3GPP TSG RAN WG1 Meeting #84 **RP-160840**

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Title: **Initial measurement results on 28GHz**

Source: **KT Corp.**

Agenda Item: **7.5.3.4**

Document for: **Discussion**

1. Introduction

At the last RAN plenary meeting, a study item (SI) for channel modelling for frequency spectrum above 6 GHz was approved [1].

In this document, radio propagation measurements and analysis are presented to investigate the channel characteristics of millimeter wave(28GHz) transmission for outdoor cellular communication systems. The measurement campaign is performed in a ski resort town (UMi street canyon) and biathlon stadium (UMi open square) placed in Pyeongchang, South Korea.

2. Discussion

2.1 NLoS(UMi street canyon) measurement results

The channel sounding was carried out in an Alpensia ski resort town similar to the typical urban environment. In this campaign, there were 15 non LoS (NLoS) locations; with Tx-Rx distances ranging from 55 m to 207 m. The transmitter was located in two places. First, it was placed on the sixth floor (17m above the ground) of the hotel in the resort town. The second location is an external vacant lot with height of 8 m. The antenna scanning range in the azimuth and elevation domains was from -60^o to 30^o and from -30^o to 0^o, respectively, on the Tx side; these ranges were from -180^o to 180^o and from -30^o to 30^o, respectively, on the Rx side. A satellite map of the measurement site marked on transmitter and receiver locations is illustrated in Fig. 1

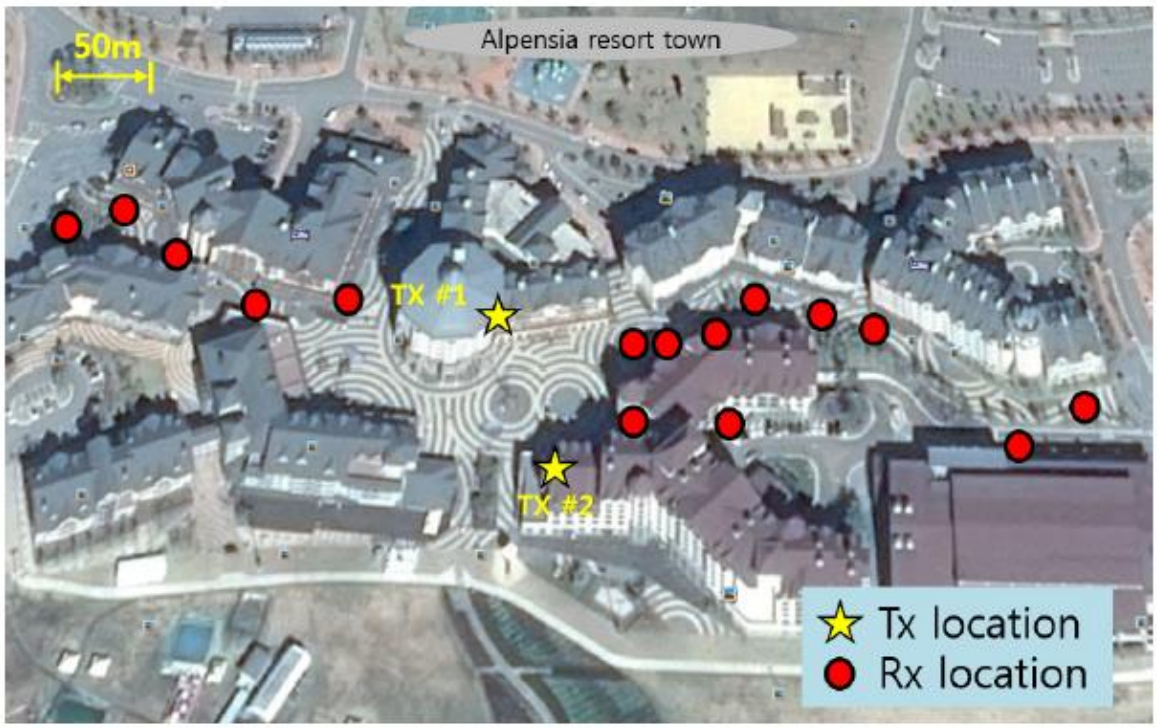

Fig. 1 map of the measurement campaign in an Alpensia resort town

In the case of NLoS measurements, as used in the 3GPP SCM and the WINNER II model, the alpha-beta model is adopted in this document. Path loss scatter plots for NLoS measurements are illustrated in Fig. 2.

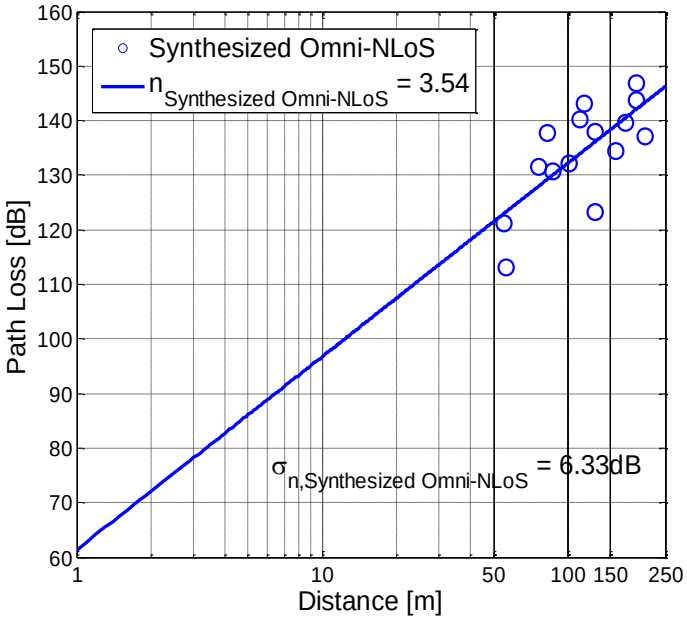

Fig. 2 NLS path loss result with Alpha-beta path loss models for NLoS environments.

2.2 LoS(Open square) measurement results

The LoS channel sounding was conducted in a biathlon stadium similar to an open square environment. In the campaign, there were 21 line-of-sight (LoS) locations with Tx-Rx distances ranging from 34 m to 117 m. The Tx antenna was installed in the height of 8 m. The rotating range of the Tx horn antenna in the azimuth axis was from -30^o to 30^o. The Tx horn antenna rotated from -10^o to 10^o in the elevation axis. In contrast, the rotating range of the Rx horn antenna was from -180^o to 180^o in the azimuth axis and from -30^o to 30^o in the elevation axis. Figure 3 depicts a satellite map of the measurement site with transmitter and receiver locations.

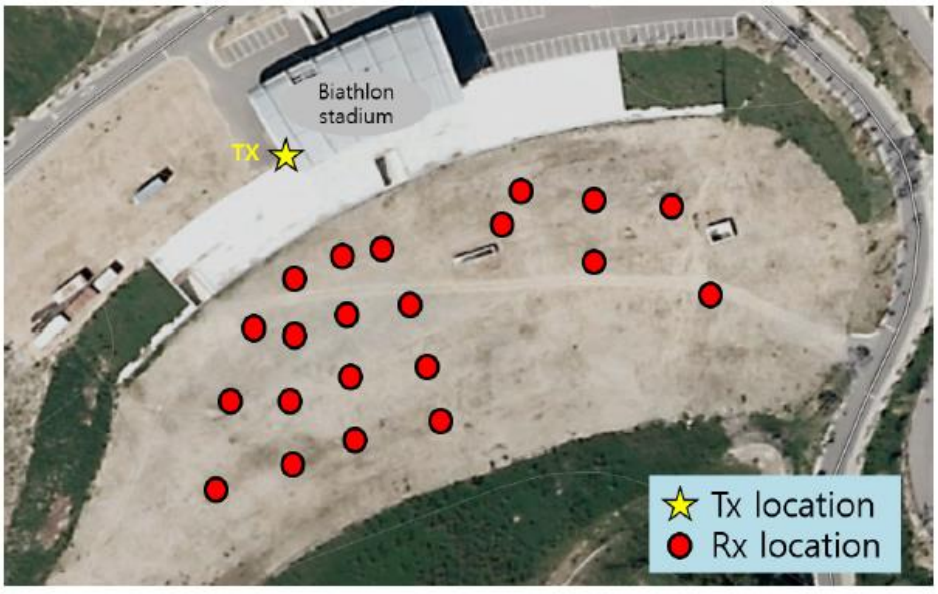

Fig. 3 Map of the measurement campaign in a biathlon stadium

For LoS locations, the well-known close-in free-space reference-distance model is used. Path loss scatter plots for LoS measurements are illustrated in Fig. 4.

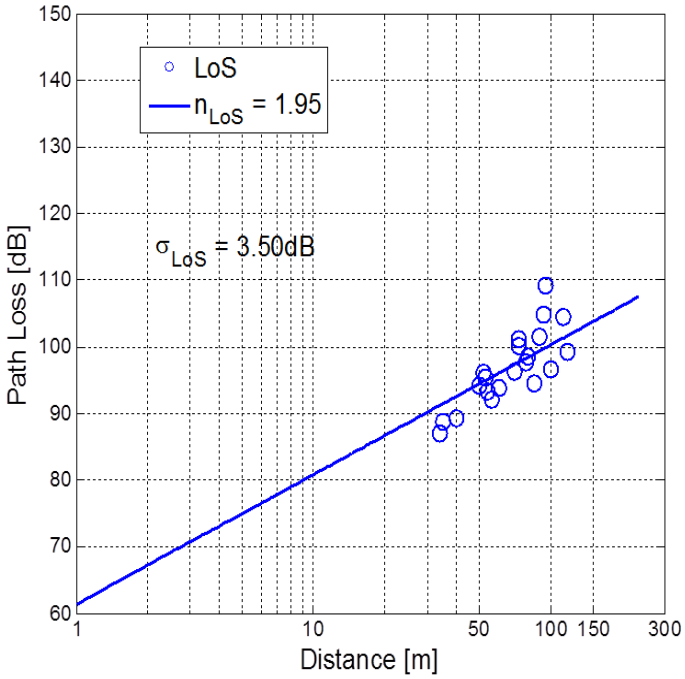

Fig. 4 LoS path loss result with Closed-in 1m ref. model

2.3 SCM parameters

To analyse the channel modelling, the SCM parameters are needed. Below table 1 shows the all parameters from KT's measurement campaign for 28GHz briefly.

Table 1. SCM parameters

Parameter	NLOS value	LOS value
RMS delay spread	60.41 ns	6.78 ns
AoD spread	6.75 deg	3.29 deg
AoA spread	43.11 deg	3.51 deg
EoD spread	4.64 deg	2.12 deg
EoA spread	7.34 deg	4.81 deg
α(linear slope)	3.54	N/A
β(floating intercept)	60.13	N/A
σ(shadow fading)	6.33	N/A

3. Summary

In this contribution, we introduced the measurement results for 28GHz in multiple deployment scenarios. The measurement results show 28GHz band is feasible to be used for cellular communication system.

References

[1] 3GPP, RP-151606, Samsung and Nokia Networks, “New SID Proposal: Study on channel model for frequency spectrum above 6 GHz,” Sep. 2015.