FCC RF Test Report

APPLICANT	:	FUJITSU LIMITED
EQUIPMENT	:	FUJITSU LIFEBOOK T series
BRAND NAME	:	FUJITSU
MODEL NAME	:	T935;TH935
FCC ID	:	EJE-WB0089
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

This is a partial report which is included the RF Conducted Power and Radiated Band Edges and Spurious Emission Measurement test items. The product was received on Sep. 15, 2014 and testing was completed on Nov. 06, 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.

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TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR491525C	Rev. 01	Initial issue of report	Oct. 29, 2014
FR491525C	Rev. 02	Adding the conduction data in section 3.2	Nov. 07, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.53 dB at 2485.200 MHz
3.2	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 0.10 dB at 6.710 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

FUJITSU LIMITED

1-1, Kamikodanaka 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 Product Feature of Equipment Under Test

Product Feature	
Equipment	FUJITSU LIFEBOOK T series
Brand Name	FUJITSU
Model Name	T935;TH935
FCC ID	EJE-WB0089
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 subjective to this standard

<table>
<tr><th colspan="2">Product Specification subjective to this standard</th></tr>
<tr><td>Tx/Rx Channel Frequency Range</td><td>802.11b/g/n: 2412 MHz ~ 2462 MHz
802.11a/n/ac: 5745~5825MHz.</td></tr>
<tr><td>Maximum Output Power to antenna</td><td><Ant. 1>
802.11b : 17.48 dBm (0.0560 W)
802.11g : 20.07 dBm (0.1016 W)
802.11a : 19.29 dBm (0.0849 W)
<Ant. 2>
802.11b : 17.46 dBm (0.0557 W)
802.11g : 20.22 dBm (0.1052 W)
802.11a : 19.18 dBm (0.0828 W)
<SISO Ant. 1>
802.11n HT20 : 20.21 dBm (0.1050 W)
802.11n HT40 : 20.07 dBm (0.1016 W)
802.11n HT20 : 19.50 dBm (0.0891 W)
802.11n HT40 : 19.25 dBm (0.0841 W)
802.11ac VHT80 : 19.72 dBm (0.0938 W)
<SISO Ant. 2>
802.11n HT20 : 20.24 dBm (0.1057 W)
802.11n HT40 : 19.75 dBm (0.0944 W)
802.11n HT20 : 19.40 dBm (0.0871 W)
802.11n HT40 : 19.46 dBm (0.0883 W)
802.11ac VHT80 : 19.95 dBm (0.0989 W)
<MIMO Ant. 1+2>
802.11n HT20 : 20.10 dBm (0.1023 W)
802.11n HT40 : 19.58 dBm (0.0908 W)
802.11n HT20 : 20.92 dBm (0.1236 W)
802.11n HT40 : 20.74 dBm (0.1186 W)
802.11ac VHT80 : 21.87 dBm (0.1538 W)</td></tr>
<tr><td>Antenna Type</td><td><Ant 1>
802.11b/g/n : PIFA Antenna type with gain 0.52 dBi
802.11a/n/ac : PIFA Antenna type with gain 0.33 dBi
<Ant 2>
802.11b/g/n : PIFA Antenna type with gain -1.61 dBi
802.11a/n/ac : PIFA Antenna type with gain 1.89 dBi</td></tr>
<tr><td>Type of Modulation</td><td>802.11b : DSSS (DBPSK / DQPSK / CCK)
802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)</td></tr>
<tr><td>Antenna Function for Transmitter</td><td>
<table>
<tr><th></th><th>Chain
Port 0
Ant. 1</th><th>Chain
Port 1
Ant. 2</th></tr>
<tr><td>802.11 a/b/g</td><td>V</td><td>V</td></tr>
<tr><td>802.11 n/ac
SISO</td><td>V</td><td>V</td></tr>
<tr><td>802.11 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 Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	**Sporton Site No.**		
	TH02-HY	CO05-HY	03CH05-HY

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
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB 644545 D01 Guidance for IEEE 802 11ac Old Rules v01r02
- FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01
- ANSI C63.4-2003

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 and Notebook Type. The worst cases (X and Y plane and Notebook Type) 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)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4	149	5745	157	5785
	151	5755	159	5795
	153	5765	161	5805
	155	5775	165	5825

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 shown in the following tables.

<Ant. 1>

	802.11b			802.11g		
Channel	01	06	11	01	06	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Peak Power (dBm)	17.48	17.30	17.36	17.46	20.07	15.82

	802.11a		
Channel	149	157	165
Frequency (MHz)	5745	5785	5825
Peak Power (dBm)	19.29	19.19	19.17

<Ant. 2>

	802.11b			802.11g		
Channel	01	06	11	01	06	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Peak Power (dBm)	17.46	17.33	17.33	18.15	20.22	15.87

	802.11a		
Channel	149	157	165
Frequency (MHz)	5745	5785	5825
Peak Power (dBm)	19.18	19.07	19.01

SISO <Ant. 1>

	802.11n HT20			802.11n HT40		
Channel	01	06	11	03	06	09
Frequency (MHz)	2412	2437	2462	2422	2437	2452
Peak Power (dBm)	17.39	20.21	15.94	16.20	20.07	15.24

	5GHz 802.11n HT20		
Channel	149	157	165
Frequency (MHz)	5745	5785	5825
Peak Power (dBm)	19.50	19.12	19.36

	5GHz 802.11n HT40		802.11ac VHT80
Channel	151	159	155
Frequency (MHz)	5755	5795	5775
Peak Power (dBm)	19.23	19.25	19.72

SISO <Ant. 2>

	802.11n HT20			802.11n HT40		
Channel	01	06	11	03	06	09
Frequency (MHz)	2412	2437	2462	2422	2437	2452
Peak Power (dBm)	18.30	20.24	15.85	16.64	19.75	14.95

	5GHz 802.11n HT20		
Channel	149	157	165
Frequency (MHz)	5745	5785	5825
Peak Power (dBm)	19.40	18.96	18.97

	5GHz 802.11n HT40		802.11ac VHT80
Channel	151	159	155
Frequency (MHz)	5755	5795	5775
Peak Power (dBm)	19.34	19.46	19.95

MIMO <Ant. 1+2>

	802.11n HT20			802.11n HT40		
Channel	**01**	**06**	**11**	**03**	**06**	**09**
Frequency (MHz)	**2412**	**2437**	**2462**	**2422**	**2437**	**2452**
Peak Power (dBm)	18.72	**20.10**	18.85	15.90	**19.58**	15.82

	5GHz 802.11n HT20		
Channel	**149**	**157**	**165**
Frequency (MHz)	**5745**	**5785**	**5825**
Peak Power (dBm)	**20.92**	20.70	20.67

	5GHz 802.11n HT40		802.11ac VHT80
Channel	**151**	**159**	**155**
Frequency (MHz)	**5755**	**5795**	**5775**
Peak Power (dBm)	**20.74**	20.42	**21.87**

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 results of test modes, data rates and test channels are shown as following table.

<2.4GHz>

Test Cases				
Radiated TCs	Test Items	Mode	Data Rate	Test Channel
	Radiated Band Edge	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
		802.11n HT40	MCS0	3/6/9
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
		802.11n HT40	MCS0	3/6/9

<5GHz>

Test Cases				
Radiated TCs	Test Items	Mode	Data Rate	Test Channel
	Radiated Spurious Emission	802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
		802.11n HT40	MCS0	151/159
		802.11ac VHT80	MCS0	155

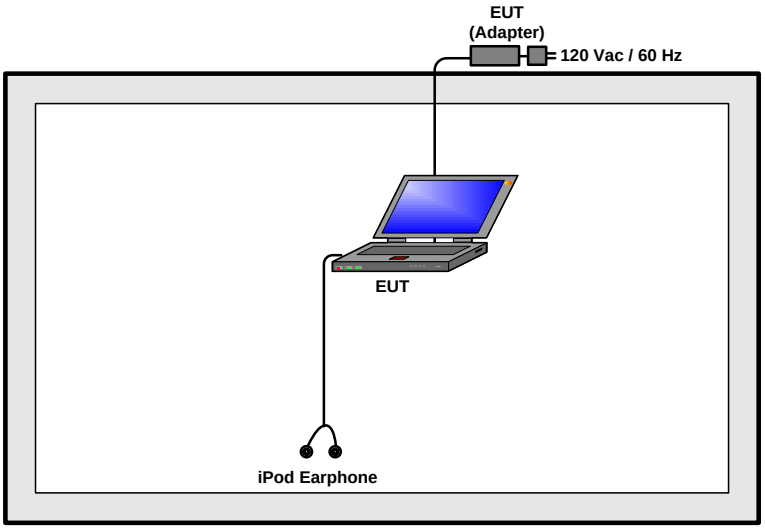
Test Cases	
AC Conducted Emission	Mode 1 : WLAN (2.4GHz) Link + Bluetooth Link + TC+ TF
	Mode 2 :WLAN (5GHz) Link + Bluetooth Link + TC+ TF

Remark:

1. The worst case of conducted emission is mode 2; only the test data of it was reported.
2. TC stands for Test Configuration, and consists of HDMI Cable, Earphone, Smart Card (Load), USB HD, RJ-45 Link, and SD Card.
3. TF stands for Test Function, and consists of MPEG4, Camera and H Patten.

2.4 Connection Diagram of Test System

<Notebook Type>



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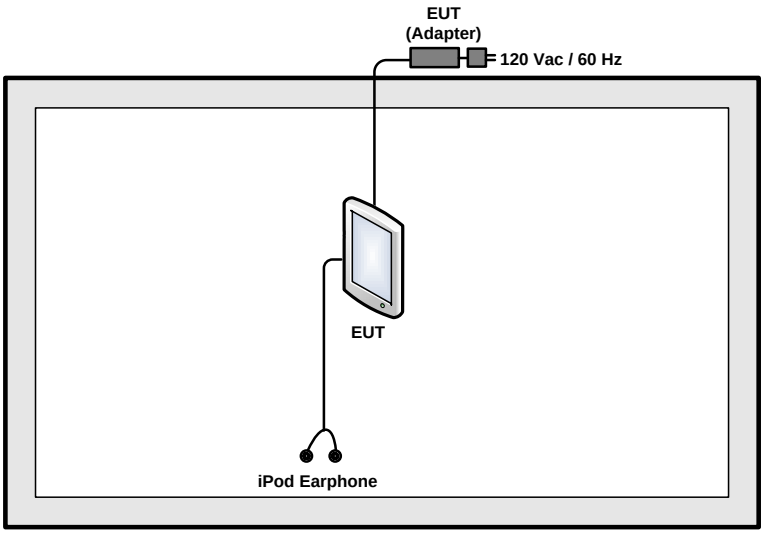
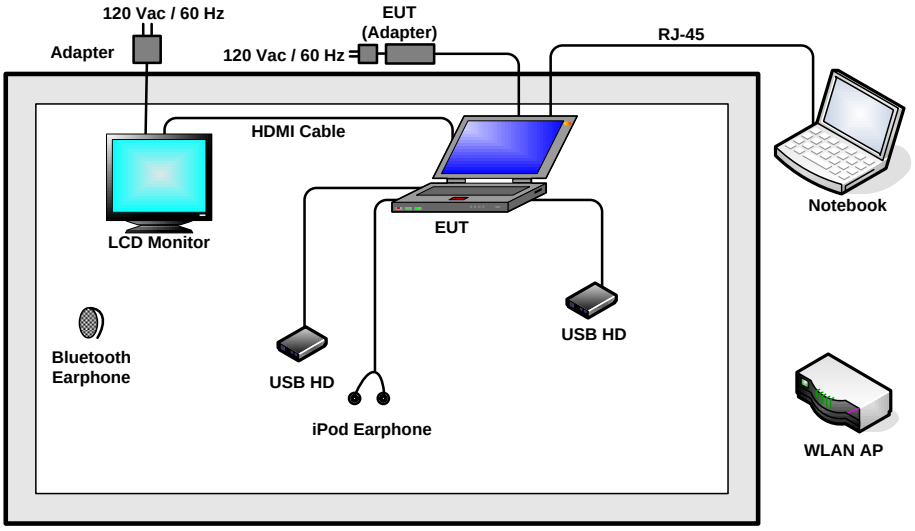


<Conduction Mode >



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	iPod Earphone	Apple	N/A	N/A	Unshielded,1.15m	N/A
3.	WLAN AP	D-Link	DIR-865L	KA2IR865LA1	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.	USB HD	WD	WDBAAR3200ABK-PESN	FCC DoC	Unshielded, 0.5 m	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
8.	Smart Card	N/A	N/A	N/A	N/A	N/A

2.6 EUT Operation Test Setup

The programmed RF utility “Test Tool”, is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated band edge and Spurious Emission Measurement

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

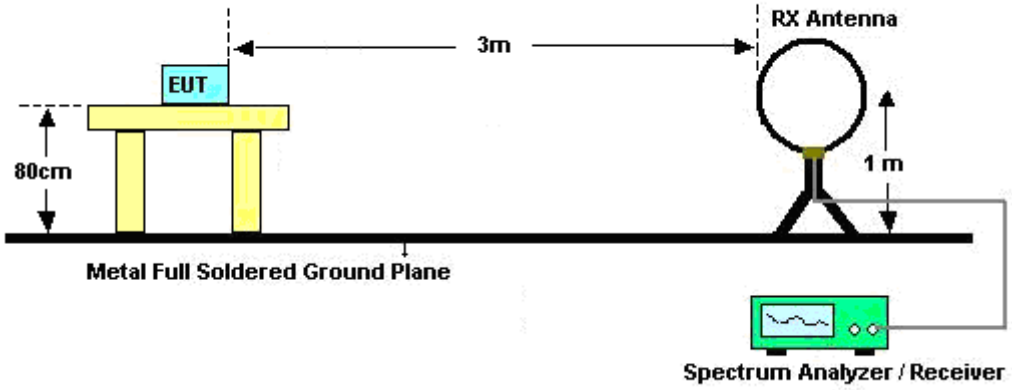
3.1.3 Test Procedure

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 - Preamp 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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - 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.

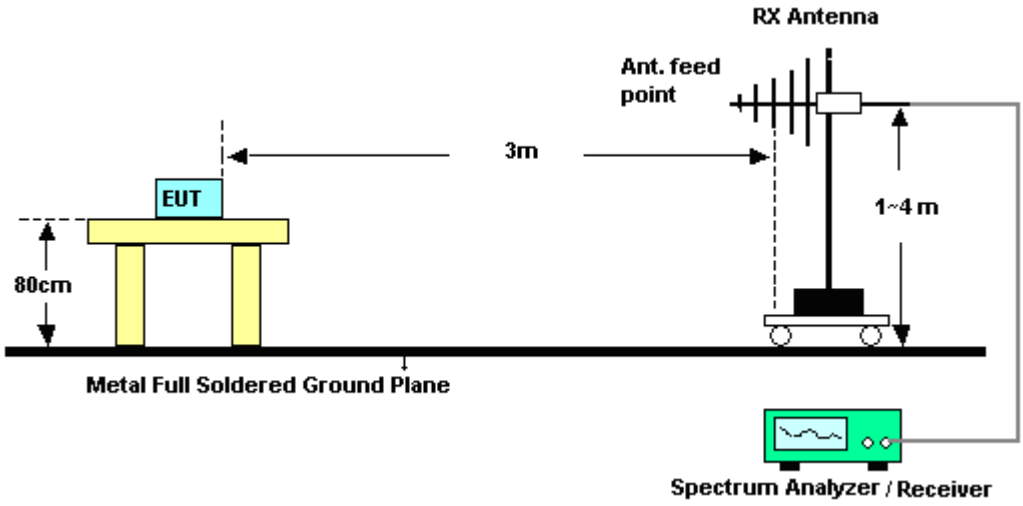
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11b	100	-	-	10Hz
2	802.11b	100	-	-	
1	802.11g	98.48	-	-	
2	802.11g	98.85	-	-	
1	2.4GHz 802.11n HT20	98.77	-	-	
2	2.4GHz 802.11n HT20	98.77	-	-	
1+2	2.4GHz 802.11n HT20	98.77	-	-	
1	2.4GHz 802.11n HT40	97.04	947.12	1.06	3kHz
2	2.4GHz 802.11n HT40	97.04	947.12	1.06	
1+2	2.4GHz 802.11n HT40	97.52	945.51	1.06	
1	802.11a	98.47	-	-	10Hz
2	802.11a	98.47	-	-	
1	5GHz 802.11n HT20	98.35	-	-	
2	5GHz 802.11n HT20	98.37	-	-	
1+2	5GHz 802.11n HT20	98.77	-	-	
1	5GHz 802.11n HT40	96.75	953.53	1.05	3kHz
2	5GHz 802.11n HT40	97.52	945.51	1.06	
1+2	5GHz 802.11n HT40	97.54	953.53	1.05	
1	5GHz 802.11ac VHT80	92.52	435.90	2.29	
2	5GHz 802.11ac VHT80	92.62	442.31	2.26	
1+2	5GHz 802.11ac VHT80	90.91	256.41	3.90	10kHz

3.1.4 Test Setup

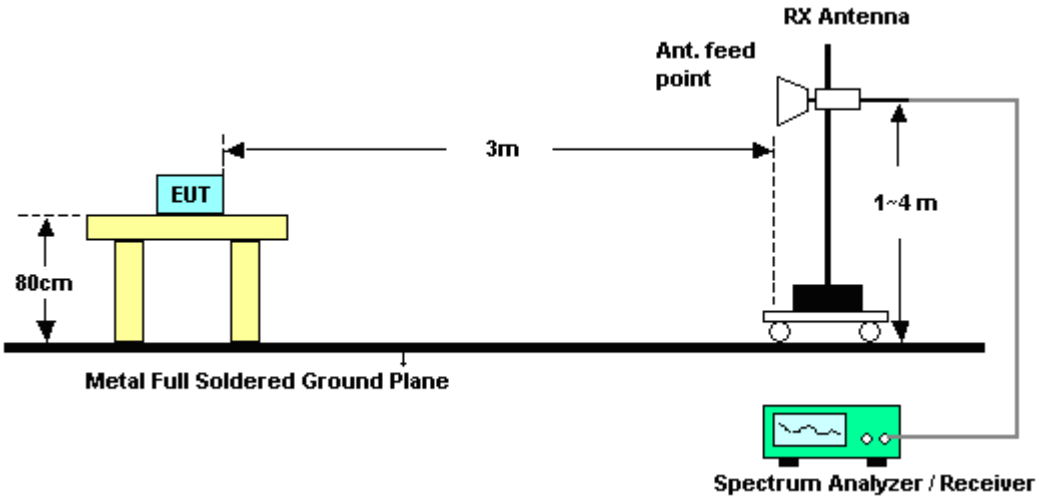
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

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 (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.

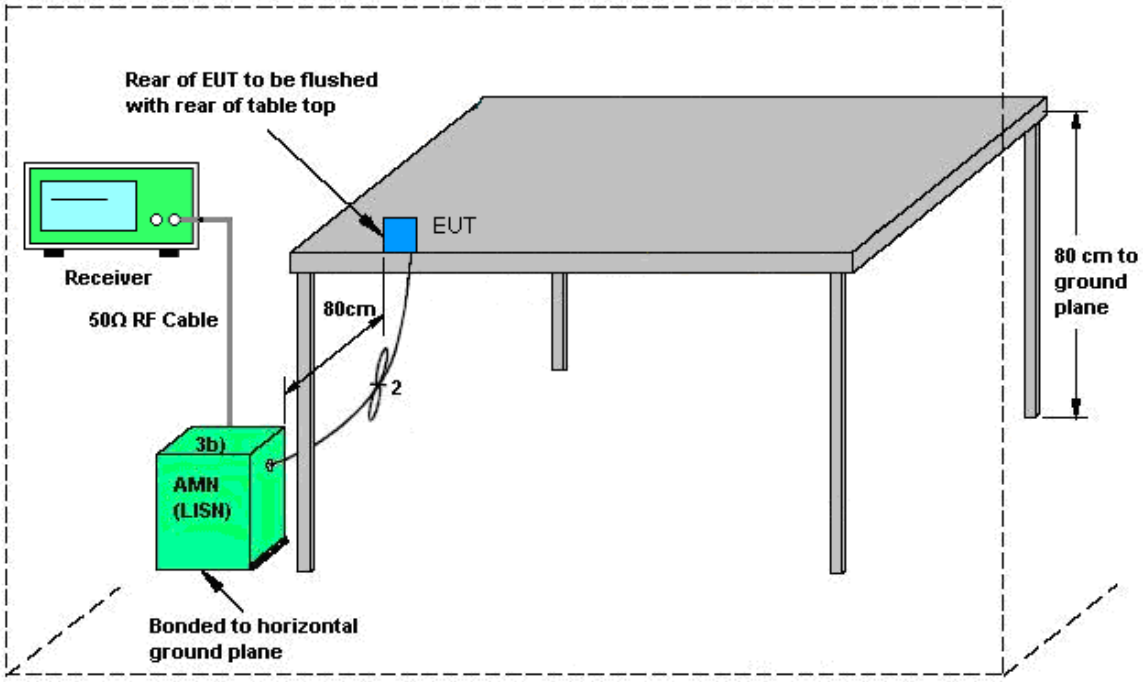
3.2.2 Measuring Instruments

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, and it 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.

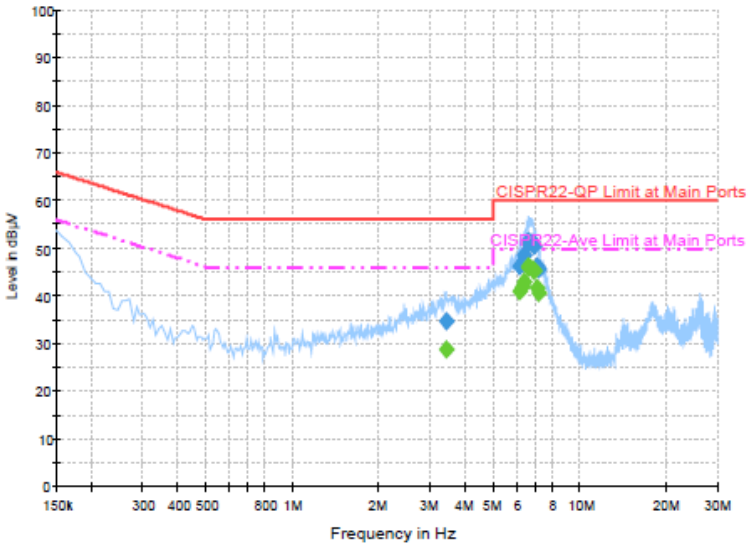
3.2.4 Test Setup



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 2	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5GHz) Link + Bluetooth Link + TC+ TF		



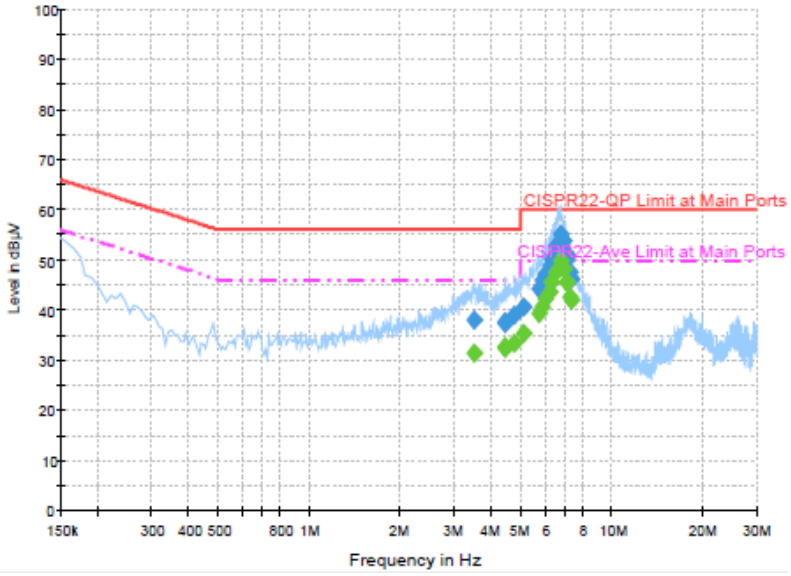
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
3.406000	34.8	Off	L1	19.6	21.2	56.0
6.166000	46.1	Off	L1	19.6	13.9	60.0
6.254000	46.9	Off	L1	19.6	13.1	60.0
6.366000	48.5	Off	L1	19.6	11.5	60.0
6.598000	50.7	Off	L1	19.7	9.3	60.0
6.622000	51.6	Off	L1	19.7	8.4	60.0
6.862000	51.0	Off	L1	19.7	9.0	60.0
6.902000	50.6	Off	L1	19.7	9.4	60.0
7.110000	46.1	Off	L1	19.7	13.9	60.0
7.134000	45.5	Off	L1	19.7	14.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
3.406000	28.8	Off	L1	19.6	17.2	46.0
6.166000	40.9	Off	L1	19.6	9.1	50.0
6.254000	41.9	Off	L1	19.6	8.1	50.0
6.366000	43.1	Off	L1	19.6	6.9	50.0
6.598000	45.8	Off	L1	19.7	4.2	50.0
6.622000	46.1	Off	L1	19.7	3.9	50.0
6.862000	45.4	Off	L1	19.7	4.6	50.0
6.902000	45.2	Off	L1	19.7	4.8	50.0
7.110000	41.6	Off	L1	19.7	8.4	50.0
7.134000	40.7	Off	L1	19.7	9.3	50.0

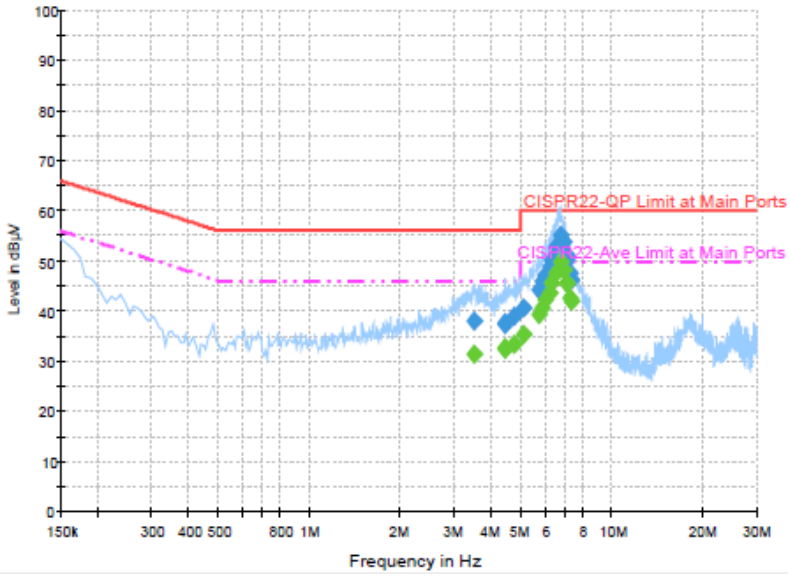
Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5GHz) Link + Bluetooth Link + TC+ TF		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
3.494000	38.0	Off	N	19.6	18.0	56.0
4.422000	37.5	Off	N	19.6	18.5	56.0
4.446000	37.6	Off	N	19.6	18.4	56.0
4.766000	39.1	Off	N	19.6	16.9	56.0
5.118000	40.7	Off	N	19.6	19.3	60.0
5.702000	44.3	Off	N	19.6	15.7	60.0
5.894000	45.8	Off	N	19.6	14.2	60.0
6.030000	47.4	Off	N	19.6	12.6	60.0
6.198000	48.8	Off	N	19.6	11.2	60.0
6.310000	50.0	Off	N	19.6	10.0	60.0
6.518000	52.7	Off	N	19.6	7.3	60.0
6.710000	55.0	Off	N	19.7	5.0	60.0
6.910000	53.7	Off	N	19.7	6.3	60.0
7.046000	51.0	Off	N	19.7	9.0	60.0
7.070000	50.2	Off	N	19.7	9.8	60.0
7.254000	47.4	Off	N	19.7	12.6	60.0
7.310000	46.3	Off	N	19.7	13.7	60.0

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5GHz) Link + Bluetooth Link + TC+ TF		



Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
3.494000	31.2	Off	N	19.6	14.8	46.0
4.422000	32.8	Off	N	19.6	13.2	46.0
4.446000	32.4	Off	N	19.6	13.6	46.0
4.766000	33.2	Off	N	19.6	12.8	46.0
5.118000	35.3	Off	N	19.6	14.7	50.0
5.702000	39.1	Off	N	19.6	10.9	50.0
5.894000	40.7	Off	N	19.6	9.3	50.0
6.030000	42.2	Off	N	19.6	7.8	50.0
6.198000	43.5	Off	N	19.6	6.5	50.0
6.310000	45.5	Off	N	19.6	4.5	50.0
6.518000	47.6	Off	N	19.6	2.4	50.0
6.710000	49.9	Off	N	19.7	0.1	50.0
6.910000	48.2	Off	N	19.7	1.8	50.0
7.046000	45.5	Off	N	19.7	4.5	50.0
7.070000	45.4	Off	N	19.7	4.6	50.0
7.254000	42.5	Off	N	19.7	7.5	50.0
7.310000	42.1	Off	N	19.7	7.9	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. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the Antenna exceeds 6 dBi. 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

FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

For CDD and beamforming 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 and beamforming.

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)
2.4 GHz	0.52	-1.61	2.53	2.53	0.00	0.00
5 GHz	0.33	1.89	4.16	4.16	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
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 09, 2014	Oct. 06, 2014 ~ Oct. 09, 2014	Aug. 08, 2015	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 09, 2014	Oct. 06, 2014 ~ Oct. 09, 2014	Aug. 08, 2015	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Jun. 08, 2015	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Sep. 27, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Sep. 26, 2015	Radiation (03CH05-HY)
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz~18GHz	Apr. 16, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Apr. 15, 2015	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Oct. 02, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Oct. 01, 2015	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	100kHz~18GHz	Jul. 07, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Jul. 06, 2015	Radiation (03CH05-HY)
Preamplifier	EMCI	EMC011830	980148	DC~18GHz	Jun. 23, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Jun. 22, 2015	Radiation (03CH05-HY)
Preamplifier	COM-POWER	PA-103	161075	9kHz~30MHz	Apr. 15, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	Apr. 14, 2015	Radiation (03CH05-HY)
Preamplifier	Miteq	TTA0204	1872107	18GHz~40GHz	May 23, 2014	Oct. 09, 2014 ~ Oct. 21, 2014	May 22, 2015	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Oct. 09, 2014 ~ Oct. 21, 2014	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Oct. 09, 2014 ~ Oct. 21, 2014	N/A	Radiation (03CH05-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Dec. 02, 2012	Oct. 09, 2014 ~ Oct. 21, 2014	Dec. 03, 2014	Radiation (03CH05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 15, 2013	Nov. 06, 2014	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2013	Nov. 06, 2014	Dec. 11, 2014	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 04, 2013	Nov. 06, 2014	Dec. 03, 2014	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 06, 2014	N/A	Conduction (CO05-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**

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

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