

ANNEX B_EMI TEST RESULT

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	June 20, 2019	Initial Release
1	June 27, 2019	Added the results of testing band
2	July 4, 2019	Revised the result of LTE B71 and LTE B14

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

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1. GENERAL INFORMATION

1.1 Details of Support Equipment

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Manufacturer	Tech. Information
EUT	SM-T727U	SAMSUNG	-
TA	EP-TA200	SOLUM	Input: AC 100~240 V, 50~60 Hz, 0.5 A Output: DC 9.0 V, 1.67 A or DC 5.0 V, 2.0 A
Data Cable	EP-DT725BWE	KSD	-
Earphone	EHS64AVFWE	ALMUS	-
Ear-Jack Gender	KCA-ET-2-0305	KSD	-
Micro SD Card	-	SAMSUNG	-

1.2 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB Type C	Y	Y	(P,D) 1.0
	USB Type C (Ear-Jack Gender)	N/A	N	(D) 0.09
Ear-Jack Gender	Earphone	N/A	N	(D) 1.2

NOTE. The marked "(D)" means the data cable and "(P)" means the power cable.

1.3 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	USB Type C	N	N/A	Y	Both End
	Ear-Jack Gender	N	N/A	Y	Both End
Ear-Jack Gender	Earphone	N	N/A	Y	EUT End

1.4 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Designation No.
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	

1.5 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

1.6 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	1.78 dB
Radiated Emissions (30 MHz to 1 GHz)	6.00 dB
Radiated Emissions (1 GHz to 18 GHz)	4.78 dB
Radiated Emissions (18 GHz to 40 GHz)	4.94 dB

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dBμV)	Average (dBμV)	Quasi-Peak (dBμV)	Average (dBμV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber.
The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
(1 GHz to 40 GHz)

Radiated Emission Limits

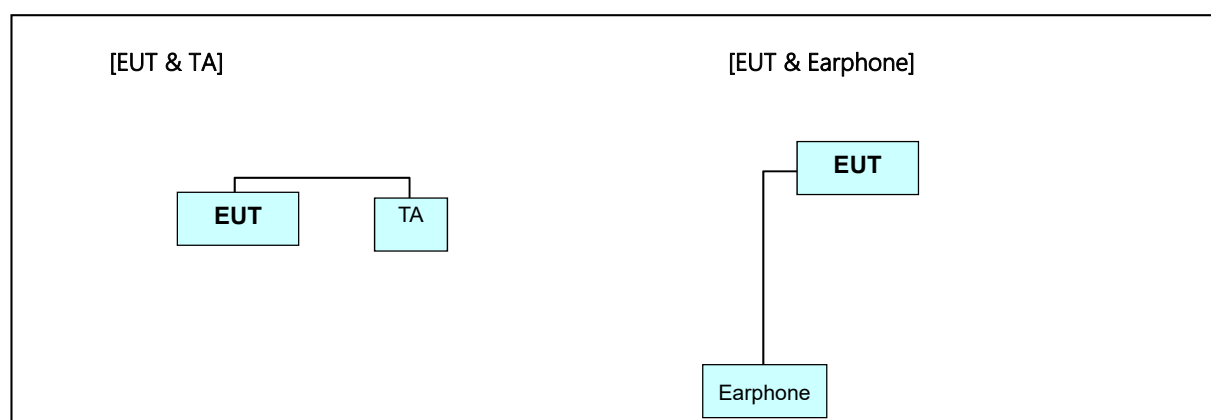
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	
Above 1 000	3	80	60	74	54	

2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



Non-Conductive Table

Power Line: 120 VAC, 60 Hz

3. PRELIMINARY TEST

During preliminary tests, the following operating mode was investigated.

Receiver mode (WCDMA 850 Idle (Low/Middle/High CH))

Receiver mode (LTE B5 / B12 / B13 / B14 / B17 / B26 / B71 Idle (Low/Middle/High CH))

NOTE. The worst band is tested.

3.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Mode: Receiver mode (LTE B12+B13+B17 Middle CH Idle)

3.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Mode:

30 MHz to 1 GHz

[EUT & TA]

Receiver mode (LTE B71 Low / Middle / High CH Idle)

Receiver mode (LTE B26+B5 Low / Middle / High CH Idle)

Receiver mode (LTE B12+B13+B17 Low / Middle / High CH Idle)

Receiver mode (LTE B14 Low / Middle / High CH Idle)

[EUT & Earphone]

Receiver mode (LTE B71 Low / Middle / High CH Idle)

Receiver mode (LTE B26+B5 Low / Middle / High CH Idle)

Receiver mode (LTE B12+B13+B17 Low / Middle / High CH Idle)

Receiver mode (LTE B14 Low / Middle / High CH Idle)

1 GHz to 30 GHz**[EUT & TA]**

Receiver mode (LTE B12+B13+B17 Middle CH Idle)

[EUT & Earphone]

Receiver mode (LTE B26+B5 Low CH Idle)

NOTE.

1. Three orientations have been investigated and the worst case orientation is reported.
2. The worst case of operating mode is reported.

4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission

4.1.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
☒	LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
☒	RADIO COMMUNICATION ANALYZER	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	ANTENNA(for Communication)	USLP9142	Schwarzbeck	VSLP 9142-200	-	-
☒	Software	Rohde & Schwarz	EMC32 VER8.54.0	-	-	-

4.1.2 Operating Condition

The test results of conducted emission at mains ports provide the following information:

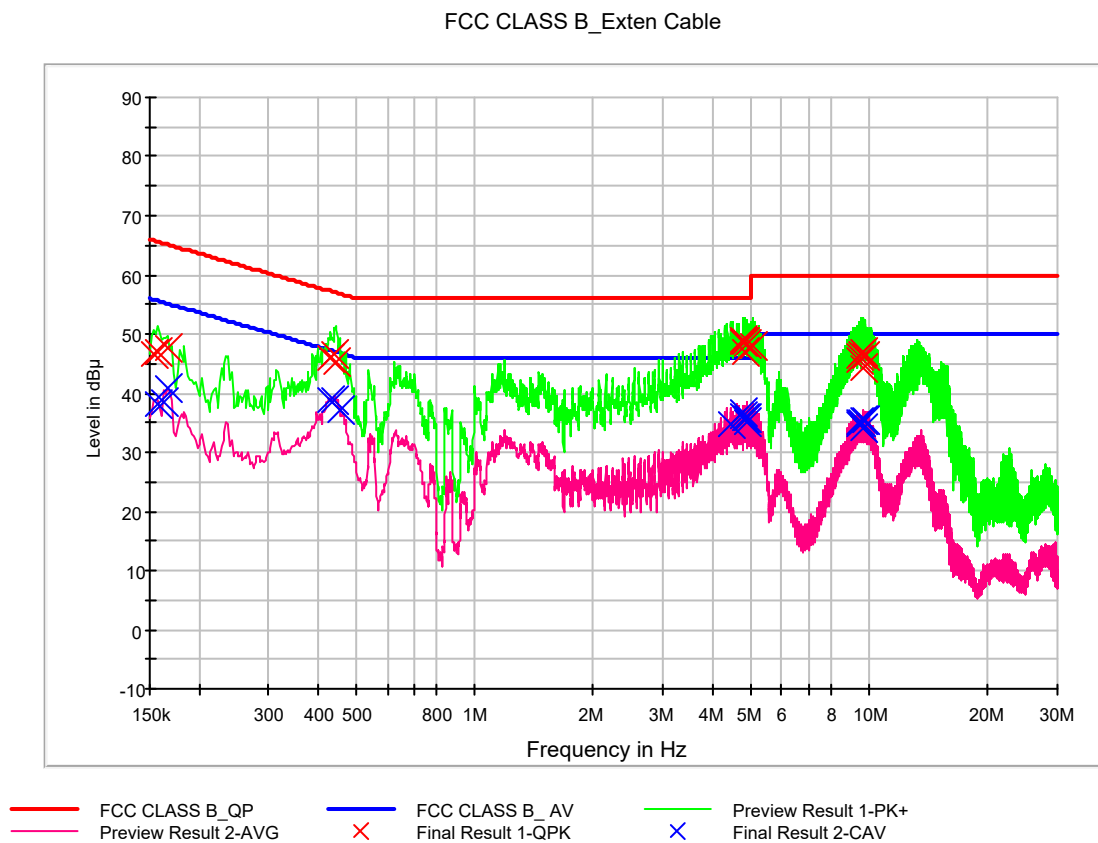
Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operating Mode	Receiver mode (LTE B12+B13+B17 Middle CH Idle)
Kind of Test Site	Shielded Room
Temperature	23.3 °C
Relative Humidity	46.1 %
Test Date	July 4, 2019

-Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

4.1.3 Measuring Data

Figure 1: Conducted Emission, AC Main Port, Line (L1)



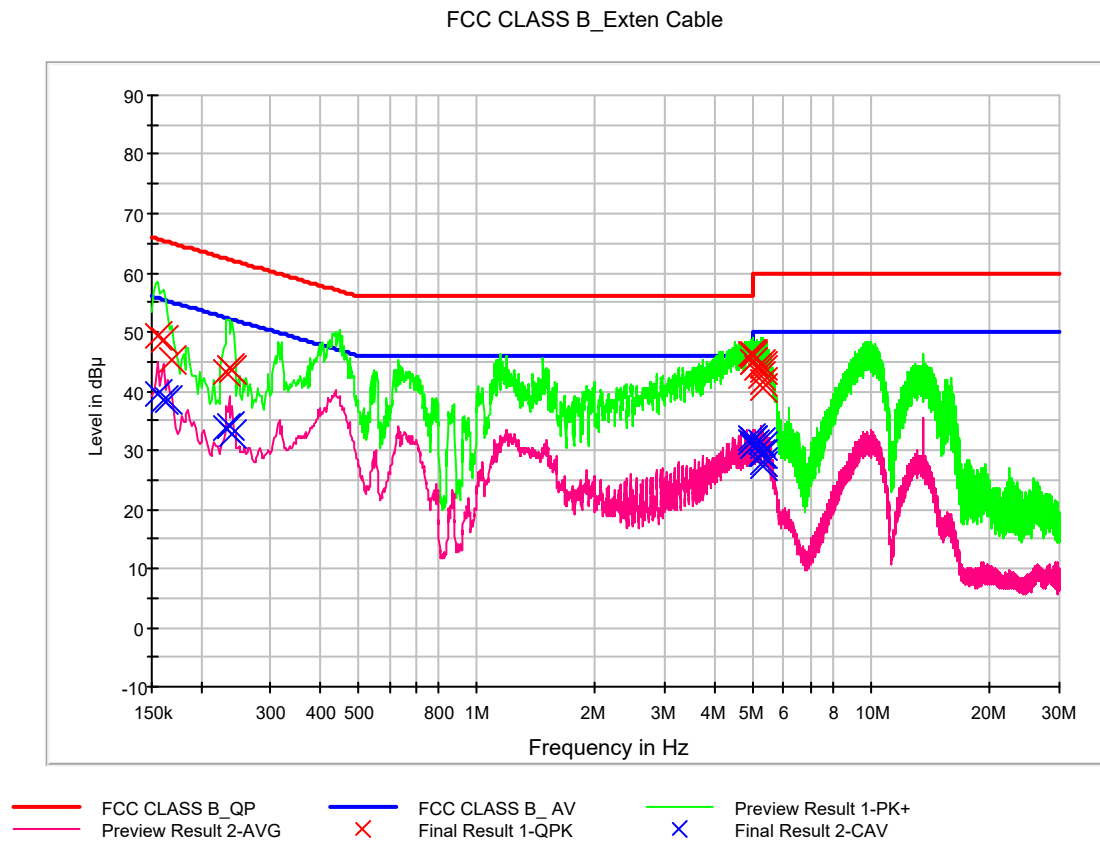
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.154000	46.7	9.000	L1	9.7	19.1	65.8
0.158000	47.1	9.000	L1	9.7	18.5	65.6
0.166000	47.7	9.000	L1	9.7	17.4	65.2
0.432000	45.9	9.000	L1	9.7	11.4	57.2
0.440000	46.5	9.000	L1	9.7	10.6	57.1
0.444000	45.2	9.000	L1	9.7	11.8	57.0
4.758000	48.8	9.000	L1	10.0	7.2	56.0
4.764000	49.0	9.000	L1	10.0	7.0	56.0
4.830000	47.0	9.000	L1	10.0	9.0	56.0
4.840000	48.7	9.000	L1	10.0	7.3	56.0
4.910000	48.3	9.000	L1	10.0	7.7	56.0
5.068000	48.0	9.000	L1	10.0	12.0	60.0
9.432000	45.8	9.000	L1	10.2	14.2	60.0
9.448000	46.3	9.000	L1	10.2	13.7	60.0
9.520000	46.6	9.000	L1	10.2	13.4	60.0
9.658000	44.2	9.000	L1	10.2	15.8	60.0
9.672000	46.8	9.000	L1	10.2	13.2	60.0
9.760000	46.1	9.000	L1	10.2	13.9	60.0

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	38.3	9.000	L1	9.7	17.3	55.6
0.162000	38.6	9.000	L1	9.7	16.7	55.4
0.166000	41.0	9.000	L1	9.7	14.2	55.2
0.432000	38.7	9.000	L1	9.7	8.5	47.2
0.442000	38.9	9.000	L1	9.7	8.1	47.0
0.454000	37.2	9.000	L1	9.8	9.6	46.8
4.448000	34.8	9.000	L1	10.0	11.2	46.0
4.760000	36.2	9.000	L1	10.0	9.8	46.0
4.764000	36.7	9.000	L1	10.0	9.3	46.0
4.832000	35.7	9.000	L1	10.0	10.3	46.0
4.906000	35.0	9.000	L1	10.0	11.0	46.0
4.910000	35.8	9.000	L1	10.0	10.2	46.0
9.432000	34.7	9.000	L1	10.2	15.3	50.0
9.448000	35.0	9.000	L1	10.2	15.0	50.0
9.520000	35.1	9.000	L1	10.2	14.9	50.0
9.658000	34.1	9.000	L1	10.2	15.9	50.0
9.672000	35.4	9.000	L1	10.2	14.6	50.0
9.760000	35.3	9.000	L1	10.2	14.7	50.0

Figure 2: Conducted Emission, AC Main Port, Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.156000	49.3	9.000	N	9.8	16.4	65.7
0.160000	48.7	9.000	N	9.8	16.8	65.5
0.168000	45.1	9.000	N	9.8	19.9	65.1
0.232000	43.2	9.000	N	9.9	19.2	62.4
0.236000	43.8	9.000	N	9.9	18.4	62.2
0.240000	43.4	9.000	N	9.9	18.7	62.1
4.934000	46.4	9.000	N	10.2	9.6	56.0
5.002000	44.9	9.000	N	10.2	15.1	60.0
5.008000	46.1	9.000	N	10.2	13.9	60.0
5.012000	46.3	9.000	N	10.2	13.7	60.0
5.016000	45.0	9.000	N	10.2	15.0	60.0
5.156000	43.9	9.000	N	10.2	16.1	60.0
5.248000	44.7	9.000	N	10.2	15.3	60.0
5.256000	42.6	9.000	N	10.2	17.4	60.0
5.320000	43.4	9.000	N	10.2	16.6	60.0
5.328000	44.1	9.000	N	10.2	15.9	60.0
5.338000	41.7	9.000	N	10.2	18.3	60.0
5.342000	40.6	9.000	N	10.2	19.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.156000	39.5	9.000	N	9.8	16.2	55.7
0.160000	38.4	9.000	N	9.8	17.1	55.5
0.164000	38.6	9.000	N	9.8	16.7	55.3
0.232000	33.7	9.000	N	9.9	18.7	52.4
0.236000	34.2	9.000	N	9.9	18.0	52.2
0.240000	32.8	9.000	N	9.9	19.3	52.1
4.930000	32.2	9.000	N	10.2	13.8	46.0
4.934000	31.5	9.000	N	10.2	14.5	46.0
5.002000	31.6	9.000	N	10.2	18.4	50.0
5.012000	31.8	9.000	N	10.2	18.2	50.0
5.016000	30.5	9.000	N	10.2	19.5	50.0
5.094000	31.0	9.000	N	10.2	19.0	50.0
5.248000	31.3	9.000	N	10.2	18.7	50.0
5.256000	29.4	9.000	N	10.2	20.6	50.0
5.328000	30.6	9.000	N	10.2	19.4	50.0
5.334000	29.3	9.000	N	10.2	20.7	50.0
5.338000	27.9	9.000	N	10.2	22.1	50.0
5.342000	27.2	9.000	N	10.2	22.8	50.0

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	RADIO COMMUNICATION ANALYZER	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

4.2.2 Operating Condition

The test results of radiated emission provide the following information:

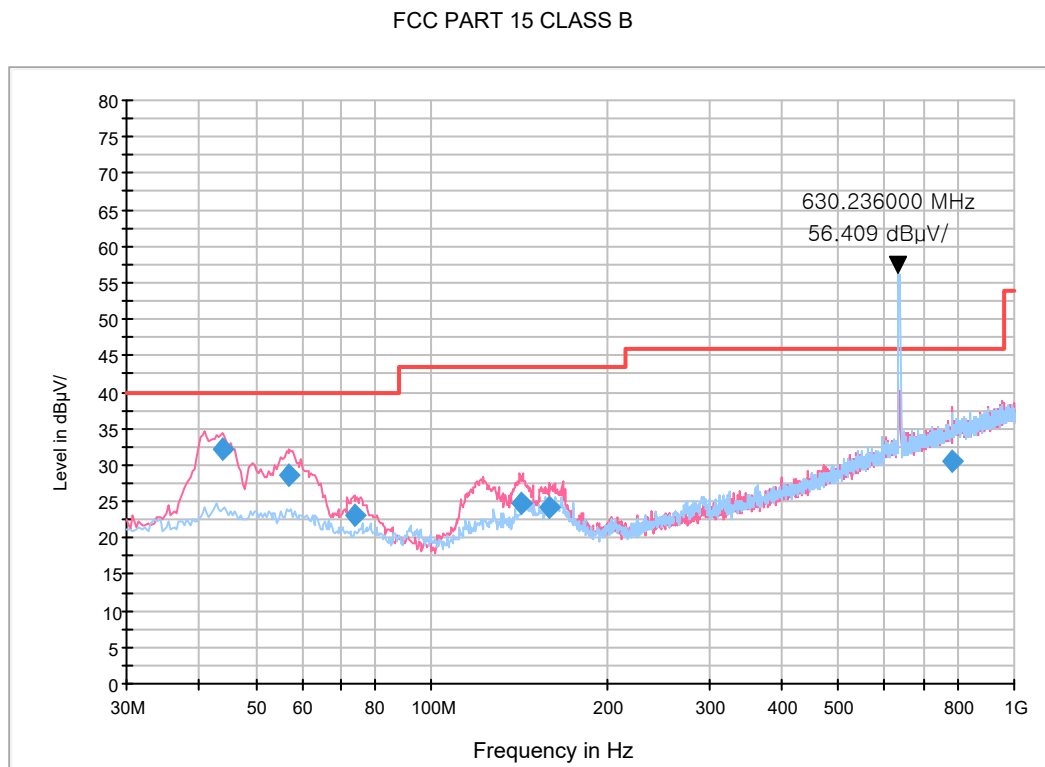
Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	30 MHz to 1 000 MHz
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Worst Case of Operating Mode	[EUT & TA] Receiver mode (LTE B71 Middle CH Idle) [EUT & TA] Receiver mode (LTE B26+B5 Low CH Idle) [EUT & TA] Receiver mode (LTE B12+B13+B17 Middle CH Idle) [EUT & TA] Receiver mode (LTE B14 Middle CH Idle) [EUT & Earphone] Receiver mode (LTE B71 Middle CH Idle) [EUT & Earphone] Receiver mode (LTE B26+B5 Low CH Idle) [EUT & Earphone] Receiver mode (LTE B12+B13+B17 Middle CH Idle) [EUT & Earphone] Receiver mode (LTE B14 Middle CH Idle)
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.8 °C / 24.1 °C / 24.5 °C / 24.3 °C
Relative Humidity	42.1 % / 43.8 % / 44.3 % / 43.1 %
Test Date	June 08, 2019 / June 27, 2019 / July 1, 2019 / July 4, 2019

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

4.2.3 Measuring Data

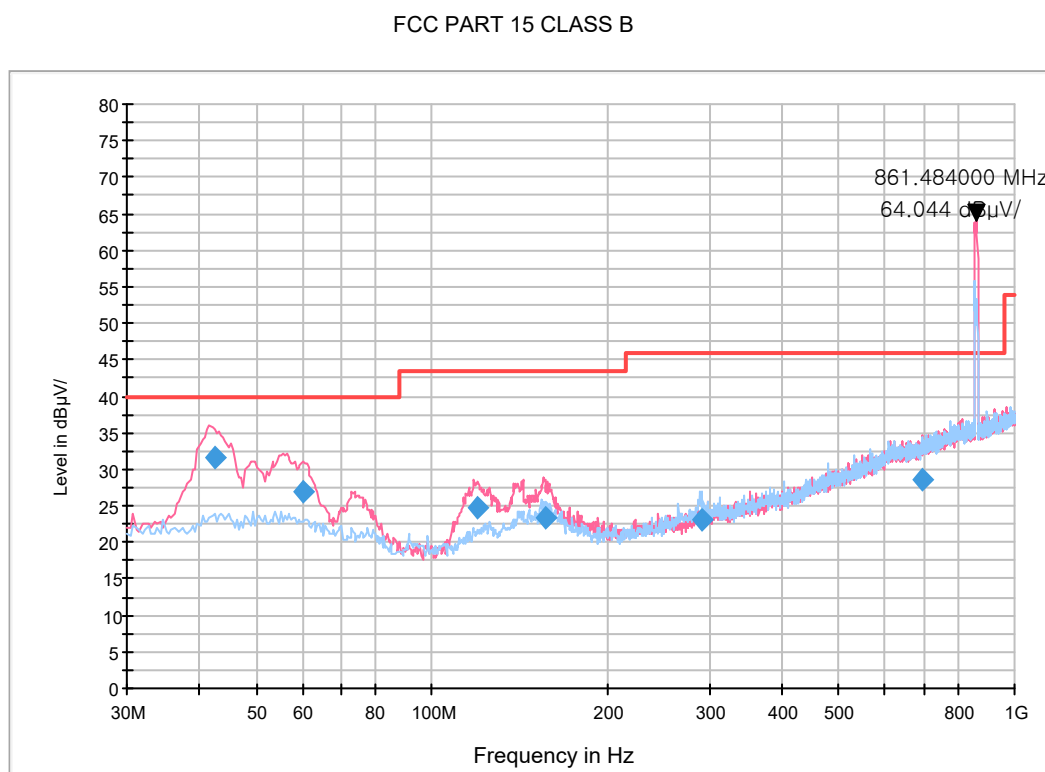
Figure 3: Radiated Emission, Receiver mode (LTE B71 Middle CH Idle)



- note. 1. LTE B71 Middle ch Rx Frequency: 630.236 MHz
 2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
43.908000	32.0	100.0	V	64.0	19.3	8.0	40.0
57.030400	28.6	100.0	V	358.0	19.5	11.4	40.0
74.241600	23.0	100.0	V	347.0	17.1	17.0	40.0
142.732000	24.8	100.0	V	178.0	19.1	18.7	43.5
159.388800	24.3	100.0	V	155.0	19.9	19.2	43.5
784.644800	30.4	100.0	V	346.0	30.1	15.6	46.0

Figure 4: Radiated Emission, [EUT & TA] Receiver mode (LTE B26+B5 Low CH Idle)

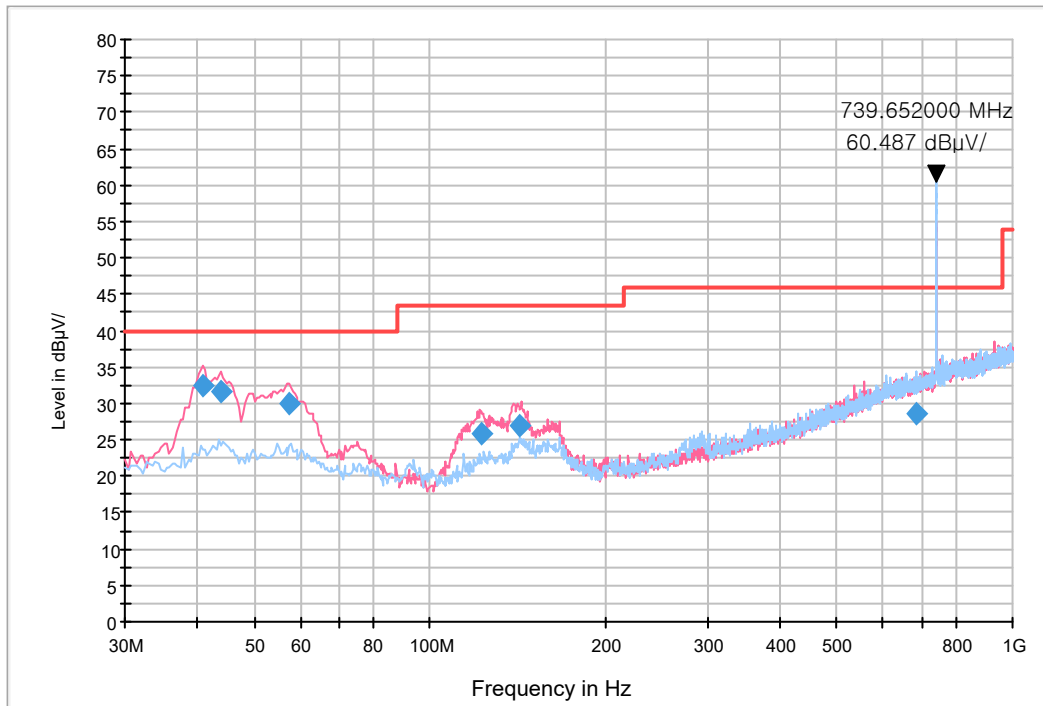


- NOTE. 1. LTE B26+B5 Low CH RX Frequency: 861.484 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
42.441600	31.7	100.0	V	18.0	19.2	8.3	40.0
60.065600	26.8	117.8	V	30.0	19.4	13.2	40.0
119.571200	24.9	100.0	V	188.0	17.4	18.6	43.5
156.466400	23.4	125.1	V	151.0	19.8	20.1	43.5
290.046400	23.1	100.0	H	68.0	20.2	22.9	46.0
693.181600	28.7	292.8	V	263.0	28.7	17.3	46.0

Figure 5: Radiated Emission, [EUT & TA] Receiver mode (LTE B12+B13+B17 Middle CH Idle)

FCC PART 15 CLASS B

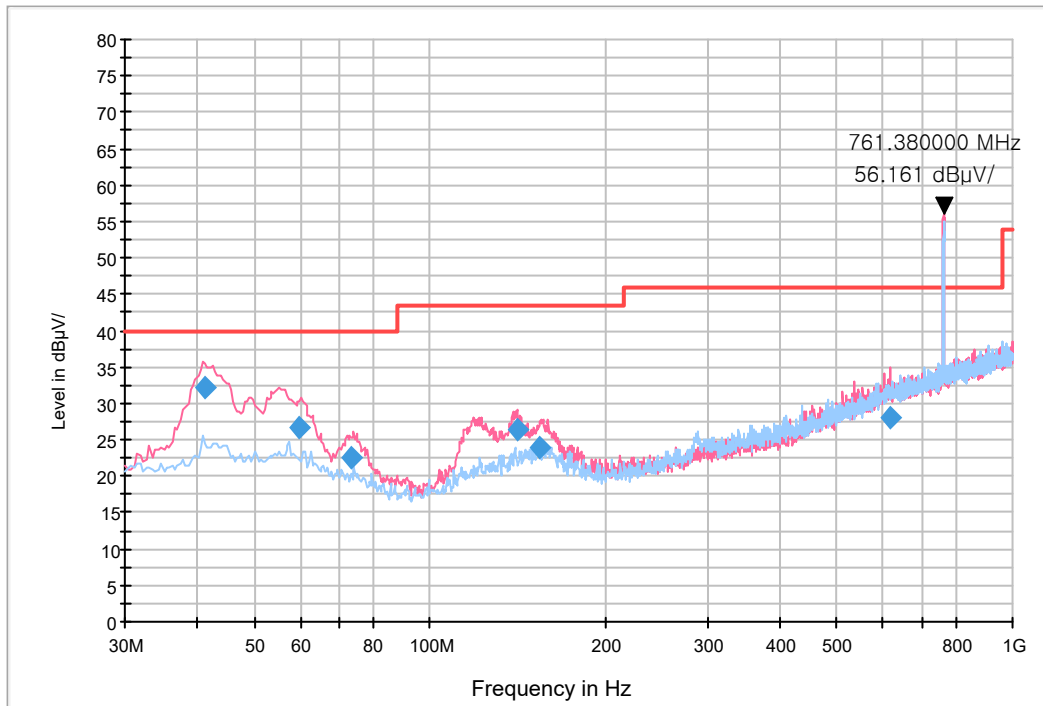


- NOTE. 1. LTE B12+B13+B17 Middle CH RX Frequency: 739.652 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
40.997600	32.4	100.0	V	132.0	19.1	7.6	40.0
43.935200	31.5	100.0	V	132.0	19.3	8.5	40.0
57.342400	30.1	100.0	V	322.0	19.5	9.9	40.0
122.429600	25.9	100.0	V	218.0	17.6	17.6	43.5
143.208000	27.0	100.0	V	163.0	19.2	16.5	43.5
682.080000	28.5	192.9	H	95.0	28.6	17.5	46.0

Figure 6: Radiated Emission, [EUT & TA] Receiver mode (LTE B14 Middle CH Idle)

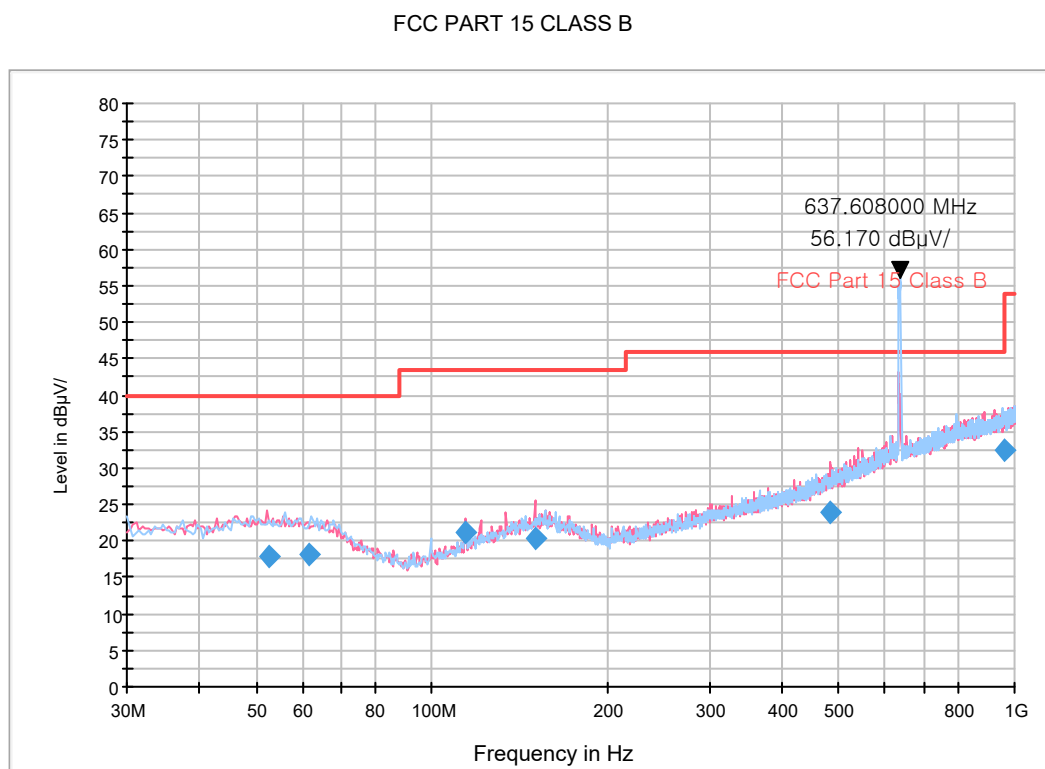
FCC PART 15 CLASS B



- NOTE. 1. LTE B14 Middle CH RX Frequency: 761.380 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
41.130400	32.1	100.0	V	54.0	19.1	7.9	40.0
59.824800	26.8	116.9	V	358.0	19.4	13.2	40.0
73.352800	22.5	100.0	V	303.0	17.3	17.5	40.0
141.028800	26.3	100.0	V	199.0	19.1	17.2	43.5
154.915200	24.0	100.0	V	64.0	19.7	19.5	43.5
617.273600	28.1	100.0	V	326.0	27.7	17.9	46.0

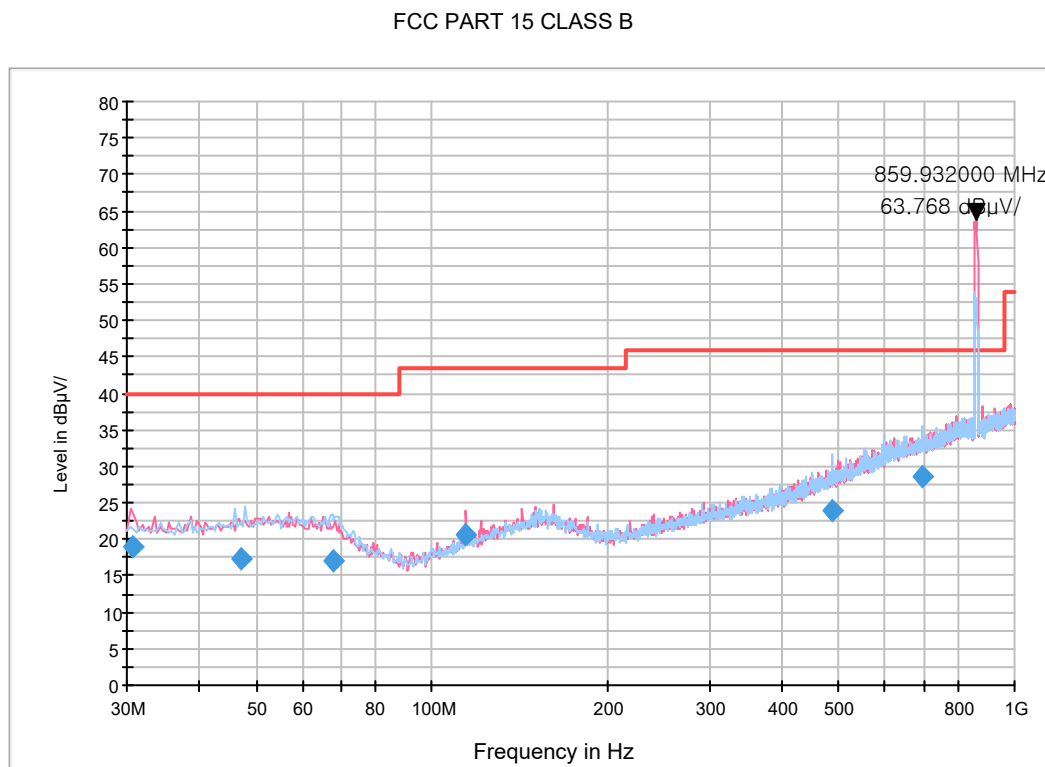
Figure 7: Radiated Emission, [EUT & Earphone] Receiver mode (LTE B71 Middle CH Idle)



NOTE. 1. LTE B71 Middle CH RX Frequency: 637.608 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
52.636800	17.8	100.0	V	117.0	19.7	22.2	40.0
61.452000	18.0	192.7	H	153.0	19.2	22.0	40.0
114.559200	21.1	174.8	V	336.0	16.8	22.4	43.5
150.388000	20.2	174.9	V	306.0	19.5	23.3	43.5
483.420800	24.0	225.2	V	107.0	24.9	22.0	46.0
957.787200	32.3	274.9	H	354.0	32.0	13.7	46.0

Figure 8: Radiated Emission, [EUT & Earphone] Receiver mode (LTE B26+B5 Low CH Idle)

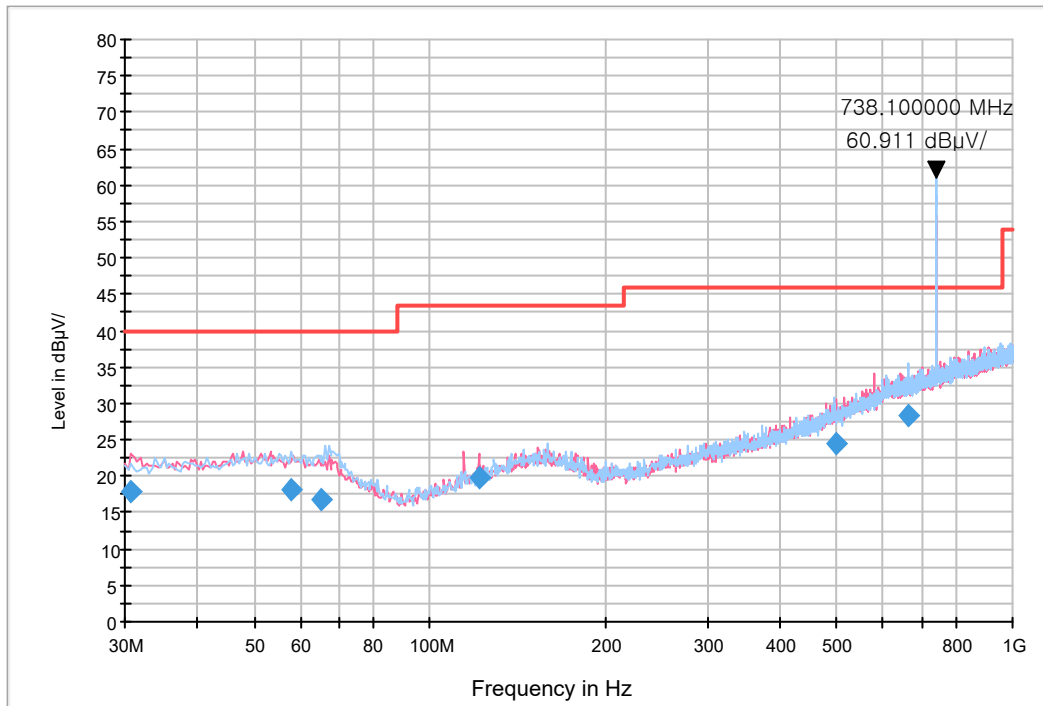


NOTE. 1. LTE B26+B5 Low CH RX Frequency: 859.932 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.796712	19.1	174.9	V	217.0	18.4	20.9	40.0
47.030400	17.4	225.2	H	278.0	19.6	22.6	40.0
67.971200	17.0	274.9	H	344.0	18.3	23.0	40.0
114.576800	20.7	174.8	V	33.0	16.8	22.8	43.5
485.434400	24.0	275.0	H	163.0	24.9	22.0	46.0
695.290400	28.7	274.7	H	185.0	28.7	17.3	46.0

Figure 9: Radiated Emission, [EUT & Earphone] Receiver mode (LTE B12+B13+B17 Middle CH Idle)

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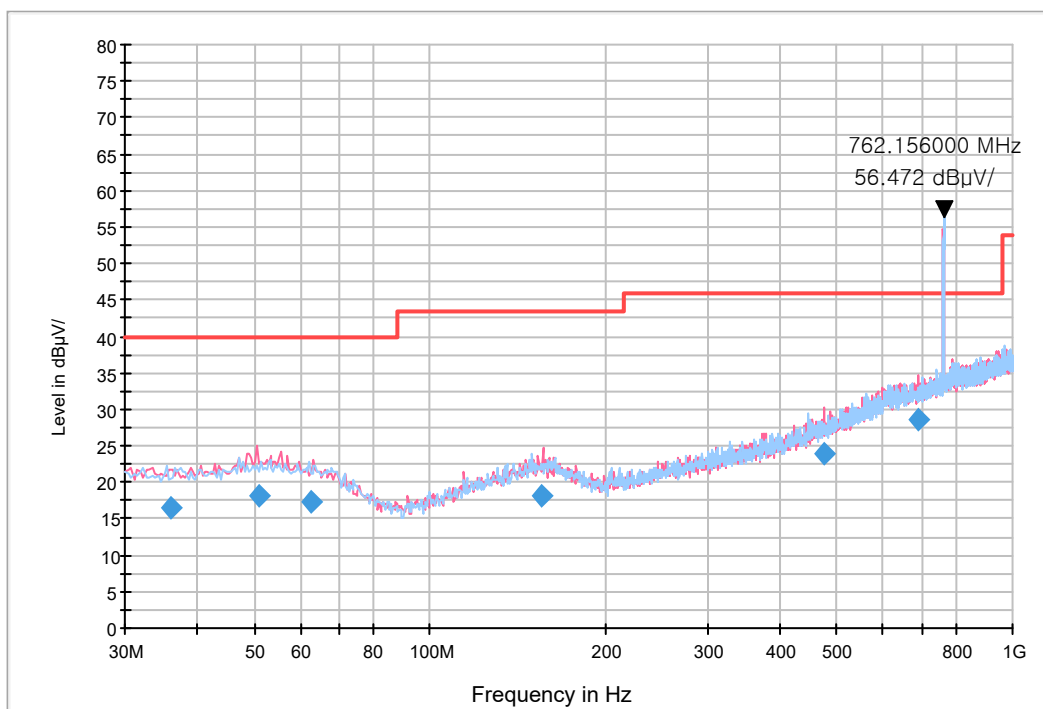


NOTE. 1. LTE B12+B13+B17 Middle CH RX Frequency: 738.100 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.678432	17.8	225.0	V	69.0	18.4	22.2	40.0
58.077600	18.2	225.2	H	0.0	19.5	21.8	40.0
65.356000	16.7	193.7	H	324.0	18.7	23.3	40.0
121.719200	19.8	192.7	V	0.0	17.6	23.7	43.5
496.408800	24.4	100.0	H	17.0	25.2	21.6	46.0
663.313600	28.3	100.0	H	242.0	28.3	17.7	46.0

Figure 10: Radiated Emission, [EUT & Earphone] Receiver mode (LTE B14 Middle CH Idle)

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NOTE. 1. LTE B14 Middle CH RX Frequency: 762.156 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
35.865600	16.4	100.0	H	328.0	18.7	23.6	40.0
50.840000	18.2	117.8	V	231.0	19.8	21.8	40.0
62.529600	17.2	125.3	V	103.0	19.1	22.8	40.0
156.267200	18.2	100.0	V	42.0	19.8	25.3	43.5
476.338400	23.8	125.2	V	346.0	24.7	22.2	46.0
686.750400	28.6	100.0	V	150.0	28.6	17.4	46.0

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Horn antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.20.2018
☒	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☒	Power Amplifier	TESTEK	TK-PA1840H	170030-L	1 year	12.17.2019
☒	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170 #786	2 year	12.05.2017
☒	RADIO COMMUNICATION ANALYZER	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	ANTENNA (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

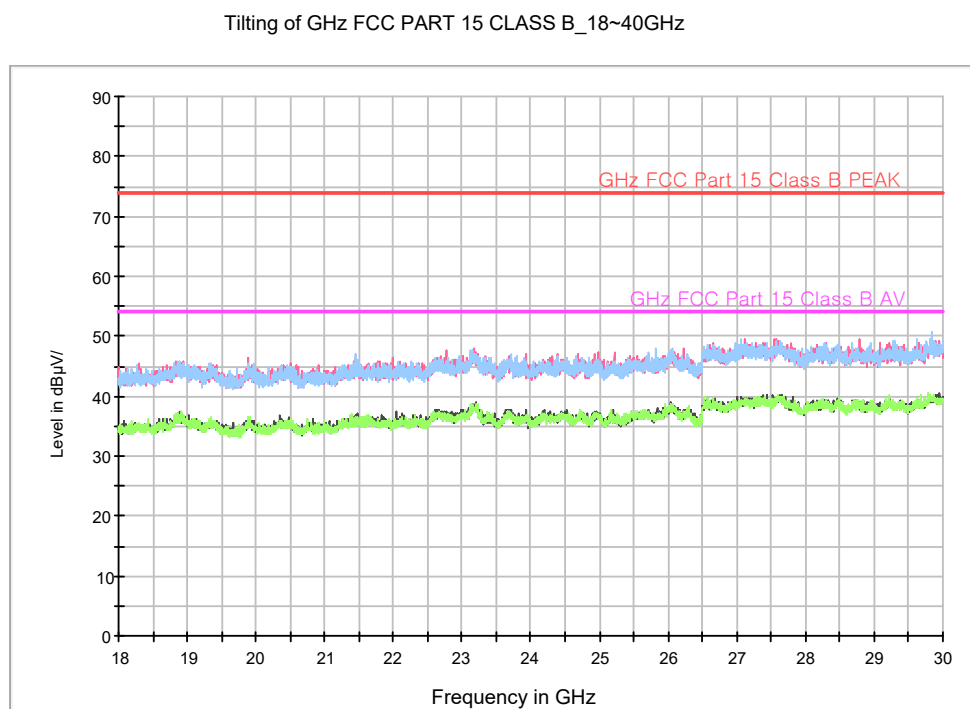
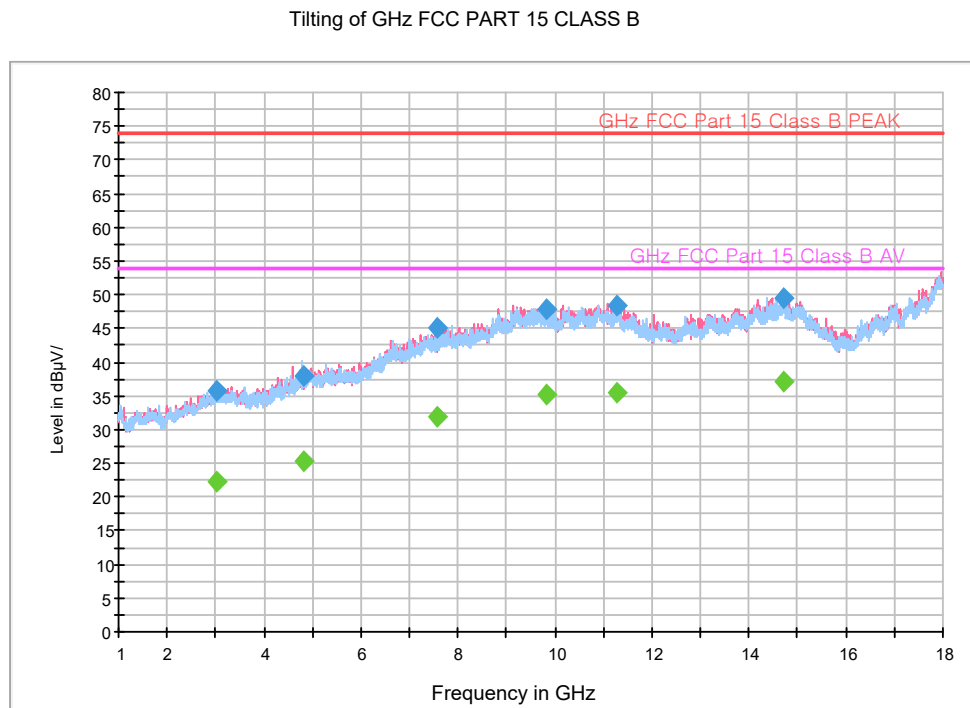
Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	5 825 MHz
Tested Frequency Range	1 GHz to 30 GHz
Operation Mode	[EUT & TA] Receiver mode (LTE B12+B13+B17 Middle CH Idle) [EUT & Earphone] Receiver mode (LTE B26+B5 Low CH Idle)
Kind of Test Site	3 m semi anechoic chamber
Temperature	24.3 °C
Relative Humidity	43.1 %
Test Date	July 4, 2019

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage

4.3.3 Measuring Data

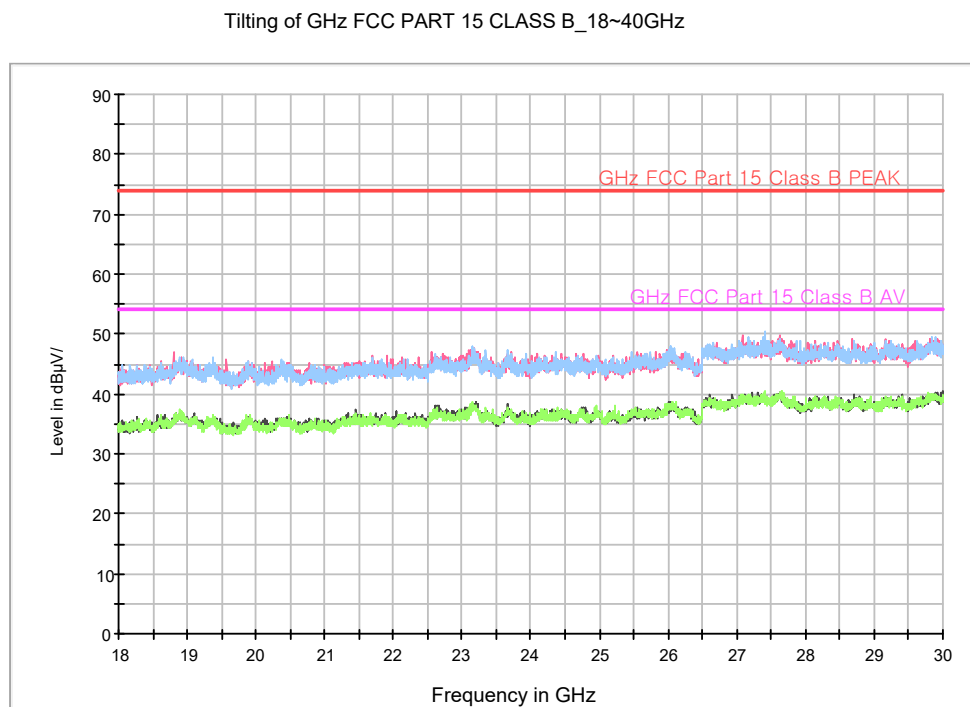
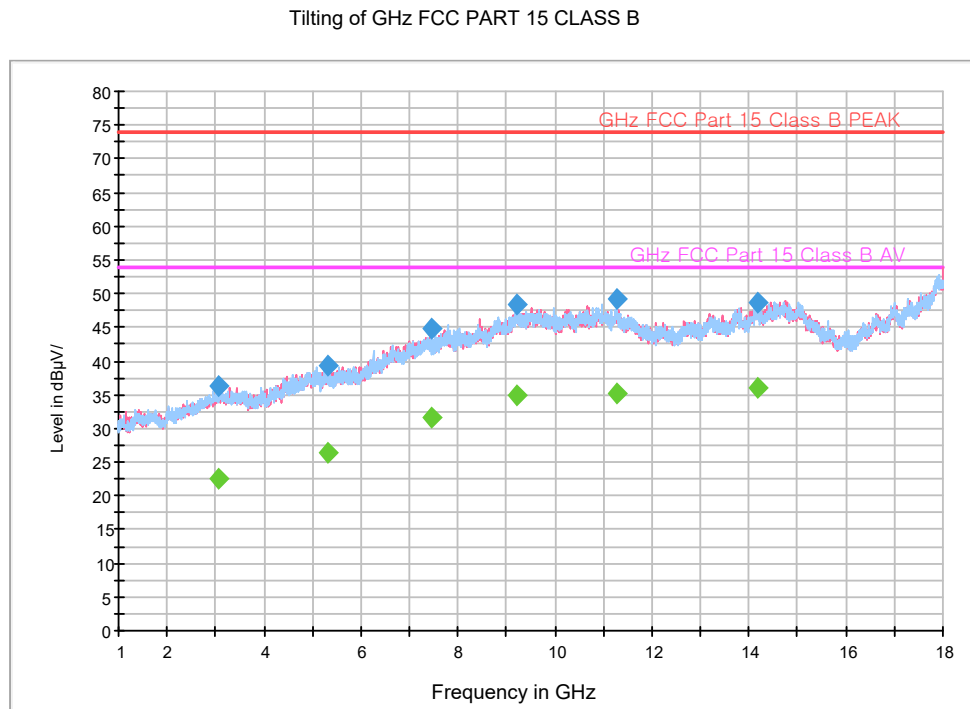
Figure 11: Radiated Emission, [EUT & TA] Receiver mode (LTE B12+B13+B17 Middle CH Idle)



Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3016.375000	35.6	111.4	H	42.0	-21.0	38.4	74.0
4806.620000	37.8	198.5	H	277.0	-16.4	36.2	74.0
7569.945000	45.0	190.5	V	201.0	-9.2	29.0	74.0
9842.850000	47.9	249.4	V	259.0	-5.1	26.1	74.0
11276.550000	48.5	100.0	V	231.0	-2.4	25.5	74.0
14711.590000	49.6	100.0	H	0.0	1.0	24.4	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3016.375000	22.4	111.4	H	42.0	-21.0	31.6	54.0
4806.620000	25.3	198.5	H	277.0	-16.4	28.7	54.0
7569.945000	31.9	190.5	V	201.0	-9.2	22.1	54.0
9842.850000	35.2	249.4	V	259.0	-5.1	18.8	54.0
11276.550000	35.6	100.0	V	231.0	-2.4	18.4	54.0
14711.590000	37.1	100.0	H	0.0	1.0	16.9	54.0

Figure 12: Radiated Emission, [EUT & Earphone] Receiver mode (LTE B26+B5 Low CH Idle)



Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3075.955000	36.3	350.0	V	12.0	-20.9	37.7	74.0
5306.165000	39.2	100.0	H	179.0	-15.4	34.8	74.0
7438.075000	44.8	176.4	H	50.0	-9.4	29.2	74.0
9218.090000	48.5	140.7	V	257.0	-5.9	25.5	74.0
11263.415000	49.3	248.6	V	287.0	-2.4	24.7	74.0
14173.130000	48.6	100.0	H	336.0	-0.1	25.4	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3075.955000	22.5	350.0	V	12.0	-20.9	31.5	54.0
5306.165000	26.3	100.0	H	179.0	-15.4	27.7	54.0
7438.075000	31.7	176.4	H	50.0	-9.4	22.3	54.0
9218.090000	35.0	140.7	V	257.0	-5.9	19.0	54.0
11263.415000	35.2	248.6	V	287.0	-2.4	18.8	54.0
14173.130000	35.9	100.0	H	336.0	-0.1	18.1	54.0

5. EMI TEST SETUP PHOTO

Please refer to Appendix and test setup photo file no. as follows;

Revision No.	Date of Issue	File No.
0	June 20, 2019	HCT-RF-1906-FC052-P

End of report