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著者(和文)	猪又稔
Author(English)	Minoru Inomata
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種別(和文)	論文要旨
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（博士課程）
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論 文 要 旨

THESIS SUMMARY

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学生氏名： Student's Name	猪又 稔		
指導教員（主）： Academic Supervisor(main)	高田 潤一		
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

Chapter 1, "Introduction", provides a detailed explanation of the research background, conventional models issues, objectives and outline of this dissertation. In 5G, since high frequency band small cells are newly installed in urban microcell environment (UMi) where high traffic occurs. Since the new high-frequency bands have extremely short wavelengths, radio propagation is significantly affected by objects surrounding mobile station, it is necessary to clarify specific the outdoor path loss characteristics, building penetration loss characteristics, and outdoor channel characteristics based on the detailed building structure and objects in a UMi environment for high frequency 5G cell deployment. Thus, the literature review is provided, which conclude that the most studies focus on the stochastic characteristics using stochastic model and ray tracing, and the site-specific characteristics predictions for cell deployment is scarce. Therefore, the target of this dissertation is to clarify a path loss and channel characteristics based on detailed building structure and objects and to construct the prediction models condisdered those effects in UMi environment for high frequency 5G cell deployment. In order to clarify those characteristics in UMi environment, the subjects of this dissertation are to clarify dominant path from each building shape in actual site which significantly affect the outdoor path loss characteristics and construct the prediction, to clarify the specific building penetration loss characteristics which considered penetration paths to building windows and construct a building penetration loss prediction, to construct the channel prediction based on scattering from the building irregularities and reflection from vehicles in actual site.

Chapter 2, "Predictions of Outdoor Path Loss Characteristics considering Building Shapes", describes the dominant paths from various building shapes and constructs outdoor path loss predictions based on dominant paths. In this chapter, the outdoor path loss characteristics are measured in the 2 to 37 GHz band in UMi when the building shape of the intersection is wedge shaped building and chamfered shaped building.When the building shape of the intersection is wedge shaped building, the dominant path is multiple reflection waves which propagate along the street. Ray tracing calculation is used and compared results obtained from it with measurement results. It is clarified that specular reflection from chamfered shaped buildings strongly contributes the power. Therefore, in ray tracing simulation, it is necessary to consider those building shapes in the intersection.

Chapter 3, "Predictions of Penetration Loss Characteristics through the Building Windows", shows the dominant path which penetrates to building window and the building penetration loss predictions. In this chapter, it is first reported how measurements to clarify the effect of the penetration paths to building

window are conducted in the bands ranging from 0.8 to 37.0 GHz. To clarify the dominant path, ray tracing is used to carry out calculation and compare measurement with calculation results. It is clarified that paths reflected multiple times between the external walls of buildings and then diffracted into one of the building were dominant.

Chapter 4, “Predictions of Channel Characteristics considering Buildings Surface Irregularity”, describes channel models based on the scattering form building irregularities. In this chapter, Propagation channel prediction method that uses point cloud data based on a hybrid of the RT method and the ER model is proposed. Since the parameters related to structure irregularities can be obtained by point cloud data. The validity of the proposed method was confirmed based on comparison of measurement results and prediction results using the proposed method based on the power delay profile and angular profile.

Chapter 5, “Predictions of Dynamic Channel Characteristics due to Vehicles”, clarify the effect on the specular reflection from the vehicles. the dominant paths are investigated based on the measured power delay angular profile using a 20-GHz band channel sounder. It is confirmed based on these results that the arrival waves from the building on the same or opposite side of the Rx antenna and the scattering path from the vehicles on the road are dominant. Therefore, a prediction method using a vehicle model with a rectangular screen is proposed. It is confirmed the validity of the proposed prediction method based on comparison results between measurements and simulations using proposed method.

Last, in chapter 6 “Conclusions”, summarizes this dissertation and the contributions. The availability of the prediction method in each chapter was discussed from the viewpoint of computational complexity and the possible research topics for future work are also provided.