FCC RF Test Report

APPLICANT	:	Lenovo(Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	:	Portable Tablet Computer
BRAND NAME	:	Lenovo
MODEL NAME	:	701LV, 702LV
FCC ID	:	O57TAB4LV
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Aug. 22, 2017 and testing was completed on Oct. 19, 2017. 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

Approved by: James Huang / Manager

NVLAP®
TESTING
NVLAP LAB CODE 600155-0

Sporton International (Kunshan) Inc.
No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR782206C	Rev. 01	Initial issue of report	Nov. 07, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	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 8.49 dB at 2483.560 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 7.26 dB at 0.173 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lenovo(Shanghai) Electronics Technology Co., Ltd.
NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	Lenovo
Model Name	701LV, 702LV
FCC ID	O57TAB4LV
EUT supports Radios application	LTE WLAN2.4GHz 802.11b/g/n HT20/HT40 WLAN5GHz 802.11a/n HT20/HT40 WLAN5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0+EDR/Bluetooth v4.0 LE/ Bluetooth v4.1 LE/Bluetooth v4.2 LE
IMEI Code	Conducted: 866423030007253 Radiation: 866423030007717 Conduction: 866423030007907
HW Version	LenovoPad 701LV
SW Version	TB-701LV_RF02_20170831
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 18.73 dBm (0.0746 W) 802.11g : 24.06 dBm (0.2547 W) 802.11n HT20 : 23.51 dBm (0.2244 W) 802.11n HT40 : 24.15 dBm (0.2600 W)
99% Occupied Bandwidth	802.11b : 13.44MHz 802.11g : 18.63MHz 802.11n HT20 : 19.28MHz 802.11n HT40 : 36.86MHz
Antenna Type / Gain	IFA Antenna with gain 0.55 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

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 National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

Test Site	Sporton International (Kunshan) Inc.			
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL: +86-512-57900158 FAX: +86-512-57900958			
Test Site No.	**Sporton Site No.**			**FCC Test Firm Registration No.**
	TH01-KS	03CH03-KS	CO01-KS	630927

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

1.7 Specification of Accessory

Specification of Accessory				
Battery 1	**Brand Name**	Lenovo(SCUD)	**Model Name**	L16D2P31
	Power Rating	3.85 Vdc, 7000 mAh	**Type**	Li-ion
Battery 2	**Brand Name**	Lenovo (Celxpert)	**Model Name**	L16D2P31
	Power Rating	3.85 Vdc, 7000 mAh	**Type**	Li-ion

1.8 Component List

Note: There are two types of EUT, the details refer the following table. According to the difference, we choose the sample 1 to full test.

Component	Sample 1		Sample 2	
CPU	MSM-8953-2-857NSP-TR-01-1-AB	Qualcomm	MSM-8953-2-857NSP-TR-01-1-AB	Qualcomm
Flash	KMQE10013M-B318013	Samsung	H9TQ17ABJTBCUR-KUM(A05)	Hynix
LCD	P101KDA-AF0	INX	TV101WUM-NL1	BOE
TP	MTF-101-2856IKA	O-flim	TC101GFL16V.A	GIS
Front Camera	V10835V0	C&T	B02SF0105	Broad
Rear Camera	FX219BH	QTECH	L8856A10	O-film
Battery	L16D2P31	SCUD	L16D2P31	celxpert
motor	HZF-Z04BE-RL67B25-90	HONGZHIFA	CY0408L-021HB-064	Kunwang
Speaker 1	XHB171220B08-01-B1F-RH	HAOSHENG	XHB171220B08-01-B1F-RH	HAOSHENG
Speaker 2	XHB171220B08-02-B1F-RH	HAOSHENG	XHB171220B08-02-B1F-RH	HAOSHENG

1.9 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 v04
- 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 three orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

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		

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.

Single Antenna

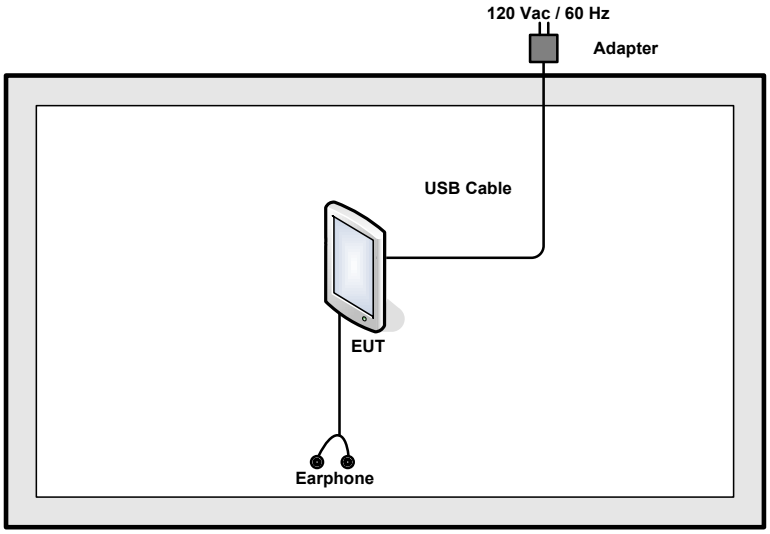
Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : LTE Band 41 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable (Charging from Adapter) + Earphone for Sample 1
Remark: For Radiated TCs, the tests were performed with Adapter, Earphone and USB Cable.	

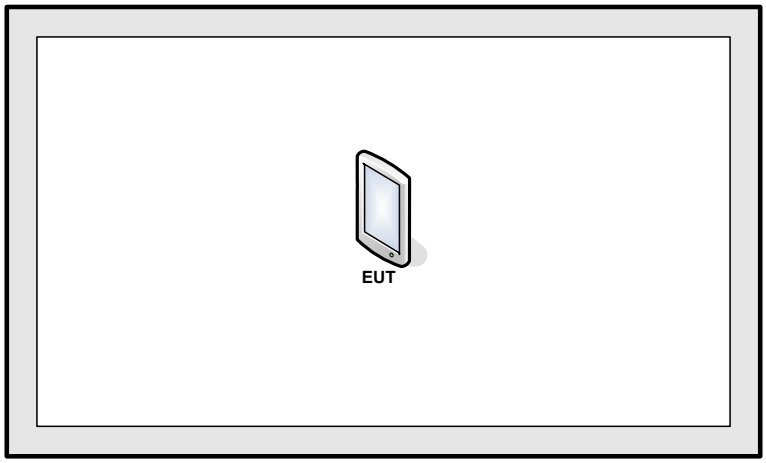
2.3 Connection Diagram of Test System

<WLAN Tx Mode>

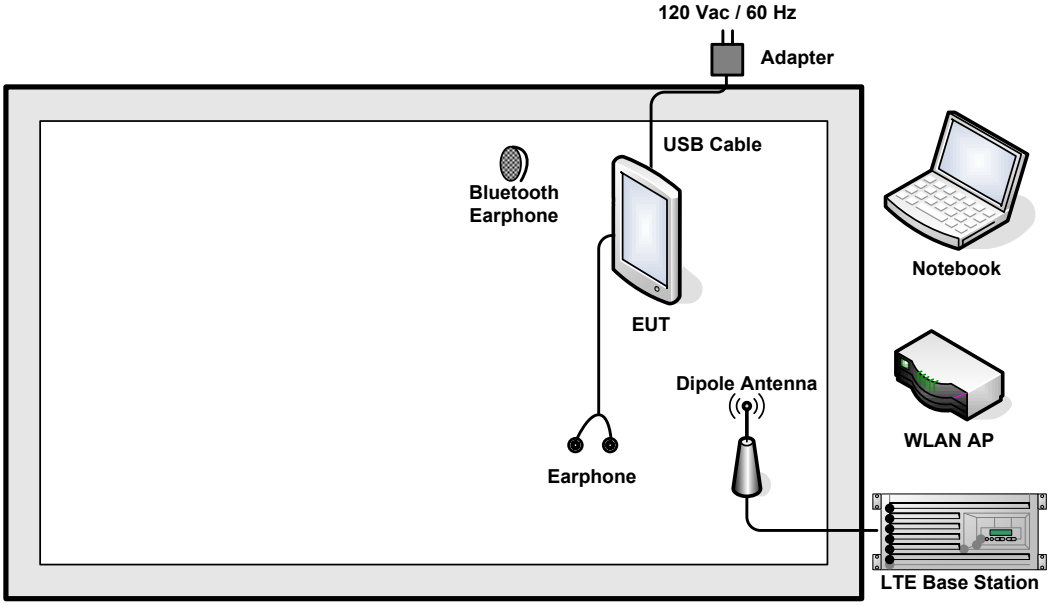
For 802.11b, 802.11g



For 802.11n HT20, 802.11n HT40



<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	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	Shielded cable DC O/P 1.8 m Unshielded AC I/P cable1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	NA	NA	N/A
5.	Earphone	Lenovo	SH100	N/A	Unshielded, 1.2m	N/A
6.	Adapter	Lenovo	C-P35	N/A	N/A	N/A
7.	USB cable	LI QI	N/A	N/A	shielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

For WLAN function, the 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 Notebook 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 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.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5.8dB attenuator.

Offset(dB) = RF cable loss(dB).

= 5.8 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

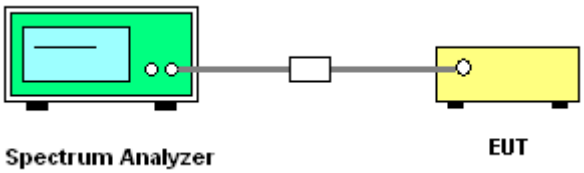
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

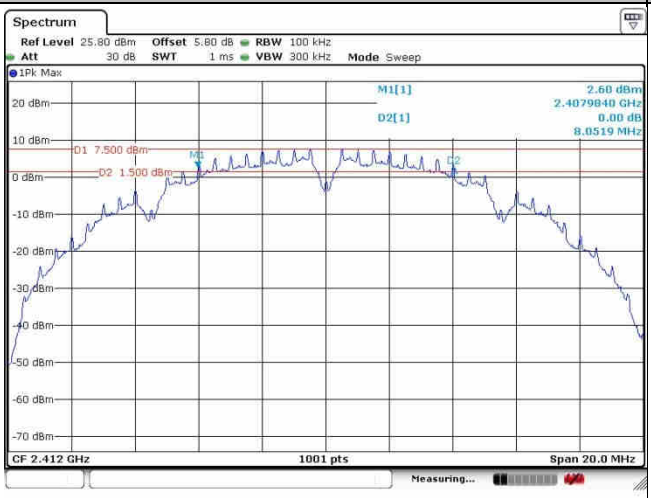
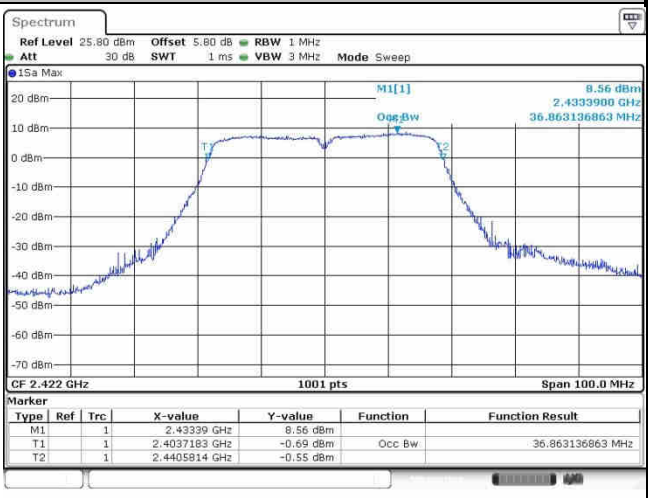
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is 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.

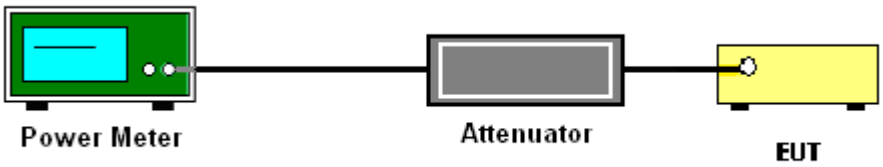
3.2.2 Measuring Instruments

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 v04 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.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

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.

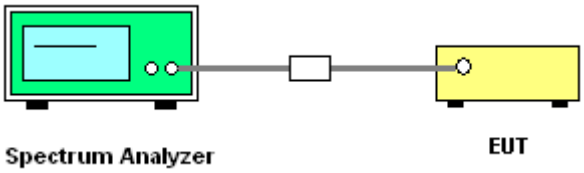
3.3.2 Measuring Instruments

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 v04
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.

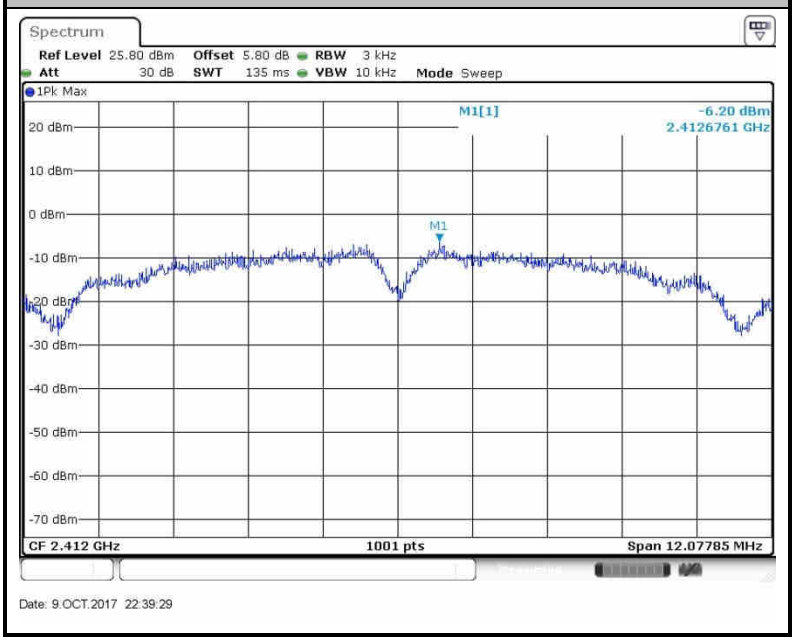
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz)



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.

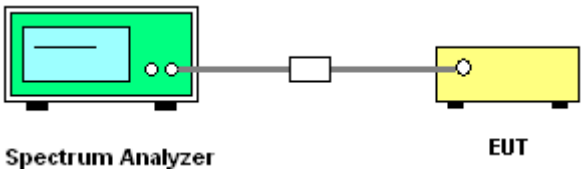
3.4.2 Measuring Instruments

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 v04.
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.
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

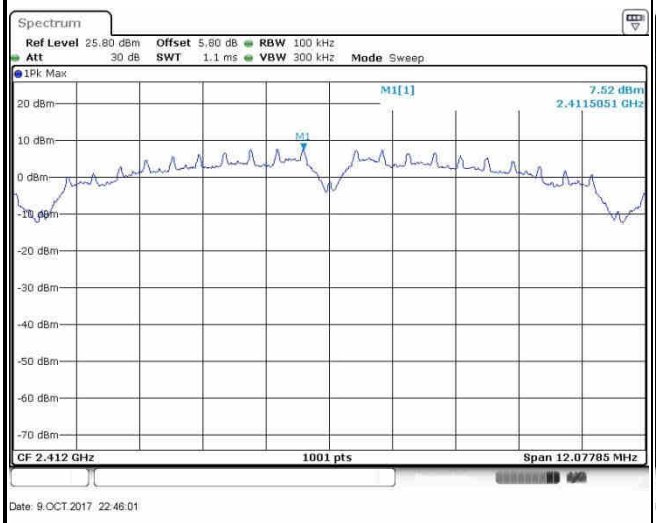


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

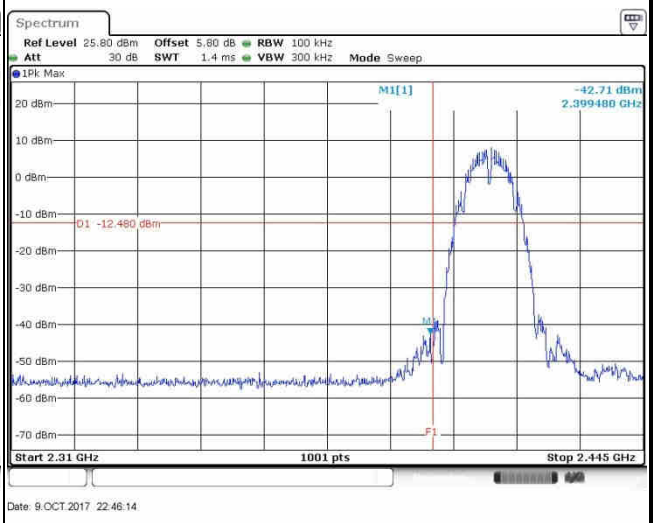
Test Mode :	802.11b	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~55%
Test Channel :	01	**Test Engineer :**	Silent Hai

WLAN 802.11b Channel 01

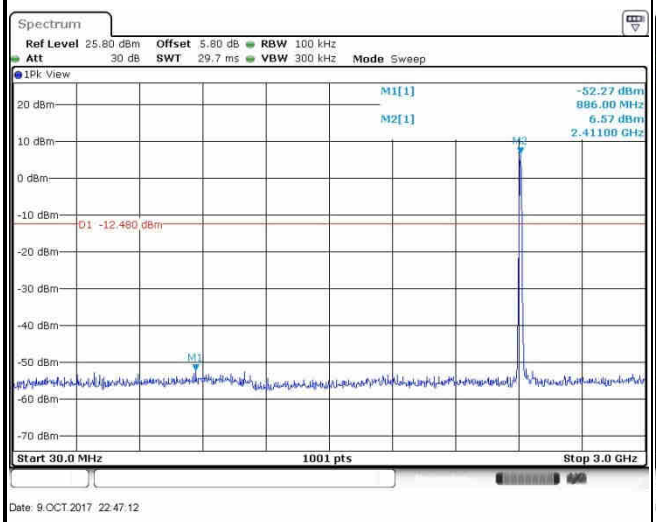
100kHz PSD reference Level



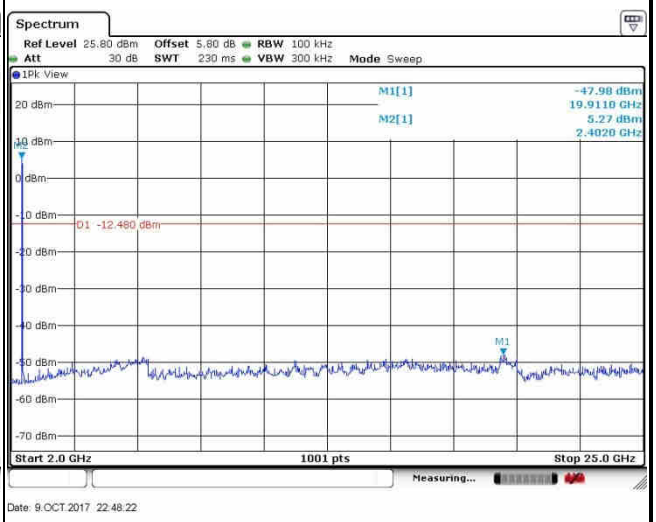
Low Channel Plot



Spurious Emission 30MHz~3GHz



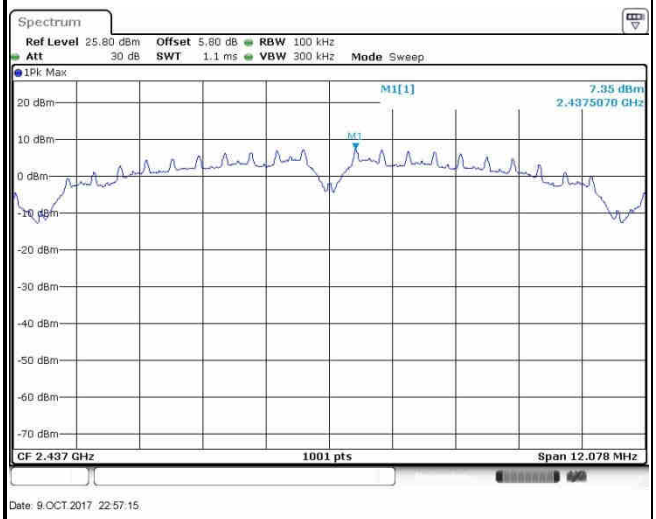
Spurious Emission 2GHz~25GHz



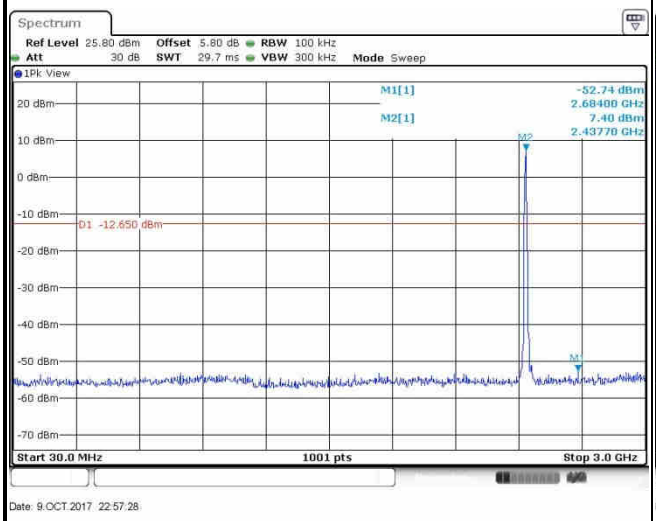
Test Mode :	802.11b	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	51~55%
Test Channel :	06	**Test Engineer :**	Silent Hai

WLAN 802.11b Channel 06

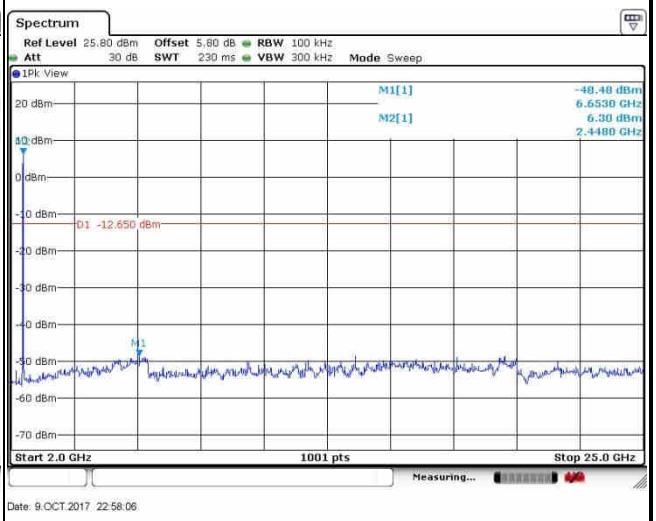
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



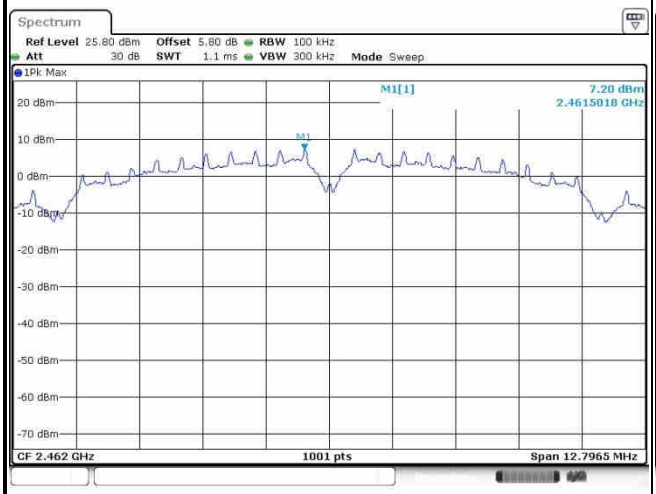
Spurious Emission 2GHz~25GHz



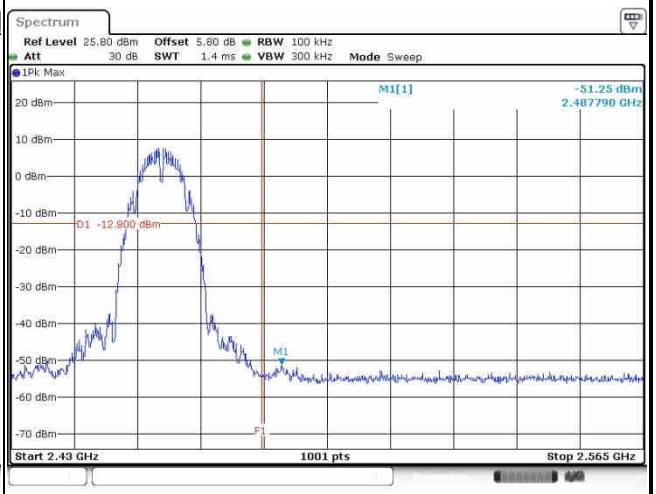
Test Mode :	802.11b	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~55%
Test Channel :	11	**Test Engineer :**	Silent Hai

WLAN 802.11b Channel 11

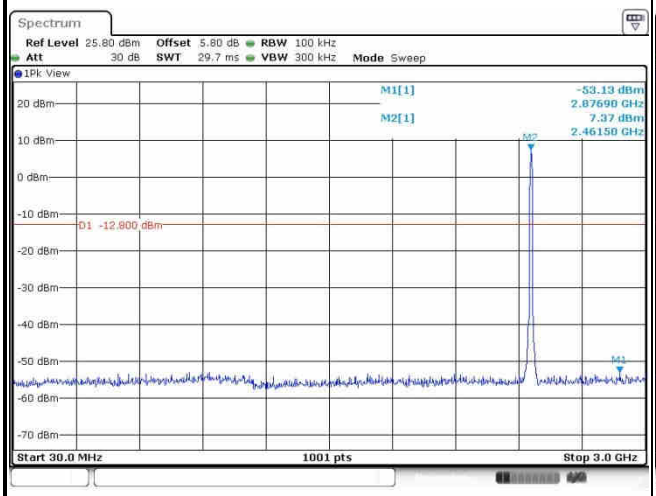
100kHz PSD reference Level



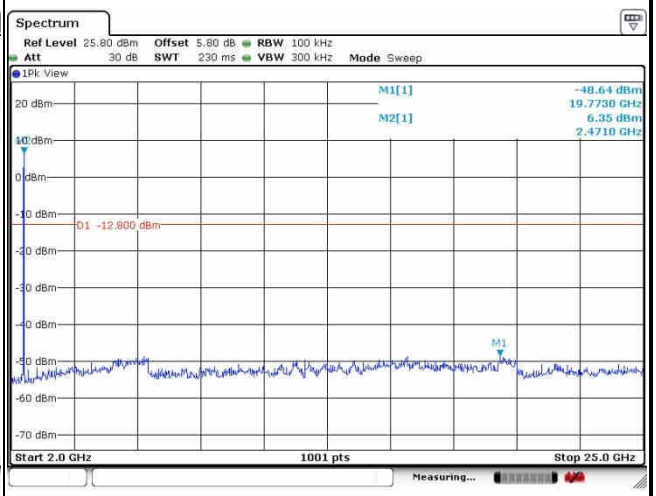
High Channel Plot



Spurious Emission 30MHz~3GHz



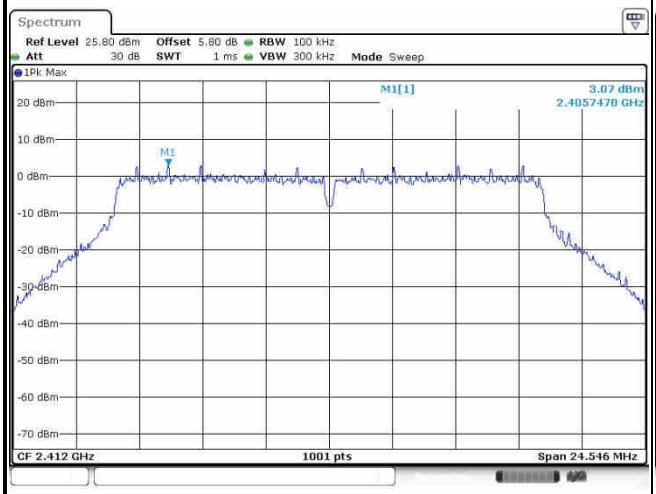
Spurious Emission 2GHz~25GHz



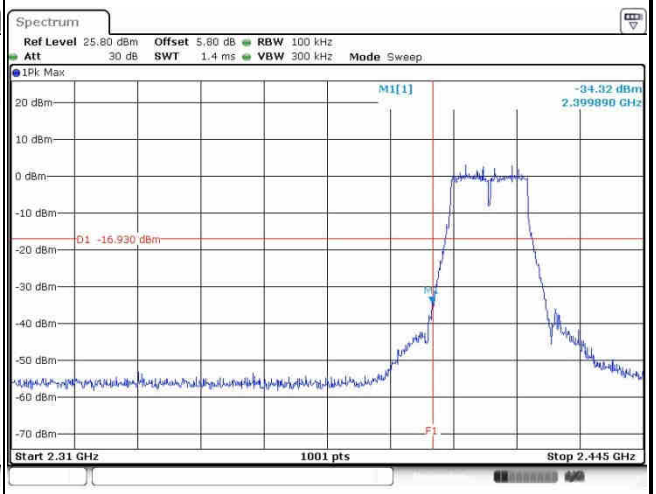
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~55%
Test Channel :	01	**Test Engineer :**	Silent Hai

WLAN 802.11g Channel 01

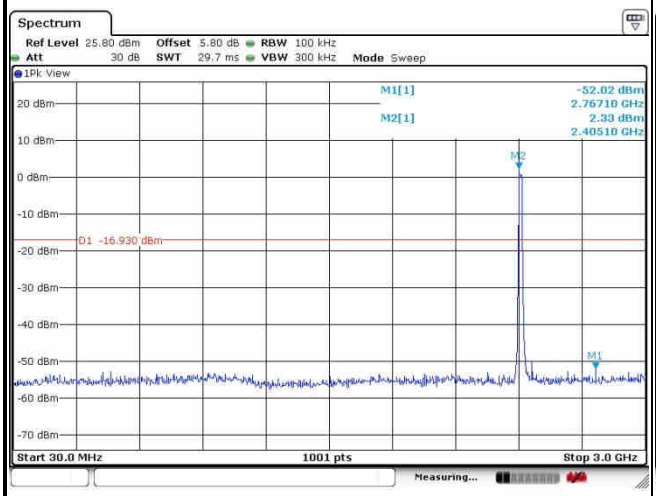
100kHz PSD reference Level



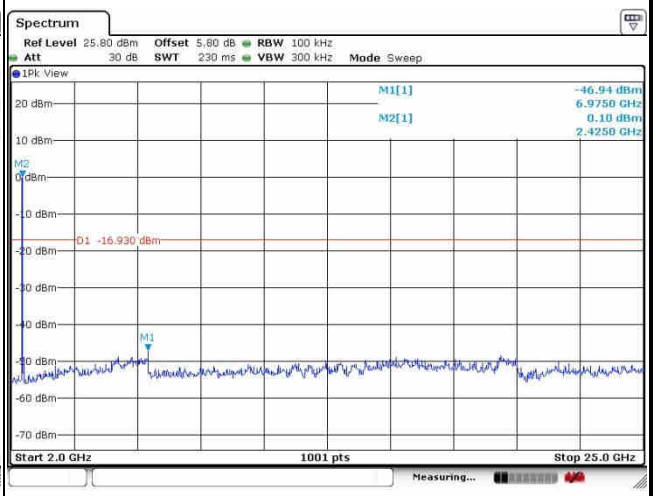
Low Channel Plot



Spurious Emission 30MHz~3GHz



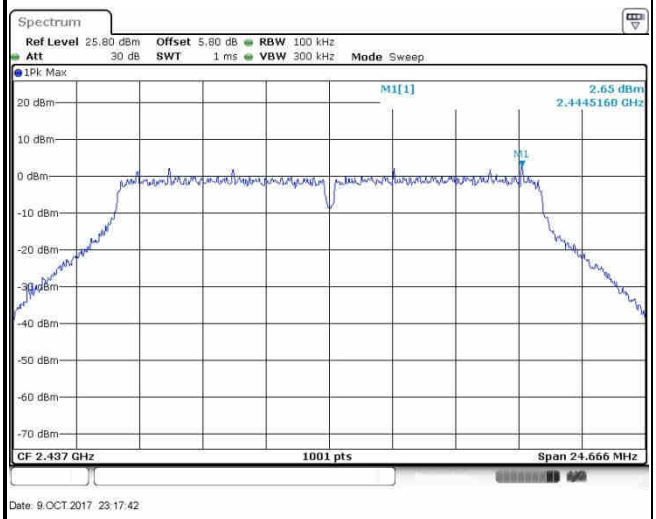
Spurious Emission 2GHz~25GHz



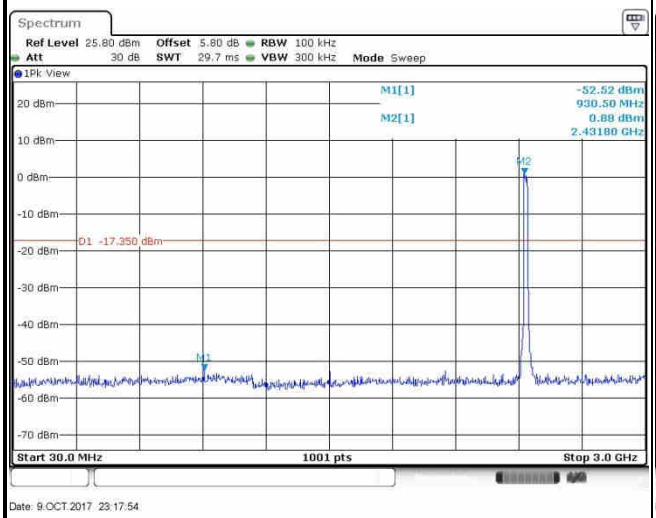
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	51~55%
Test Channel :	06	**Test Engineer :**	Silent Hai

WLAN 802.11g Channel 06

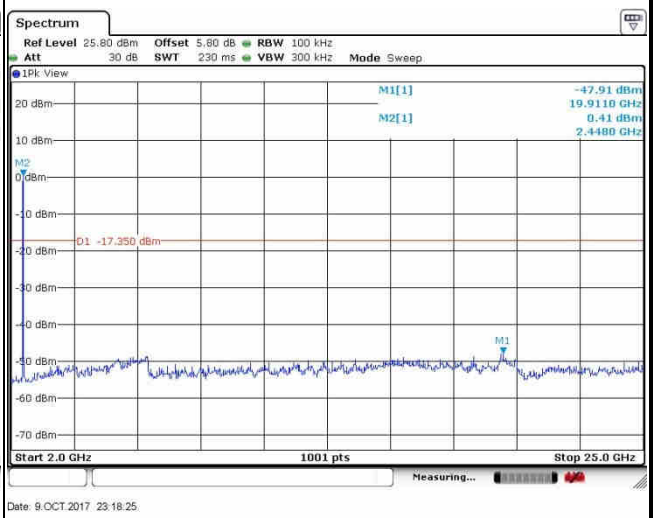
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



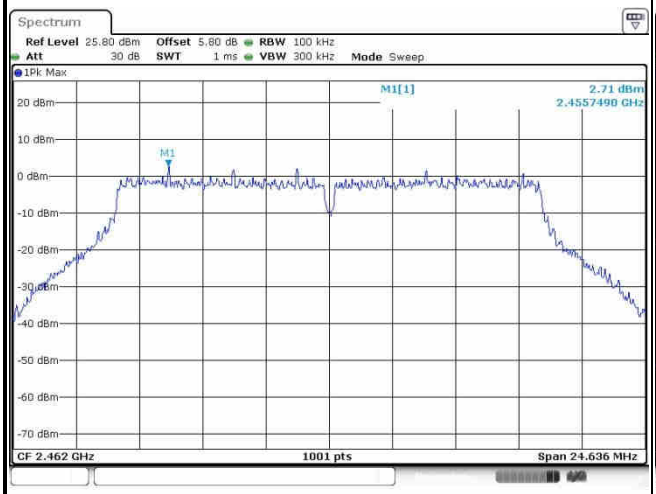
Spurious Emission 2GHz~25GHz



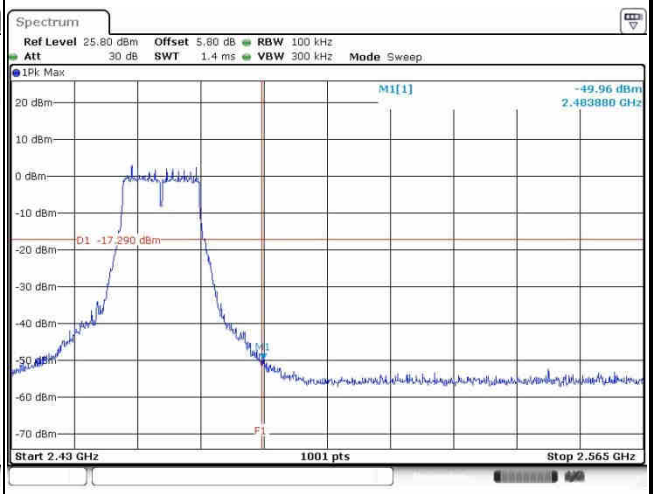
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~55%
Test Channel :	11	**Test Engineer :**	Silent Hai

WLAN 802.11g Channel 11

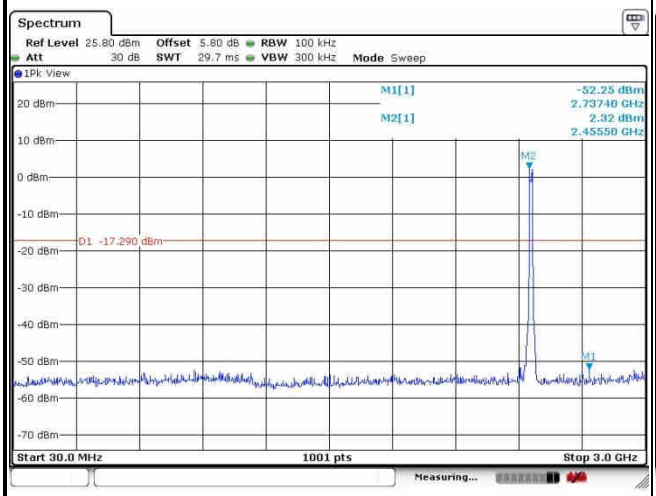
100kHz PSD reference Level



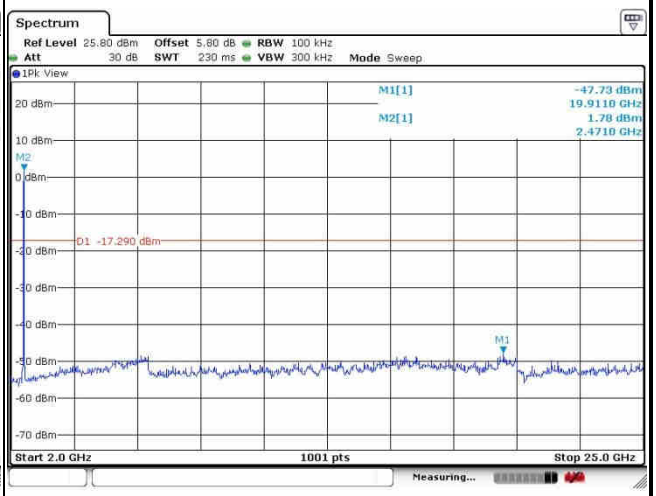
High Channel Plot



Spurious Emission 30MHz~3GHz



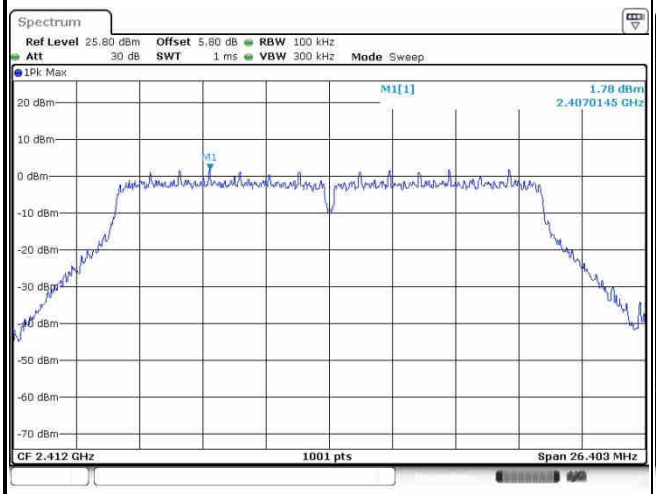
Spurious Emission 2GHz~25GHz



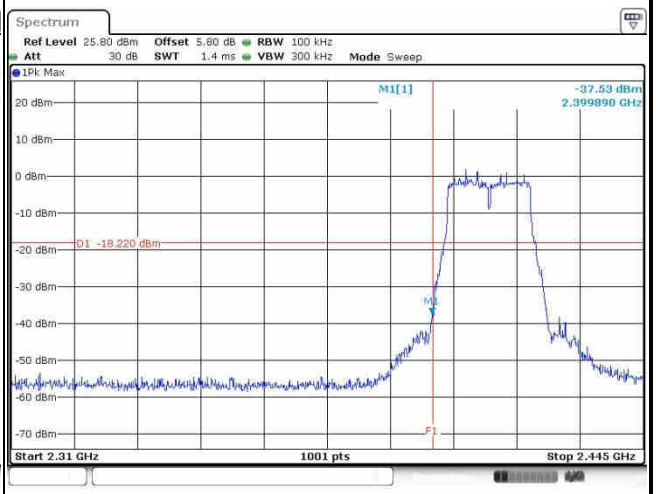
Test Mode :	802.11n HT20	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~55%
Test Channel :	01	**Test Engineer :**	Silent Hai

WLAN 802.11n HT20 Channel 01

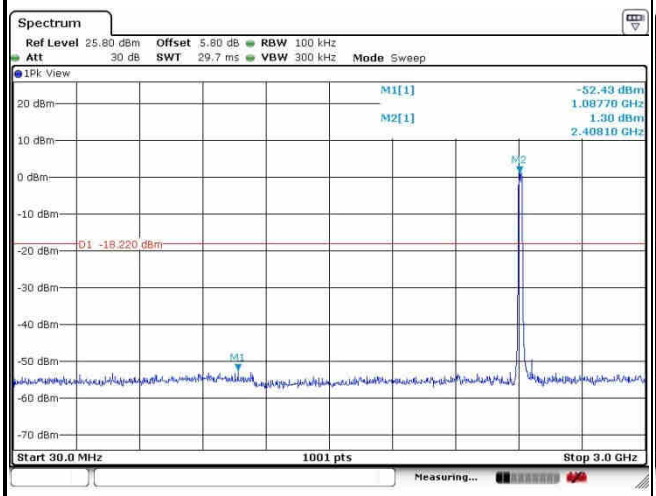
100kHz PSD reference Level



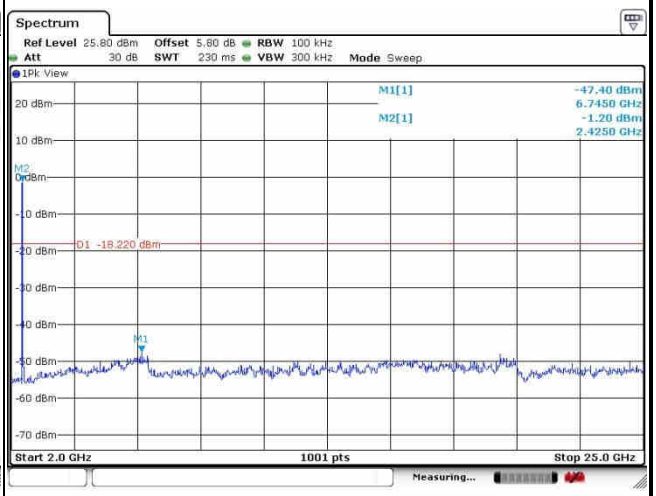
Low Channel Plot



Spurious Emission 30MHz~3GHz



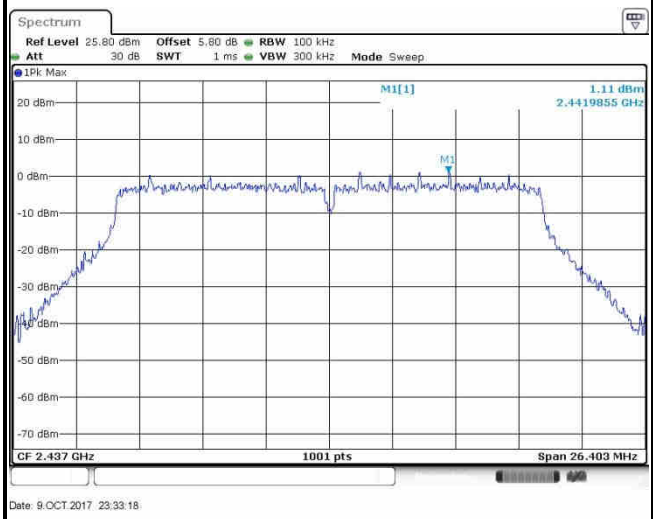
Spurious Emission 2GHz~25GHz



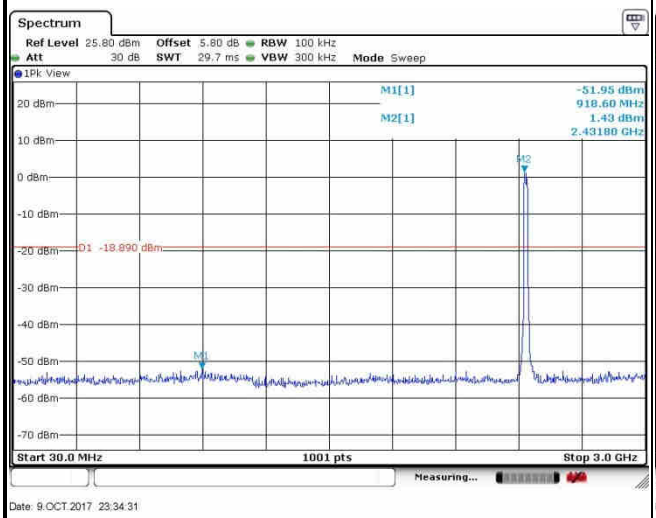
Test Mode :	802.11n HT20	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	51~55%
Test Channel :	06	**Test Engineer :**	Silent Hai

WLAN 802.11n HT20 Channel 06

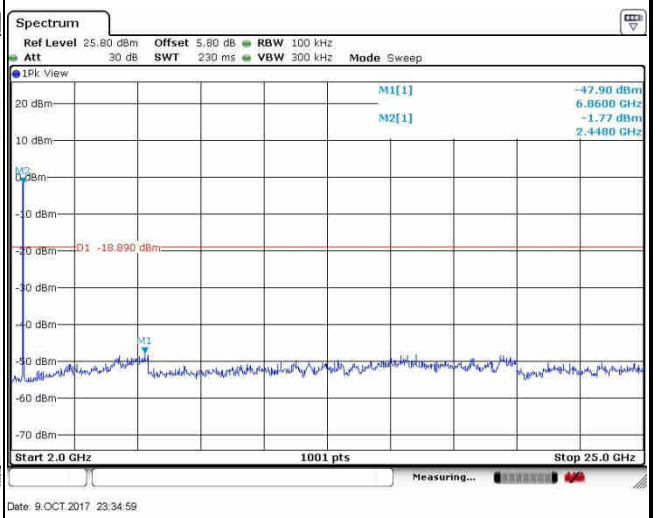
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



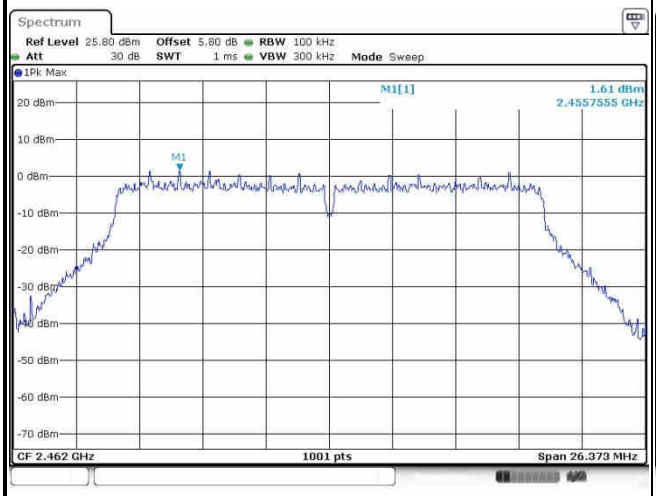
Spurious Emission 2GHz~25GHz



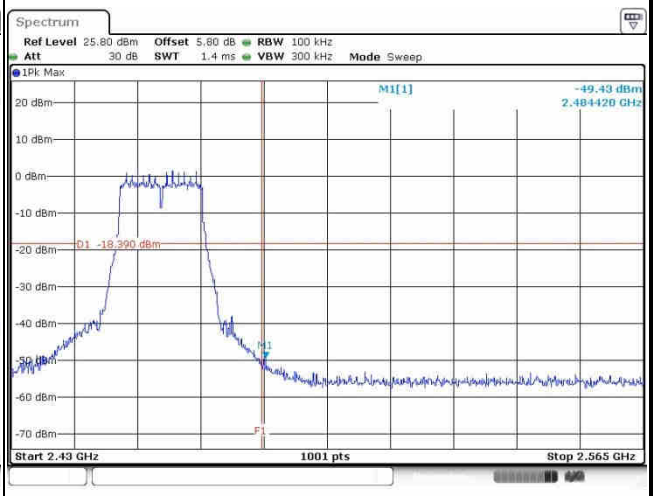
Test Mode :	802.11n HT20	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~55%
Test Channel :	11	**Test Engineer :**	Silent Hai

WLAN 802.11n HT20 Channel 11

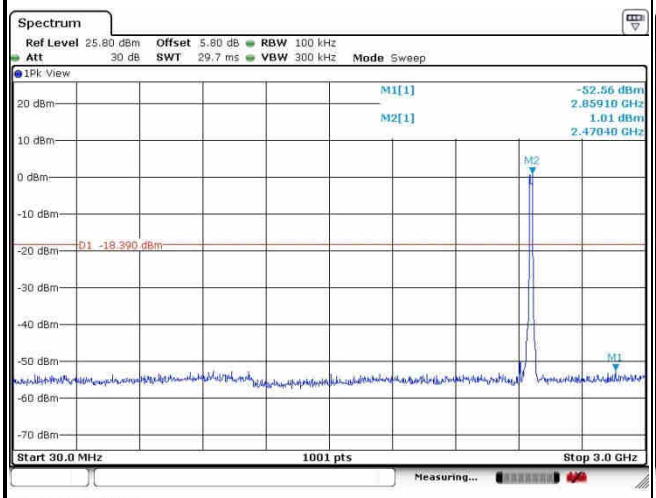
100kHz PSD reference Level



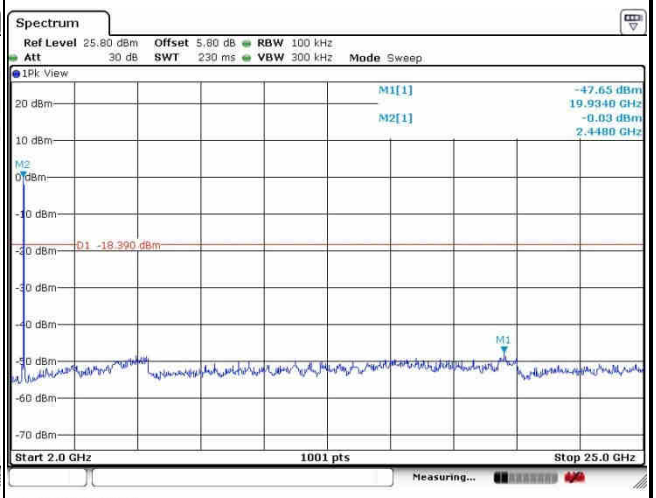
High Channel Plot



Spurious Emission 30MHz~3GHz



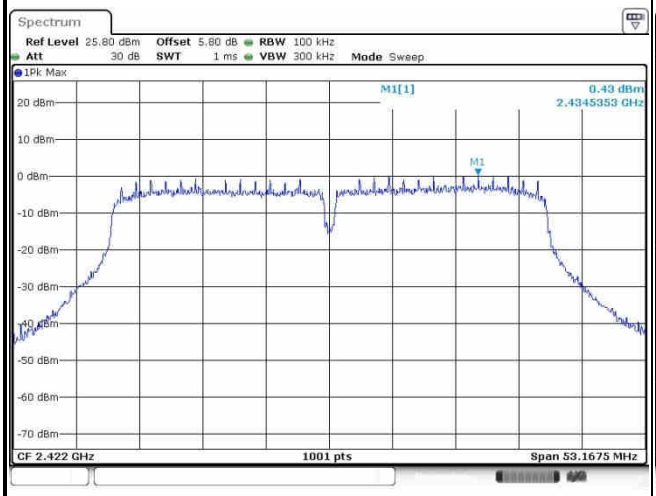
Spurious Emission 2GHz~25GHz



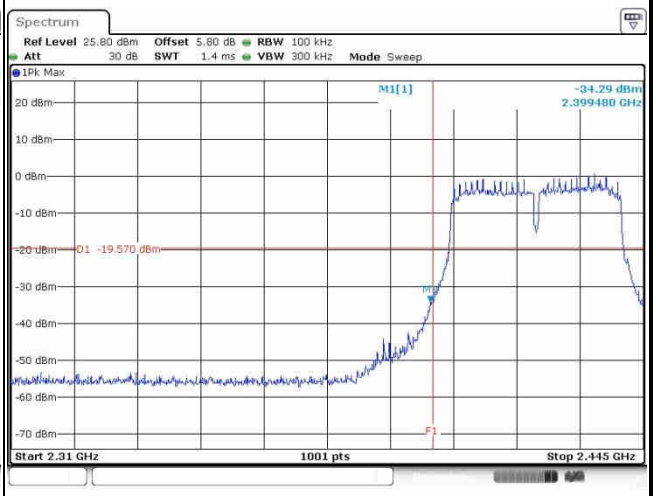
Test Mode :	802.11n HT40	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~55%
Test Channel :	03	**Test Engineer :**	Silent Hai

WLAN 802.11n HT40 Channel 03

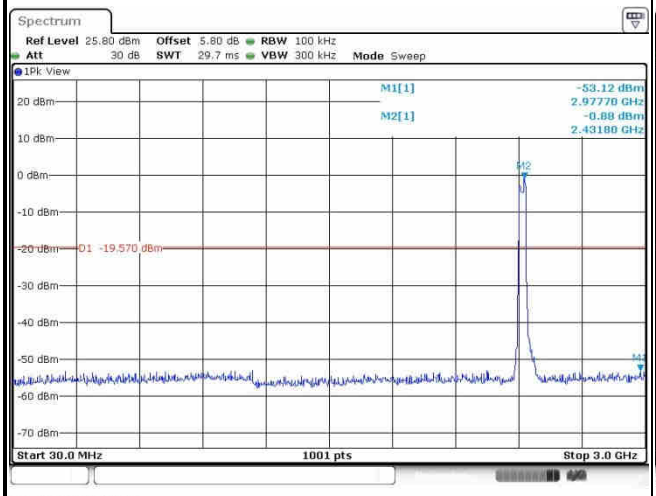
100kHz PSD reference Level



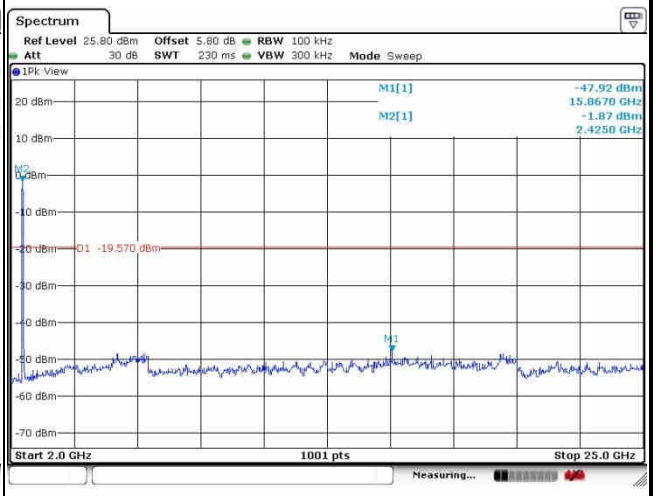
Low Channel Plot



Spurious Emission 30MHz~3GHz



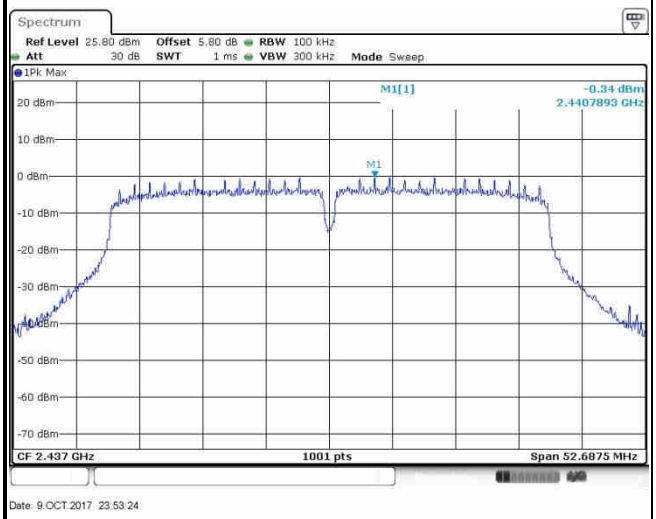
Spurious Emission 2GHz~25GHz



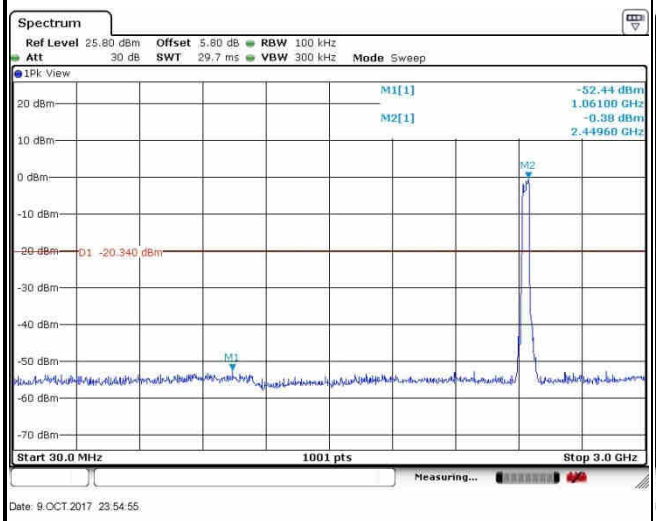
Test Mode :	802.11n HT40	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	51~55%
Test Channel :	06	**Test Engineer :**	Silent Hai

WLAN 802.11n HT40 Channel 06

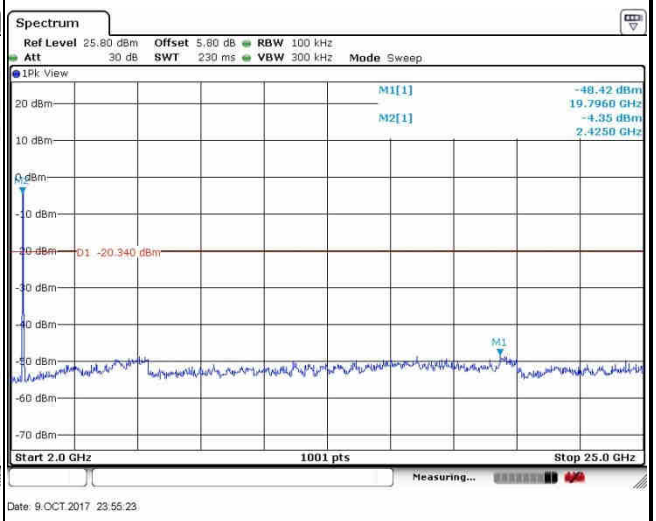
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



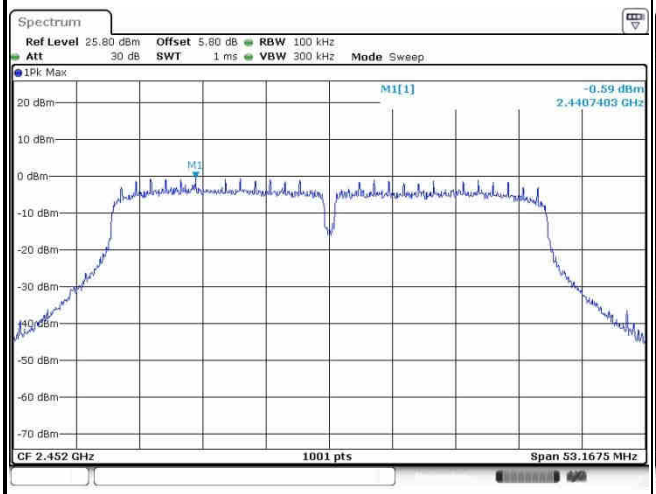
Spurious Emission 2GHz~25GHz



Test Mode :	802.11n HT40	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~55%
Test Channel :	09	**Test Engineer :**	Silent Hai

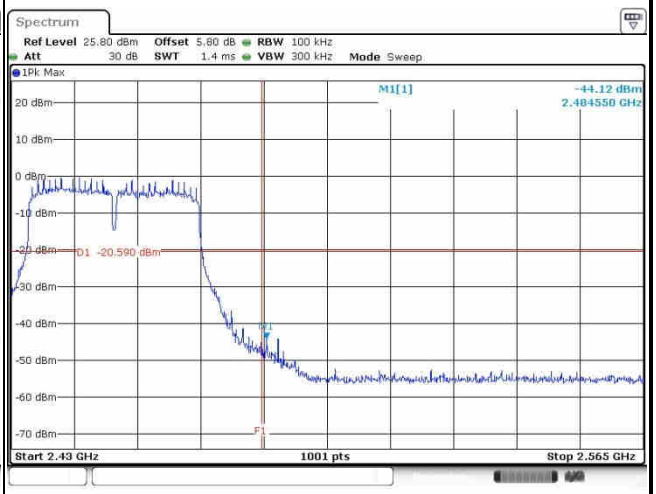
WLAN 802.11n HT40 Channel 09

100kHz PSD reference Level



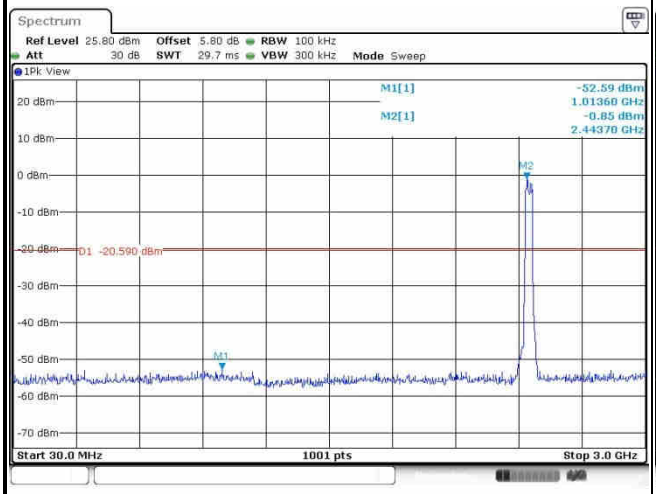
Date: 10.OCT.2017 00:00:06

High Channel Plot



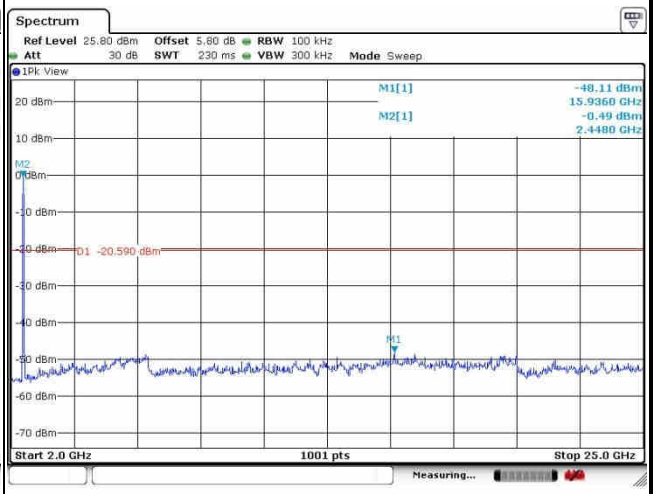
Date: 10.OCT.2017 00:00:21

Spurious Emission 30MHz~3GHz



Date: 10.OCT.2017 00:00:37

Spurious Emission 2GHz~25GHz



Date: 10.OCT.2017 00:01:41

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 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

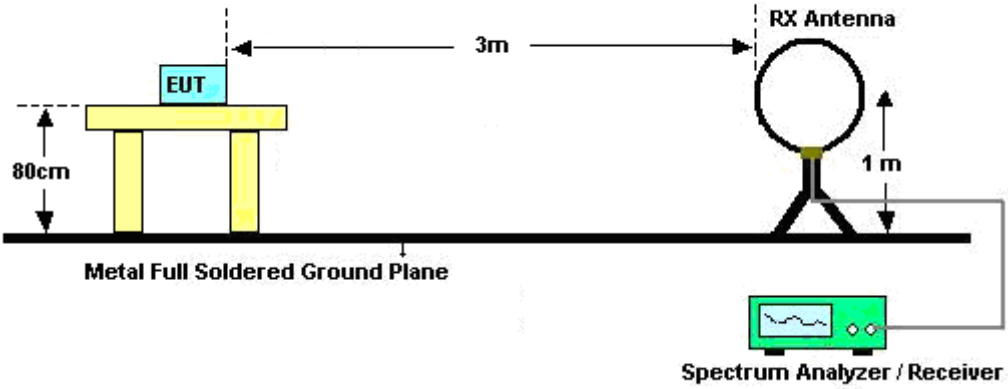
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

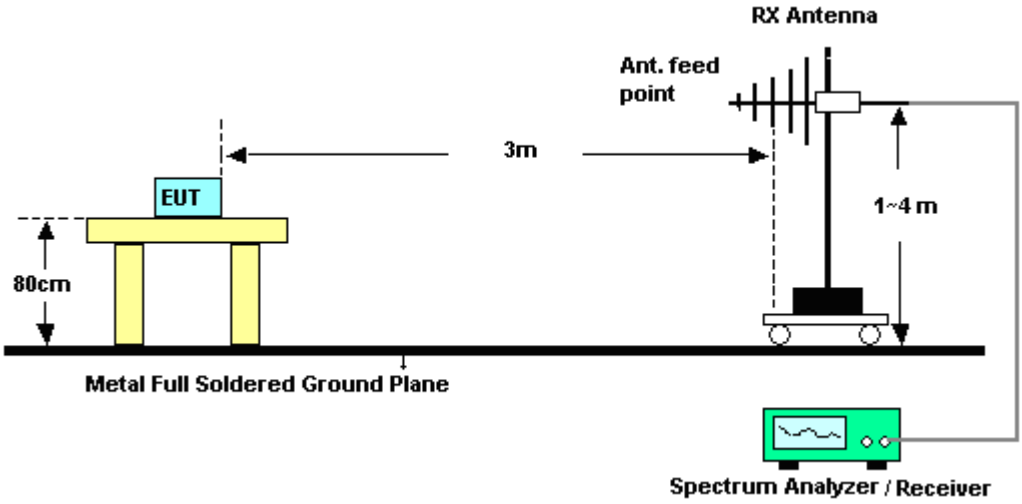
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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

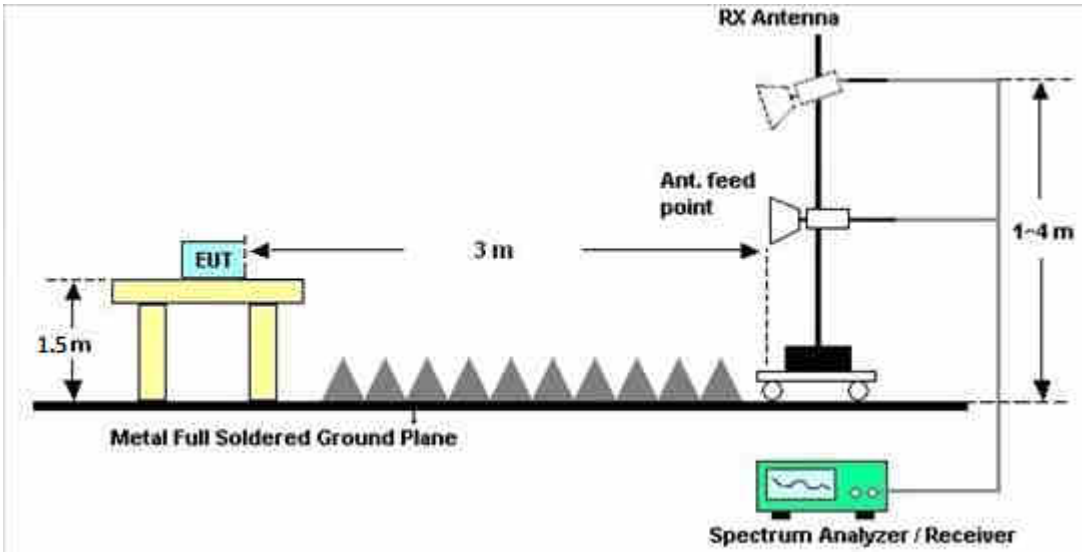
For radiated emissions below 30MHz



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 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.

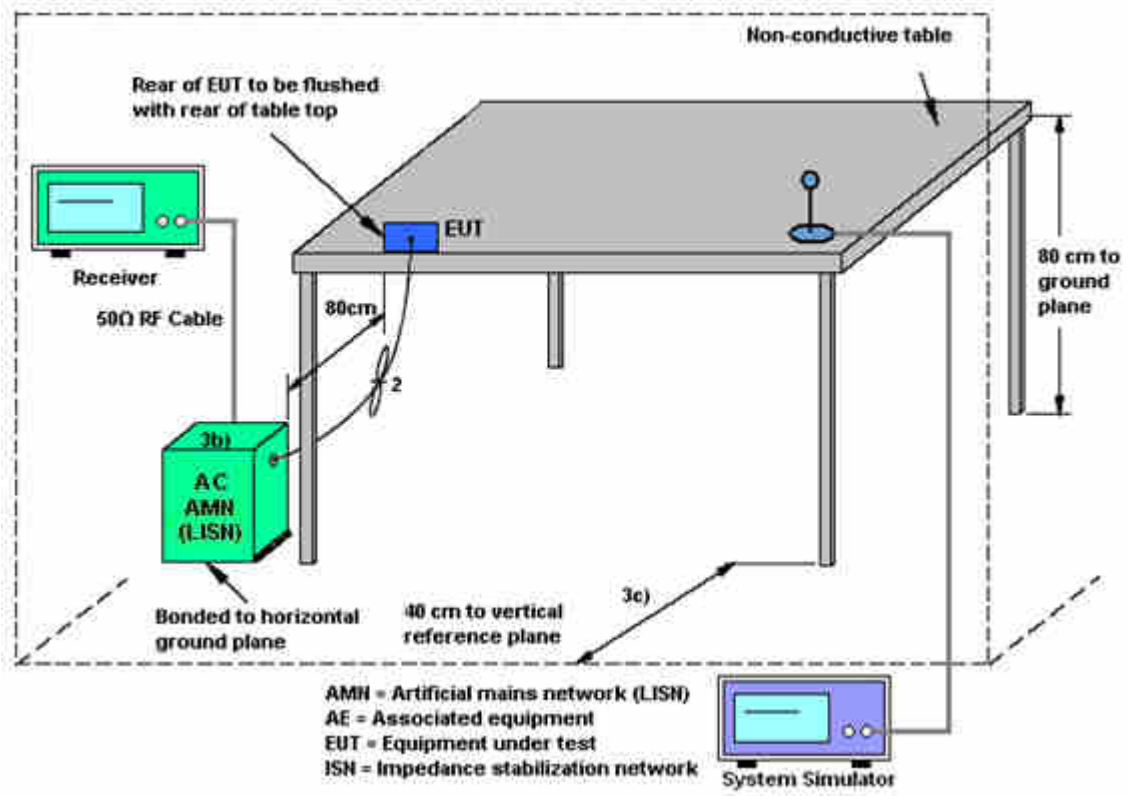
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

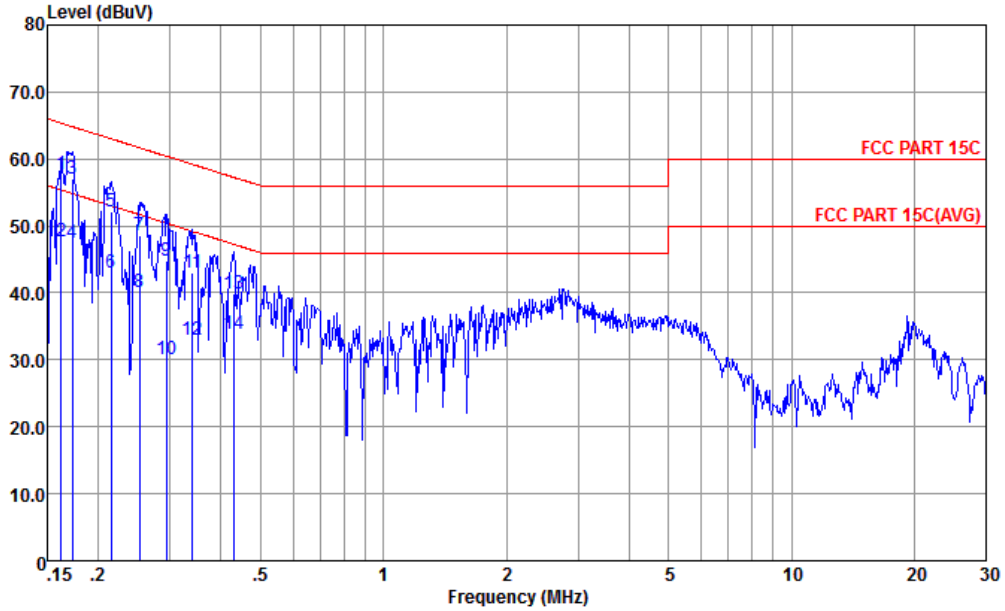
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 1	**Temperature :**	22~24℃
Test Engineer :	Amos Zhang	**Relative Humidity :**	42~46%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	LTE Band 41 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable (Charging from Adapter) + Earphone for Sample 1		

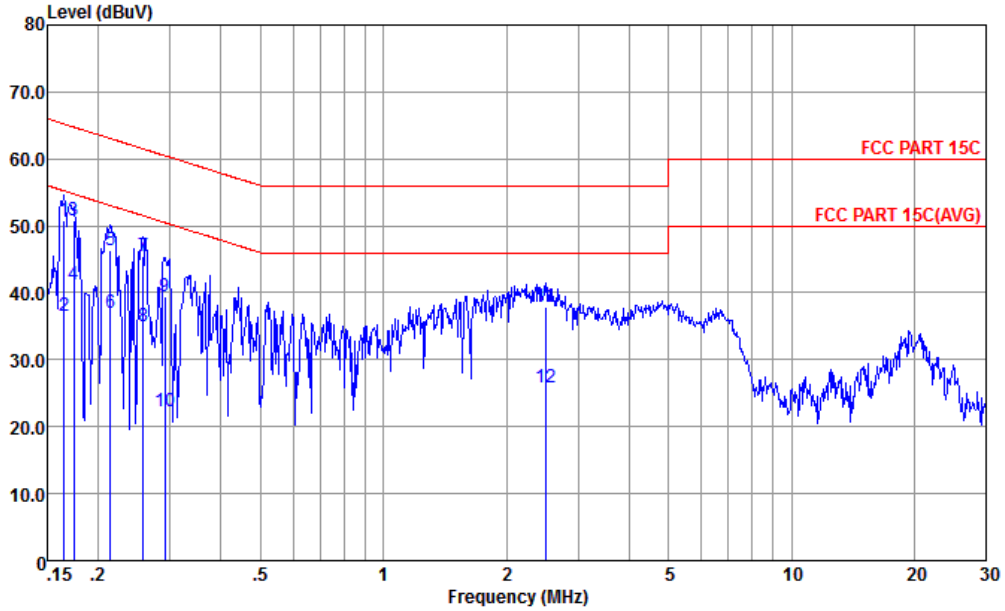


Site : CO01-KS
Condition : FCC PART 15C LISN-L-161017-060103 LINE

mode : Mode 1
: 866423030007907 #18

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.162	57.64	-7.70	65.34	46.60	0.47	10.57	QP
2	0.162	47.64	-7.70	55.34	36.60	0.47	10.57	Average
3	0.173	57.15	-7.66	64.81	46.20	0.41	10.54	QP
4 *	0.173	47.55	-7.26	54.81	36.60	0.41	10.54	Average
5	0.215	52.22	-10.79	63.01	41.50	0.27	10.45	QP
6	0.215	42.92	-10.09	53.01	32.20	0.27	10.45	Average
7	0.252	48.61	-13.08	61.69	37.90	0.27	10.44	QP
8	0.252	40.01	-11.68	51.69	29.30	0.27	10.44	Average
9	0.294	44.90	-15.51	60.41	34.20	0.27	10.43	QP
10	0.294	30.00	-20.41	50.41	19.30	0.27	10.43	Average
11	0.341	42.99	-16.19	59.18	32.30	0.27	10.42	QP
12	0.341	32.89	-16.29	49.18	22.20	0.27	10.42	Average
13	0.428	39.95	-17.34	57.29	29.30	0.27	10.38	QP
14	0.428	33.85	-13.44	47.29	23.20	0.27	10.38	Average

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	42~46%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 41 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable (Charging from Adapter) + Earphone for Sample 1		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-161017-060103 NEUTRAL

mode : Mode 1
: 866423030007907 #18

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.165	50.80	-14.41	65.21	39.90	0.34	10.56	QP
2		0.165	36.50	-18.71	55.21	25.60	0.34	10.56	Average
3		0.174	50.77	-14.00	64.77	39.90	0.33	10.54	QP
4	*	0.174	41.17	-13.60	54.77	30.30	0.33	10.54	Average
5		0.214	46.38	-16.67	63.05	35.60	0.33	10.45	QP
6		0.214	37.08	-15.97	53.05	26.30	0.33	10.45	Average
7		0.258	45.38	-16.13	61.51	34.60	0.34	10.44	QP
8		0.258	35.08	-16.43	51.51	24.30	0.34	10.44	Average
9		0.291	39.38	-21.12	60.50	28.60	0.35	10.43	QP
10		0.291	22.28	-28.22	50.50	11.50	0.35	10.43	Average
11		2.500	37.90	-18.10	56.00	27.30	0.40	10.20	QP
12		2.500	25.90	-20.10	46.00	15.30	0.40	10.20	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. 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 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
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 08, 2017	Oct. 01, 2017~ Oct. 10, 2017	Aug. 07, 2018	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 19, 2017	Oct. 01, 2017~ Oct. 10, 2017	Jan. 18, 2018	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 19, 2017	Oct. 01, 2017~ Oct. 10, 2017	Jan. 18, 2018	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 22, 2016	Oct. 19, 2017	Oct. 21, 2017	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44GHz	Apr. 18, 2017	Oct. 19, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 23, 2016	Oct. 19, 2017	Nov. 22, 2017	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Apr. 22, 2017	Oct. 19, 2017	Apr. 21, 2018	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1356	1GHz~18GHz	Apr. 22, 2017	Oct. 19, 2017	Apr. 21, 2018	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 15, 2017	Oct. 19, 2017	Feb. 14, 2018	Radiation (03CH03-KS)
Amplifier	com-power	PA-103A	161069	1MHz ~1000MHz / 32 dB	Apr. 18, 2017	Oct. 19, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18GHz~40GHz	Oct. 12, 2017	Oct. 19, 2017	Oct. 11, 2018	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Apr. 18, 2017	Oct. 19, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 19, 2017	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 19, 2017	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 19, 2017	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2017	Oct. 14, 2017	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	Oct. 14, 2017	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	Oct. 14, 2017	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	Oct. 14, 2017	Oct. 11, 2018	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))	4.6dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.5dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7dB

Appendix A. Conducted Test Results

Report Number : FR782206C

A1 - DTS Part

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2017/10/01~2017/10/10	Relative Humidity:	51~55	%

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	13.34	8.05	0.50	Pass
11b	1Mbps	1	6	2437	13.34	8.05	0.50	Pass
11b	1Mbps	1	11	2462	13.44	8.53	0.50	Pass
11g	6Mbps	1	1	2412	18.38	16.36	0.50	Pass
11g	6Mbps	1	6	2437	18.48	16.44	0.50	Pass
11g	6Mbps	1	11	2462	18.63	16.42	0.50	Pass
HT20	MCS0	1	1	2412	19.23	17.60	0.50	Pass
HT20	MCS0	1	6	2437	19.28	17.60	0.50	Pass
HT20	MCS0	1	11	2462	19.23	17.58	0.50	Pass
HT40	MCS0	1	3	2422	36.86	35.45	0.50	Pass
HT40	MCS0	1	6	2437	36.46	35.13	0.50	Pass
HT40	MCS0	1	9	2452	36.76	35.45	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	18.73	30.00	0.55	19.28	36.00	Pass
11b	1Mbps	1	6	2437	18.42	30.00	0.55	18.97	36.00	Pass
11b	1Mbps	1	11	2462	18.49	30.00	0.55	19.04	36.00	Pass
11g	6Mbps	1	1	2412	24.06	30.00	0.55	24.61	36.00	Pass
11g	6Mbps	1	6	2437	23.67	30.00	0.55	24.22	36.00	Pass
11g	6Mbps	1	11	2462	23.86	30.00	0.55	24.41	36.00	Pass
HT20	MCS0	1	1	2412	23.51	30.00	0.55	24.06	36.00	Pass
HT20	MCS0	1	6	2437	22.89	30.00	0.55	23.44	36.00	Pass
HT20	MCS0	1	11	2462	23.02	30.00	0.55	23.57	36.00	Pass
HT40	MCS0	1	3	2422	24.15	30.00	0.55	24.70	36.00	Pass
HT40	MCS0	1	6	2437	23.82	30.00	0.55	24.37	36.00	Pass
HT40	MCS0	1	9	2452	23.76	30.00	0.55	24.31	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.11	16.12
11b	1Mbps	1	6	2437	0.11	15.52
11b	1Mbps	1	11	2462	0.11	15.62
11g	6Mbps	1	1	2412	0.58	14.81
11g	6Mbps	1	6	2437	0.58	14.04
11g	6Mbps	1	11	2462	0.58	14.16
HT20	MCS0	1	1	2412	0.62	13.83
HT20	MCS0	1	6	2437	0.62	13.13
HT20	MCS0	1	11	2462	0.62	13.19
HT40	MCS0	1	3	2422	0.64	14.05
HT40	MCS0	1	6	2437	0.64	13.86
HT40	MCS0	1	9	2452	0.64	13.60

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	-6.20	0.55	8.00	Pass
11b	1Mbps	1	6	2437	-6.61	0.55	8.00	Pass
11b	1Mbps	1	11	2462	-6.52	0.55	8.00	Pass
11g	6Mbps	1	1	2412	-10.75	0.55	8.00	Pass
11g	6Mbps	1	6	2437	-11.03	0.55	8.00	Pass
11g	6Mbps	1	11	2462	-11.40	0.55	8.00	Pass
HT20	MCS0	1	1	2412	-11.99	0.55	8.00	Pass
HT20	MCS0	1	6	2437	-12.74	0.55	8.00	Pass
HT20	MCS0	1	11	2462	-11.07	0.55	8.00	Pass
HT40	MCS0	1	3	2422	-13.38	0.55	8.00	Pass
HT40	MCS0	1	6	2437	-13.81	0.55	8.00	Pass
HT40	MCS0	1	9	2452	-14.21	0.55	8.00	Pass

Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2388.52	43.42	-30.58	74	44.67	25.4	5.65	32.3	309	219	P	H
		2387.09	31.74	-22.26	54	32.99	25.4	5.65	32.3	309	219	A	H
	*	2412	103.45	-	-	104.55	25.54	5.67	32.31	309	219	P	H
	*	2414	100.35	-	-	101.45	25.54	5.67	32.31	309	219	A	H
		2388	40.89	-33.11	74	42.14	25.4	5.65	32.3	103	65	P	V
		2387.35	30.82	-23.18	54	32.07	25.4	5.65	32.3	103	65	A	V
	*	2412	101.48	-	-	102.58	25.54	5.67	32.31	103	65	P	V
	*	2414	98.32	-	-	99.42	25.54	5.67	32.31	103	65	A	V
802.11b CH 06 2437MHz		2389.56	41.26	-32.74	74	42.51	25.4	5.65	32.3	335	218	P	H
		2389.56	30.55	-23.45	54	31.8	25.4	5.65	32.3	335	218	A	H
	*	2436	103.6	-	-	104.55	25.69	5.69	32.33	335	218	P	H
	*	2436	100.38	-	-	101.33	25.69	5.69	32.33	335	218	A	H
		2485	43.5	-30.5	74	44.01	26.11	5.75	32.37	335	218	P	H
		2483.5	33.11	-20.89	54	33.62	26.11	5.75	32.37	335	218	A	H
		2382.93	41.33	-32.67	74	42.63	25.35	5.63	32.28	109	4	P	V
		2389.95	30.56	-23.44	54	31.81	25.4	5.65	32.3	109	4	A	V
	*	2436	100.92	-	-	101.87	25.69	5.69	32.33	109	4	P	V
	*	2436	97.72	-	-	98.67	25.69	5.69	32.33	109	4	A	V
		2492.32	42.69	-31.31	74	43.05	26.26	5.77	32.39	109	4	P	V
		2483.5	31.93	-22.07	54	32.44	26.11	5.75	32.37	109	4	A	V

802.11b CH 11 2462MHz	*	2462	103.69	-	-	104.35	25.97	5.73	32.36	333	220	P	H
	*	2462	100.48	-	-	101.14	25.97	5.73	32.36	333	220	A	H
		2486.38	47.42	-26.58	74	47.93	26.11	5.75	32.37	333	220	P	H
		2487.58	38.85	-15.15	54	39.21	26.26	5.77	32.39	333	220	A	H
	*	2462	100.94	-	-	101.6	25.97	5.73	32.36	100	355	P	V
	*	2462	97.74	-	-	98.4	25.97	5.73	32.36	100	355	A	V
		2484.58	45.34	-28.66	74	45.85	26.11	5.75	32.37	100	355	P	V
		2487.58	36.51	-17.49	54	36.87	26.26	5.77	32.39	100	355	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	41.17	-32.83	74	63.72	30.9	7.86	61.31	300	0	P	H
		4824	41.04	-32.96	74	63.59	30.9	7.86	61.31	100	0	P	V
802.11b CH 06 2437MHz		4874	40.12	-33.88	74	62.41	31.01	7.9	61.2	100	0	P	H
		7311	41.62	-32.38	74	59.88	35.34	9.5	63.1	100	0	P	H
		4874	44.37	-29.63	74	66.66	31.01	7.9	61.2	100	360	P	V
		7308	42.04	-31.96	74	60.3	35.34	9.5	63.1	100	360	P	V
802.11b CH 11 2462MHz		4926	40.87	-33.13	74	62.89	31.12	7.94	61.08	100	0	P	H
		7386	40.75	-33.25	74	58.84	35.55	9.53	63.17	100	0	P	H
		4926	45.4	-28.6	74	67.42	31.12	7.94	61.08	100	360	P	V
		7386	42.03	-31.97	74	60.12	35.55	9.53	63.17	100	360	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		2389.95	50.9	-23.1	74	52.15	25.4	5.65	32.3	312	314	P	H
		2389.43	35.39	-18.61	54	36.64	25.4	5.65	32.3	312	314	A	H
	*	2408	102.66	-	-	103.76	25.54	5.67	32.31	312	314	P	H
	*	2410	94.81	-	-	95.91	25.54	5.67	32.31	312	314	A	H
		2389.43	49.88	-24.12	74	51.13	25.4	5.65	32.3	100	110	P	V
		2389.82	34.92	-19.08	54	36.17	25.4	5.65	32.3	100	110	A	V
	*	2406	102.63	-	-	103.73	25.54	5.67	32.31	100	110	P	V
	*	2408	94.66	-	-	95.76	25.54	5.67	32.31	100	110	A	V
802.11g CH 06 2437MHz		2384.1	41.38	-32.62	74	42.68	25.35	5.63	32.28	300	315	P	H
		2385.14	31.63	-22.37	54	32.93	25.35	5.63	32.28	300	315	A	H
	*	2434	103.6	-	-	104.55	25.69	5.69	32.33	300	315	P	H
	*	2432	94.34	-	-	95.29	25.69	5.69	32.33	300	315	A	H
		2489.26	47.2	-26.8	74	47.56	26.26	5.77	32.39	300	315	P	H
		2489.32	37.89	-16.11	54	38.25	26.26	5.77	32.39	300	315	A	H
		2385.01	41.64	-32.36	74	42.94	25.35	5.63	32.28	100	111	P	V
		2384.75	31.82	-22.18	54	33.12	25.35	5.63	32.28	100	111	A	V
	*	2442	100.38	-	-	101.18	25.83	5.71	32.34	100	111	P	V
	*	2430	92.68	-	-	93.63	25.69	5.69	32.33	100	111	A	V
		2489.02	44.24	-29.76	74	44.6	26.26	5.77	32.39	100	111	P	V
		2489.26	34.71	-19.29	54	35.07	26.26	5.77	32.39	100	111	A	V

802.11g CH 11 2462MHz	*	2458	102.57	-	-	103.23	25.97	5.73	32.36	296	319	P	H
	*	2458	94.85	-	-	95.51	25.97	5.73	32.36	296	319	A	H
		2483.56	55.97	-18.03	74	56.48	26.11	5.75	32.37	296	319	P	H
		2483.56	41.33	-12.67	54	41.84	26.11	5.75	32.37	296	319	A	H
	*	2456	101.24	-	-	101.9	25.97	5.73	32.36	102	28	P	V
	*	2456	93.75	-	-	94.41	25.97	5.73	32.36	102	28	A	V
		2483.86	52.75	-21.25	74	53.26	26.11	5.75	32.37	102	28	P	V
		2483.56	39.65	-14.35	54	40.16	26.11	5.75	32.37	102	28	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	40.78	-33.22	74	63.33	30.9	7.86	61.31	100	0	P	H
		4824	40.37	-33.63	74	62.92	30.9	7.86	61.31	100	360	P	V
802.11g CH 06 2437MHz		4872	39.66	-34.34	74	61.95	31.01	7.9	61.2	100	0	P	H
		7311	41.5	-32.5	74	59.76	35.34	9.5	63.1	100	0	P	H
		4872	39.01	-34.99	74	61.3	31.01	7.9	61.2	100	360	P	V
		7311	40.95	-33.05	74	59.21	35.34	9.5	63.1	100	360	P	V
802.11g CH 11 2462MHz		4926	41.22	-32.78	74	63.24	31.12	7.94	61.08	100	360	P	H
		7386	42.56	-31.44	74	60.65	35.55	9.53	63.17	100	360	P	H
		4926	41.49	-32.51	74	63.51	31.12	7.94	61.08	100	0	P	V
		7386	41.52	-32.48	74	59.61	35.55	9.53	63.17	100	0	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		2387.09	53.29	-20.71	74	54.54	25.4	5.65	32.3	120	49	P	H
		2389.82	37.44	-16.56	54	38.69	25.4	5.65	32.3	120	49	A	H
	*	2412	104.16	-	-	105.26	25.54	5.67	32.31	120	49	P	H
	*	2420	96.25	-	-	97.2	25.69	5.69	32.33	120	49	A	H
		2389.95	48.78	-25.22	74	50.03	25.4	5.65	32.3	388	176	P	V
		2389.95	36.53	-17.47	54	37.78	25.4	5.65	32.3	388	176	A	V
	*	2418	102.09	-	-	103.19	25.54	5.67	32.31	388	176	P	V
	*	2416	94.32	-	-	95.42	25.54	5.67	32.31	388	176	A	V
802.11n HT20 CH 06 2437MHz		2385.4	42.42	-31.58	74	43.72	25.35	5.63	32.28	152	47	P	H
		2385.53	33.46	-20.54	54	34.71	25.4	5.65	32.3	152	47	A	H
	*	2434	103.04	-	-	103.99	25.69	5.69	32.33	152	47	P	H
	*	2432	95.33	-	-	96.28	25.69	5.69	32.33	152	47	A	H
		2489.02	48.39	-25.61	74	48.75	26.26	5.77	32.39	152	47	P	H
		2488.6	40.24	-13.76	54	40.6	26.26	5.77	32.39	152	47	A	H
		2385.53	42.04	-31.96	74	43.29	25.4	5.65	32.3	382	226	P	V
		2385.4	32.37	-21.63	54	33.67	25.35	5.63	32.28	382	226	A	V
	*	2444	102.07	-	-	102.87	25.83	5.71	32.34	382	226	P	V
	*	2442	94.29	-	-	95.09	25.83	5.71	32.34	382	226	A	V
		2489.2	48.71	-25.29	74	49.07	26.26	5.77	32.39	382	226	P	V
		2488.66	39.95	-14.05	54	40.31	26.26	5.77	32.39	382	226	A	V

802.11n HT20 CH 11 2462MHz	*	2456	103.05	-	-	103.71	25.97	5.73	32.36	100	47	P	H
	*	2458	95.2	-	-	95.86	25.97	5.73	32.36	100	47	A	H
		2483.98	57.42	-16.58	74	57.93	26.11	5.75	32.37	100	47	P	H
		2483.51	43.29	-10.71	54	43.8	26.11	5.75	32.37	100	47	A	H
	*	2456	102.67	-	-	103.33	25.97	5.73	32.36	380	224	P	V
	*	2466	95.11	-	-	95.77	25.97	5.73	32.36	380	224	A	V
		2483.51	56.64	-17.36	74	57.15	26.11	5.75	32.37	380	224	P	V
		2483.51	44.32	-9.68	54	44.83	26.11	5.75	32.37	380	224	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	44.59	-29.41	74	67.14	30.9	7.86	61.31	100	360	P	H
		4824	39.47	-34.53	74	62.02	30.9	7.86	61.31	100	0	P	V
802.11n HT20 CH 06 2437MHz		4872	42.34	-31.66	74	64.63	31.01	7.9	61.2	100	360	P	H
		7308	42.58	-31.42	74	60.84	35.34	9.5	63.1	100	360	P	H
		4872	39.18	-34.82	74	61.47	31.01	7.9	61.2	100	0	P	V
		7308	41.29	-32.71	74	59.55	35.34	9.5	63.1	100	0	P	V
802.11n HT20 CH 11 2462MHz		4926	43.87	-30.13	74	65.89	31.12	7.94	61.08	100	360	P	H
		7386	41.72	-32.28	74	59.81	35.55	9.53	63.17	100	360	P	H
		4926	40.57	-33.43	74	62.59	31.12	7.94	61.08	100	0	P	V
		7386	41.67	-32.33	74	59.76	35.55	9.53	63.17	100	0	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 HT40 (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 HT40 CH 03 2422MHz		2389.95	55.69	-18.31	74	56.94	25.4	5.65	32.3	188	319	P	H
		2389.69	41.12	-12.88	54	42.37	25.4	5.65	32.3	188	319	A	H
	*	2434	101.12	-	-	102.07	25.69	5.69	32.33	188	319	P	H
	*	2434	93.04	-	-	93.99	25.69	5.69	32.33	188	319	A	H
		2485.24	51.47	-22.53	74	51.98	26.11	5.75	32.37	188	319	P	H
		2483.86	37.95	-16.05	54	38.46	26.11	5.75	32.37	188	319	A	H
		2389.69	53.85	-20.15	74	55.1	25.4	5.65	32.3	375	263	P	V
		2389.95	39	-15	54	40.25	25.4	5.65	32.3	375	263	A	V
	*	2432	98.53	-	-	99.48	25.69	5.69	32.33	375	263	P	V
	*	2412	90.61	-	-	91.71	25.54	5.67	32.31	375	263	A	V
		2483.56	49.36	-24.64	74	49.87	26.11	5.75	32.37	375	263	P	V
		2483.92	34.81	-19.19	54	35.32	26.11	5.75	32.37	375	263	A	V
802.11n HT40 CH 06 2437MHz		2388.91	48.63	-25.37	74	49.88	25.4	5.65	32.3	197	324	P	H
		2389.82	33.72	-20.28	54	34.97	25.4	5.65	32.3	197	324	A	H
	*	2440	100.62	-	-	101.42	25.83	5.71	32.34	197	324	P	H
	*	2450	92.58	-	-	93.38	25.83	5.71	32.34	197	324	A	H
		2487.64	57.12	-16.88	74	57.48	26.26	5.77	32.39	197	324	P	H
		2483.74	42.22	-11.78	54	42.73	26.11	5.75	32.37	197	324	A	H
		2389.82	46.43	-27.57	74	47.68	25.4	5.65	32.3	100	329	P	V
		2389.82	32.71	-21.29	54	33.96	25.4	5.65	32.3	100	329	A	V
	*	2428	97.34	-	-	98.29	25.69	5.69	32.33	100	329	P	V
	*	2426	89.65	-	-	90.6	25.69	5.69	32.33	100	329	A	V
		2484.22	51.91	-22.09	74	52.42	26.11	5.75	32.37	100	329	P	V
		2483.86	37.76	-16.24	54	38.27	26.11	5.75	32.37	100	329	A	V

802.11n HT40 CH 09 2452MHz		2389.82	40.53	-33.47	74	41.78	25.4	5.65	32.3	168	322	P	H
		2389.95	30.86	-23.14	54	32.11	25.4	5.65	32.3	168	322	A	H
	*	2442	99.53	-	-	100.33	25.83	5.71	32.34	168	322	P	H
	*	2440	91.92	-	-	92.72	25.83	5.71	32.34	168	322	A	H
		2483.5	57.52	-16.48	74	58.03	26.11	5.75	32.37	168	322	P	H
		2483.56	45.51	-8.49	54	46.02	26.11	5.75	32.37	168	322	A	H
		2388.65	42.19	-31.81	74	43.44	25.4	5.65	32.3	100	154	P	V
		2389.95	30.78	-23.22	54	32.03	25.4	5.65	32.3	100	154	A	V
	*	2448	97.13	-	-	97.93	25.83	5.71	32.34	100	154	P	V
	*	2440	89.44	-	-	90.24	25.83	5.71	32.34	100	154	A	V
		2484.88	54.5	-19.5	74	55.01	26.11	5.75	32.37	100	154	P	V
		2483.56	40.86	-13.14	54	41.37	26.11	5.75	32.37	100	154	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 HT40 (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		4842	40.33	-33.67	74	62.8	30.93	7.87	61.27	100	360	P	H
HT40		7266	41.64	-32.36	74	59.96	35.26	9.48	63.06	100	360	P	H
CH 03		4842	42.35	-31.65	74	64.82	30.93	7.87	61.27	100	0	P	V
2422MHz		7266	40.38	-33.62	74	58.7	35.26	9.48	63.06	100	0	P	V
802.11n		4872	39.36	-34.64	74	61.65	31.01	7.9	61.2	100	360	P	H
HT40		7308	41.37	-32.63	74	59.63	35.34	9.5	63.1	100	360	P	H
CH 06		4872	38.72	-35.28	74	61.01	31.01	7.9	61.2	100	0	P	V
2437MHz		7308	40.25	-33.75	74	58.51	35.34	9.5	63.1	100	0	P	V
802.11n		4902	37.97	-36.03	74	60.08	31.08	7.93	61.12	100	360	P	H
HT40		7356	41.55	-32.45	74	59.7	35.47	9.52	63.14	100	360	P	H
CH 09		4902	38.69	-35.31	74	60.8	31.08	7.93	61.12	100	0	P	V
2452MHz		7356	40.51	-33.49	74	58.66	35.47	9.52	63.14	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

Emission below 1GHz

2.4GHz WIFI 802. 11n HT40 (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		30.97	24.43	-15.57	40	30.4	25.74	0.58	32.29	100	254	P	H
		74.62	22.87	-17.13	40	39.56	14.6	0.92	32.21	-	-	P	H
		146.4	21.93	-21.57	43.5	35.57	17.34	1.3	32.28	-	-	P	H
		223.03	27.95	-18.05	46	41.8	16.72	1.61	32.18	-	-	P	H
		448.07	23.96	-22.04	46	30.29	23.27	2.34	31.94	-	-	P	H
		719.67	28.03	-17.97	46	29.74	27	2.99	31.7	-	-	P	H
		30	26.74	-13.26	40	32.16	26.3	0.57	32.29	100	29	P	V
		36.79	26.47	-13.53	40	35.93	22.14	0.66	32.26	-	-	P	V
		74.62	24.74	-15.26	40	41.43	14.6	0.92	32.21	-	-	P	V
		90.14	21.44	-22.06	43.5	35.78	16.9	1.03	32.27	-	-	P	V
		354.95	22.86	-23.14	46	31.55	21.34	2.05	32.08	-	-	P	V
		734.22	28.59	-17.41	46	30.14	27.14	3.02	31.71	-	-	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.	
2		(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)

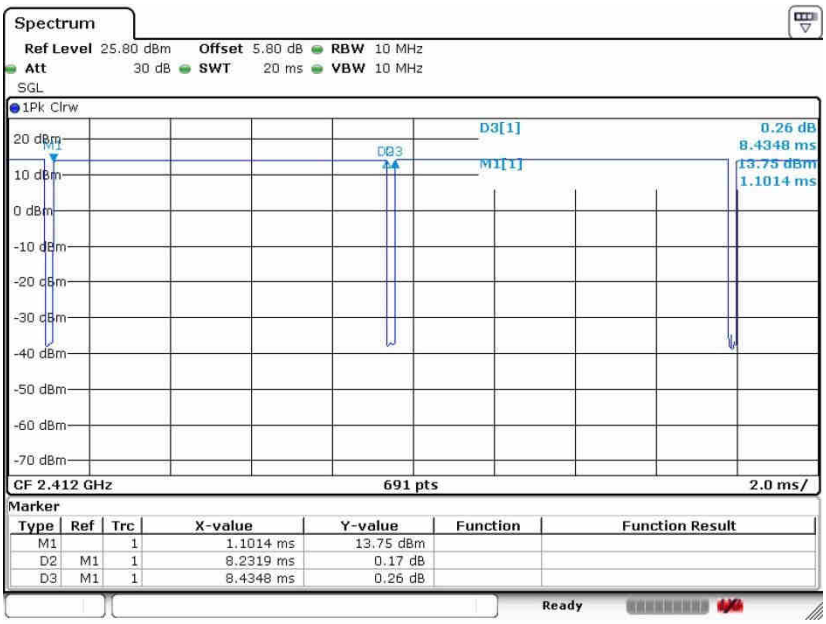
= -10.46(dB)

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

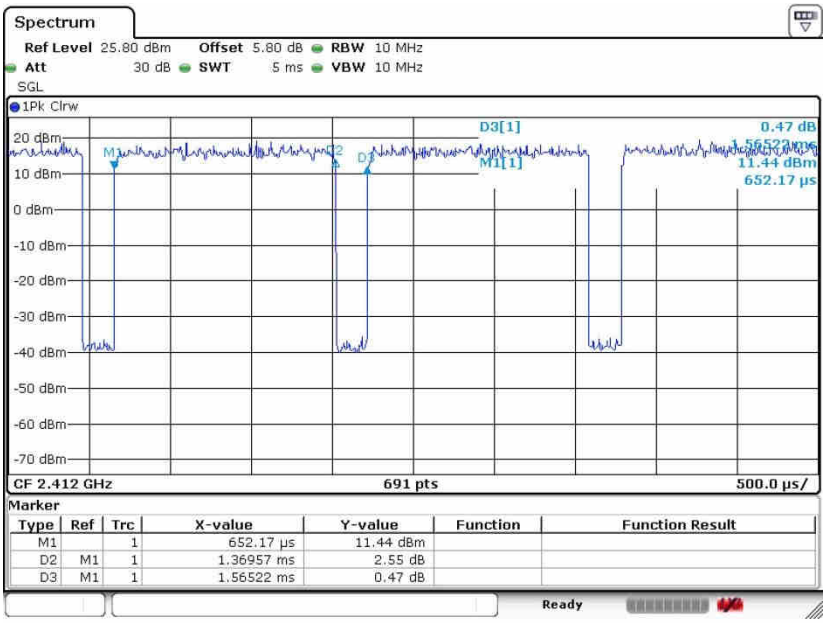
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.59	8.232	0.121	300Hz
802.11g	87.50	1.370	0.730	1kHz
802.11n HT20	86.70	1.275	0.784	1kHz
802.11n HT40	86.29	1.232	0.812	1kHz

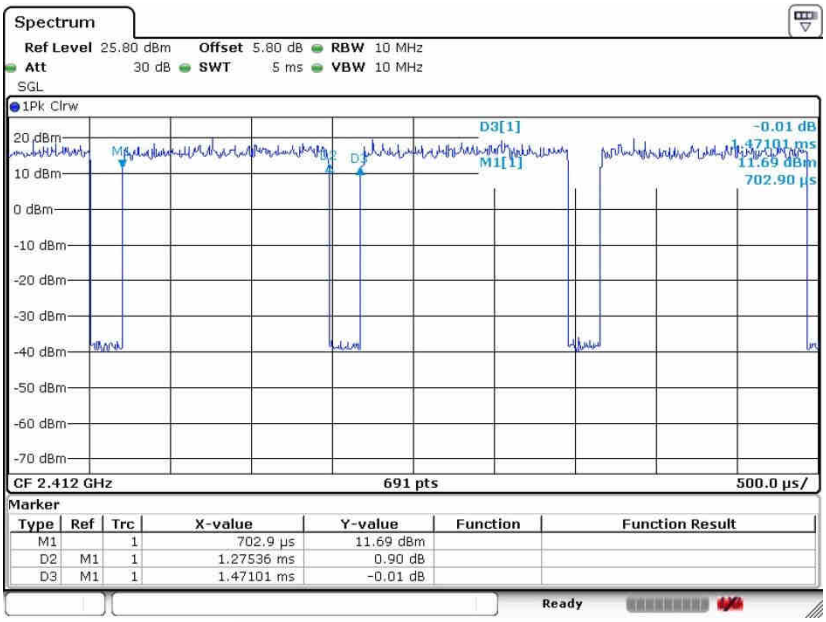
802.11b



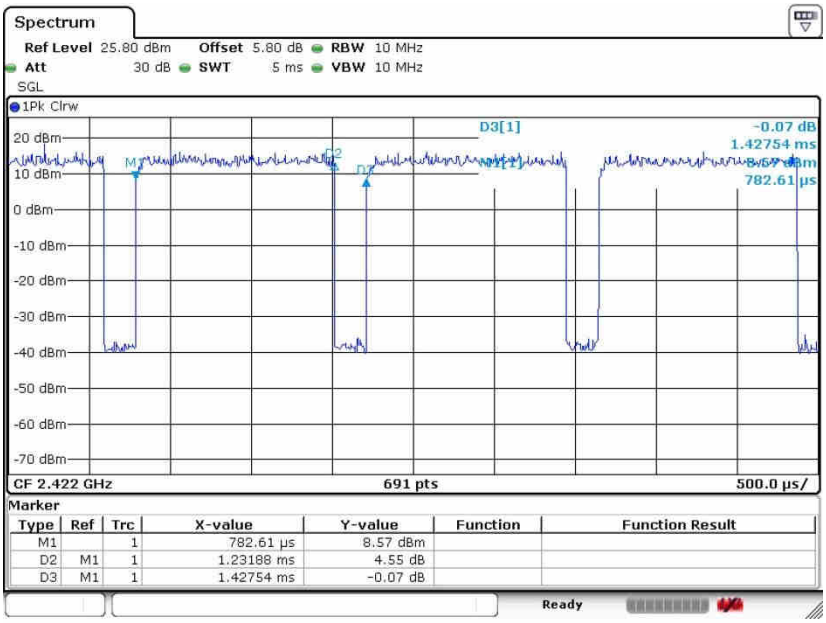
802.11g



802.11n HT20



802.11n HT40


Spectrum
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Att 30 dB SWT 5 ms VBW 10 MHz
SGL
1Pk Clrw
D3[1]
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1.42754 ms
782.61 µs
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.422 GHz
691 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 782.61 µs 8.57 dBm
D2 M1 1 1.23188 ms 4.55 dB
D3 M1 1 1.42754 ms -0.07 dB
Ready