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Frequency Characteristics of Diffuse Scattering in SHF band in Indoor Environments

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In the fifth-generation mobile communication system (5G), the millimeter wave band wireless communication is highly expected to increase the network capacity drastically. The radio propagation characteristics in the millimeter wave band are thought to be quite different from the microwave band that has been used for the current mobile wireless communication system. Therefore, it is needed to clarify those differences in a comparable way for the feasibility investigation of those high-frequency band systems in the actual environment.

In this paper, we focused on the frequency characteristics of the diffuse scattering of radio waves. The diffuse scattering is caused by the irregular scattering from uneven reflection surfaces, and it is thought to have the significant frequency dependency. However, those characteristics have not been clarified even though it affects the multiple-input multiple-output (MIMO) transmission performance. We conducted the channel measurements in 3 GHz, 10 GHz and 28 GHz bands in several indoor environments to solve the issue. The measurement system was the vector network analyzer (VNA) based channel sounder. And the propagation delay and angle characteristics of radio waves were evaluated by the virtual uniform cylindrical array-based measurement. The result showed that the power and the angular spread of diffuse scattering tended to decrease as the carrier frequency increased. The parameter estimation of diffuse scattering waves from the measured data and the further detailed investigation of the physical mechanism will be the future works.