FCC RF Test Report

APPLICANT	**:**	**Shanghai Longcheer Technology Co. Ltd.**
EQUIPMENT	**:**	**Connected Media Applicance**
BRAND NAME	**:**	**Longcheer**
MODEL NAME	**:**	**CMA1000**
FCC ID	**:**	**WH7CMA1000**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	**:**	**(DTS) Digital Transmission System**

The product was received on May 04, 2017 and testing was completed on Jun. 12, 2017. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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 5
1.5 Modification of EUT 5
1.6 Testing Location 6
1.7 Applicable Standards 6

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 7

2.1 Carrier Frequency and Channel 7
2.2 Test Mode 8
2.3 Connection Diagram of Test System 9
2.4 Support Unit used in test configuration and system 10
2.5 EUT Operation Test Setup 10
2.6 Measurement Results Explanation Example 10

3 TEST RESULT 11

3.1 6dB Bandwidth Measurement 11
3.2 Output Power Measurement 13
3.3 Power Spectral Density Measurement 14
3.4 Conducted Band Edges and Spurious Emission Measurement 16
3.5 Radiated Band Edges and Spurious Emission Measurement 29
3.6 AC Conducted Emission Measurement 33
3.7 Antenna Requirements 37

4 LIST OF MEASURING EQUIPMENT 38

5 UNCERTAINTY OF EVALUATION 39

APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. RADIATED SPURIOUS EMISSION

APPENDIX C. DUTY CYCLE PLOTS

APPENDIX D. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR750402C	Rev. 01	Initial issue of report	Jun. 28, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	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 3.28 dB at 33.880 MHz for Quasi-Peak
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.03 dB at 0.433 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Shanghai Longcheer Technology Co. Ltd.
No.401, Building 1, Caobao, Xuhui District, Shanghai, China

1.2 Manufacturer

Shanghai Longcheer Technology Co. Ltd.
No.401, Building 1, Caobao, Xuhui District, Shanghai, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Connected Media Applicance
Brand Name	Longcheer
Model Name	CMA1000
FCC ID	WH7CMA1000
EUT supports Radios application	LTE/WLAN2.4GHz 802.11b/g/n HT20/HT40 WLAN5GHz 802.11a/n HT20/HT40 Bluetoothv3.0 +EDR/ Bluetoothv4.0 LE/ Bluetoothv4.1 LE
HW Version	LLAM013C2-1
SW Version	0.1.6
EUT Stage	Production Unit

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

1.4 Product Specification 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 : 14.81 dBm (0.0303 W) 802.11g : 18.17 dBm (0.0656 W) 802.11n HT20 : 18.28 dBm (0.0673 W) 802.11n HT40 : 18.68 dBm (0.0738 W)
Antenna Type / Gain	IFA Antenna with gain -1.9 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

Test Site	Sporton International (KunShan) INC.			
Test Site Location	No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	**Sporton Site No.**			**FCC Registration No.**
	TH01-KS	03CH02-KS	CO01-KS	418269

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

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance 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).

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

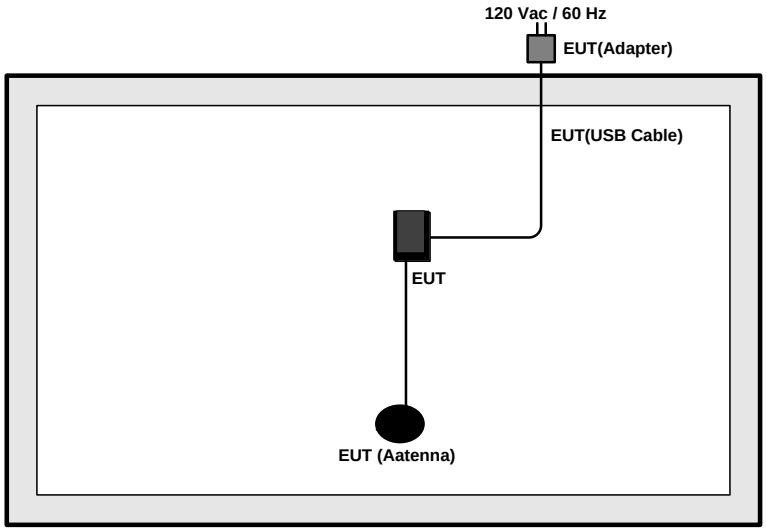
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

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

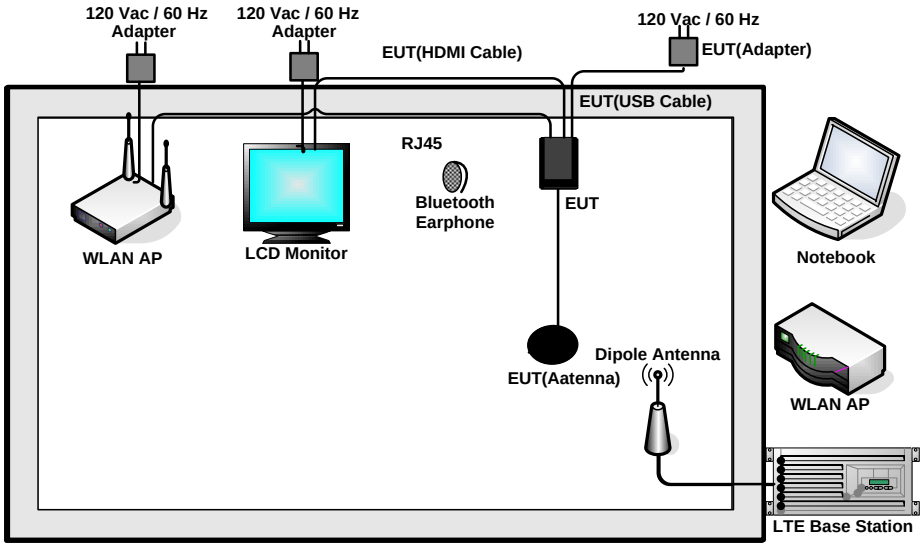
Test Cases	
AC Conducted Emission	Mode 1 : LTE Band 2 Idle + Bluetooth Link + WLAN Link(2.4G) + USB Cable (Charging from Adapter)
Remark: For Radiated TCs; the tests were performed with adapter and USB cable.	

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.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
3.	WLAN AP	Cisco	Air-AP1262N-A-K9	LDK102073	N/A	Unshielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
5.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	SD Card	Kingston	8GB	N/A	N/A	N/A
7.	LCD Monitor	Dell	IN1940MWb	Fcc DoC	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT (connect with Bluetooth base station to) 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.

Offset = RF cable loss

Following shows an offset computation example with cable loss 4.5dB.

Offset(dB) = RF cable loss(dB)

= 4.5 (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.

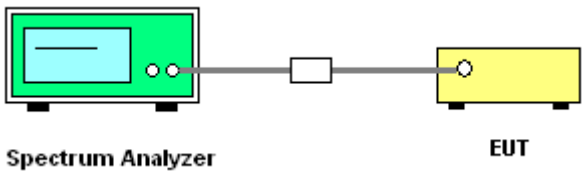
3.1.2 Measuring Instruments

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 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. Measure and record the results in the test report.

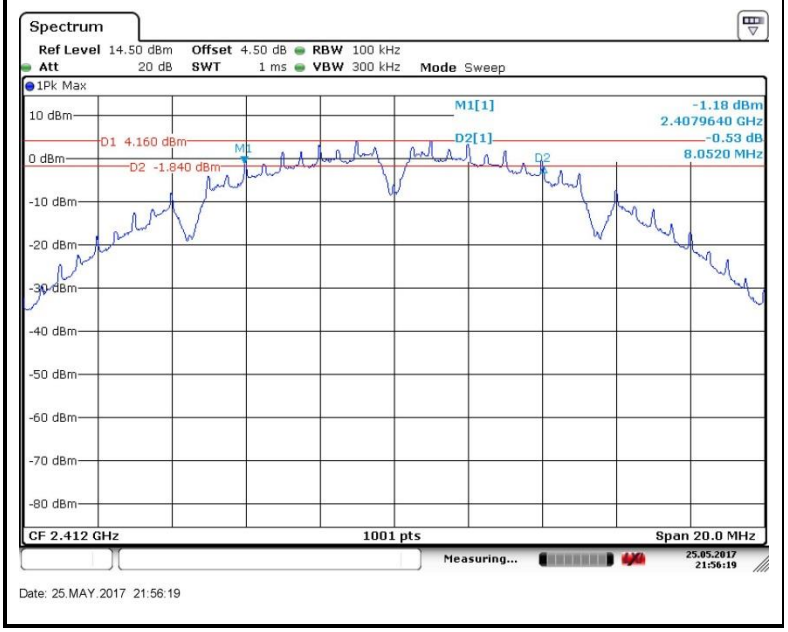
3.1.4 Test Setup



3.1.5 Test Result of 6dB

Please refer to Appendix A.

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.

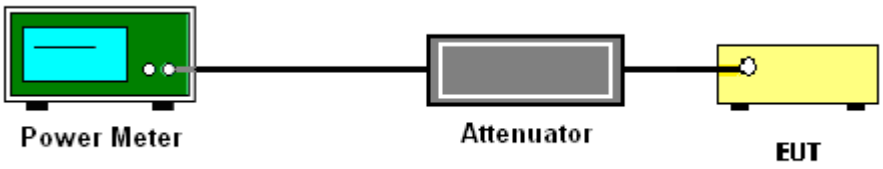
3.2.2 Measuring Instruments

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 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.

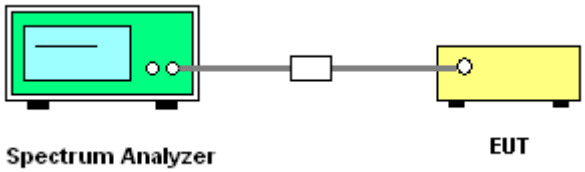
3.3.2 Measuring Instruments

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.

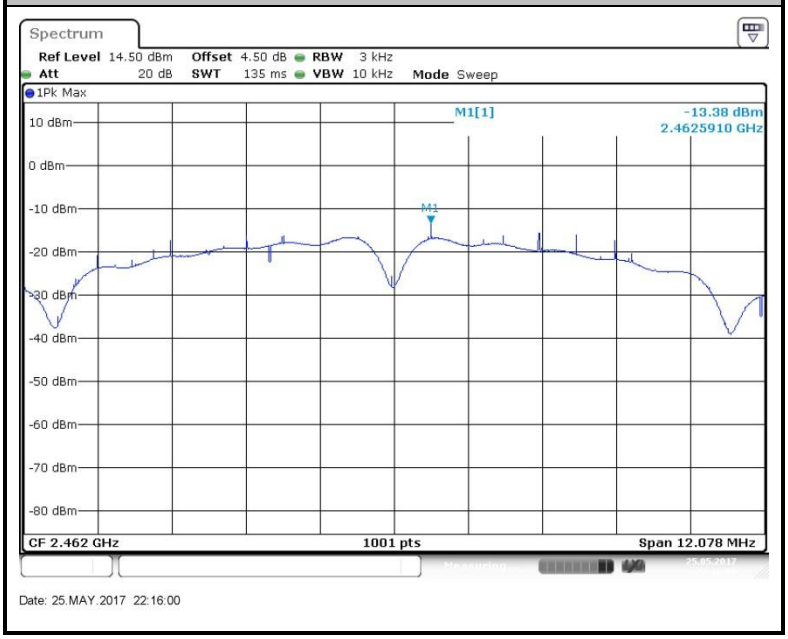
3.3.4 Test Setup



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.

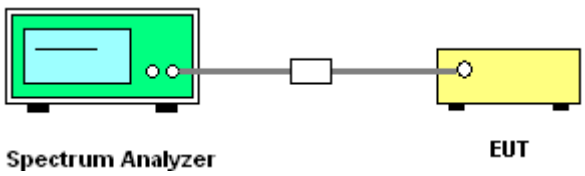
3.4.2 Measuring Instruments

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

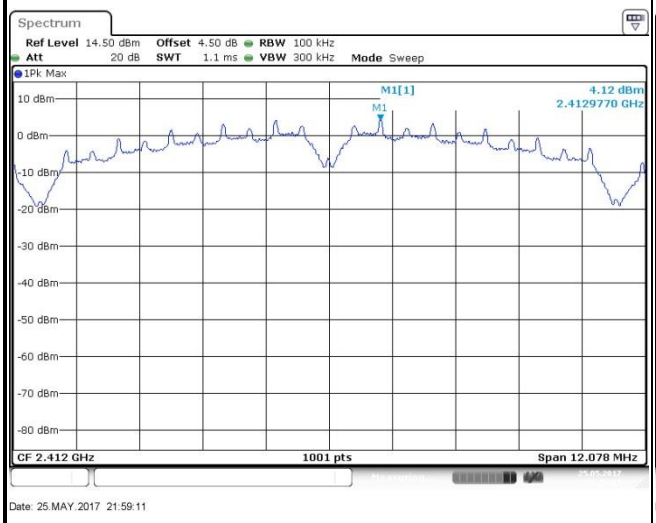


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

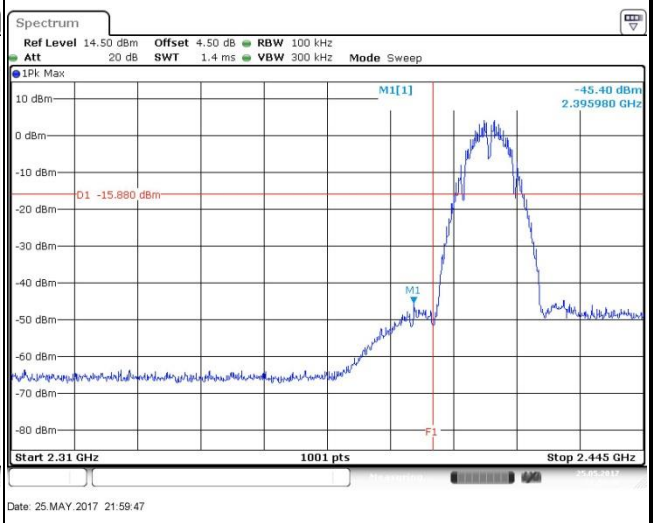
Test Mode :	802.11b	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~55%
Test Channel :	01	**Test Engineer :**	Silent Hai

WLAN 802.11b Channel 01

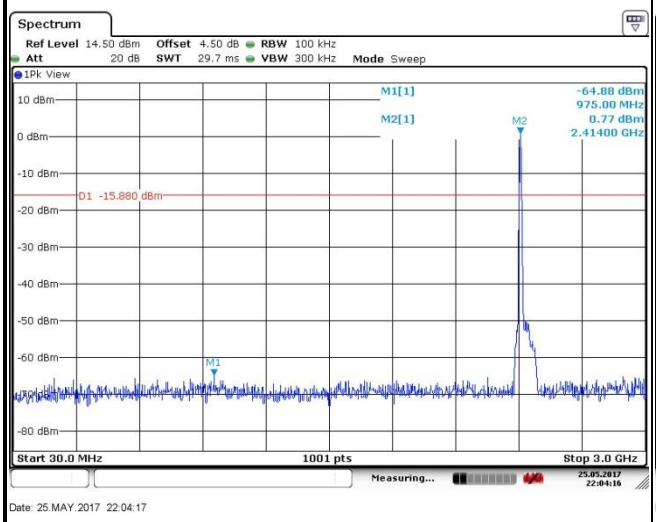
100kHz PSD reference Level



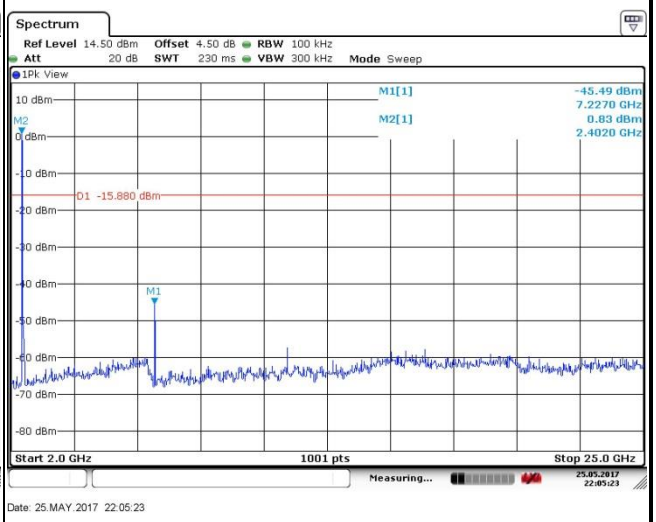
Low Channel Plot



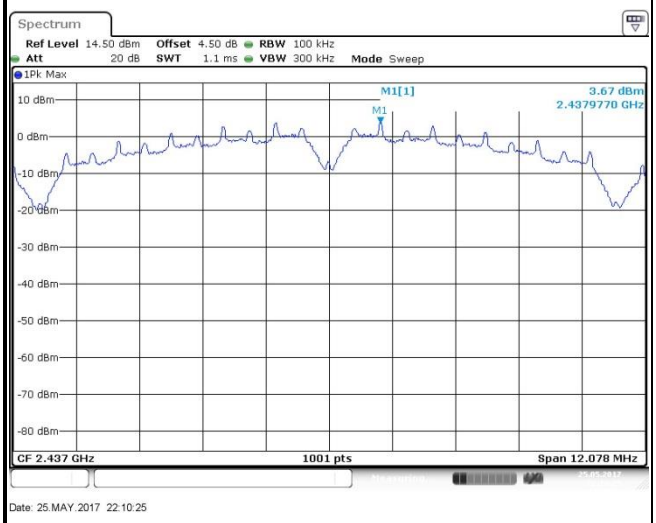
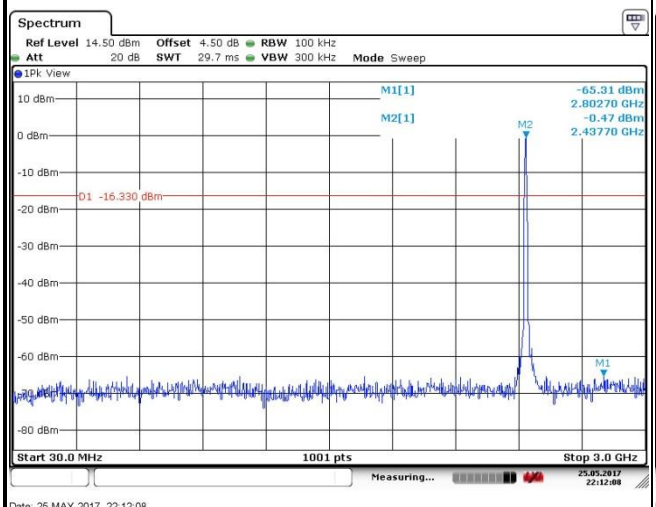
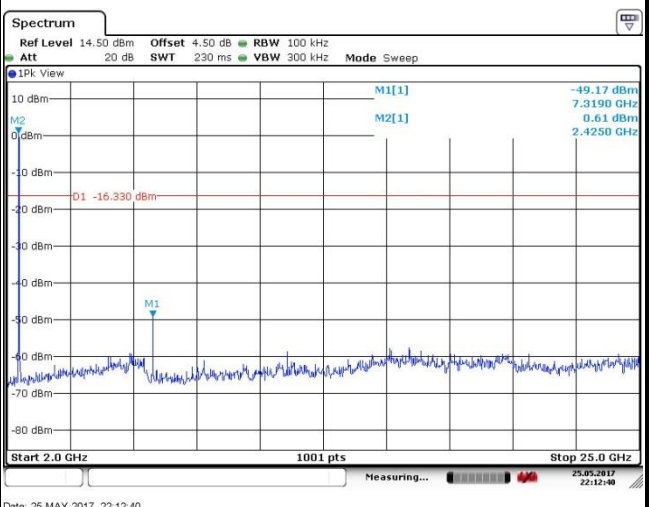
Spurious Emission 30MHz~3GHz



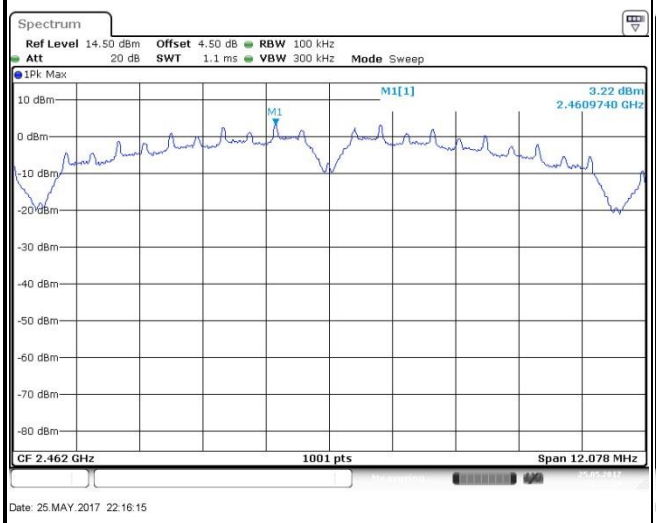
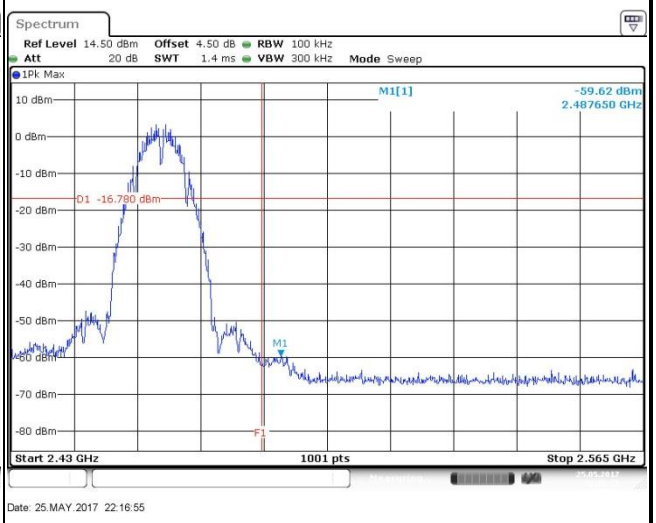
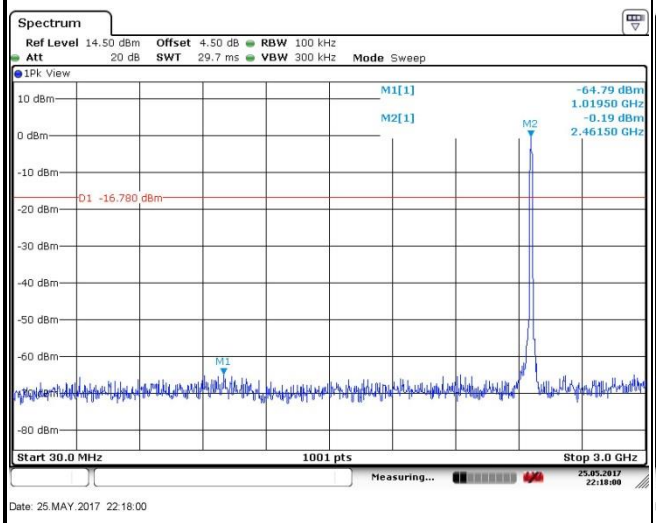
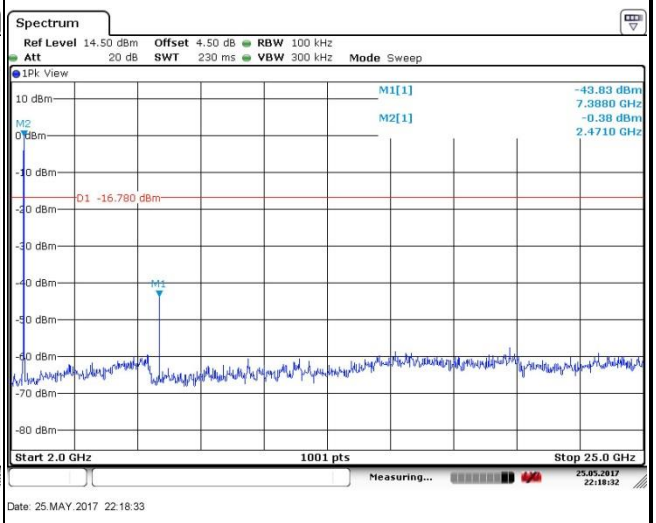
Spurious Emission 2GHz~25GHz



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
	

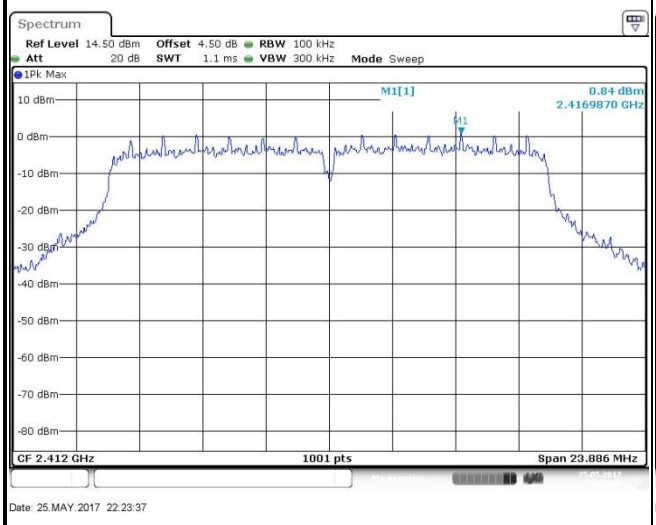
Test Mode :	802.11b	Temperature :	21~25℃
Test Band :	2.4GHz High	Relative Humidity :	51~55%
Test Channel :	11	Test Engineer :	Silent Hai

WLAN 802.11b Channel 11	
100kHz PSD reference Level	High Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

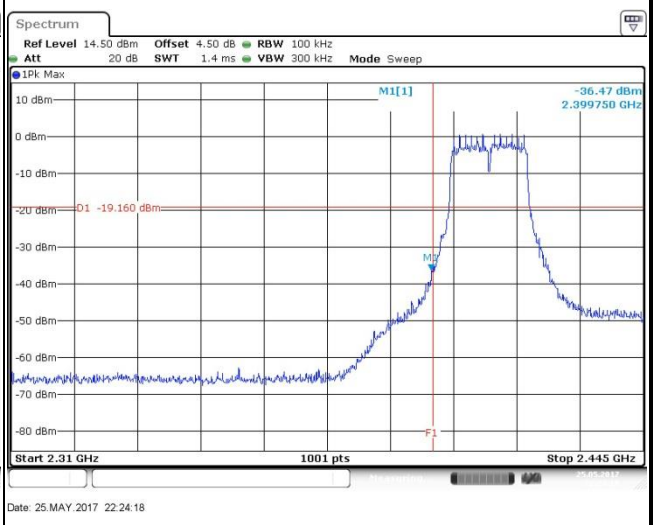
Test Mode :	802.11g	Temperature :	21~25℃
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	01	Test Engineer :	Silent Hai

WLAN 802.11g Channel 01

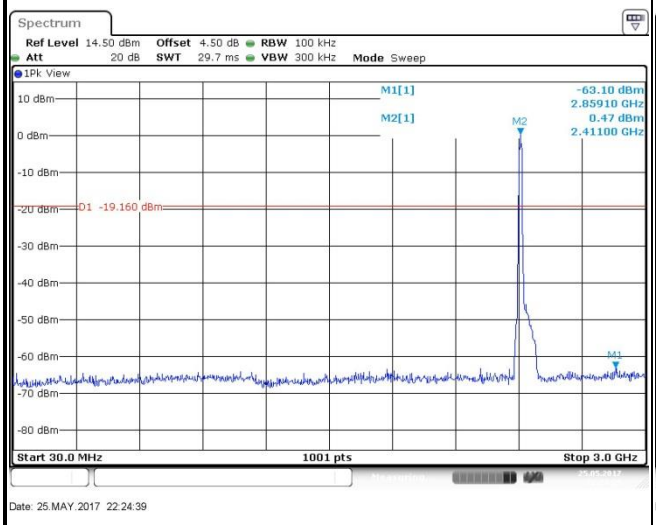
100kHz PSD reference Level



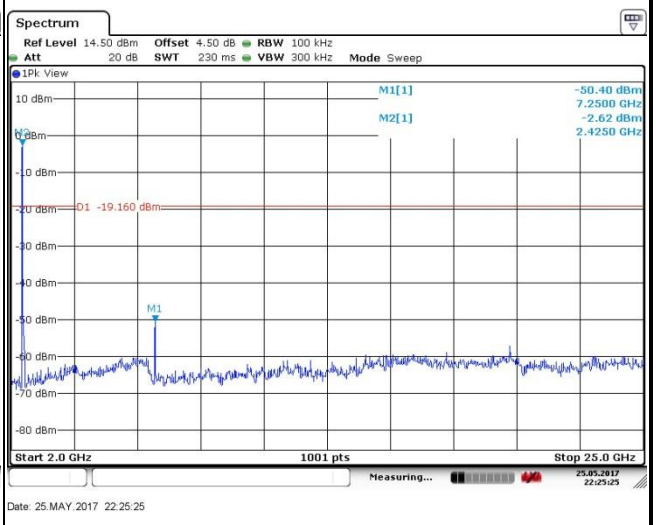
Low Channel Plot



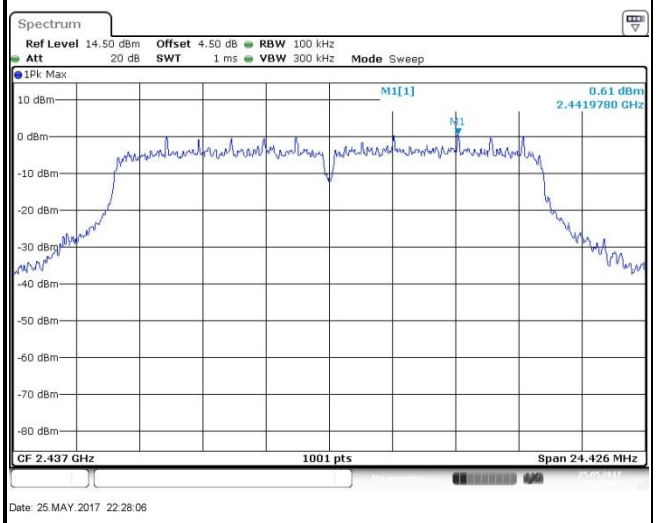
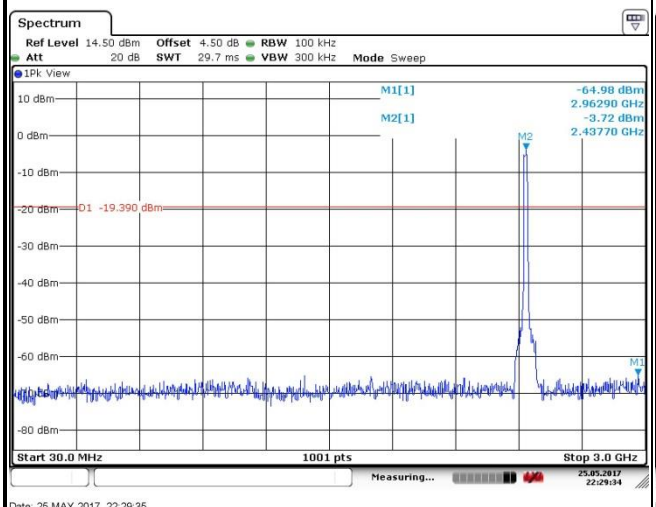
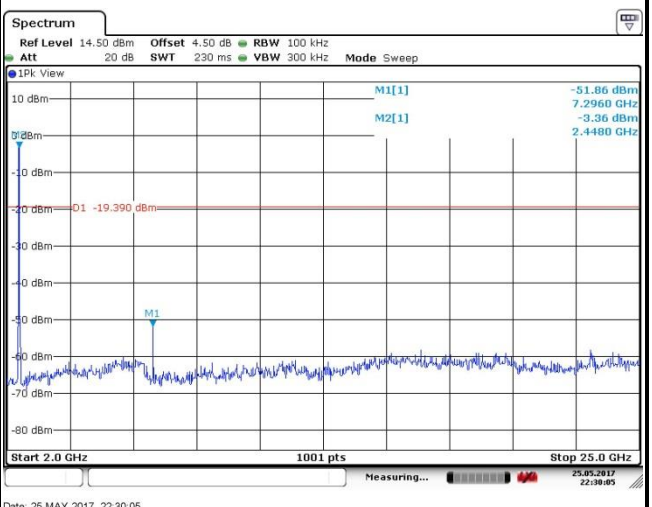
Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz



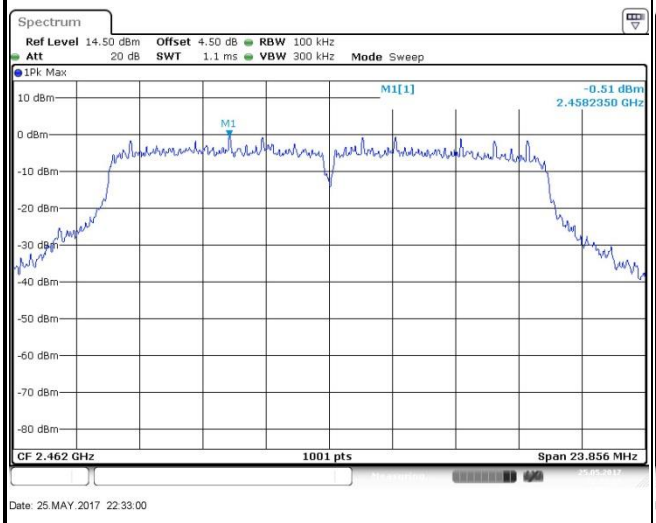
Test Mode :	802.11g	Temperature :	21~25℃
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11g Channel 06	
100kHz PSD reference Level	
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

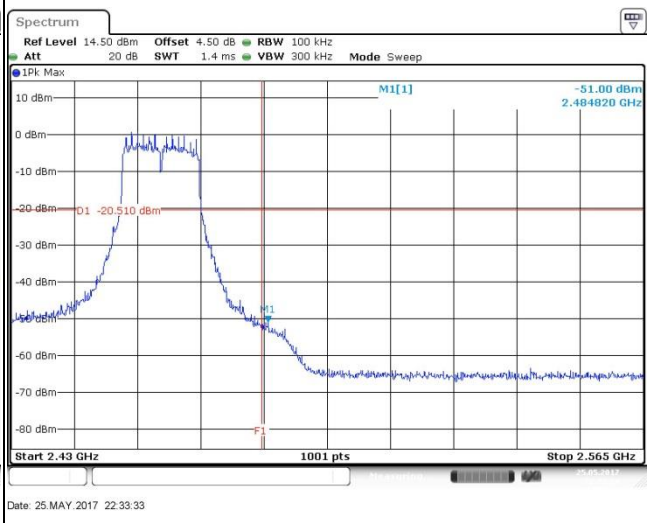
Test Mode :	802.11g	Temperature :	21~25℃
Test Band :	2.4GHz High	Relative Humidity :	51~55%
Test Channel :	11	Test Engineer :	Silent Hai

WLAN 802.11g Channel 11

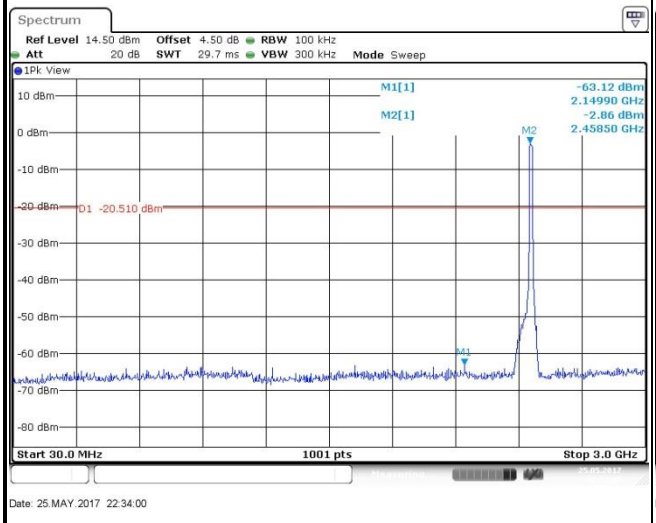
100kHz PSD reference Level



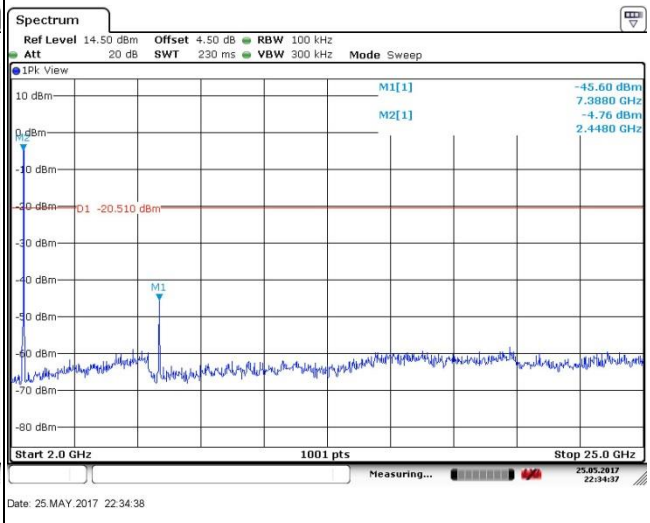
High Channel Plot



Spurious Emission 30MHz~3GHz



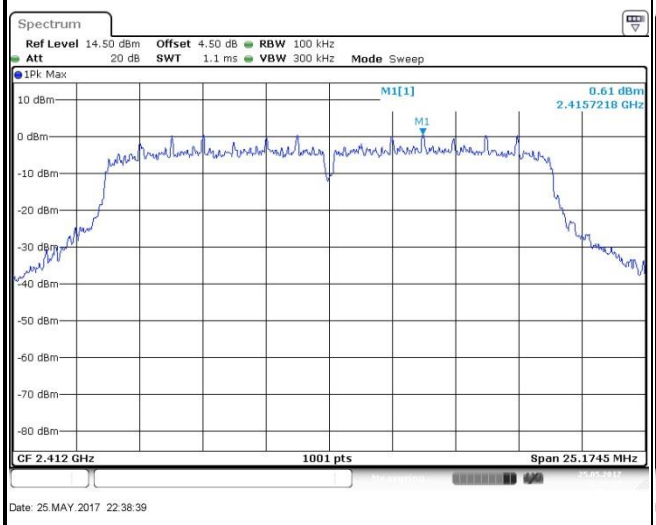
Spurious Emission 2GHz~25GHz



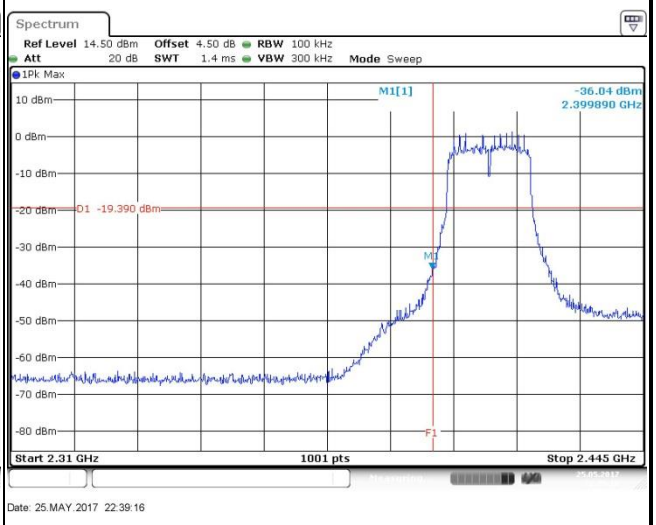
Test Mode :	802.11n HT20	Temperature :	21~25℃
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	01	Test Engineer :	Silent Hai

WLAN 802.11n HT20 Channel 01

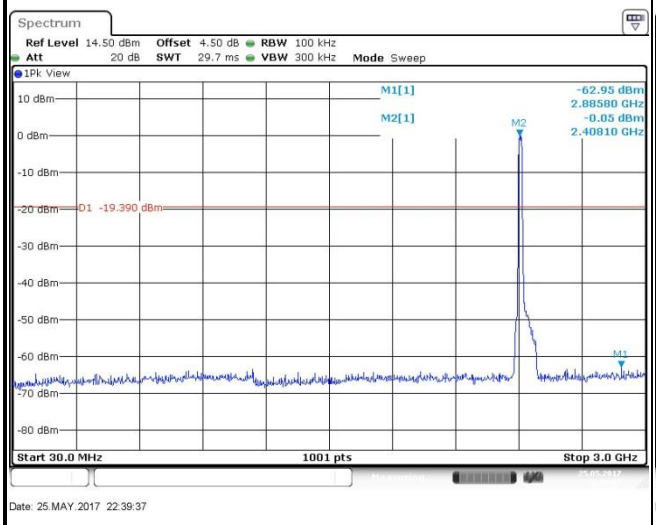
100kHz PSD reference Level



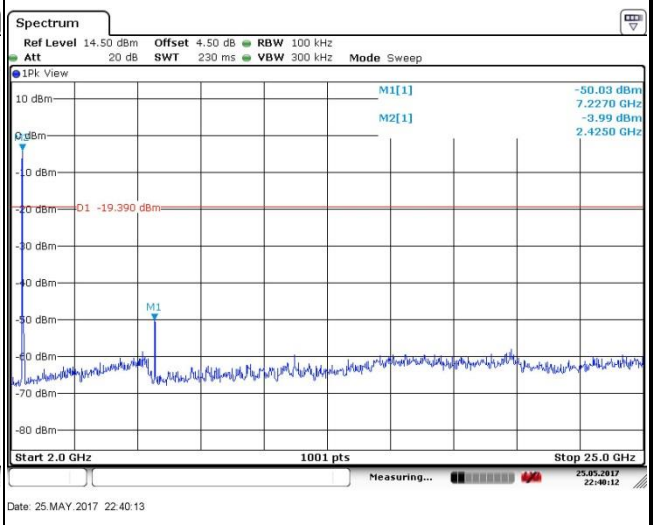
Low Channel Plot



Spurious Emission 30MHz~3GHz



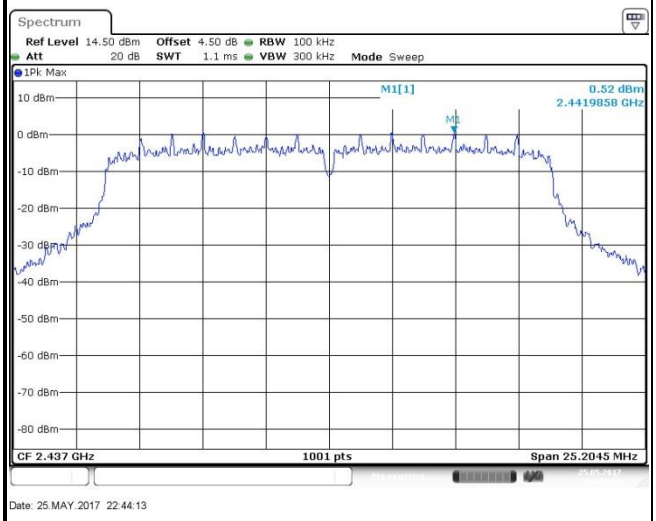
Spurious Emission 2GHz~25GHz



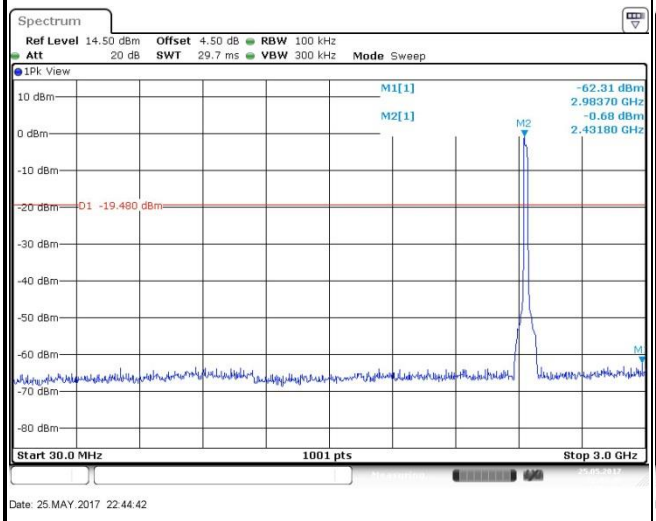
Test Mode :	802.11n HT20	Temperature :	21~25℃
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT20 Channel 06

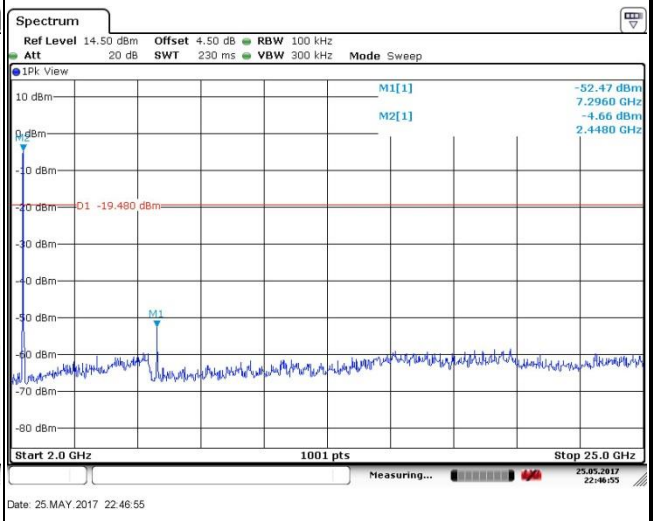
100kHz PSD reference Level



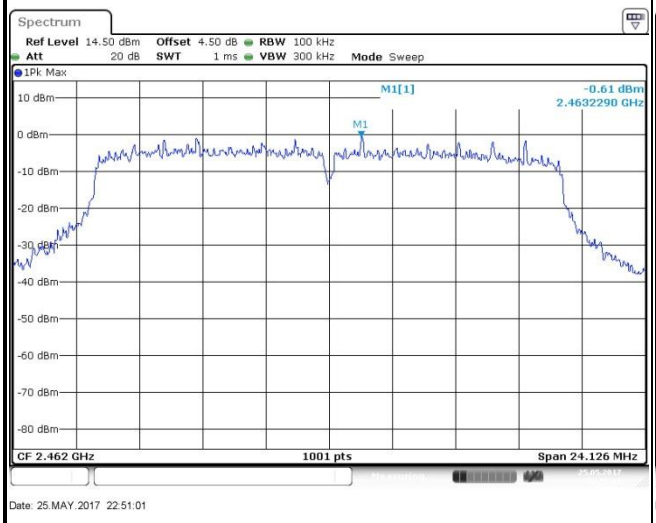
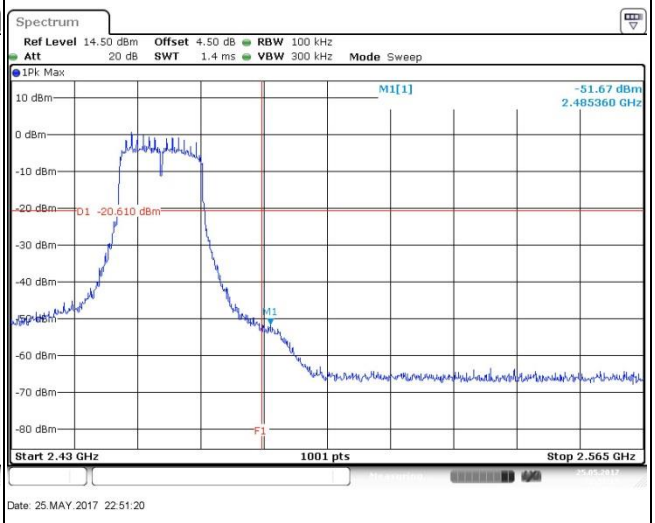
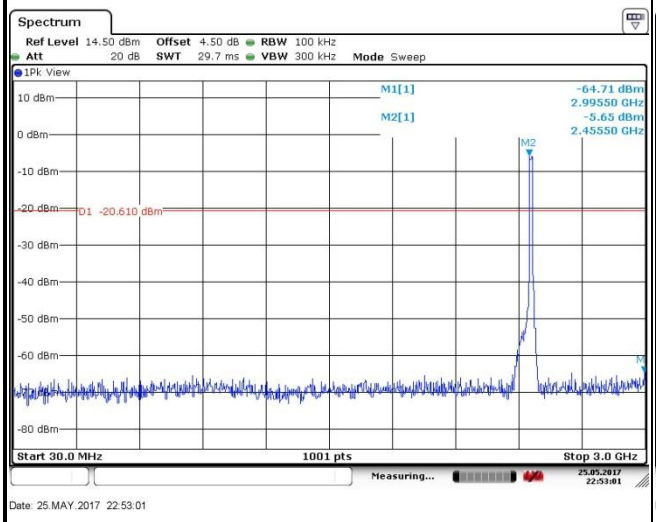
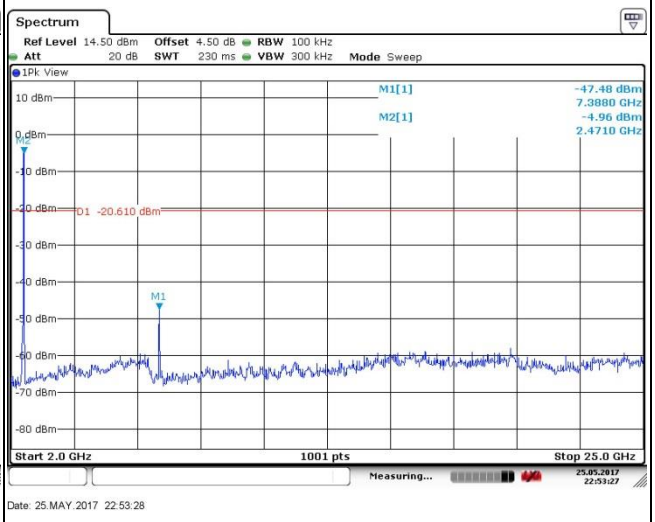
Spurious Emission 30MHz~3GHz



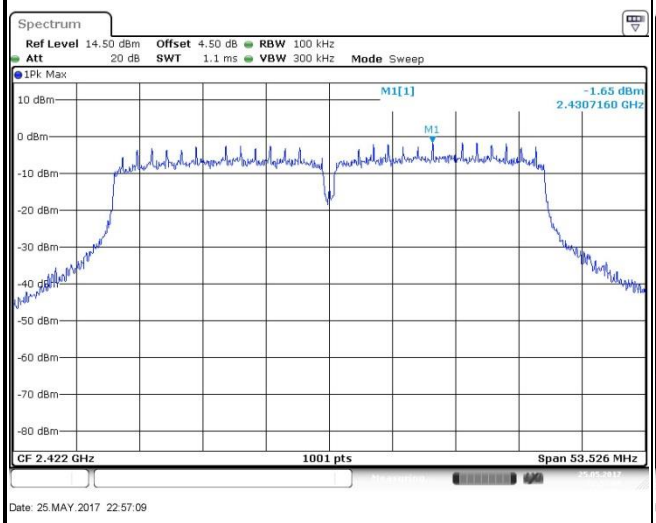
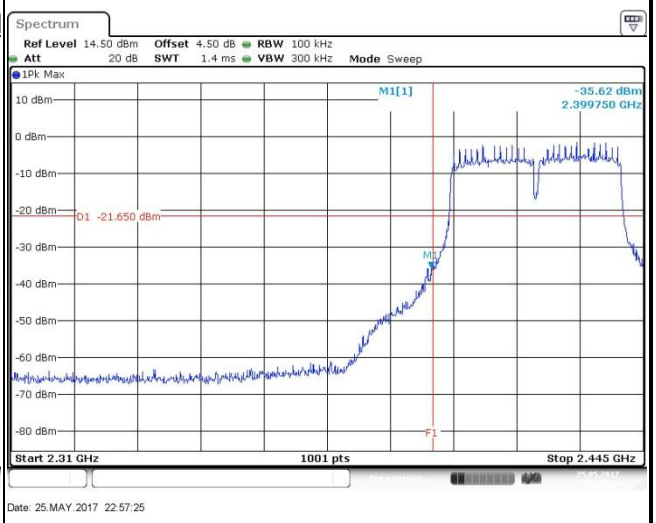
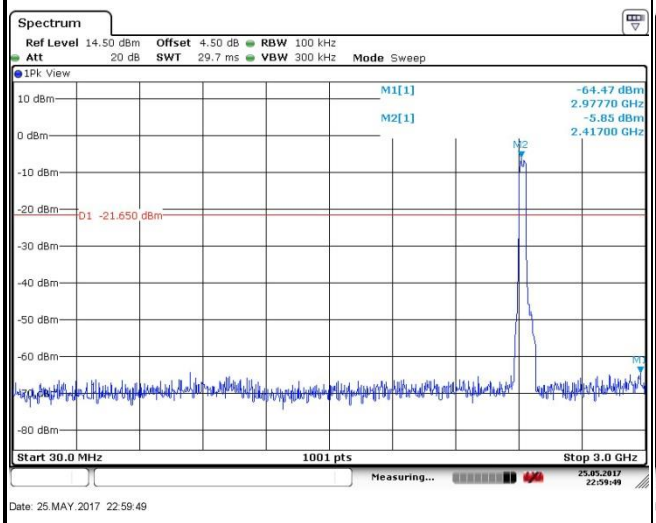
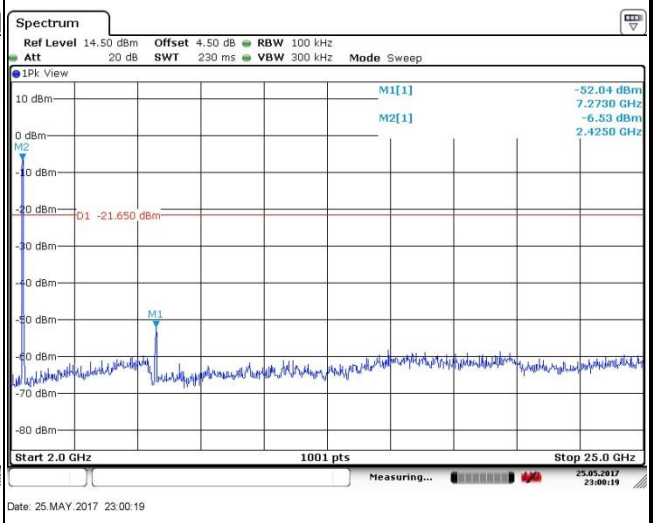
Spurious Emission 2GHz~25GHz



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
	

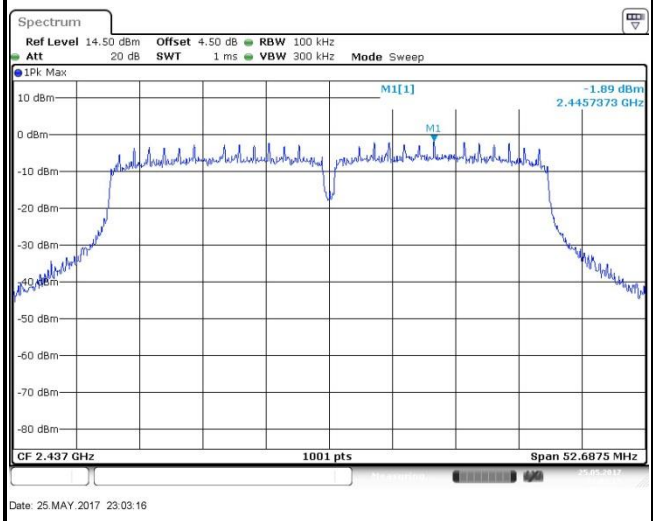
Test Mode :	802.11n HT40	Temperature :	21~25℃
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	03	Test Engineer :	Silent Hai

WLAN 802.11n HT40 Channel 03	
100kHz PSD reference Level	Low Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

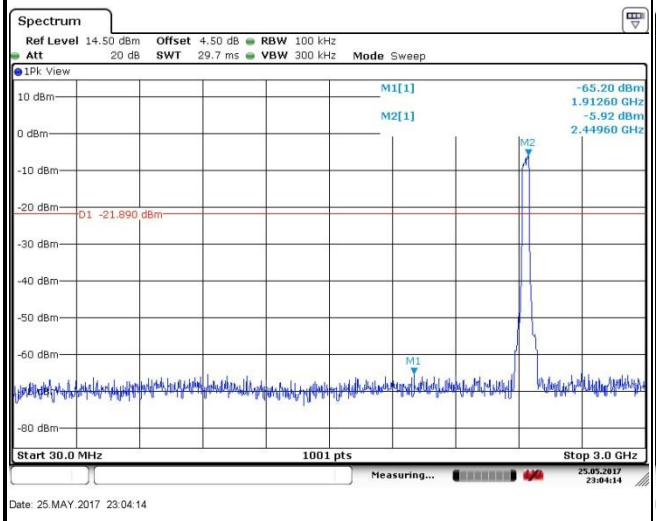
Test Mode :	802.11n HT40	Temperature :	21~25℃
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT40 Channel 06

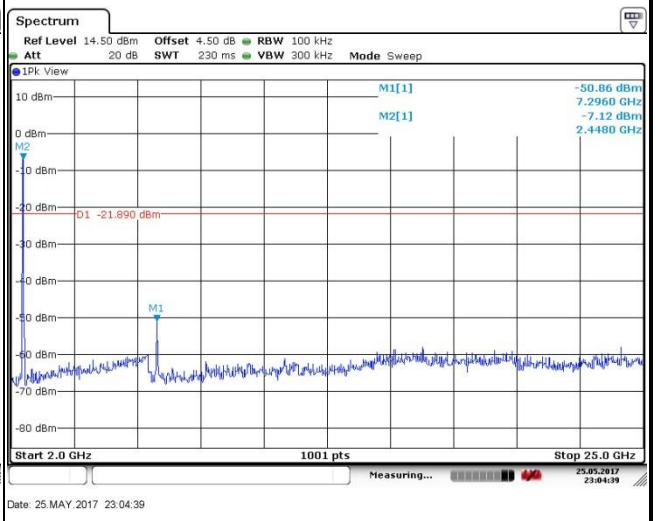
100kHz PSD reference Level



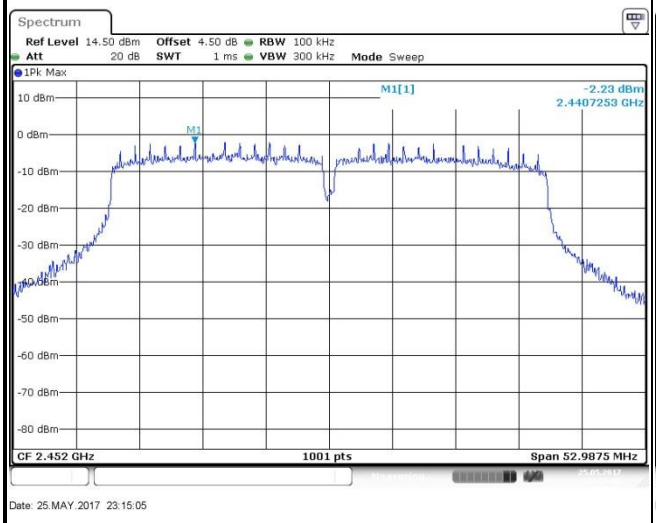
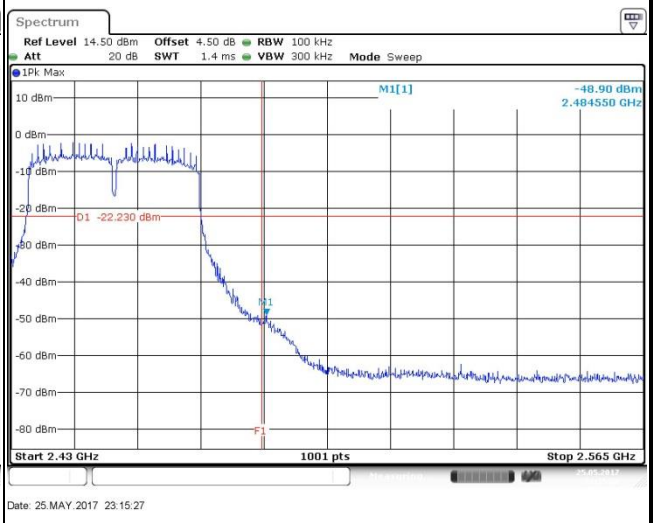
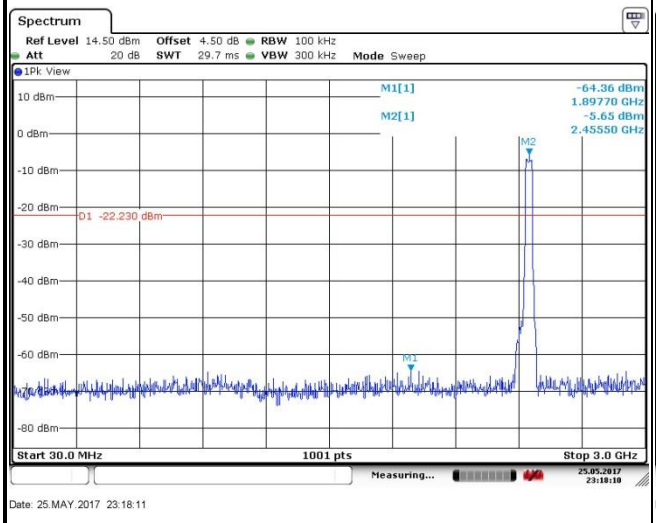
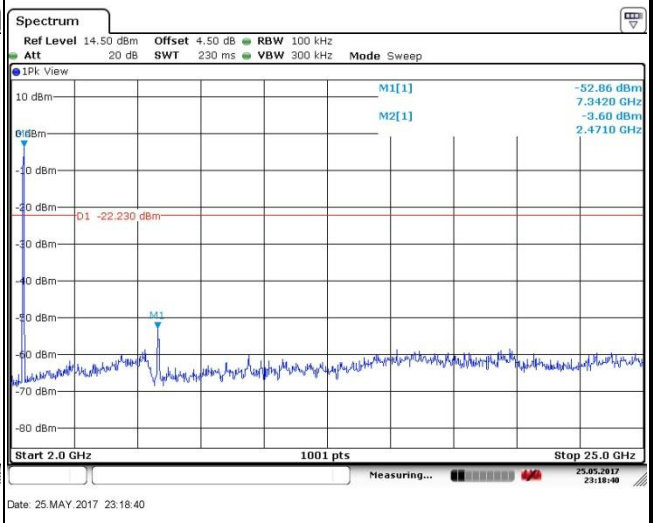
Spurious Emission 30MHz~3GHz



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	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 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

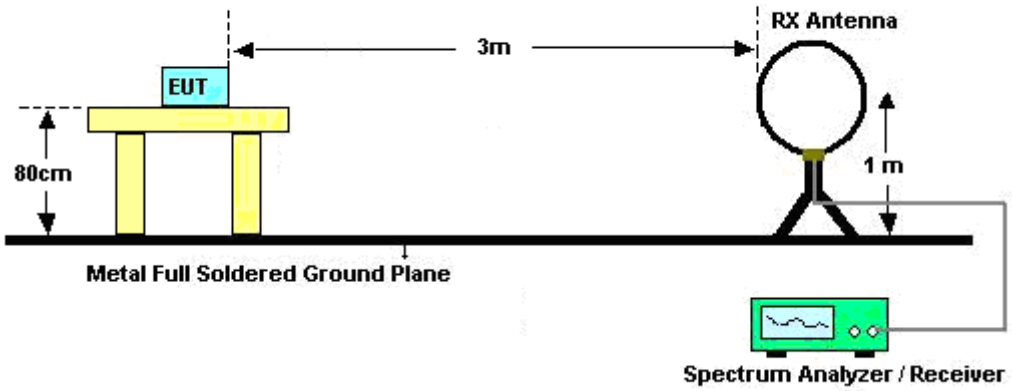
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

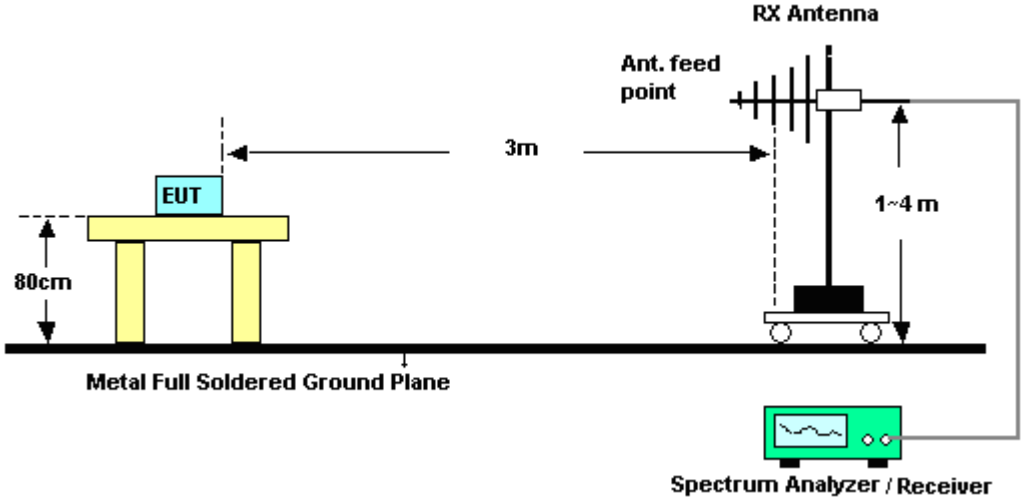
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test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

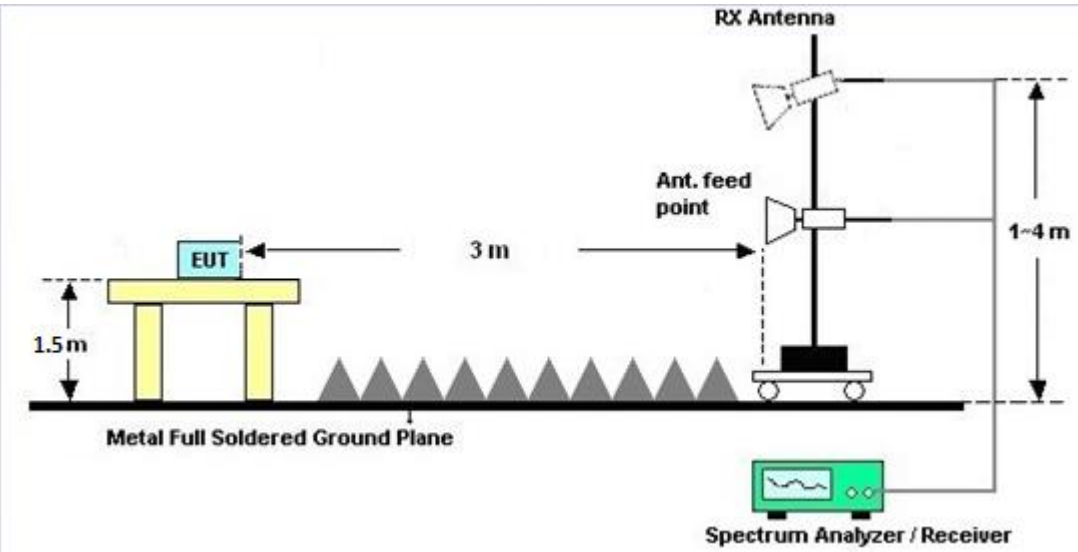
For radiated emissions below 30MHz



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.

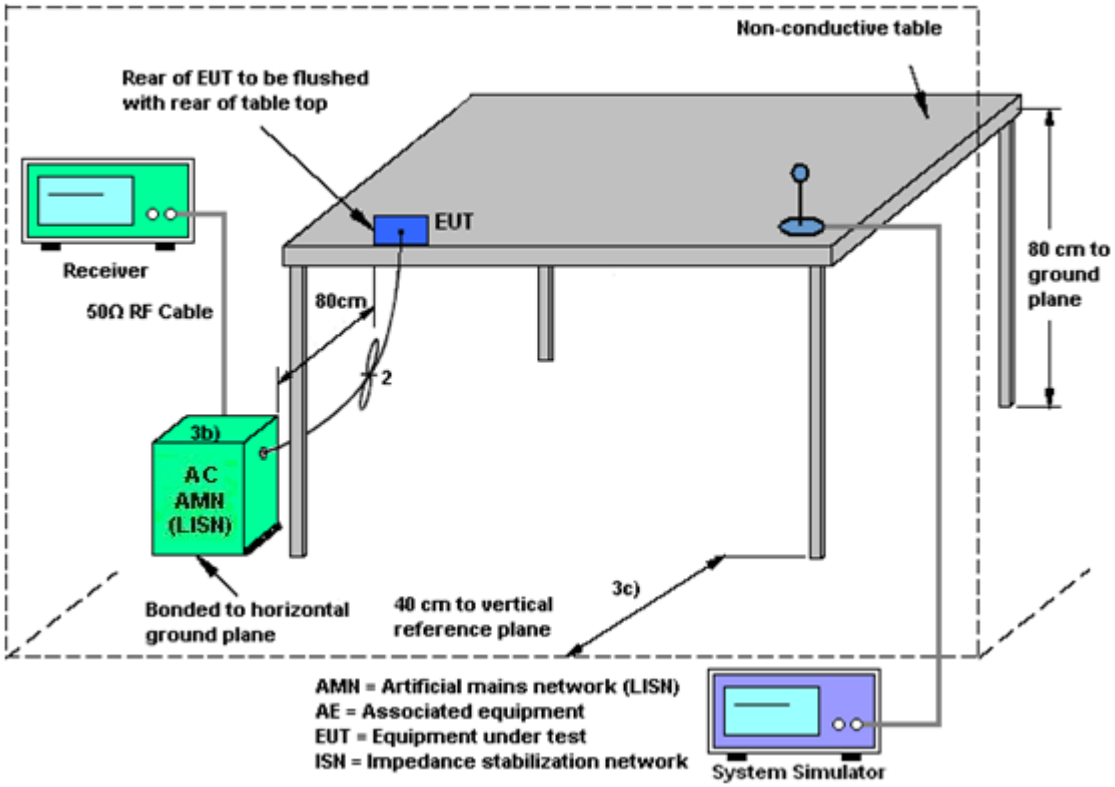
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

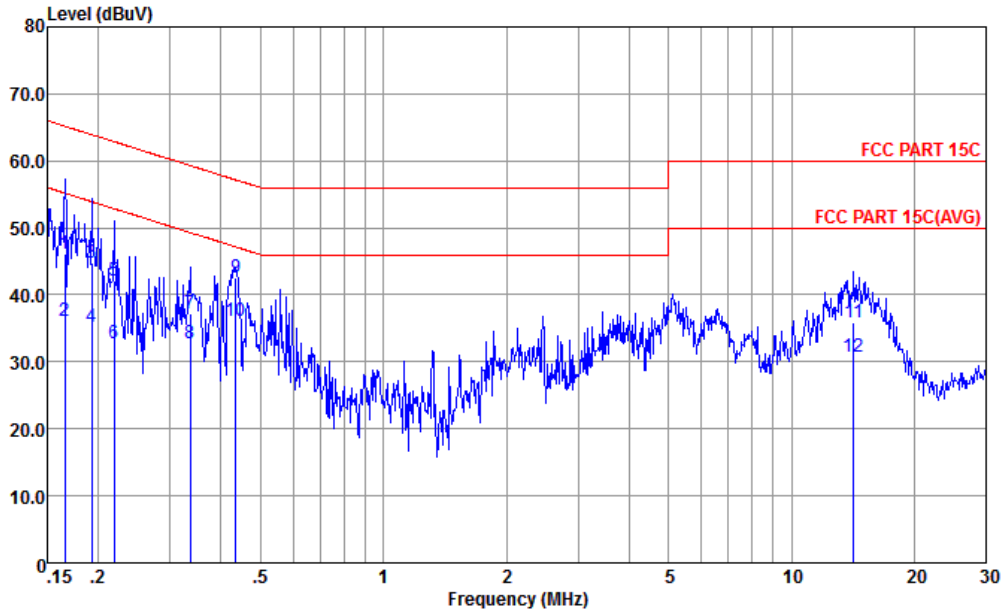
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 2 Idle + Bluetooth Link + WLAN Link(2.4G) + USB Cable (Charging from Adapter)		

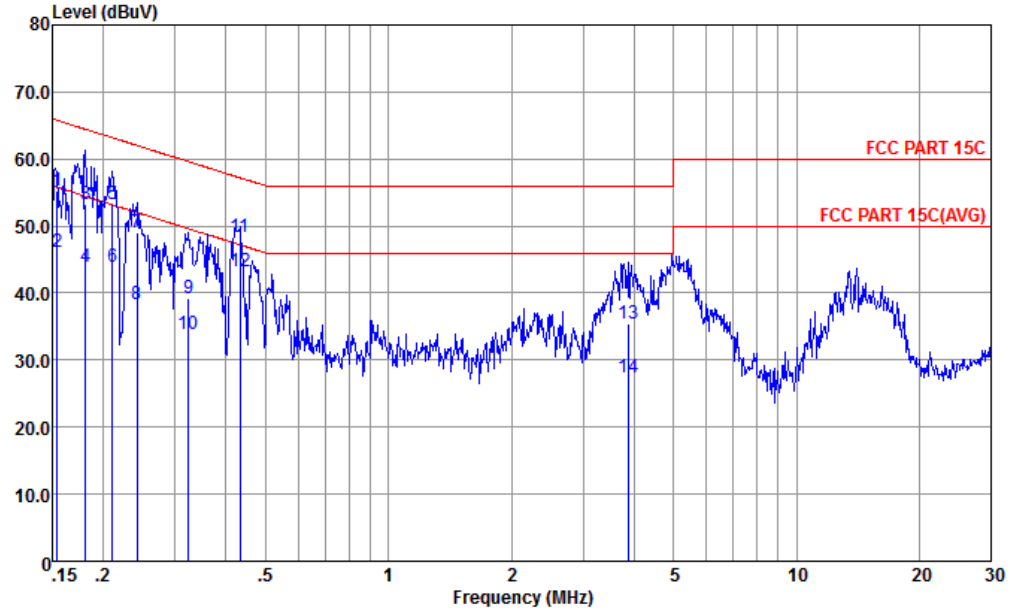


Site : CO01-KS
Condition : FCC PART 15C LISN-L-161017-060103 LINE

mode : Mode 1
: 865464030000055 #14

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.166	46.13	-19.03	65.16	35.31	0.45	10.37	QP
2		0.166	36.03	-19.13	55.16	25.21	0.45	10.37	Average
3		0.192	44.84	-19.09	63.93	34.20	0.30	10.34	QP
4		0.192	35.24	-18.69	53.93	24.60	0.30	10.34	Average
5		0.219	42.19	-20.69	62.88	31.60	0.27	10.32	QP
6		0.219	32.79	-20.09	52.88	22.20	0.27	10.32	Average
7		0.336	37.10	-22.21	59.31	26.60	0.27	10.23	QP
8		0.336	32.80	-16.51	49.31	22.30	0.27	10.23	Average
9		0.435	42.66	-14.49	57.15	32.20	0.27	10.19	QP
10	*	0.435	36.06	-11.09	47.15	25.60	0.27	10.19	Average
11		14.213	35.92	-24.08	60.00	25.21	0.28	10.43	QP
12		14.213	30.82	-19.18	50.00	20.11	0.28	10.43	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 2 Idle + Bluetooth Link + WLAN Link(2.4G) + USB Cable (Charging from Adapter)		



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

mode : Mode 1
: 865464030000055 #14

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.154	55.33	-10.45	65.78	44.60	0.34	10.39	QP
2		0.154	46.03	-9.75	55.78	35.30	0.34	10.39	Average
3		0.181	53.29	-11.17	64.46	42.61	0.33	10.35	QP
4		0.181	43.99	-10.47	54.46	33.31	0.33	10.35	Average
5		0.211	53.26	-9.92	63.18	42.61	0.33	10.32	QP
6		0.211	43.96	-9.22	53.18	33.31	0.33	10.32	Average
7		0.242	48.94	-13.10	62.04	38.30	0.34	10.30	QP
8		0.242	38.24	-13.80	52.04	27.60	0.34	10.30	Average
9		0.323	39.20	-20.42	59.62	28.60	0.36	10.24	QP
10		0.323	33.90	-15.72	49.62	23.30	0.36	10.24	Average
11		0.433	48.47	-8.73	57.20	37.90	0.37	10.20	QP
12	*	0.433	43.17	-4.03	47.20	32.60	0.37	10.20	Average
13		3.860	35.53	-20.47	56.00	24.90	0.39	10.24	QP
14		3.860	27.43	-18.57	46.00	16.80	0.39	10.24	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 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. 09, 2016	May 23, 2017~ May 25, 2017	Aug. 08, 2017	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 19, 2017	May 23, 2017~ May 25, 2017	Jan. 18, 2018	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 19, 2017	May 23, 2017~ May 25, 2017	Jan. 18, 2018	Conducted (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2017	May 29, 2017	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2016	May 29, 2017	Oct. 12, 2017	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2016	May 29, 2017	Oct. 12, 2017	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 13, 2016	May 29, 2017	Oct. 12, 2017	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Aug. 09, 2016	May 23, 2017~ May 29, 2017	Aug. 08, 2017	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44G,MAX 30dB	Apr. 18, 2017	May 23, 2017~ May 29, 2017	Apr. 17, 2018	Radiation (03CH02-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 23, 2016	May 23, 2017~ May 29, 2017	Nov. 22, 2017	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	37879	30MHz-2GHz	Aug. 20, 2016	May 23, 2017~ May 29, 2017	Aug. 19, 2017	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 22, 2016	May 23, 2017~ May 29, 2017	Oct. 21, 2017	Radiation (03CH02-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz ~40GHz	Feb. 15, 2017	May 23, 2017~ May 29, 2017	Feb. 14, 2018	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 09, 2016	May 23, 2017~ May 29, 2017	Aug. 08, 2017	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1GHz~26.5GHz	Oct. 13, 2016	May 23, 2017~ May 29, 2017	Oct. 12, 2017	Radiation (03CH02-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Oct. 13, 2016	May 23, 2017~ May 29, 2017	Oct. 12, 2017	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	May 23, 2017~ May 29, 2017	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	May 23, 2017~ May 29, 2017	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	May 23, 2017~ May 29, 2017	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required.

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.3 dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1GMHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18GMHz)

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.3 dB**

Appendix A. Conducted Test Results

Report Number : FR750402C

A1 - DTS Part

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2017/5/23~2017/5/25	Relative Humidity:	51~55	%

Report Number : FR750402C

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	13.29	8.05	0.50	Pass
11b	1Mbps	1	6	2437	13.24	8.05	0.50	Pass
11b	1Mbps	1	11	2462	13.19	8.05	0.50	Pass
11g	6Mbps	1	1	2412	17.03	15.92	0.50	Pass
11g	6Mbps	1	6	2437	17.08	16.28	0.50	Pass
11g	6Mbps	1	11	2462	17.03	15.90	0.50	Pass
HT20	MCS0	1	1	2412	18.08	16.78	0.50	Pass
HT20	MCS0	1	6	2437	18.13	16.80	0.50	Pass
HT20	MCS0	1	11	2462	18.08	16.08	0.50	Pass
HT40	MCS0	1	3	2422	36.36	35.68	0.50	Pass
HT40	MCS0	1	6	2437	36.56	35.13	0.50	Pass
HT40	MCS0	1	9	2452	36.56	35.33	0.50	Pass

Report Number : FR750402C

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	14.81	30.00	-1.90	12.91	36.00	Pass
11b	1Mbps	1	6	2437	14.56	30.00	-1.90	12.66	36.00	Pass
11b	1Mbps	1	11	2462	14.12	30.00	-1.90	12.22	36.00	Pass
11g	6Mbps	1	1	2412	18.17	30.00	-1.90	16.27	36.00	Pass
11g	6Mbps	1	6	2437	17.95	30.00	-1.90	16.05	36.00	Pass
11g	6Mbps	1	11	2462	17.65	30.00	-1.90	15.75	36.00	Pass
HT20	MCS0	1	1	2412	18.28	30.00	-1.90	16.38	36.00	Pass
HT20	MCS0	1	6	2437	17.95	30.00	-1.90	16.05	36.00	Pass
HT20	MCS0	1	11	2462	17.56	30.00	-1.90	15.66	36.00	Pass
HT40	MCS0	1	3	2422	18.68	30.00	-1.90	16.78	36.00	Pass
HT40	MCS0	1	6	2437	18.65	30.00	-1.90	16.75	36.00	Pass
HT40	MCS0	1	9	2452	18.59	30.00	-1.90	16.69	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	0.00	12.15
11b	1Mbps	1	6	2437	0.00	11.76
11b	1Mbps	1	11	2462	0.00	11.44
11g	6Mbps	1	1	2412	0.24	11.96
11g	6Mbps	1	6	2437	0.24	11.60
11g	6Mbps	1	11	2462	0.24	11.15
HT20	MCS0	1	1	2412	0.25	11.80
HT20	MCS0	1	6	2437	0.25	11.48
HT20	MCS0	1	11	2462	0.25	11.03
HT40	MCS0	1	3	2422	0.50	12.01
HT40	MCS0	1	6	2437	0.50	11.91
HT40	MCS0	1	9	2452	0.50	11.72

Report Number : FR750402C

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	-13.96	-1.90	8.00	Pass
11b	1Mbps	1	6	2437	-14.74	-1.90	8.00	Pass
11b	1Mbps	1	11	2462	-13.38	-1.90	8.00	Pass
11g	6Mbps	1	1	2412	-15.47	-1.90	8.00	Pass
11g	6Mbps	1	6	2437	-15.33	-1.90	8.00	Pass
11g	6Mbps	1	11	2462	-16.59	-1.90	8.00	Pass
HT20	MCS0	1	1	2412	-16.27	-1.90	8.00	Pass
HT20	MCS0	1	6	2437	-15.75	-1.90	8.00	Pass
HT20	MCS0	1	11	2462	-16.86	-1.90	8.00	Pass
HT40	MCS0	1	3	2422	-18.47	-1.90	8.00	Pass
HT40	MCS0	1	6	2437	-18.18	-1.90	8.00	Pass
HT40	MCS0	1	9	2452	-18.41	-1.90	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		2389.3	45.51	-28.49	74	47.65	25.4	4.76	32.3	265	11	P	H
		2389.95	32.64	-21.36	54	34.78	25.4	4.76	32.3	265	11	A	H
	*	2414	97.98	-	-	99.97	25.54	4.78	32.31	265	11	P	H
	*	2412	93.24	-	-	95.23	25.54	4.78	32.31	265	11	A	H
		2389.82	48.81	-25.19	74	50.95	25.4	4.76	32.3	215	148	P	V
		2389.95	39.09	-14.91	54	41.23	25.4	4.76	32.3	215	148	A	V
	*	2412	102.83	-	-	104.82	25.54	4.78	32.31	215	148	P	V
	*	2414	99.46	-	-	101.45	25.54	4.78	32.31	215	148	A	V
802.11b CH 06 2437MHz		2373.31	46.39	-27.61	74	48.57	25.35	4.75	32.28	158	4	P	H
		2389.95	34.89	-19.11	54	37.03	25.4	4.76	32.3	158	4	A	H
	*	2438	98.58	-	-	100.27	25.83	4.82	32.34	158	4	P	H
	*	2438	95.04	-	-	96.73	25.83	4.82	32.34	158	4	A	H
		2498.74	47.76	-26.24	74	49.01	26.26	4.88	32.39	158	4	P	H
		2485.12	35.87	-18.13	54	37.27	26.11	4.86	32.37	158	4	A	H
		2350.04	46.26	-27.74	74	48.56	25.24	4.71	32.25	215	149	P	V
		2389.95	35.49	-18.51	54	37.63	25.4	4.76	32.3	215	149	A	V
	*	2438	102.07	-	-	103.76	25.83	4.82	32.34	215	149	P	V
	*	2438	98.89	-	-	100.58	25.83	4.82	32.34	215	149	A	V
		2484.16	47.97	-26.03	74	49.37	26.11	4.86	32.37	215	149	P	V
		2484.1	36.13	-17.87	54	37.53	26.11	4.86	32.37	215	149	A	V

802.11b CH 11 2462MHz	*	2462	101.86	-	-	103.41	25.97	4.84	32.36	291	178	P	H
	*	2460	98.55	-	-	100.1	25.97	4.84	32.36	291	178	A	H
		2488.36	48.04	-25.96	74	49.29	26.26	4.88	32.39	291	178	P	H
		2488.3	38	-16	54	39.25	26.26	4.88	32.39	291	178	A	H
	*	2462	101.6	-	-	103.15	25.97	4.84	32.36	296	131	P	V
	*	2460	98.27	-	-	99.82	25.97	4.84	32.36	296	131	A	V
		2486.56	48.25	-25.75	74	49.65	26.11	4.86	32.37	296	131	P	V
		2488.78	37.7	-16.3	54	38.95	26.26	4.88	32.39	296	131	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	40.8	-33.2	74	64.34	30.9	6.87	61.31	152	360	P	H
		4824	39.66	-34.34	74	63.2	30.9	6.87	61.31	152	360	P	V
802.11b CH 06 2437MHz		4872	38.83	-35.17	74	62.16	31.01	6.86	61.2	152	360	P	H
		7308	43	-31	74	62.29	35.34	8.47	63.1	152	360	P	H
		4872	38.07	-35.93	74	61.4	31.01	6.86	61.2	152	360	P	V
		7308	44.43	-29.57	74	63.72	35.34	8.47	63.1	152	360	P	V
802.11b CH 11 2462MHz		4926	38.3	-35.7	74	61.42	31.12	6.84	61.08	152	360	P	H
		7386	41.07	-32.93	74	60.2	35.55	8.49	63.17	152	360	P	H
		4926	39.93	-34.07	74	63.05	31.12	6.84	61.08	152	360	P	V
		7386	43.78	-30.22	74	62.91	35.55	8.49	63.17	152	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		2389.56	47.83	-26.17	74	49.97	25.4	4.76	32.3	204	24	P	H
		2389.95	38.37	-15.63	54	40.51	25.4	4.76	32.3	204	24	A	H
	*	2416	99.65	-	-	101.64	25.54	4.78	32.31	204	24	P	H
	*	2416	91.74	-	-	93.73	25.54	4.78	32.31	204	24	A	H
		2389.3	52.93	-21.07	74	55.07	25.4	4.76	32.3	185	151	P	V
		2389.95	42.64	-11.36	54	44.78	25.4	4.76	32.3	185	151	A	V
	*	2408	103.55	-	-	105.54	25.54	4.78	32.31	185	151	P	V
	*	2414	95.43	-	-	97.42	25.54	4.78	32.31	185	151	A	V
802.11g CH 06 2437MHz		2373.57	46.69	-27.31	74	48.87	25.35	4.75	32.28	143	23	P	H
		2389.95	36.01	-17.99	54	38.15	25.4	4.76	32.3	143	23	A	H
	*	2444	98.82	-	-	100.51	25.83	4.82	32.34	143	23	P	H
	*	2442	90.78	-	-	92.47	25.83	4.82	32.34	143	23	A	H
		2483.8	49.09	-24.91	74	50.49	26.11	4.86	32.37	143	23	P	H
		2483.5	38.8	-15.2	54	40.2	26.11	4.86	32.37	143	23	A	H
		2389.3	48.15	-25.85	74	50.29	25.4	4.76	32.3	170	133	P	V
		2389.95	38.85	-15.15	54	40.99	25.4	4.76	32.3	170	133	A	V
	*	2440	103.61	-	-	105.3	25.83	4.82	32.34	170	133	P	V
	*	2442	95.67	-	-	97.36	25.83	4.82	32.34	170	133	A	V
		2484.22	49.6	-24.4	74	51	26.11	4.86	32.37	170	133	P	V
		2483.98	39.74	-14.26	54	41.14	26.11	4.86	32.37	170	133	A	V

802.11g CH 11 2462MHz	*	2460	99.53	-	-	101.08	25.97	4.84	32.36	192	4	P	H
	*	2458	91.51	-	-	93.06	25.97	4.84	32.36	192	4	A	H
		2483.62	50.8	-23.2	74	52.2	26.11	4.86	32.37	192	4	P	H
		2483.5	40.81	-13.19	54	42.21	26.11	4.86	32.37	192	4	A	H
	*	2460	103.17	-	-	104.72	25.97	4.84	32.36	257	134	P	V
	*	2460	95.24	-	-	96.79	25.97	4.84	32.36	257	134	A	V
		2483.92	53.37	-20.63	74	54.77	26.11	4.86	32.37	257	134	P	V
		2483.5	43.28	-10.72	54	44.68	26.11	4.86	32.37	257	134	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	39.35	-34.65	74	62.89	30.9	6.87	61.31	152	360	P	H
		4824	38.73	-35.27	74	62.27	30.9	6.87	61.31	152	360	P	V
802.11g CH 06 2437MHz		4872	38.17	-35.83	74	61.5	31.01	6.86	61.2	152	360	P	H
		7308	40.72	-33.28	74	60.01	35.34	8.47	63.1	152	360	P	H
		4872	37.56	-36.44	74	60.89	31.01	6.86	61.2	152	360	P	V
		7308	43.63	-30.37	74	62.92	35.34	8.47	63.1	152	360	P	V
802.11g CH 11 2462MHz		4926	37.87	-36.13	74	60.99	31.12	6.84	61.08	152	360	P	H
		7386	40.27	-33.73	74	59.4	35.55	8.49	63.17	152	360	P	H
		4926	38.56	-35.44	74	61.68	31.12	6.84	61.08	152	360	P	V
		7386	39.53	-34.47	74	58.66	35.55	8.49	63.17	152	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 802.11n 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)
		2389.95	49.57	-24.43	74	51.71	25.4	4.76	32.3	171	349	P	H
		2389.95	39.02	-14.98	54	41.16	25.4	4.76	32.3	171	349	A	H
802.11n	*	2416	100.27	-	-	102.26	25.54	4.78	32.31	171	349	P	H
HT20	*	2416	92.41	-	-	94.4	25.54	4.78	32.31	171	349	A	H
CH 01		2389.04	55.54	-18.46	74	57.68	25.4	4.76	32.3	281	115	P	V
2412MHz		2389.95	44.35	-9.65	54	46.49	25.4	4.76	32.3	281	115	A	V
	*	2416	104.83	-	-	106.82	25.54	4.78	32.31	281	115	P	V
	*	2416	96.67	-	-	98.66	25.54	4.78	32.31	281	115	A	V
		2389.82	43.29	-30.71	74	45.43	25.4	4.76	32.3	251	163	P	H
		2389.95	32.89	-21.11	54	35.03	25.4	4.76	32.3	251	163	A	H
	*	2442	99.53	-	-	101.22	25.83	4.82	32.34	251	163	P	H
	*	2442	91.61	-	-	93.3	25.83	4.82	32.34	251	163	A	H
802.11n		2484.4	46.85	-27.15	74	48.25	26.11	4.86	32.37	251	163	P	H
HT20		2483.98	36.38	-17.62	54	37.78	26.11	4.86	32.37	251	163	A	H
CH 06		2389.69	47.67	-26.33	74	49.81	25.4	4.76	32.3	205	119	P	V
2437MHz		2389.95	37.74	-16.26	54	39.88	25.4	4.76	32.3	205	119	A	V
	*	2442	103.23	-	-	104.92	25.83	4.82	32.34	205	119	P	V
	*	2442	95.24	-	-	96.93	25.83	4.82	32.34	205	119	A	V
		2483.62	48.95	-25.05	74	50.35	26.11	4.86	32.37	205	119	P	V
		2483.74	39.66	-14.34	54	41.06	26.11	4.86	32.37	205	119	A	V

	*	2460	99.8	-	-	101.35	25.97	4.84	32.36	244	162	P	H
	*	2458	91.72	-	-	93.27	25.97	4.84	32.36	244	162	A	H
802.11n		2483.56	49.99	-24.01	74	51.39	26.11	4.86	32.37	244	162	P	H
HT20		2483.92	40.13	-13.87	54	41.53	26.11	4.86	32.37	244	162	A	H
CH 11	*	2458	103.61	-	-	105.16	25.97	4.84	32.36	257	119	P	V
2462MHz	*	2458	95.47	-	-	97.02	25.97	4.84	32.36	257	119	A	V
		2484.4	52.64	-21.36	74	54.04	26.11	4.86	32.37	257	119	P	V
		2483.51	42.67	-11.33	54	44.07	26.11	4.86	32.37	257	119	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	39.08	-34.92	74	62.62	30.9	6.87	61.31	152	360	P	H
		4824	37.75	-36.25	74	61.29	30.9	6.87	61.31	152	360	P	V
802.11n HT20 CH 06 2437MHz		4872	38.96	-35.04	74	62.29	31.01	6.86	61.2	152	360	P	H
		7308	45.41	-28.59	74	64.7	35.34	8.47	63.1	152	360	P	H
		4872	38.96	-35.04	74	62.29	31.01	6.86	61.2	152	360	P	V
		7308	45.72	-28.28	74	65.01	35.34	8.47	63.1	152	360	P	V
802.11n HT20 CH 11 2462MHz		4926	37.54	-36.46	74	60.66	31.12	6.84	61.08	152	360	P	H
		7386	42.51	-31.49	74	61.64	35.55	8.49	63.17	152	360	P	H
		4926	39.46	-34.54	74	62.58	31.12	6.84	61.08	152	360	P	V
		7386	43.82	-30.18	74	62.95	35.55	8.49	63.17	152	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 802.11n 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)
		2389.95	53.45	-20.55	74	55.59	25.4	4.76	32.3	216	150	P	H
		2389.95	39.53	-14.47	54	41.67	25.4	4.76	32.3	216	150	A	H
	*	2432	97.13	-	-	98.97	25.69	4.8	32.33	216	150	P	H
	*	2434	89	-	-	90.84	25.69	4.8	32.33	216	150	A	H
802.11n		2485.96	53.49	-20.51	74	54.89	26.11	4.86	32.37	216	150	P	H
HT40		2483.62	40.58	-13.42	54	41.98	26.11	4.86	32.37	216	150	A	H
CH 03		2388.52	59.95	-14.05	74	62.09	25.4	4.76	32.3	206	116	P	V
2422MHz		2389.95	46.84	-7.16	54	48.98	25.4	4.76	32.3	206	116	A	V
	*	2436	101.12	-	-	102.96	25.69	4.8	32.33	206	116	P	V
	*	2436	93.25	-	-	95.09	25.69	4.8	32.33	206	116	A	V
		2483.98	57.46	-16.54	74	58.86	26.11	4.86	32.37	206	116	P	V
		2483.56	43.86	-10.14	54	45.26	26.11	4.86	32.37	206	116	A	V
		2389.95	48.76	-25.24	74	50.9	25.4	4.76	32.3	283	167	P	H
		2389.69	34.83	-19.17	54	36.97	25.4	4.76	32.3	283	167	A	H
	*	2450	97.15	-	-	98.84	25.83	4.82	32.34	283	167	P	H
	*	2450	89.29	-	-	90.98	25.83	4.82	32.34	283	167	A	H
802.11n		2485.9	54.81	-19.19	74	56.21	26.11	4.86	32.37	283	167	P	H
HT40		2483.56	40.78	-13.22	54	42.18	26.11	4.86	32.37	283	167	A	H
CH 06		2389.56	54.1	-19.9	74	56.24	25.4	4.76	32.3	173	119	P	V
2437MHz		2389.95	40.48	-13.52	54	42.62	25.4	4.76	32.3	173	119	A	V
	*	2446	101.05	-	-	102.74	25.83	4.82	32.34	173	119	P	V
	*	2446	93.11	-	-	94.8	25.83	4.82	32.34	173	119	A	V
		2487.64	56.73	-17.27	74	57.98	26.26	4.88	32.39	173	119	P	V
		2483.86	42.56	-11.44	54	43.96	26.11	4.86	32.37	173	119	A	V

		2389.82	48.95	-25.05	74	51.09	25.4	4.76	32.3	364	167	P	H
		2389.95	34.28	-19.72	54	36.42	25.4	4.76	32.3	364	167	A	H
	*	2444	96.84	-	-	98.53	25.83	4.82	32.34	364	167	P	H
	*	2444	89.64	-	-	91.33	25.83	4.82	32.34	364	167	A	H
802.11n		2485.54	60.32	-13.68	74	61.72	26.11	4.86	32.37	364	167	P	H
HT40		2485.12	43.11	-10.89	54	44.51	26.11	4.86	32.37	364	167	A	H
CH 09		2389.56	54.21	-19.79	74	56.35	25.4	4.76	32.3	129	118	P	V
2452MHz		2389.82	40.2	-13.8	54	42.34	25.4	4.76	32.3	129	118	A	V
	*	2440	100.88	-	-	102.57	25.83	4.82	32.34	129	118	P	V
	*	2440	92.98	-	-	94.67	25.83	4.82	32.34	129	118	A	V
		2485.9	61.3	-12.7	74	62.7	26.11	4.86	32.37	129	118	P	V
		2484.52	45.45	-8.55	54	46.85	26.11	4.86	32.37	129	118	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	39.85	-34.15	74	63.32	30.93	6.87	61.27	100	360	P	H
HT40		7266	43.05	-30.95	74	62.39	35.26	8.46	63.06	100	360	P	H
CH 03		4842	38.62	-35.38	74	62.09	30.93	6.87	61.27	100	360	P	V
2422MHz		7266	42.67	-31.33	74	62.01	35.26	8.46	63.06	100	360	P	V
802.11n		4872	38.19	-35.81	74	61.52	31.01	6.86	61.2	152	360	P	H
HT40		7308	41.77	-32.23	74	61.06	35.34	8.47	63.1	152	360	P	H
CH 06		4872	37.92	-36.08	74	61.25	31.01	6.86	61.2	152	360	P	V
2437MHz		7308	43.31	-30.69	74	62.6	35.34	8.47	63.1	152	360	P	V
802.11n		4902	37.62	-36.38	74	60.81	31.08	6.85	61.12	100	360	P	H
HT40		7356	44.18	-29.82	74	63.36	35.47	8.49	63.14	100	360	P	H
CH 09		4902	38.27	-35.73	74	61.46	31.08	6.85	61.12	100	360	P	V
2452MHz		7356	43.82	-30.18	74	63	35.47	8.49	63.14	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

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	25.42	-14.58	40	29.72	26.3	0.5	31.1	-	-	P	H
		104.69	25.02	-18.48	43.5	37.57	17.75	0.42	30.72	-	-	P	H
		159.98	28.22	-15.28	43.5	40.48	16.99	1.69	30.94	-	-	P	H
		193.93	24.54	-18.96	43.5	38.07	15.89	1.66	31.08	-	-	P	H
		237.58	25.47	-20.53	46	37.76	17.35	1.54	31.18	-	-	P	H
		307.42	33.04	-12.96	46	42.94	19.85	1.75	31.5	100	23	P	H
		33.88	36.72	-3.28	40	43.13	24.06	0.55	31.02	100	265	QP	V
		90.14	24.35	-19.15	43.5	37.13	16.9	0.92	30.6	-	-	P	V
		191.02	23.79	-19.71	43.5	37.28	15.98	1.59	31.06	-	-	P	V
		243.4	24.11	-21.89	46	36.14	17.6	1.56	31.19	-	-	P	V
		315.18	23.7	-22.3	46	33.33	20.09	1.78	31.5	-	-	P	V
		931.13	29.86	-16.14	46	28.11	29.79	3.18	31.22	-	-	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)

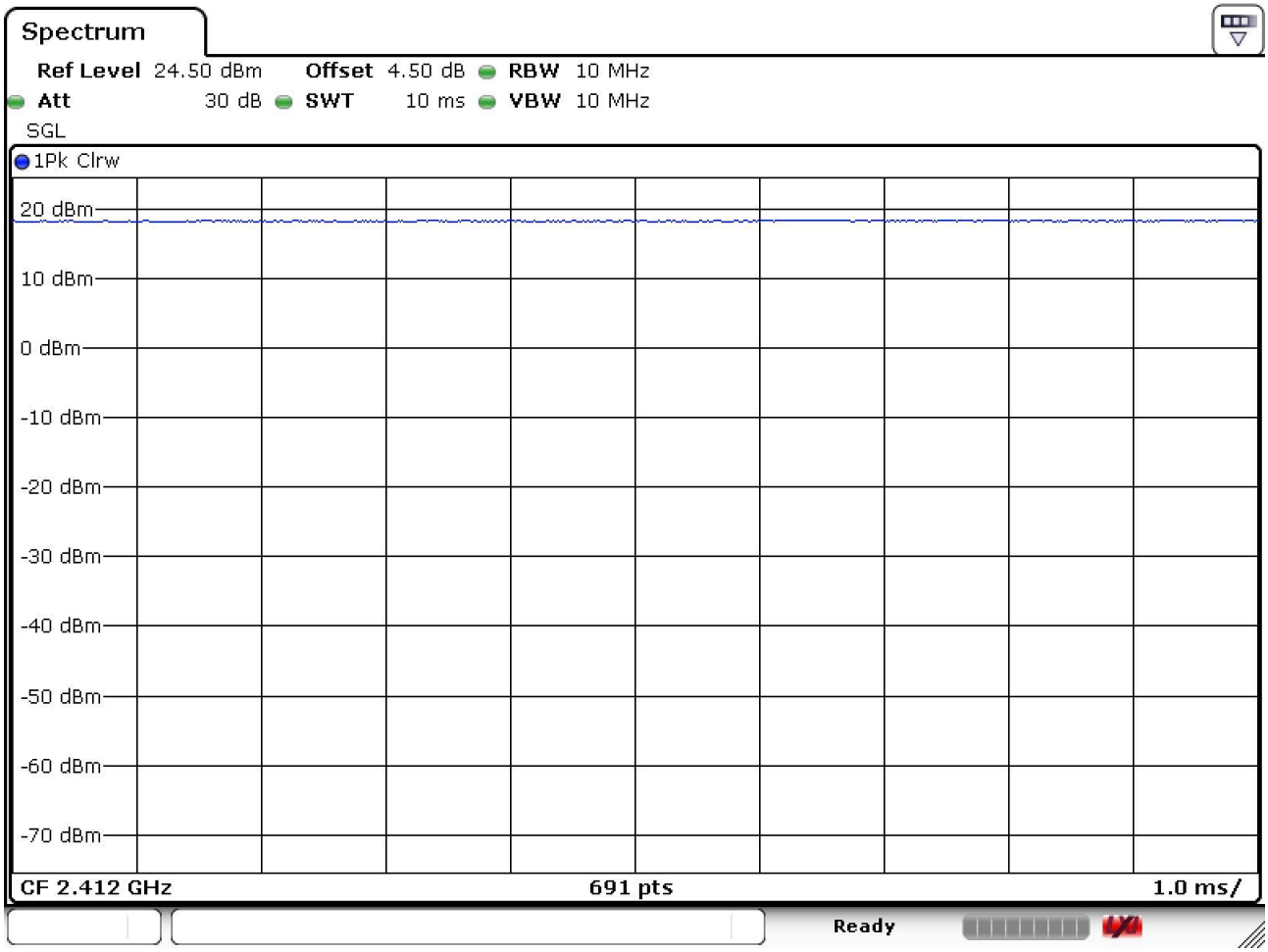
= -10.46(dB)

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

Appendix C. Duty Cycle Plots

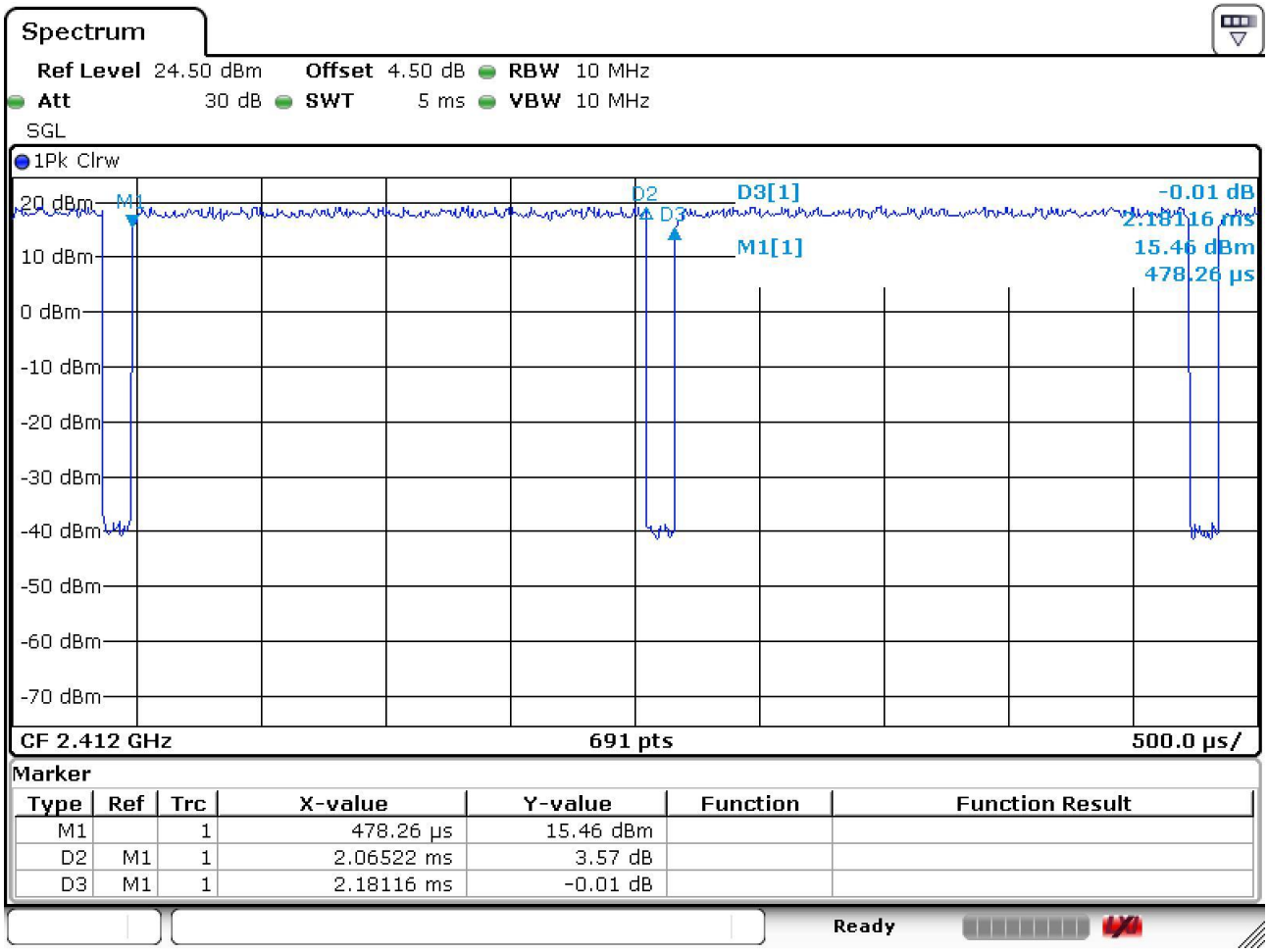
Band	Duty Cycle(%)	T(ms)	1/T(KHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	94.68	2.065	0.484	1KHz
802.11n(BW20MHz)	94.33	1.928	0.519	1KHz
802.11n(BW40MHz)	89.04	0.942	1.062	3KHz

802.11b



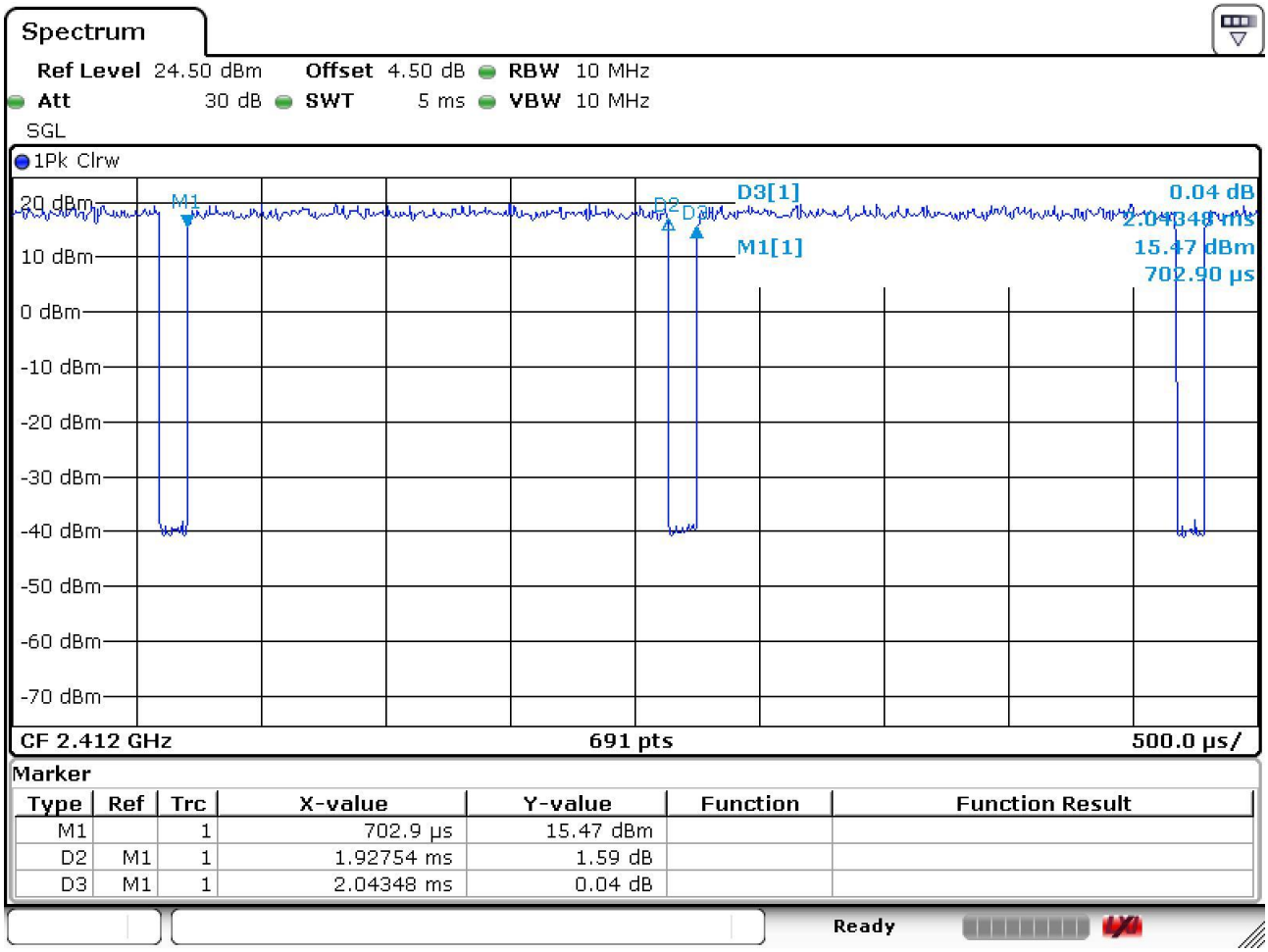
Date: 23.MAY.2017 10:34:17

802.11g



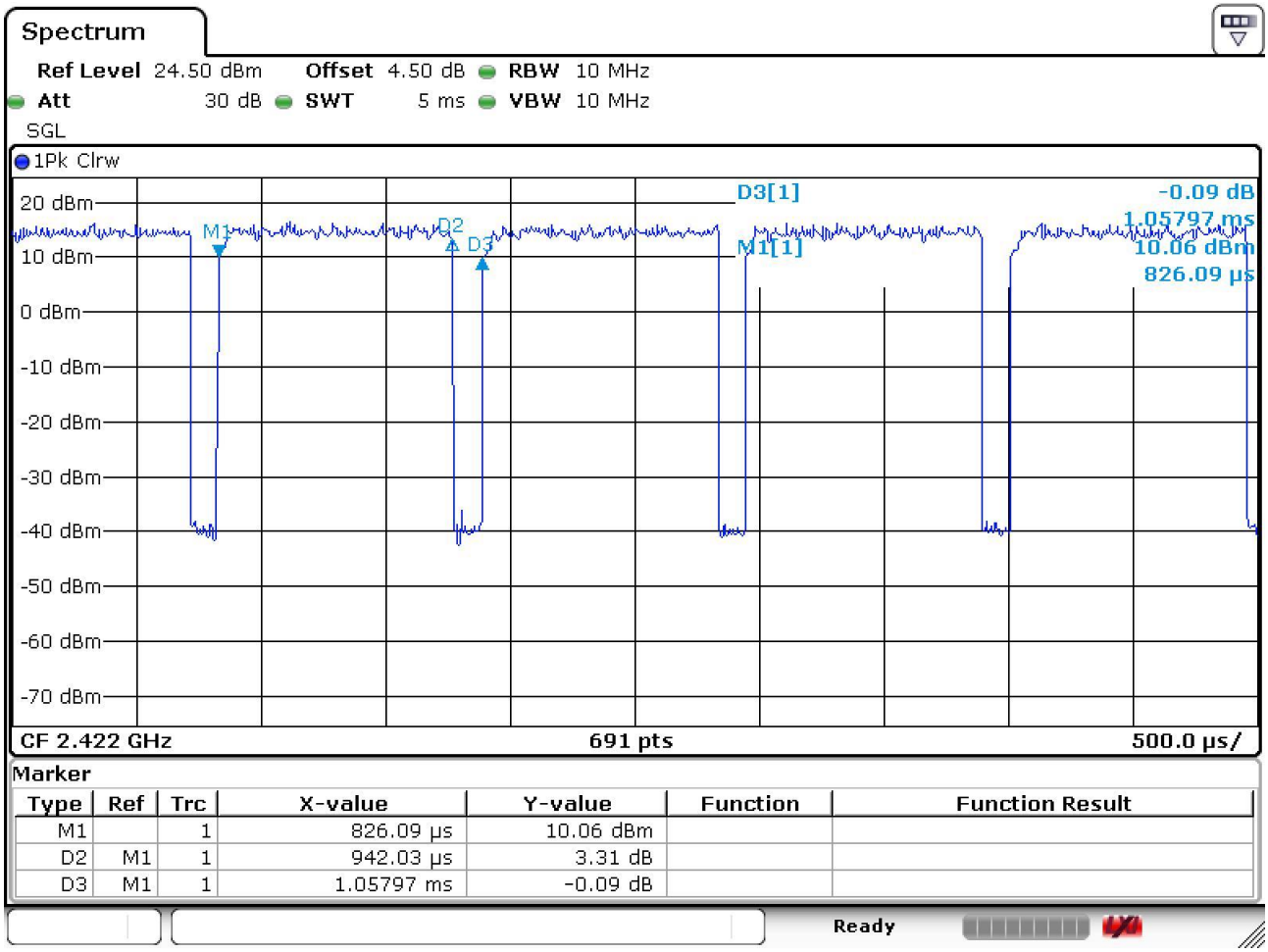
Date: 23.MAY.2017 10:35:18

802.11n(BW20MHz)



Date: 23.MAY.2017 10:35:50

802.11n(BW40MHz)



Date: 23.MAY.2017 10:36:38