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Double-directional Dual-polarimetric Ultra-wideband Cluster-based Characterization of 70-77 GHz Indoor Propagation Channels

Abstract—Recently, a measurement campaign for characterizing delay, spatial and polarimetric radio channels ranging from 70 GHz to 77 GHz was carried out in the small office and entrance hall scenarios respectively. Composite channel behaviors and statistics are analyzed and compared for various measurement configurations. Based on the multi-dimensional power spectra of delay, direction (i.e. azimuth and co-elevation) of departure and arrival, the multipaths are further grouped into clusters via K- means, threshold-based and Gaussian Mixture Model (GMM) approaches. Besides, the spatial positions of the clusters are identified by using the measurement-based ray tracer (MBRT) method, and both first- and last-hop scatterers along propagation paths between the transceivers are localized. Those results manifest the merits of the threshold-based clustering algorithm in case of clusters' compactness, separation and exclusiveness, and the significance of the localization techniques for the propagation clusters. Additionally, it is noted that the deployment of the networks, such as the geometry size of the environment, both positions and heights of the Txs and Rxs, and the polarization combinations exerts tremendous influence on the statistical chan- nel models and characteristics of the indoor millimeter- (mm-)wave propagation.

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