use scenarios are necessary. A ray-tracing study was conducted with the use of a Wireless Insite ray tracing algorithm to characterize the mmWave channel in urban areas, using Lagos Island, Nigeria databases to predict measured statistics. These statistics include path loss, rms delay spread, angular spread of arrival, and departure in the azimuth and elevation domain. A 3GPP-style 3D mmWave channel is modeled and reconstructed, emphasizing the use of a ray tracer to determine elevation model parameters. Line of sight (LOS) and non-line of sight (NLOS) 3D models were developed for street canyon and high-rise scenarios

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I. Introduction (Heading 1)

The volatile constantly-increasing appetite for mobile traffic as everyone's desire for online presence, such as Facebook, Twitter, and video streaming [1], has led to the evolution of the Long Term Evolution (LTE) into the LTE-Advance without being able to meet the ever-growing demand for mobile data. The above condition necessitates the introduction of the 5G network. Network Densification (ND) has been suggested as a method to meet the data rate requirement of the 5G [2] [3]. ND is the unification of spatial densification and spectral aggregation. Spatial densification is the deployment of small cells (Picocells, Femtocells) as an overlay in macrocells and the use of massive multiple-input and multiple-output (MIMO) at the base station [4]. Spectral aggregation uses large carrier frequencies spanning 500 MHz to the mmWave (30 GHz – 300 GHz) band.