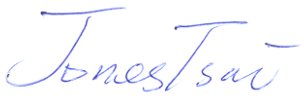
FCC RF Test Report

APPLICANT	:	DT Research Inc.
EQUIPMENT	:	WLAN Module
BRAND NAME	:	DT Research Inc.
MODEL NAME	:	600C
FCC ID	:	YE3600C
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

This is a partial report. The product was received on Oct. 03, 2014 and testing was completed on Jan. 11, 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

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR491670-01C	Rev. 01	Initial issue of report	Jan. 20, 2015

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.25 dB at 2484.920 MHz
3.2	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 14.10 dB at 28.702 MHz
3.3	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

DT Research Inc.
6F, NO. 1, NingPo E. St., Taipei, 100 Taiwan, R.O.C.

1.2 Manufacturer

DT Research Inc.
6F, NO. 1, NingPo E. St., Taipei, 100 Taiwan, R.O.C.

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	WLAN Module
Brand Name	DT Research Inc.
Model Name	600C
FCC ID	YE3600C
installed Mobile Tablet	Brand Name: DT Research Inc. Model Name: DT398H
EUT supports Radios application	CDMA/EV-DO/LTE WLAN 11a/b/g/n (HT20/HT40) WLAN 11ac (VHT20/VHT40/VHT80) Bluetooth v4.0 EDR/LE
EUT Stage	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

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n/ac : 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5745~5825MHz.
Maximum (Peak) Output Power to antenna	**<2412 MHz ~ 2462 MHz >** **<Ant. 1>** 802.11b : 17.58 dBm (0.0573 W) 802.11g : 23.71 dBm (0.2350 W) **<SISO Ant. 1>** 802.11n HT20 : 23.70 dBm (0.2344 W) 802.11n HT40 : 22.73 dBm (0.1875 W) **<Ant. 2>** 802.11b : 19.67 dBm (0.0927 W) 802.11g : 24.89 dBm (0.3083 W) **<SISO Ant. 2>** 802.11n HT20 : 25.18 dBm (0.3296 W) 802.11n HT40 : 24.98 dBm (0.3148 W) **<MIMO Ant.1+ 2>** 802.11n HT20 : 21.83 dBm (0.1524 W) 802.11n HT40 : 21.58 dBm (0.1439 W) **<5745 MHz ~ 5825 MHz >** **< Ant. 1>** 802.11a : 25.45 dBm (0.3508 W) **<SISO Ant. 1>** 802.11n HT20 : 24.13 dBm (0.2588 W) 802.11n HT40 : 19.55 dBm (0.0902 W) **<Ant. 2>** 802.11a : 24.20 dBm (0.2630 W) **<SISO Ant. 2>** 802.11n HT20 : 24.39 dBm (0.2748 W) 802.11n HT40 : 19.10 dBm (0.0813 W) **<MIMO Ant.1+ 2>** 802.11n HT20 : 22.13 dBm (0.1633 W) 802.11n HT40 : 22.27 dBm (0.1687 W)
Antenna Type	2.4GHz Main Antenna : PIFA_UP Antenna with gain 1.44 dBi Aux. Antenna : PIFA_D Antenna with gain 3.36 dBi 5GHz Main Antenna : PIFA_UP Antenna with gain 3.06 dBi Aux. Antenna : PIFA_D Antenna with gain 3.90 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

Antenna Function for Transmitter	

	Chain Port 0 Ant. 1	Chain Port 1 Ant. 2
802.11 a/b/g	V	V
802.11 n/ac SISO	V	V
802.11 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 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	03CH06-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 C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
- 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:

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 (Y 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)
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				
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps
Peak Power (dBm)	17.58	17.55	17.50	17.47

802.11g								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	23.71	23.67	23.68	23.60	23.62	23.56	23.54	23.58

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	23.70	23.66	23.67	23.61	23.58	23.66	23.62	23.67

2.4GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	22.73	22.44	22.41	22.63	22.36	22.41	22.65	22.50

802.11a								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	25.45	25.32	25.37	25.39	25.33	25.36	25.37	25.39

5GHz 802.11n HT20							
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	24.13	23.86	23.85	23.71	23.80	23.80	23.72	23.50

5GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	19.55	19.52	19.52	19.51	19.52	19.49	19.50	19.36

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Peak Power (dBm)	24.11	24.05	24.02	23.82	23.91	23.93	23.88	23.77	23.73

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	19.20	19.12	19.14	19.17	19.14	19.14	19.01	18.97	18.96	19.01

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	23.19	22.86	22.92	23.10	23.12	22.90	22.88	22.92	22.99	23.01

<Ant. 2>

802.11b				
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps
Peak Power (dBm)	19.67	19.61	19.51	19.52

802.11g								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	24.89	24.82	24.74	24.72	24.59	24.72	24.60	24.72

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	25.18	25.13	25.14	25.09	25.13	25.11	25.13	25.07

2.4GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	24.98	24.63	24.74	24.81	24.81	24.87	24.92	24.95

802.11a								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	24.20	24.17	24.19	23.99	24.10	24.17	24.09	24.19

5GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	24.39	24.22	24.26	24.28	24.26	24.25	24.27	24.21

5GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	19.10	19.06	18.92	19.01	19.04	18.92	18.94	18.72

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Peak Power (dBm)	24.37	24.25	24.32	24.01	24.10	24.18	24.06	24.09	24.17

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	18.96	18.85	18.84	18.90	18.93	18.87	18.89	18.83	18.74	18.86

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	23.52	23.33	23.40	23.50	23.50	23.29	23.42	23.37	23.38	23.40

MIMO <Ant. 1+2>

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	21.83	21.66	21.65	21.68	21.58	21.69	21.69	21.74

2.4GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	21.58	21.42	21.38	21.52	21.43	21.47	21.37	21.57

5GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	22.13	21.71	21.89	21.97	22.10	21.69	21.85	21.79

5GHz 802.11n HT40								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	22.27	22.02	22.01	22.12	22.08	22.20	22.10	22.05

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Peak Power (dBm)	22.07	21.86	21.77	21.98	21.99	21.99	22.07	22.06	22.00

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	21.92	21.64	21.62	21.65	21.61	21.49	21.62	21.30	21.34	21.41

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Peak Power (dBm)	22.70	22.45	22.47	22.67	22.58	22.57	22.56	22.41	22.46	22.29

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 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

<2.4GHz>

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

<5GHz>

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

<2.4GHz>

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

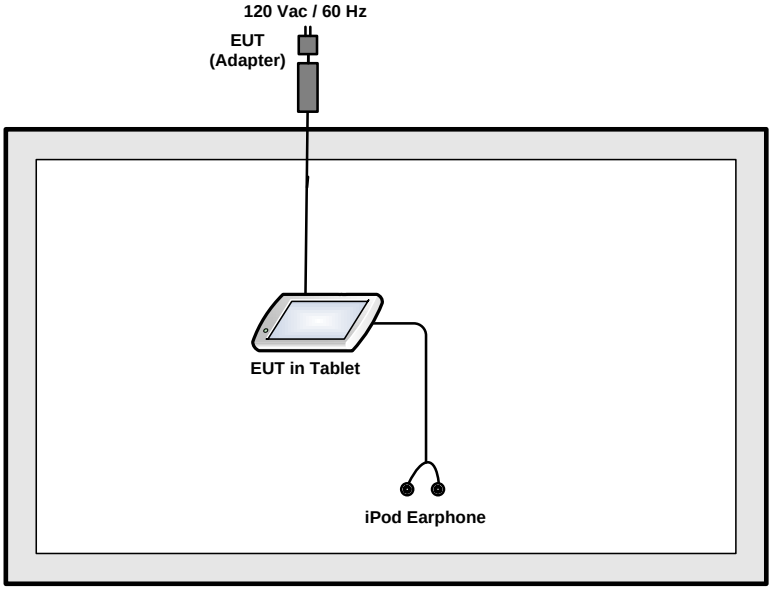
<5GHz>

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

Test Cases	
AC Conducted Emission	Mode 1 : CDMA2000 BC0 Idle + Bluetooth Idle + WLAN Link + e-SATA HDD + USB Cable (Charging from Adapter) + H-Pattern + MPEG4 + Camera + Smart Card + SD Card + Earphone

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



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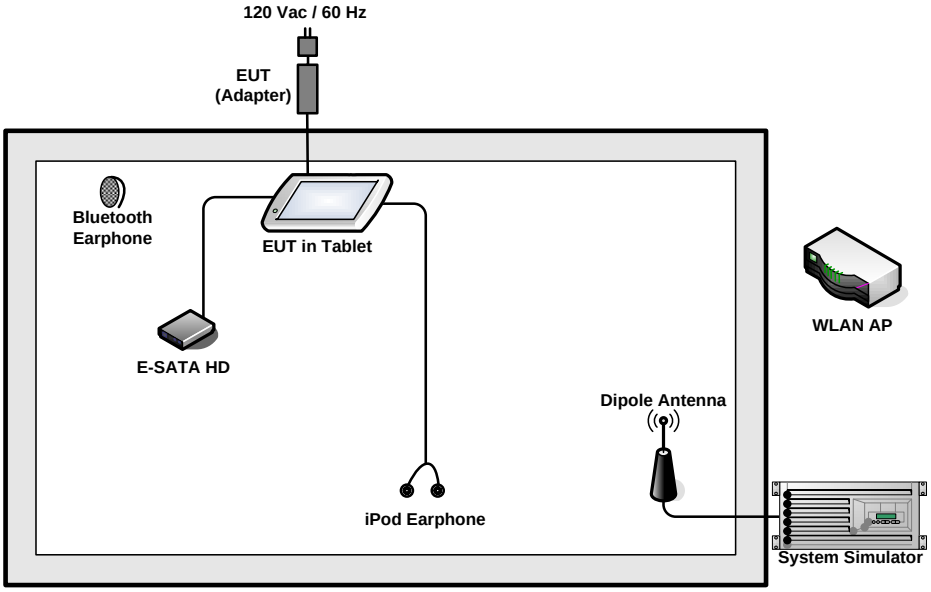


2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	eSATA	FREECOM	SSYBBA	FCC DoC	Shielded, 0.5m	Unshielded, 1.8 m
5.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
6.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	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

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

2.7 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.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

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.

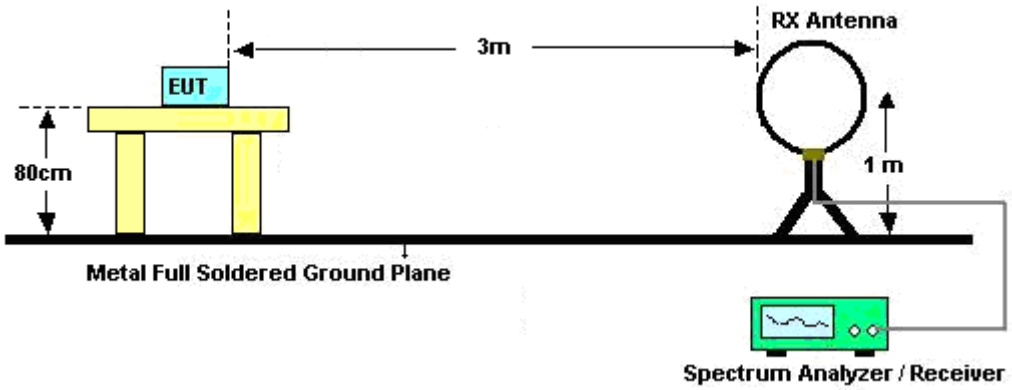
3.1.3 Test Procedure

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 for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively 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.

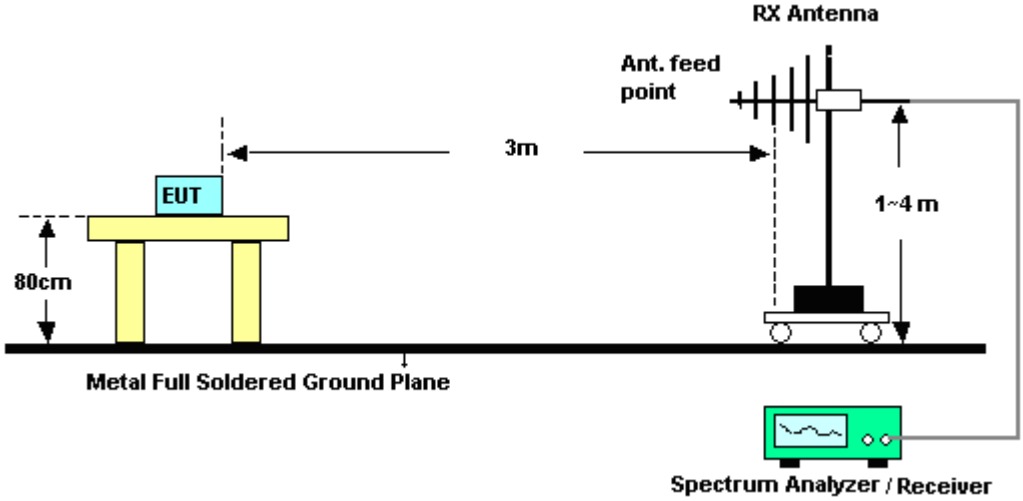
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11b	98.68	-	-	10Hz
1	802.11g	99.04	-	-	10Hz
1	2.4GHz 802.11n HT20	98.46	-	-	10Hz
1	2.4GHz 802.11n HT40	96.91	940	1.06	3kHz
1+2	2.4GHz 802.11n HT20 for Ant 1	97.63	990	1.01	3kHz
1+2	2.4GHz 802.11n HT20 for Ant 2	97.62	984	1.02	3kHz
1+2	2.4GHz 802.11n HT40 for Ant 1	94.32	498	2.01	3kHz
1+2	2.4GHz 802.11n HT40 for Ant 2	94.32	498	2.01	3kHz
1	802.11a	98.56	-	-	10Hz
1	5GHz 802.11n HT20	98.46	-	-	10Hz
1	5GHz 802.11n HT40	97.94	950	1.05	3kHz
1+2	5GHz 802.11n HT20 for Ant 1	97.04	982	1.02	3kHz
1+2	5GHz 802.11n HT20 for Ant 2	97.03	980	1.02	3kHz
1+2	5GHz 802.11n HT40 for Ant 1	95.4	498	2.01	3kHz
1+2	5GHz 802.11n HT40 for Ant 2	95.4	498	2.01	3kHz
1	5GHz 802.11ac VHT20	98.47	-	-	10Hz
1	5GHz 802.11ac VHT40	97.55	954	1.05	3kHz
1	5GHz 802.11ac VHT80	94.02	440	2.27	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 1	97.63	990	1.01	3kHz
1+2	5GHz 802.11ac VHT20 for Ant 2	97.63	990	1.01	3kHz
1+2	5GHz 802.11ac VHT40 for Ant 1	95.45	504	1.98	3kHz
1+2	5GHz 802.11ac VHT40 for Ant 2	95.45	504	1.98	3kHz
1+2	5GHz 802.11ac VHT80 for Ant 1	90.14	256	3.91	10kHz
1+2	5GHz 802.11ac VHT80 for Ant 2	90.85	258	3.88	10kHz

3.1.4 Test Setup

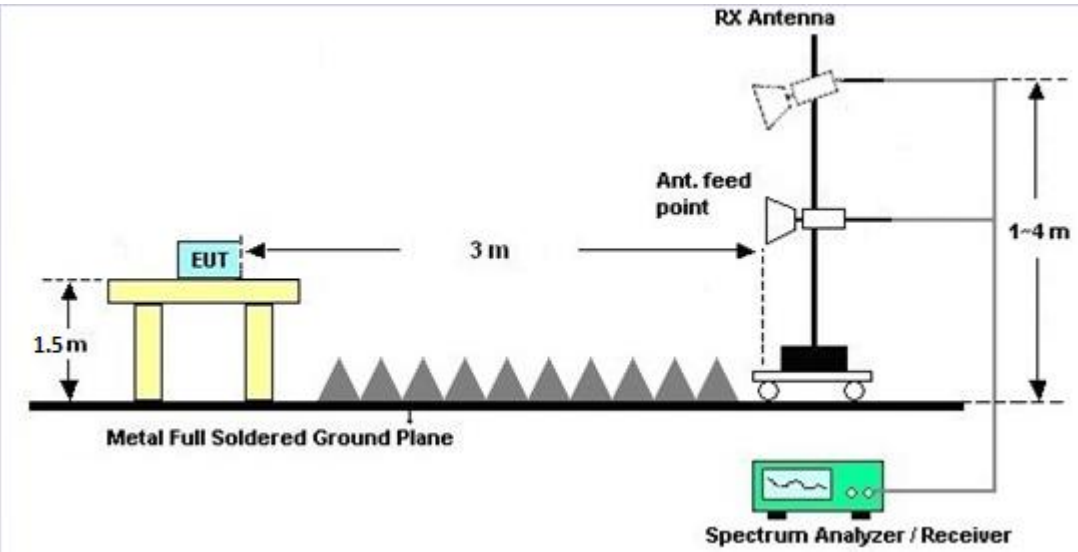
For radiated emissions below 30MHz



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 of Radiated Spurious at Band Edges

Please refer to Appendix B of this report.

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

Please refer to Appendix B of this report.

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.

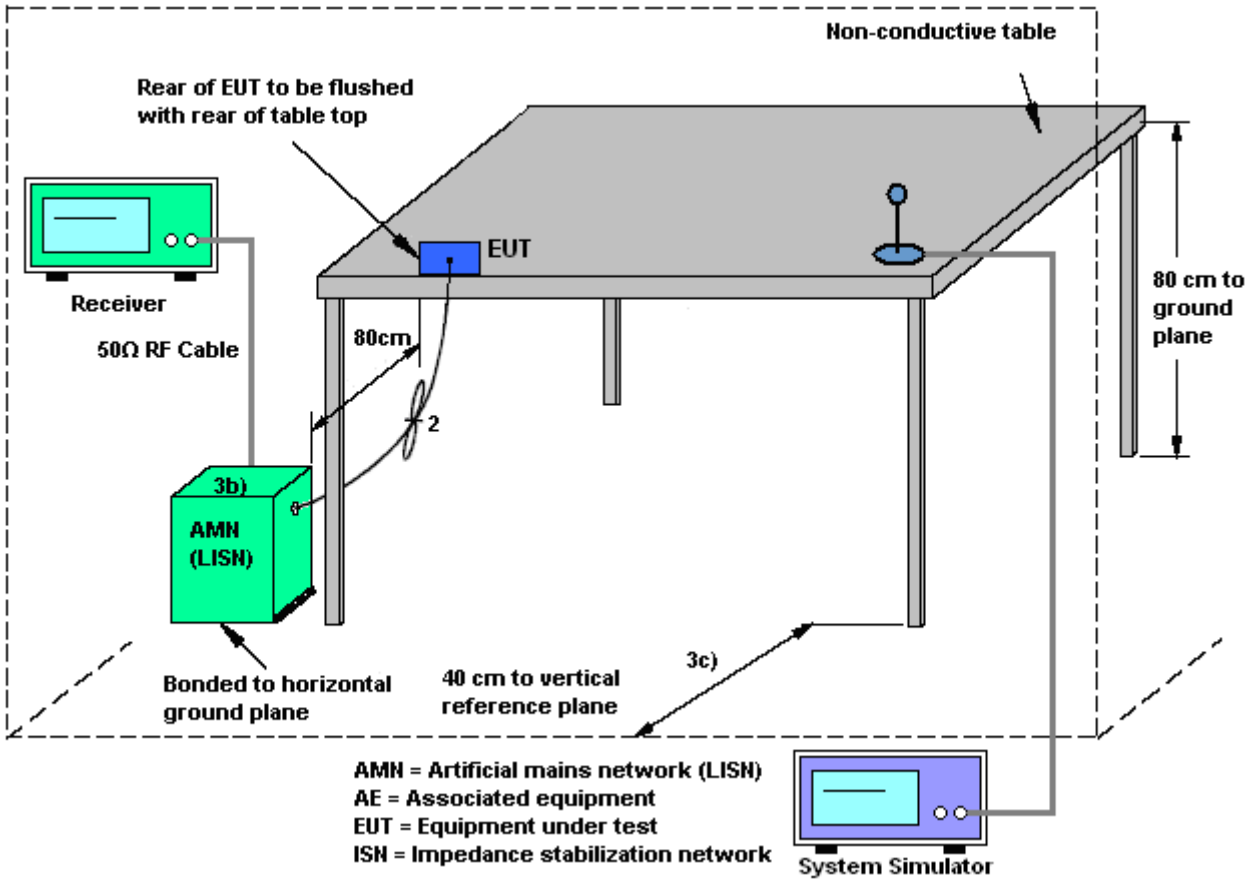
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

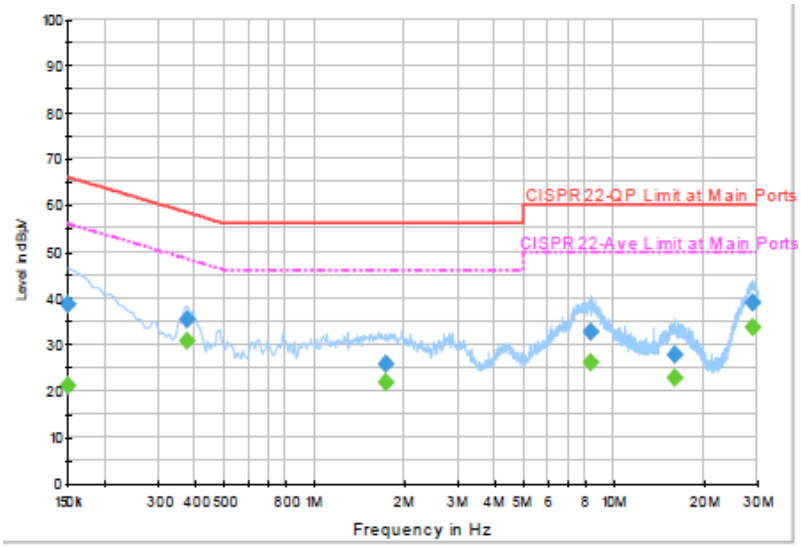
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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



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 :	CDMA2000 BC0 Idle + Bluetooth Idle + WLAN Link + e-SATA HDD + USB Cable (Charging from Adapter) + H-Pattern + MPEG4 + Camera + Smart Card + SD Card + Earphone		



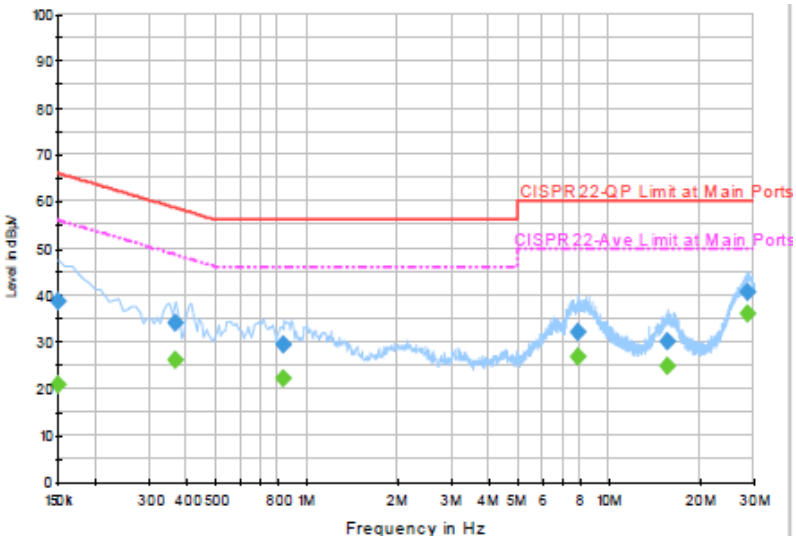
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.5	Off	L1	19.4	27.5	66.0
0.374000	35.2	Off	L1	19.5	23.2	58.4
1.726000	25.7	Off	L1	19.6	30.3	56.0
8.350000	32.6	Off	L1	19.8	27.4	60.0
15.894000	27.7	Off	L1	19.9	32.3	60.0
29.086000	38.8	Off	L1	20.1	21.2	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	21.2	Off	L1	19.4	34.8	56.0
0.374000	30.6	Off	L1	19.5	17.8	48.4
1.726000	21.7	Off	L1	19.6	24.3	46.0
8.350000	26.1	Off	L1	19.8	23.9	50.0
15.894000	22.7	Off	L1	19.9	27.3	50.0
29.086000	33.8	Off	L1	20.1	16.2	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	CDMA2000 BC0 Idle + Bluetooth Idle + WLAN Link + e-SATA HDD + USB Cable (Charging from Adapter) + H-Pattern + MPEG4 + Camera + Smart Card + SD Card + Earphone		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.7	Off	N	19.4	27.3	66.0
0.366000	34.1	Off	N	19.5	24.5	58.6
0.838000	29.5	Off	N	19.6	26.5	56.0
7.822000	32.0	Off	N	19.7	28.0	60.0
15.566000	30.0	Off	N	19.9	30.0	60.0
28.702000	40.5	Off	N	20.2	19.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	20.9	Off	N	19.4	35.1	56.0
0.366000	26.1	Off	N	19.5	22.5	48.6
0.838000	22.1	Off	N	19.6	23.9	46.0
7.822000	26.6	Off	N	19.7	23.4	50.0
15.566000	24.7	Off	N	19.9	25.3	50.0
28.702000	35.9	Off	N	20.2	14.1	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)	for Power (dBi)	for PSD (dBi)	Limit Reduction (dB)	Limit Reduction (dB)
2.4 GHz	1.44	3.36	5.46	5.46	0.00	0.00
5 GHz	3.06	3.90	6.50	6.50	0.50	0.50

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	Jan. 12, 2015	Jun. 08, 2015	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 09, 2014	Jan. 12, 2015	Aug. 08, 2015	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 09, 2014	Jan. 12, 2015	Aug. 08, 2015	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Dec. 01, 2014	Oct. 06, 2014	Nov. 30, 2015	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 08, 2014	Oct. 06, 2014	Dec. 07, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 02, 2014	Oct. 06, 2014	Dec. 01, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Oct. 06, 2014	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101067	9kHz ~ 30GHz	Nov. 21, 2014	Dec. 31, 2014~ Jan. 11, 2015	Nov. 20, 2015	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9kHz ~ 26.5GHz	Nov. 27, 2014	Dec. 31, 2014~ Jan. 11, 2015	Nov. 26, 2015	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 06, 2014	Dec. 31, 2014~ Jan. 11, 2015	May 05, 2015	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Dec. 31, 2014~ Jan. 11, 2015	Jul. 27, 2015	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL6112B	2885	30MHz ~ 2GHz	Sep. 27, 2014	Dec. 31, 2014~ Jan. 11, 2015	Sep. 26, 2015	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Jul. 24, 2014	Dec. 31, 2014~ Jan. 11, 2015	Jul. 23, 2015	Radiation (03CH06-HY)
Amplifier	SONOMA	310N	186713	9kHz ~ 1GHz	Apr. 16, 2014	Dec. 31, 2014~ Jan. 11, 2015	Apr. 15, 2015	Radiation (03CH06-HY)
Preamplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 17, 2014	Dec. 31, 2014~ Jan. 11, 2015	Jul. 16, 2015	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz- 40GHz	Oct. 02, 2014	Dec. 31, 2014~ Jan. 11, 2015	Oct. 01, 2015	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 10, 2014	Dec. 31, 2014~ Jan. 11, 2015	Apr. 09, 2015	Radiation (03CH06-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))	**4.50**