

5G Testbed @ 15GHz

Indoor Test Report

At Ericsson Hong Kong Office

1 Introduction

To facilitate further advancement of mobile technology development in Hong Kong, Ericsson has conducted deployment of a 5G testbed and performed field test during January-February 2017. Our objective with this testbed is to create public/industry awareness of the 5G technology and to collaborate with one of the MNOs in Hong Kong for live measurement of radio performance. The testbed was running over air interface in the 15GHz band.

This document contains test report for the 5G testbed in indoor measurement at Ericsson Hong Kong office.

2 Trial Setup

2.1 5G Equipment

2.1.1 5G Base Station



- L1/L2 board
- GPS simulator
- GPS splitter

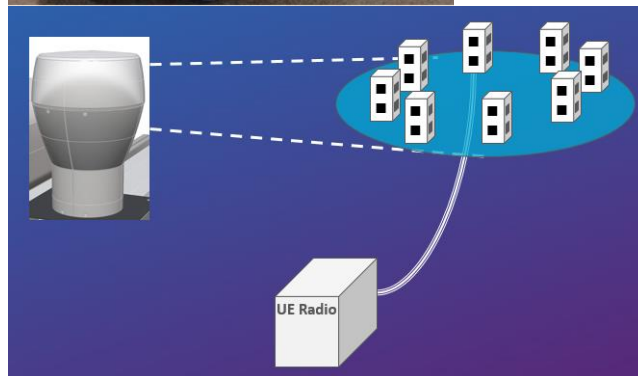
- Switch for LMT port
- Switch for TN port
- Firewall
- Blade Core Network emulator

2.1.2 5G RRU



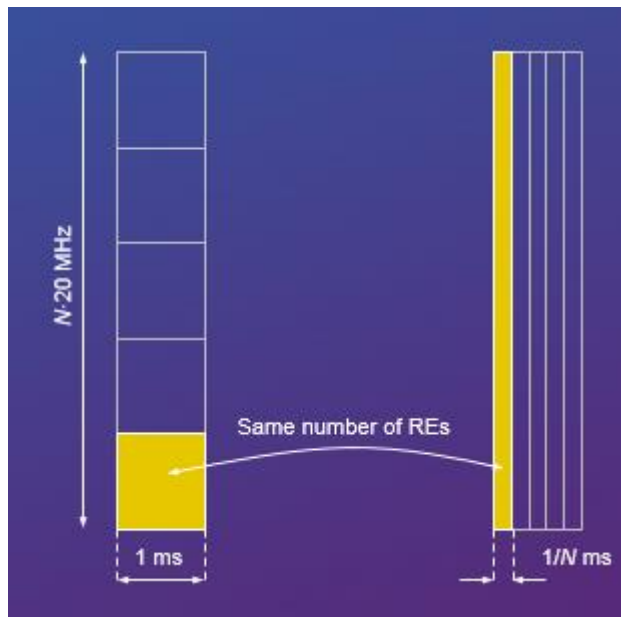
- Frequency range : 14.7 ~ 15.1 GHz
- Total bandwidth: 400MHz
- Antenna
 - o array : 64 element
 - o gain : 14 dBi
 - o horizontal : 90 deg
 - o vertical : 8.5 deg

2.1.3 5G UE



- 4x4 MIMO
- Similar building practice as BS
- Used 220V AC power in operation

2.2 5G Prototype L1 Characteristics



Carrier bandwidth	100 Mhz
Overall bandwidth with 4 carriers	400 Mhz
Subcarrier spacing	75 kHz
Subframe duration	0.2ms

2.3 5G Prototype Power

Total Power = 40W (46dBm)

Bandwidth = 400MHz

Channel power per 100Mhz = 40dBm

RS power (per 15kHz) = $40\text{dBm} - 10\log(100000000/15000) \approx 1.8\text{dBm}$

3 Test Cases

Test Objects	Purpose
Indoor single UE throughput test of LOS scenario	In the indoor LOS scenario, test the single UE throughput of different signal strength.
Indoor single UE throughput test of NLOS scenario	In the indoor NLOS scenario, test the single UE throughput of different signal strength.

3.1 Case 1: Single user measurement on LOS scenario

Purpose: measure single user performance under different scenarios (LOS)

Configurations:

- Base station : 1
- UE : 1
- Frequency bandwidth : 400MHz
- UE test point :
 - Line of sight scenario
 - Refer to Floor Plan

Test procedure :

1 : Power on 5G prototype system ;

2 : Startup UE on the good point, reach peak throughput;

3 : Start downlink throughput test, keep 30 second on each point , record RSRP, SINR, Latency and throughput at each point by photo or screenshot.

3.2 Case 2: Single user measurement on NLOS scenario

Purpose : measure single user performance under different scenarios (NLOS)

Configuration :

- Base station : 1
- UE : 1
- Frequency bandwidth : 400MHz
- UE test point :
 - NLOS
 - Refer to Floor Plan

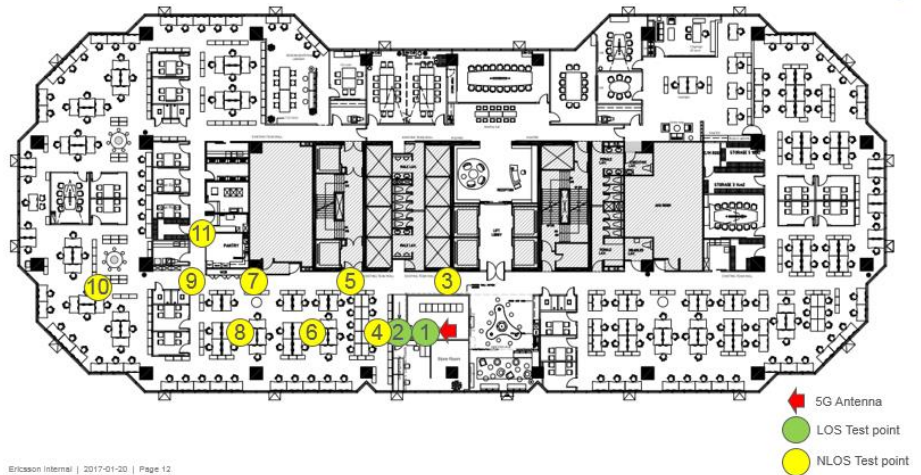
Test procedure :

1 : Power on 5G prototype system ;

2 : Startup UE on the good point, reach peak throughput;

3 : Start downlink throughput test, keep 30 second on each point , record RSRP, SINR, Latency and throughput at each point by photo or screenshot.

3.3 Floor Plan

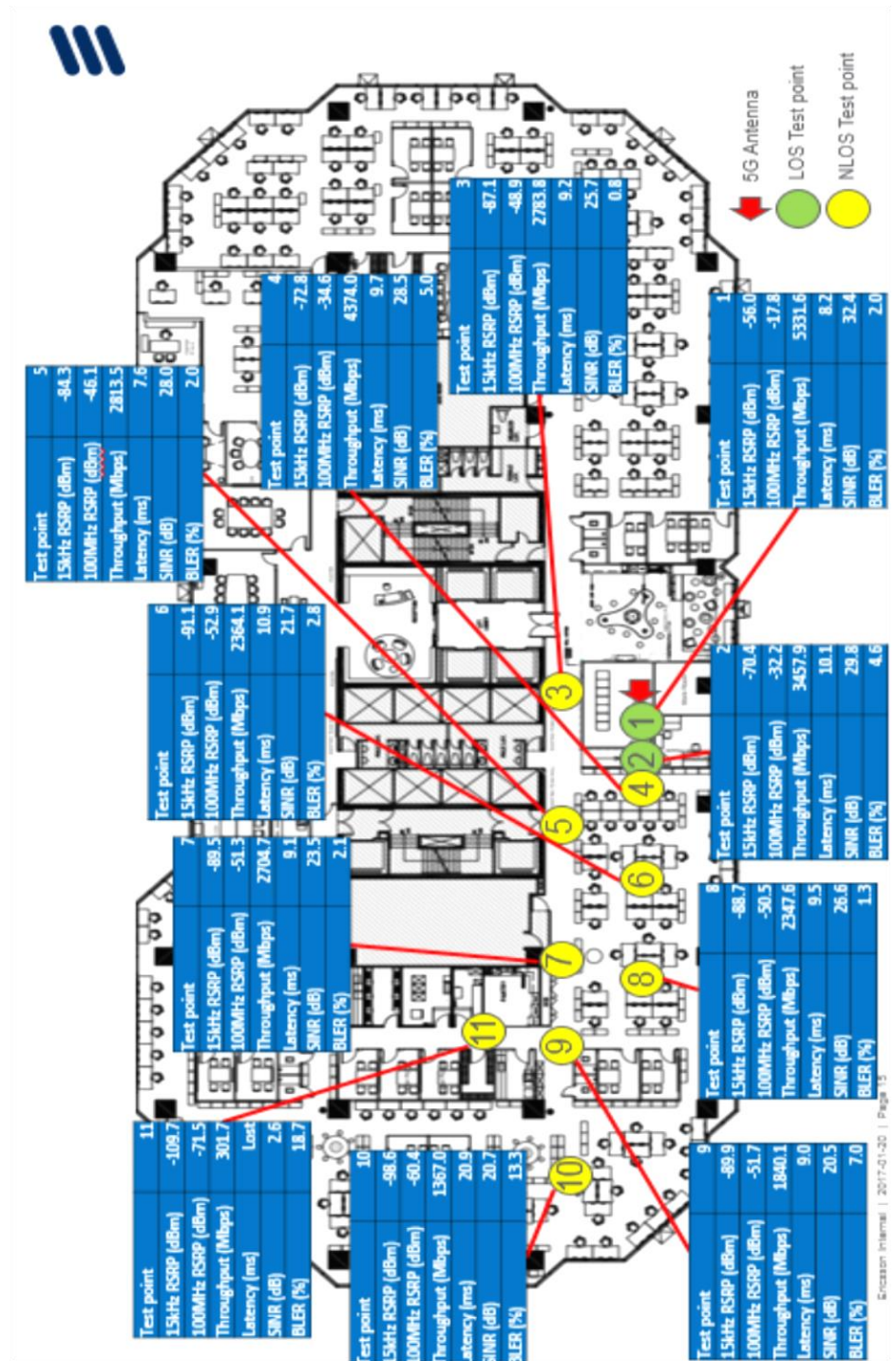


4 Test Result

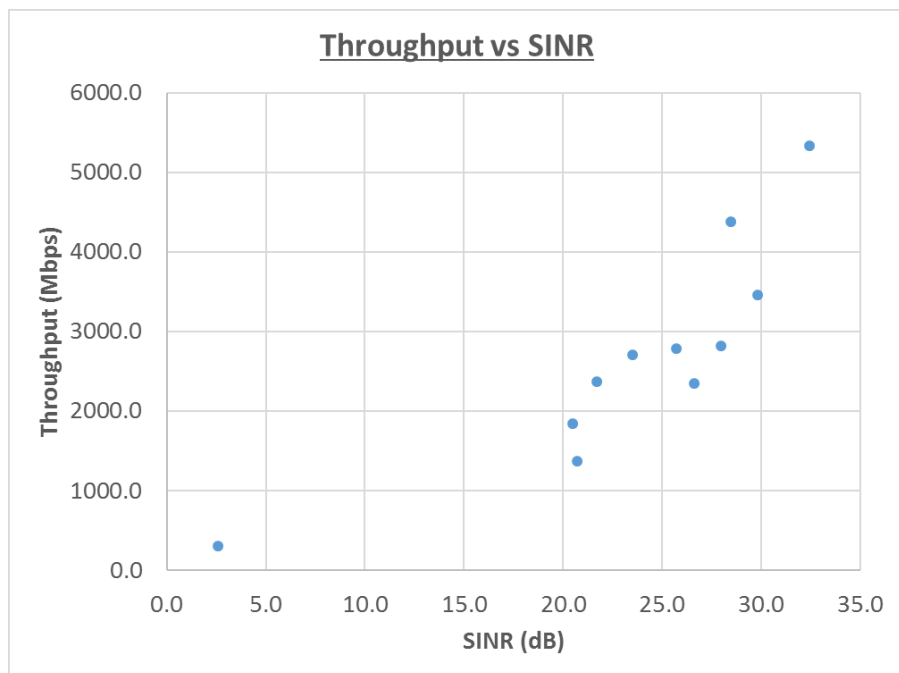
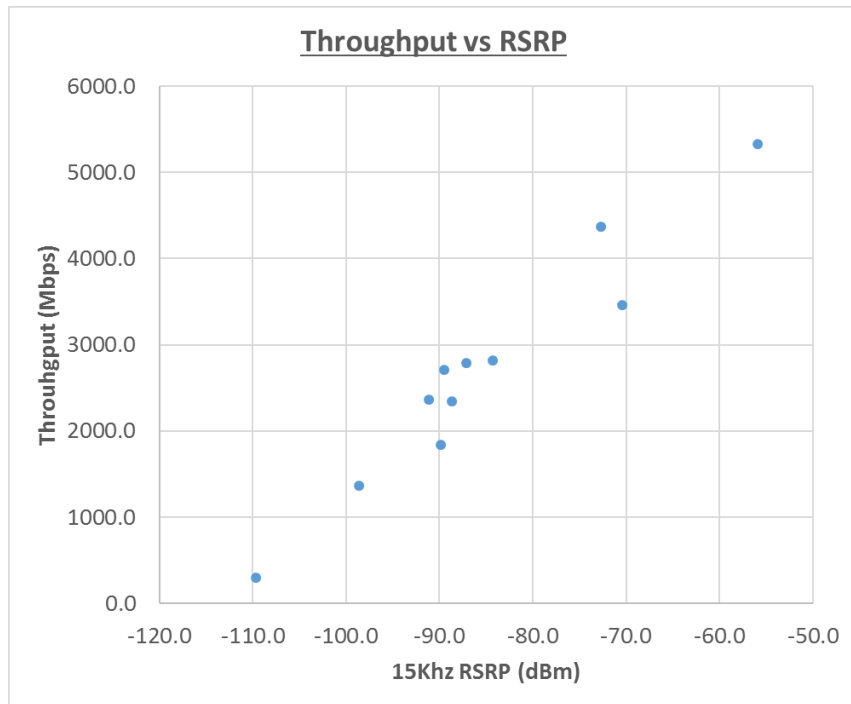
4.1 Summary

Test point	Test point type	15kHz RSRP (dBm)	100MHz RSRP (dBm)	Throughput (Mbps)	Latency (ms)	SINR (dB)	BLER (%)
1	LOS	-56.0	-17.8	5331.6	8.19	32.4	2.0
2	LOS	-70.4	-32.2	3457.9	10.12	29.8	4.6
3	NLOS	-87.1	-48.9	2783.8	9.18	25.7	0.8
4	NLOS	-72.8	-34.6	4374.0	9.72	28.5	5.0
5	NLOS	-84.3	-46.1	2813.5	7.57	28.0	2.0
6	NLOS	-91.1	-52.9	2364.1	10.85	21.7	2.8
7	NLOS	-89.5	-51.3	2704.7	9.07	23.5	2.1
8	NLOS	-88.7	-50.5	2347.6	9.48	26.6	1.3
9	NLOS	-89.9	-51.7	1840.1	9	20.5	7.0
10	NLOS	-98.6	-60.4	1367.0	20.85	20.7	13.3
11	NLOS	-109.7	-71.5	301.7	Lost	2.6	18.7

Remarks: Latency at Test point 11 cannot be measured



4.2 Throughput vs RSRP/SINR



5 Conclusions

The measurement trial has shown a satisfactory max throughput of 5.3Gbps achieved in the excellent indoor LOS environment. Performance varies according to different LOS and NLOS locations, depending on the SINR qualities seen.

Overall, the 5G Phase 1 Prototype Testbed has demonstrated a 5Gbps data throughput achieved in the 15Ghz band.