

FCC RF Test Report

APPLICANT : Wonderosa L.L.C.
EQUIPMENT : Digital Media Receiver
MODEL NAME : MW46WB
FCC ID : 2AETL-0725
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The testing was completed on Jun. 21, 2016. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

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TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant	5
1.2 Product Feature of Equipment Under Test.....	5
1.3 Product Specification of Equipment Under Test.....	6
1.4 Modification of EUT	6
1.5 Testing Location	7
1.6 Applicable Standards.....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1 Carrier Frequency and Channel	8
2.2 Pre-Scanned RF Power.....	9
2.3 Test Mode.....	10
2.4 Connection Diagram of Test System.....	11
2.5 Support Unit used in test configuration and system	12
2.6 EUT Operation Test Setup	12
2.7 Measurement Results Explanation Example.....	12
3 TEST RESULT	13
3.1 6dB and 99% Bandwidth Measurement	13
3.2 Peak Output Power Measurement	15
3.3 Power Spectral Density Measurement	16
3.4 Conducted Band Edges and Spurious Emission Measurement	18
3.5 Radiated Band Edges and Spurious Emission Measurement	49
3.6 AC Conducted Emission Measurement.....	53
3.7 Antenna Requirements.....	57
4 LIST OF MEASURING EQUIPMENT	58
5 UNCERTAINTY OF EVALUATION	60
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. RADIATED TEST RESULTS	
APPENDIX C. RADIATED SPURIOUS EMISSION PLOTS	
APPENDIX D. DUTY CYCLE PLOTS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR572808-01C	Rev. 01	Initial issue of report	Jun. 08, 2016
FR572808-01C	Rev. 02	Update report of updating the plots and data of band edge and fundamental at appendix B and C	Jun. 22, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass
3.1	-	99% Bandwidth	-	Pass
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass
		Conducted Spurious Emission		Pass
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass
3.6	15.207	AC Conducted Emission	15.207(a)	Pass
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass



1 General Description

1.1 Applicant

Wonderosa L.L.C.

1 North Water Street, 10th Floor

Mobile, Alabama, 36602

1.2 Product Feature of Equipment Under Test

Product Feature	
Equipment	Digital Media Receiver
Model Name	MW46WB
FCC ID	2AETL-0725
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.1 EDR/LE

1.3 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	SISO <Ant. 1> 802.11b : 23.20 dBm (0.2089 W) 802.11g : 26.02 dBm (0.3999 W) 802.11n HT20 : 26.20 dBm (0.4169 W) SISO <Ant. 2> 802.11b : 22.68 dBm (0.1854 W) 802.11g : 25.90 dBm (0.3890 W) 802.11n HT20 : 26.23 dBm (0.4198 W) MIMO <Ant. 1+2> 802.11g : 29.02 dBm (0.7980 W) 802.11n HT20 : 28.92 dBm (0.7798 W)		
Antenna Type	Ant. 1 : Fixed Internal Antenna Ant. 2 : Fixed Internal Antenna		
Antenna Gain	Ant. 1 : 2.81 dBi Ant. 2 : 3.05 dBi		
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)		
Antenna Function for Transmitter		Chain Port 1	Chain Port 2
	802.11 b/g/n SISO	V	V
	802.11 g/n MIMO	V	V

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		
	TH02-HY	CO05-HY	03CH07-HY

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

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855		
Test Site No.	Sporton Site No.		
	03CH11-HY		

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

1.6 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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

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).

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		



2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test shown in the following tables.

SISO <Ant. Port 1>

802.11b				
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps
Peak Power (dBm)	23.20	22.91	22.99	23.15

802.11g								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	26.02	26.01	26.01	26.00	26.01	25.81	25.96	25.62

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	26.20	26.13	26.10	26.18	26.17	26.19	26.18	16.16

SISO <Ant. Port 2>

802.11b				
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps
Peak Power (dBm)	22.68	22.40	22.30	22.58

802.11g								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	25.90	25.80	25.84	25.75	25.62	25.88	25.89	25.56

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	26.23	26.18	26.19	26.18	26.14	26.19	26.12	26.18

MIMO <Ant. 1+2>

802.11g								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	29.02	28.91	28.92	28.83	28.98	29.00	28.99	28.85

2.4GHz 802.11n HT20								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	28.92	28.86	28.89	28.87	28.88	28.86	28.88	28.88

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.



2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Single Antenna

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

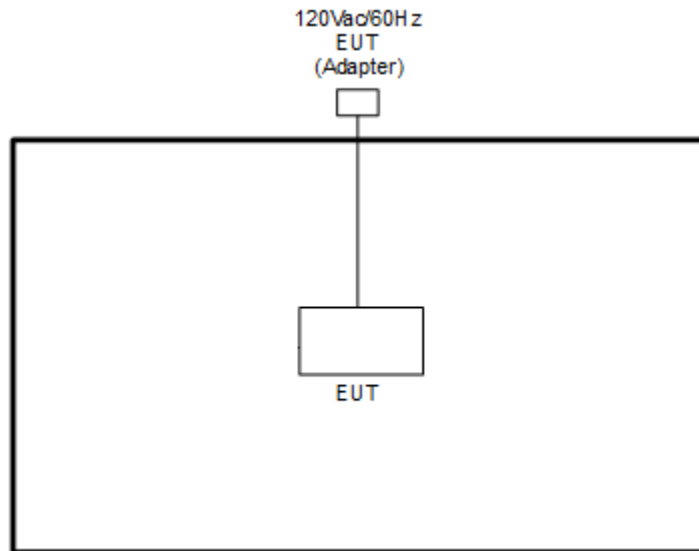
MIMO Antenna

Modulation	Data Rate
802.11g	6 Mbps
802.11n HT20	MCS0

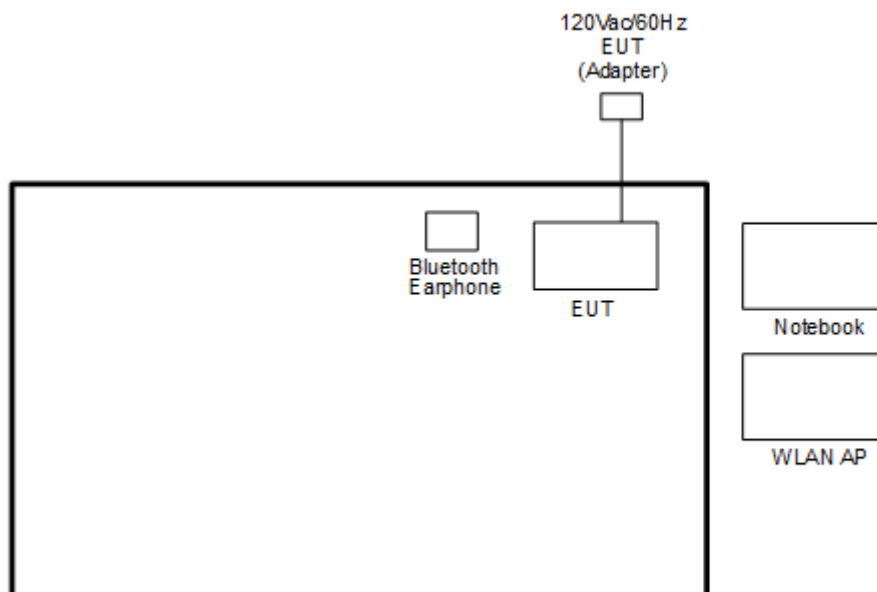
Test Cases	
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + MPEG4 + Adapter

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m

2.6 EUT Operation Test Setup

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

2.7 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

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

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

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

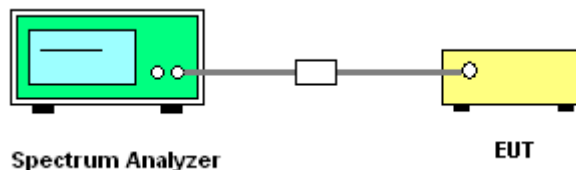
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

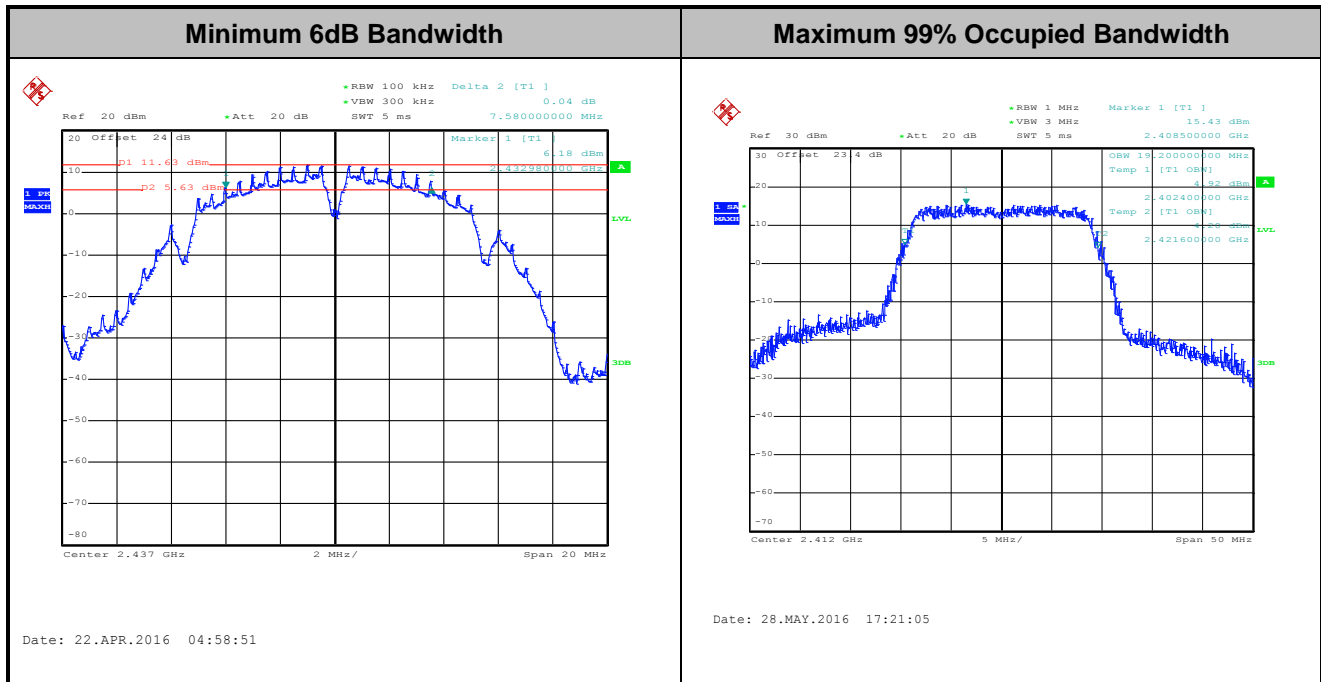
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A of this report.



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

3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

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

3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A of this report.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A of this report.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

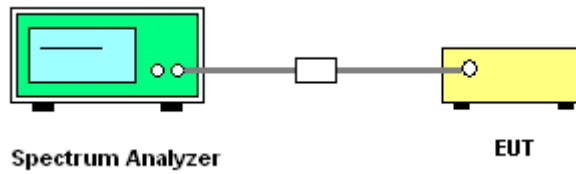
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

Method (1): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

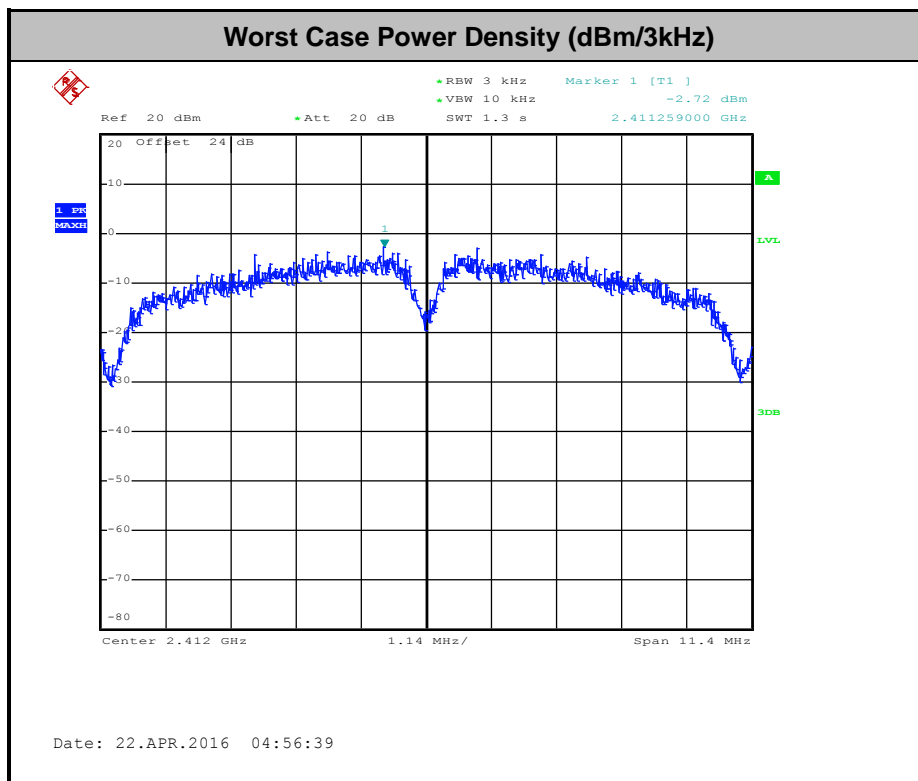
Method (2): Measure and add $10 \log(N)$ dB, where N is the number of outputs. (N=2)

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A of this report.



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

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

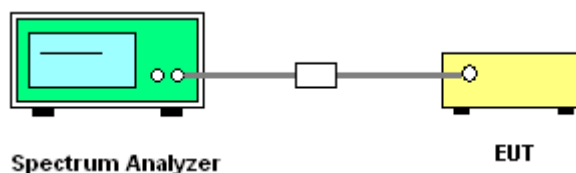
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

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

3.4.4 Test Setup

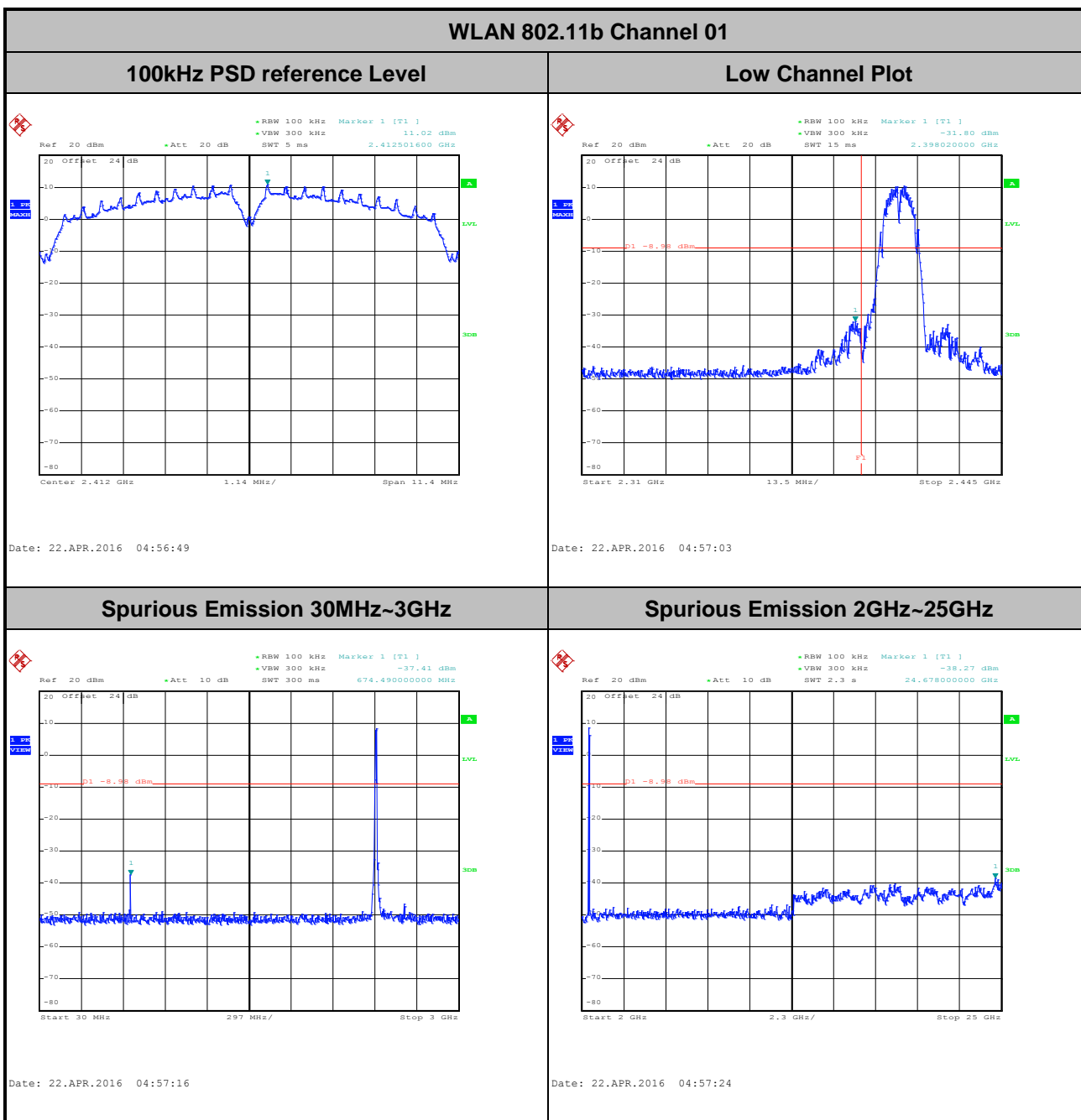




3.4.5 Test Result of Conducted Band Edges and Spurious Emission

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

Number of TX	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus



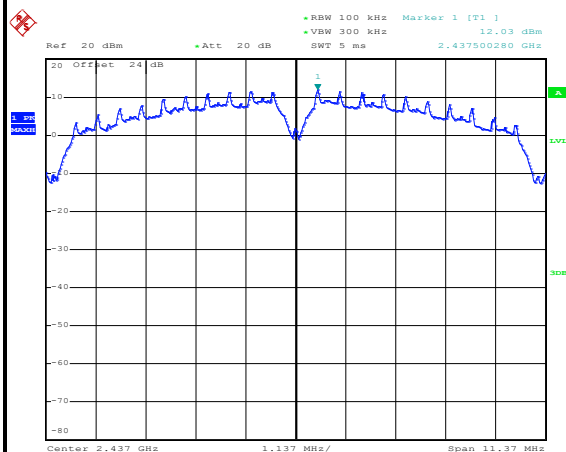


Number of TX :	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11b Channel 06

100kHz PSD reference Level

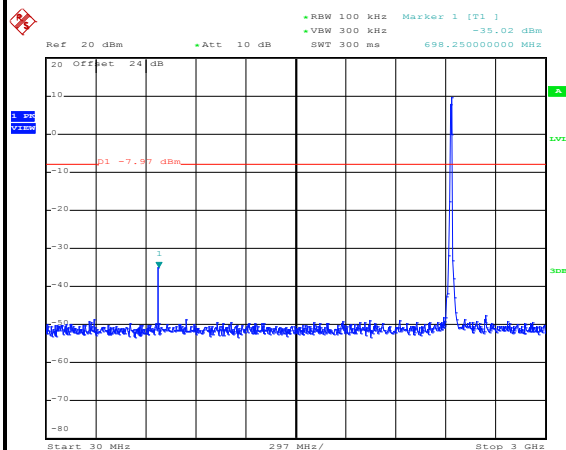
Mid Channel Plot



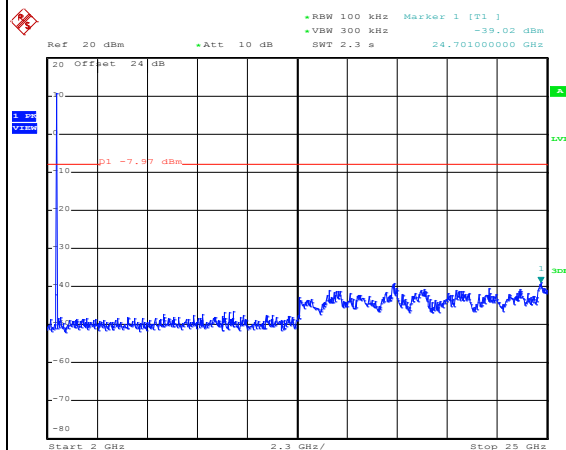
Date: 22.APR.2016 04:59:18

Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz



Date: 22.APR.2016 04:59:30



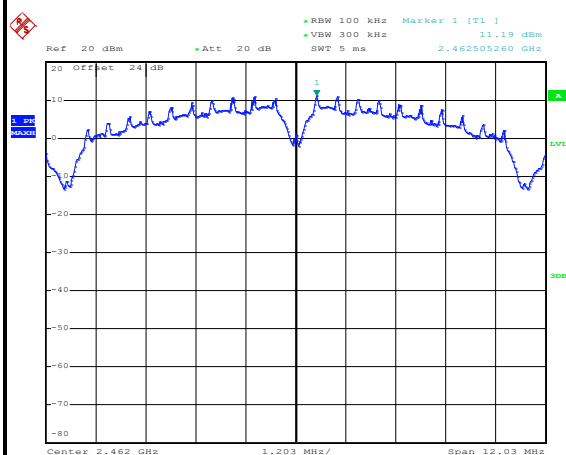
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Number of TX :	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

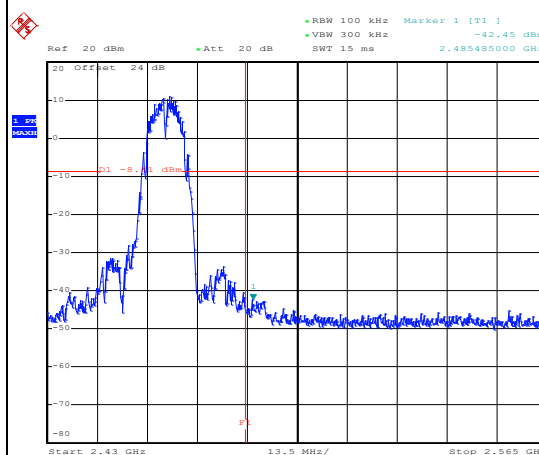
WLAN 802.11b Channel 11

100kHz PSD reference Level



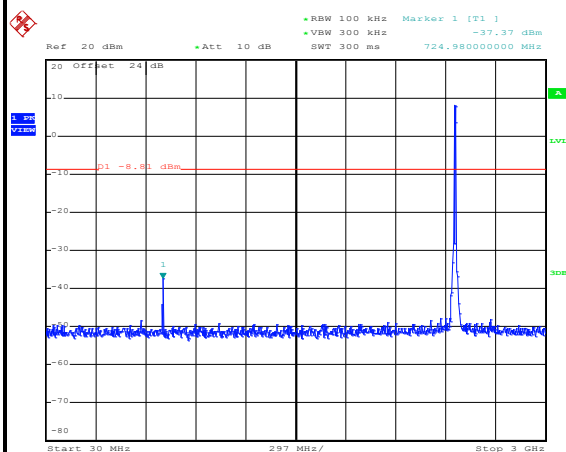
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High Channel Plot



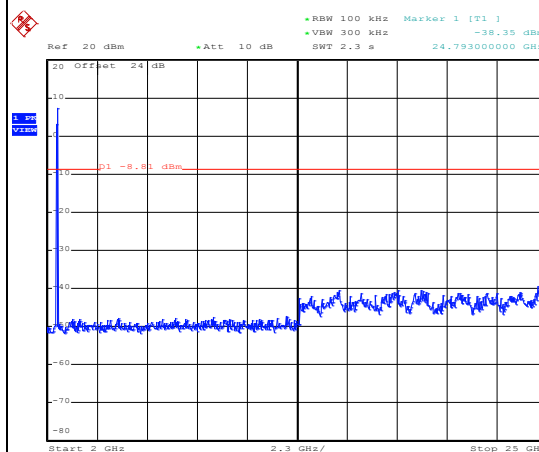
Date: 22.APR.2016 05:01:50

Spurious Emission 30MHz~3GHz



Date: 22.APR.2016 05:02:22

Spurious Emission 2GHz~25GHz



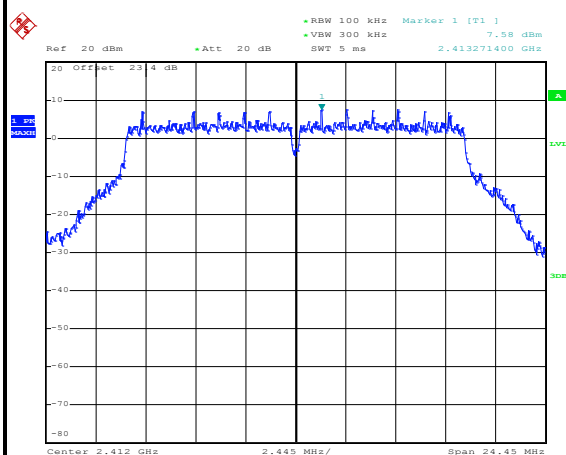
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Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

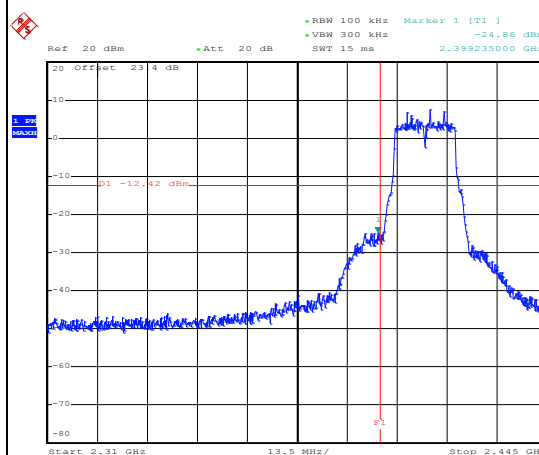
WLAN 802.11g Channel 01

100kHz PSD reference Level



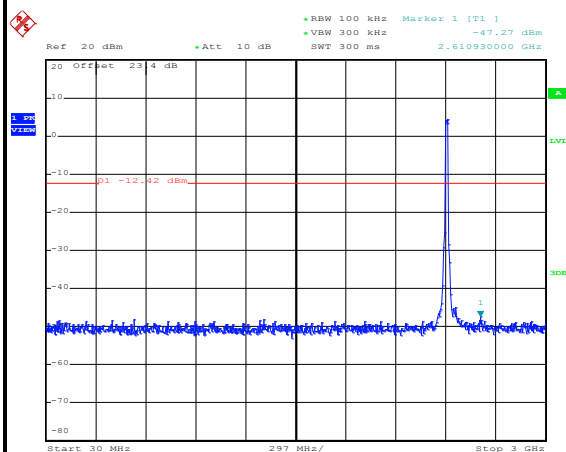
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Low Channel Plot



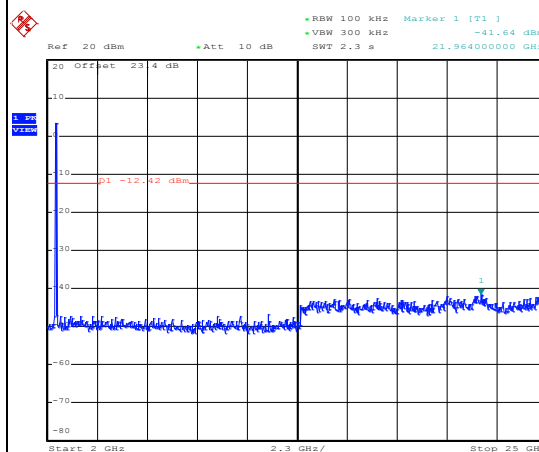
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Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 16:44:36

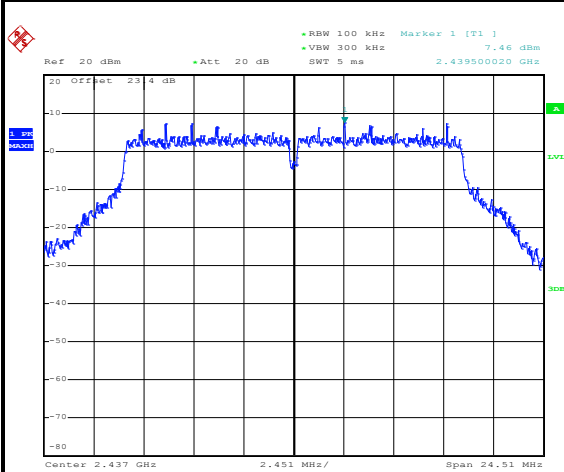
Spurious Emission 2GHz~25GHz



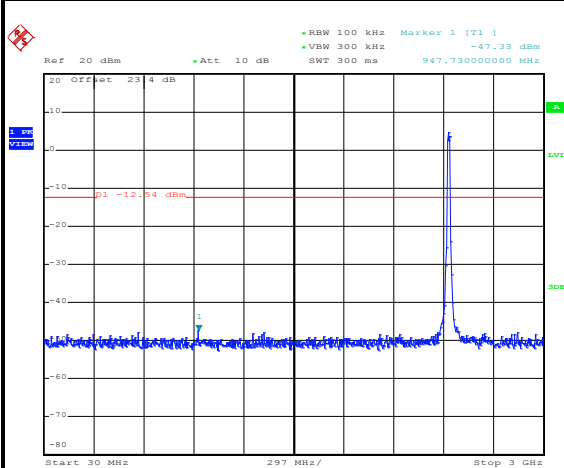
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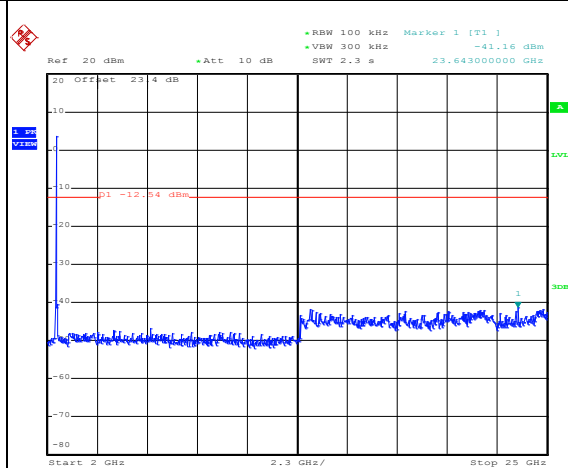
Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11g Channel 06**100kHz PSD reference Level**

Date: 28.MAY.2016 15:37:52

Mid Channel Plot**Spurious Emission 30MHz~3GHz**

Date: 28.MAY.2016 15:38:07

Spurious Emission 2GHz~25GHz

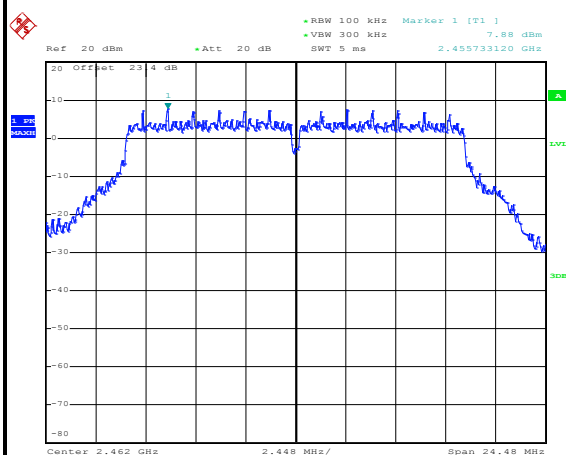
Date: 28.MAY.2016 15:38:16



Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

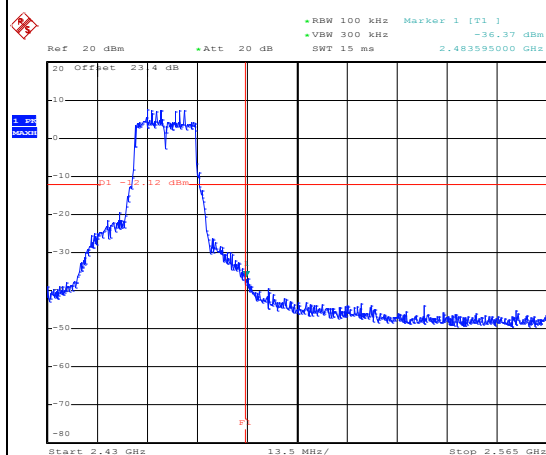
WLAN 802.11g Channel 11

100kHz PSD reference Level



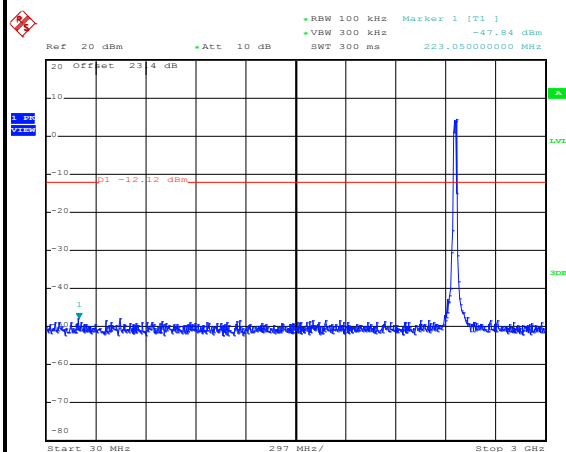
Date: 28.MAY.2016 16:46:18

High Channel Plot



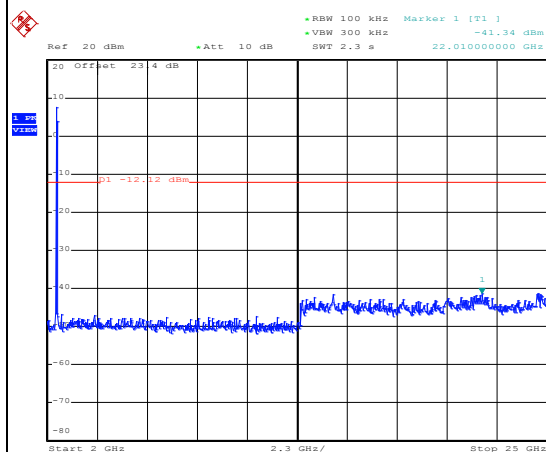
Date: 28.MAY.2016 16:46:41

Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 16:46:58

Spurious Emission 2GHz~25GHz



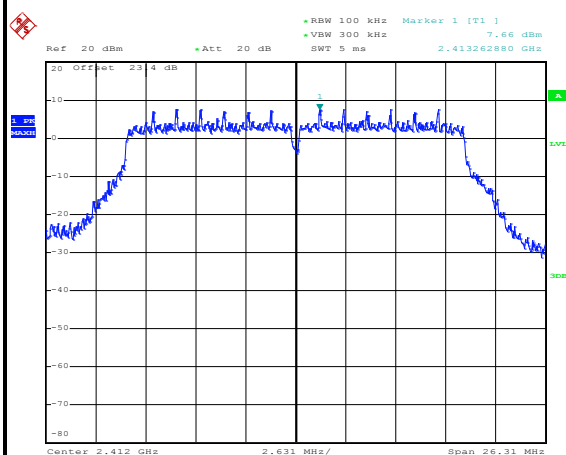
Date: 28.MAY.2016 16:47:06



Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

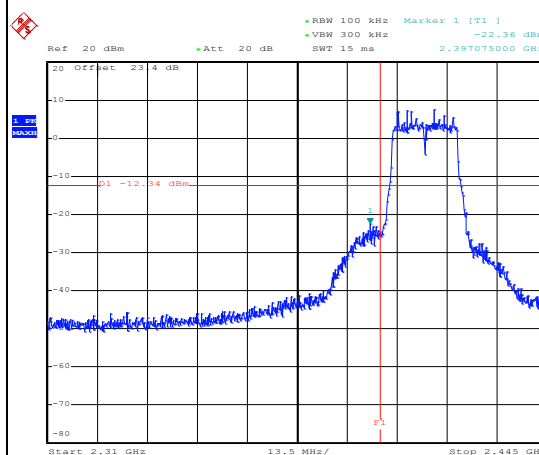
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



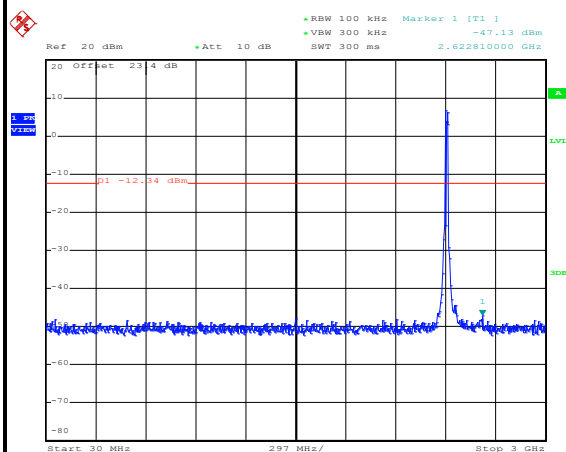
Date: 28.MAY.2016 17:13:38

Low Channel Plot



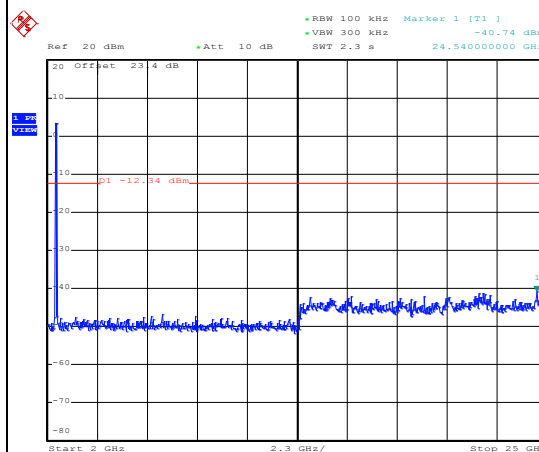
Date: 28.MAY.2016 17:13:47

Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 17:13:59

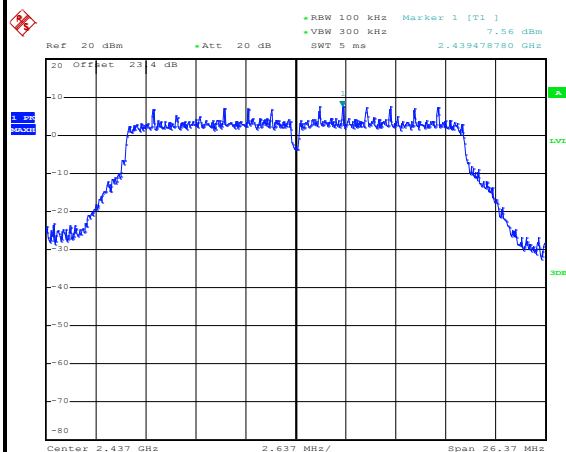
Spurious Emission 2GHz~25GHz



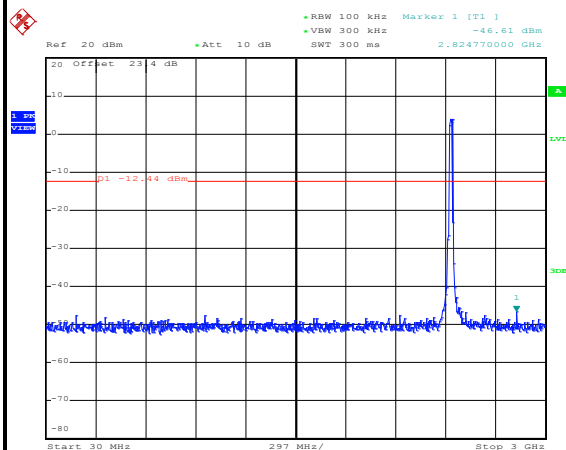
Date: 28.MAY.2016 17:14:08



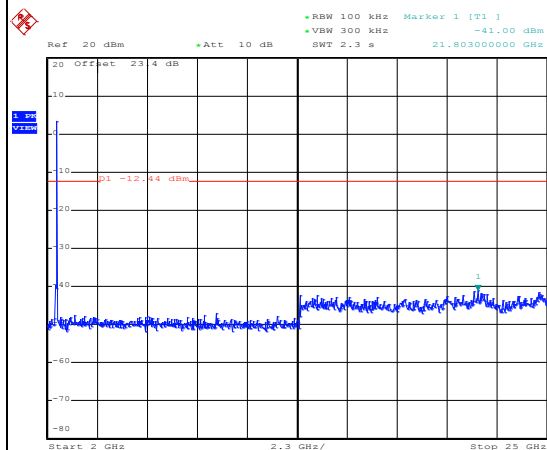
Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level****Mid Channel Plot**

Date: 28.MAY.2016 17:15:35

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

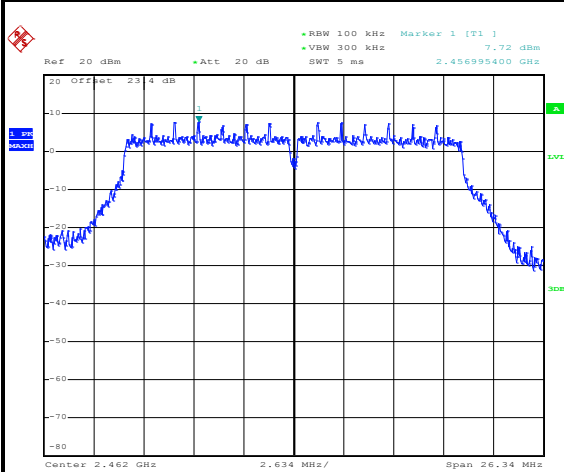
Date: 28.MAY.2016 17:15:46



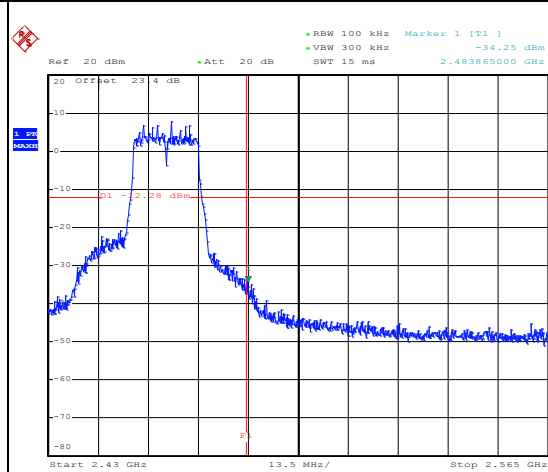
Date: 28.MAY.2016 17:15:54



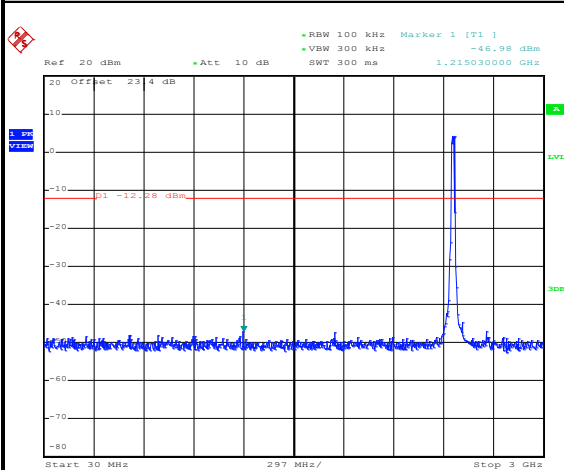
Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 11**100kHz PSD reference Level**

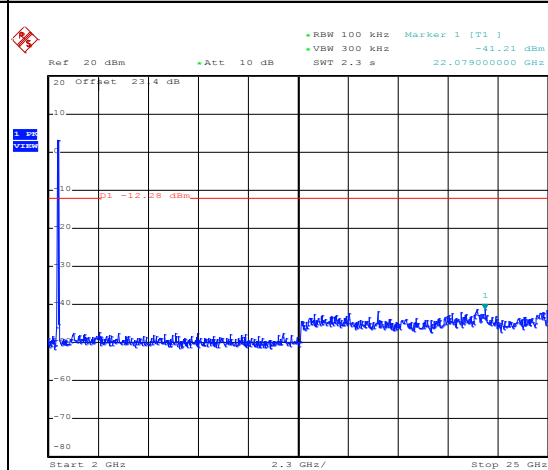
Date: 28.MAY.2016 17:17:22

High Channel Plot

Date: 28.MAY.2016 17:17:34

Spurious Emission 30MHz~3GHz

Date: 28.MAY.2016 17:17:52

Spurious Emission 2GHz~25GHz

Date: 28.MAY.2016 17:18:00

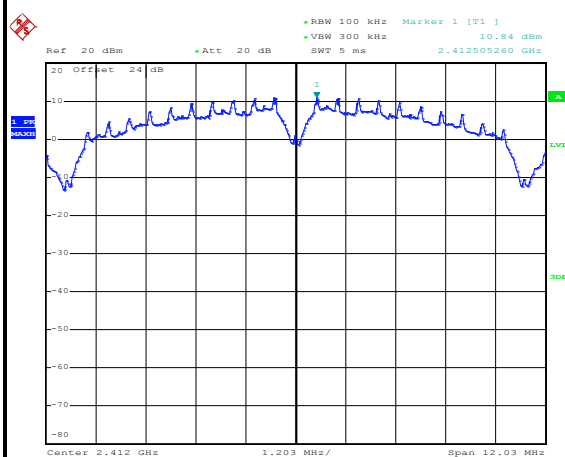


Number of TX = 1, Ant. 2 (Measured)

Number of TX :	1	Ant. :	2
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

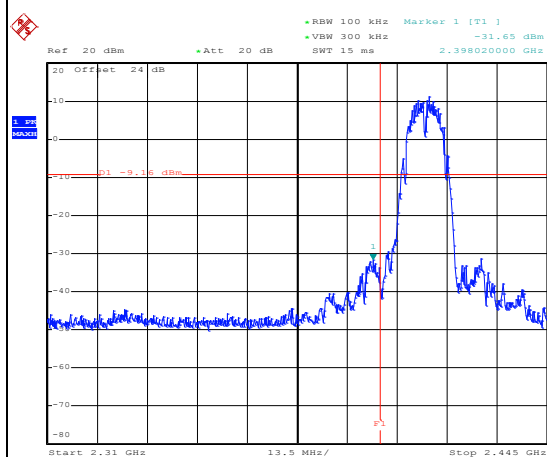
WLAN 802.11b Channel 01

100kHz PSD reference Level



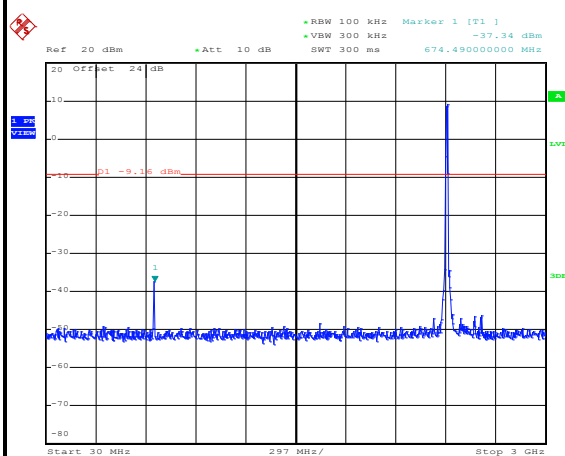
Date: 22.APR.2016 05:04:45

Low Channel Plot



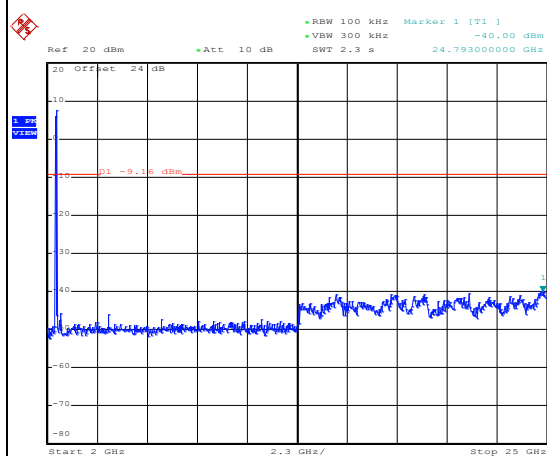
Date: 22.APR.2016 05:04:59

Spurious Emission 30MHz~3GHz



Date: 22.APR.2016 05:05:10

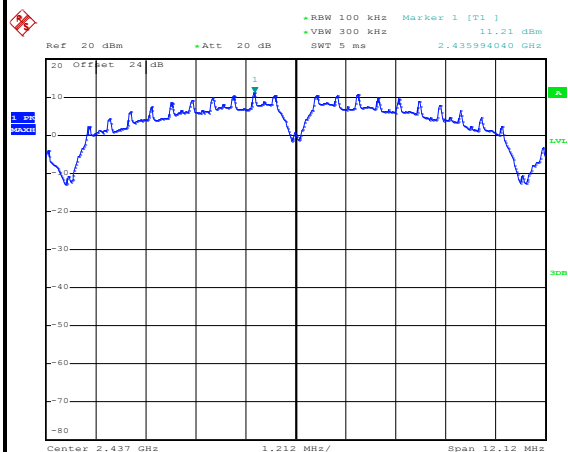
Spurious Emission 2GHz~25GHz



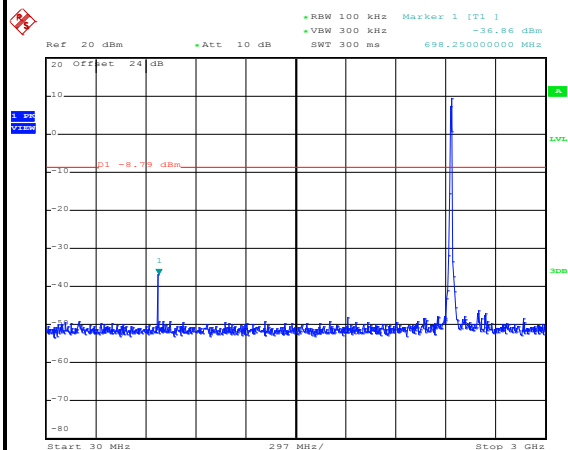
Date: 22.APR.2016 05:05:18



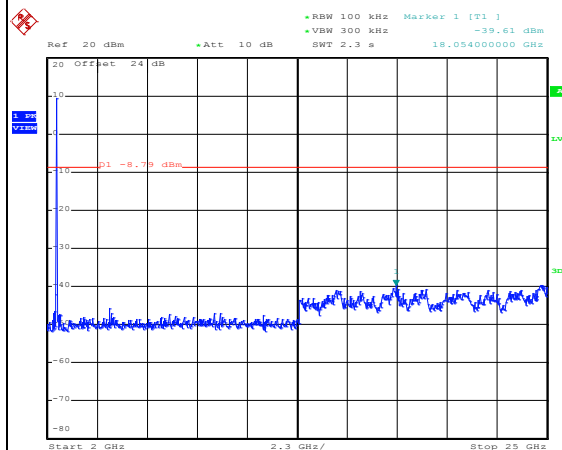
Number of TX :	1	Ant. :	2
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11b Channel 06**100kHz PSD reference Level****Mid Channel Plot**

Date: 22.APR.2016 05:06:59

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

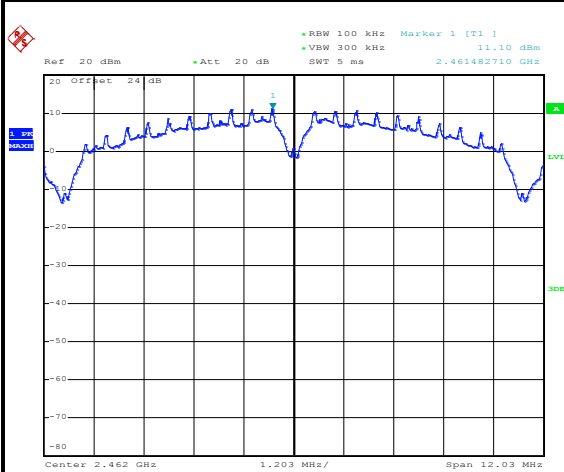
Date: 22.APR.2016 05:07:25



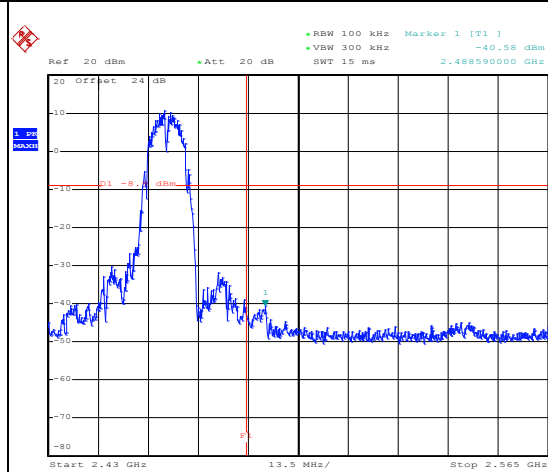
Date: 22.APR.2016 05:07:33



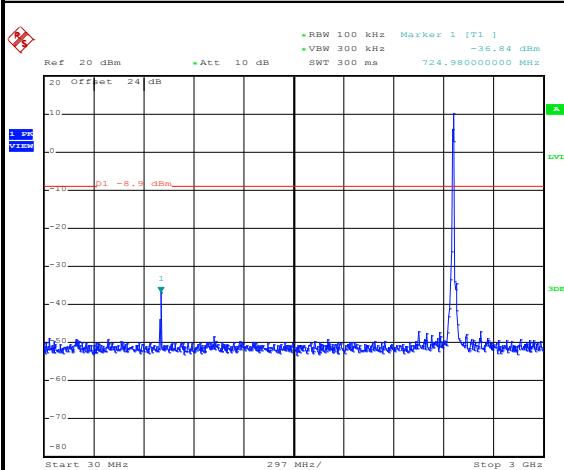
Number of TX :	1	Ant. :	2
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11b Channel 11**100kHz PSD reference Level**

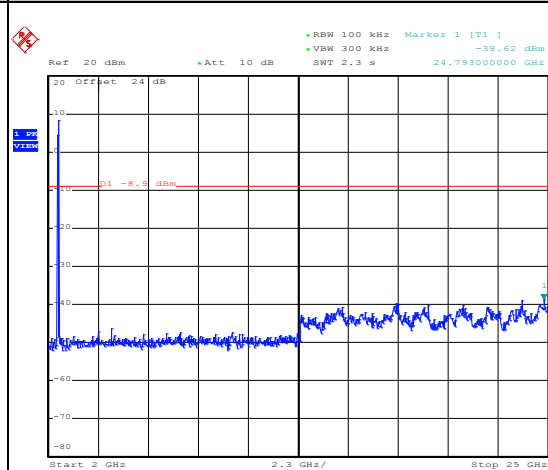
Date: 22.APR.2016 05:09:17

High Channel Plot

Date: 22.APR.2016 05:09:31

Spurious Emission 30MHz~3GHz

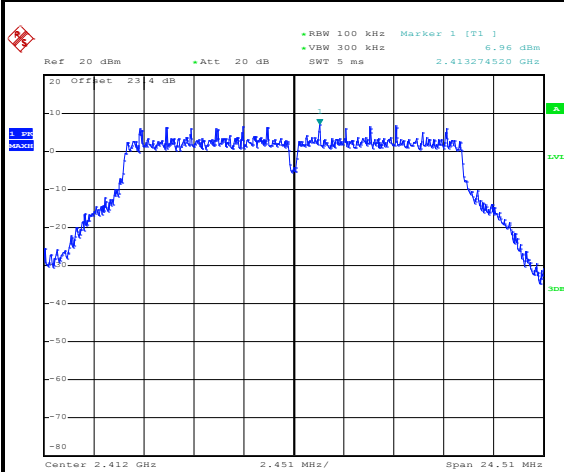
Date: 22.APR.2016 05:09:43

Spurious Emission 2GHz~25GHz

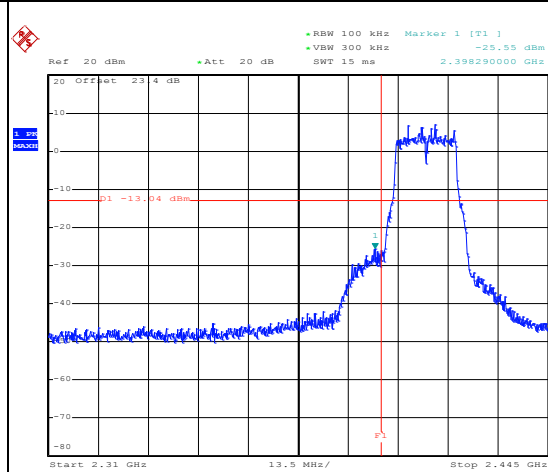
Date: 22.APR.2016 05:09:51



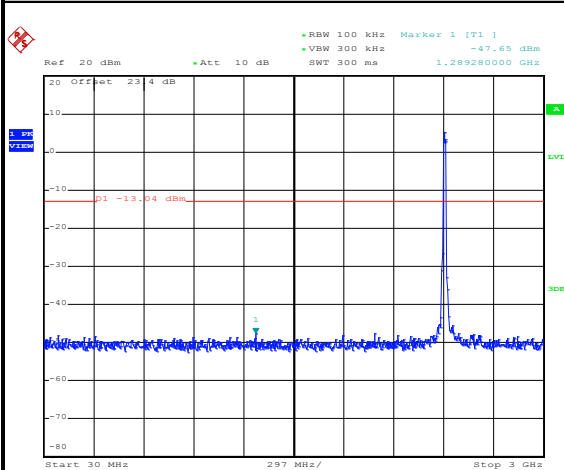
Number of TX :	1	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

WLAN 802.11g Channel 01**100kHz PSD reference Level**

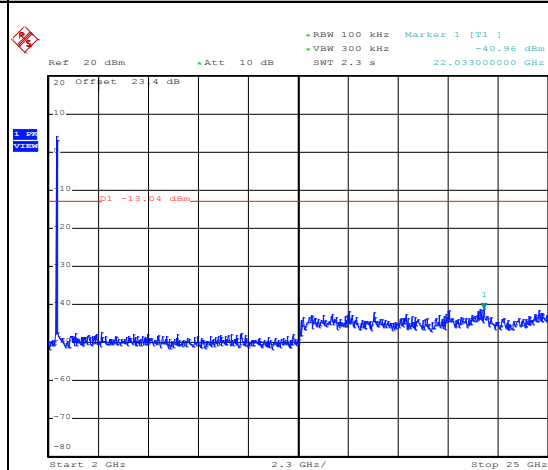
Date: 28.MAY.2016 16:56:57

Low Channel Plot

Date: 28.MAY.2016 16:57:08

Spurious Emission 30MHz~3GHz

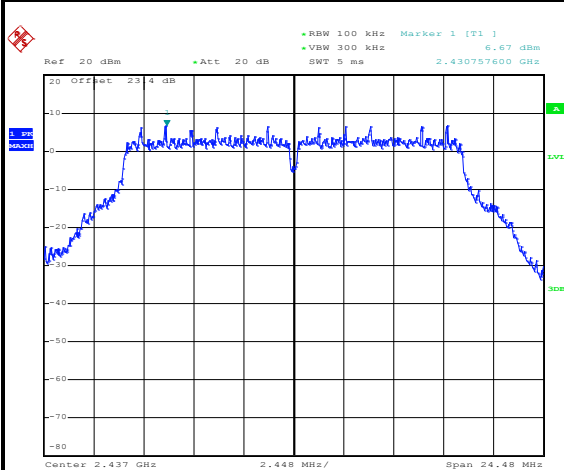
Date: 28.MAY.2016 16:57:22

Spurious Emission 2GHz~25GHz

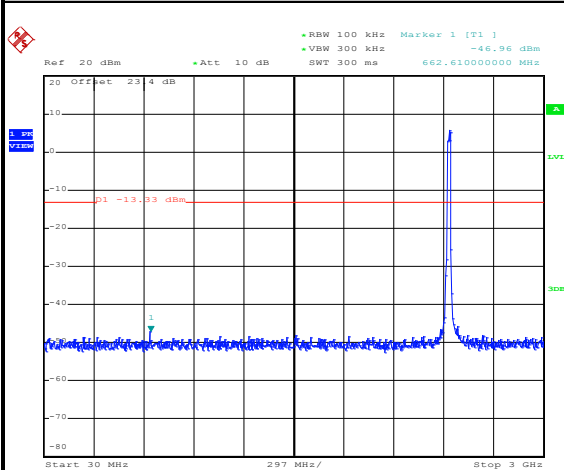
Date: 28.MAY.2016 16:57:30



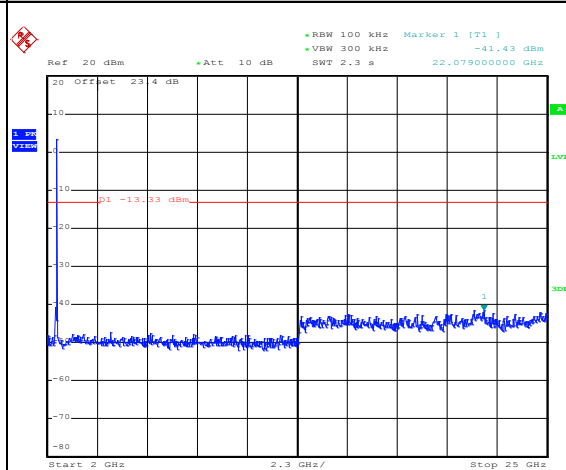
Number of TX :	1	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11g Channel 06**100kHz PSD reference Level**

Date: 28.MAY.2016 15:46:22

Mid Channel Plot**Spurious Emission 30MHz~3GHz**

Date: 28.MAY.2016 15:46:34

Spurious Emission 2GHz~25GHz

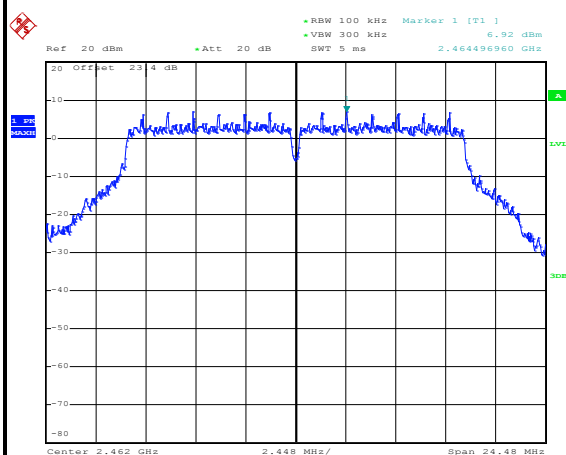
Date: 28.MAY.2016 15:46:43



Number of TX :	1	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

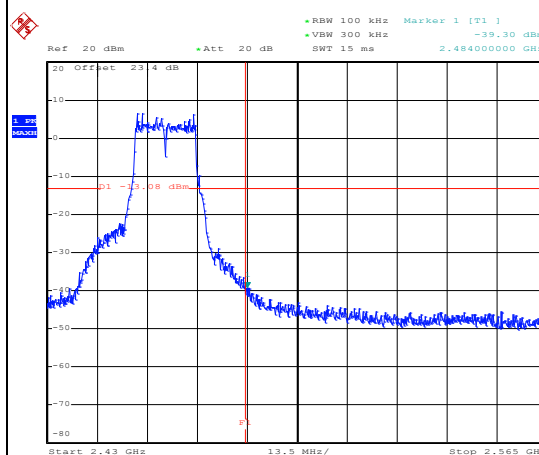
WLAN 802.11g Channel 11

100kHz PSD reference Level



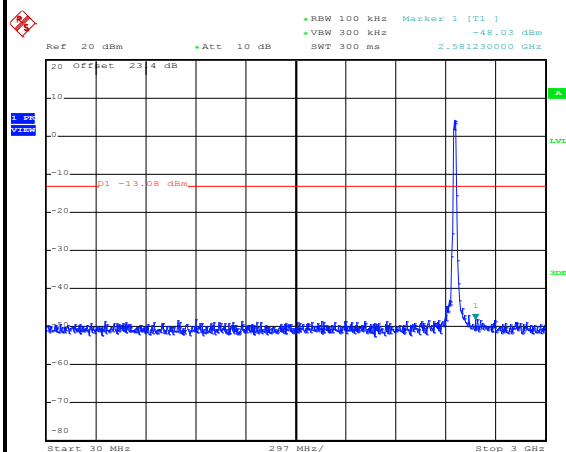
Date: 28.MAY.2016 16:59:23

High Channel Plot



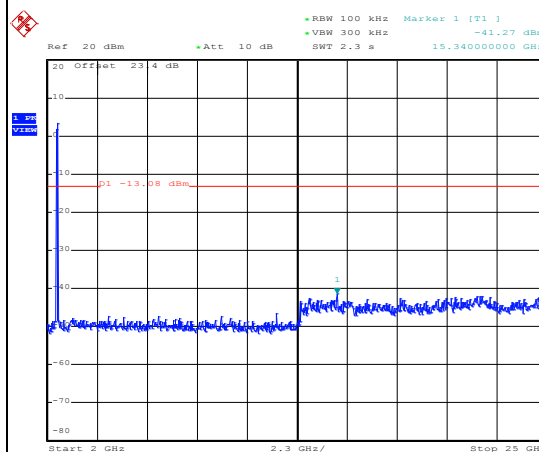
Date: 28.MAY.2016 16:59:35

Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 17:00:27

Spurious Emission 2GHz~25GHz



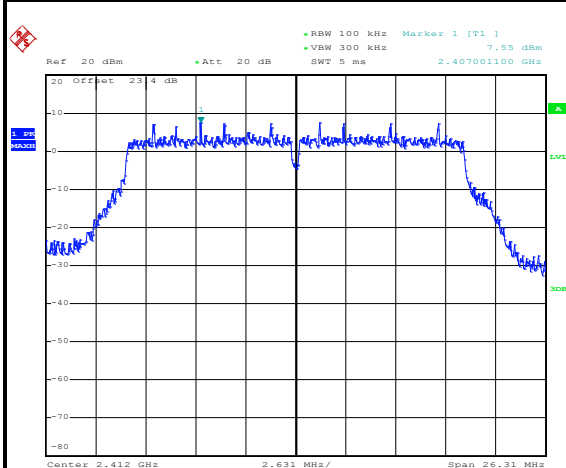
Date: 28.MAY.2016 17:00:36



Number of TX :	1	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

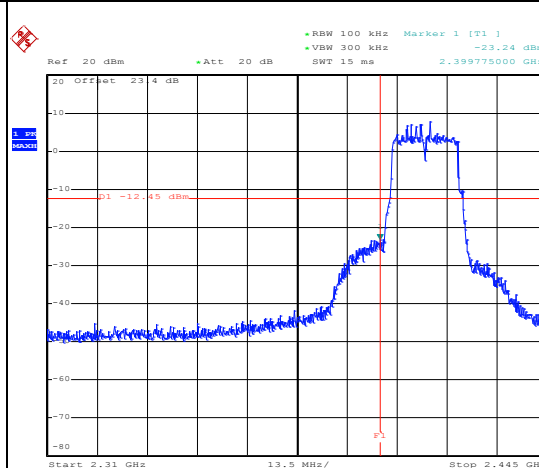
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



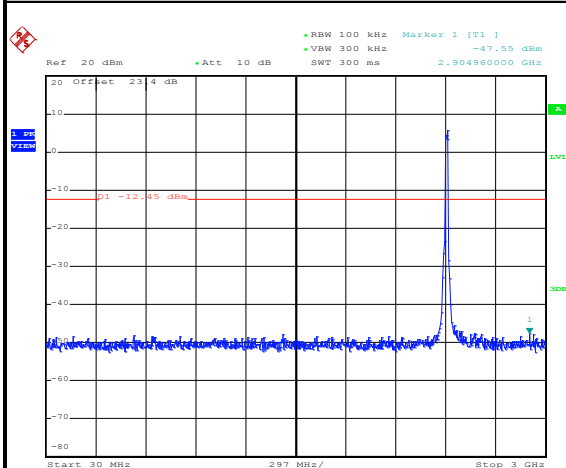
Date: 28.MAY.2016 17:20:16

Low Channel Plot



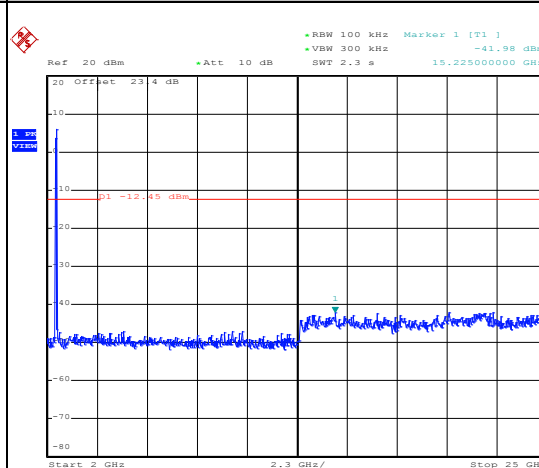
Date: 28.MAY.2016 17:20:26

Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 17:20:39

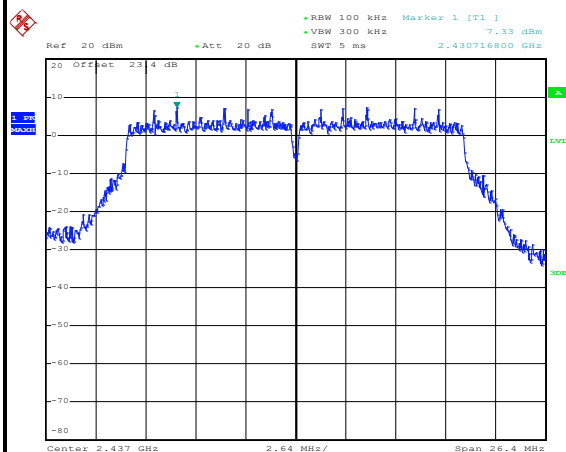
Spurious Emission 2GHz~25GHz



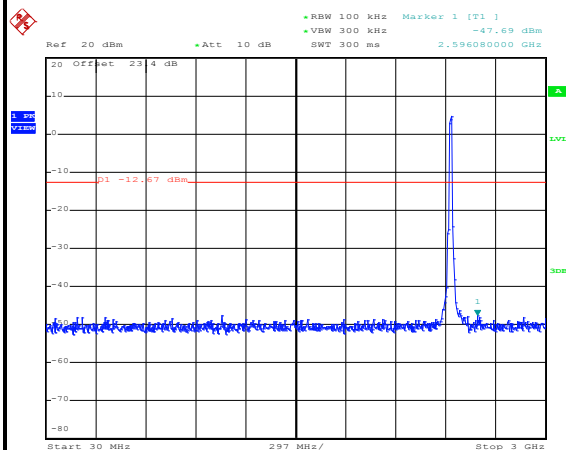
Date: 28.MAY.2016 17:20:47



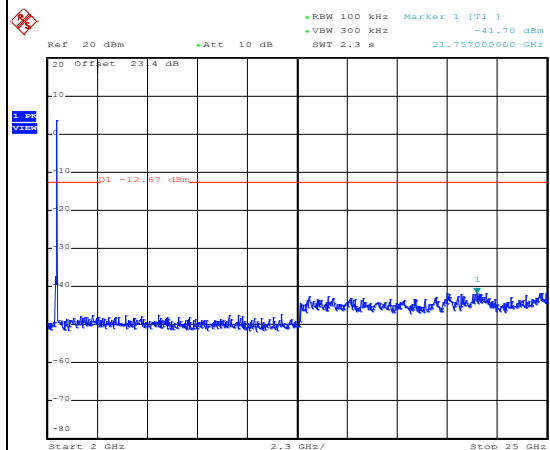
Number of TX :	1	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level****Mid Channel Plot**

Date: 28.MAY.2016 17:22:33

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

Date: 28.MAY.2016 17:22:45



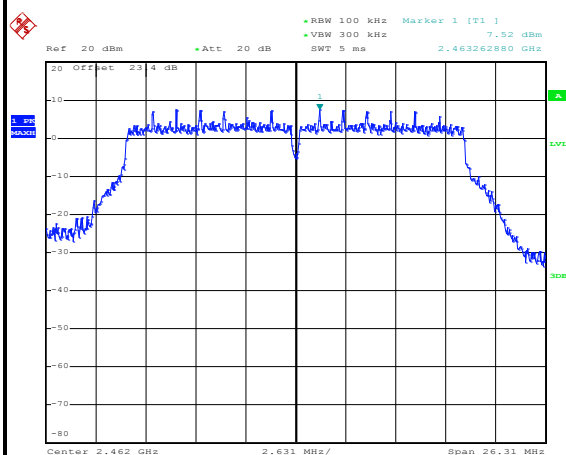
Date: 28.MAY.2016 17:22:53



Number of TX :	1	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

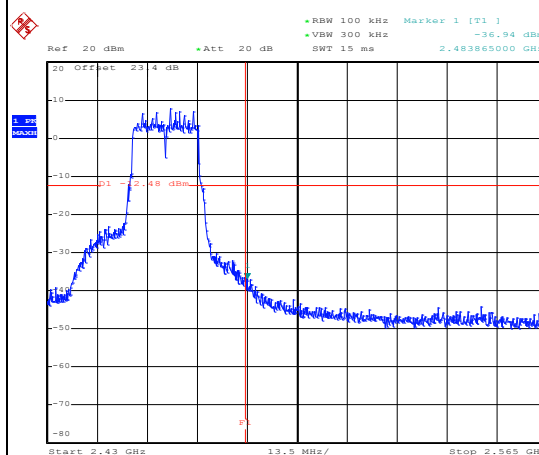
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



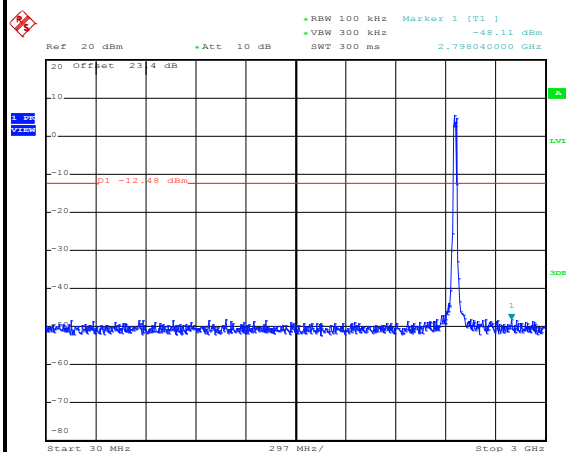
Date: 28.MAY.2016 17:24:37

High Channel Plot



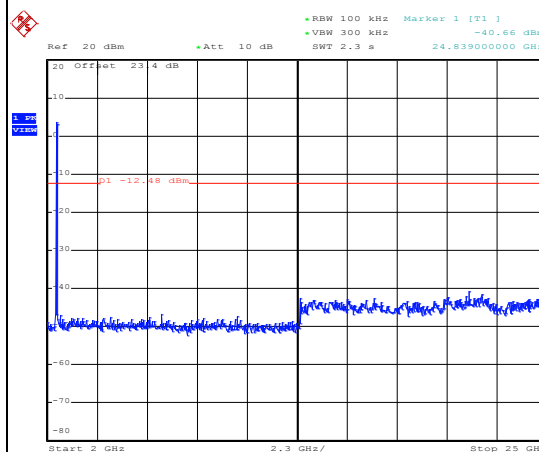
Date: 28.MAY.2016 17:24:47

Spurious Emission 30MHz~3GHz



Date: 28.MAY.2016 17:25:19

Spurious Emission 2GHz~25GHz



Date: 28.MAY.2016 17:25:28

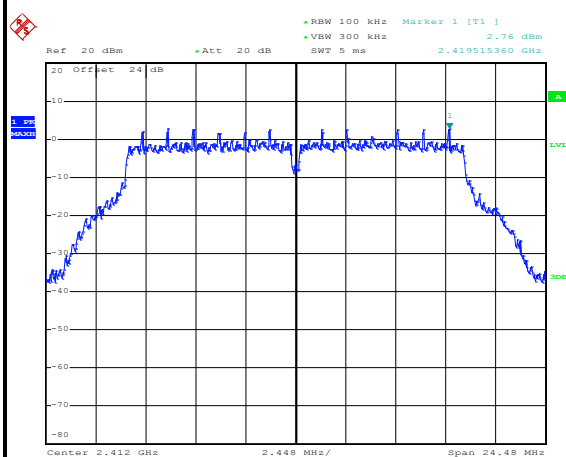


Number of TX = 2, Ant. 1 (Measured)

Number of TX :	2	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

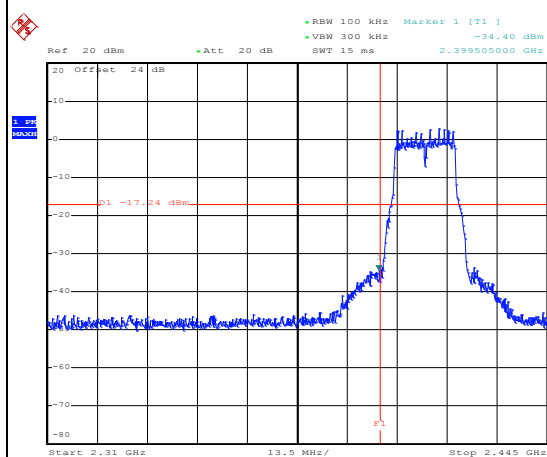
WLAN 802.11g Channel 01

100kHz PSD reference Level



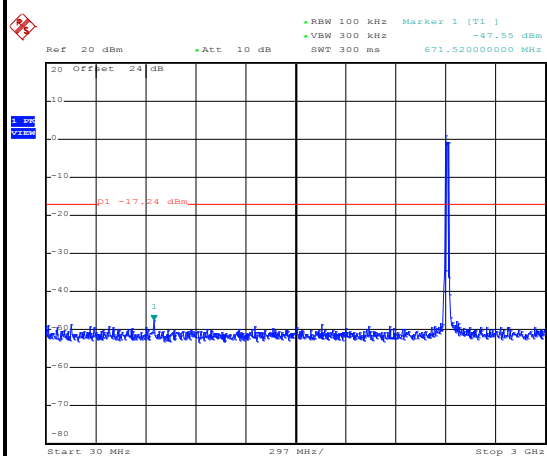
Date: 22.APR.2016 05:18:32

Low Channel Plot



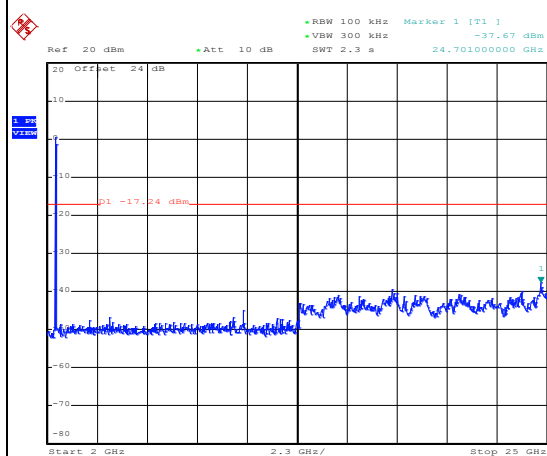
Date: 22.APR.2016 05:18:44

Spurious Emission 30MHz~3GHz



Date: 22.APR.2016 05:18:57

Spurious Emission 2GHz~25GHz



Date: 22.APR.2016 05:19:05

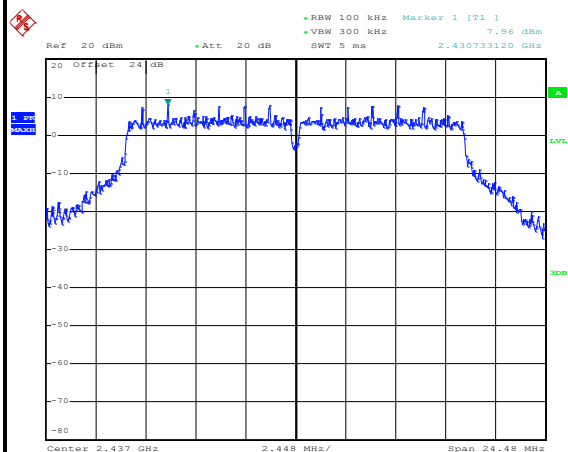


Number of TX :	2	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11g Channel 06

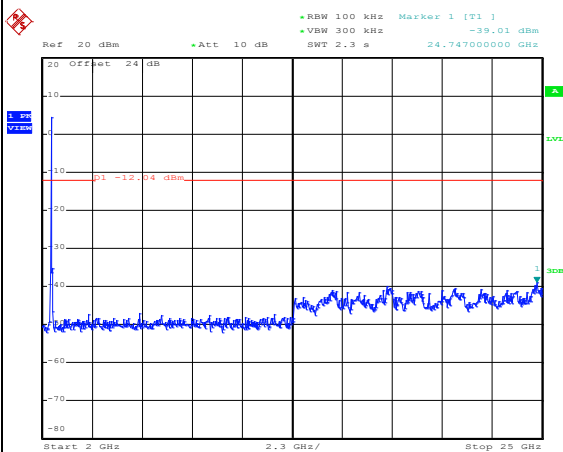
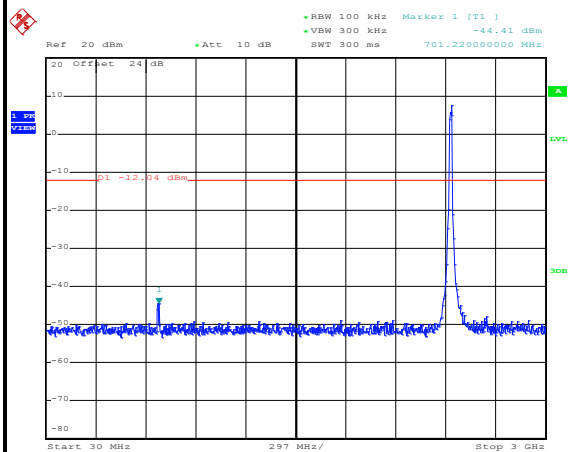
100kHz PSD reference Level

Mid Channel Plot



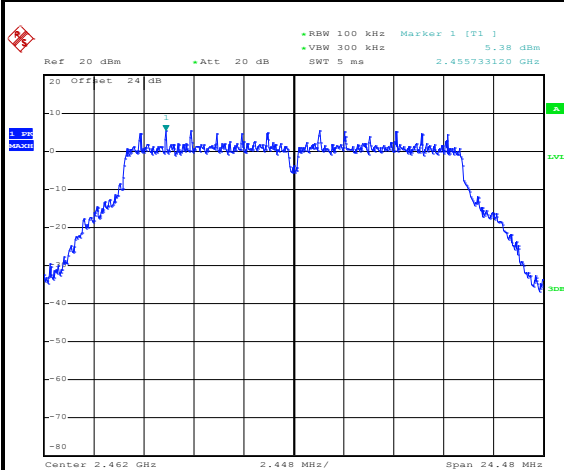
Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz

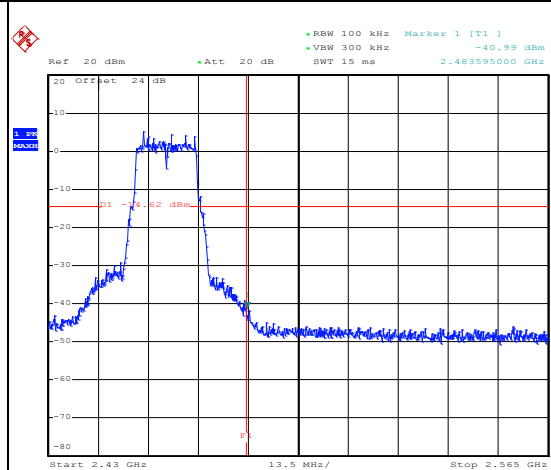




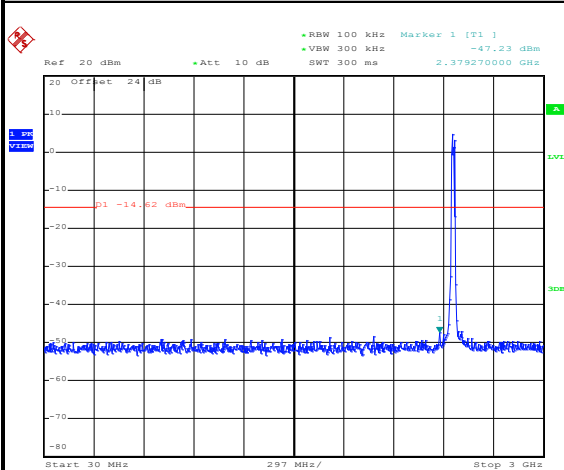
Number of TX :	2	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11g Channel 11**100kHz PSD reference Level**

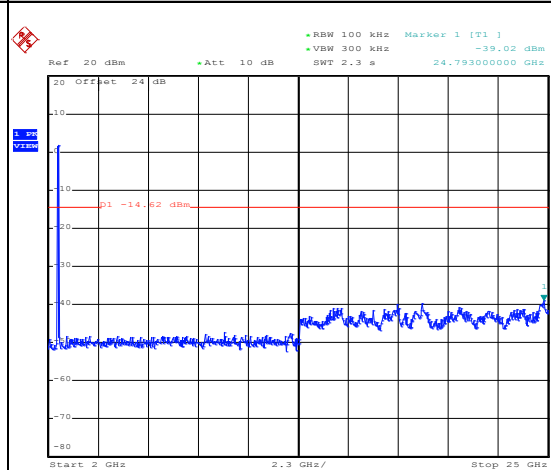
Date: 22.APR.2016 05:29:26

High Channel Plot

Date: 22.APR.2016 05:29:38

Spurious Emission 30MHz~3GHz

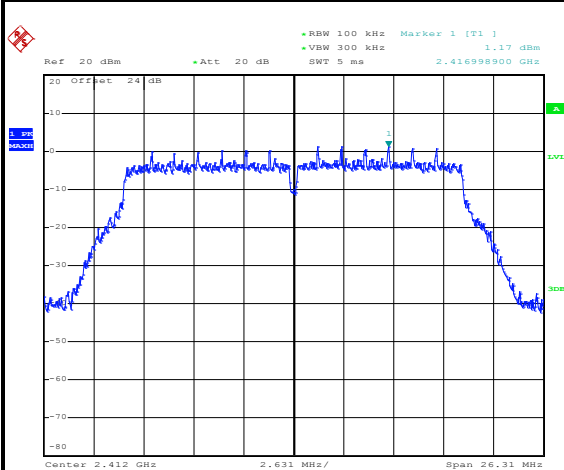
Date: 22.APR.2016 05:29:52

Spurious Emission 2GHz~25GHz

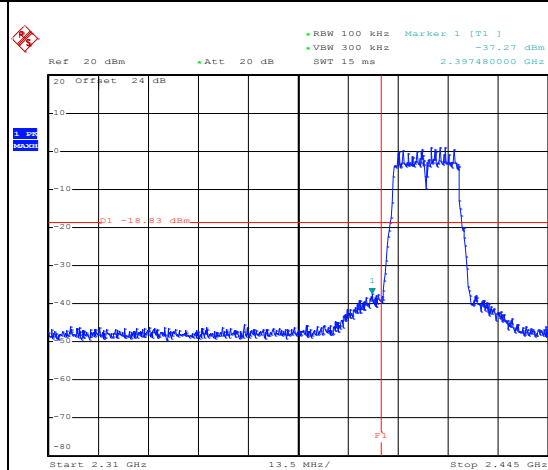
Date: 22.APR.2016 05:30:01



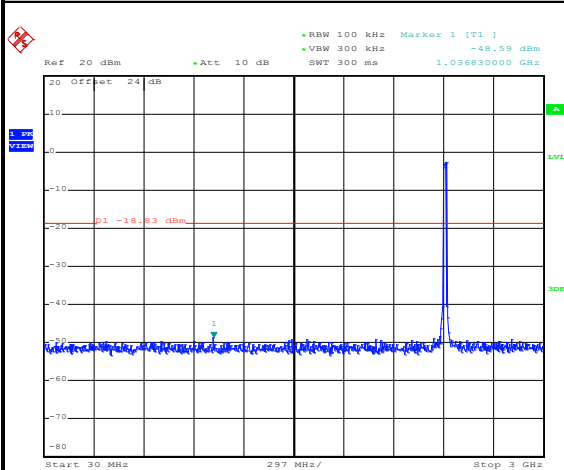
Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 01**100kHz PSD reference Level**

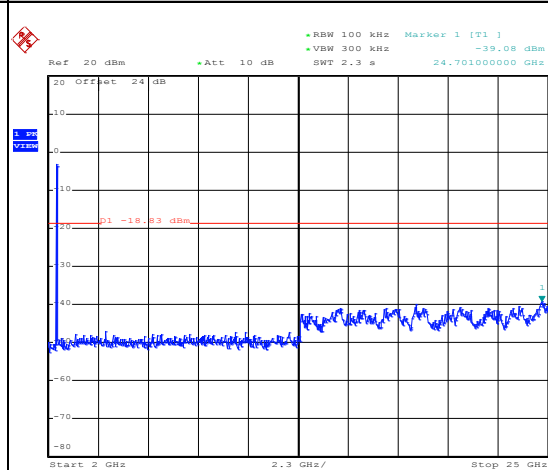
Date: 22.APR.2016 06:05:13

Low Channel Plot

Date: 22.APR.2016 06:05:31

Spurious Emission 30MHz~3GHz

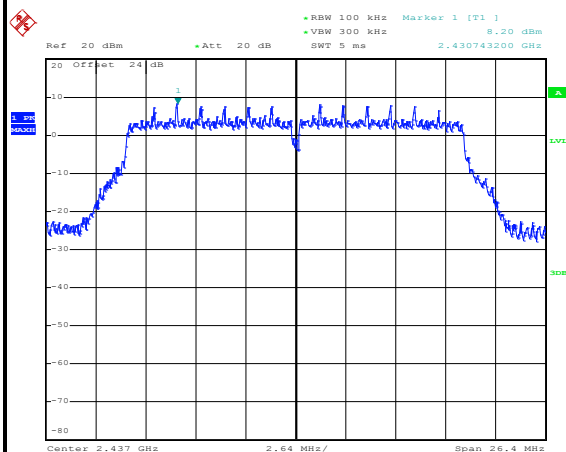
Date: 22.APR.2016 06:05:43

Spurious Emission 2GHz~25GHz

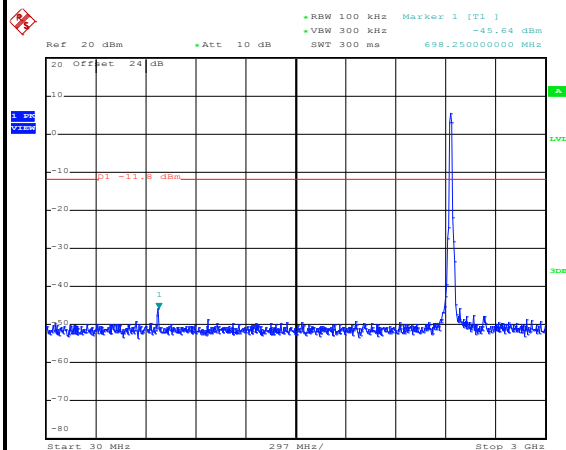
Date: 22.APR.2016 06:05:51



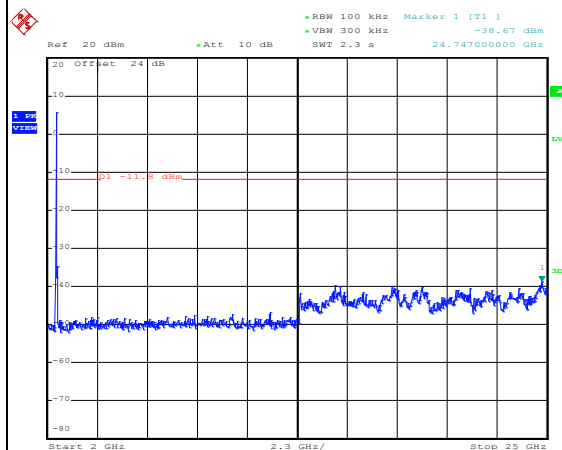
Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level****Mid Channel Plot**

Date: 22.APR.2016 05:41:10

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

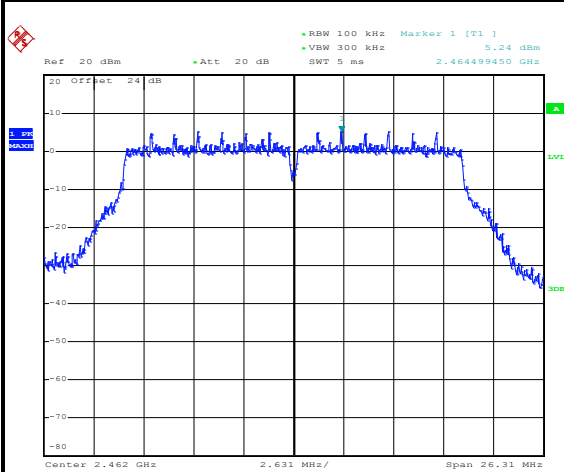
Date: 22.APR.2016 05:41:23



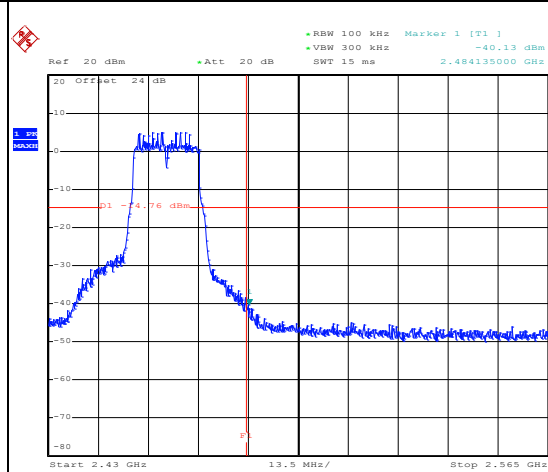
Date: 22.APR.2016 05:41:31



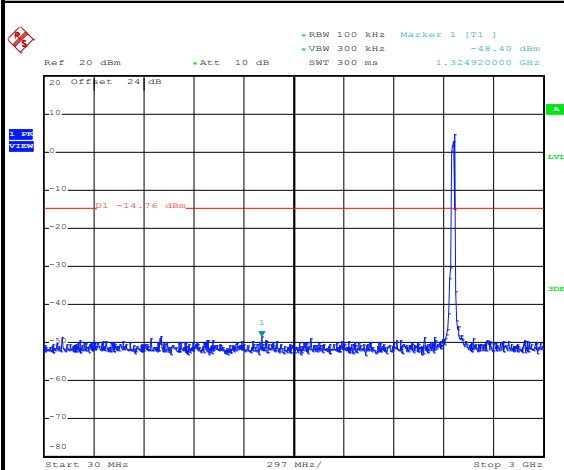
Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 11**100kHz PSD reference Level**

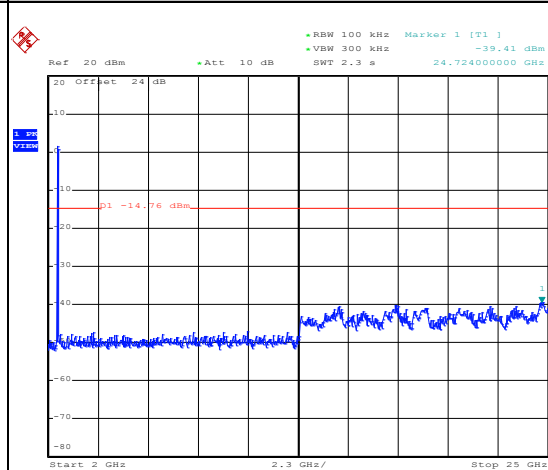
Date: 22.APR.2016 05:43:40

High Channel Plot

Date: 22.APR.2016 05:44:09

Spurious Emission 30MHz~3GHz

Date: 22.APR.2016 05:44:21

Spurious Emission 2GHz~25GHz

Date: 22.APR.2016 05:44:29

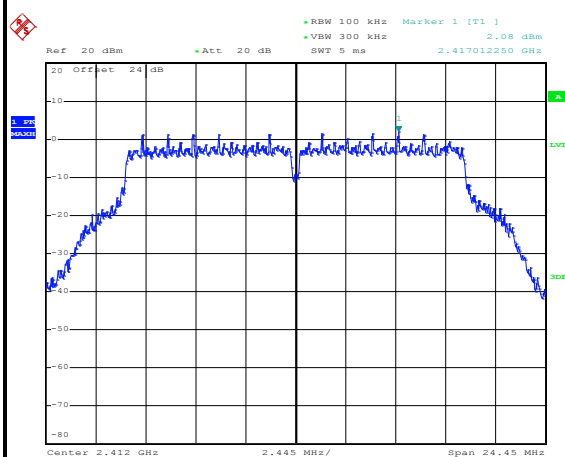


Number of TX = 2, Ant. 2 (Measured)

Number of TX :	2	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

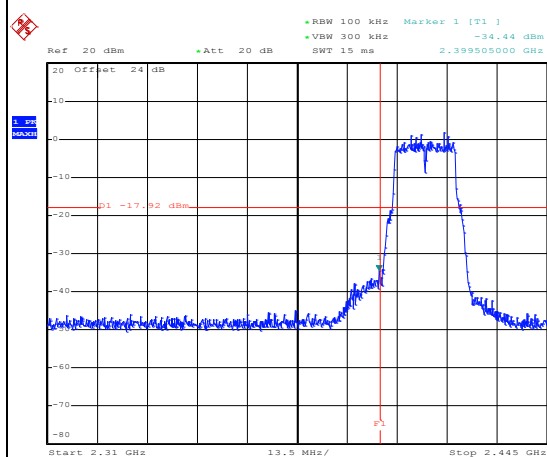
WLAN 802.11g Channel 01

100kHz PSD reference Level



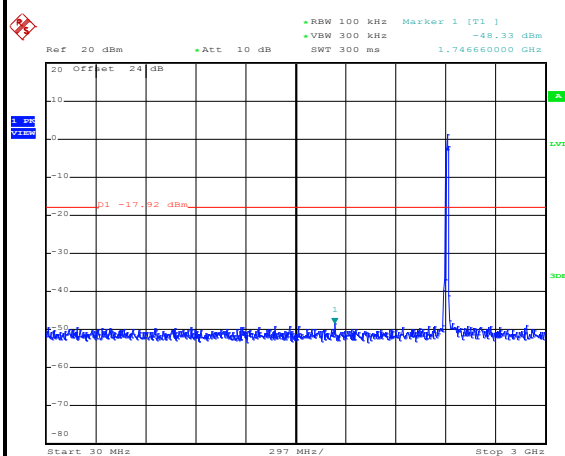
Date: 22.APR.2016 05:15:22

Low Channel Plot



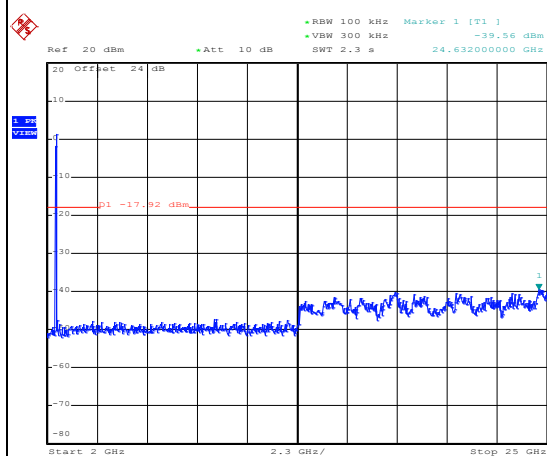
Date: 22.APR.2016 05:15:35

Spurious Emission 30MHz~3GHz



Date: 22.APR.2016 05:15:47

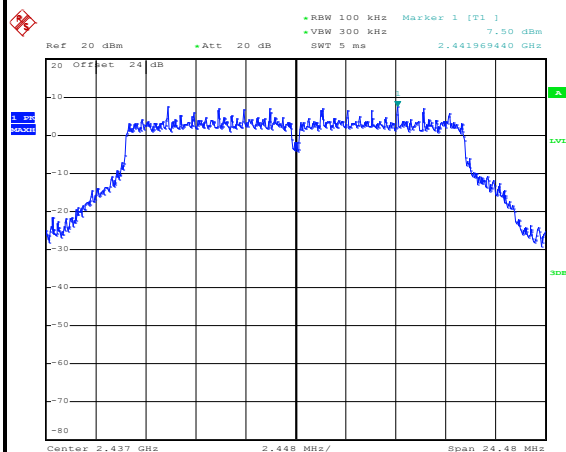
Spurious Emission 2GHz~25GHz



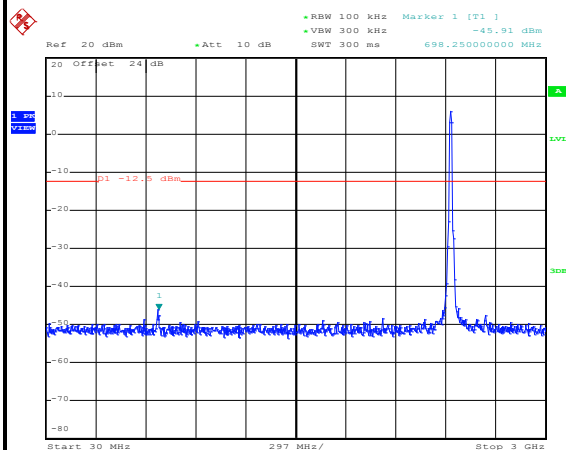
Date: 22.APR.2016 05:15:55



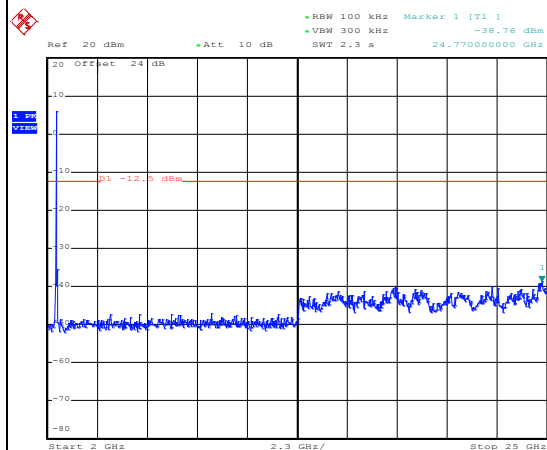
Number of TX :	2	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11g Channel 06**100kHz PSD reference Level****Mid Channel Plot**

Date: 22.APR.2016 05:23:27

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

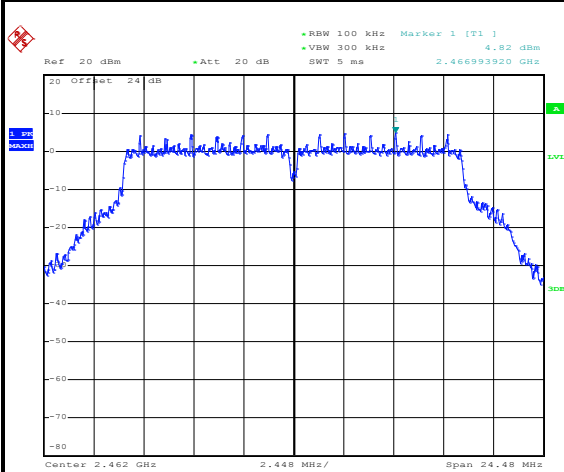
Date: 22.APR.2016 05:23:43



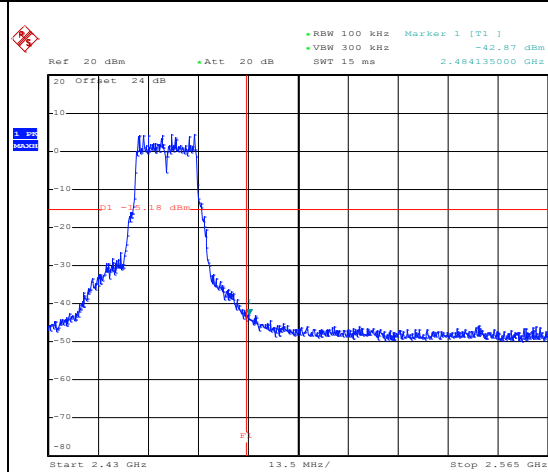
Date: 22.APR.2016 05:23:51



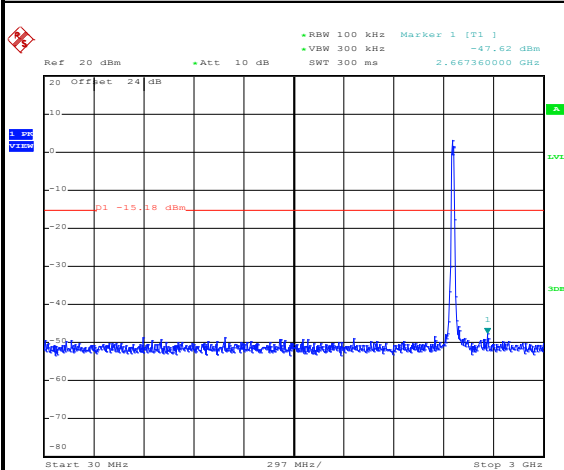
Number of TX :	2	Ant. :	2
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11g Channel 11**100kHz PSD reference Level**

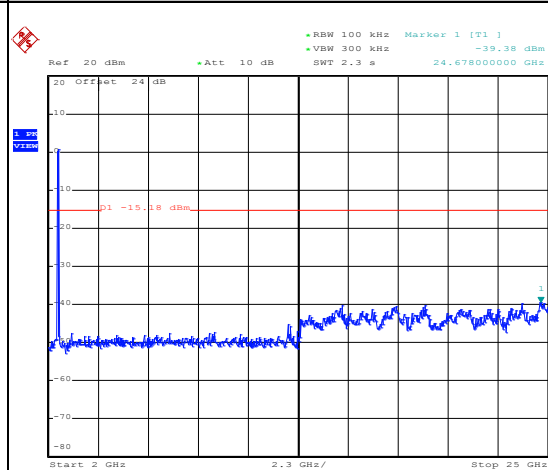
Date: 22.APR.2016 05:25:50

High Channel Plot

Date: 22.APR.2016 05:26:07

Spurious Emission 30MHz~3GHz

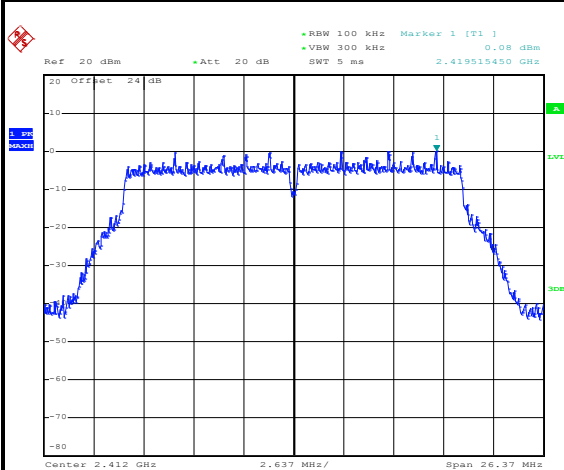
Date: 22.APR.2016 05:26:25

Spurious Emission 2GHz~25GHz

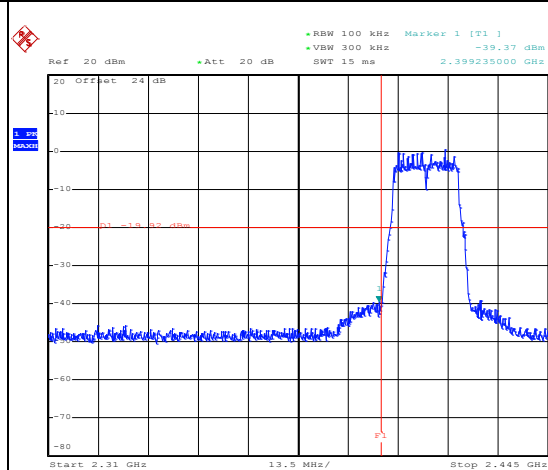
Date: 22.APR.2016 05:26:33



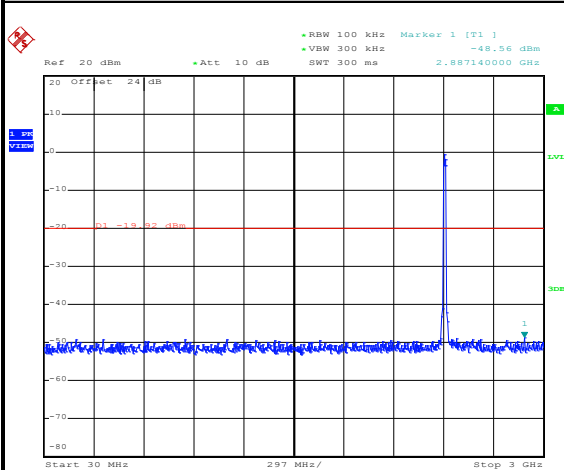
Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 01**100kHz PSD reference Level**

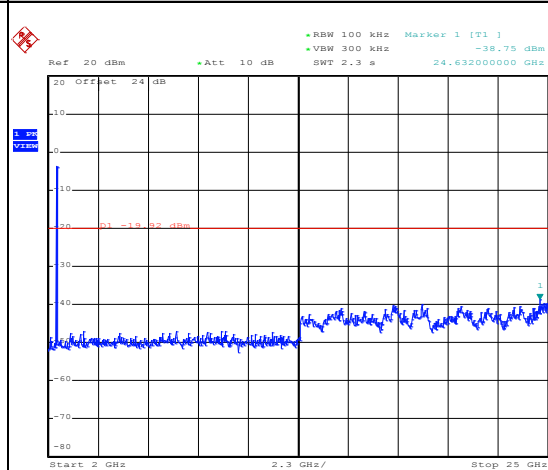
Date: 22.APR.2016 05:34:51

Low Channel Plot

Date: 22.APR.2016 05:35:02

Spurious Emission 30MHz~3GHz

Date: 22.APR.2016 05:35:14

Spurious Emission 2GHz~25GHz

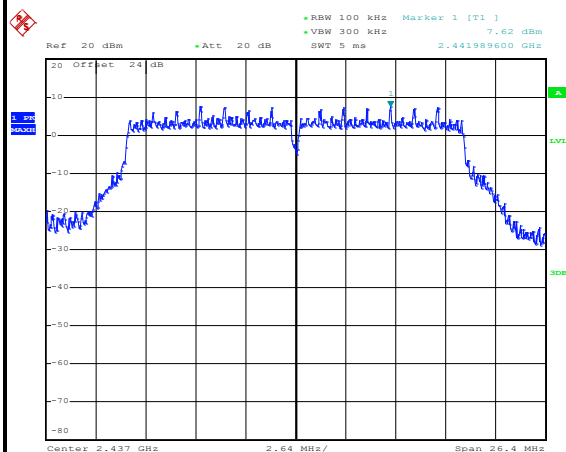
Date: 22.APR.2016 05:35:22



Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 06

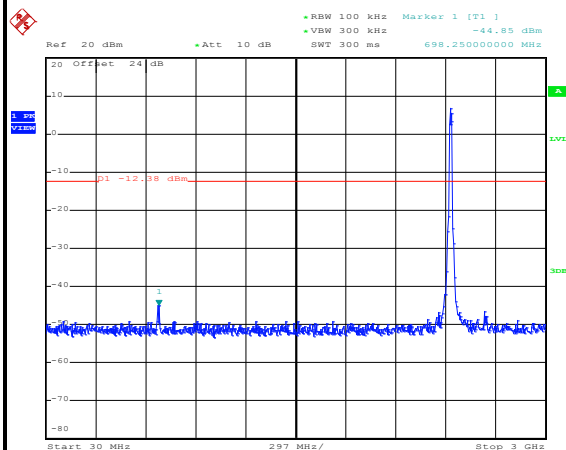
100kHz PSD reference Level



Date: 22.APR.2016 05:37:20

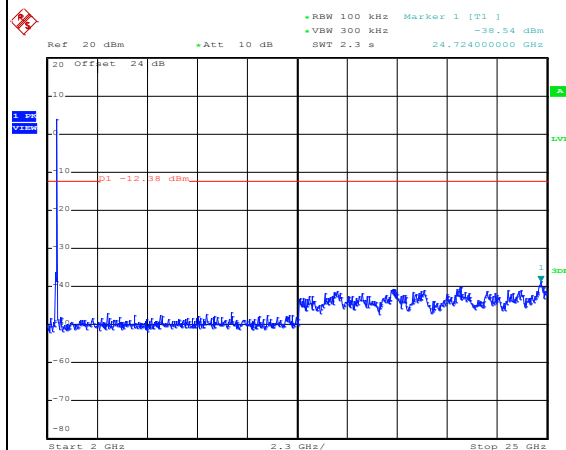
Mid Channel Plot

Spurious Emission 30MHz~3GHz



Date: 22.APR.2016 05:37:50

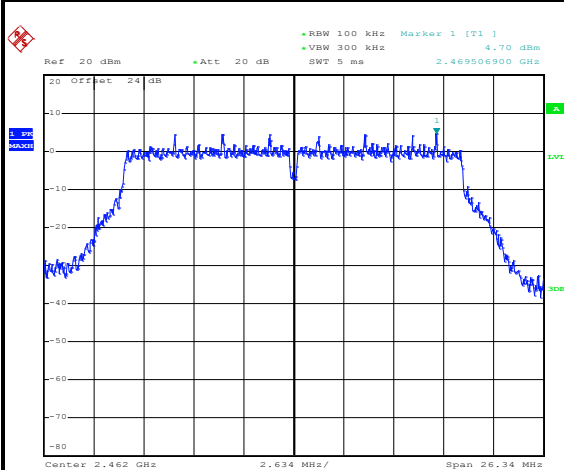
Spurious Emission 2GHz~25GHz



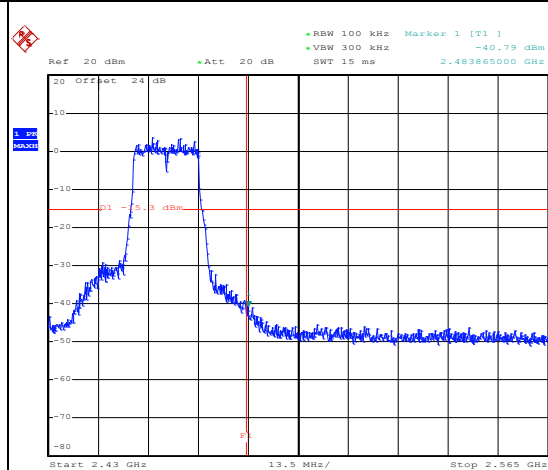
Date: 22.APR.2016 05:37:58



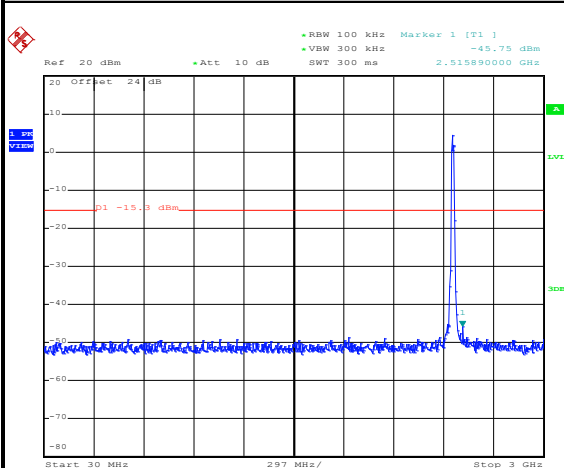
Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Derek Hus

WLAN 802.11n HT20 Channel 11**100kHz PSD reference Level**

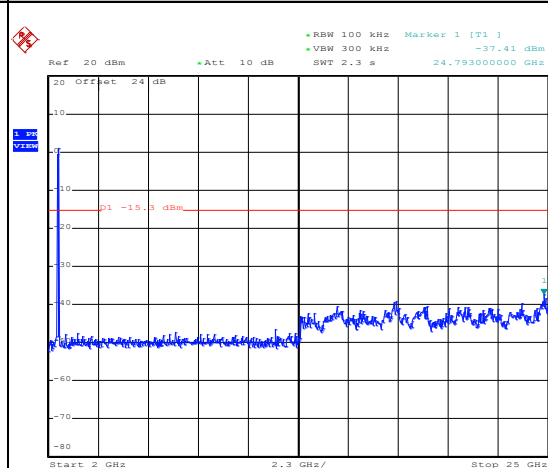
Date: 22.APR.2016 05:47:38

High Channel Plot

Date: 22.APR.2016 05:47:46

Spurious Emission 30MHz~3GHz

Date: 22.APR.2016 05:48:00

Spurious Emission 2GHz~25GHz

Date: 22.APR.2016 05:48:09



3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

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



3.5.3 Test Procedure

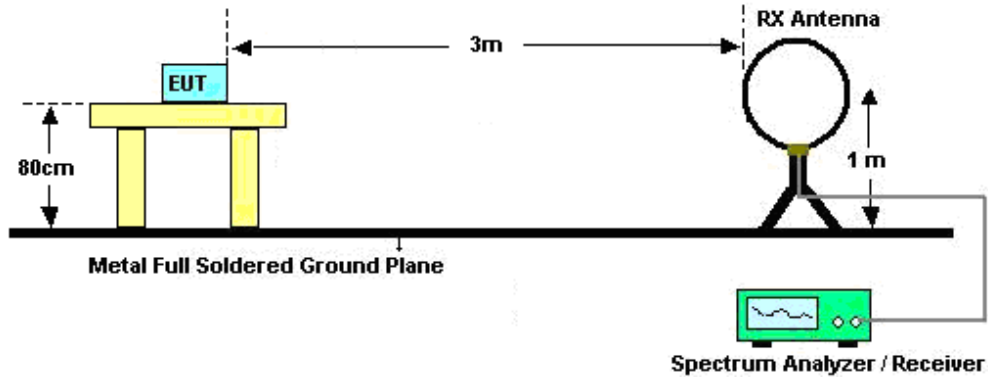
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

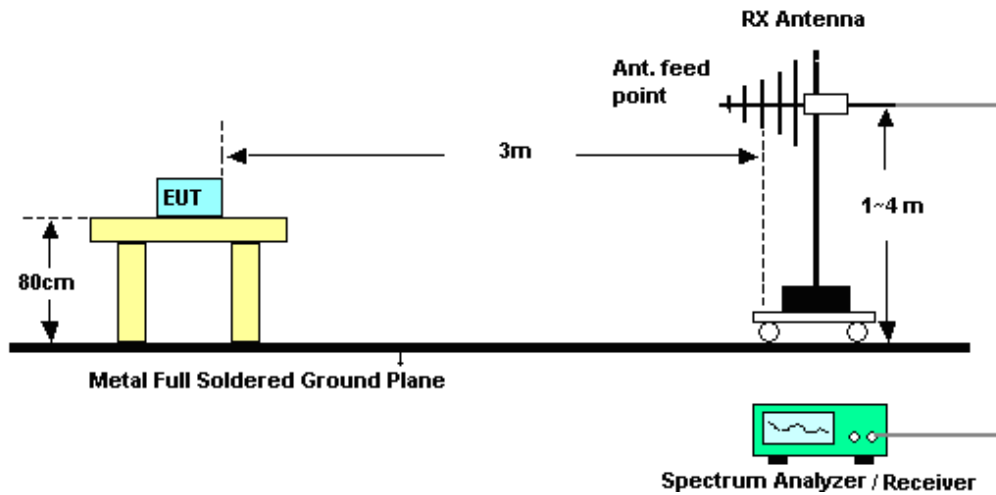
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

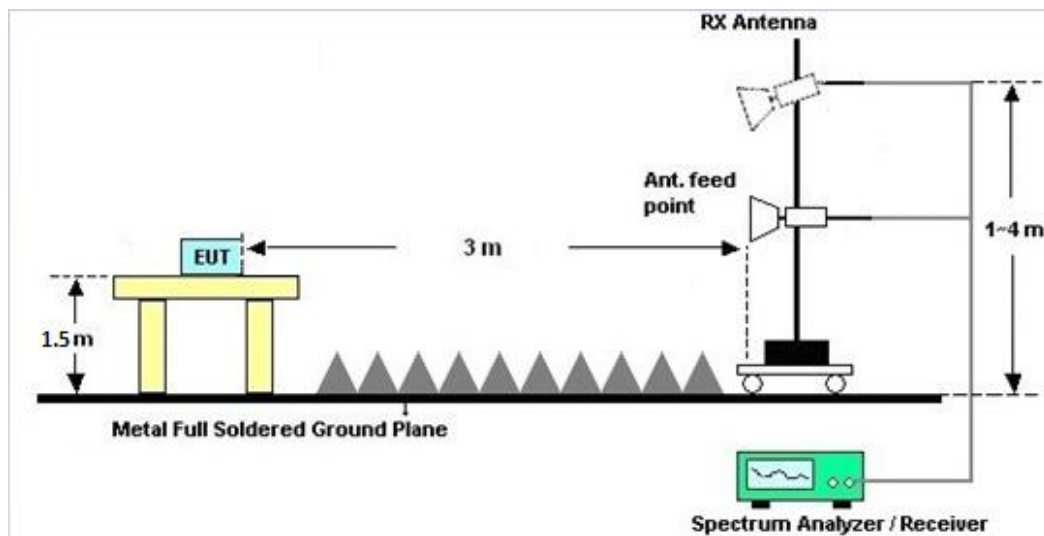
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.5.5 Test Results of Radiated Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C of this test report.

3.5.7 Duty Cycle

Please refer to Appendix D of this test report.

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

Please refer to Appendix B and C of this test report.

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 (dB μ V)	
	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.

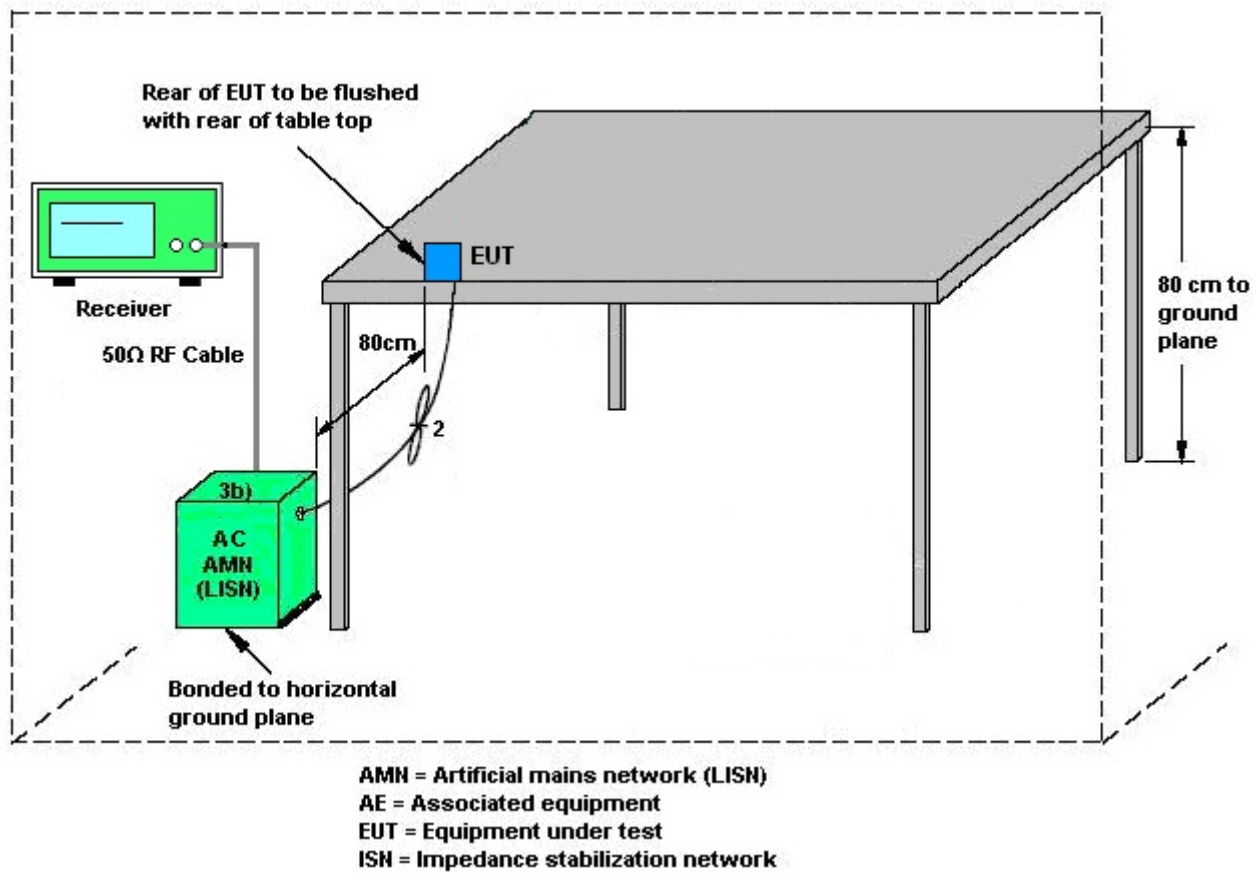
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

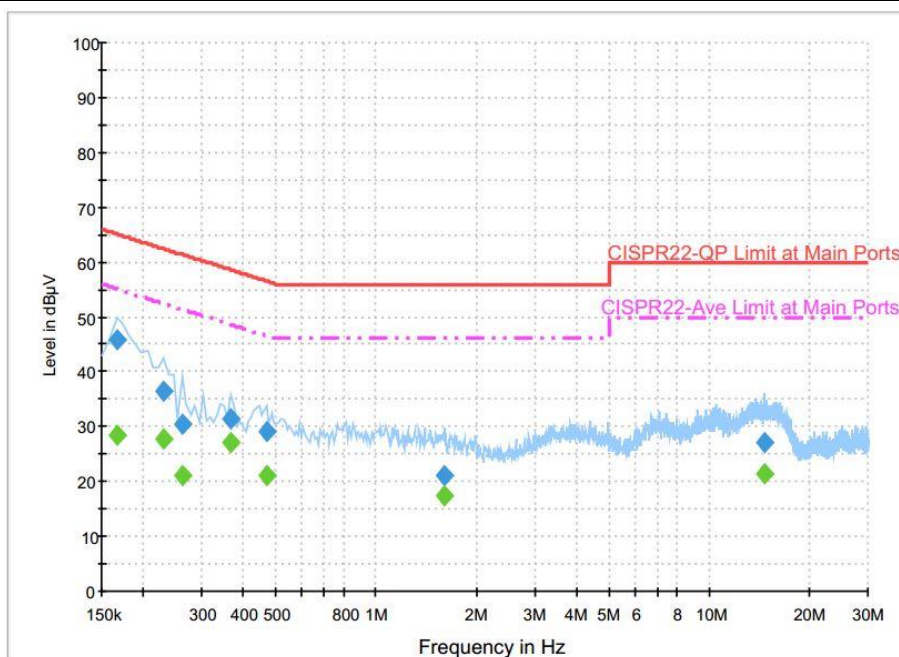
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 :	21~22°C
Test Engineer :	Derreck Chen	Relative Humidity :	51~52%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (2.4GHz) Link + Bluetooth Link + MPEG4 + Adapter		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.166000	45.7	Off	L1	19.6	19.5	65.2
0.230000	36.5	Off	L1	19.6	25.9	62.4
0.262000	30.5	Off	L1	19.6	30.9	61.4
0.366000	31.4	Off	L1	19.6	27.2	58.6
0.470000	28.9	Off	L1	19.6	27.6	56.5
1.606000	21.0	Off	L1	19.6	35.0	56.0
14.702000	27.2	Off	L1	19.8	32.8	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.166000	28.6	Off	L1	19.6	26.6	55.2
0.230000	27.6	Off	L1	19.6	24.8	52.4
0.262000	21.2	Off	L1	19.6	30.2	51.4
0.366000	27.1	Off	L1	19.6	21.5	48.6
0.470000	21.0	Off	L1	19.6	25.5	46.5
1.606000	17.2	Off	L1	19.6	28.8	46.0
14.702000	21.5	Off	L1	19.8	28.5	50.0