FCC RADIO TEST REPORT

FCC ID	:	**2AP65-7225**
Equipment	:	**Digital Media Receiver**
Model Name	:	**P5B83L**
Applicant	:	**Lindland LLC** **9121 Anson Way, Ste. 200, Raleigh, NC 27615**
Standard	:	**FCC Part 15 Subpart C §15.247**

The testing was completed on Jul. 18, 2018. 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

This report contains data that were produced under subcontract by accredited Sporton laboratory located in Taiwan.
Sporton Lab in Taiwan is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No.TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Eric Shih

TESTING
NVLAP LAB CODE 600156-0

Approved by: Eric Shih / Manager

Sporton International (Shenzhen) Inc.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China

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Appendix A. Conducted Test Results

Appendix B. Radiated Spurious Emission

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Appendix D. Duty Cycle Plots

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History of this test report

Report No.	Version	Description	Issued Date
FR842408-01D	01	Initial issue of report	Jul. 30, 2018
FR842408-01D	02	Revising the description of applicable standards in section 1.5 and test results in section 3.5.5.	Aug. 28, 2018

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
3.1	15.247(a)(2)	6dB Bandwidth	Pass
3.1	2.1049	99% Occupied Bandwidth	Reporting only
3.2	15.247(b)	Power Output Measurement	Pass
3.3	15.247(e)	Power Spectral Density	Pass
3.4	15.247(d)	Conducted Band Edges	Pass
		Conducted Spurious Emission	Pass
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass
3.6	15.203 & 15.247(b)	Antenna Requirement	Pass

Reviewed by: Joseph Lin

Report Producer: Natasha Hsieh

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Digital Media Receiver
Model Name	P5B83L
FCC ID	2AP65-7225
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth LE

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2472 MHz
Maximum (Peak) Output Power to antenna	<Ant.1> 802.11b : 22.26 dBm (0.1683 W) 802.11g : 24.08 dBm (0.2559 W) 802.11n HT20 : 24.09 dBm (0.2564 W) <Ant.2> 802.11b : 22.49 dBm (0.1774 W) 802.11g : 24.07 dBm (0.2553 W) 802.11n HT20 : 24.15 dBm (0.2600 W)
99% Occupied Bandwidth	<Ant.1> 802.11b : 14.49 MHz 802.11g : 17.18 MHz 802.11n HT20 : 17.93 MHz <Ant.2> 802.11b : 14.34 dBm 802.11g : 17.18 dBm 802.11n HT20 : 17.98 dBm
Antenna Type / Gain	Ant. 1: Fixed Internal Antenna type with gain 2.97 dBi Ant. 2: Fixed Internal Antenna type with gain 1.36 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.3 Modification of EUT

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

1.4 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0) and the FCC designation No are CN5018 and CN5019.

Test Site	Sporton International (Shenzhen) Inc.	
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
Test Site No.	**Sporton Site No.**	**FCC Test Firm Registration No.**
	TH01-SZ	251365

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

Test Site	Sporton International (Shenzhen) Inc.	
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District Shenzhen City Guangdong Province 518055 China TEL: +86-755-3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Test Firm Registration No.**
	03CH04-SZ	577730

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

1.5 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
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

a. 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: radiation 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	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432	12	2467
	6	2437	13	2472
	7	2442		

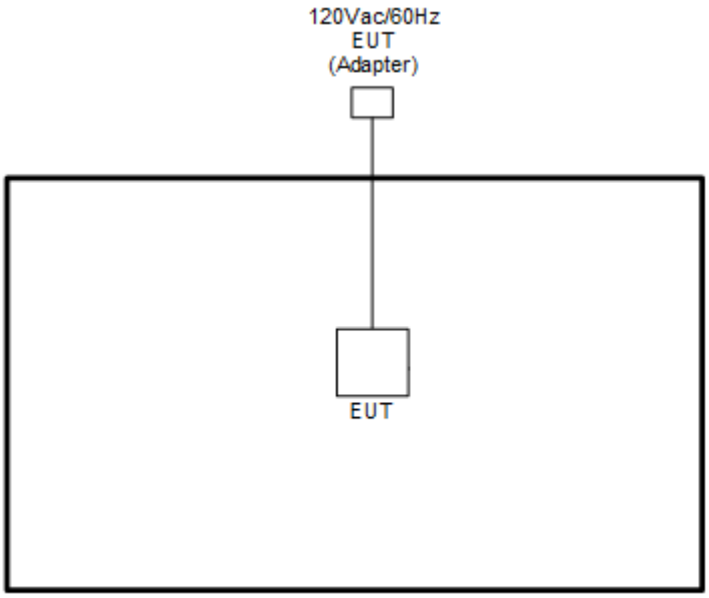
2.2 Test Mode

Final test modes 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**

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility "CMD" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.5 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

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

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 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.

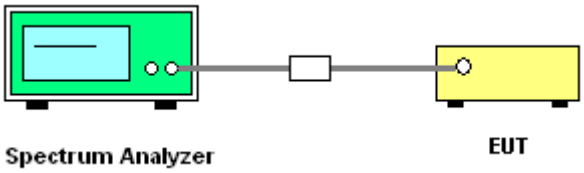
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

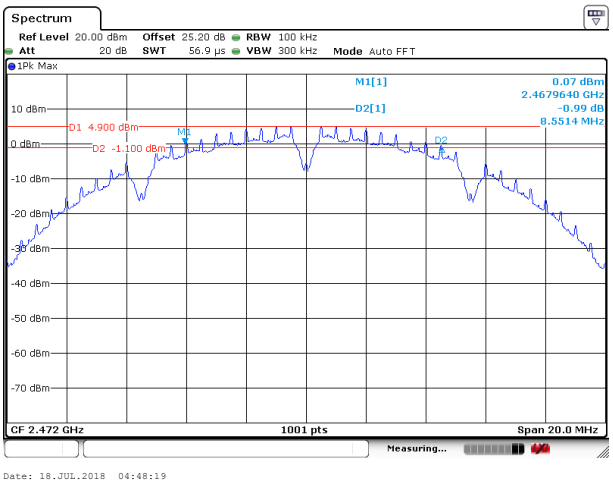
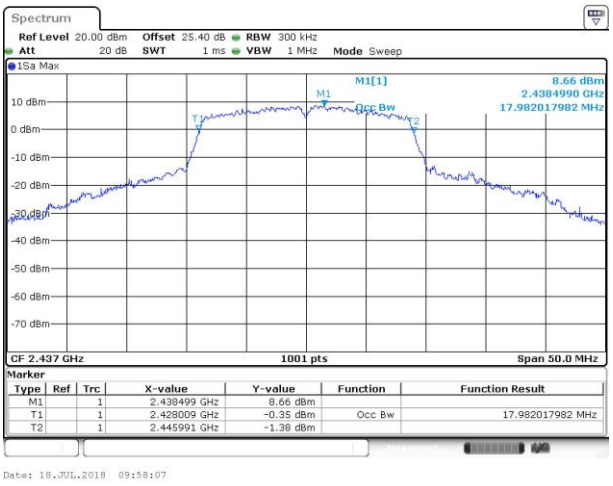
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
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 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 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.

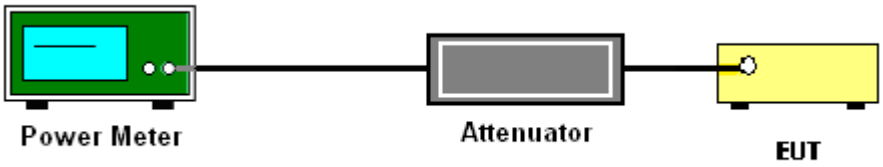
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. For Peak Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.3 PKPM1 Peak power meter method.
2. For Average Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.2.3.1 Method AVGPM.
3. 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.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. 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.

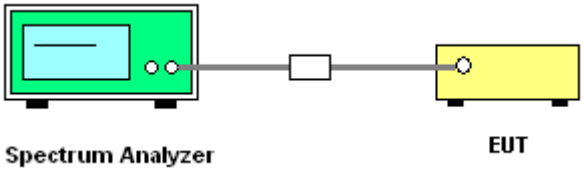
3.3.2 Measuring Instruments

See list of measuring equipment 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.

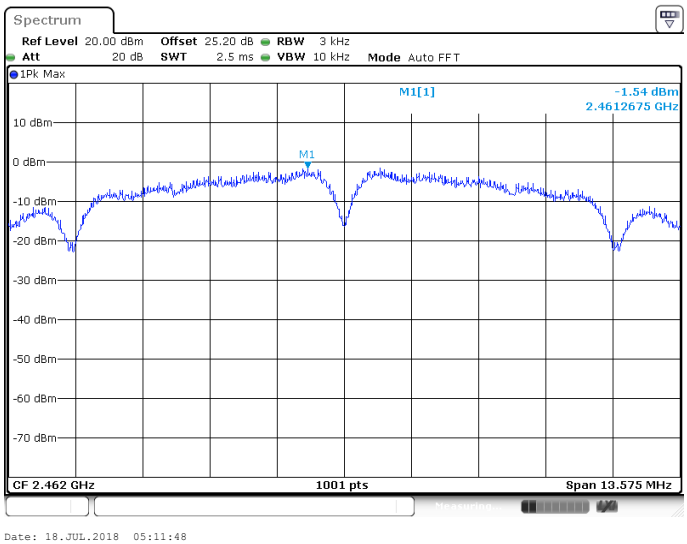
3.3.4 Test Setup



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.

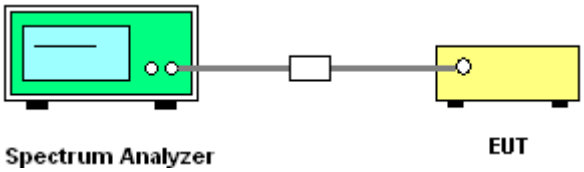
3.4.2 Measuring Instruments

See list of measuring equipment 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 per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



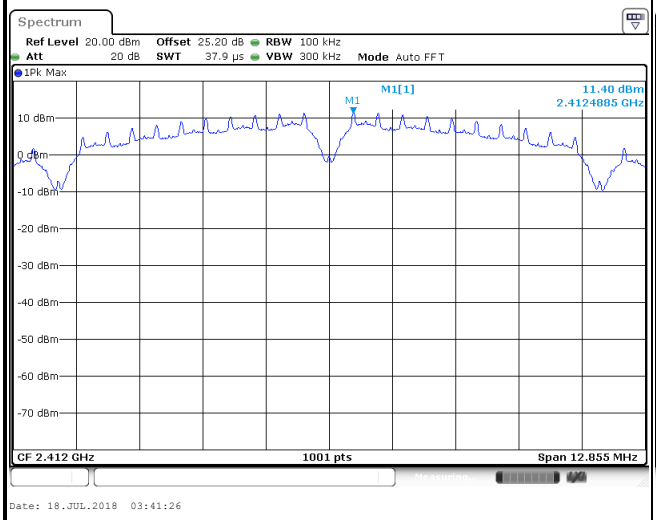
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer :	Sam Zheng	**Temperature :**	21~25℃
		Relative Humidity :	51~54%

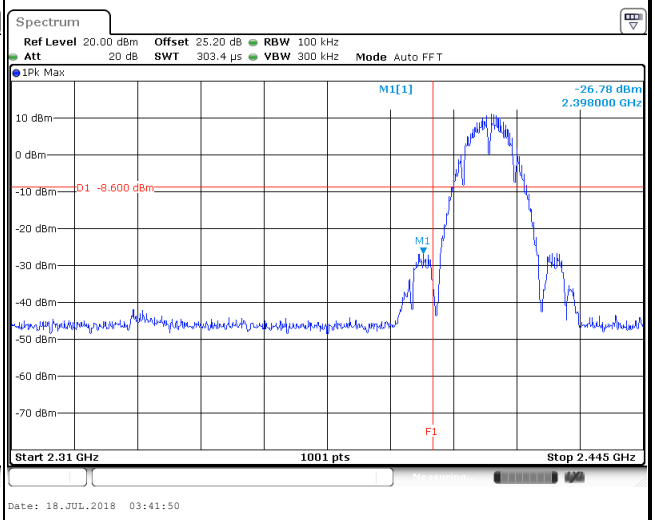
Number of TX = 1, Ant. 1 (Measured)

Test Mode :	802.11b	**Test Channel :**	01

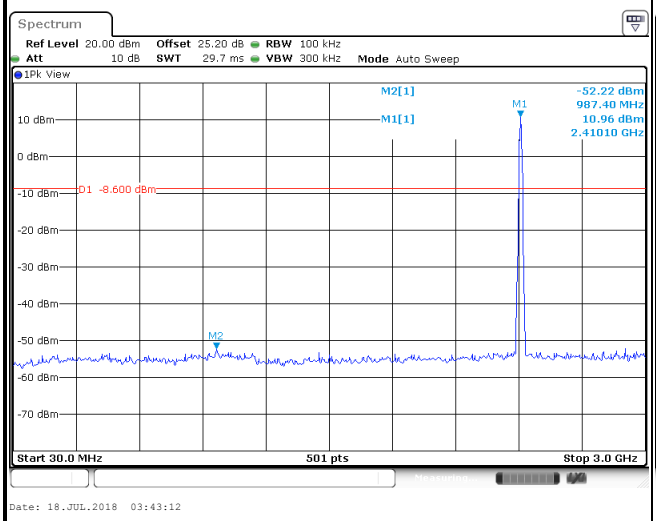
100kHz PSD reference Level



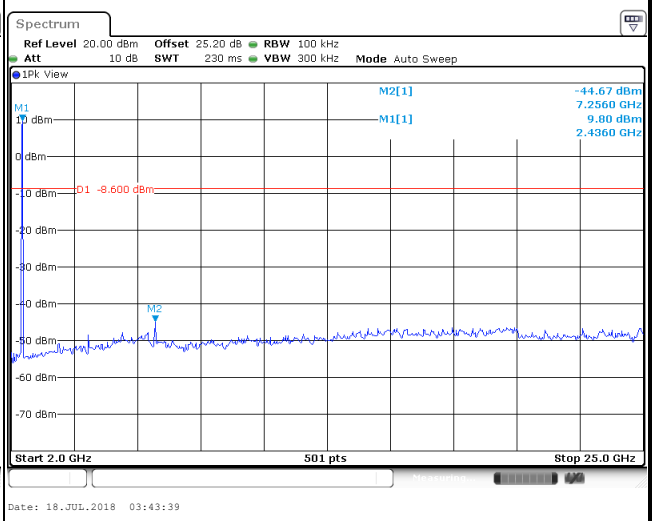
Channel Plot



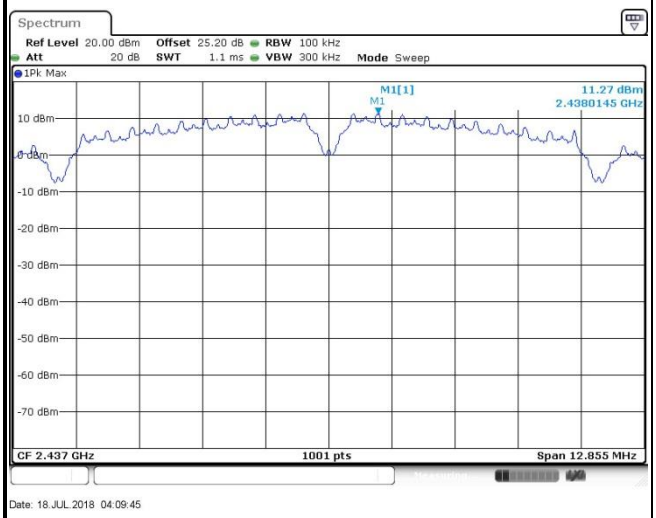
Spurious Emission 30MHz~3GHz

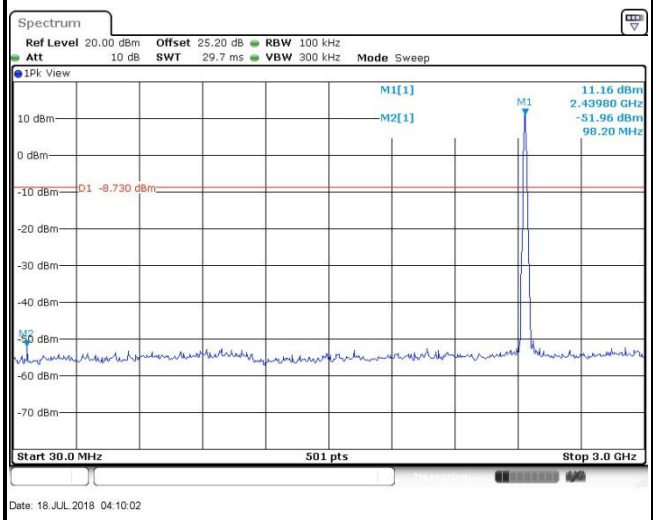
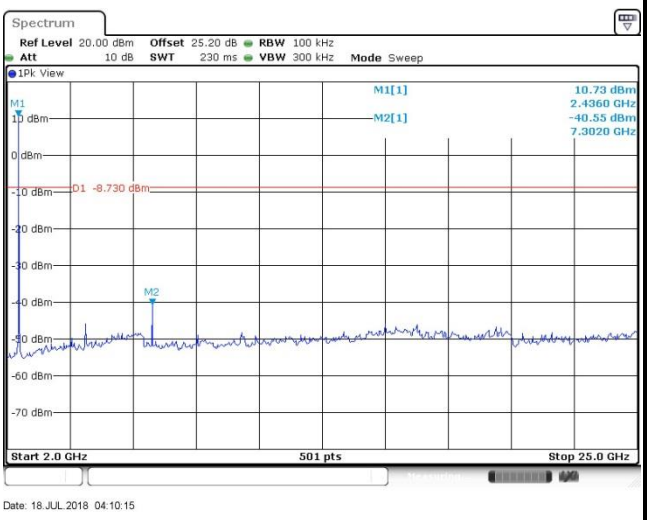


Spurious Emission 2GHz~25GHz



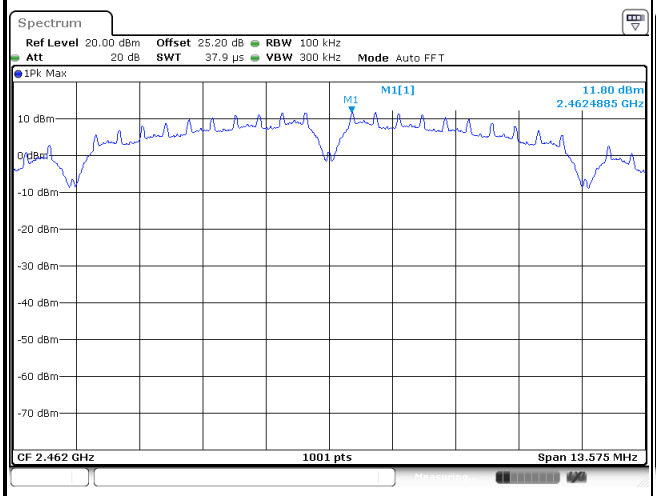
Test Mode :	802.11b	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

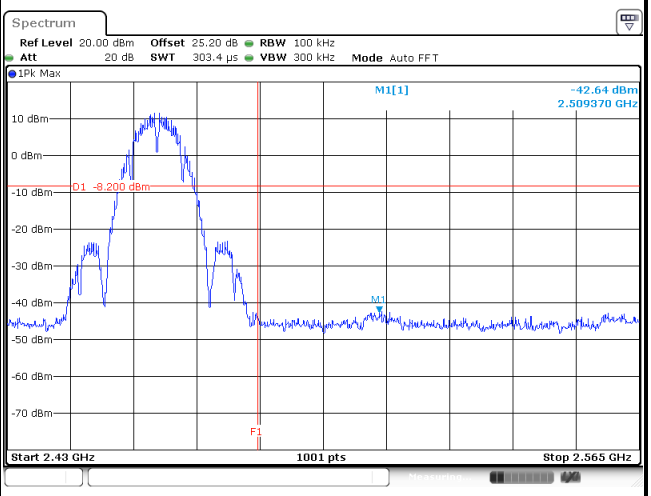
Test Mode :	802.11b	Test Channel :	11

100kHz PSD reference Level



Date: 18.JUL.2018 04:02:41

Channel Plot



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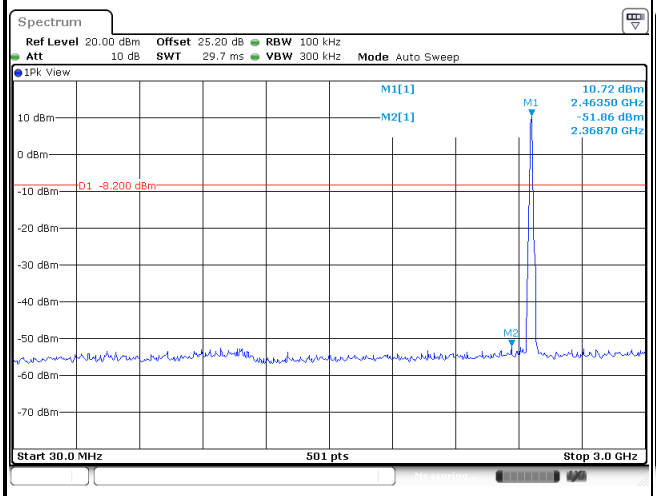
Spurious Emission 30MHz~3GHz



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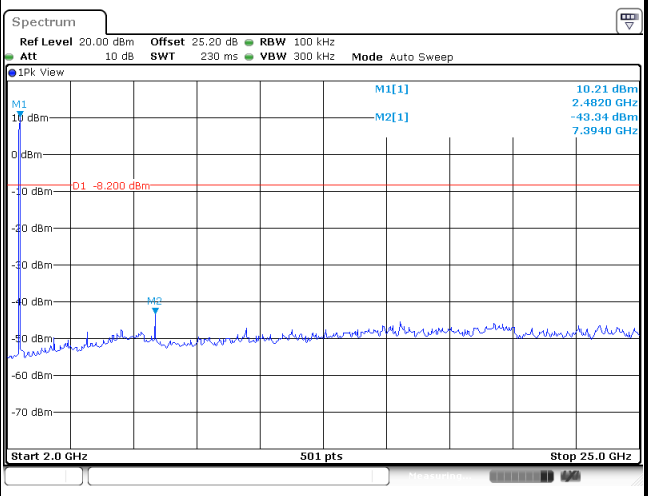
Spurious Emission 2GHz~25GHz



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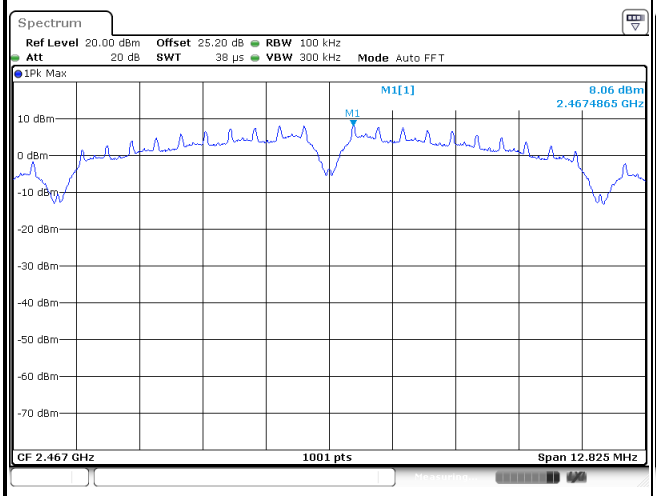
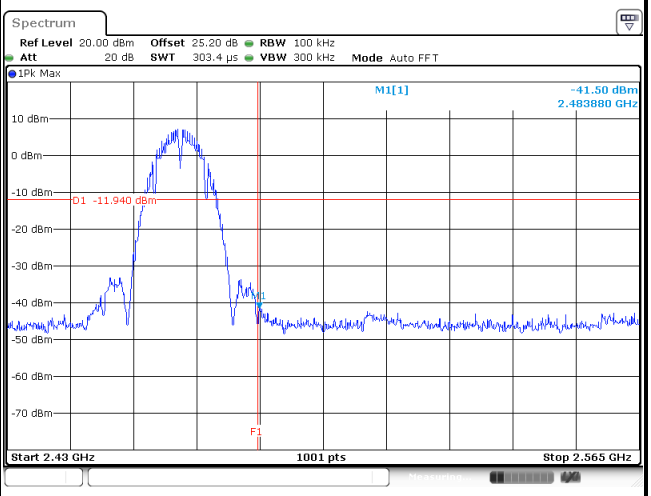
Test Mode :	802.11b	Test Channel :	12

100kHz PSD reference Level



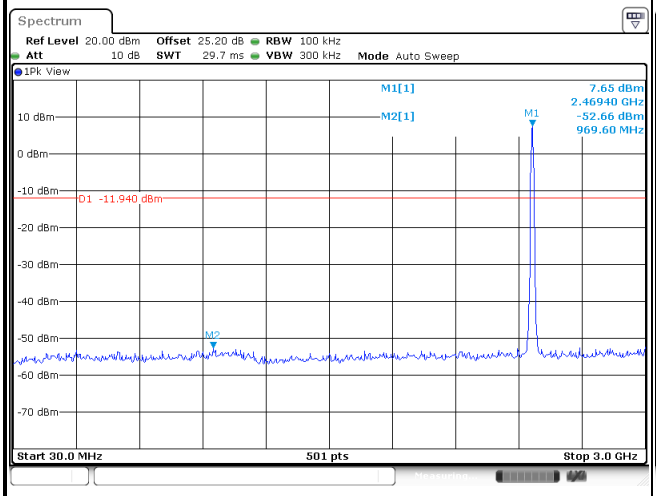
Date: 18.JUL.2018 04:38:44

Channel Plot



Date: 18.JUL.2018 04:39:11

Spurious Emission 30MHz~3GHz



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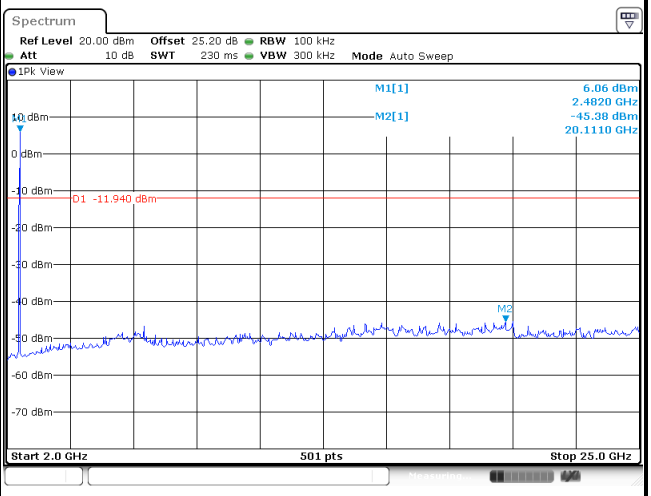
Spurious Emission 2GHz~25GHz



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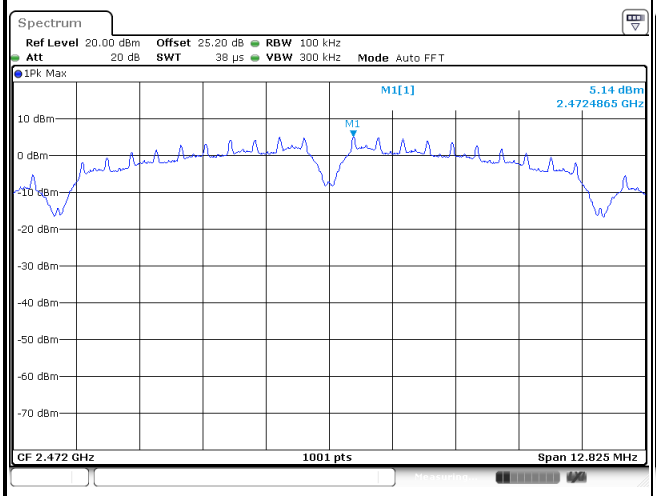
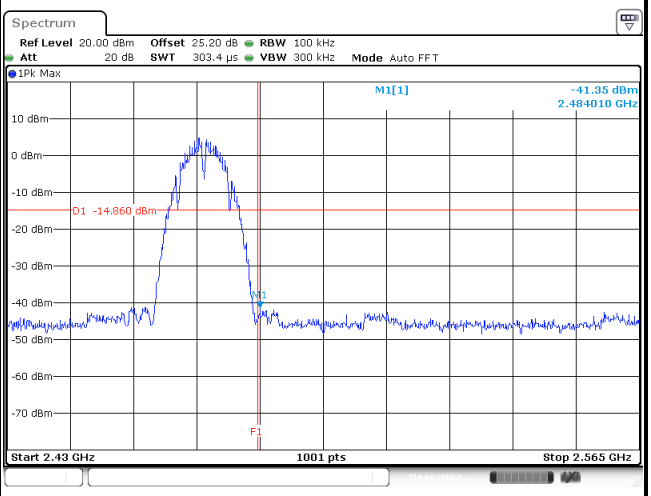
Test Mode :	802.11b	Test Channel :	13

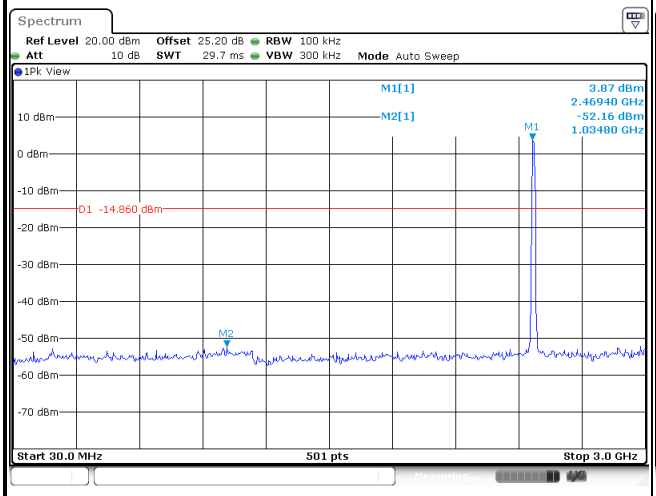
100kHz PSD reference Level



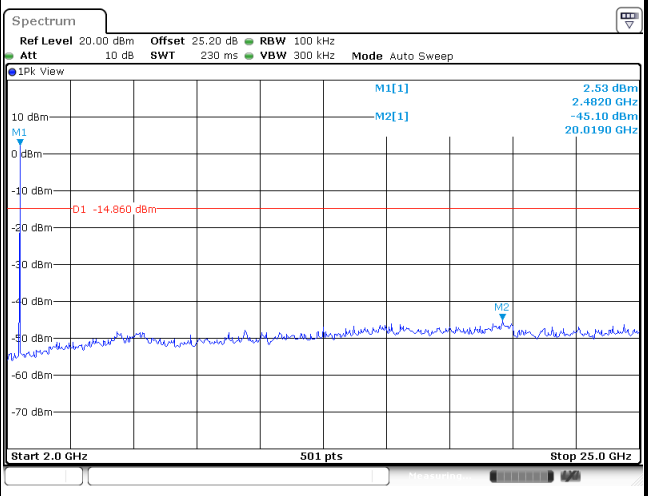
Channel Plot



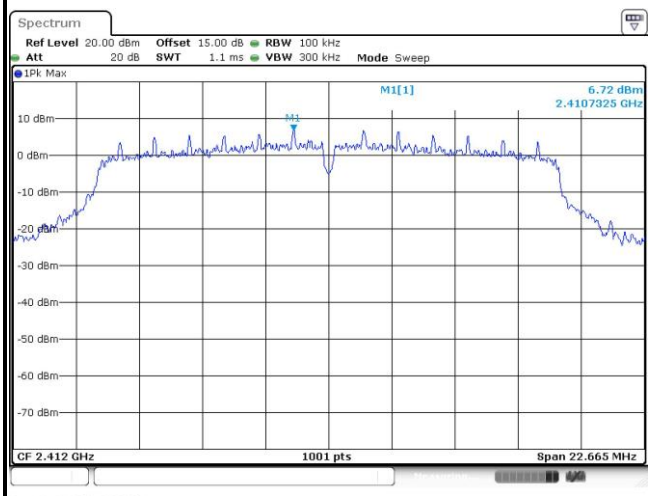
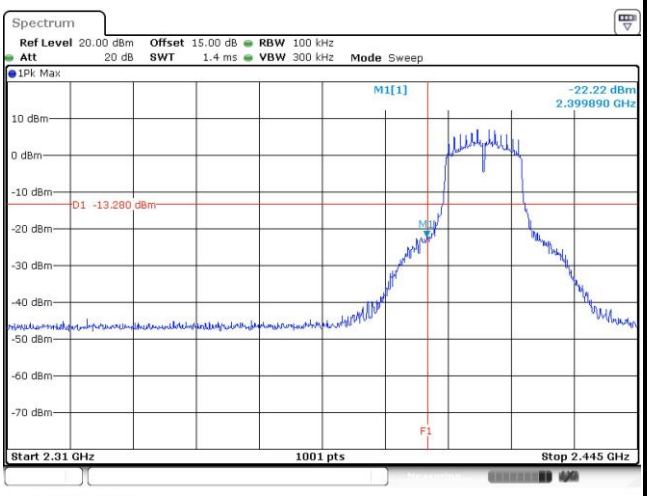
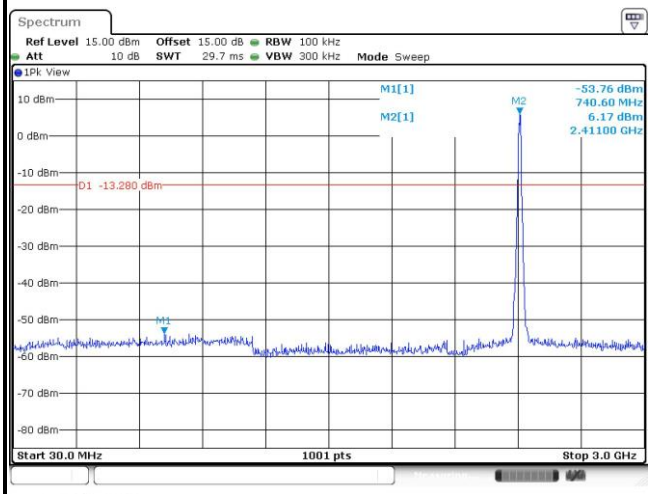
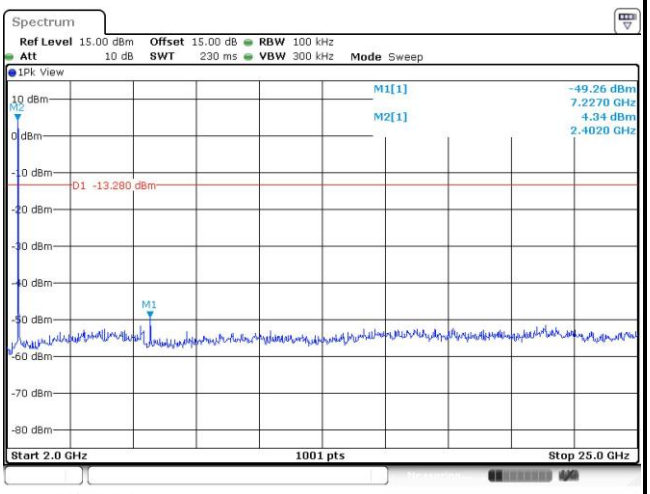
Spurious Emission 30MHz~3GHz



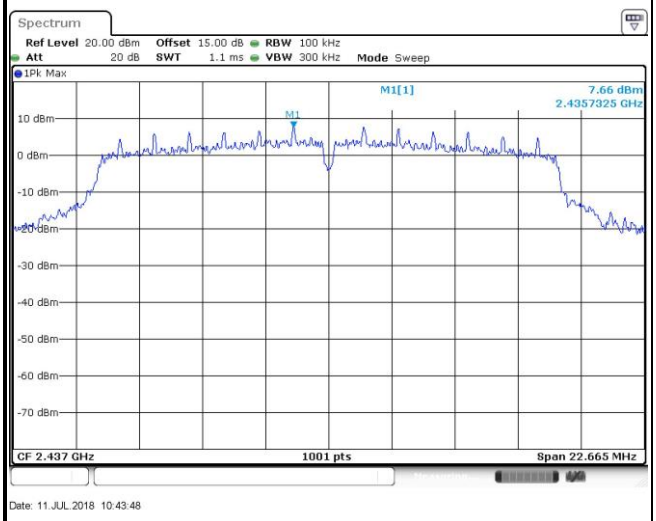
Spurious Emission 2GHz~25GHz

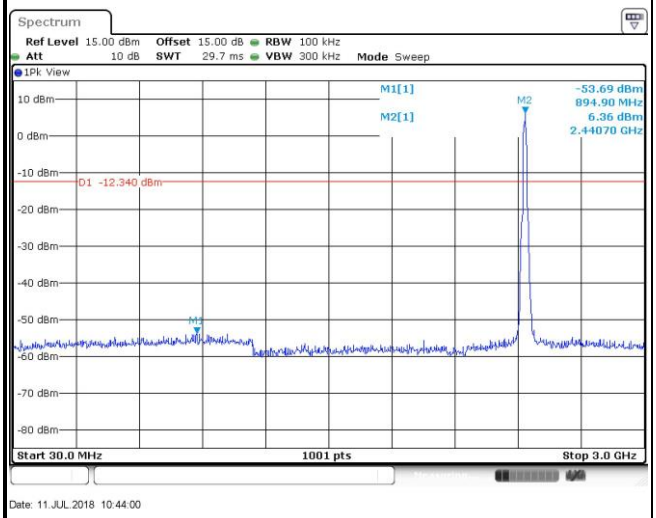
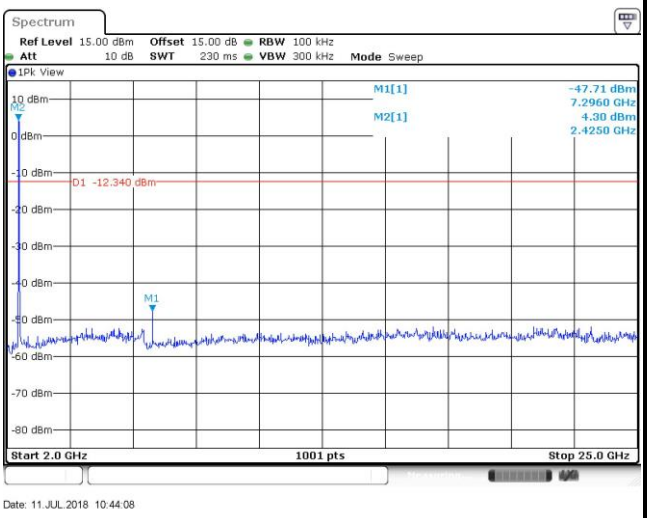


Test Mode :	802.11g	Test Channel :	01

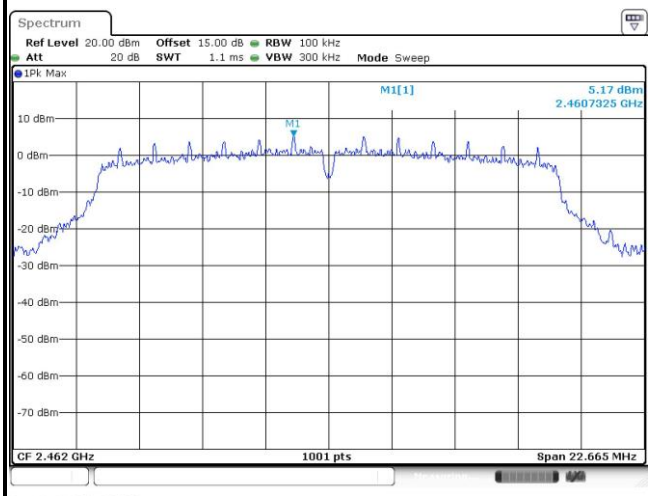
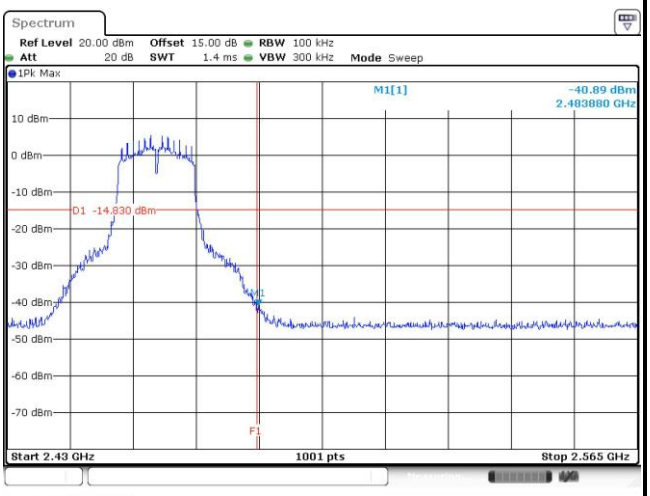
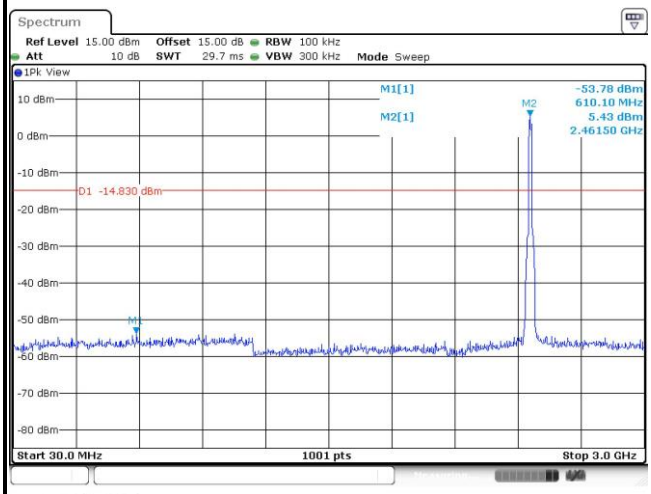
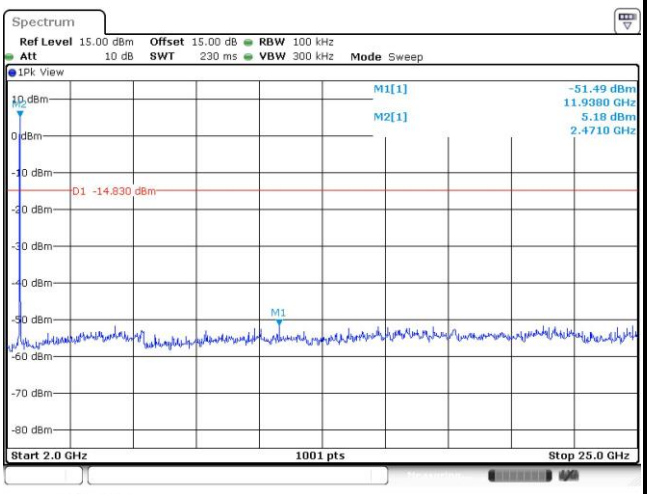
100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 10:34:52	Date: 11.JUL.2018 10:35:32
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 10:35:44	Date: 11.JUL.2018 10:35:52

Test Mode :	802.11g	Test Channel :	06

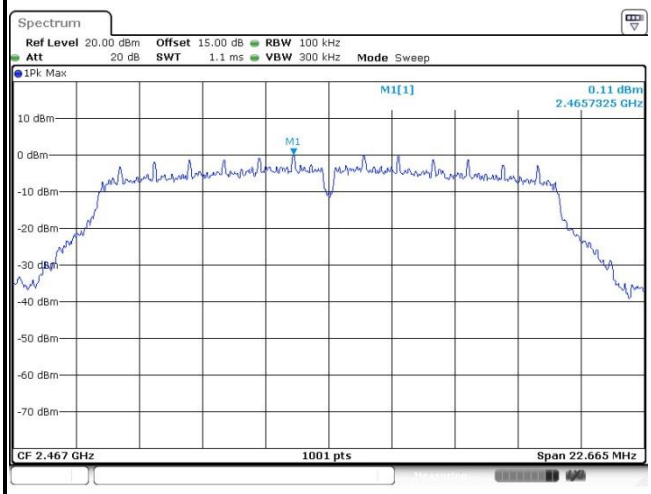
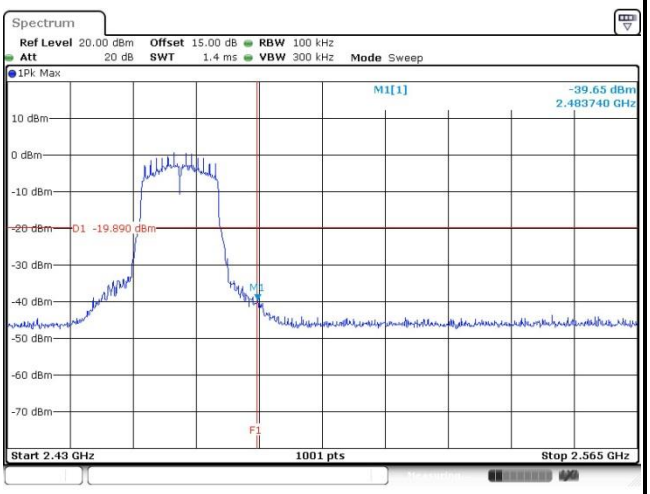
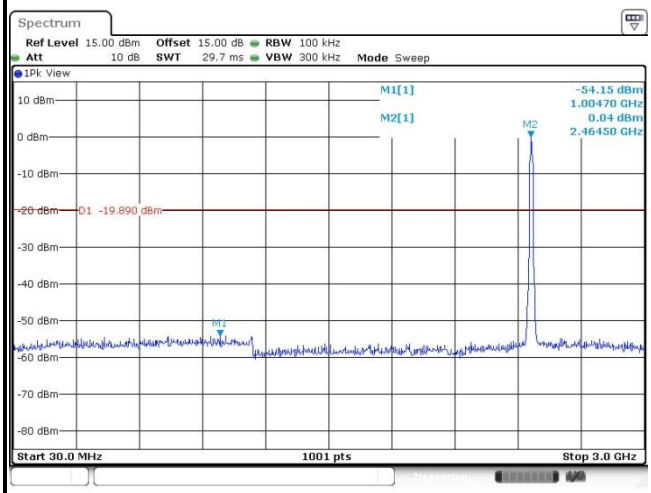
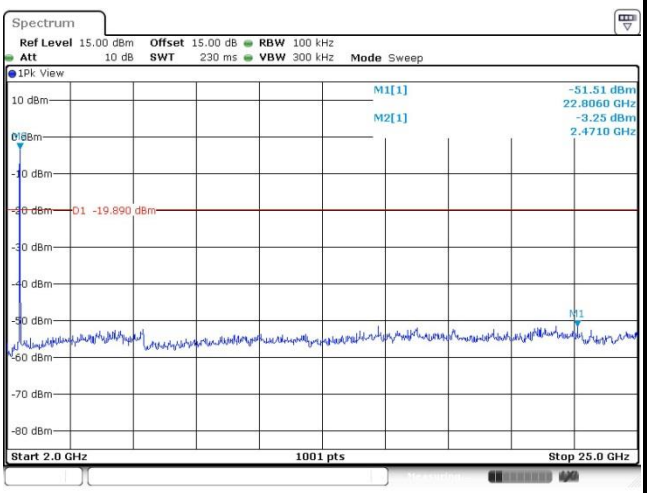
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

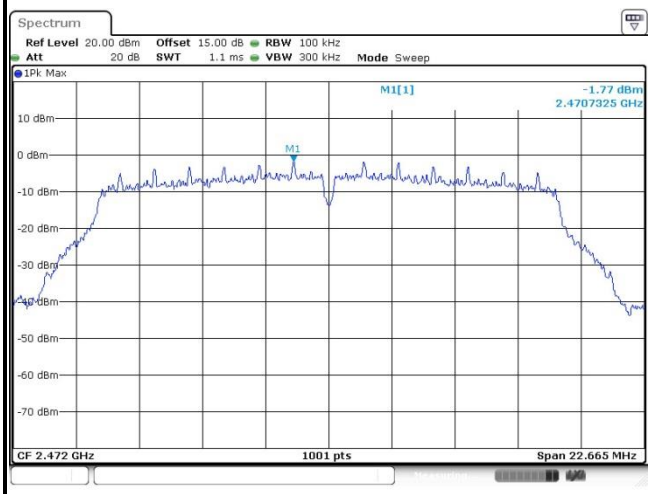
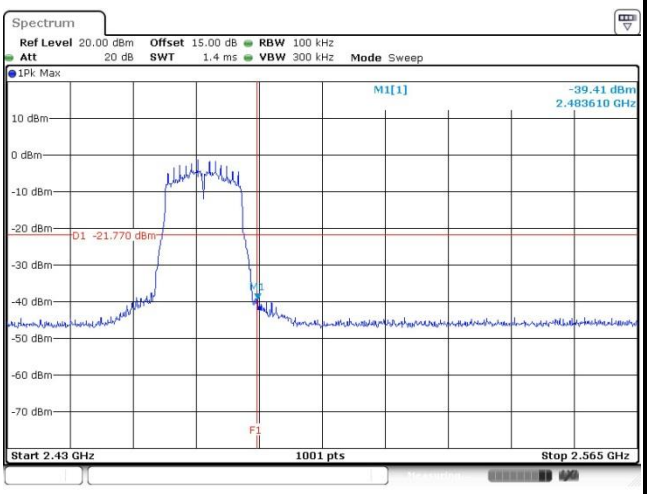
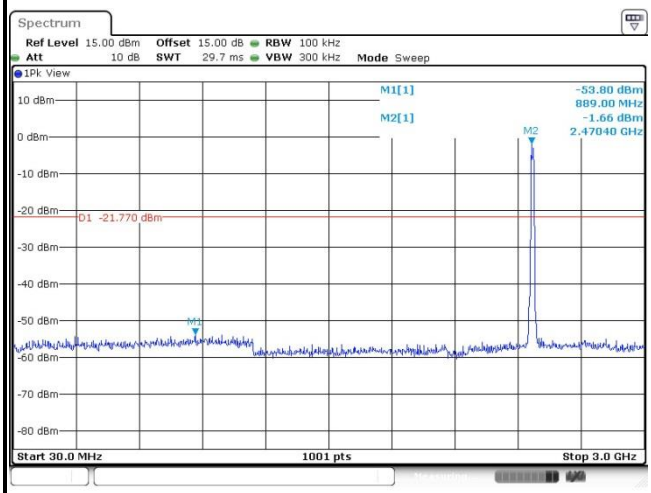
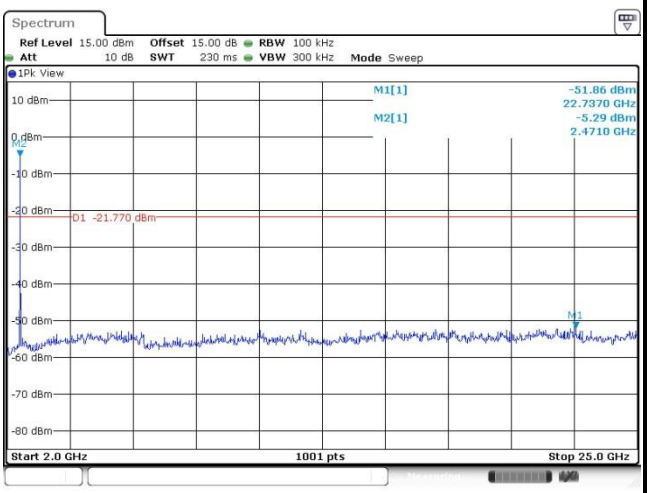
Test Mode :	802.11g	Test Channel :	11

100kHz PSD reference Level	Channel Plot
 Date: 11.JUL.2018 10:50:24	 Date: 11.JUL.2018 10:50:52
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
 Date: 11.JUL.2018 10:51:50	 Date: 11.JUL.2018 10:51:58

Test Mode :	802.11g	Test Channel :	12

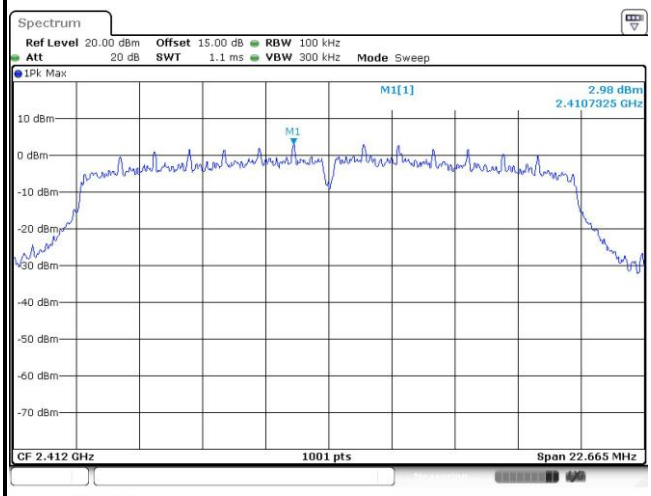
100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 10:56:50	Date: 11.JUL.2018 10:59:32
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 10:57:02	Date: 11.JUL.2018 10:57:10

Test Mode :	802.11g	Test Channel :	13

100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 11:04:02	Date: 11.JUL.2018 11:05:05
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 11:06:57	Date: 11.JUL.2018 11:07:05

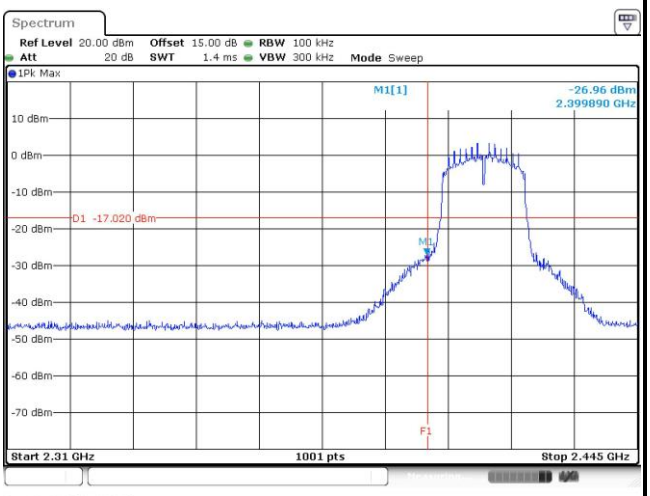
Test Mode :	802.11n HT20	Test Channel :	01

100kHz PSD reference Level



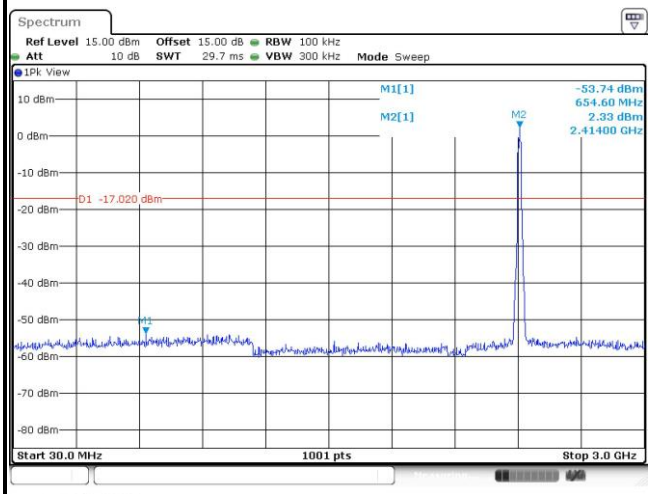
Date: 11.JUL.2018 11:12:10

Channel Plot



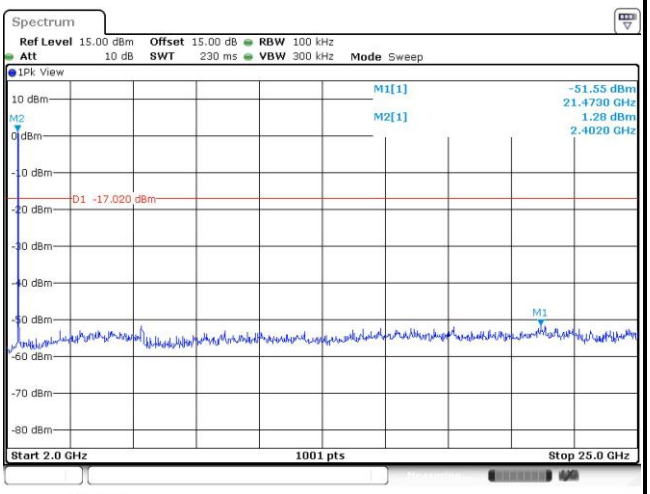
Date: 11.JUL.2018 11:13:09

Spurious Emission 30MHz~3GHz



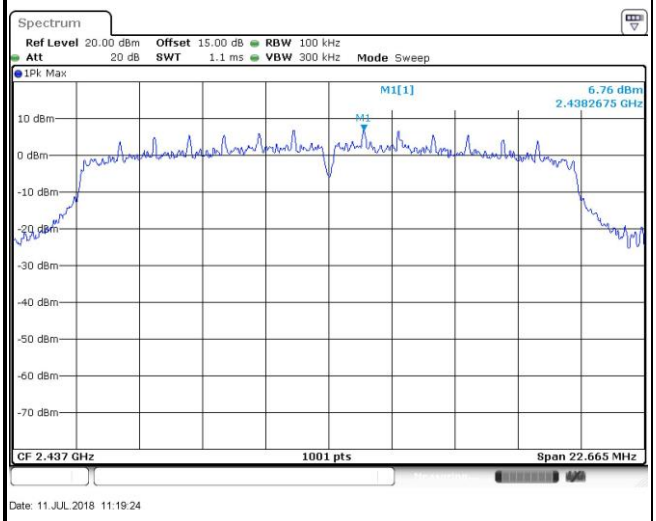
Date: 11.JUL.2018 11:13:21

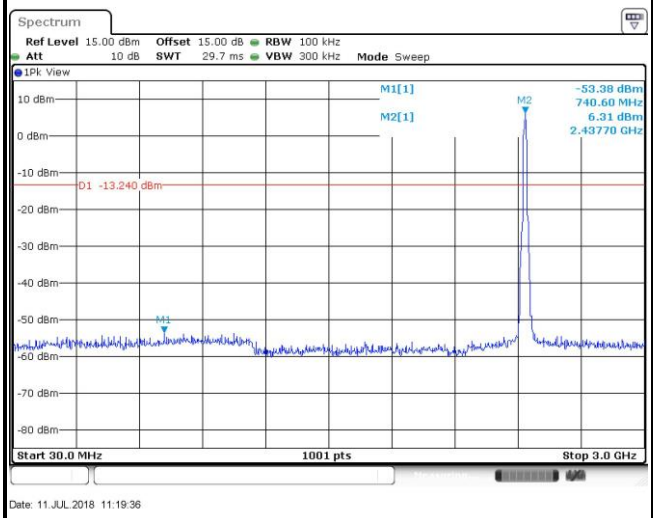
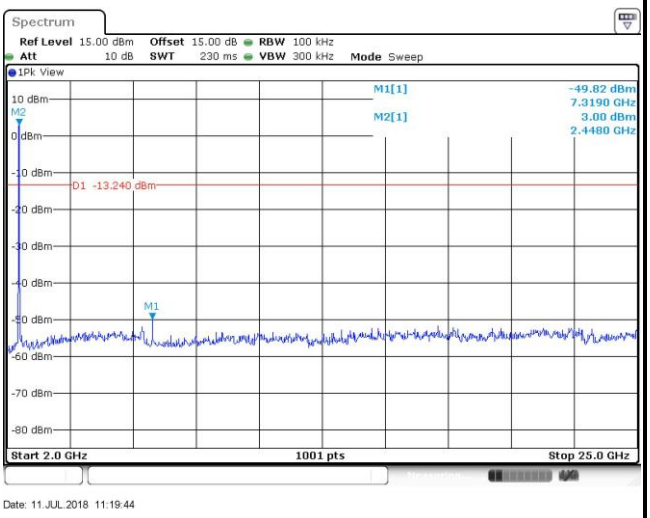
Spurious Emission 2GHz~25GHz



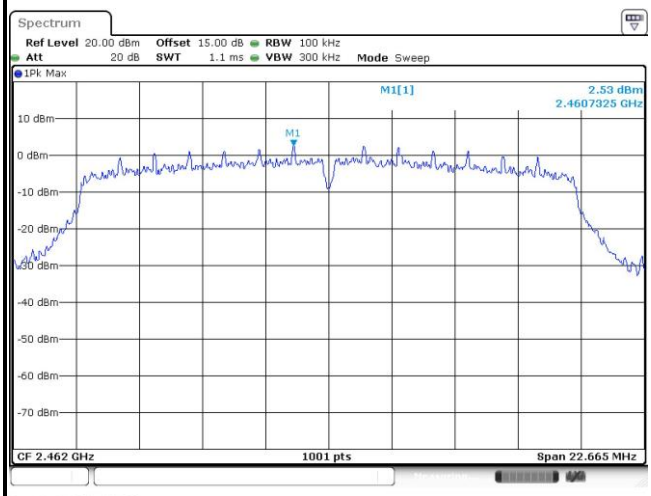
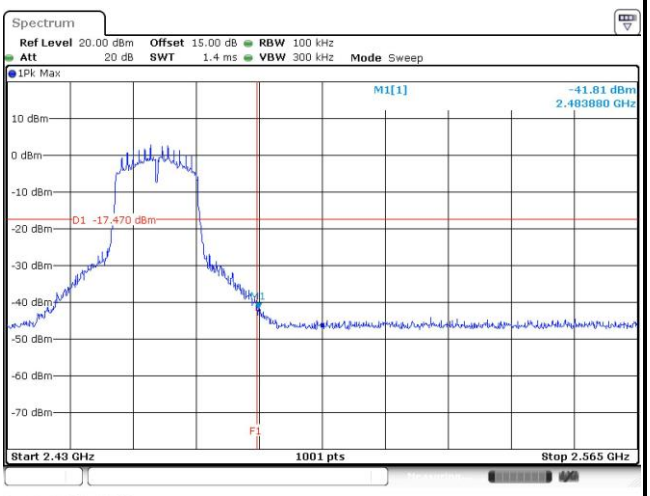
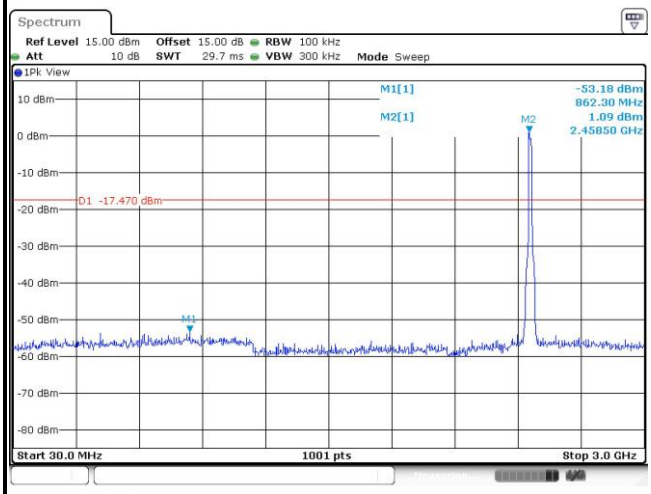
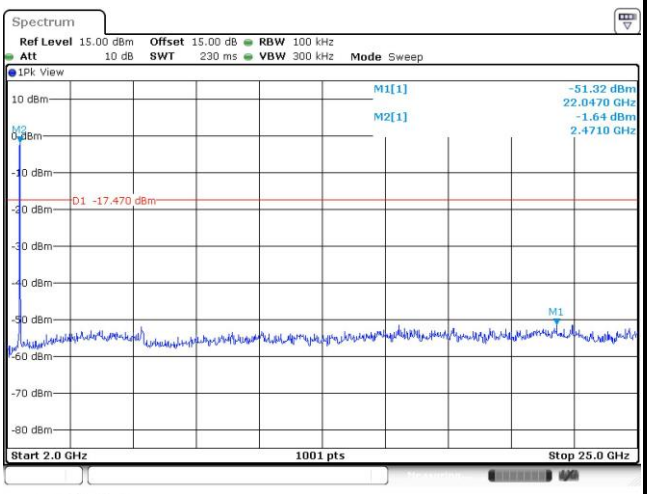
Date: 11.JUL.2018 11:13:29

Test Mode :	802.11n HT20	Test Channel :	06

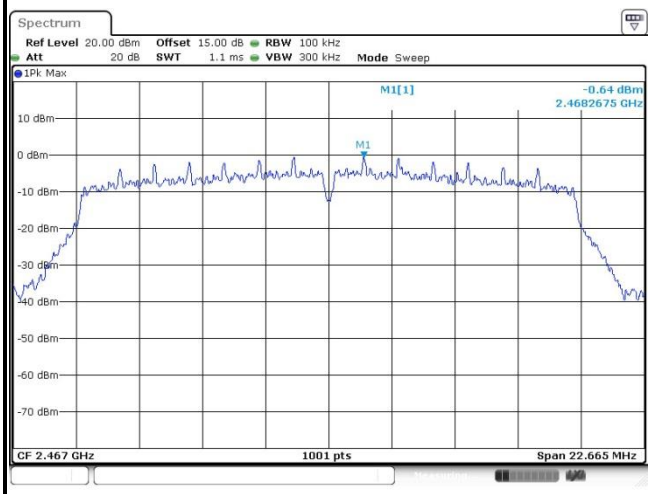
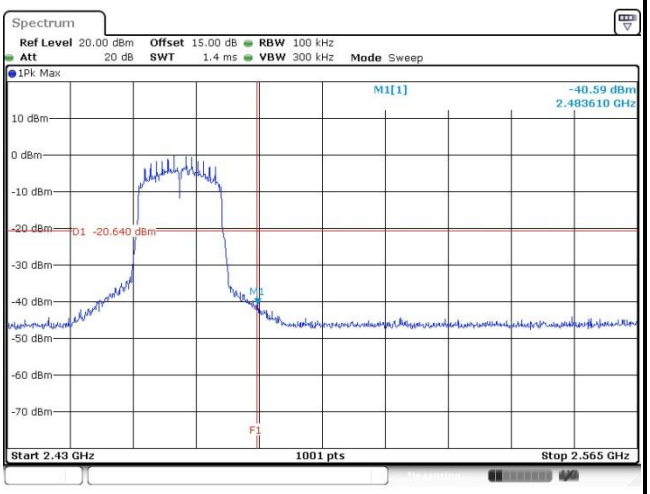
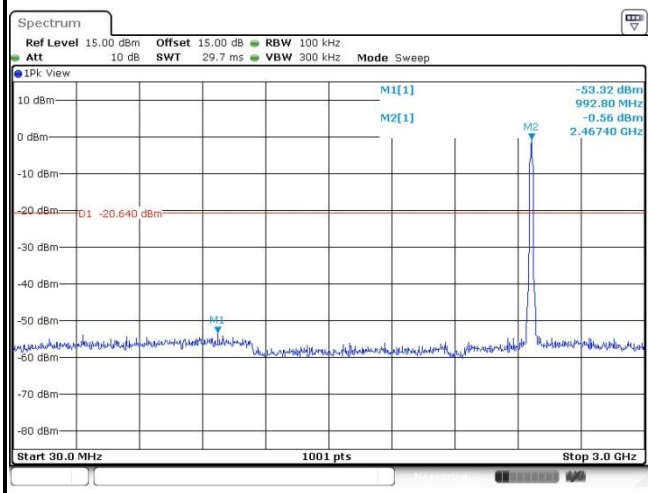
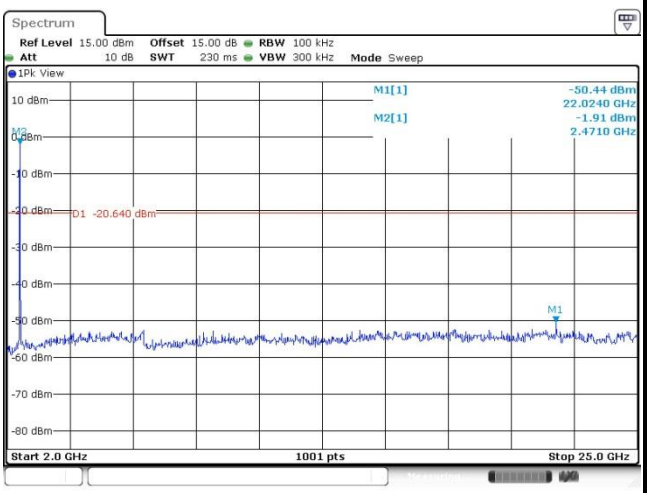
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

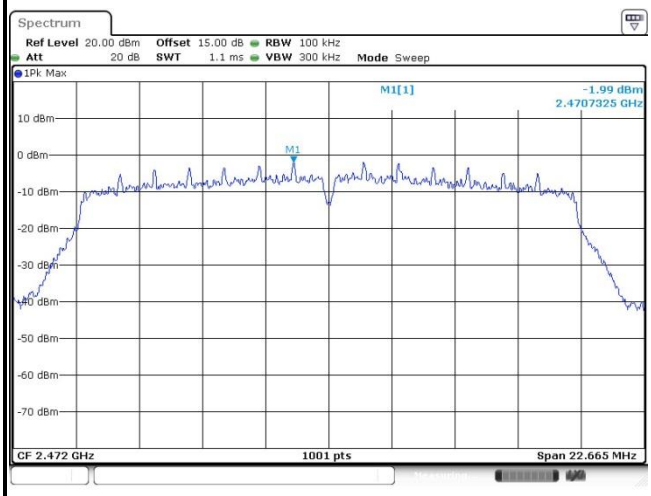
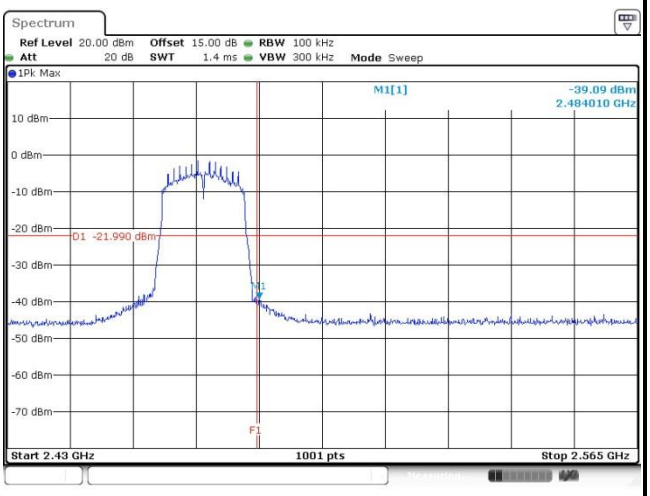
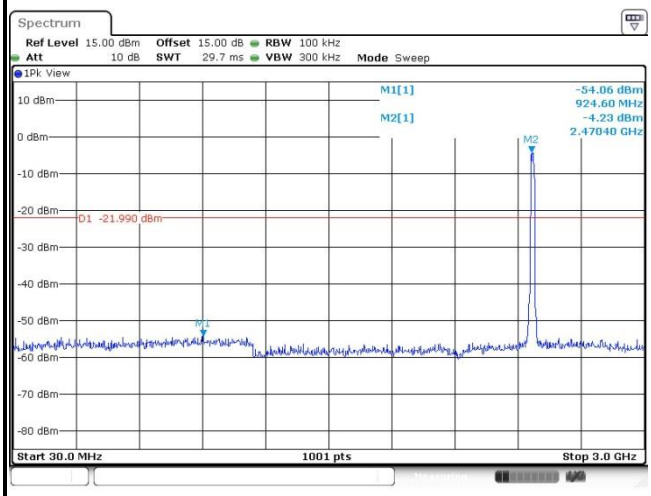
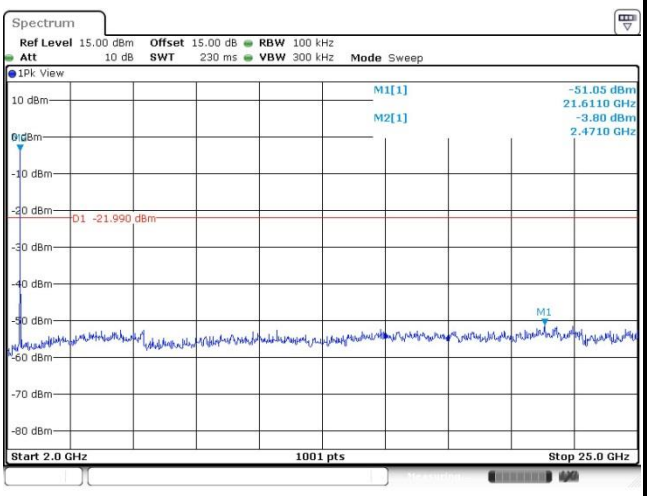
Test Mode :	802.11n HT20	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 11:27:10	Date: 11.JUL.2018 11:27:51
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 11:28:03	Date: 11.JUL.2018 11:28:11

Test Mode :	802.11n HT20	Test Channel :	12

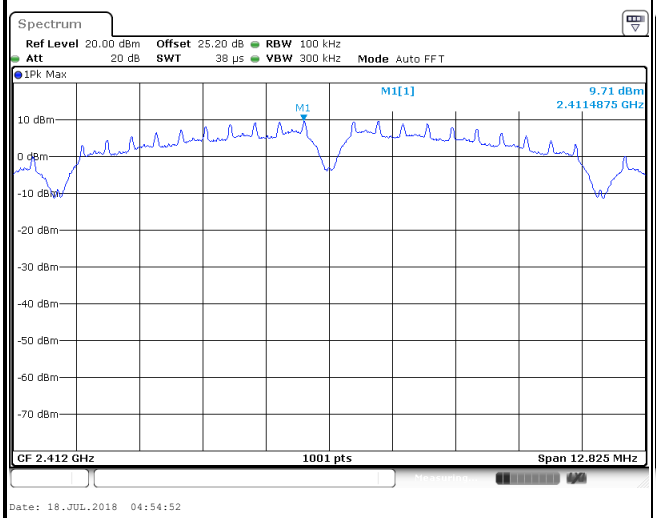
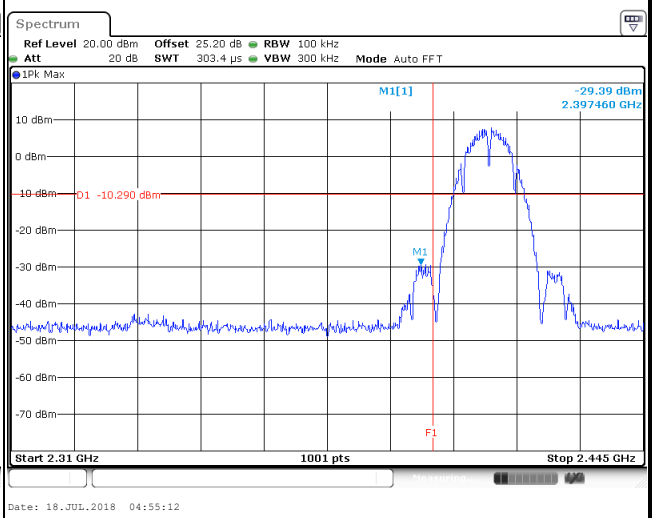
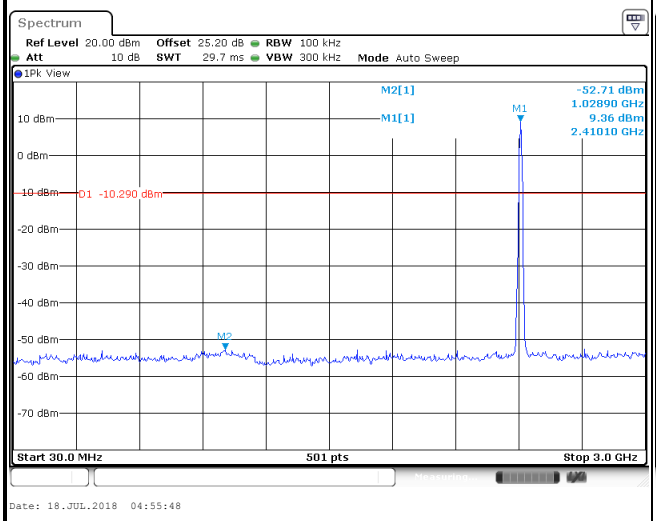
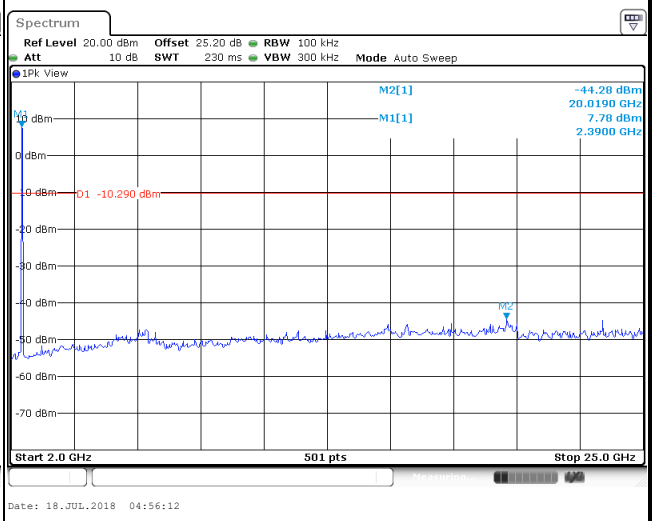
100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 11:33:28	Date: 11.JUL.2018 11:36:06
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 11:33:39	Date: 11.JUL.2018 11:33:47

Test Mode :	802.11n HT20	Test Channel :	13

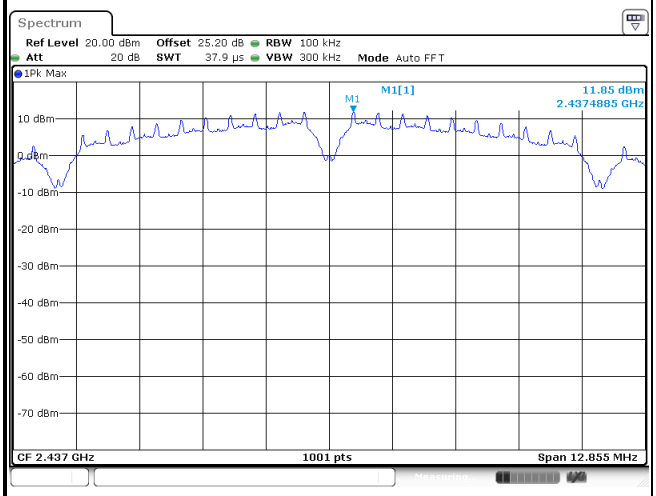
100kHz PSD reference Level	Channel Plot
	
Date: 11.JUL.2018 11:42:49	Date: 11.JUL.2018 11:46:00
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 11.JUL.2018 11:46:18	Date: 11.JUL.2018 11:46:26

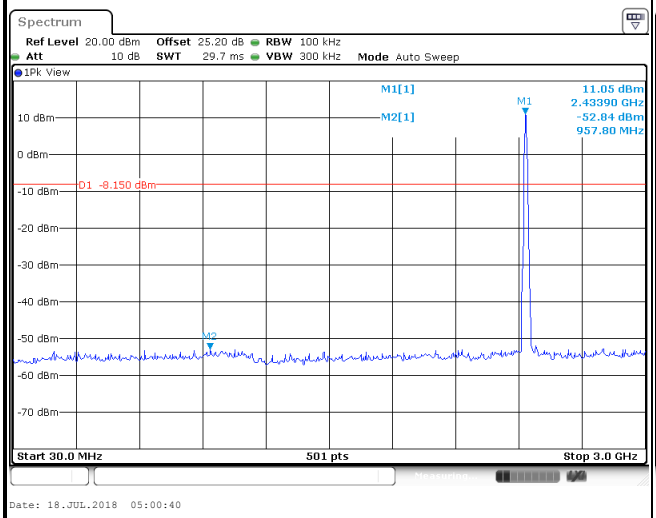
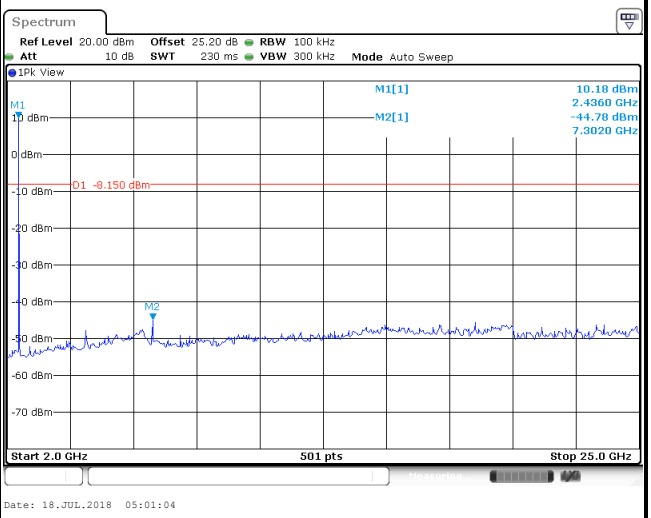
Number of TX = 1, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

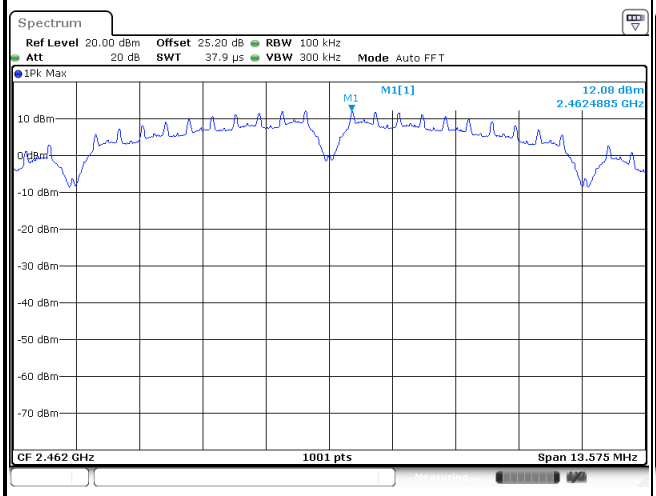
Test Mode :	802.11b	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

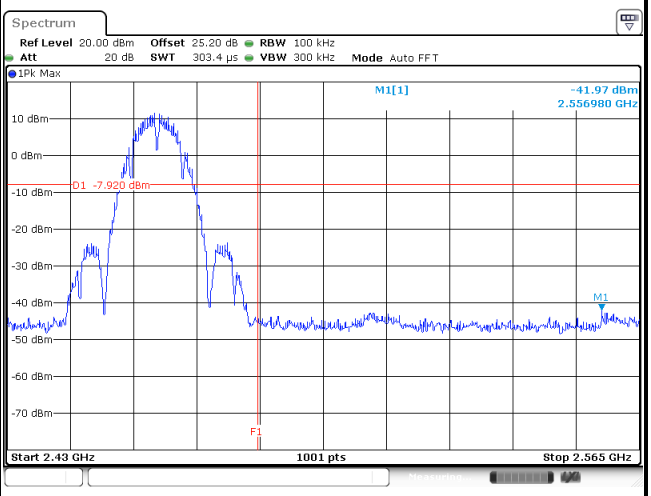
Test Mode :	802.11b	Test Channel :	11

100kHz PSD reference Level



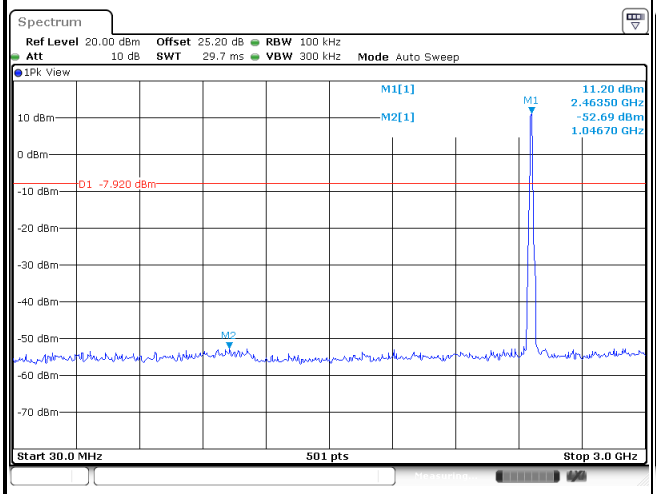
Date: 18.JUL.2018 05:12:24

Channel Plot



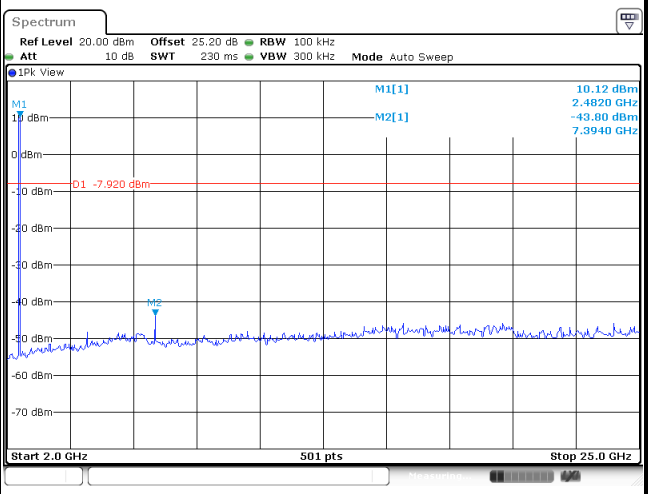
Date: 18.JUL.2018 05:13:15

Spurious Emission 30MHz~3GHz



Date: 18.JUL.2018 05:13:43

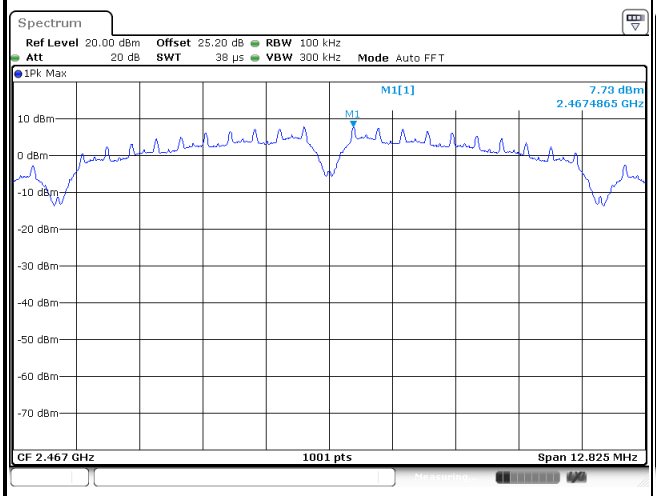
Spurious Emission 2GHz~25GHz



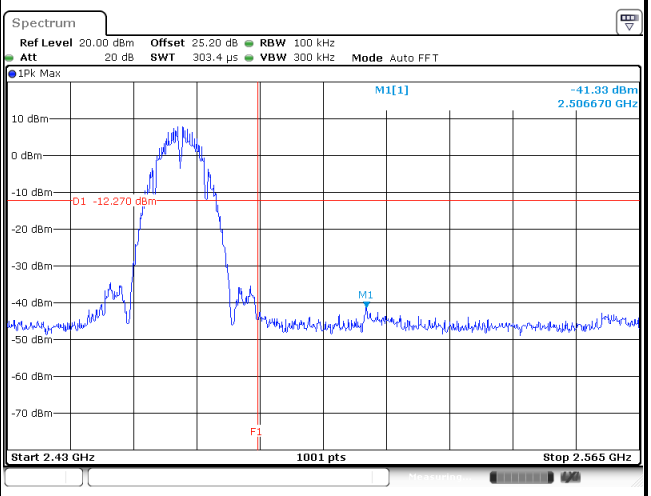
Date: 18.JUL.2018 05:14:04

Test Mode :	802.11b	Test Channel :	12

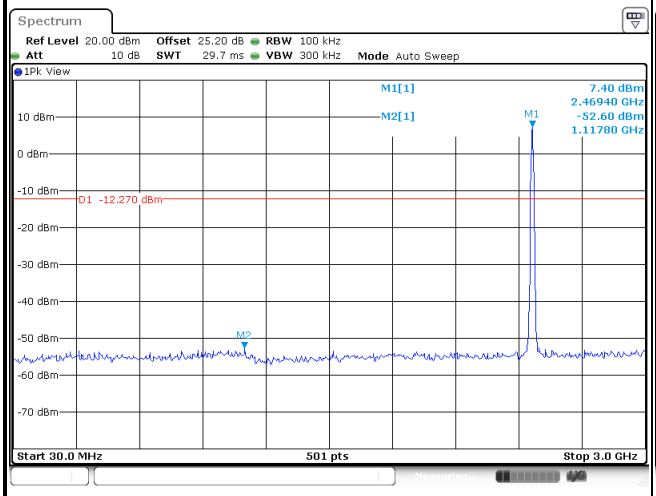
100kHz PSD reference Level



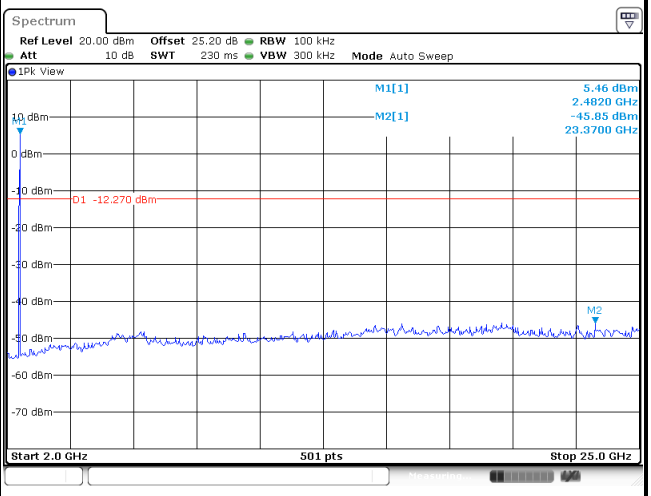
Channel Plot



Spurious Emission 30MHz~3GHz

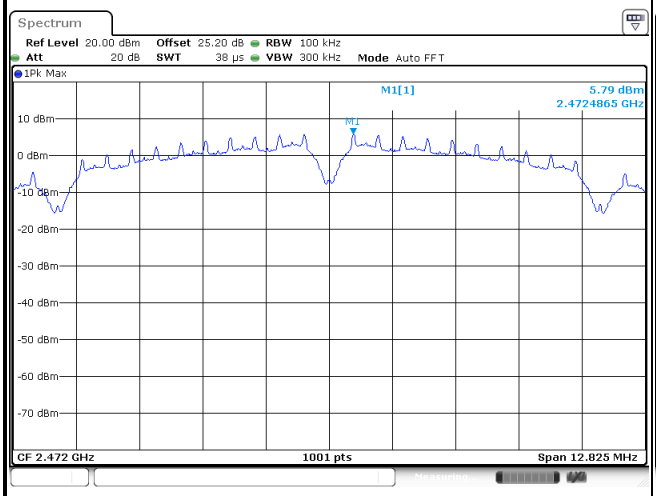


Spurious Emission 2GHz~25GHz



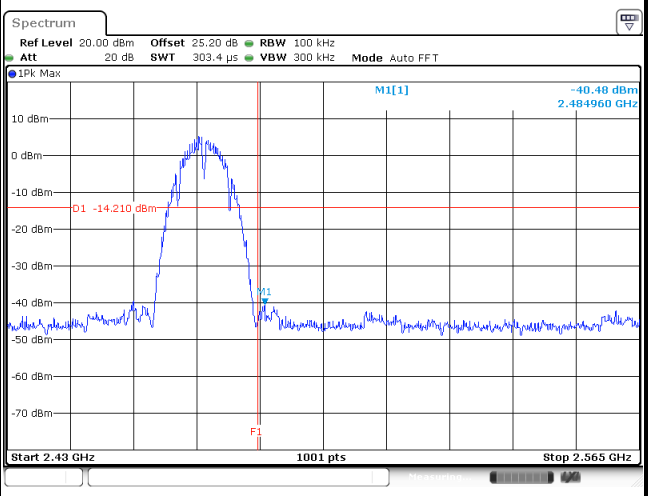
Test Mode :	802.11b	Test Channel :	13

100kHz PSD reference Level



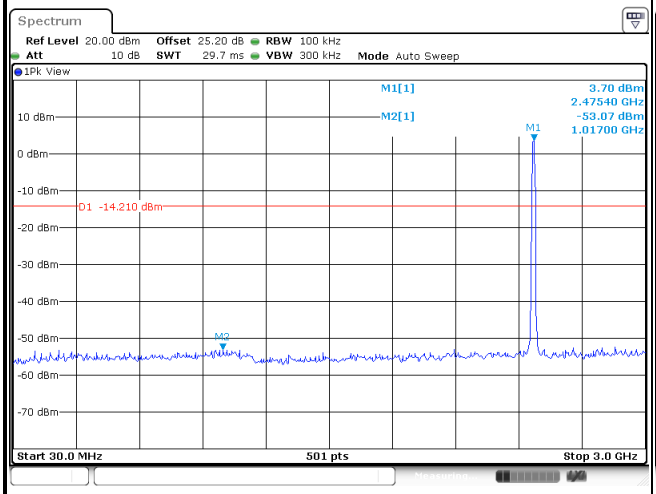
Date: 18.JUL.2018 05:22:14

Channel Plot



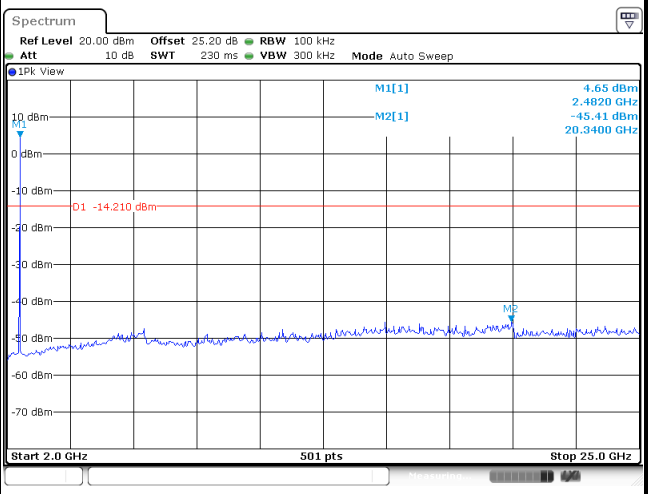
Date: 18.JUL.2018 05:22:33

Spurious Emission 30MHz~3GHz



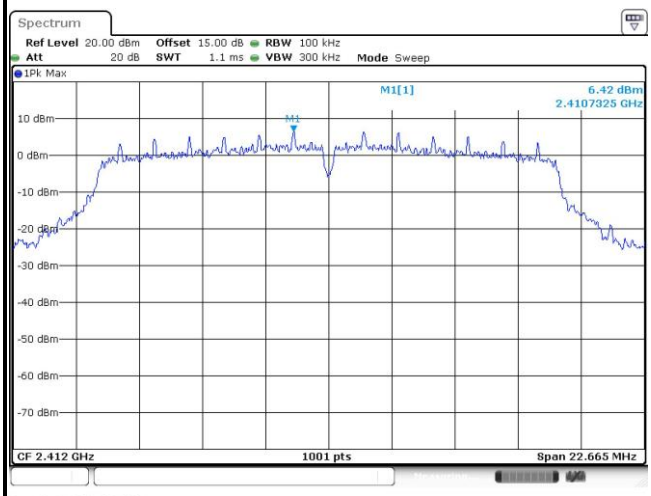
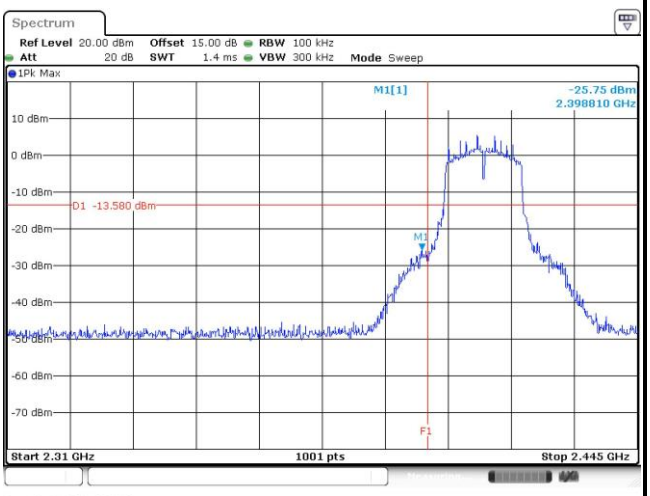
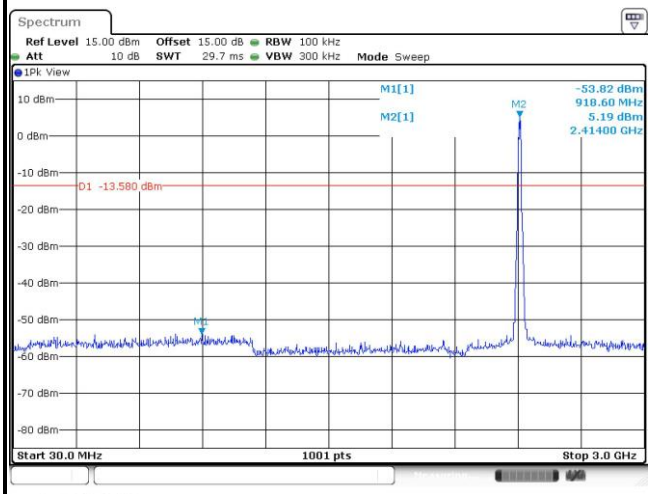
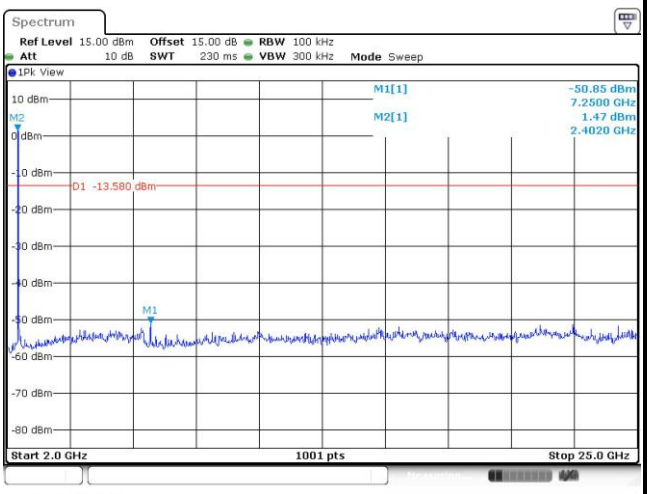
Date: 18.JUL.2018 05:23:08

Spurious Emission 2GHz~25GHz

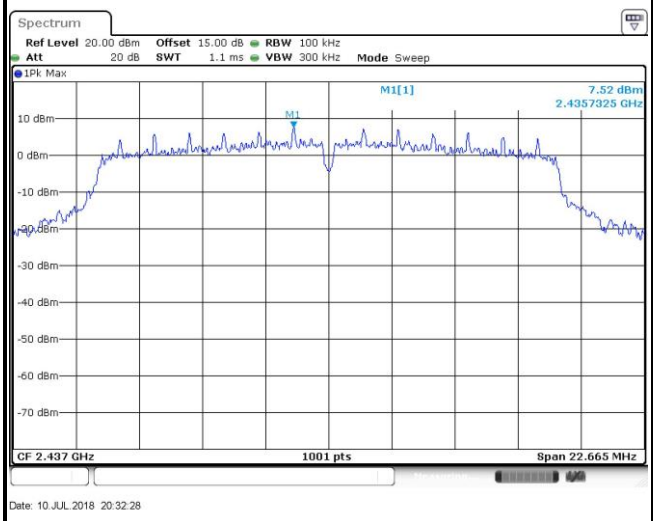


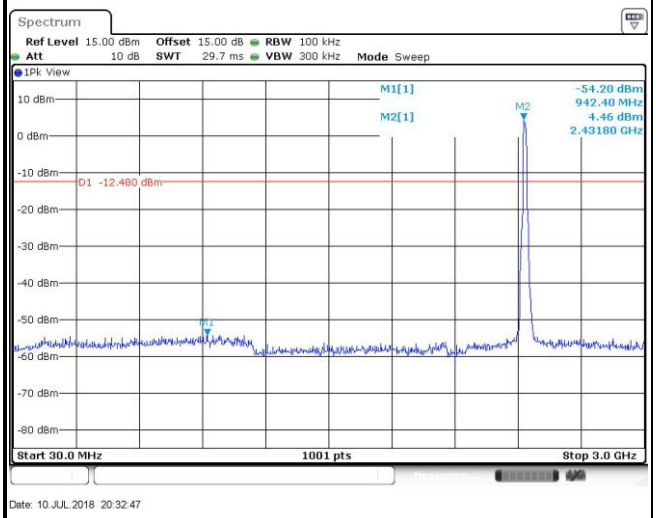
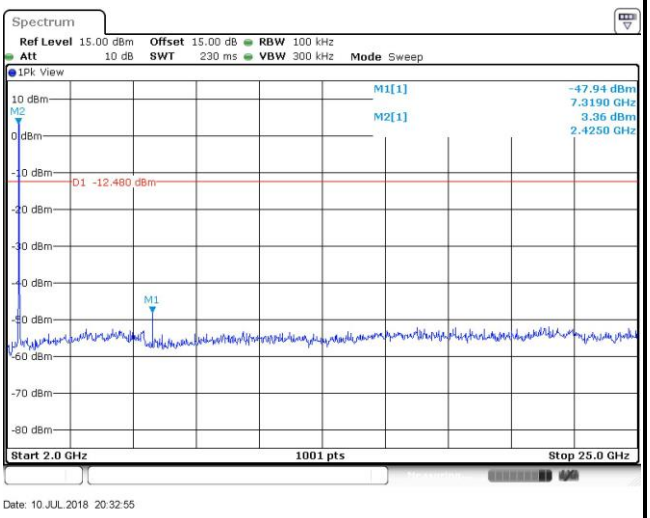
Date: 18.JUL.2018 05:23:29

Test Mode :	802.11g	Test Channel :	01

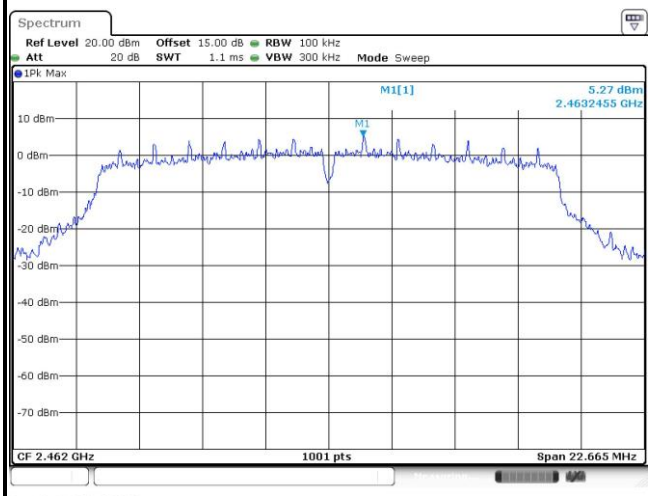
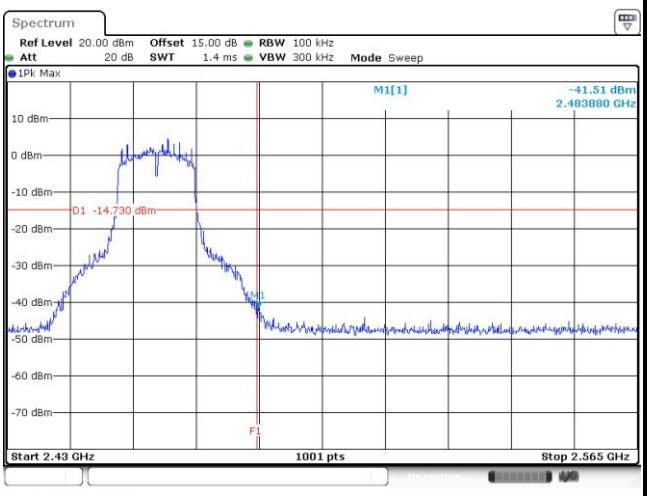
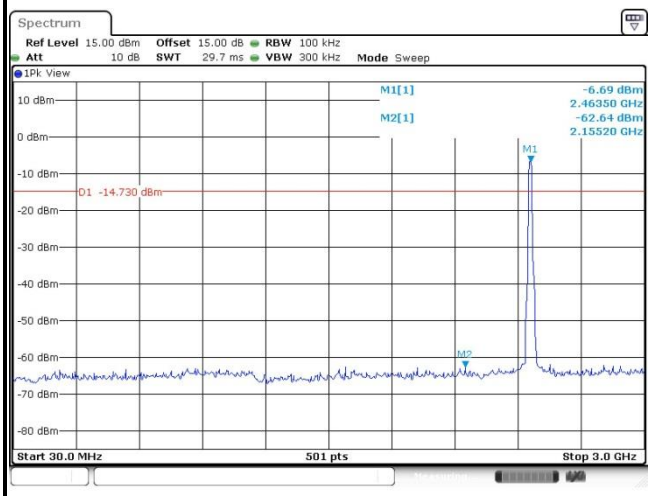
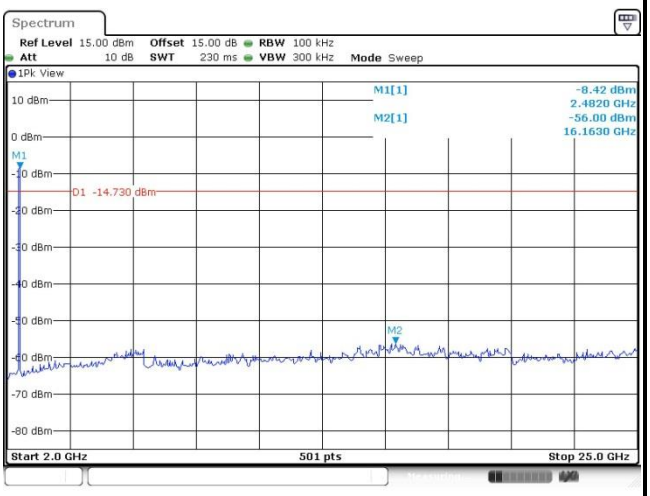
100kHz PSD reference Level	Channel Plot
 Date: 10.JUL.2018 20:27:52	 Date: 10.JUL.2018 20:29:10
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
 Date: 10.JUL.2018 20:29:23	 Date: 10.JUL.2018 20:29:31

Test Mode :	802.11g	Test Channel :	06

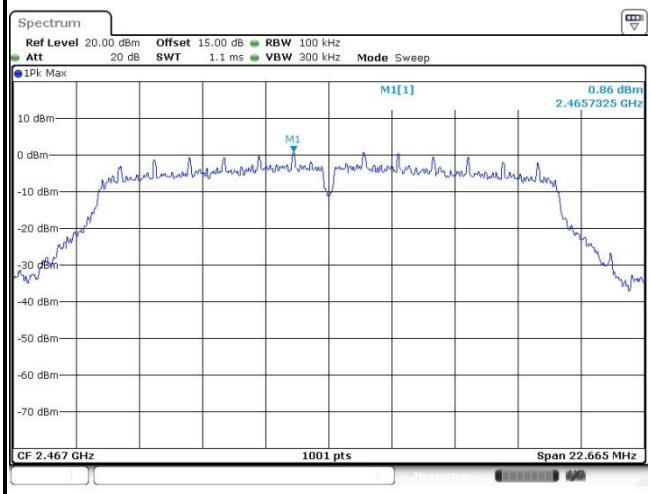
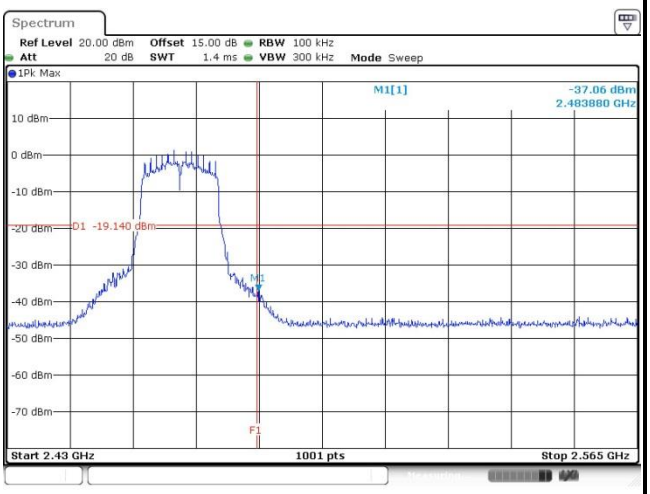
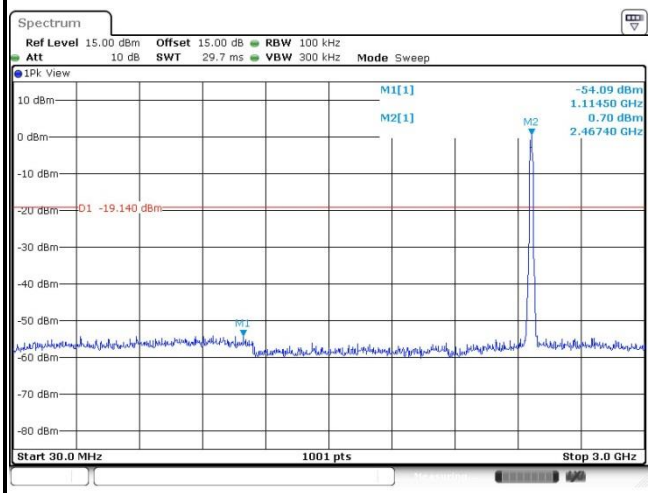
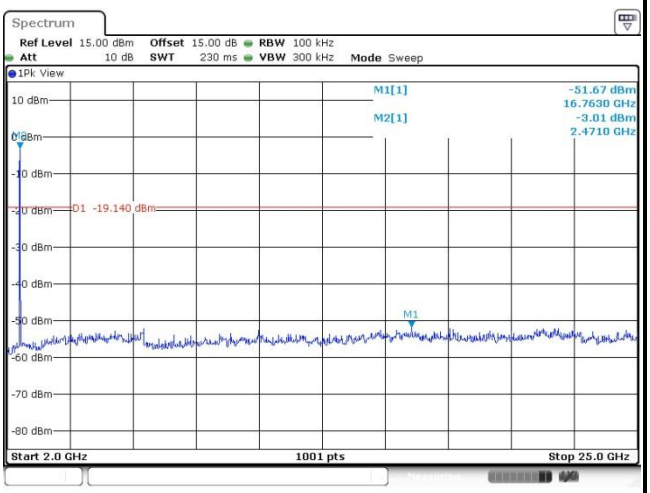
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

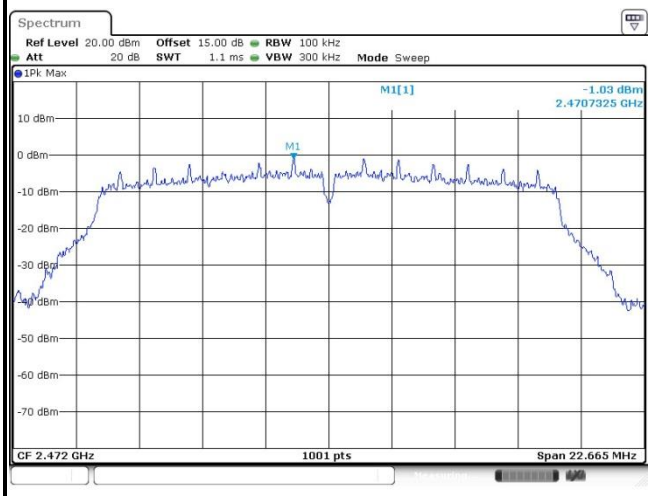
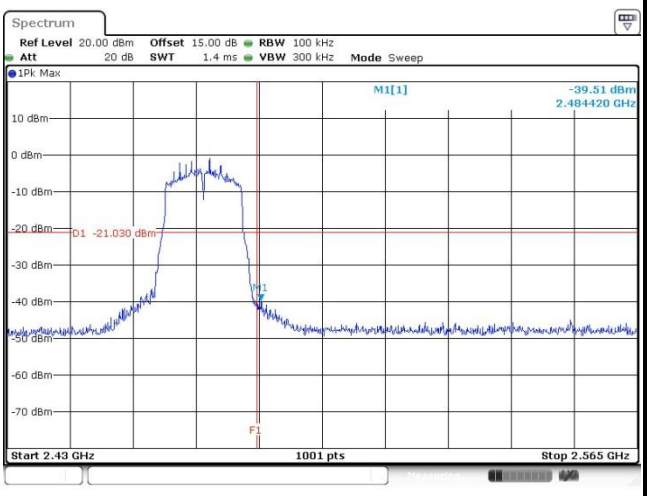
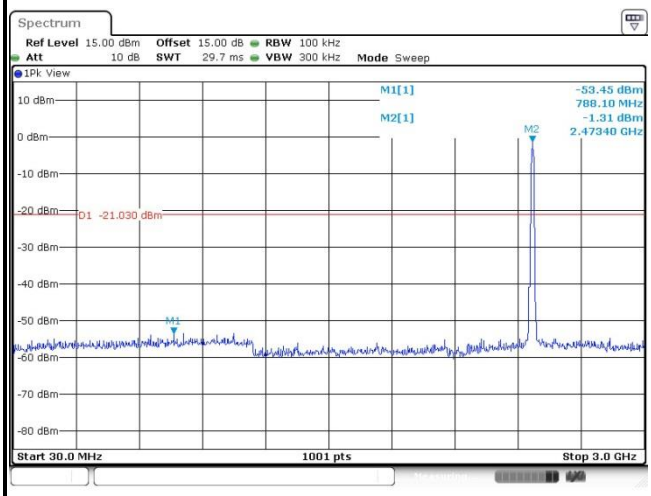
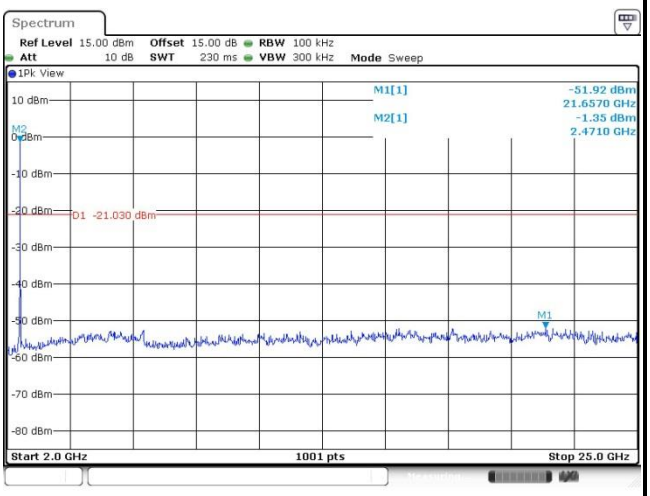
Test Mode :	802.11g	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 20:39:24	Date: 10.JUL.2018 20:39:43
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 20:40:54	Date: 10.JUL.2018 20:41:07

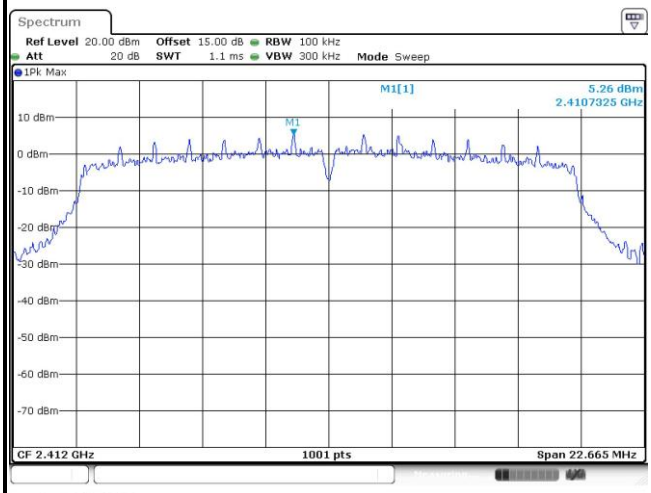
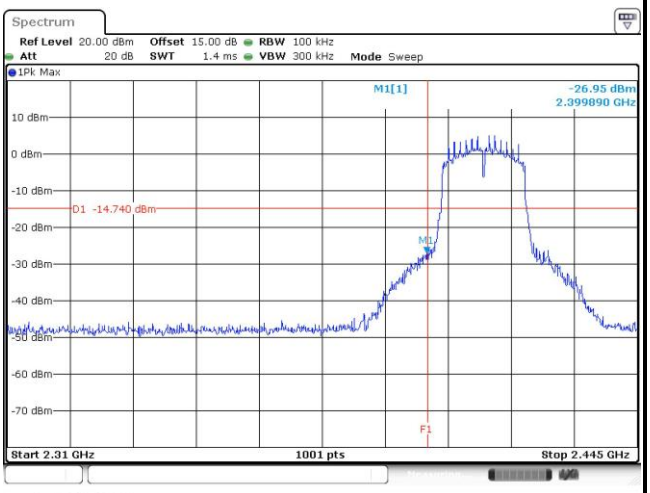
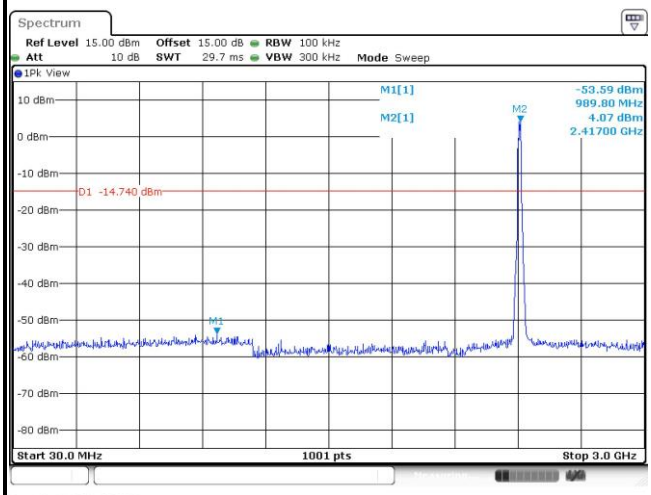
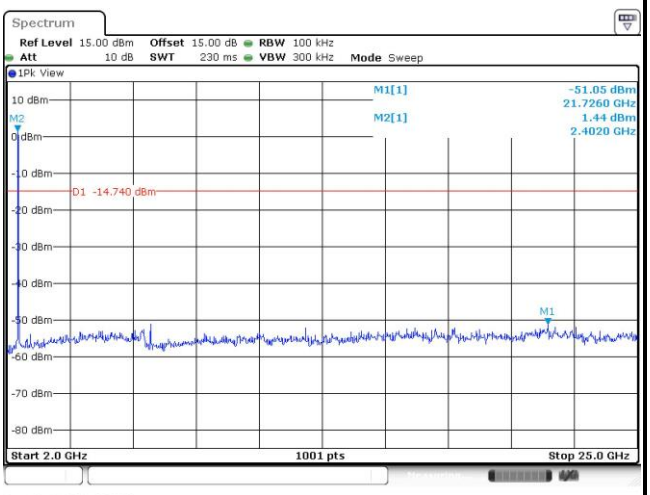
Test Mode :	802.11g	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 20:42:45	Date: 10.JUL.2018 21:27:44
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 20:43:14	Date: 10.JUL.2018 20:43:22

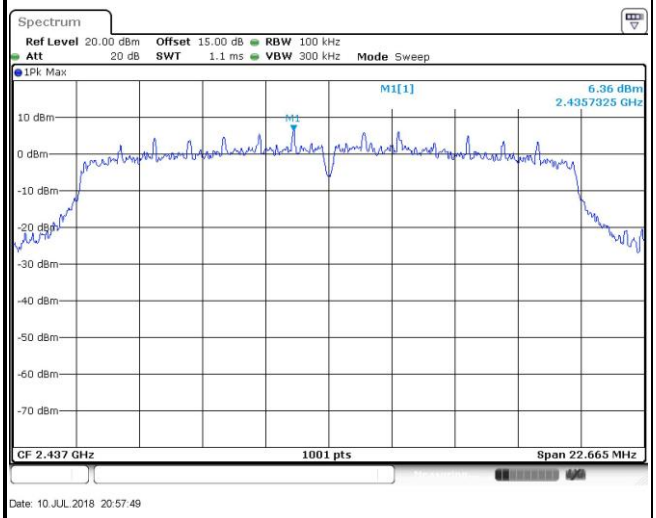
Test Mode :	802.11g	Test Channel :	13

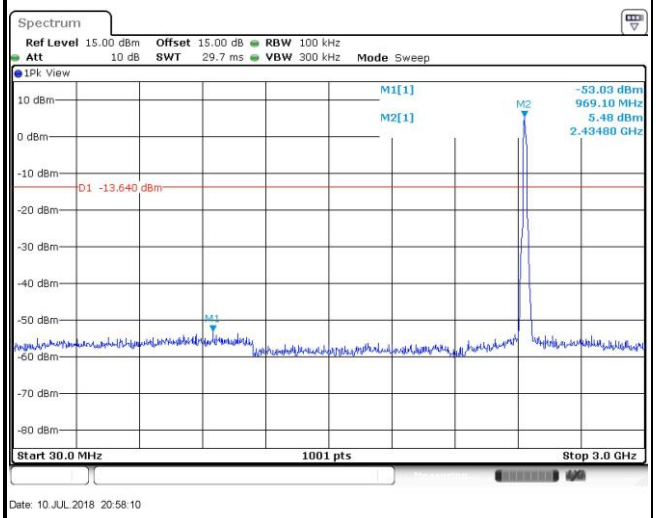
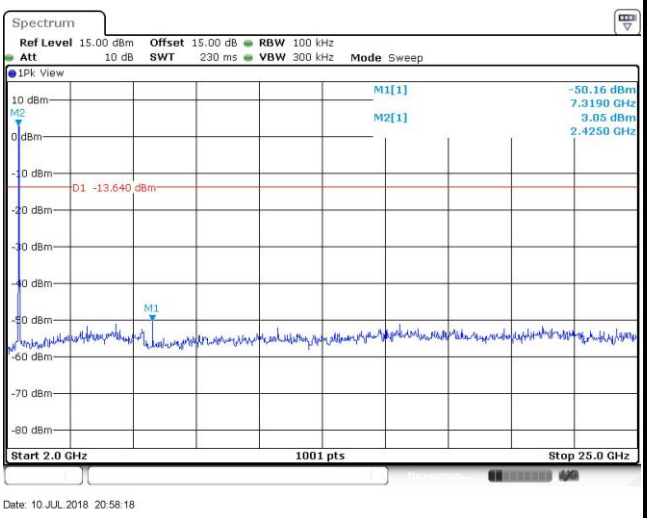
100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 20:48:35	Date: 10.JUL.2018 20:49:12
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 20:49:24	Date: 10.JUL.2018 20:49:32

Test Mode :	802.11n HT20	Test Channel :	01

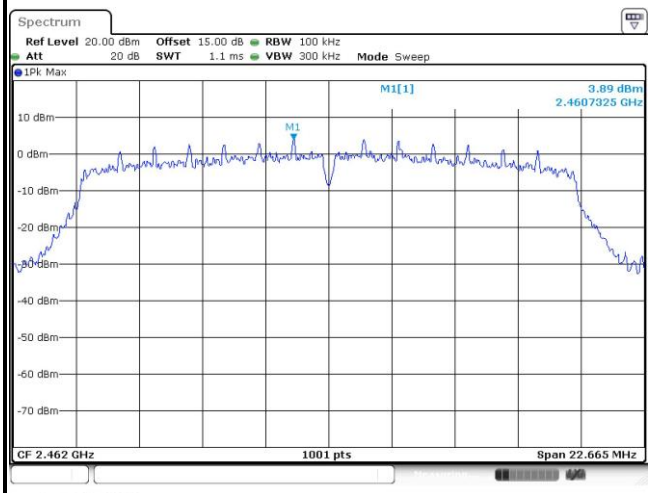
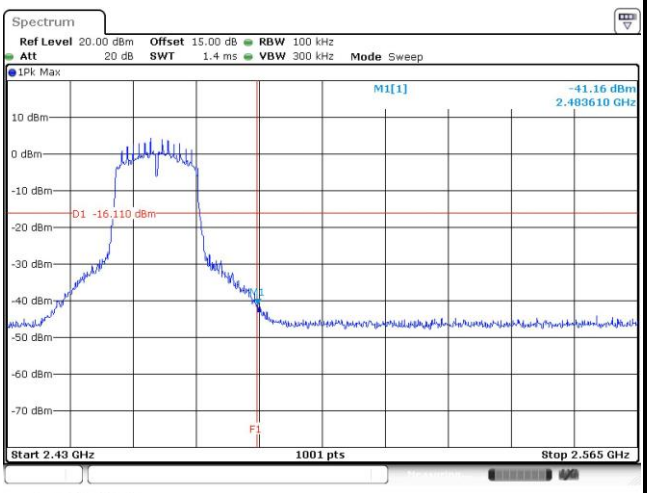
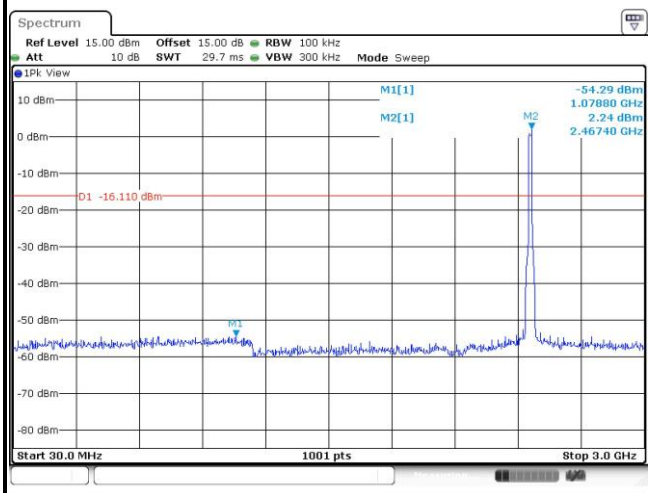
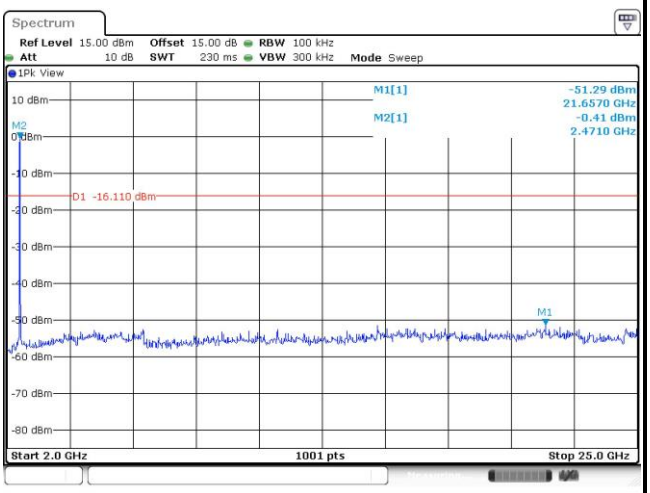
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT20	Test Channel :	06

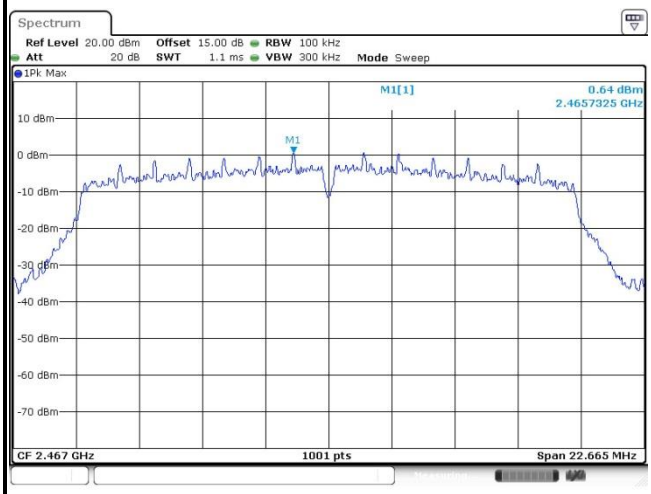
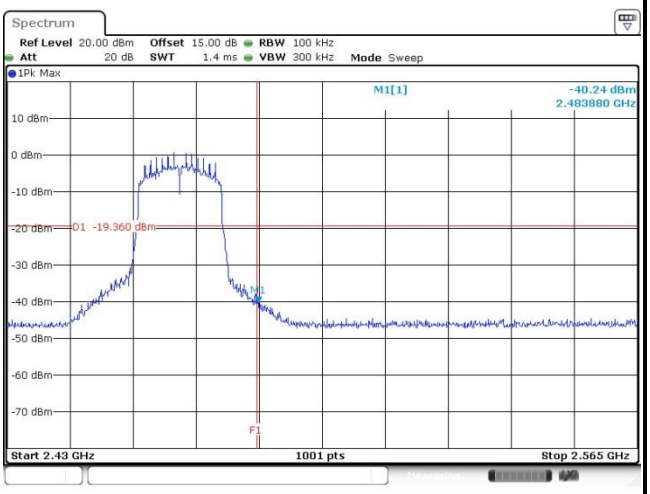
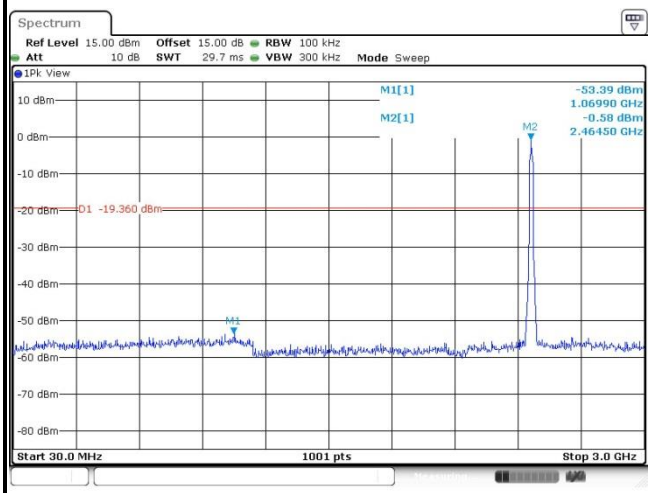
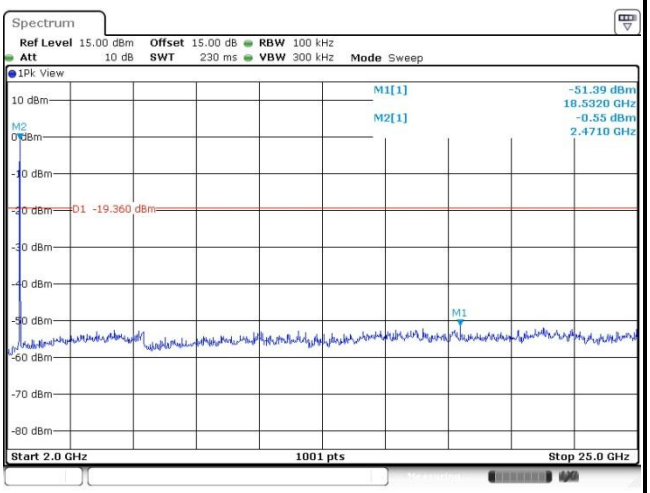
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

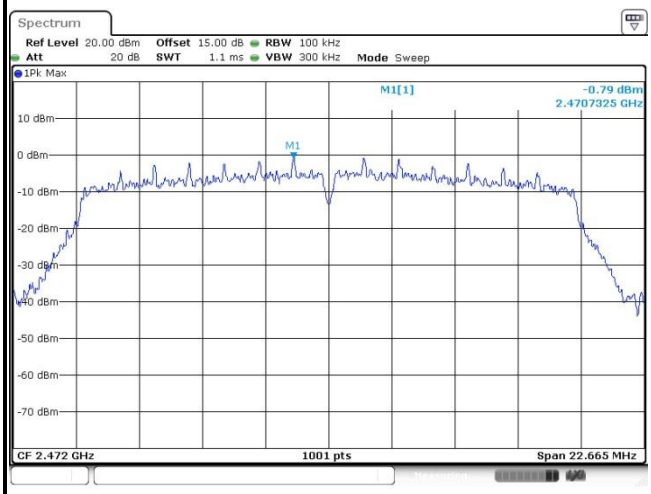
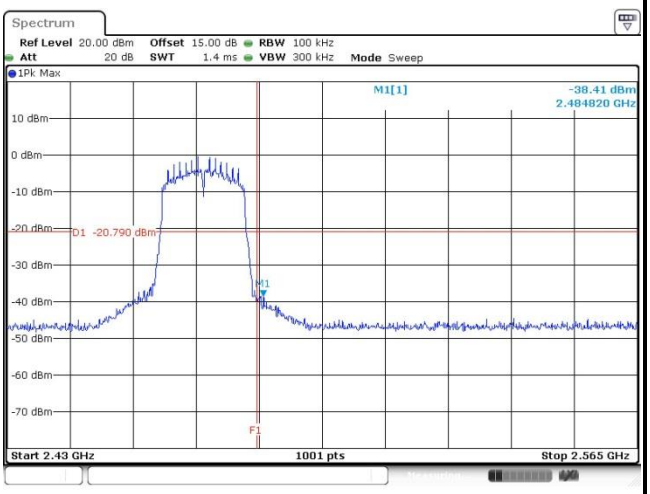
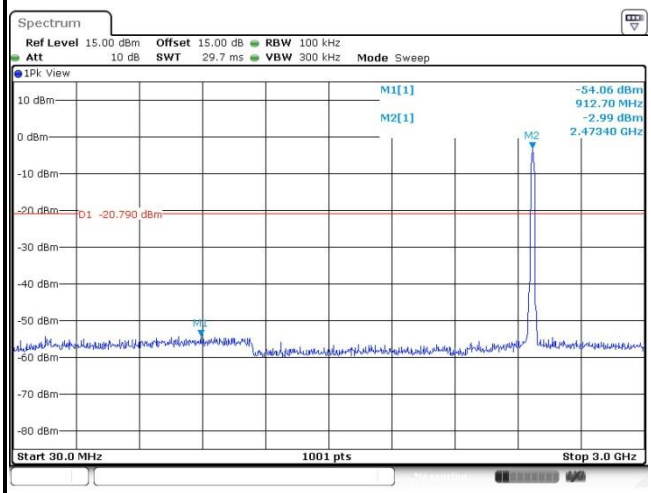
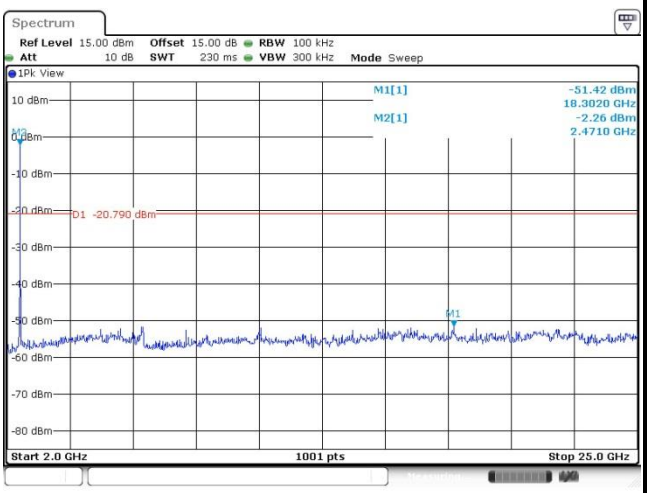
Test Mode :	802.11n HT20	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 21:05:19	Date: 10.JUL.2018 21:06:46
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 21:07:04	Date: 10.JUL.2018 21:07:12

Test Mode :	802.11n HT20	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 21:10:52	Date: 10.JUL.2018 21:30:45
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 21:11:14	Date: 10.JUL.2018 21:11:23

Test Mode :	802.11n HT20	Test Channel :	13

100kHz PSD reference Level	Channel Plot
	
Date: 10.JUL.2018 21:14:56	Date: 10.JUL.2018 21:15:11
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 10.JUL.2018 21:15:25	Date: 10.JUL.2018 21:15:33

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

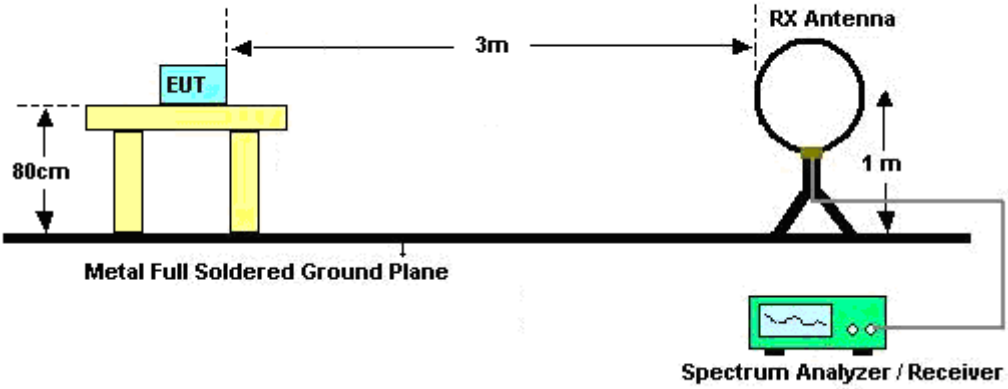
See list of measuring equipment of this test report.

3.5.3 Test Procedures

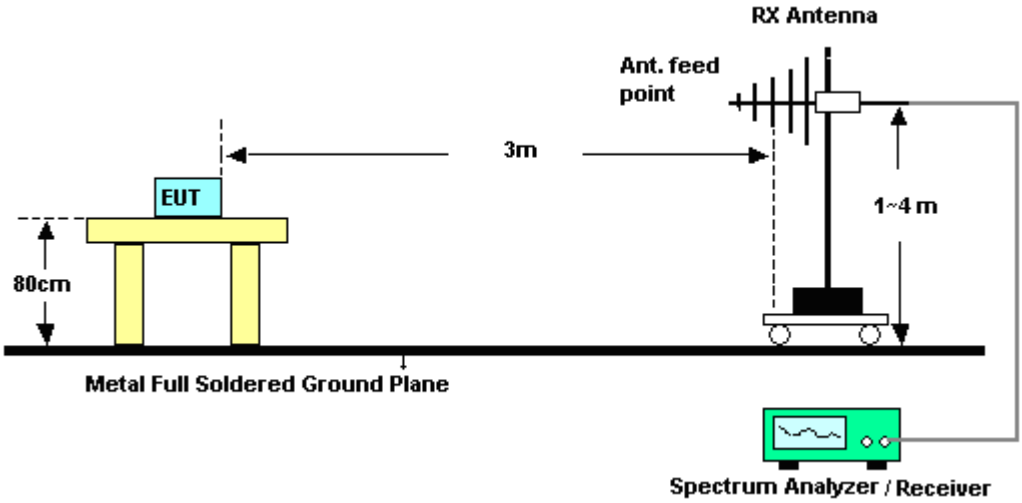
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. 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

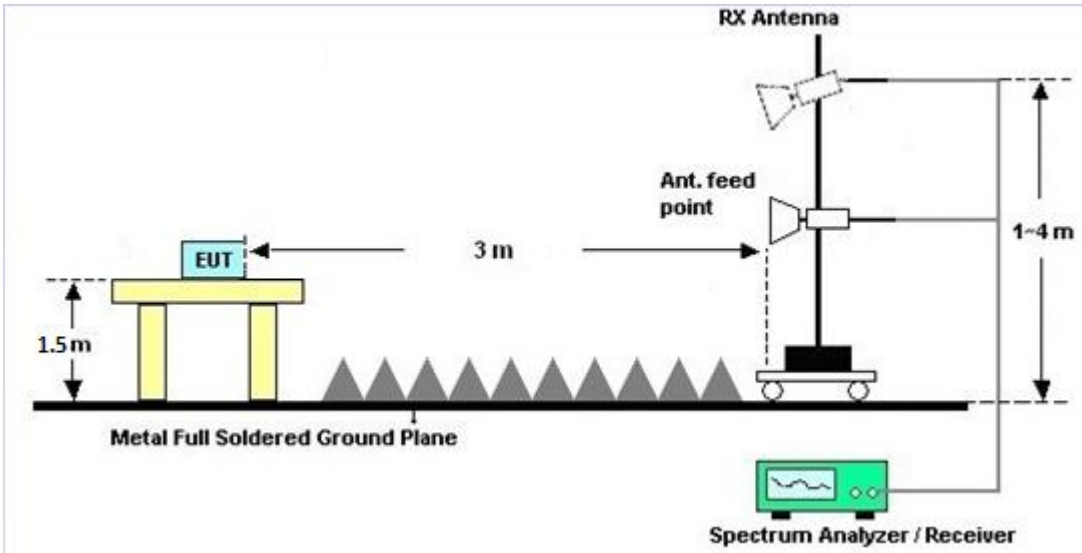
For radiated emissions below 30MHz



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.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

3.6 Antenna Requirements

3.6.1 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.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 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	FSP30	101400	9kHz~40GHz	Dec. 26, 2017	Jun. 12, 2018 ~ Jul. 18, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	Apr. 19, 2018	Jun. 12, 2018 ~ Jul. 18, 2018	Apr. 18, 2019	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 26, 2017	Jun. 12, 2018 ~ Jul. 18, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 26, 2017	Jun. 12, 2018 ~ Jul. 18, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Apr. 19, 2018	Jun. 17, 2018 ~ Jul. 14, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Apr. 19, 2018	Jun. 17, 2018 ~ Jul. 14, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2018	Jun. 17, 2018 ~ Jul. 14, 2018	May 13, 2019	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Aug. 29, 2017	Jun. 17, 2018 ~ Jul. 14, 2018	Aug. 28, 2018	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1285	1GHz~18GHz	Dec. 13, 2017	Jun. 17, 2018 ~ Jul. 14, 2018	Dec. 12, 2018	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Apr. 20 2018	Jun. 17, 2018 ~ Jul. 14, 2018	Apr. 19, 2019	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct.19, 2017	Jun. 17, 2018 ~ Jul. 14, 2018	Oct. 18, 2018	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1989346	1GHz~18GHz	Jul. 27, 2017	Jun. 17, 2018 ~ Jul. 14, 2018	Jul. 26, 2018	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1988315	18GHz~40GHz	Jul. 27, 2017	Jun. 17, 2018 ~ Jul. 14, 2018	Jul. 26, 2018	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY53270156	500MHz~26.5GHz	Apr. 19, 2018	Jun. 17, 2018 ~ Jul. 14, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	Jun. 17, 2018 ~ Jul. 14, 2018	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 17, 2018 ~ Jul. 14, 2018	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 17, 2018 ~ Jul. 14, 2018	NCR	Radiation (03CH04-SZ)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.1

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.9

Appendix A. Conducted Test Results

Test Engineer:	Sam Zheng	Temperature:	21~25	°C
Test Date:	2018/06/12 ~ 2018/07/18	Relative Humidity:	51~54	%

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
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	1	1	2412	14.14	14.09	8.57	8.55	0.50	Pass
11b	1Mbps	1	6	2437	14.19	14.24	8.57	8.57	0.50	Pass
11b	1Mbps	1	11	2462	14.49	14.34	9.05	9.05	0.50	Pass
11b	1Mbps	1	12	2467	13.89	13.79	8.55	8.55	0.50	Pass
11b	1Mbps	1	13	2472	13.54	13.59	8.55	8.55	0.50	Pass
11g	6Mbps	1	1	2412	16.98	16.98	15.11	15.11	0.50	Pass
11g	6Mbps	1	6	2437	17.18	17.18	15.11	15.11	0.50	Pass
11g	6Mbps	1	11	2462	16.88	16.88	15.11	15.11	0.50	Pass
11g	6Mbps	1	12	2467	16.78	16.78	15.11	15.11	0.50	Pass
11g	6Mbps	1	13	2472	16.78	16.78	15.11	15.11	0.50	Pass
HT20	MCS0	1	1	2412	17.73	17.78	15.11	15.11	0.50	Pass
HT20	MCS0	1	6	2437	17.93	17.98	15.11	15.11	0.50	Pass
HT20	MCS0	1	11	2462	17.83	17.78	15.11	15.11	0.50	Pass
HT20	MCS0	1	12	2467	17.73	17.68	15.11	15.11	0.50	Pass
HT20	MCS0	1	13	2472	17.63	17.73	15.11	15.11	0.50	Pass

TEST RESULTS DATA
Peak Output Power

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
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	22.25	20.58	30.00	30.00	2.97	1.36	25.22	21.94	36.00	36.00	Pass
11b	1Mbps	1	6	2437	22.26	22.45	30.00	30.00	2.97	1.36	25.23	23.81	36.00	36.00	Pass
11b	1Mbps	1	11	2462	22.18	22.49	30.00	30.00	2.97	1.36	25.15	23.85	36.00	36.00	Pass
11b	1Mbps	1	12	2467	18.59	18.39	30.00	30.00	2.97	1.36	21.56	19.75	36.00	36.00	Pass
11b	1Mbps	1	13	2472	15.67	16.31	30.00	30.00	2.97	1.36	18.64	17.67	36.00	36.00	Pass
11g	6Mbps	1	1	2412	23.87	23.84	30.00	30.00	2.97	1.36	26.84	25.20	36.00	36.00	Pass
11g	6Mbps	1	6	2437	24.08	24.07	30.00	30.00	2.97	1.36	27.05	25.43	36.00	36.00	Pass
11g	6Mbps	1	11	2462	23.38	23.45	30.00	30.00	2.97	1.36	26.35	24.81	36.00	36.00	Pass
11g	6Mbps	1	12	2467	19.73	20.56	30.00	30.00	2.97	1.36	22.70	21.92	36.00	36.00	Pass
11g	6Mbps	1	13	2472	18.52	19.33	30.00	30.00	2.97	1.36	21.49	20.69	36.00	36.00	Pass
HT20	MCS0	1	1	2412	21.70	23.96	30.00	30.00	2.97	1.36	24.67	25.32	36.00	36.00	Pass
HT20	MCS0	1	6	2437	24.09	24.15	30.00	30.00	2.97	1.36	27.06	25.51	36.00	36.00	Pass
HT20	MCS0	1	11	2462	21.20	23.28	30.00	30.00	2.97	1.36	24.17	24.64	36.00	36.00	Pass
HT20	MCS0	1	12	2467	20.30	20.92	30.00	30.00	2.97	1.36	23.27	22.28	36.00	36.00	Pass
HT20	MCS0	1	13	2472	19.56	20.25	30.00	30.00	2.97	1.36	22.53	21.61	36.00	36.00	Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band								
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)	
					Ant 1	Ant 2	Ant 1	Ant 2
11b	1Mbps	1	1	2412	0.06	0.06	20.31	18.59
11b	1Mbps	1	6	2437	0.06	0.06	20.35	20.47
11b	1Mbps	1	11	2462	0.06	0.06	20.24	20.52
11b	1Mbps	1	12	2467	0.06	0.06	16.40	16.17
11b	1Mbps	1	13	2472	0.06	0.06	13.41	14.13
11g	6Mbps	1	1	2412	0.31	0.28	17.25	16.67
11g	6Mbps	1	6	2437	0.31	0.28	18.19	18.10
11g	6Mbps	1	11	2462	0.31	0.28	16.05	16.01
11g	6Mbps	1	12	2467	0.31	0.28	10.96	12.19
11g	6Mbps	1	13	2472	0.31	0.28	9.02	10.03
HT20	MCS0	1	1	2412	0.33	0.33	13.58	15.95
HT20	MCS0	1	6	2437	0.33	0.33	17.17	17.08
HT20	MCS0	1	11	2462	0.33	0.33	12.93	14.44
HT20	MCS0	1	12	2467	0.33	0.33	10.38	11.56
HT20	MCS0	1	13	2472	0.33	0.33	8.85	9.96

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)		DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	-2.21	-3.80	2.97	1.36	8.00	8.00	Pass
11b	1Mbps	1	6	2437	-2.21	-1.64	2.97	1.36	8.00	8.00	Pass
11b	1Mbps	1	11	2462	-1.64	-1.54	2.97	1.36	8.00	8.00	Pass
11b	1Mbps	1	12	2467	-5.27	-5.82	2.97	1.36	8.00	8.00	Pass
11b	1Mbps	1	13	2472	-8.37	-7.61	2.97	1.36	8.00	8.00	Pass
11g	6Mbps	1	1	2412	-8.52	-8.52	2.97	1.36	8.00	8.00	Pass
11g	6Mbps	1	6	2437	-7.66	-9.68	2.97	1.36	8.00	8.00	Pass
11g	6Mbps	1	11	2462	-9.46	-11.49	2.97	1.36	8.00	8.00	Pass
11g	6Mbps	1	12	2467	-14.75	-15.02	2.97	1.36	8.00	8.00	Pass
11g	6Mbps	1	13	2472	-17.01	-16.54	2.97	1.36	8.00	8.00	Pass
HT20	MCS0	1	1	2412	-12.10	-9.86	2.97	1.36	8.00	8.00	Pass
HT20	MCS0	1	6	2437	-8.80	-7.48	2.97	1.36	8.00	8.00	Pass
HT20	MCS0	1	11	2462	-12.07	-11.80	2.97	1.36	8.00	8.00	Pass
HT20	MCS0	1	12	2467	-16.52	-15.64	2.97	1.36	8.00	8.00	Pass
HT20	MCS0	1	13	2472	-15.59	-16.73	2.97	1.36	8.00	8.00	Pass

Measured power density (dBm) has offset with cable loss.

Appendix B. Radiated Spurious Emission

Test Engineer :	Vikki Peng	Temperature :	22~25°C
		Relative Humidity :	48~52%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	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		2384.34	54.28	-19.72	74	51.39	27.72	4.72	29.55	242	286	P	H
		2390	44.28	-9.72	54	41.36	27.7	4.78	29.56	242	286	A	H
	*	2412	111.5	-	-	108.59	27.69	4.78	29.56	242	286	P	H
	*	2412	108.32	-	-	105.41	27.69	4.78	29.56	242	286	A	H
		2386.545	55.21	-18.79	74	52.28	27.7	4.78	29.55	380	233	P	V
		2385.915	46.23	-7.77	54	43.3	27.7	4.78	29.55	380	233	A	V
	*	2412	108.24	-	-	105.33	27.69	4.78	29.56	380	233	P	V
	*	2412	105.07	-	-	102.16	27.69	4.78	29.56	380	233	A	V
802.11b CH 06 2437MHz		2375.1	52.68	-21.32	74	49.79	27.72	4.72	29.55	215	283	P	H
		2388.82	42.25	-11.75	54	39.32	27.7	4.78	29.55	215	283	A	H
	*	2437	110.26	-	-	107.35	27.66	4.82	29.57	215	283	P	H
	*	2436	107.17	-	-	104.25	27.67	4.82	29.57	215	283	A	H
		2493.91	52.8	-21.2	74	49.94	27.61	4.85	29.6	215	283	P	H
		2485.65	41.87	-12.13	54	38.98	27.63	4.85	29.59	215	283	A	H
		2362.92	52.25	-21.75	74	49.33	27.74	4.72	29.54	375	236	P	V
		2388.26	41.84	-12.16	54	38.91	27.7	4.78	29.55	375	236	A	V
	*	2437	107.41	-	-	104.5	27.66	4.82	29.57	375	236	P	V
	*	2437	104.31	-	-	101.4	27.66	4.82	29.57	375	236	A	V
		2484.39	52.71	-21.29	74	49.82	27.63	4.85	29.59	375	236	P	V
		2485.51	41.8	-12.2	54	38.91	27.63	4.85	29.59	375	236	A	V

802.11b CH 11 2462MHz	*	2462	109.75	-	-	106.87	27.64	4.82	29.58	215	283	P	H
	*	2462	106.69	-	-	103.81	27.64	4.82	29.58	215	283	A	H
		2488.12	55.18	-18.82	74	52.31	27.61	4.85	29.59	215	283	P	H
		2488.32	45.91	-8.09	54	43.04	27.61	4.85	29.59	215	283	A	H
	*	2462	106.43	-	-	103.55	27.64	4.82	29.58	375	235	P	V
	*	2462	103.28	-	-	100.4	27.64	4.82	29.58	375	235	A	V
		2487.28	53.2	-20.8	74	50.31	27.63	4.85	29.59	375	235	P	V
		2487.76	44.37	-9.63	54	41.5	27.61	4.85	29.59	375	235	A	V
802.11b CH 12 2467MHz	*	2467	104.29	-	-	101.39	27.64	4.85	29.59	104	294	P	H
	*	2467	101.3	-	-	98.4	27.64	4.85	29.59	104	294	A	H
		2483.6	59.11	-14.89	74	56.22	27.63	4.85	29.59	104	294	P	H
		2483.52	53.23	-0.77	54	50.34	27.63	4.85	29.59	104	294	A	H
	*	2467	103.48	-	-	100.58	27.64	4.85	29.59	375	236	P	V
	*	2467	100.56	-	-	97.66	27.64	4.85	29.59	375	236	A	V
		2483.52	59.27	-14.73	74	56.38	27.63	4.85	29.59	375	236	P	V
		2483.52	52.93	-1.07	54	50.04	27.63	4.85	29.59	375	236	A	V
802.11b CH 13 2472MHz	*	2472	103.41	-	-	100.52	27.63	4.85	29.59	215	283	P	H
	*	2472	100.39	-	-	97.5	27.63	4.85	29.59	215	283	A	H
		2487.48	57.97	-16.03	74	55.08	27.63	4.85	29.59	215	283	P	H
		2487.2	52.09	-1.91	54	49.2	27.63	4.85	29.59	215	283	A	H
	*	2472	102.55	-	-	99.66	27.63	4.85	29.59	374	275	P	V
	*	2472	99.42	-	-	96.53	27.63	4.85	29.59	374	275	A	V
		2484.72	57.43	-16.57	74	54.54	27.63	4.85	29.59	374	275	P	V
		2487.2	51.13	-2.87	54	48.24	27.63	4.85	29.59	374	275	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	54.68	-19.32	74	75.56	31.76	5.55	58.19	135	65	P	H
		4824	53.08	-0.92	54	73.96	31.76	5.55	58.19	135	65	A	H
		4824	53.76	-20.24	74	74.64	31.76	5.55	58.19	102	60	P	V
		4824	50.97	-3.03	54	71.85	31.76	5.55	58.19	102	60	A	V
802.11b CH 06 2437MHz		4874	55.43	-18.57	74	76	31.88	5.65	58.1	116	30	P	H
		4874	52.33	-1.67	54	72.9	31.88	5.65	58.1	116	30	A	H
		7311	53.44	-20.56	74	67.22	36.88	7.26	57.92	270	295	P	H
		7311	48.56	-5.44	54	62.34	36.88	7.26	57.92	270	295	A	H
		4874	49.56	-24.44	74	70.13	31.88	5.65	58.1	104	60	P	V
		7311	50.62	-23.38	74	64.4	36.88	7.26	57.92	113	246	A	V
		7311	45.86	-8.14	54	59.64	36.88	7.26	57.92	113	246	P	V
		4874	55.43	-18.57	74	76	31.88	5.65	58.1	116	30	A	V
802.11b CH 11 2462MHz		4924	43.67	-30.33	74	60.33	31.59	9.77	58.02	150	285	P	H
		7386	56.81	-17.19	74	65.73	36.65	12.08	57.65	155	274	P	H
		7386	53.17	-0.83	54	62.09	36.65	12.08	57.65	155	274	A	H
		4924	45.51	-28.49	74	62.17	31.59	9.77	58.02	150	285	P	V
		7386	54.73	-19.27	74	63.65	36.65	12.08	57.65	155	274	P	V
		7386	51.24	-2.76	54	60.16	36.65	12.08	57.65	155	274	A	V
802.11b CH 12 2467MHz		4934	47.41	-26.59	74	64.07	31.59	9.77	58.02	150	285	P	H
		7401	55.87	-18.13	74	64.66	36.71	12.1	57.6	155	274	P	H
		7401	53.13	-0.87	54	61.92	36.71	12.1	57.6	155	274	A	H
		4934	44.06	-29.94	74	60.72	31.59	9.77	58.02	150	285	P	V
		7401	50.14	-23.86	74	58.93	36.71	12.1	57.6	155	274	P	V
		7401	47.14	-6.86	54	55.93	36.71	12.1	57.6	155	274	A	V