



FCC RF Test Report

APPLICANT : FUJITSU LIMITED
EQUIPMENT : FUJITSU STYLISTIC Q series
BRAND NAME : FUJITSU
MODEL NAME : Q665
FCC ID : EJE-WB0093
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure

This is a partial report which is included the RF conducted power, radiated emission and AC conducted emission test items. The product was received on Mar. 25, 2015 and testing was completed on May 04, 2015. 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



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TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Feature of Equipment Under Test	5
1.4 Product Specification of Equipment Under Test	6
1.5 Modification of EUT	8
1.6 Testing Location	9
1.7 Applicable Standards	9
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	10
2.1 Carrier Frequency and Channel	11
2.2 Pre-Scanned RF Power	12
2.3 Test Mode	21
2.4 Connection Diagram of Test System	24
2.5 Support Unit used in test configuration and system	25
2.6 EUT Operation Test Setup	25
3 TEST RESULT	26
3.1 Unwanted Emissions Measurement	26
3.2 AC Conducted Emission Measurement	32
3.4 Automatically Discontinue Transmission	36
3.5 Antenna Requirements	37
4 LIST OF MEASURING EQUIPMENT	39
5 UNCERTAINTY OF EVALUATION	40
APPENDIX A. RADIATED TEST RESULTS	
APPENDIX B. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR532514D	Rev. 01	Initial issue of report	May 05, 2015



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.407(b)	RSS-210 A9.3	Unwanted Emissions	$\leq -17, -27$ dBm (depend on band)&15.209(a)	Pass	Under limit 0.10 dB at 16740.000 MHz
3.2	15.207	RSS-Gen 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 14.40 dB at 0.182 MHz
3.4	15.407(c)	RSS-210 A9.4	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.5	15.203 & 15.407(a)	RSS-210 A9.2	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, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	FUJITSU STYLISTIC Q series
Brand Name	FUJITSU
Model Name	Q665
FCC ID	EJE-WB0093
integrated WLAN Module	Brand Name: Intel Model Name: 7265NGW
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.0 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

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5580 MHz and 5660 MHz ~ 5700 MHz
Maximum Output Power	<5180 MHz ~ 5240 MHz> <Ant. 1> 802.11a : 13.48 dBm / 0.0223 W SISO <Ant. Port 1> 802.11n HT20 : 13.49 dBm / 0.0223 W 802.11n HT40 : 13.29 dBm / 0.0213 W 802.11ac VHT20: 13.47 dBm / 0.0222 W 802.11ac VHT40: 13.26 dBm / 0.0212 W 802.11ac VHT80: 11.90 dBm / 0.0155 W <Ant. 2> 802.11a : 13.46 dBm / 0.0222 W SISO <Ant. Port 2> 802.11n HT20 : 13.47 dBm / 0.0222 W 802.11n HT40 : 13.41 dBm / 0.0219 W 802.11ac VHT20: 13.40 dBm / 0.0219 W 802.11ac VHT40: 13.34 dBm / 0.0216 W 802.11ac VHT80: 11.68 dBm / 0.0147 W MIMO <Ant. Port 1 + 2> 802.11a : 12.59 dBm / 0.0182 W 802.11n HT20 : 12.85 dBm / 0.0193 W 802.11n HT40 : 14.23 dBm / 0.0265 W 802.11ac VHT20: 12.79 dBm / 0.0190 W 802.11ac VHT40: 14.20 dBm / 0.0263 W 802.11ac VHT80: 12.78 dBm / 0.0190 W

Product Specification subjective to this standard	
Maximum Output Power	<5260 MHz ~ 5320 MHz> <Ant. 1> 802.11a : 13.22 dBm / 0.0210 W SISO <Ant. Port 1> 802.11n HT20 : 13.24 dBm / 0.0211 W 802.11n HT40 : 13.21 dBm / 0.0209 W 802.11ac VHT20: 13.11 dBm / 0.0205 W 802.11ac VHT40: 13.12 dBm / 0.0205 W 802.11ac VHT80: 11.95 dBm / 0.0157 W <Ant. 2> 802.11a : 13.33 dBm / 0.0215 W SISO <Ant. Port 2> 802.11n HT20 : 13.47 dBm / 0.0222 W 802.11n HT40 : 13.45 dBm / 0.0221 W 802.11ac VHT20: 13.42 dBm / 0.0220 W 802.11ac VHT40: 13.25 dBm / 0.0211 W 802.11ac VHT80: 11.93 dBm / 0.0156 W MIMO <Ant. Port 1 + 2> 802.11a : 14.37 dBm / 0.0274 W 802.11n HT20 : 14.49 dBm / 0.0281 W 802.11n HT40 : 14.12 dBm / 0.0258 W 802.11ac VHT20: 14.46 dBm / 0.0279 W 802.11ac VHT40: 14.05 dBm / 0.0254 W 802.11ac VHT80: 12.83 dBm / 0.0192 W 5500 MHz ~ 5580 MHz and 5660 MHz ~ 5700 MHz <Ant. 1> 802.11a : 13.49 dBm / 0.0223 W SISO <Ant. Port 1> 802.11n HT20 : 13.30 dBm / 0.0214 W 802.11n HT40 : 13.49 dBm / 0.0223 W 802.11ac VHT20: 13.28 dBm / 0.0213 W 802.11ac VHT40: 13.26 dBm / 0.0212 W 802.11ac VHT80: 13.42 dBm / 0.0220 W <Ant. 2> 802.11a : 13.45 dBm / 0.0221 W SISO <Ant. Port 2> 802.11n HT20 : 13.49 dBm / 0.0223 W 802.11n HT40 : 13.49 dBm / 0.0223 W 802.11ac VHT20: 13.46 dBm / 0.0279 W 802.11ac VHT40: 13.42 dBm / 0.0220 W 802.11ac VHT80: 13.22 dBm / 0.0210 W MIMO <Ant. Port 1 + 2> 802.11a : 14.93 dBm / 0.0311 W 802.11n HT20 : 14.97 dBm / 0.0314 W 802.11n HT40 : 14.94 dBm / 0.0312 W 802.11ac VHT20: 14.93 dBm / 0.0311 W 802.11ac VHT40: 14.89 dBm / 0.0308 W 802.11ac VHT80: 14.98 dBm / 0.0315 W

Product Specification subjective to this standard			
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)		
Antenna Type	Ant. 1: PIFA Antenna Ant. 2 : PIFA Antenna		
Antenna Gain	<510 MHz ~ 5250 MHz> Ant. 1 : -0.09 dBi Ant. 2 : -2.27 dBi <5250 MHz ~ 5350 MHz> Ant. 1 : -0.09 dBi Ant. 2 : -2.27 dBi <5470 MHz ~ 5725 MHz> Ant. 1 : -0.99 dBi Ant. 2 : -4.95 dBi		
Antenna Function Description		Ant.1	Ant. 2
	802.11 a/n/ac SISO	V	V
	802.11 a/n/ac MIMO	V	V

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 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	03CH05-HY

Note: The test site complies with ANSI C63.4 2009 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 D01 General UNII Test Procedures Old Rules v01r04.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ FCC KDB 644545 D01 Guidance for IEEE 802.11ac Old Rules v01r02.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry tracking number 961829.



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)
5470-5600 MHz and 5650-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102	5510	116	5580
	104	5520	132	5660
	106	5530	134	5670
	108	5540	136	5680
	110	5550	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.

<Ant. 1>

Channel	Frequency	5GHz 802.11a Average Power (dBm)	
		Data Rate	
		6 Mbps	
CH 36	5180 MHz	12.48	
CH 44	5220 MHz	13.48	
CH 48	5240 MHz	13.46	
CH 52	5260 MHz	13.22	
CH 60	5300 MHz	13.16	
CH 64	5320 MHz	11.81	
CH 100	5500 MHz	11.71	
CH 116	5580 MHz	13.49	
CH 140	5700 MHz	11.49	

SISO <Ant. Port 1>

Channel	Frequency	5GHz 802.11n HT20 Average Power (dBm) (800ns)	
		Data Rate	
		MCS0	
CH 36	5180 MHz	12.35	
CH 44	5220 MHz	13.48	
CH 48	5240 MHz	13.49	
CH 52	5260 MHz	13.24	
CH 60	5300 MHz	13.11	
CH 64	5320 MHz	11.89	
CH 100	5500 MHz	11.82	
CH 116	5580 MHz	13.30	
CH 140	5700 MHz	11.13	



Channel	Frequency	5GHz 802.11n HT40 Average Power (dBm) (800ns)
		Data Rate
		MCS0
CH 38	5190MHz	10.16
CH 46	5230MHz	13.29
CH 54	5270MHz	13.21
CH 62	5310MHz	11.91
CH 102	5510MHz	11.71
CH 110	5550MHz	13.49
CH 134	5670MHz	13.26

Channel	Frequency	5GHz 802.11ac VHT20 Average Power (dBm)
		Data Rate
		MCS0
CH 36	5180 MHz	12.28
CH 44	5220 MHz	13.46
CH 48	5240 MHz	13.47
CH 52	5260 MHz	13.11
CH 60	5300 MHz	13.06
CH 64	5320 MHz	11.86
CH 100	5500 MHz	11.78
CH 116	5580 MHz	13.28
CH 140	5700 MHz	11.10

Channel	Frequency	5GHz 802.11ac VHT40 Average Power (dBm)
		Data Rate
		MCS0
CH 38	5190MHz	10.13
CH 46	5230MHz	13.26
CH 54	5270MHz	13.12
CH 62	5310MHz	11.75
CH 102	5510MHz	11.68
CH 110	5550MHz	13.26
CH 134	5670MHz	13.24



Channel	Frequency	5GHz 802.11ac VHT80 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 42	5210MHz	11.90	
CH 58	5290MHz	11.95	
CH 106	5530MHz	11.98	
CH 122	5610MHz	13.42	

**<Ant. 2>**

Channel	Frequency	5GHz 802.11a Average Power (dBm)	
		Data Rate	
		6 Mbps	
CH 36	5180 MHz	12.47	
CH 44	5220 MHz	13.28	
CH 48	5240 MHz	13.46	
CH 52	5260 MHz	13.33	
CH 60	5300 MHz	13.22	
CH 64	5320 MHz	11.39	
CH 100	5500 MHz	11.99	
CH 116	5580 MHz	13.45	
CH 140	5700 MHz	11.26	

SISO <Ant. Port 2>

Channel	Frequency	5GHz 802.11n HT20 Average Power (dBm) (800ns)	
		Data Rate	
		MCS0	
CH 36	5180 MHz	12.28	
CH 44	5220 MHz	13.47	
CH 48	5240 MHz	13.42	
CH 52	5260 MHz	13.13	
CH 60	5300 MHz	13.47	
CH 64	5320 MHz	11.69	
CH 100	5500 MHz	11.81	
CH 116	5580 MHz	13.49	
CH 140	5700 MHz	11.33	



Channel	Frequency	5GHz 802.11n HT40 Average Power (dBm) (800ns)	
		Data Rate	
		MCS0	
CH 38	5190MHz	11.78	
CH 46	5230MHz	13.41	
CH 54	5270MHz	13.45	
CH 62	5310MHz	11.59	
CH 102	5510MHz	12.46	
CH 110	5550MHz	13.49	
CH 134	5670MHz	13.36	

Channel	Frequency	5GHz 802.11ac VHT20 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 36	5180 MHz	12.22	
CH 44	5220 MHz	13.38	
CH 48	5240 MHz	13.40	
CH 52	5260 MHz	13.09	
CH 60	5300 MHz	13.42	
CH 64	5320 MHz	11.64	
CH 100	5500 MHz	11.78	
CH 116	5580 MHz	13.46	
CH 140	5700 MHz	11.28	

Channel	Frequency	5GHz 802.11ac VHT40 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 38	5190MHz	11.77	
CH 46	5230MHz	13.34	
CH 54	5270MHz	13.25	
CH 62	5310MHz	11.70	
CH 102	5510MHz	12.40	
CH 110	5550MHz	13.42	
CH 134	5670MHz	13.32	



Channel	Frequency	5GHz 802.11ac VHT80 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 42	5210MHz	11.68	
CH 58	5290MHz	11.93	
CH 106	5530MHz	11.96	
CH 122	5610MHz	13.22	

**MIMO <Ant. 1+2>**

Channel	Frequency	5GHz 802.11a Average Power (dBm)
		Data Rate
		6 Mbps
CH 36	5180 MHz	12.59
CH 44	5220 MHz	12.59
CH 48	5240 MHz	12.57
CH 52	5260 MHz	14.37
CH 60	5300 MHz	14.27
CH 64	5320 MHz	12.95
CH 100	5500 MHz	11.87
CH 116	5580 MHz	14.93
CH 140	5700 MHz	12.17

Channel	Frequency	5GHz 802.11n HT20 Average Power (dBm) (800ns)
		Data Rate
		MCS0
CH 36	5180 MHz	12.73
CH 44	5220 MHz	12.78
CH 48	5240 MHz	12.85
CH 52	5260 MHz	14.49
CH 60	5300 MHz	14.47
CH 64	5320 MHz	12.84
CH 100	5500 MHz	11.57
CH 116	5580 MHz	14.97
CH 140	5700 MHz	12.22



Channel	Frequency	5GHz 802.11n HT40 Average Power (dBm) (800ns)	
		Data Rate	
		MCS0	
CH 38	5190MHz	11.20	
CH 46	5230MHz	14.23	
CH 54	5270MHz	14.12	
CH 62	5310MHz	12.87	
CH 102	5510MHz	12.74	
CH 110	5550MHz	14.94	
CH 134	5670MHz	14.73	

Channel	Frequency	5GHz 802.11ac VHT20 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 36	5180 MHz	12.69	
CH 44	5220 MHz	12.76	
CH 48	5240 MHz	12.79	
CH 52	5260 MHz	14.46	
CH 60	5300 MHz	14.41	
CH 64	5320 MHz	12.77	
CH 100	5500 MHz	11.54	
CH 116	5580 MHz	14.93	
CH 140	5700 MHz	12.19	

Channel	Frequency	5GHz 802.11ac VHT40 Average Power (dBm)	
		Data Rate	
		MCS0	
CH 38	5190MHz	11.19	
CH 46	5230MHz	14.20	
CH 54	5270MHz	14.05	
CH 62	5310MHz	12.45	
CH 102	5510MHz	12.56	
CH 110	5550MHz	14.89	
CH 134	5670MHz	14.66	



Channel	Frequency	5GHz 802.11ac VHT80 Average Power (dBm)
		Data Rate
		MCS0
CH 42	5210MHz	12.78
CH 58	5290MHz	12.83
CH 106	5530MHz	12.87
CH 122	5610MHz	14.98

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.

2.3 Test Mode

Final test mode of 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 VHT80	MCS0

MIMO Antenna

Modulation	Data Rate
802.11n HT20	MCS8
802.11n HT40	MCS8
802.11ac VHT80	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : WLAN (5GHz) Tx + TF + TC
Remark: 1. TF stands for Test Configuration, and consists of MPEG4, camera, GPS Rx, and H-Pattern. 2. TC stands for Test Configuration, and consists of USB HD, HDMI Cable, Adapter, SD Card, and iPod earphone.	



Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5600 MHz and 5650-5725MHz
		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 : 5470-5600 MHz and 5650-5725MHz
		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 : 5470-5600 MHz and 5650-5725MHz
		802.11n HT40	802.11n HT40	802.11n HT40
L	Low	38	54	102
M	Middle	-	-	110
H	High	46	62	134
Straddle		-	-	142



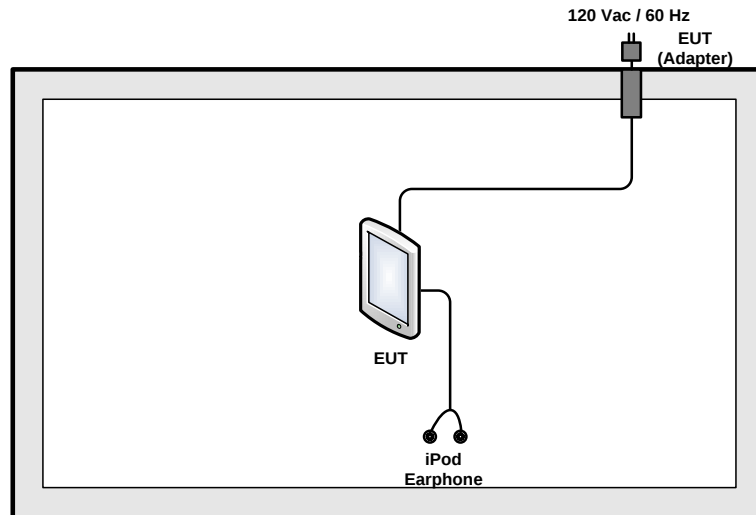
Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5600 MHz and 5650-5725MHz
		802.11ac VHT20	802.11ac VHT20	802.11ac VHT20
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140

Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5600 MHz and 5650-5725MHz
		802.11ac VHT40	802.11ac VHT40	802.11ac VHT40
L	Low	38	54	102
M	Middle	-	-	110
H	High	46	62	134

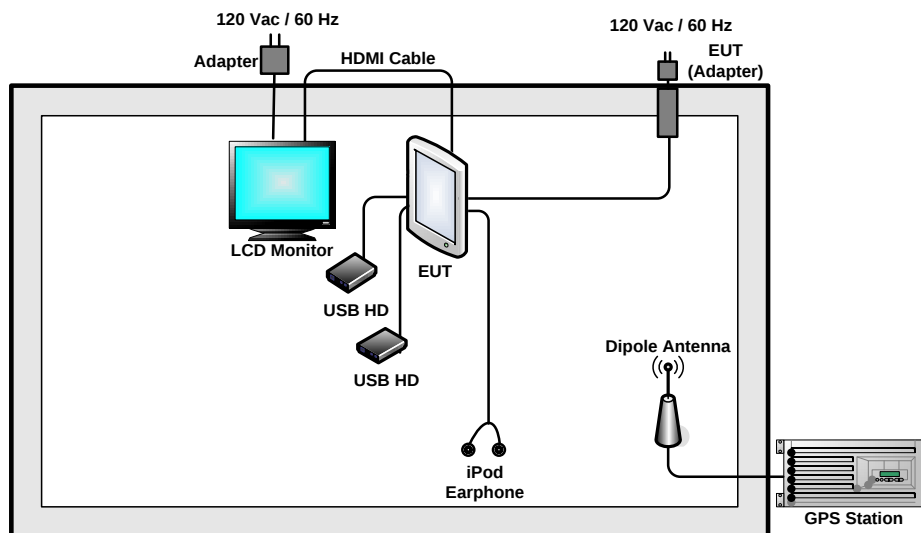
Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5600 MHz and 5650-5725MHz
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	-
M	Middle	42	58	106
H	High	-	-	-

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.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
2.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
3.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
4.	USB HD	WD	WDBKXH5000-ARD-NESN	FCC DoC	Unshielded, 0.5 m	N/A
5.	USB HD	DigiFusion	HD-326U3S	FCC DoC	Unshielded, 0.5 m	N/A
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.6 EUT Operation Test Setup

For WLAN function, programmed RF utility, "DRTU" 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.

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

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

- (3) KDB789033 v01 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

- The testing follows FCC KDB 789033 D01 General UNII Test Procedures Old Rules v01r04. Section H) 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

- The setting follows the H) 5) of FCC KDB 789033.
- RBW = 1 MHz
- VBW ≥ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

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

- The setting follows H) 6) of FCC KDB 789033.
- RBW = 1 MHz
- 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.

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11a	98.57	-	-	10Hz
1+2	802.11a for Ant 1	98.66	-	-	10Hz
1+2	802.11a for Ant 2	98.67	-	-	10Hz
1	5GHz 802.11n HT20	98.47	-	-	10Hz
1	5GHz 802.11n HT40	96.93	500	2	3kHz
1+2	5GHz 802.11n HT20 for Ant 1	97.06	990	1.01010101	3kHz
1+2	5GHz 802.11n HT20 for Ant 2	97.06	990	1.01010101	3kHz
1+2	5GHz 802.11n HT40 for Ant 1	94.7	500	2	3kHz
1+2	5GHz 802.11n HT40 for Ant 2	94.7	500	2	3kHz
1	5GHz 802.11ac VHT20	98.47	-	-	10Hz
1	5GHz 802.11ac VHT40	96.95	954	1.048218029	3kHz
1	5GHz 802.11ac VHT80	94.07	444	2.252252252	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 1	97.08	996	1.004016064	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 2	97.08	996	1.004016064	3kHz
1+2	5GHz 802.11ac VHT40 for Ant 1	94.74	504	1.984126984	3kHz
1+2	5GHz 802.11ac VHT40 for Ant 2	94.74	504	1.984126984	3kHz
1+2	5GHz 802.11ac VHT80 for Ant 1	90.21	258	3.875968992	10kHz
1+2	5GHz 802.11ac VHT80 for Ant 2	90.14	256	3.90625	10kHz

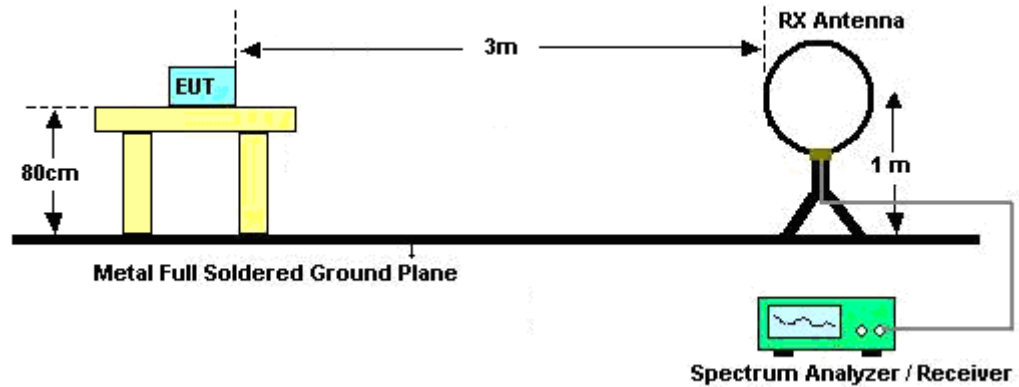
- The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The antenna is a broadband 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.
- 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.



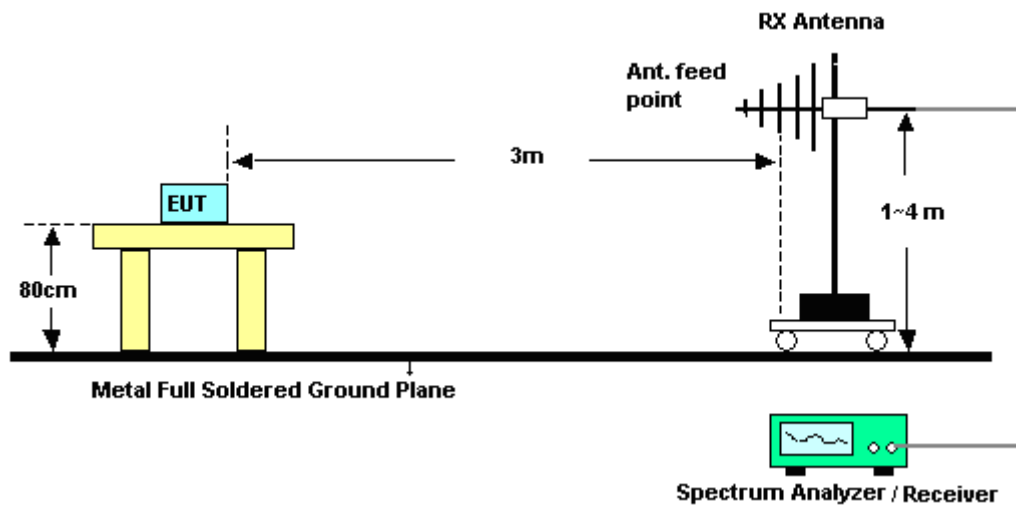
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level 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

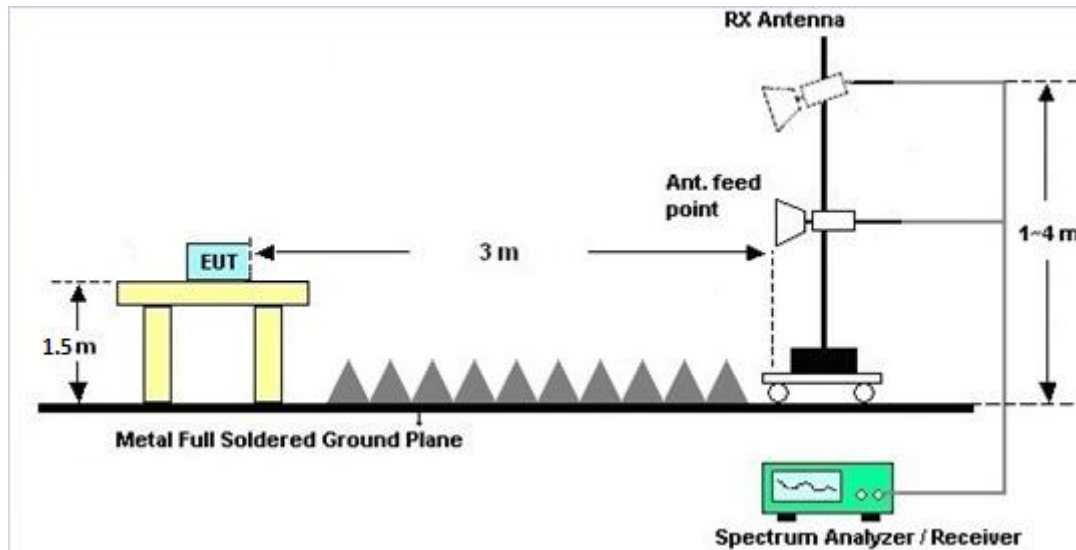
For radiated emissions below 30MHz



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.

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

Please refer to Appendix A.

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.

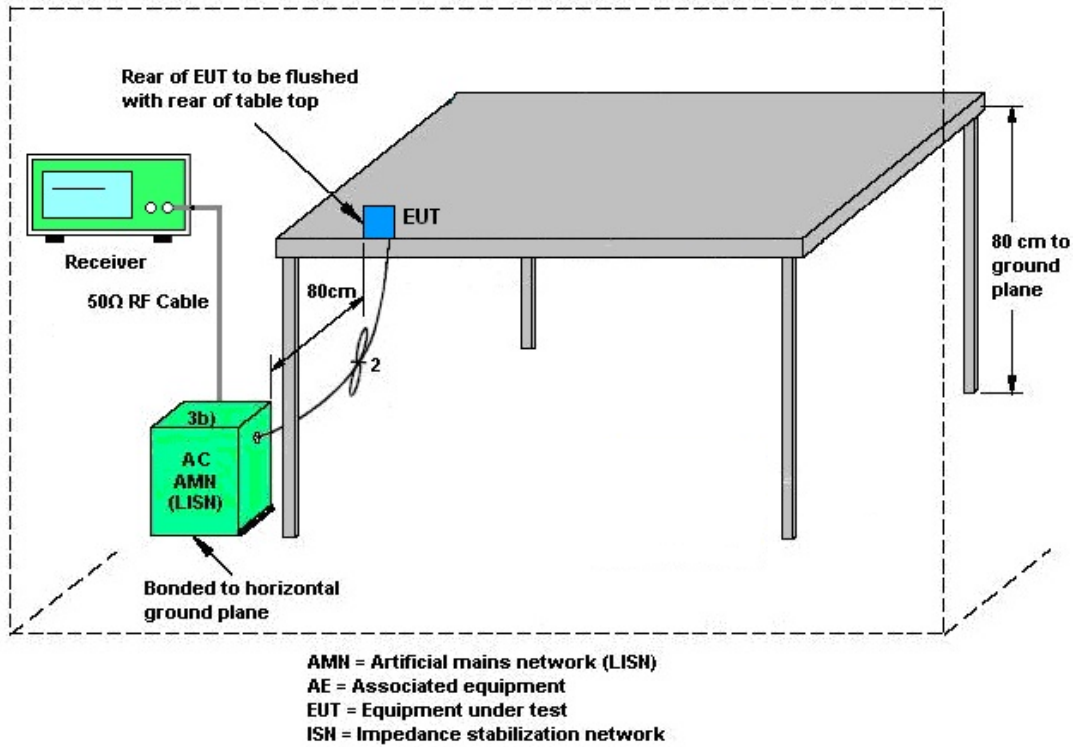
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

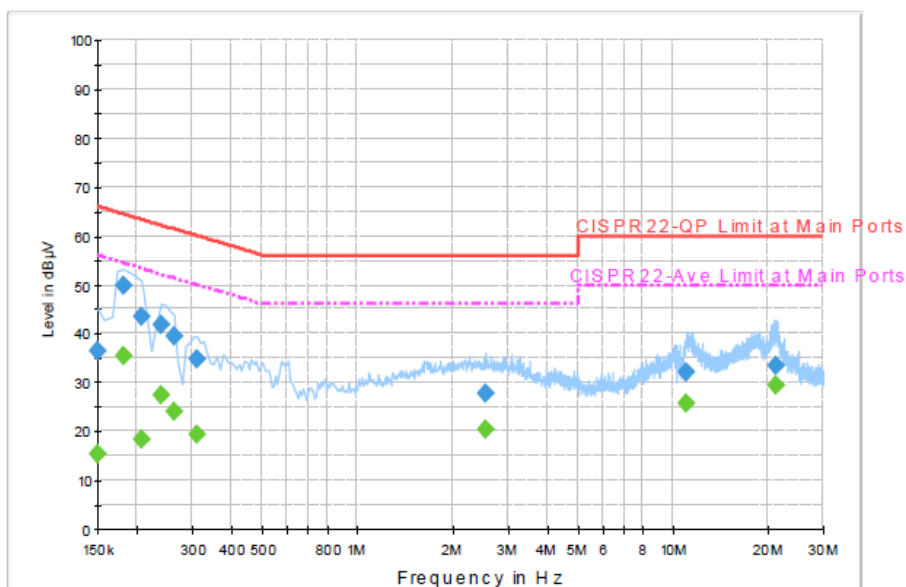
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.2.4 Test Setup



3.2.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	23~25°C
Test Engineer :	Eric Jeng	Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5GHz) Tx + TF + TC		



Final Result : QuasiPeak

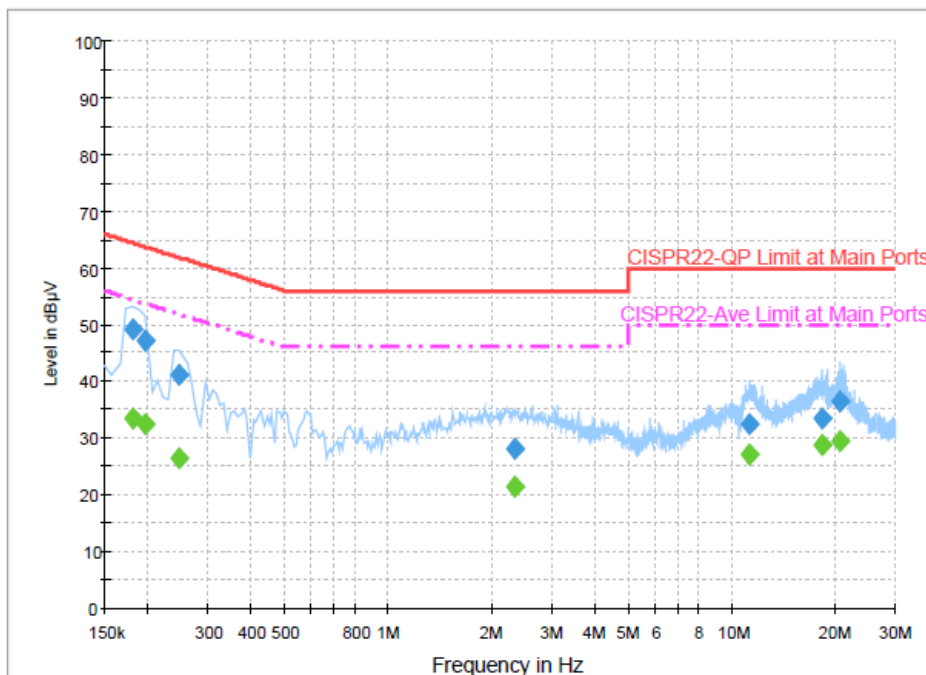
Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	36.3	Off	L1	19.5	29.7	66.0
0.182000	50.0	Off	L1	19.5	14.4	64.4
0.206000	43.3	Off	L1	19.4	20.1	63.4
0.238000	41.7	Off	L1	19.5	20.5	62.2
0.262000	39.5	Off	L1	19.5	21.9	61.4
0.310000	34.7	Off	L1	19.5	25.3	60.0
2.542000	27.8	Off	L1	19.7	28.2	56.0
11.094000	32.2	Off	L1	19.9	27.8	60.0
21.246000	33.4	Off	L1	20.0	26.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	15.4	Off	L1	19.5	40.6	56.0
0.182000	35.4	Off	L1	19.5	19.0	54.4
0.206000	18.5	Off	L1	19.4	34.9	53.4
0.238000	27.5	Off	L1	19.5	24.7	52.2
0.262000	24.1	Off	L1	19.5	27.3	51.4
0.310000	19.3	Off	L1	19.5	30.7	50.0
2.542000	20.5	Off	L1	19.7	25.5	46.0
11.094000	25.7	Off	L1	19.9	24.3	50.0
21.246000	29.3	Off	L1	20.0	20.7	50.0



Test Mode :	Mode 1	Temperature :	23~25°C
Test Engineer :	Eric Jeng	Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5GHz) Tx + TF + TC		

**Final Result : QuasiPeak**

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	49.3	Off	N	19.5	15.1	64.4
0.198000	47.3	Off	N	19.4	16.4	63.7
0.246000	41.2	Off	N	19.4	20.7	61.9
2.342000	28.2	Off	N	19.7	27.8	56.0
11.318000	32.6	Off	N	19.9	27.4	60.0
18.310000	33.3	Off	N	20.1	26.7	60.0
20.662000	36.4	Off	N	20.1	23.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	33.4	Off	N	19.5	21.0	54.4
0.198000	32.3	Off	N	19.4	21.4	53.7
0.246000	26.4	Off	N	19.4	25.5	51.9
2.342000	21.4	Off	N	19.7	24.6	46.0
11.318000	27.0	Off	N	19.9	23.0	50.0
18.310000	28.8	Off	N	20.1	21.2	50.0
20.662000	29.6	Off	N	20.1	20.4	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

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

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 k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th 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.



			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant 1 (dBi)	Ant 2 (dBi)				
Band I	-0.09	-2.27	1.90	1.90	0.00	0.00
Band II	-0.09	-2.27	1.90	1.90	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
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Mar. 26, 2015 ~ Mar. 27, 2015	Jun. 08, 2015	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 09, 2014	Mar. 26, 2015 ~ Mar. 27, 2015	Aug. 08, 2015	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 09, 2014	Mar. 26, 2015 ~ Mar. 27, 2015	Aug. 08, 2015	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Apr. 13, 2015 ~ May 04, 2015	Jun. 08, 2015	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Sep. 27, 2014	Apr. 13, 2015 ~ May 04, 2015	Sep. 26, 2015	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Oct. 02, 2014	Apr. 13, 2015 ~ May 04, 2015	Oct. 01, 2015	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	100kHz~18GHz	Jul. 07, 2014	Apr. 13, 2015 ~ May 04, 2015	Jul. 06, 2015	Radiation (03CH05-HY)
Preamplifier	EMCI	EMC011830	980148	DC~18GHz	Jun. 23, 2014	Apr. 13, 2015 ~ May 04, 2015	Jun. 22, 2015	Radiation (03CH05-HY)
Preamplifier	COM-POWER	PA-103	161075	9kHz~30MHz	Apr. 09, 2015	Apr. 13, 2015 ~ May 04, 2015	Apr. 08, 2016	Radiation (03CH05-HY)
Preamplifier	Miteq	TTA0204	1872107	18GHz~40GHz	May 23, 2014	Apr. 13, 2015 ~ May 04, 2015	May 22, 2015	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Apr. 13, 2015 ~ Apr. 17, 2015	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Apr. 13, 2015 ~ May 04, 2015	N/A	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Apr. 13, 2015 ~ May 04, 2015	Jul. 27, 2015	Radiation (03CH05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Dec. 01, 2014	Apr. 28, 2015	Nov. 30, 2015	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 08, 2014	Apr. 28, 2015	Dec. 07, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 02, 2014	Apr. 28, 2015	Dec. 01, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 28, 2015	N/A	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
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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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