FCC RF Test Report

APPLICANT	**:**	**FUJITSU LIMITED**
EQUIPMENT	**:**	**STYLISTIC Q series**
BRAND NAME	**:**	**FUJITSU**
MODEL NAME	**:**	**Q616**
FCC ID	**:**	**EJE-WB0099**
STANDARD	**:**	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	**:**	**(NII) Unlicensed National Information Infrastructure**

This is a partial report which is included the Unwanted Emissions Measurement test items. The product was received on Dec. 13, 2015 and testing was completed on Jan. 08, 2016. 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

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5N1313D	Rev. 01	Initial issue of report	Jan. 21, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	Under limit 0.35 dB at 5469.520 MHz
3.2	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.30 dB at 0.198 MHz
3.5	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

FUJITSU LIMITED

1-1, Kamikonadaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

1.2 Manufacturer

FUJITSU LIMITED

1-1, Kamikonadaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	STYLISTIC Q series
Brand Name	FUJITSU
Model Name	Q616
FCC ID	EJE-WB0099
integrated WLAN Module	Brand Name: Intel Model Name: 8260NGW FCC ID: PD98260NG, PD98260NGU
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.1 EDR/LE
EUT Stage	Pre-Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

<table>
<tr><th colspan="2">Standards-related Product Specification</th></tr>
<tr><td>Tx/Rx Channel Frequency Range</td><td>5180 MHz ~ 5240 MHz
5260 MHz ~ 5320 MHz
5500 MHz ~ 5700 MHz</td></tr>
<tr><td>Antenna Type</td><td><5180 MHz ~ 5240 MHz>
Ant. 1 : PIFA Antenna with gain -0.09 dBi
Ant. 2 : PIFA Antenna with gain -2.27 dBi
<5260 MHz ~ 5320 MHz>
Ant. 1 : PIFA Antenna with gain 0.35 dBi
Ant. 2 : PIFA Antenna with gain -2.27 dBi
<5500 MHz ~ 5700 MHz >
Ant. 1 : PIFA Antenna with gain -0.99 dBi
Ant. 2 : PIFA Antenna with gain -4.95 dBi</td></tr>
<tr><td>Type of Modulation</td><td>802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)</td></tr>
<tr><td>Antenna Function Description</td><td>
<table>
<tr><td></td><td>Ant. 1</td><td>Ant. 2</td></tr>
<tr><td>802.11 a/n/ac SISO</td><td>V</td><td>V</td></tr>
<tr><td>802.11 a/n/ac MIMO</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
</table>

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 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH10-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

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 E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r01
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

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: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38	**5190**	**46**	**5230**
	40	5200	48	5240
	42	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54	**5270**	**62**	**5310**
	56	5280	64	5320
	58	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	120	5600
	102	**5510**	122	5610
	104	5520	124	5620
	106	5530	**126**	**5630**
	108	5540	128	5640
	110	**5550**	132	5660
	112	5560	**134**	**5670**
	116	5580	136	5680
	118	**5590**	140	5700

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	144	5720	**142**	**5710**
	138	5690		

Note: The above Frequency and Channel in boldface were 802.11n HT40.

2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in the following tables.

SISO <Ant. 1>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	13.27	**13.33**	13.28

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	**13.38**	13.37	13.25

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	13.40	**13.44**	13.43

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	**13.47**	13.46	13.43

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	13.38	**13.42**	13.28

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	13.42	**13.44**	13.40

5GHz 802.11n HT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	13.35	**13.40**	**13.49**	12.73

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	13.48	13.45	13.46

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	13.35	13.32	13.37

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	13.43	13.29	13.24

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	13.38	13.31	13.21

5GHz 802.11n VHT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	13.46	13.32	13.41	12.89

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	13.43	13.49	13.42

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 42	CH 58	CH106
Frequency (MHz)	5210	5290	5530
Avg. Power	13.39	11.94	12.99

SISO <Ant. 2>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	13.34	13.35	**13.36**

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	13.39	**13.41**	13.28

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	**13.49**	13.40	13.42

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	**13.49**	13.42	13.39

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	**13.46**	13.25	13.30

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	**13.48**	13.46	13.44

5GHz 802.11n HT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	**13.48**	13.46	13.40	**13.45**

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	13.34	13.30	13.31

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	13.34	13.31	13.39

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	13.41	13.37	13.43

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	13.40	13.32	13.36

5GHz 802.11n VHT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	13.41	13.40	13.43	13.30

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	13.38	13.36	13.30

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 42	CH 58	CH106
Frequency (MHz)	5210	5290	5530
Avg. Power	13.34	9.87	13.46

MIMO <Ant. 1+2>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	16.43	16.22	16.43

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	16.46	16.42	16.32

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	16.48	16.42	16.48

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	16.31	16.30	16.48

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	16.49	16.48	16.43

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	16.47	16.47	16.49

5GHz 802.11n HT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	16.42	16.38	16.46	15.42

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	15.98	16.40	16.32

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 36	CH 44	CH 48
Frequency (MHz)	5180	5220	5240
Avg. Power	16.39	**16.42**	16.34

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 52	CH 60	CH 64
Frequency (MHz)	5260	5300	5320
Avg. Power	16.37	**16.38**	16.23

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 100	CH 116	CH 140
Frequency (MHz)	5500	5580	5700
Avg. Power	16.41	16.27	**16.43**

5GHz 802.11n VHT40 mode Output Power (dBm)				
Channel	CH 38	CH 46	CH 54	CH 62
Frequency (MHz)	5190	5230	5270	5310
Avg. Power	16.39	**16.44**	**16.46**	15.37

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 102	CH 110	CH134
Frequency (MHz)	5510	5550	5670
Avg. Power	15.93	16.48	**16.49**

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 42	CH 58	CH106
Frequency (MHz)	5210	5290	5530
Avg. Power	**14.99**	**12.73**	**14.49**

<Straddle Channel>

SISO <Ant. 1>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.43	12.77	4.91

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.24	12.50	5.17

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	13.47	13.26	0.20

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.25	12.57	4.88

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	13.38	13.17	0.16

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 138		
Frequency (MHz)	5690	Lower	Upper
Avg. Power	13.42	13.35	-4.78

SISO <Ant. 2>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.46	12.84	4.70

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.28	12.58	5.03

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	13.39	13.20	-0.23

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	13.49	12.85	4.84

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	13.36	13.16	-0.12

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 138		
Frequency (MHz)	5690	Lower	Upper
Avg. Power	13.27	13.22	-5.91

MIMO <Ant. 1+2>

5GHz 802.11a mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	16.25	15.65	7.37

5GHz 802.11n HT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	16.48	15.81	8.05

5GHz 802.11n HT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	16.17	15.97	2.71

5GHz 802.11n VHT20 mode Output Power (dBm)			
Channel	CH 144		
Frequency (MHz)	5720	Lower	Upper
Avg. Power	16.47	15.80	8.06

5GHz 802.11n VHT40 mode Output Power (dBm)			
Channel	CH 142		
Frequency (MHz)	5710	Lower	Upper
Avg. Power	16.40	16.20	2.89

5GHz 802.11n VHT80 mode Output Power (dBm)			
Channel	CH 138		
Frequency (MHz)	5690	Lower	Upper
Avg. Power	16.18	16.12	-2.32

2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Single Antenna

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

MIMO Antenna

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

AC Conducted Emission	Mode 1 : Bluetooth Tx + TC + TF Mode 2 : WLAN (5GHz) Tx + TC +TF

Remark:

1. TC stands for Test Configuration, and consists of USB HD, SD Card, Earphone, HDMI Cable and adapter.
2. TF stands for Test Function, and consists of MPEG4, Camera and H-Pattern.
3. The worst case of conducted emission is mode 1; only the test data of it was reported.

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11a	802.11a	802.11a
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140
Straddle		-	-	144

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11n HT20	802.11n HT20	802.11n HT20
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140
Straddle		-	-	144

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11n HT40	802.11n HT40	802.11n HT40
L	Low	38	54	102
M	Middle	-	-	110
H	High	46	62	134
Straddle		-	-	142

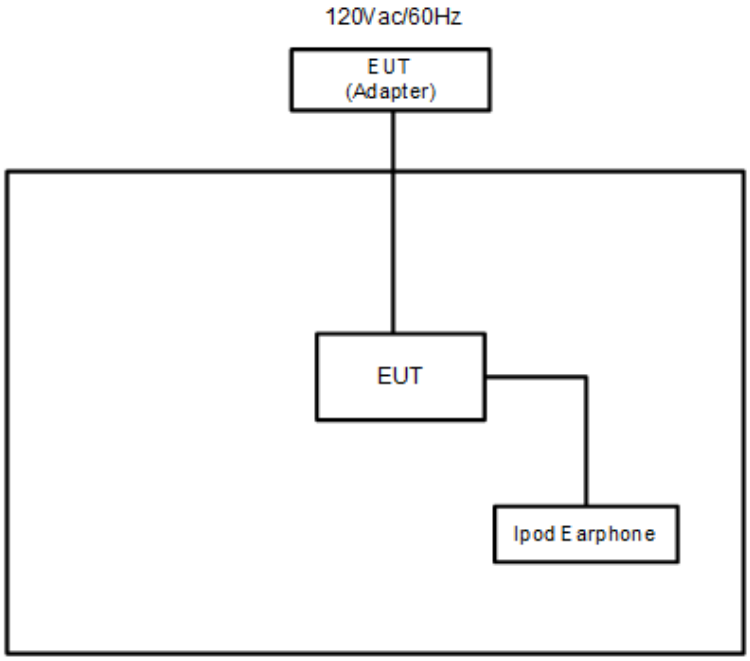
Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11ac VHT20	802.11ac VHT20	802.11ac VHT20
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140
Straddle		-	-	144

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11ac VHT40	802.11ac VHT40	802.11ac VHT40
L	Low	38	54	102
M	Middle	-	-	110
H	High	46	62	134
Straddle		-	-	142

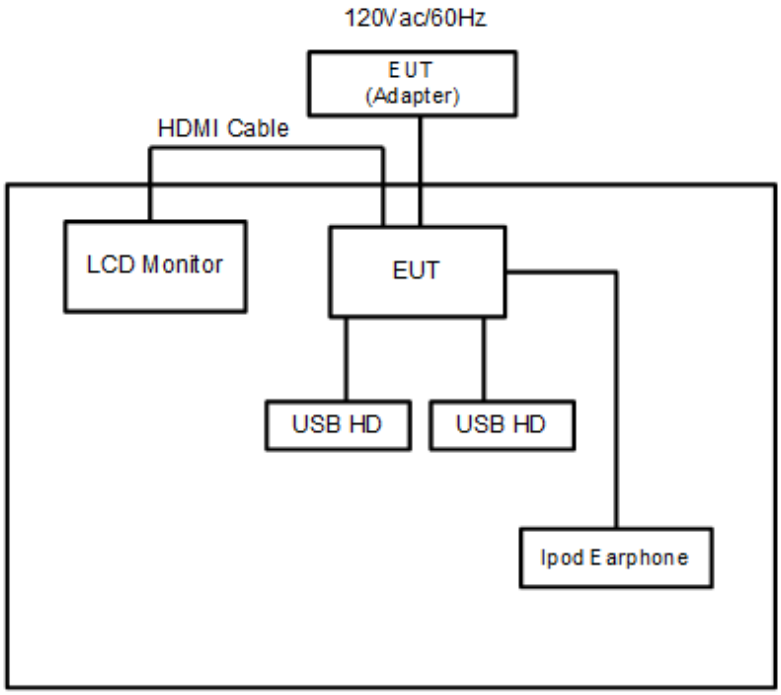
Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	-
M	Middle	42	58	106
H	High	-	-	-
Straddle		-	-	138

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
3.	USB HD	PQI	H568V	FCC DoC	Shielded, 0.5m	N/A
4.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.6 EUT Operation Test Setup

For WLAN function, programmed RF utility, “DRTU Tool” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

3 Test Result

3.1 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.1.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

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

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
-17	78.3
- 27	68.3

(3) KDB789033 D02 v01r01 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r01. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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.

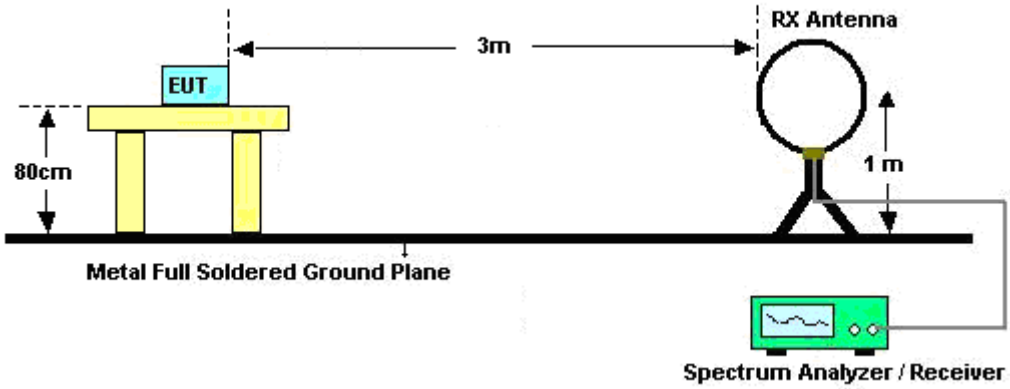
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
0	802.11a	98.1	-	-	10Hz
0	5GHz 802.11n HT20	98.47	-	-	10Hz
0	5GHz 802.11n HT40	95.92	940	1.06	3kHz
1	802.11a	98.1	-	-	10Hz
1	5GHz 802.11n HT20	98.47	-	-	10Hz
1	5GHz 802.11n HT40	95.96	950	1.05	3kHz
1+2	5GHz 802.11a for Ant 1	98.11	-	-	10Hz
1+2	5GHz 802.11a for Ant 2	98.1	-	-	10Hz
1+2	5GHz 802.11n HT20 for Ant 1	96.12	990	1.01	3kHz
1+2	5GHz 802.11n HT20 for Ant 2	96.12	990	1.01	3kHz
1+2	5GHz 802.11n HT40 for Ant 1	93.18	492	2.03	3kHz
1+2	5GHz 802.11n HT40 for Ant 2	93.18	492	2.03	3kHz
0	5GHz 802.11ac VHT20	97.98	1940	0.52	1kHz
0	5GHz 802.11ac VHT40	95.96	498	2.01	3kHz
0	5GHz 802.11ac VHT80	92.31	432	2.31	3kHz
1	5GHz 802.11ac VHT20	97.98	1940	0.52	1kHz
1	5GHz 802.11ac VHT40	95.46	498	2.01	3kHz
1	5GHz 802.11ac VHT80	93.59	438	2.28	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 1	96.12	990	1.01	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 2	96.15	1000	1.00	1kHz
1+2	5GHz 802.11ac VHT40 for Ant 1	92.74	498	2.01	3kHz
1+2	5GHz 802.11ac VHT40 for Ant 2	93.26	498	2.01	3kHz
1+2	5GHz 802.11ac VHT80 for Ant 1	87.67	256	3.91	10kHz
1+2	5GHz 802.11ac VHT80 for Ant 2	86.3	252	3.97	10kHz

2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.

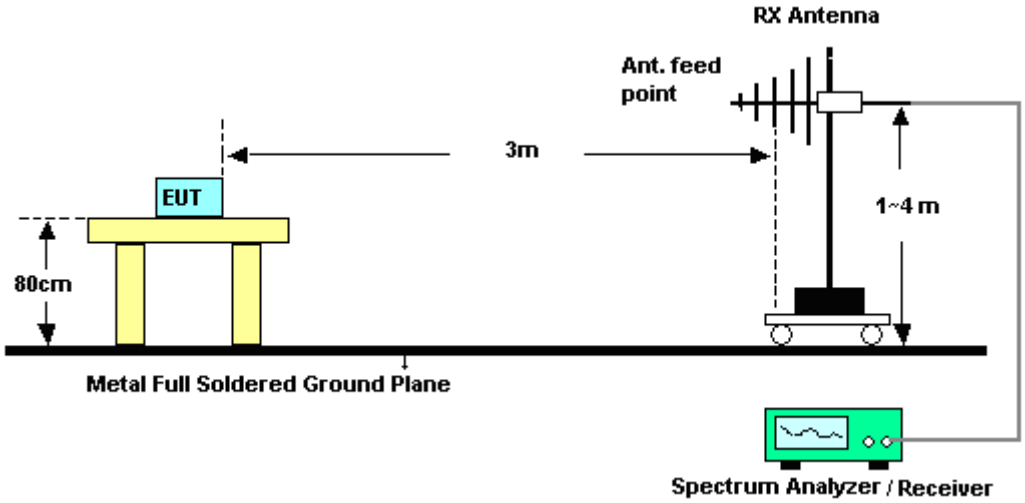
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.1.4 Test Setup

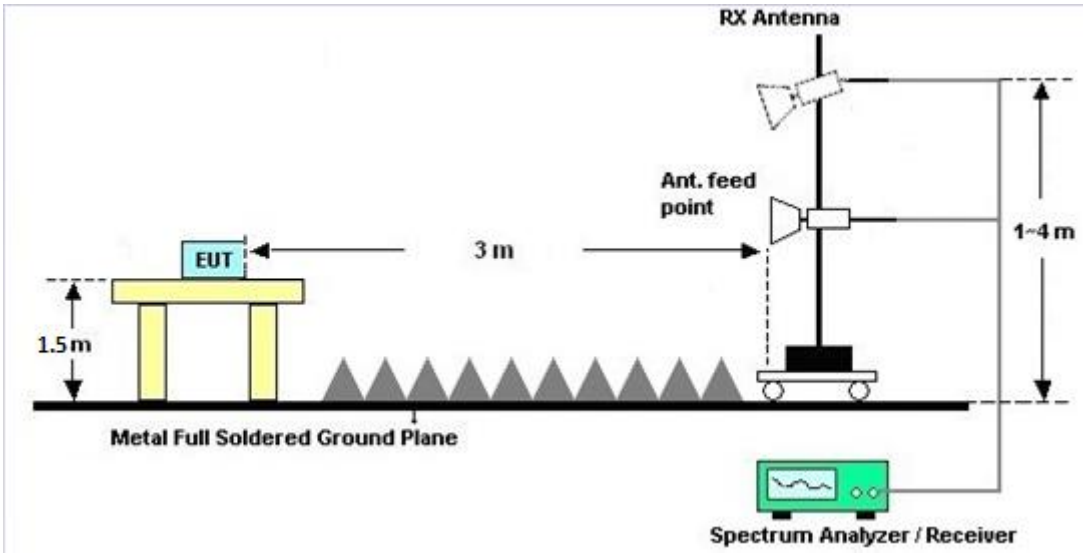
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.1.6 Test Result of Radiated Band Edges

Please refer to Appendix A and B.

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

Please refer to Appendix A and B.

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 (dBμV)	
	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.

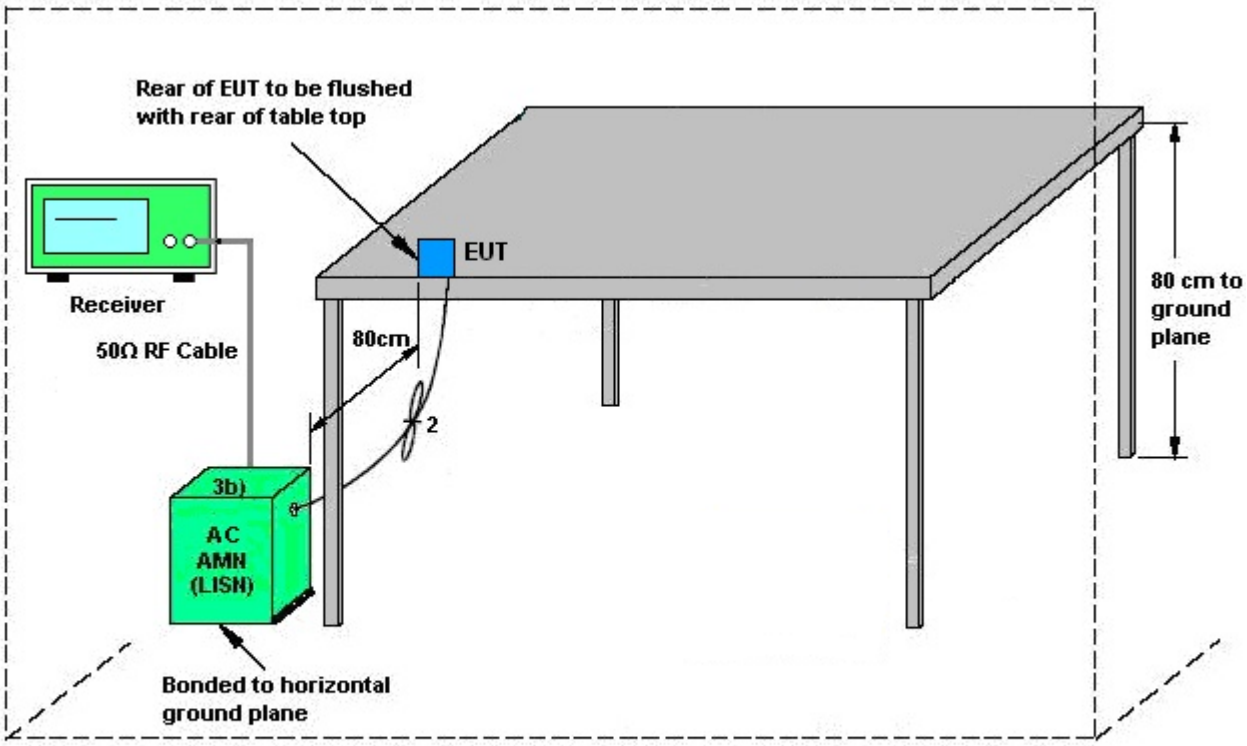
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

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.

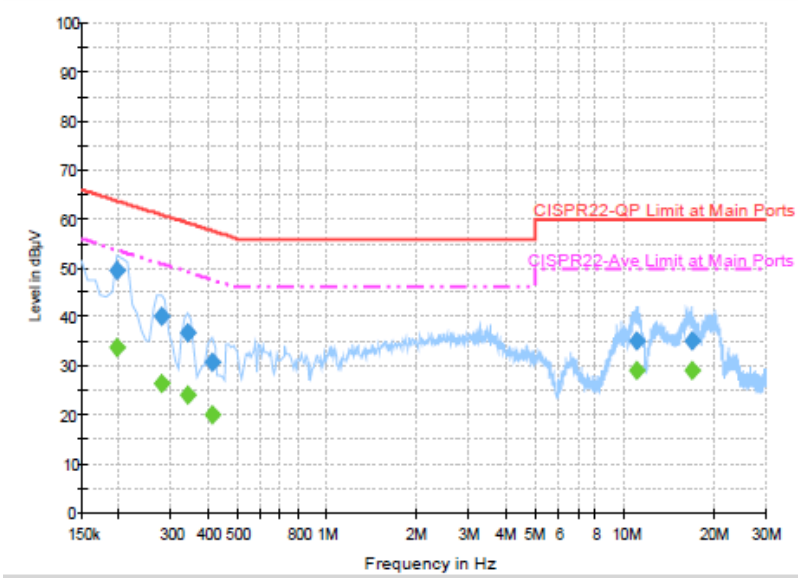
3.2.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.2.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~23℃
Test Engineer :	Derreck Chen	Relative Humidity :	52~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Tx + TC + TF		



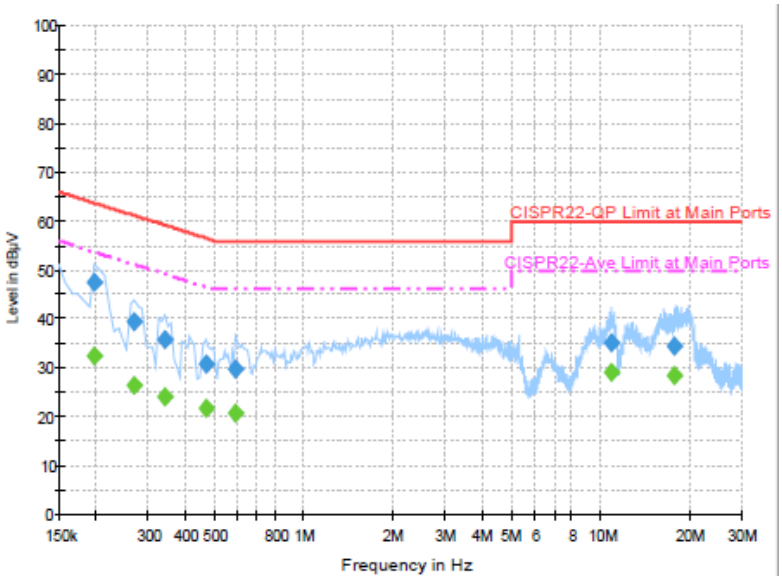
Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	49.4	Off	L1	19.7	14.3	63.7
0.278000	40.2	Off	L1	19.7	20.7	60.9
0.342000	36.7	Off	L1	19.7	22.5	59.2
0.414000	30.7	Off	L1	19.6	26.9	57.6
11.038000	35.2	Off	L1	19.8	24.8	60.0
16.886000	35.2	Off	L1	19.9	24.8	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	33.6	Off	L1	19.7	20.1	53.7
0.278000	26.3	Off	L1	19.7	24.6	50.9
0.342000	24.0	Off	L1	19.7	25.2	49.2
0.414000	20.2	Off	L1	19.6	27.4	47.6
11.038000	29.0	Off	L1	19.8	21.0	50.0
16.886000	29.0	Off	L1	19.9	21.0	50.0

Test Mode :	Mode 1	Temperature :	22~23℃
Test Engineer :	Derreck Chen	Relative Humidity :	52~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Tx + TC + TF		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	47.6	Off	N	19.7	16.1	63.7
0.270000	39.5	Off	N	19.7	21.6	61.1
0.342000	35.9	Off	N	19.7	23.3	59.2
0.470000	30.6	Off	N	19.7	25.9	56.5
0.590000	29.9	Off	N	19.7	26.1	56.0
10.910000	35.2	Off	N	19.8	24.8	60.0
17.670000	34.3	Off	N	19.9	25.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	32.3	Off	N	19.7	21.4	53.7
0.270000	26.5	Off	N	19.7	24.6	51.1
0.342000	24.1	Off	N	19.7	25.1	49.2
0.470000	21.7	Off	N	19.7	24.8	46.5
0.590000	20.8	Off	N	19.7	25.2	46.0
10.910000	28.9	Off	N	19.8	21.1	50.0
17.670000	28.3	Off	N	19.9	21.7	50.0

3.4 Automatically Discontinue Transmission

3.4.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.5 Antenna Requirements

3.5.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

$$Directional Gain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

The EUT supports CDD mode.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band I	-0.09	-2.27	1.90	1.90	0.00	0.00
Band II	0.35	-2.27	2.15	2.15	0.00	0.00
Band III	-0.99	-4.95	0.26	0.26	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Dec. 19, 2015~ Dec. 26, 2015	Sep. 01, 2016	Radiation (03CH10-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Nov. 16, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 15, 2016	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20Hz ~ 8.4GHz	Nov. 04, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 03, 2016	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 30, 2015	Dec. 19, 2015~ Dec. 26, 2015	Sep. 29, 2016	Radiation (03CH10-HY)
Hygrometer	TECPEL	DTM-303B	TP140320	N/A	Nov. 17, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 16, 2016	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Nov. 13, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 12, 2016	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHZ	Oct. 15, 2015	Dec. 19, 2015~ Dec. 26, 2015	Oct. 14, 2016	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Dec. 19, 2015~ Dec. 26, 2015	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0-360 degree	N/A	Dec. 19, 2015~ Dec. 26, 2015	N/A	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D	35414	30MHz~1GHz	Nov. 17, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 16, 2016	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 02, 2015	Dec. 19, 2015~ Dec. 26, 2015	Nov. 01, 2016	Radiation (03CH10-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 02, 2015	Dec. 19, 2015~ Dec. 26, 2015	Jun. 01, 2016	Radiation (03CH10-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 08, 2016	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 26, 2015	Jan. 08, 2016	Aug. 25, 2016	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 02, 2015	Jan. 08, 2016	Dec. 01, 2016	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.90**