ETSI EN 300 328 V2.1.1: 2016

TEST REPORT

For

AIS Class B Transponder

Trade Name: AMEC

Model: WideLink B600W, WideLink B600

Issued to

Alltek Marine Electronics Corp.
14F-2, No.237, Sec. 1, Datong Rd., Xizhi District, New Taipei City, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
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Issued Date: December 30, 2016

Testing Laboratory
1309

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 30, 2016	Initial Issue	ALL	Doris Chu

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1. TEST RESULT CERTIFICATION

Applicant: Alltek Marine Electronics Corp.
14F-2, No.237, Sec. 1, Datong Rd., Xizhi District, New Taipei City, Taiwan, R.O.C.

Equipment Under Test: AIS Class B Transponder

Trade Name: AMEC

Model Number: WideLink B600W, WideLink B600

Date of Test: March 9 ~ Dec 28, 2016

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V2.1.1: 2016	Pass

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in ETSI EN 300 328. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Sam Chuang
Manager
Compliance Certification Services Inc.

Tested by:

Zeus Chen
Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

<table>
<tr><td>Product</td><td>AIS Class B Transponder</td></tr>
<tr><td>Trade Name</td><td>AMEC</td></tr>
<tr><td>Model Number</td><td>WideLink B600W, WideLink B600</td></tr>
<tr><td>Model Discrepancy</td><td>WideLink B600 without Wi-Fi
WideLink B600W with Wi-Fi</td></tr>
<tr><td>Received Date</td><td>February 22, 2016</td></tr>
<tr><td>Power supply</td><td>Power from power supply: DC 12/24V</td></tr>
<tr><td>Frequency Range</td><td>IEEE 802.11b/g/ IEEE 802.11n HT 20 MHz Mode: 2412 ~ 2472 MHz
IEEE 802.11n HT 40 MHz Mode: 2422~ 2462 MHz</td></tr>
<tr><td>Modulation Technique</td><td>IEEE 802.11b mode: DSSS
IEEE 802.11g mode: OFDM
IEEE 802.11n HT 20 MHz Mode: OFDM
IEEE 802.11n HT 40 MHz Mode: OFDM</td></tr>
<tr><td>Number of Channels</td><td>IEEE 802.11b/g mode: 13 Channels
IEEE 802.11n HT 20 MHz Mode: 13 Channels
IEEE 802.11n HT 40 MHz Mode: 9 Channels</td></tr>
<tr><td>Transmit Power (mean EIRP)</td><td>
<table>
<tr><th>Mode</th><th>Transmit Power (dBm)</th><th>Transmit Power (mW)</th></tr>
<tr><td>IEEE 802.11b Mode</td><td>19.53</td><td>89.7429</td></tr>
<tr><td>IEEE 802.11g Mode</td><td>19.52</td><td>89.5365</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz Mode</td><td>19.48</td><td>88.7156</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz Mode</td><td>19.49</td><td>88.9201</td></tr>
</table>
</td></tr>
<tr><td>Antenna Specification</td><td>CHIP Antenna: 1.00 dBi
Dipole Antenna: 2.94 dBi</td></tr>
<tr><td>Temperature Range</td><td>-15°C ~ +55°C</td></tr>
<tr><td>Hardware</td><td>M-PCB-B601MBV2</td></tr>
<tr><td>Software</td><td>V1.1.5</td></tr>
</table>

Remark: *for more details, please refer to the User's manual of the EUT.*

3. TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

ETSI EN 300 328 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques: Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

3.2 DESCRIPTION OF TEST MODES

The EUT (model: WideLink B600W) comes with two modes (DC 12V / DC 24V). After the preliminary test, the mode DC 12V was found to emit the worst emissions and therefore had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

IEEE 802.11b Mode:
Channel Low (2412MHz) and Channel High (2472MHz) with 1Mbps data rate were chosen for full testing.

IEEE 802.11g Mode:
Channel Low (2412MHz)and Channel High (2472MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz Mode:

Channel Low (2412MHz) and Channel High (2472MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz Mode:

Channel Low (2422MHz) and Channel High (2462MHz) with 13.5Mbps data rate were chosen for full testing.

4 INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.*

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supplies	GW Instek	SPS-3610	GPE880163	01/19/2016	01/18/2017
Digital Thermo-Hygro Meter	WISEWIND	1110	D03	03/07/2016	03/06/2017
Power Meter	Anritsu	ML2495A	1012009	07/08/2015	07/07/2016
Power Sensor	Anritsu	MA2411B	917072	07/08/2015	07/07/2016
PSA Series Spectrum Analyzer	Agilent	E4445A	MY48250198	08/10/2015	08/09/2016
Signal Analyzer	R&S	FSV 40	101073	07/20/2015	07/19/2016
Spectrum Analyzer	Agilent	E4446A	US42510268	02/15/2016	02/14/2017
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/08/2015	10/07/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54250027	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260016	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260020	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260007	10/26/2015	10/25/2016
Vector Signal Generator	R&S	SMU 200A	102239	03/10/2016	03/09/2017
AC Power Source	EXTECH	6205	1140845	N.C.R	N.C.R

4.3 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 7 is based on such expansion factors.

Table 7: Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	+/- 5%
RF output power, conducted	+/- 1,5 dB
Power Spectral Density, conducted	+/- 3 dB
Unwanted Emissions, conducted	+/- 3 dB
All emissions, radiated	+/- 6 dB
Temperature	+/- 3°C
Supply voltages	+/- 3%
Time	+/- 5%

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6 SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	N/A						

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7 ETSI EN 300 328 REQUIREMENTS

7.1 RF OUTPUT POWER

LIMIT

EN 300 328
FHSS:

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm. The maximum RF output power for non-adaptive Frequency Hopping equipment, shall be declared by the supplier. See clause 5.3.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm.

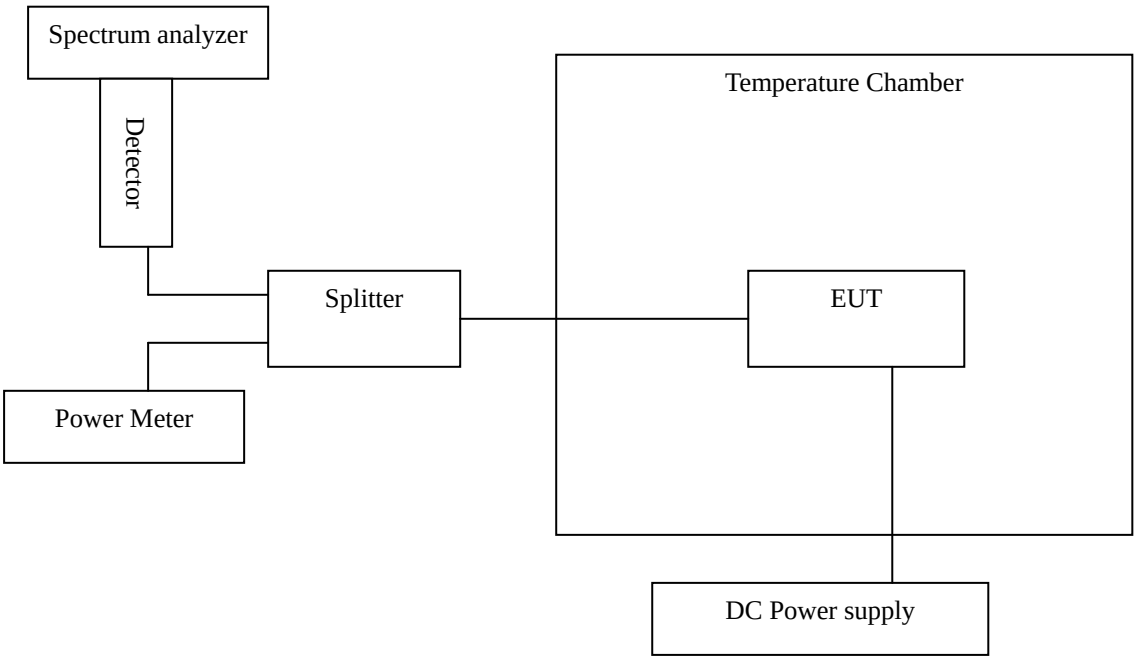
Other than FHSS:

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be20 dBm. The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 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 supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

Pass.

Test Results: PASS **Test Mode:** IEEE 802.11b (MIMO Operation: Chain0 + Chain1)

Tested By: Zeus Chen **Test Date:** April 26, 2016

Antenna Gain = 2.94 dBi

Cable Loss = 1 dB

Test Conditions		Transmitter Power (dBm)					
		Temp (20)°C		Temp (-15)°C		Temp (55)°C	
Channel	Voltage / Power	12v		12v		12v	
		chain0	chain1	chain0	chain1	chain0	chain1
Low	Measured Power	13.08	12.14	13.97	12.58	12.34	11.36
	Total Power	15.65		16.34		14.89	
	EIRP	18.59		19.28		17.83	
Mid	Measured Power	13.42	12.74	13.88	13.15	12.27	13.07
	Total Power	16.10		16.54		15.70	
	EIRP	19.04		19.48		18.64	
High	Measured Power	13.09	13.13	13.69	13.46	12.63	12.84
	Total Power	16.12		16.59		15.75	
	EIRP	19.06		***19.53**		18.69	
Limit		Average Limit= 20 dBm					
Measurement Uncertainty		+/- 1.20dB					

Remark: *EIRP=A+G+CL*
A = Reading
G = Antenna Gain
CL = Cable Loss

Test Results: PASS **Test Mode:** IEEE 802.11g Mode (MIMO Operation: Chain0 + Chain1)

Tested By: Zeus Chen **Test Date:** April 26, 2016

Antenna Gain =	2.94 dBi
Cable Loss =	1 dB

Test Conditions		Transmitter Power (dBm)					
		Temp (20)°C		Temp (-15)°C		Temp (55)°C	
Channel	Voltage / Power	12v		12v		12v	
		chain0	chain1	chain0	chain1	chain0	chain1
Low	Measured Power	13.25	12.83	13.58	12.98	12.21	12.96
	Total Power	16.06		16.30		15.61	
	EIRP	19.00		19.24		18.55	
Mid	Measured Power	13.31	12.96	13.74	13.25	13.02	12.36
	Total Power	16.15		16.51		15.71	
	EIRP	19.09		19.45		18.65	
High	Measured Power	13.28	13.15	13.54	13.60	12.89	12.63
	Total Power	16.23		16.58		15.77	
	EIRP	19.17		***19.52**		18.71	
Limit		Average Limit= 20 dBm					
Measurement Uncertainty		+/- 1.20dB					

Remark: *EIRP=A+G+CL*
A = Reading
G = Antenna Gain
CL = Cable Loss

Test Results:	PASS	**Test Mode:**	IEEE 802.11n HT 20 MHz Mode (MIMO Operation: Chain0 + Chain1)
Tested By:	Zeus Chen	**Test Date:**	April 26, 2016

Antenna Gain =	2.94 dBi
Cable Loss =	1 dB

Test Conditions		**Transmitter Power (dBm)**					
		Temp (20)°C		**Temp (-15)°C**		**Temp (55)°C**	
Channel	**Voltage / Power**	**12v**		**12v**		**12v**	
		chain0	**chain1**	**chain0**	**chain1**	**chain0**	**chain1**
Low	**Measured Power**	13.17	12.87	13.52	13.12	12.88	11.91
	Total Power	16.03		16.33		15.43	
	EIRP	18.97		19.27		18.37	
Mid	**Measured Power**	13.35	12.79	13.75	13.29	12.66	11.88
	Total Power	16.09		16.54		15.30	
	EIRP	19.03		***19.48**		18.24	
High	**Measured Power**	12.83	12.74	13.02	12.85	12.42	12.29
	Total Power	15.80		15.95		15.37	
	EIRP	18.74		18.89		18.31	
Limit		**Average Limit= 20 dBm**					
Measurement Uncertainty		**+/- 1.20dB**					

Remark: *EIRP=A+G+CL*
A = Reading
G = Antenna Gain
CL = Cable Loss

Test Results: PASS **Test Mode:** IEEE 802.11n HT 40 MHz Mode (MIMO Operation: Chain0 + Chain1)

Tested By: Zeus Chen **Test Date:** April 26, 2016

Antenna Gain =	2.94 dBi
Cable Loss =	1 dB

Test Conditions		Transmitter Power (dBm)					
		Temp (20)°C		Temp (-15)°C		Temp (55)°C	
Channel	Voltage / Power	12v		12v		12v	
		chain0	chain1	chain0	chain1	chain0	chain1
Low	Measured Power	12.93	13.64	13.15	13.89	12.18	13.24
	Total Power	16.31		16.55		15.75	
	EIRP	19.25		***19.49**		18.69	
Mid	Measured Power	12.74	13.39	13.02	13.79	11.99	13.16
	Total Power	16.09		16.43		15.62	
	EIRP	19.03		19.37		18.56	
High	Measured Power	12.98	13.28	13.40	13.58	12.54	13.17
	Total Power	16.14		16.50		15.88	
	EIRP	19.08		19.44		18.82	
Limit		Average Limit= 20 dBm					
Measurement Uncertainty		+/- 1.20dB					

Remark: *EIRP=A+G+CL*
A = Reading
G = Antenna Gain
CL = Cable Loss

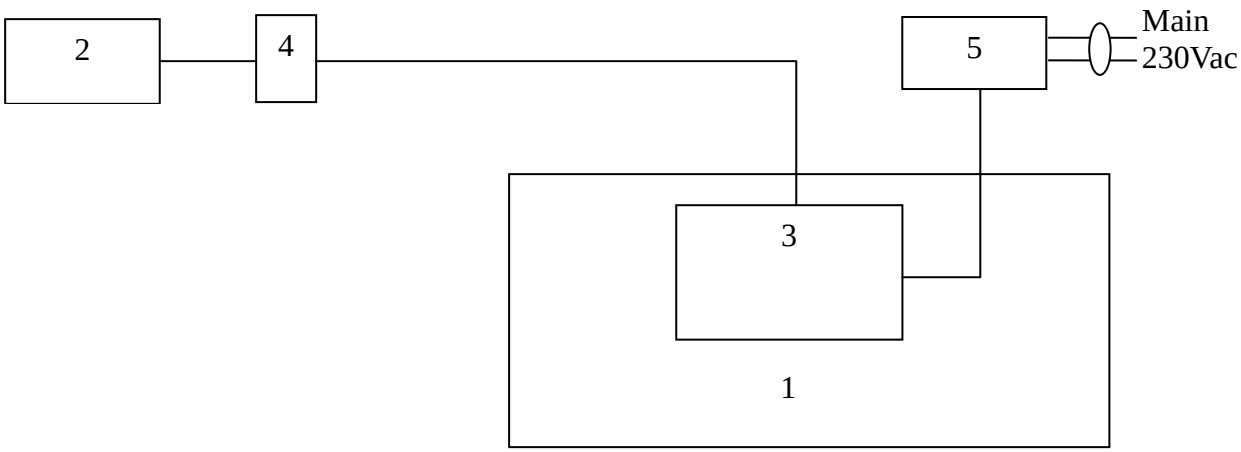
7.2 MAXIMUM SPECTRAL POWER DENSITY

LIMIT

ETSI EN 300 328

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to10 dBm per MHz.

Test Configuration



Legend

1. Wooden table
2. Spectrum analyzer
3. EUT
4. DC block
5. Power supply

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

For MIMO operation that employs simultaneous transmission at two chains of the transmission, measurements were done, and point of sample is captured at respective chain individually, and sums out to produce the final result.

TEST RESULTS

Pass.

Test Results: PASS **Test Mode:** IEEE 802.11b
Tested By: Zeus Chen **Test Date:** April 26, 2016

Test Conditions		Reading (dBm/MHz) (A)	Antenna Gain (dBi) (B)	Measured Power Density (dBm/MHz) (A+B)
Measured Power Density	Low	0.14	2.94	3.08
	Mid	-0.08		2.86
	High	0.47		3.41
Limit		10 dBm/MHz		
Measurement Uncertainty		+1.5dB / -1.4dB		

Test Results: PASS **Test Mode:** IEEE 802.11g
Tested By: Zeus Chen **Test Date:** April 26, 2016

Test Conditions		Reading (dBm/MHz) (A)	Antenna Gain (dBi) (B)	Measured Power Density (dBm/MHz) (A+B)
Measured Power Density	Low	-1.87	2.94	1.07
	Mid	-1.64		1.30
	High	-1.26		1.68
Limit		10 dBm/MHz		
Measurement Uncertainty		+1.5dB / -1.4dB		

Test Results: PASS **Test Mode:** IEEE 802.11n HT 20 MHz Mode
Tested By: Zeus Chen **Test Date:** April 26, 2016

Test Conditions		Reading (dBm/MHz) (A)	Antenna Gain (dBi) (B)	Measured Power Density (dBm/MHz) (A+B)
Measured Power Density	Low	-1.18	2.94	1.76
	Mid	-1.95		0.99
	High	-2.14		0.80
Limit		10 dBm/MHz		
Measurement Uncertainty		+1.5dB / -1.4dB		

Test Results: PASS **Test Mode:** IEEE 802.11n HT 40 MHz Mode
Tested By: Zeus Chen **Test Date:** April 26, 2016

Test Conditions		Reading (dBm/MHz) (A)	Antenna Gain (dBi) (B)	Measured Power Density (dBm/MHz) (A+B)
Measured Power Density	Low	-3.41	2.94	-0.47
	Mid	-4.28		-1.34
	High	-4.93		-1.99
Limit		10 dBm/MHz		
Measurement Uncertainty		+1.5dB / -1.4dB		

7.3 DUTY CYCLE, TX-SEQUENCE, TX-GAP

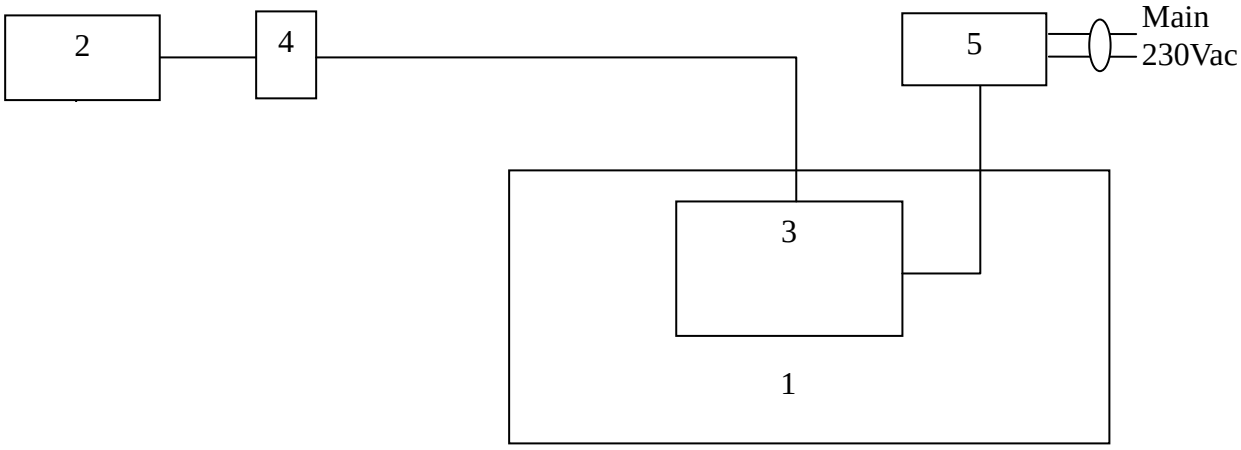
LIMIT

ETSI EN 300 328

For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier. In addition, the maximum Tx-sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms.

For non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS. The Duty Cycle shall be equal to or less than the maximum value declared by the supplier

Test Configuration



Legend

1. Wooden table
2. Spectrum analyzer
3. EUT
4. DC block
5. Power supply

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

N/A for Modulation Technology other than non-adaptive FHSS.

7.4 DWELL TIME, MINIMUM FREQUENCT OCCUPATION AND HOPPING SEQUENCE

LIMIT

ETSI EN 300 328

Non-adaptive frequency hopping systems

The accumulated Dwell Time on any hopping frequency shall not be greater than 15 ms within any period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. Non-adaptive medical devices requiring reverse compatibility with other medical devices placed on the market when earlier versions of the present document were harmonised, are allowed to have an operating mode in which the maximum dwell time is 400 ms. The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater. The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

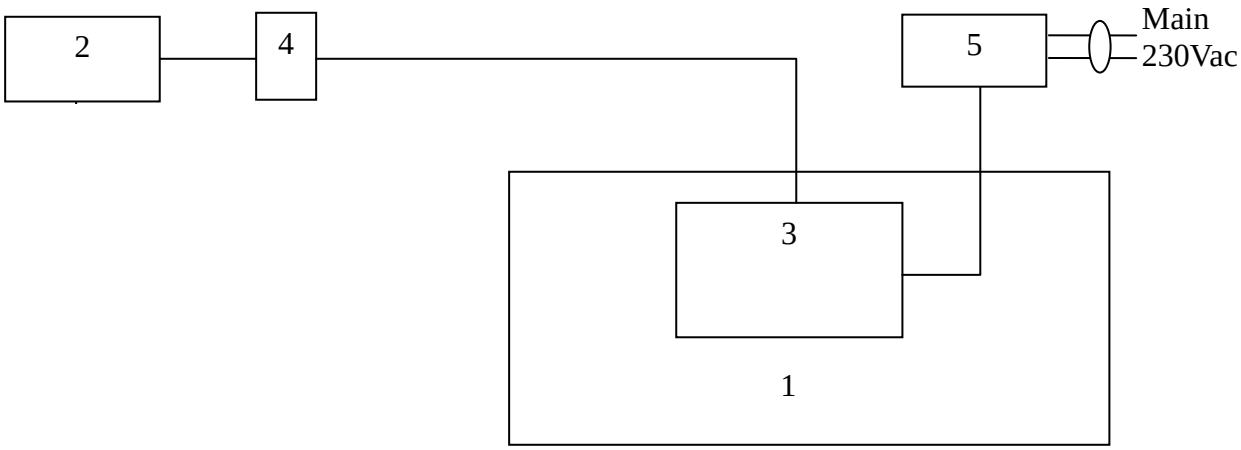
Adaptive frequency hopping systems

Adaptive Frequency Hopping systems shall be capable of operating over a minimum of 70 % of the band specified in clause 1. The maximum accumulated dwell time on any hopping frequency shall be 400 ms within any period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater. The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

Other Requirements

Frequency Hopping equipment shall transmit on a minimum of two hopping frequencies. For non-Adaptive Frequency Hopping equipment, when not transmitting on a hopping frequency, the equipment has to occupy that frequency for the duration of the typical dwell time.
For Adaptive Frequency Hopping systems using LBT based DAA, if a signal is detected during the CCA, these systems may jump immediately to the next frequency in the hopping sequence (see clause 4.3.1.6.1.2 point 2) provided the limit for maximum dwell is respected.

Test Configuration



Legend

1. Wooden table
2. Spectrum analyzer
3. EUT
4. DC block
5. Power supply

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

Dwell Time: *N/A for Modulation Technology other than FHSS.*

Minimum Frequency Occupation Time Result: *N/A for Modulation Technology other than FHSS*

Hopping sequence: *N/A for Modulation Technology other than FHSS*

7.5 HOPPING FREQUENCY SEPARATION

LIMIT

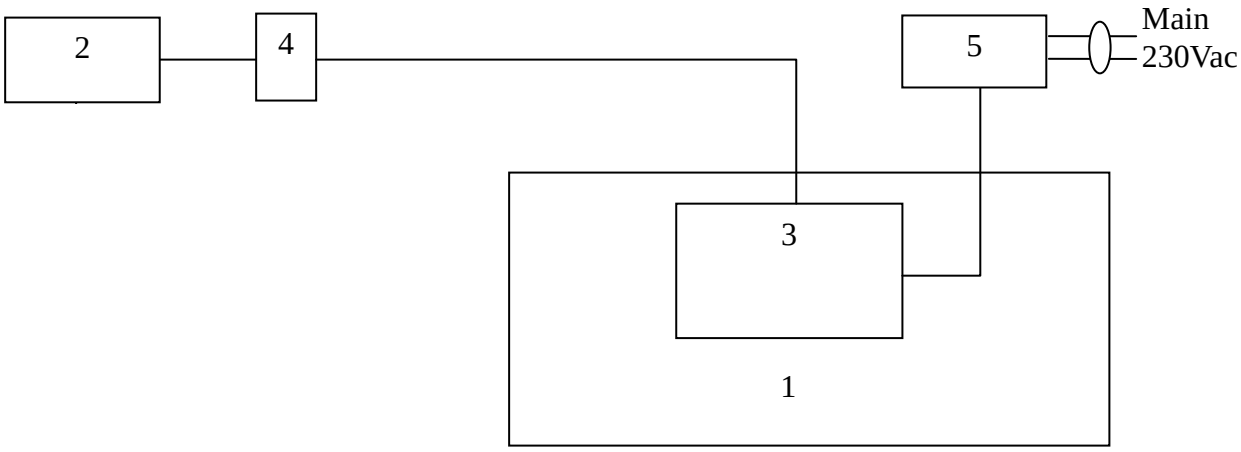
ETSI EN 300 328

Non-adaptive frequency hopping systems
The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth (see clause 4.3.1.7) of a single hop, with a minimum separation of 100 kHz.

Adaptive frequency hopping systems

The minimum Hopping Frequency Separation shall be 100 kHz.

Test Configuration



Legend

1. Wooden table
2. Spectrum analyzer
3. EUT
4. DC block
5. Power supply

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

N/A for Modulation Technology other than FHSS.

7.6 MEDIUM UTILISATION

LIMIT

ETSI EN 300 328

The maximum Medium Utilisation factor for non-adaptive Frequency Hopping equipment shall be 10 %.

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

N/A for equipments that employs the adaptive mechanism. This given UE implements adaptive mechanism to identify transmission of likely presence in the band.

7.7 ADAPTIVITY

LIMIT

ETSI EN 300 328
Adaptive Frequency Hopping using LBT based DAA

Adaptive Frequency Hopping equipment using LBT based DAA shall comply with the following minimum set of requirements:

1) At the start of every dwell time, before transmission on a hopping frequency, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time (see step 3) with a minimum of 18 µs. If the equipment finds the hopping frequency to be clear, it may transmit immediately (see step 3).

2) If it is determined that a signal is present with a level above the detection threshold defined in step 5. the hopping frequency shall be marked as 'unavailable'. Then the equipment may jump to the next frequency in the hopping scheme even before the end of the dwell time, but in that case the 'unavailable' channel can not be considered as being 'occupied' and shall be disregarded with respect to the requirement to maintain a minimum of 15 hopping frequencies. Alternatively, the equipment can remain on the frequency during the remainder of the dwell time. However, if the equipment remains on the frequency with the intention to transmit, it shall perform an extended CCA check in which the (unavailable) channel is observed for a random duration between the value defined for the CCA observation time in step 1 and 5 % of the Channel Occupancy Time defined in step 3. If the extended CCA check has determined the frequency to be no longer occupied, the hopping frequency becomes available again. The CCA observation time used by the equipment shall be declared by the supplier.

3) The total time during which an equipment has transmissions on a given hopping frequency without re-evaluating the availability of that frequency is defined as the Channel Occupancy Time. The Channel Occupancy Time for a given hopping frequency, which starts immediately after a successful CCA, shall be less than 60 ms followed by an Idle Period of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After this, the procedure as in step 1 shall be repeated before having new transmissions on this hopping frequency during the same dwell time.

EXAMPLE: A system with a dwell time of 400 ms can have 6 transmission sequences of 60 ms each, Separated with an Idle Period of 3 ms. Each transmission sequence was preceded with a successful CCA check of 120 µs.

NOTE: For LBT based frequency hopping systems with a dwell time < 60 ms, the maximum Channel Occupancy Time is limited by the dwell time.

4) Unavailable' channels may be removed from or may remain in the hopping sequence, but in any case:
- there shall be no transmissions on 'unavailable' channels;
- a minimum of 15 hopping frequencies shall always be maintained.

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 or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). For power levels below 20 dBm e.i.r.p., the detection threshold level may be relaxed to TL = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm).

Adaptive Frequency Hopping using other forms of DAA (non-LBT based)

Adaptive Frequency Hopping equipment using non-LBT based DAA, shall comply with the following minimum set of requirements:

1) During normal operation, the equipment shall evaluate the presence of a signal for each of its hopping frequencies If it is determined that a signal is present with a level above the detection threshold defined in step 5. the hopping frequency shall be marked as 'unavailable'.

2) The frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of hopping frequencies multiplied with the Channel Occupancy Time whichever is the longest. There shall be no transmissions during this period on this frequency. After this, the hopping frequency may be considered again as an 'available' frequency.

3) The total time during which an equipment has transmissions on a given hopping frequency without re-evaluating the availability of that frequency is defined as the Channel Occupancy Time. The Channel Occupancy Time for a given hopping frequency shall be less than 40 ms. For equipment using a dwell time > 40 ms that want to have other transmissions during the same hop (dwell time) an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Period with a minimum of 100 µs shall be implemented. After this, the procedure as in step 1 need to be repeated before having new transmissions on this hopping frequency during the same dwell time.

EXAMPLE: A system with a dwell time of 400 ms can have 9 transmission sequences of 40 ms each, Separated with an Idle Period of 3 ms.

NOTE: For non-LBT based frequency hopping systems with a dwell time < 40 ms, the maximum Channel Occupancy Time may be non-contiguous, i.e. spread over a number of hopping sequences (equal to 40 msec divided by the dwell time [msec]).

4) Unavailable' channels may be removed from or may remain in the hopping sequence, but in any case:
   - there shall be no transmissions on 'unavailable' channels;
   - a minimum of 15 hopping frequencies shall always be maintained.

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 or lower than -70 dBm/MHz at the input to thereceiver (assuming a 0 dBi receive antenna). For power levels below 20 dBm e.i.r.p., the detection threshold levelmay be relaxed to TL = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm).

Non-LBT based Detect and Avoid

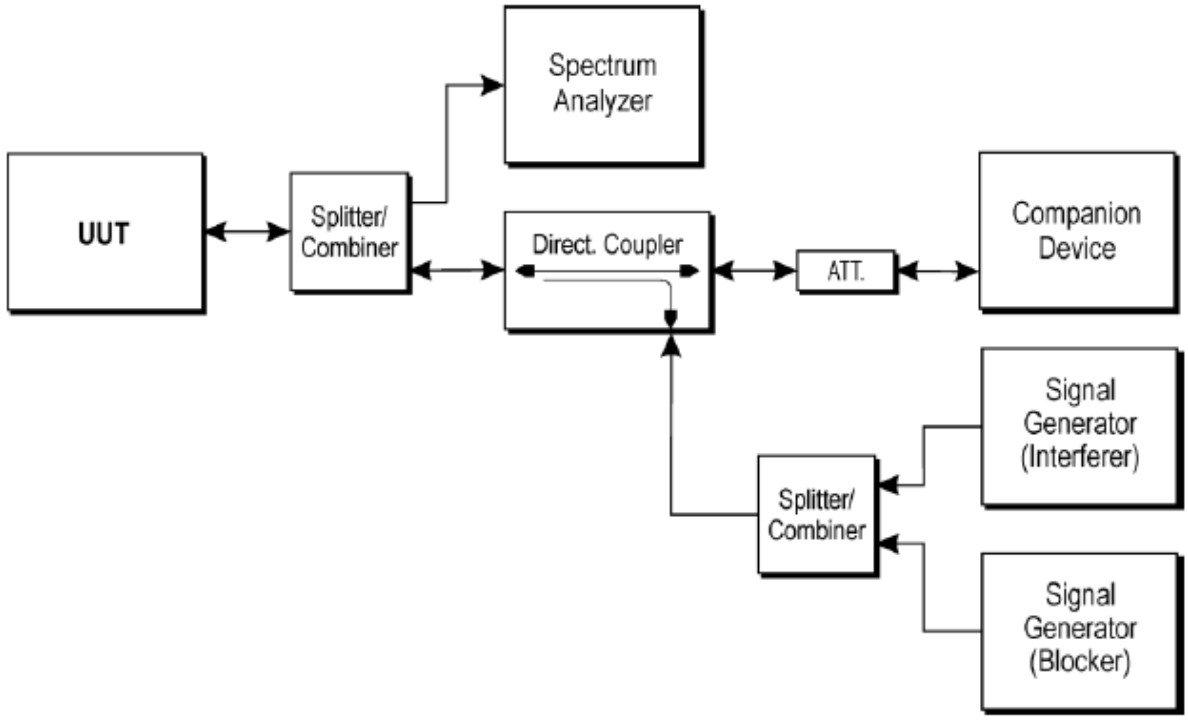
Equipment using a modulation other than FHSS and using the non-LBT based Detect and Avoid mechanism, shall comply with the following minimum set of requirements:

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 4). the channel shall be marked as 'unavailable'.
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' channel.
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.
4) The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed with 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.
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 or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). For power levels below 20 dBm e.i.r.p., the detection threshold level may be relaxed to TL = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm).

LBT based Detect and Avoid

The present document defines 2 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.

Test Configuration



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

The spectrum analyser sweep was triggered by the start of the interfering signal, with the interfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal.

TEST RESULTS

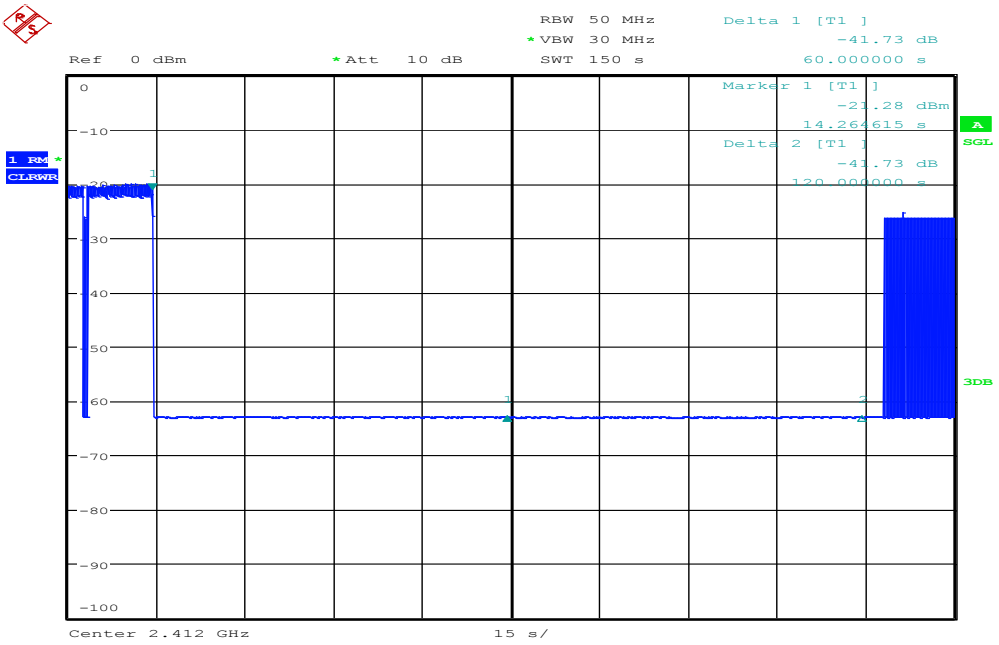
IEEE 802.11b Mode	Signal duration after interfering (s)	
	2412	2472
	Pass	Pass

IEEE 802.11g Mode	Signal duration after interfering (s)	
	2412	2472
	Pass	Pass

IEEE 802.11n HT 20 MHz Mode	Signal duration after interfering (s)	
	2412	2472
	Pass	Pass

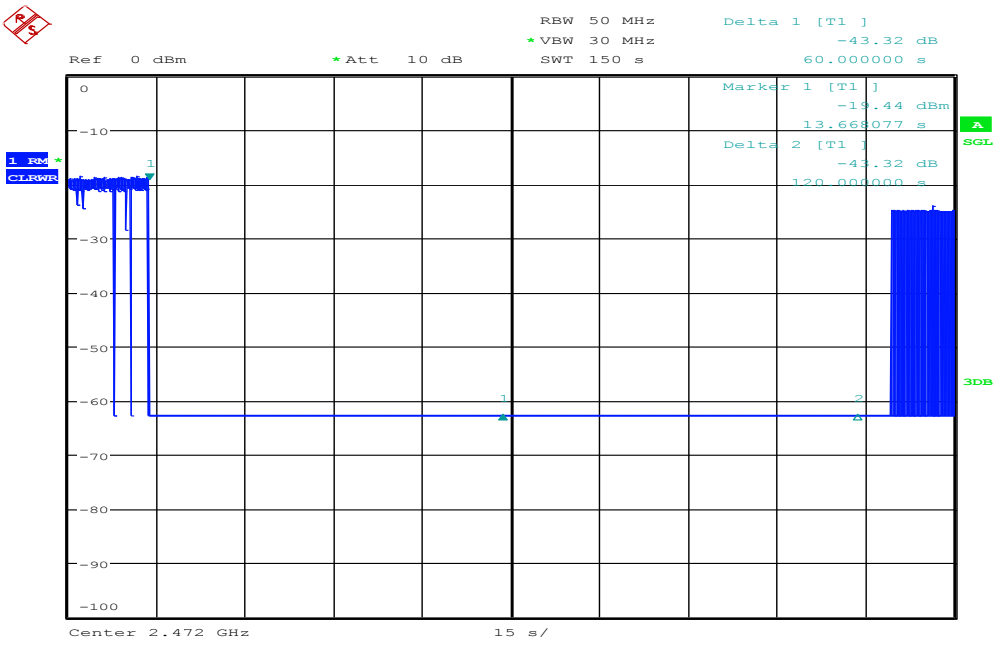
IEEE 802.11n HT 40 MHz Mode	Signal duration after interfering (s)	
	2422	2462
	Pass	Pass

Test results: IEEE 802.11b Mode / Low



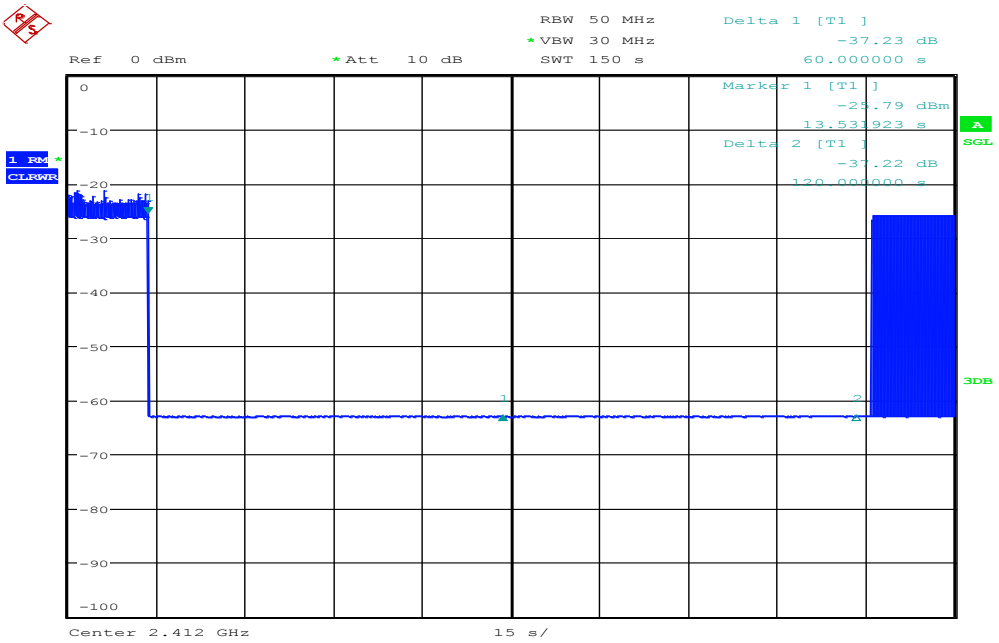
Date: 9.MAR.2016 13:54:33

Test results: IEEE 802.11b Mode / High



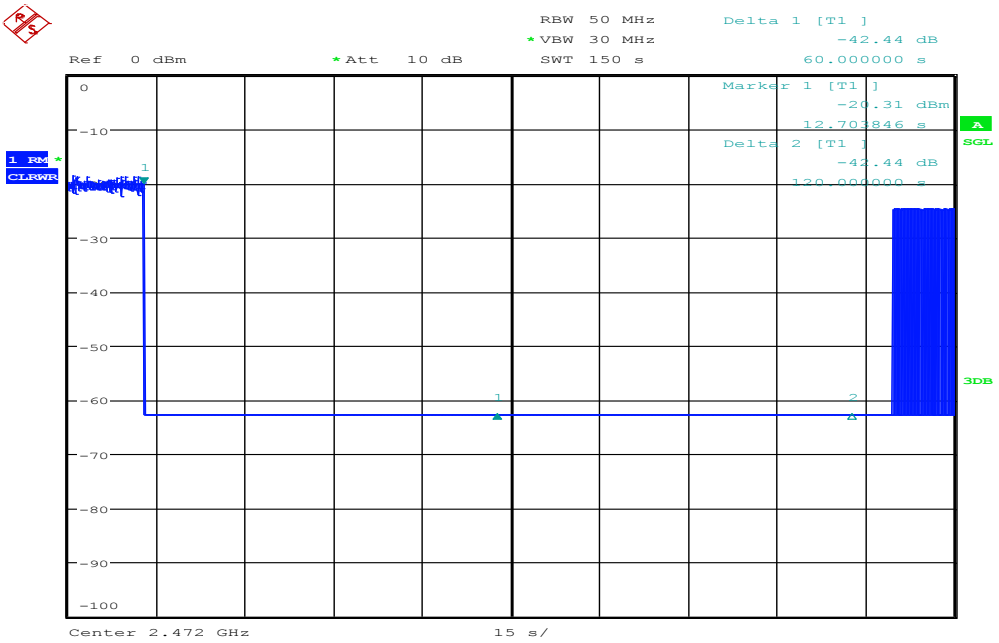
Date: 9.MAR.2016 14:52:10

Test results: IEEE 802.11g Mode / Low



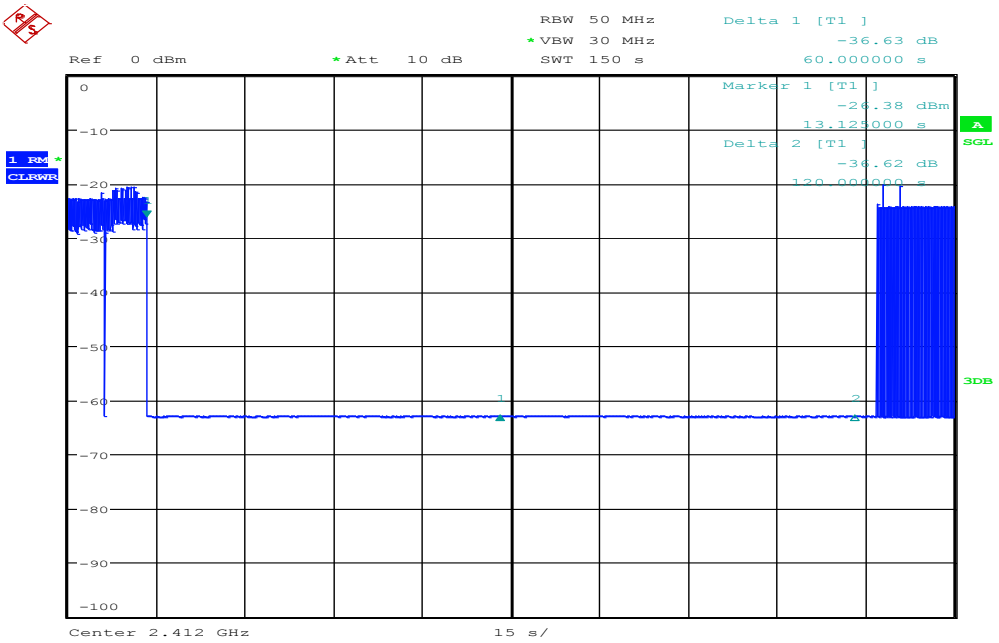
Date: 9.MAR.2016 13:59:20

Test results: IEEE 802.11g Mode / High



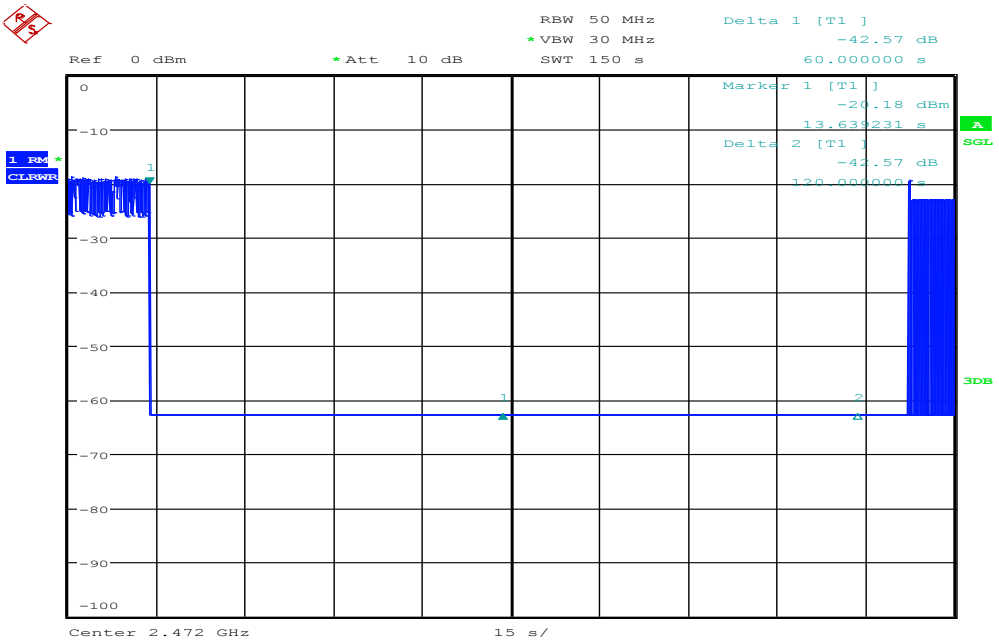
Date: 9.MAR.2016 14:33:45

Test results: IEEE 802.11n HT 20 MHz Mode / Low



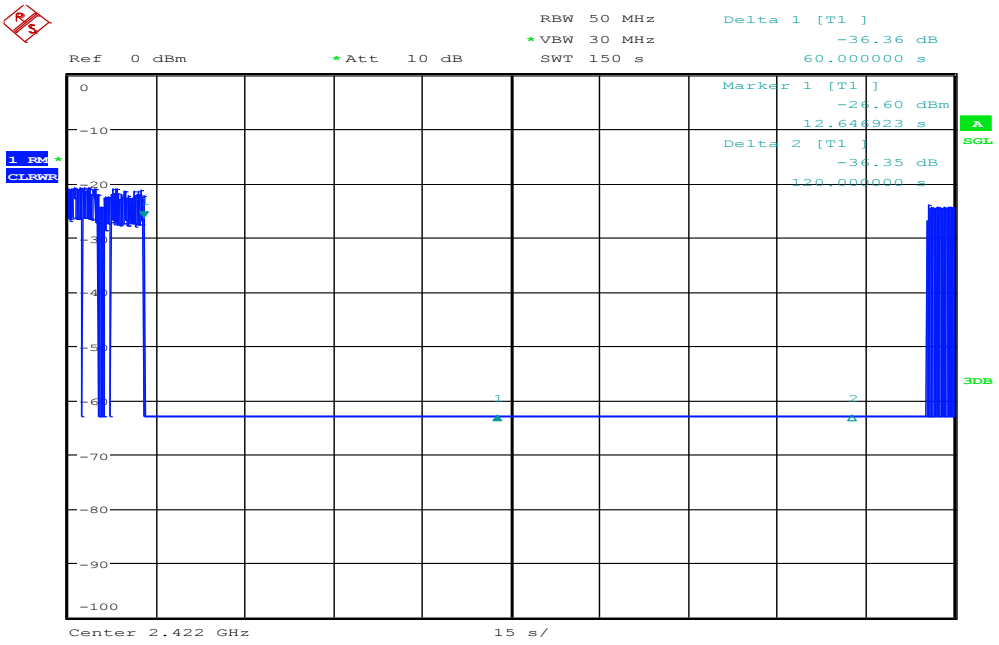
Date: 9.MAR.2016 14:08:01

Test results: IEEE 802.11n HT 20 MHz Mode / High



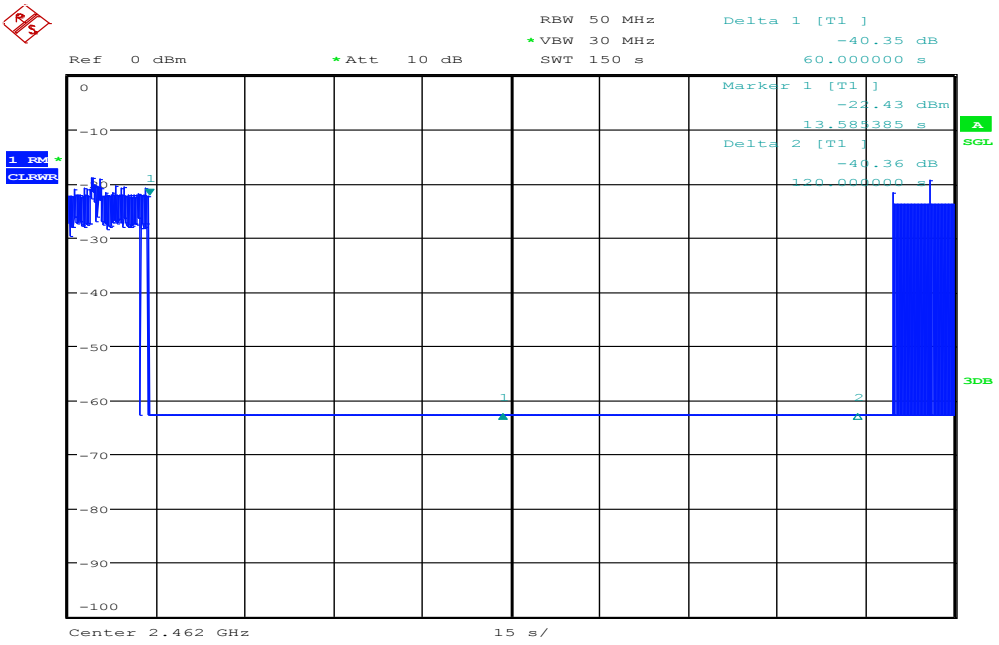
Date: 9.MAR.2016 14:20:22

Test results: IEEE 802.11n HT 40 MHz Mode / Low



Date: 9.MAR.2016 15:14:02

Test results: IEEE 802.11n HT 40 MHz Mode / High



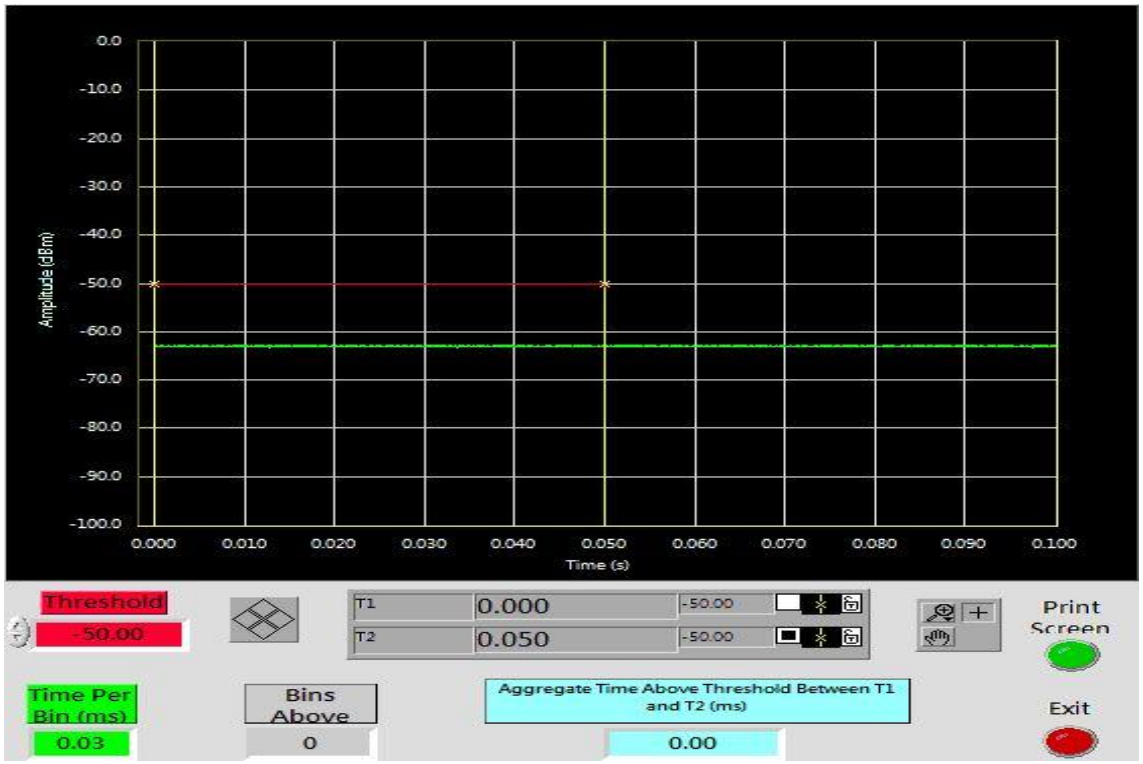
Date: 9.MAR.2016 15:28:41

TEST RESULTS

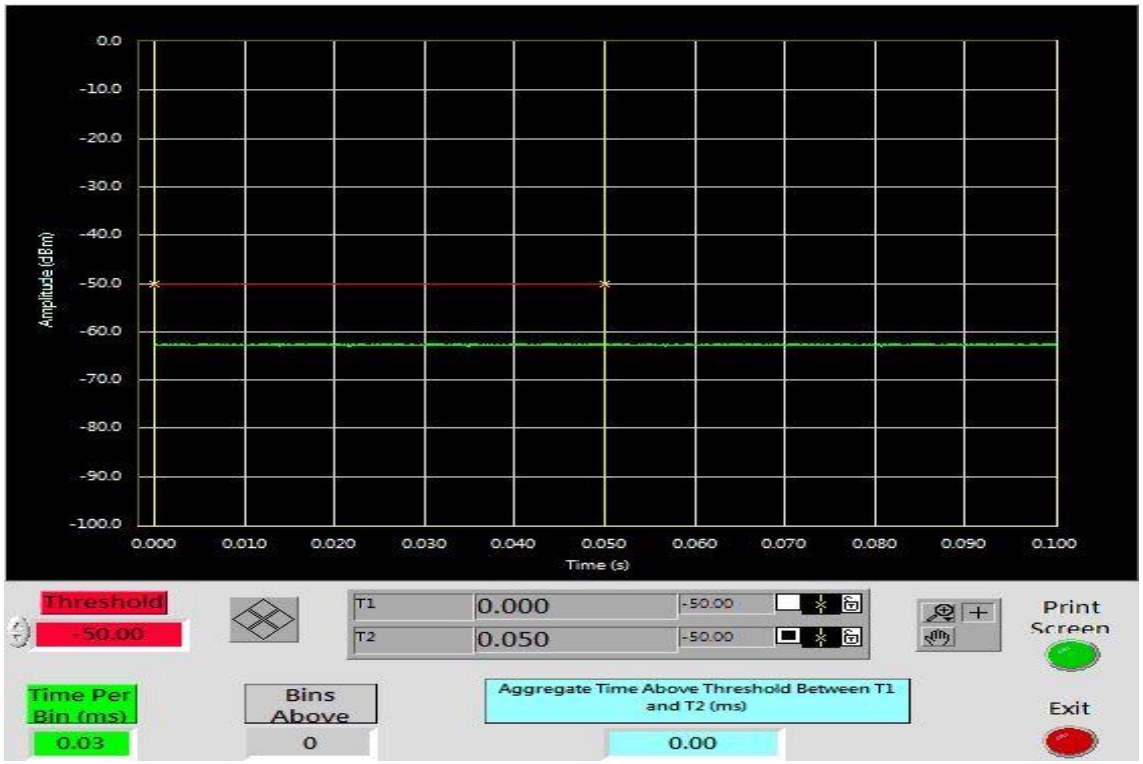
Short Control Signalling Transmissions			
Mode	Maximum duty cycle(ms)		Limit(ms)
	2412	2472	
IEEE 802.11b Mode	0.00	0.00	5
IEEE 802.11g Mode	0.00	0.00	5
IEEE 802.11n HT 20 MHz Mode	0.00	0.00	5

Short Control Signalling Transmissions			
Mode	Maximum duty cycle(ms)		Limit(ms)
	2422	2462	
IEEE 802.11n HT 40 MHz Mode	0.00	0.00	5

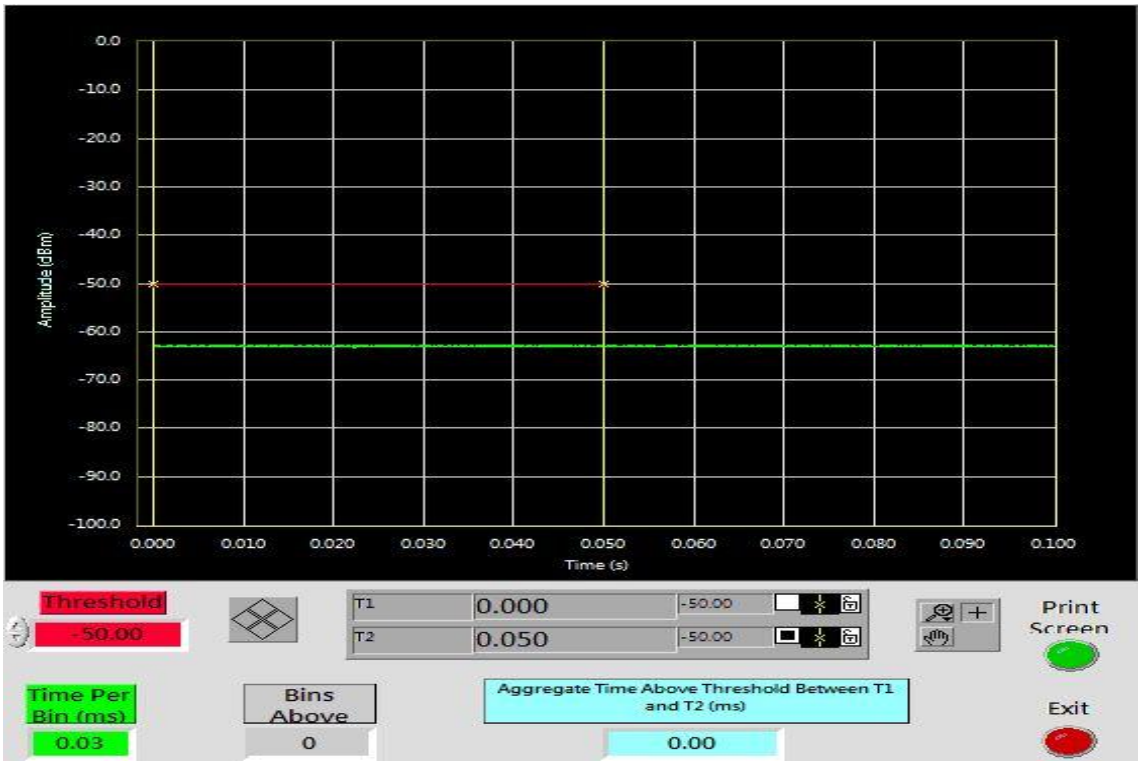
Test results: IEEE 802.11b / Low



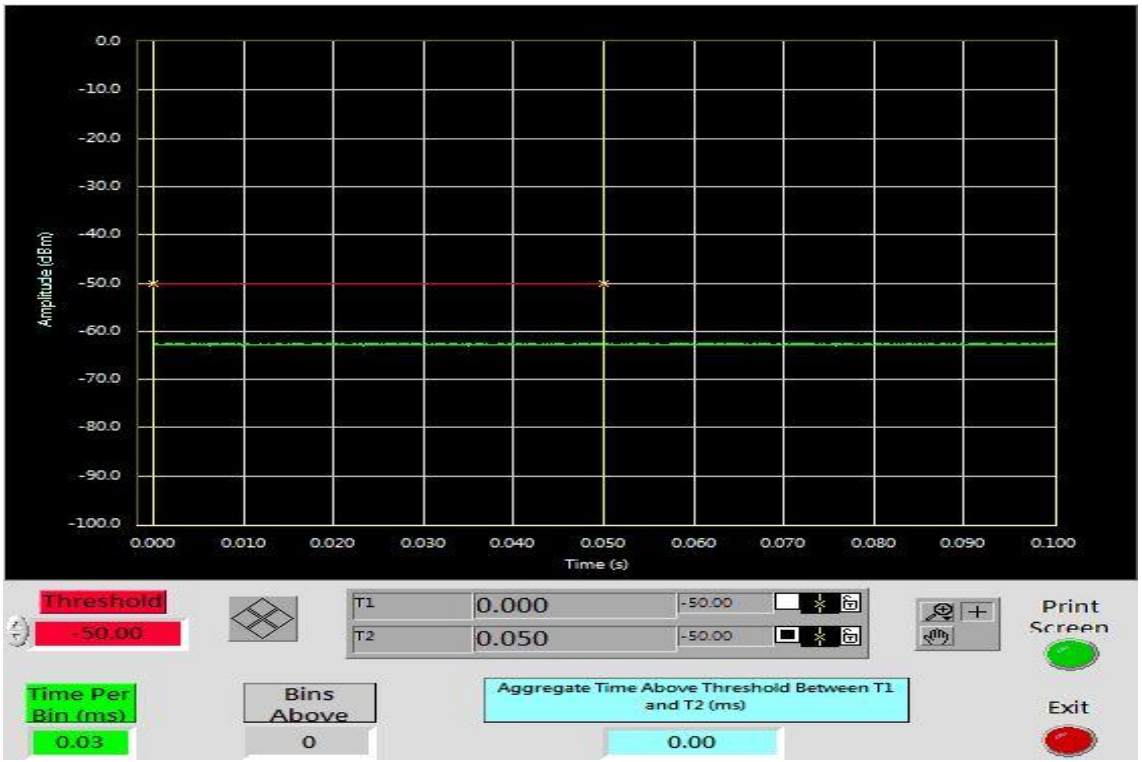
Test results: IEEE 802.11b / High



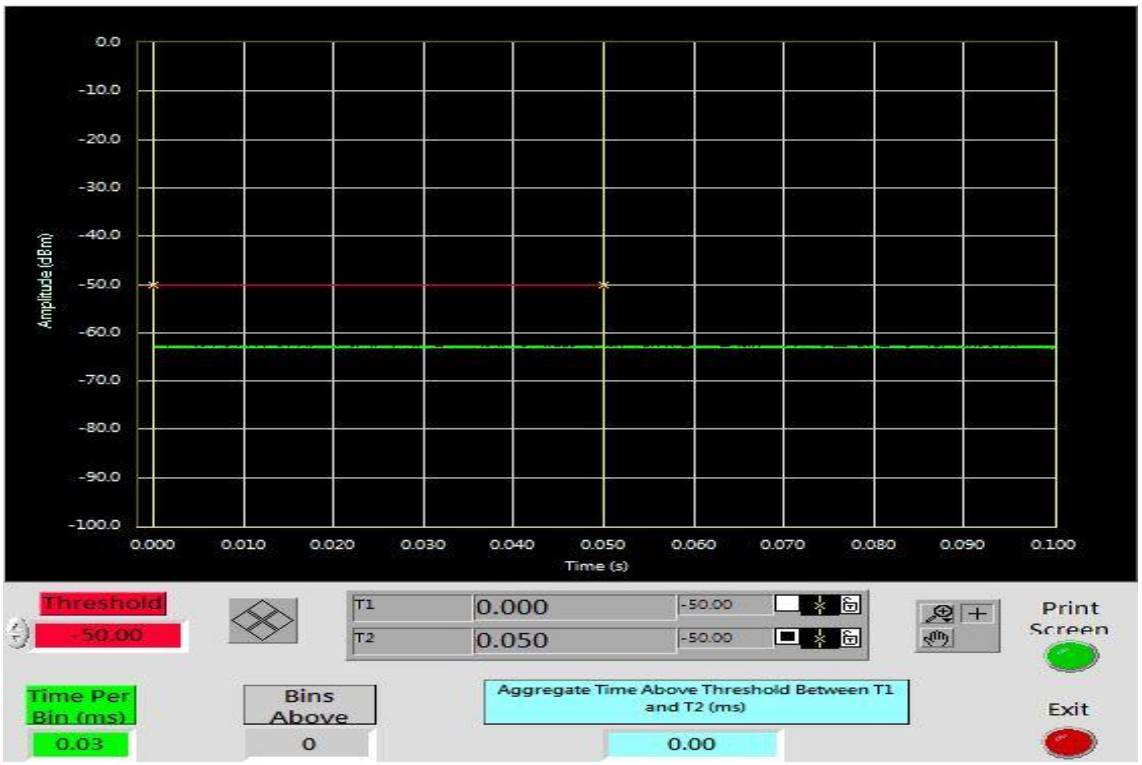
Test results: IEEE 802.11g / Low



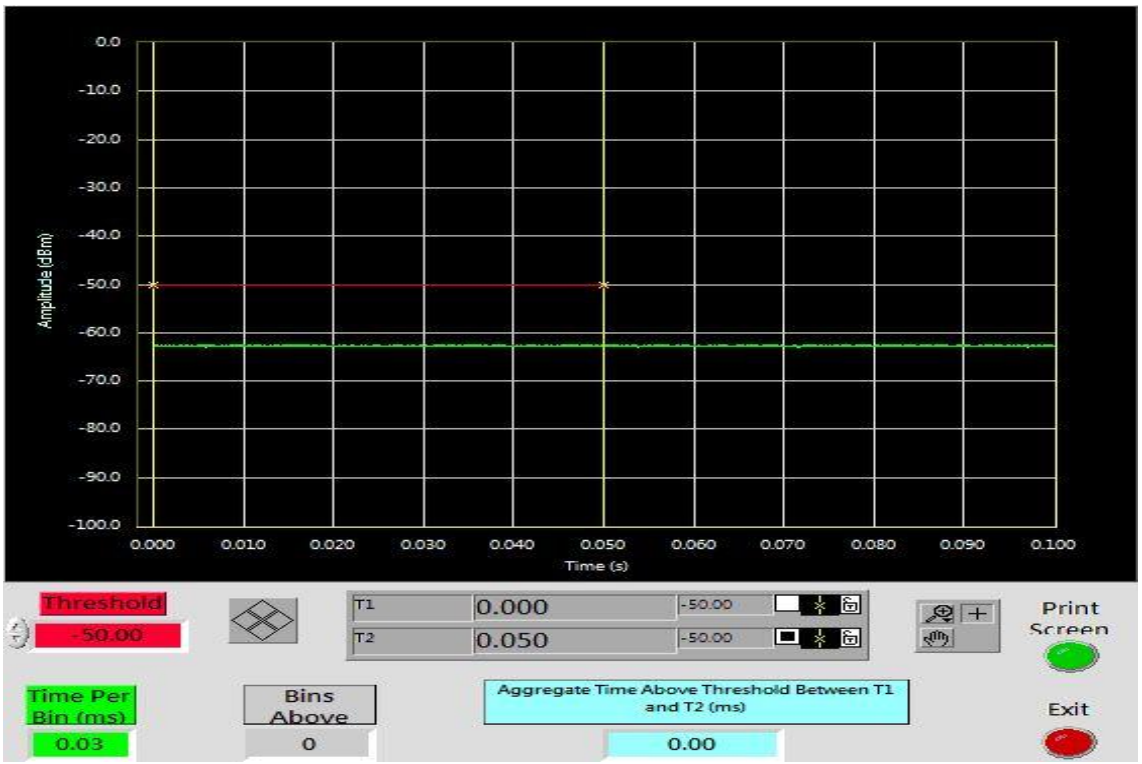
Test results: IEEE 802.11g / High



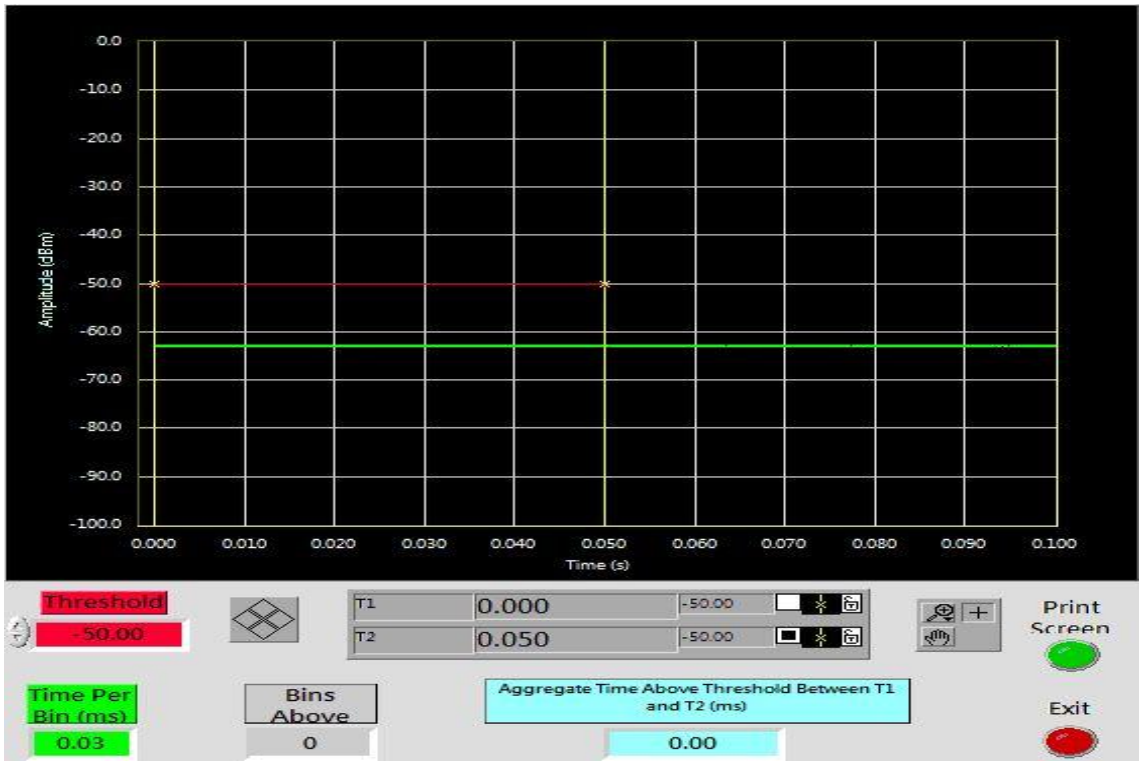
Test results: IEEE 802.11n HT 20 / Low



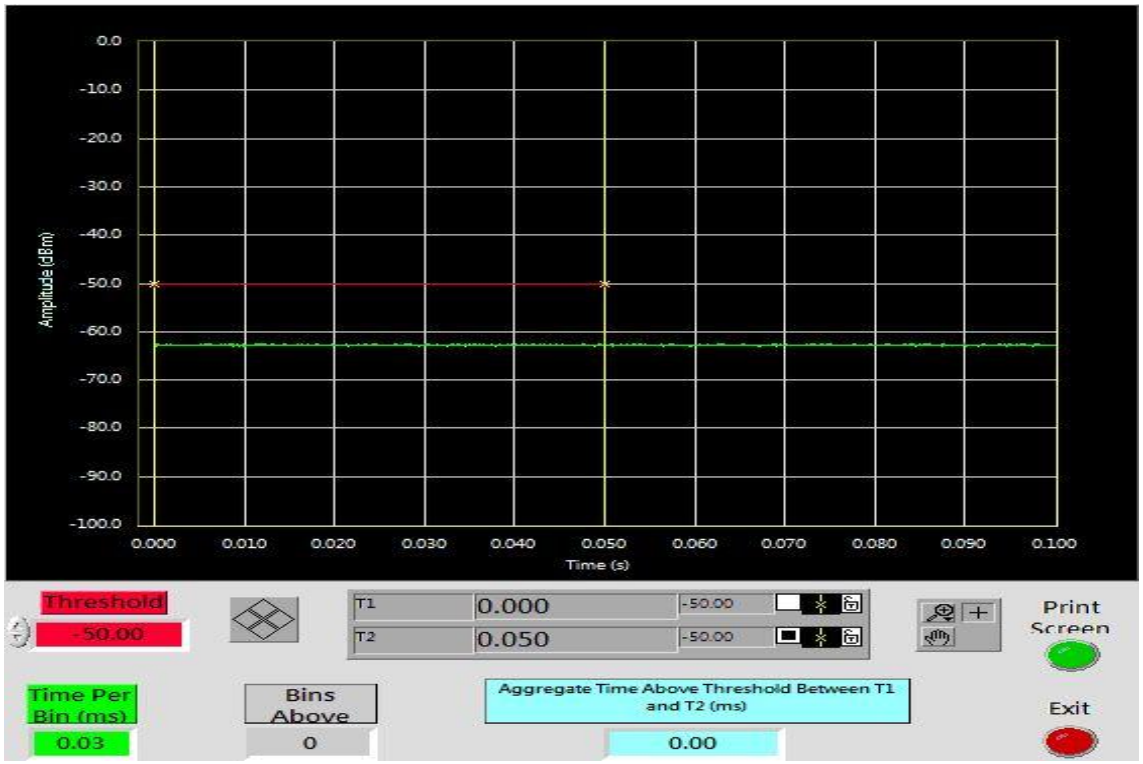
Test results: IEEE 802.11n HT 20 / High



Test results: IEEE 802.11n HT 40 / Low

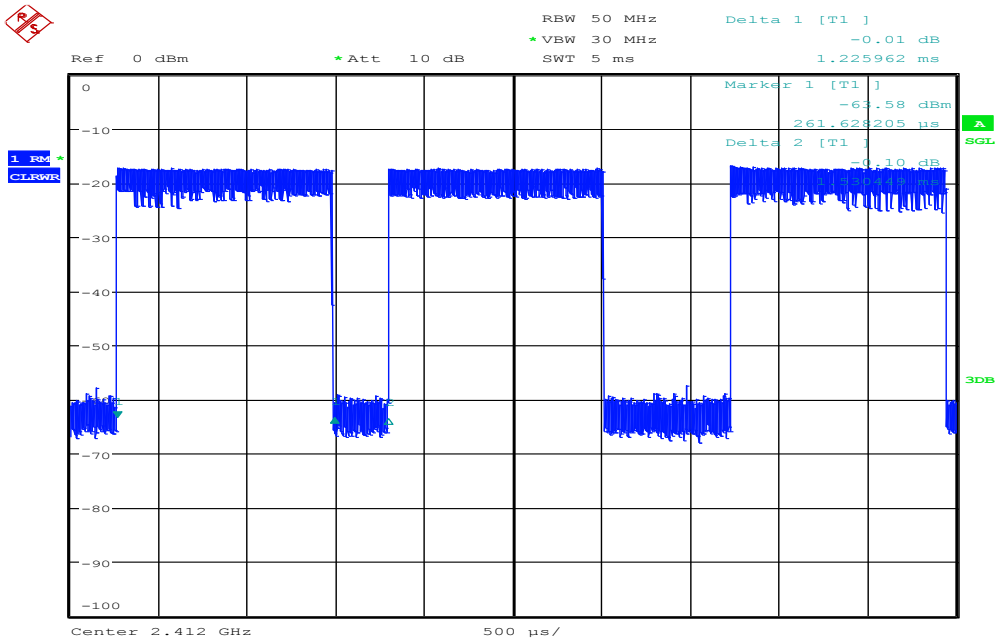


Test results: IEEE 802.11n HT 40 / High



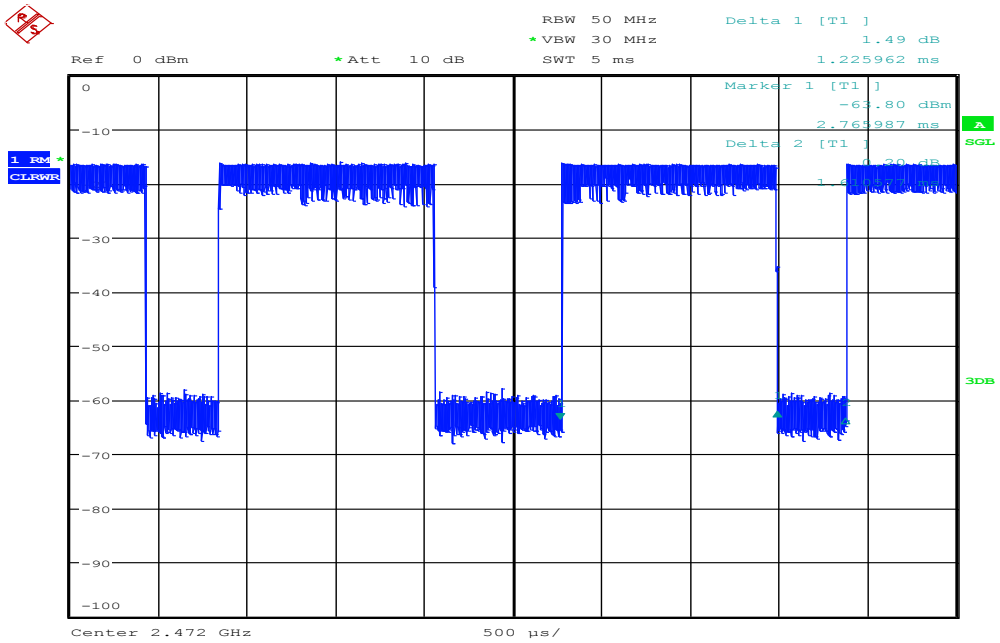
Occupancy time

Test results: IEEE 802.11b Mode / Low



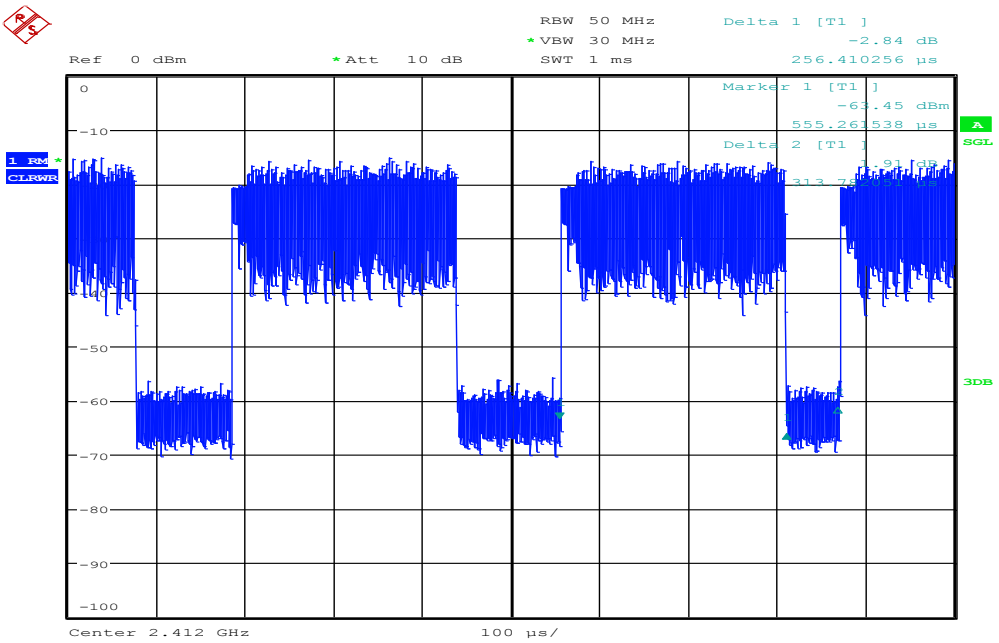
Date: 9.MAR.2016 13:40:39

Test results: IEEE 802.11b Mode / High



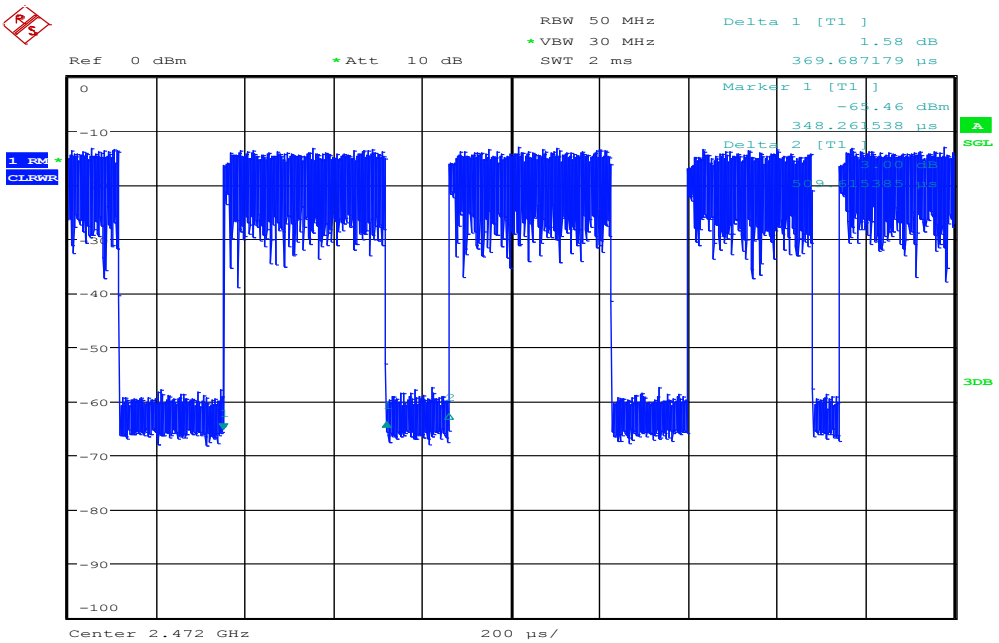
Date: 9.MAR.2016 14:41:44

Test results: IEEE 802.11g Mode / Low



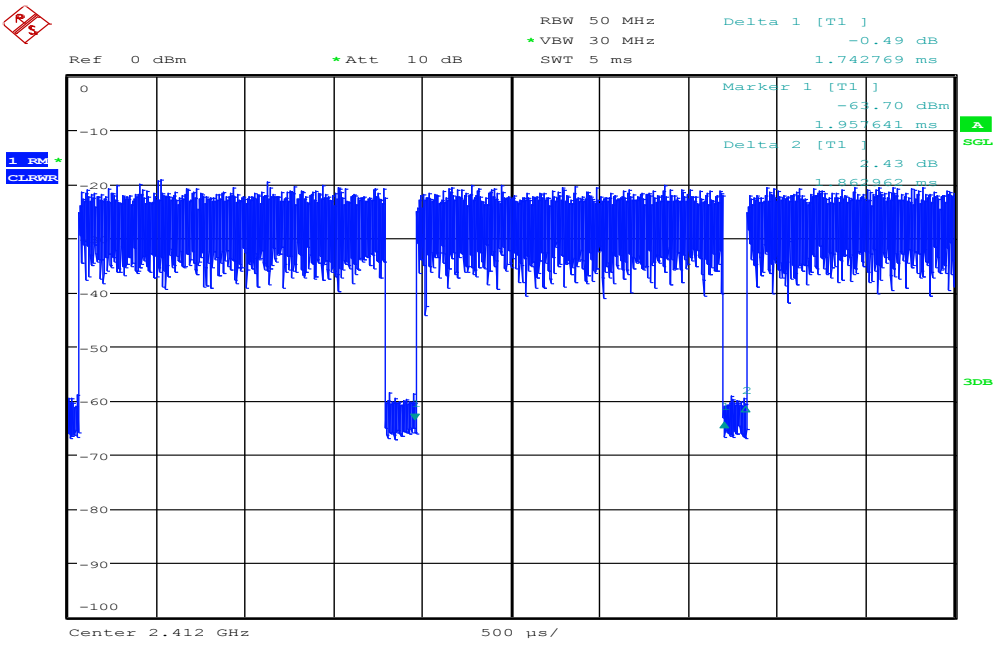
Date: 9.MAR.2016 13:56:25

Test results: IEEE 802.11g Mode / High



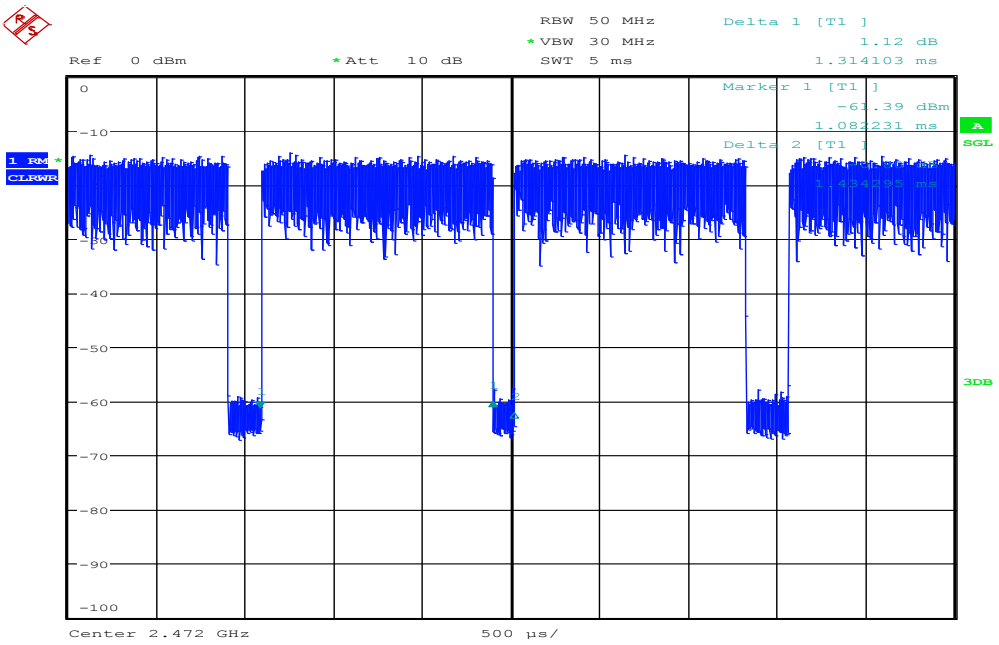
Date: 9.MAR.2016 14:30:21

Test results: IEEE 802.11n HT 20 MHz Mode / Low



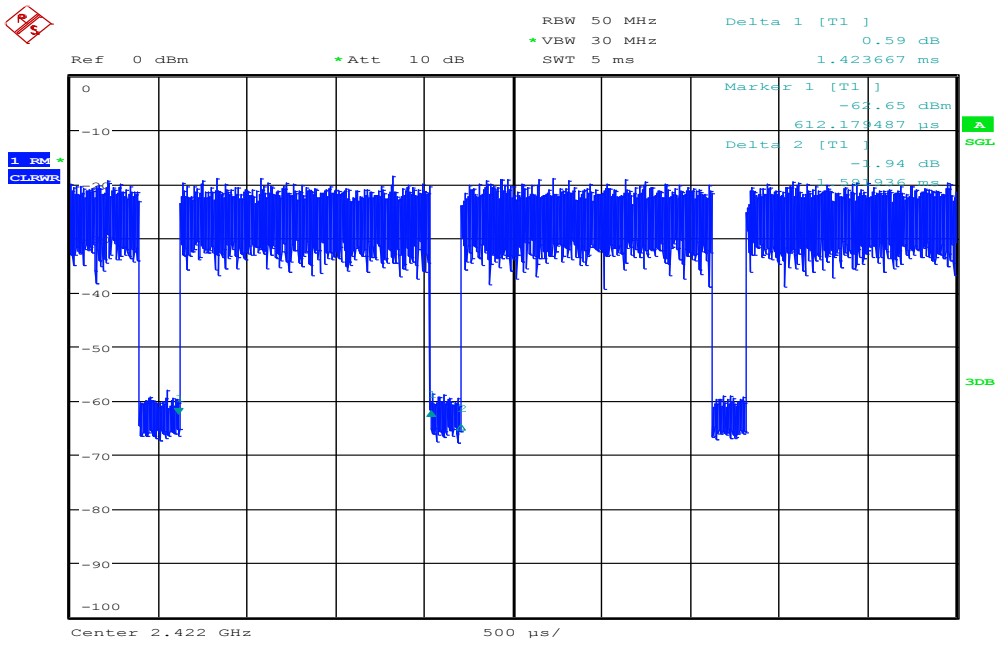
Date: 9.MAR.2016 14:04:01

Test results: IEEE 802.11n HT 20 MHz Mode / High



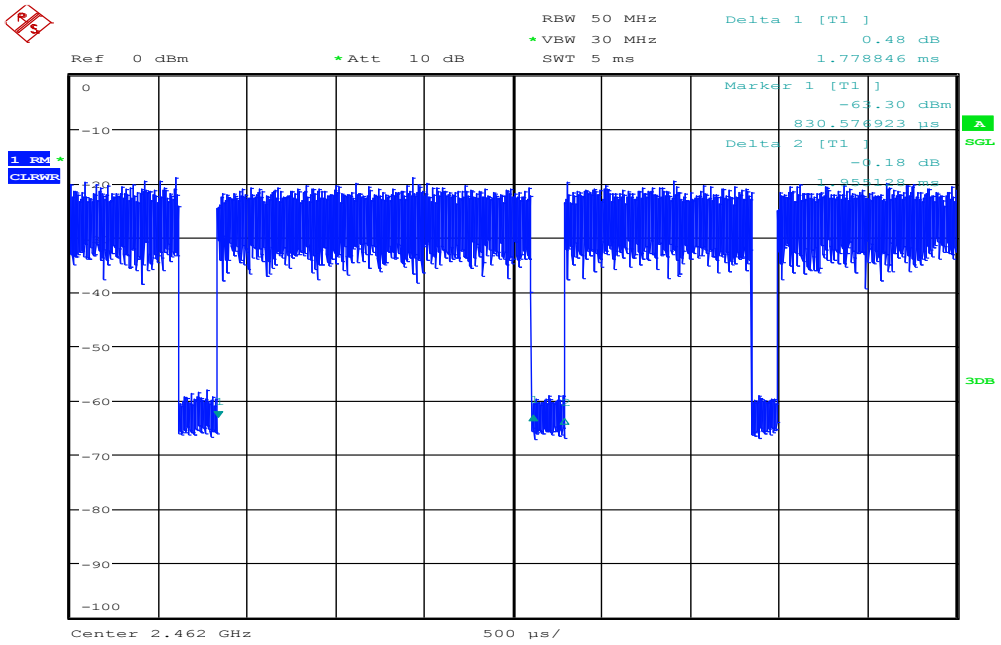
Date: 9.MAR.2016 14:13:49

Test results: IEEE 802.11n HT 40 MHz Mode / Low



Date: 9.MAR.2016 14:56:28

Test results: IEEE 802.11n HT 40 MHz Mode / High



Date: 9.MAR.2016 15:25:55

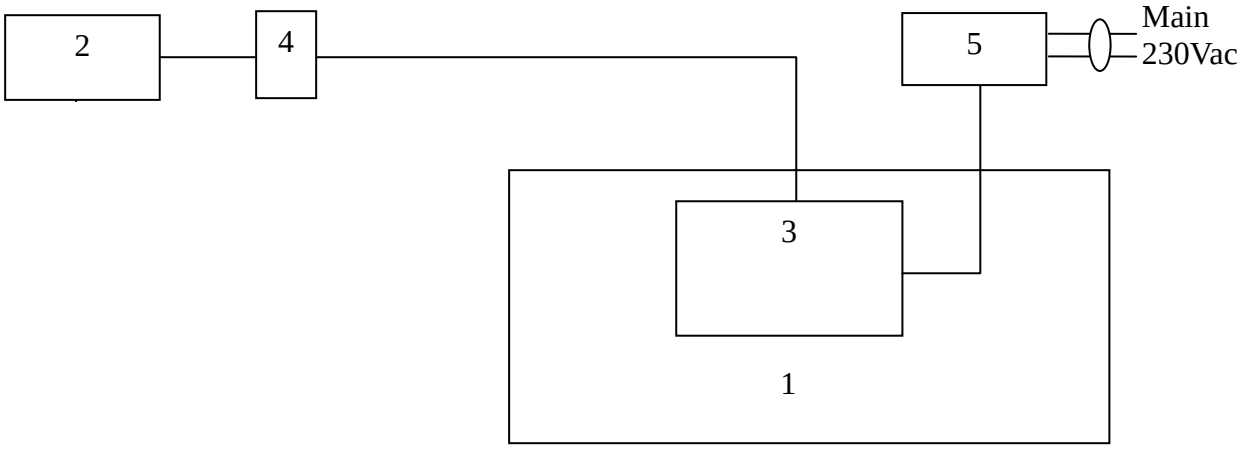
7.8 OCCUPIED CHANNEL BANDWIDTH

LIMIT

ETSI EN 300 328
For non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

For non-adaptive Frequency Hopping equipment with e.i.r.p greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

Test Configuration



Legend

1. Wooden table
2. Spectrum analyzer
3. EUT
4. DC block
5. Power supply

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

Pass.

IEEE 802.11b Mode

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	2412	14.16
High	2472	13.91

IEEE 802.11g Mode

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	2412	16.53
High	2472	16.47

IEEE 802.11n HT20M Mode

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	2412	17.69
High	2472	17.67

IEEE 802.11n HT40M Mode

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	2422	36.41
High	2462	36.41

7.9 TRANSMITTER UNWANTED EMISSIONS IN THE OOB DOMAIN

LIMIT

ETSI EN 300 328

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 figure 1.

NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.7.

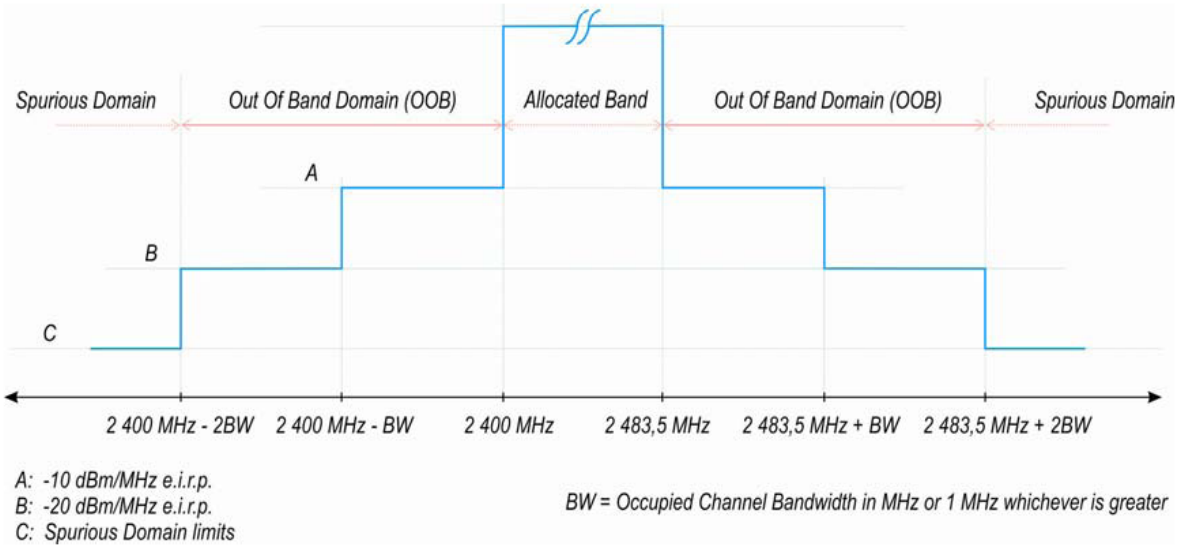
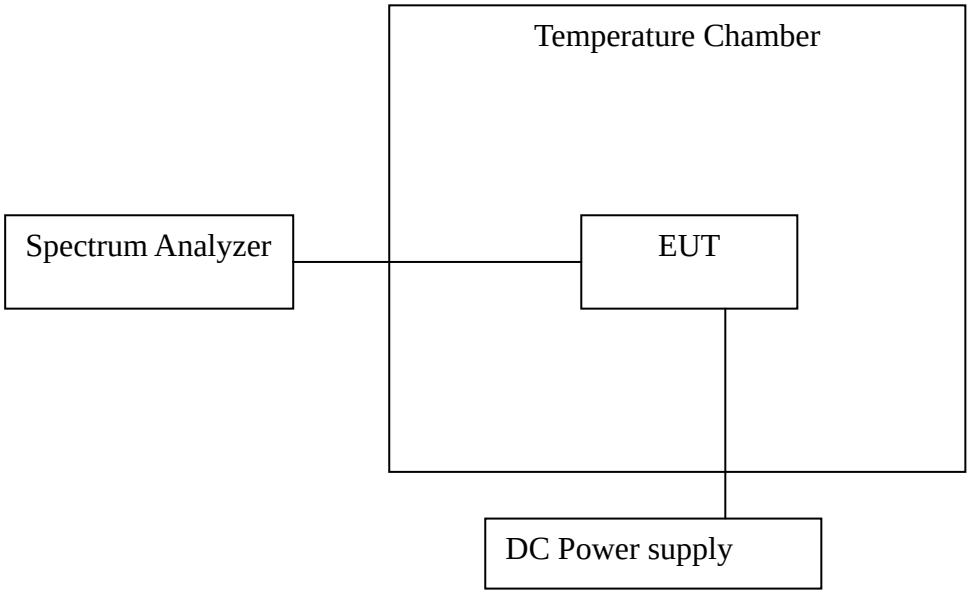


Figure 1: Transmit mask

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

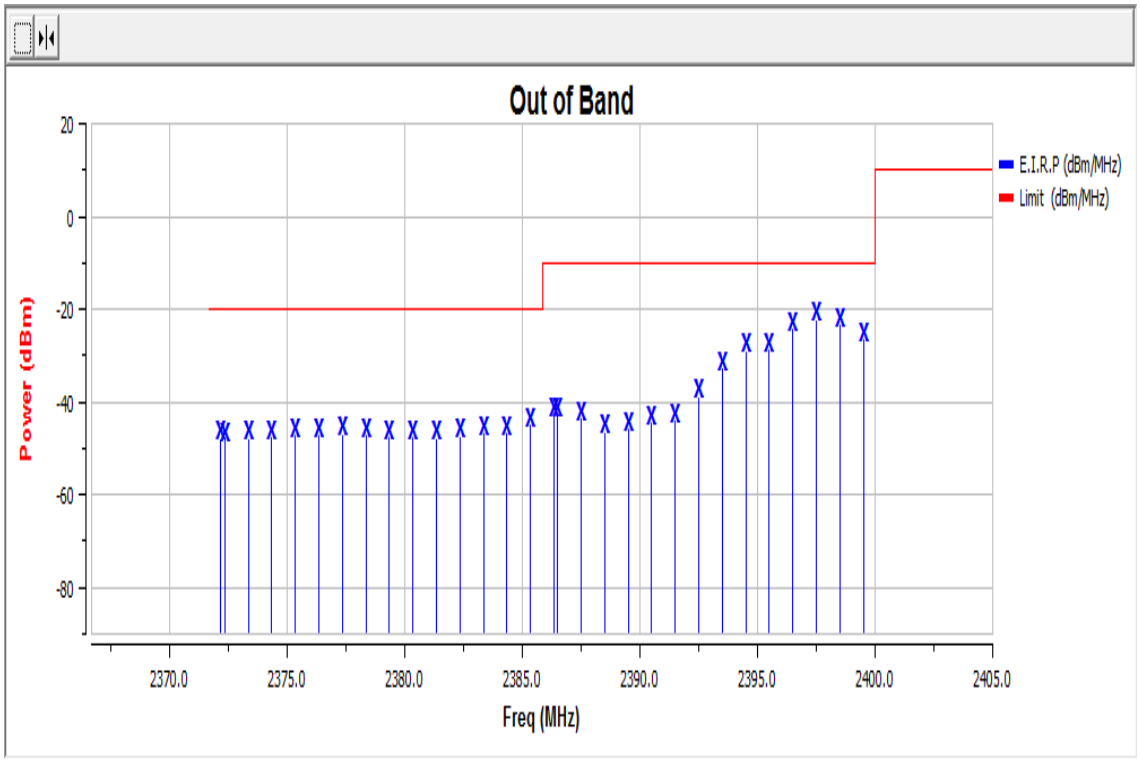
1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

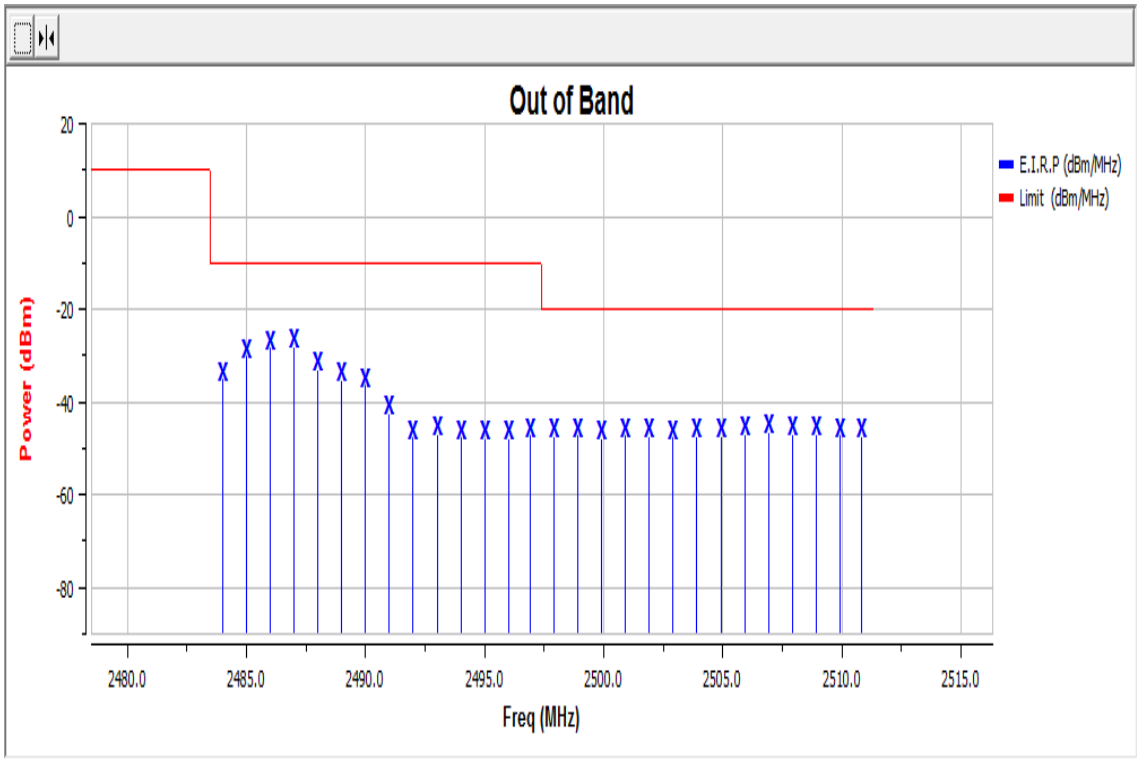
No non-compliance noted.

Test results: IEEE 802.11b Mode

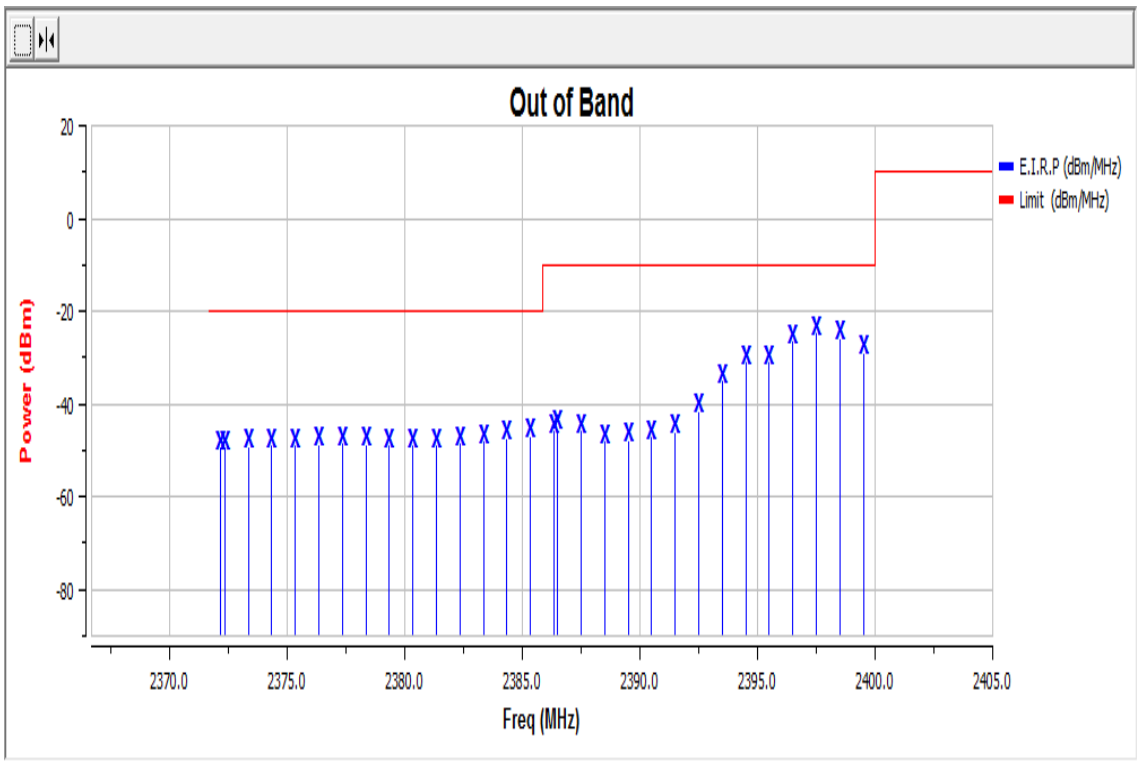
-15℃ /12V CH Low



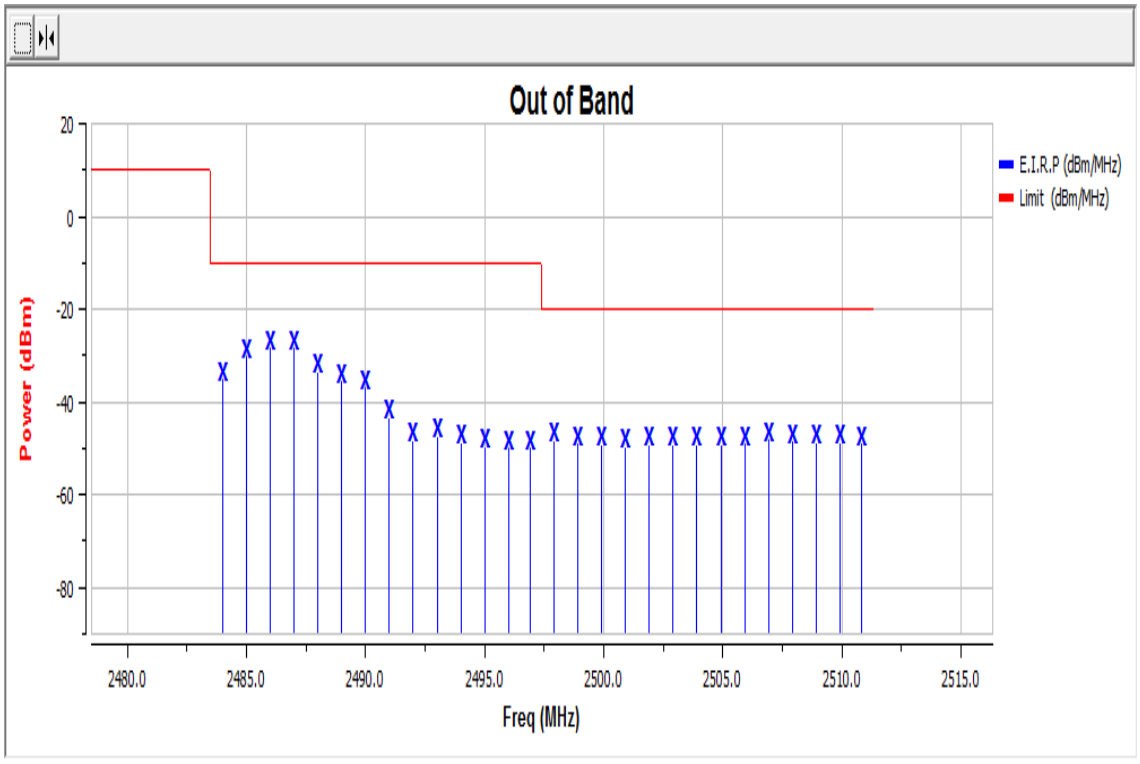
-15℃ /12V CH High



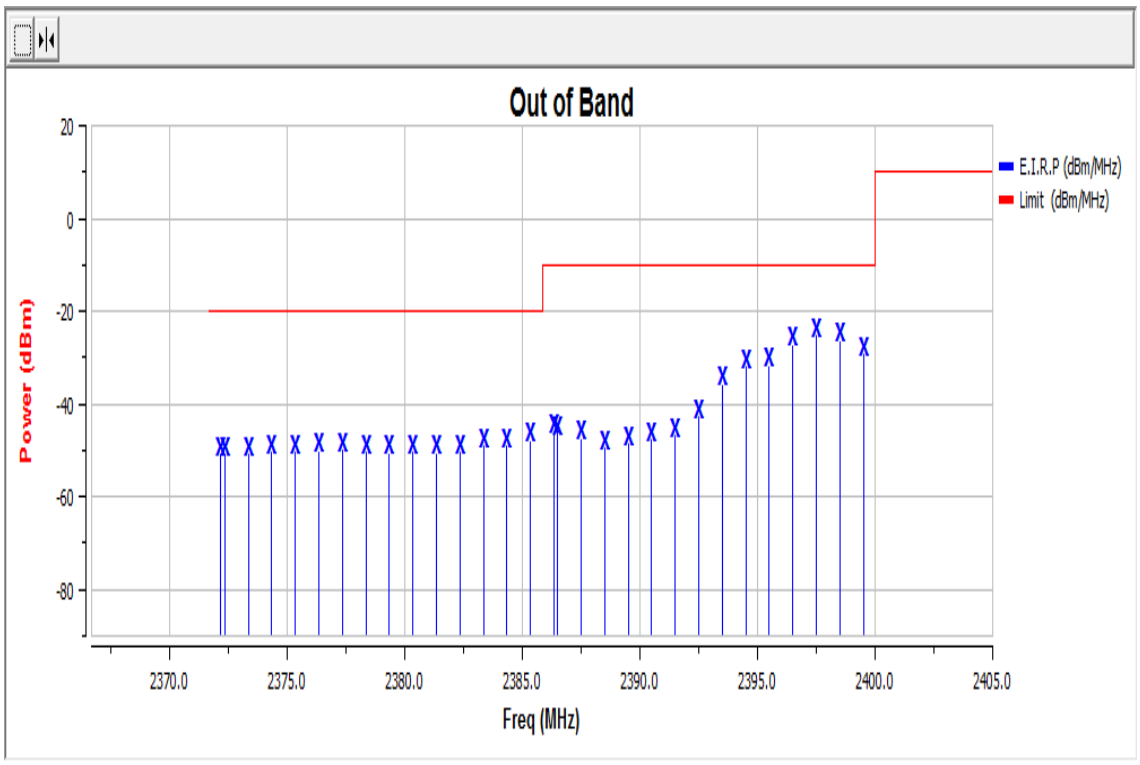
20℃ /12V CH Low



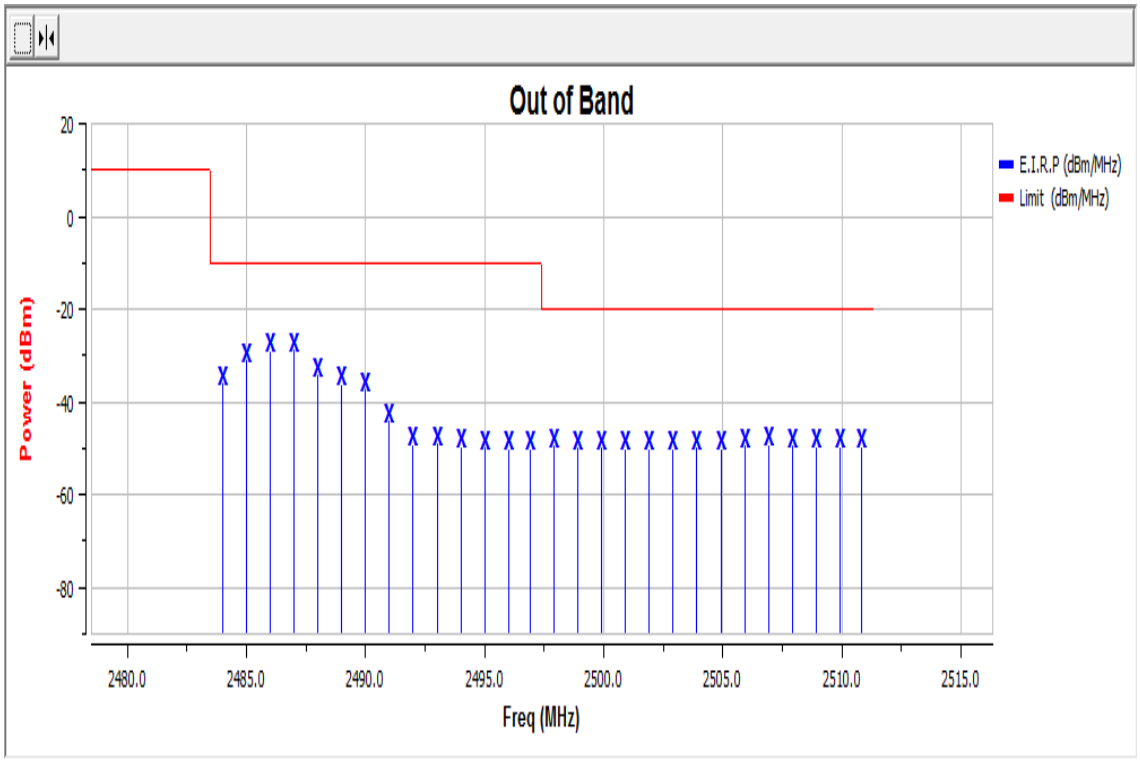
20℃ /12V CH High



55℃ /12V CH Low

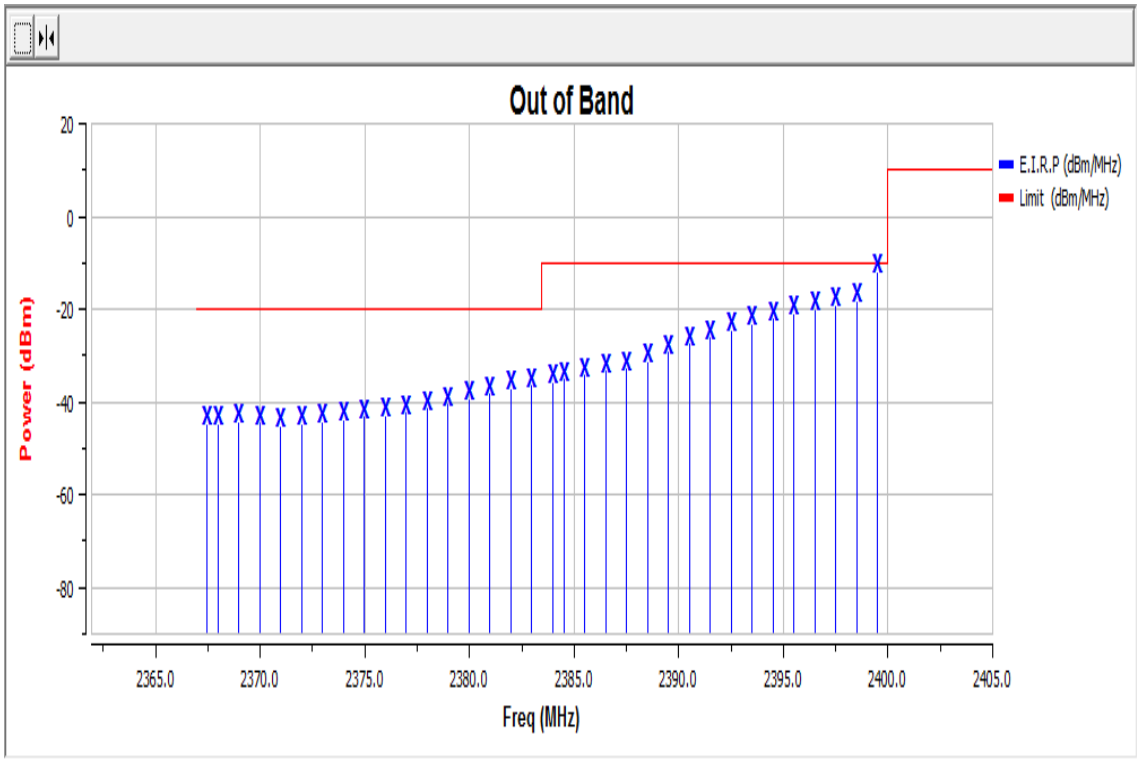


55℃ /12V CH High

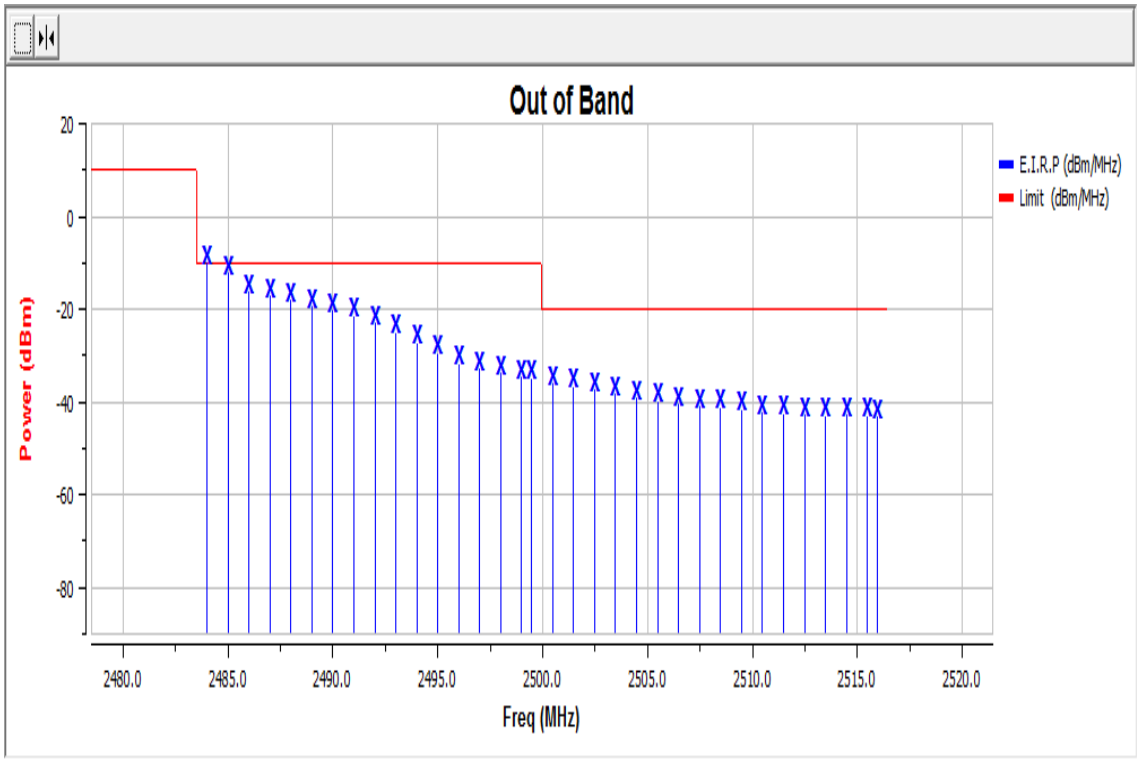


Test results: IEEE 802.11g Mode

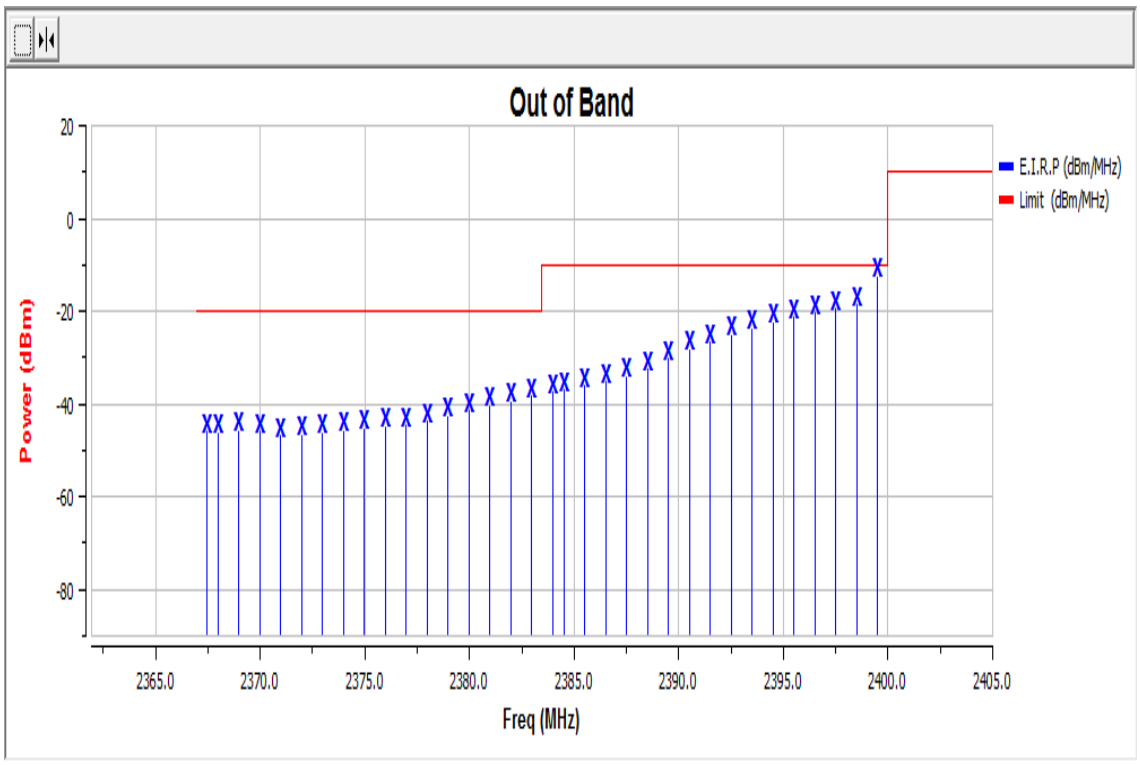
-15℃ /12V CH Low



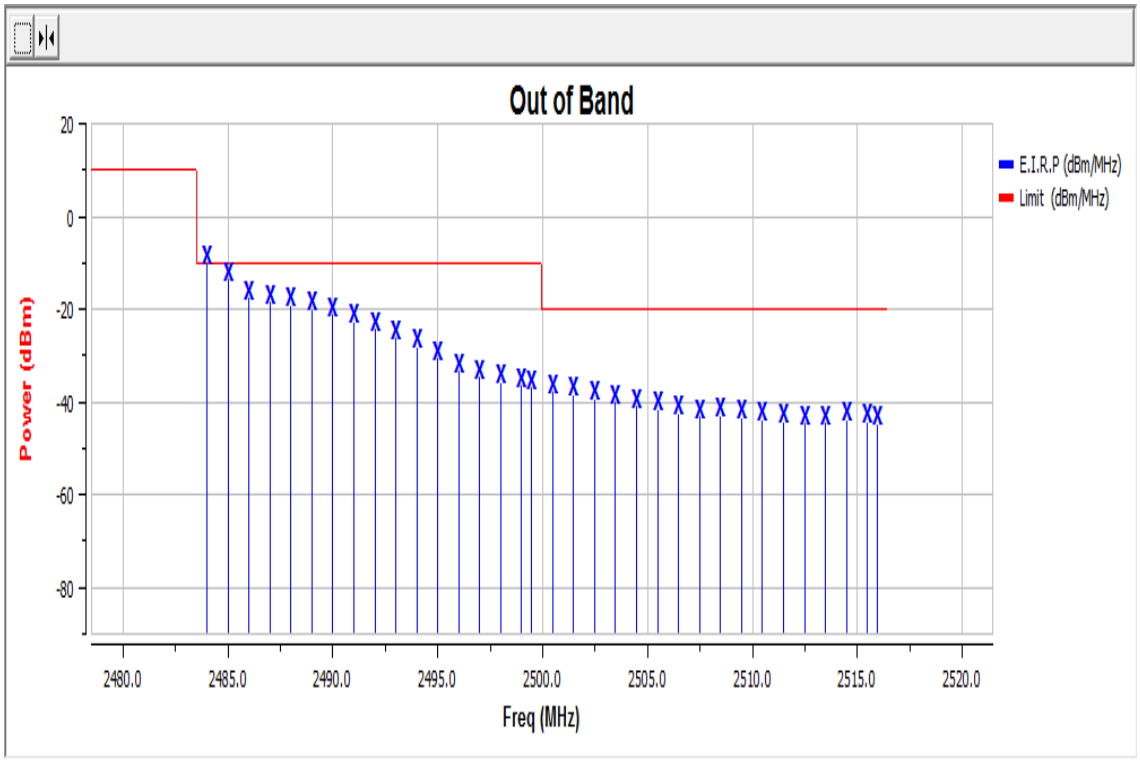
-15℃ /12V CH High



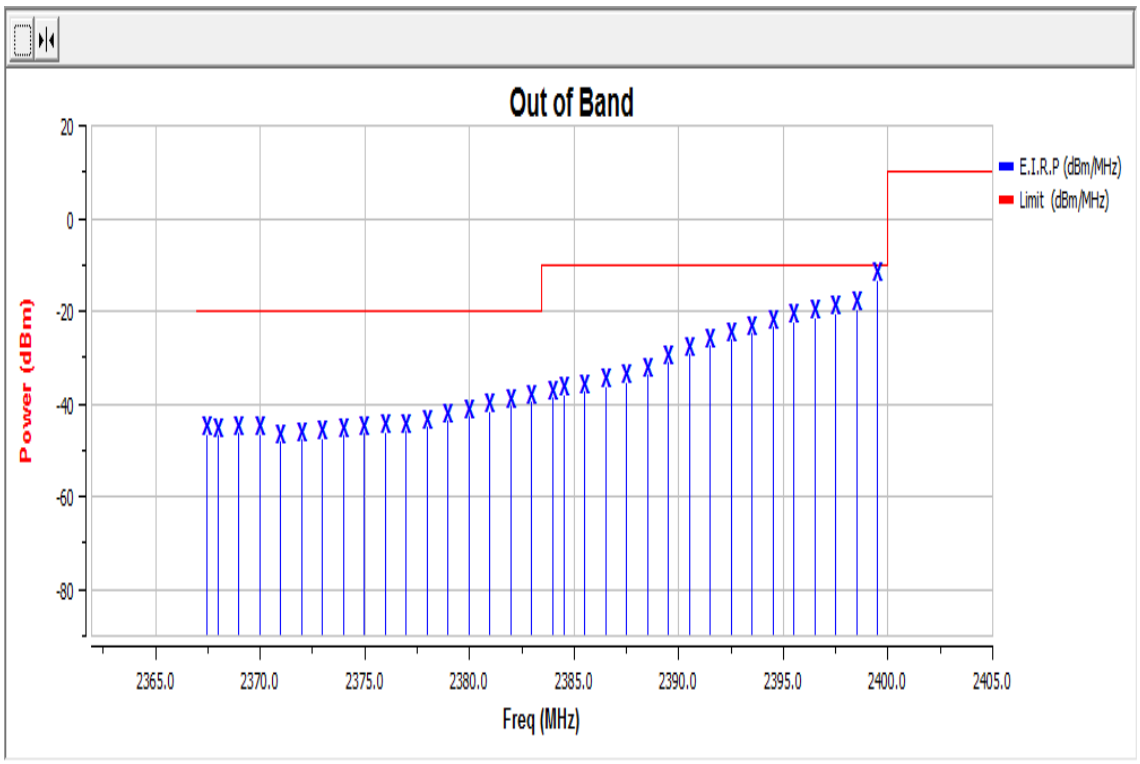
20℃ /12V CH Low



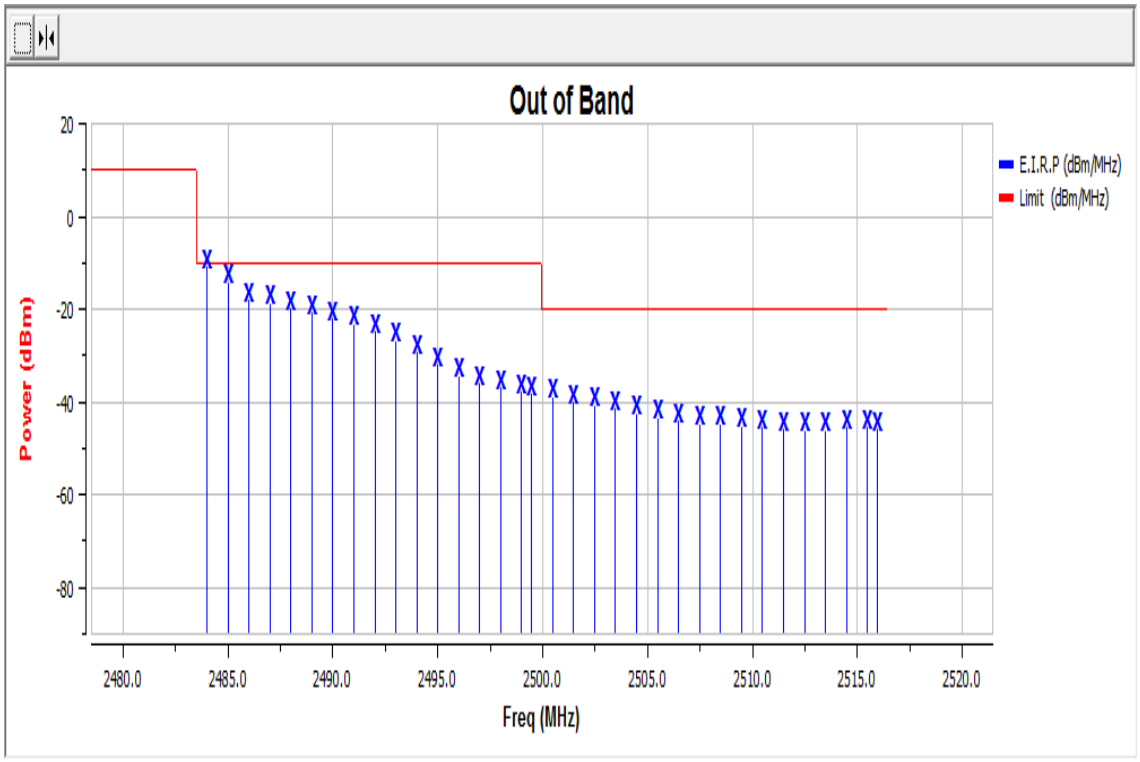
20℃ /12V CH High



55℃ /12V CH Low

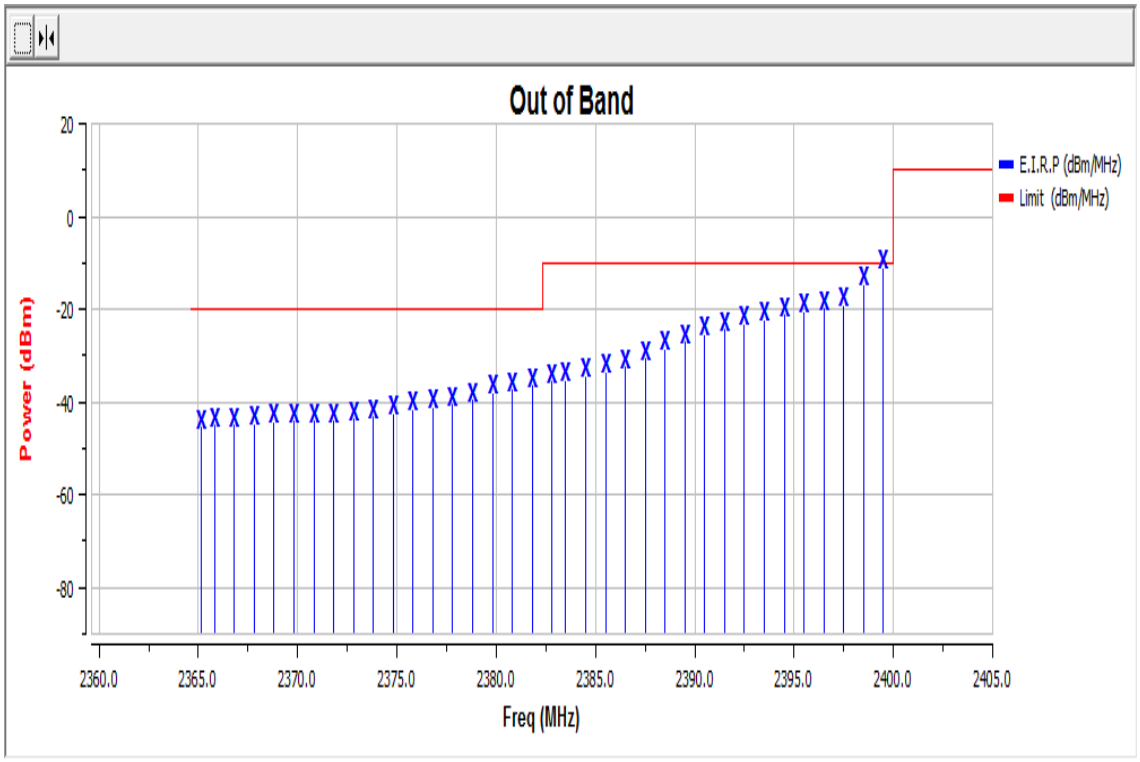


55℃ /12V CH High

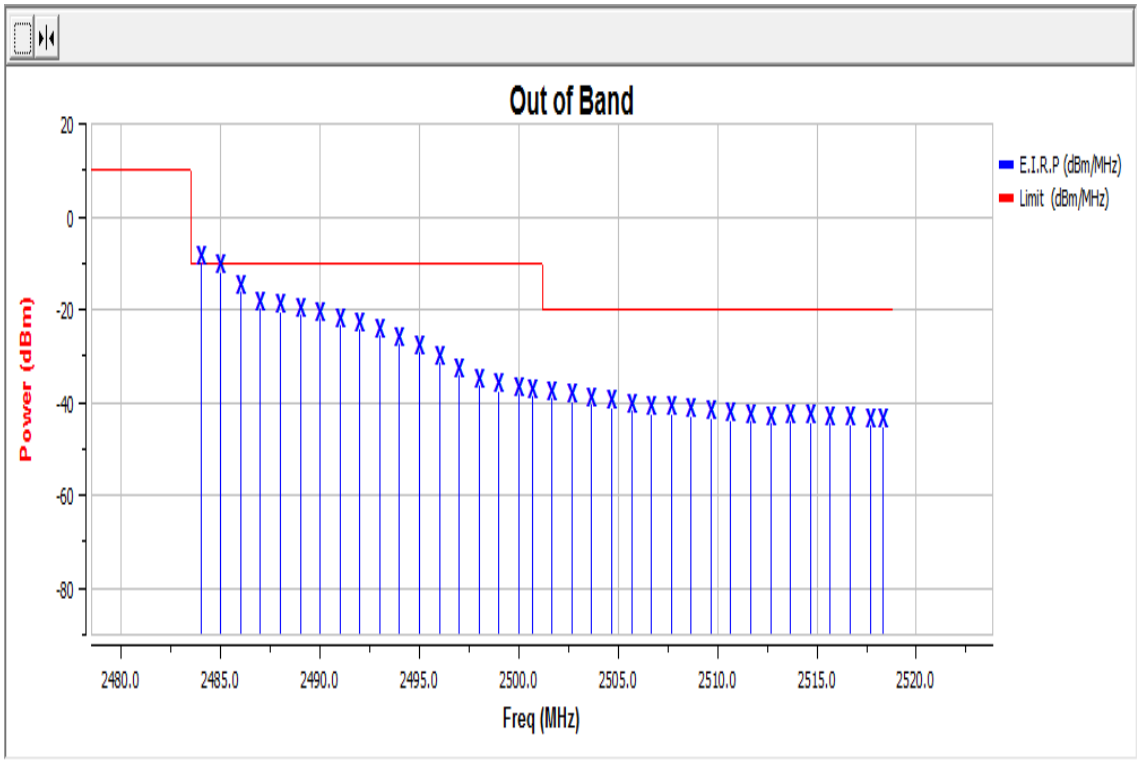


Test results: IEEE 802.11n HT 20 MHz Mode

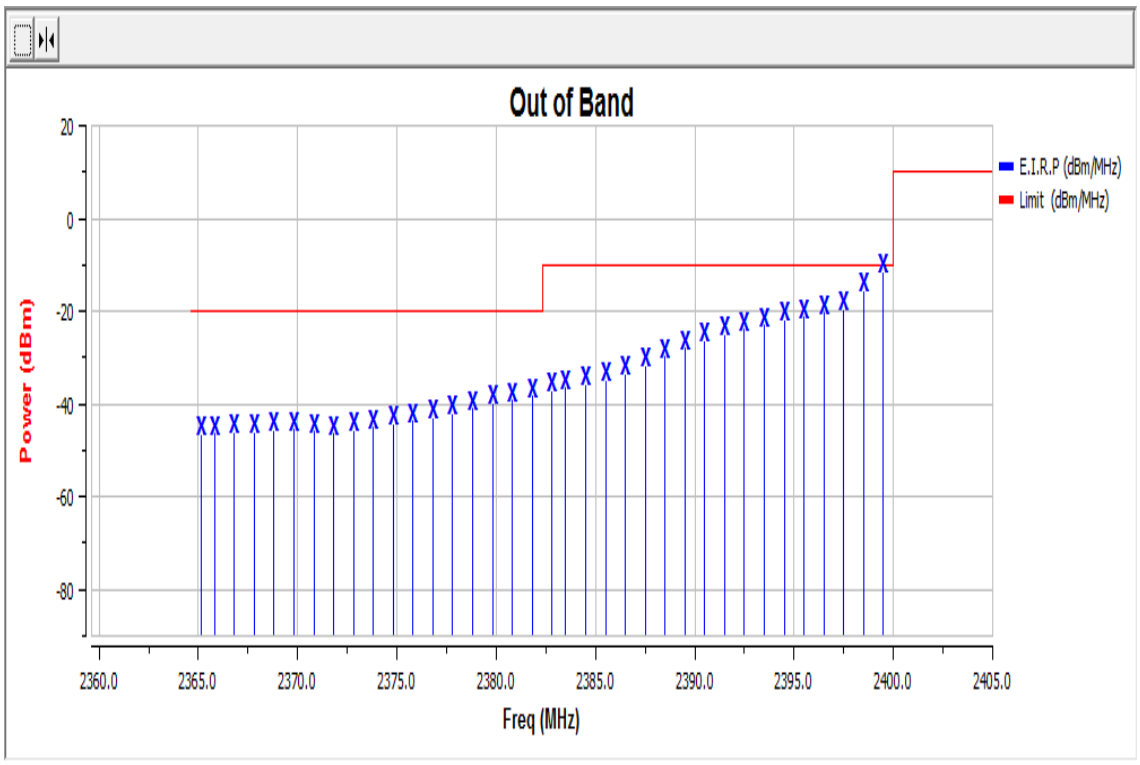
-15℃ /12V CH Low



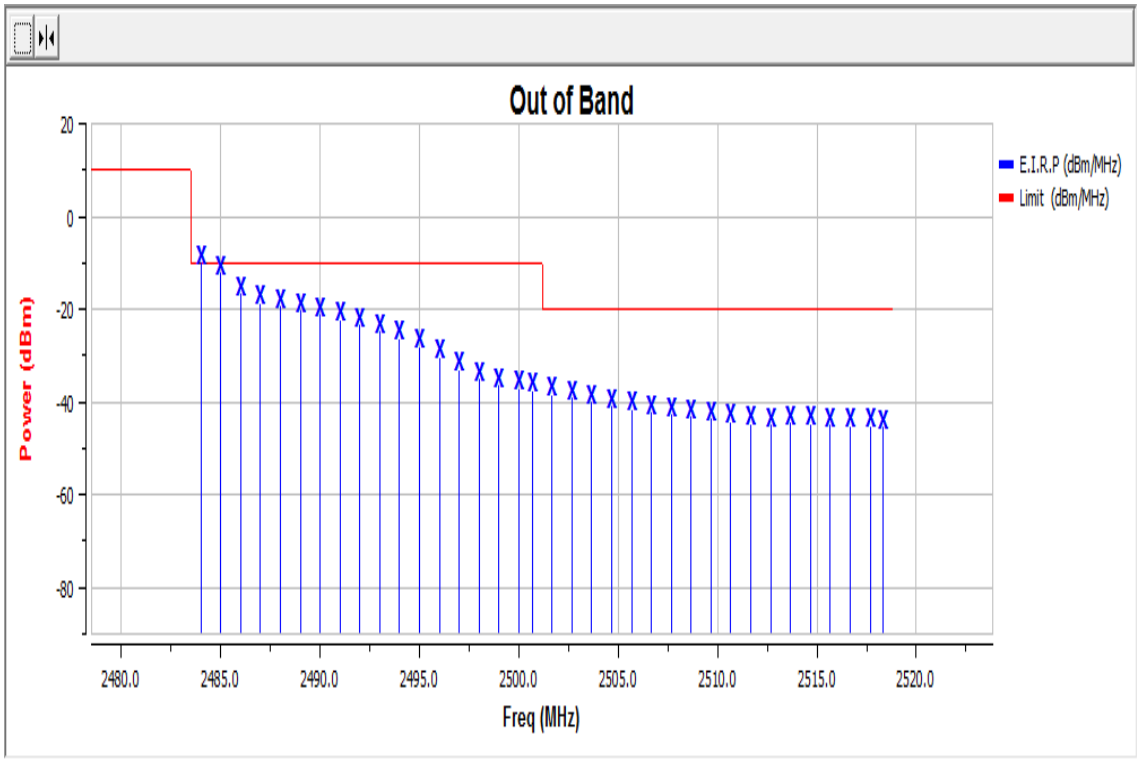
-15℃ /12V CH High



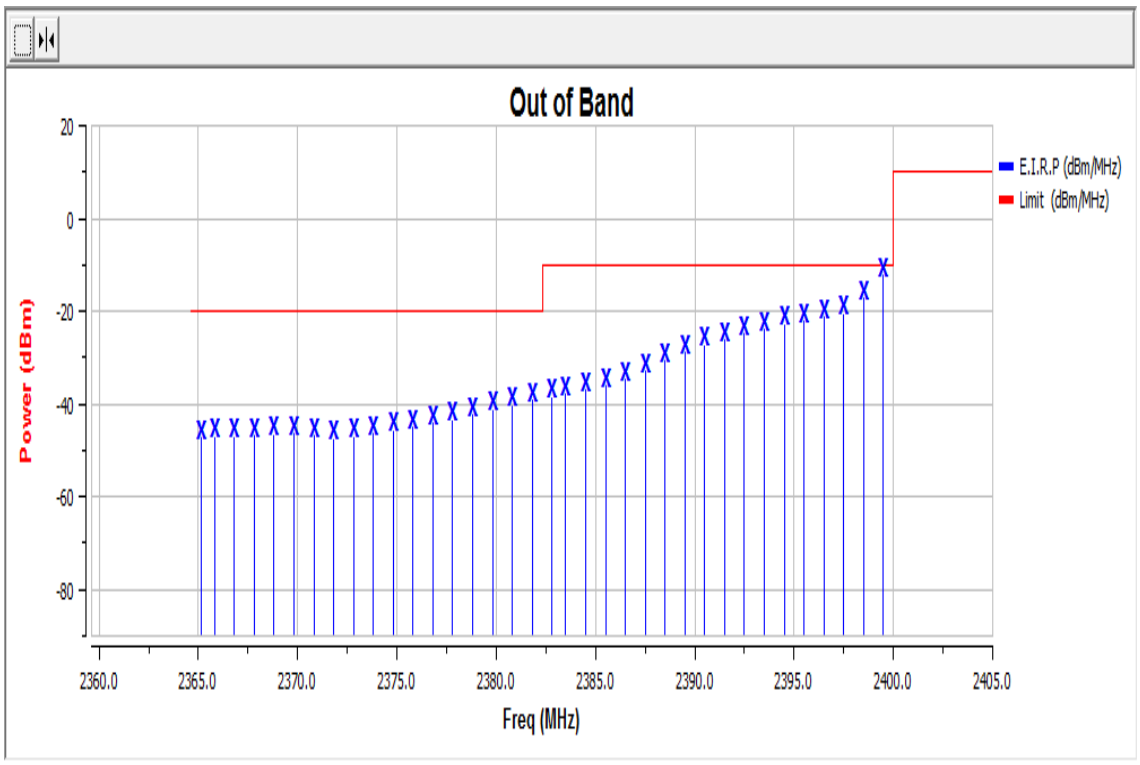
20℃ /12V CH Low



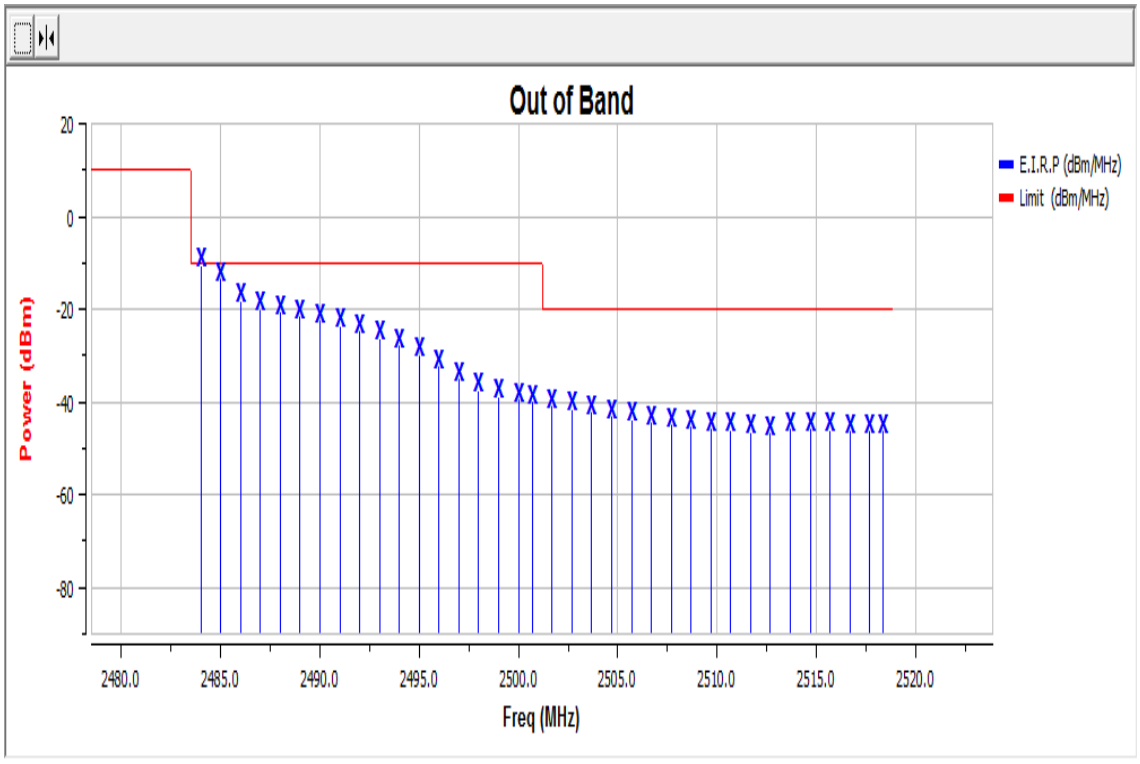
20℃ /12V CH High



55℃ /12V CH Low

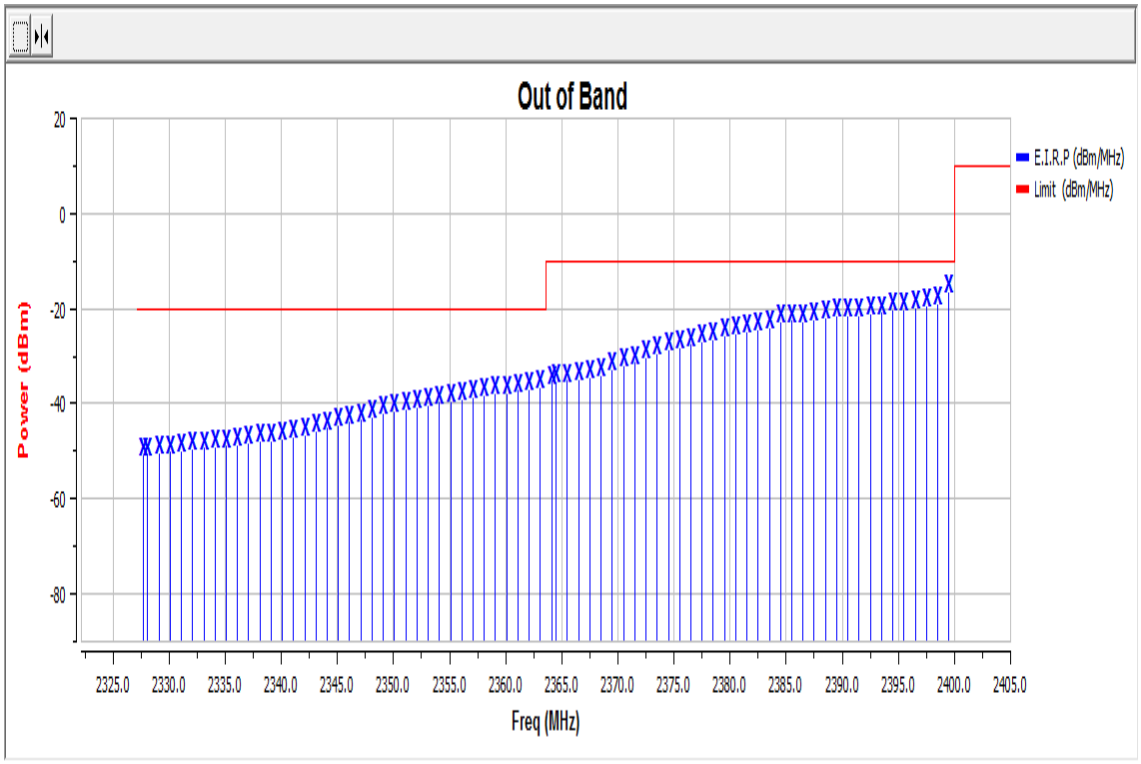


55℃ /12V CH High



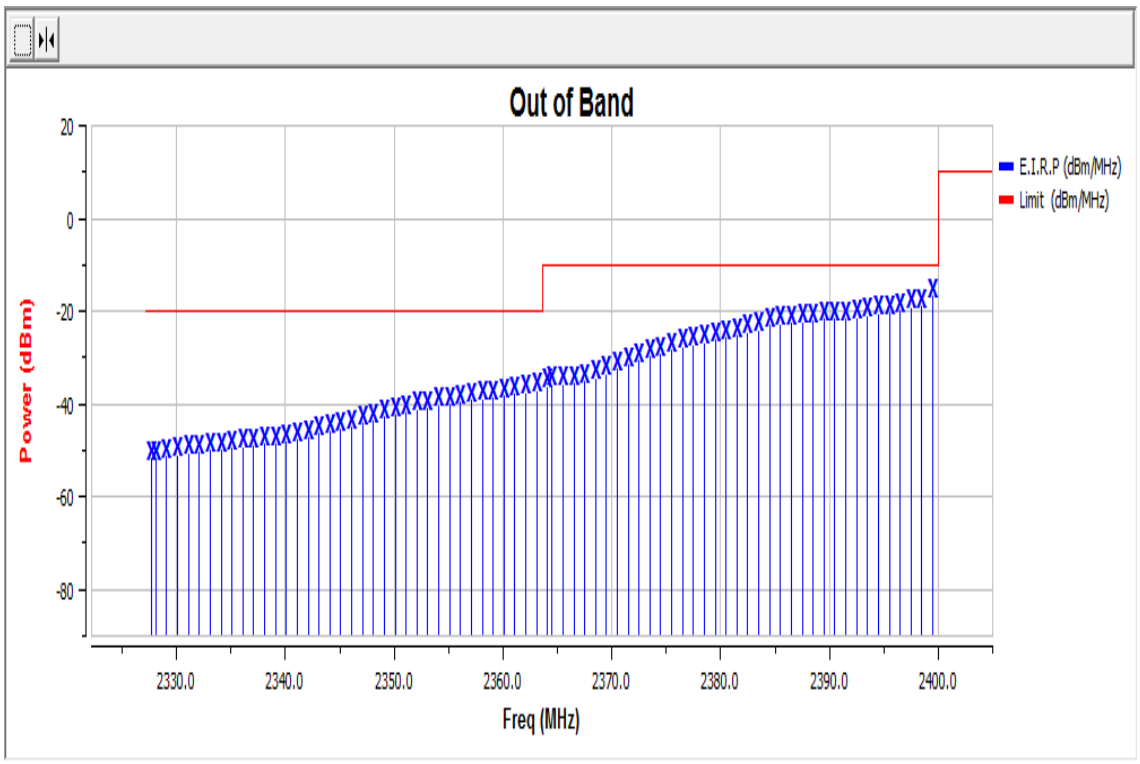
Test results: IEEE 802.11n HT 40 MHz Mode

-15℃ /12V CH Low

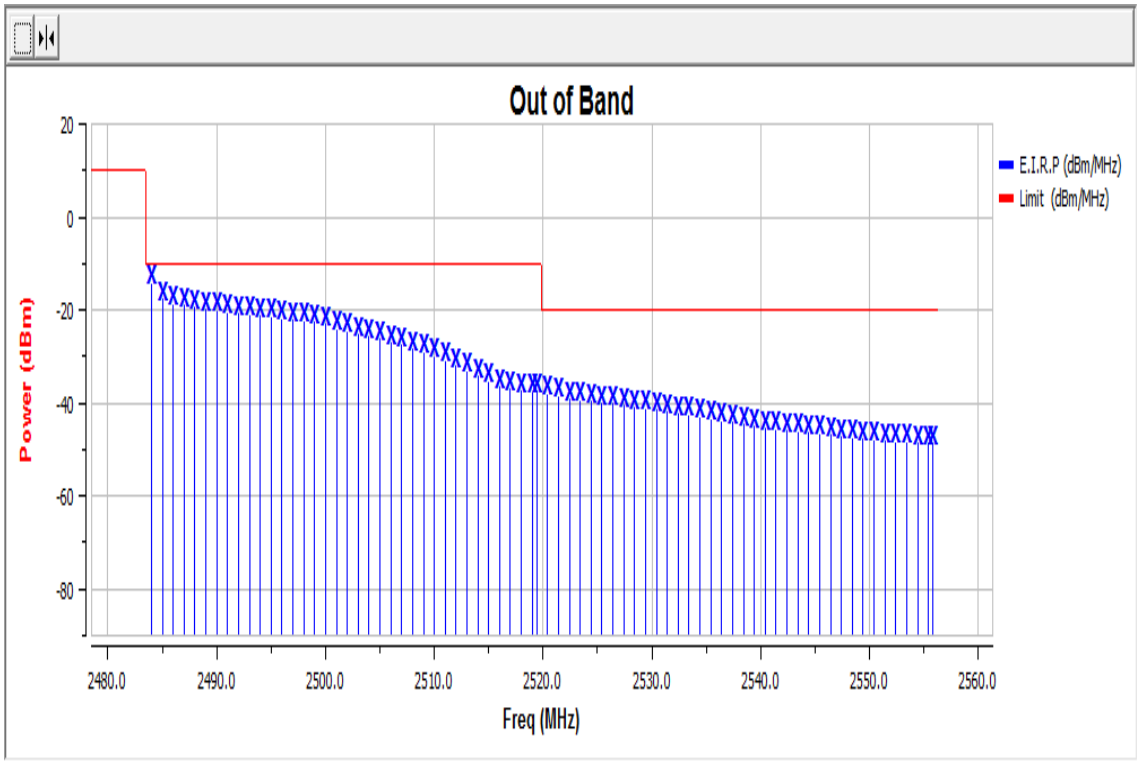


-15℃ /12V CH High

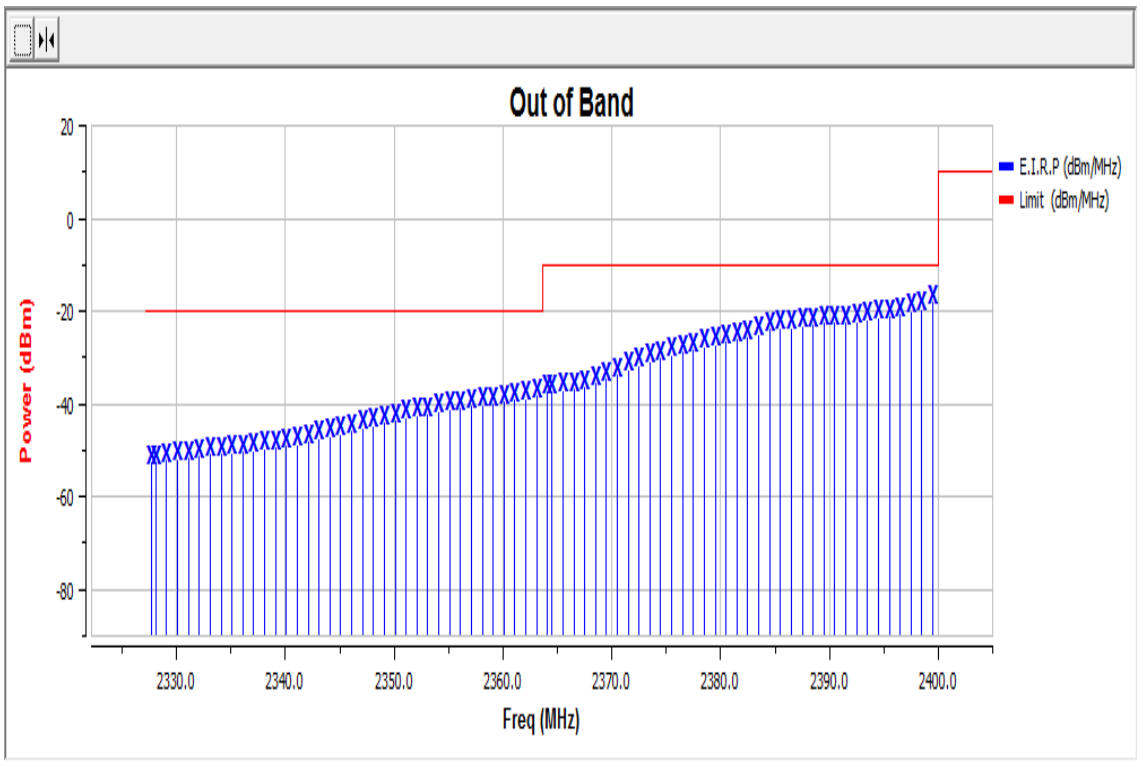
20℃ /12V CH Low



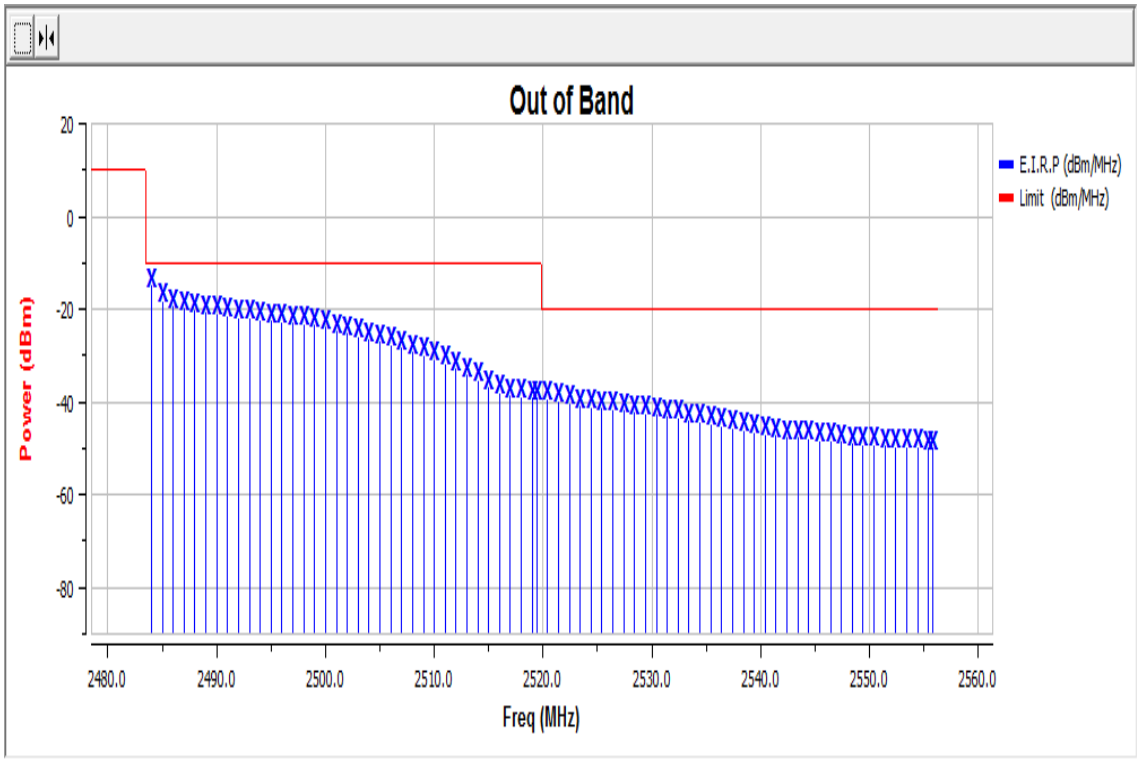
20℃ /12V CH High



55℃ /12V CH Low



55℃ /12V CH High



7.10 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

LIMIT

ETSI EN 300 328

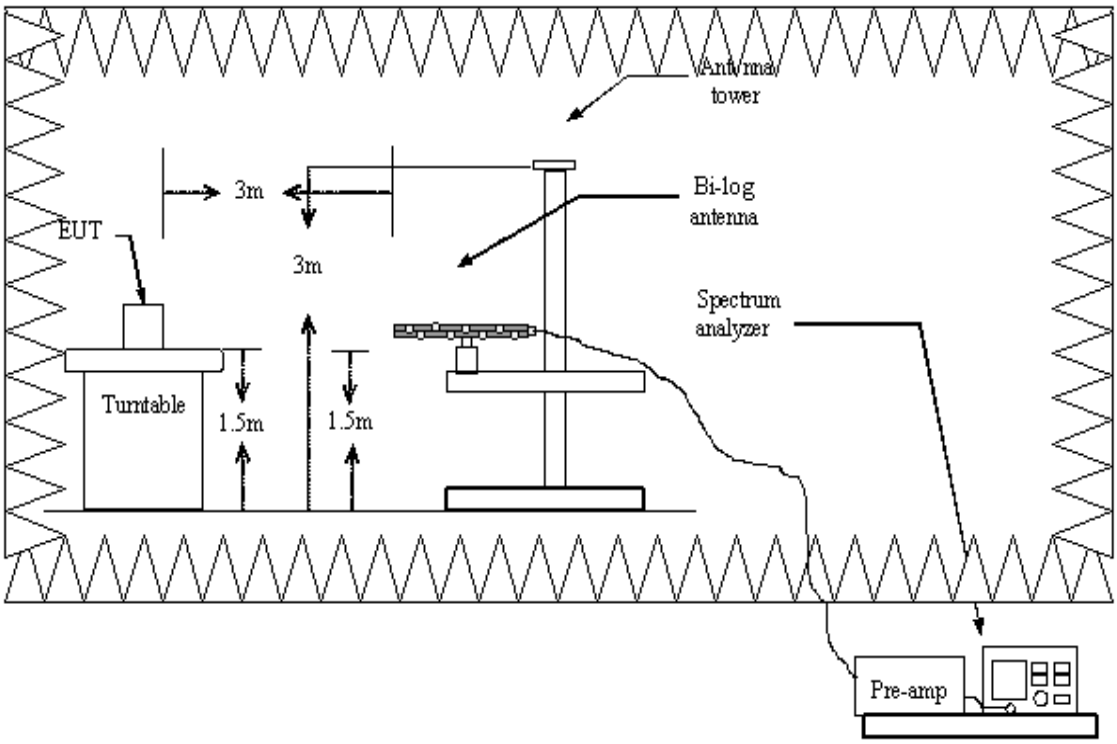
The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 1.

Table 1: Transmitter limits for spurious emissions

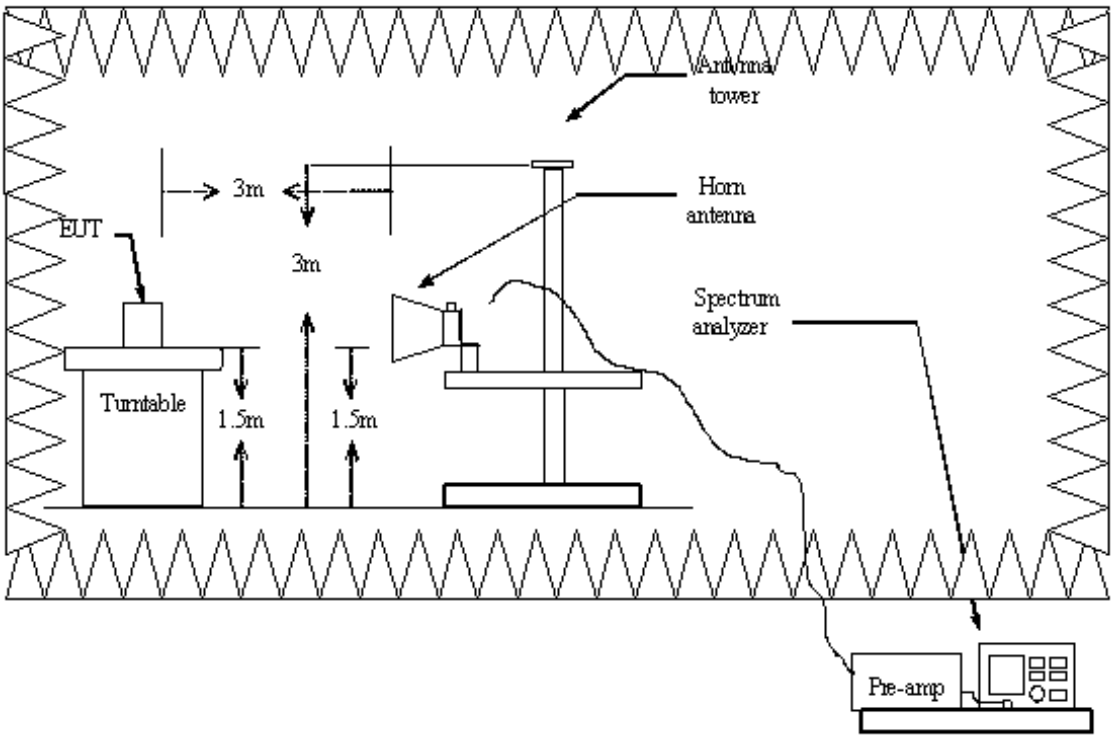
Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-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

Test Configuration

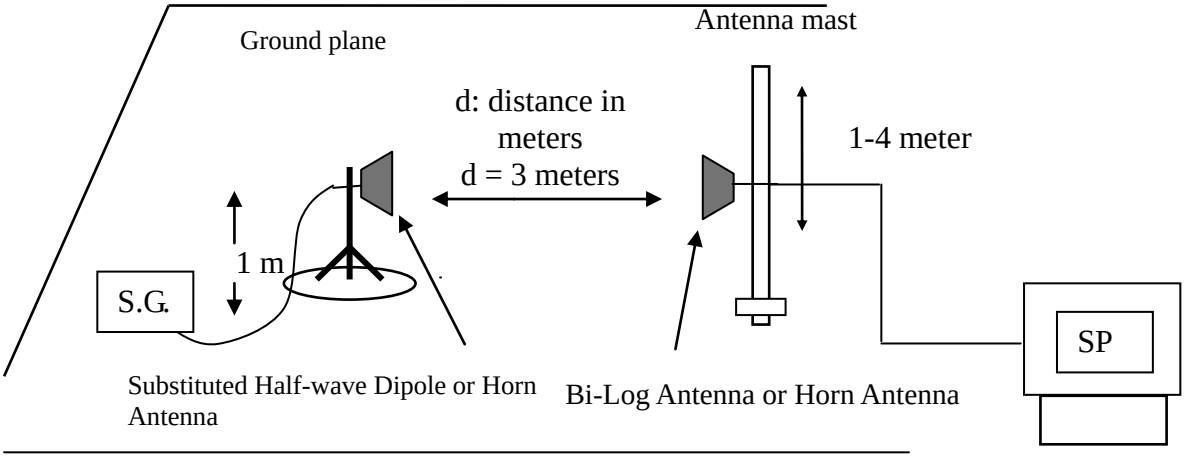
Below 1GHz



Above 1GHz



Substituted Method Test Set-up



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement methods.

Measurement Uncertainty

The measurement uncertainty of the test is ± 2.65dB.

TEST RESULTS

No value of the measurement limit is within 6dB, and therefore no further investigation and identification to measure emission with point of measurement is required.

Below 1GHz

Test Mode: Normal Link **Tested by:** Jason Lu

Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
125.0600	-57.26	-18.62	-75.88	-36.00	-39.88	V
250.1900	-59.02	-18.79	-77.81	-36.00	-41.81	V
624.6100	-57.97	-11.75	-69.72	-54.00	-15.72	V
749.7400	-57.55	-10.53	-68.08	-54.00	-14.08	V
874.8700	-55.03	-8.91	-63.94	-36.00	-27.94	V
981.5700	-60.13	-7.56	-67.69	-36.00	-31.69	V
125.0600	-42.73	-12.81	-55.54	-36.00	-19.54	H
375.3200	-53.18	-12.55	-65.73	-36.00	-29.73	H
500.4500	-57.06	-9.82	-66.88	-54.00	-12.88	H
624.6100	-52.47	-7.50	-59.97	-54.00	-5.97	H
874.8700	-49.02	-5.04	-54.06	-36.00	-18.06	H
981.5700	-49.78	-4.17	-53.95	-36.00	-17.95	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Above 1GHz

Test Mode: IEEE 802.11b / TX (CH Low) **Tested by:** Jason Lu

Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4822.000	-43.98	8.21	-35.77	-30.00	-5.77	V
7405.000	-57.79	16.26	-41.53	-30.00	-11.53	V
N/A						
4822.000	-50.76	9.01	-41.75	-30.00	-11.75	H
11306.000	-64.10	26.97	-37.13	-30.00	-7.13	H
N/A						

Test Mode: IEEE 802.11b / TX (CH High) **Tested by:** Jason Lu

Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4941.000	-48.23	8.15	-40.08	-30.00	-10.08	V
9885.750	-61.55	24.61	-36.94	-30.00	-6.94	V
N/A						
4941.000	-50.94	8.88	-42.06	-30.00	-12.06	H
9890.000	-59.61	24.44	-35.17	-30.00	-5.17	H
N/A						

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor*

Test Mode: IEEE 802.11g **/** TX (CH Low) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4815.000	-46.11	8.22	-37.89	-30.00	-7.89	V
10888.000	-63.63	27.17	-36.46	-30.00	-6.46	V
N/A						
4822.000	-51.92	9.01	-42.91	-30.00	-12.91	H
11396.000	-63.71	26.85	-36.86	-30.00	-6.86	H
N/A						

Test Mode: IEEE 802.11g **/** TX (CH High) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4941.000	-49.92	8.15	-41.77	-30.00	-11.77	V
11092.000	-64.44	27.21	-37.23	-30.00	-7.23	V
N/A						
4955.000	-53.08	8.92	-44.16	-30.00	-14.16	H
10859.000	-64.07	27.19	-36.88	-30.00	-6.88	H
N/A						

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Test Mode: IEEE 802.11n HT 20 MHz Mode **/** TX (CH Low) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4822.000	-47.58	8.21	-39.37	-30.00	-9.37	V
11282.000	-63.66	26.99	-36.67	-30.00	-6.67	V
N/A						
4822.000	-53.28	9.01	-44.27	-30.00	-14.27	H
11325.000	-63.70	26.95	-36.75	-30.00	-6.75	H
N/A						

Test Mode: IEEE 802.11n HT 20 MHz Mode / TX (CH High) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4941.000	-50.51	8.15	-42.36	-30.00	-12.36	V
10075.000	-63.55	25.07	-38.48	-30.00	-8.48	V
N/A						
4941.000	-54.89	8.88	-46.01	-30.00	-16.01	H
10848.000	-64.87	27.18	-37.69	-30.00	-7.69	H
N/A						

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Test Mode: IEEE 802.11n HT 40 MHz Mode / TX (CH Low) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4850.000	-50.55	8.16	-42.39	-30.00	-12.39	V
10014.000	-64.22	24.85	-39.37	-30.00	-9.37	V
N/A						
4850.000	-56.40	8.91	-47.49	-30.00	-17.49	H
11662.250	-64.00	26.28	-37.72	-30.00	-7.72	H
N/A						

Test Mode: IEEE 802.11n HT 40 MHz Mode / TX (CH High) **Tested by:** Jason Lu
Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4941.000	-53.35	8.15	-45.20	-30.00	-15.20	V
10636.250	-64.36	26.82	-37.54	-30.00	-7.54	V
N/A						
1021.000	-43.60	-2.09	-45.69	-30.00	-15.69	H
11372.500	-63.30	26.88	-36.42	-30.00	-6.42	H
N/A						

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

7.11 RECEIVER SPURIOUS EMISSIONS

LIMIT

The spurious emissions of the receiver shall not exceed the values given in table 2.

Table 2: Spurious emission limits for receivers

Frequency range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

Test Configuration

Radiated Spurious Emissions:
(Same as section 7.10 in this test report)

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement methods.

Measurement Uncertainty

The measurement uncertainty of the test is ± 2.65dB.

TEST RESULTS

Pass.

Below 1GHz

Test Mode: Normal Link **Tested by:** Jason Lu

Ambient temperature: 22.6°C **Relative humidity:** 57.2 % RH **Date:** April 22, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
51.3400	-55.70	-20.61	-76.31	-57.00	-19.31	V
75.5900	-51.57	-21.31	-72.88	-57.00	-15.88	V
99.8400	-45.35	-23.06	-68.41	-57.00	-11.41	V
217.2100	-56.53	-18.93	-75.46	-57.00	-18.46	V
400.5400	-60.37	-16.20	-76.57	-57.00	-19.57	V
500.4500	-63.90	-13.52	-77.42	-57.00	-20.42	V
58.1300	-56.23	-14.86	-71.09	-57.00	-14.09	H
92.0800	-39.48	-19.53	-59.01	-57.00	-2.01	H
130.8800	-48.27	-13.03	-61.30	-57.00	-4.30	H
230.7900	-56.06	-14.01	-70.07	-57.00	-13.07	H
500.4500	-62.70	-9.82	-72.52	-57.00	-15.52	H
600.3600	-63.80	-8.43	-72.23	-57.00	-15.23	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Above 1GHz

Test Mode: Normal Link **Tested by:** Jason Lu

Ambient temperature: 22°C **Relative humidity:** 60 % RH **Date:** March 9, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4941.000	-63.35	8.15	-55.20	-47.00	-8.20	V
11282.000	-83.12	26.99	-56.13	-47.00	-9.13	V
N/A						
4821.000	-63.76	8.21	-55.55	-47.00	-8.55	H
11306.000	-85.69	26.97	-58.72	-47.00	-11.72	H
N/A						

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

7.12 RECEIVER BLOCKING

Limit

Receiver Category	☒ **Category 1 :** Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment. ☐ **Category 2 :** Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment. ☐ **Category 3 :** Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment

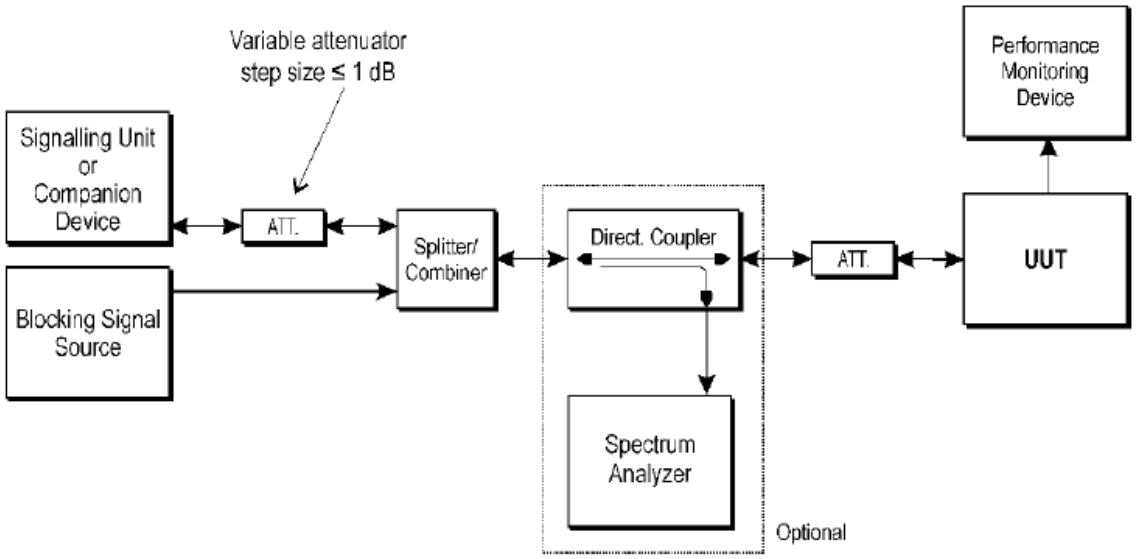
Category 1			
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
Pmin + 6 dB	2 380 2 503,5	-53	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW

NOTE 1:
Pmin is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 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 antenna assembly gain.

Category 2			
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 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.			

Category 3			
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
Pmin + 12 dB	2 380 2 503,5	-57	CW
Pmin + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 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.			

Test Configuration



TEST PROCEDURE

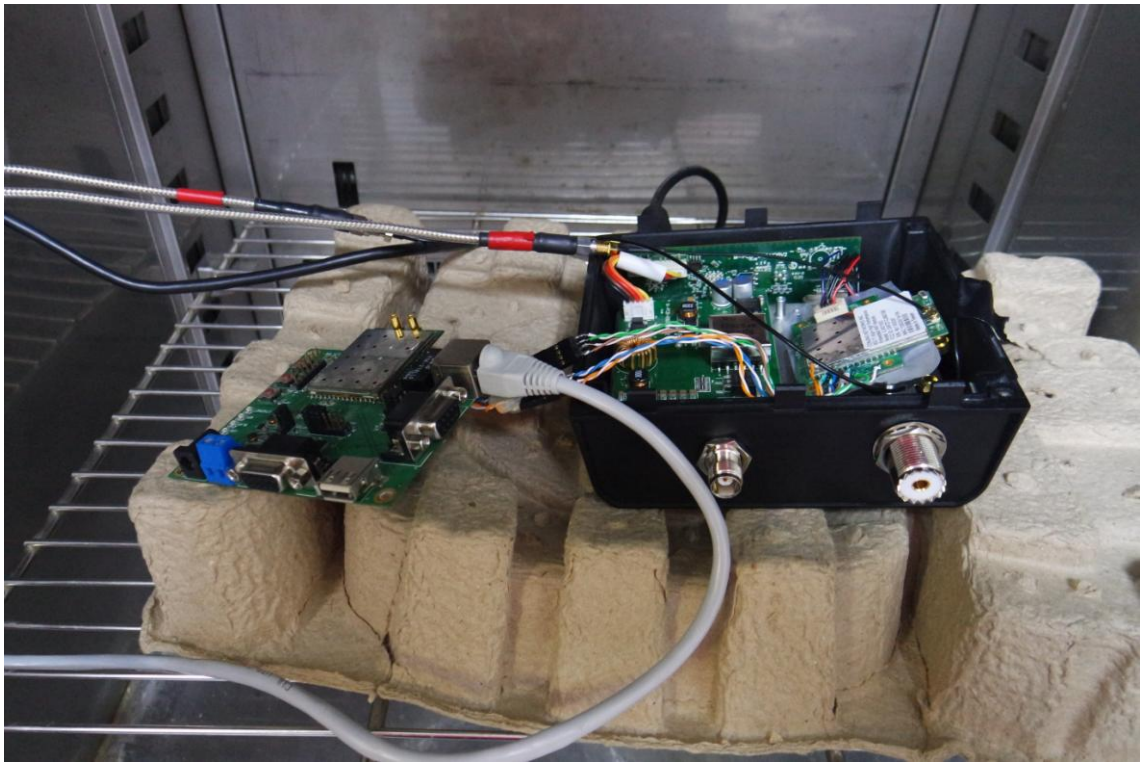
1. Please refer to ETSI EN 300 328 (V2.1.1) for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) for the measurement method.

TEST RESULTS

Configuration	Frequency (MHz)	Blocking signal frequency(MHz)	Receiver Blocking signal power (dBm)	Wanted signal mean power from companion device (dBm) [Pmin]	Pmin + 6dB Per Values (dBm)	Per Results	Limit (%)	Result
IEEE 802.11b Mode	2412	2380	-53	-70	-64	2.00%	10.00%	Pass
		2503.5		-70	-64	2.00%	10.00%	Pass
		2300	-47	-70	-64	1.00%	10.00%	Pass
		2330		-70	-64	4.00%	10.00%	Pass
		2360		-70	-64	3.00%	10.00%	Pass
		2523.5	-47	-70	-64	2.00%	10.00%	Pass
		2553.5		-70	-64	5.00%	10.00%	Pass
		2583.5		-70	-64	4.00%	10.00%	Pass
		2613.5		-70	-64	5.00%	10.00%	Pass
		2643.5		-70	-64	8.00%	10.00%	Pass
		2673.5		-70	-64	6.00%	10.00%	Pass
IEEE 802.11b Mode	2472	2380	-53	-72	-66	3.00%	10.00%	Pass
		2503.5		-72	-66	5.00%	10.00%	Pass
		2300	-47	-72	-66	5.00%	10.00%	Pass
		2330		-72	-66	4.00%	10.00%	Pass
		2360		-72	-66	5.00%	10.00%	Pass
		2523.5	-47	-72	-66	2.00%	10.00%	Pass
		2553.5		-72	-66	6.00%	10.00%	Pass
		2583.5		-72	-66	3.00%	10.00%	Pass
		2613.5		-72	-66	4.00%	10.00%	Pass
		2643.5		-72	-66	4.00%	10.00%	Pass
		2673.5		-72	-66	3.00%	10.00%	Pass

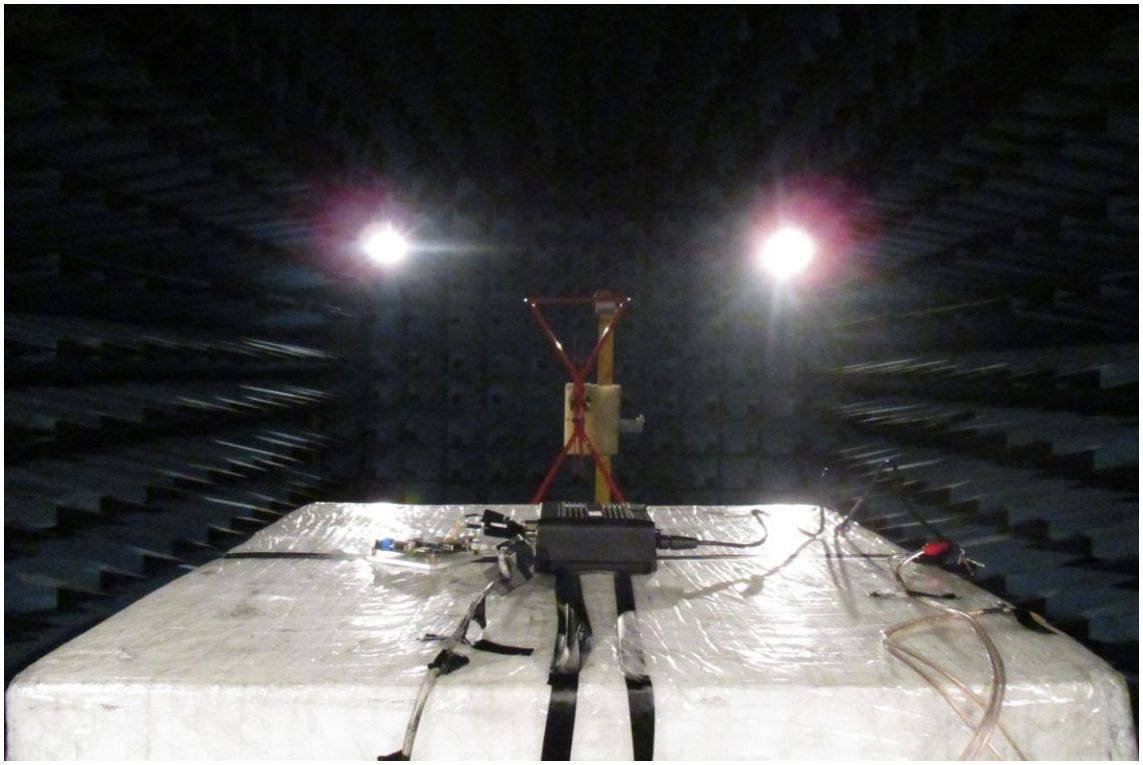
APPENDIX I
PHOTOGRAPHS OF TEST SETUP

Conducted Emissions Setup Photos



Radiated Emissions Setup Photos

Below 1GHz



Above 1GHz