FCC RF Test Report

APPLICANT	:	Lenovo Mobile Communication Technology Ltd.
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Lenovo
MODEL NAME	:	Lenovo K33a48
FCC ID	:	YCNK33A48
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Jun. 28, 2016 and testing was completed on Aug. 14, 2016. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

James Huang

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China

TABLE OF CONTENTS

1 GENERAL DESCRIPTION 5

1.1 Applicant 5
1.2 Manufacturer 5
1.3 Product Feature of Equipment Under Test 5
1.4 Product Specification of Equipment Under Test 6
1.5 Specification of Accessory 6
1.6 Modification of EUT 7
1.7 Testing Location 7
1.8 Applicable Standards 8

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 9

2.1 Carrier Frequency Channel 9
2.2 Test Mode 10
2.3 Connection Diagram of Test System 11
2.4 Support Unit used in test configuration and system 12
2.5 EUT Operation Test Setup 12
2.6 Measurement Results Explanation Example 12

3 TEST RESULT 13

3.1 6dB Bandwidth Measurement 13
3.2 Output Power Measurement 15
3.3 Power Spectral Density Measurement 16
3.4 Conducted Band Edges and Spurious Emission Measurement 18
3.5 Radiated Band Edges and Spurious Emission Measurement 28
3.6 AC Conducted Emission Measurement 32
3.7 Antenna Requirements 36

4 LIST OF MEASURING EQUIPMENT 37

5 UNCERTAINTY OF EVALUATION 38

APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. RADIATED TEST RESULTS

APPENDIX C. DUTY CYCLE PLOTS

APPENDIX D. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR662815C	Rev. 01	Initial issue of report	Sep. 05, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 9.7 dB at 34.850 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 8.36 dB at 18.040 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lenovo Mobile Communication Technology Ltd.
No.999, Qishan North 2nd Road, Information & Optoelectronics Park, Torch Hi-tech Industry Development Zone, Xiamen, P.R.China

1.2 Manufacturer

Motorola Mobility LLC
222 W. Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Lenovo
Model Name	Lenovo K33a48
FCC ID	YCNK33A48
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/HSPA+/LTE/ WLAN 2.4GHz 802.11b/g/n HT20/ Bluetooth v3.0 + EDR/Bluetooth v4.0 LE/Bluetooth v4.2 LE
IMEI Code	Conducted: NA Conduction: 861576030039298/861576030039306 Radiation: 861576030040098/861576030040106
HW Version	82937_1_13
SW Version	K33_S117_1608021219_ROW
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT sample 1 and sample 2, the differences between two samples are only for SIM slot, sample 1 is dual SIM slot, sample 2 is single SIM slot. According to the difference, we evaluate is not affect RF performance, so only choose sample 1 to perform RF test.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 16.60 dBm (0.0457 W) 802.11g : 22.48 dBm (0.1770 W) 802.11n HT20 : 21.57 dBm (0.1435 W)
Antenna Type/Gain	PIFA Antenna with gain 1.20 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Lenovo (Acbel)	**Model Name**	C-P35
	Power Rating	I/P: 100-240 Vac, 300mA, O/P: 5.2Vdc, 2000mA		
AC Adapter 2	**Brand Name**	Lenovo (Huntkey)	**Model Name**	C-P35
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5.2Vdc, 2000mA		
Battery	**Brand Name**	Lenovo (scud)	**Model Name**	BL267
	Power Rating	4.4Vdc,3000mAh		
Earphone 1	**Brand Name**	Lenovo (suicen)	**Model Name**	SX-H1801A-06
	Signal Line Type	1.1 meter, non-shielded cable, without ferrite core		
Earphone 2	**Brand Name**	Lenovo (New Leader)	**Model Name**	NLD-EM127E-96SH-6
	Signal Line Type	1.1 meter, non-shielded cable, without ferrite core		
USB Cable 1	**Brand Name**	Lenovo(saibao)	**Model Name**	SWT-A053A
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		
USB Cable 2	**Brand Name**	Lenovo(starw)	**Model Name**	XJ-007070
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		
LCD Panel	**Brand Name**	tianma	**Model Name**	Black: TL050VVXP14-00 Golden: TL050VVXP16-00 White: TL050VVXP15-00
Camera	**Brand Name**	Q Technology	**Model Name**	Front: FX219BQS Post: FX258BDS
CTP Module	**Brand Name**	O-FILM	**Model Name**	Black: MCF-050-2585 Golden: MCF-050-2585-02 White: MCF-050-2585-01

1.6 Modification of EUT

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

1.7 Testing Location

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.**
	TH02-HY

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958
Test Site No.	**Sporton Site No.**
	CO01-KS

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Registration No.**
	03CH03-SZ	565805

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

1.8 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 v03r05
- 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. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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 four orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

2.1 Carrier Frequency 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	-	-

2.2 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

<2.4GHz>

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0

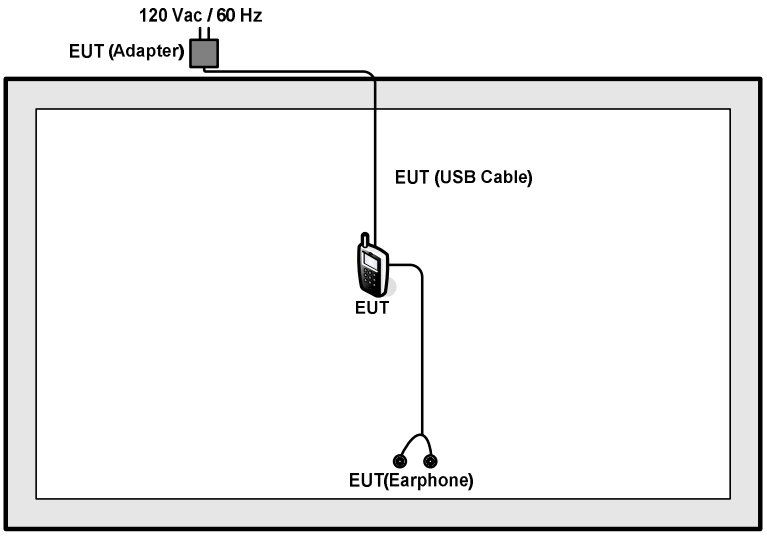
Test Cases		
AC Conducted Emission	Mode 1 :	GSM 850 Idle + Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter 1) + Earphone 1 for Sample 1
	Mode 2 :	**GSM 850 Idle + Bluetooth Link + WLAN Link + USB Cable 2 (Charging from Adapter 2) + Earphone 2 for Sample 1**

Remark:

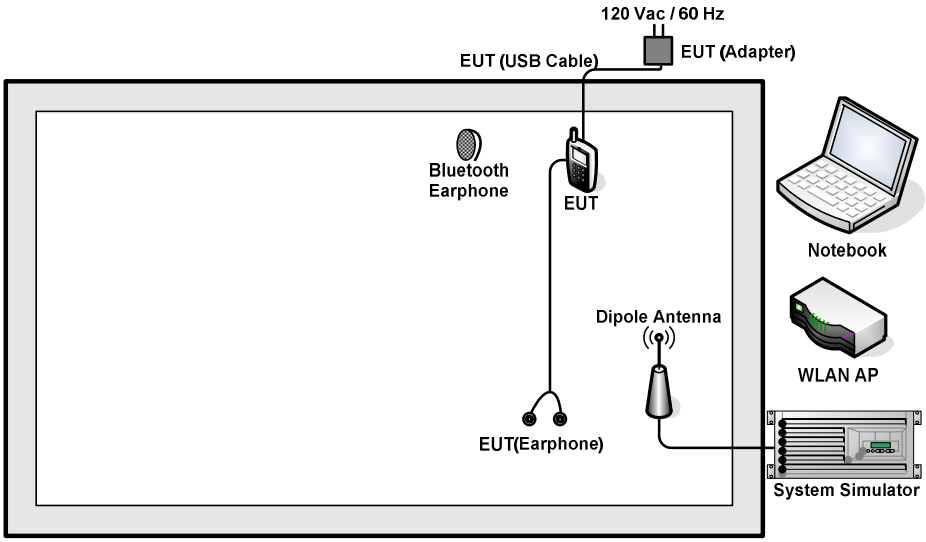
1. The worst case of conducted emission is mode 2; only the test data of it was reported.
2. For radiated test cases, the tests were performed with adapter 1, earphone 1 and USB cable 1 for sample 1.

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritus	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	PRC4	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 0.3 dB and 22.9dB attenuator.

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

= 0.3 + 22.9 = 23.2 (dB)

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

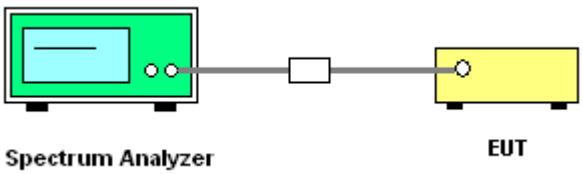
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

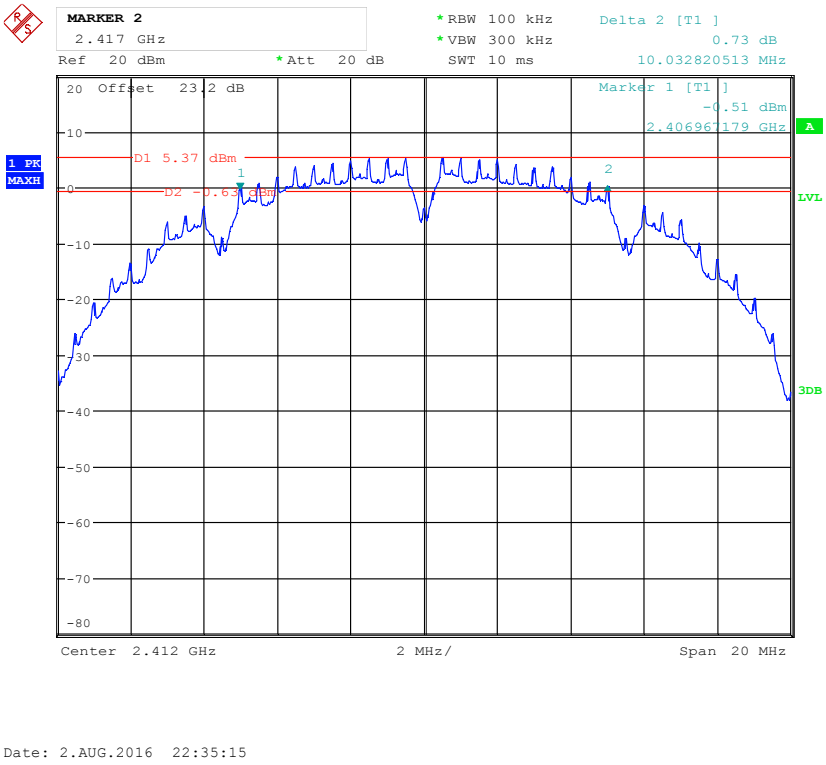
3.1.4 Test Setup



3.1.5 Test Result of 6dB and Bandwidth

Please refer to Appendix A of this test report.

Minimum 6dB Bandwidth



3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting Antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the Antenna exceeds 6dBi.

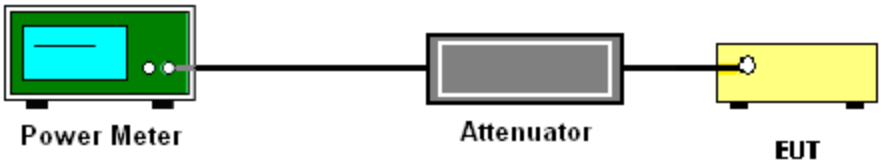
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A of this test report.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A of this test report.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

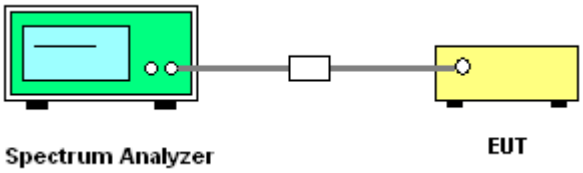
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

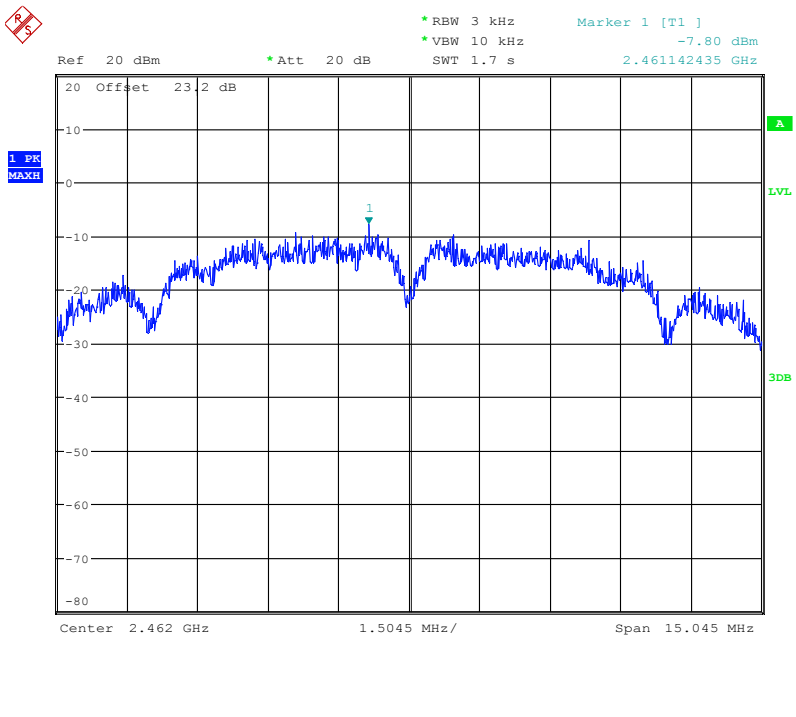
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A of this test report.

Worst Case Power Density (dBm/3kHz)



Date: 2.AUG.2016 22:53:51

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

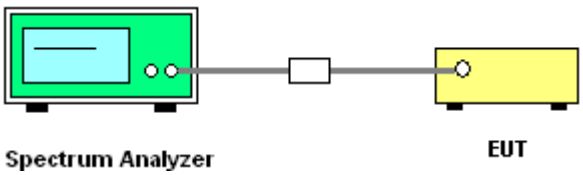
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

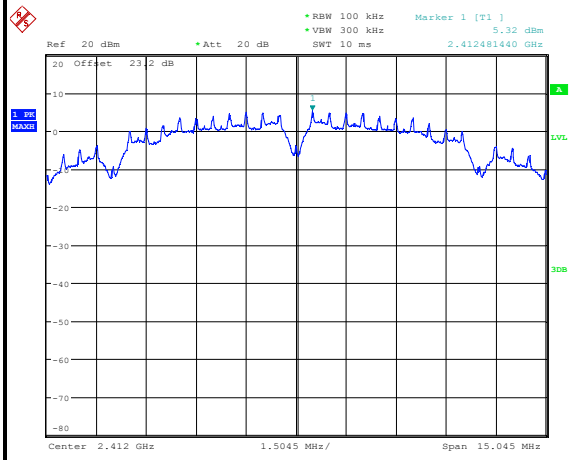


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

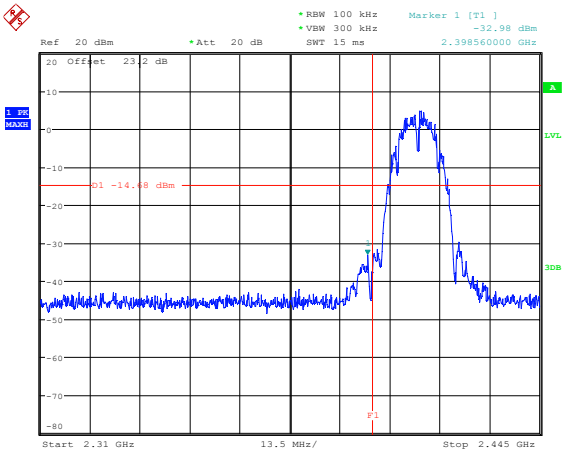
Test Mode :	802.11b	**Temperature :**	24~26℃
Test Band :	2.4GHz Low	**Relative Humidity :**	45~49%
Test Channel :	01	**Test Engineer :**	AC Chang

WLAN 802.11b Channel 01

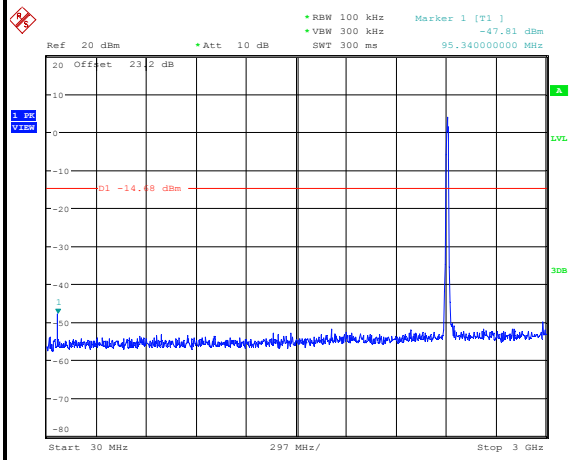
100kHz PSD reference Level



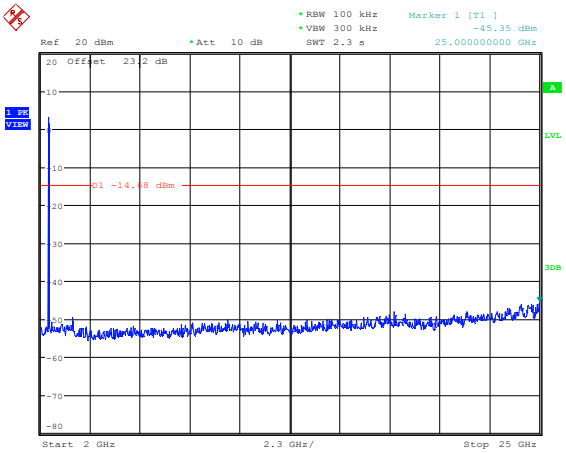
Low Channel Plot



Spurious Emission 30MHz~3GHz



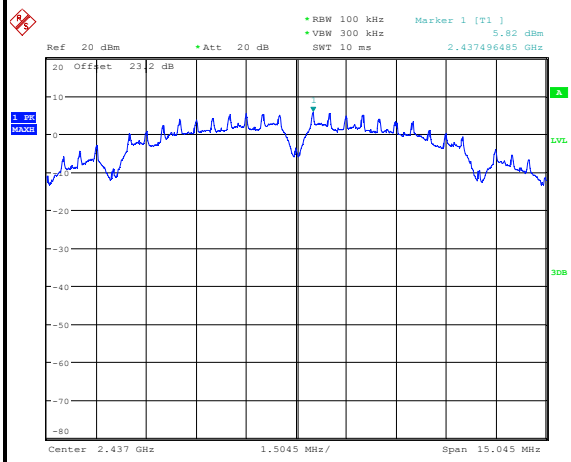
Spurious Emission 2GHz~25GHz



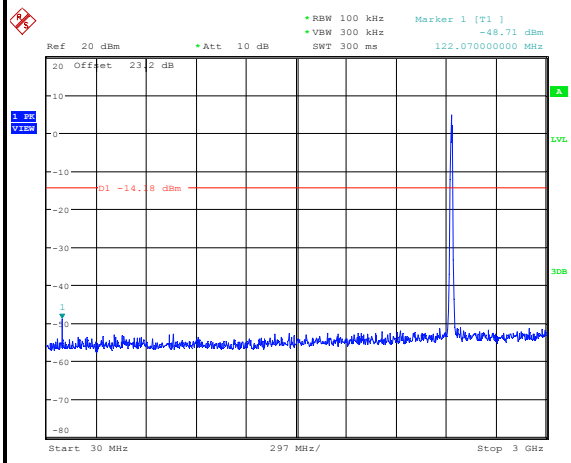
Test Mode :	802.11b	**Temperature :**	24~26℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	45~49%
Test Channel :	06	**Test Engineer :**	AC Chang

WLAN 802.11b Channel 06

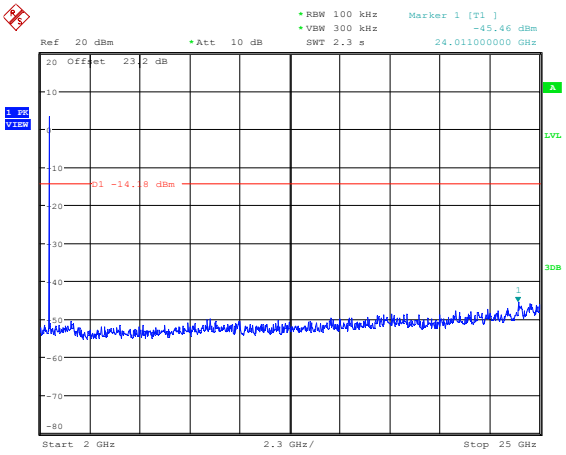
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



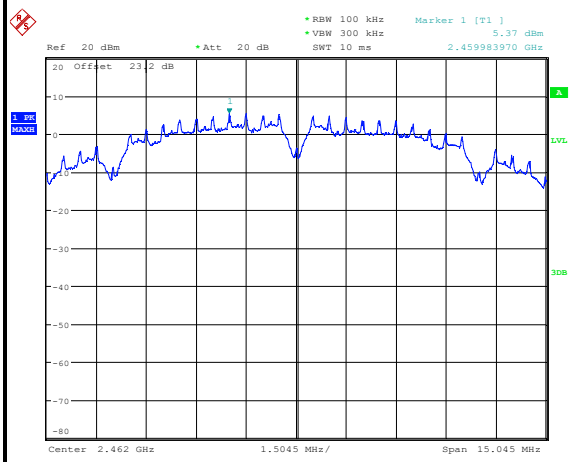
Spurious Emission 2GHz~25GHz



Test Mode :	802.11b	**Temperature :**	24~26℃
Test Band :	2.4GHz High	**Relative Humidity :**	45~49%
Test Channel :	11	**Test Engineer :**	AC Chang

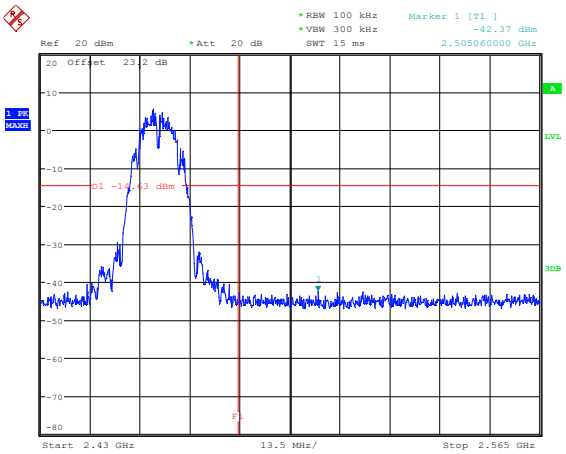
WLAN 802.11b Channel 11

100kHz PSD reference Level



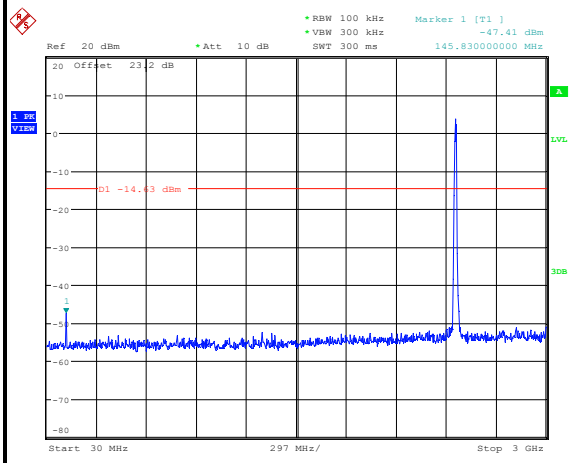
Date: 2.AUG.2016 22:54:18

High Channel Plot



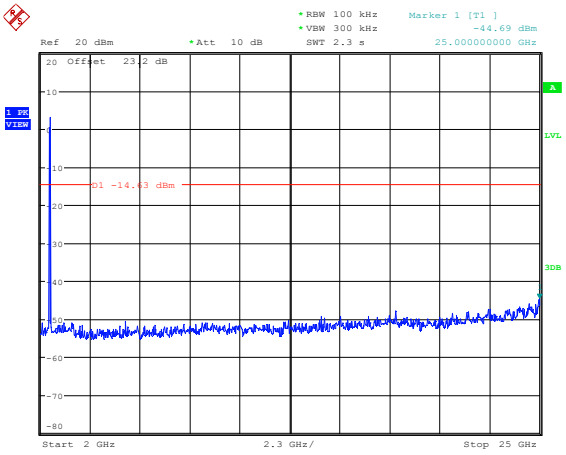
Date: 2.AUG.2016 22:54:26

Spurious Emission 30MHz~3GHz



Date: 2.AUG.2016 22:54:40

Spurious Emission 2GHz~25GHz

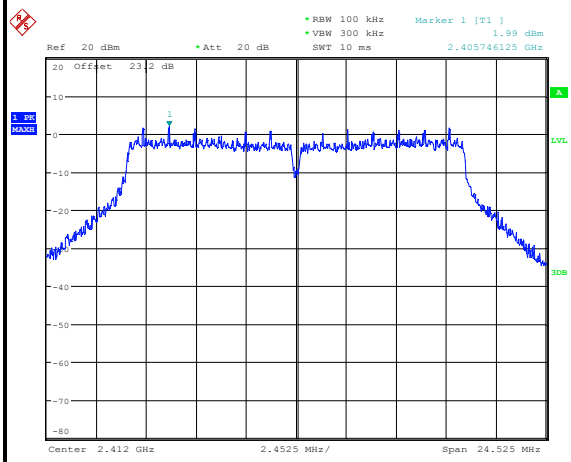


Date: 2.AUG.2016 22:54:48

Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	45~49%
Test Channel :	01	Test Engineer :	AC Chang

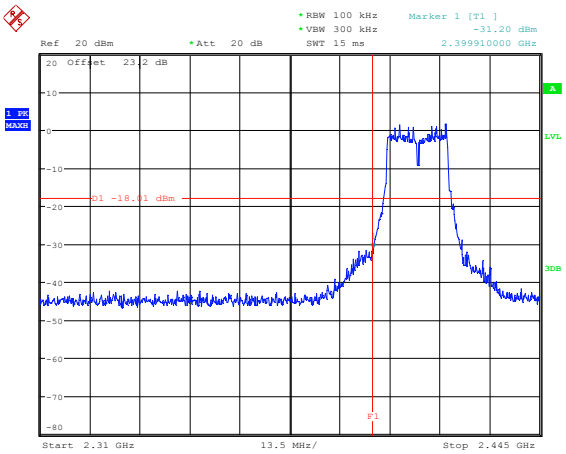
WLAN 802.11g Channel 01

100kHz PSD reference Level



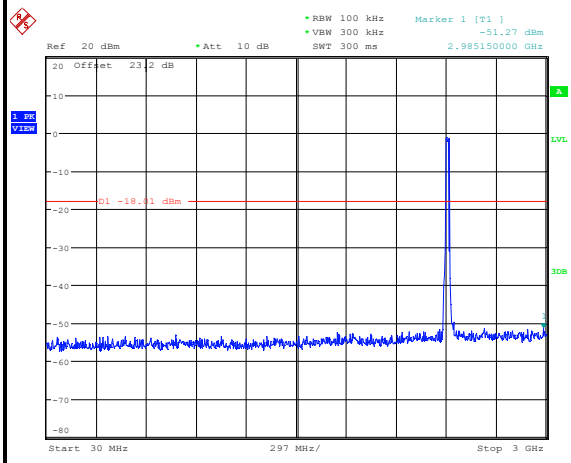
Date: 2.AUG.2016 22:59:22

Low Channel Plot



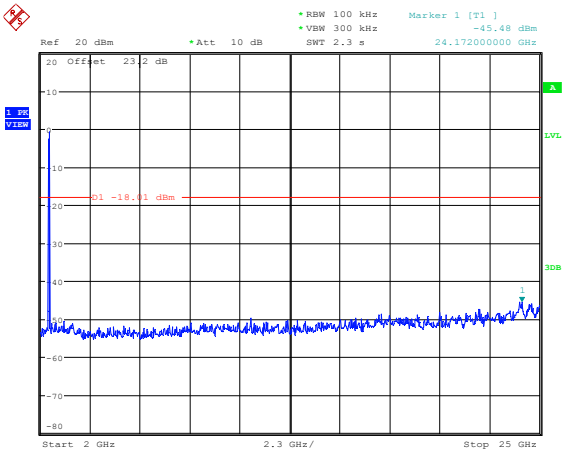
Date: 2.AUG.2016 22:59:33

Spurious Emission 30MHz~3GHz



Date: 2.AUG.2016 23:00:37

Spurious Emission 2GHz~25GHz

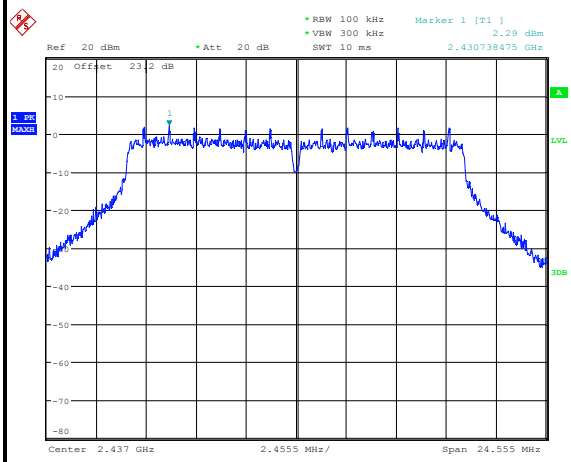


Date: 2.AUG.2016 23:00:45

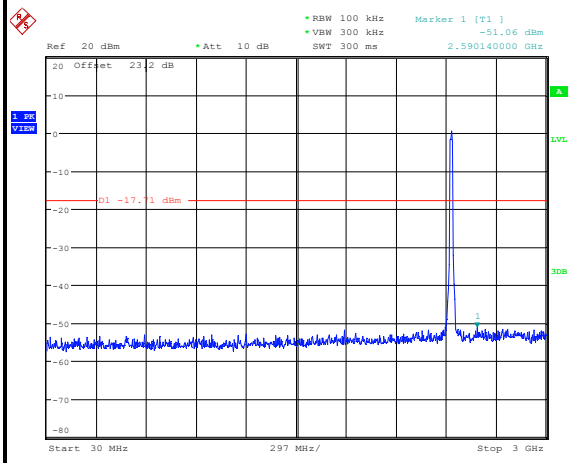
Test Mode :	802.11g	**Temperature :**	24~26℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	45~49%
Test Channel :	06	**Test Engineer :**	AC Chang

WLAN 802.11g Channel 06

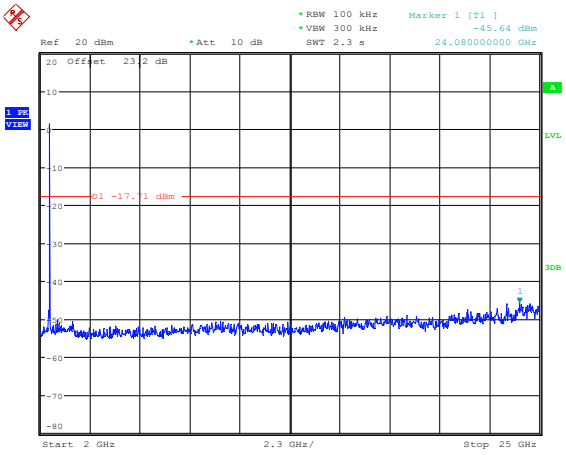
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



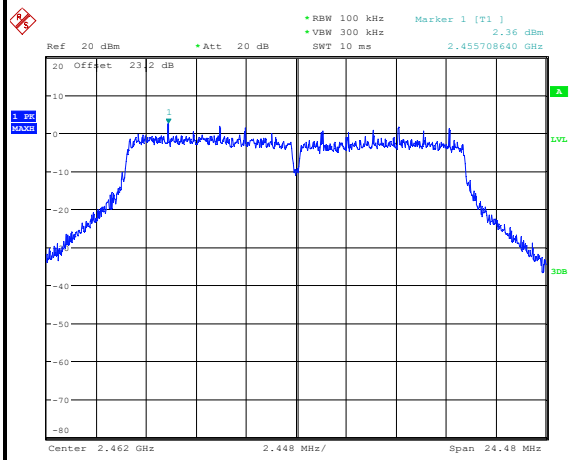
Spurious Emission 2GHz~25GHz



Test Mode :	802.11g	**Temperature :**	24~26℃
Test Band :	2.4GHz High	**Relative Humidity :**	45~49%
Test Channel :	11	**Test Engineer :**	AC Chang

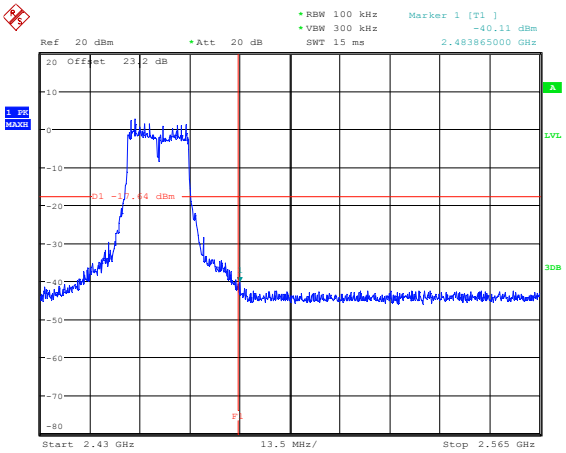
WLAN 802.11g Channel 11

100kHz PSD reference Level



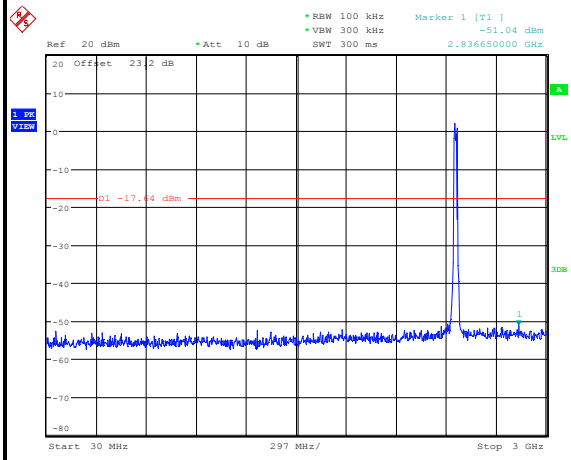
Date: 2.AUG.2016 23:09:56

High Channel Plot



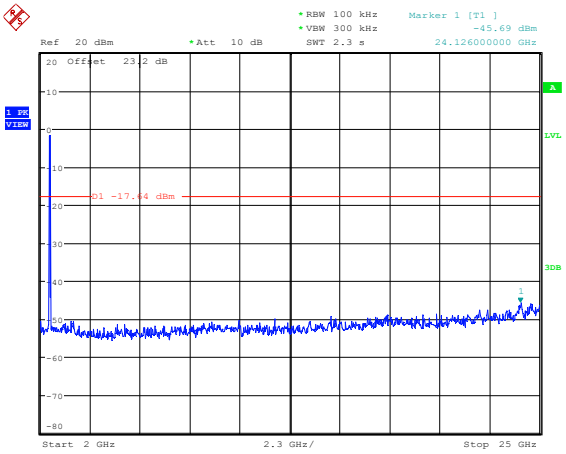
Date: 2.AUG.2016 23:10:11

Spurious Emission 30MHz~3GHz



Date: 2.AUG.2016 23:11:14

Spurious Emission 2GHz~25GHz

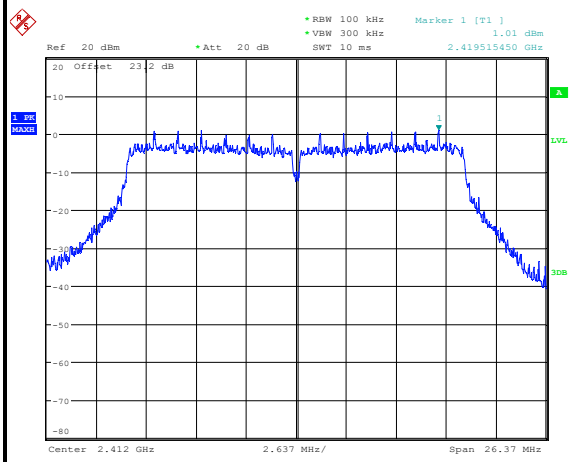


Date: 2.AUG.2016 23:11:22

Test Mode :	802.11n HT20	**Temperature :**	24~26℃
Test Band :	2.4GHz Low	**Relative Humidity :**	45~49%
Test Channel :	01	**Test Engineer :**	AC Chang

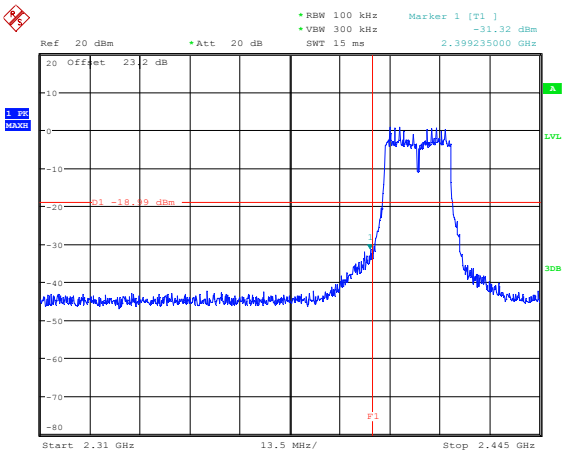
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



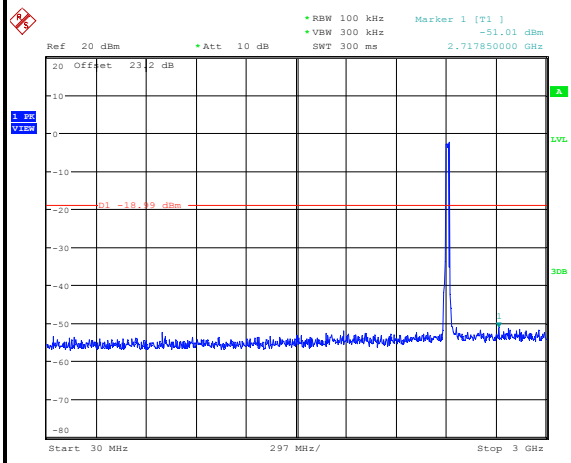
Date: 2.AUG.2016 23:17:25

Low Channel Plot



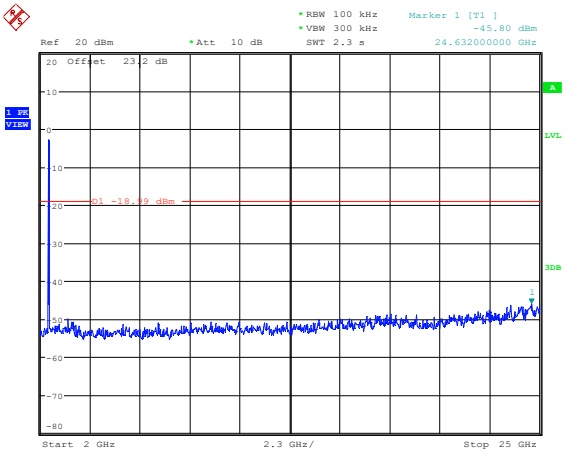
Date: 2.AUG.2016 23:17:35

Spurious Emission 30MHz~3GHz



Date: 2.AUG.2016 23:18:05

Spurious Emission 2GHz~25GHz

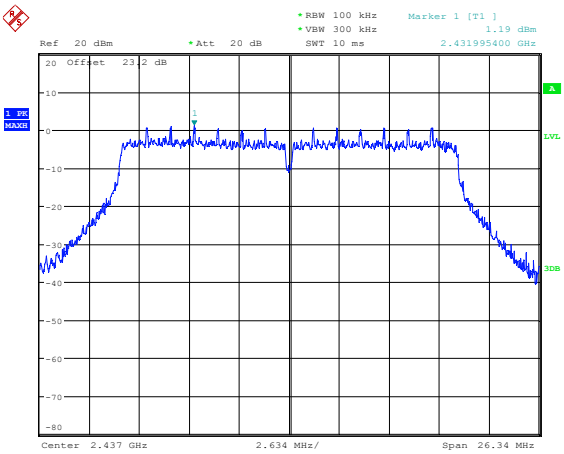


Date: 2.AUG.2016 23:18:13

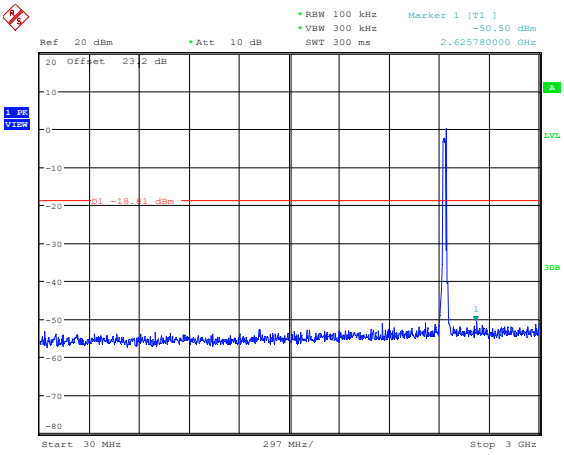
Test Mode :	802.11n HT20	**Temperature :**	24~26℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	45~49%
Test Channel :	06	**Test Engineer :**	AC Chang

WLAN 802.11n HT20 Channel 06

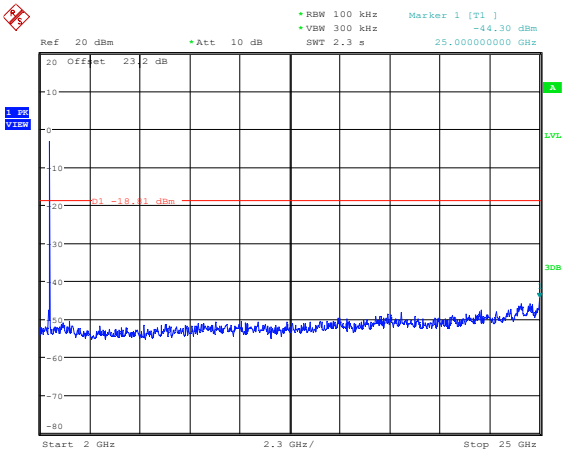
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



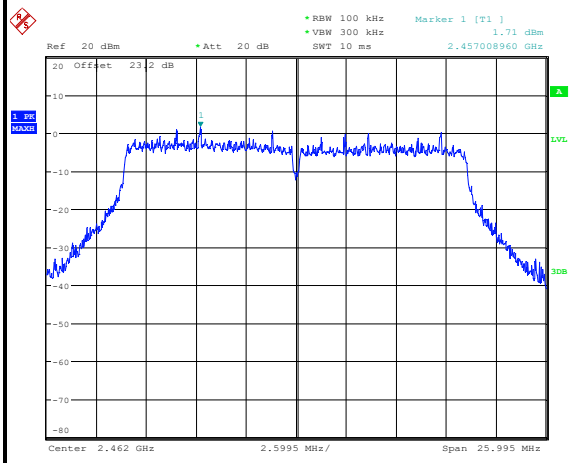
Spurious Emission 2GHz~25GHz



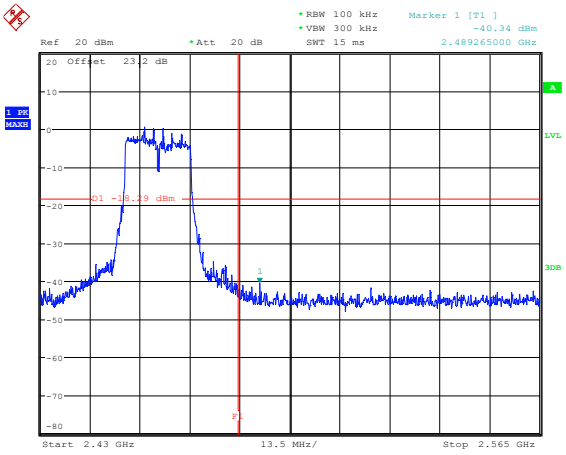
Test Mode :	802.11n HT20	**Temperature :**	24~26℃
Test Band :	2.4GHz High	**Relative Humidity :**	45~49%
Test Channel :	11	**Test Engineer :**	AC Chang

WLAN 802.11n HT20 Channel 11

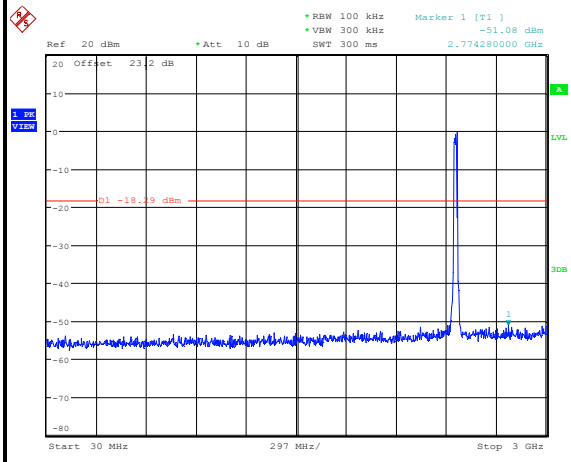
100kHz PSD reference Level



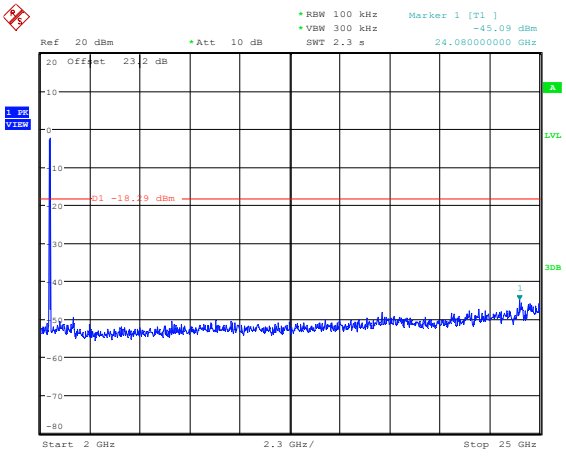
High Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz



3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 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

3.5.2 Measuring Instruments

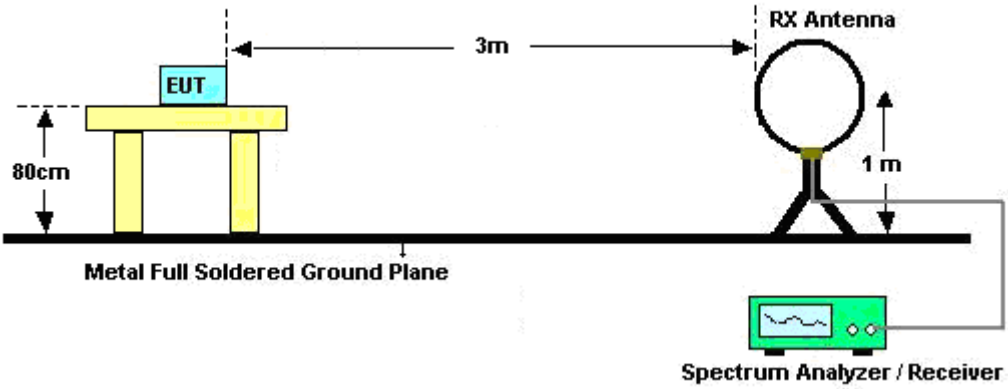
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

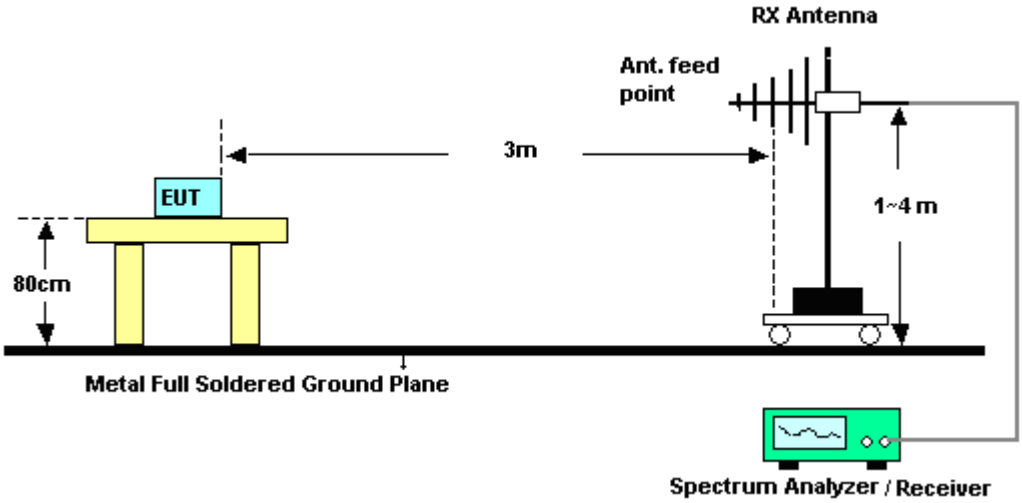
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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.

3.5.4 Test Setup

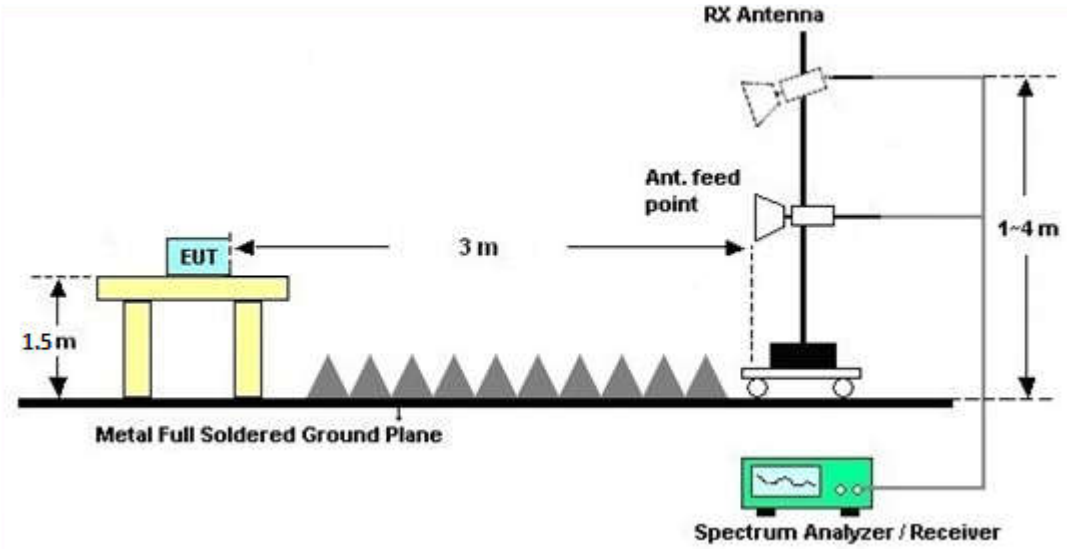
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious 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.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.

3.6 AC Conducted Emission Measurement

3.6.1 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.

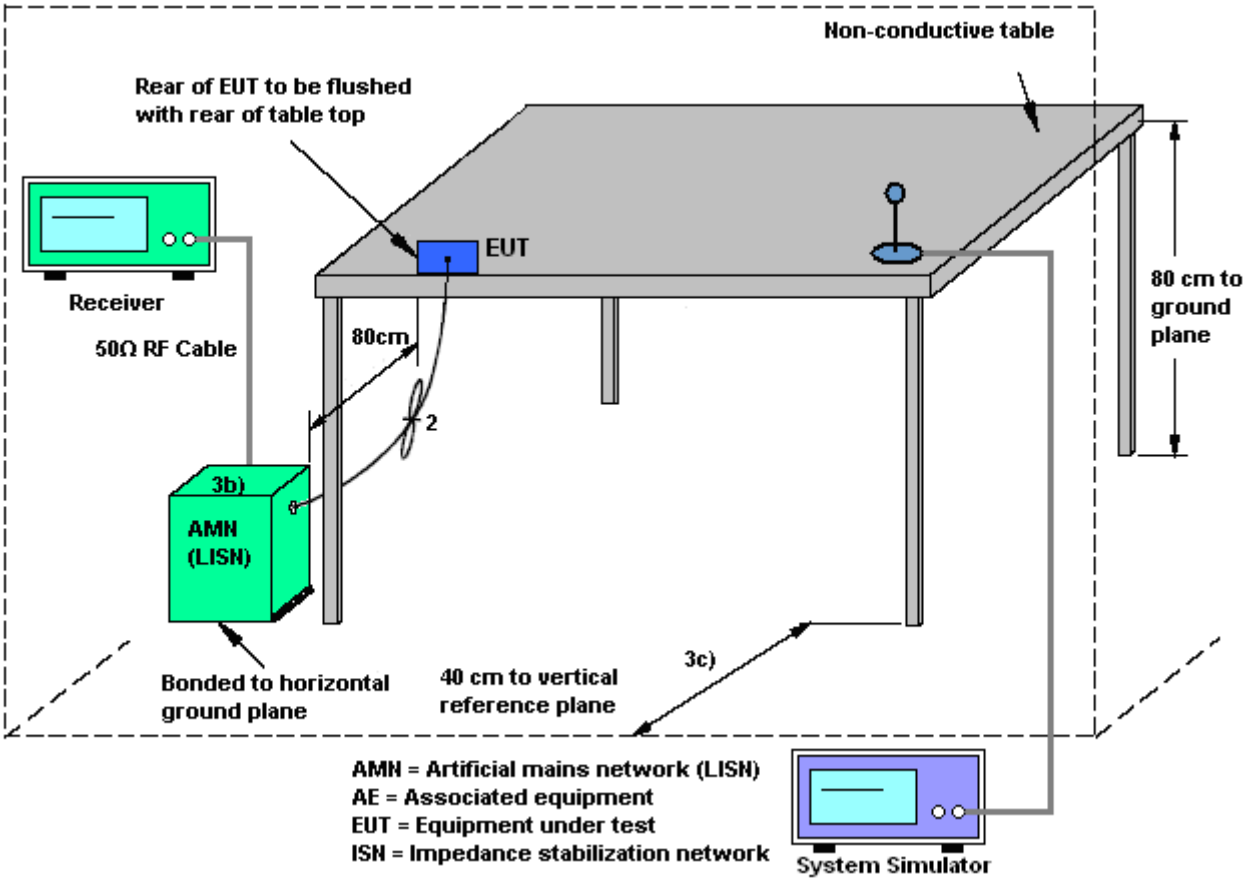
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

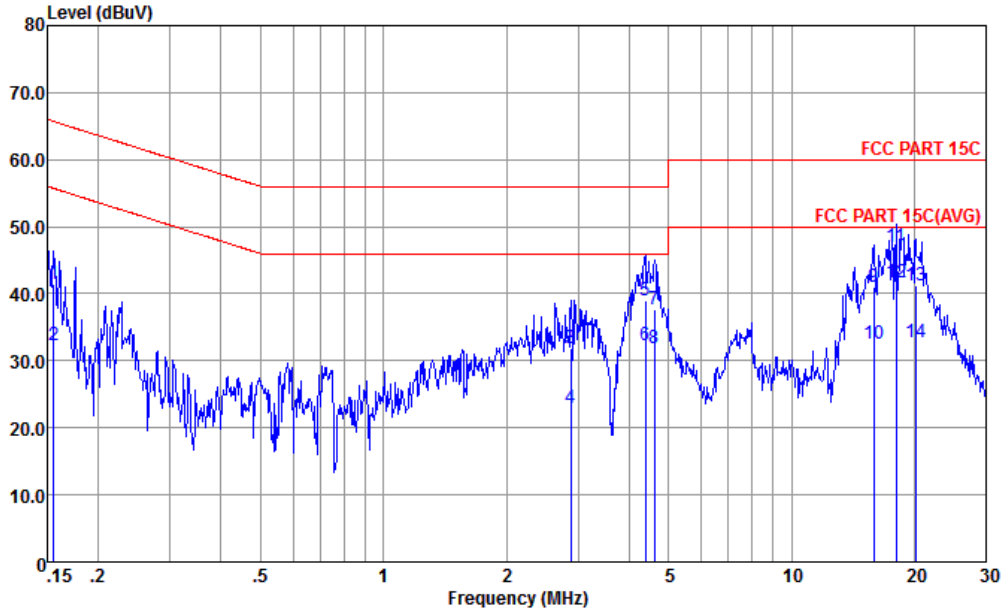
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Amos Zhang	**Relative Humidity :**	44~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM 850 Idle + Bluetooth Link + WLAN Link + USB Cable 2 (Charging from Adapter 2) + Earphone 2 for Sample 1		

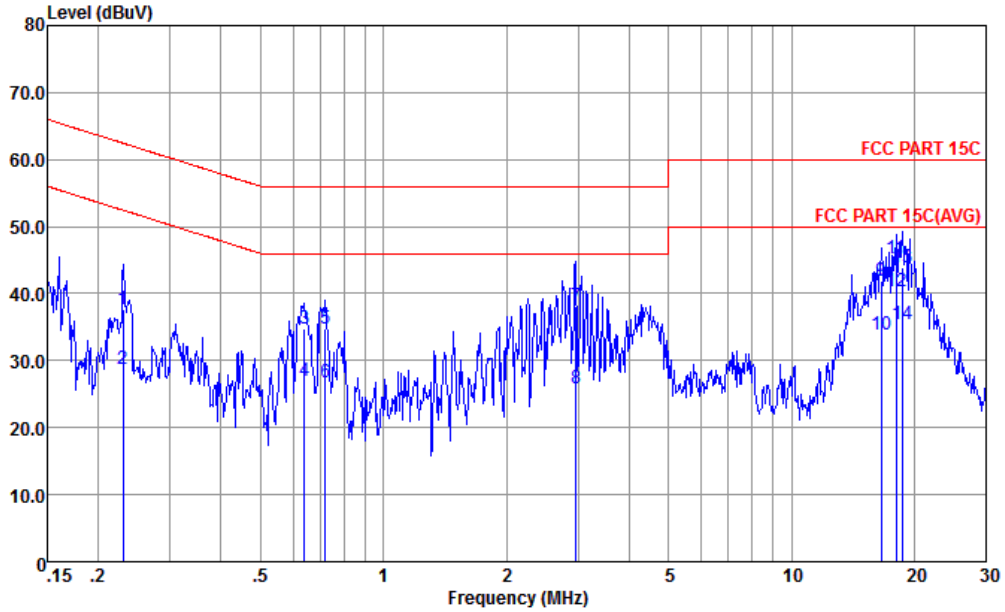


Site : CO01-KS
Condition : FCC PART 15C LISN-L-20151024 LINE

mode : Mode 2
: 861576030039298/861576030039306 #15

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.16	41.50	-24.19	65.69	30.90	0.49	10.11	QP
2		0.16	32.20	-23.49	55.69	21.60	0.49	10.11	Average
3		2.88	31.94	-24.06	56.00	21.61	0.18	10.15	QP
4		2.88	22.94	-23.06	46.00	12.61	0.18	10.15	Average
5		4.38	38.96	-17.04	56.00	28.60	0.19	10.17	QP
6		4.38	32.26	-13.74	46.00	21.90	0.19	10.17	Average
7		4.62	37.67	-18.33	56.00	27.30	0.19	10.18	QP
8		4.62	31.87	-14.13	46.00	21.50	0.19	10.18	Average
9		15.89	40.97	-19.03	60.00	30.30	0.26	10.41	QP
10		15.89	32.47	-17.53	50.00	21.80	0.26	10.41	Average
11		18.04	46.94	-13.06	60.00	36.19	0.27	10.48	QP
12	*	18.04	41.64	-8.36	50.00	30.89	0.27	10.48	Average
13		20.16	41.31	-18.69	60.00	30.50	0.27	10.54	QP
14		20.16	32.71	-17.29	50.00	21.90	0.27	10.54	Average

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Amos Zhang	**Relative Humidity :**	44~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	GSM 850 Idle + Bluetooth Link + WLAN Link + USB Cable 2 (Charging from Adapter 2) + Earphone 2 for Sample 1		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-20151024 NEUTRAL

mode : Mode 2
: 861576030039298/861576030039306 #15

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.23	37.75	-24.69	62.44	27.30	0.31	10.14	QP
2		0.23	28.65	-23.79	52.44	18.20	0.31	10.14	Average
3		0.64	34.79	-21.21	56.00	24.30	0.33	10.16	QP
4		0.64	26.99	-19.01	46.00	16.50	0.33	10.16	Average
5		0.72	34.79	-21.21	56.00	24.30	0.34	10.15	QP
6		0.72	26.69	-19.31	46.00	16.20	0.34	10.15	Average
7		2.96	38.12	-17.88	56.00	27.60	0.37	10.15	QP
8		2.96	25.82	-20.18	46.00	15.30	0.37	10.15	Average
9		16.57	41.90	-18.10	60.00	31.21	0.26	10.43	QP
10		16.57	33.80	-16.20	50.00	23.11	0.26	10.43	Average
11		18.04	45.33	-14.67	60.00	34.59	0.26	10.48	QP
12	*	18.04	40.33	-9.67	50.00	29.59	0.26	10.48	Average
13		18.72	43.95	-16.05	60.00	33.20	0.25	10.50	QP
14		18.72	35.35	-14.65	50.00	24.60	0.25	10.50	Average

3.7 Antenna Requirements

3.7.1 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.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Jul. 28, 2016	Jul. 29, 2016 ~ Aug. 02, 2016	Jul. 27, 2017	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Jul. 28, 2016	Jul. 29, 2016 ~ Aug. 02, 2016	Jul. 27, 2017	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 17, 2016	Jul. 29, 2016 ~ Aug. 02, 2016	Jun. 16, 2017	Conducted (TH02-HY)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	May 07, 2016	Jul. 29, 2016~ Aug. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz	May 07, 2016	Jul. 29, 2016~ Aug. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	Jul. 29, 2016~ Aug. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	May 21, 2016	Jul. 29, 2016~ Aug. 14, 2016	May 20, 2017	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2016	Jul. 29, 2016~ Aug. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug.19, 2015	Jul. 29, 2016~ Aug. 14, 2016	Aug. 18, 2016	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 20, 2015	Jul. 29, 2016~ Aug. 14, 2016	Oct. 19, 2016	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 20, 2015	Jul. 29, 2016~ Aug. 14, 2016	Oct. 19, 2016	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 12, 2016	Jul. 29, 2016~ Aug. 14, 2016	Jan. 11, 2017	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jul. 29, 2016~ Aug. 14, 2016	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jul. 29, 2016~ Aug. 14, 2016	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jul. 29, 2016~ Aug. 14, 2016	NCR	Radiation (03CH03-SZ)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Jul. 16, 2016	Sep. 09, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Jul. 16, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Jul. 16, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Jul. 16, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required

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))	2.3dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB

Appendix A. Conducted Test Results

Report Number : FR662815C

A1 - DTS Part

Test Engineer:	AC Chang	Temperature:	24~26	°C
Test Date:	2016/7/29~2016/8/2	Relative Humidity:	45~49	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	14.55	10.03	0.50	Pass
11b	1Mbps	1	6	2437	14.45	10.03	0.50	Pass
11b	1Mbps	1	11	2462	14.45	10.03	0.50	Pass
11g	6Mbps	1	1	2412	18.50	16.35	0.50	Pass
11g	6Mbps	1	6	2437	18.35	16.37	0.50	Pass
11g	6Mbps	1	11	2462	18.30	16.32	0.50	Pass
HT20	MCS0	1	1	2412	19.25	17.58	0.50	Pass
HT20	MCS0	1	6	2437	19.20	17.56	0.50	Pass
HT20	MCS0	1	11	2462	19.10	17.33	0.50	Pass

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	16.49	30.00	1.20	17.69	36.00	Pass
11b	1Mbps	1	6	2437	16.60	30.00	1.20	17.80	36.00	Pass
11b	1Mbps	1	11	2462	16.58	30.00	1.20	17.78	36.00	Pass
11g	6Mbps	1	1	2412	22.48	30.00	1.20	23.68	36.00	Pass
11g	6Mbps	1	6	2437	21.99	30.00	1.20	23.19	36.00	Pass
11g	6Mbps	1	11	2462	22.09	30.00	1.20	23.29	36.00	Pass
HT20	MCS0	1	1	2412	21.57	30.00	1.20	22.77	36.00	Pass
HT20	MCS0	1	6	2437	21.23	30.00	1.20	22.43	36.00	Pass
HT20	MCS0	1	11	2462	21.06	30.00	1.20	22.26	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.10	14.08
11b	1Mbps	1	6	2437	0.10	14.25
11b	1Mbps	1	11	2462	0.10	14.05
11g	6Mbps	1	1	2412	0.65	13.49
11g	6Mbps	1	6	2437	0.65	13.48
11g	6Mbps	1	11	2462	0.65	13.45
HT20	MCS0	1	1	2412	0.63	12.48
HT20	MCS0	1	6	2437	0.63	12.43
HT20	MCS0	1	11	2462	0.63	12.45

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-8.64	1.20	8.00	Pass
11b	1Mbps	1	6	2437	-7.86	1.20	8.00	Pass
11b	1Mbps	1	11	2462	-7.80	1.20	8.00	Pass
11g	6Mbps	1	1	2412	-11.87	1.20	8.00	Pass
11g	6Mbps	1	6	2437	-11.86	1.20	8.00	Pass
11g	6Mbps	1	11	2462	-12.05	1.20	8.00	Pass
HT20	MCS0	1	1	2412	-12.97	1.20	8.00	Pass
HT20	MCS0	1	6	2437	-13.26	1.20	8.00	Pass
HT20	MCS0	1	11	2462	-12.11	1.20	8.00	Pass

Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		2356.935	48.66	-25.34	74	51.67	27.22	4.82	35.05	150	214	P	H
		2388.33	38.03	-15.97	54	40.9	27.29	4.86	35.02	150	214	A	H
	*	2412	95.02	-	-	97.81	27.33	4.88	35	150	214	P	H
	*	2412	90.2	-	-	92.99	27.33	4.88	35	150	214	A	H
		2345.49	48.42	-25.58	74	51.46	27.19	4.82	35.05	236	68	P	V
		2389.905	38.03	-15.97	54	40.88	27.29	4.86	35	236	68	A	V
	*	2412	91.6	-	-	94.39	27.33	4.88	35	236	68	P	V
	*	2412	89.09	-	-	91.88	27.33	4.88	35	236	68	A	V
802.11b CH 06 2437MHz		2381.54	49.4	-24.6	74	52.3	27.26	4.86	35.02	150	215	P	H
		2387.98	39.46	-14.54	54	42.33	27.29	4.86	35.02	150	215	A	H
	*	2437	96.33	-	-	99.02	27.4	4.88	34.97	150	215	P	H
	*	2437	93.34	-	-	96.03	27.4	4.88	34.97	150	215	A	H
		2488.59	50.71	-23.29	74	53.21	27.5	4.92	34.92	150	215	P	H
		2491.11	40.04	-13.96	54	42.54	27.5	4.92	34.92	150	215	A	H
		2379.3	49.95	-24.05	74	52.85	27.26	4.86	35.02	150	39	P	V
		2389.94	39.51	-14.49	54	42.36	27.29	4.86	35	150	39	A	V
	*	2437	96.11	-	-	98.8	27.4	4.88	34.97	150	39	P	V
	*	2437	93.14	-	-	95.83	27.4	4.88	34.97	150	39	A	V
		2499.23	52.73	-21.27	74	55.21	27.5	4.92	34.9	150	39	P	V
		2496.22	41.72	-12.28	54	44.2	27.5	4.92	34.9	150	39	A	V

802.11b CH 11 2462MHz	*	2462	93.71	-	-	96.33	27.43	4.9	34.95	200	185	P	H
	*	2462	90.45	-	-	93.07	27.43	4.9	34.95	200	185	A	H
		2484.04	51	-23	74	53.55	27.47	4.9	34.92	200	185	P	H
		2483.52	40.14	-13.86	54	42.69	27.47	4.9	34.92	200	185	A	H
	*	2462	93.37	-	-	95.99	27.43	4.9	34.95	180	37	P	V
	*	2462	90.26	-	-	92.88	27.43	4.9	34.95	180	37	A	V
		2499.68	53.09	-20.91	74	55.57	27.5	4.92	34.9	180	37	P	V
		2490.88	41.56	-12.44	54	44.06	27.5	4.92	34.92	180	37	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	40.79	-33.21	74	59.65	32.56	6.97	58.39	150	360	P	H
		4824	41.05	-32.95	74	59.91	32.56	6.97	58.39	150	360	P	V
802.11b CH 06 2437MHz		4874	40	-34	74	59.01	32.66	6.99	58.66	150	360	P	H
		7311	48.86	-25.14	74	60.89	37.66	8.93	58.62	174	100	P	H
		4874	39.58	-34.42	74	58.59	32.66	6.99	58.66	150	360	P	V
		7311	48.24	-25.76	74	60.27	37.66	8.93	58.62	174	100	P	V
802.11b CH 11 2462MHz		4924	41.09	-32.91	74	59.85	32.76	7	58.52	150	347	P	H
		7386	48.57	-25.43	74	60.28	37.68	9.15	58.54	150	274	P	H
		4924	40.29	-33.71	74	59.05	32.76	7	58.52	150	347	P	V
		7386	48.11	-25.89	74	59.82	37.68	9.15	58.54	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2388.54	56.49	-17.51	74	59.36	27.29	4.86	35.02	247	217	P	H
		2389.695	43.47	-10.53	54	46.34	27.29	4.86	35.02	247	217	A	H
	*	2412	96.02	-	-	98.81	27.33	4.88	35	247	217	P	H
	*	2412	89.38	-	-	92.17	27.33	4.88	35	247	217	A	H
		2389.485	53.82	-20.18	74	56.69	27.29	4.86	35.02	188	156	P	V
		2389.905	41.84	-12.16	54	44.69	27.29	4.86	35	188	156	A	V
	*	2412	94.46	-	-	97.25	27.33	4.88	35	188	156	P	V
	*	2412	87.56	-	-	90.35	27.33	4.88	35	188	156	A	V
802.11g CH 06 2437MHz		2380.14	49.28	-24.72	74	52.18	27.26	4.86	35.02	150	212	P	H
		2386.02	38.51	-15.49	54	41.38	27.29	4.86	35.02	150	212	A	H
	*	2437	95.26	-	-	97.95	27.4	4.88	34.97	150	212	P	H
	*	2437	87.99	-	-	90.68	27.4	4.88	34.97	150	212	A	H
		2490.48	48.52	-25.48	74	51.02	27.5	4.92	34.92	150	212	P	H
		2489.64	39.24	-14.76	54	41.74	27.5	4.92	34.92	150	212	A	H
		2362.64	48.02	-25.98	74	51.03	27.22	4.82	35.05	150	39	P	V
		2378.88	38.46	-15.54	54	41.36	27.26	4.86	35.02	150	39	A	V
	*	2437	95.62	-	-	98.31	27.4	4.88	34.97	150	39	P	V
	*	2437	87.88	-	-	90.57	27.4	4.88	34.97	150	39	A	V
		2498.67	51.57	-22.43	74	54.05	27.5	4.92	34.9	150	39	P	V
		2489.36	40.54	-13.46	54	43.04	27.5	4.92	34.92	150	39	A	V

802.11g CH 11 2462MHz	*	2462	93.02	-	-	95.64	27.43	4.9	34.95	250	223	P	H
	*	2462	85.71	-	-	88.33	27.43	4.9	34.95	250	223	A	H
		2483.56	51.73	-22.27	74	54.28	27.47	4.9	34.92	250	223	P	H
		2483.52	40.33	-13.67	54	42.88	27.47	4.9	34.92	250	223	A	H
	*	2462	92.17	-	-	94.79	27.43	4.9	34.95	168	161	P	V
	*	2462	85.64	-	-	88.26	27.43	4.9	34.95	168	161	A	V
		2483.92	50.49	-23.51	74	53.04	27.47	4.9	34.92	168	161	P	V
		2483.52	39.33	-14.67	54	41.88	27.47	4.9	34.92	168	161	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	40.2	-33.8	74	59.06	32.56	6.97	58.39	150	360	P	H
		4824	39.59	-34.41	74	58.45	32.56	6.97	58.39	150	360	P	V
802.11g CH 06 2437MHz		4874	40.04	-33.96	74	59.05	32.66	6.99	58.66	150	360	P	H
		7311	48.7	-25.3	74	60.73	37.66	8.93	58.62	174	100	P	H
		4874	41.04	-32.96	74	60.05	32.66	6.99	58.66	150	360	P	V
		7311	48.14	-25.86	74	60.17	37.66	8.93	58.62	174	100	P	V
802.11g CH 11 2462MHz		4924	40.81	-33.19	74	59.57	32.76	7	58.52	150	347	P	H
		7386	48.67	-25.33	74	60.38	37.68	9.15	58.54	150	274	P	H
		4924	40.72	-33.28	74	59.48	32.76	7	58.52	150	347	P	V
		7386	48.64	-25.36	74	60.35	37.68	9.15	58.54	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2389.17	54.82	-19.18	74	57.69	27.29	4.86	35.02	150	215	P	H
		2389.8	42.79	-11.21	54	45.64	27.29	4.86	35	150	215	A	H
	*	2412	94.5	-	-	97.29	27.33	4.88	35	150	215	P	H
	*	2412	87.99	-	-	90.78	27.33	4.88	35	150	215	A	H
		2389.59	52.7	-21.3	74	55.57	27.29	4.86	35.02	244	72	P	V
		2389.8	42	-12	54	44.85	27.29	4.86	35	244	72	A	V
	*	2412	92.77	-	-	95.56	27.33	4.88	35	244	72	P	V
	*	2412	86.34	-	-	89.13	27.33	4.88	35	244	72	A	V
802.11n HT20 CH 06 2437MHz		2358.3	48.9	-25.1	74	51.91	27.22	4.82	35.05	150	216	P	H
		2384.76	38.63	-15.37	54	41.53	27.26	4.86	35.02	150	216	A	H
	*	2437	95.65	-	-	98.34	27.4	4.88	34.97	150	216	P	H
	*	2437	86.86	-	-	89.55	27.4	4.88	34.97	150	216	A	H
		2497.69	48.56	-25.44	74	51.04	27.5	4.92	34.9	150	216	P	H
		2488.66	39.43	-14.57	54	41.93	27.5	4.92	34.92	150	216	A	H
		2318.26	49.47	-24.53	74	52.59	27.16	4.79	35.07	231	103	P	V
		2385.32	38.68	-15.32	54	41.58	27.26	4.86	35.02	231	103	A	V
	*	2437	94.03	-	-	96.72	27.4	4.88	34.97	231	103	P	V
	*	2437	85.66	-	-	88.35	27.4	4.88	34.97	231	103	A	V
		2492.23	50.18	-23.82	74	52.66	27.5	4.92	34.9	231	103	P	V
		2489.29	39.65	-14.35	54	42.15	27.5	4.92	34.92	231	103	A	V

802.11n HT20 CH 11 2462MHz	*	2462	91.93	-	-	94.55	27.43	4.9	34.95	223	218	P	H
	*	2462	85.47	-	-	88.09	27.43	4.9	34.95	223	218	A	H
		2485.92	51.25	-22.75	74	53.8	27.47	4.9	34.92	223	218	P	H
		2483.6	39.64	-14.36	54	42.19	27.47	4.9	34.92	223	218	A	H
	*	2462	90.16	-	-	92.78	27.43	4.9	34.95	214	163	P	V
	*	2462	83.77	-	-	86.39	27.43	4.9	34.95	214	163	A	V
		2493.24	49.9	-24.1	74	52.38	27.5	4.92	34.9	214	163	P	V
		2492.8	38.94	-15.06	54	41.42	27.5	4.92	34.9	214	163	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	40.25	-33.75	74	59.11	32.56	6.97	58.39	150	360	P	H
		4824	40.59	-33.41	74	59.45	32.56	6.97	58.39	150	360	P	V
802.11n HT20 CH 06 2437MHz		4874	39.67	-34.33	74	58.68	32.66	6.99	58.66	150	360	P	H
		7311	49.09	-24.91	74	61.12	37.66	8.93	58.62	174	100	P	H
		4874	41	-33	74	60.01	32.66	6.99	58.66	150	360	P	V
		7311	49.03	-24.97	74	61.06	37.66	8.93	58.62	174	100	P	V
802.11n HT20 CH 11 2462MHz		4924	41.29	-32.71	74	60.05	32.76	7	58.52	150	347	P	H
		7386	49.11	-24.89	74	60.82	37.68	9.15	58.54	150	274	P	H
		4924	41.18	-32.82	74	59.94	32.76	7	58.52	150	347	P	V
		7386	48.31	-25.69	74	60.02	37.68	9.15	58.54	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz 802.11g LF		32.91	26.9	-13.1	40	32.24	25.44	1	31.78	100	0	P	H
		235.64	27.58	-18.42	46	39.75	17.31	1.8	31.28	-	-	P	H
		318.09	30.46	-15.54	46	40.25	19.58	1.94	31.31	-	-	P	H
		407.33	27.81	-18.19	46	31.09	25.83	2.12	31.23	-	-	P	H
		901.06	32.16	-13.84	46	31.83	28.52	3.09	31.28	-	-	P	H
		973.81	32.42	-21.58	54	30.63	29.88	3.18	31.27	-	-	P	H
		34.85	30.3	-9.7	40	36.48	24.6	1	31.78	100	0	P	V
		321	25.85	-20.15	46	35.57	19.65	1.94	31.31	-	-	P	V
		425.76	27.98	-18.02	46	31.55	25.43	2.22	31.22	-	-	P	V
		715.79	30.09	-15.91	46	30.99	27.57	2.75	31.22	-	-	P	V
		882.63	32.55	-13.45	46	32.43	28.36	3.03	31.27	-	-	P	V
		988.36	32.95	-21.05	54	30.86	30.17	3.18	31.26	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

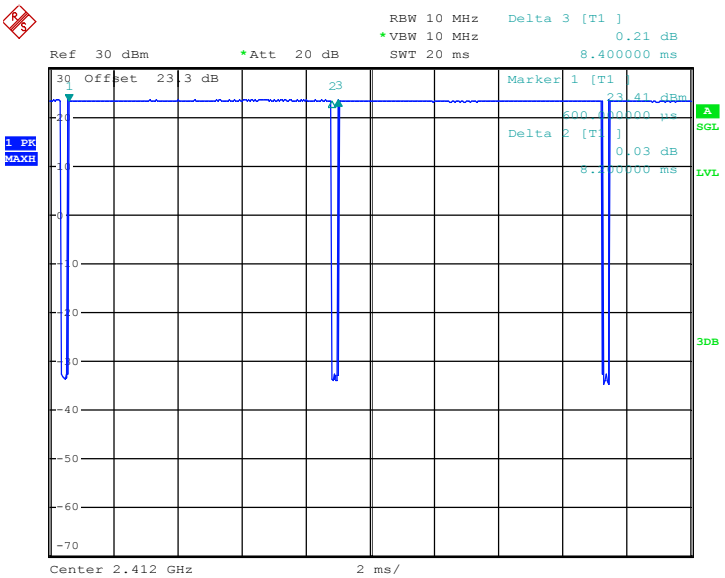
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Duty Cycle Plots

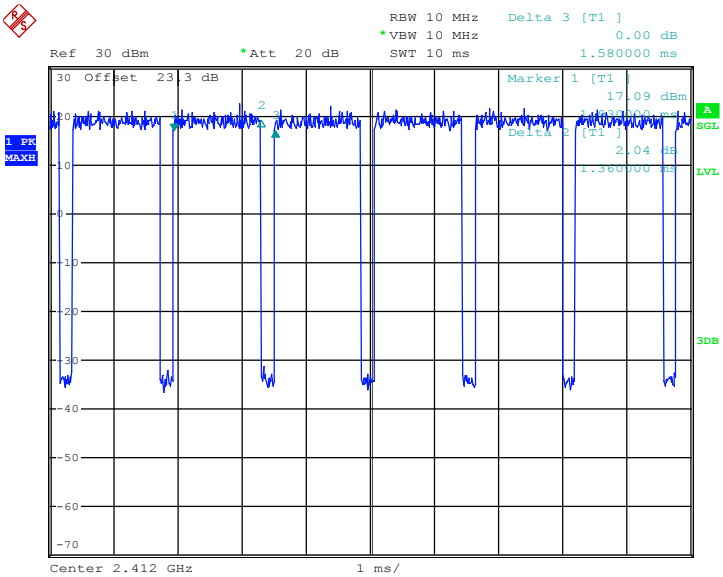
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.62	8.20	0.12	300Hz
802.11g	86.08	1.36	0.74	1kHz
2.4GHz 802.11n HT20	86.49	1.28	0.78	1kHz

802.11b



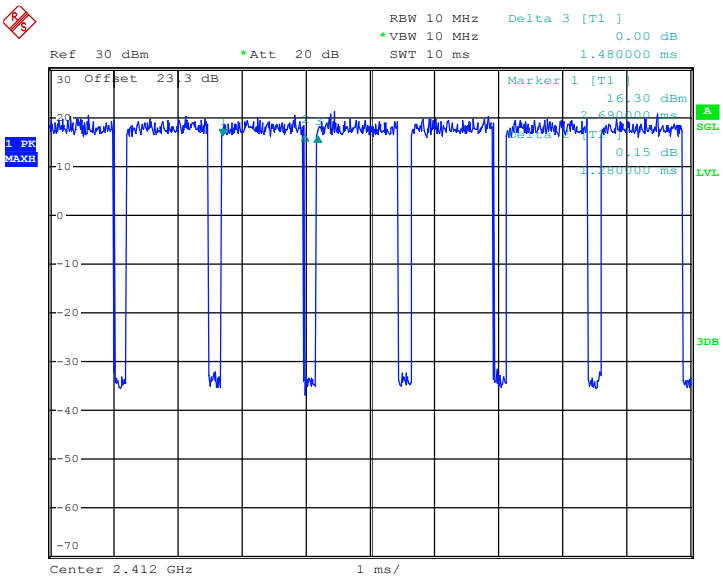
Date: 29.JUL.2016 20:31:30

802.11g



Date: 29.JUL.2016 20:35:07

2.4GHz 802.11n HT20



Date: 29.JUL.2016 20:38:19