



# CERTIFICATE OF COMPLIANCE

This is to certify that the equipment listed below was (were) tested in the BTL Laboratory and shown compliance with the applicable technical standard(s) according to the Radio Equipment Directive (RED) 2014/53/EU.

**Equipment** PHOTON

**Model Name** PHOTONH

**Brand Name** Particle

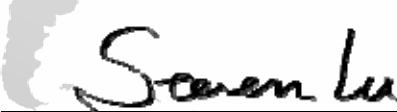
**Applicant** Particle Industries, Inc

**Address** 1475 Folsom Street, Suite 200, San Francisco, CA 94103

**Standard(s)** EN 301 489-1 V2.2.0 (2017-03) Draft  
EN 301 489-17 V3.2.0 (2017-03) Draft  
EN 300 328 V2.1.1 (2016-11)  
EN 62311: 2008

**Report(s)** BTL-ETSE-1-1504C213C  
BTL-ETSP-1-1504C213C  
BTL-ETSP-2-1504C213C

The test data, data evaluation, and equipment configuration contained in our test report(s) above was(were) obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s). The test data contained in the referenced test report relate only to the EUT sample and item(s) tested.



Steven Lu

Authorized Signatory



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Testing Laboratory  
2640



專業檢測  
用心 30 年



# CE Radio Test Report

**Project No.** : 1504C213C  
**Equipment** : PHOTON  
**Model Name** : PHOTONH  
**Applicant** : Particle Industries, Inc  
**Address** : 1475 Folsom Street, Suite 200, San Francisco, CA 94103

**Date of Receipt** : Aug. 29, 2016, Jul. 03, 2017  
**Date of Test** : Aug. 29, 2016 ~ Jan. 13, 2017  
Jul. 03, 2017 ~ Jul. 12, 2017  
**Issued Date** : Jul. 13, 2017  
**Tested by** : BTL Inc.

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**Authorized Signatory** : Steven Lu  
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## Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

**BTL**'s reports apply only to the specific samples tested under conditions. It is manufacturer's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

**BTL**'s report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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**BTL**'s laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

## Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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## REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-ETSP-1-1504C213	Original report.	May 22, 2015
BTL-ETSP-1-1504C213B	<p>Compared with the previous report (BTL-ETSP-1-1504C213),</p> <p>1. The changes of components</p> <p>(a) Replace the USB connection Encapsulation.</p> <p>(b) The model of the power controlling IC U2 changes from RT8008-3V3 to RT8059.</p> <p>(c) Add two 0201 resistances R9 and R10.</p> <p>(d) Add one 0201 capacitance C18.</p> <p>(e) change the resistor R4's encapsulation from 0402 to 0201.</p> <p>2. Layout changes.</p> <p>3. Standard version is updated to the latest.</p> <p>4. Applicant and address are updated.</p> <p>5. Brand name (Particle) is added.</p> <p>All test results has been re-evaluated and recorded in the test report.</p>	Jan. 16, 2017
BTL-ETSP-1-1504C213C	Compared with previous report (BTL-ETSP-1-1504C213B), the standard is updated to the latest. The receiver blocking and spurious emissions above 1GHz have been re-evaluated and recorded in the test report.	Jul. 13, 2017

## 1. CERTIFICATION

Equipment : PHOTON  
Brand Name : Particle  
Model Name : PHOTONH  
Applicant : Particle Industries, Inc  
Date of Test : Aug. 29, 2016 ~ Jan. 13, 2017  
Jul. 03, 2017 ~ Jul. 12, 2017  
Test Sample : Engineering Sample  
Standard(s) : EN 300 328 V2.1.1 (2016-11)

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-ETSP-1-1504C213C) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. RF EMISSIONS MEASUREMENT

### 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-CB12/OVEN** at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

### 2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2 .The BTL measurement uncertainty is less than the CISPR 16-4-2  $U_{cisp}$  requirement.

Parameter	Uncertainty
Output Power	$\pm 0.95\text{dB}$
Occupied Channel Bandwidth	$\pm 3.8\%$
Power Spectral Density	$\pm 0.86\text{ dB}$
Conducted Spurious Emission	$\pm 2.71\text{ dB}$
Radiated Emissions, ( $f \leq 1\text{GHz}$ )	$\pm 3.38\text{dB}$
Radiated Emissions, ( $1\text{ GHz} < f \leq 26.5\text{GHz}$ )	$\pm 3.06\text{dB}$
Temperature	$\pm 0.08^\circ\text{C}$

### 2.3 TEST CHANNEL

IEEE 802.11b/g/n(20 MHz)		
Test Channel	EUT Channel	Test Frequency (MHz)
low	CH01	2412
middle	CH07	2442
high	CH13	2472

Note:

- (1) The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be stated by the supplier.

## 2.4 TEST METHODOLOGY AND RESULTS

Harmonised Standard ETSI EN 300 328 V2.1.1					
Essential Requirement			Requirement Conditionality		Result
No	Description	Reference: Clause No	U/C	Condition	
1	RF Output Power	4.3.1.2 or 4.3.2.2	U	-	Pass
2	Power spectral Density	4.3.2.3	C	Only for equipment using wide band modulations other than FHSS	Pass
3	Duty cycle, Tx-Sequence, Tx-gap	4.3.1.3 or 4.3.2.4	C	Only for non-adaptive equipment and RF Output Power>10dBm	N/A
4	Accumulated Transmit time,, Frequency Occupation & Hopping Sequence	4.3.1.4	C	Only for FHSS equipment	N/A
5	Hopping Frequency Separation	4.3.1.5	C	Only for FHSS equipment	N/A
6	Medium Utilisation	4.3.1.6 or 4.3.2.5	C	Only for non-adaptive equipment and RF Output Power>10dBm	N/A
7	Adaptivity	4.3.1.7 or 4.3.2.6	C	Only for adaptive equipment and RF Output Power>10dBm	Pass
8	Occupied Channel Bandwidth	4.3.1.8 or 4.3.2.7	U	-	Pass
9	Transmitter unwanted emissions in the OOB domain	4.3.1.9 or 4.3.2.8	U	-	Pass
10	Transmitter unwanted emissions in the spurious domain	4.3.1.10 or 4.3.2.9	U	-	Pass
11	Receiver spurious emissions	4.3.1.11 or 4.3.2.10	U	-	Pass
12	Receiver Blocking	4.3.1.12 or 4.3.2.11	U	-	Pass
13	Geo-location capability	4.3.1.13 or 4.3.2.12	C	Only for equipment with geo-location capability	N/A

NOTE:

- (1) “U/C”: indicates whether the requirement is to be **unconditionally** applicable (**U**) or is **conditional** upon the manufacturers claimed functionality of the equipment (**C**).
- “N/A”: indicates test is not applicable to this device.

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	PHOTON	
Brand Name	Particle	
Model Name	PHOTONH	
Model Difference	N/A	
Power Source	Supplied from PC USB port.	
Power Rating	DC 5V	
Product Description	Operation Frequency	2412~2472MHz
	Modulation Technology	802.11b: DSSS 802.11g: OFDM 802.11n: OFDM
	Bit Rate of Transmitter	802.11b: 11/5.5/2/1 Mbps 802.11g: 54/48/36/24/18/12/9/6 Mbps 802.11n: up to 65 Mbps
	EIRP Power (Max.) - Chip antenna	802.11b: 18.72 dBm 802.11g: 17.58 dBm 802.11n (20MHz): 17.32 dBm
	E.I.R.P. Power (Max.) - Dipole antenna	802.11b: 18.51 dBm 802.11g: 17.72 dBm 802.11n (20MHz): 16.49 dBm
	Categorization	<input checked="" type="checkbox"/> Receiver category 1 <input type="checkbox"/> Receiver category 2 <input type="checkbox"/> Receiver category 3

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 2. Channel List:

CH01 - CH13 for 802.11b, 802.11g, 802.11n(20MHz)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	06	2437	11	2462
02	2417	07	2442	12	2467
03	2422	08	2447	13	2472
04	2427	09	2452		
05	2432	10	2457		

## 3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	ACX	AT7020 -E3R0HBA	Chip	N/A	1.30
2	CRM <b>X</b> <sub>TM</sub>	104-1001	Dipole	RP-TNC	2.15

Note: EUT has two types of antenna, one with chip antenna, another one with dipole antenna.  
Only 1 antenna active at any moment in time.

### 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Items	Mode	Data Rate	Channel
RF Output Power Power Spectral Density	IEEE 802.11b/CCK	1 Mbps	01/07/13
	IEEE 802.11g/BPSK	6 Mbps	01/07/13
	IEEE 802.11n(20MHz)/BPSK	MCS 0	01/07/13
Adaptivity, Receiver Blocking Occupied Channel Bandwidth	IEEE 802.11b/CCK	1 Mbps	01/13
	IEEE 802.11g/BPSK	6 Mbps	01/13
Transmitter unwanted emissions in the OOB domain	IEEE 802.11n(20MHz)/BPSK	MCS 0	01/13
Transmitter unwanted emissions in the spurious domain (30MHz~1GHz)	IEEE 802.11b/CCK	1 Mbps	01/13
Transmitter unwanted emissions in the spurious domain (1GHz~12.75GHz)	IEEE 802.11b/CCK	1 Mbps	01/07/13
	IEEE 802.11g/BPSK	6 Mbps	01/07/13
	IEEE 802.11n(20MHz)/BPSK	MCS 0	01/07/13
Receiver spurious emissions (30MHz~1GHz)	IEEE 802.11b/CCK	1 Mbps	01/13
Receiver spurious emissions (1GHz~12.75GHz)	IEEE 802.11b/CCK	1 Mbps	01/07/13
	IEEE 802.11g/BPSK	6 Mbps	01/07/13
	IEEE 802.11n(20MHz)/BPSK	MCS 0	01/07/13
Receiver Blocking	IEEE 802.11b/CCK	1 Mbps	01/13

### 3.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

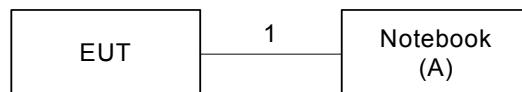
For Chip antenna:

Test Software Version	CMD		
Frequency (MHz)	2412	2442	2472
IEEE 802.11b	17	17	17
IEEE 802.11g	15	15	15
802.11n (20MHz)	15	15	15

For Dipole antenna:

Test Software Version	CMD		
Frequency (MHz)	2412	2442	2472
IEEE 802.11b	17	17	17
IEEE 802.11g	17	17	17
802.11n (20MHz)	16	16	16

### 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Notebook	Lenovo	G480	DOC	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	0.5m	USB Cable

## 4. RF OUTPUT POWER

### 4.1 APPLIED PROCEDURES / LIMIT

Clause	4.3.2.2
Test Item	RF output power
Limit	For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm. The maximum RF output power for non-adaptive equipment shall be declared by the manufacturer and shall not exceed 20 dBm. See clause 5.4.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

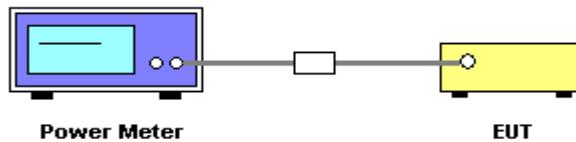
### 4.2 TEST PROCEDURES

Please refer to chapter 5.4.2 of ETSI EN 300 328 V2.1.1.

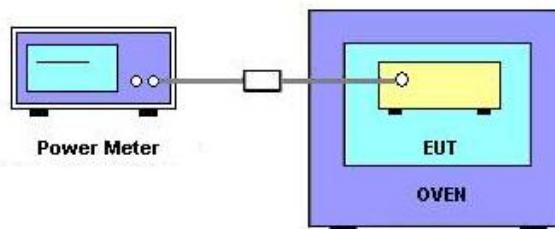
Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input checked="" type="checkbox"/> Lowest, Middle and highest Channel	<input type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input type="checkbox"/> Normal	<input checked="" type="checkbox"/> Normal and Extreme

### 4.3 TEST SETUP LAYOUT

#### Normal Condition



#### Extreme Condition



### 4.4 TEST DEVIATION

There is no deviation with the original standard.

### 4.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 4.6 TEST RESULTS

Please refer to the Appendix A.

## 5. POWER SPECTRAL DENSITY

### 5.1 APPLIED PROCEDURES / LIMIT

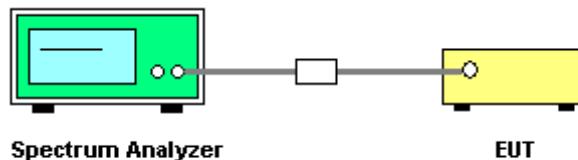
Clause	4.3.2.3
Test Item	Power Spectral Density
Limit	For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

### 5.2 TEST PROCEDURES

Please refer to chapter 5.4.3 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input checked="" type="checkbox"/> Lowest, Middle and highest Channel	<input type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 5.3 TEST SETUP LAYOUT



### 5.4 TEST DEVIATION

There is no deviation with the original standard.

### 5.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 5.6 TEST RESULTS

Please refer to the Appendix B.

## 6. DUTY CYCLE, TX-SEQUENCE, TX-GAP

### 6.1 APPLIED PROCEDURES / LIMIT

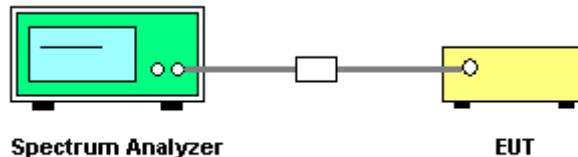
Clause	4.3.2.4
Test Item	Duty Cycle, Tx-sequence, Tx-gap
Limit	<p>The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.</p> <p>The Tx-sequence time shall be equal to or less than 10 ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.</p>

### 6.2 TEST PROCEDURES

Please refer to chapter 5.4.2 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input checked="" type="checkbox"/> Lowest, Middle and highest Channel	<input type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 6.3 TEST SETUP LAYOUT



### 6.4 TEST DEVIATION

There is no deviation with the original standard.

### 6.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 6.6 TEST RESULTS

Please refer to the Appendix C.

## 7. MEDIUM UTILISATION (MU) FACTOR

### 7.1 APPLIED PROCEDURES / LIMIT

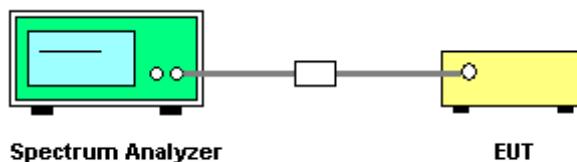
Clause	4.3.2.5
Test Item	Medium Utilisation (MU) factor
Limit	For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilisation factor shall be 10 %.

### 7.2 TEST PROCEDURES

Please refer to chapter 5.4.2 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input checked="" type="checkbox"/> Lowest, Middle and highest Channel	<input type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 7.3 TEST SETUP LAYOUT



### 7.4 TEST DEVIATION

There is no deviation with the original standard.

### 7.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 7.6 TEST RESULTS

Please refer to the Appendix D.

## 8. ADAPTIVITY (ADAPTIVE EQUIPMENT USING MODULATIONS OTHER THAN FHSS)

### 8.1 APPLIED PROCEDURES / LIMIT

Clause	4.3.2.6						
Test Item	<p>Adaptivity(adaptive equipment using modulations other than FHSS)</p> <p><b>Non-LBT based Detect and Avoid</b></p> <p>Equipment using a modulation other than FHSS and using the non-LBT based Detect and Avoid mechanism, shall comply with the following minimum set of requirements:</p> <ol style="list-style-type: none"> <li>1) During normal operation, the equipment shall evaluate the presence of a signal on its current operating channel. If it is determined that a signal is present with a level above the detection threshold defined in step 5 the channel shall be marked as 'unavailable'.</li> <li>2) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available'</li> <li>3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time.</li> <li>4) The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After this, the procedure as in step 1 needs to be repeated.</li> <li>5) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may <math>TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW/Pout})</math> (Pout in mW e.i.r.p.).</li> <li>6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 9.</li> </ol>						
Limit	<p><b>Table 9: Unwanted Signal parameters</b></p> <table border="1"> <thead> <tr> <th>Wanted signal mean power from companion device (dBm)</th> <th>Unwanted signal frequency (MHz)</th> <th>Unwanted CW signal power (dBm)</th> </tr> </thead> <tbody> <tr> <td>-30</td> <td>2 395 or 2 488,5 (see note 1)</td> <td>-35 (see note 2)</td> </tr> </tbody> </table> <p>NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.</p> <p>NOTE 2: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.</p>	Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)	-30	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)					
-30	2 395 or 2 488,5 (see note 1)	-35 (see note 2)					

<p><b>LBT based Detect and Avoid</b></p> <p>The present document defines two types of adaptive equipment using wide band modulations other than FHSS and that uses an LBT based Detect and Avoid mechanism: Frame Based Equipment and Load Based Equipment. Adaptive equipment which is capable of operating as either Load Based Equipment or as Frame Based Equipment is allowed to switch dynamically between these types of operation.</p> <p><b>a. Frame Based Equipment</b></p> <p>Frame Based Equipment shall comply with the following requirements:</p>
<p>1) Before transmission, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately. See figure 2 below.</p> <p>2) If the equipment finds the channel occupied, it shall not transmit on this channel during the next Fixed Frame Period. The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. See clause 4.3.2.6.1. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.</p> <p>3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time. The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Fixed Frame Period. See figure 2 below.</p> <p>4) An equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames(e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of such transmissions by the equipment without a new CCA shall not exceed the maximum Channel Occupancy Time. For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.</p> <p>5) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p. the CCA threshold level may be relaxed to:  <math display="block">TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW/Pout}) \text{ (Pout in mW e.i.r.p.)}</math></p> <p>6) The equipment shall comply with the requirements defined in step 1 to step 4 in the present clause in the presence of an unwanted CW signal as defined in table 10.</p>

**Table 10: Unwanted Signal parameters**

<b>Wanted signal mean power from companion device</b>	<b>Unwanted signal frequency (MHz)</b>	<b>Unwanted signal power (dBm)</b>
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)

**NOTE 1:** The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.

**NOTE 2:** A typical value which can be used in most cases is -50 dBm/MHz.

**NOTE 3:** The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.

**b.Load Based Equipment**

Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect as described in IEEE 802.11™-2012 [i.3], clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8 providing the equipment complies with the conformance requirements referred to in clause 4.3.2.6.3.4. Load Based Equipment not using any of the mechanisms referenced above shall comply with the following minimum set of requirements:

Limit

- 1) Before a transmission or a burst of transmissions, the equipment shall perform a Clear Channel Assessment(CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately.
- 2) If the equipment finds the channel occupied, it shall not transmit on this channel (see also the next paragraph). The equipment shall perform an Extended CCA check in which the channel is observed for a random duration in the range between 18 µs and at least 160 µs. If the extended CCA check has determined the channel to be no longer occupied, the equipment may resume transmissions on this channel. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied.

**NOTE:** The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.

The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.

- 3) The total time that an equipment makes use of a RF channel is defined as the Channel Occupancy Time. This Channel Occupancy Time shall be less than 13 ms, after which the device shall perform a new CCA as described in step 1 above.
- 4) The equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames(e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of transmissions by the equipment without a new CCA shall not exceed the maximum channel occupancy time as defined in step 3 above.  
 For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.
- 5) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the CCA threshold level may be relaxed to:  

$$TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW/Pout}) \text{ (Pout in mW e.i.r.p.)}$$
- 6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 11.

**Table 11: Unwanted Signal parameters**

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
<b>NOTE 1:</b> The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
<b>NOTE 2:</b> A typical value which can be used in most cases is -50 dBm/MHz.		
<b>NOTE 3:</b> The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

#### **Short Control Signalling Transmissions**

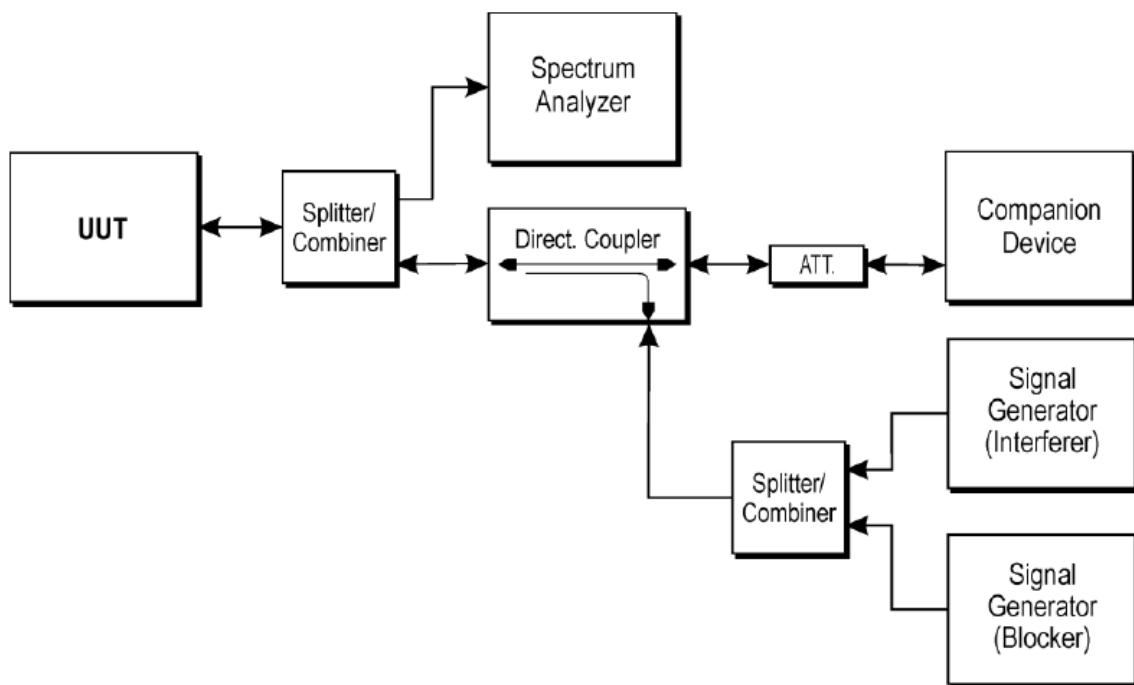
If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

## 8.2 TEST PROCEDURES

Please refer to chapter 5.4.6 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

## 8.3 TEST SETUP LAYOUT



## 8.4 TEST DEVIATION

There is no deviation with the original standard.

## 8.5 EUT OPERATION DURING TEST

The measurements shall be performed during normal operation.

## 8.6 TEST RESULTS

Please refer to the Appendix E.

## 9. OCCUPIED CHANNEL BANDWIDTH

### 9.1 APPLIED PROCEDURES / LIMIT

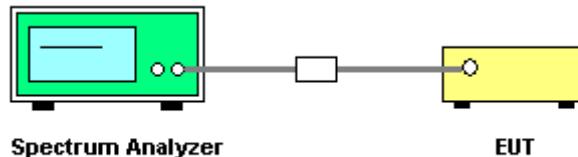
Clause	4.3.2.7
Test Item	Occupied Channel Bandwidth
Limit	The Occupied Channel Bandwidth shall fall completely within the band given in clause 1. In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm.

### 9.2 TEST PROCEDURES

Please refer to chapter 5.4.7 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 9.3 TEST SETUP LAYOUT



### 9.4 TEST DEVIATION

There is no deviation with the original standard.

### 9.5 EUT OPERATION DURING TEST

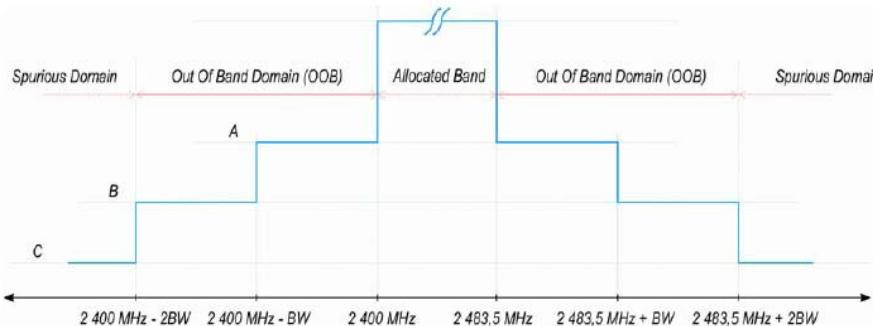
The measurements shall be performed during continuously transmitting.

### 9.6 TEST RESULTS

Please refer to the Appendix F.

## 10. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

### 10.1 APPLIED PROCEDURES / LIMIT

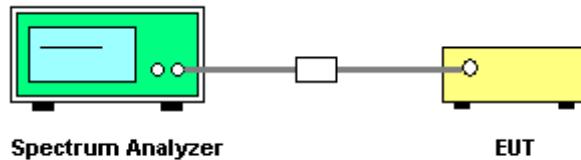
Clause	4.3.2.8
Test Item	Transmitter unwanted emissions in the out-of-band domain
Limit	<p>The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in below figure.</p>  <p>A: -10 dBm/MHz e.i.r.p.    B: -20 dBm/MHz e.i.r.p.    C: Spurious Domain limits</p> <p>BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater</p>

### 10.2 TEST PROCEDURES

Please refer to chapter 5.4.8 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 10.3 TEST SETUP LAYOUT



### 10.4 TEST DEVIATION

There is no deviation with the original standard.

### 10.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 10.6 TEST RESULTS

Please refer to the Appendix G.

## 11. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

### 11.1 APPLIED PROCEDURES / LIMIT

Clause	4.3.2.9																																			
Test Item	Transmitter unwanted emissions in the spurious domain																																			
	<p>The transmitter unwanted emissions in the spurious domain shall not exceed the values given in below table.</p> <p>These limits are e.r.p for emissions up to 1GHz and e.i.r.p for emissions above 1GHz.</p>																																			
<table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum power</th> <th>Bandwidth</th> </tr> </thead> <tbody> <tr> <td>30 MHz to 47 MHz</td> <td>-36 dBm</td> <td>100 kHz</td> </tr> <tr> <td>47 MHz to 74 MHz</td> <td>-54 dBm</td> <td>100 kHz</td> </tr> <tr> <td>74 MHz to 87,5 MHz</td> <td>-36 dBm</td> <td>100 kHz</td> </tr> <tr> <td>87,5 MHz to 118 MHz</td> <td>-54 dBm</td> <td>100 kHz</td> </tr> <tr> <td>118 MHz to 174 MHz</td> <td>-36 dBm</td> <td>100 kHz</td> </tr> <tr> <td>174 MHz to 230 MHz</td> <td>-54 dBm</td> <td>100 kHz</td> </tr> <tr> <td>230 MHz to 470 MHz</td> <td>-36 dBm</td> <td>100 kHz</td> </tr> <tr> <td>470 MHz to 862 MHz</td> <td>-54 dBm</td> <td>100 kHz</td> </tr> <tr> <td>862 MHz to 1 GHz</td> <td>-36 dBm</td> <td>100 kHz</td> </tr> <tr> <td>1 GHz to 12,75 GHz</td> <td>-30 dBm</td> <td>1 MHz</td> </tr> </tbody> </table>				Frequency range	Maximum power	Bandwidth	30 MHz to 47 MHz	-36 dBm	100 kHz	47 MHz to 74 MHz	-54 dBm	100 kHz	74 MHz to 87,5 MHz	-36 dBm	100 kHz	87,5 MHz to 118 MHz	-54 dBm	100 kHz	118 MHz to 174 MHz	-36 dBm	100 kHz	174 MHz to 230 MHz	-54 dBm	100 kHz	230 MHz to 470 MHz	-36 dBm	100 kHz	470 MHz to 862 MHz	-54 dBm	100 kHz	862 MHz to 1 GHz	-36 dBm	100 kHz	1 GHz to 12,75 GHz	-30 dBm	1 MHz
Frequency range	Maximum power	Bandwidth																																		
30 MHz to 47 MHz	-36 dBm	100 kHz																																		
47 MHz to 74 MHz	-54 dBm	100 kHz																																		
74 MHz to 87,5 MHz	-36 dBm	100 kHz																																		
87,5 MHz to 118 MHz	-54 dBm	100 kHz																																		
118 MHz to 174 MHz	-36 dBm	100 kHz																																		
174 MHz to 230 MHz	-54 dBm	100 kHz																																		
230 MHz to 470 MHz	-36 dBm	100 kHz																																		
470 MHz to 862 MHz	-54 dBm	100 kHz																																		
862 MHz to 1 GHz	-36 dBm	100 kHz																																		
1 GHz to 12,75 GHz	-30 dBm	1 MHz																																		

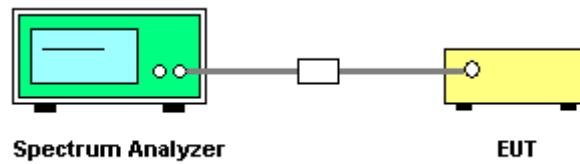
### 11.2 TEST PROCEDURES

Please refer to chapter 5.4.9 of ETSI EN 300 328 V2.1.1.

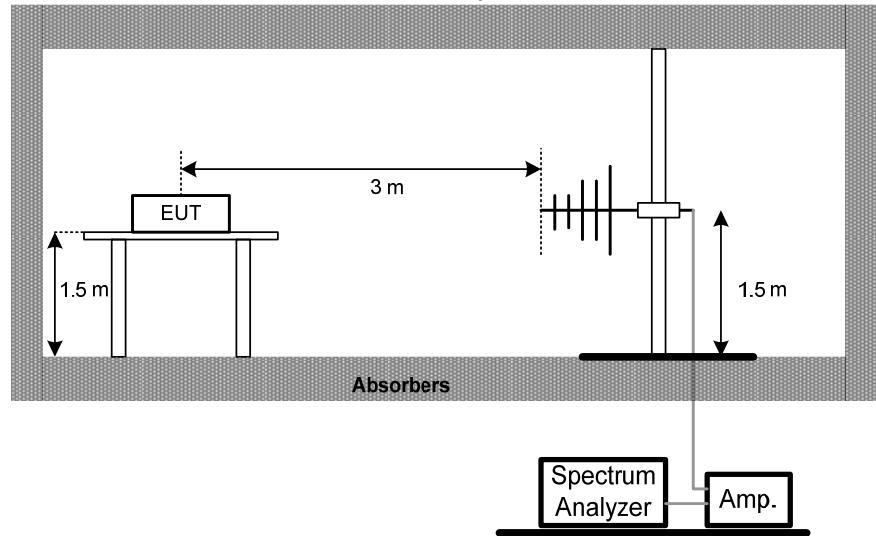
Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input checked="" type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 11.3 TEST SETUP LAYOUT

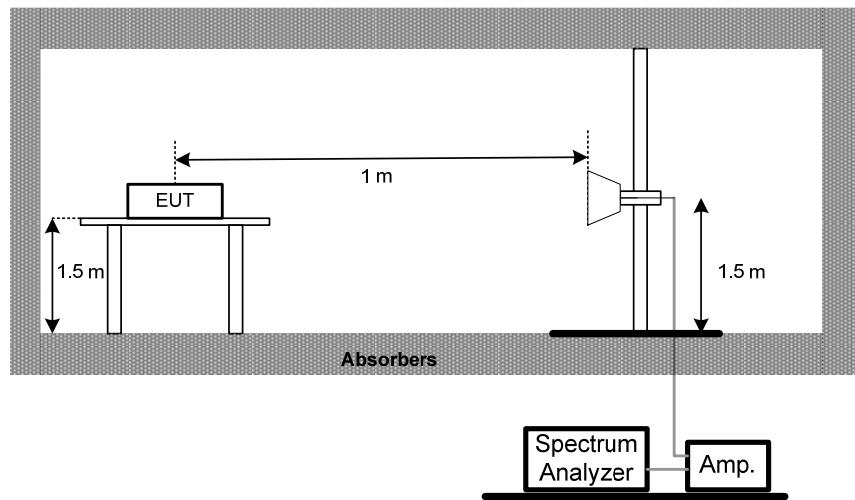
#### Conducted Measurement



#### Radiated Measurement Test Set-Up Frequency Below 1 GHz



#### Radiated Measurement Test Set-Up Frequency Above 1 GHz



### 11.4 TEST DEVIATION

There is no deviation with the original standard.

### 11.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

### 11.6 TEST RESULTS

Please refer to the Appendix H

## 12.RECEIVER SPURIOUS EMISSIONS

### 12.1 APPLIED PROCEDURES / LIMIT

Clause	4.3.2.10		
Test Item	Receiver spurious emissions		
Limit	The spurious emissions of the receiver shall not exceed the values given in below table. These limits are e.r.p for emissions up to 1GHz and e.i.r.p for emissions above 1GHz.		
Frequency range	Maximum power	Measurement bandwidth	
30 MHz to 1 GHz	-57 dBm	100 kHz	
1 GHz to 12,75 GHz	-47 dBm	1 MHz	

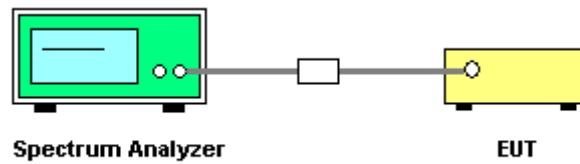
### 12.2 TEST PROCEDURES

Please refer to chapter 5.4.10 of ETSI EN 300 328 V2.1.1.

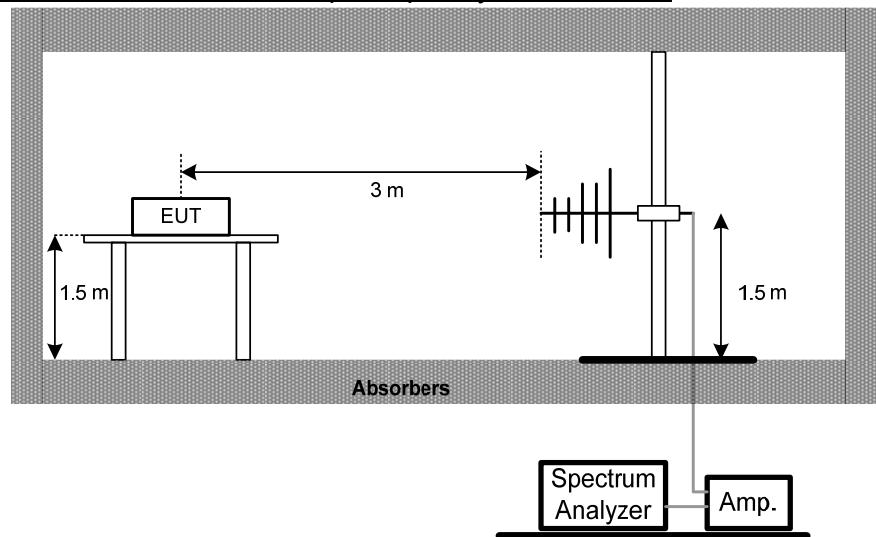
Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input checked="" type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 12.3 TEST SETUP LAYOUT

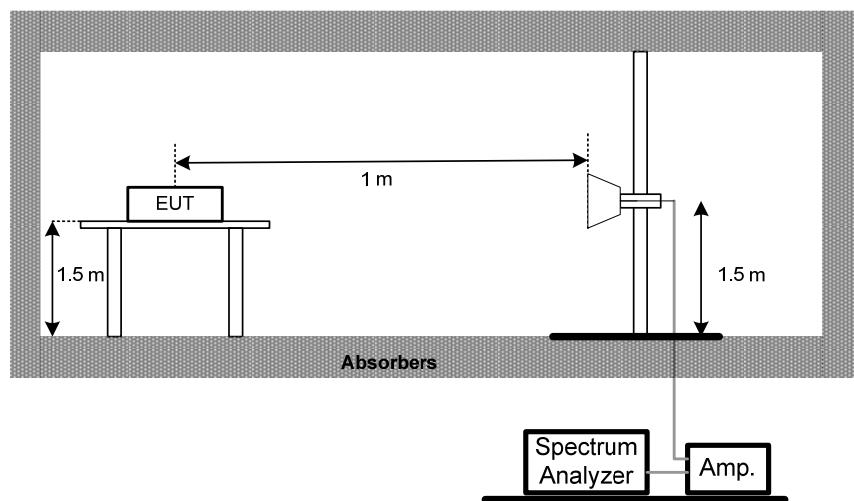
#### Conducted Measurement



#### Radiated Measurement Test Set-Up Frequency Below 1 GHz



#### Radiated Measurement Test Set-Up Frequency Above 1 GHz



### 12.4 TEST DEVIATION

There is no deviation with the original standard.

### 12.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously receiving.

### 12.6 TEST RESULTS

Please refer to the Appendix I.

## 13. RECEIVER BLOCKING

### 13.1 APPLIED PROCEDURES / LIMIT

Clause	4.3.2.11																			
Test Item	Receiver Blocking																			
	<p>While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table 14, table 15 or table 16.</p> <p><b>Receiver Category 1</b>            Table 14 contains the Receiver Blocking parameters for Receiver Category 1 equipment.</p> <p><b>Table 14: Receiver Blocking parameters for Receiver Category 1 equipment</b></p> <table border="1"> <thead> <tr> <th>Wanted signal mean power from companion device (dBm)</th> <th>Blocking signal frequency (MHz)</th> <th>Blocking signal power (dBm) (see note 2)</th> <th>Type of blocking signal</th> </tr> </thead> <tbody> <tr> <td><math>P_{min} + 6 \text{ dB}</math></td> <td>2 380 2 503,5</td> <td>-53</td> <td>CW</td> </tr> <tr> <td><math>P_{min} + 6 \text{ dB}</math></td> <td>2 300 2 330 2 360</td> <td>-47</td> <td>CW</td> </tr> <tr> <td><math>P_{min} + 6 \text{ dB}</math></td> <td>2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5</td> <td>-47</td> <td>CW</td> </tr> </tbody> </table> <p>NOTE 1: <math>P_{min}</math> is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.            NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p>				Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal	$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-53	CW	$P_{min} + 6 \text{ dB}$	2 300 2 330 2 360	-47	CW	$P_{min} + 6 \text{ dB}$	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal																	
$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-53	CW																	
$P_{min} + 6 \text{ dB}$	2 300 2 330 2 360	-47	CW																	
$P_{min} + 6 \text{ dB}$	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW																	
Limit	<p><b>Receiver Category 2</b>            Table 15 contains the Receiver Blocking parameters for Receiver Category 2 equipment.</p> <p><b>Table 15: Receiver Blocking parameters receiver category 2 equipment</b></p> <table border="1"> <thead> <tr> <th>Wanted signal mean power from companion device (dBm)</th> <th>Blocking signal frequency (MHz)</th> <th>Blocking signal power (dBm) (see note 2)</th> <th>Type of blocking signal</th> </tr> </thead> <tbody> <tr> <td><math>P_{min} + 6 \text{ dB}</math></td> <td>2 380 2 503,5</td> <td>-57</td> <td>CW</td> </tr> <tr> <td><math>P_{min} + 6 \text{ dB}</math></td> <td>2 300 2 583,5</td> <td>-47</td> <td>CW</td> </tr> </tbody> </table> <p>NOTE 1: <math>P_{min}</math> is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.            NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p>				Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal	$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW	$P_{min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW				
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal																	
$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW																	
$P_{min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW																	

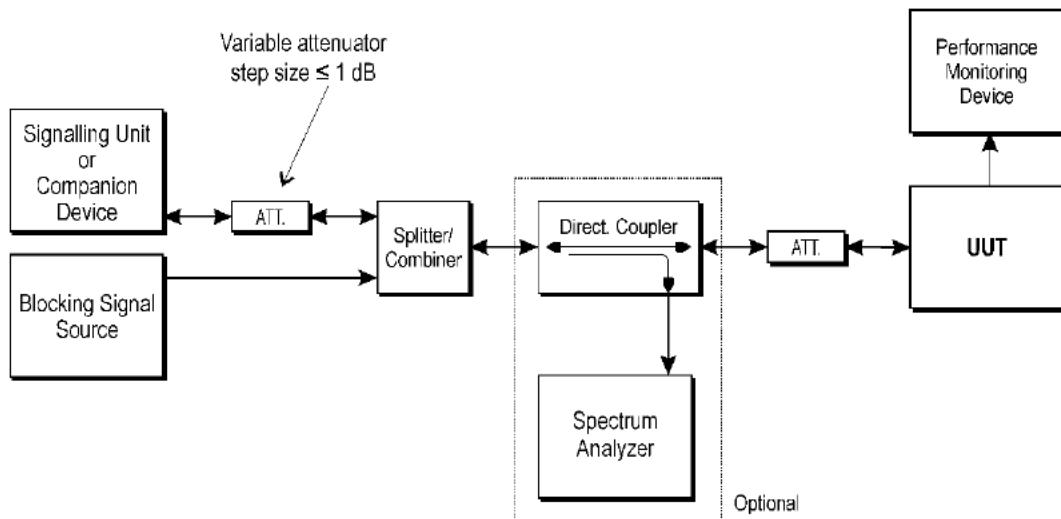
Limit	Receiver Category 3 Table 16 contains the Receiver Blocking parameters for Receiver Category 3 equipment. <b>Table 16: Receiver Blocking parameters receiver category 3 equipment</b>			
	Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
	$P_{\min} + 12 \text{ dB}$	2 380 2 503,5	-57	CW
	$P_{\min} + 12 \text{ dB}$	2 300 2 583,5	-47	CW
NOTE 1: $P_{\min}$ is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.				

### 13.2 TEST PROCEDURES

Please refer to chapter 5.4.11 of ETSI EN 300 328 V2.1.1.

Test Method	
<input checked="" type="checkbox"/> Conducted Measurement	<input type="checkbox"/> Radiated Measurement
Test Channels	
<input type="checkbox"/> Lowest, Middle and highest Channel	<input checked="" type="checkbox"/> Lowest and highest Channel
<input type="checkbox"/> Two Adjacent Hopping Channel	<input type="checkbox"/> Two Hopping Channel
Environmental conditions	
<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Normal and Extreme

### 13.3 TEST SETUP LAYOUT



### 13.4 TEST DEVIATION

There is no deviation with the original standard.

### 13.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously receiving.

### 13.6 TEST RESULTS

Please refer to the Appendix J.

## 14. INFORMATION AS REQUIRED BY EN 300 328 V2.1.1, CLAUSE 5.4.1

### For Chip antenna

In accordance with EN 300 328, clause 5.4.1, the following information is provided by the supplier.

#### 14.1 The type of modulation used by the equipment:

- FHSS
- other forms of modulation

#### 14.2 In case of FHSS modulation:

(1) In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies: N/A

(2) In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies: N/A

The minimum number of Hopping Frequencies: N/A

(3) The (average) Dwell Time: N/A

#### 14.3 Adaptive / non-adaptive equipment:

- non-adaptive Equipment
- adaptive Equipment without the possibility to switch to a non-adaptive mode
- adaptive Equipment which can also operate in a non-adaptive mode

#### 14.4 In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment: 0.2 ms

The equipment has implemented an LBT based DAA mechanism

\* In case of equipment using modulation different from FHSS:

- The equipment is Frame Based equipment
- The equipment is Load Based equipment
- The equipment can switch dynamically between Frame Based and Load Based

equipment

The CCA time implemented by the equipment: 118  $\mu$ s

The equipment has implemented a non-LBT based DAA mechanism

The equipment can operate in more than one adaptive mode

**14.5 The worst case operational mode for each of the following tests:**

- (1) RF Output Power: 18.72 dBm
- (2) Power Spectral Density: 9.98 dBm/MHz
- (3) Duty cycle, Tx-Sequence, Tx-gap: N/A
- (4) Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment): N/A
- (5) Hopping Frequency Separation (only for FHSS equipment): N/A
- (6) Medium Utilisation: N/A
- (7) Adaptivity & Receiver Blocking: PASS
- (8) Nominal Channel Bandwidth: 21.534 MHz
- (9) Transmitter unwanted emissions in the OOB domain: -16.78 dBm
- (10) Transmitter unwanted emissions in the spurious domain: -37.95 dBm
- (11) Receiver spurious emissions: -53.13 dBm

**14.6 The different transmit operating modes (tick all that apply):**

- Operating mode 1: Single Antenna Equipment
  - Equipment with only 1 antenna
  - Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
  - Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

- Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
  - Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

- Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
  - Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

**14.7 In case of Smart Antenna Systems:**(1) The number of Receive chains: N/A(2) The number of Transmit chains: N/A symmetrical power distribution asymmetrical power distributionIn case of beam forming, the maximum (additional) beam forming gain: N/A dBi

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

**14.8 Operating Frequency Range(s) of the equipment:**(1) Operating Frequency Range 1: 2412 MHz to 2472 MHz

NOTE: Add more lines if more Frequency Ranges are supported.

**14.9 Nominal Channel Bandwidth(s):**(1) Nominal Channel Bandwidth 1: 21.534 MHz

NOTE: Add more lines if more channel bandwidths are supported.

**14.10 Type of Equipment (stand-alone, combined, plug-in radio device, etc.):** Stand-alone Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment) Plug-in radio device (Equipment intended for a variety of host systems) Other \_\_\_\_\_**14.11 The extreme operating conditions that apply to the equipment:**Operating temperature range: -20 °C to 60 °CDetails provided are for the:  stand-alone equipment combined (or host) equipment test jig

**14.12 The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:**

- Details provided are for the:  stand-alone equipment  
 combined (or host) equipment  
 test jig

Supply voltage  DC State DC voltage 5 V  
 DC State AC voltage \_\_\_ V

In case of DC, indicate the type of power source

- Internal Power Supply  
 External Power Supply or AC/DC adapter  
 Battery  
 Other: USB Port

**14.13 Describe the test modes available which can facilitate testing:**

The measurements shall be performed during continuously transmitting and normal operation.

**14.14 The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):**

IEEE 802.11™ [i.3]

## For Dipole antenna

In accordance with EN 300 328, clause 5.4.1, the following information is provided by the supplier.

### 14.15 The type of modulation used by the equipment:

- FHSS
- other forms of modulation

### 14.16 In case of FHSS modulation:

(1) In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies: N/A

(2) In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies: N/A

The minimum number of Hopping Frequencies: N/A

(3) The (average) Dwell Time: N/A

### 14.17 Adaptive / non-adaptive equipment:

- non-adaptive Equipment
- adaptive Equipment without the possibility to switch to a non-adaptive mode
- adaptive Equipment which can also operate in a non-adaptive mode

### 14.18 In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment: 0.2 ms

The equipment has implemented an LBT based DAA mechanism

\* In case of equipment using modulation different from FHSS:

- The equipment is Frame Based equipment
- The equipment is Load Based equipment
- The equipment can switch dynamically between Frame Based and Load Based

equipment

The CCA time implemented by the equipment: 118  $\mu$ s

The equipment has implemented a non-LBT based DAA mechanism

The equipment can operate in more than one adaptive mode

**14.19 The worst case operational mode for each of the following tests:**

- (1) RF Output Power: 18.51 dBm
- (2) Power Spectral Density: 9.98 dBm/MHz
- (3) Duty cycle, Tx-Sequence, Tx-gap: N/A
- (4) Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment): N/A
- (5) Hopping Frequency Separation (only for FHSS equipment): N/A
- (6) Medium Utilisation: N/A
- (7) Adaptivity & Receiver Blocking: PASS
- (8) Nominal Channel Bandwidth: 18.869 MHz
- (9) Transmitter unwanted emissions in the OOB domain: -20.12 dBm
- (10) Transmitter unwanted emissions in the spurious domain: -62.10 dBm
- (11) Receiver spurious emissions: -59.37 dBm

**14.20 The different transmit operating modes (tick all that apply):**

- Operating mode 1: Single Antenna Equipment
  - Equipment with only 1 antenna
  - Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
  - Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

- Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
  - Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

- Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
  - Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

**14.21 In case of Smart Antenna Systems:**(1) The number of Receive chains: N/A(2) The number of Transmit chains: N/A symmetrical power distribution asymmetrical power distributionIn case of beam forming, the maximum (additional) beam forming gain:    dBi

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

**14.22 Operating Frequency Range(s) of the equipment:**(1) Operating Frequency Range 1: 2412 MHz to 2472 MHz

NOTE: Add more lines if more Frequency Ranges are supported.

**14.23 Nominal Channel Bandwidth(s):**(1) Nominal Channel Bandwidth 1: 18.869 MHz

NOTE: Add more lines if more channel bandwidths are supported.

**14.24 Type of Equipment (stand-alone, combined, plug-in radio device, etc.):** Stand-alone Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment) Plug-in radio device (Equipment intended for a variety of host systems) Other \_\_\_\_\_**14.25 The extreme operating conditions that apply to the equipment:**Operating temperature range: -20 ° C to 60 ° CDetails provided are for the:  stand-alone equipment combined (or host) equipment test jig

**14.26 The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:**

- Details provided are for the:  stand-alone equipment  
 combined (or host) equipment  
 test jig

Supply voltage  DC State DC voltage 5 V  
 DC State AC voltage \_\_\_ V

In case of DC, indicate the type of power source

- Internal Power Supply  
 External Power Supply or AC/DC adapter  
 Battery  
 Other: USB Port

**14.27 Describe the test modes available which can facilitate testing:**

The measurements shall be performed during continuously transmitting and normal operation.

**14.28 The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):**

IEEE 802.11™ [i.3]

## 15. MEASUREMENT INSTRUMENTS LIST

RF Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Const Temp,& Humidity Chamber	GiantForce	ITH-225-20-S	IAB0309-001	Dec. 03, 2017
2	Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	N/A	N/A
3	Cable	emci	EMC80-NM-NM-12000(9KHz-1GHz)	N/A	N/A
4	Power Sensor	Agilent	U2021XA	MY53020007	Jul. 31, 2017
5	Power Sensor	Agilent	U2021XA	MY53130004	Jul. 31, 2017
6	Power Sensor	Agilent	U2021XA	MY53260025	Jul. 31, 2017
7	Power Sensor	Agilent	U2021XA	MY53180019	Jul. 31, 2017
8	Measurement Software	Keysight	EN300328V191(V 2.151229)	N/A	N/A

Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017
2	Test Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	C-100	N/A
3	Measurement Software	Keysight	EN300328V191(V 2.151229)	N/A	N/A

Adaptivity & Receiver Blocking					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017
2	MXG Vector Signal Generator	Agilent	N5172B	MY53050758	Mar. 27, 2017
3	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Oct. 10, 2017
4	Microflex Cable	NA	NA	1m	Jan. 17, 2017
5	POWER SPLITTER	Mimi-Circuits	ZFRSC-183-S+	SF601301339-1	Mar. 10, 2017
6	POWER SPLITTER	Mimi-Circuits	ZN4PD1-63-S+	SF9335D1045-2	Mar. 10, 2017
7	COUPLER	Mimi-Circuits	ZADC-10-63-S+	SF631801334	Feb. 23, 2017
8	Measurement Software	Keysight	EN300328V191(V 2.151229)	N/A	N/A

Occupied Channel Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017
2	Test Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	C-100	N/A
3	Measurement Software	Keysight	EN300328V191(V 2.151229)	N/A	N/A

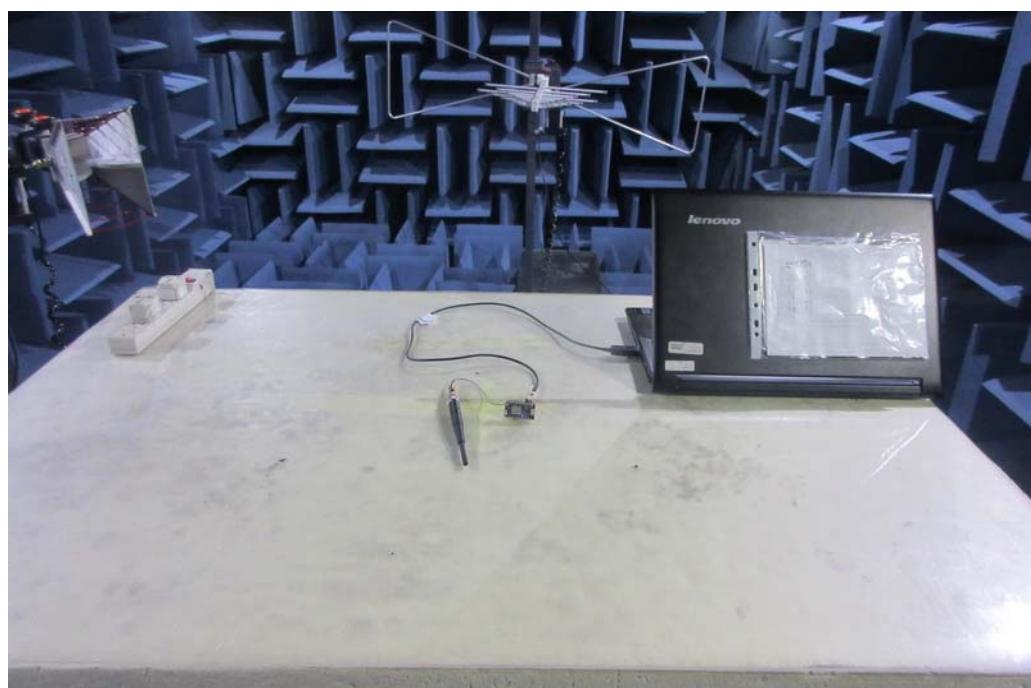
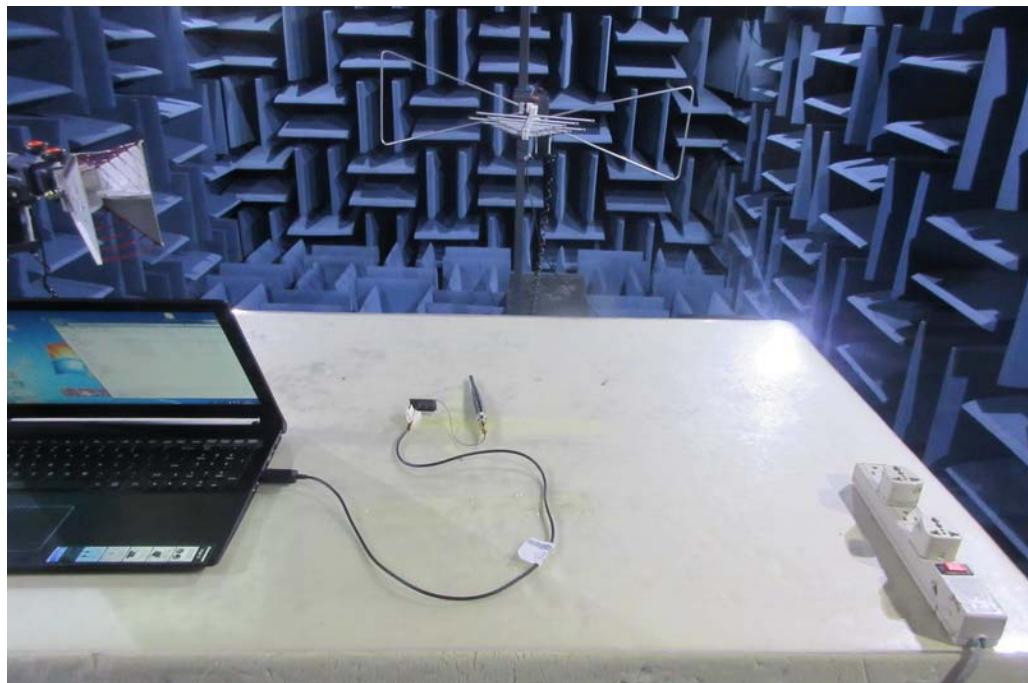
Transmitter Unwanted Out Of Band Domain					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017
2	Test Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	C-100	N/A
3	Const Temp. & Humidity Chamber	GIANT FORCE	ITH-225-20-S	IAB0309-001	Dec.10, 2017
4	Measurement Software	Keysight	EN300328V191(V 2.151229)	N/A	N/A

Transmitter and Receiver Spurious Emission (Radiated Measurement)					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 26, 2018
2	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC012645B	980221	Sep. 04, 2017
3	Amplifier	Agilent	8449B	3008A02274	Mar. 09, 2018
4	Double Ridged Guide Antenna	ETS-LINDGREN	3115	00075846	Mar. 26, 2018
5	Antenna	SCHWARZBEC K	VULB 9160	9160-3231	Mar. 26, 2018
6	Test Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	C-100	N/A
7	Test Cable	emci	EMC80-NM-NM-12000(9KHz-1GHz)	C-65	N/A
8	Controller	CT	SC100	N/A	N/A
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Receiver Blocking					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 26, 2018
2	MXG Vector Signal Generator	Agilent	N5172B	MY53050758	Mar. 26, 2018
3	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Oct. 10, 2017
4	Microflex Cable	NA	NA	1m	Jan. 16, 2018
5	POWER SPLITTER	Mimi-Circuits	ZFRSC-183-S +	SF601301339 -1	Mar. 09, 2018
6	POWER SPLITTER	Mimi-Circuits	ZN4PD1-63-S +	SF9335D1045 -2	Mar. 09, 2018
7	COUPLER	Mimi-Circuits	ZADC-10-63-S +	SF631801334	Feb. 22, 2018
8	WIFI communication tester	Keysight	AD211	TW54033508	N/A
9	Measurement Software	Keysight	EN300328v2.1 .1(v1.01.00)	N/A	N/A

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

**16. EUT TEST PHOTO****Radiated Measurement**

## APPENDIX A - RF OUTPUT POWER

## For Chip antenna

Test Mode:	TX Mode_ 802.11b Mode
------------	-----------------------

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	18.69	18.33	18.64	12.00	13.00	11.00
T min (°C)	-20.00	18.72	18.36	18.67	11.00	11.00	12.00
T max (°C)	60.00	18.65	18.31	18.61	12.00	12.00	12.00
Max EIRP Power		18.72			11.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

Test Mode:	TX Mode_ 802.11g Mode
------------	-----------------------

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	17.46	17.43	17.49	11.00	12.00	11.00
T min (°C)	-20.00	17.49	17.47	17.58	14.00	13.00	12.00
T max (°C)	60.00	17.43	17.40	17.42	14.00	12.00	13.00
Max EIRP Power		17.58			11.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

Test Mode:	TX Mode_ 802.11n 20M Mode
------------	---------------------------

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	17.27	17.23	16.61	12.00	14.00	12.00
T min (°C)	-20.00	17.32	17.26	16.67	13.00	12.00	12.00
T max (°C)	60.00	17.25	17.21	16.58	12.00	12.00	13.00
Max EIRP Power		17.32			12.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

Note: EIRP Power = output power conducted + G ant

## For Dipole antenna

Test Mode: TX Mode\_ 802.11b Mode

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	18.44	18.48	18.34	11.00	13.00	12.00
T min (°C)	-20.00	18.46	18.51	18.37	11.00	12.00	12.00
T max (°C)	60.00	18.41	18.45	18.30	12.00	11.00	12.00
Max EIRP Power		18.51			11.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

Test Mode: TX Mode\_ 802.11g Mode

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	17.63	17.57	17.68	11.00	11.00	11.00
T min (°C)	-20.00	17.65	17.60	17.72	13.00	12.00	12.00
T max (°C)	60.00	17.61	17.55	17.64	12.00	13.00	14.00
Max EIRP Power		17.72			11.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

Test Mode: TX Mode\_ 802.11n 20M Mode

Test Conditions		EIRP Power ( dBm )			Number Of Bursts		
		CH01	CH07	CH13	CH01	CH07	CH13
T nom (°C)	25.00	16.36	16.33	16.47	12.00	11.00	14.00
T min (°C)	-20.00	16.39	16.38	16.49	13.00	12.00	12.00
T max (°C)	60.00	16.31	16.29	16.45	12.00	11.00	12.00
Max EIRP Power		16.49			11.00		
Limits		20dBm (-10dBW)			$\geq 10$		
Result		Complies			Complies		

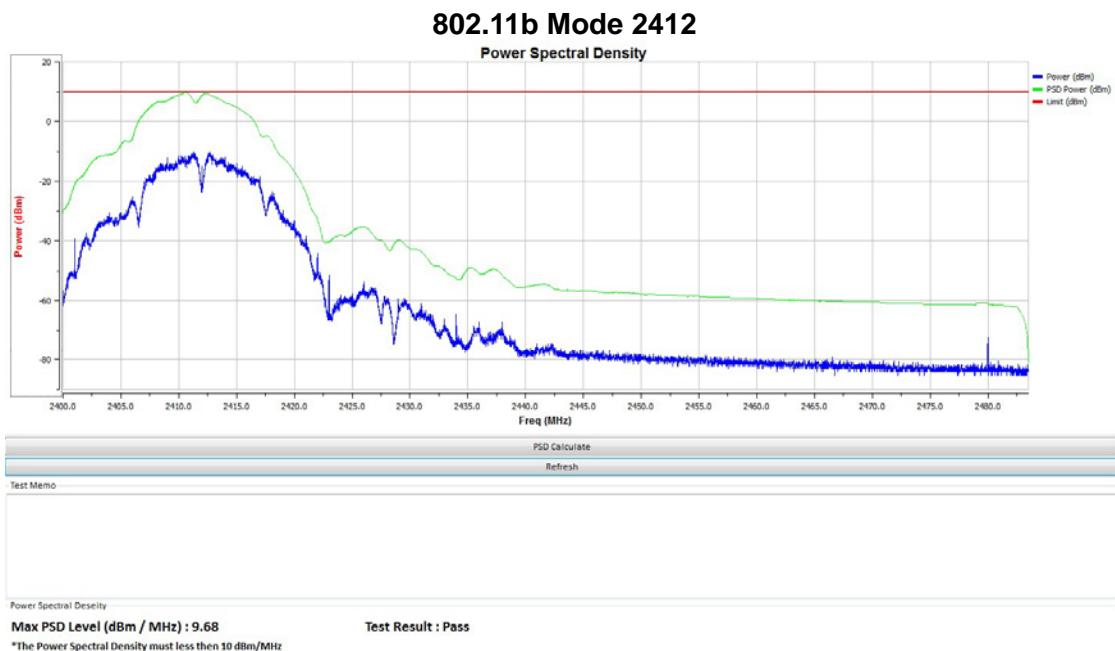
Note: EIRP Power = output power conducted + G ant

## APPENDIX B - POWER SPECTRAL DENSITY

## For Chip antenna

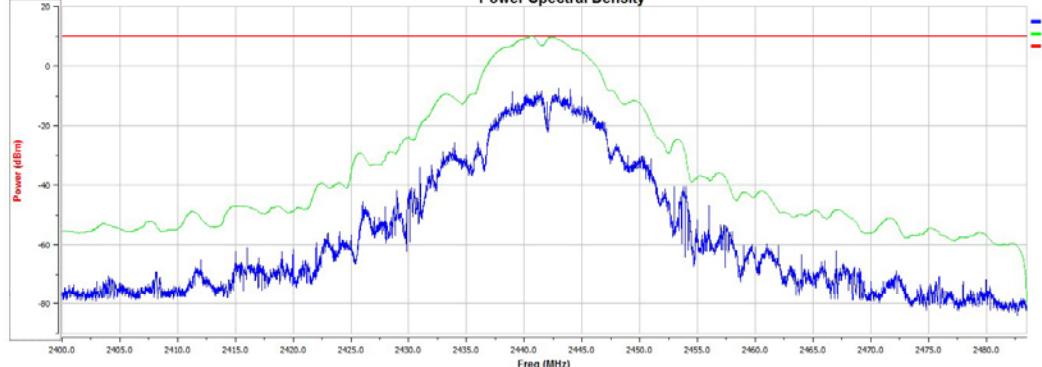
Test Mode: TX Mode\_ 802.11b Mode

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	9.68	10.00	Pass
2442	9.93	10.00	Pass
2472	9.98	10.00	Pass



**802.11b Mode 2442**

Power Spectral Density



PSD Calculate

Refresh

Test Memo

Power Spectral Densit

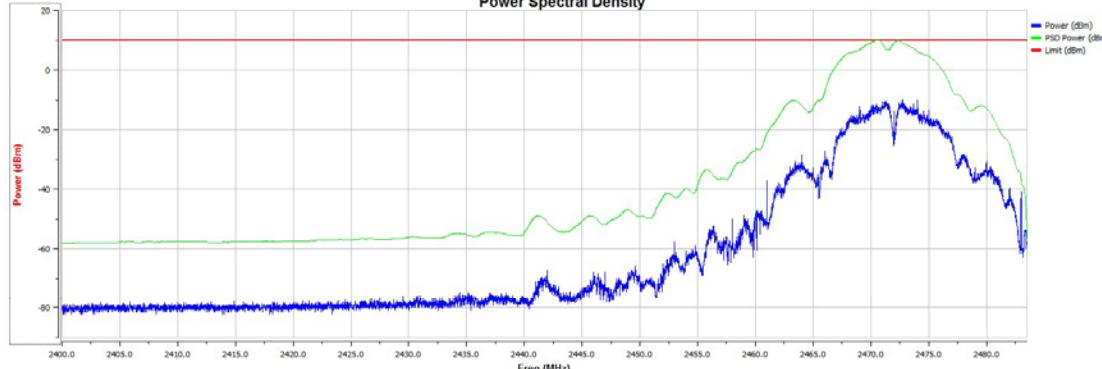
Max PSD Level (dBm / MHz) : 9.93

Test Result : Pass

\*The Power Spectral Density must less than 10 dBm/MHz

**802.11b Mode 2472**

Power Spectral Density



PSD Calculate

Refresh

Test Memo

Power Spectral Densit

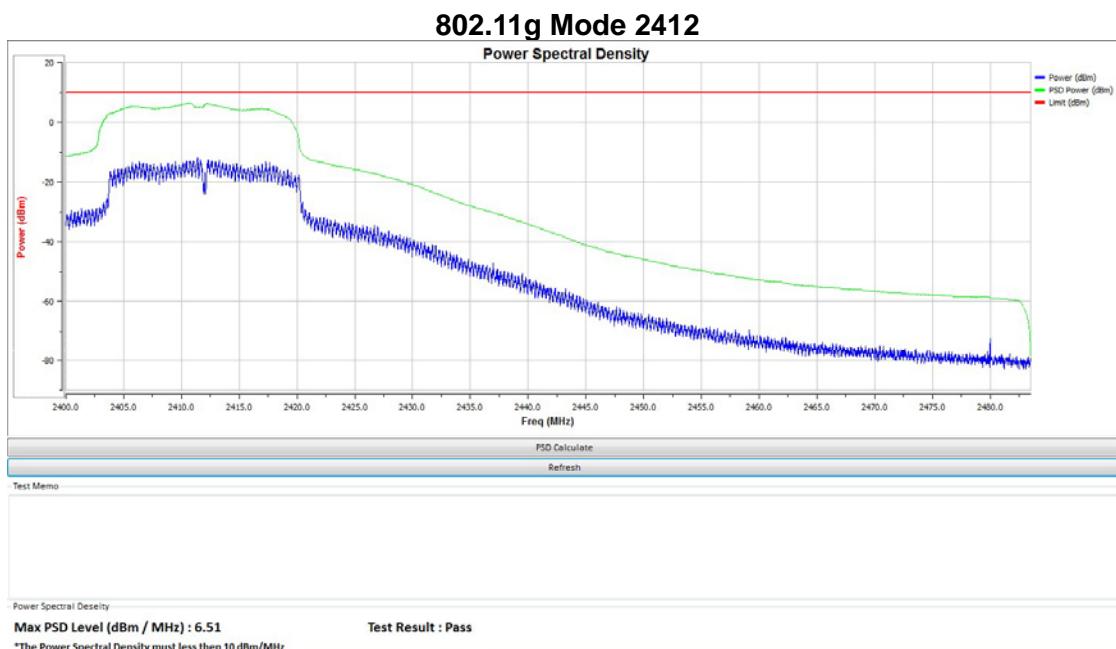
Max PSD Level (dBm / MHz) : 9.98

Test Result : Pass

\*The Power Spectral Density must less than 10 dBm/MHz

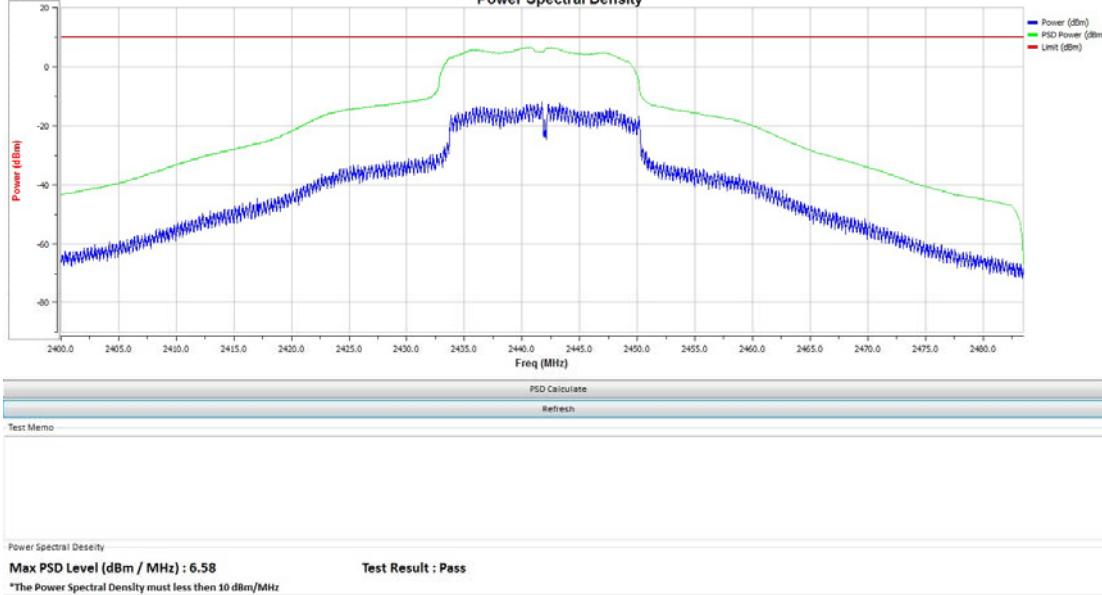
Test Mode: TX Mode\_ 802.11g Mode

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	6.51	10.00	Pass
2442	6.58	10.00	Pass
2472	6.54	10.00	Pass



**802.11g Mode 2442**

Power Spectral Density

**802.11g Mode 2472**

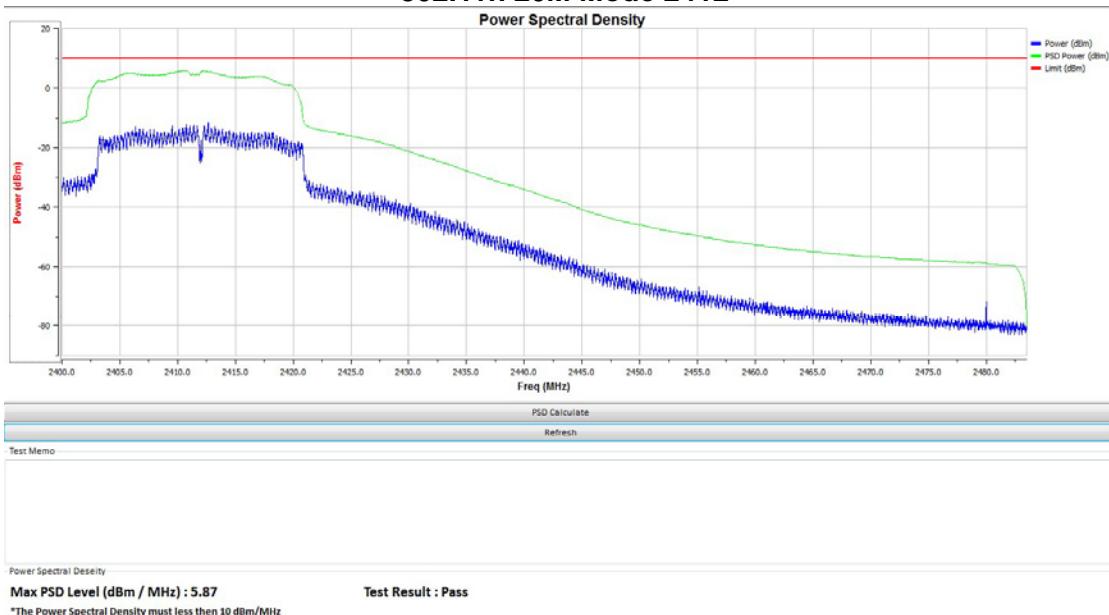
Power Spectral Density



Test Mode: TX Mode\_ 802.11n 20M Mode

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	5.87	10.00	Pass
2442	5.78	10.00	Pass
2472	5.27	10.00	Pass

### 802.11n 20M Mode 2412



**802.11n 20M Mode 2442**

Power Spectral Density



PSD Calculate

Refresh

Test Memo

Power Spectral Density

Max PSD Level (dBm / MHz) : 5.78

Test Result : Pass

\*The Power Spectral Density must less than 10 dBm/MHz

**802.11n 20M Mode 2472**

Power Spectral Density



PSD Calculate

Refresh

Test Memo

Power Spectral Density

Max PSD Level (dBm / MHz) : 5.27

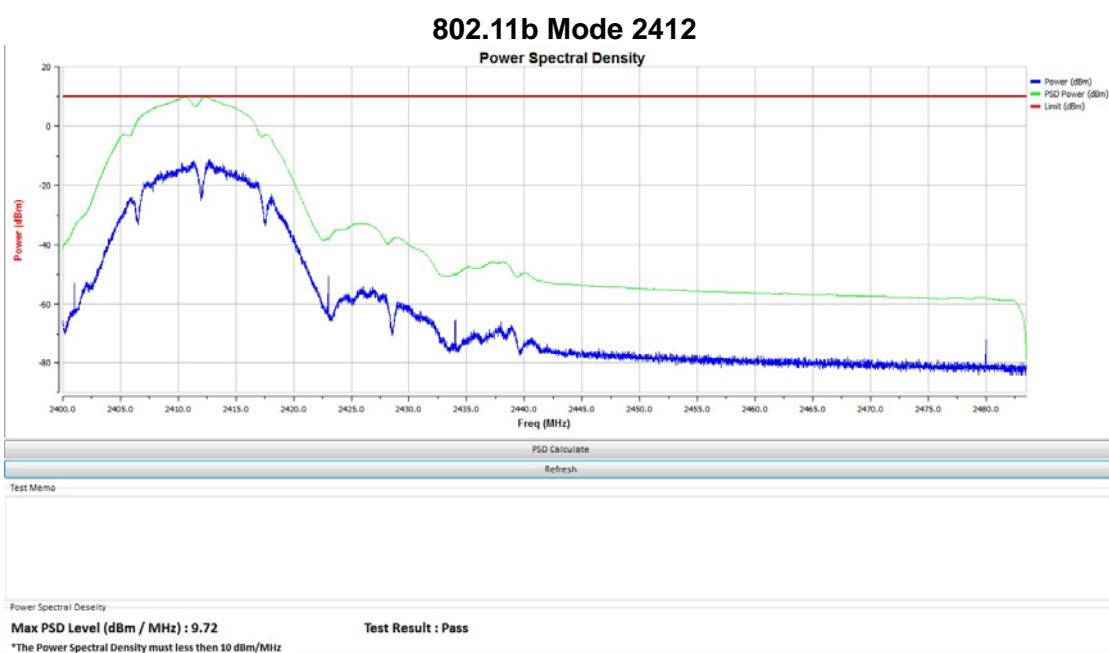
Test Result : Pass

\*The Power Spectral Density must less than 10 dBm/MHz

## For Dipole antenna

Test Mode: TX Mode\_ 802.11b Mode

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	9.72	10.00	Pass
2442	9.91	10.00	Pass
2472	9.98	10.00	Pass



**802.11b Mode 2442**

## Power Spectral Density

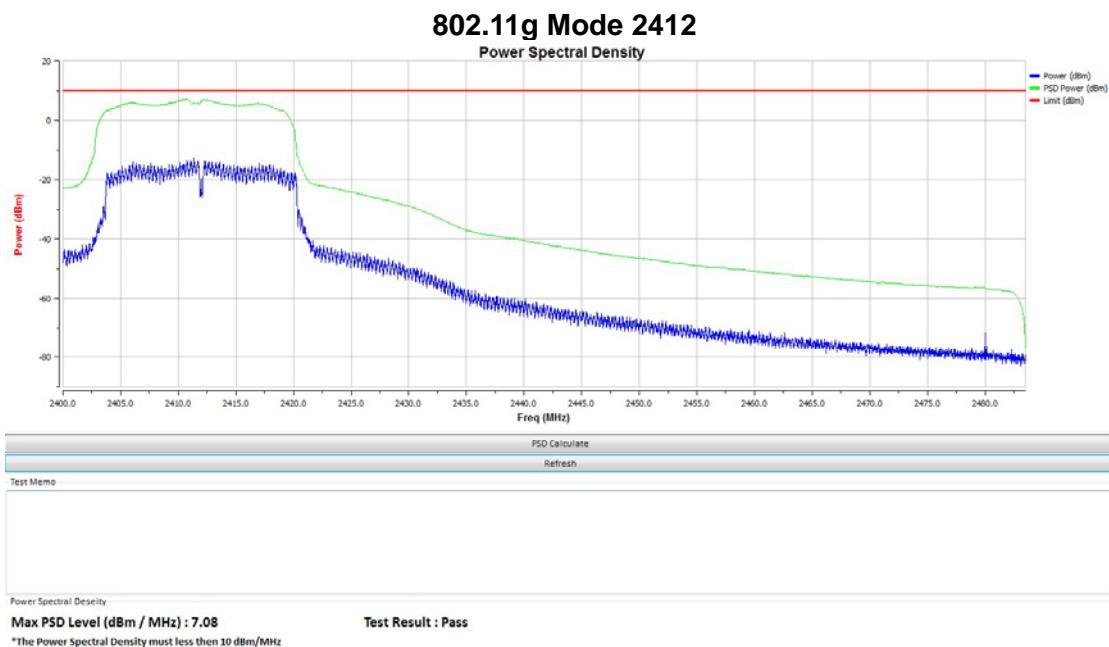
**802.11b Mode 2472**

## Power Spectral Density



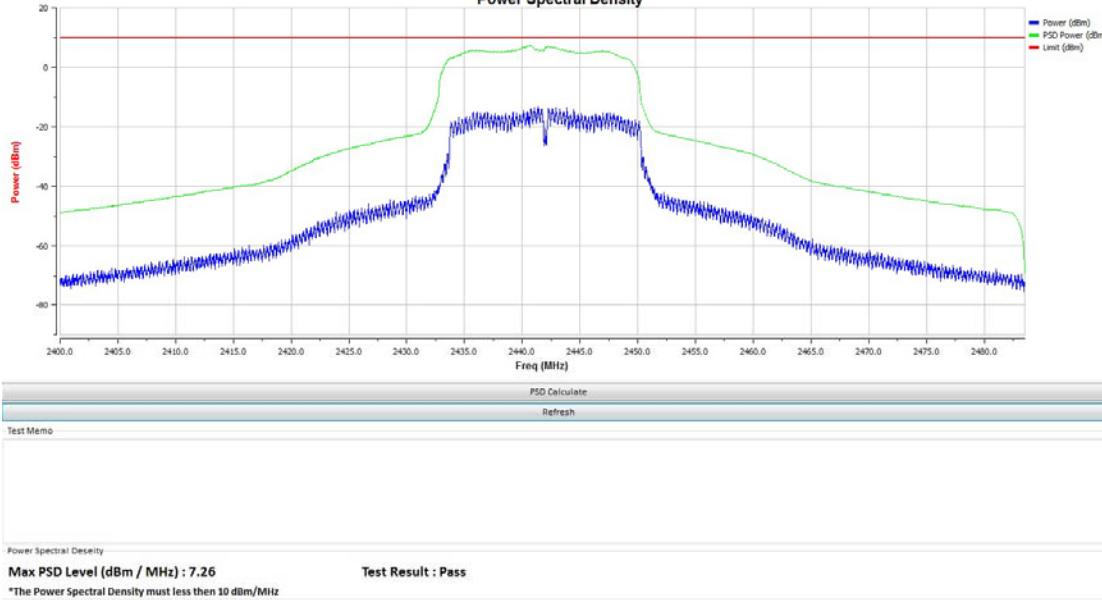
Test Mode:	TX Mode_ 802.11g Mode
------------	-----------------------

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	7.08	10.00	Pass
2442	7.26	10.00	Pass
2472	7.11	10.00	Pass

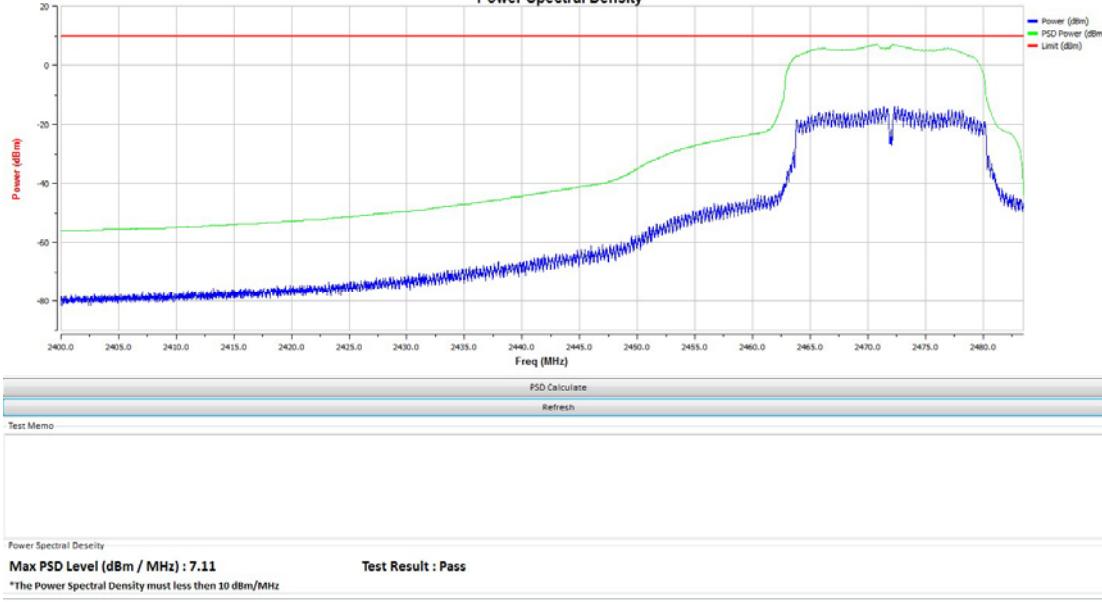


**802.11g Mode 2442**

Power Spectral Density

**802.11g Mode 2472**

Power Spectral Density



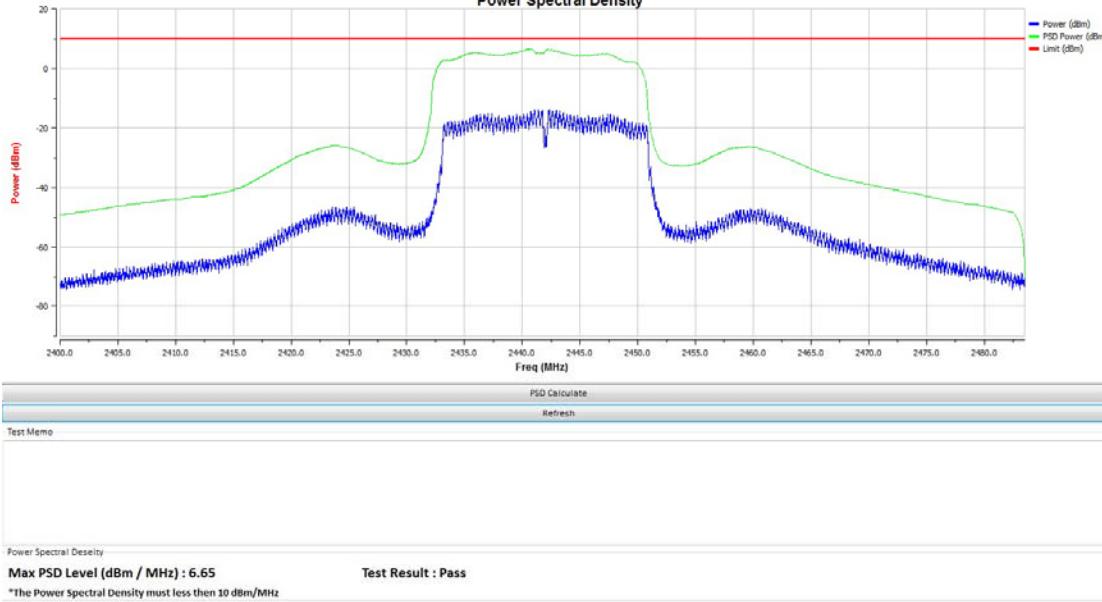
Test Mode: TX Mode\_ 802.11n 20M Mode

Frequency (MHz)	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
2412	6.55	10.00	Pass
2442	6.65	10.00	Pass
2472	5.84	10.00	Pass



**802.11n 20M Mode 2442**

Power Spectral Density

**802.11n 20M Mode 2472**

Power Spectral Density



## APPENDIX C - DUTY CYCLE, TX-SEQUENCE, TX-GAP

**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

## APPENDIX D - MEDIUM UTILISATION (MU) FACTOR

**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

## APPENDIX E - ADAPTIVITY

### 1. List of measurements

UUT Operational Mode	Frame Based Equipment	
	Load Based Equipment (CCA using 'energy detect')	✓
	Load Based Equipment (CCA not using any of the mechanisms referenced)	

Clause	Test Parameter	Remarks	Pass / Fail
4.3.2.6.3.2.2	Adaptive (Frame Based Equipment)	Not Applicable	N/A
4.3.2.6.3.2.3	Adaptive (Load Based Equipment)	Applicable	Pass
4.3.2.6.4	Short Control Signaling Transmissions	Applicable	Pass

## For Chip antenna

Test Mode: TX Mode\_ 802.11b Mode

### Channel Occupancy Time and Clear Channel Assessment Measured Results

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.20	113.00
2472	0.20	112.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

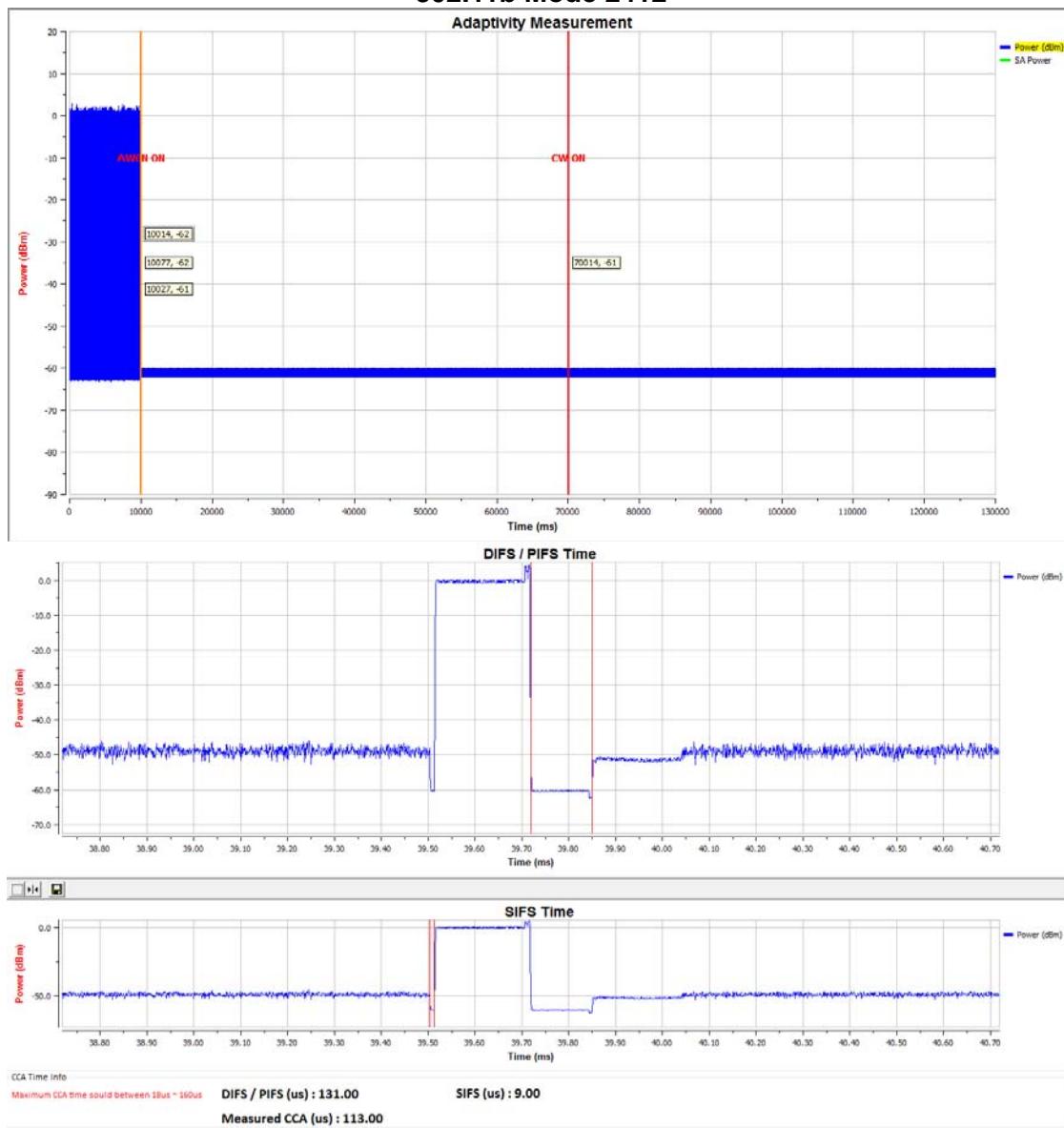
### Adaptivity & Receiver Blocking

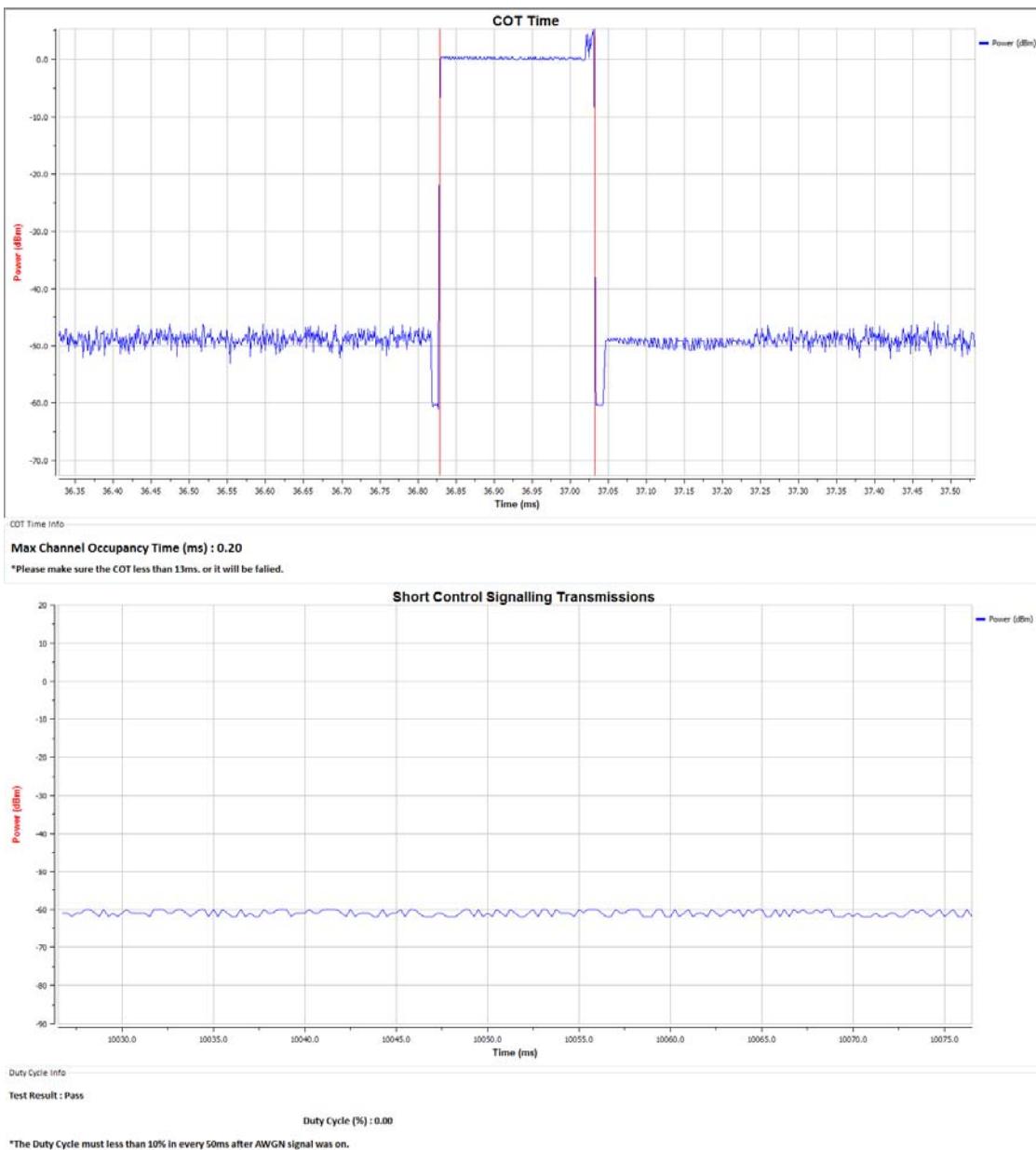
Adaptivity Detection Threshold Level	2412 MHz	-68.72 dBm/MHz	
	2472 MHz	-68.67 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0
2472	Pass	Pass	1.245
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

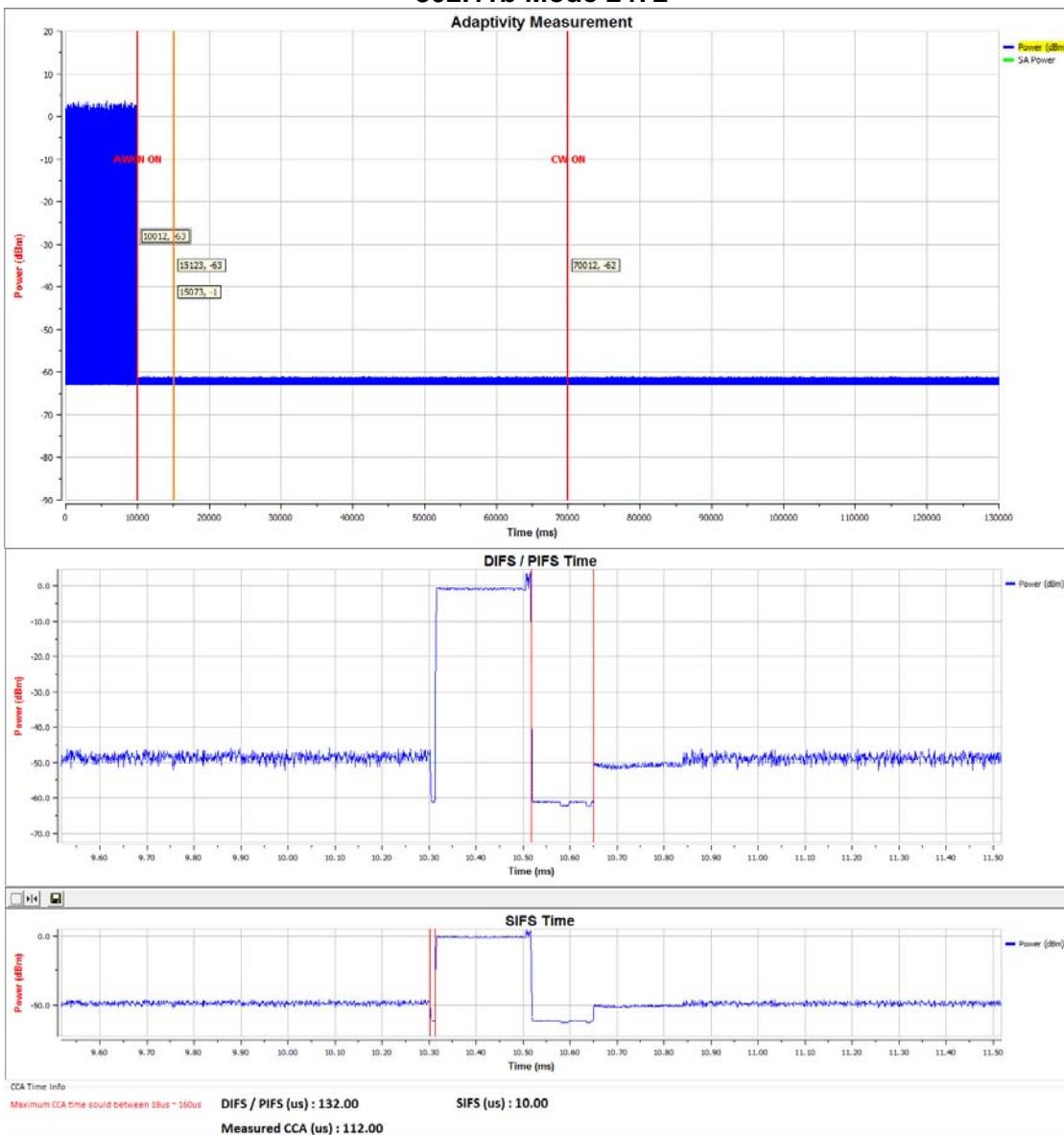
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

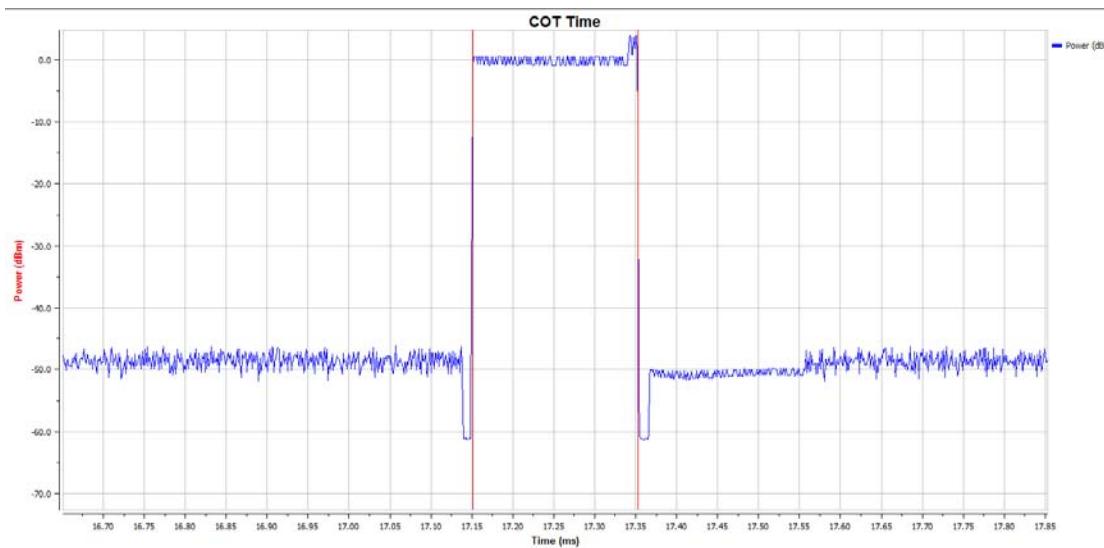
## 802.11b Mode 2412





## 802.11b Mode 2472

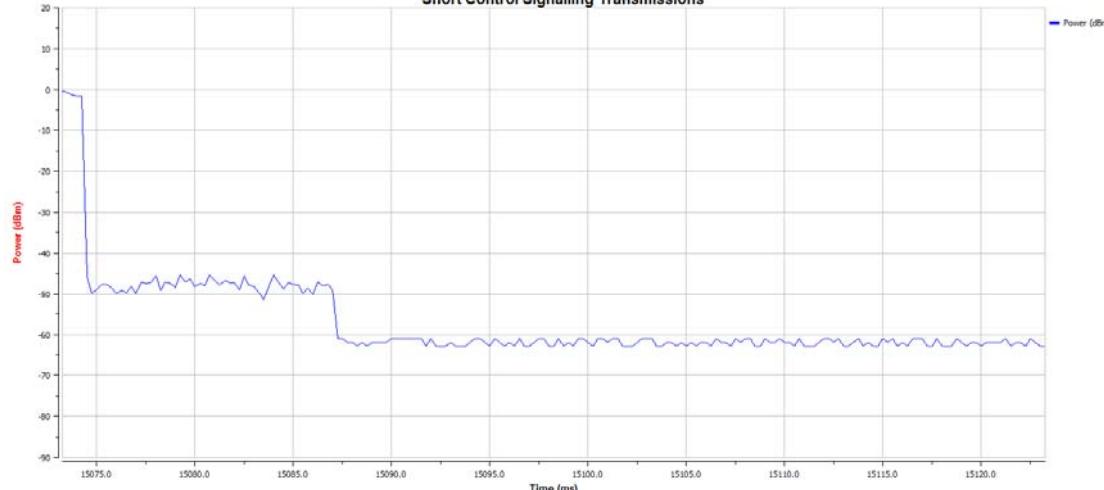




COT Time Info

**Max Channel Occupancy Time (ms) : 0.20**

\*Please make sure the COT less than 13ms, or it will be failed.

**Short Control Signalling Transmissions**

Duty Cycle Info

Test Result : Pass

Duty Cycle (%) : 2.49

\*The Duty Cycle must less than 10% in every 50ms after AWGN signal was on.

Test Mode:	TX Mode_ 802.11g Mode
------------	-----------------------

### Channel Occupancy Time and Clear Channel Assessment Measured Results

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.03	118.00
2472	0.03	92.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

### Adaptivity & Receiver Blocking

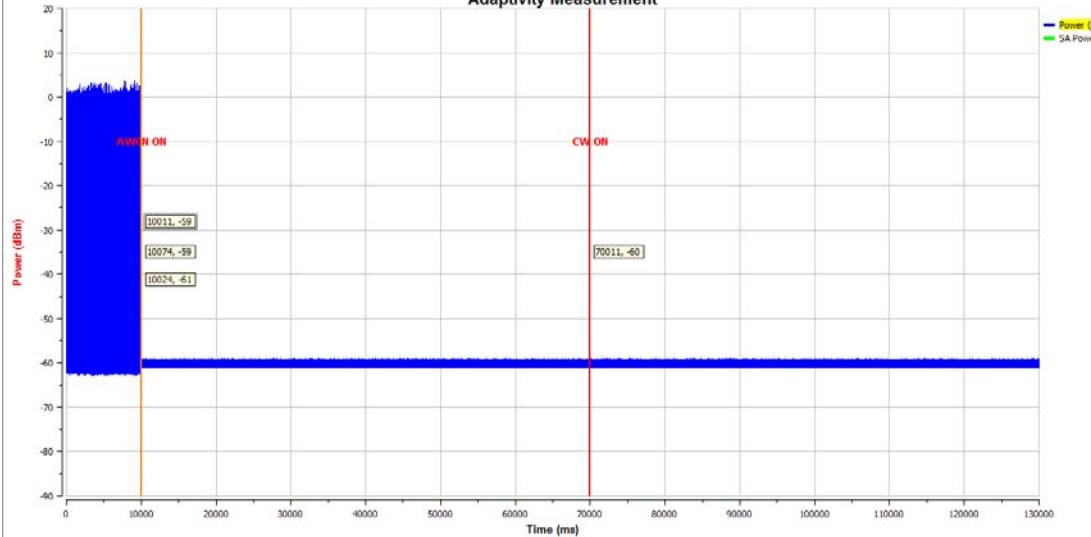
Adaptivity Detection Threshold Level	2412 MHz	-67.49 dBm/MHz	
	2472 MHz	-67.58 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0
2472	Pass	Pass	1.245
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

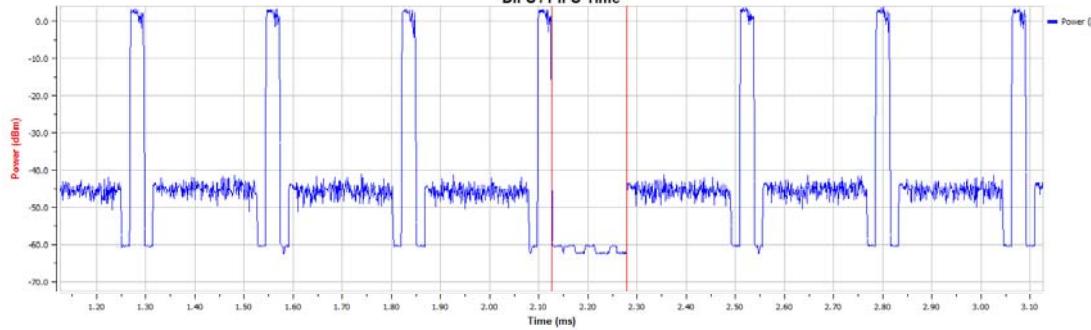
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

## 802.11g Mode 2412

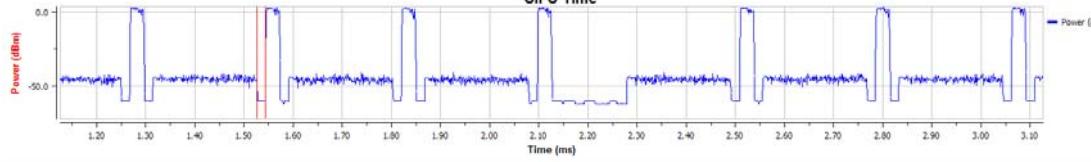
## Adaptivity Measurement



## DIFS / PIFS Time



## SIFS Time



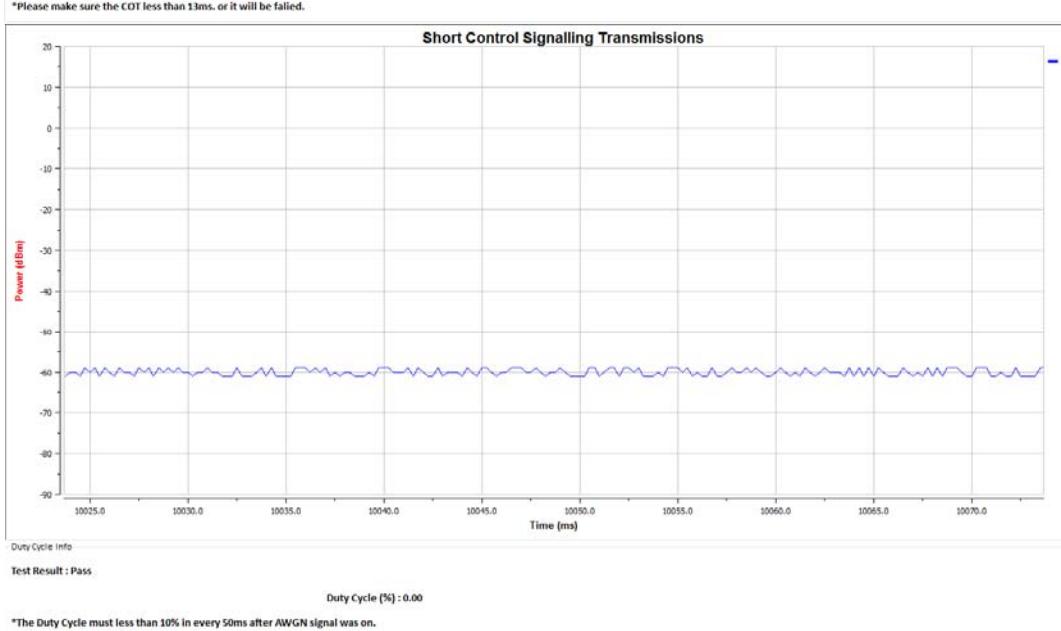
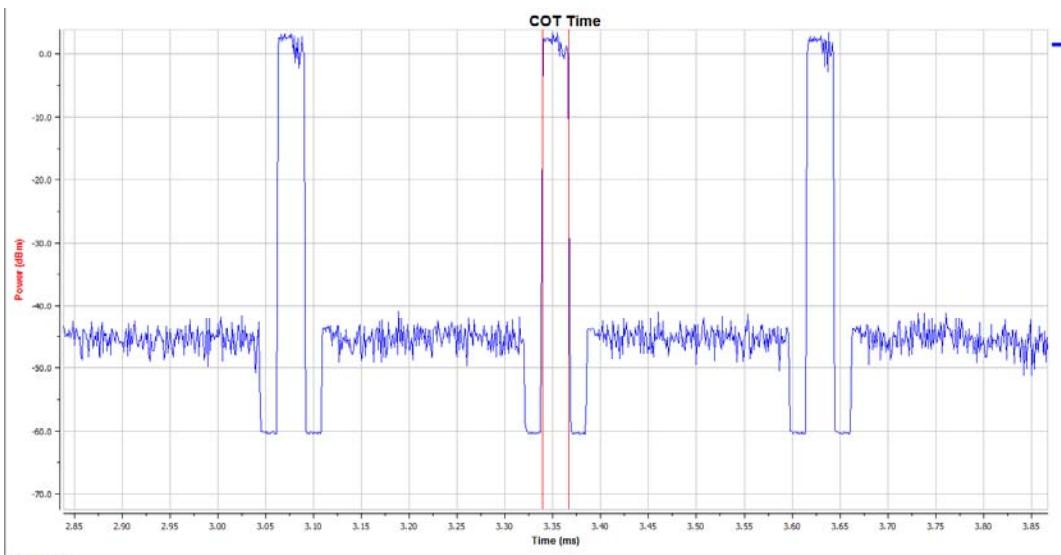
## CCA Time Info

Maximum CCA-time should between 18us ~ 160us

DIFS / PIFS (us) : 152.00

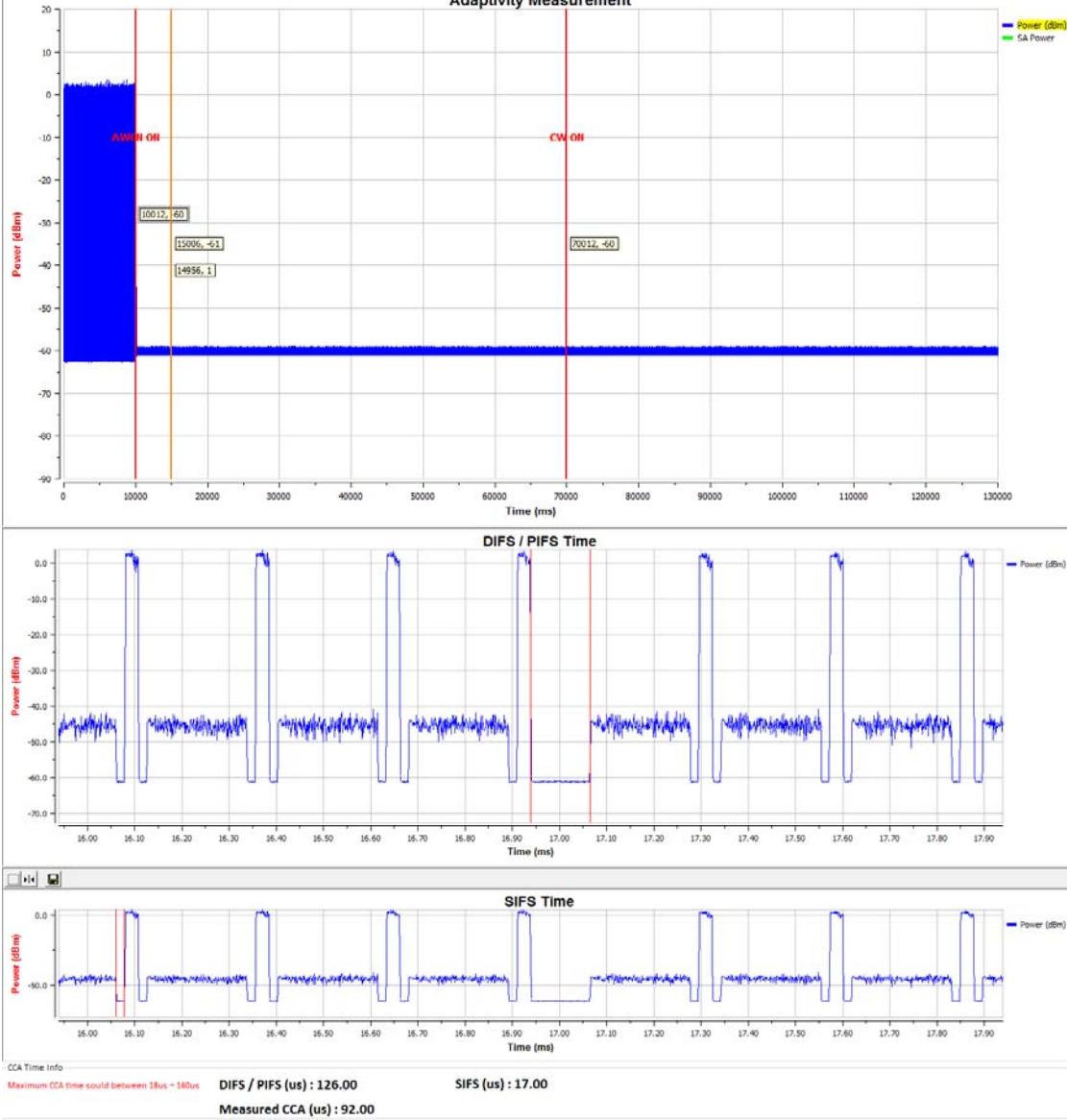
SIFS (us) : 17.00

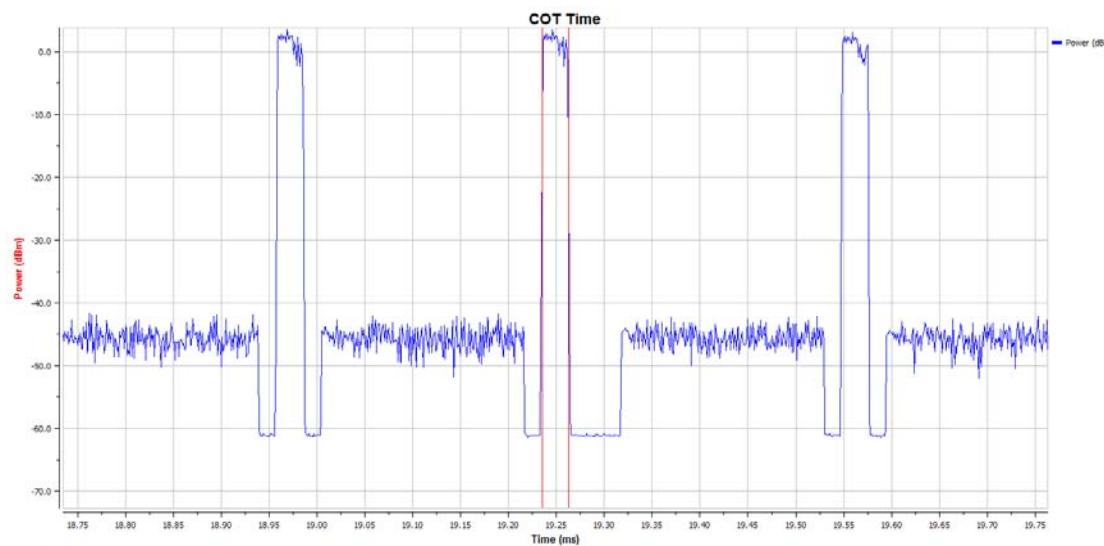
Measured CCA (us) : 118.00



## 802.11g Mode 2472

## Adaptivity Measurement

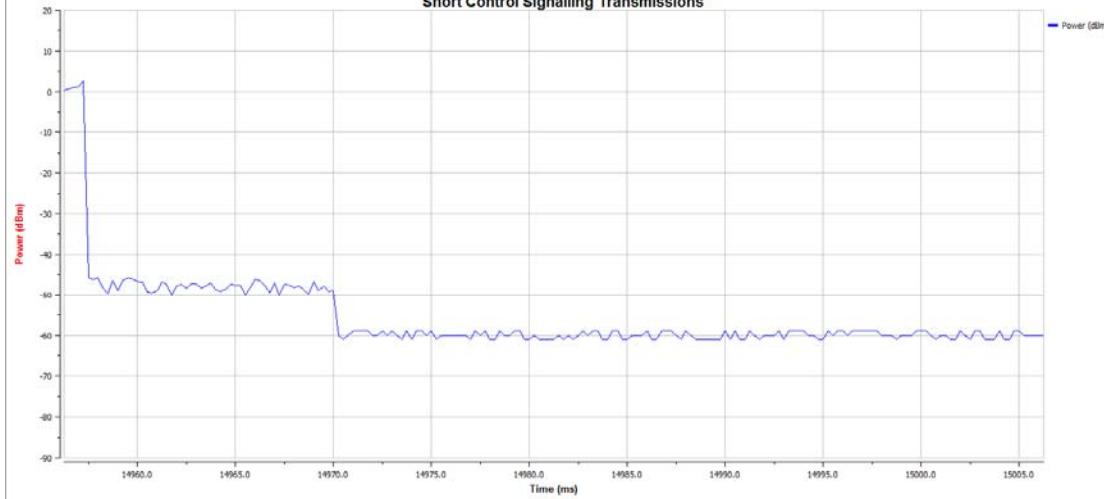




COT Time Info

**Max Channel Occupancy Time (ms) : 0.03**

\*Please make sure the COT less than 13ms, or it will be failed.

**Short Control Signalling Transmissions**

Duty Cycle Info

Test Result : Pass

Duty Cycle [%] : 2.49

\*The Duty Cycle must less than 10% in every 50ms after AWGN signal was on.

Test Mode:	TX Mode_ 802.11n 20M Mode
------------	---------------------------

### Channel Occupancy Time and Clear Channel Assessment Measured Results

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.03	100.00
2472	0.03	109.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

### Adaptivity & Receiver Blocking

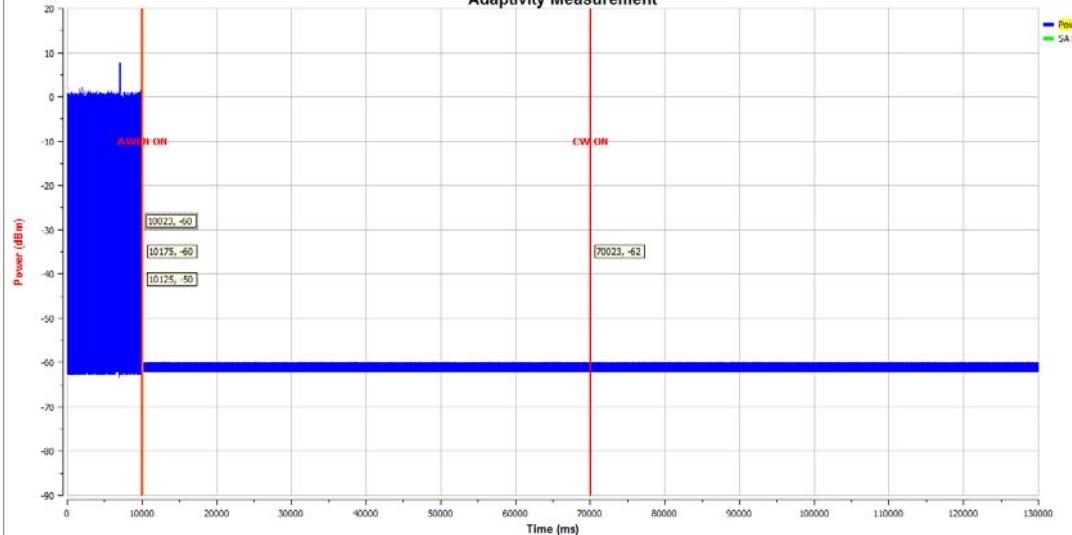
Adaptivity Detection Threshold Level	2412 MHz	-67.32 dBm/MHz	
	2472 MHz	-66.67 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0.25
2472	Pass	Pass	0.5
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

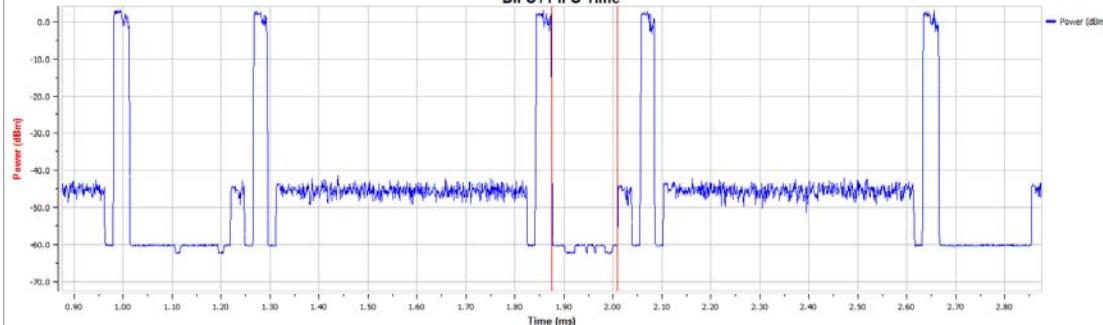
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

## 802.11n 20M Mode 2412

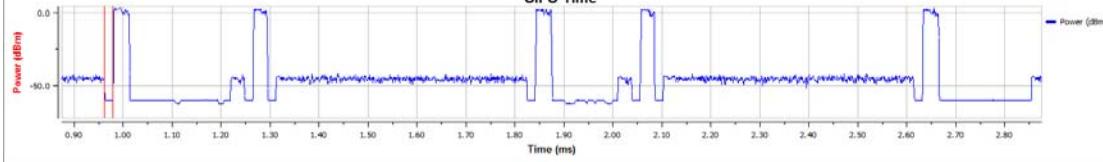
## Adaptivity Measurement



## DIFS / PIFS Time



## SIFS Time



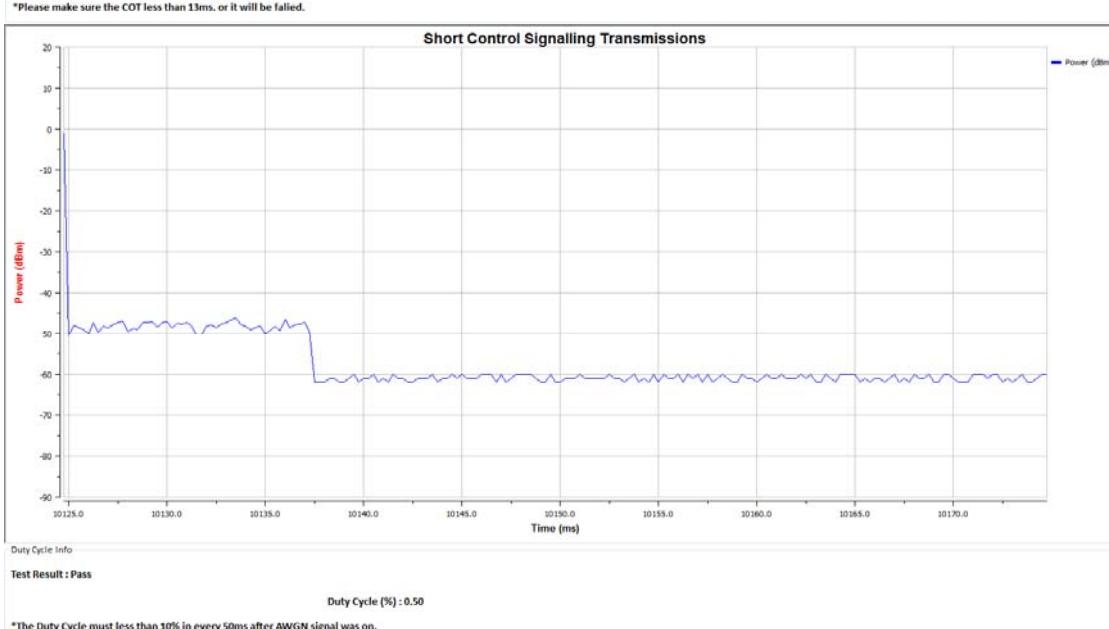
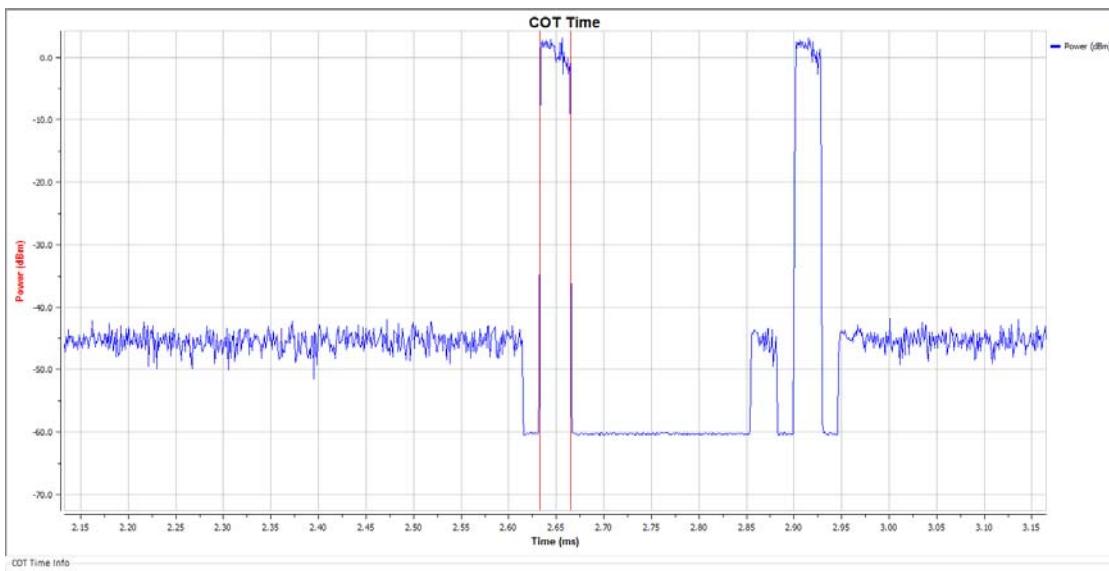
## CCA Time Info

Maximum CCA time should between 18us ~ 160us

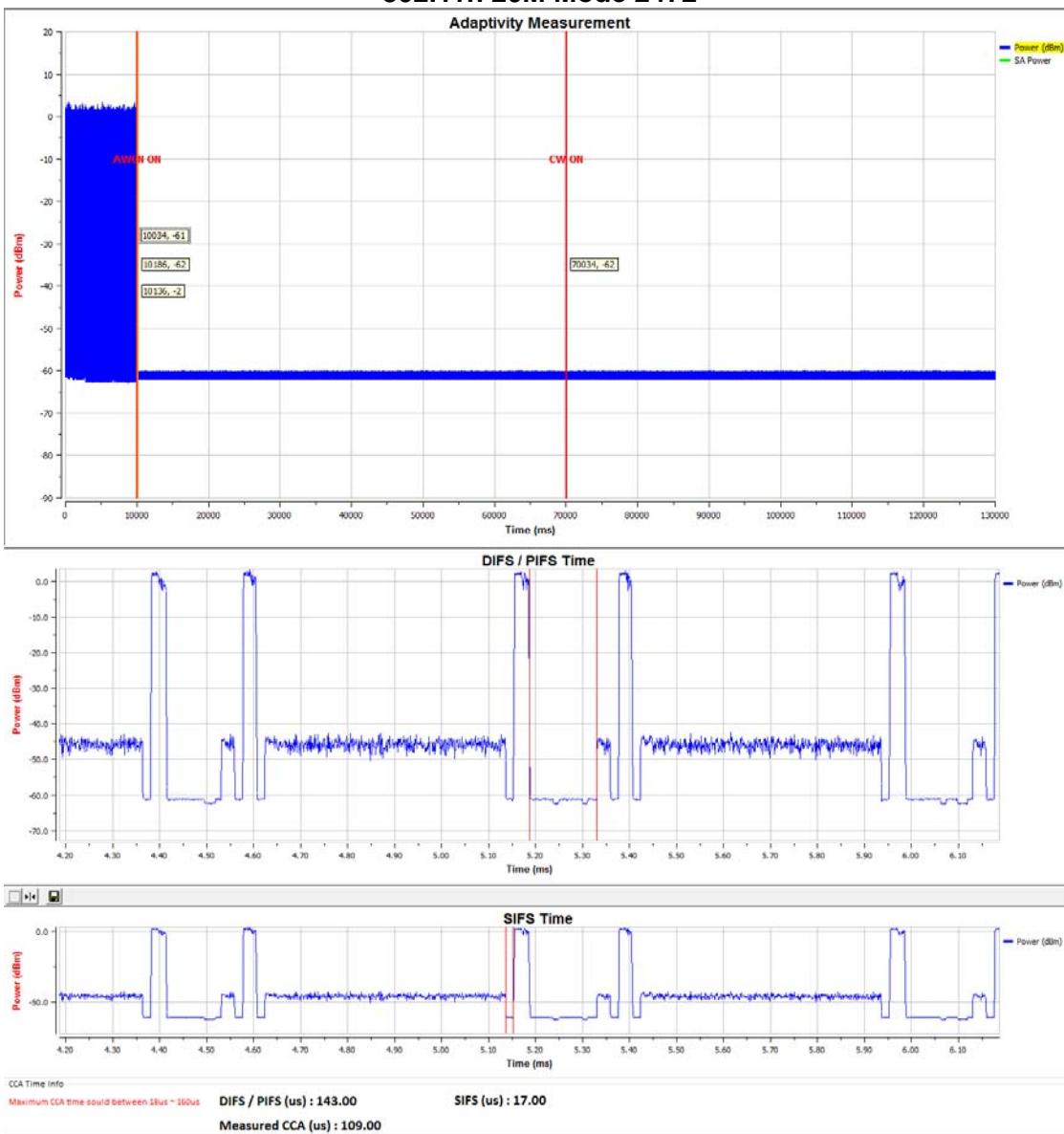
DIFS / PIFS (us) : 134.00

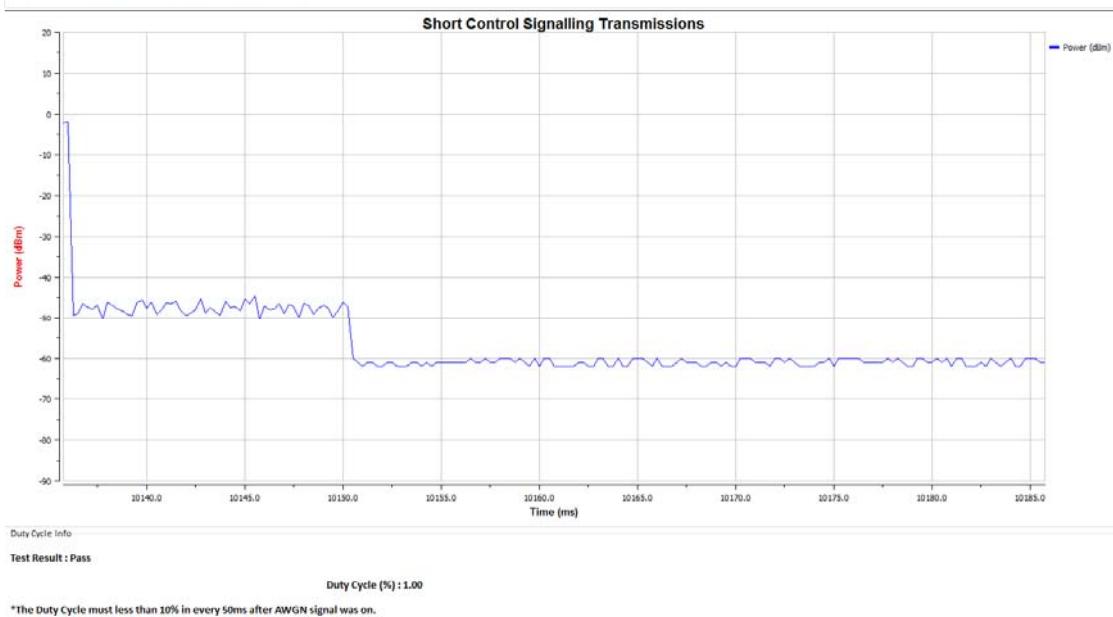
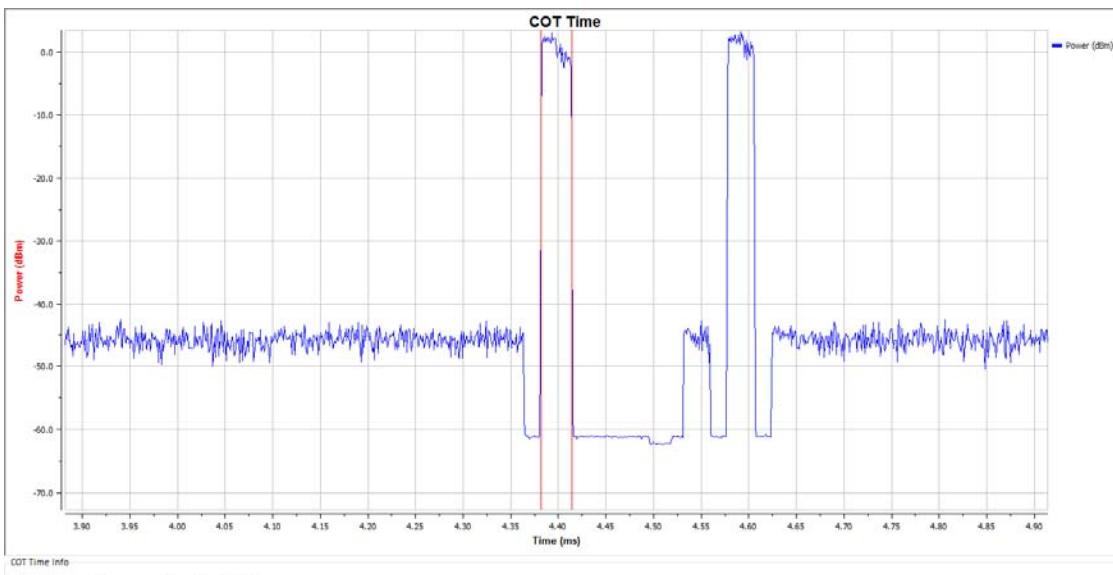
SIFS (us) : 17.00

Measured CCA (us) : 100.00



## 802.11n 20M Mode 2472





## For Dipole antenna

Test Mode: TX Mode\_ 802.11b Mode

### **Channel Occupancy Time and Clear Channel Assessment Measured Results**

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.20	113.00
2472	0.20	112.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

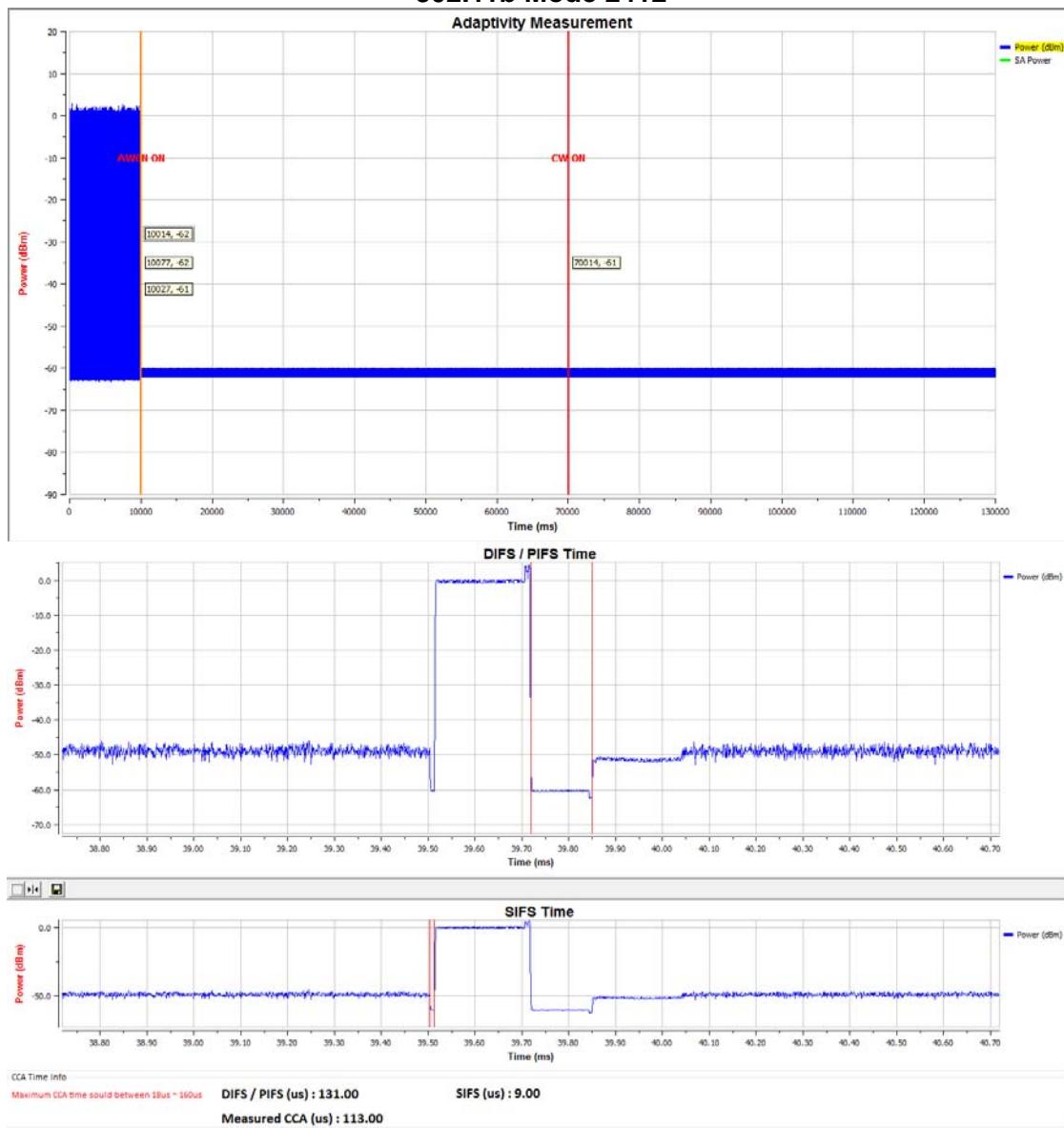
### **Adaptivity & Receiver Blocking**

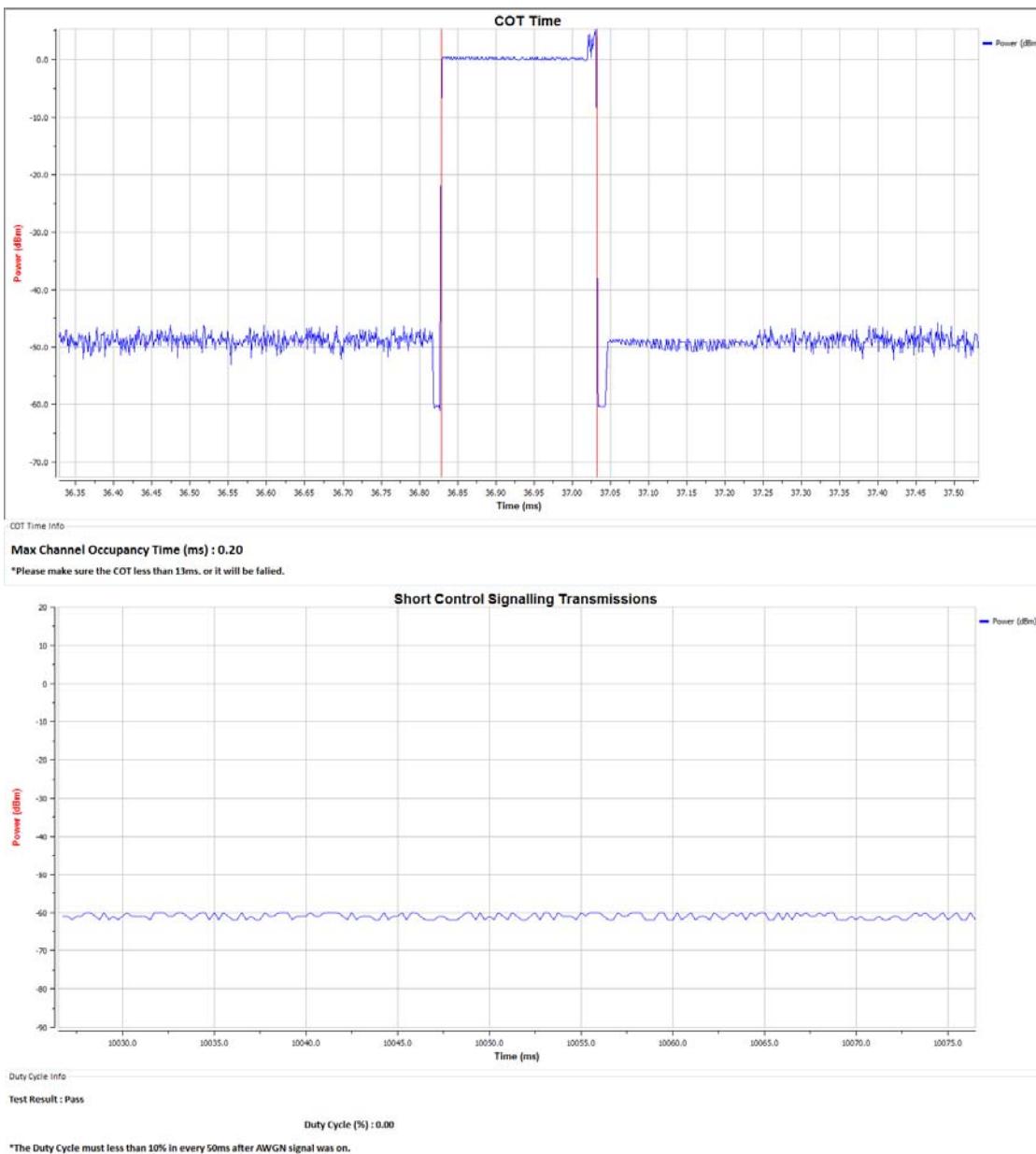
Adaptivity Detection Threshold Level	2412 MHz	-68.46 dBm/MHz	
	2472 MHz	-68.37 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0
2472	Pass	Pass	1.245
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

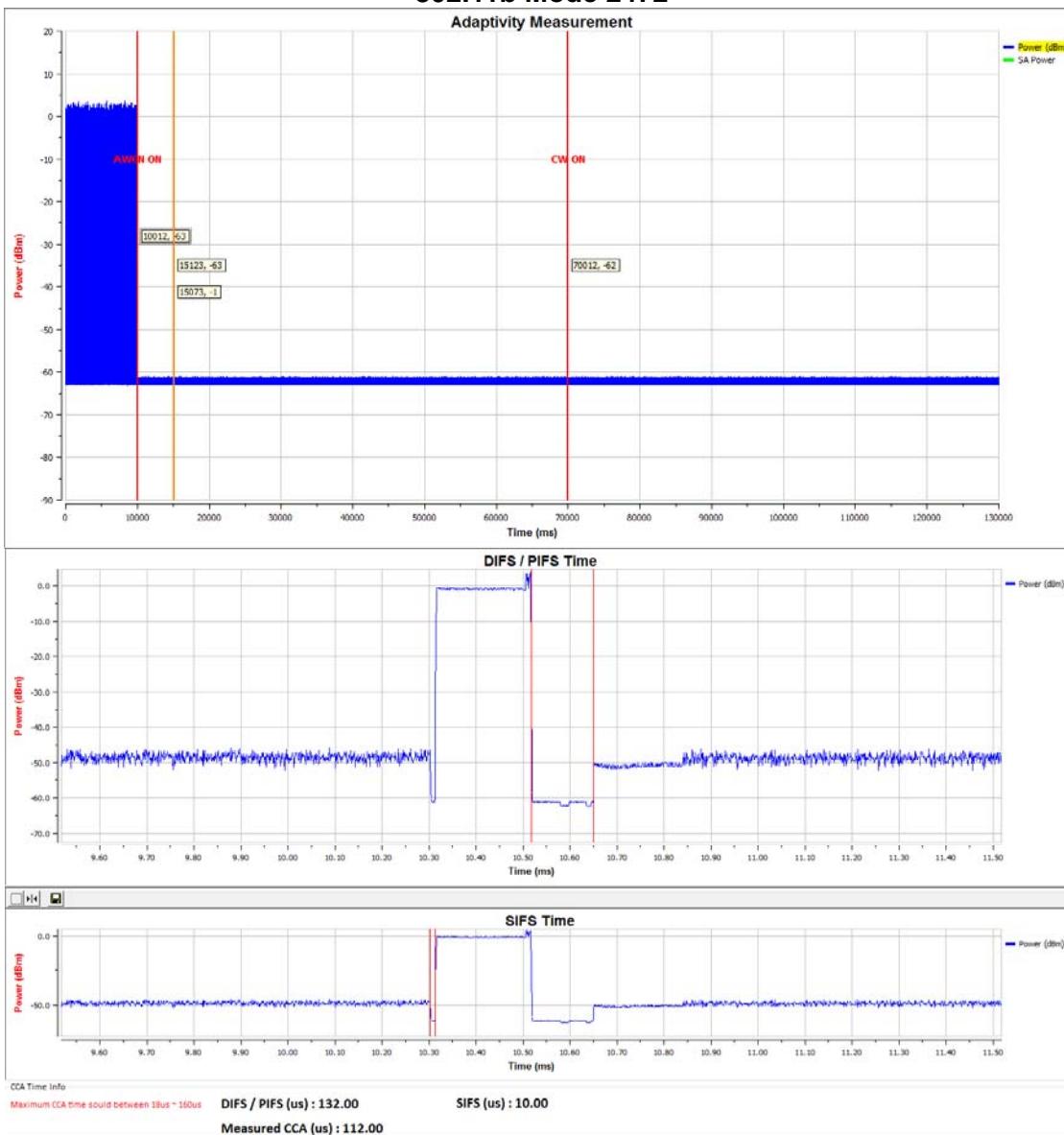
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

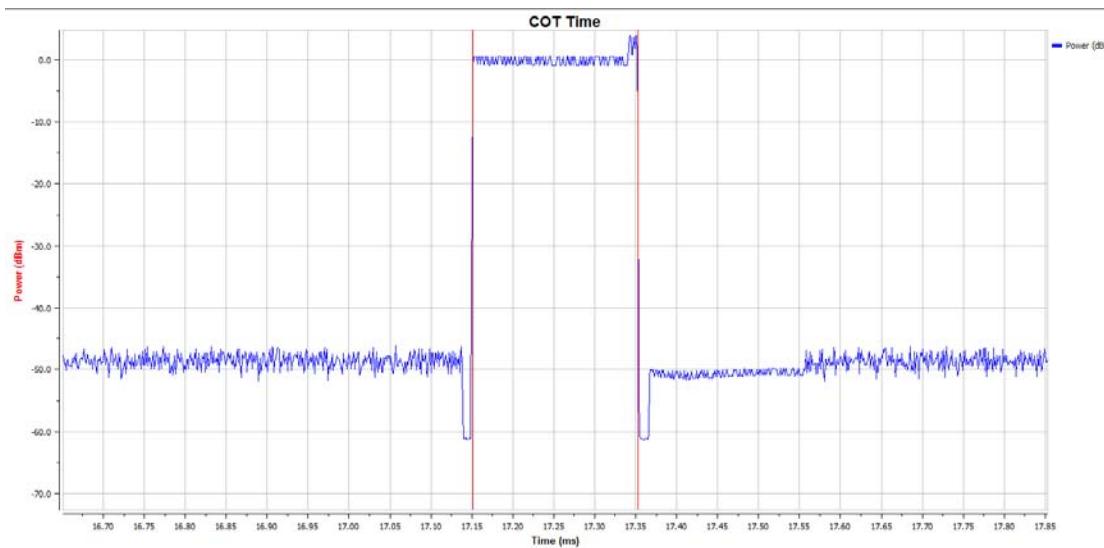
## 802.11b Mode 2412





## 802.11b Mode 2472

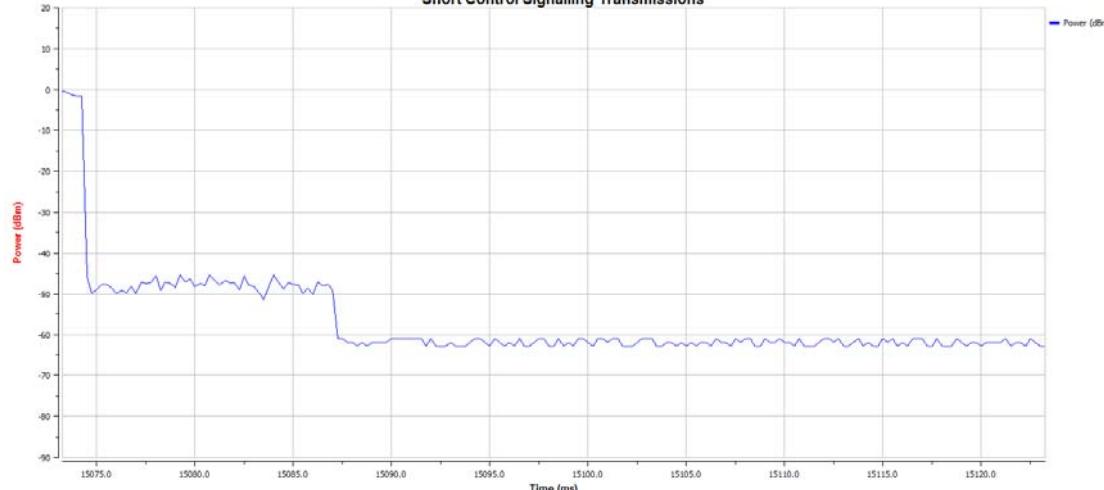




COT Time Info

**Max Channel Occupancy Time (ms) : 0.20**

\*Please make sure the COT less than 13ms, or it will be failed.

**Short Control Signalling Transmissions**

Duty Cycle Info

Test Result : Pass

Duty Cycle (%) : 2.49

\*The Duty Cycle must less than 10% in every 50ms after AWGN signal was on.

Test Mode:	TX Mode_ 802.11g Mode
------------	-----------------------

### Channel Occupancy Time and Clear Channel Assessment Measured Results

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.03	118.00
2472	0.03	92.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

### Adaptivity & Receiver Blocking

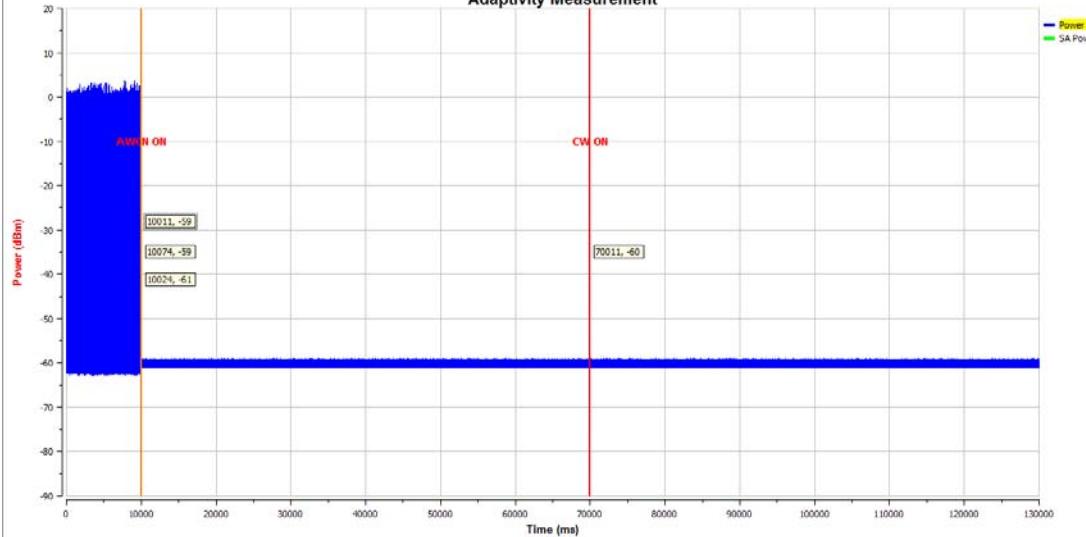
Adaptivity Detection Threshold Level	2412 MHz	-67.65 dBm/MHz	
	2472 MHz	-67.72 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0
2472	Pass	Pass	1.245
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

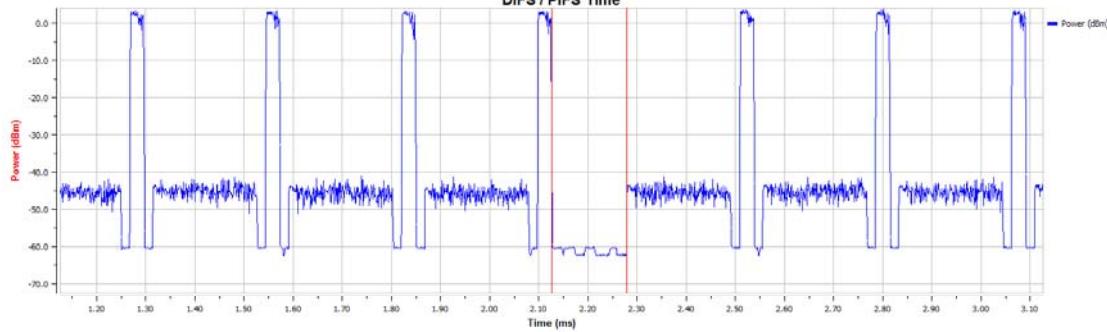
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

## 802.11g Mode 2412

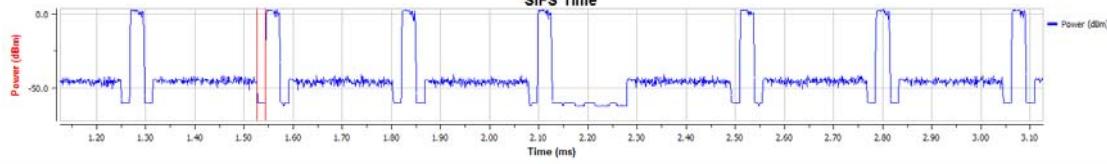
## Adaptivity Measurement



## DIFS / PIFS Time



## SIFS Time



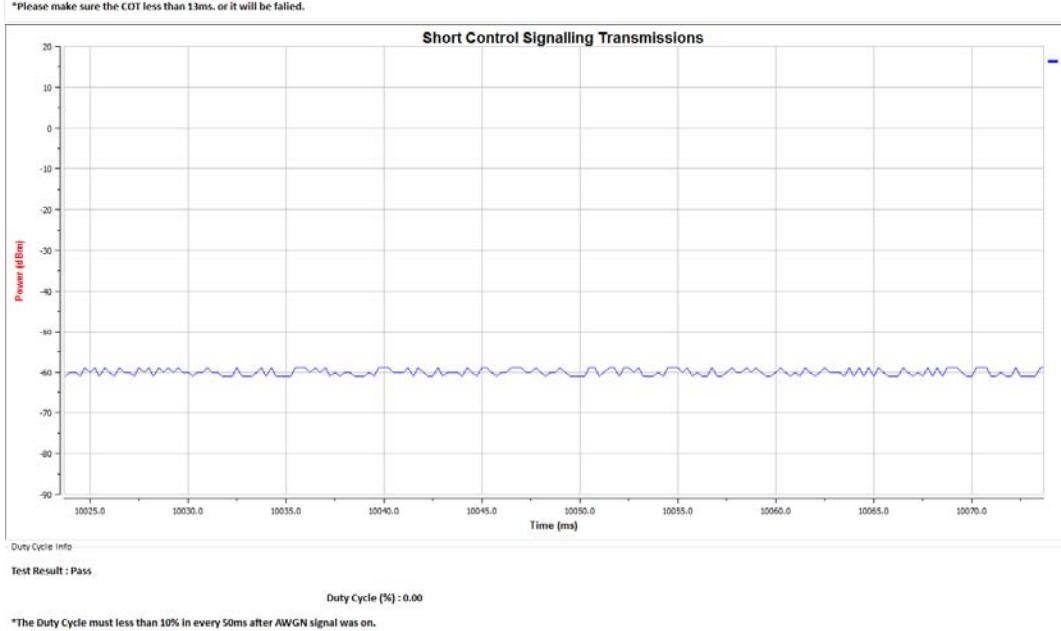
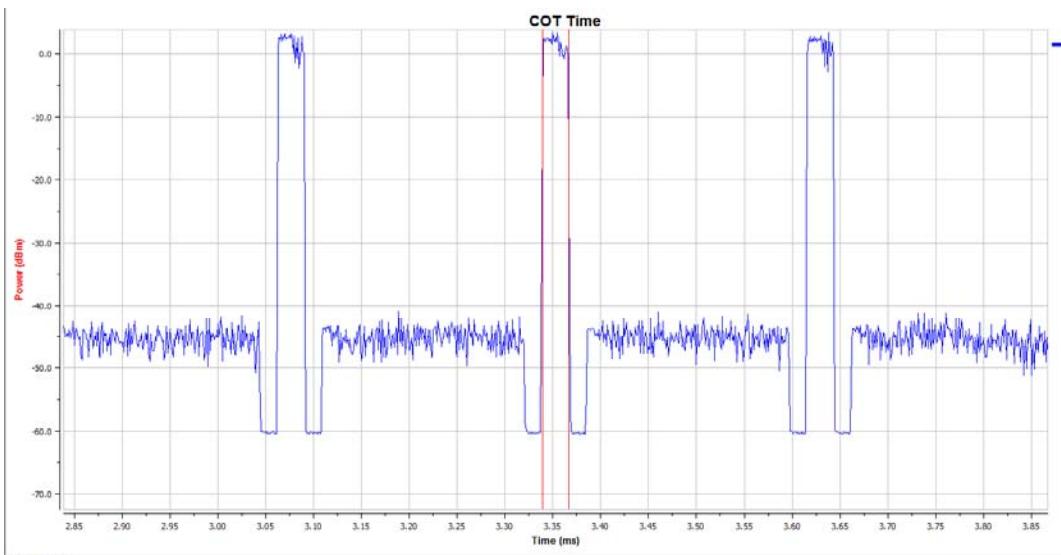
## CCA Time Info

Maximum CCA-time should between 18us ~ 160us

DIFS / PIFS (us) : 152.00

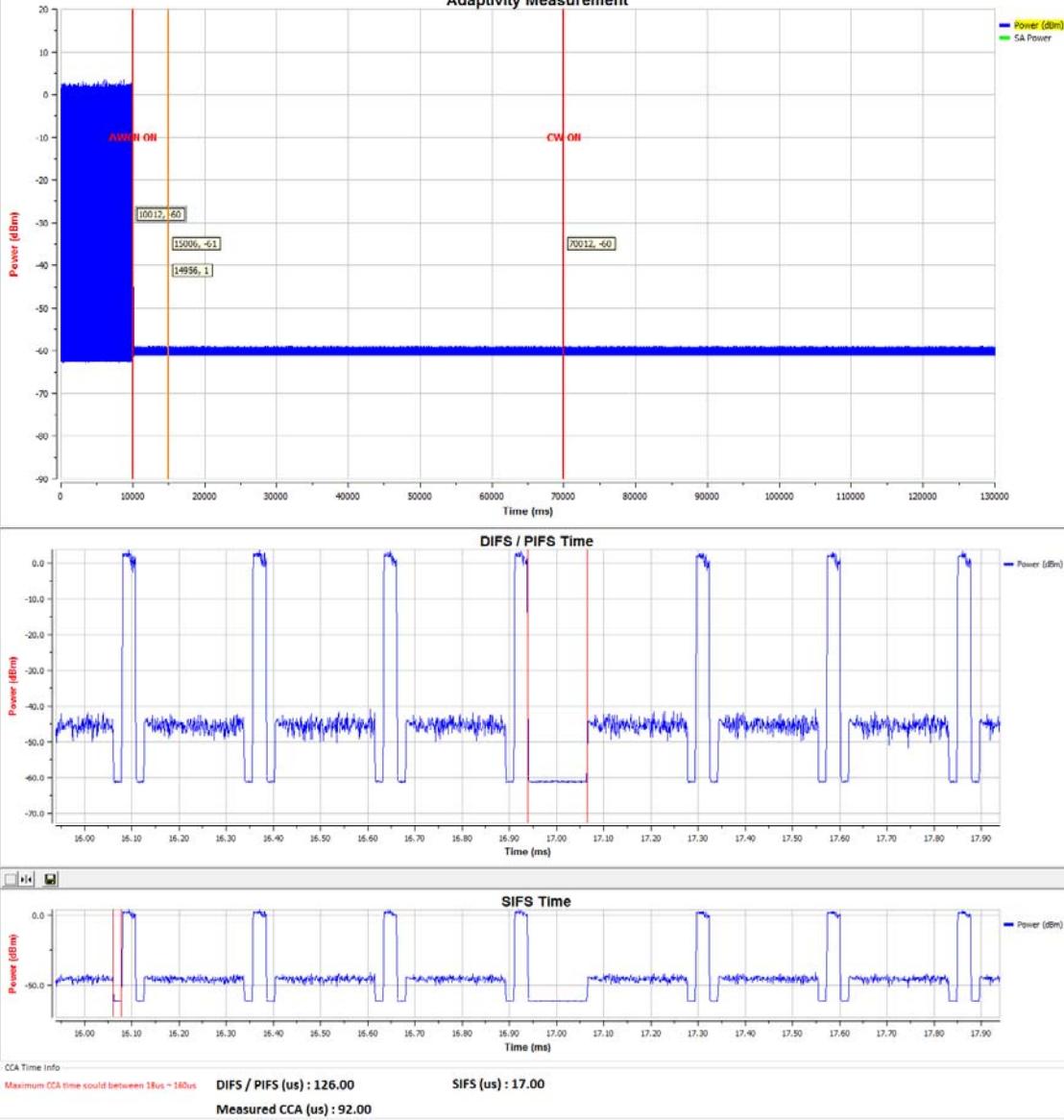
SIFS (us) : 17.00

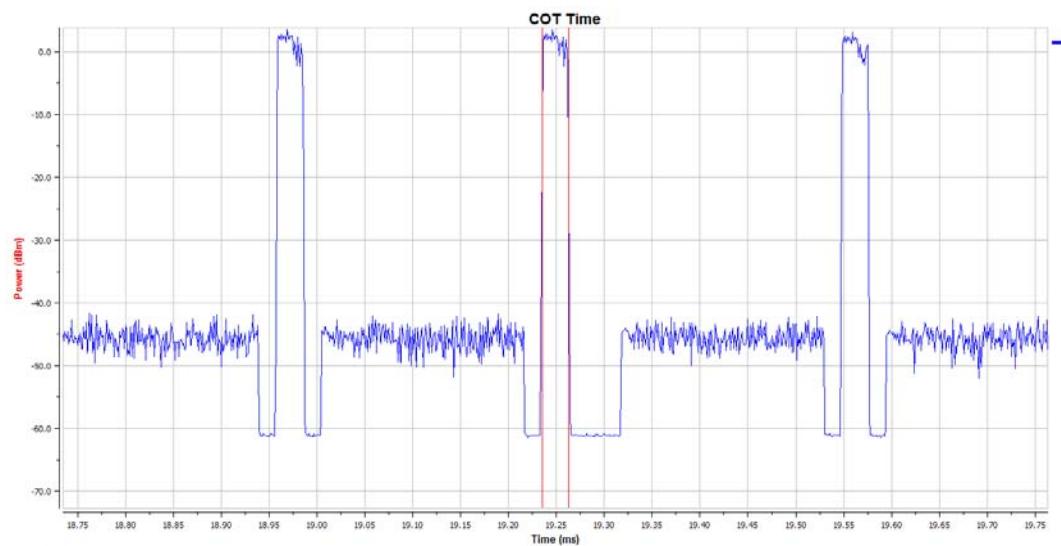
Measured CCA (us) : 118.00



## 802.11g Mode 2472

## Adaptivity Measurement

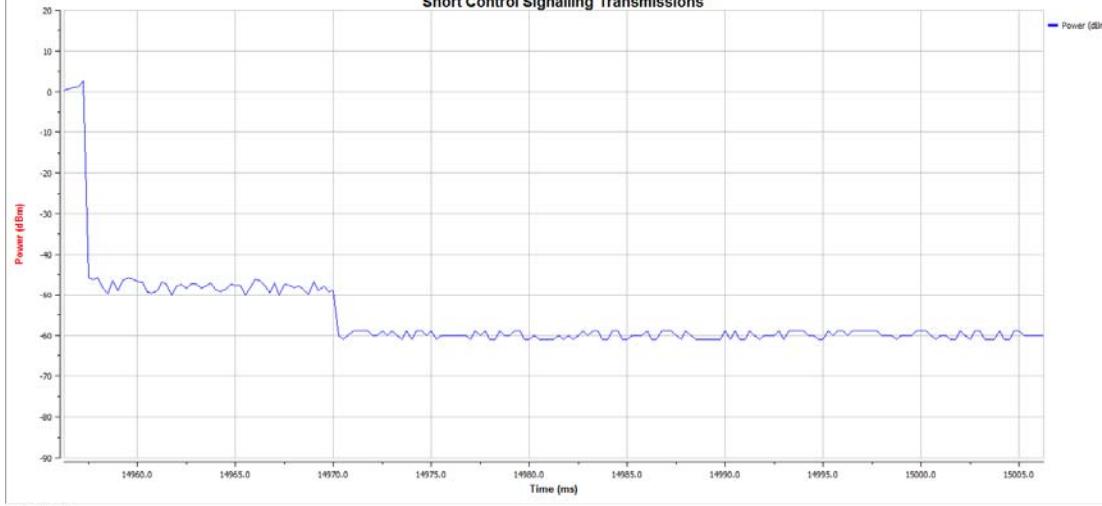




COT Time Info

**Max Channel Occupancy Time (ms) : 0.03**

\*Please make sure the COT less than 13ms, or it will be failed.

**Short Control Signalling Transmissions**

Duty Cycle Info

Test Result : Pass

Duty Cycle [%] : 2.49

\*The Duty Cycle must less than 10% in every 50ms after AWGN signal was on.

Test Mode: TX Mode\_ 802.11n 20M Mode

**Channel Occupancy Time and Clear Channel Assessment Measured Results**

Freq.(MHz)	Channel Occupancy Time (ms)	Clear Channel Assessment (us)
2412	0.03	100.00
2472	0.03	109.00
Limit	13	18~160

Note: Channel Occupancy Time and Clear Channel Assessment follow as IEEE Std. 802.11-2012 and IEEE 802.11n-2012 Specification without restriction.

**Adaptivity & Receiver Blocking**

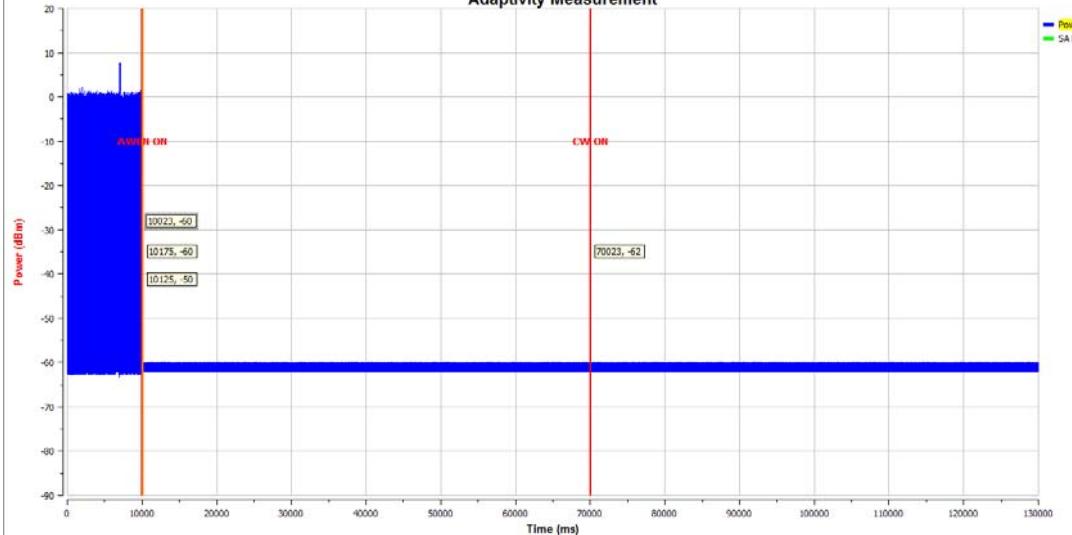
Adaptivity Detection Threshold Level	2412 MHz	-66.39 dBm/MHz	
	2472 MHz	-66.49 dBm/MHz	
Receiver Blocking Signal Level	-35 dBm		
Freq.(MHz)	Adaptivity	Receiver Blocking test Status	Short Control Signalling Transmissions (ms)
2412	Pass	Pass	0.25
2472	Pass	Pass	0.5
Limit	N/A	N/A	5
Result	Pass		

Note: Threshold Level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm).

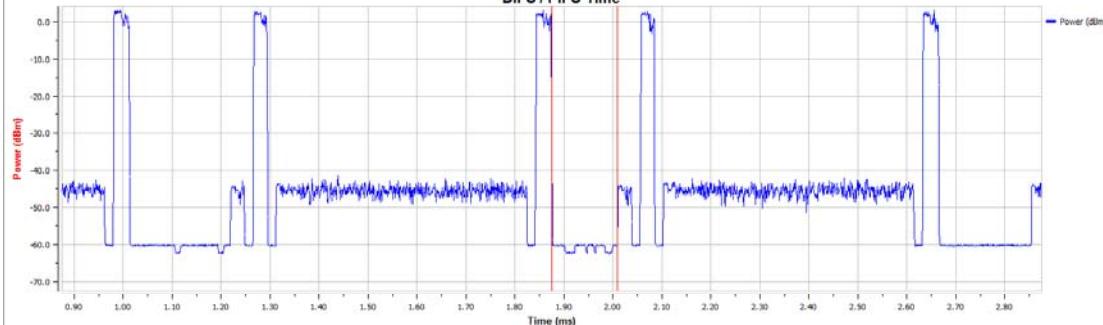
Short Control Signalling Transmissions = 50 (ms) \* Duty cycle (%)

## 802.11n 20M Mode 2412

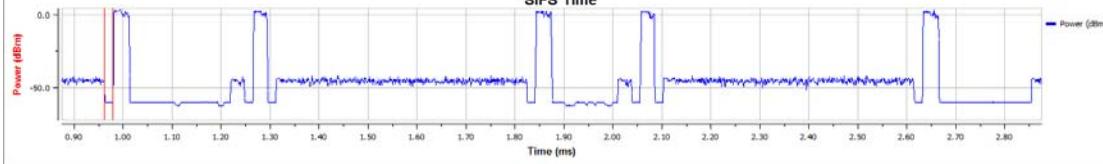
## Adaptivity Measurement



## DIFS / PIFS Time



## SIFS Time



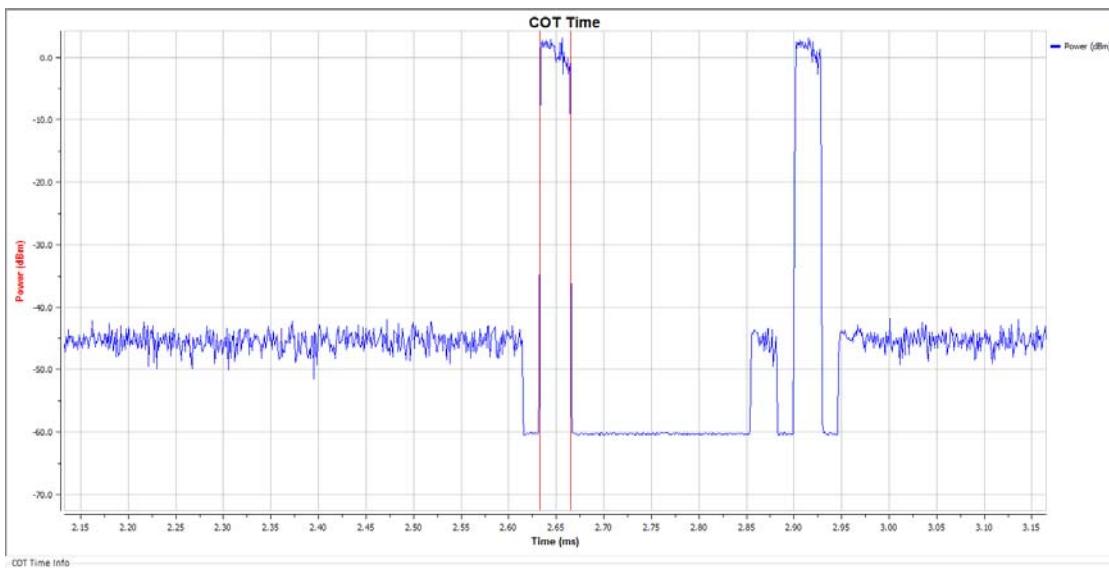
## CCA Time Info

Maximum CCA time should between 18us ~ 160us

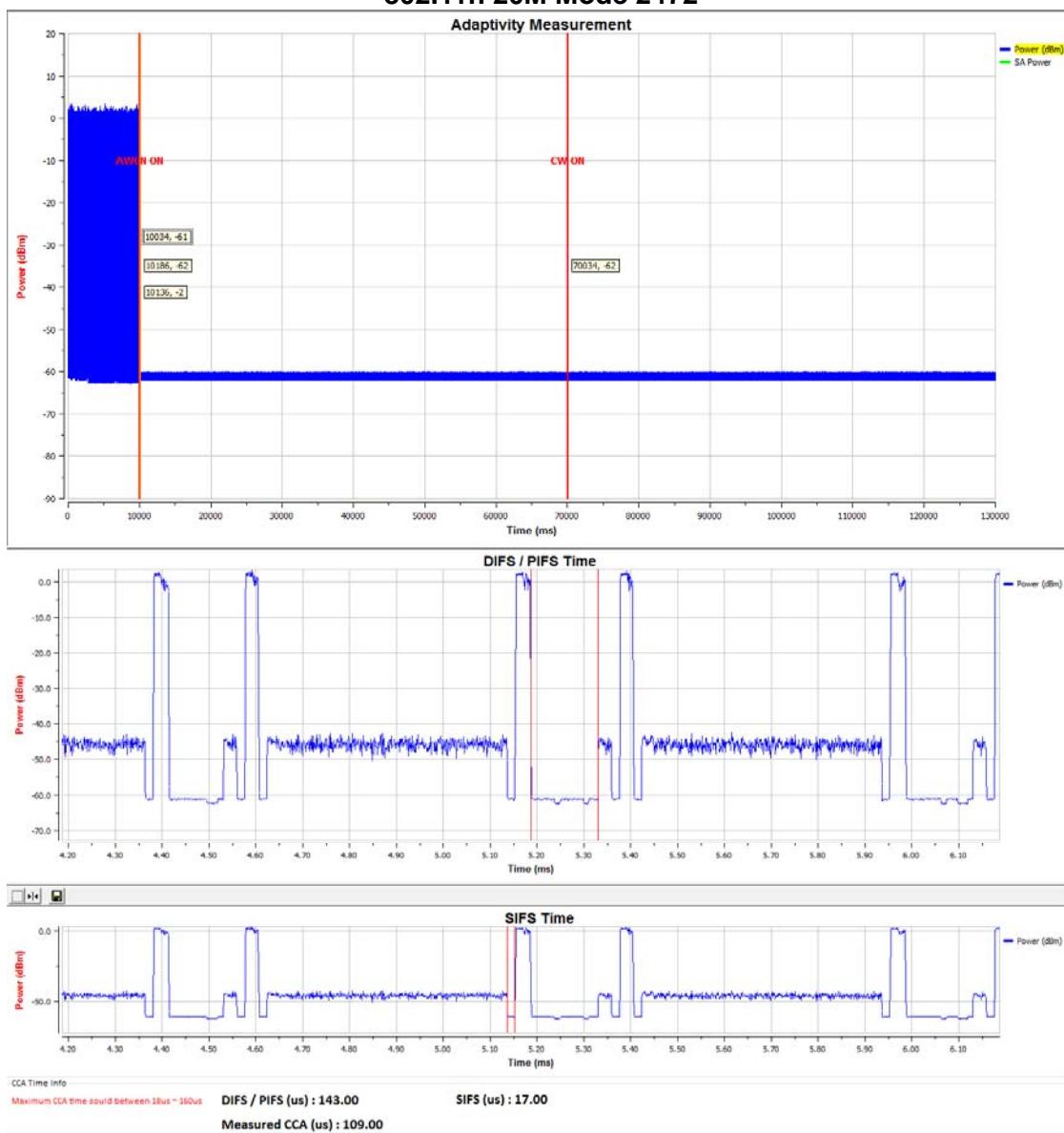
DIFS / PIFS (us) : 134.00

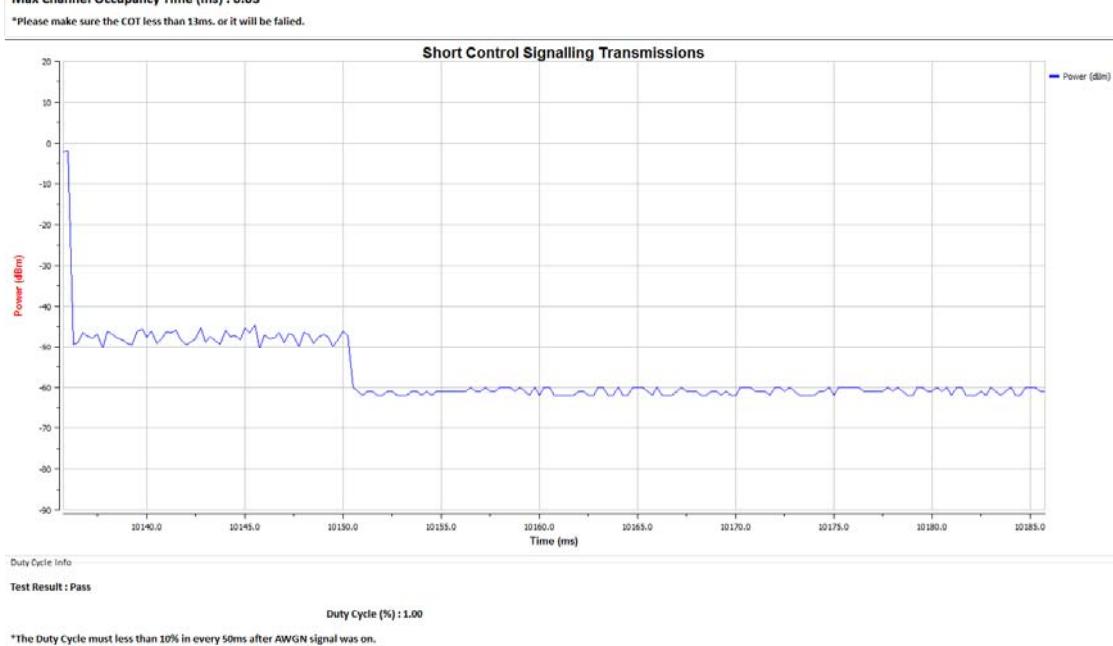
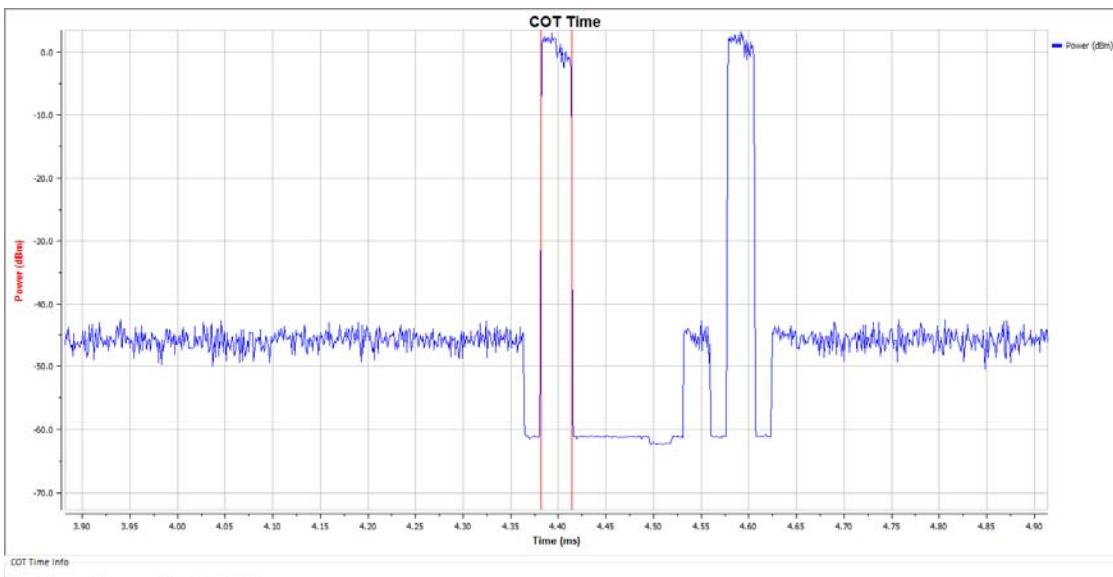
SIFS (us) : 17.00

Measured CCA (us) : 100.00



## 802.11n 20M Mode 2472





## APPENDIX F - OCCUPIED CHANNEL BANDWIDTH

## For Chip antenna

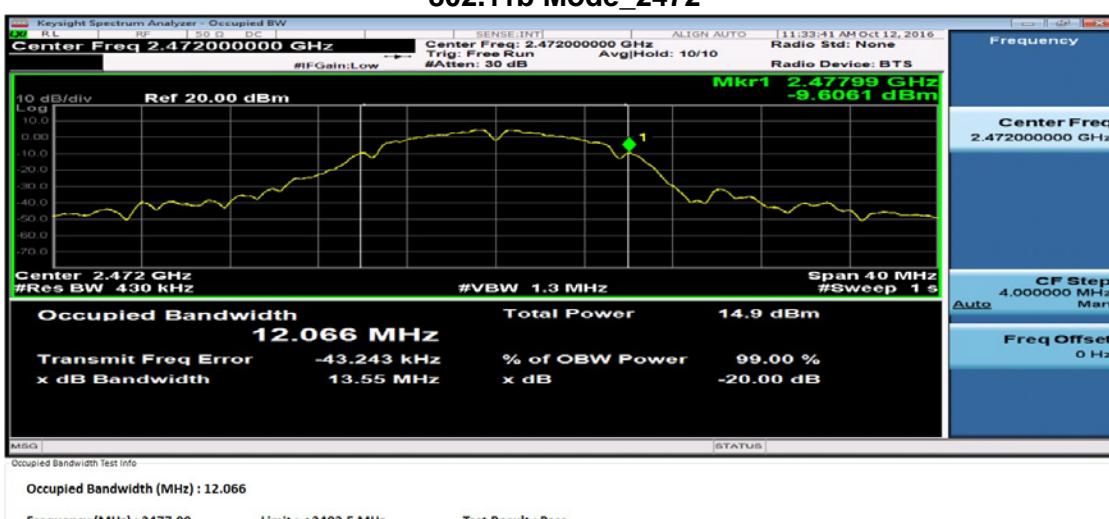
Test Mode: TX Mode\_ 802.11b Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	13.219	2405.00	-	Pass
2472	12.066	-	2477.99	
N/A		$F_L > 2400$	$F_H < 2483.5$	

### 802.11b Mode\_2412



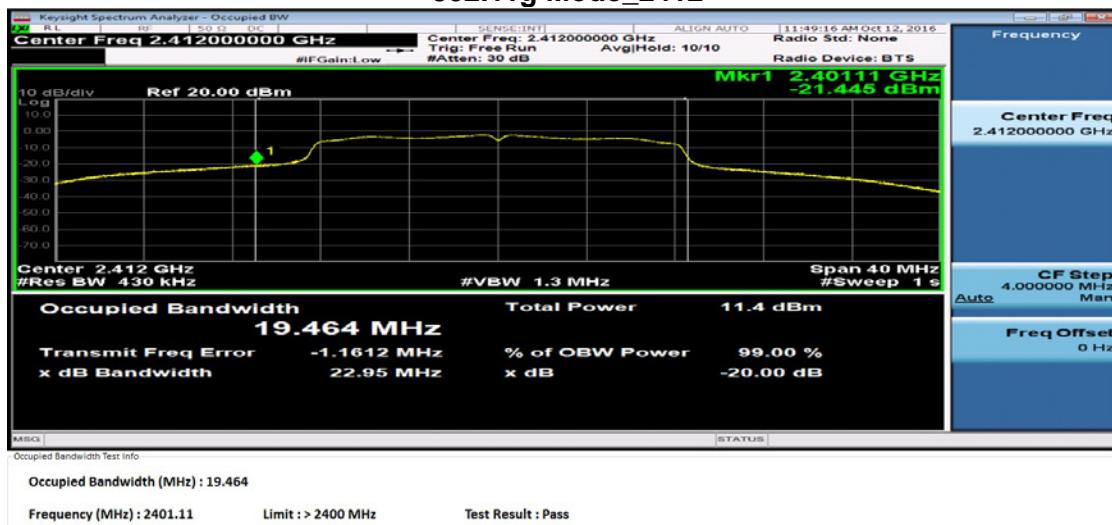
### 802.11b Mode\_2472



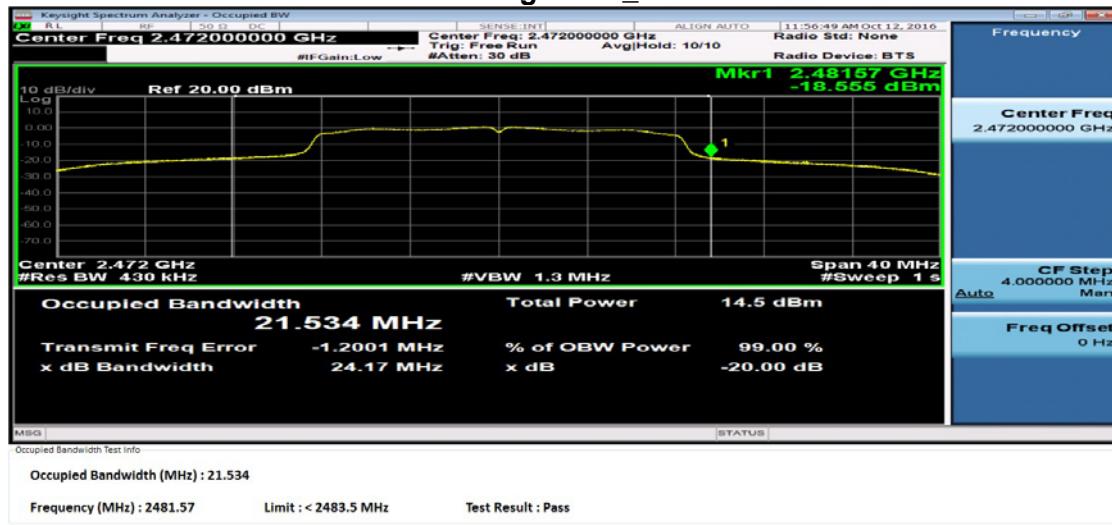
Test Mode: TX Mode\_ 802.11g Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	19.464	2401.11	-	Pass
2472	21.534	-	2481.57	
N/A		$F_L > 2400$	$F_H < 2483.5$	

### 802.11g Mode\_2412



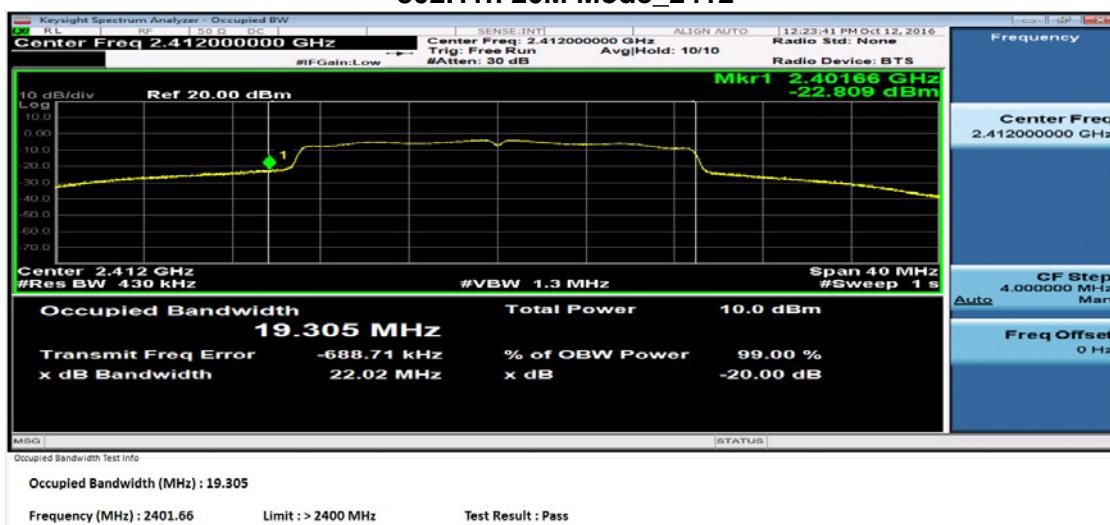
### 802.11g Mode\_2472



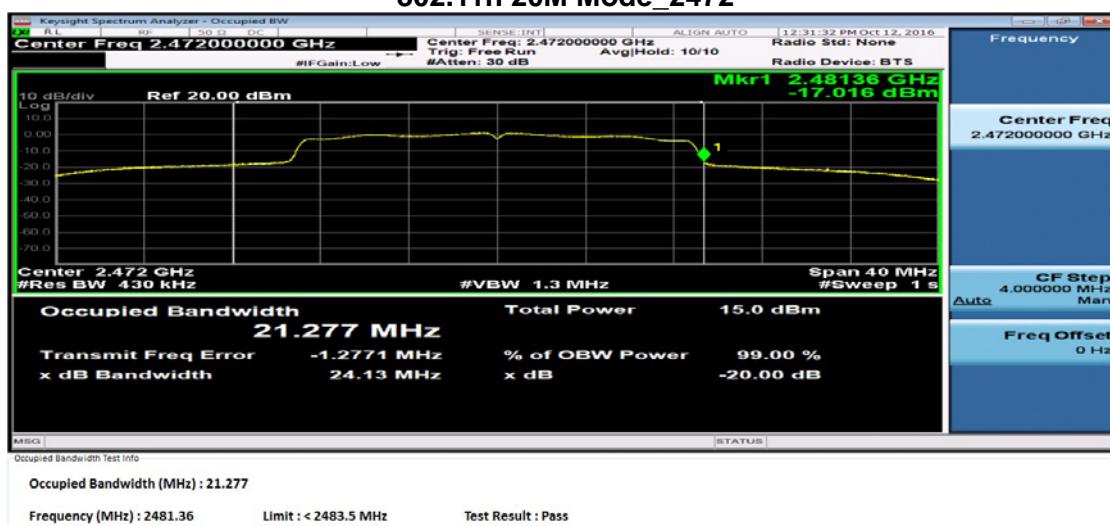
Test Mode: TX Mode 802.11n 20M Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	19.305	2401.66	-	Pass
2472	21.277	-	2481.36	
N/A		$F_L > 2400$	$F_H < 2483.5$	

**802.11n 20M Mode 2412**



802.11n 20M Mode 2472



## For Dipole antenna

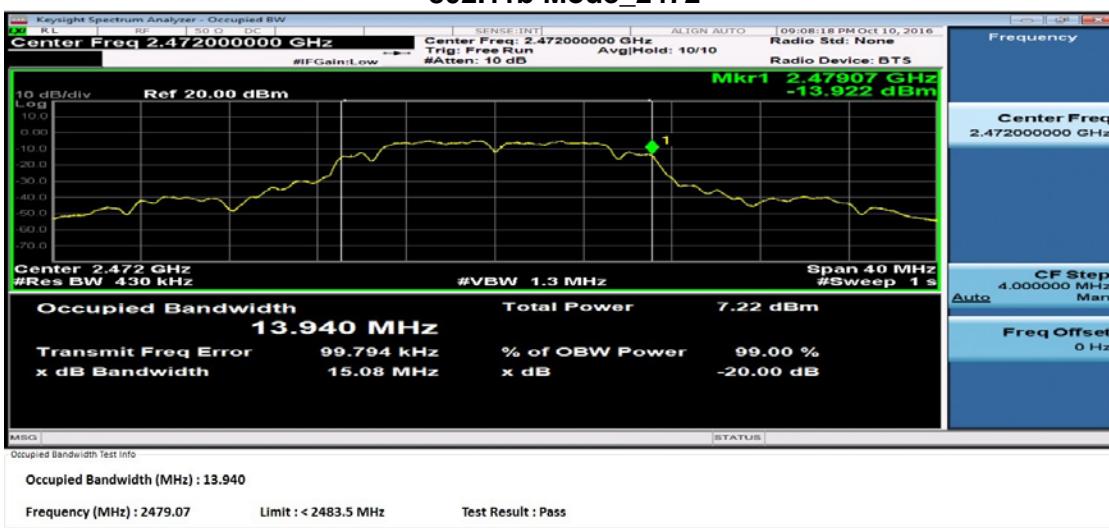
Test Mode: TX Mode\_ 802.11b Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	13.934	2405.12	-	Pass
2472	13.940	-	2479.07	
N/A		$F_L > 2400$	$F_H < 2483.5$	

### 802.11b Mode\_2412



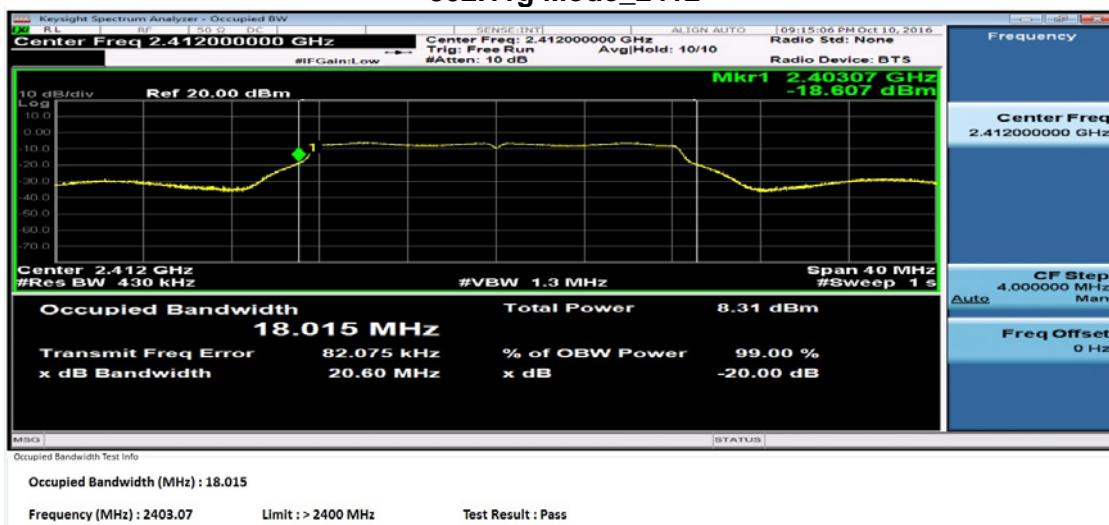
### 802.11b Mode\_2472



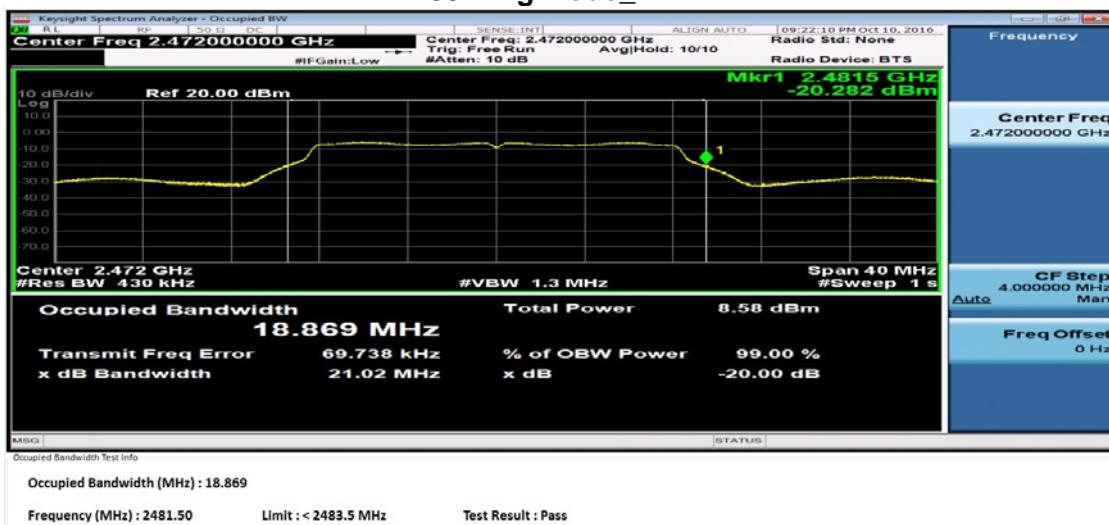
Test Mode: TX Mode\_802.11g Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	18.015	2403.07	-	Pass
2472	18.869	-	2481.50	
N/A		$F_L > 2400$	$F_H < 2483.5$	

### 802.11g Mode\_2412



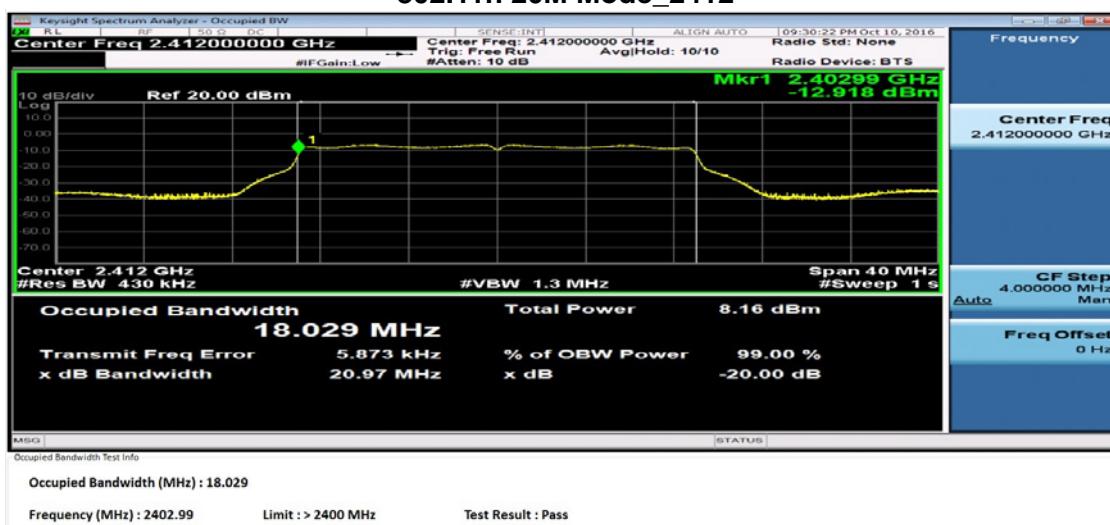
### 802.11g Mode\_2472



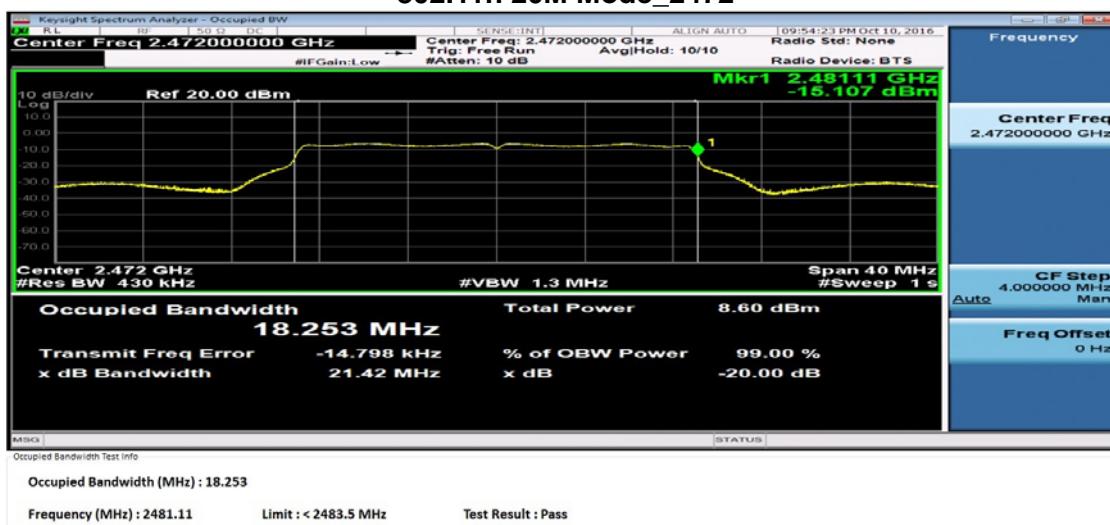
Test Mode: TX Mode\_802.11n 20M Mode

Frequency (MHz)	Occupied Channel Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Result
2412	18.029	2402.99	-	Pass
2472	18.253	-	2481.11	
N/A		$F_L > 2400$	$F_H < 2483.5$	

### 802.11n 20M Mode\_2412



### 802.11n 20M Mode\_2472

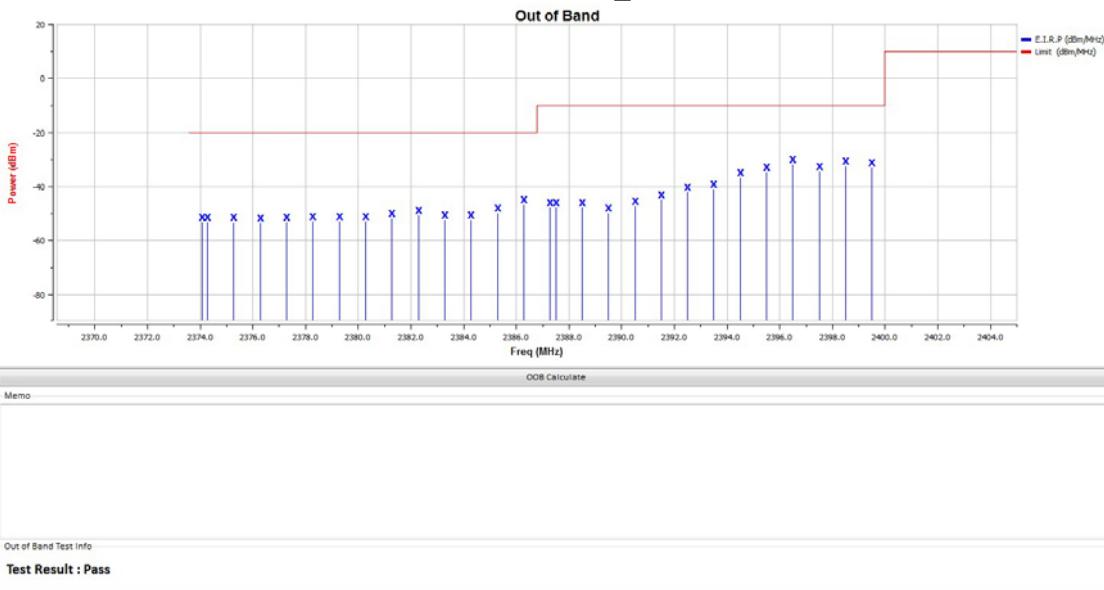


## APPENDIX G - TRANSMITTER UNWANTED EMISSIONS IN THE OOB DOMAIN

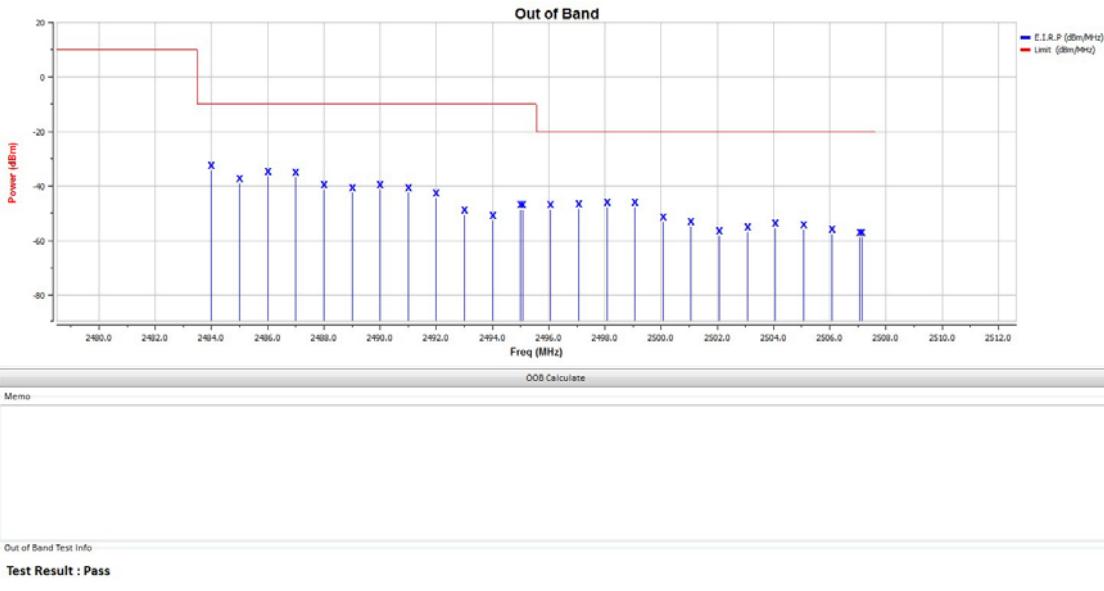
## For Chip antenna

Test Mode: TX Mode\_ 802.11b Mode\_ Normal Temperature

### 802.11b Mode\_2412

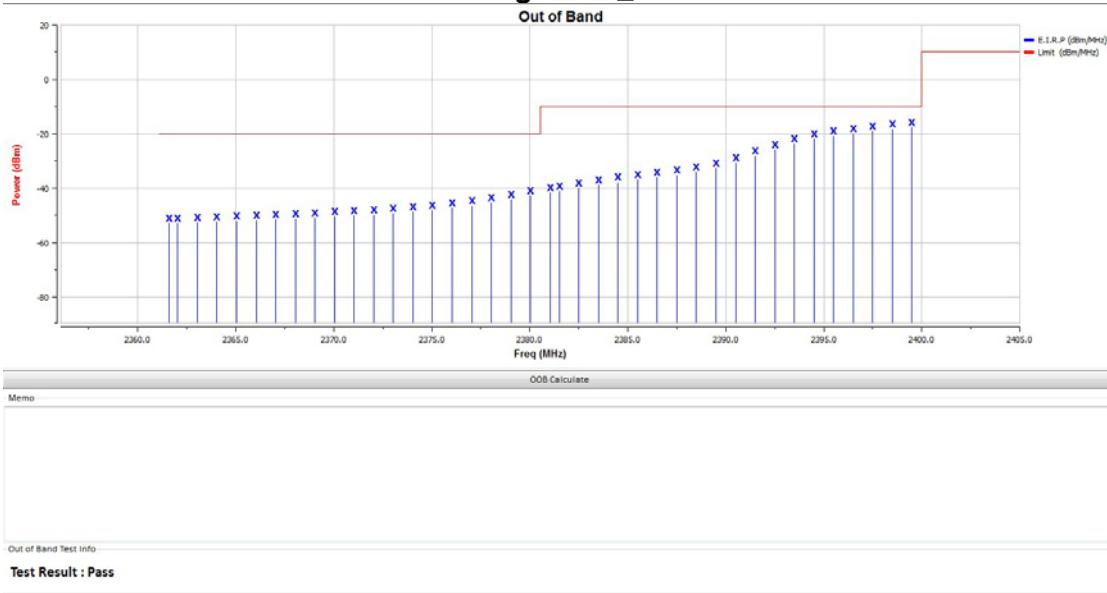


### 802.11b Mode\_2472

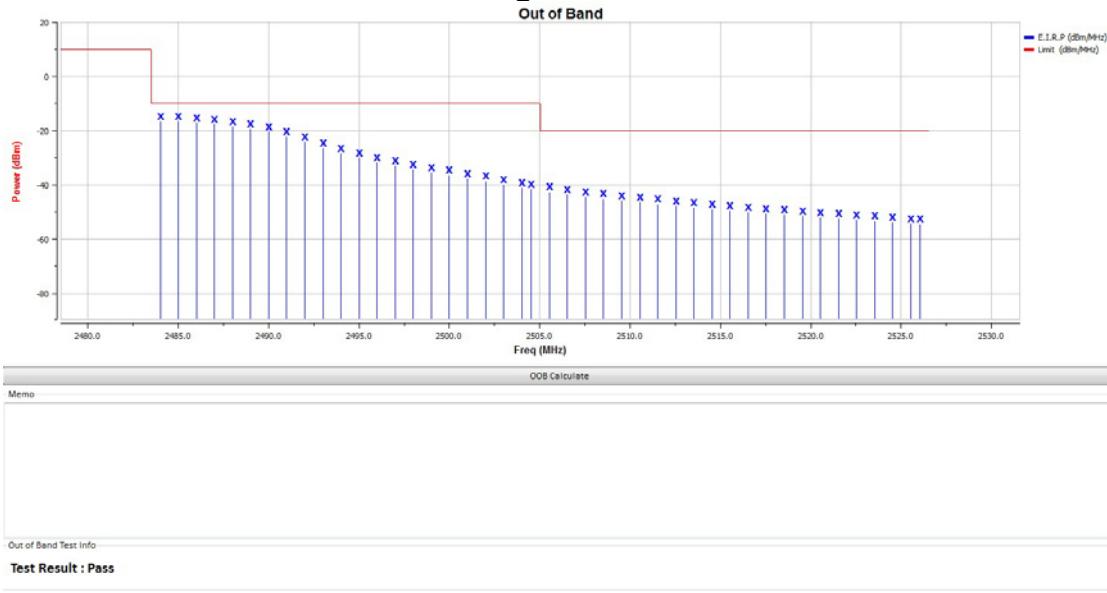


Test Mode: TX Mode\_ 802.11g Mode\_ Normal Temperature

### 802.11g Mode\_2412

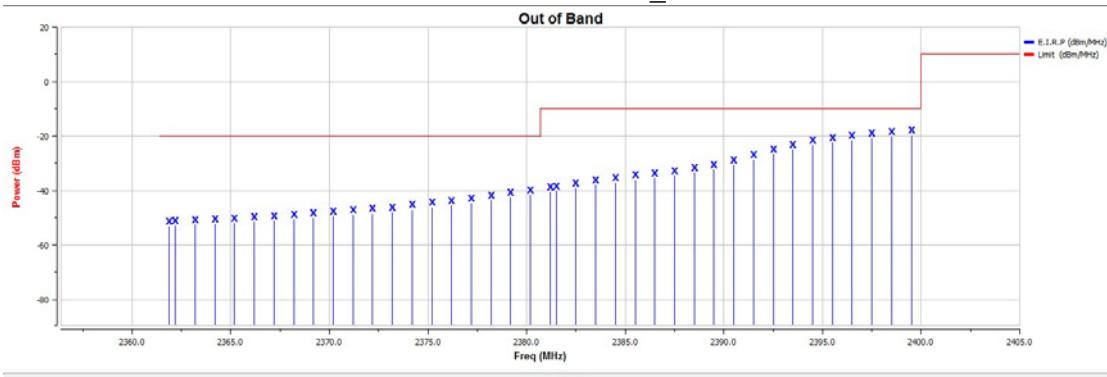


### 802.11g Mode\_2472



Test Mode: TX Mode\_ 802.11n 20M Mode\_ Normal Temperature

### 802.11n 20M Mode\_2412



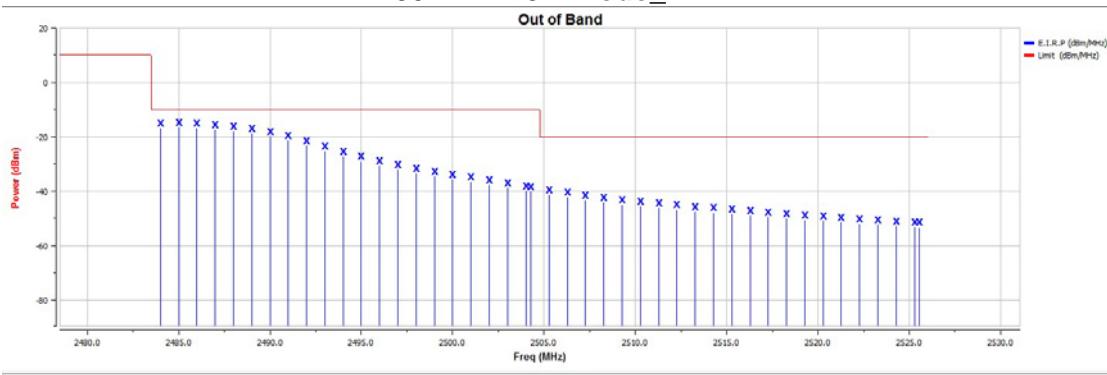
OOB Calculate

Memo

Out of Band Test Info

Test Result : Pass

### 802.11n 20M Mode\_2472



OOB Calculate

Memo

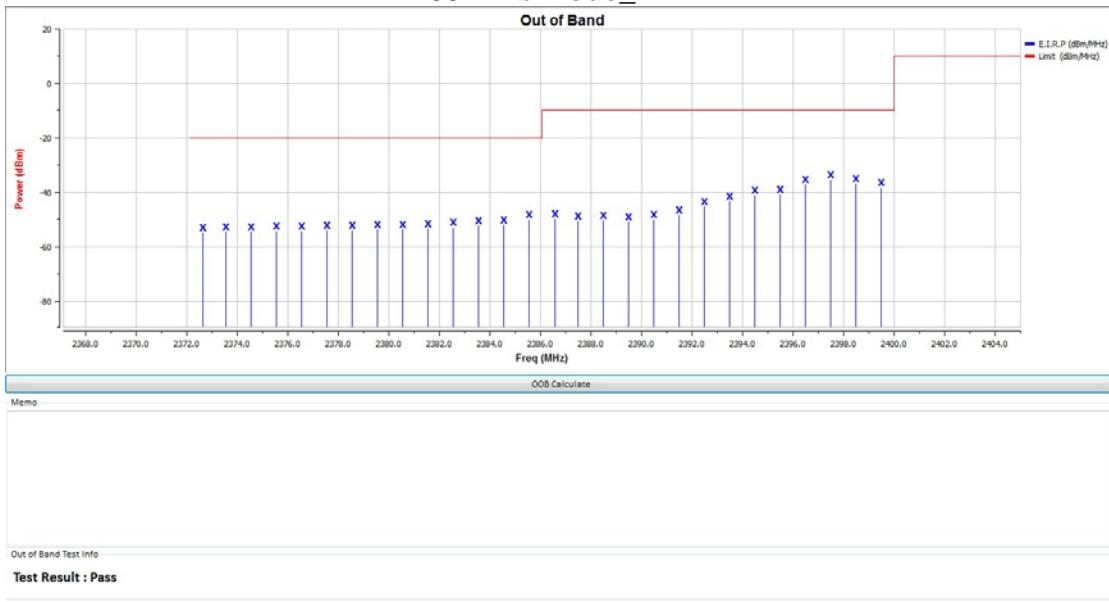
Out of Band Test Info

Test Result : Pass

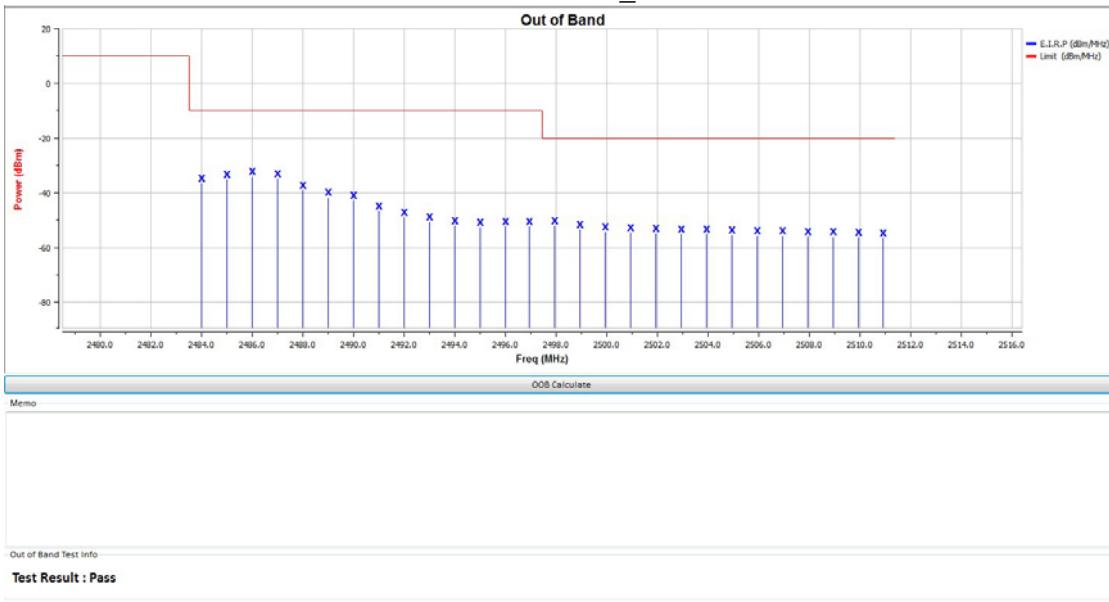
## For Dipole antenna

Test Mode: TX Mode\_802.11b Mode\_Normal Temperature

### 802.11b Mode\_2412



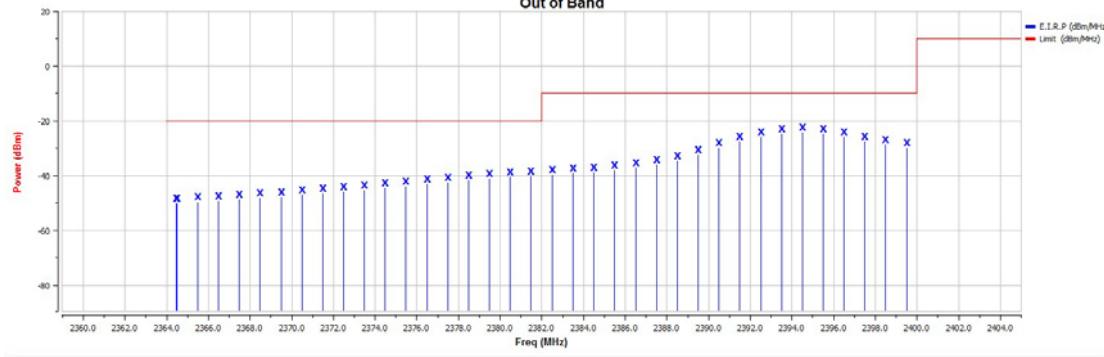
### 802.11b Mode\_2472



Test Mode: TX Mode\_ 802.11g Mode\_ Normal Temperature

### 802.11g Mode\_2412

Out of Band



OOB Calculate

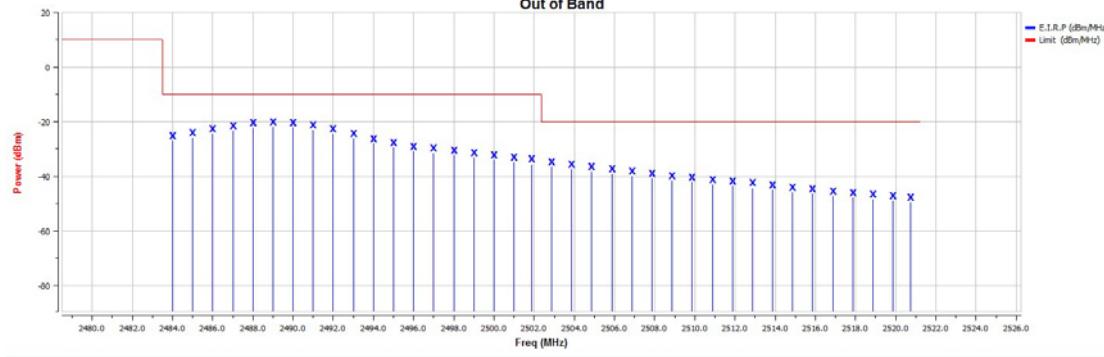
Memo

Out of Band Test Info

Test Result : Pass

### 802.11g Mode\_2472

Out of Band



OOB Calculate

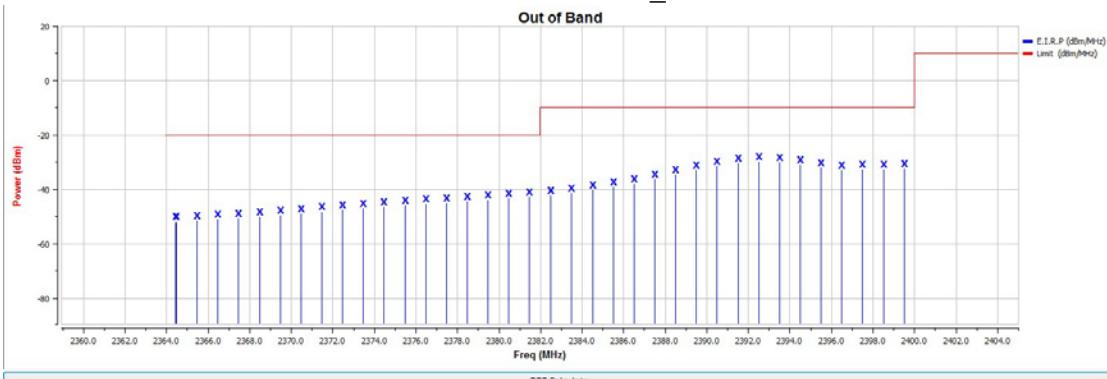
Memo

Out of Band Test Info

Test Result : Pass

Test Mode: TX Mode\_ 802.11n 20M Mode\_ Normal Temperature

### 802.11n 20M Mode\_2412



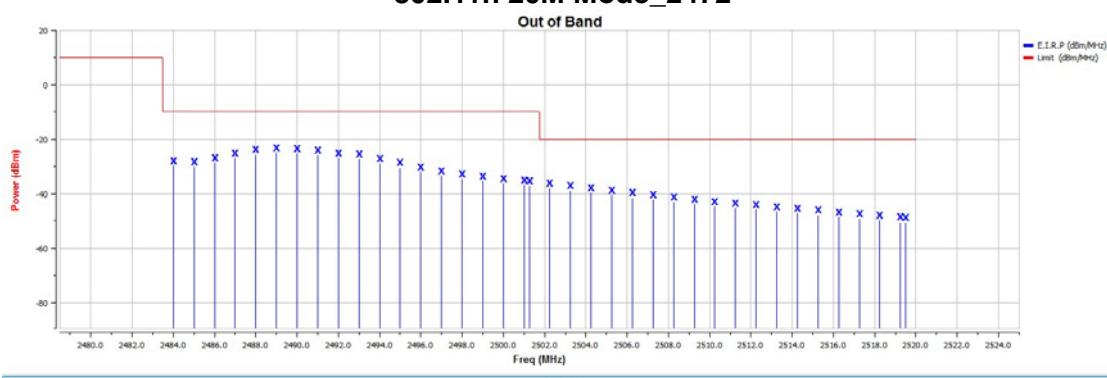
OOB Calculate

Memo

Out of Band Test Info

Test Result : Pass

### 802.11n 20M Mode\_2472



OOB Calculate

Memo

Out of Band Test Info

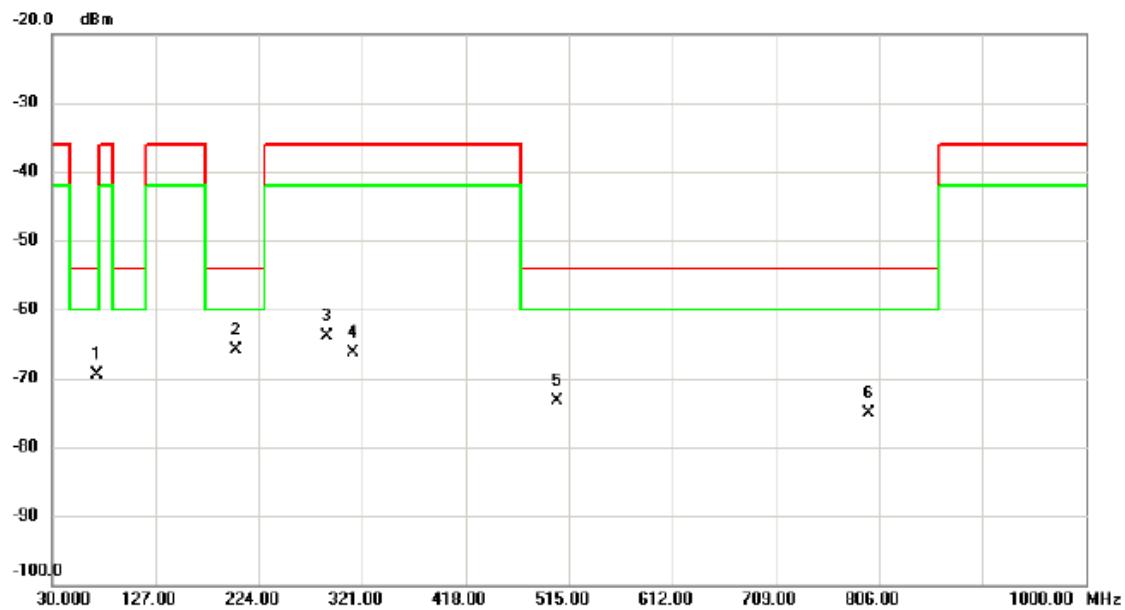
Test Result : Pass

## APPENDIX H - TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

## For Chip antenna

Test Mode: TX Mode 2412 MHz (11b)

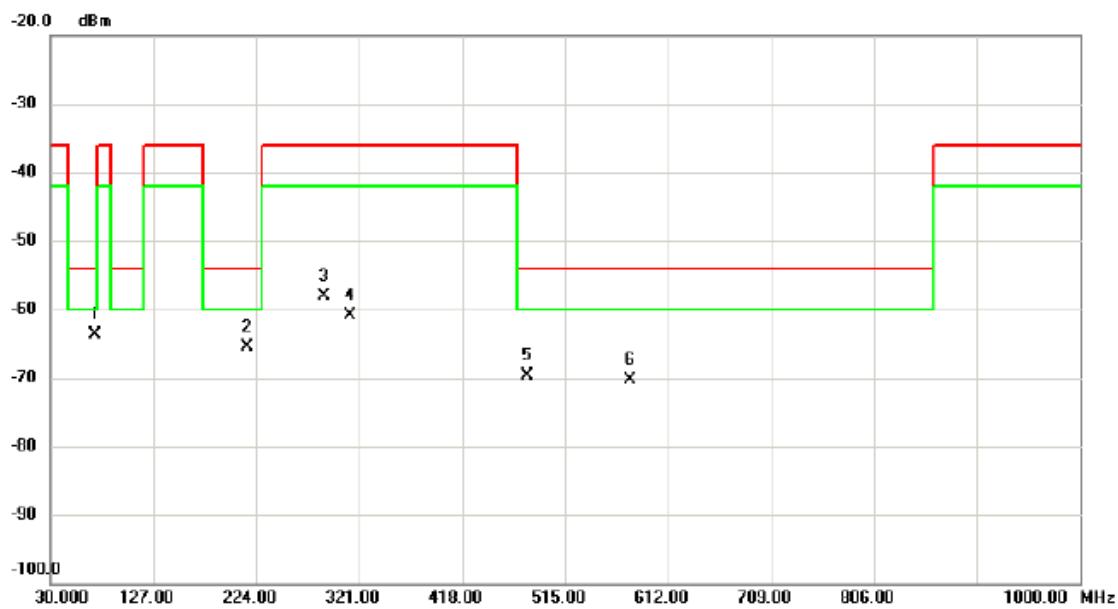
Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1		72.001	-63.13	-6.28	-69.41	-54.00	-15.41	RMS	
2 *		202.951	-60.47	-5.50	-65.97	-54.00	-11.97	RMS	
3		287.923	-62.71	-1.21	-63.92	-36.00	-27.92	RMS	
4		311.979	-65.44	-0.76	-66.20	-36.00	-30.20	RMS	
5		503.845	-77.39	4.11	-73.28	-54.00	-19.28	RMS	
6		796.591	-83.16	8.16	-75.00	-54.00	-21.00	RMS	

Test Mode: TX Mode 2412 MHz (11b)

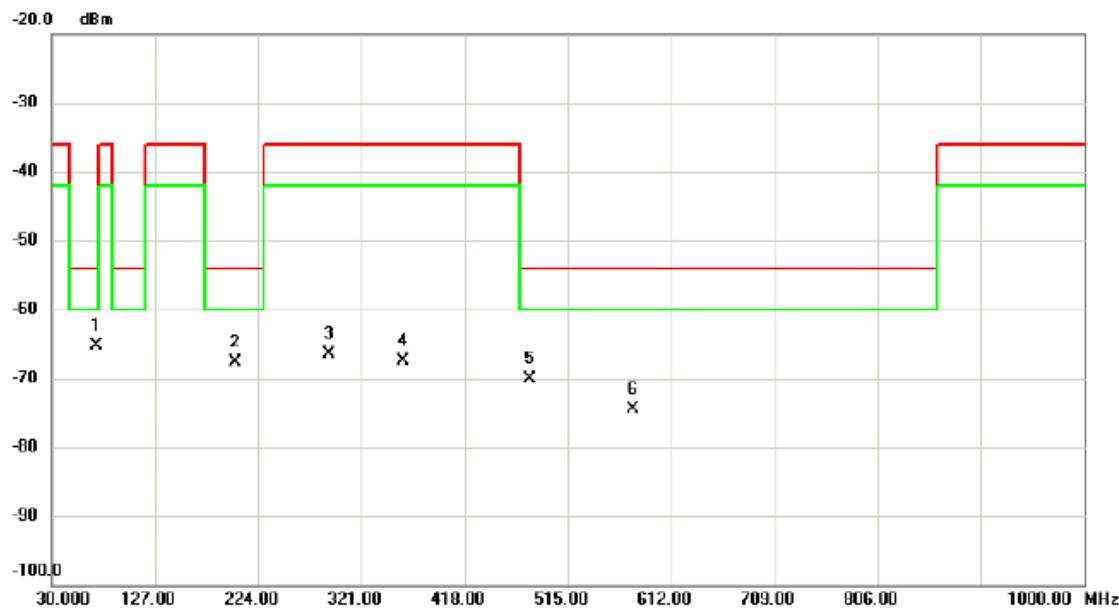
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	72.001	-56.32	-7.47	-63.79	-54.00	-9.79	RMS	
2		215.949	-61.21	-4.19	-65.40	-54.00	-11.40	RMS	
3		287.923	-56.34	-1.78	-58.12	-36.00	-22.12	RMS	
4		311.979	-59.34	-1.60	-60.94	-36.00	-24.94	RMS	
5		479.983	-73.10	3.37	-69.73	-54.00	-15.73	RMS	
6		575.916	-76.58	6.33	-70.25	-54.00	-16.25	RMS	

Test Mode: TX Mode 2472 MHz (11b)

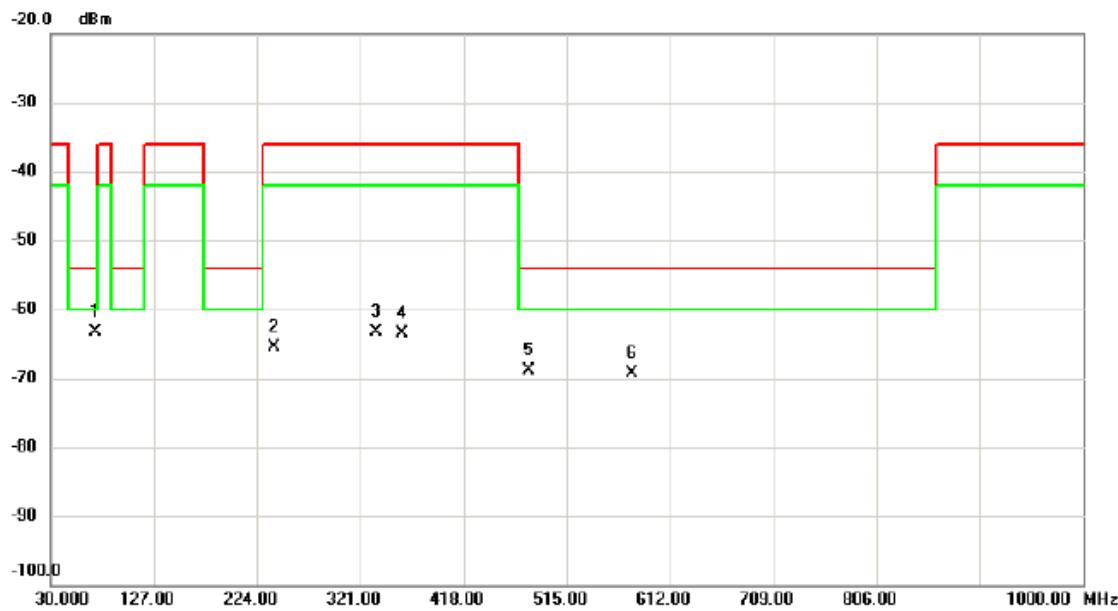
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	72.001	-59.05	-6.28	-65.33	-54.00	-11.33	RMS	
2		202.660	-62.09	-5.52	-67.61	-54.00	-13.61	RMS	
3		290.251	-65.45	-1.07	-66.52	-36.00	-30.52	RMS	
4		359.897	-68.00	0.42	-67.58	-36.00	-31.58	RMS	
5		479.983	-73.71	3.69	-70.02	-54.00	-16.02	RMS	
6		575.916	-80.37	5.77	-74.60	-54.00	-20.60	RMS	

Test Mode: TX Mode 2472 MHz (11b)

## Horizontal



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin	Detector	Comment
		Freq.	Level						
		MHz	dBm	dB	dBm	dBm	dB		
1	*	72.001	-55.78	-7.47	-63.25	-54.00	-9.25	RMS	
2		239.908	-62.97	-2.44	-65.41	-36.00	-29.41	RMS	
3		335.938	-62.03	-1.31	-63.34	-36.00	-27.34	RMS	
4		359.897	-64.09	0.57	-63.52	-36.00	-27.52	RMS	
5		479.983	-72.23	3.37	-68.86	-54.00	-14.86	RMS	
6		575.916	-75.62	6.33	-69.29	-54.00	-15.29	RMS	

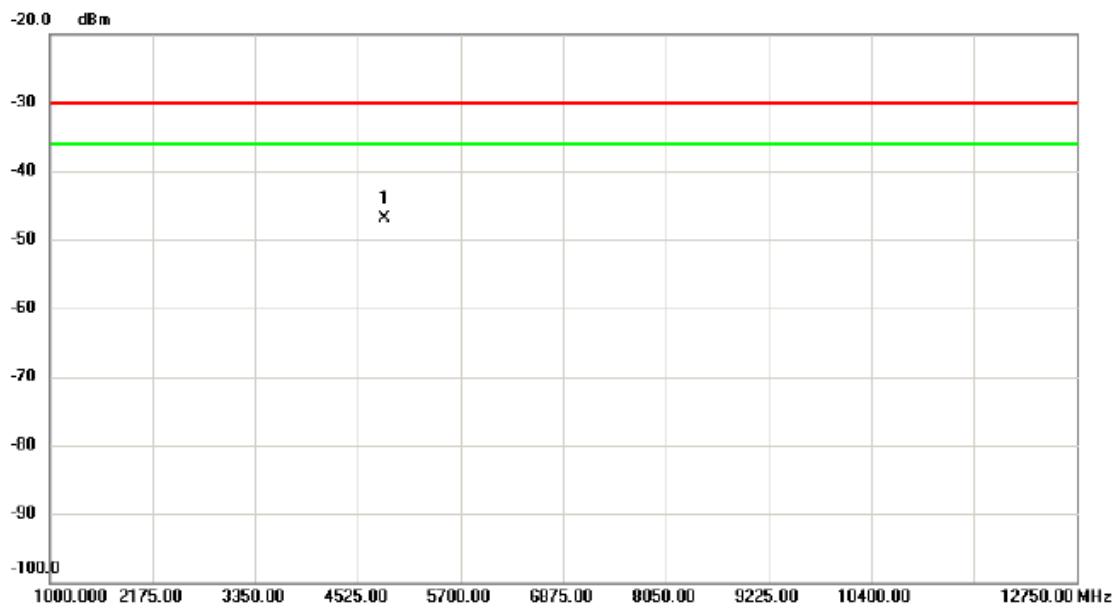
Test Mode: TX Mode 2412 MHz (11b)

## Vertical



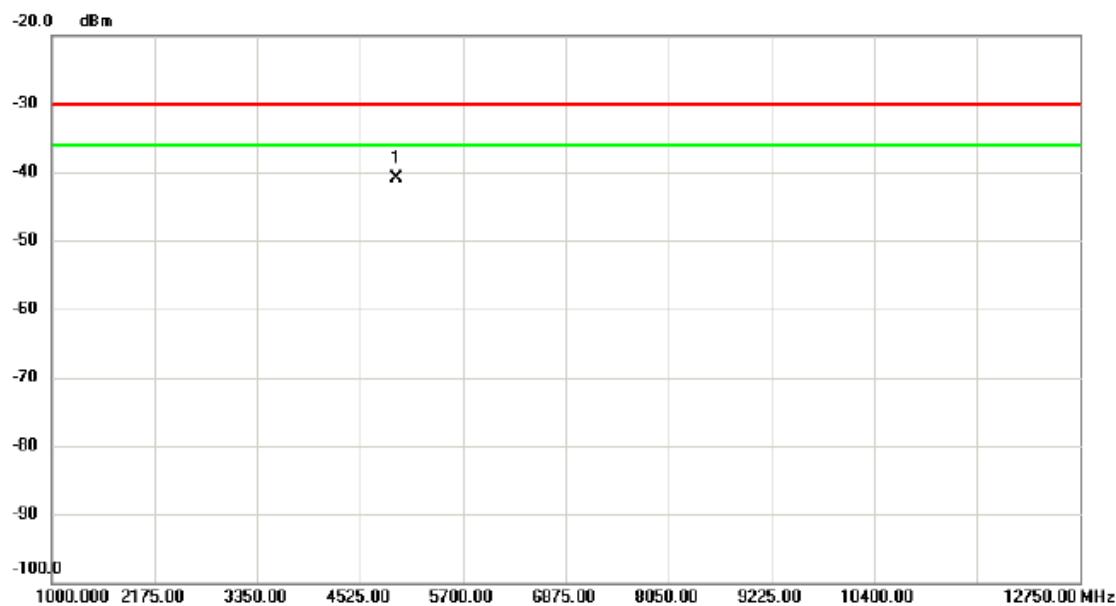
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		4823.994	-29.78	-8.17	-37.95	-30.00	-7.95 RMS

Test Mode:	TX Mode 2412 MHz (11b)
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**Horizontal**

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBm	dB	dBm	dB	Detector	Comment
1 *		4824.013	-34.80	-12.14	-46.94	-30.00	-16.94	RMS

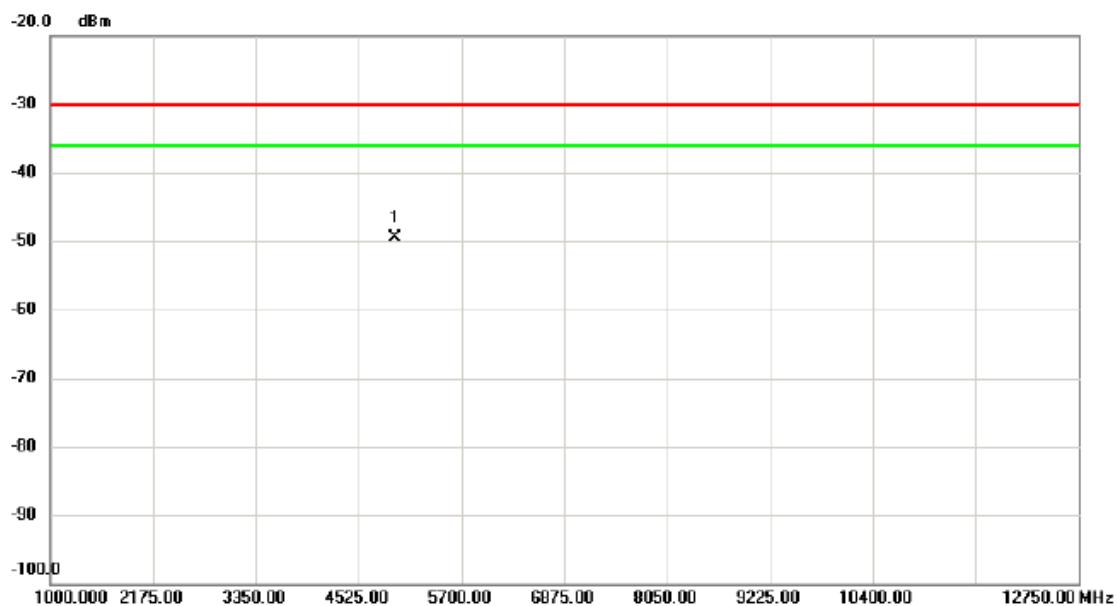
Test Mode:	TX Mode 2472 MHz (11b)
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**Vertical**

No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
	MHz	dBm	dB	dBm	dBm	dB	Detector Comment
1 *	4943.839	-32.79	-8.05	-40.84	-30.00	-10.84	RMS

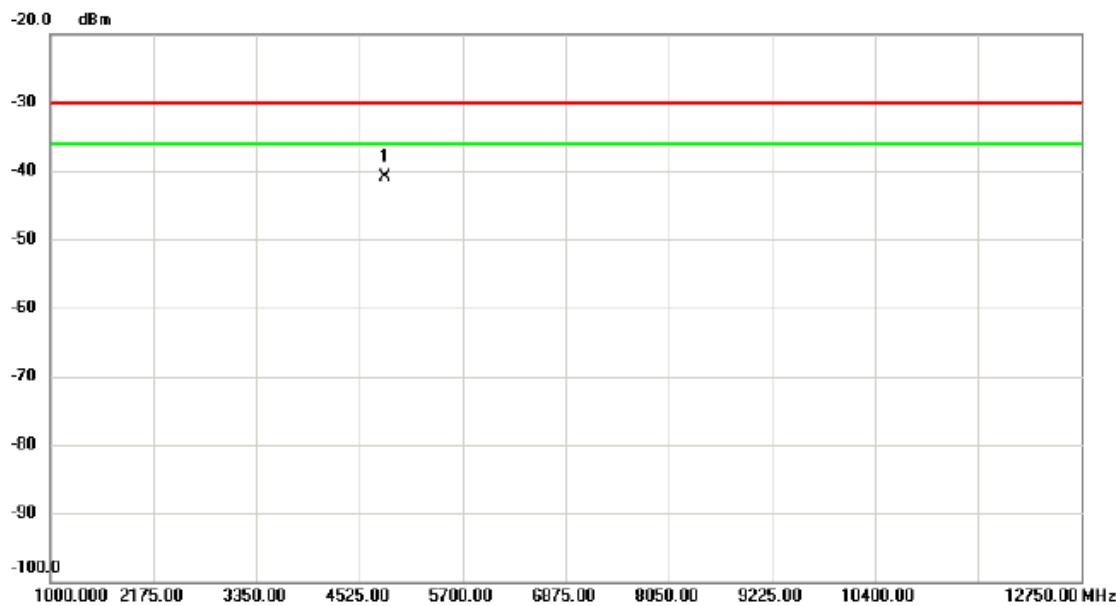
Test Mode: TX Mode 2472 MHz (11b)

## Horizontal



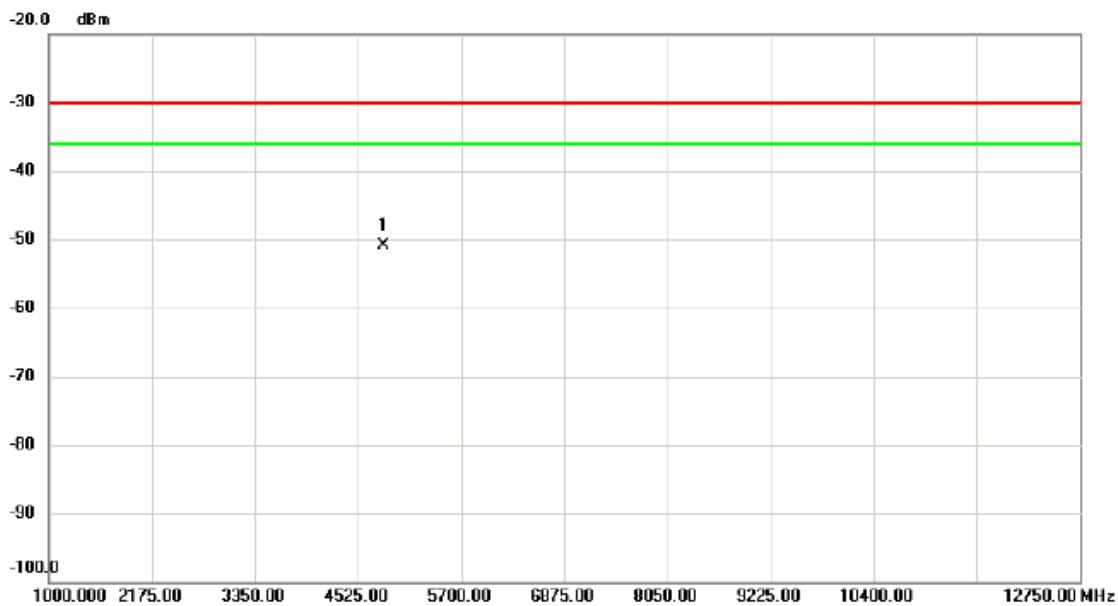
No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4944.037	-37.11	-12.31	-49.42	-30.00	-19.42	RMS	

Test Mode:	TX Mode 2412 MHz (11g)
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**Vertical**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4820.589	-32.76	-8.18	-40.94	-30.00	-10.94	RMS	

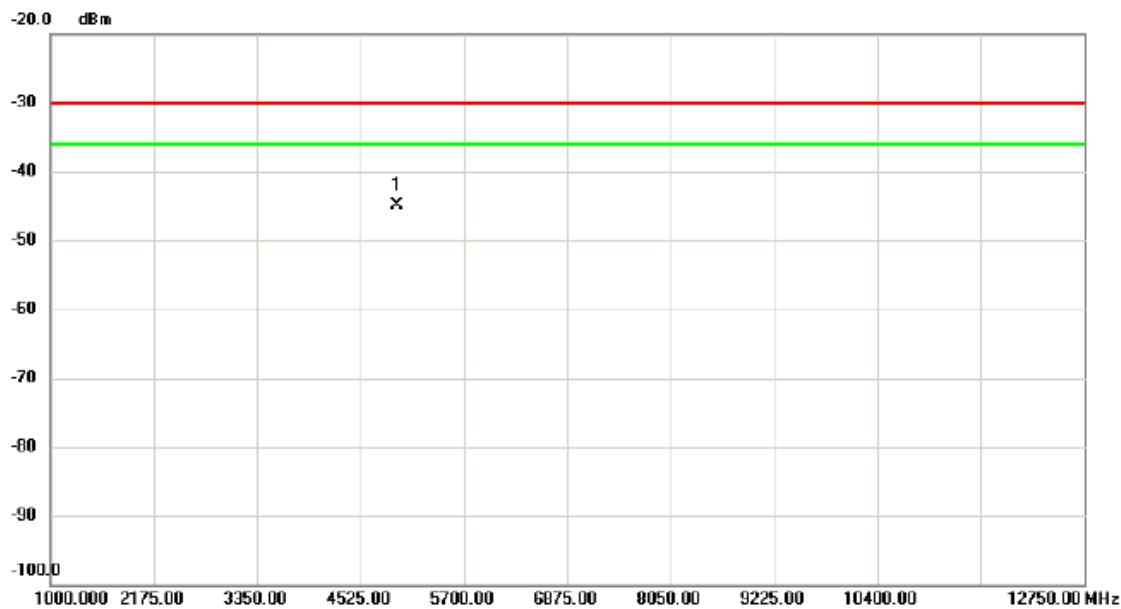
Test Mode:	TX Mode 2412 MHz (11g)
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**Horizontal**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	4822.619	-38.74	-12.14	-50.88	-30.00	-20.88	RMS	

Test Mode: TX Mode 2472 MHz (11g)

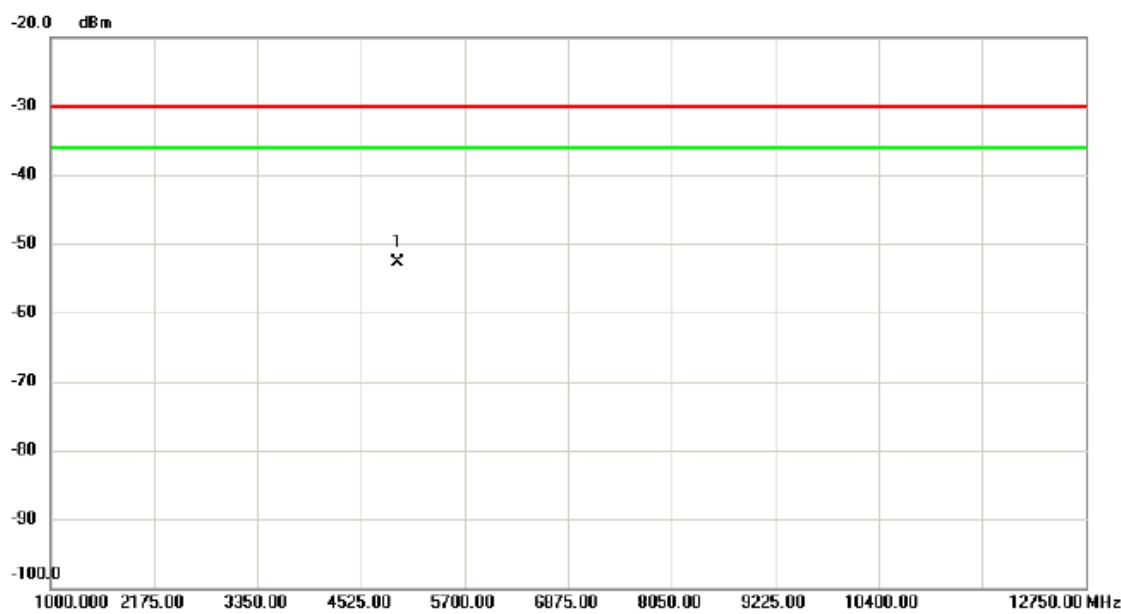
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4941.978	-36.74	-8.06	-44.80	-30.00	-14.80	RMS	

Test Mode: TX Mode 2472 MHz (11g)

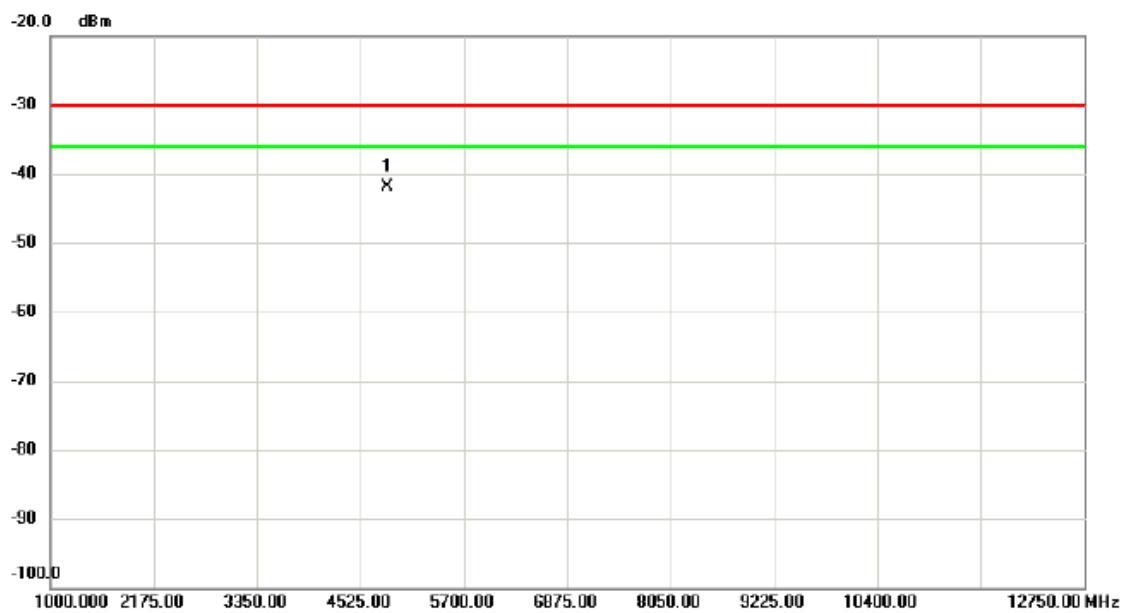
## Horizontal



No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBM	dB	dBM	dB	Detector Comment
1 *		4940.808	-40.41	-12.31	-52.72	-30.00	-22.72 RMS

Test Mode: TX Mode 2412 MHz (11n 20M)

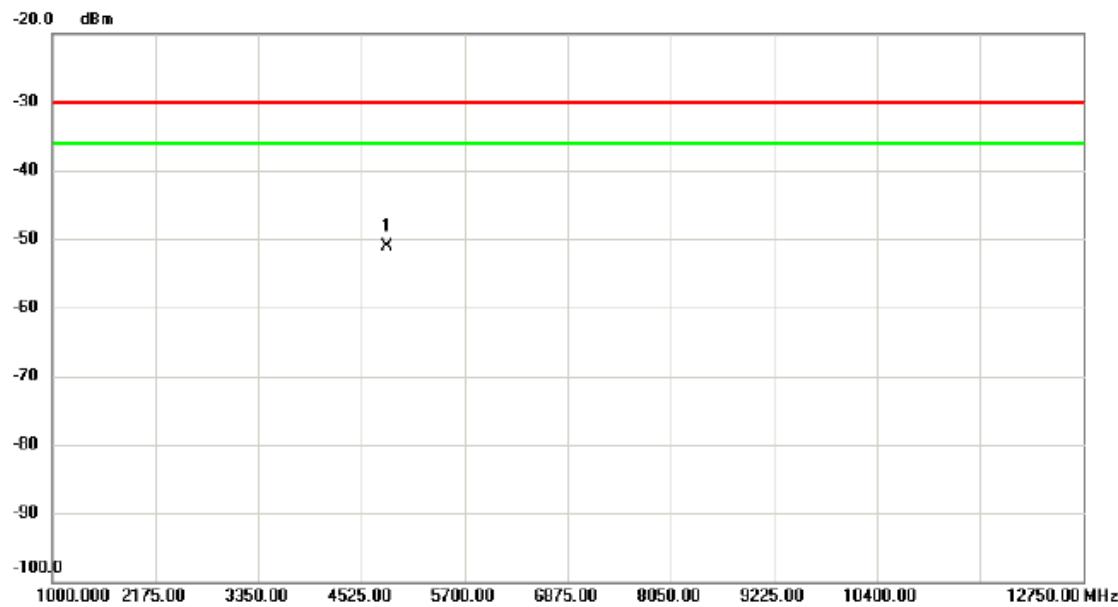
Vertical



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin	
		Freq. MHz	Level dBm					
1 *		4826.592	-33.82	-8.17	-41.99	-30.00	-11.99	RMS

Test Mode: TX Mode 2412 MHz (11n 20M)

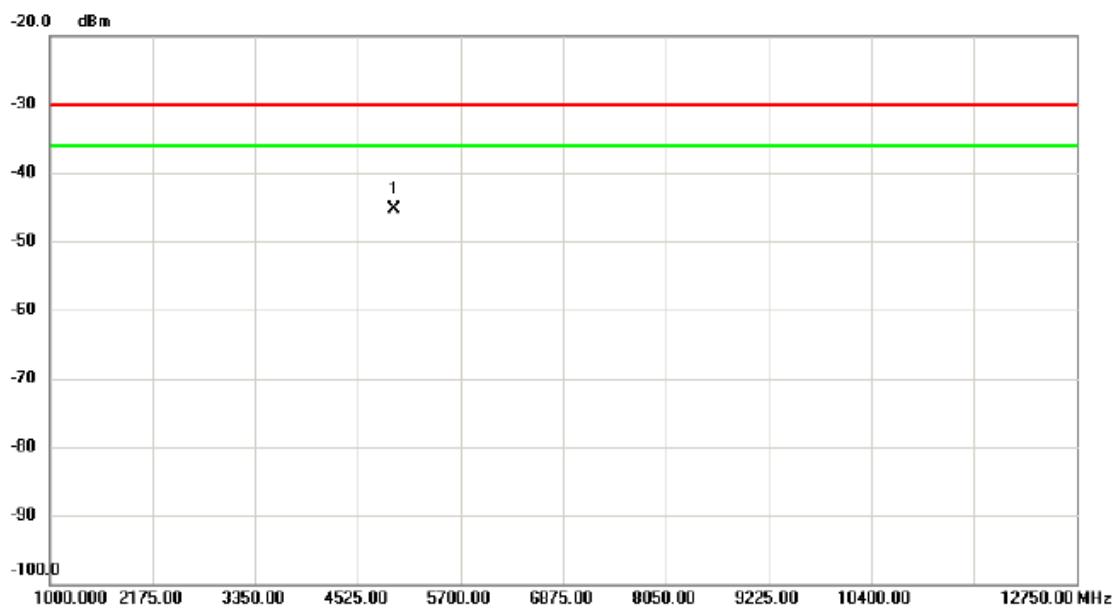
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4821.497	-38.90	-12.14	-51.04	-30.00	-21.04	RMS	

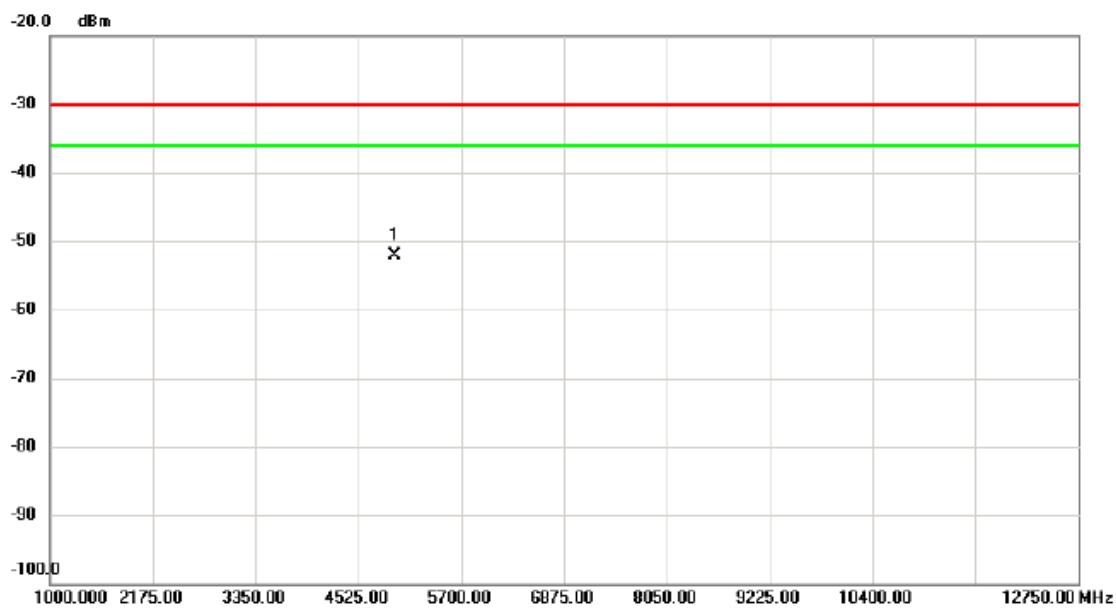
Test Mode: TX Mode 2472 MHz (11n 20M)

### Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4940.860	-37.32	-8.06	-45.38	-30.00	-15.38	RMS	

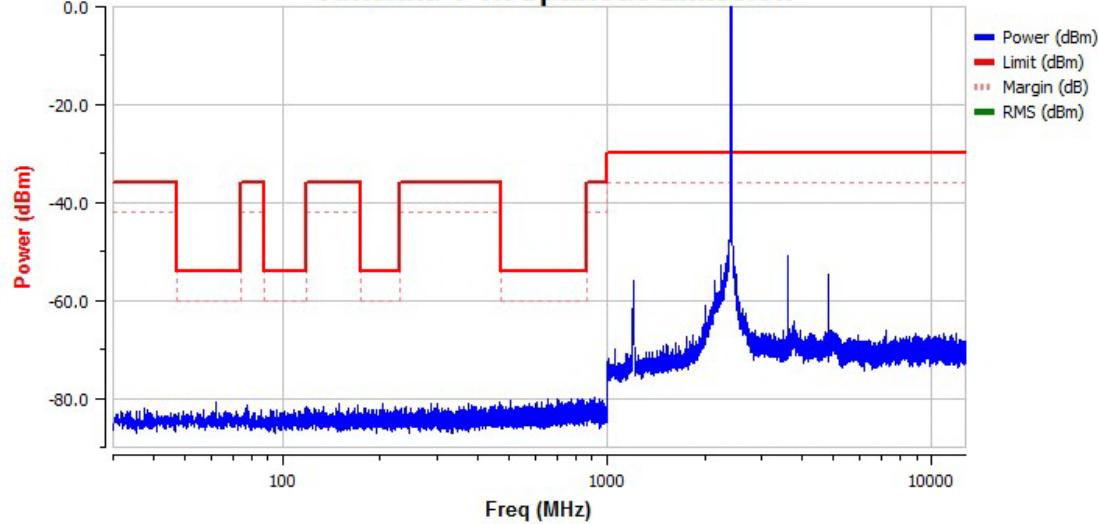
Test Mode: TX Mode 2472 MHz (11n 20M)

**Horizontal**

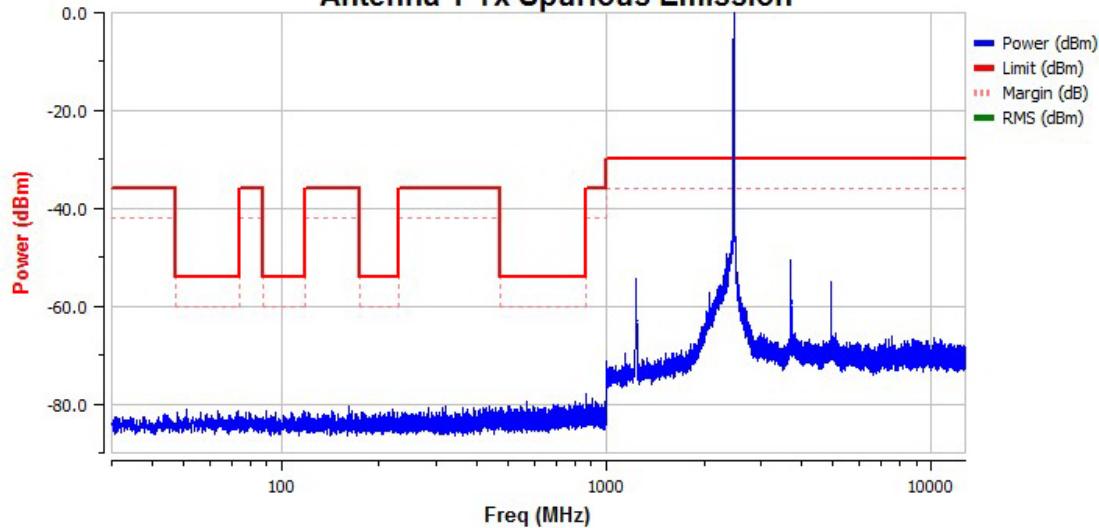
No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4943.591	-39.84	-12.31	-52.15	-30.00	-22.15	RMS	

### For Dipole antenna

802.11b Mode\_CH01  
Antenna 1 Tx Spurious Emission

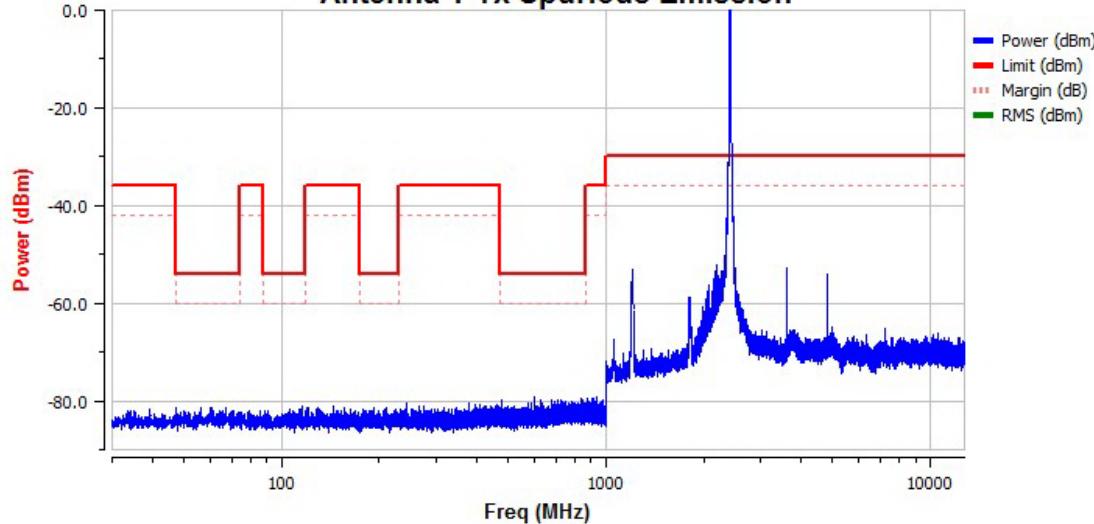


802.11b Mode\_CH13  
Antenna 1 Tx Spurious Emission



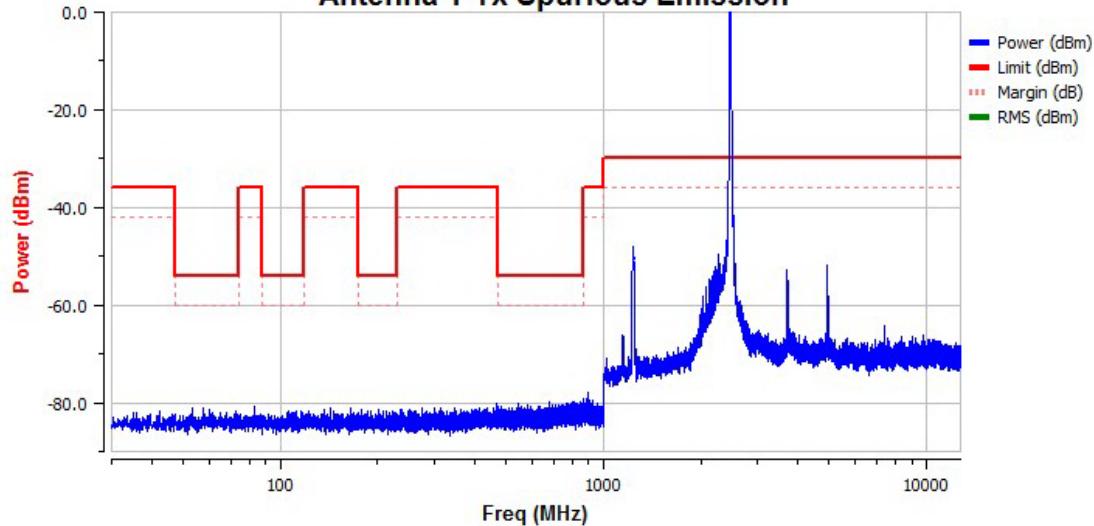
## 802.11g Mode\_CH01

## Antenna 1 Tx Spurious Emission

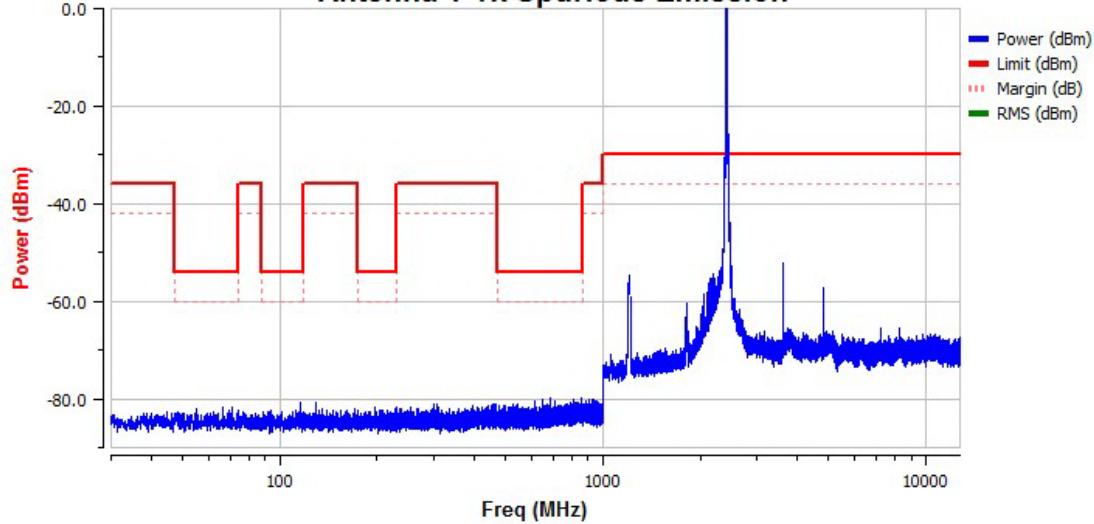


## 802.11g Mode\_CH13

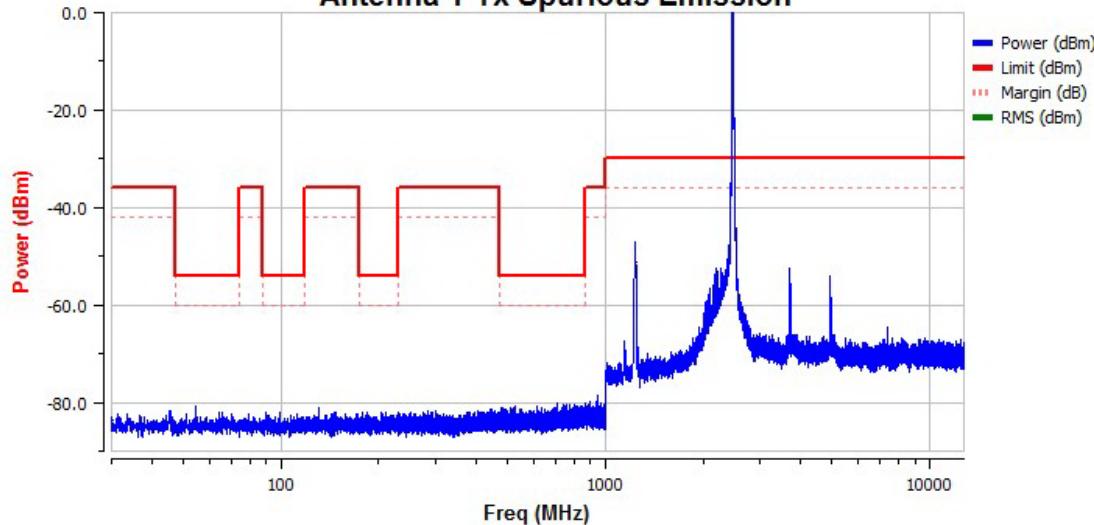
## Antenna 1 Tx Spurious Emission



**802.11n 20M Mode\_CH01**  
**Antenna 1 Tx Spurious Emission**

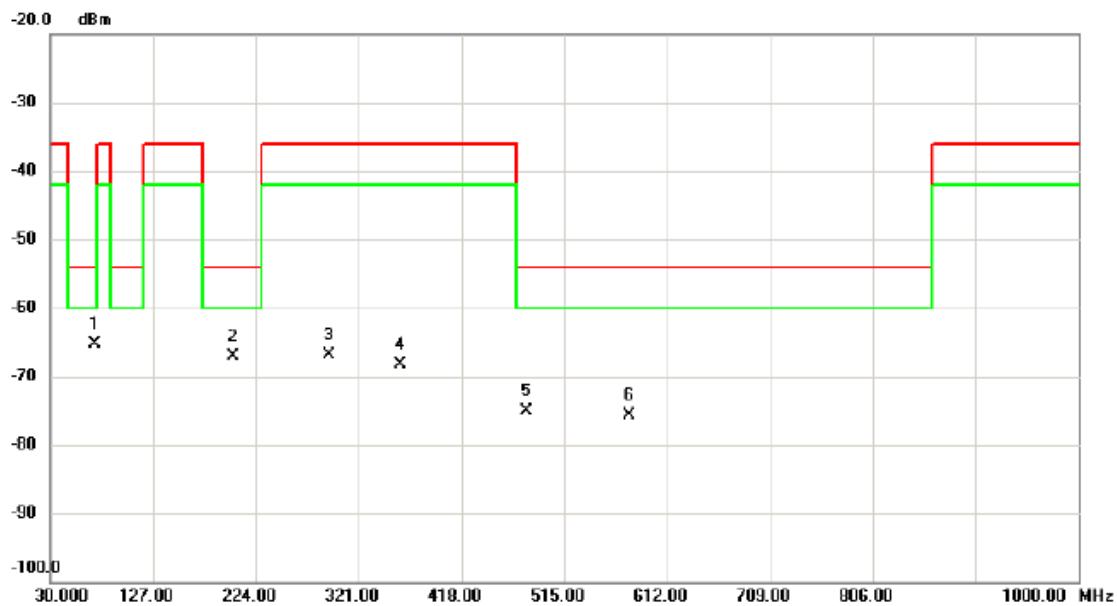


**802.11n 20M Mode\_CH13**  
**Antenna 1 Tx Spurious Emission**



Test Mode: TX Mode 2412 MHz (11b)

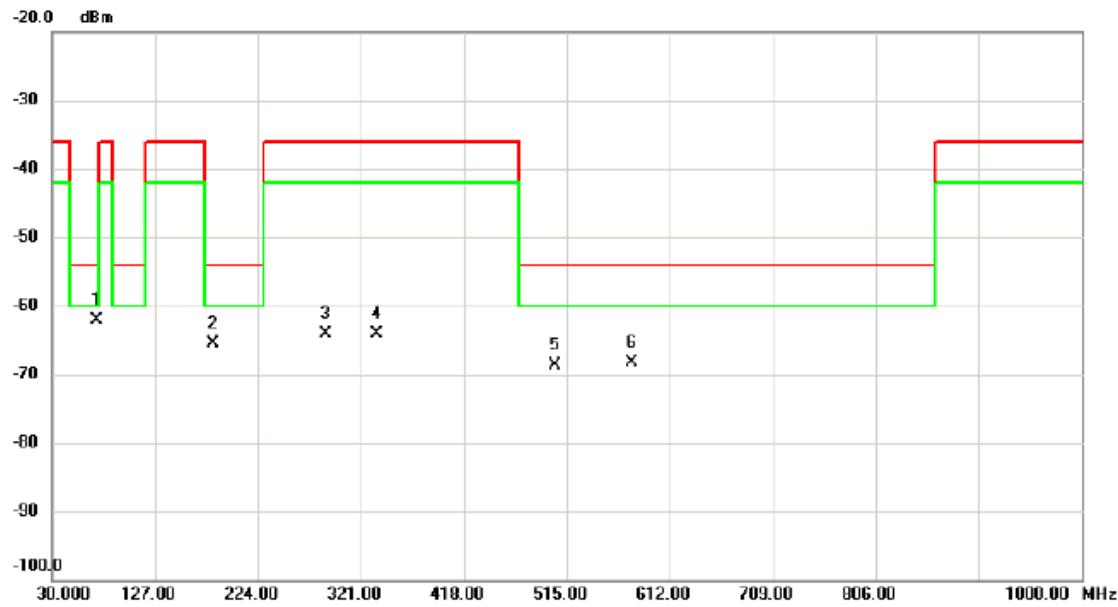
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	72.001	-59.08	-6.28	-65.36	-54.00	-11.36	RMS	
2		202.369	-61.46	-5.54	-67.00	-54.00	-13.00	RMS	
3		293.840	-65.85	-1.08	-66.93	-36.00	-30.93	RMS	
4		360.091	-68.69	0.43	-68.26	-36.00	-32.26	RMS	
5		479.983	-78.72	3.69	-75.03	-54.00	-21.03	RMS	
6		575.916	-81.47	5.77	-75.70	-54.00	-21.70	RMS	

Test Mode: TX Mode 2412 MHz (11b)

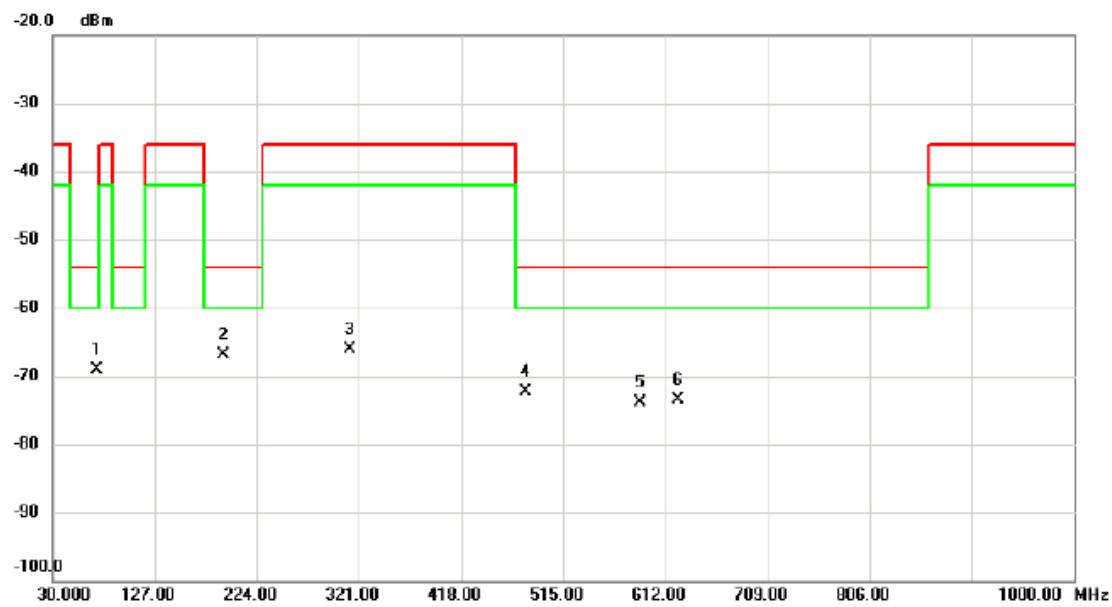
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	72.001	-54.63	-7.47	-62.10	-54.00	-8.10	RMS	
2		181.320	-61.68	-3.81	-65.49	-54.00	-11.49	RMS	
3		287.923	-62.38	-1.78	-64.16	-36.00	-28.16	RMS	
4		335.938	-62.88	-1.31	-64.19	-36.00	-28.19	RMS	
5		504.039	-72.81	4.12	-68.69	-54.00	-14.69	RMS	
6		576.013	-74.61	6.33	-68.28	-54.00	-14.28	RMS	

Test Mode: TX Mode 2472 MHz (11b)

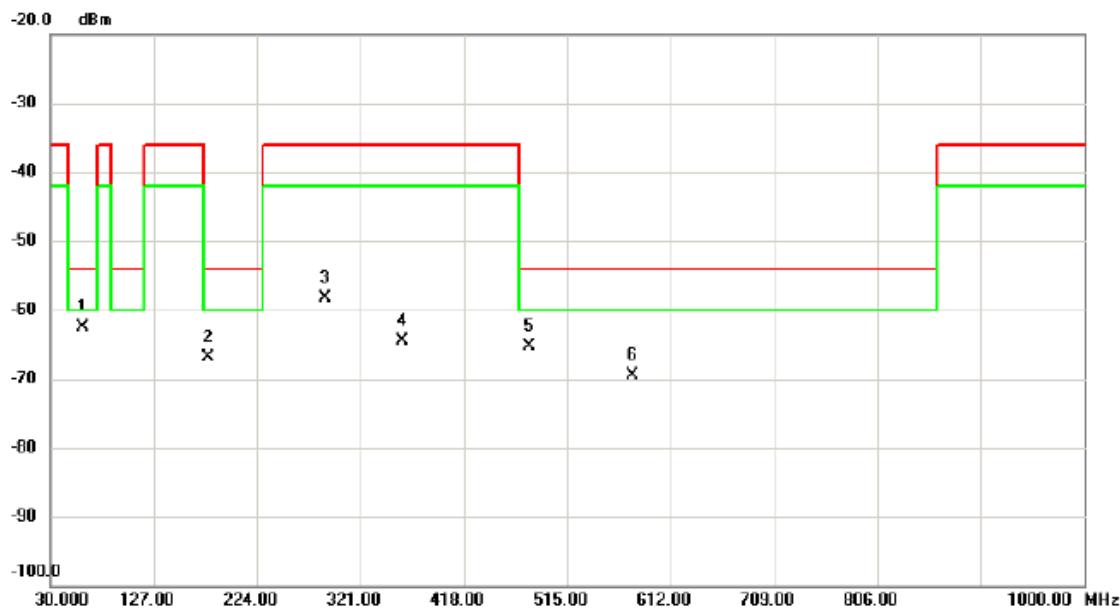
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1		71.904	-62.90	-6.22	-69.12	-54.00	-15.12	RMS	
2 *		191.990	-61.49	-5.47	-66.96	-54.00	-12.96	RMS	
3		311.979	-65.37	-0.76	-66.13	-36.00	-30.13	RMS	
4		479.983	-75.90	3.69	-72.21	-54.00	-18.21	RMS	
5		588.138	-80.43	6.51	-73.92	-54.00	-19.92	RMS	
6		623.931	-79.75	6.34	-73.41	-54.00	-19.41	RMS	

Test Mode: TX Mode 2472 MHz (11b)

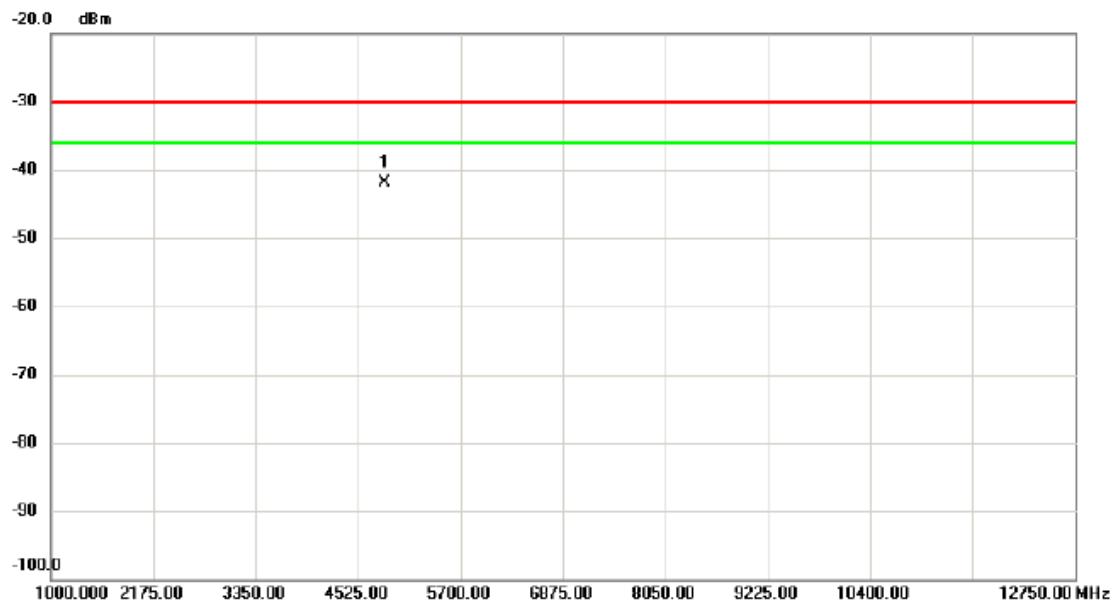
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	59.973	-58.09	-4.50	-62.59	-54.00	-8.59	RMS	
2		178.313	-63.18	-3.68	-66.86	-54.00	-12.86	RMS	
3		287.923	-56.55	-1.78	-58.33	-36.00	-22.33	RMS	
4		359.994	-64.98	0.58	-64.40	-36.00	-28.40	RMS	
5		479.983	-68.65	3.37	-65.28	-54.00	-11.28	RMS	
6		575.916	-75.89	6.33	-69.56	-54.00	-15.56	RMS	

Test Mode: TX Mode 2412 MHz (11b)

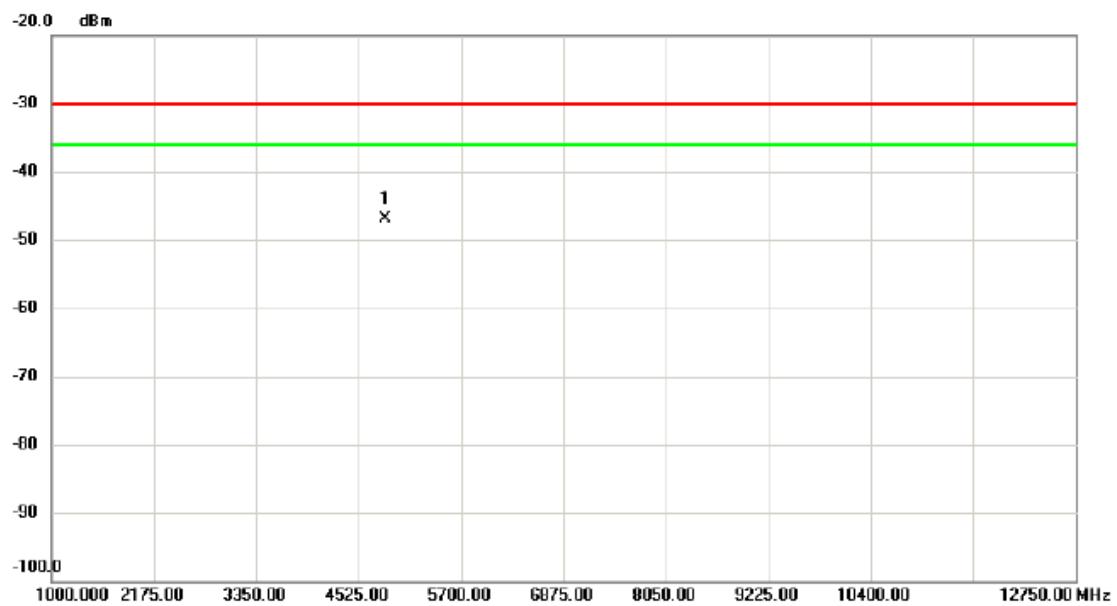
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4823.878	-33.78	-8.17	-41.95	-30.00	-11.95	RMS	

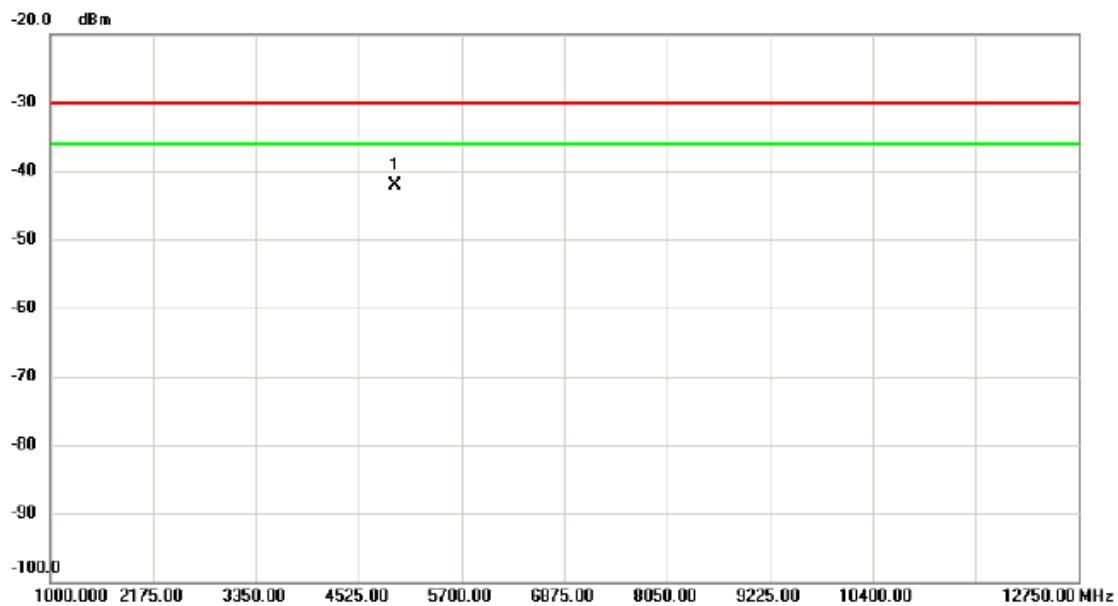
Test Mode: TX Mode 2412 MHz (11b)

## Horizontal



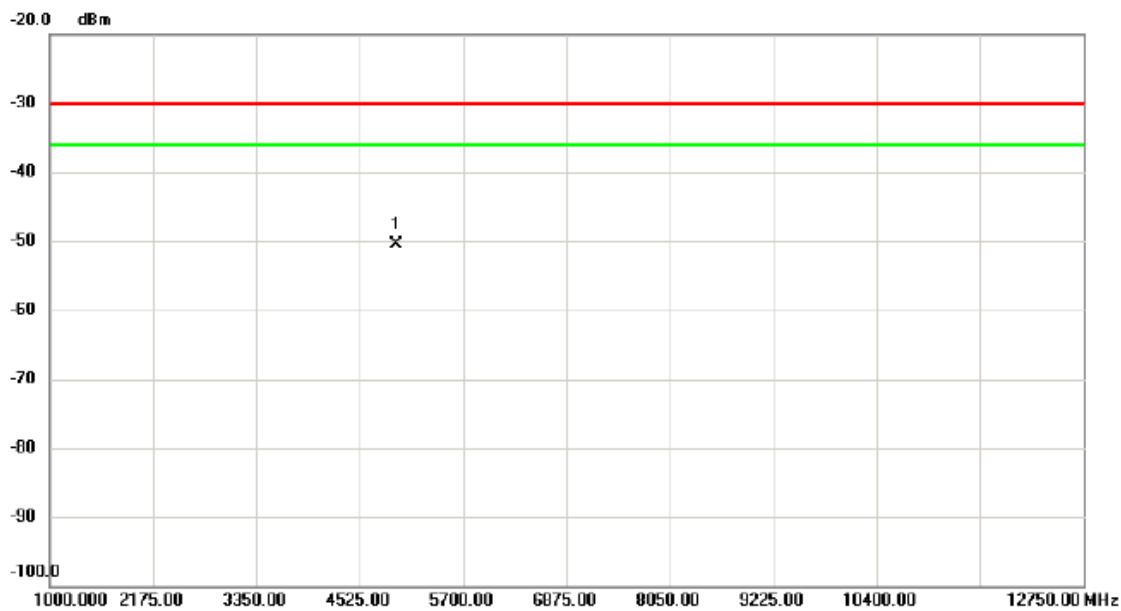
No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4823.940	-34.84	-12.14	-46.98	-30.00	-16.98	RMS	

Test Mode:	TX Mode 2472 MHz (11b)
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**Vertical**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4943.987	-34.00	-8.05	-42.05	-30.00	-12.05	RMS	

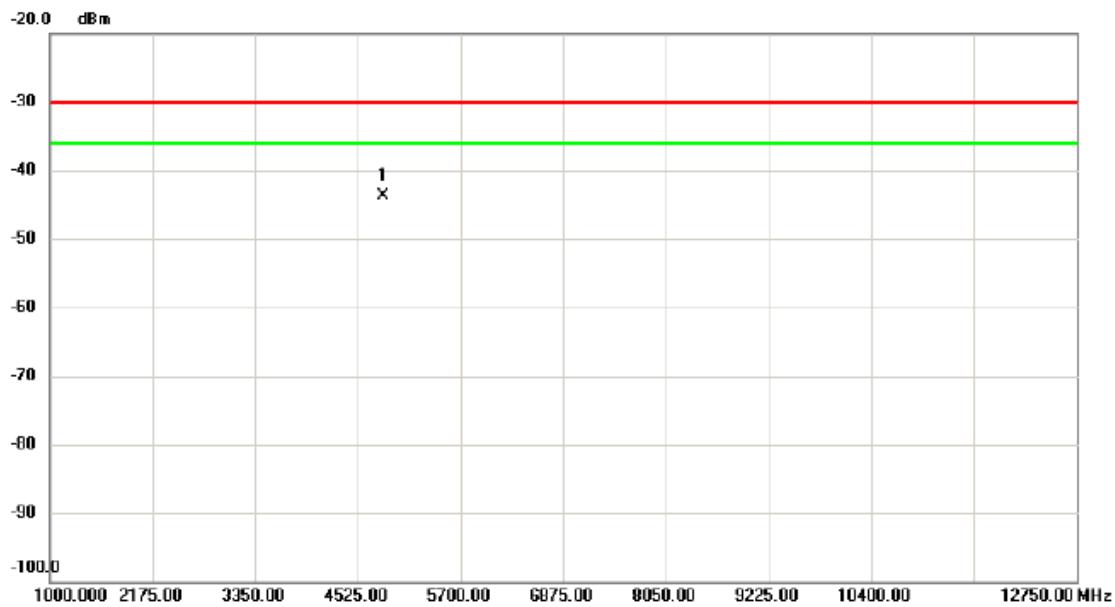
Test Mode:	TX Mode 2472 MHz (11b)
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**Horizontal**

No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin
		Freq. MHz	Level dBm				
1 *		4943.975	-38.09	-12.31	-50.40	-30.00	-20.40 RMS

Test Mode: TX Mode 2412 MHz (11g)

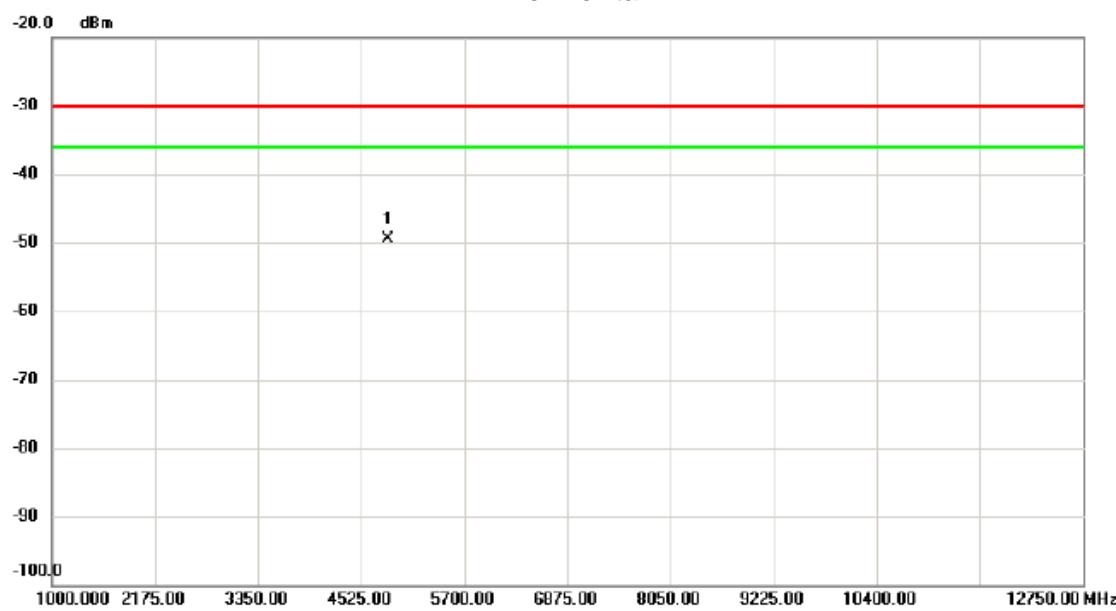
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		4822.646	-35.58	-8.17	-43.75	-30.00	-13.75 RMS

Test Mode: TX Mode 2412 MHz (11g)

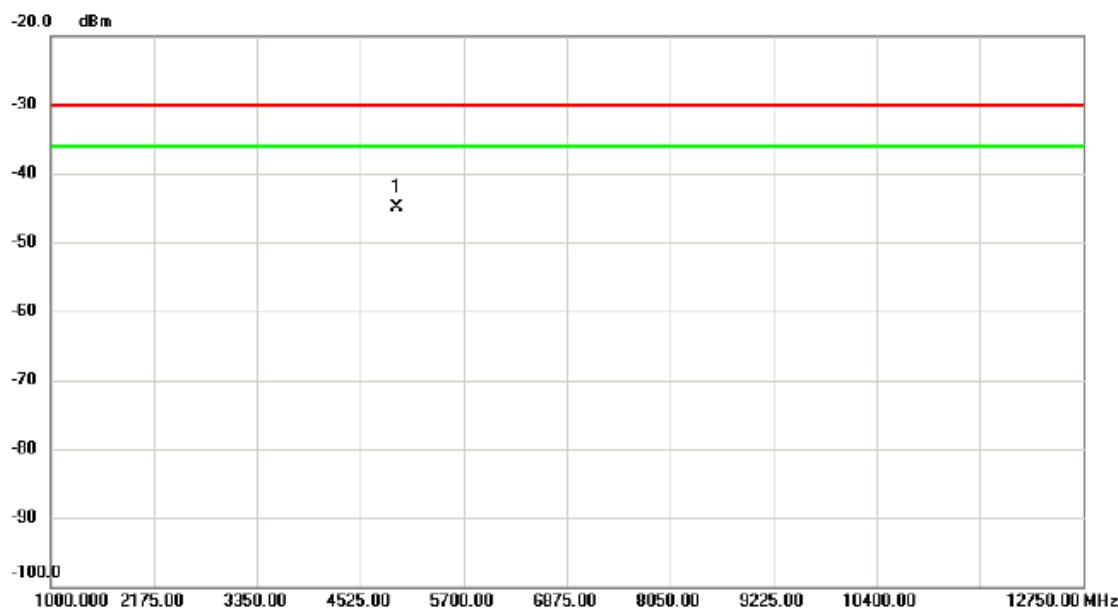
### Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		4823.498	-37.34	-12.14	-49.48	-30.00	-19.48	RMS	

Test Mode: TX Mode 2472 MHz (11g)

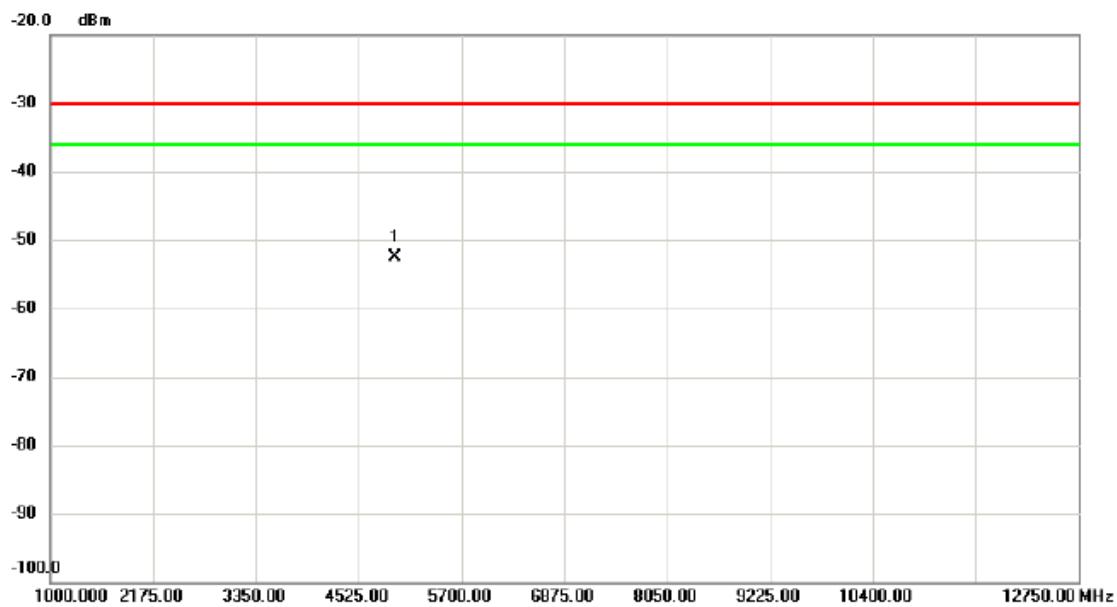
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		4942.751	-36.92	-8.06	-44.98	-30.00	-14.98 RMS

Test Mode: TX Mode 2472 MHz (11g)

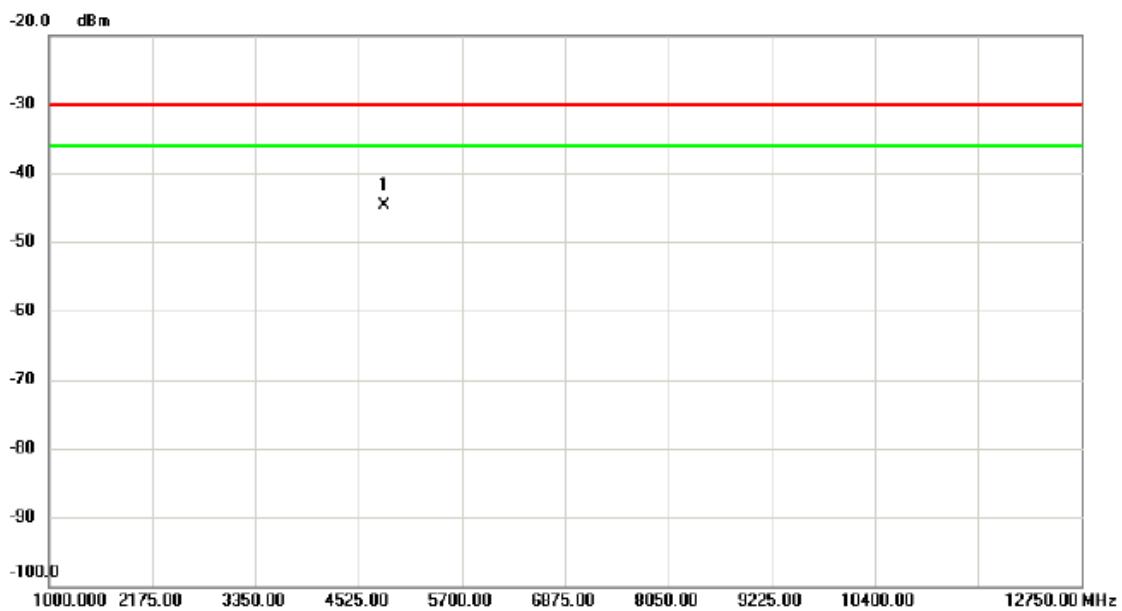
## Horizontal



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBm					
1 *		4944.577	-40.20	-12.31	-52.51	-30.00	-22.51	RMS

Test Mode: TX Mode 2412 MHz (11n 20M)

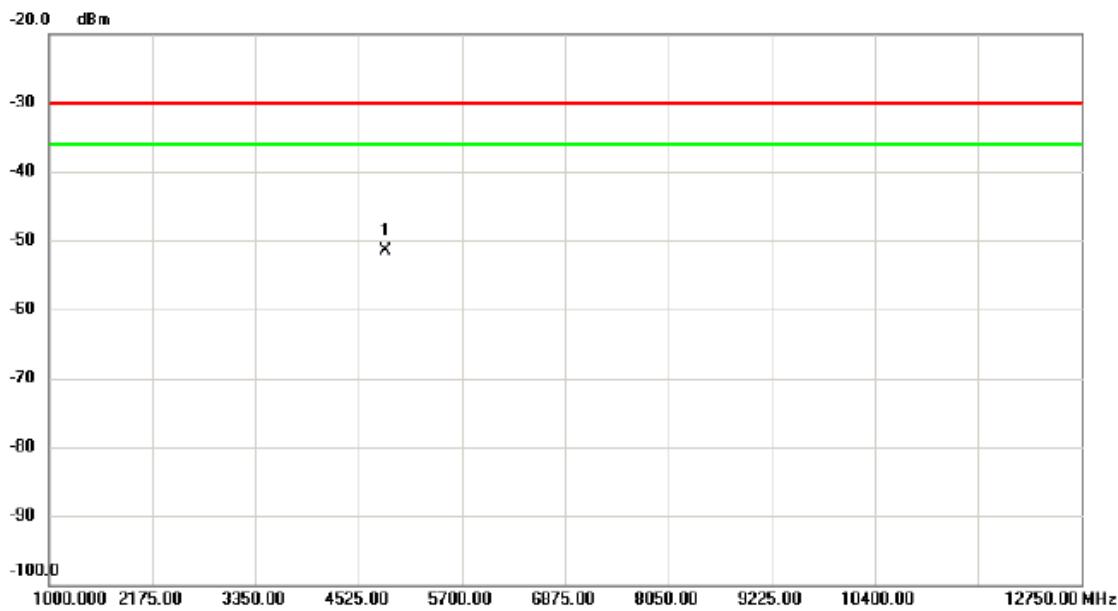
Vertical



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin	
		Freq. MHz	Level dBm					
1 *		4821.677	-36.48	-8.17	-44.65	-30.00	-14.65	RMS

Test Mode: TX Mode 2412 MHz (11n 20M)

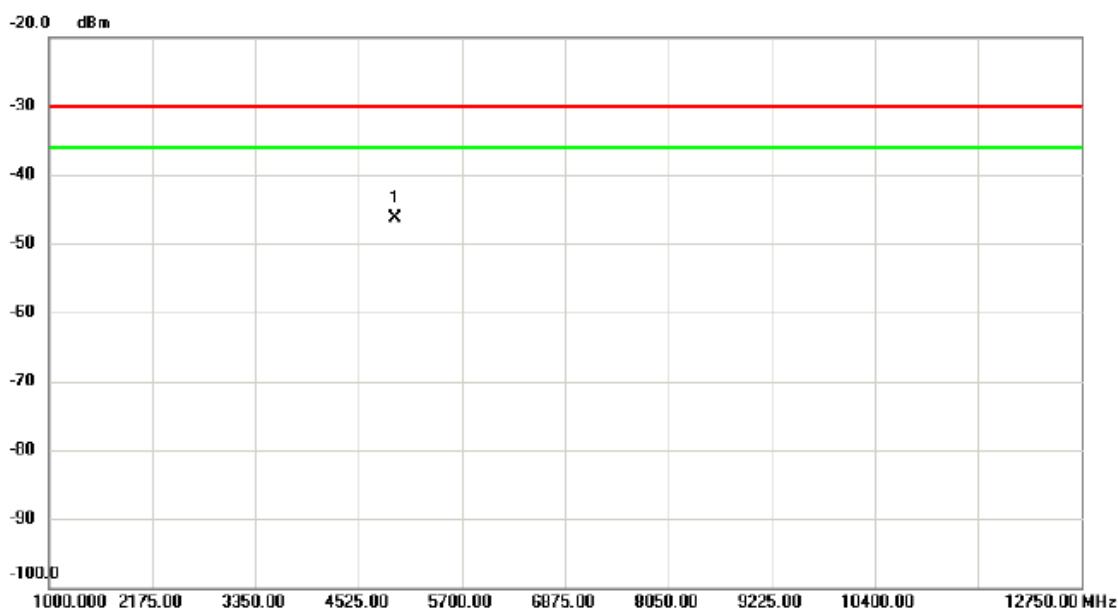
## Horizontal



No.	Mk.	Reading	Correct	Measure-	Limit	Margin	
		Freq.	Level	Factor	ment		
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		4823.976	-39.37	-12.14	-51.51	-30.00	-21.51 RMS

Test Mode: TX Mode 2472 MHz (11n 20M)

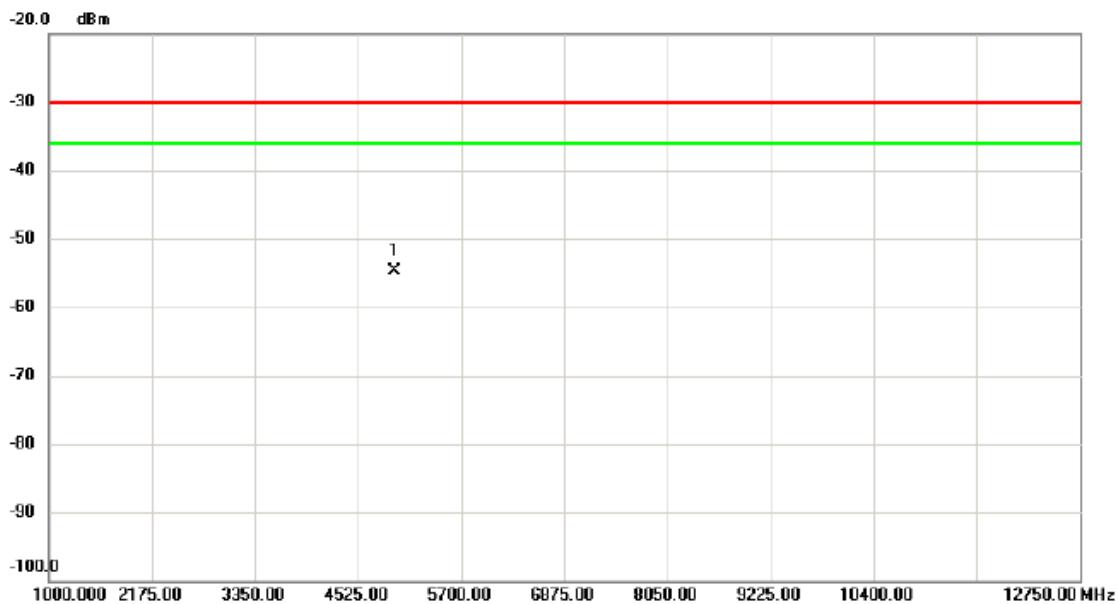
Vertical



No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
	MHz	dBm	dB	dBm	dBm	dB	Detector Comment
1 *	4939.674	-38.28	-8.06	-46.34	-30.00	-16.34	RMS

Test Mode: TX Mode 2472 MHz (11n 20M)

### Horizontal

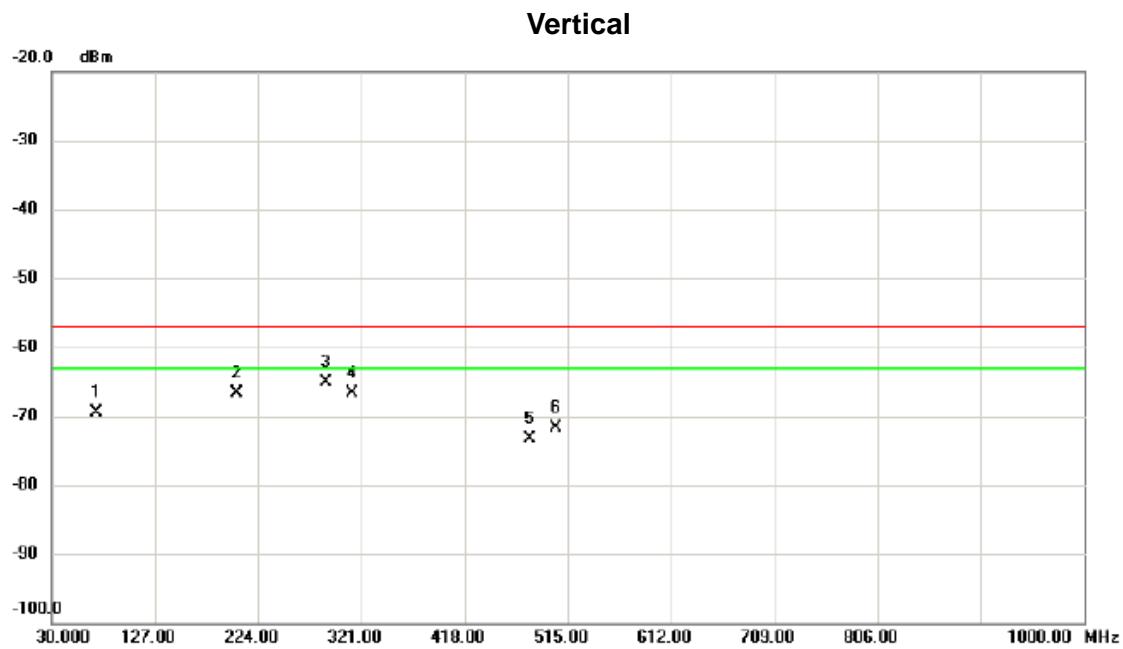


No.	Mk.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
	MHz	dBm	dB	dBm	dBm	dB	Detector Comment
1	*	4945.777	-42.33	-12.31	-54.64	-30.00	-24.64 RMS

## APPENDIX I - RECEIVER SPURIOUS EMISSIONS

## For Chip antenna

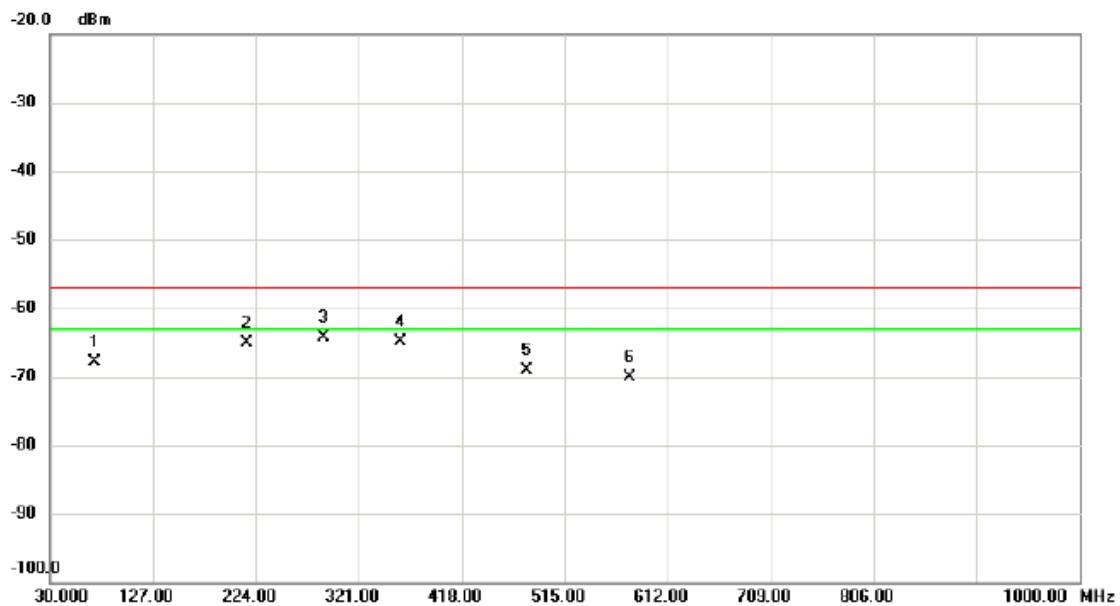
Test Mode: RX Mode 2412 MHz (11b)



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1		72.001	-63.25	-6.28	-69.53	-57.00	-12.53	RMS	
2		204.115	-61.30	-5.43	-66.73	-57.00	-9.73	RMS	
3 *		287.923	-63.89	-1.21	-65.10	-57.00	-8.10	RMS	
4		311.979	-65.98	-0.76	-66.74	-57.00	-9.74	RMS	
5		479.983	-77.05	3.69	-73.36	-57.00	-16.36	RMS	
6		504.136	-75.81	4.11	-71.70	-57.00	-14.70	RMS	

Test Mode: RX Mode 2412 MHz (11b)

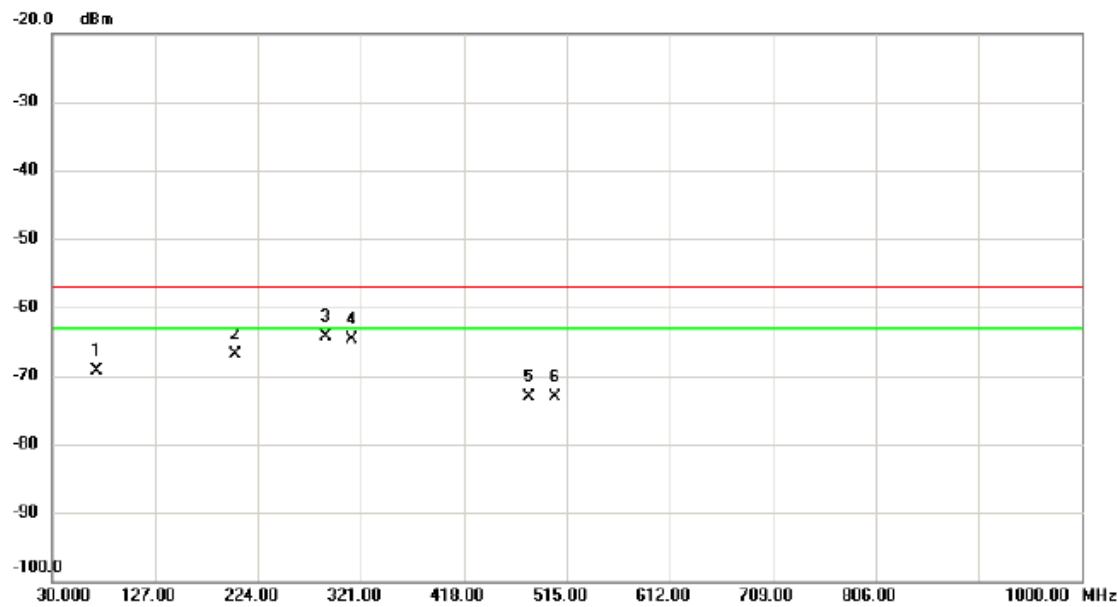
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	72.001	72.001	-60.33	-7.47	-67.80	-57.00	-10.80	RMS	
2	215.949	215.949	-60.97	-4.19	-65.16	-57.00	-8.16	RMS	
3 *	287.923	287.923	-62.52	-1.78	-64.30	-57.00	-7.30	RMS	
4	359.994	359.994	-65.41	0.58	-64.83	-57.00	-7.83	RMS	
5	479.983	479.983	-72.44	3.37	-69.07	-57.00	-12.07	RMS	
6	575.916	575.916	-76.52	6.33	-70.19	-57.00	-13.19	RMS	

Test Mode: RX Mode 2472 MHz (11b)

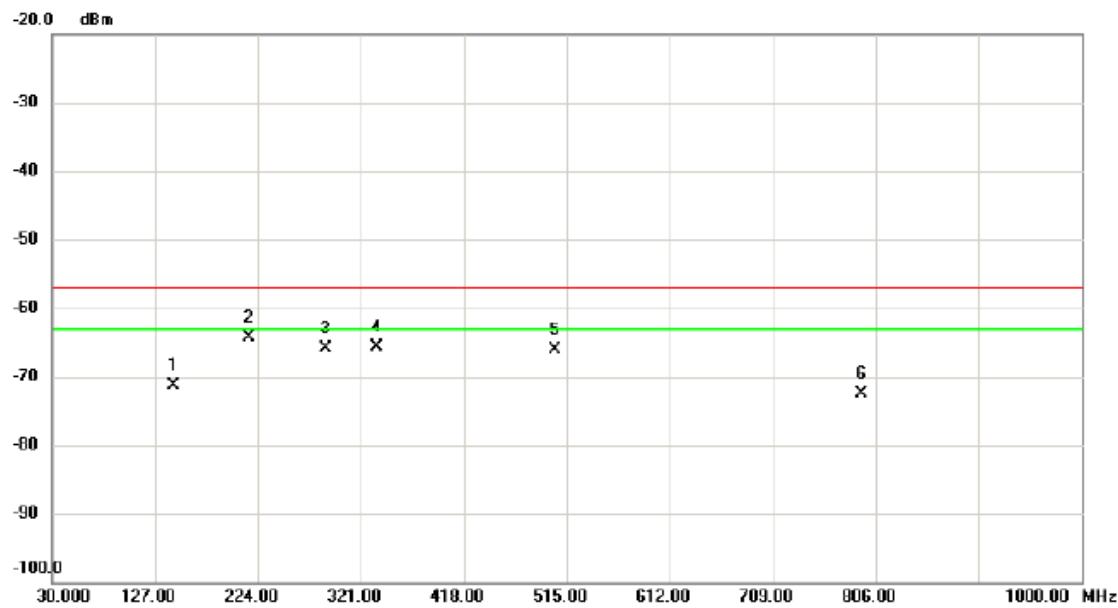
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1		72.098	-62.87	-6.34	-69.21	-57.00	-12.21	RMS	
2		202.660	-61.42	-5.52	-66.94	-57.00	-9.94	RMS	
3 *		287.923	-63.08	-1.21	-64.29	-57.00	-7.29	RMS	
4		311.979	-63.96	-0.76	-64.72	-57.00	-7.72	RMS	
5		479.983	-76.81	3.69	-73.12	-57.00	-16.12	RMS	
6		503.942	-77.12	4.11	-73.01	-57.00	-16.01	RMS	

Test Mode: RX Mode 2472 MHz (11b)

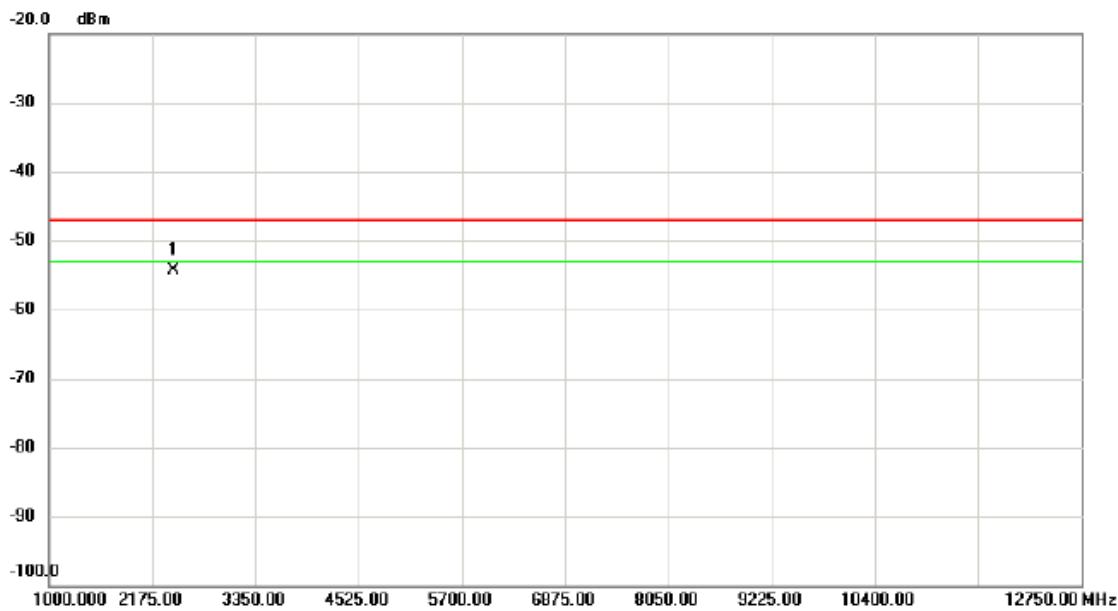
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	143.975	-70.65	-0.73	-71.38	-57.00	-14.38	RMS		
2 *	215.949	-60.08	-4.19	-64.27	-57.00	-7.27	RMS		
3	287.923	-64.20	-1.78	-65.98	-57.00	-8.98	RMS		
4	335.938	-64.42	-1.31	-65.73	-57.00	-8.73	RMS		
5	503.942	-70.17	4.12	-66.05	-57.00	-9.05	RMS		
6	791.935	-80.80	8.29	-72.51	-57.00	-15.51	RMS		

Test Mode: RX Mode 2412 MHz (11b)

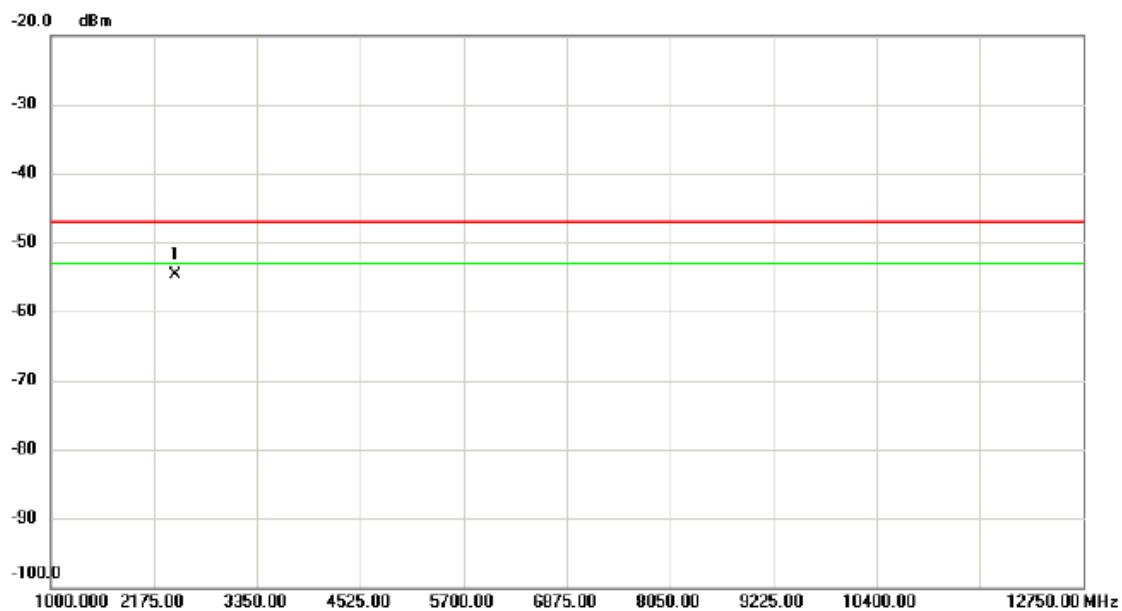
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.148	-50.97	-3.32	-54.29	-47.00	-7.29 RMS

Test Mode: RX Mode 2412 MHz (11b)

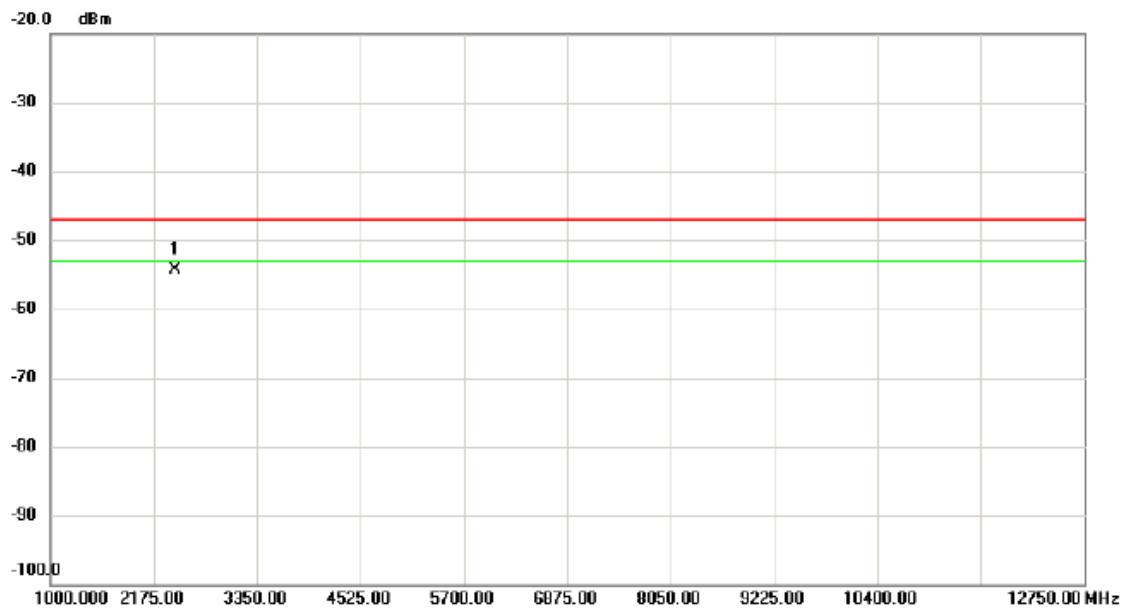
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.173	-51.40	-3.34	-54.74	-47.00	-7.74	RMS	

Test Mode: RX Mode 2472 MHz (11b)

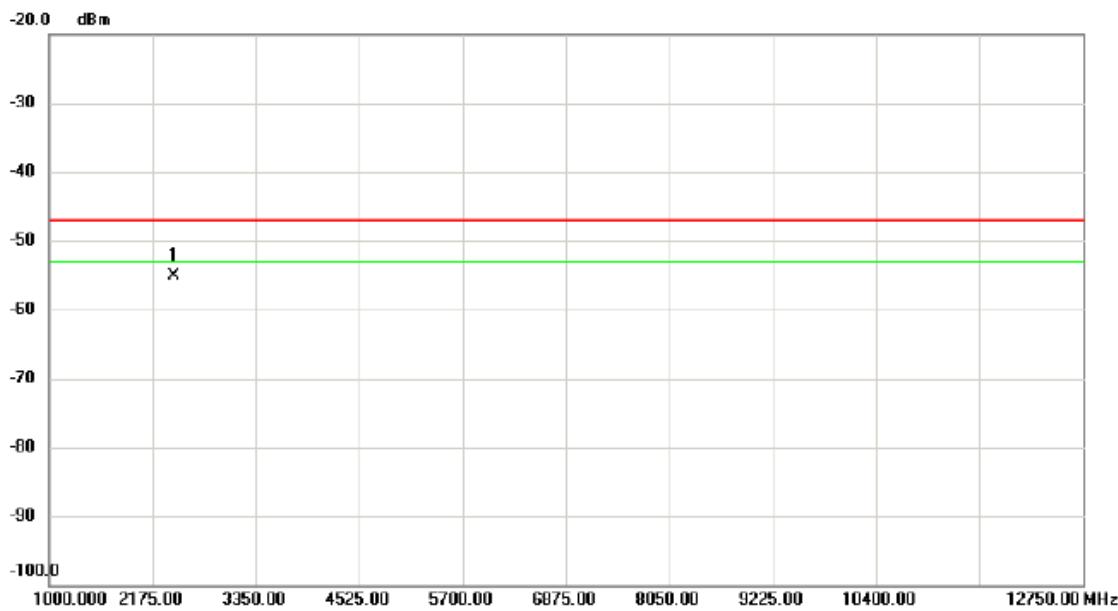
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.038	-50.89	-3.32	-54.21	-47.00	-7.21 RMS

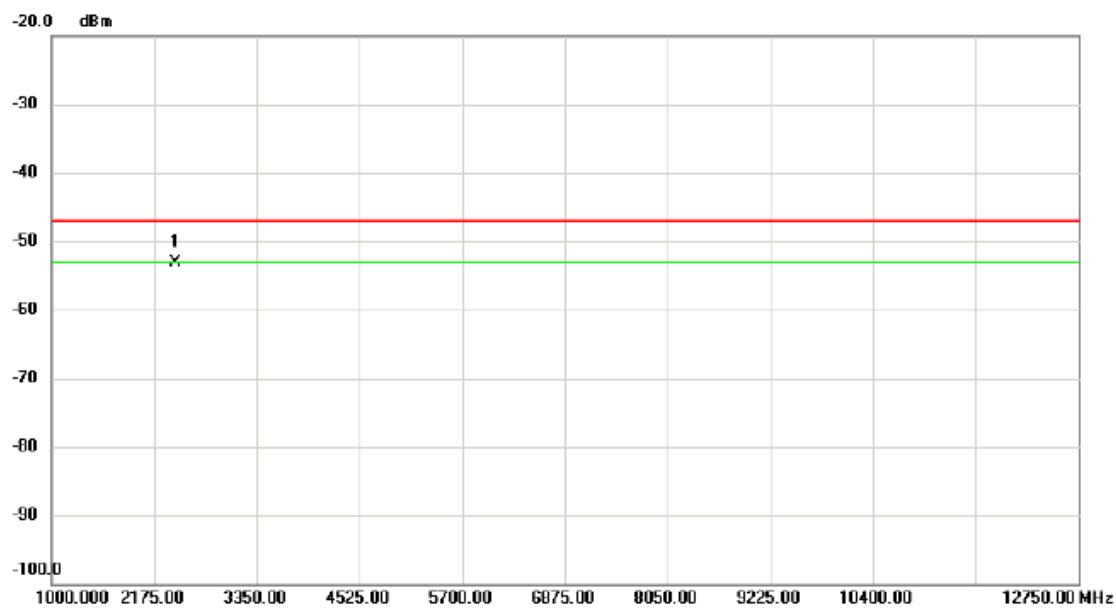
Test Mode: RX Mode 2472 MHz (11b)

## Horizontal



No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.110	-51.73	-3.34	-55.07	-47.00	-8.07 RMS

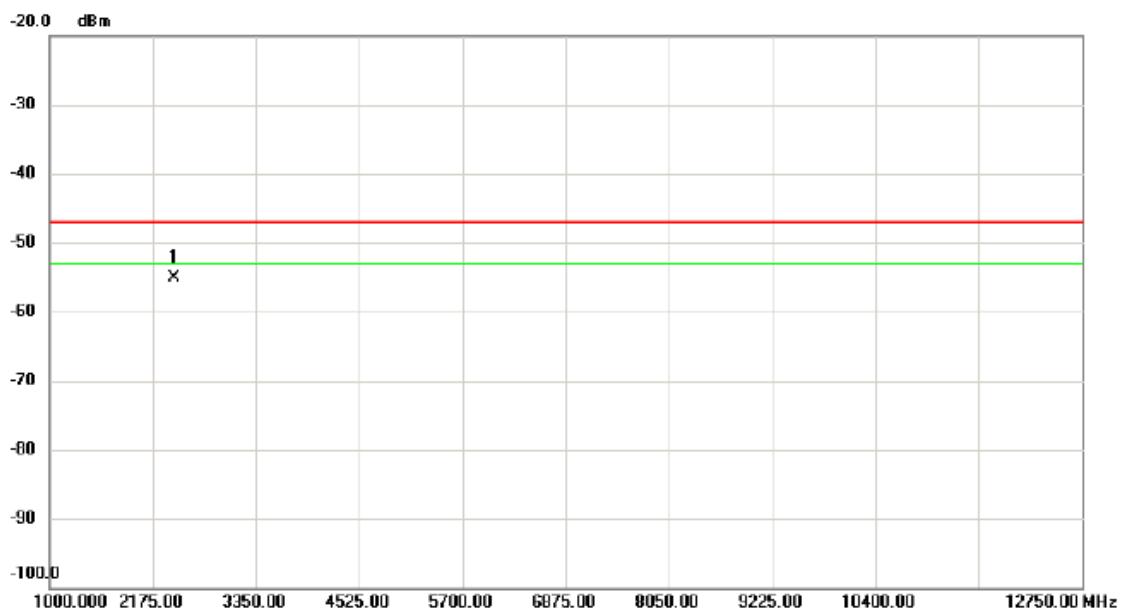
Test Mode:	RX Mode 2412 MHz (11g)
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**Vertical**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.067	-49.81	-3.32	-53.13	-47.00	-6.13	RMS	

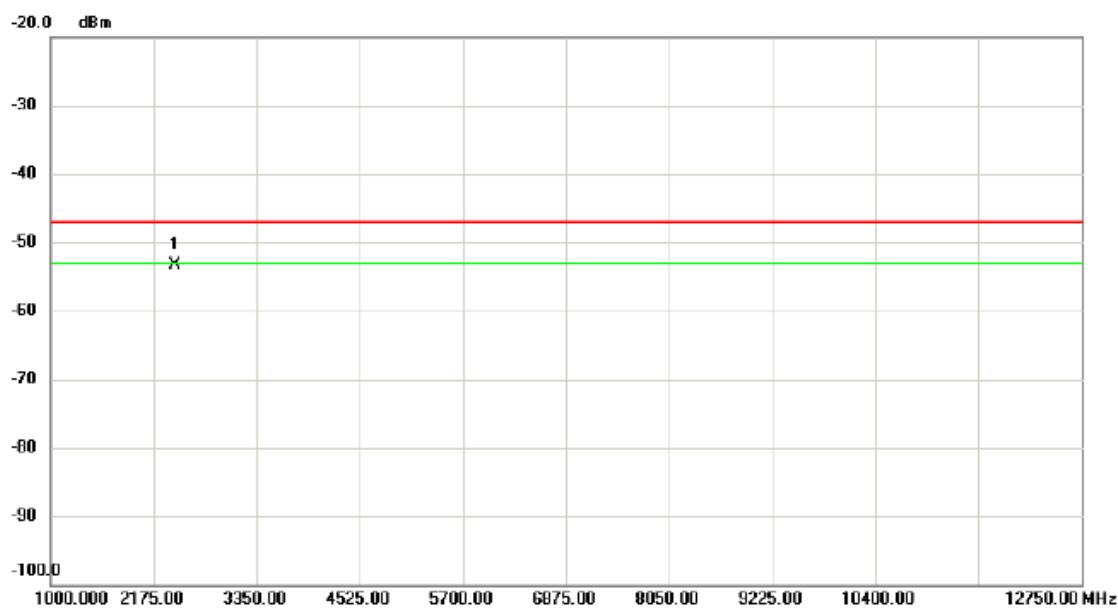
Test Mode: RX Mode 2412 MHz (11g)

## Horizontal



No.	Mk.	Reading		Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm					Detector	Comment
1 *		2412.154	-51.82	-3.34	-55.16	-47.00	-8.16	RMS	

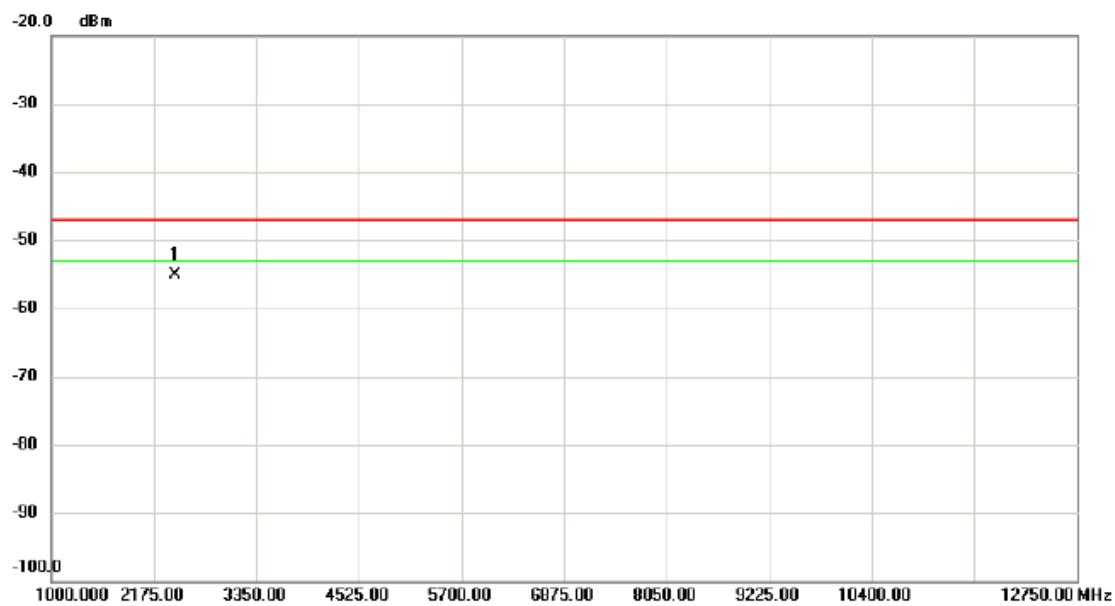
Test Mode:	RX Mode 2472 MHz (11g)
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**Vertical**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	2412.048	-49.97	-3.32	-53.29	-47.00	-6.29	RMS	

Test Mode: RX Mode 2472 MHz (11g)

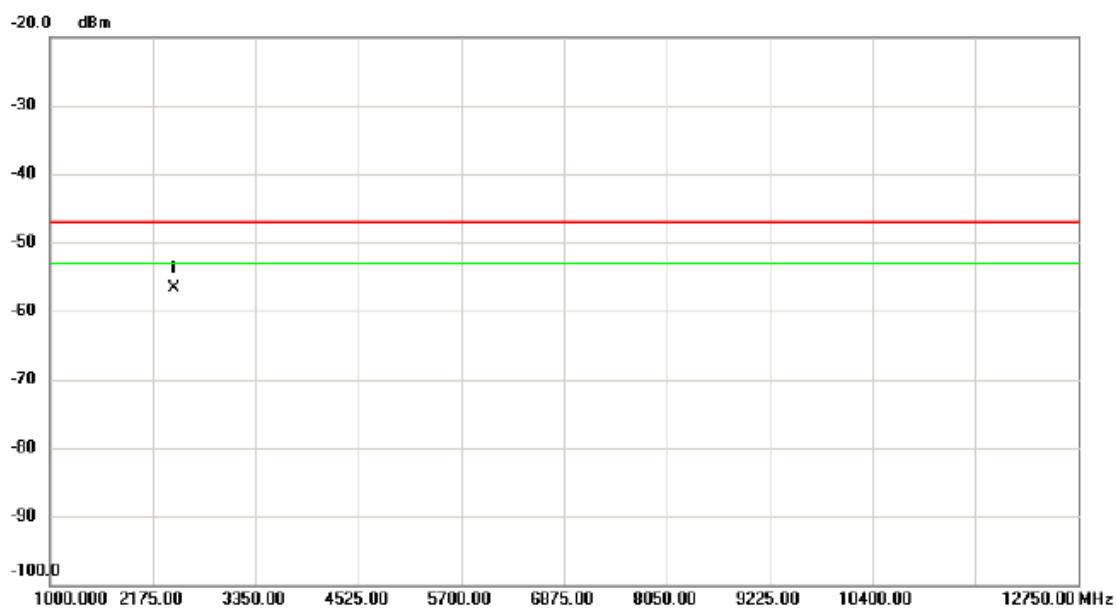
### Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.184	-51.67	-3.34	-55.01	-47.00	-8.01	RMS	

Test Mode: RX Mode 2412 MHz (11n 20M)

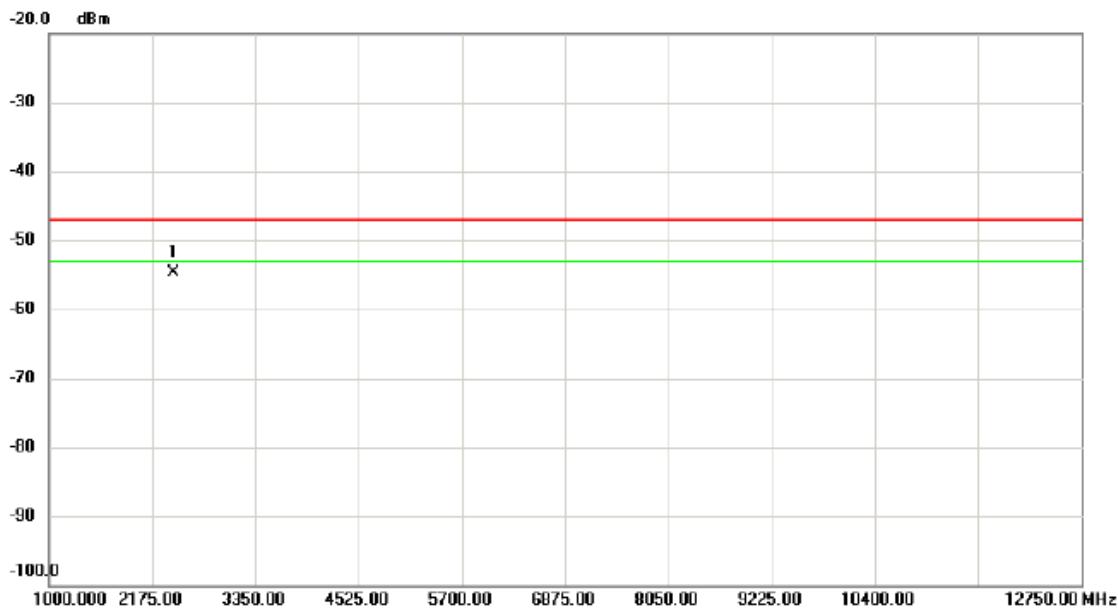
Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.951	-53.29	-3.32	-56.61	-47.00	-9.61	RMS	

Test Mode: RX Mode 2412 MHz (11n 20M)

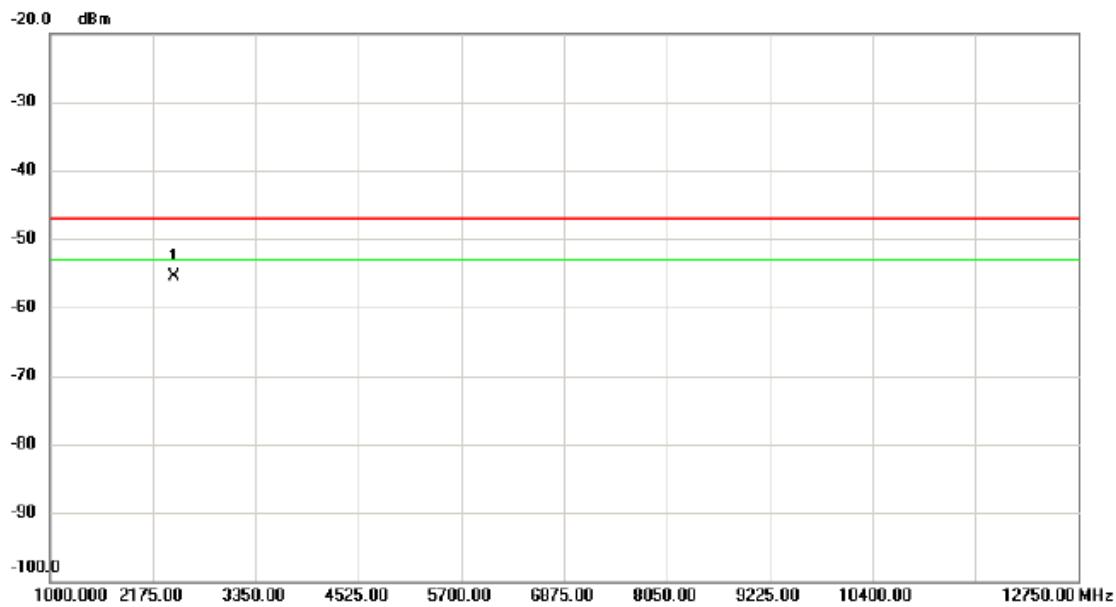
### Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.109	-51.29	-3.34	-54.63	-47.00	-7.63	RMS	

Test Mode: RX Mode 2472 MHz (11n 20M)

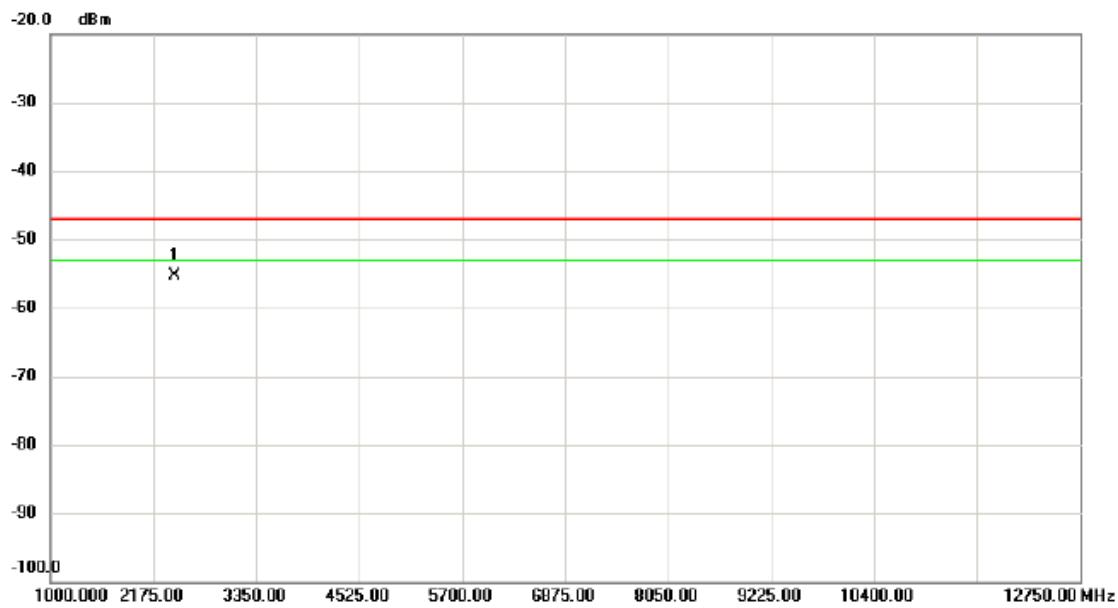
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.147	-52.14	-3.32	-55.46	-47.00	-8.46 RMS

Test Mode: RX Mode 2472 MHz (11n 20M)

### Horizontal

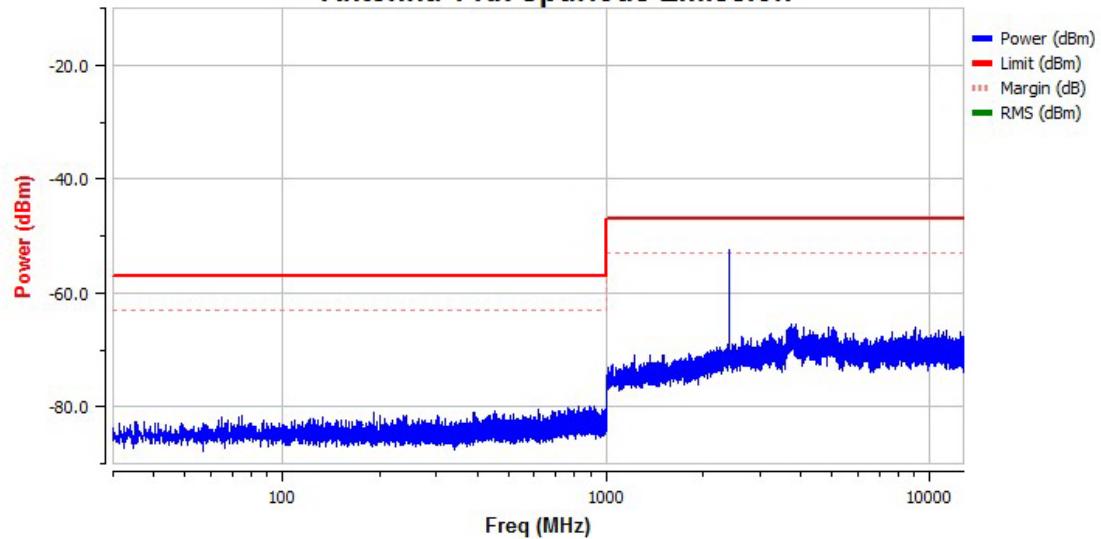


No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.285	-51.93	-3.34	-55.27	-47.00	-8.27	RMS	

## For Dipole antenna

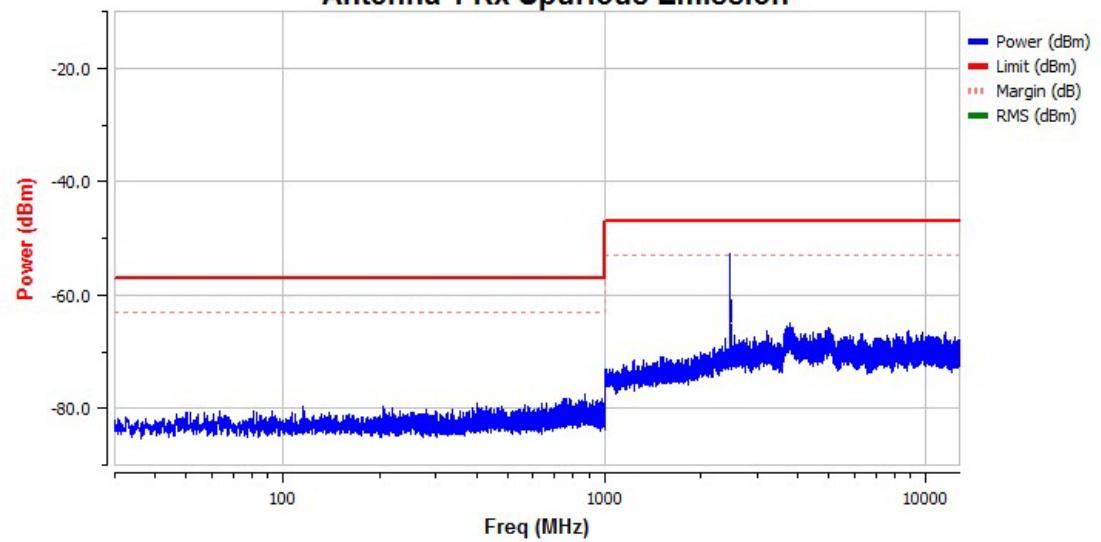
### 802.11b Mode\_CH01

#### Antenna 1 Rx Spurious Emission



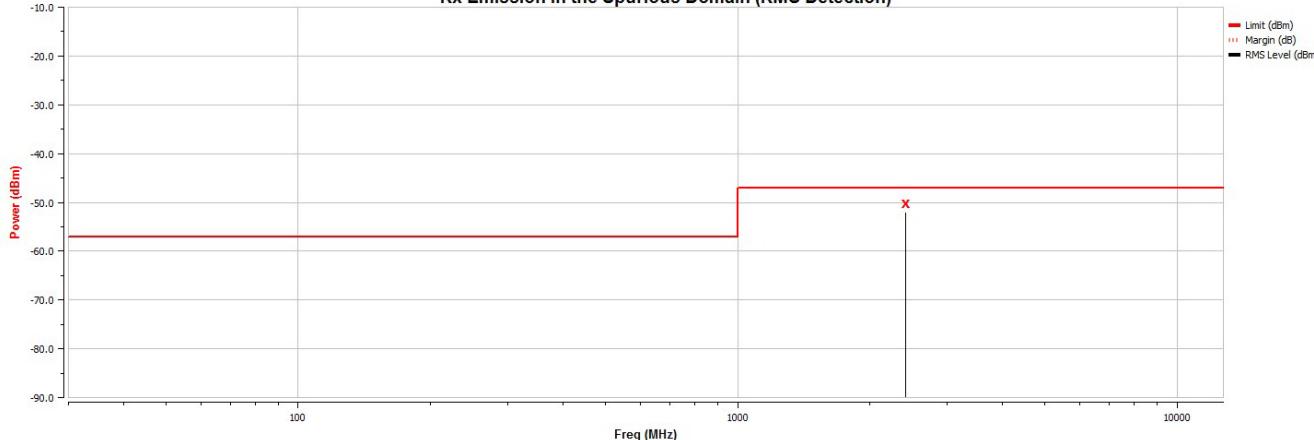
### 802.11b Mode\_CH13

#### Antenna 1 Rx Spurious Emission



## 802.11b Mode\_CH01\_RMS

Rx Emission in the Spurious Domain (RMS Detection)



Starting RMS Test

Refresh

Memo

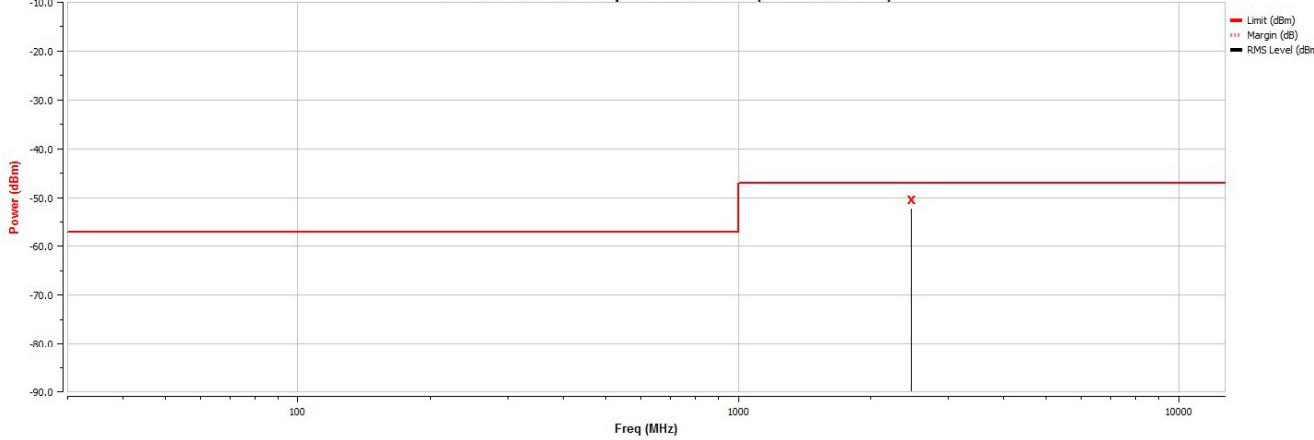
Rx Spurious Emission Test Info

Peak Test Status : Failed

RMS Test Status : Pass

## 802.11b Mode\_CH13\_RMS

Rx Emission in the Spurious Domain (RMS Detection)



Starting RMS Test

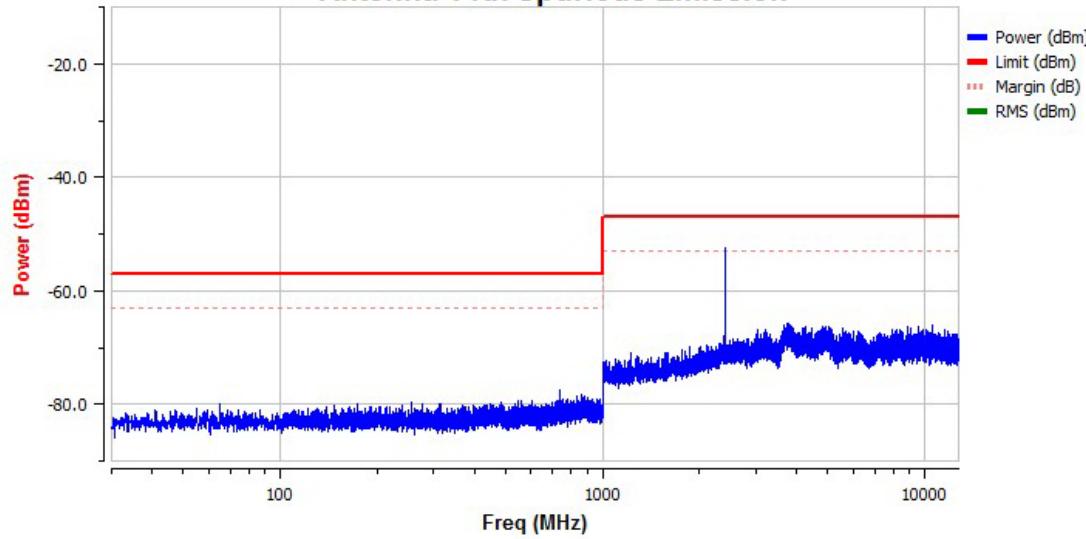
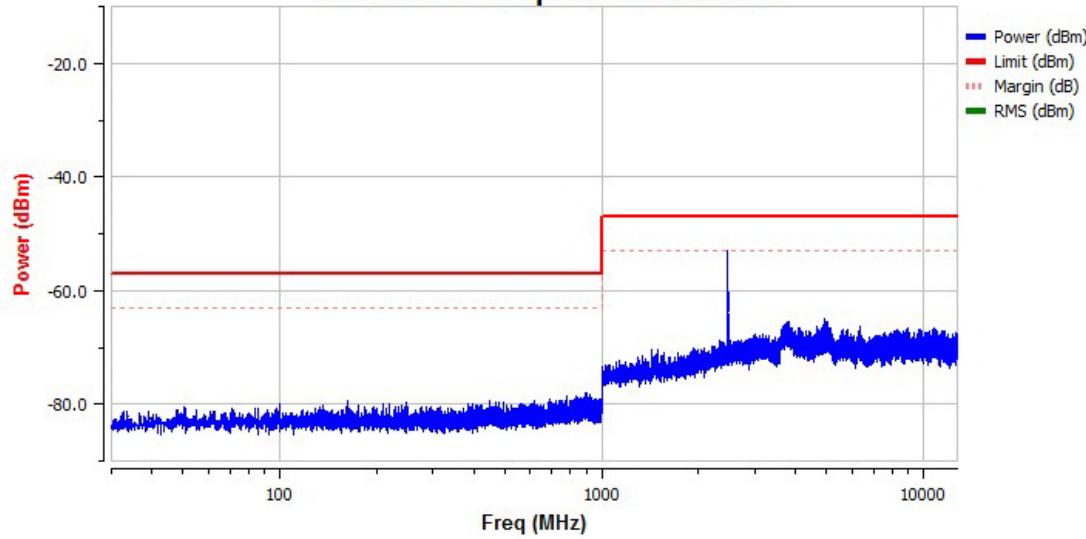
Refresh

Memo

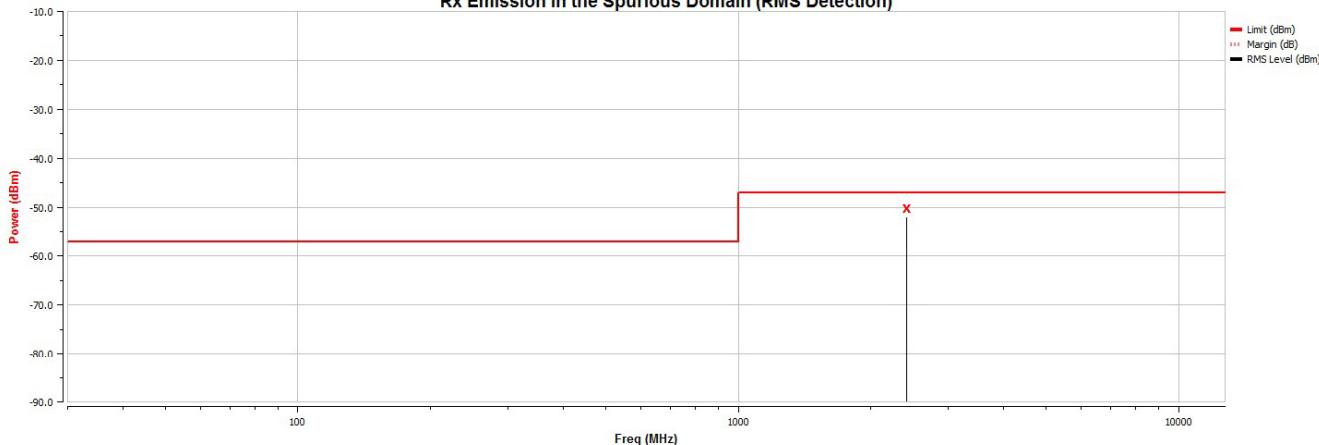
Rx Spurious Emission Test Info

Peak Test Status : Failed

RMS Test Status : Pass

**802.11g Mode\_CH01****Antenna 1 Rx Spurious Emission****802.11g Mode\_CH13****Antenna 1 Rx Spurious Emission**

### 802.11g Mode\_CH01\_RMS Rx Emission in the Spurious Domain (RMS Detection)



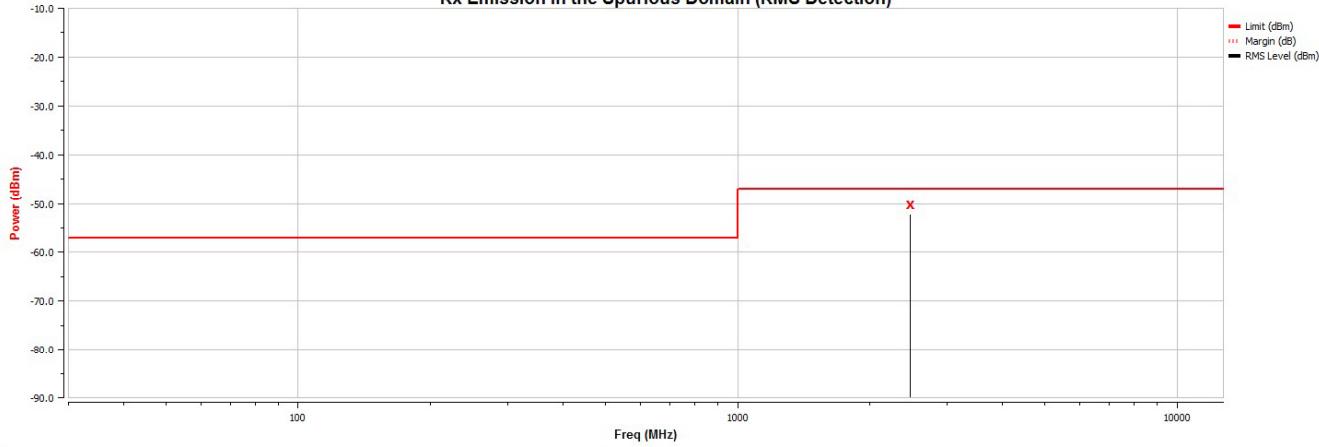
Rx Spurious Emission Test Info

Peak Test Status : Failed

RMS Test Status : Pass

### 802.11g Mode\_CH13\_RMS

#### Rx Emission in the Spurious Domain (RMS Detection)

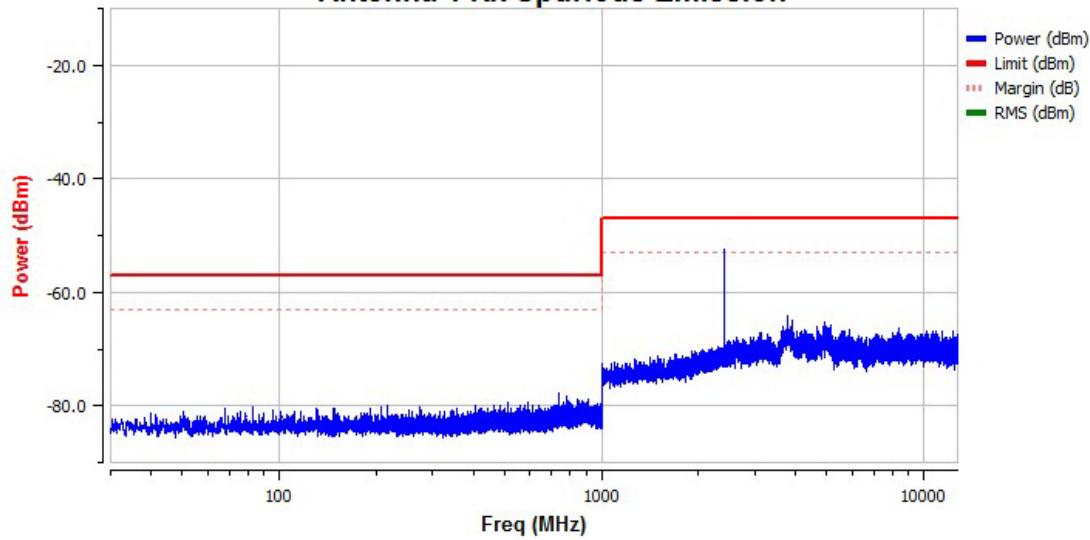


Rx Spurious Emission Test Info

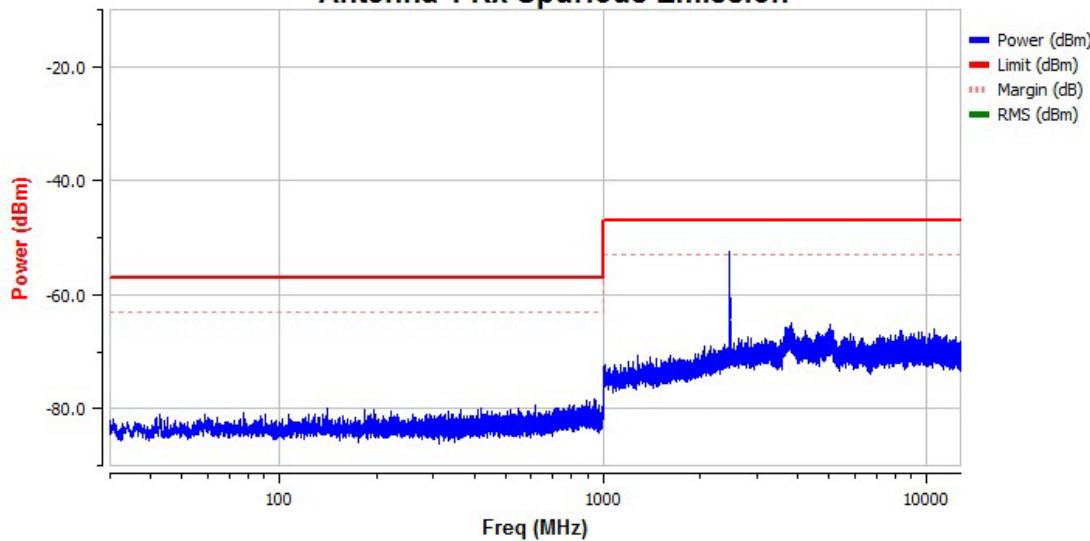
Peak Test Status : Failed

RMS Test Status : Pass

**802.11n 20M Mode\_CH01**  
**Antenna 1 Rx Spurious Emission**

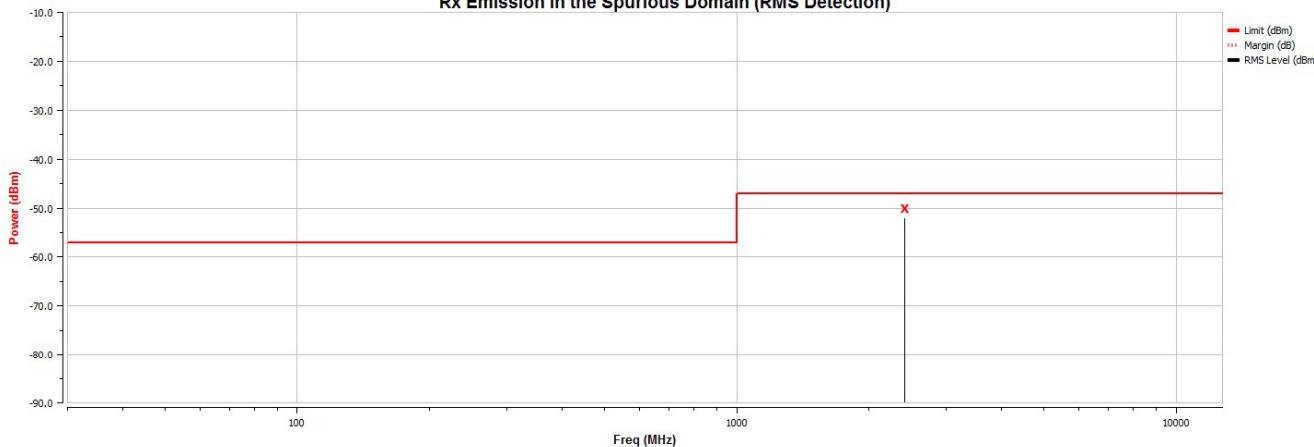


**802.11n 20M Mode\_CH13**  
**Antenna 1 Rx Spurious Emission**



## 802.11n20 Mode\_CH01\_RMS

Rx Emission in the Spurious Domain (RMS Detection)



Starting RMS Test

Refresh

Memo

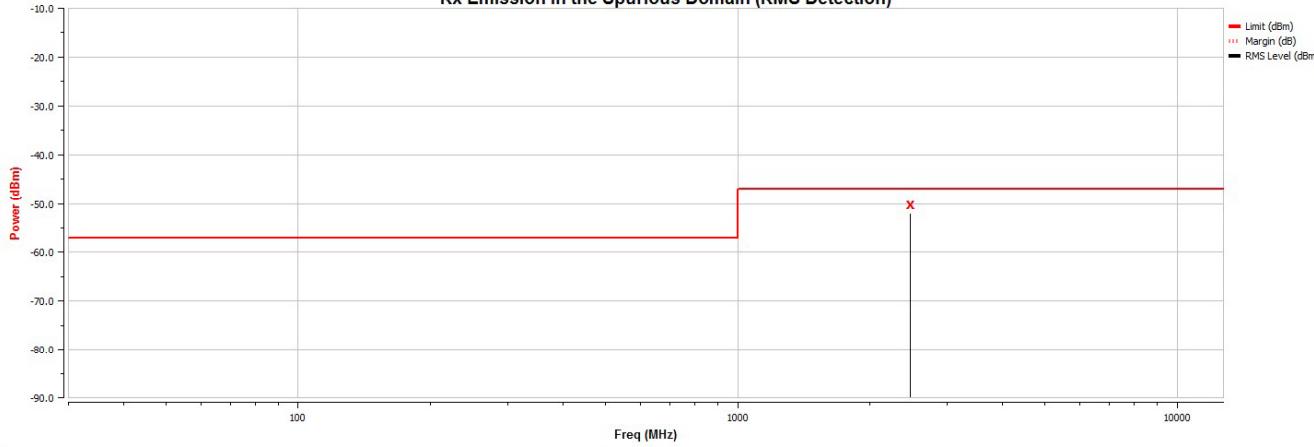
Rx Spurious Emission Test Info

Peak Test Status : Failed

RMS Test Status : Pass

## 802.11n20 Mode\_CH13\_RMS

Rx Emission in the Spurious Domain (RMS Detection)



Starting RMS Test

Refresh

Memo

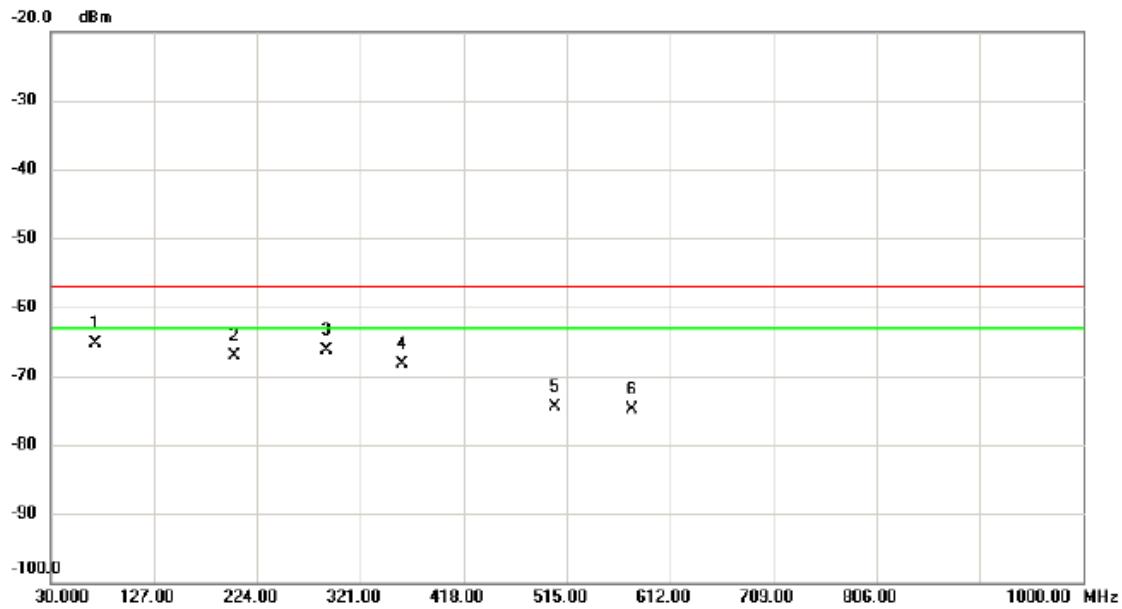
Rx Spurious Emission Test Info

Peak Test Status : Failed

RMS Test Status : Pass

Test Mode: RX Mode 2412 MHz (11b)

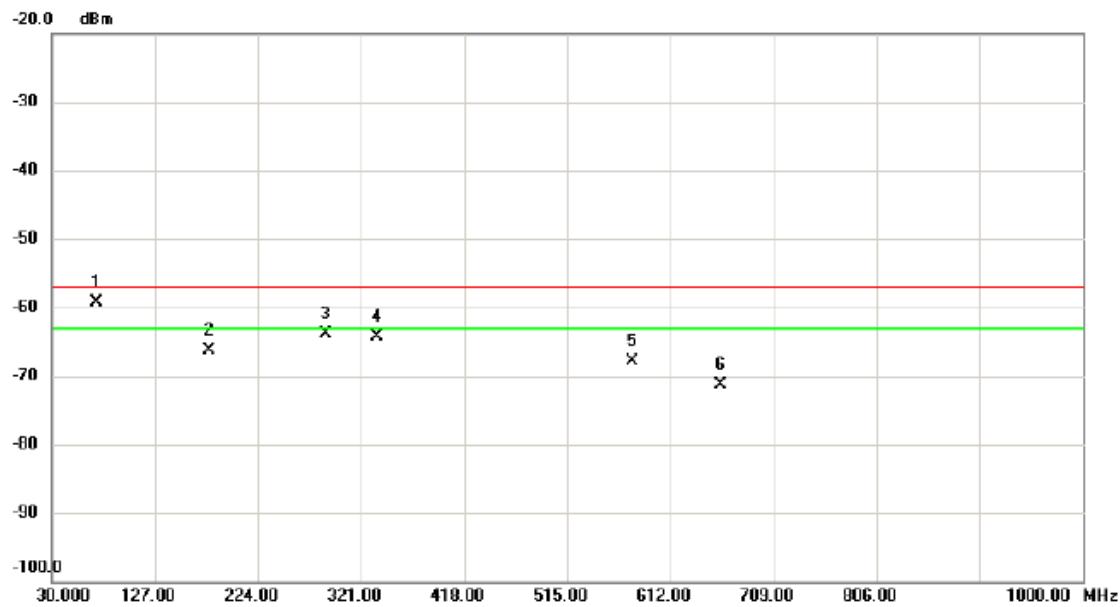
### Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	72.001	-59.04	-6.28	-65.32	-57.00	-8.32	RMS	
2		202.660	-61.58	-5.52	-67.10	-57.00	-10.10	RMS	
3		289.475	-65.27	-1.10	-66.37	-57.00	-9.37	RMS	
4		359.994	-68.70	0.43	-68.27	-57.00	-11.27	RMS	
5		504.039	-78.65	4.11	-74.54	-57.00	-17.54	RMS	
6		575.916	-80.58	5.77	-74.81	-57.00	-17.81	RMS	

Test Mode: RX Mode 2412 MHz (11b)

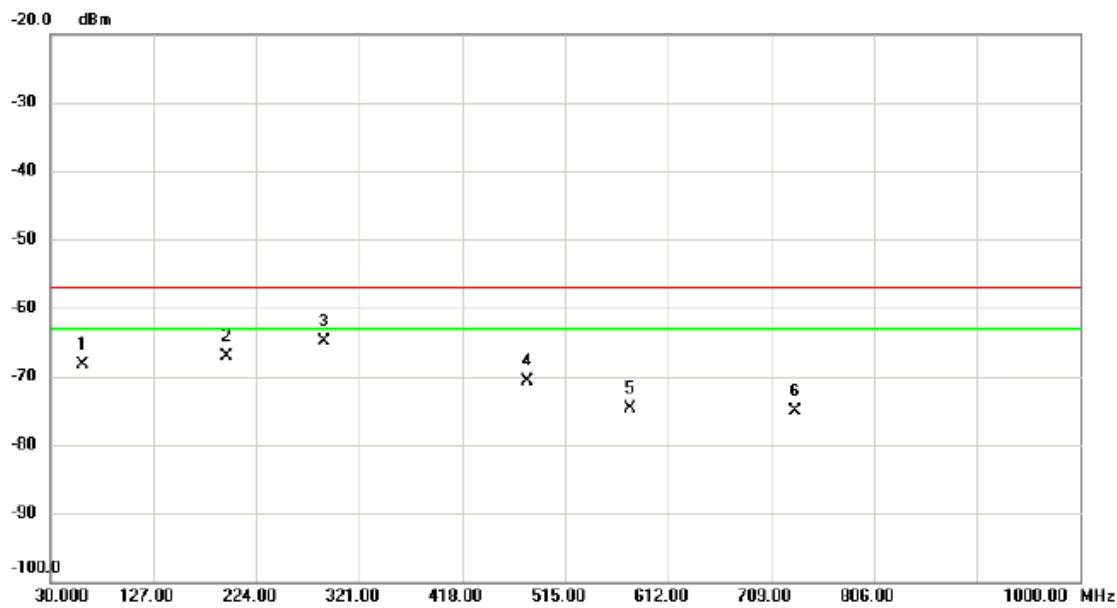
## Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dB	Margin Detector	Comment
1	*	72.001	-51.90	-7.47	-59.37	-57.00	-2.37	RMS
2		178.313	-62.69	-3.68	-66.37	-57.00	-9.37	RMS
3		287.923	-62.13	-1.78	-63.91	-57.00	-6.91	RMS
4		335.938	-62.92	-1.31	-64.23	-57.00	-7.23	RMS
5		575.916	-74.31	6.33	-67.98	-57.00	-10.98	RMS
6		659.821	-76.54	5.26	-71.28	-57.00	-14.28	RMS

Test Mode: RX Mode 2472 MHz (11b)

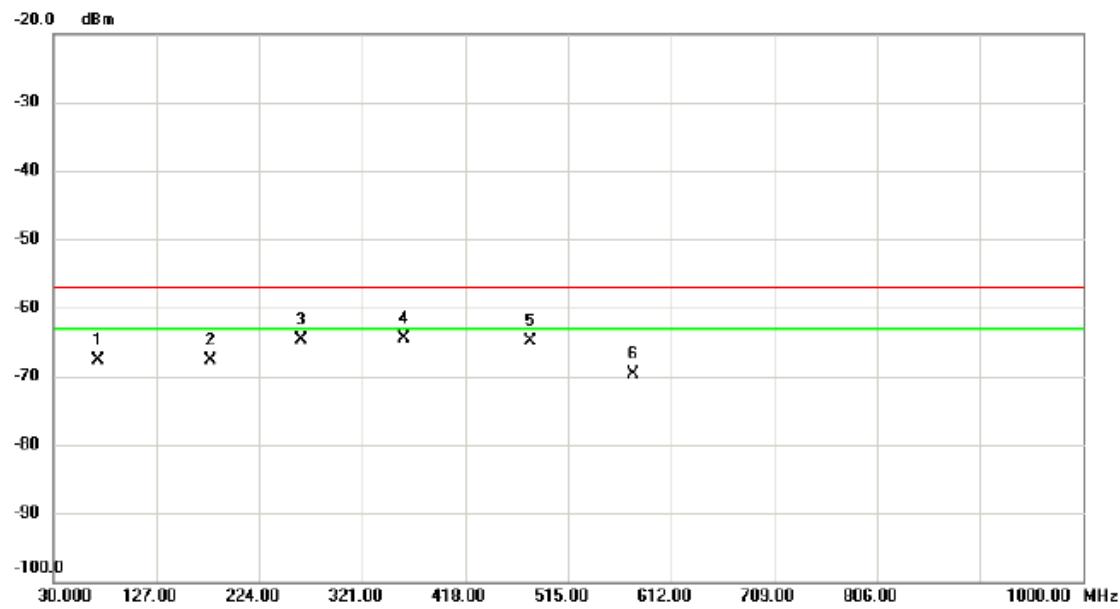
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	59.973	-65.31	-3.08	-68.39	-57.00	-11.39	RMS		
2	196.161	-61.60	-5.58	-67.18	-57.00	-10.18	RMS		
3 *	288.020	-63.65	-1.20	-64.85	-57.00	-7.85	RMS		
4	479.983	-74.31	3.69	-70.62	-57.00	-13.62	RMS		
5	575.916	-80.57	5.77	-74.80	-57.00	-17.80	RMS		
6	731.795	-83.16	7.98	-75.18	-57.00	-18.18	RMS		

Test Mode: RX Mode 2472 MHz (11b)

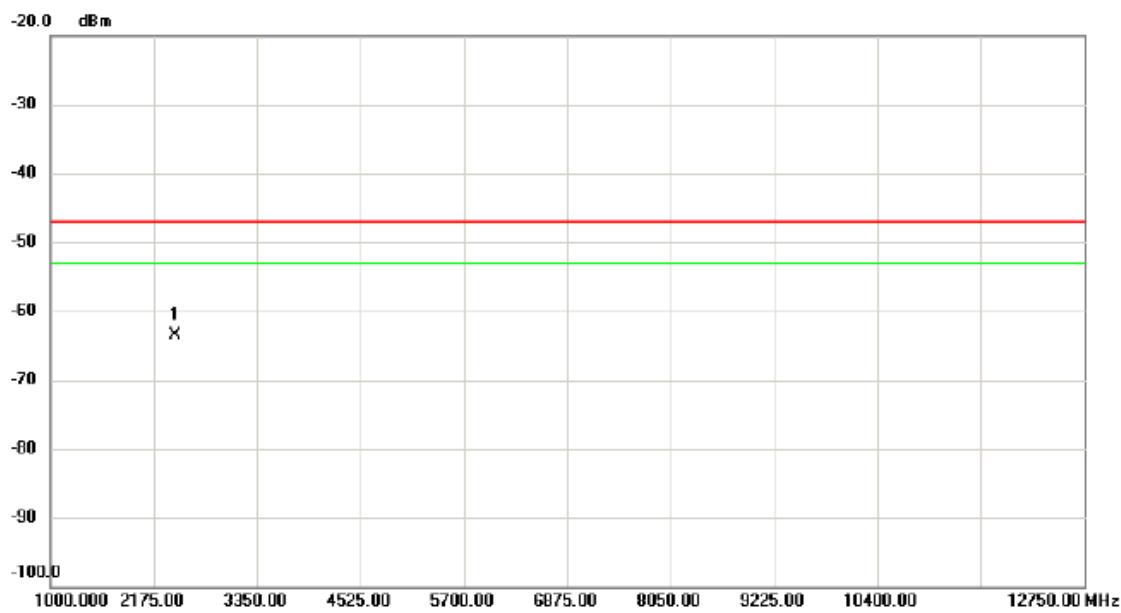
## Horizontal



No.	Mk.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit	Margin	Detector	Comment
			dBm	dB	dBm	dB			
1		71.904	-60.26	-7.41	-67.67	-57.00	-10.67	RMS	
2		178.313	-63.95	-3.68	-67.63	-57.00	-10.63	RMS	
3		263.964	-62.00	-2.69	-64.69	-57.00	-7.69	RMS	
4 *		359.994	-65.03	0.58	-64.45	-57.00	-7.45	RMS	
5		479.983	-68.33	3.37	-64.96	-57.00	-7.96	RMS	
6		575.916	-76.09	6.33	-69.76	-57.00	-12.76	RMS	

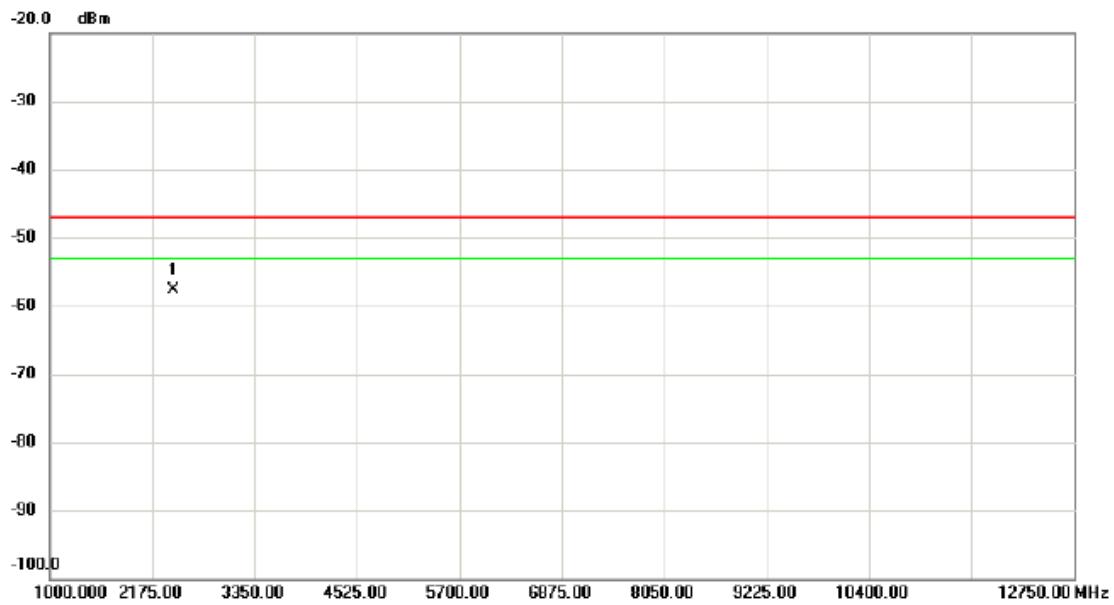
Test Mode: RX Mode 2412 MHz (11b)

## Vertical



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin						
		Freq.	Level					dBm	dB	dBm	dB	Detector	Comment
1 *		2412.000	-65.05	1.54	-63.51	-47.00	-16.51	RMS					

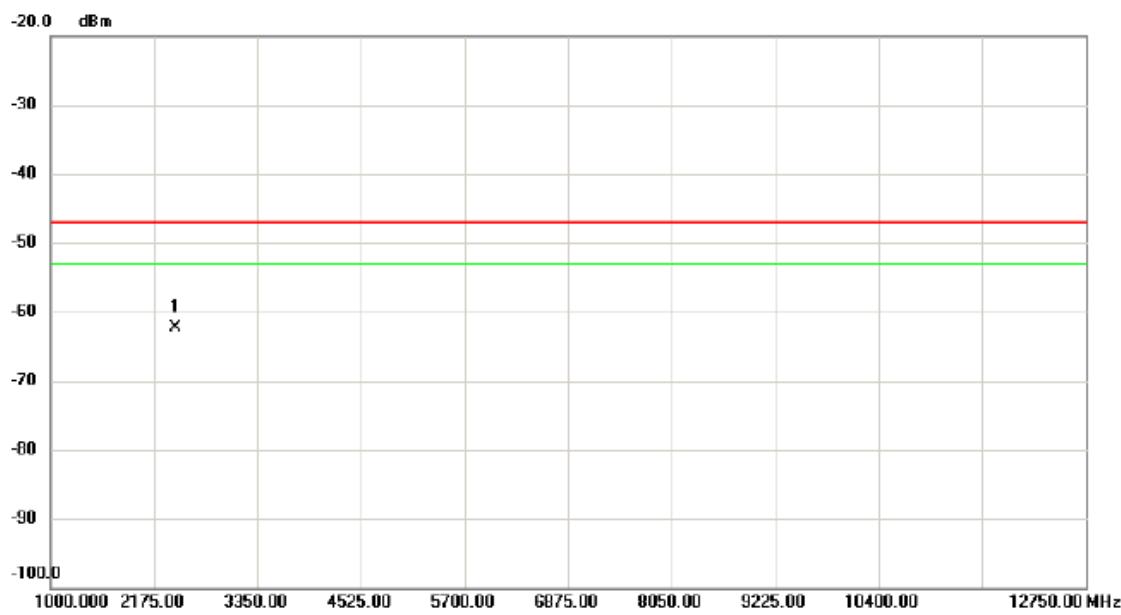
Test Mode:	RX Mode 2412 MHz (11b)
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**Horizontal**

No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1 *		2412.342	-57.72	-0.05	-57.77	-47.00	-10.77	RMS	

Test Mode: RX Mode 2472 MHz (11b)

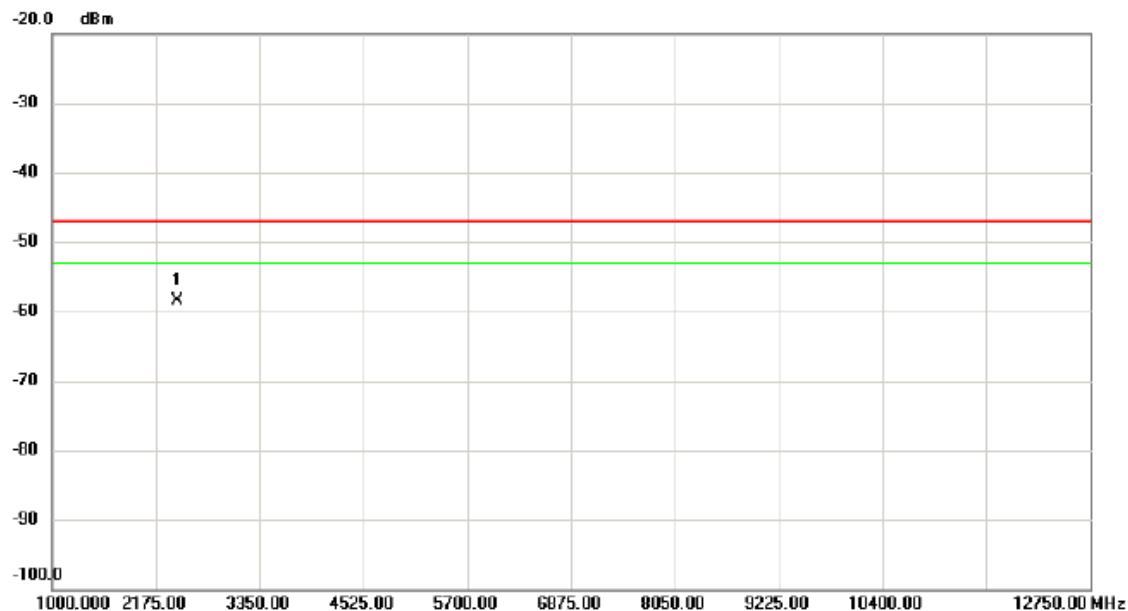
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.950	-63.94	1.55	-62.39	-47.00	-15.39 RMS

Test Mode: RX Mode 2472 MHz (11b)

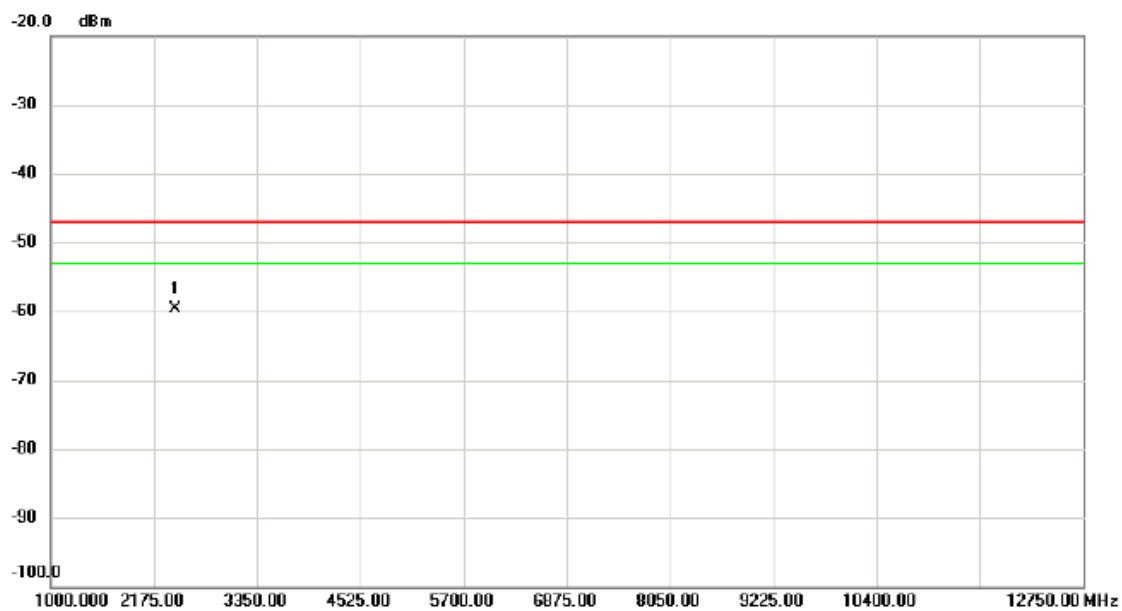
## Horizontal



No.	Mk.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.950	-58.40	-0.02	-58.42	-47.00	-11.42 RMS

Test Mode: RX Mode 2412 MHz (11g)

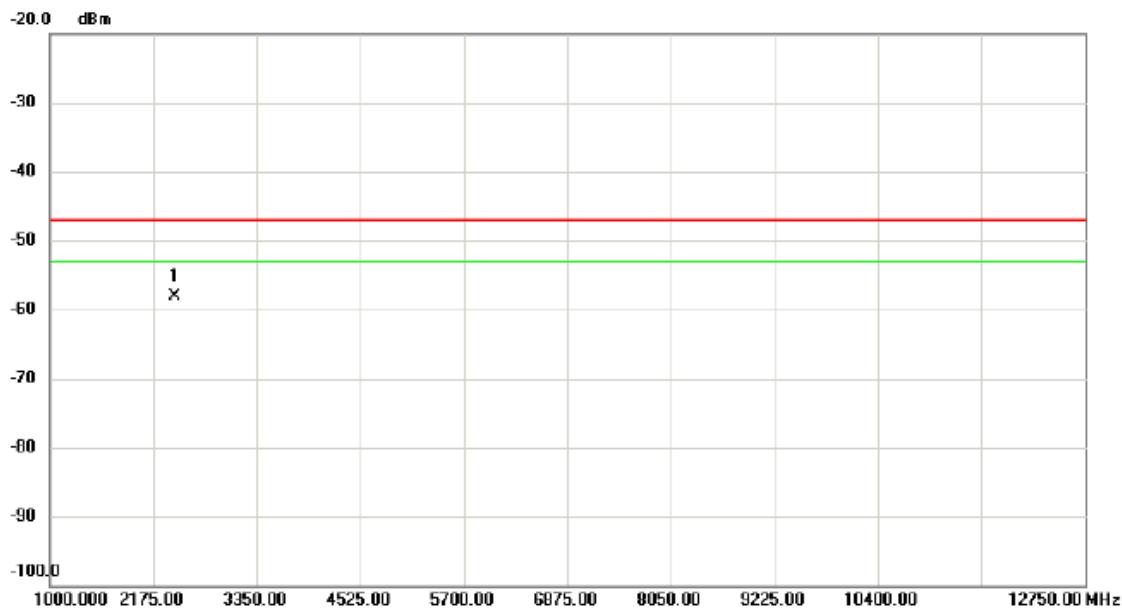
## Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin
		MHz	dBm	dB	dBm	dB	Detector Comment
1 *		2412.658	-61.15	1.55	-59.60	-47.00	-12.60 RMS

Test Mode: RX Mode 2412 MHz (11g)

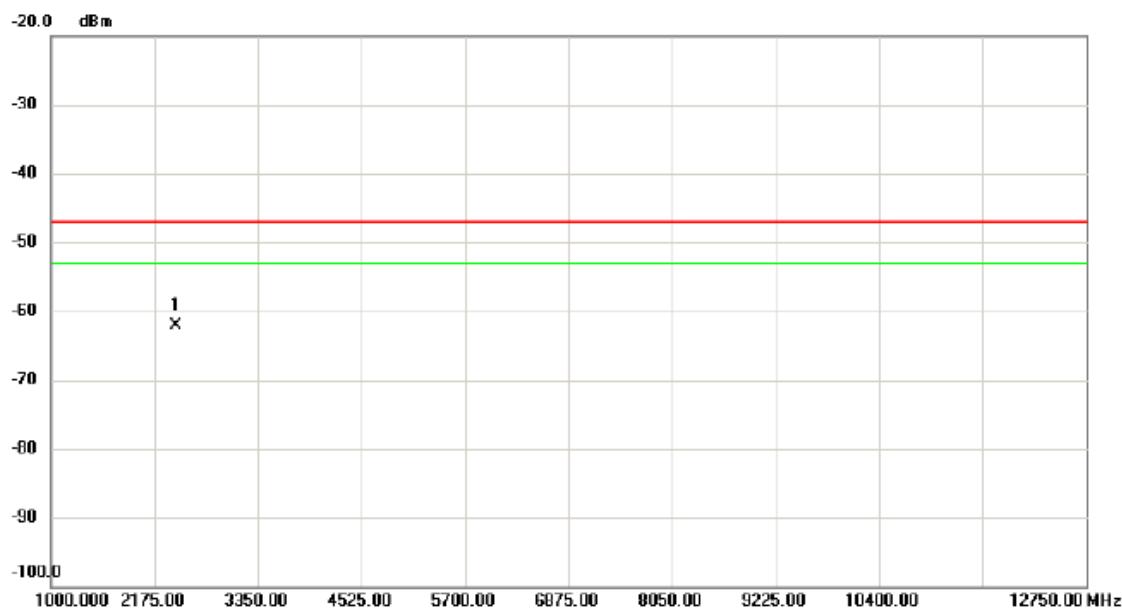
## Horizontal



No.	Mk.	Reading		Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBm					
1 *		2412.050	-57.99	-0.06	-58.05	-47.00	-11.05	RMS

Test Mode: RX Mode 2472 MHz (11g)

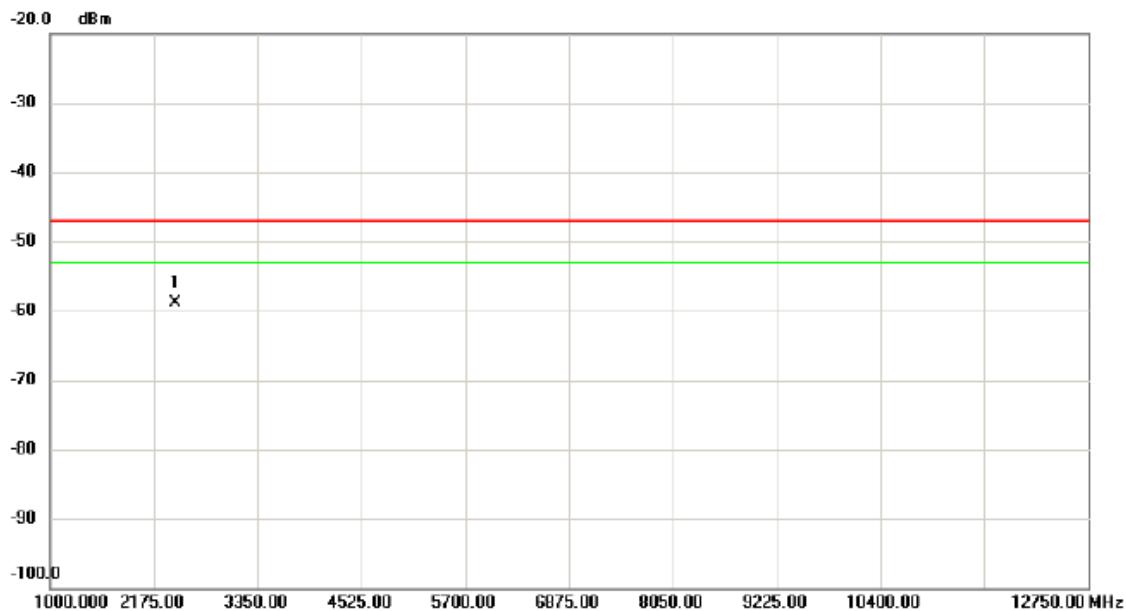
Vertical



No.	Mk.	Reading Freq. MHz	Correct Level dBm	Measure- ment Factor dB	Limit dBm	Margin dB	Detector	Comment
1 *		2412.950	-63.68	1.55	-62.13	-47.00	-15.13	RMS

Test Mode: RX Mode 2472 MHz (11g)

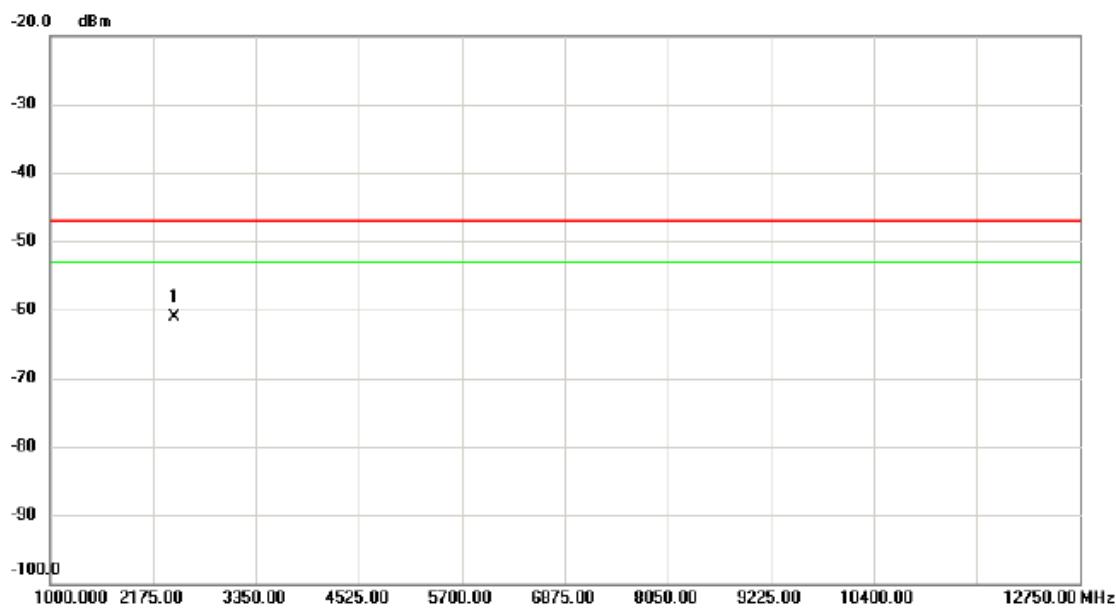
## Horizontal



No.	Mk.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
	MHz	dBm	dB	dBm	dB	Detector	Comment
1 *	2412.950	-58.83	-0.02	-58.85	-47.00	-11.85	RMS

Test Mode: RX Mode 2412 MHz (11n 20M)

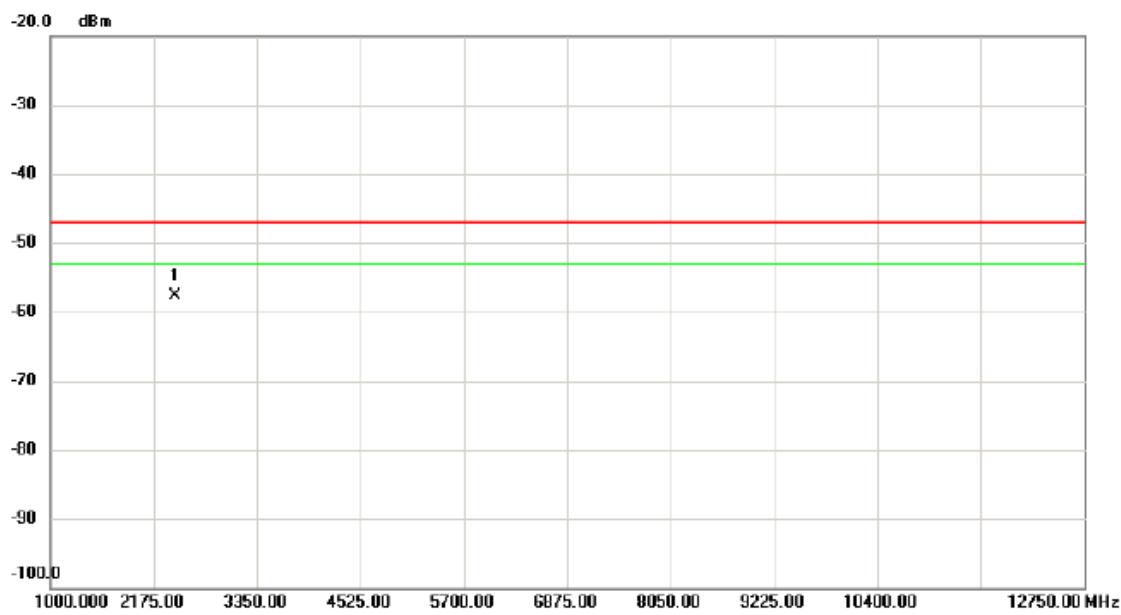
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBm	dB	dBm	dB	Detector	Comment
1 *		2412.367	-62.55	1.55	-61.00	-47.00	-14.00	RMS

Test Mode: RX Mode 2412 MHz (11n 20M)

## Horizontal



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBm					
1 *		2412.367	-57.67	-0.05	-57.72	-47.00	-10.72	RMS

Test Mode: RX Mode 2472 MHz (11n 20M)

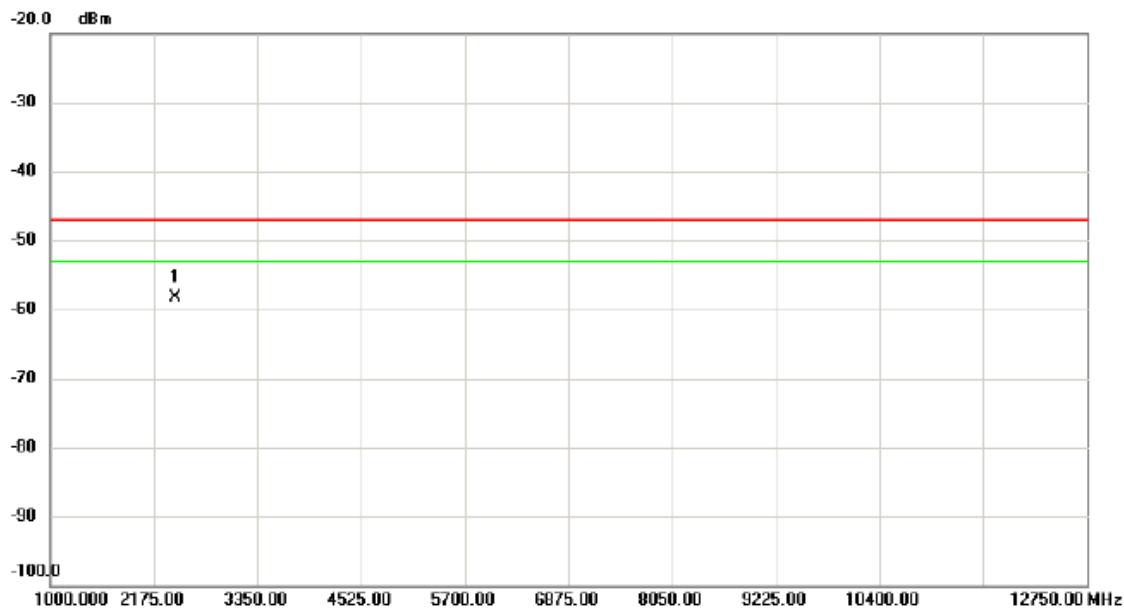
Vertical



No.	Mk.	Reading		Correct Factor	Measure- ment	Limit	Margin
		Freq.	Level				
MHz	dBm	dB	dBm	dB	dB	Detector	Comment
1 *	2412.250	-65.02	1.54	-63.48	-47.00	-16.48	RMS

Test Mode: RX Mode 2472 MHz (11n 20M)

### Horizontal

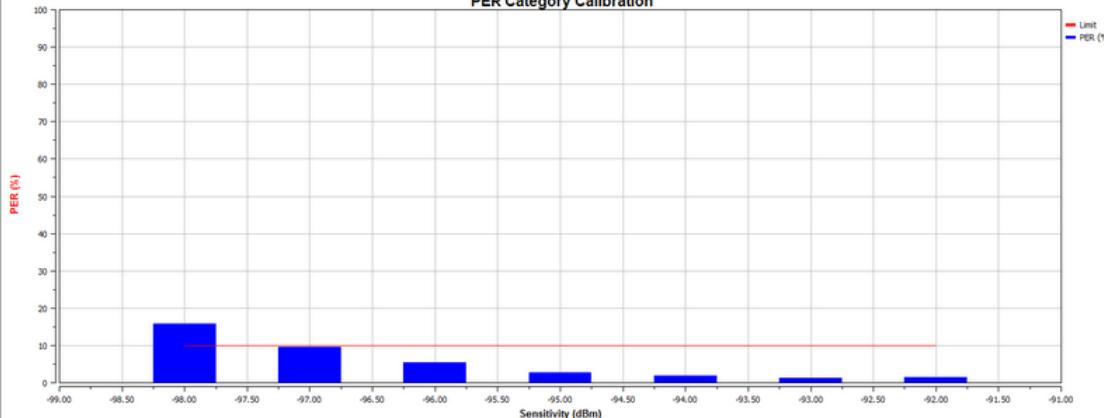


No.	Mk.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
	MHz	dBm	dB	dBm	dBm	dB	Detector Comment
1 *	2412.633	-58.22	-0.04	-58.26	-47.00	-11.26	RMS

## APPENDIX J - RECEIVER BLOCKING

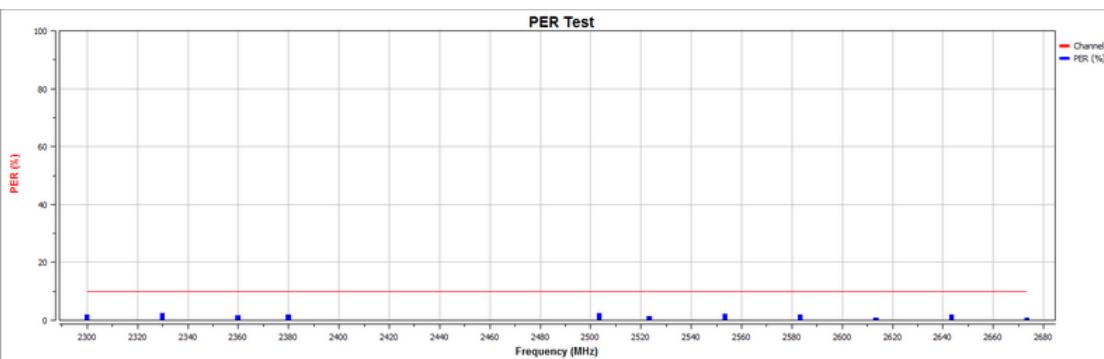
### 802.11b Mode 2412MHz

PER Category Calibration



Receiver Blocking Test Data

Sensitivity (dBm)	Attenuator (dB)	C Bin	U Bin	PER (%)
-92	92	561	553	1.426025
-93	93	548	541	1.277372
-94	94	562	552	1.779359
-95	95	556	541	2.697842
-96	96	582	503	5.451128
-97	97	545	493	9.541285
-98	98	510	429	15.88235

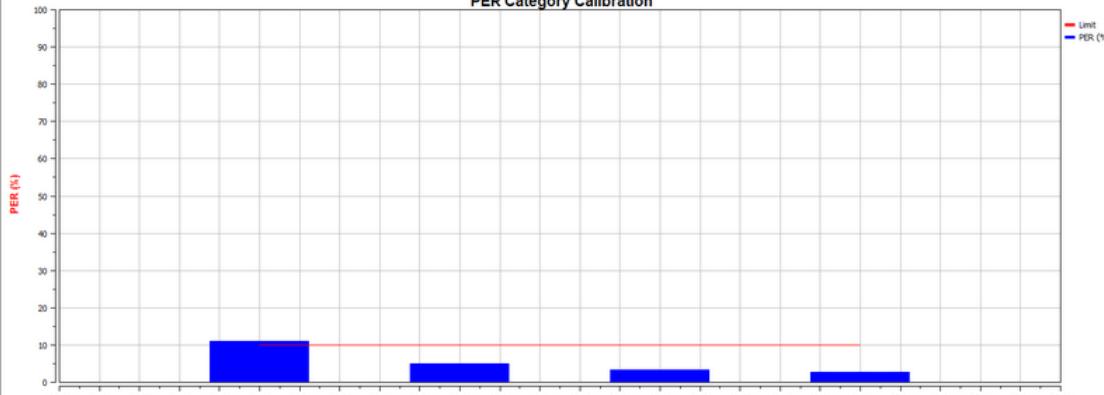


Receiver Category

Blocking Signal Freq (MHz)	Blocking Level (dBm)	PER (%)	Limit (%)	Status
2300	-47	1.776199	10	Pass
2330	-47	2.317291	10	Pass
2360	-47	1.598579	10	Pass
2380	-53	1.957295	10	Pass
2503.5	-53	2.482227	10	Pass
2523.5	-47	1.423488	10	Pass
2553.5	-47	2.139037	10	Pass
2583.5	-47	1.808818	10	Pass
2613.5	-47	0.7168459	10	Pass
2643.5	-47	1.761252	10	Pass
2673.5	-47	0.7326007	10	Pass

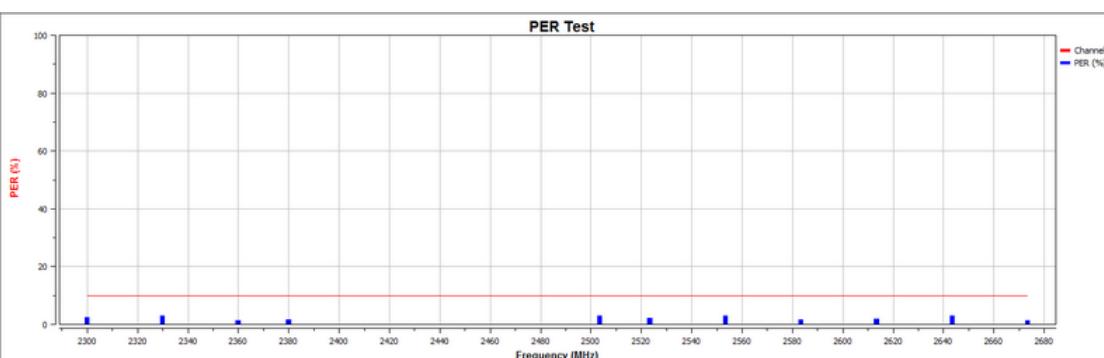
### 802.11b Mode 2472MHz

PER Category Calibration



Receiver Blocking Test Data

Sensitivity (dBm)	Attenuator (dB)	C Bin	U Bin	PER (%)
-88	88	528	514	2.651515
-89	89	558	539	3.405018
-90	90	520	494	5
-91	91	541	481	11.09057



Receiver Category

Blocking Signal Freq (MHz)	Blocking Level (dBm)	PER (%)	Limit (%)	Status
2300	-47	2.321429	10	Pass
2330	-47	3.857143	10	Pass
2360	-47	1.252236	10	Pass
2380	-53	1.607143	10	Pass
2503.5	-53	2.863254	10	Pass
2523.5	-47	2.142857	10	Pass
2553.5	-47	3.041145	10	Pass
2583.5	-47	1.612903	10	Pass
2613.5	-47	1.785714	10	Pass
2643.5	-47	3.041145	10	Pass
2673.5	-47	1.428571	10	Pass

## ATTACHMENT

## PHOTOGRAPHS OF EUT

