

FCC/IC RF Test Report

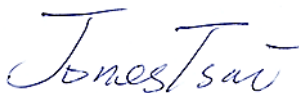
APPLICANT : VERTU Corporation Limited
EQUIPMENT : Cellular Telephone
BRAND NAME : VERTU
MODEL NAME : ASTER
TYPE NAME (LTE) : VM-01
TYPE NAME (WCDMA) : VM-01C
FCC ID : P7QVM-01
IC : 4299A-VM01
STANDARD : FCC Part 15 Subpart C §15.247
IC RSS-210 issue 8
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jun. 23, 2014 and testing was completed on Jul. 24, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.
TEL : 886-3-327-3456
FAX : 886-3-328-4978
FCC ID : P7QVM-01
IC : 4299A-VM01

Page Number : 1 of 34
Report Issued Date : Jul. 30, 2014
Report Version : Rev. 01
Report Template No.: BU5-FR15CBT4.0 Version 1.0
Report Template No.: BU5- CR210BT4.0 Version 1.0



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR462340B	Rev. 01	Initial issue of report	Jul. 30, 2014



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Not Performed	Please refer to Sporton Report No. : FR430469B
-	-	RSS-Gen 4.6.1	99% Bandwidth	-	Not Performed	Please refer to Sporton Report No. : FR430469B
-	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	$\leq 30\text{dBm}$	Not Performed	Please refer to Sporton Report No. : FR430469B
-	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Not Performed	Please refer to Sporton Report No. : FR430469B
-	15.247(d)	RSS-210 A8.5	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Not Performed	Please refer to Sporton Report No. : FR430469B
3.1	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.78 dB at 913.200 MHz
3.2	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 9.00 dB at 0.182 MHz
3.3	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

VERTU Corporation Limited

Beacon Hill Road, Church Crookham, Hampshire GU52 8DY, United Kingdom

1.2 Manufacturer

VERTU Corporation Limited

Beacon Hill Road, Church Crookham, Hampshire GU52 8DY, United Kingdom

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Cellular Telephone
Brand Name	VERTU
Model Name	ASTER
Type Name (LTE)	VM-01
Type Name (WCDMA)	VM-01C
Sample 1	LTE Sku
Sample 2	WCDMA Sku
FCC ID	P7QVM-01
IC	4299A-VM01
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.0 EDR/LE
HW Version	F2
SW Version	000C_1_420
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two different types of EUT sample #1, and sample #2. For WWAN bands, Sample 1 support GSM, WCDMA and LTE bands. Sample #2 only support GSM and WCDMA bands, and LTE band is disabled by software.

List of Accessory:

Specification of Accessory		
AC Adapter	Brand Name	VERTU
	Model Name	AC-32V
Battery	Brand Name	VERTU
	Model Name	BP-9V
Car Charger	Brand Name	VERTU
	Model Name	DC-30V
Portable Power Charger	Brand Name	VERTU
	Model Name	DC-15V
Earphone 1	Brand Name	VERTU
	Model Name	WH-4V
Earphone 2	Brand Name	VERTU
	Model Name	WH-5V
Earphone 3	Brand Name	VERTU
	Model Name	HP-1V
USB Cable	Brand Name	VERTU
	Model Name	CA-225DV
Wireless Charger	Brand Name	VERTU
	Model Name	AC-35V
Wireless Speaker	Brand Name	VERTU
	Model Name	SP-1V

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	2.04 dBm (0.0016 W)
Antenna Type	PIFA Antenna type with gain -2.00 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.			
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978			
Test Site No.	Sporton Site No.			IC Registration No.
	TH02-HY	CO05-HY	03CH05-HY	4086B-1



1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
- ♦ ANSI C63.4-2003
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3
- ♦ NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, “ Receivers Excluded from Industry Canada Requirements”, only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

The RF output power was recorded in the following table:

Channel	Frequency	Bluetooth 4.0 – LE RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	1.43 dBm
Ch19	2440MHz	2.04 dBm
Ch39	2480MHz	1.21 dBm

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Y plane as worst plane) from all possible combinations.
- b. AC power line Conducted Emission was tested under maximum output power.

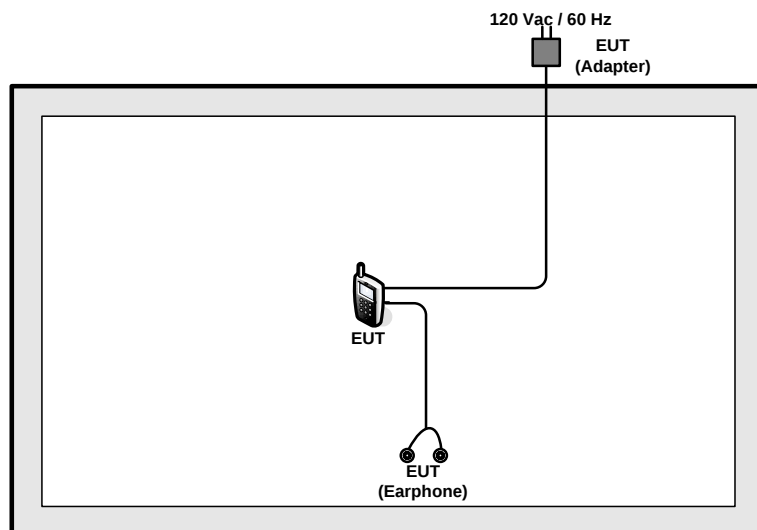
2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

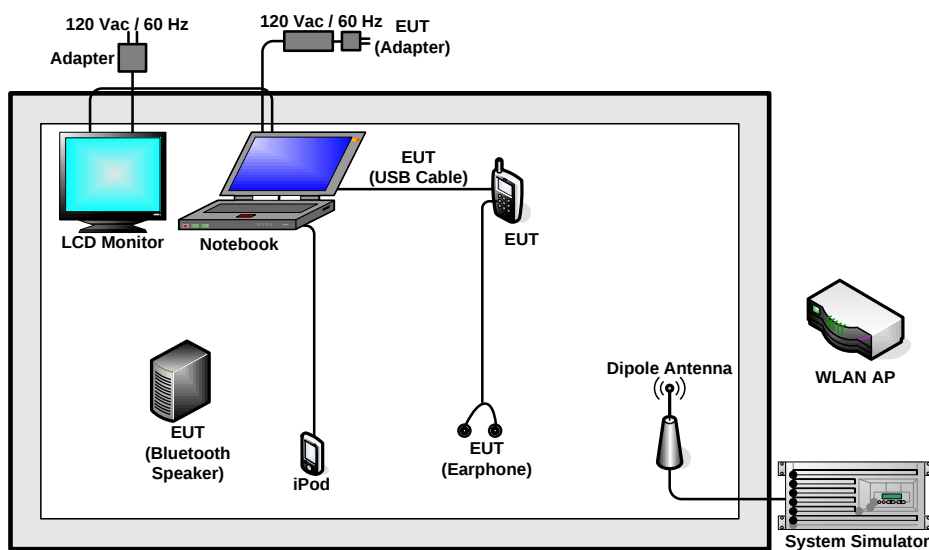
Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 – LE / GFSK
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH39_2480 MHz_1Mbps with WPC Charging
AC Conducted Emission	Mode 1: LTE Band 7 Idle + WLAN (2.4GHz) Link + Bluetooth Link + NFC On + Earphone 1 + Battery + WPC Charging + USB Cable (Data Link with Notebook) Mode 2: LTE Band 7 Idle + WLAN (5GHz) Link + Bluetooth Link + NFC On + Earphone 1 + Battery + WPC Charging + USB Cable (Data Link with Notebook) Mode 3: GSM1900 Idle + WLAN (2.4GHz) Idle + Bluetooth Idle + WPC Charging + MP3 + Earphone 2 + Wireless Charger (Charging from Adapter)
Remark: 1. The worst case of conducted emission is mode 1; only the test data of it was reported. 2. All the radiated test cases were performance with Sample 1.	

2.3 Connection Diagram of Test System

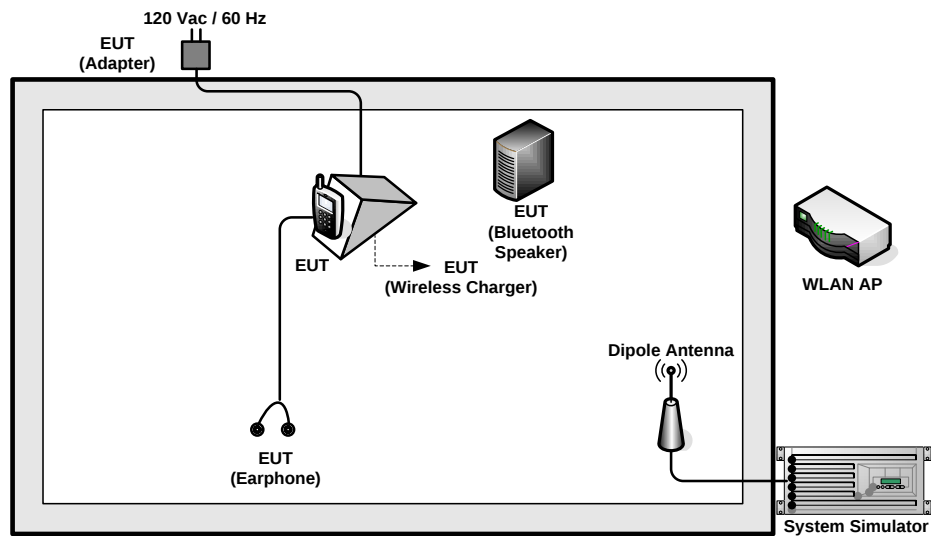
<Bluetooth 4.0 – LE Tx Mode>



<AC Conducted Emission Mode>



<EUT with WPC Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
8.	NFC Card	Metro Taipei	Easy Card	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program (000C_1_420) was provided and enabled to make EUT transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 4.2 + 10 = 14.2 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamplifier Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

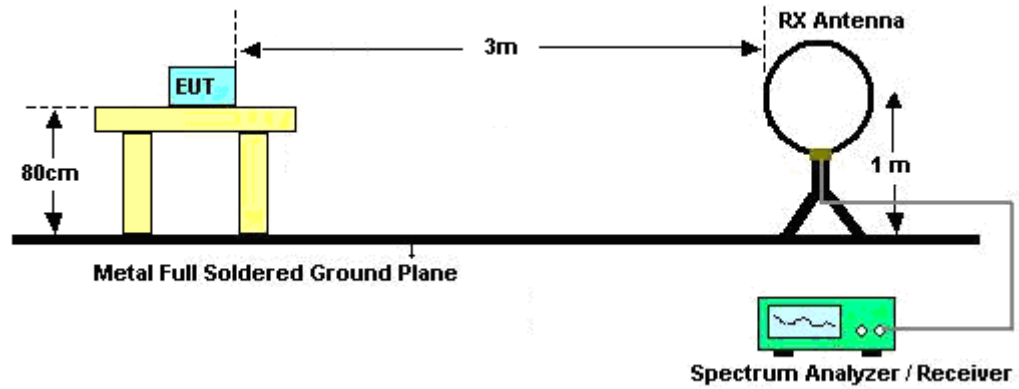
For average measurement:

 - $VBW = 10$ Hz, when duty cycle is no less than 98 percent.
 - $VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

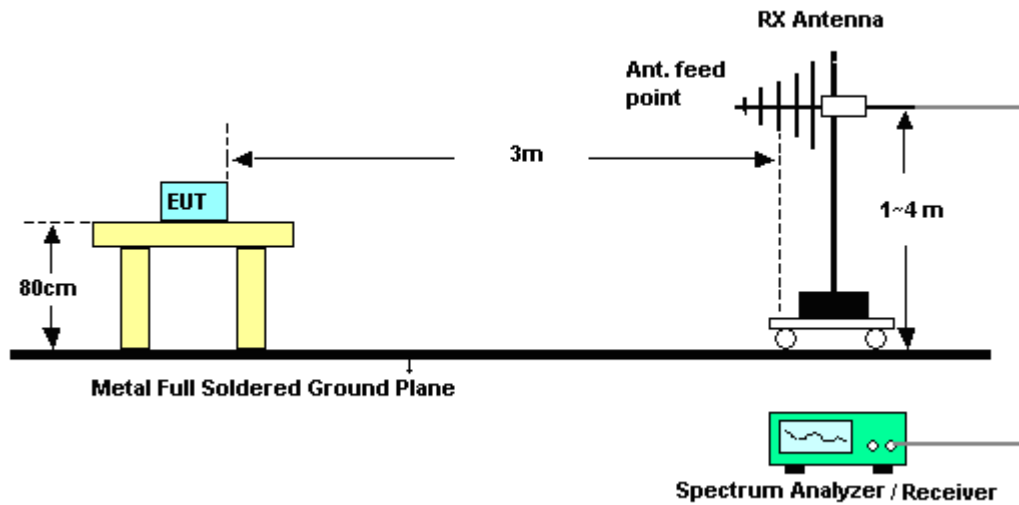
Band	Duty Cycle(%)	T(μ s)	1/T(kHz)	VBW Setting
Bluetooth 4.0 - LE	62.24	391.00	2.56	3kHz

3.1.4 Test Setup

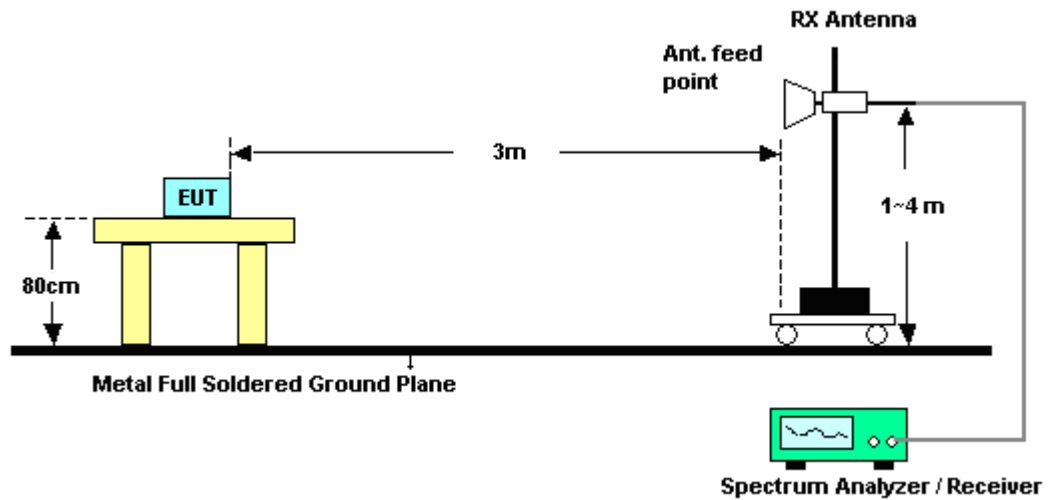
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



**3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

<Below 30MHz>

Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	Bluetooth Tx CH39 with WPC Charging Mode	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Horizontal

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.04669	32.06	-82.16	114.22	11.6	20.17	0.29	-	-	Average
0.07872	23.99	-85.69	109.68	3.63	20.07	0.29	-	-	Average
0.09372	30.03	-78.14	108.17	9.69	20.05	0.29	-	-	QP
0.13012	22.85	-82.47	105.32	2.54	20.02	0.29	-	-	Average
0.14332	54.48	-50	104.48	34.17	20.02	0.29	-	-	Average
0.42744	43.96	-51.03	94.99	23.76	19.91	0.29	-	-	Average
1.136	39.66	-26.84	66.5	19.43	19.92	0.31	100	299	QP
13.904	35.62	-34.38	70	15.62	19.6	0.4	-	-	QP
21.301	37.18	-32.82	70	16.63	20.12	0.43	-	-	QP
27.26	35.82	-34.18	70	15.01	20.33	0.48	-	-	QP



Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	Bluetooth Tx CH39 with WPC Charging Mode	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Vertical

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.01201	31.65	-94.36	126.01	11.08	20.28	0.29	-	-	Average
0.07869	24.81	-84.88	109.69	4.45	20.07	0.29	-	-	Average
0.1069	22.64	-84.38	107.02	2.3	20.05	0.29	-	-	QP
0.12456	24.16	-81.54	105.7	3.85	20.02	0.29	-	-	Average
0.14824	47.47	-56.71	104.18	27.18	20	0.29	-	-	Average
0.22786	41.58	-58.87	100.45	21.33	19.96	0.29	-	-	Average
1.271	39.31	-26.21	65.52	19.07	19.93	0.31	100	143	QP
11.472	36.51	-33.49	70	16.41	19.71	0.39	-	-	QP
21.049	37.51	-32.49	70	16.98	20.1	0.43	-	-	QP
28.26	35.71	-34.29	70	14.89	20.32	0.5	-	-	QP

3.1.6 Test Result of Radiated Spurious at Band Edges

Test Mode :	Mode 1	Temperature :	25~26°C
Test Channel :	00	Relative Humidity :	50~51%
		Test Engineer :	Jet Lu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV /m)	Over Limit (dB)	Limit Line (dBμV /m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2342.4	45.77	-28.23	74	48.09	26.8	4.57	33.69	134	22	Peak
2379.39	34.17	-19.83	54	36.34	26.89	4.6	33.66	134	22	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV /m)	Over Limit (dB)	Limit Line (dBμV /m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2359.41	45.75	-28.25	74	47.99	26.84	4.6	33.68	104	149	Peak
2374.44	34.15	-19.85	54	36.32	26.89	4.6	33.66	104	149	Average

Test Mode :	Mode 3	Temperature :	25~26°C
Test Channel :	39	Relative Humidity :	50~51%
		Test Engineer :	Jet Lu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV /m)	Over Limit (dB)	Limit Line (dBμV /m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2493.91	46.25	-27.75	74	47.88	27.2	4.73	33.56	104	19	Peak
2490.55	34.66	-19.34	54	36.29	27.2	4.73	33.56	104	19	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV /m)	Over Limit (dB)	Limit Line (dBμV /m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2493.04	46.33	-27.67	74	47.96	27.2	4.73	33.56	103	63	Peak
2496.46	34.72	-19.28	54	36.35	27.2	4.73	33.56	103	63	Average

**<Bluetooth Tx Mode with WPC Charging Mode>**

Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	Bluetooth Tx CH39 with WPC Charging Mode	Relative Humidity :	50~51%
		Test Engineer :	Jet Lu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dB μ V /m)	Over Limit (dB)	Limit Line (dB μ V /m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.53	41.08	-32.92	74	42.76	27.16	4.73	33.57	107	158	Peak
2483.5	33.14	-20.86	54	34.82	27.16	4.73	33.57	107	158	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dB μ V /m)	Over Limit (dB)	Limit Line (dB μ V /m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.59	39.9	-34.1	74	41.58	27.16	4.73	33.57	180	199	Peak
2483.5	31.46	-22.54	54	33.14	27.16	4.73	33.57	180	199	Average

3.1.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	Mode 1	Temperature :	25~26°C
Test Channel :	00	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	89.97	-	-	92.07	26.93	4.62	33.65	134	22	Average
2402	90.37	-	-	92.47	26.93	4.62	33.65	134	22	Peak
4803	36.43	-37.57	74	57.68	31.2	6.52	58.97	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 1	Temperature :	25~26°C
Test Channel :	00	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	87.02	-	-	89.12	26.93	4.62	33.65	104	149	Average
2402	87.52	-	-	89.62	26.93	4.62	33.65	104	149	Peak
4803	36.01	-37.99	74	57.26	31.2	6.52	58.97	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 2	Temperature :	25~26°C
Test Channel :	19	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Horizontal
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2440	90.7	-	-	92.55	27.07	4.68	33.6	102	21	Average
2440	91.81	-	-	93.66	27.07	4.68	33.6	102	21	Peak
4881	36.19	-37.81	74	57.17	31.31	6.58	58.87	100	0	Peak
7320	40.9	-33.1	74	54.96	36.19	8.24	58.49	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	Temperature :	25~26°C
Test Channel :	19	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Vertical
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2440	86.17	-	-	88.02	27.07	4.68	33.6	101	71	Average
2440	87.11	-	-	88.96	27.07	4.68	33.6	101	71	Peak
4881	37.04	-36.96	74	58.02	31.31	6.58	58.87	100	0	Peak
7320	40.9	-33.1	74	54.96	36.19	8.24	58.49	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 3	Temperature :	25~26°C
Test Channel :	39	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Horizontal
Remark :	1. 2481 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	25.61	-14.39	40	37.83	18.9	0.7	31.82	125	226	Peak
138	14.08	-29.42	43.5	33.1	11.5	1.26	31.78	-	-	Peak
258.69	17.42	-28.58	46	33.77	13.75	1.67	31.77	-	-	Peak
764.1	24	-22	46	31.03	22.16	2.77	31.96	-	-	Peak
921.6	26.07	-19.93	46	30.35	23.94	3.03	31.25	-	-	Peak
976.2	27.03	-26.97	54	29.83	24.86	3.16	30.82	-	-	Peak
2481	90.06	-	-	91.74	27.16	4.73	33.57	104	19	Average
2481	90.42	-	-	92.1	27.16	4.73	33.57	104	19	Peak
4959	37.38	-36.62	74	58.08	31.44	6.61	58.75	100	0	Peak
7440	41.6	-32.4	74	55.47	36.48	8.36	58.71	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 3	Temperature :	25~26°C
Test Channel :	39	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Vertical
Remark :	1. 2481 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
32.7	30.05	-9.95	40	43.8	17.34	0.72	31.81	158	227	Peak
49.17	25.21	-14.79	40	47.56	8.65	0.8	31.8	-	-	Peak
258.42	15.79	-30.21	46	32.29	13.6	1.67	31.77	-	-	Peak
741.7	24.33	-21.67	46	31.39	22.2	2.73	31.99	-	-	Peak
836.2	25.89	-20.11	46	31.65	23.08	2.9	31.74	-	-	Peak
977.6	28.41	-25.59	54	31.18	24.88	3.17	30.82	-	-	Peak
2481	88.98	-	-	90.66	27.16	4.73	33.57	103	63	Average
2481	89.5	-	-	91.18	27.16	4.73	33.57	103	63	Peak
4959	37.55	-36.45	74	58.25	31.44	6.61	58.75	100	0	Peak
7440	41.49	-32.51	74	55.36	36.48	8.36	58.71	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	Bluetooth Tx CH39 with WPC Charging Mode	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Horizontal
Remark :	1. 2481 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	25.61	-14.39	40	37.83	18.9	0.7	31.82	125	226	Peak
138	14.08	-29.42	43.5	33.1	11.5	1.26	31.78	-	-	Peak
258.69	17.42	-28.58	46	33.77	13.75	1.67	31.77	-	-	Peak
764.1	24	-22	46	31.03	22.16	2.77	31.96	-	-	Peak
921.6	26.07	-19.93	46	30.35	23.94	3.03	31.25	-	-	Peak
976.2	27.03	-26.97	54	29.83	24.86	3.16	30.82	-	-	Peak
2481	90.06	-	-	91.74	27.16	4.73	33.57	104	19	Average
2481	90.42	-	-	92.1	27.16	4.73	33.57	104	19	Peak
4959	37.38	-36.62	74	58.08	31.44	6.61	58.75	100	0	Peak
7440	41.6	-32.4	74	55.47	36.48	8.36	58.71	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	Bluetooth Tx CH39 with WPC Charging Mode	Relative Humidity :	50~51%
Test Engineer :	Jet Lu	Polarization :	Vertical
Remark :	1. 2481 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
32.7	30.05	-9.95	40	43.8	17.34	0.72	31.81	158	227	Peak
49.17	25.21	-14.79	40	47.56	8.65	0.8	31.8	-	-	Peak
258.42	15.79	-30.21	46	32.29	13.6	1.67	31.77	-	-	Peak
741.7	24.33	-21.67	46	31.39	22.2	2.73	31.99	-	-	Peak
836.2	25.89	-20.11	46	31.65	23.08	2.9	31.74	-	-	Peak
977.6	28.41	-25.59	54	31.18	24.88	3.17	30.82	-	-	Peak
2481	88.98	-	-	90.66	27.16	4.73	33.57	103	63	Average
2481	89.5	-	-	91.18	27.16	4.73	33.57	103	63	Peak
4959	37.55	-36.45	74	58.25	31.44	6.61	58.75	100	0	Peak
7440	41.49	-32.51	74	55.36	36.48	8.36	58.71	100	0	Peak

Note: Other harmonics are lower than background noise.

3.2 AC Conducted Emission Measurement

3.2.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

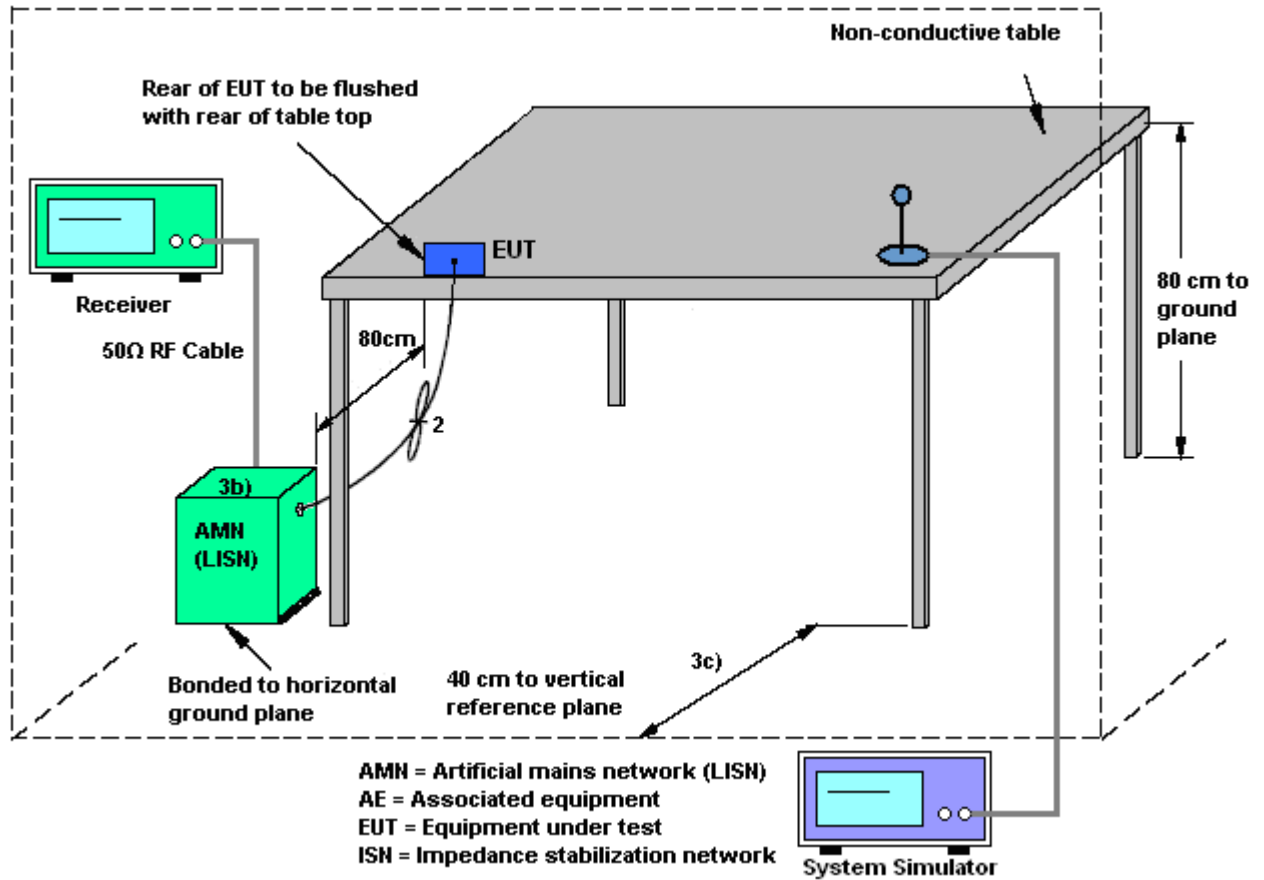
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

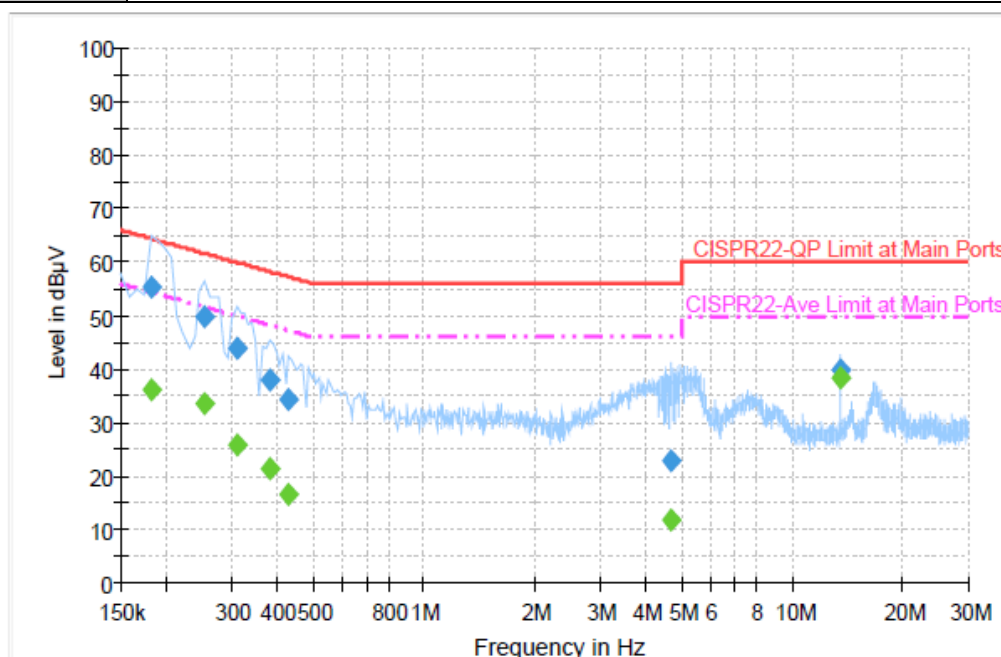
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.2.4 Test Setup



3.2.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	LTE Band 7 Idle + WLAN (2.4GHz) Link + Bluetooth Link + NFC On + Earphone 1 + Battery + WPC Charging + USB Cable (Data Link with Notebook)		



Final Result : Quasi-Peak

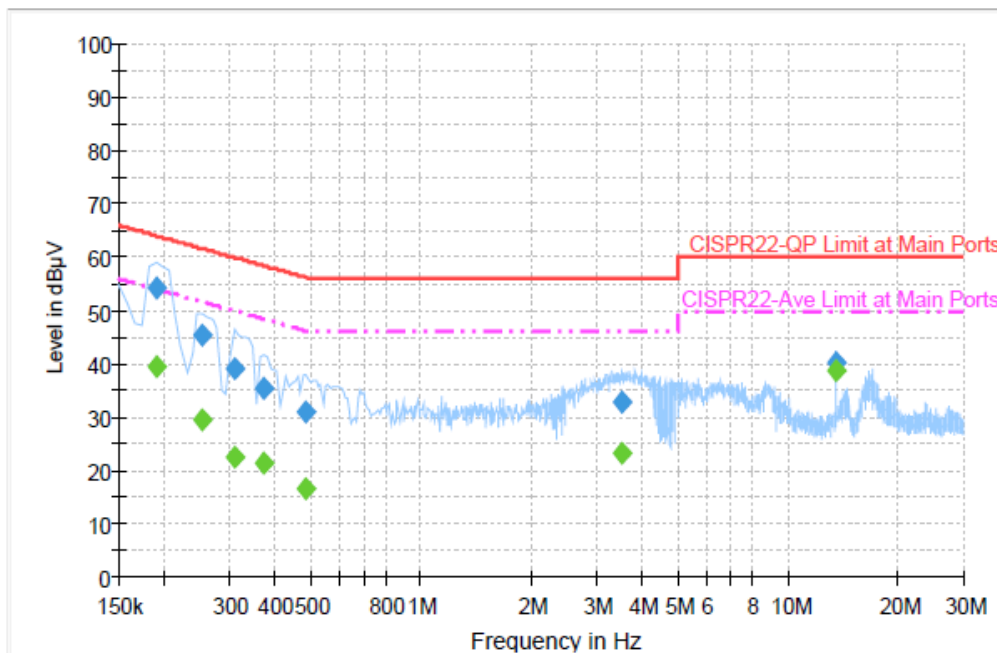
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	55.4	Off	L1	19.4	9.0	64.4
0.254000	49.9	Off	L1	19.4	11.7	61.6
0.310000	43.9	Off	L1	19.4	16.1	60.0
0.382000	38.1	Off	L1	19.4	20.1	58.2
0.430000	34.4	Off	L1	19.4	22.9	57.3
4.694000	22.8	Off	L1	19.6	33.2	56.0
13.558000	40.0	Off	L1	19.8	20.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	36.3	Off	L1	19.4	18.1	54.4
0.254000	33.6	Off	L1	19.4	18.0	51.6
0.310000	25.9	Off	L1	19.4	24.1	50.0
0.382000	21.5	Off	L1	19.4	26.7	48.2
0.430000	16.8	Off	L1	19.4	30.5	47.3
4.694000	11.9	Off	L1	19.6	34.1	46.0
13.558000	38.3	Off	L1	19.8	11.7	50.0



Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 7 Idle + WLAN (2.4GHz) Link + Bluetooth Link + NFC On + Earphone 1 + Battery + WPC Charging + USB Cable (Data Link with Notebook)		

**Final Result : Quasi-Peak**

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	54.3	Off	N	19.3	9.7	64.0
0.254000	45.2	Off	N	19.4	16.4	61.6
0.310000	39.0	Off	N	19.4	21.0	60.0
0.374000	35.4	Off	N	19.4	23.0	58.4
0.486000	31.0	Off	N	19.4	25.2	56.2
3.526000	32.7	Off	N	19.6	23.3	56.0
13.558000	40.2	Off	N	19.8	19.8	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	39.6	Off	N	19.3	14.4	54.0
0.254000	29.6	Off	N	19.4	22.0	51.6
0.310000	22.3	Off	N	19.4	27.7	50.0
0.374000	21.3	Off	N	19.4	27.1	48.4
0.486000	16.6	Off	N	19.4	29.6	46.2
3.526000	23.1	Off	N	19.6	22.9	46.0
13.558000	38.7	Off	N	19.8	11.3	50.0



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Agilent	E4416A	GB412923 44	300MHz~40GHz	Jan. 28, 2014	Jul. 16, 2014	Jan. 27, 2015	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US404415 48	300MHz~40GHz	Jan. 28, 2014	Jul. 16, 2014	Jan. 27, 2015	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 15, 2013	Jul. 11, 2014	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2013	Jul. 11, 2014	Dec. 11, 2014	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 04, 2013	Jul. 11, 2014	Dec. 03, 2014	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jul. 11, 2014	N/A	Conduction (CO05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Jul. 08, 2014~ Jul. 24, 2014	Jun. 08, 2015	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Oct. 10, 2013	Jul. 08, 2014~ Jul. 24, 2014	Oct. 09, 2014	Radiation (03CH05-HY)
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-124 1	1GHz~18GHz	Apr. 16, 2014	Jul. 08, 2014~ Jul. 24, 2014	Apr. 15, 2015	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	18GHz~40GHz	Oct. 03, 2013	Jul. 08, 2014~ Jul. 24, 2014	Oct. 02, 2014	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	100kHz~18GHz	Jul. 07, 2014	Jul. 08, 2014~ Jul. 24, 2014	Jul. 06, 2015	Radiation (03CH05-HY)
Preamplifier	EMCI	EMC011830	980148	DC~18GHz	Jun. 23, 2014	Jul. 08, 2014~ Jul. 24, 2014	Jun. 22, 2015	Radiation (03CH05-HY)
Preamplifier	COM-POWER	PA-103	161075	9kHz~30MHz	Apr. 15, 2014	Jul. 08, 2014~ Jul. 24, 2014	Apr. 14, 2015	Radiation (03CH05-HY)
Preamplifier	Miteq	TTA0204	1872107	18GHz~40GHz	May 23, 2014	Jul. 08, 2014~ Jul. 24, 2014	May 22, 2015	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Jul. 08, 2014~ Jul. 24, 2014	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Jul. 08, 2014~ Jul. 24, 2014	N/A	Radiation (03CH05-HY)



5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.10
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