RADIO TEST REPORT

Report No:STS2205025W01

Issued for

WIZnet H.K. Limited

Unit 219, Building 1W, Hong Kong Science Park, Pak Shek Kok, New Territories, Hong Kong

Product Name:	WiFi Module
Brand Name:	WIZnet
Model Name:	WizFi360
Series Model:	WizFi360-PA,WizFi360-CON
Test Standard:	ETSI EN 300 328 V2.2.2 (2019-07)

Shenzhen STS Test Services Co., Ltd.
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TEST REPORT CERTIFICATION

Applicant's Name :	WIZnet H.K. Limited
Address :	Unit 219, Building 1W, Hong Kong Science Park, Pak Shek Kok, New Territories, Hong Kong
Manufacturer's Name :	WIZnet Co., Ltd.
Address :	5F Humax Village,216 Hwangsaeul-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13595 Korea

Product Description

Product Name :	WiFi Module
Brand Name :	WIZnet
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Test Standards :	ETSI EN 300 328 V2.2.2 (2019-07)

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Date of Test :	
Date (s) of performance of tests :	10 June 2019 ~ 02 Aug. 2019 27 Oct. 2020 ~ 30 Oct. 2020
Date of Issue :	10 May 2022
Test Result :	**Pass**

Testing Engineer : Chris Chen

(Chris Chen)

Technical Manager : Sean She

(Sean she)

Authorized Signatory : Bovey Yang

(Bovey Yang)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	02 Aug. 2019	STS1906023W01	ALL	Initial Issue
00	25 Feb. 2020	STS2002179W01	ALL	Updated product name, model name and series model name.
00	30 Oct. 2020	STS2010375W01	ALL	Updated standard version, RSE test data and Blocking test data, Applicant's Name/Address and Manufacturer's Name/Address
00	10 May 2022	STS2205025W01	ALL	Updated Applicant's Address and Manufacturer's Name/Address.

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

ETSI EN 300 328 V2.2.2			
Test Item	Limit	Frequency Range (MHz)	Applicable (Yes/No)
TRANSMITTER PARAMETERS			
RF output power	Clause 4.3.2.2.3	2400-2483.5	Y
Power Spectral Density	Clause 4.3.2.3.3		Y
Duty Cycle, Tx-sequence, Tx-gap	Clause 4.3.2.4.3		N
Medium Utilization	Clause 4.3.2.5.3		N
Adaptivity(adaptive equipment using modulations other than FHSS)	Clause 4.3.2.6		Y
Occupied Channel Bandwidth	Clause 4.3.2.7.3		Y
Transmitter unwanted emissions in the OOB domain	Clause 4.3.2.8.3	FL=2400-2BW FH=2483.5+2BW	Y
Transmitter unwanted emissions in the spurious domain(Conducted)	Clause 4.3.2.9.3	30-12750	N
Transmitter unwanted emissions in the spurious domain(Radiated)			Y
RECEIVER PARAMETERS			
Spurious emissions (conducted)	Clause 4.3.2.10.3	30-12750	N
Spurious emissions (radiated)			Y
Receiver Blocking	Clause 4.3.2.11.3	2400-2483.5	Y
Geo-location capability	Clause 4.3.2.12.3	--	N

1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD
Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ±**U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.68dB
2	Unwanted Emissions, conducted	±2.988dB
3	All emissions, radiated below 1GHz	±2.26dB
4	All emissions, radiated 1GHz-18GHz	±2dB
5	All emissions, radiated>18G	±2.88dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

<table>
<tr><td>Product Name</td><td>WiFi Module</td></tr>
<tr><td>Brand Name</td><td>WIZnet</td></tr>
<tr><td>Model Name.</td><td>WizFi360</td></tr>
<tr><td>Series Model</td><td>WizFi360-PA,WizFi360-CON</td></tr>
<tr><td>Model Difference</td><td>1.WizFi360-PA has a PCB antenna onboard, WizFi360-CON doesn’t have;
2.WizFi360-CON has an IPEX antenna connector onboard, WizFi360-PA doesn’t have;
3.WizFi360-PA has a LED light onboard, WizFi360-CON doesn’t have
4.WizFi360 is the same as wizfi360-PA</td></tr>
<tr><td>Product Description</td><td>The EUT is WiFi Module
<table>
<tr><td>Operation Frequency:</td><td>802.11b/g/n(20MHz): 2412~2472MHz
802.11n(40MHz):2422~2462MHz</td></tr>
<tr><td>Modulation Type:</td><td>802.11b(DSSS):CCK,DQPSK,DBPSK
802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM
802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM</td></tr>
<tr><td>Number Of Channel:</td><td>13CH/9CH .Please see Note 2.</td></tr>
<tr><td>Antenna Gain(Peak):</td><td>PCB Antenna: 2 dBi
External Antenna: 3.5 dBi</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</td></tr>
<tr><td>Channel List</td><td>Refer to below</td></tr>
<tr><td>Power Rating</td><td>DC 3.3V</td></tr>
<tr><td>Hardware version number</td><td>Rev 1.2</td></tr>
<tr><td>Software version number</td><td>V1.0.1.2</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

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

Channel List for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	06	2437	09	2452		
04	2427	07	2442	10	2457		
05	2432	08	2447	11	2462		

a) The type of modulation used by the equipment:

□FHSS

■other forms of modulation

b) In case of FHSS modulation:

•In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies:

•In case of Adaptive Frequency Hopping Equipment:

The maximum number of Frequencies: 13

The minimum number of Frequencies: 09

The (average) Dwell Time:

c) 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

d) In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment:

□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: ..... μs

The value q as referred to in clause 4.3.2.5.2.2.2 .....

□The equipment has implemented an non-LBT based DAA mechanism

□The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): ……. dBm

The maximum (corresponding) Duty Cycle: ……..%

Equipment with dynamic behavior, that behavior is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

f) The worst case operational mode for each of the following tests:

- RF Output Power
  802.11b
- Power Spectral Density
  802.11b
- Occupied Channel Bandwidth
  802.11b
- Transmitter unwanted emissions in the OOB domain
  802.11b
- Adaptivity (adaptive equipment using modulations other than FHSS)
  802.11b
- Transmitter unwanted emissions in the spurious domain
  802.11b
- Receiver spurious emissions
  802.11b
- Receiver Blocking
  802.11b

g) 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.

h) In case of Smart Antenna Systems:

- The number of Receive chains: .....
- The number of Transmit chains: .....

□symmetrical power distribution
□asymmetrical power distribution
In case of beam forming, the maximum beam forming gain: .....
NOTE: Beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

• Operating Frequency Range 1: 2412 MHz to 2472 MHz
• Operating Frequency Range 2: 2422 MHz to 2462 MHz
NOTE: Add more lines if more Frequency Ranges are supported.

j) Occupied Channel Bandwidth(s):

• Occupied Channel Bandwidth : 14.701MHz
• Occupied Channel Bandwidth : 36.321MHz
NOTE: Add more lines if more channel bandwidths are supported.

k) 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 .....

l) The extreme operating conditions that apply to the equipment:
Operating temperature range: -40° C to 85° C
Operating voltage range: DC 3.0V~ DC 3.6V(Normal: DC 3.3V)
□Details provided are for the:
■stand-alone equipment
□combined (or host) equipment
□test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:
• Antenna Type
■PCB Antenna
External Antenna
Antenna Gain: PCB Antenna: 2 dBi
External Antenna: 3.5 dBi
If applicable, additional beamforming gain (excluding basic antenna gain): ..... dB
□Temporary RF connector provided
□No temporary RF connector provided
□Dedicated Antennas (equipment with antenna connector)
□Single power level with corresponding antenna(s)
□Multiple power settings and corresponding antenna(s)
Number of different Power Levels: .....
Power Level 1: ..... dBm
Power Level 2: ..... dBm
Power Level 3: ..... dBm
NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).
• For each of the Power Levels, provide the intended antenna assemblies, their, corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: ..... dBm
Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p.(dBm)	Part number or model name
1	PCB Antenna: 2 dBi External Antenna: 3.5 dBi	15.81	WizFi360
2			
3			
4			

NOTE: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: ..... dBm
Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p.(dBm)	Part number or model name
1			
2			
3			
4			

NOTE: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: ..... dBm
Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p.(dBm)	Part number or model name
1			
2			
3			
4			

NOTE: Add more rows in case more antenna assemblies are supported for this power level.

n) 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
□AC mains State AC voltage:
■ DC State DC voltage : 3.3V
In case of DC, indicate the type of power source
□Internal Power Supply
□External Power Supply or AC/DC adapter
■Battery: 3.3V
□Other: .....

o) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], proprietary, etc.):
WLAN

p) If applicable, the statistical analysis referred to in clause 5.4.1 q)
(to be provided as separate attachment)

q) If applicable, the statistical analysis referred to in clause 5.4.1 r)
(to be provided as separate attachment)

r) Geo-location capability supported by the equipment:
□ Yes
□The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user
■ No

s) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):

2.2 ENVIRONMENTAL CONDITIONS FOR TESTING

Test Condition	Temperature(℃)	Voltage(V)	Relative Humidity(%)
NT/NV	23	3.3V	51
LT/NV	-40	3.3V	/
HT/NV	85	3.3V	/

Note:

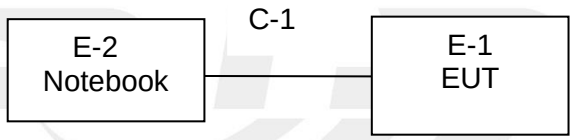
(1) The HT 85°C and LT -40°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.

(2) NV: Normal Voltage; NT: Normal Temperature.

(3) LT: Low Extreme Test Temperature; HT: High Extreme Test Temperature.

(4) The measurements are performed at the highest, middle, lowest available channels.

2.3 TEST MODE



The EUT was programmed to be in continuously transmitting mode.

Channel List for b/g/n(20MHz)		
Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH01	2412
middle	CH07	2442
highest	CH13	2472

Channel List for 802.11 n(40MHz)		
Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH03	2422
middle	CH07	2442
highest	CH11	2462

2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND 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.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-2	Notebook	HP	500-320cx	N/A	N/A
C-1	USB Cable	N/A	N/A	100cm	N/A

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2019.10.15	2022.10.14
Pre-Amplifier (0.1M-3GHz)	EM	EM330	060665	2020.09.30	2021.09.29
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2020.09.30	2021.09.29
Wireless Communications Test Set	R&S	CMW 500	131428	2020.03.05	2021.03.04
Signal Analyzer	R&S	FSV 40-N	101823	2020.09.30	2021.09.29
Temperature & Humidity	HH660	Mieo	N/A	2020.09.30	2021.09.29
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R
Test SW	BALUN	BL410-E/15.2.0.399			

RF Connected Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
MIMO Power measurement test Set	Keysight	U2021XA	MY55520005	2020.09.30	2021.09.29
			MY55520006	2020.09.30	2021.09.29
			MY56120038	2020.09.30	2021.09.29
			MY56280002	2020.09.30	2021.09.29
Signal Generator	Agilent	N5182A	MY46240556	2020.09.30	2021.09.29
Signal Analyzer	Agilent	N9020A	MY49100060	2020.09.30	2021.09.29
Universal Radio communication tester	R&S	CMU200	111058	2020.09.30	2021.09.29
Wireless Communications Test Set	R&S	CMW 500	131428	2020.03.05	2021.03.04
Temperature & Humidity	HH660	Mieo	N/A	2020.09.30	2021.09.29
Temperature& Humidity test chamber	Safety test	AG80L	171200018	2020.03.05	2021.03.04
Programmable power supply	Agilent	E3642A	MY40002025	2020.09.30	2021.09.29
Attenuator	HP	8494B	DC-18G	2020.04.30	2021.04.29
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R
Router	WAVLINK	WL-WN575A2	WL1512260336	N.C.R	N.C.R
Test SW	MWRF-TEST	MTS 8310/2.0.0.0			

3. EFFECTIVE RADIATED POWER

3.1 LIMIT

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 manufacturer. See clause 5.4.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the manufacturer. 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 be 20 dBm. The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.4.1 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 supplier.
This limit shall apply for any combination of power level and intended antenna assembly.

Limit
20 dBm

Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these P_{burst} values, as well as the start and stop times for each burst.

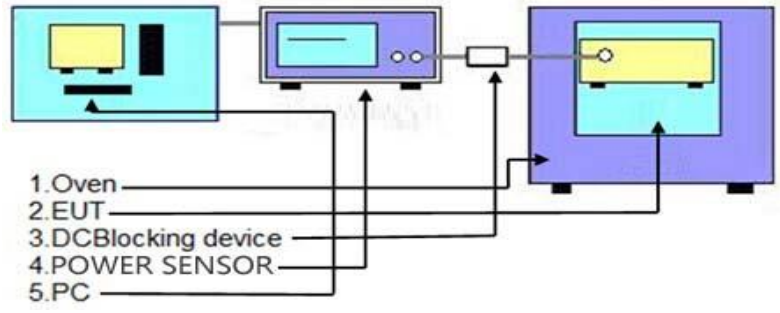
$$P_{burst} = \frac{1}{k}\sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

3.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.2 for the measurement method.
   a) Use a fast power sensor suitable for 2.4 GHz and capable of 1 MS/s.
      Use the following settings:
      - Sample speed 1 MS/s or faster.
      - The samples must represent the power of the signal.
      - Measurement duration: For non-adaptive equipment: equal to the observation period defined in b)
   b) Clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) is captured
   c) Print the plots from power sensor by used power sensor on PC, select the max result and record it.

3.3 TEST SETUP



3.4 TEST RESULTS

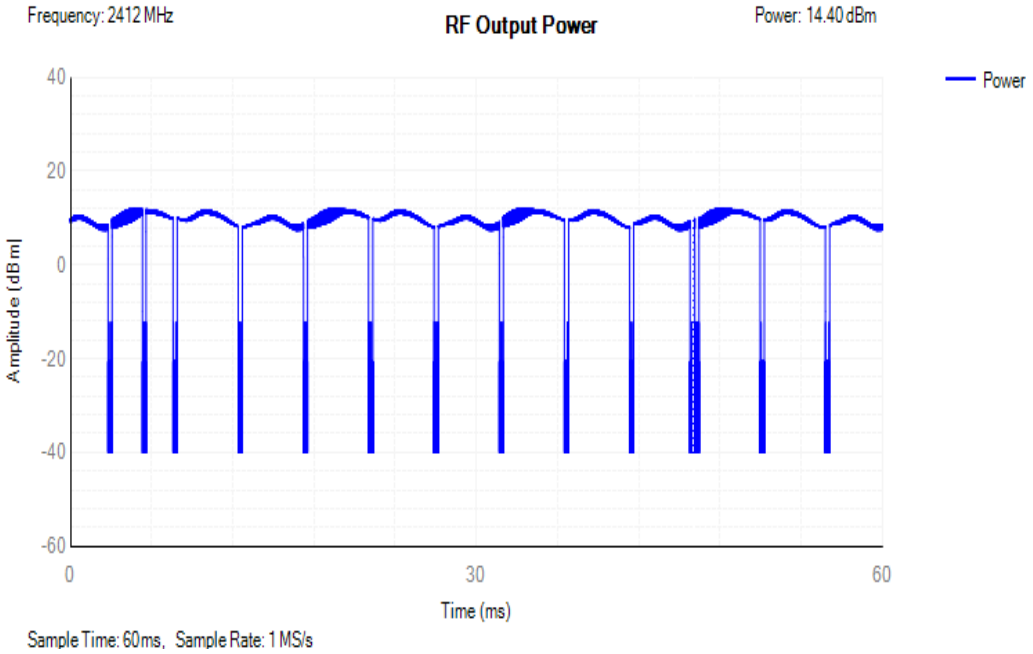
External Antenna

Modulation	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
802.11b	Normal		14.40	15.25	15.81
	Extreme	LTNV	14.39	15.25	15.80
		HTNV	14.40	15.25	15.80
	Max. E.I.R.P		15.81		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

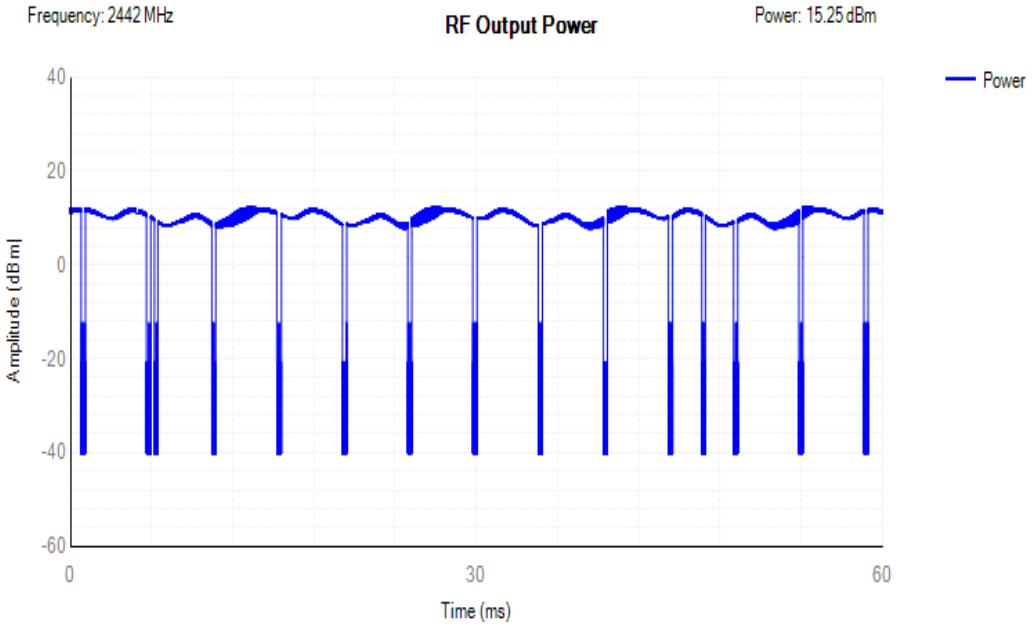
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

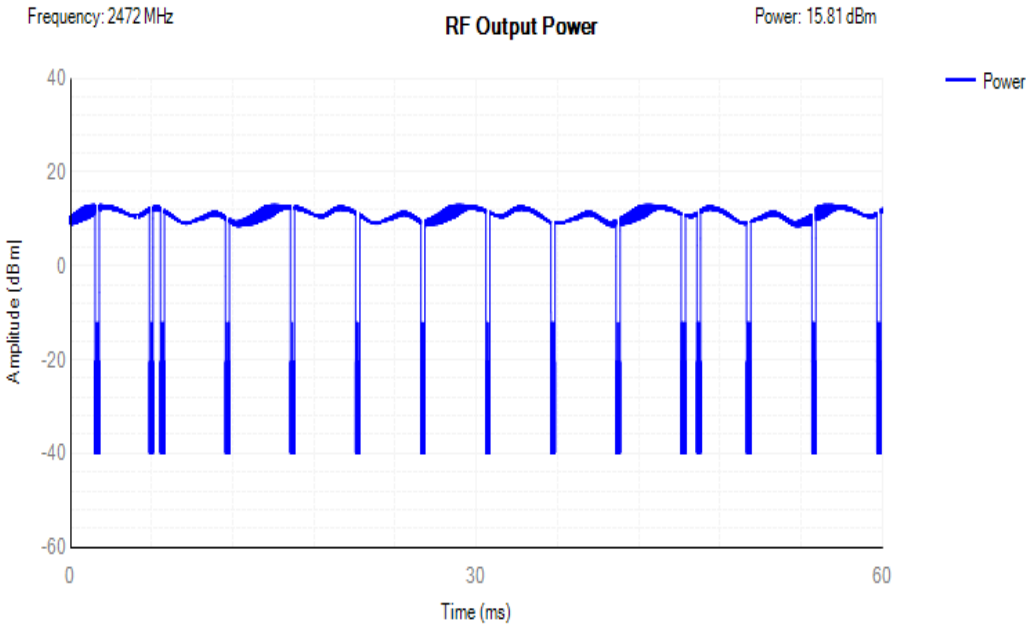
802.11b CH1



802.11b CH7



802.11b CH13

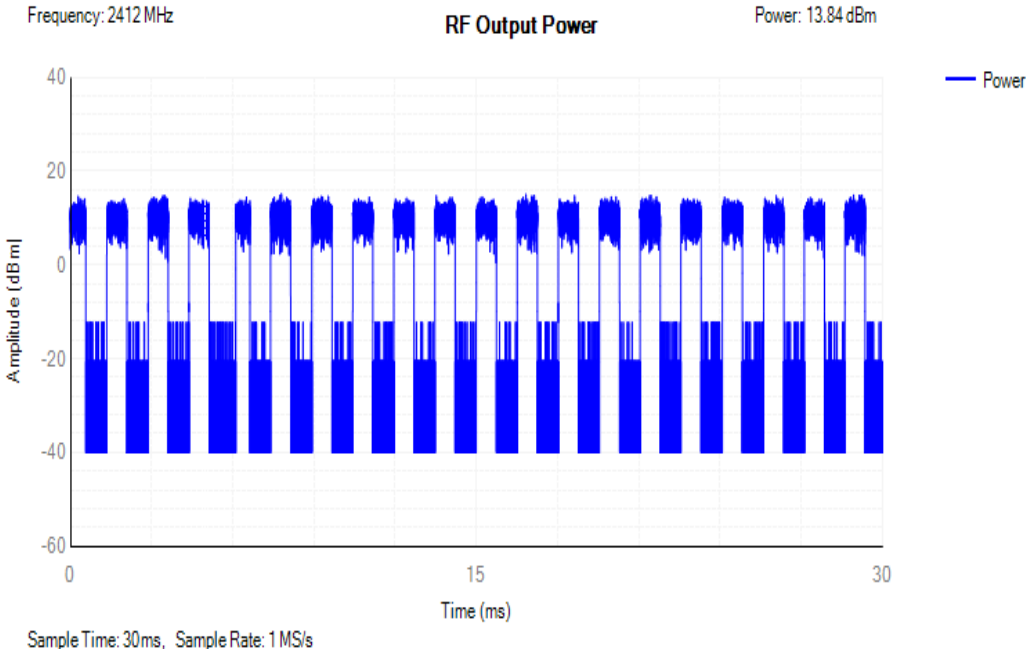


802.11g	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
	Normal		13.84	14.08	15.30
	Extreme	LTNV	13.84	14.07	15.30
		HTNV	13.84	14.08	15.29
	Max. E.I.R.P		15.30		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

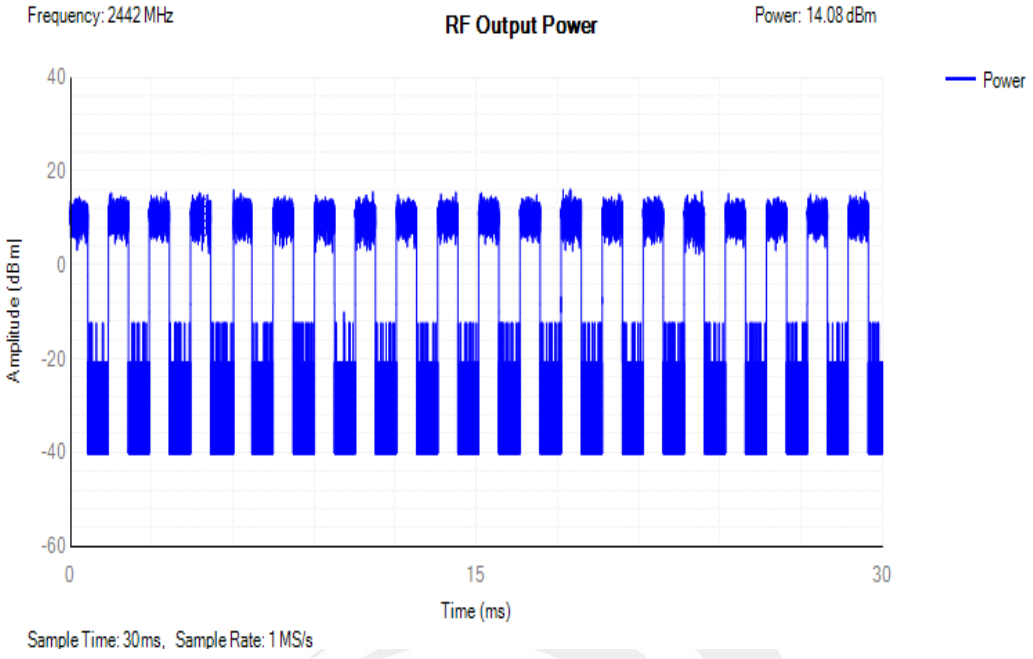
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

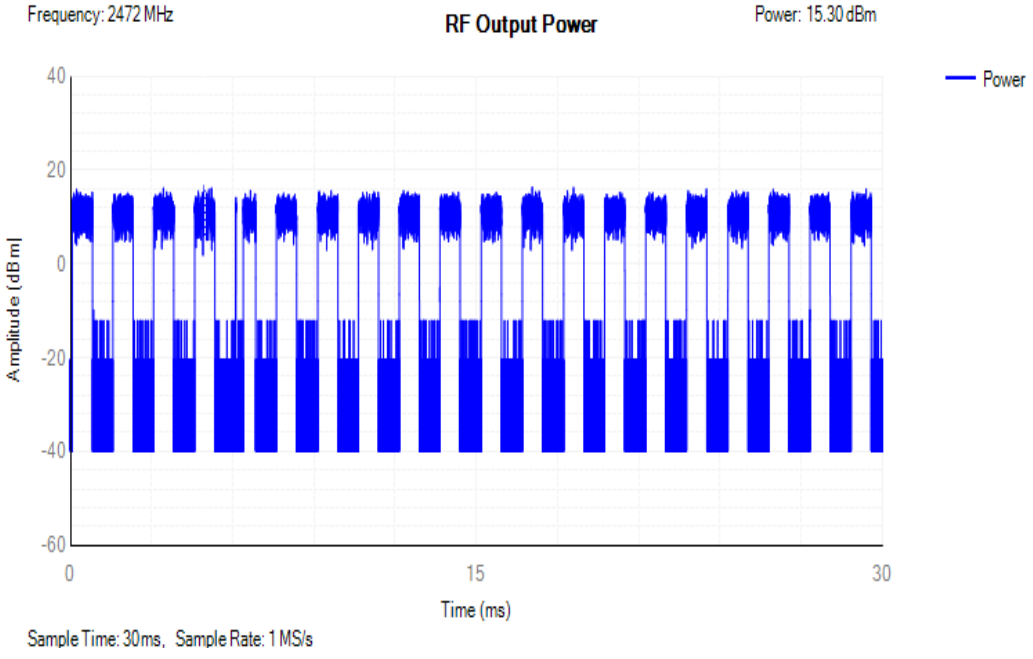
802.11g CH1



802.11g CH7



802.11g CH13

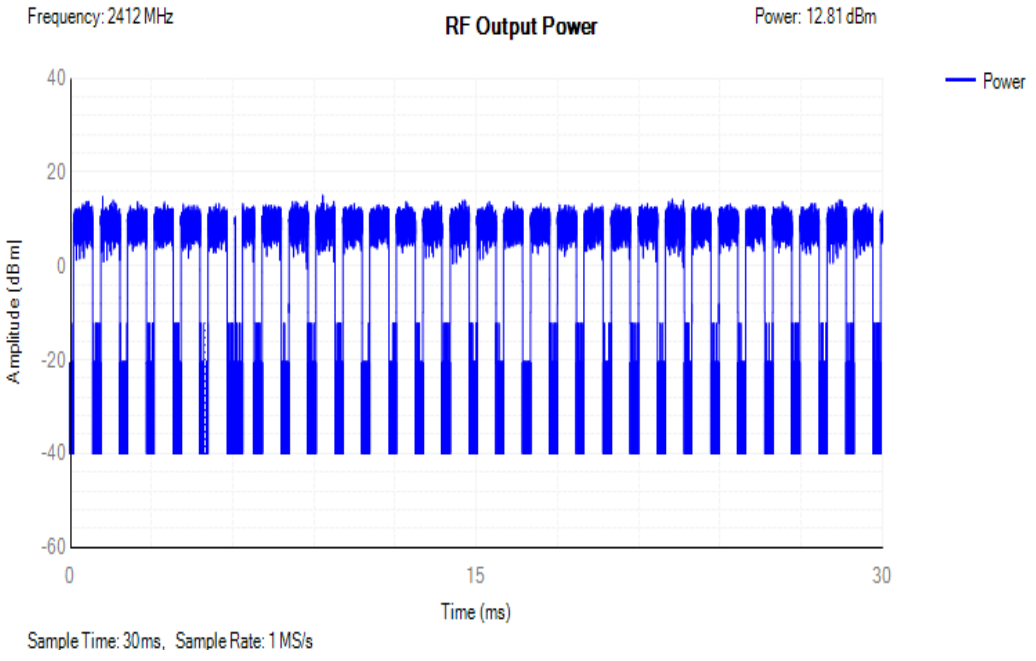


			Average EIRP Power (dBm)		
	Test conditions		Low Channel	Middle Channel	High Channel
802.11n(HT20)	Normal		12.81	13.23	13.80
	Extreme	LTNV	12.81	13.23	13.80
		HTNV	12.81	13.23	13.79
	Max. E.I.R.P		13.80		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

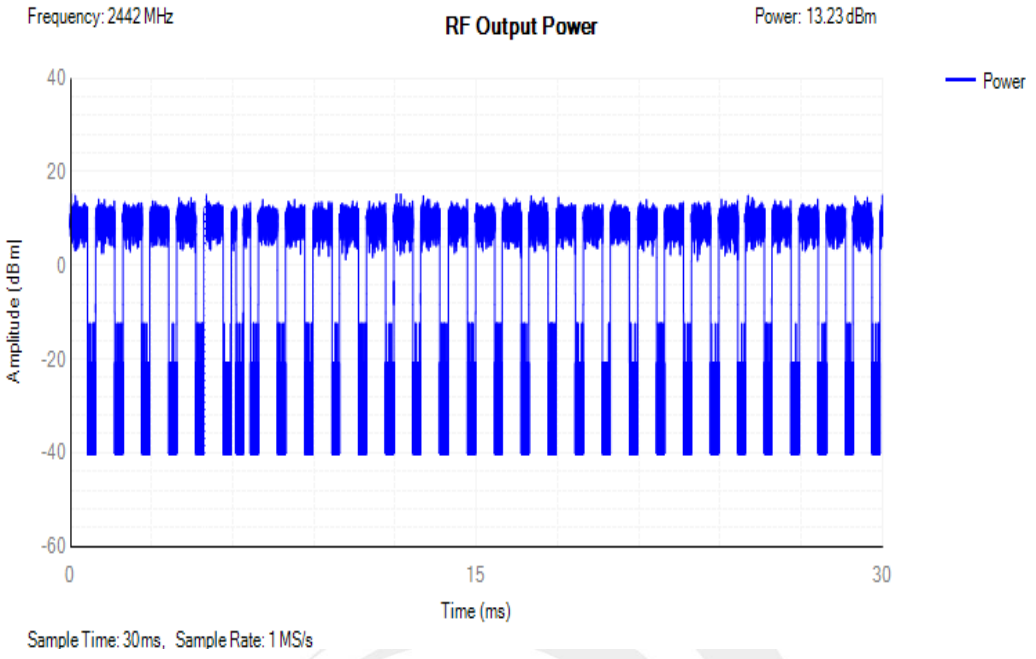
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plots

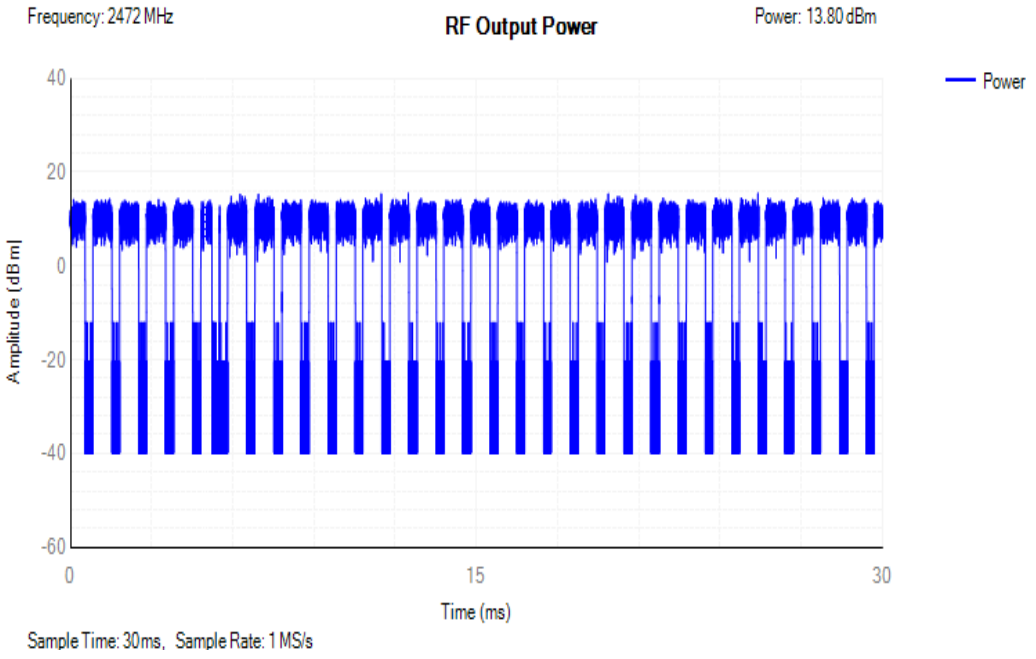
802.11n20 CH1



802.11n20 CH7



802.11n20 CH13

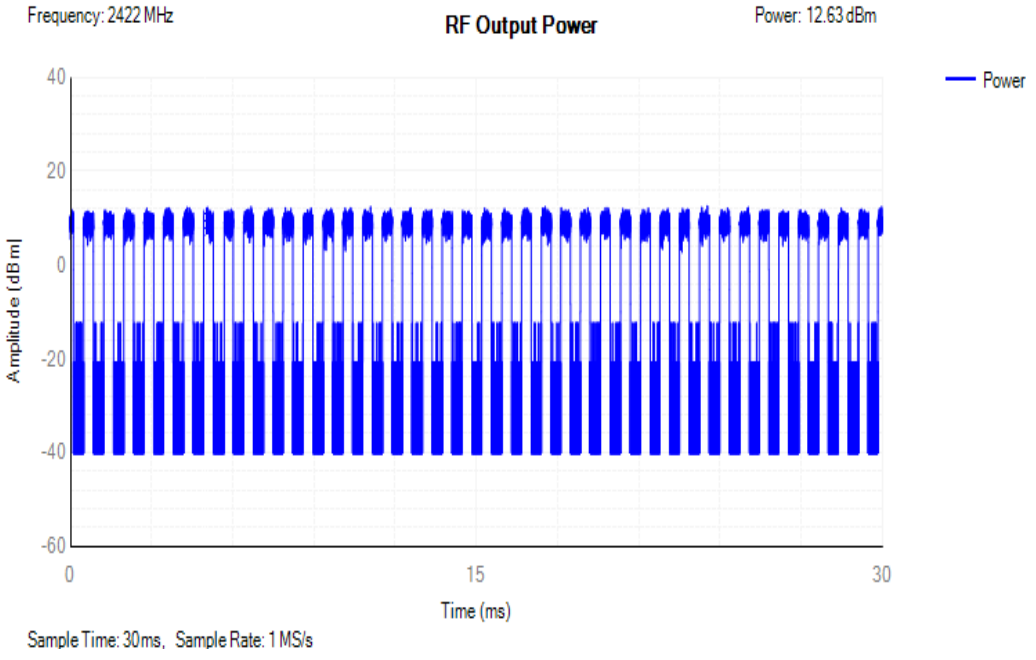


	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
802.11n(HT40)	Normal		12.63	12.99	13.36
	Extreme	LTNV	12.62	12.98	13.36
		HTNV	12.63	12.99	13.36
	Max. E.I.R.P		13.36		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

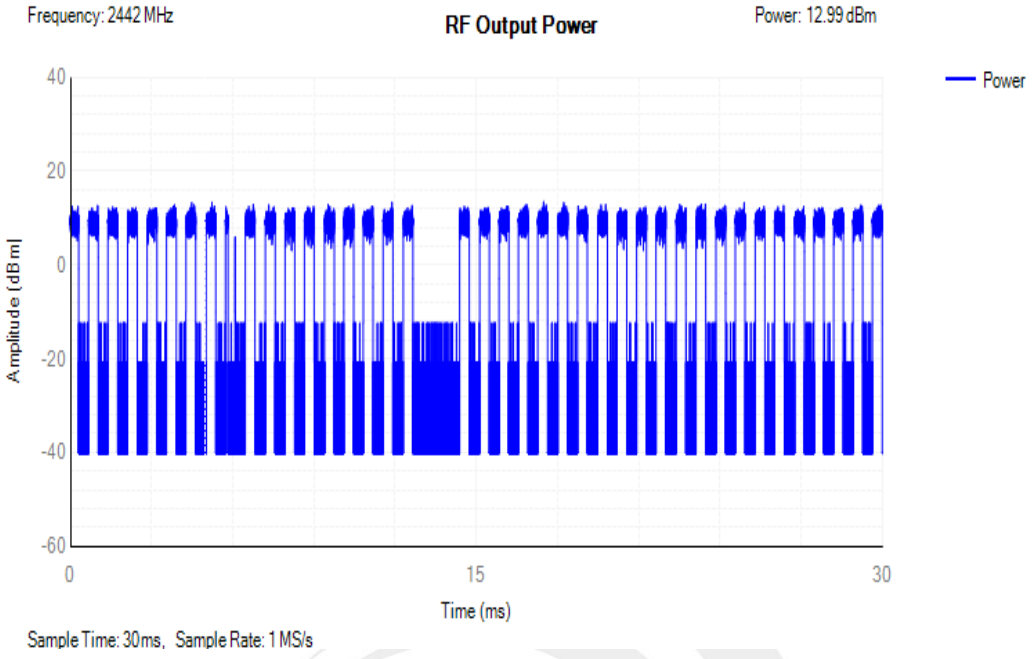
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

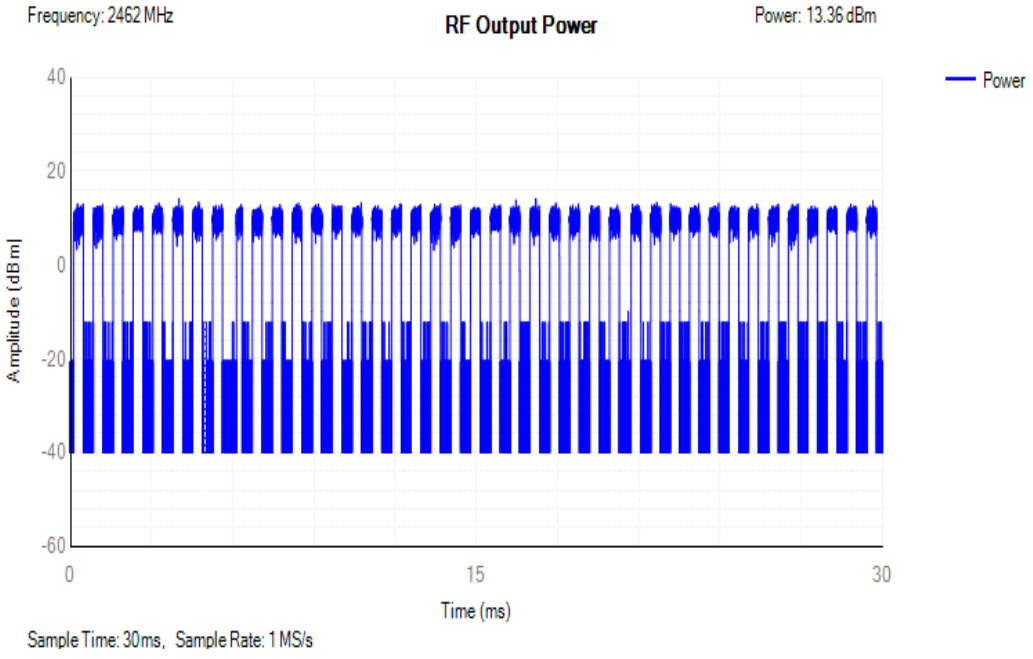
802.11n40 CH3



802.11n40 CH7



802.11n40 CH11



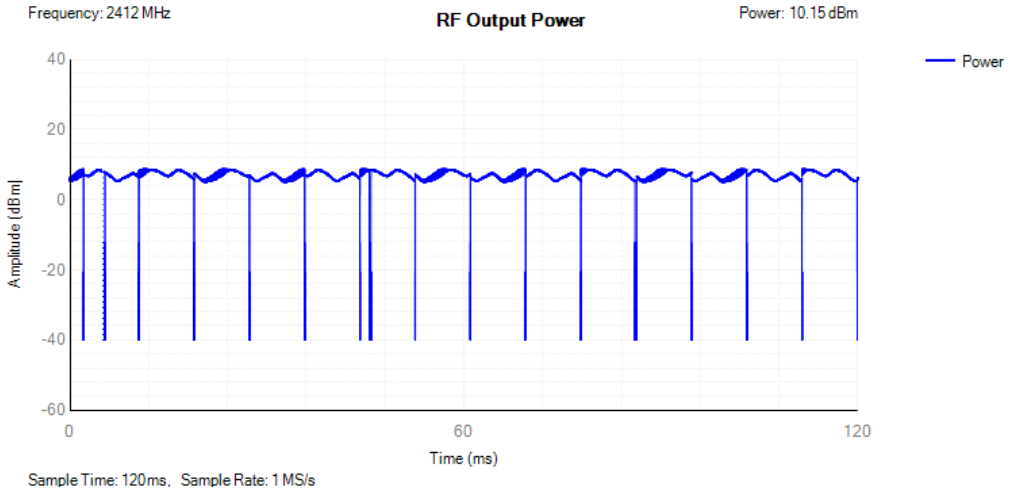
PCB Antenna

Modulation	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
802.11b	Normal		10.15	10.74	10.23
	Extreme	LTNV	9.80	10.65	10.15
		HTNV	9.48	10.40	9.98
	Max. E.I.R.P		10.74		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

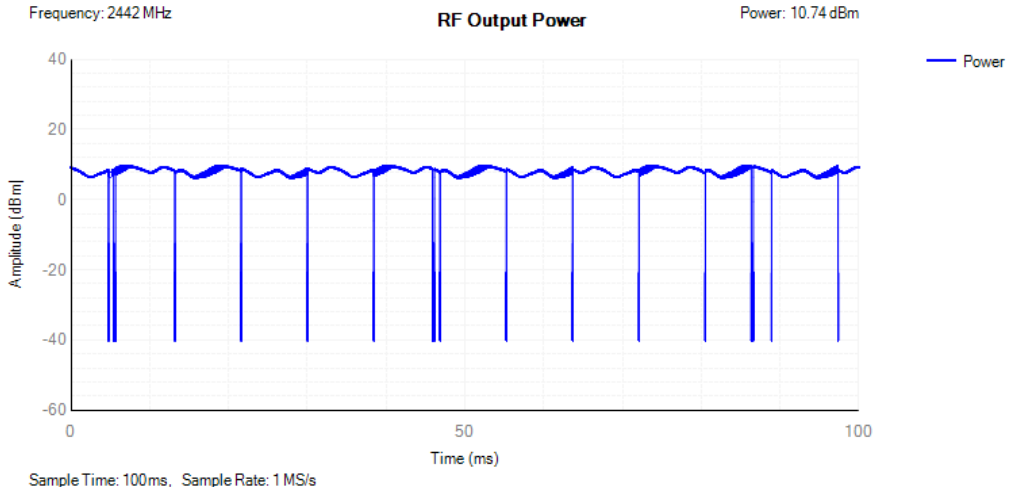
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

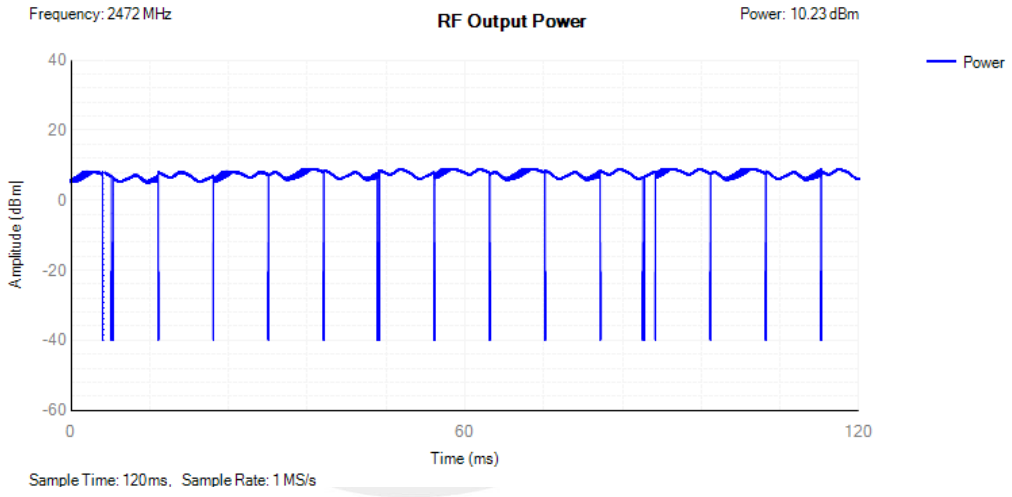
802.11b CH1



802.11b CH7



802.11b CH13

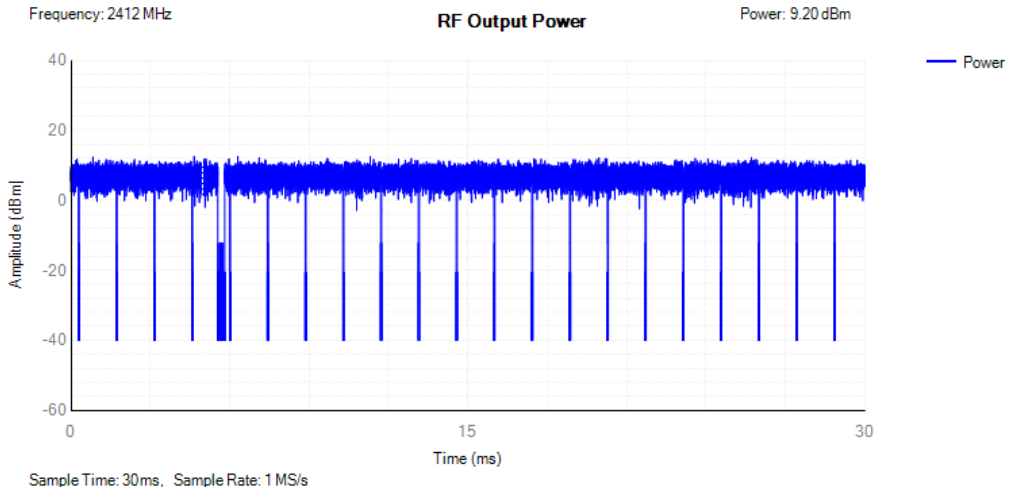


802.11g	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
	Normal		9.20	10.09	9.22
	Extreme	LTNV	8.77	9.62	8.81
		HTNV	8.52	9.51	8.56
	Max. E.I.R.P		10.09		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

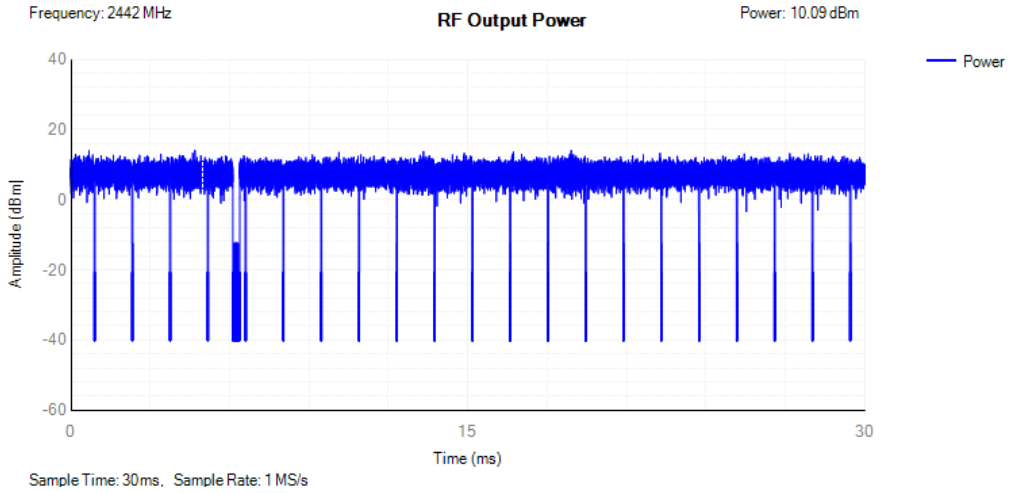
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

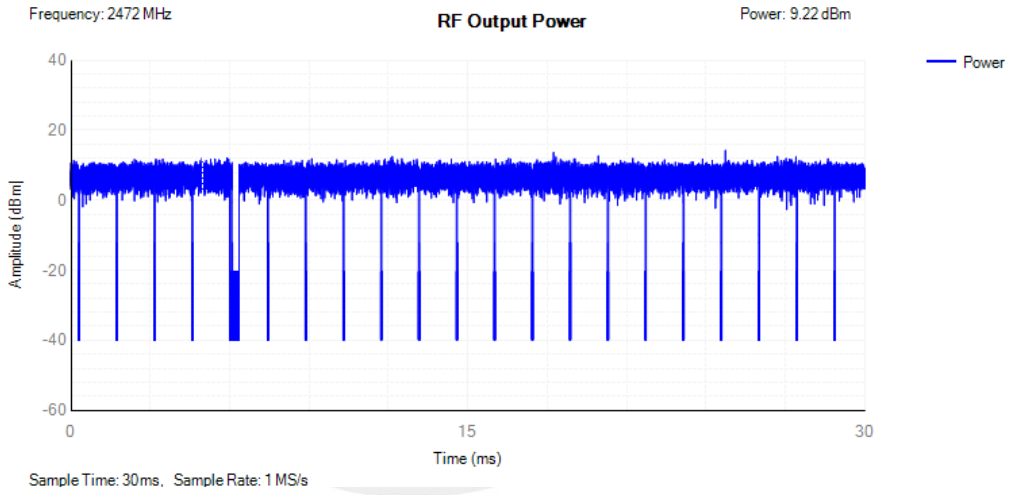
802.11g CH1



802.11g CH7



802.11g CH13

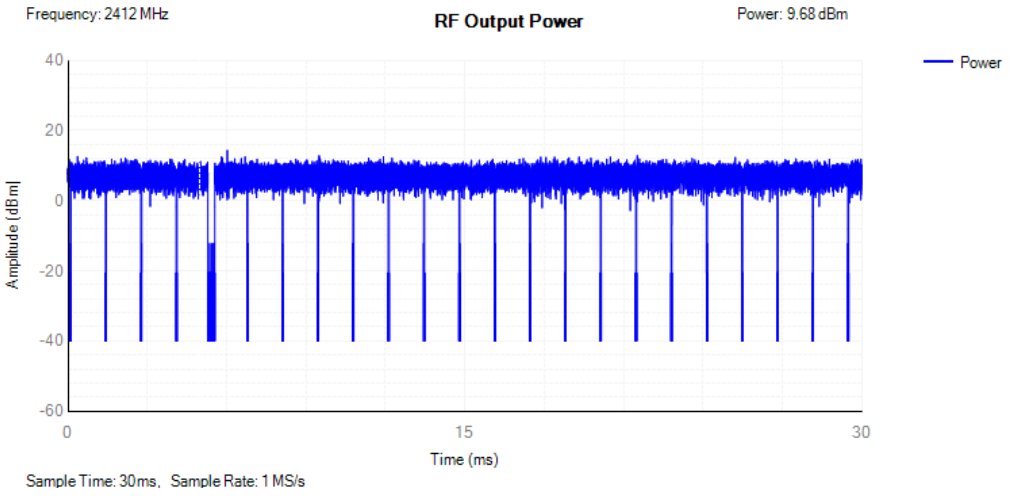


	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
802.11n(HT20)	Normal		9.68	9.64	9.43
	Extreme	LTNV	9.31	9.59	9.08
		HTNV	8.88	9.34	8.73
	Max. E.I.R.P		9.68		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

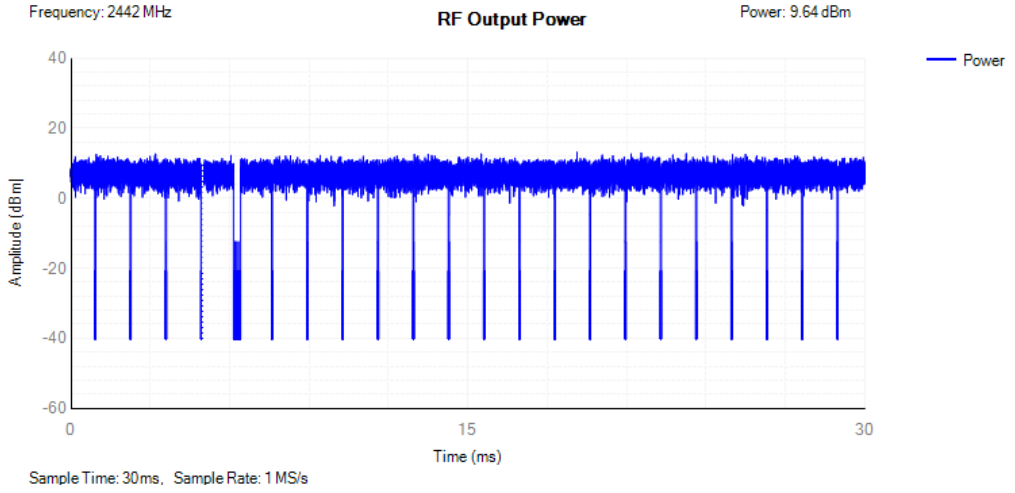
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plots

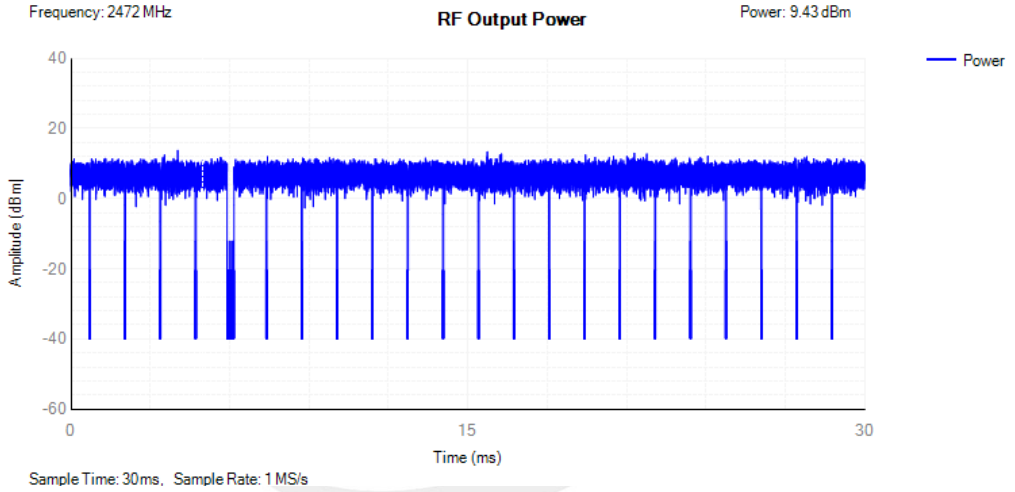
802.11n20 CH1



802.11n20 CH7



802.11n20 CH13

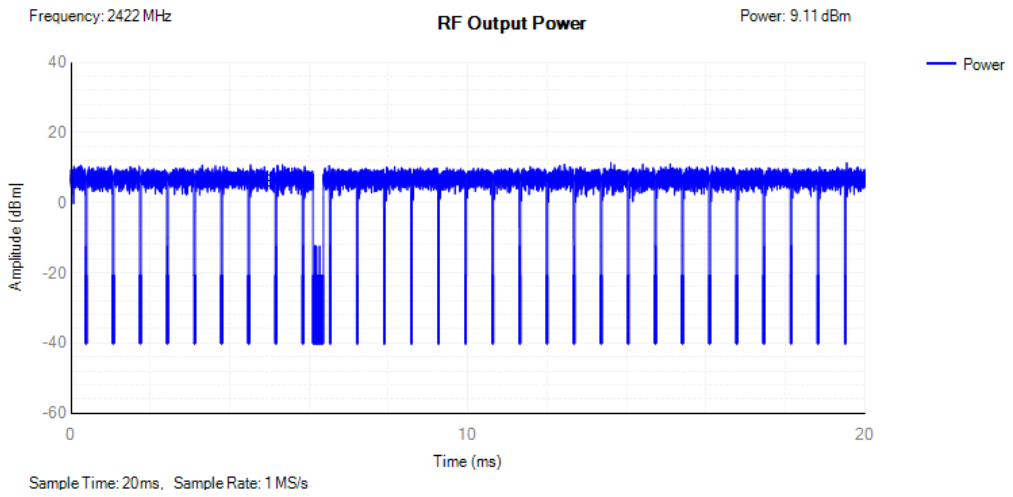


	Test conditions		Average EIRP Power (dBm)		
			Low Channel	Middle Channel	High Channel
802.11n(HT40)	Normal		9.11	9.89	9.55
	Extreme	LTNV	8.88	9.82	9.11
		HTNV	8.57	9.40	8.68
	Max. E.I.R.P		9.89		
	Limits		20dBm (-10dBW)		
	Burst plot		> 10		
	Result		Complies		

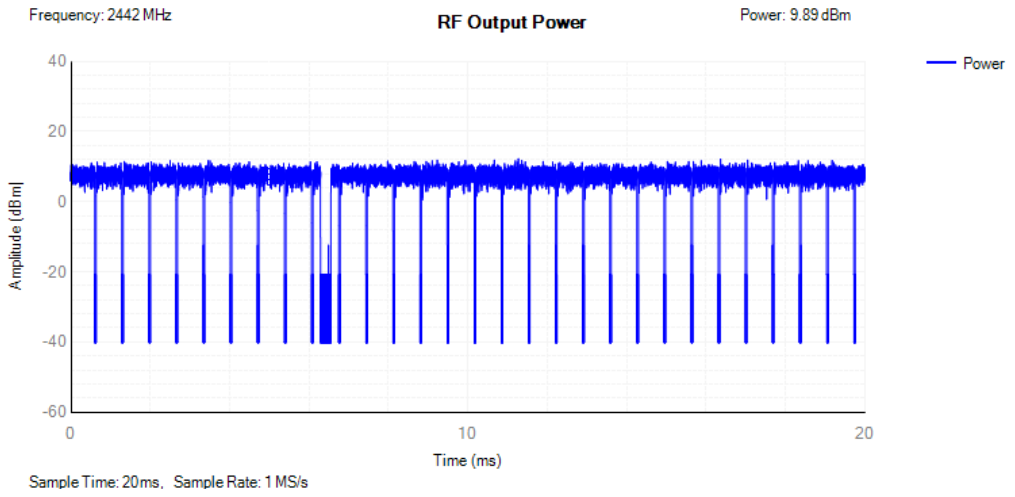
Note: Average EIRP Power = Burst power + the antenna gain value

Test Plot

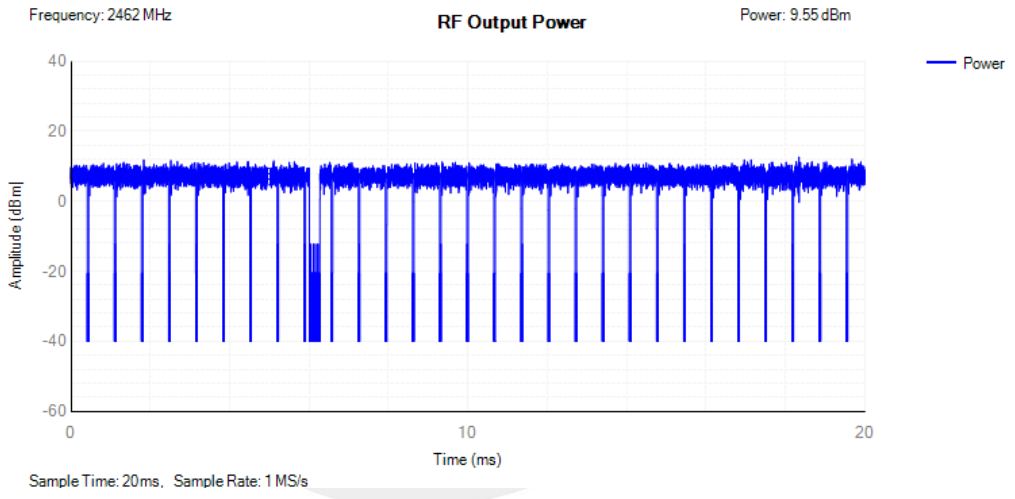
802.11n40 CH3



802.11n40 CH7



802.11n40 CH11



4. PEAK POWER DENSITY

4.1 LIMIT

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz

4.2 TEST PROCEDURES

The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range.

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.3.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.3.2 for the measurement method.

a). the equipment setup.

Frequency range	2400MHz-2483.5MHz
RBW/VBW	10KHz/30KHz
Sweep points	>8350 (Set as 10000)
Sweep time	For non-continuous transmissions: 2 × Channel Occupancy Time × number of sweep points
	For continuous transmissions: 10 s; the sweep time may be increased further until a value where the sweep time has no further impact anymore on the RMS value of the signal.
Detector	RMS
Trace	Max hold

b). For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

c). Add up the values for amplitude (power) for all the samples in the file.

d).Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.)

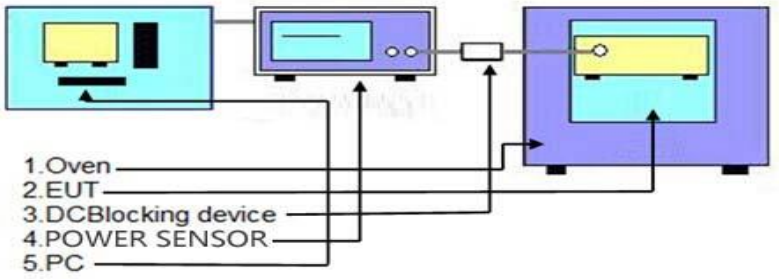
e). Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

f). Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step e (i.e. sample #2 to #101).

g). Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.

h). From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT.

4.3 TEST SETUP

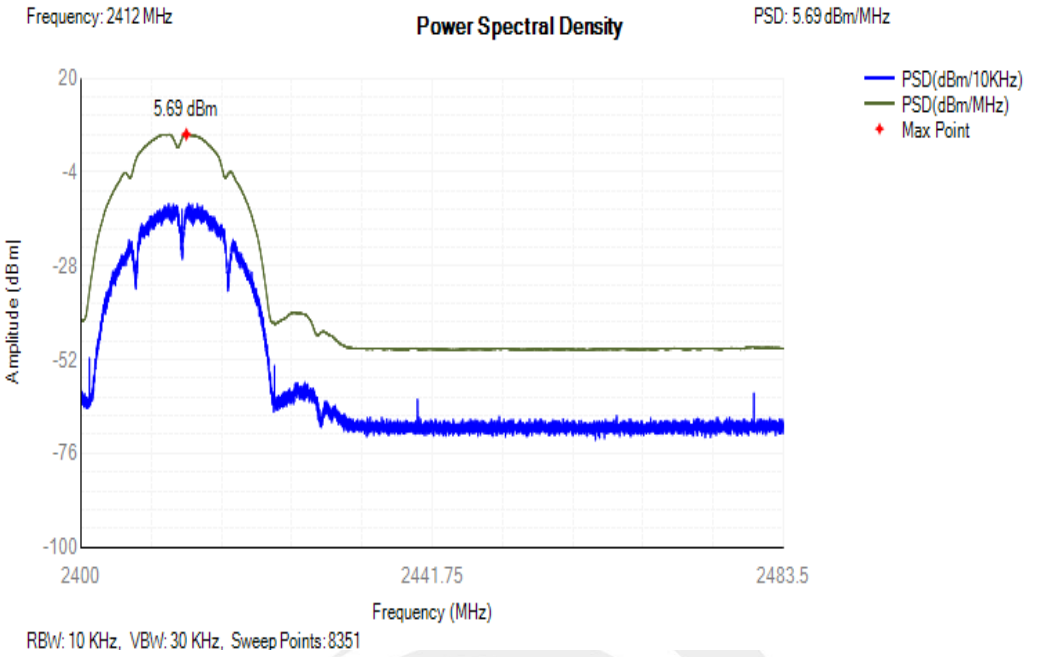


4.4 TEST RESULTS

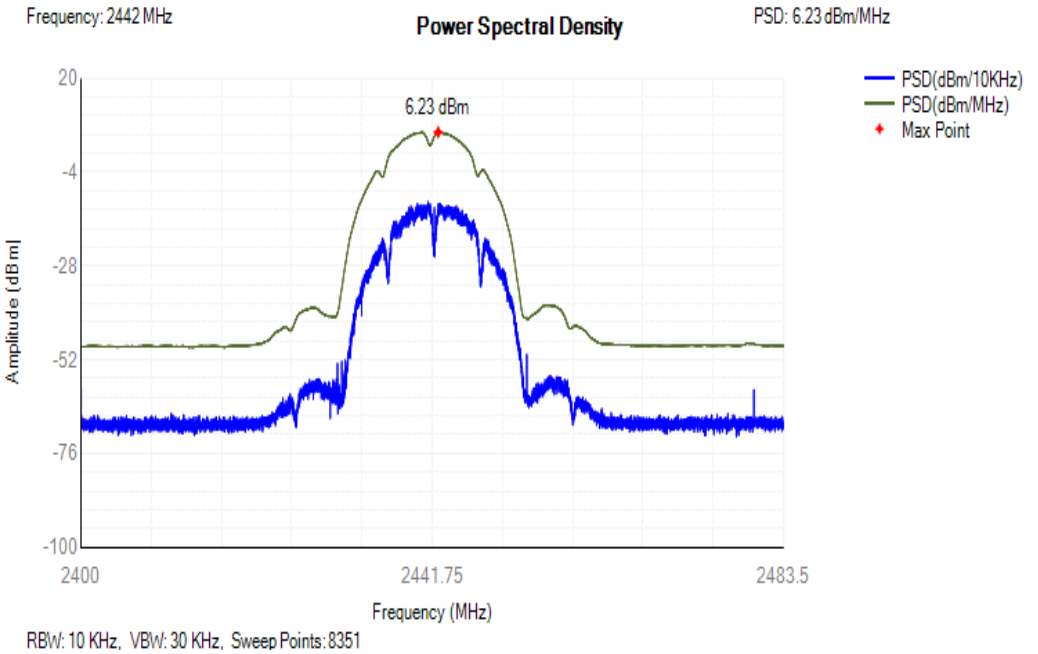
External Antenna

Condition	Mode	Frequency (MHz)	Max PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
NVNT	802.11b	2412	5.69	10	Pass
NVNT	802.11b	2442	6.23	10	Pass
NVNT	802.11b	2472	6.75	10	Pass
NVNT	802.11g	2412	3.98	10	Pass
NVNT	802.11g	2442	3.76	10	Pass
NVNT	802.11g	2472	3.83	10	Pass
NVNT	802.11n(HT20)	2412	1.15	10	Pass
NVNT	802.11n(HT20)	2442	1.42	10	Pass
NVNT	802.11n(HT20)	2472	2.09	10	Pass
NVNT	802.11n(HT40)	2422	-2.06	10	Pass
NVNT	802.11n(HT40)	2442	-1.55	10	Pass
NVNT	802.11n(HT40)	2462	-1.06	10	Pass

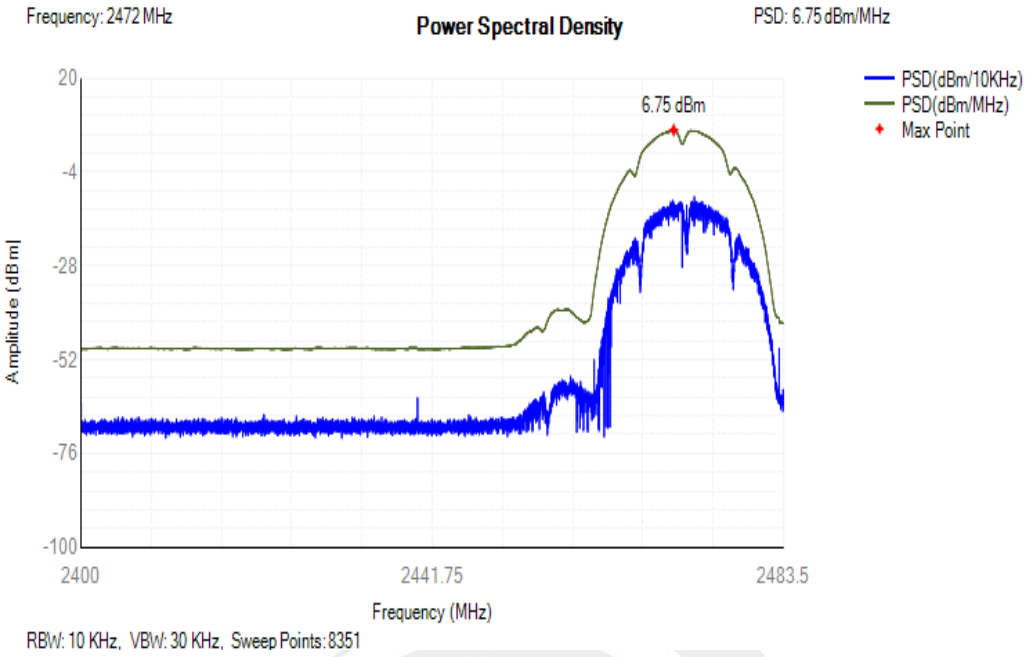
PSD NVNT 802.11b 2412MHz



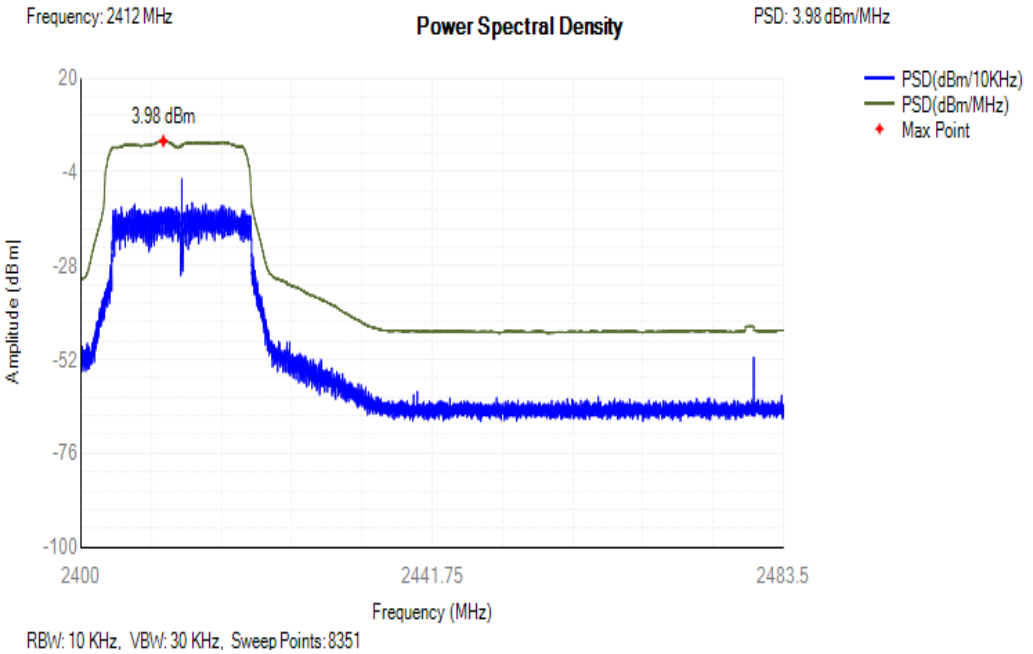
PSD NVNT 802.11b 2442MHz



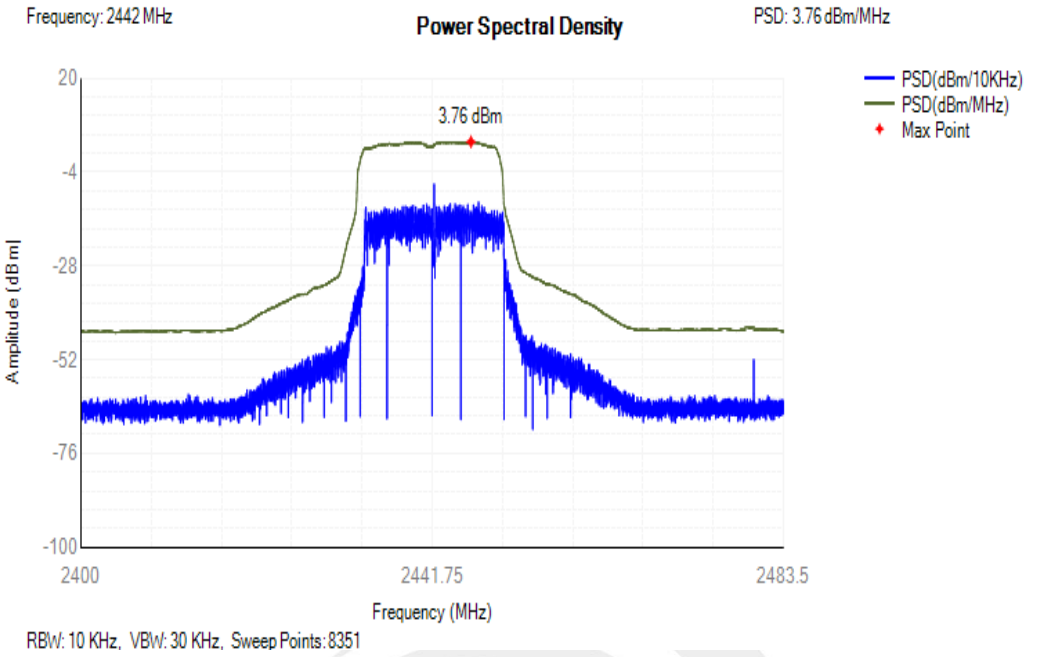
PSD NVNT 802.11b 2472MHz



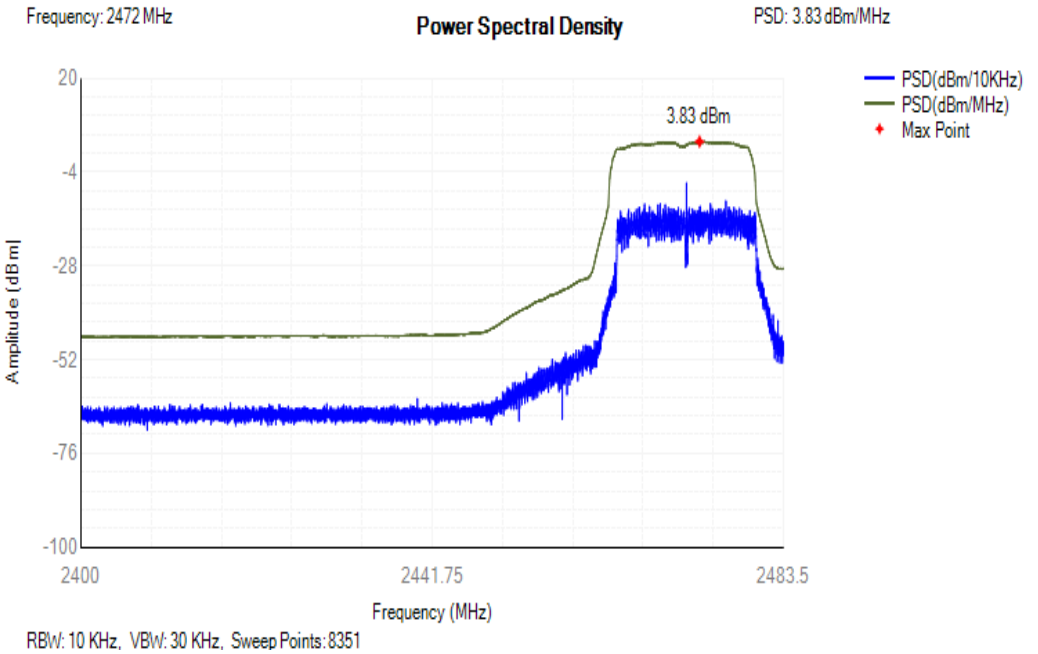
PSD NVNT 802.11g 2412MHz



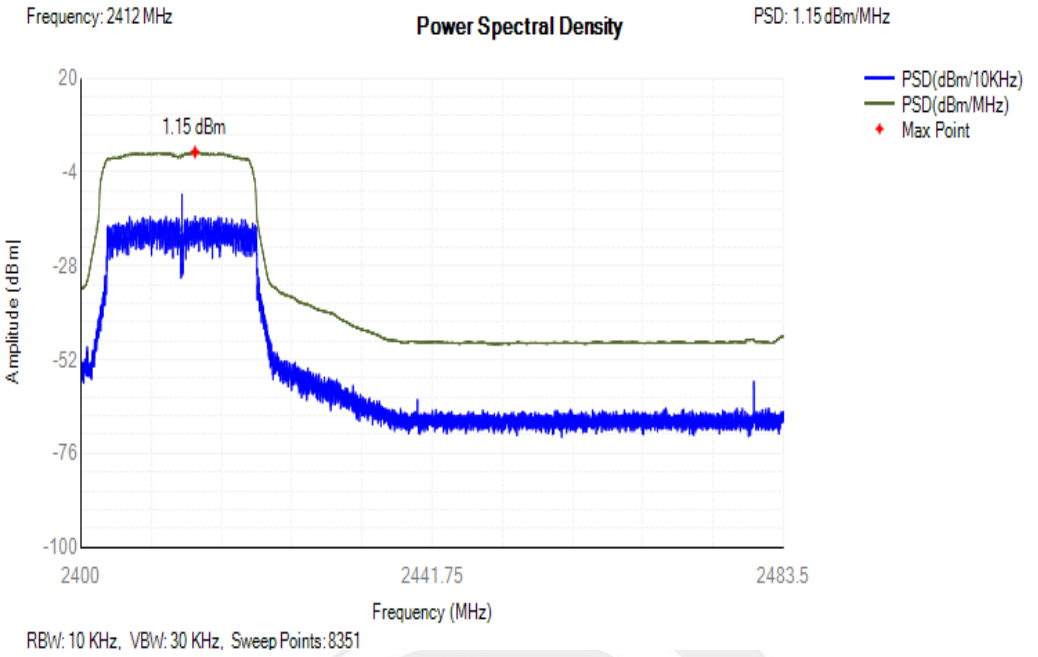
PSD NVNT 802.11g 2442MHz



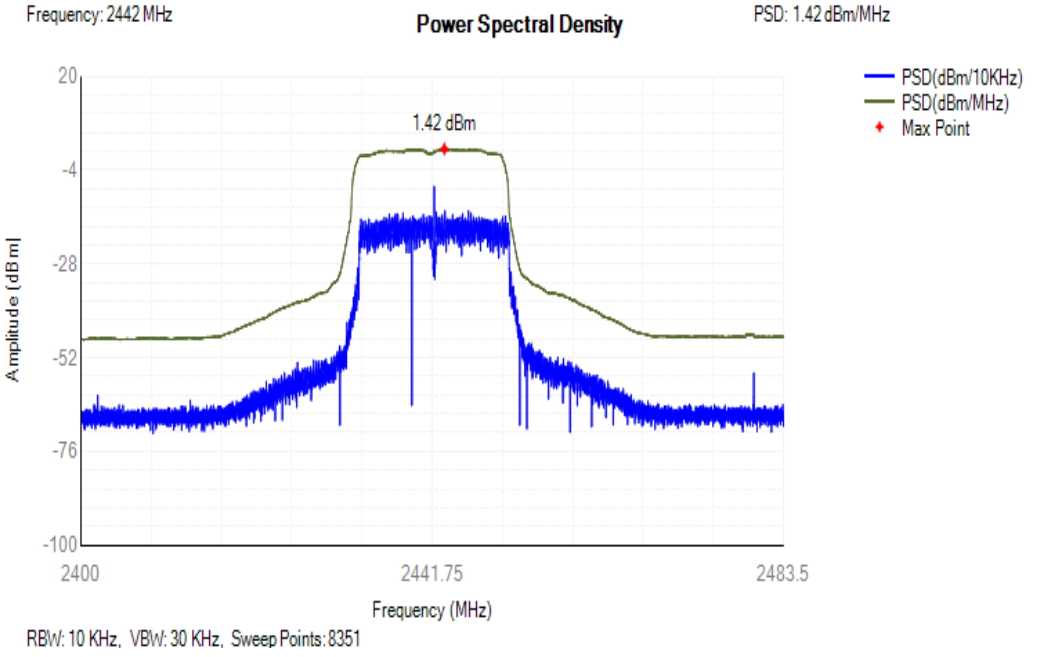
PSD NVNT 802.11g 2472MHz



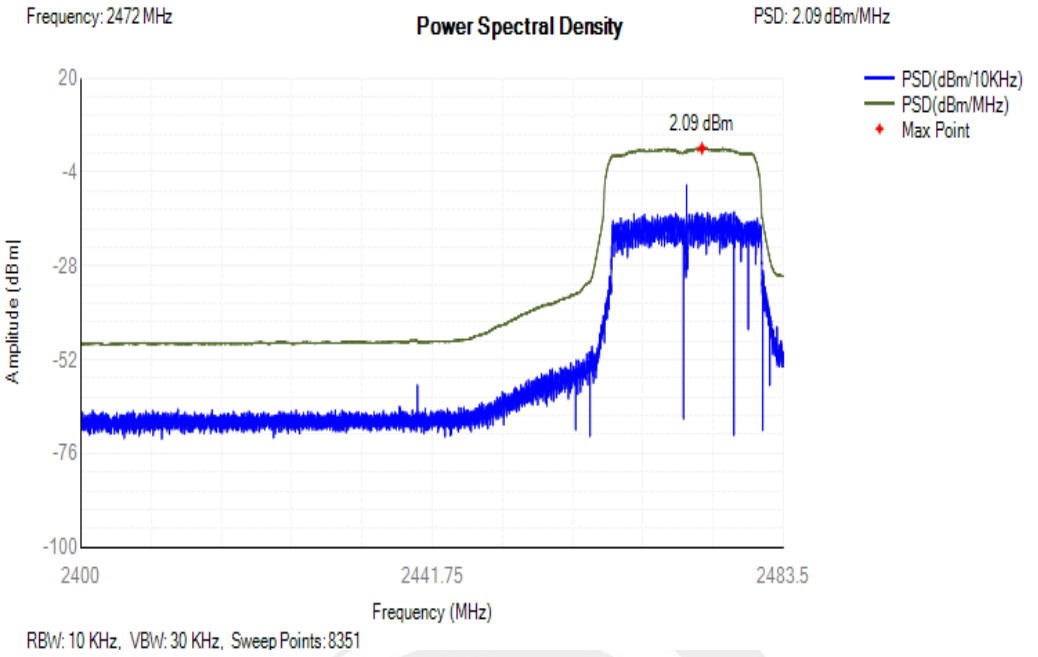
PSD NVNT 802.11n(HT20) 2412MHz



PSD NVNT 802.11n(HT20) 2442MHz

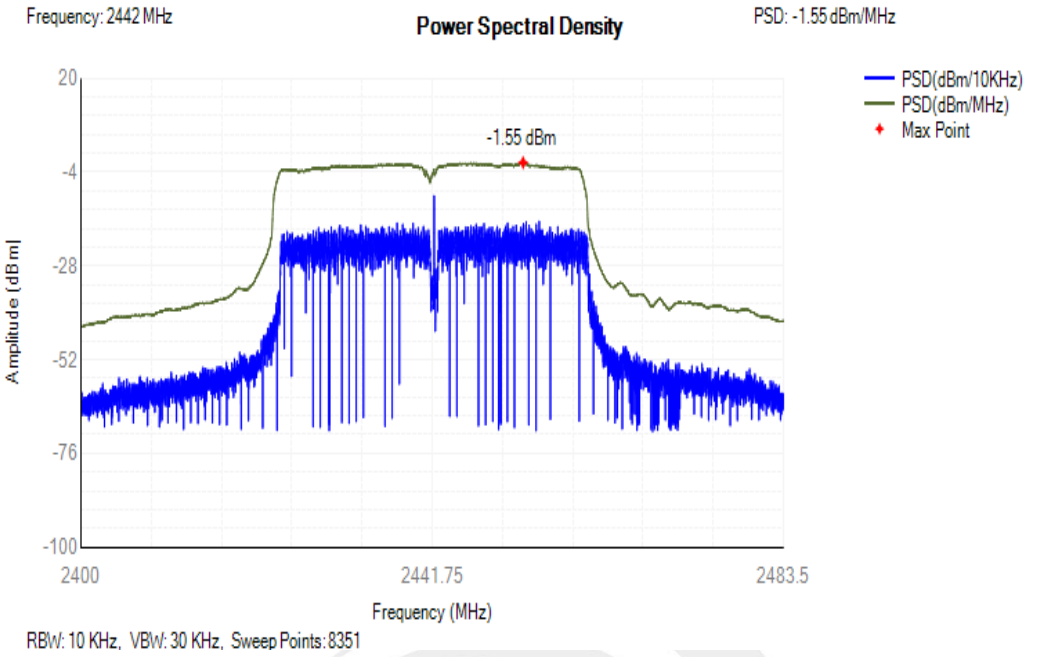


PSD NVNT 802.11n(HT20) 2472MHz

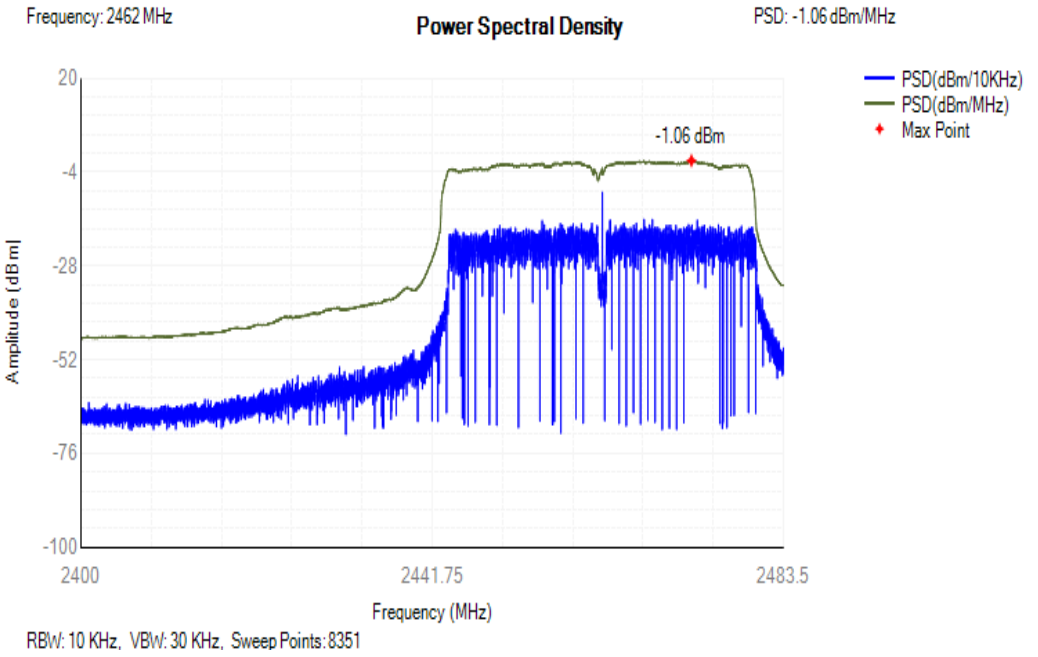


PSD NVNT 802.11n(HT40) 2422MHz

PSD NVNT 802.11n(HT40) 2442MHz



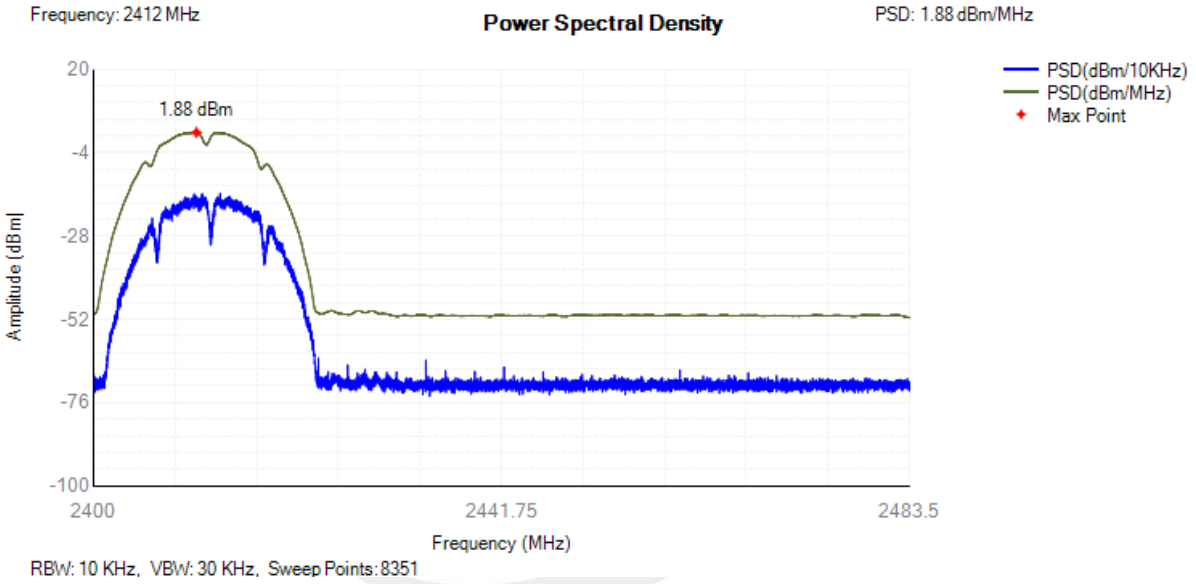
PSD NVNT 802.11n(HT40) 2462MHz



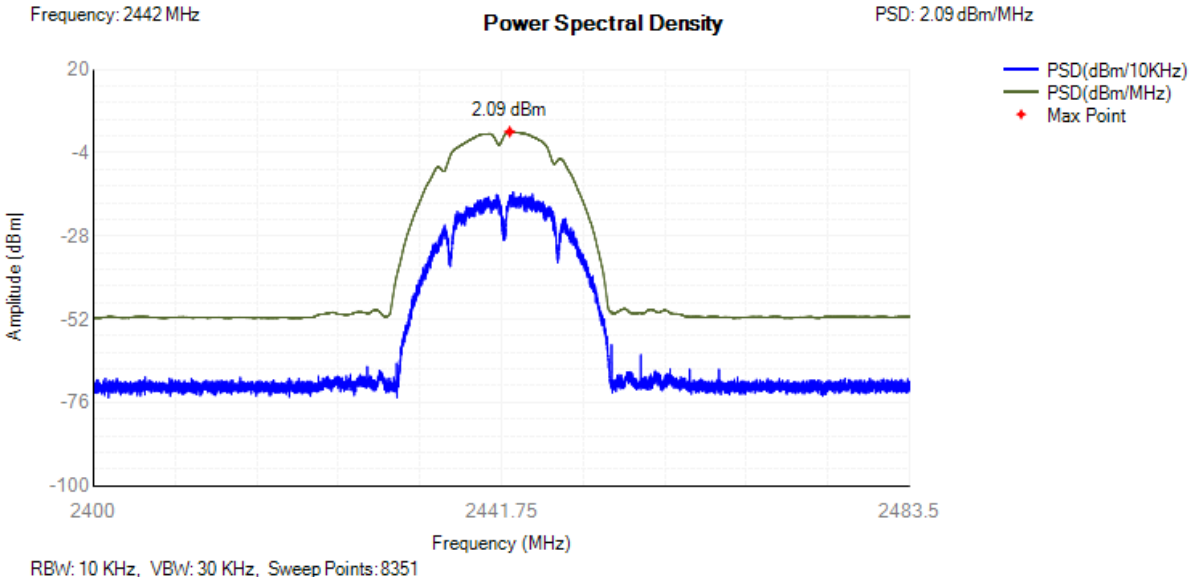
PCB Antenna

Condition	Mode	Frequency (MHz)	Max PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
NVNT	802.11b	2412	1.88	10	Pass
NVNT	802.11b	2442	2.09	10	Pass
NVNT	802.11b	2472	1.46	10	Pass
NVNT	802.11g	2412	-2.24	10	Pass
NVNT	802.11g	2442	-0.76	10	Pass
NVNT	802.11g	2472	-1.68	10	Pass
NVNT	802.11n(HT20)	2412	-1.97	10	Pass
NVNT	802.11n(HT20)	2442	-1.29	10	Pass
NVNT	802.11n(HT20)	2472	-1.45	10	Pass
NVNT	802.11n(HT40)	2422	-5.26	10	Pass
NVNT	802.11n(HT40)	2442	-3.81	10	Pass
NVNT	802.11n(HT40)	2462	-3.96	10	Pass

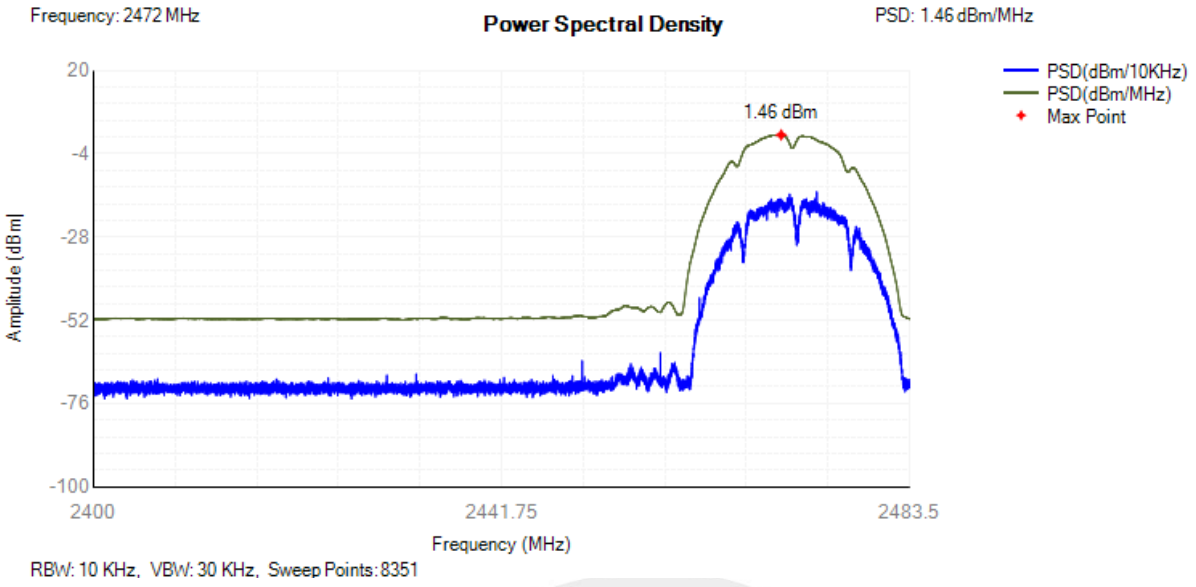
PSD NVNT 802.11b 2412MHz



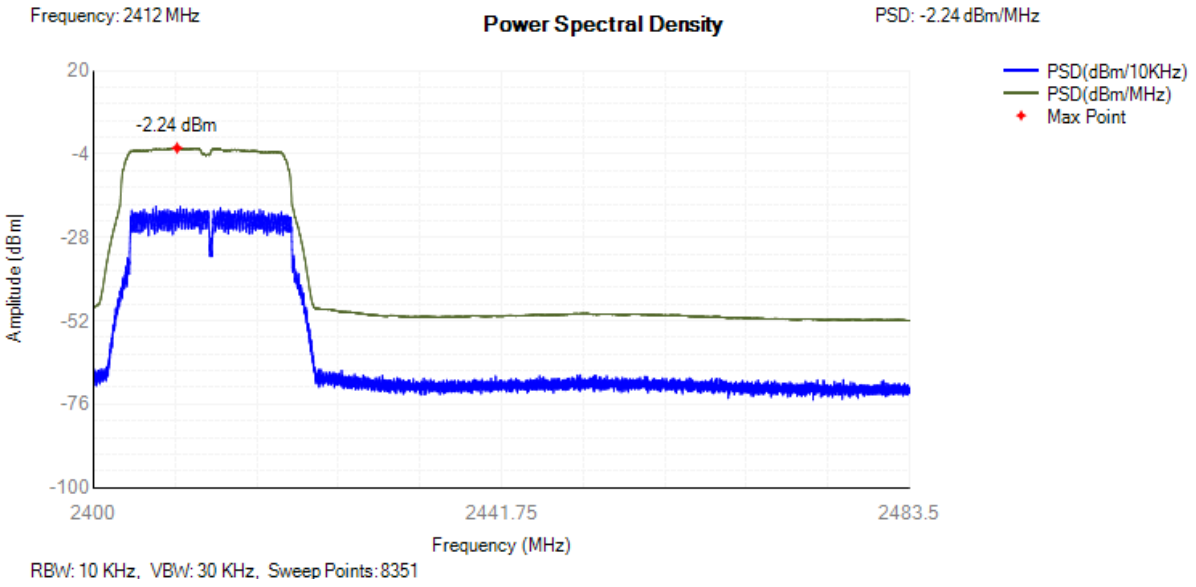
PSD NVNT 802.11b 2442MHz



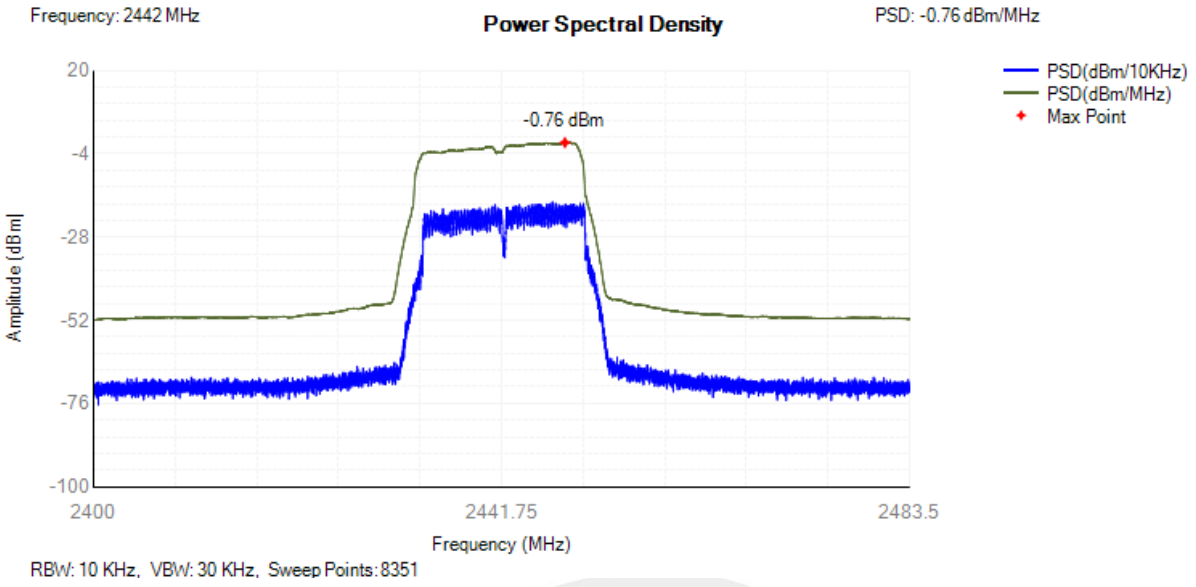
PSD NVNT 802.11b 2472MHz



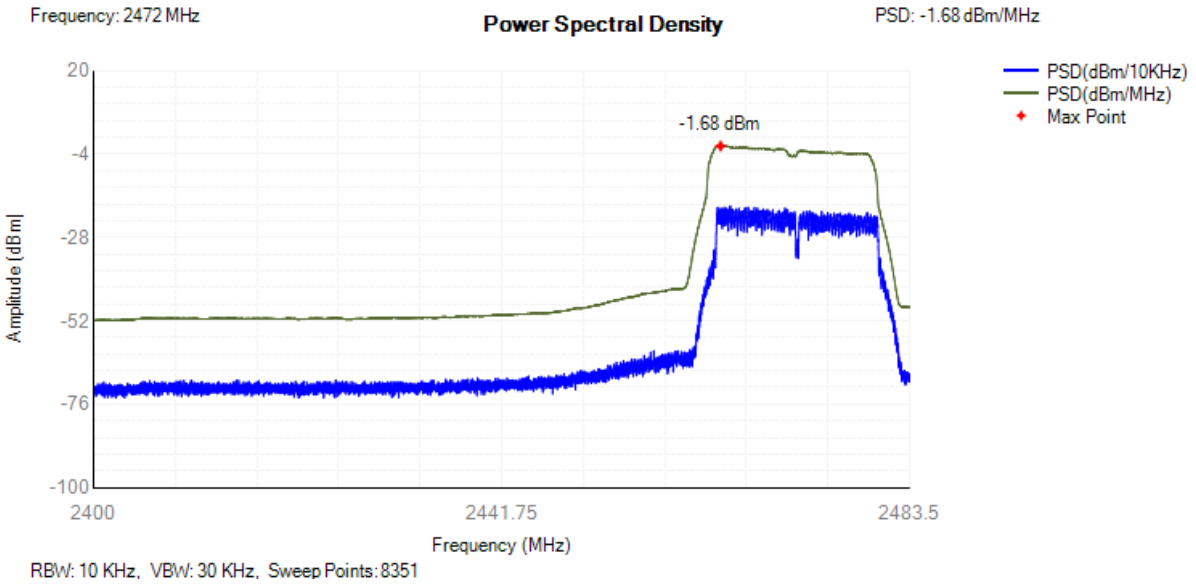
PSD NVNT 802.11g 2412MHz



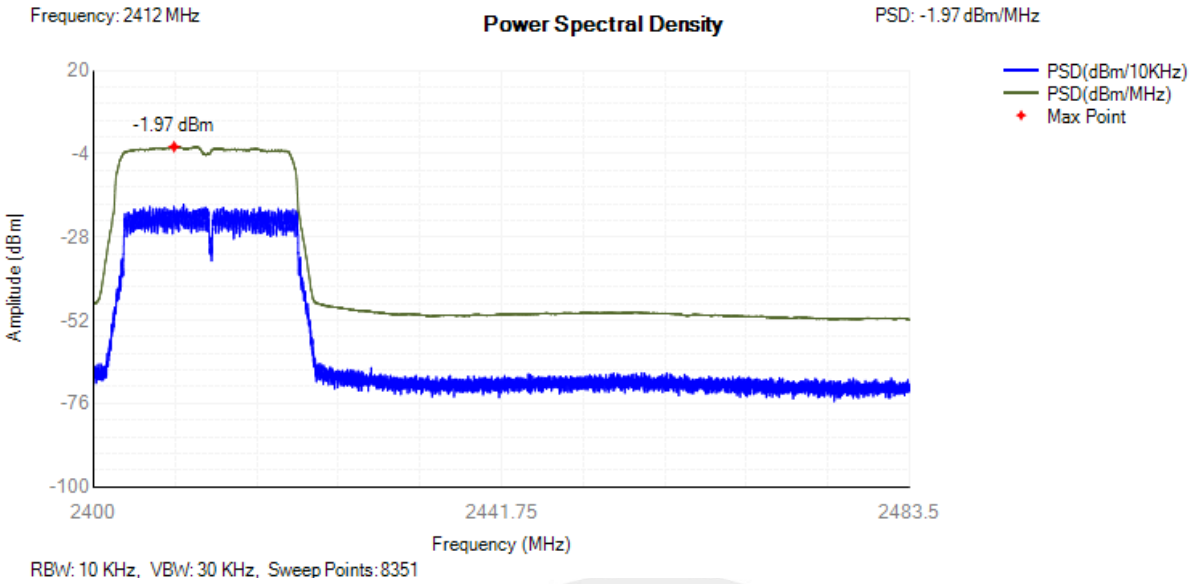
PSD NVNT 802.11g 2442MHz



PSD NVNT 802.11g 2472MHz

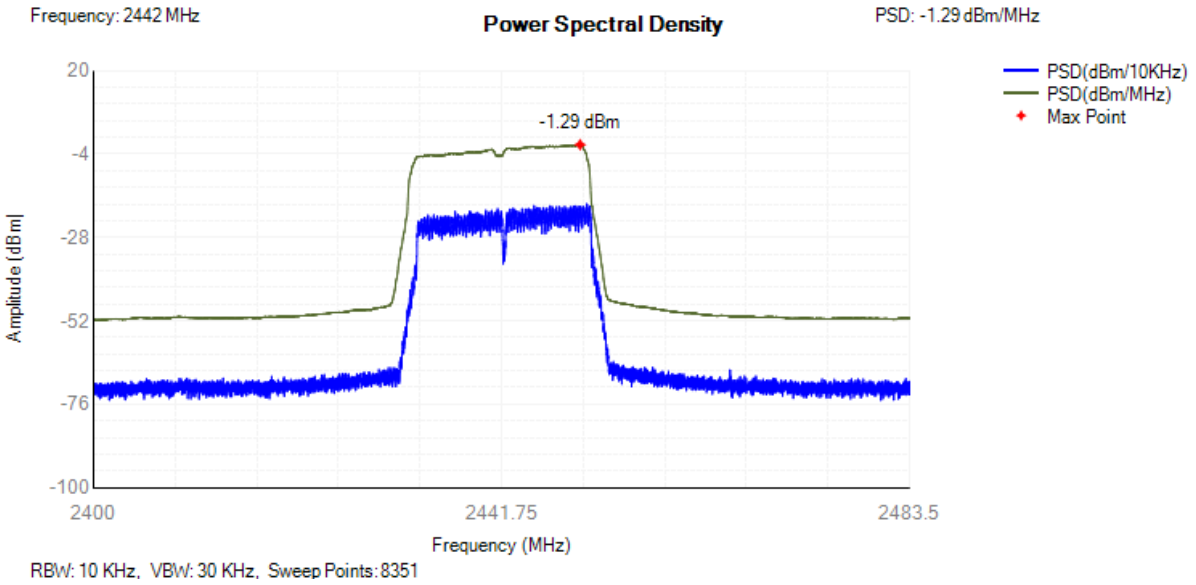


PSD NVNT 802.11n(HT20) 2412MHz



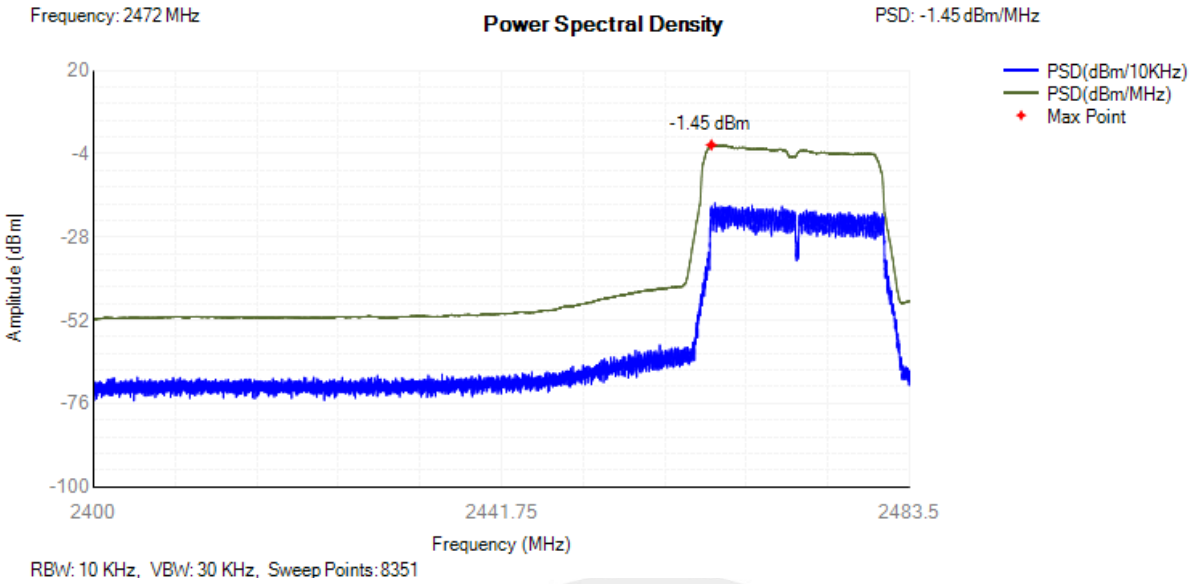
RBW: 10 KHz, VBW: 30 KHz, Sweep Points: 8351

PSD NVNT 802.11n(HT20) 2442MHz

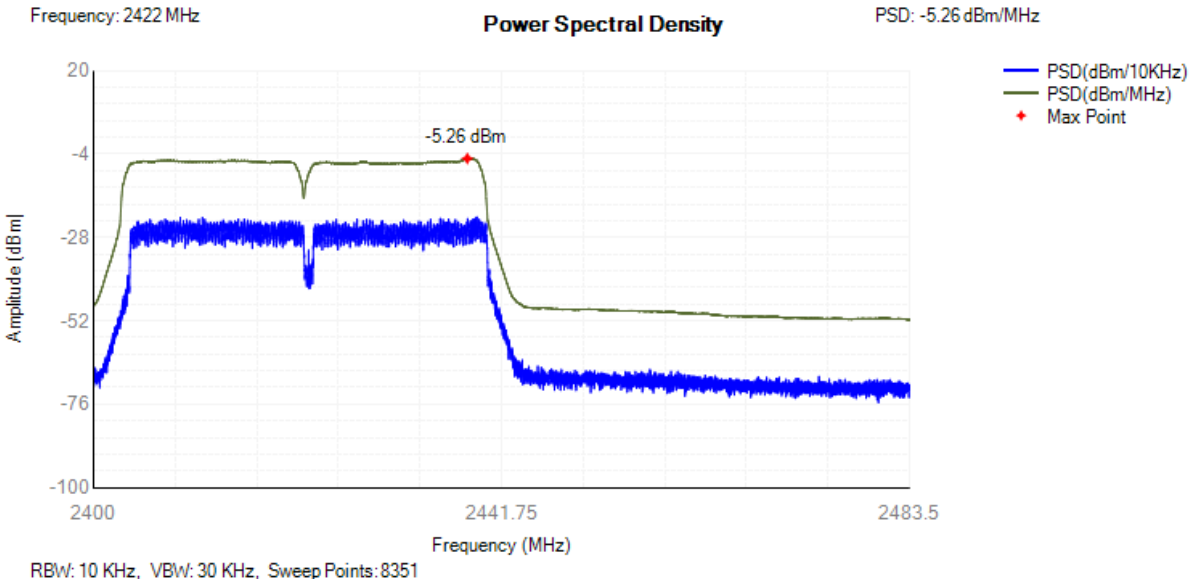


RBW: 10 KHz, VBW: 30 KHz, Sweep Points: 8351

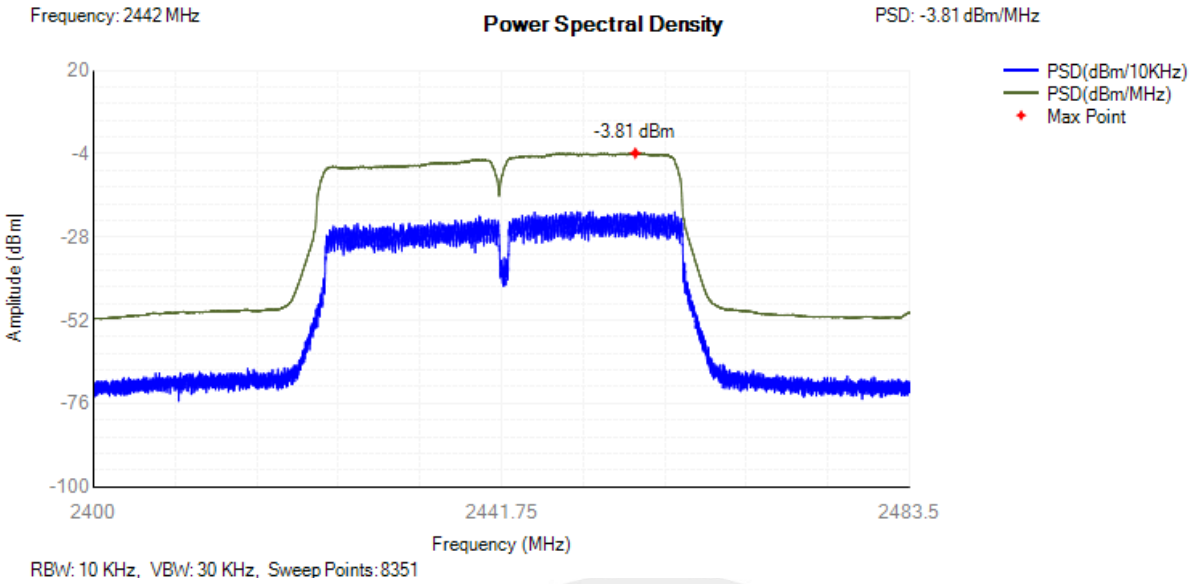
PSD NVNT 802.11n(HT20) 2472MHz



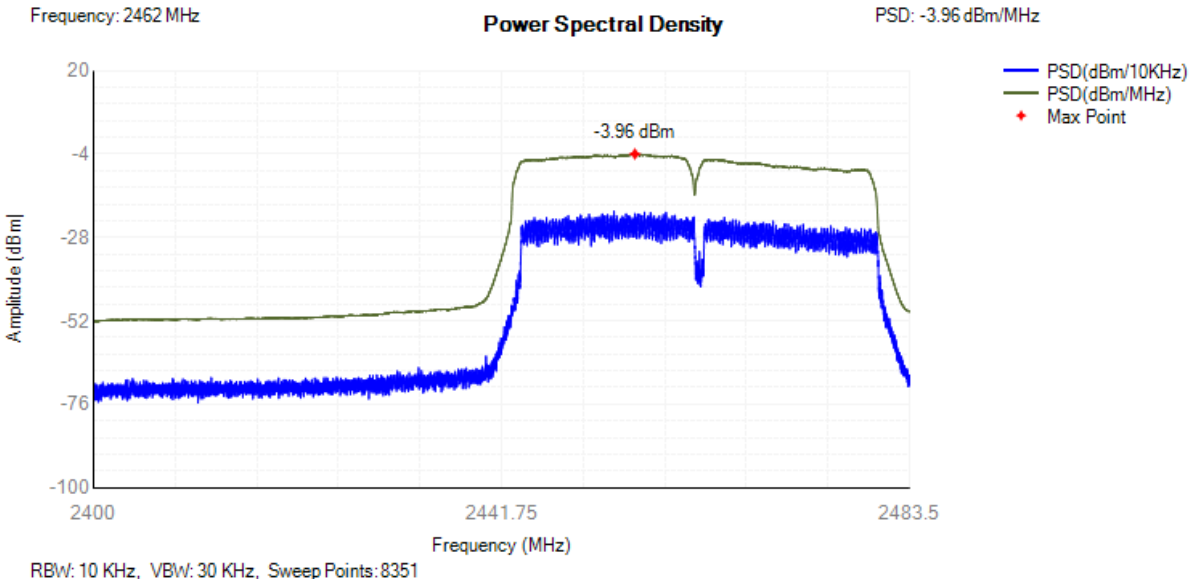
PSD NVNT 802.11n(HT40) 2422MHz



PSD NVNT 802.11n(HT40) 2442MHz



PSD NVNT 802.11n(HT40) 2462MHz



5. OCCUPIED CHANNEL BANDWIDTH

5.1 LIMIT

The Occupied Channel Bandwidth shall fall completely within the band given in 2 400 MHz to 2 483.5 MHz. In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p. greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

5.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.7.1 for the test conditions.

2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.7.2 for the measurement method.

-- Centre Frequency: The centre frequency of the channel under test

- Resolution BW: ~ 1 % of the span without going below 1 %
(430KHz for 20 MHz channel,820KHz for 40MHz)

--Video BW:(1.3MHz for 20 MHz channel,2.7MHz for 40MHz)

--Frequency Span for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence)

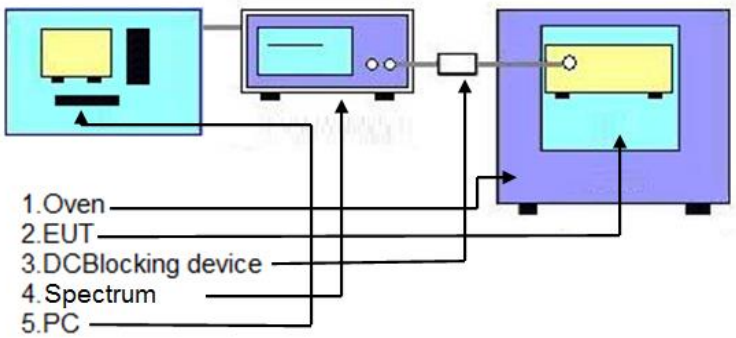
--Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel, 80 MHz for a 40 MHz channel)

-- Detector Mode: RMS

--Trace Mode: Max Hold

--Sweep time:1S

5.3 TEST SETUP

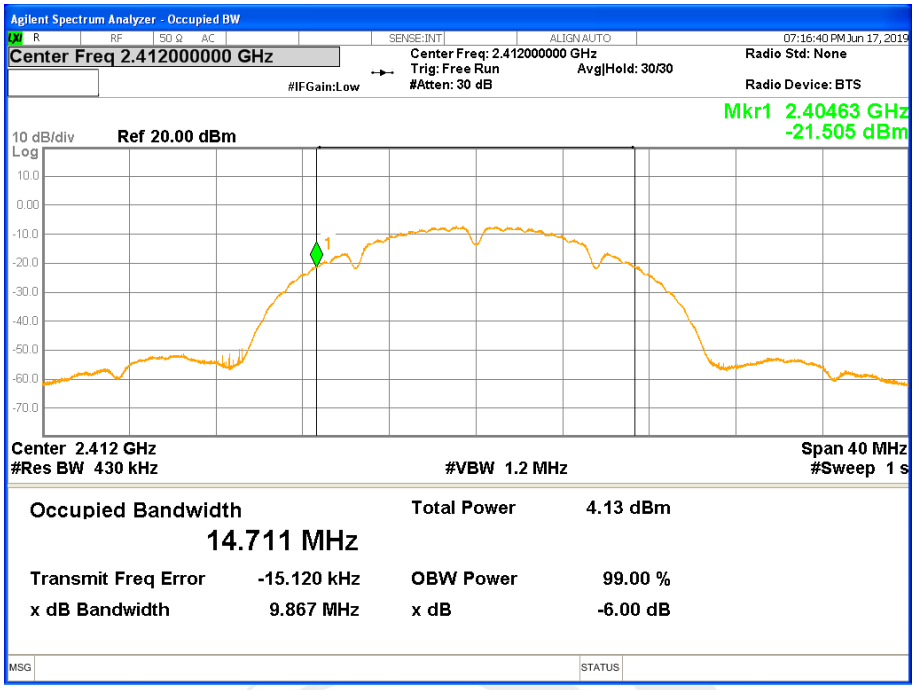


5.4 TEST RESULTS

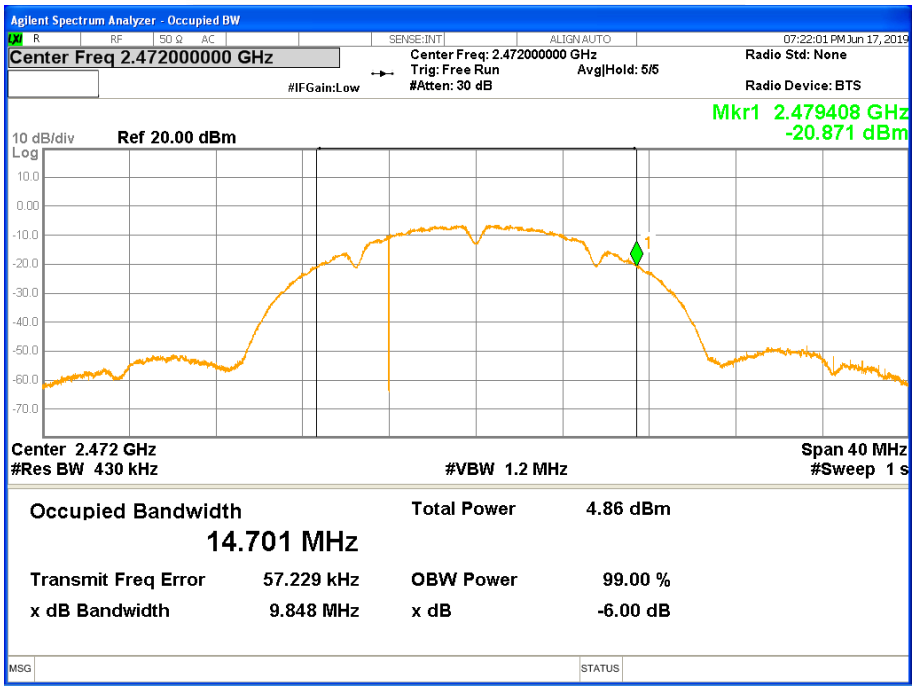
External Antenna

Condition	Mode	Frequency (MHz)	Center Frequency (MHz)	OBW (MHz)	Lower Edge (MHz)	Upper Edge (MHz)	Limit OBW (MHz)	Verdict
NVNT	802.11b	2412	2411.985	14.711	2404.63	2419.34	2400 - 2483.5MHz	Pass
NVNT	802.11b	2472	2472.057	14.701	2464.707	2479.408	2400 - 2483.5MHz	Pass
NVNT	802.11g	2412	2411.973	16.557	2403.695	2420.251	2400 - 2483.5MHz	Pass
NVNT	802.11g	2472	2471.987	16.565	2463.704	2480.269	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT20)	2412	2411.976	17.753	2403.1	2420.853	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT20)	2472	2471.995	17.752	2463.119	2480.871	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT40)	2422	2421.961	36.321	2403.8	2440.121	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT40)	2462	2462.012	36.314	2443.855	2480.169	2400 - 2483.5MHz	Pass

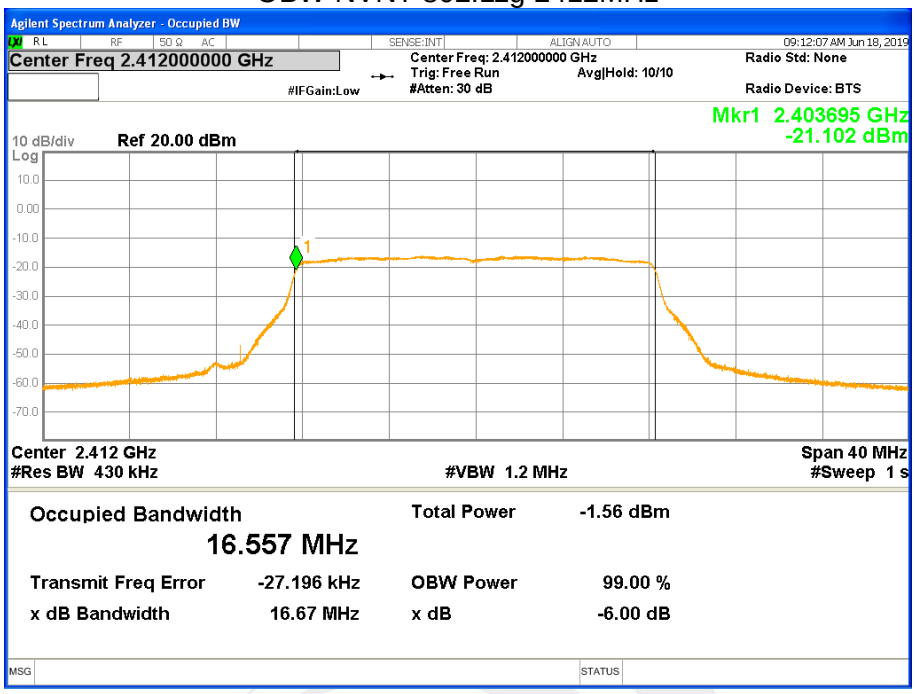
OBW NVNT 802.11b 2412MHz



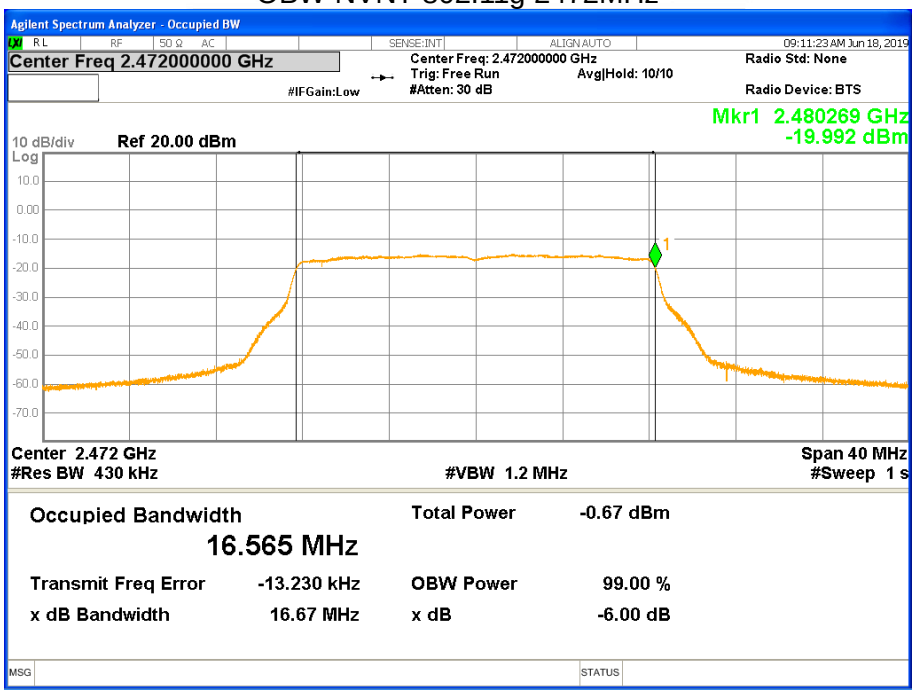
OBW NVNT 802.11b 2472MHz



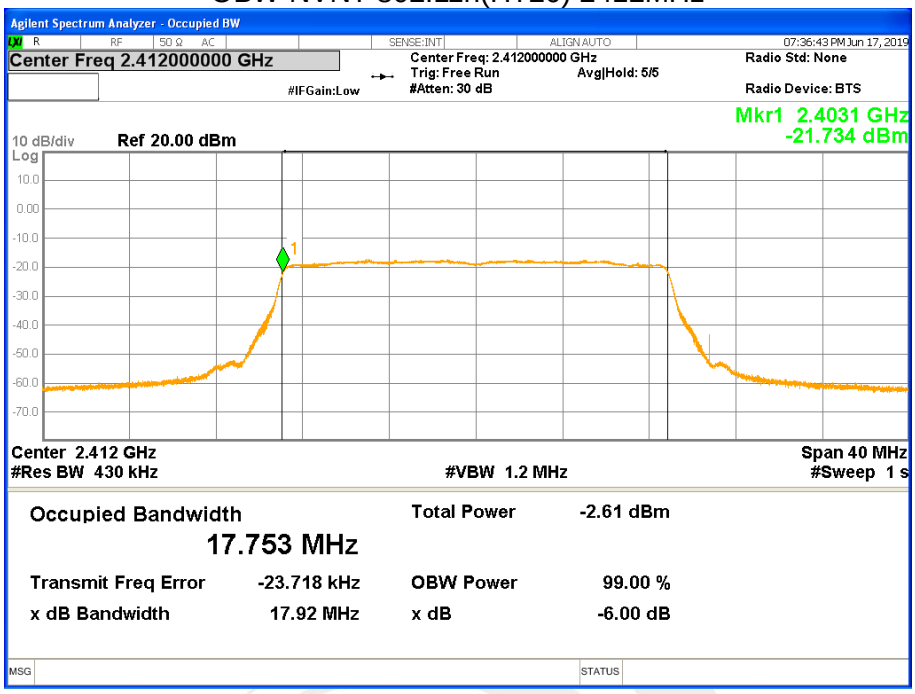
OBW NVNT 802.11g 2412MHz



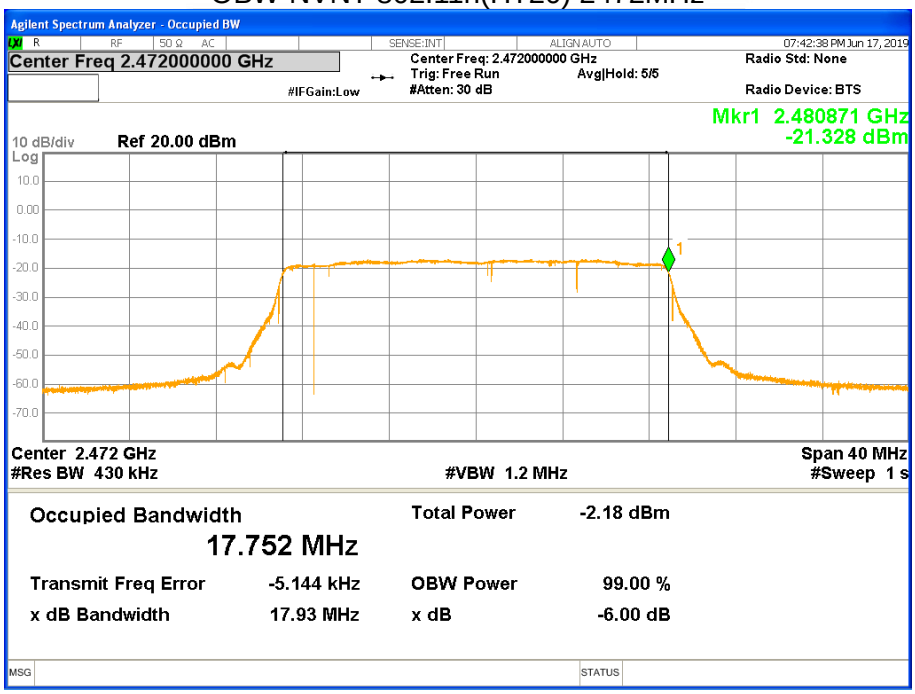
OBW NVNT 802.11g 2472MHz



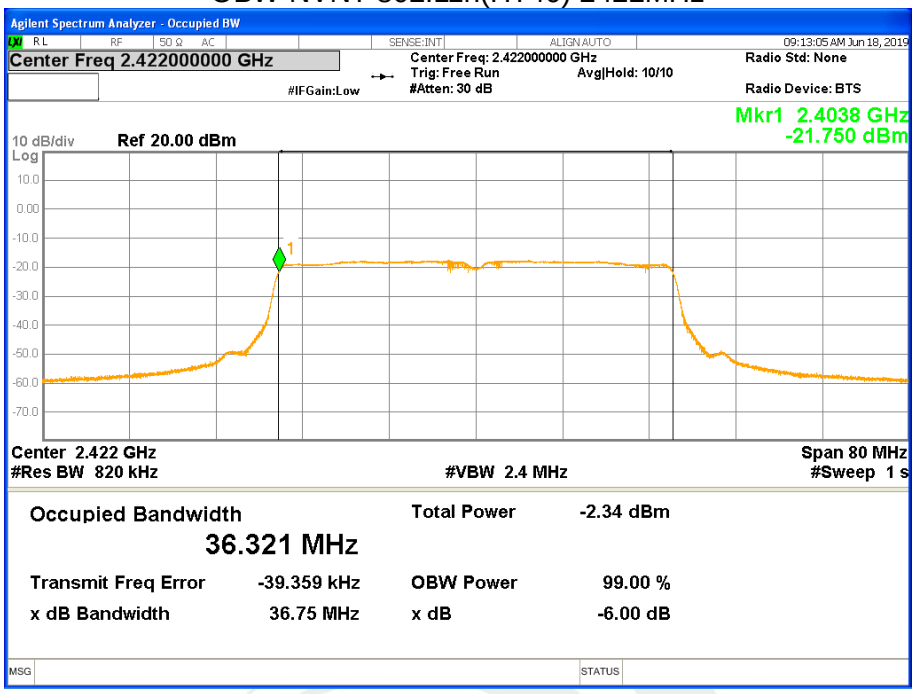
OBW NVNT 802.11n(HT20) 2412MHz



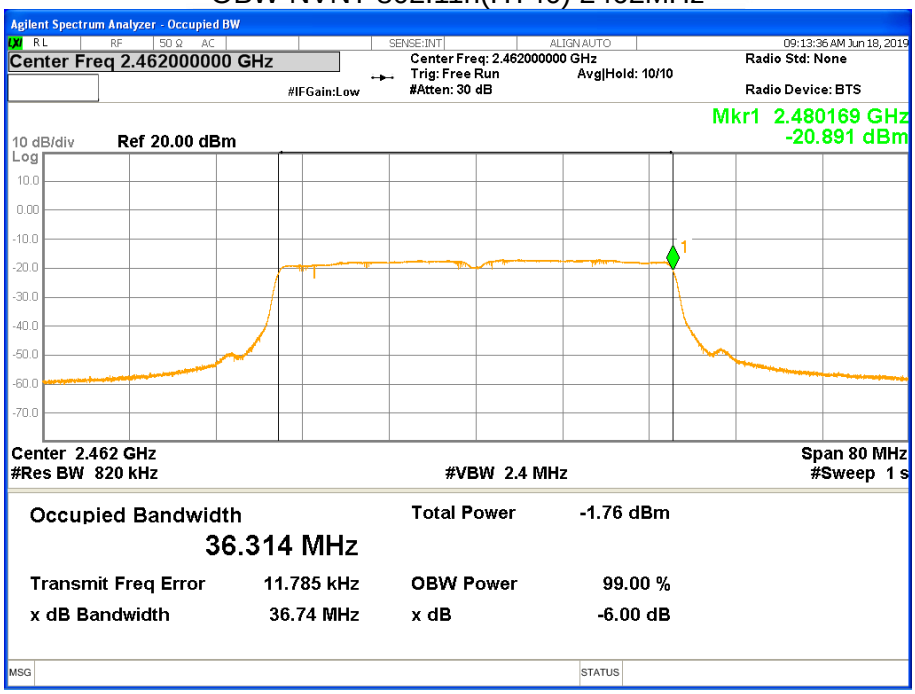
OBW NVNT 802.11n(HT20) 2472MHz



OBW NVNT 802.11n(HT40) 2422MHz



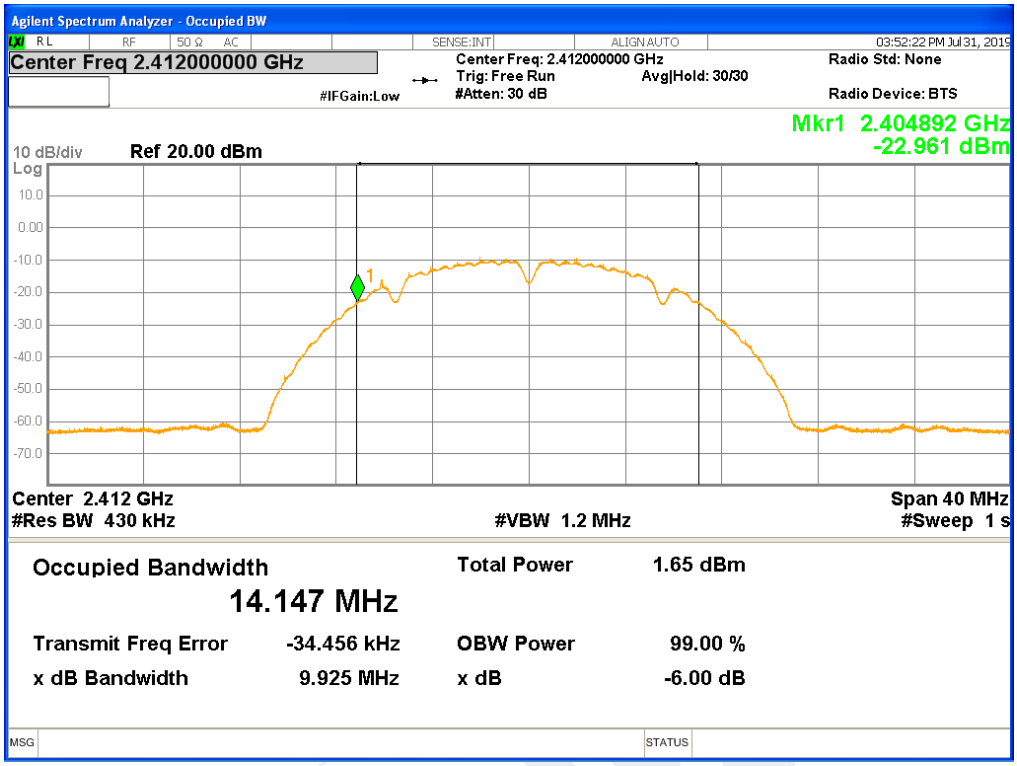
OBW NVNT 802.11n(HT40) 2462MHz



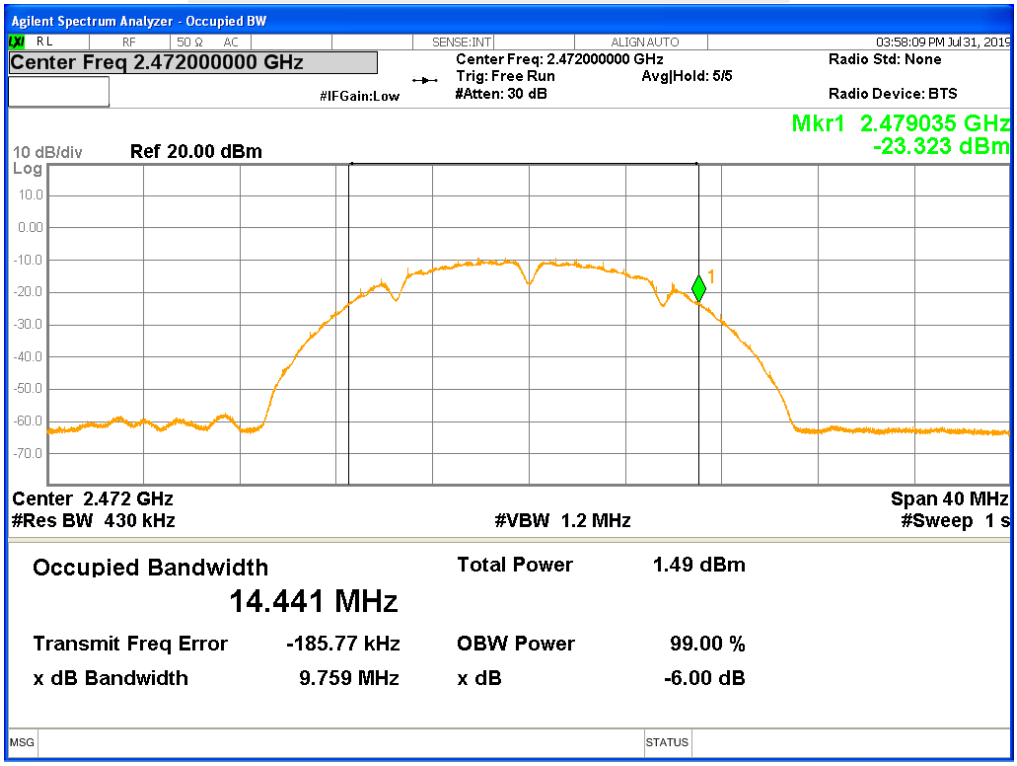
PCB Antenna

Condition	Mode	Frequency (MHz)	Center Frequency (MHz)	OBW (MHz)	Lower Edge (MHz)	Upper Edge (MHz)	Limit OBW (MHz)	Verdict
NVNT	802.11b	2412	2411.966	14.147	2404.892	2419.039	2400 - 2483.5MHz	Pass
NVNT	802.11b	2472	2471.814	14.441	2464.594	2479.035	2400 - 2483.5MHz	Pass
NVNT	802.11g	2412	2411.996	16.598	2403.697	2420.295	2400 - 2483.5MHz	Pass
NVNT	802.11g	2472	2471.942	16.675	2463.605	2480.28	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT20)	2412	2412.001	17.748	2403.127	2420.875	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT20)	2472	2471.945	17.829	2463.03	2480.859	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT40)	2422	2422.043	36.378	2403.854	2440.232	2400 - 2483.5MHz	Pass
NVNT	802.11n(HT40)	2462	2461.878	36.092	2443.832	2479.924	2400 - 2483.5MHz	Pass

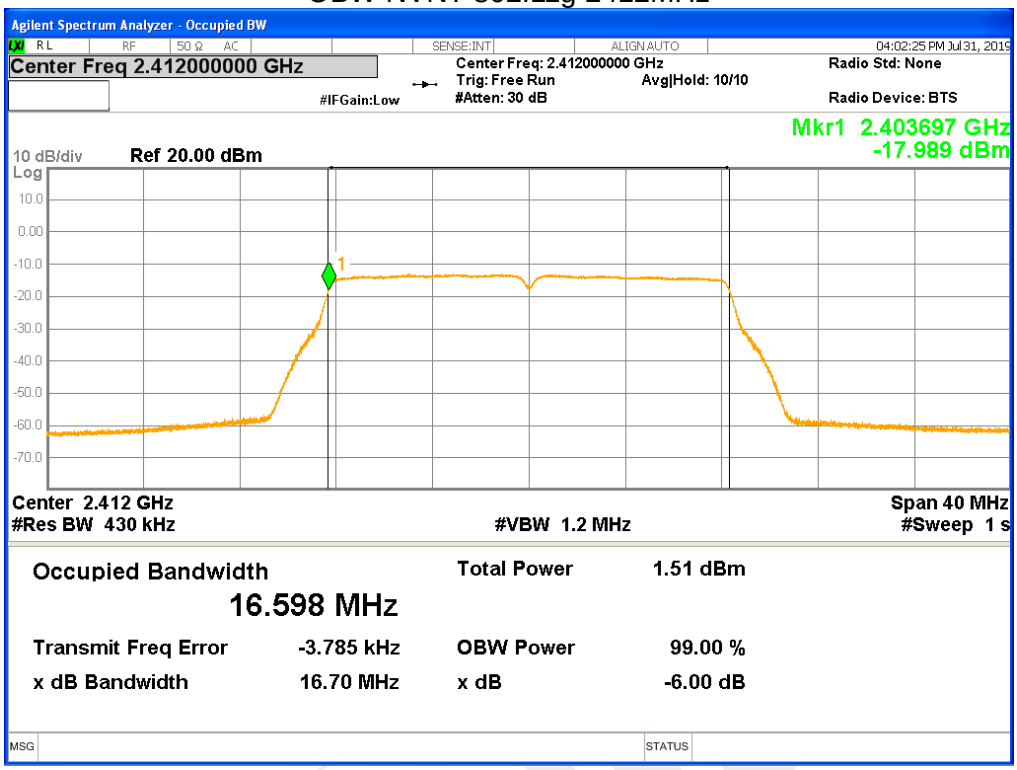
OBW NVNT 802.11b 2412MHz



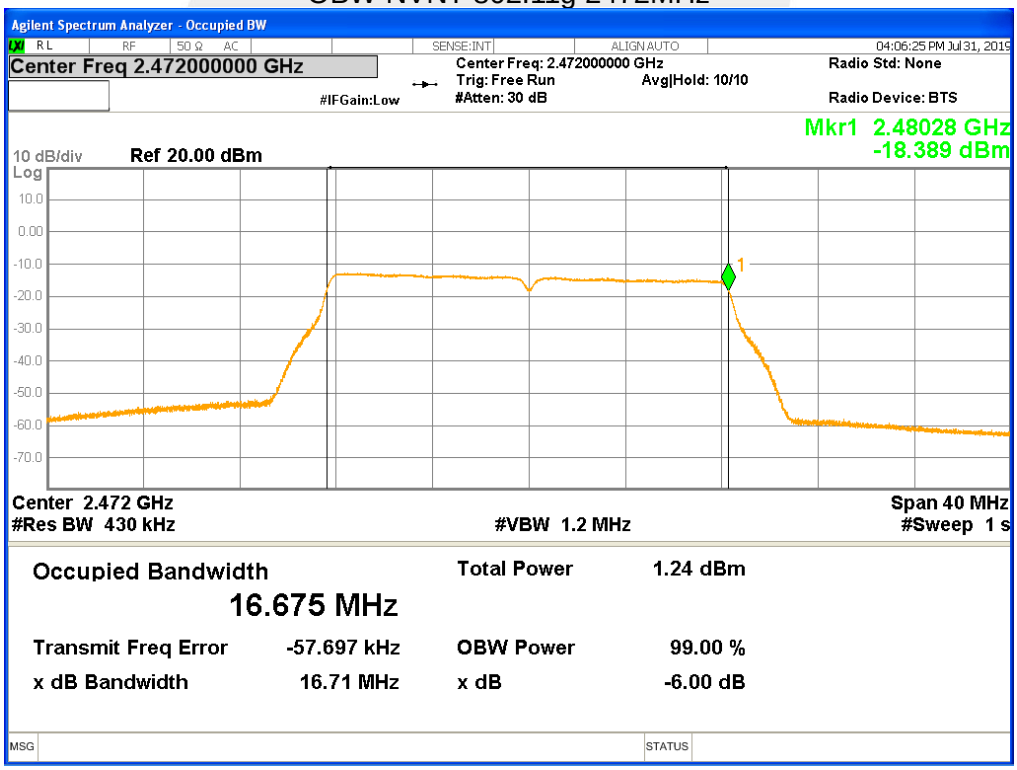
OBW NVNT 802.11b 2472MHz



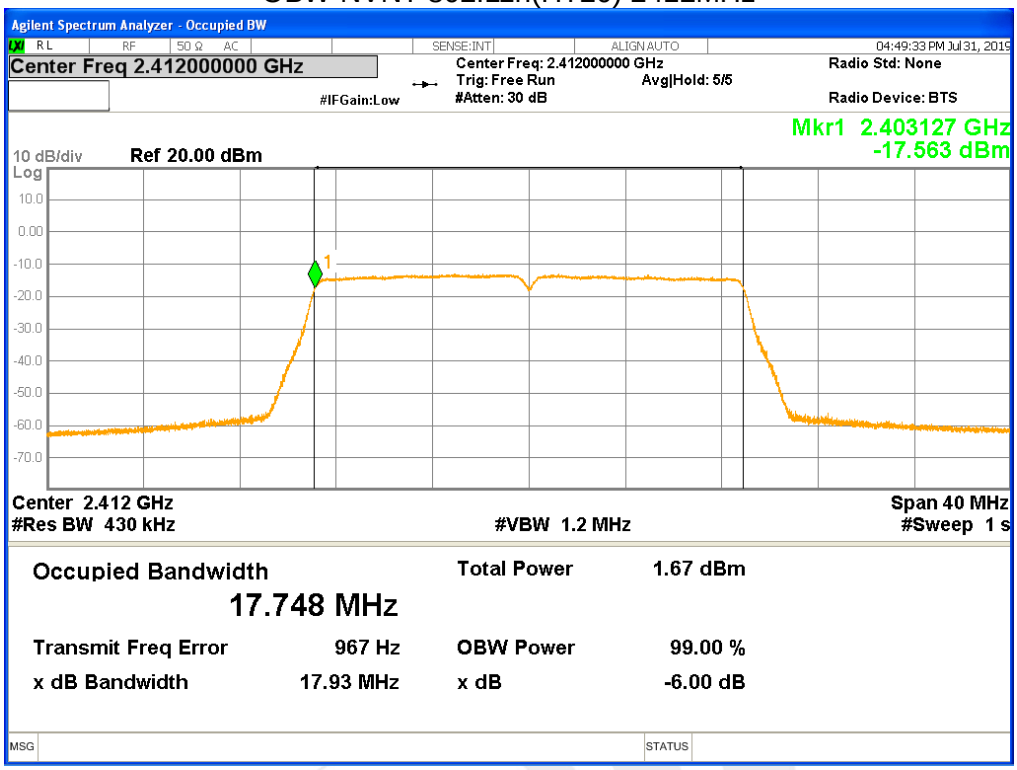
OBW NVNT 802.11g 2412MHz



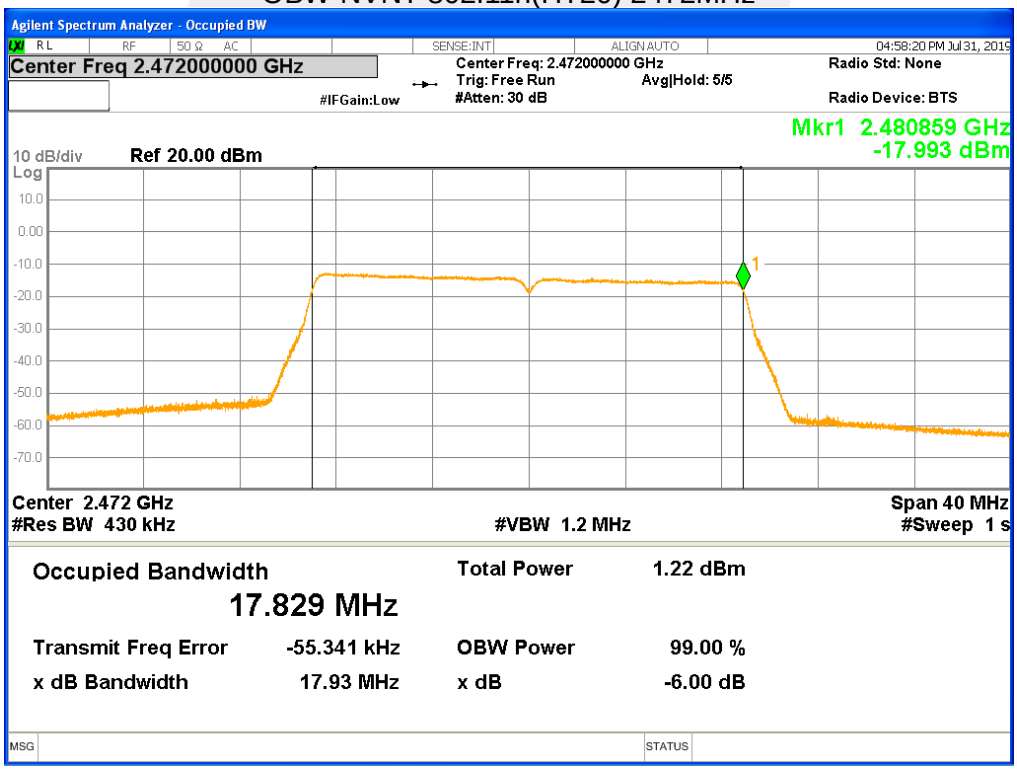
OBW NVNT 802.11g 2472MHz



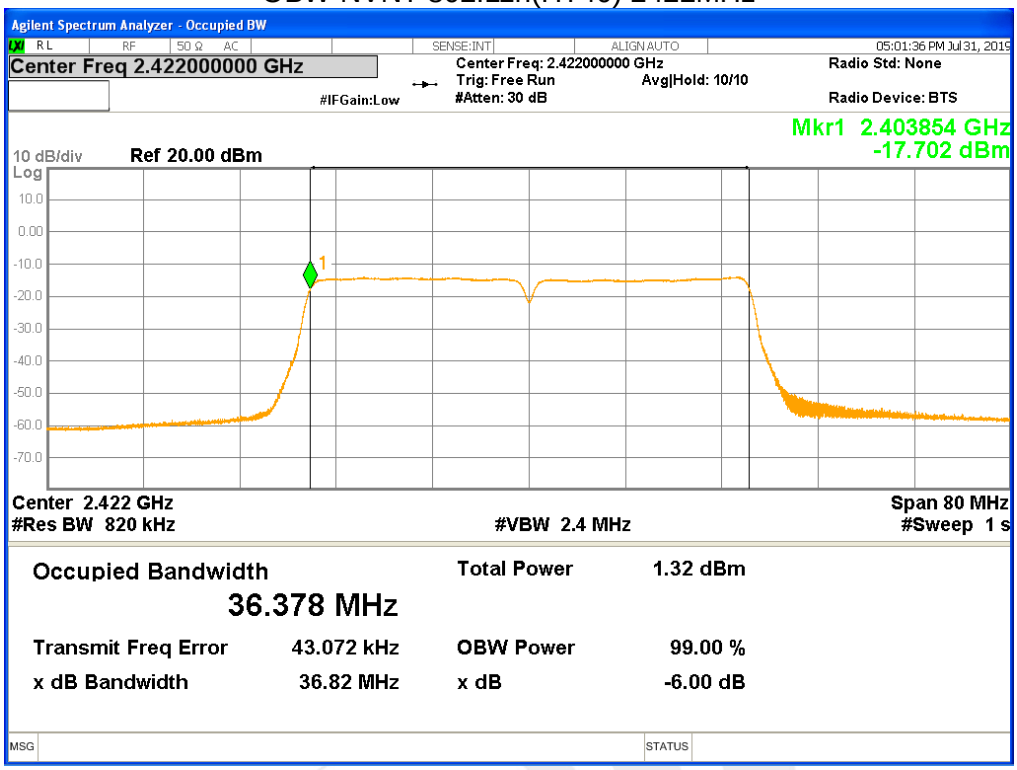
OBW NVNT 802.11n(HT20) 2412MHz



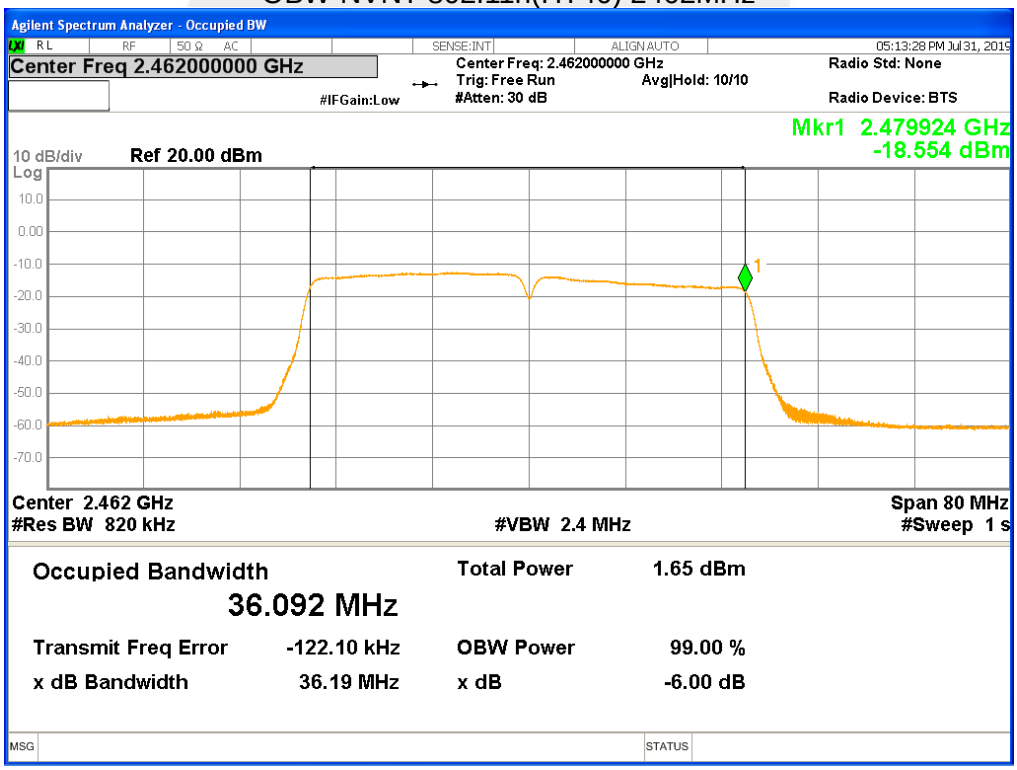
OBW NVNT 802.11n(HT20) 2472MHz



OBW NVNT 802.11n(HT40) 2422MHz



OBW NVNT 802.11n(HT40) 2462MHz



6. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

6.1 LIMIT

Clause	Frequency	Limit
4.3.2.8.3	2400-BW~2400 2483.5~2483.5+BW	-10dBm/MHz
	2400-2BW~2400-BW 2483.5+BW~2483.5+2BW	-20dBm/MHz
	<2400-2BW >2483.5+2BW	-30dBm/MHz

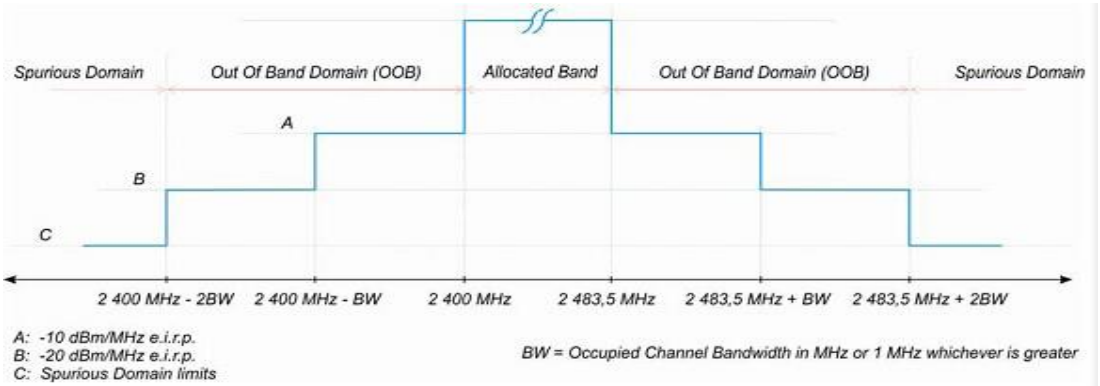


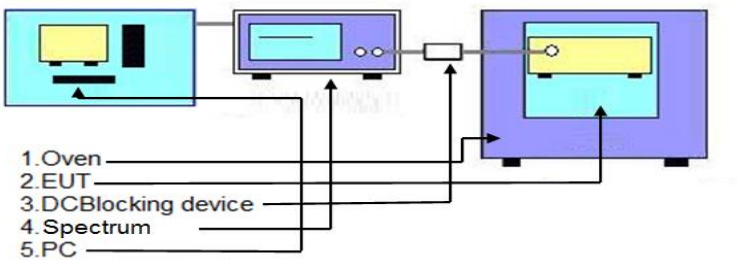
Figure 1: Transmit mask

6.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.8.2 for the measurement method.

• Connect the UUT to the spectrum analyser and use the following settings:
- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1 μ s) or 5 000 whichever is greater
- Trigger Mode: Video trigger; in case video triggering is not possible, an external trigger source may be used
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

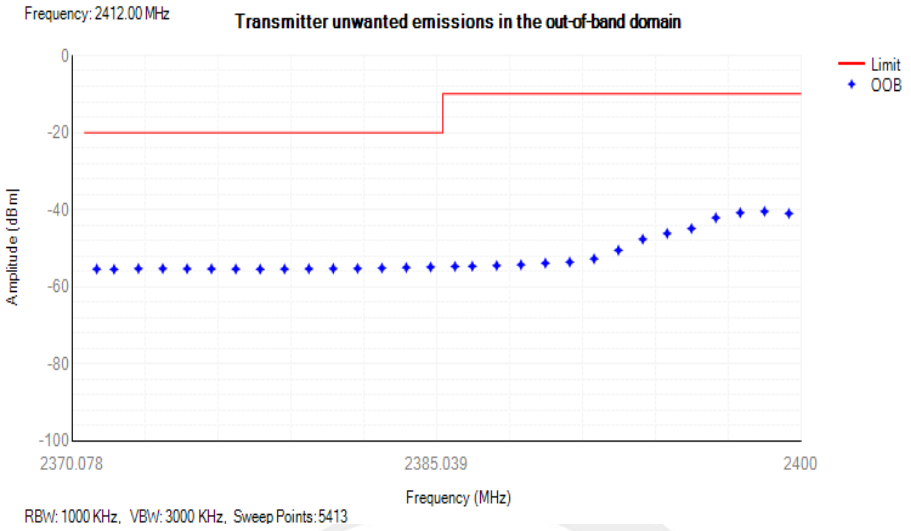
6.3 TEST SETUP



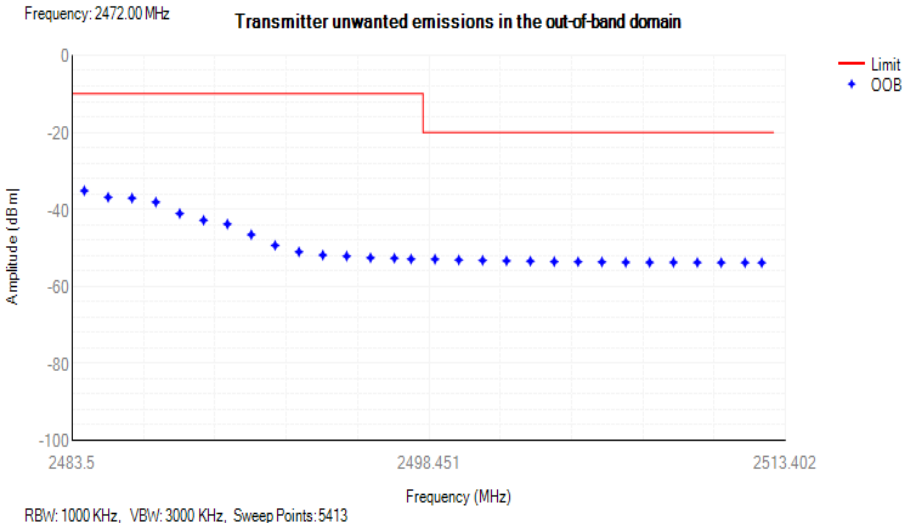
6.4 TEST RESULTS

External Antenna

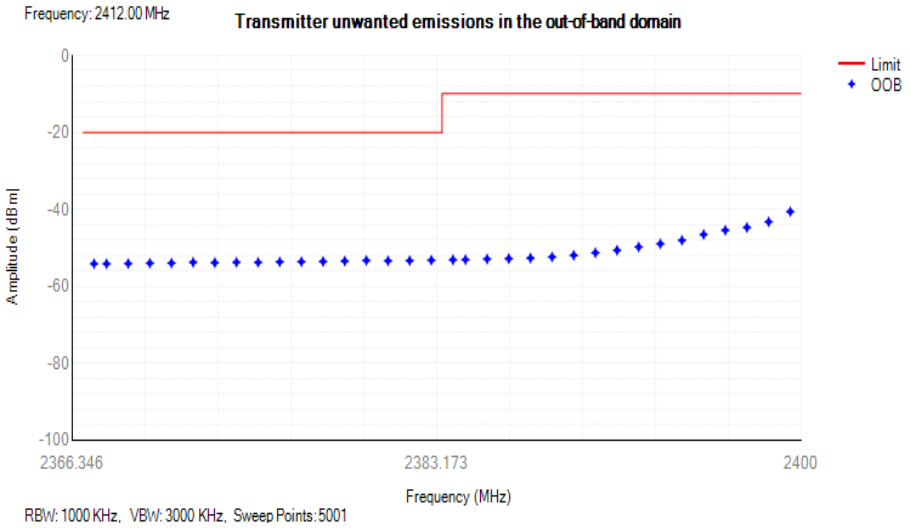
Tx. Emissions OOB NVNT 802.11b 2412MHz



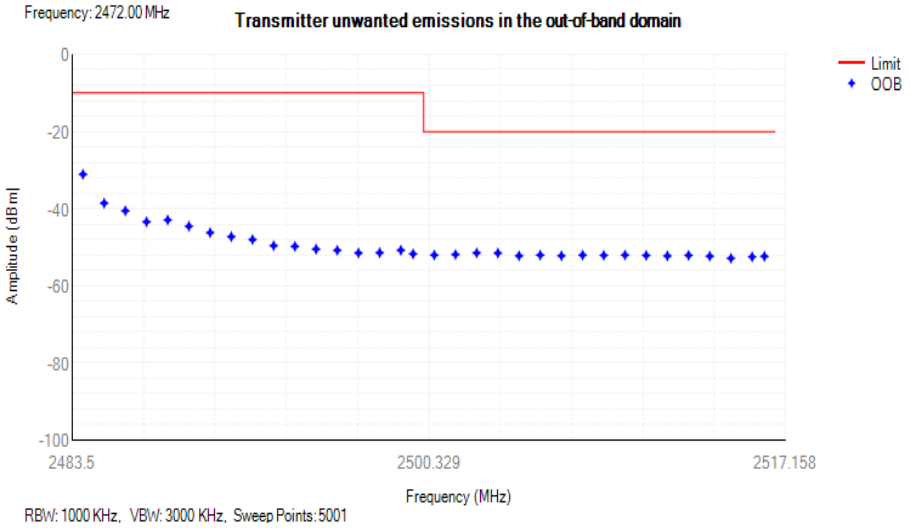
Tx. Emissions OOB NVNT 802.11b 2472MHz



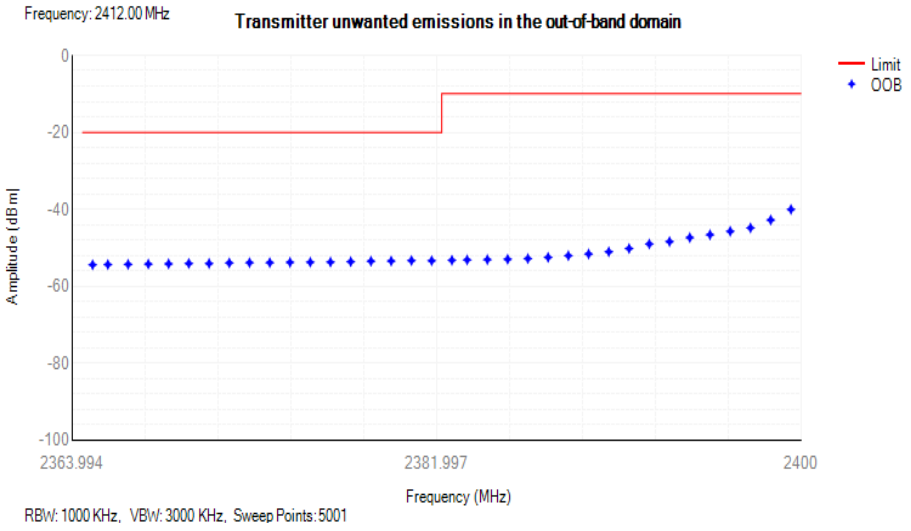
Tx. Emissions OOB NVNT 802.11g 2412MHz



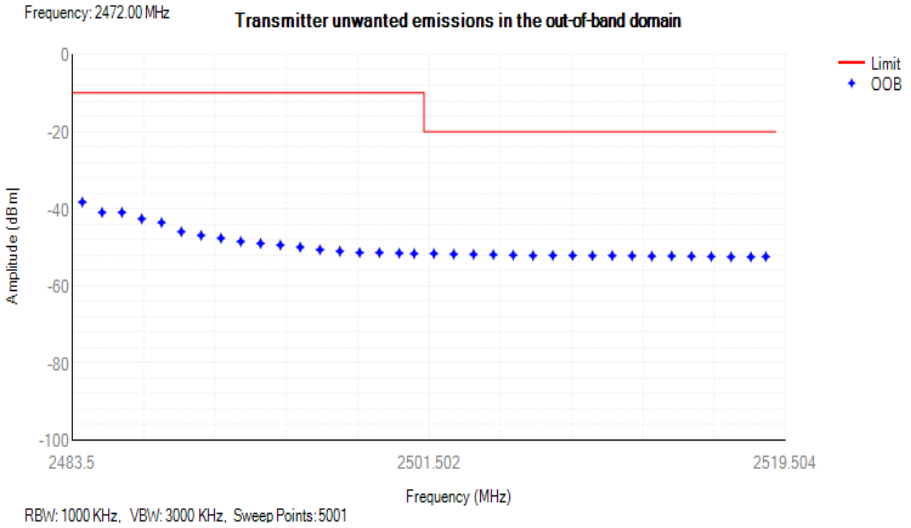
Tx. Emissions OOB NVNT 802.11g 2472MHz



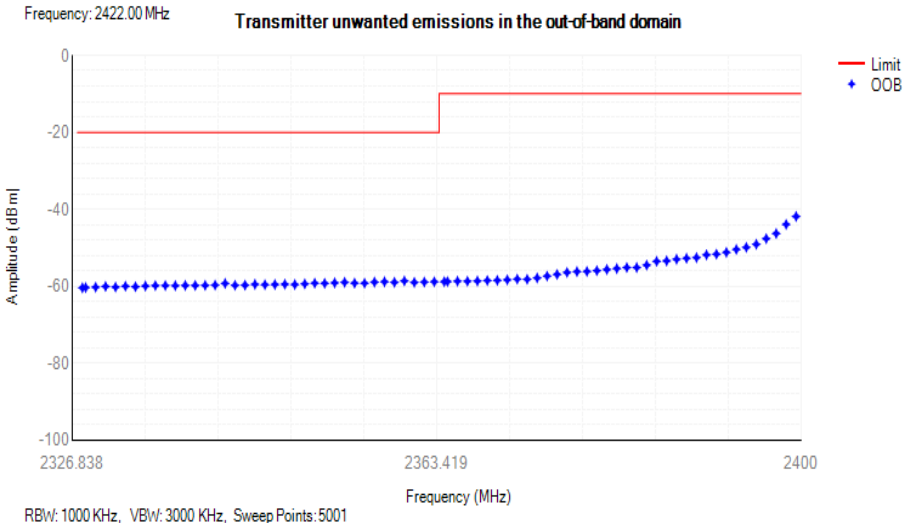
Tx. Emissions OOB NVNT 802.11n(HT20) 2412MHz



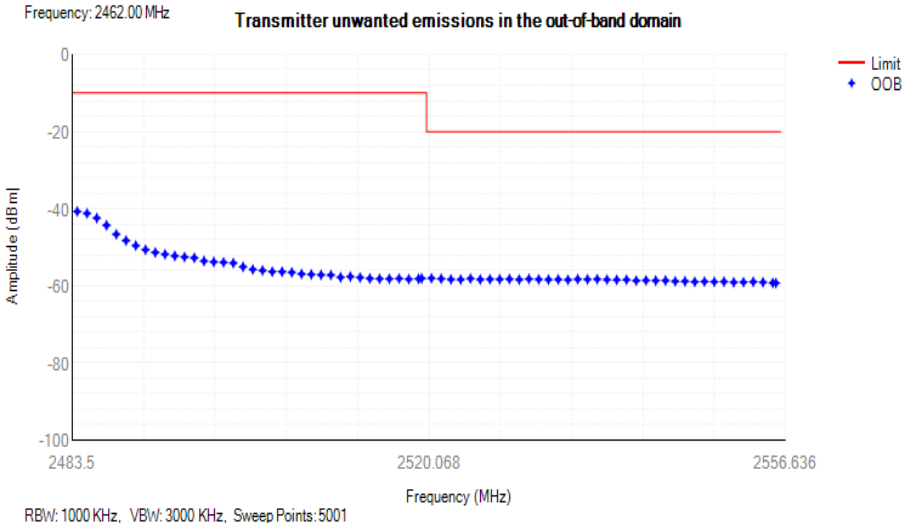
Tx. Emissions OOB NVNT 802.11n(HT20) 2472MHz



Tx. Emissions OOB NVNT 802.11n(HT40) 2422MHz

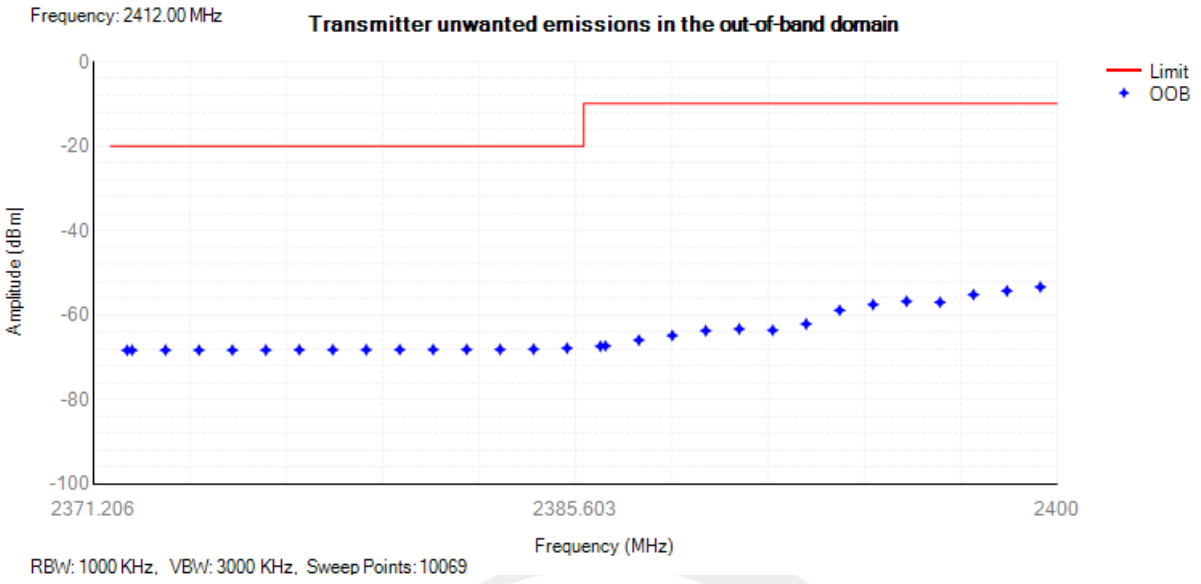


Tx. Emissions OOB NVNT 802.11n(HT40) 2462MHz

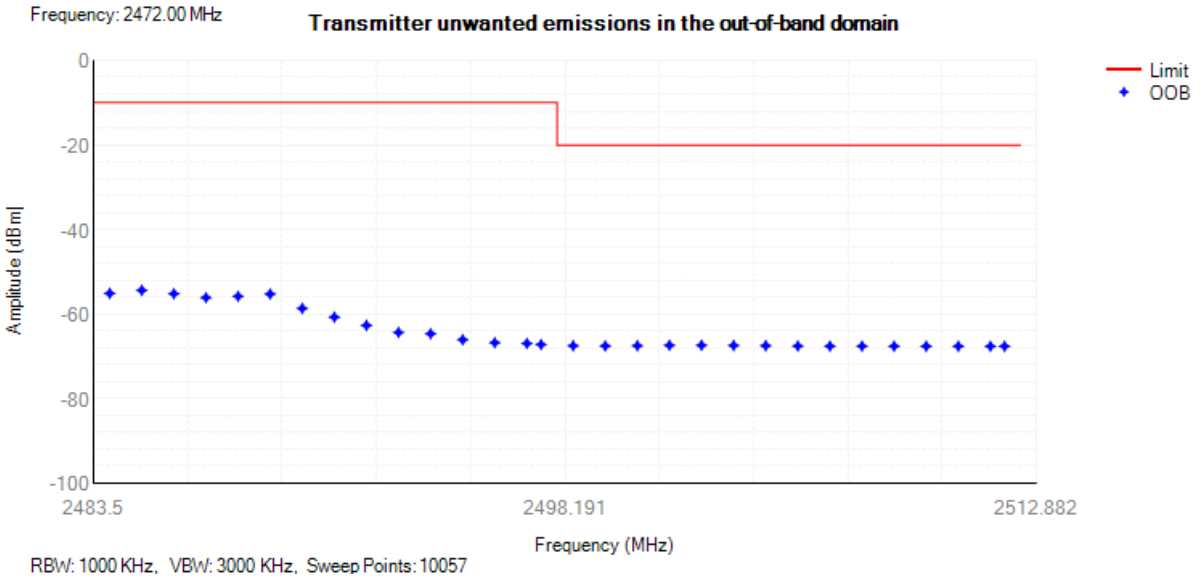


PCB Antenna

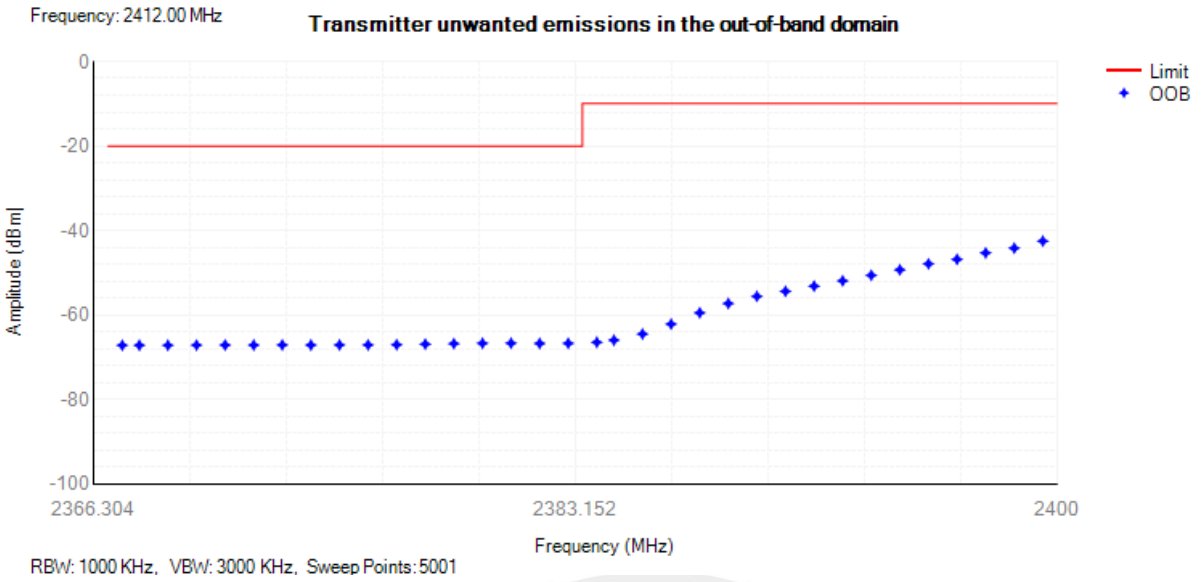
Tx. Emissions OOB NVNT 802.11b 2412MHz



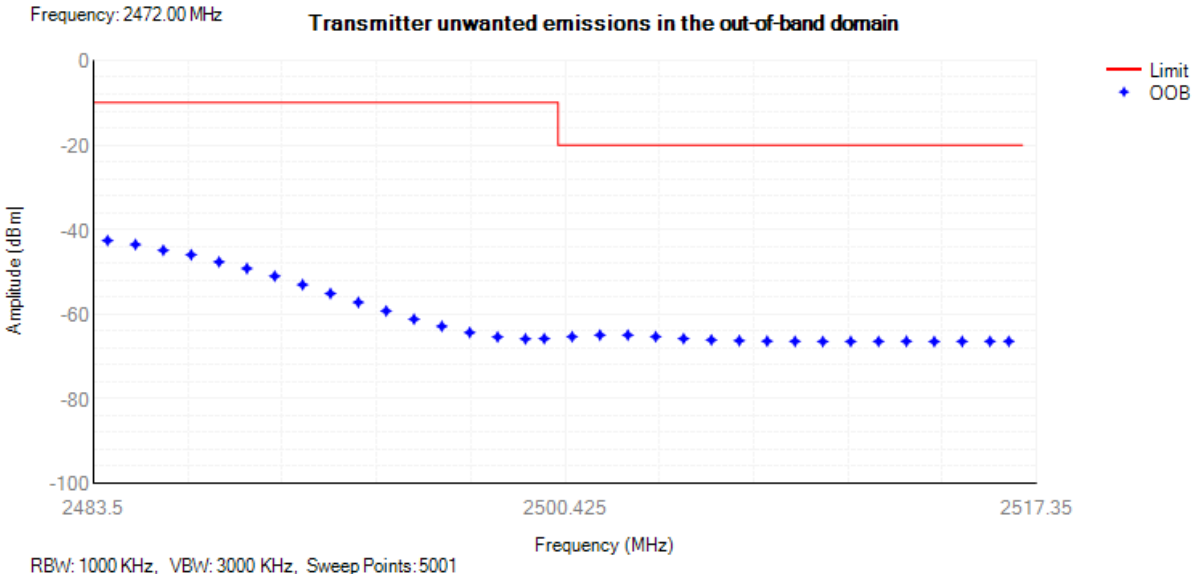
Tx. Emissions OOB NVNT 802.11b 2472MHz



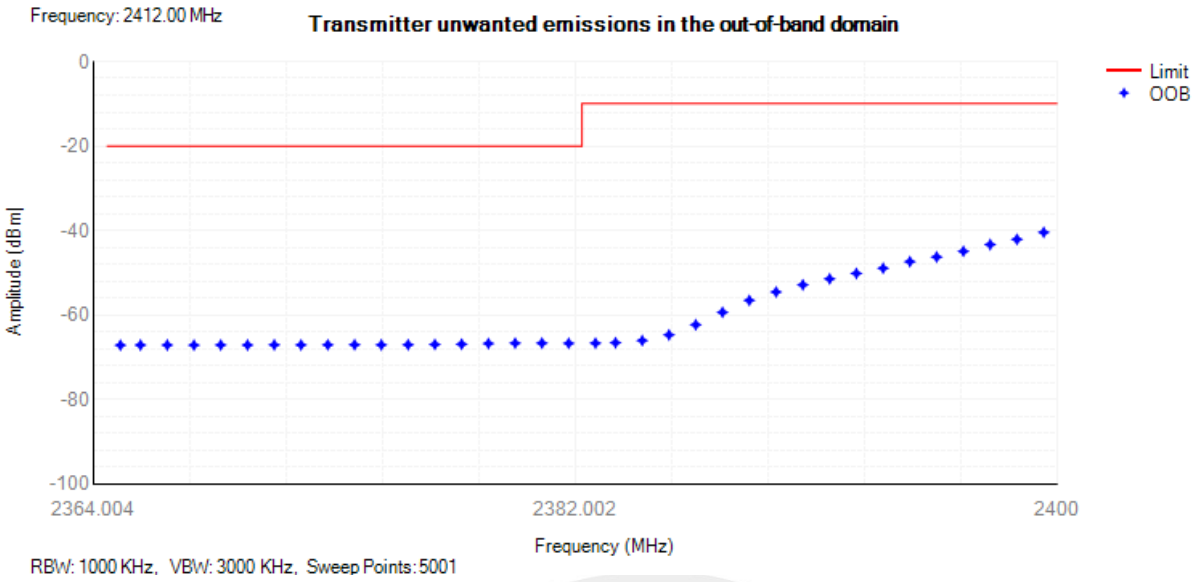
Tx. Emissions OOB NVNT 802.11g 2412MHz



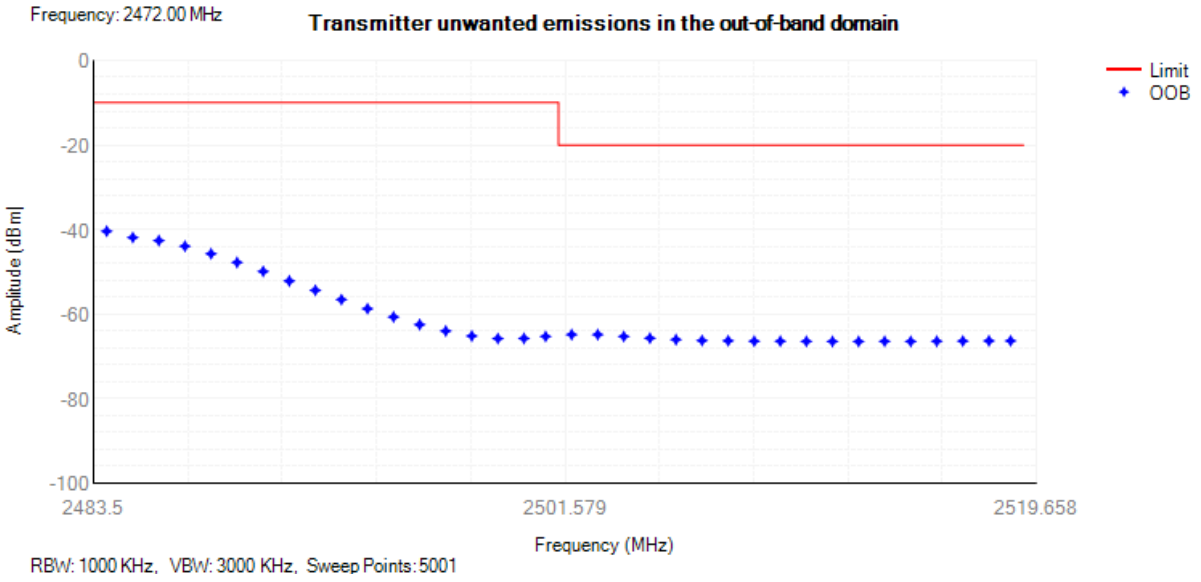
Tx. Emissions OOB NVNT 802.11g 2472MHz



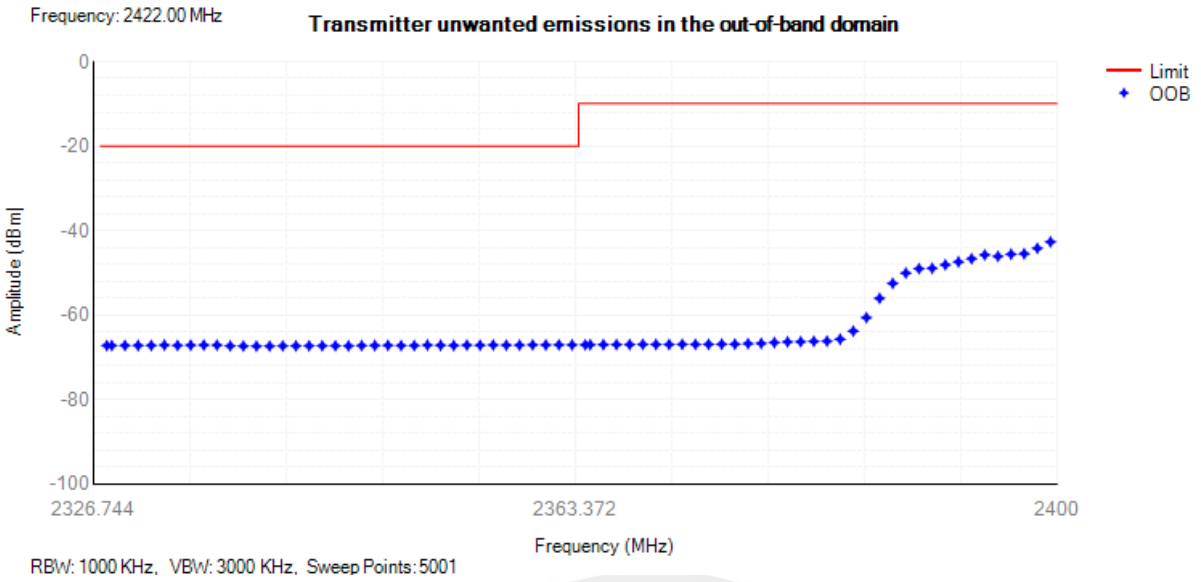
Tx. Emissions OOB NVNT 802.11n(HT20) 2412MHz



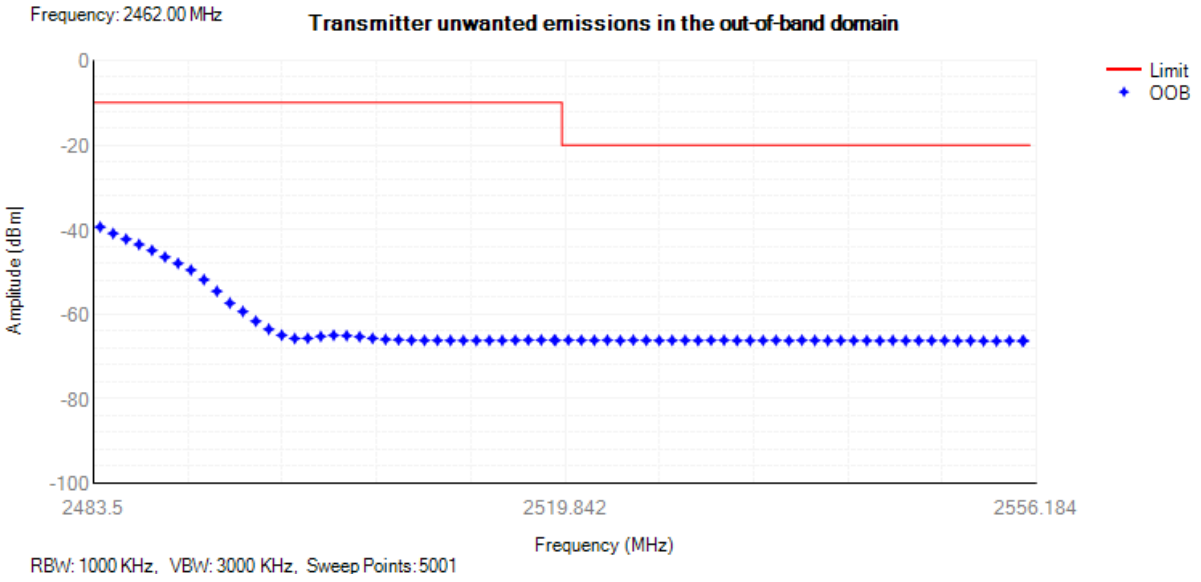
Tx. Emissions OOB NVNT 802.11n(HT20) 2472MHz



Tx. Emissions OOB NVNT 802.11n(HT40) 2422MHz



Tx. Emissions OOB NVNT 802.11n(HT40) 2462MHz



7. ADAPTIVE (CHANNEL ACCESS MECHANISM)

7.1 LIMIT

The frequency range of the equipment is determined by the lowest and highest

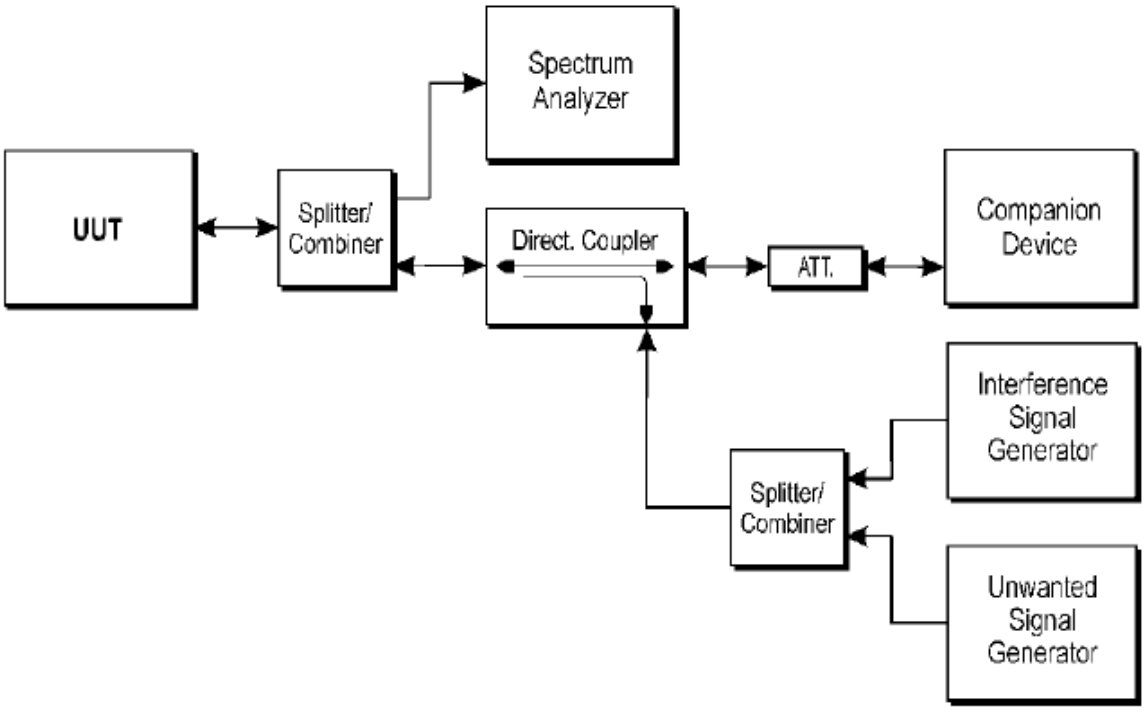
Non-LBT based Detect and Avoid: 1. The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel. 2. COT ≤ 40ms; 3. Idle Period = 5% of COT; 4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).
LBT based Detect and Avoid: 1. CCA observation time declared by the supplier: a. If 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. 2. COT = 1~10 ms; 3. Idle Period = 5% of COT; 4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).
LBT based Detect and Avoid (Load Based Equipment): 1. CCA declared by the manufacturer: a. If 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. b. If the equipment finds the channel occupied, it shall not transmit on this channel, 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. 2. COT ≤ 13 ms; 3. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).
Short Control Signalling Transmissions: Short Control Signalling Transmissions shall have a maximum duty cycle TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

7.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.6.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.6.2 for the measurement method.

3. The spectrum analyzer 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.
- RBW: ≥ Occupied Channel Bandwidth (if the analyzer does not support this setting, the highest available setting shall be used)
- RBW: use next available RBW setting below the measured Occupied Channel Bandwidth
- Filter type: Channel Filter
--- VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)
- RBW:8M/ - VBW:40M (50MHz is the MAX)
- Detector Mode: RMS
- Centre Frequency: Equal to the hopping frequency to be tested.
- Span: 0 Hz
- Sweep time: > Channel Occupancy Time of the UUT. If the Channel Occupancy Time is non-contiguous (non-LBT based equipment), the sweep time shall be sufficient to cover the period over which the Channel Occupancy Time is spread out
- Trace Mode: Clear/Write
- Trigger Mode: Video

7.3 TEST SETUP



a. WLAN is normal transmission
b. interference shall be injected -> WLAN shall stop transmission.
c. blocking shall be injected -> WLAN does not resume any normal transmission
d. Removing the interference signal

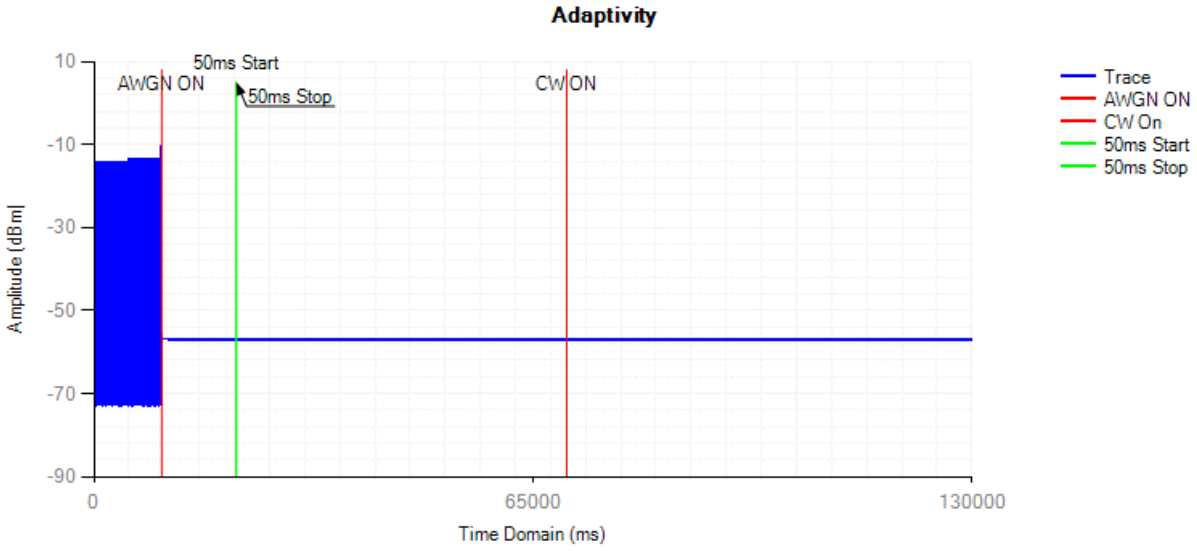
7.4 TEST RESULT

External Antenna

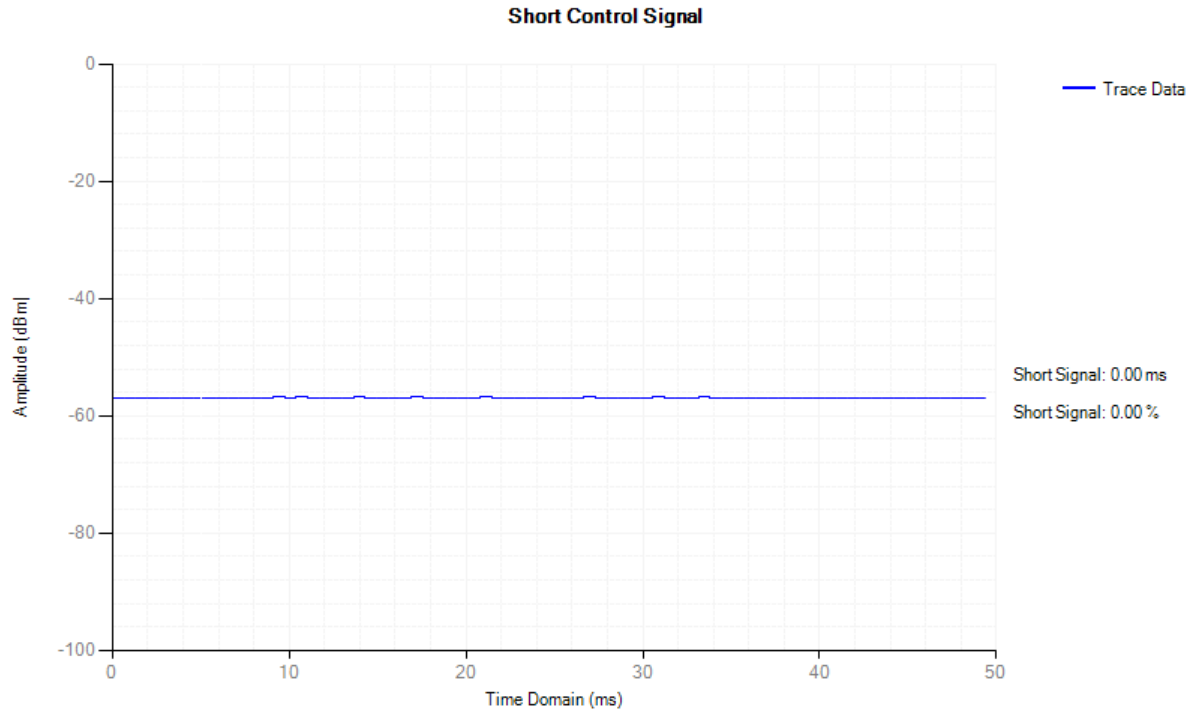
Adaptivity

Condition	Mode	Frequency (MHz)	AWGN Level (dBm)	CW Level (dBm)	Short Control Width (ms)	Short Control Ratio(%)	Limit (%)	Verdict
NVNT	802.11b	2412	-64.4	-35	0	0	<=10	Pass
NVNT	802.11b	2472	-65.81	-35	0	0	<=10	Pass
NVNT	802.11g	2412	-63.84	-35	0	0	<=10	Pass
NVNT	802.11g	2472	-65.3	-35	0	0	<=10	Pass
NVNT	802.11n(HT20)	2412	-62.81	-35	0	0	<=10	Pass
NVNT	802.11n(HT20)	2472	-63.8	-35	0	0	<=10	Pass
NVNT	802.11n(HT40)	2422	-62.63	-35	0	0	<=10	Pass
NVNT	802.11n(HT40)	2462	-63.36	-35	0	0	<=10	Pass

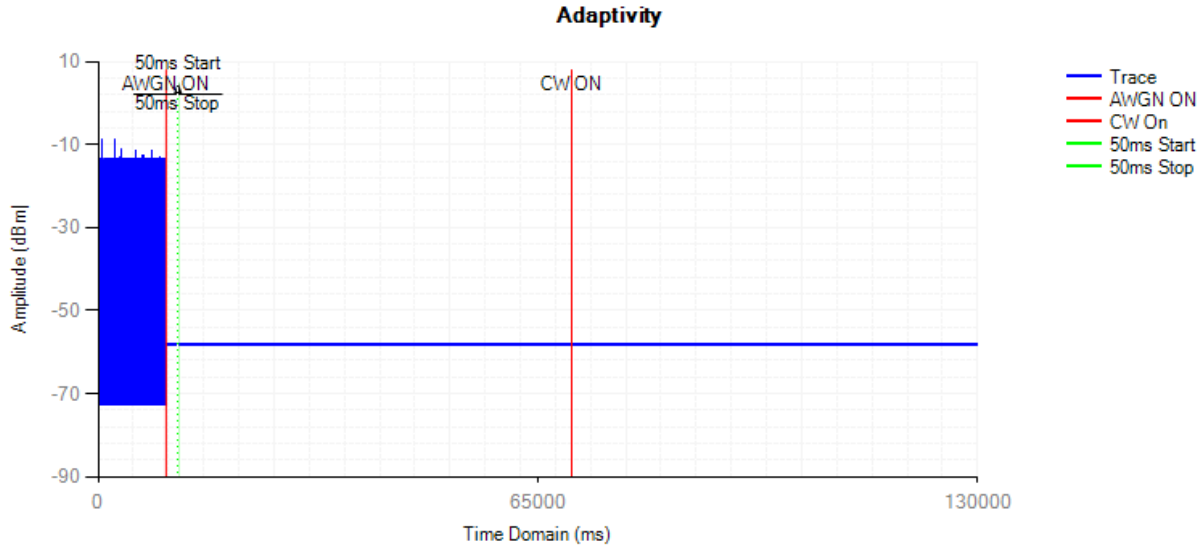
Adaptivity NVNT 802.11b 2412MHz



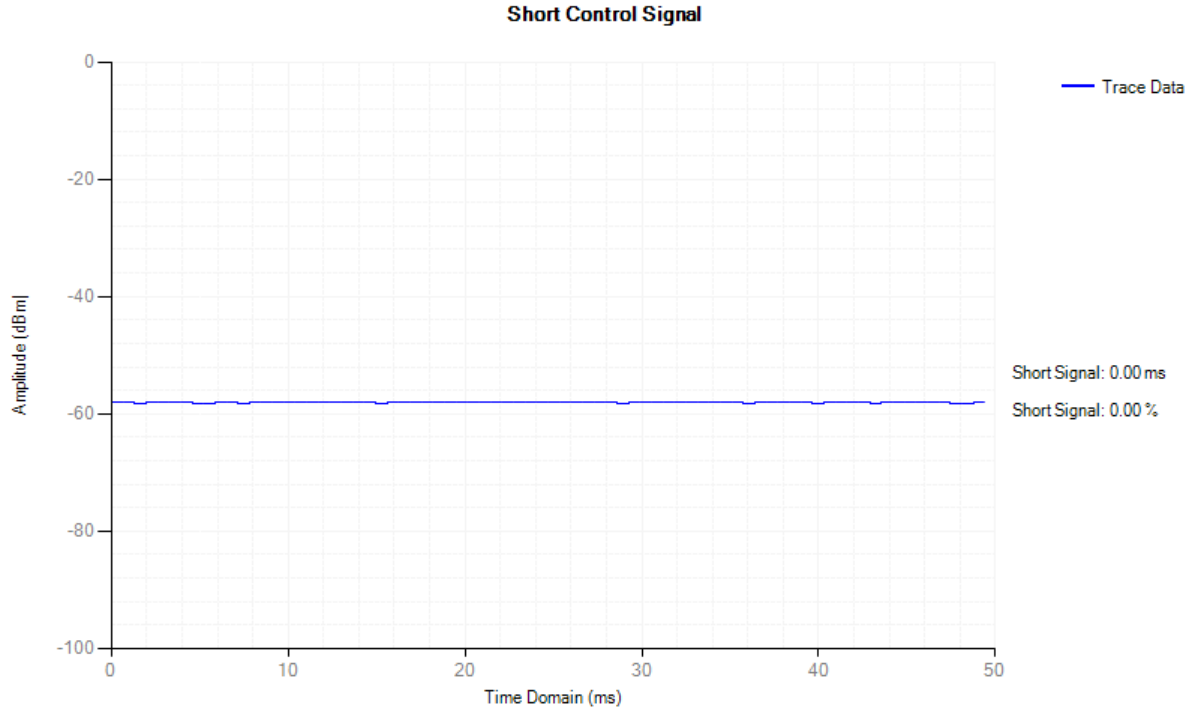
Control Signal NVNT 802.11b 2412MHz



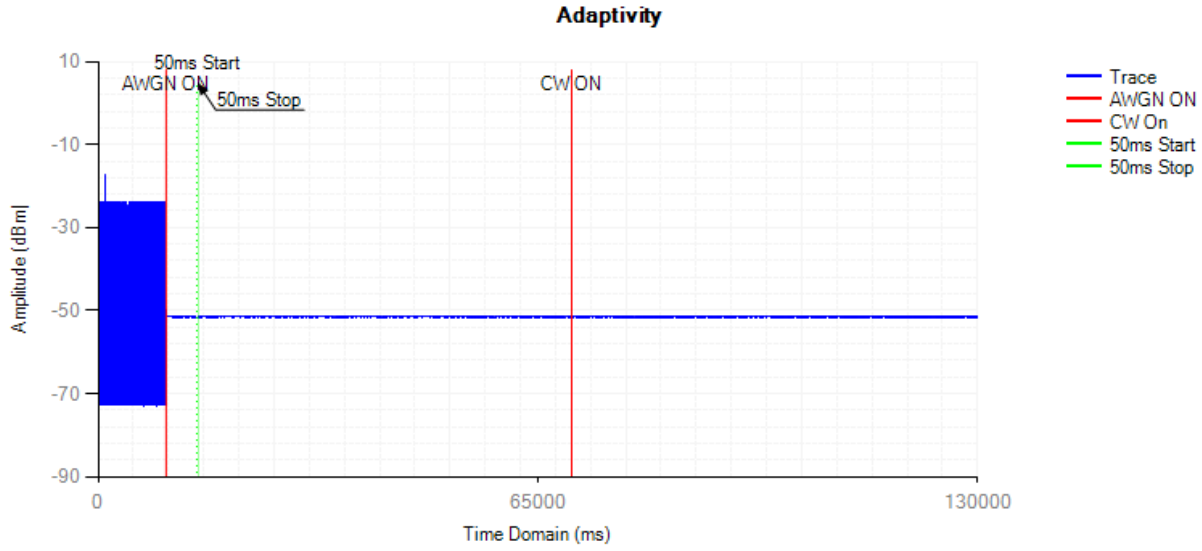
Adaptivity NVNT 802.11b 2472MHz



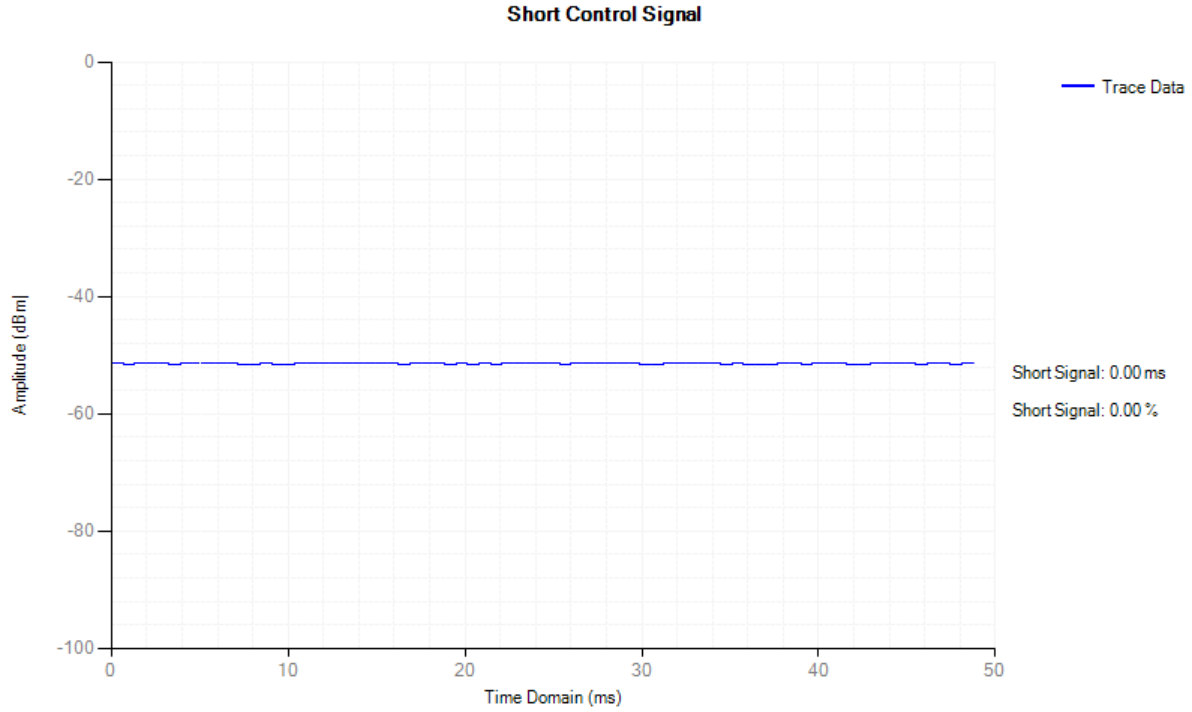
Control Signal NVNT 802.11b 2472MHz



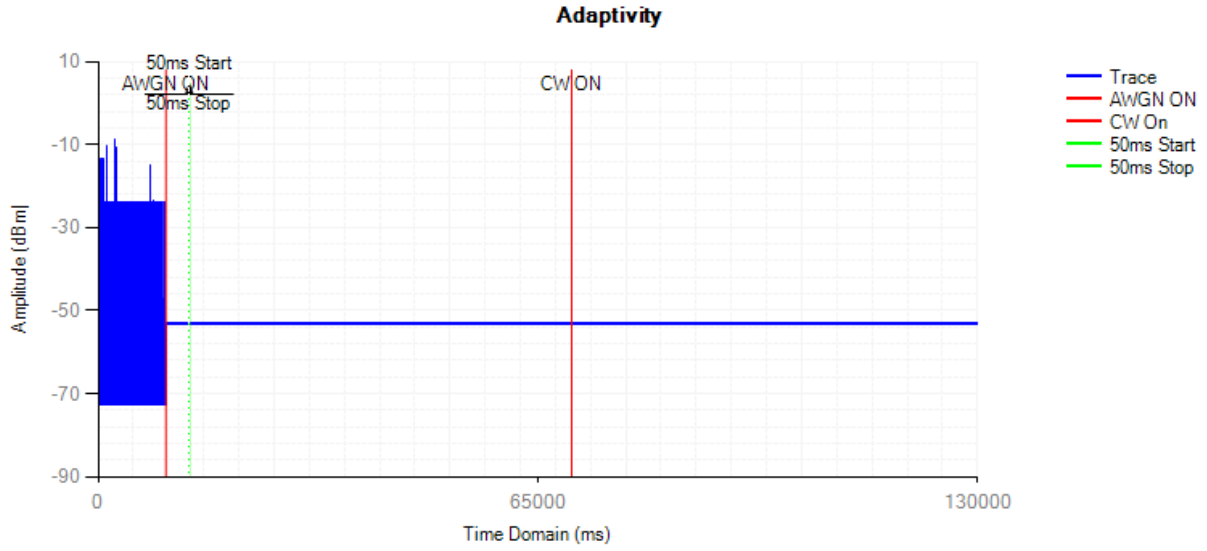
Adaptivity NVNT 802.11g 2412MHz



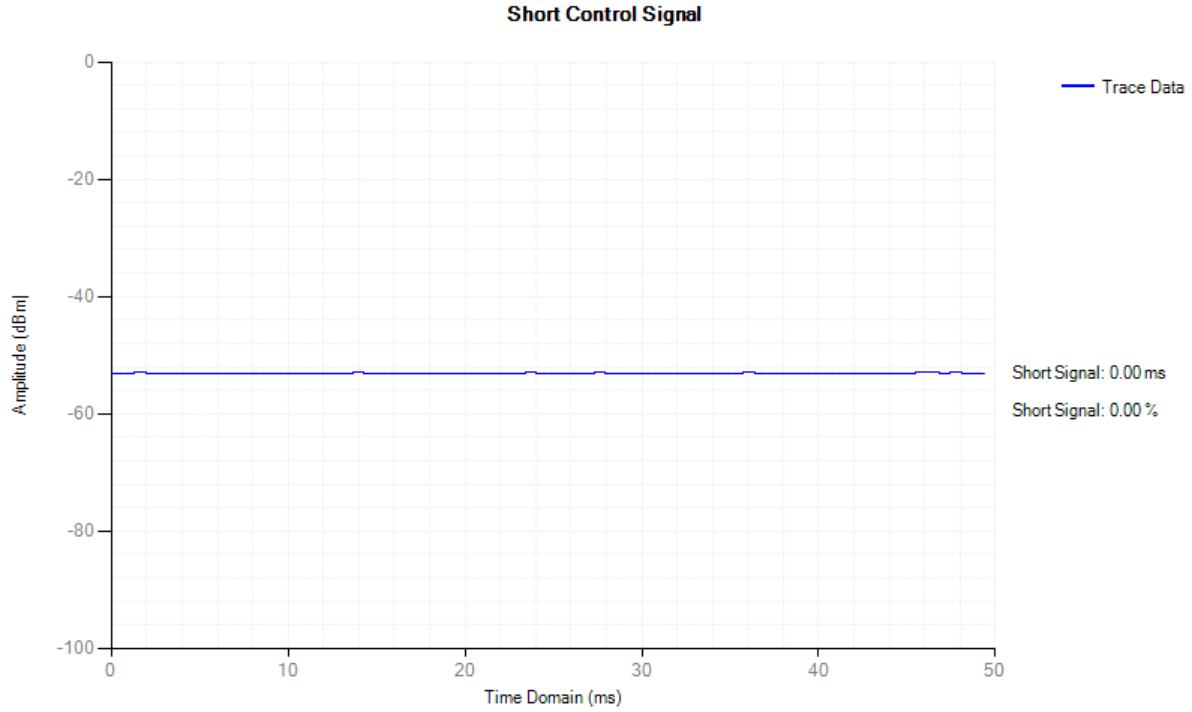
Control Signal NVNT 802.11g 2412MHz



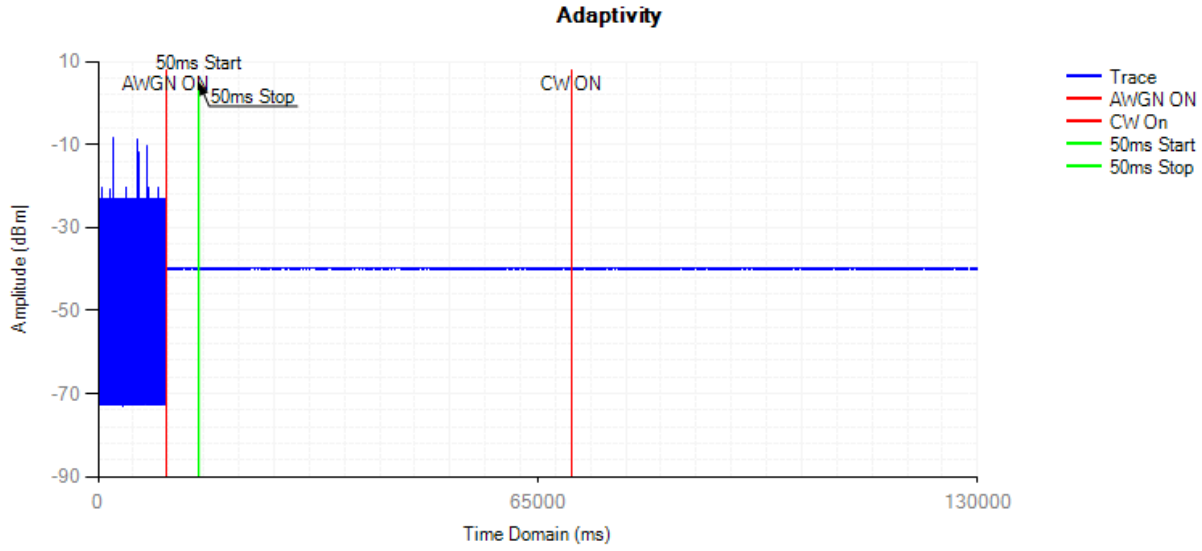
Adaptivity NVNT 802.11g 2472MHz



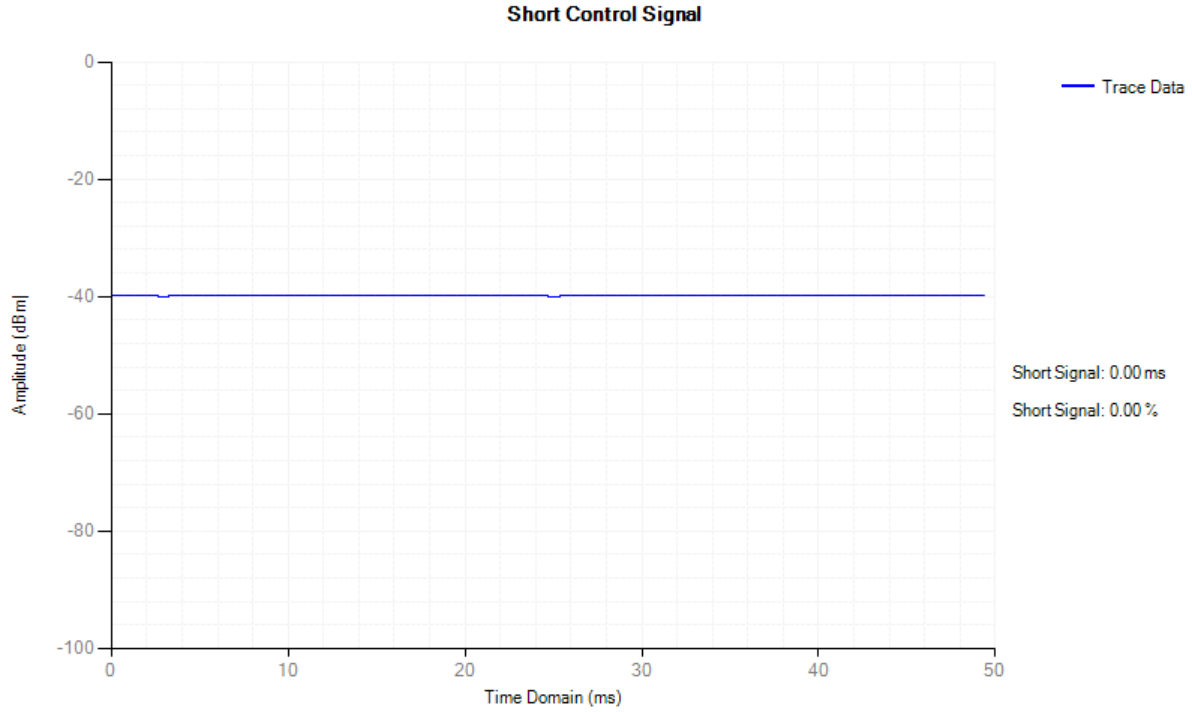
Control Signal NVNT 802.11g 2472MHz



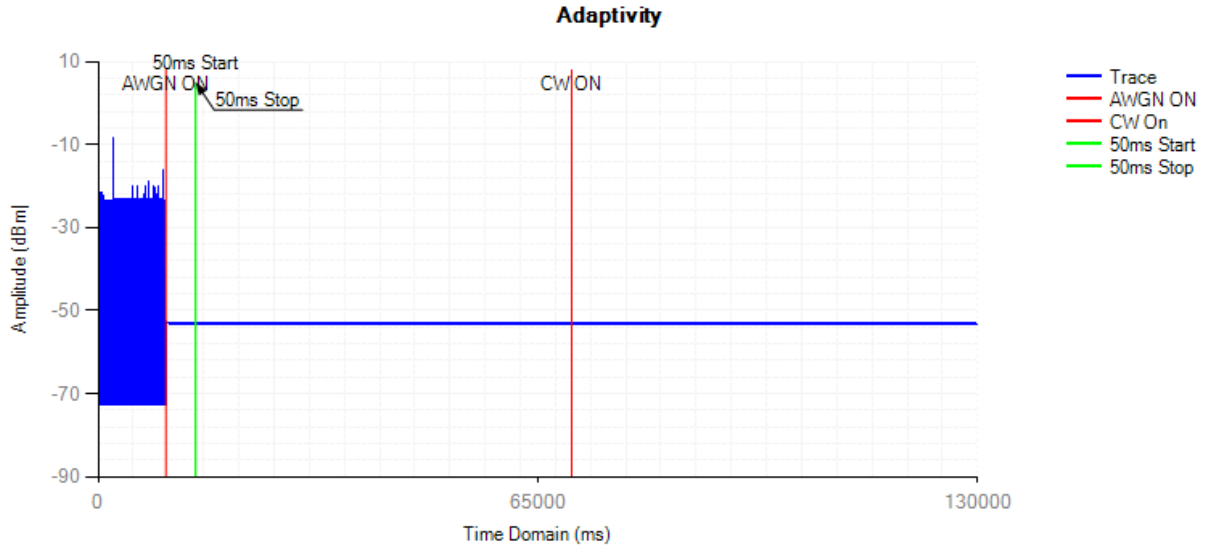
Adaptivity NVNT 802.11n(HT20) 2412MHz



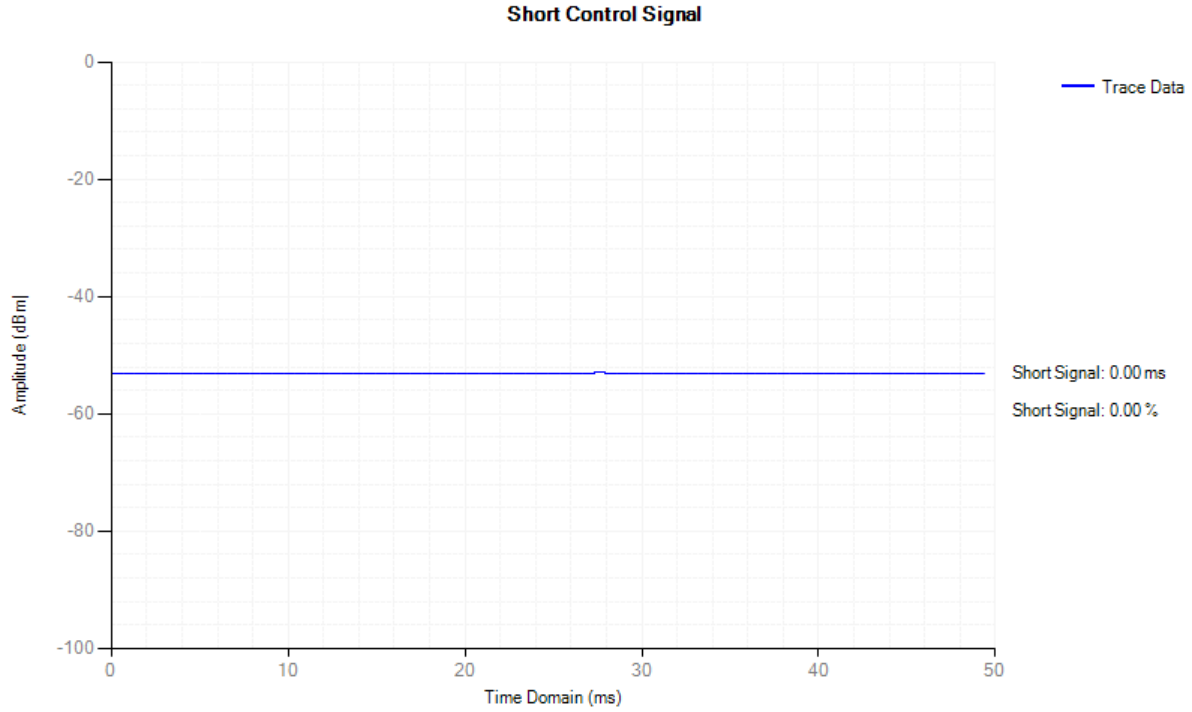
Control Signal NVNT 802.11n(HT20) 2412MHz



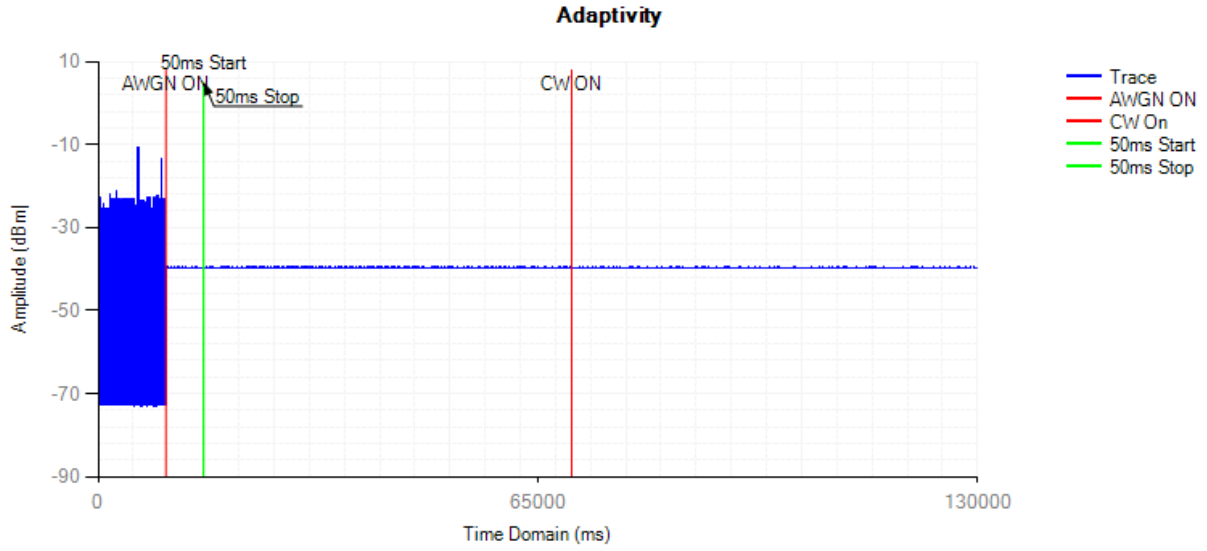
Adaptivity NVNT 802.11n(HT20) 2472MHz



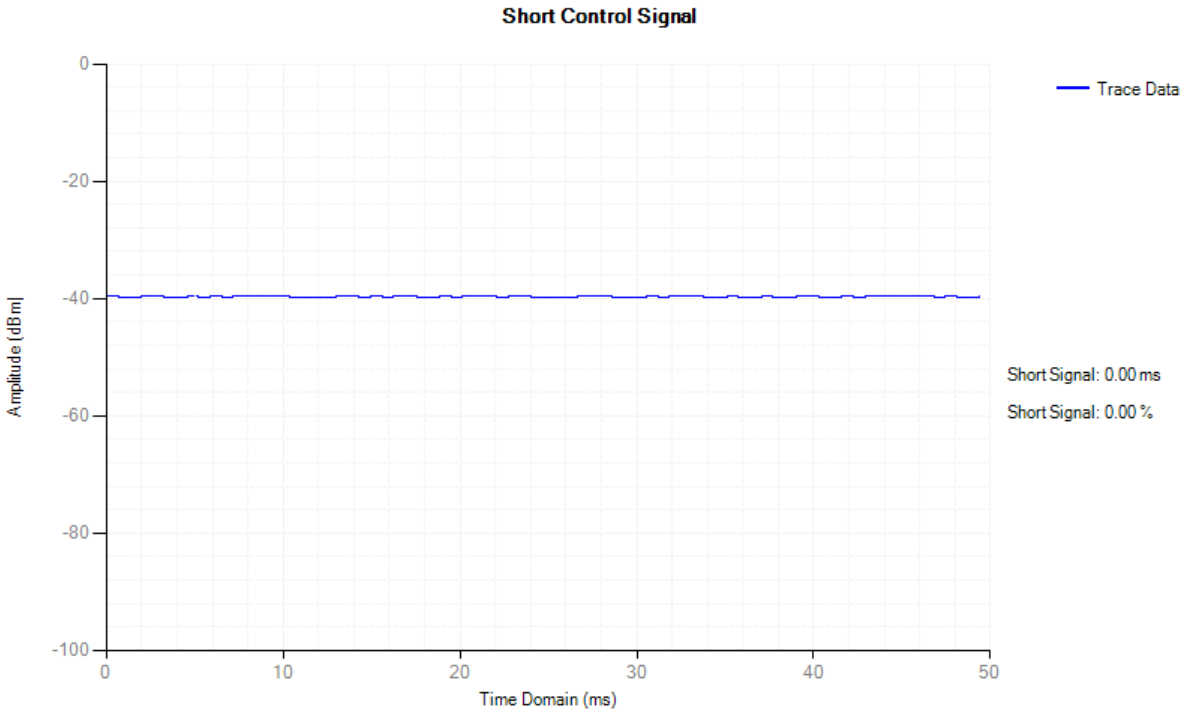
Control Signal NVNT 802.11n(HT20) 2472MHz



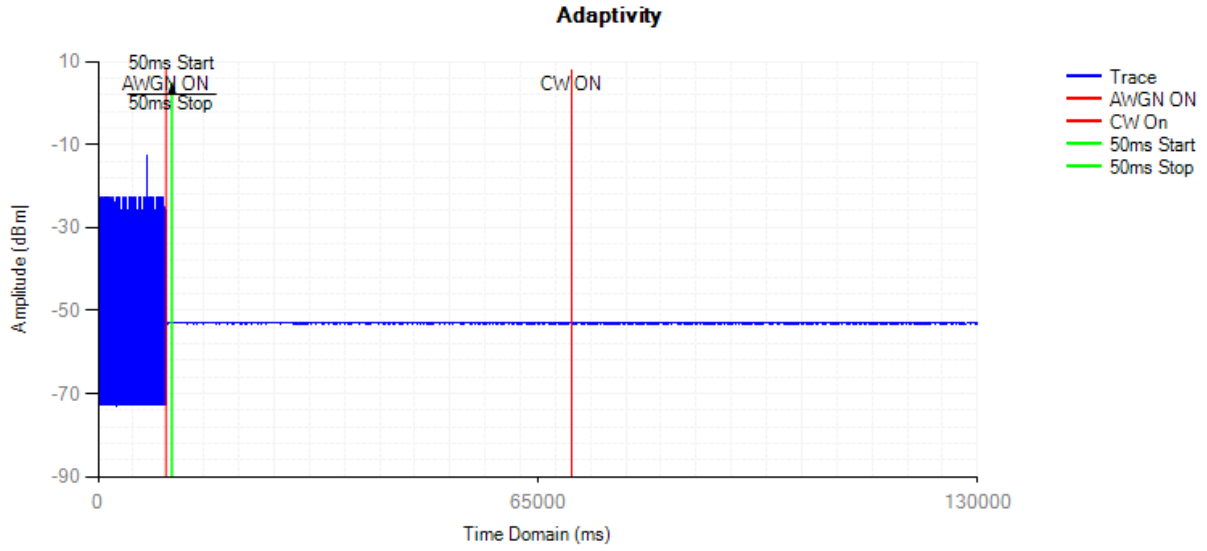
Adaptivity NVNT 802.11n(HT40) 2422MHz



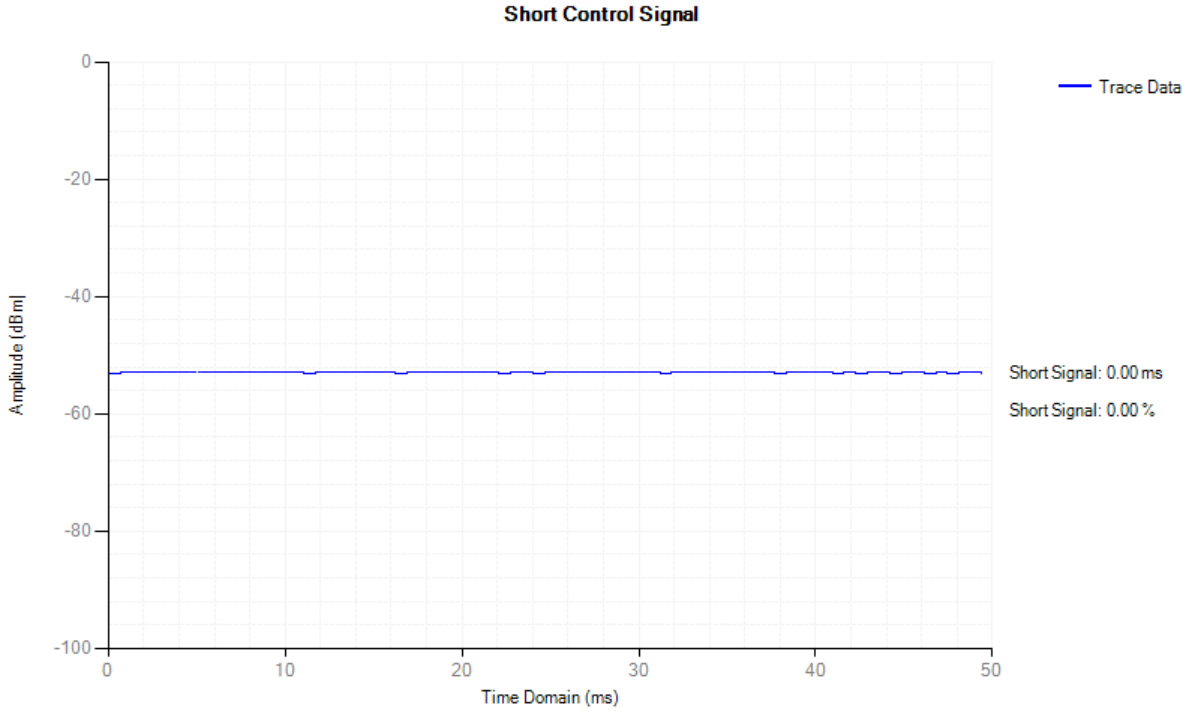
Control Signal NVNT 802.11n(HT40) 2422MHz



Adaptivity NVNT 802.11n(HT40) 2462MHz



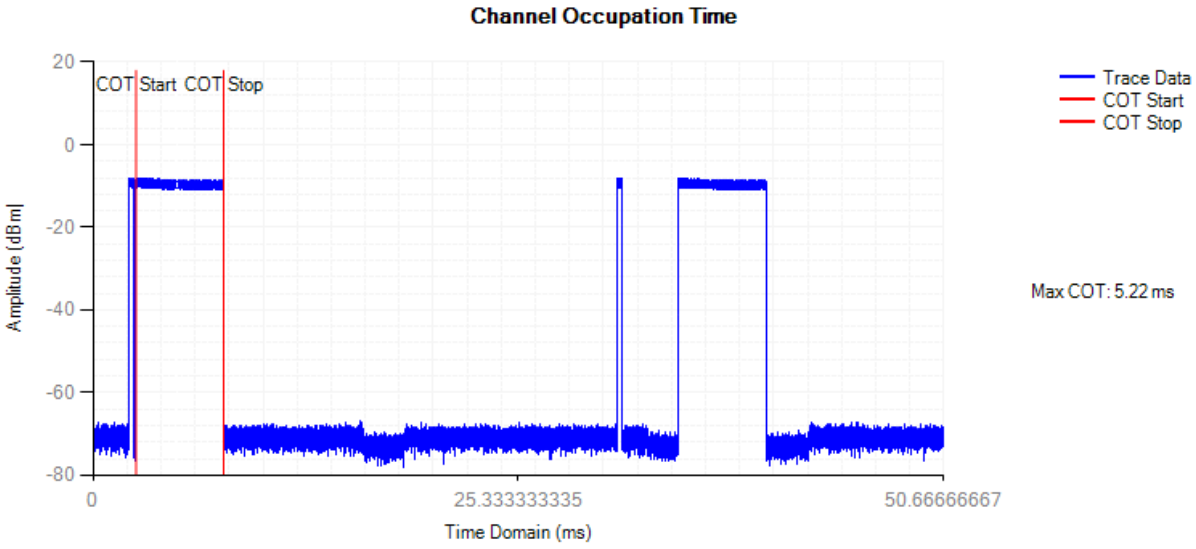
Control Signal NVNT 802.11n(HT40) 2462MHz



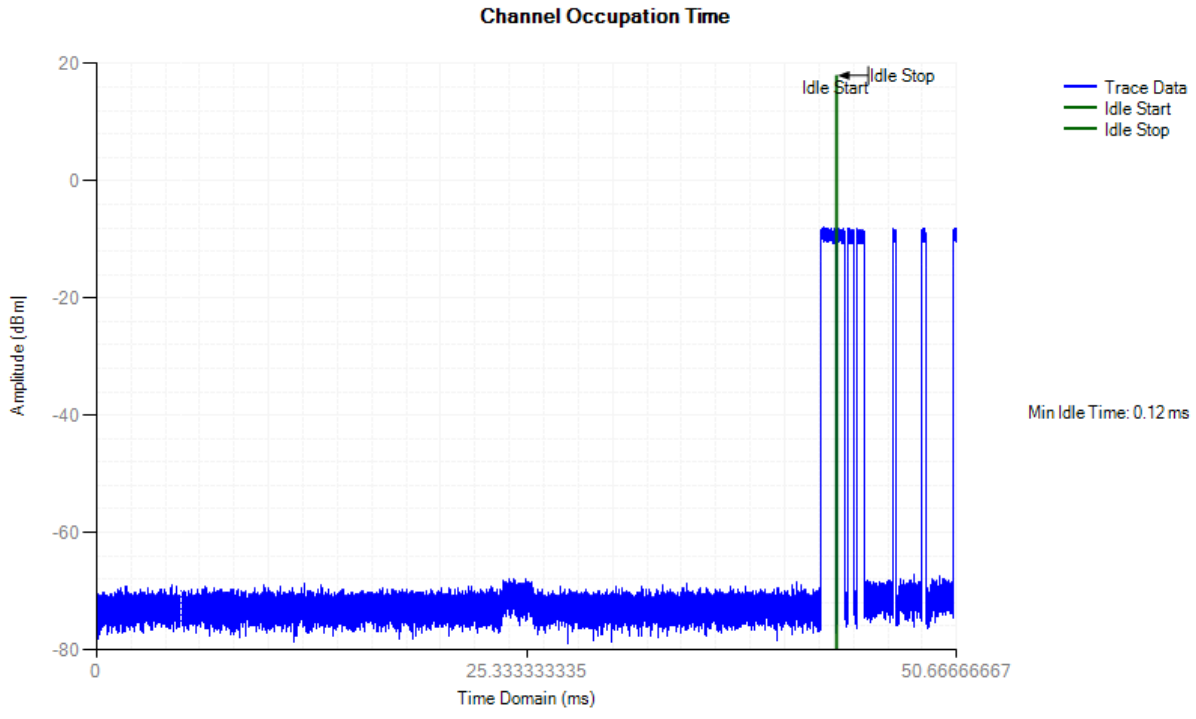
Adaptivity COT Channel Occupancy Time

Condition	Mode	Frequency (MHz)	Max COT (ms)	Limit COT (ms)	Min Idle Time (ms)	Limit Idle Time (ms)	Verdict
NVNT	802.11b	2412	5.219	<=13	0.115	>0.018	Pass
NVNT	802.11b	2472	0.833	<=13	0.081	>0.018	Pass
NVNT	802.11g	2412	0.029	<=13	0.27	>0.018	Pass
NVNT	802.11g	2472	0.029	<=13	0.269	>0.018	Pass
NVNT	802.11n(HT20)	2412	0.113	<=13	0.317	>0.018	Pass
NVNT	802.11n(HT20)	2472	0.114	<=13	0.257	>0.018	Pass
NVNT	802.11n(HT40)	2422	0.044	<=13	0.087	>0.018	Pass
NVNT	802.11n(HT40)	2462	0.044	<=13	0.269	>0.018	Pass

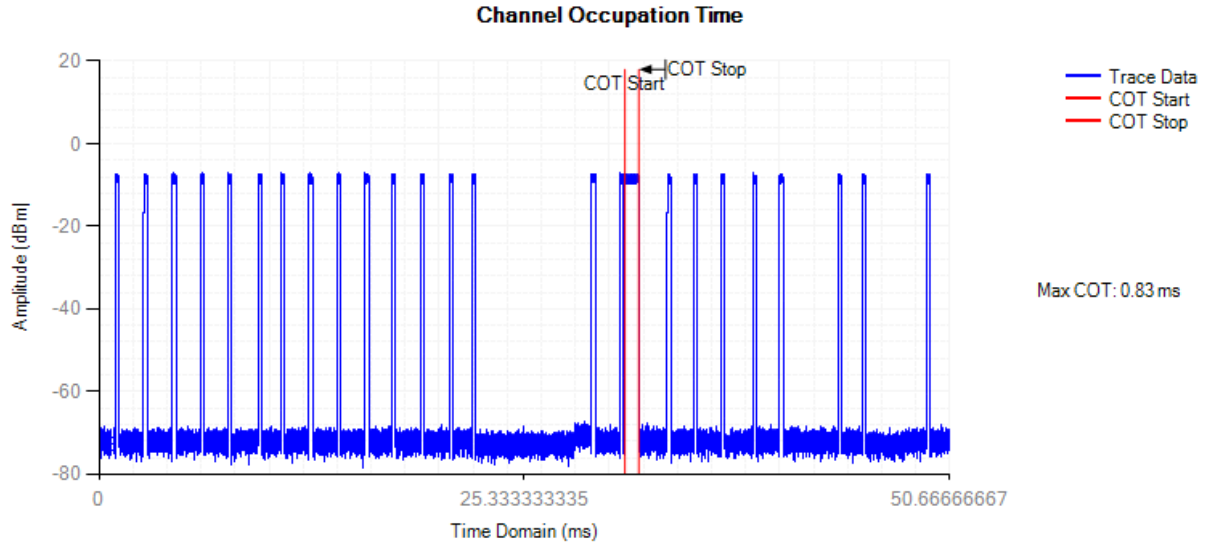
COT NVNT 802.11b 2412MHz



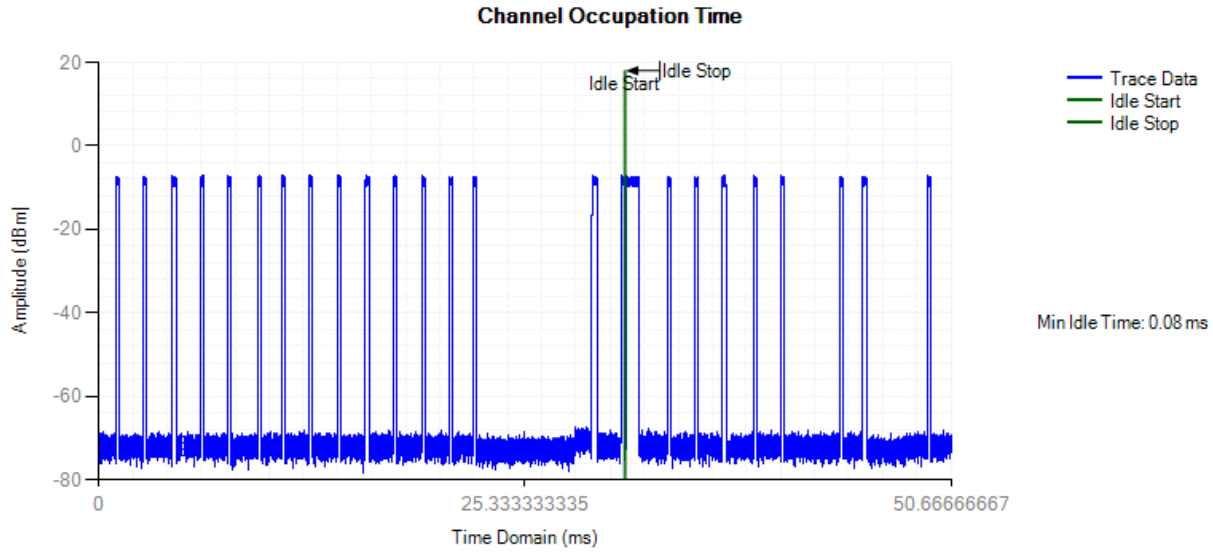
Idle NVNT 802.11b 2412MHz



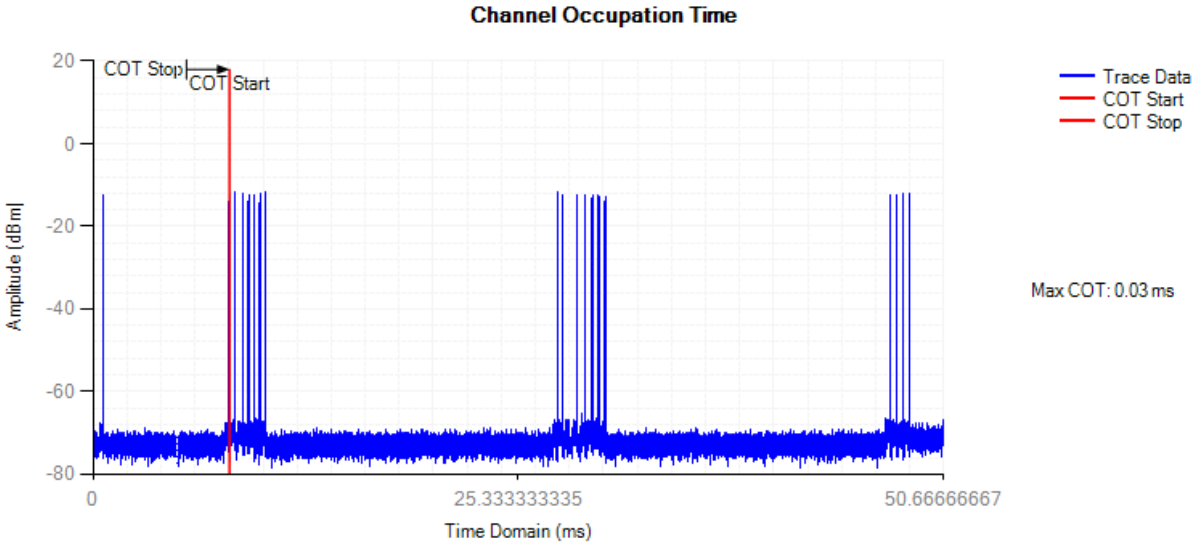
COT NVNT 802.11b 2472MHz



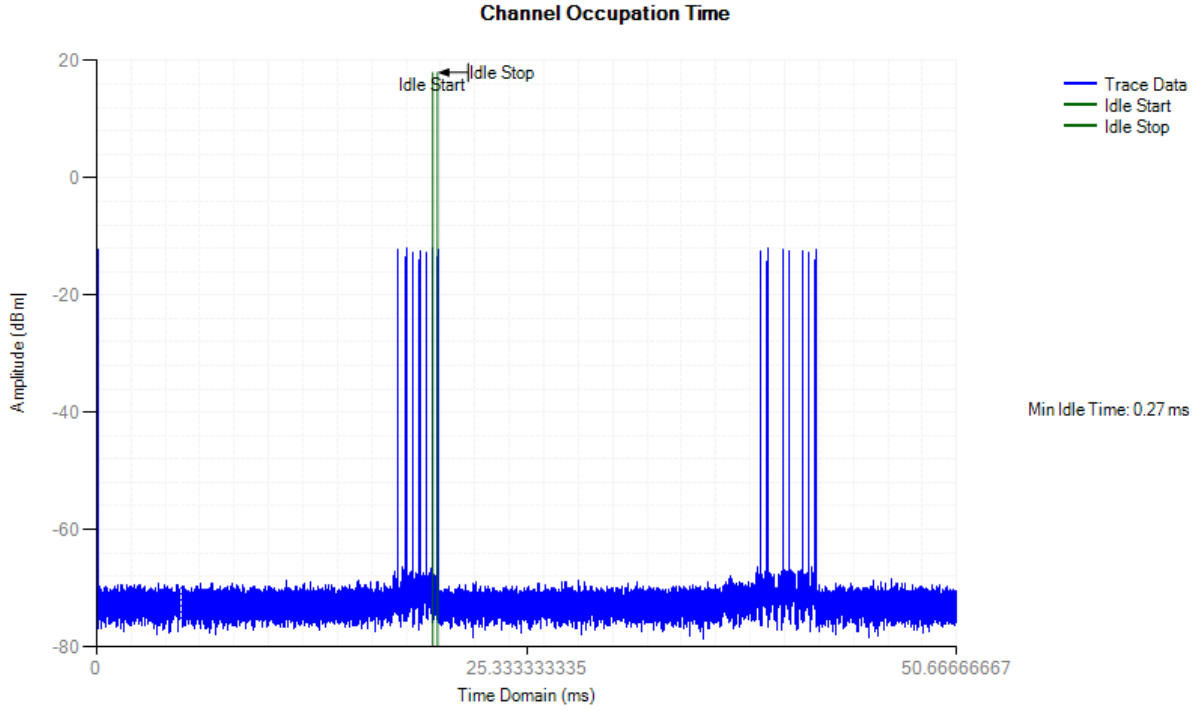
Idle NVNT 802.11b 2472MHz



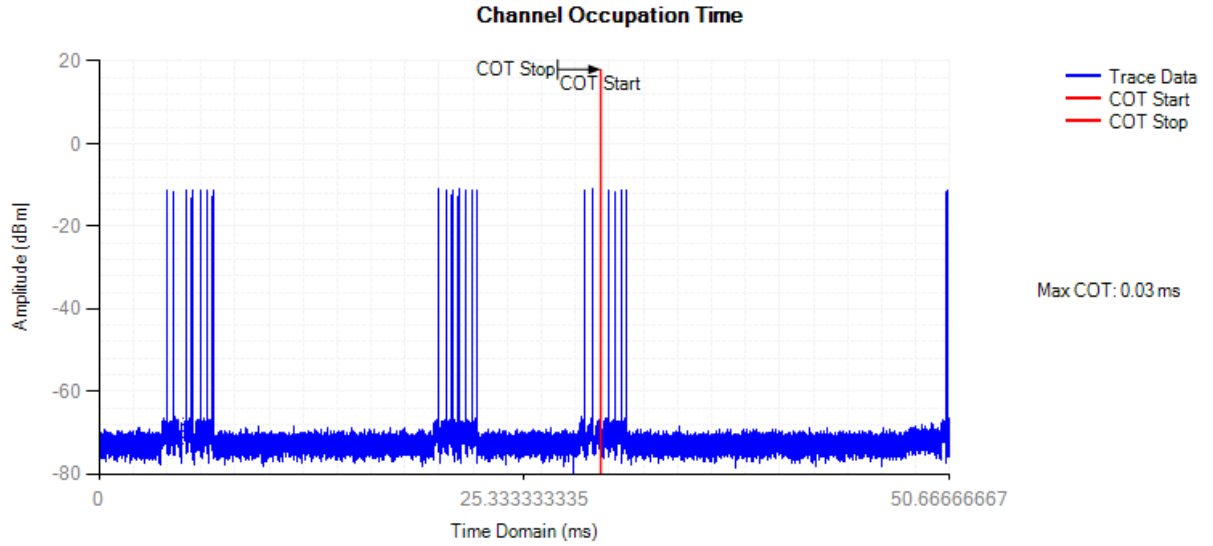
COT NVNT 802.11g 2412MHz



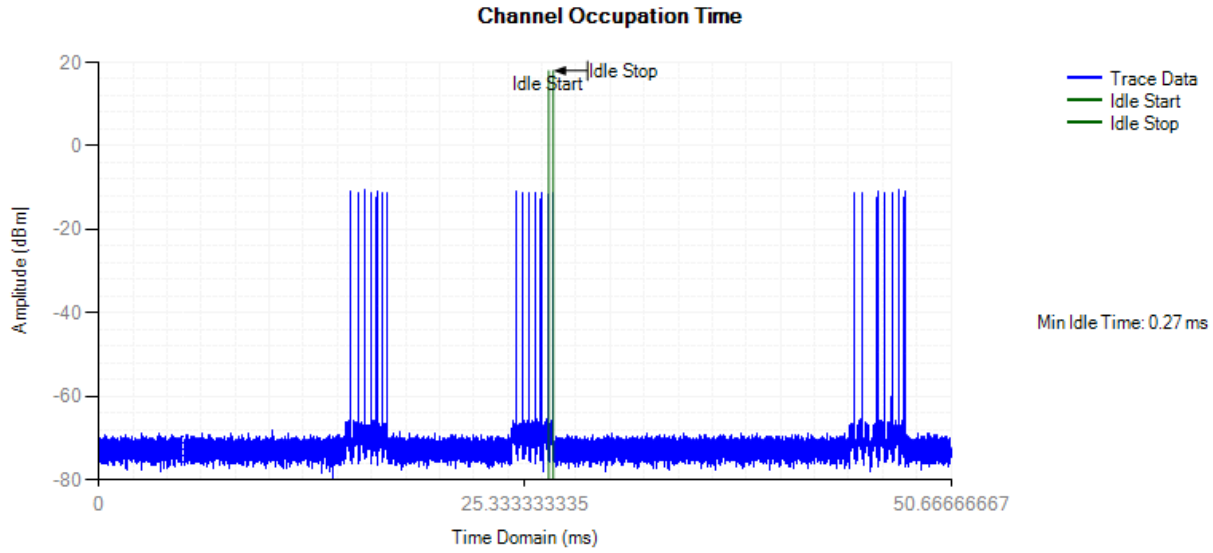
Idle NVNT 802.11g 2412MHz



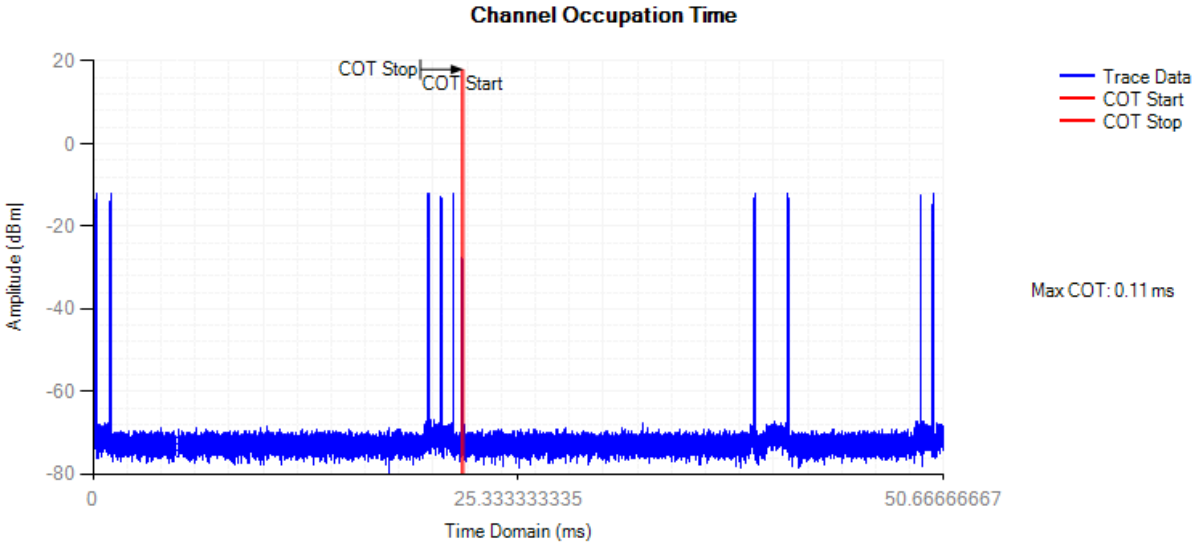
COT NVNT 802.11g 2472MHz



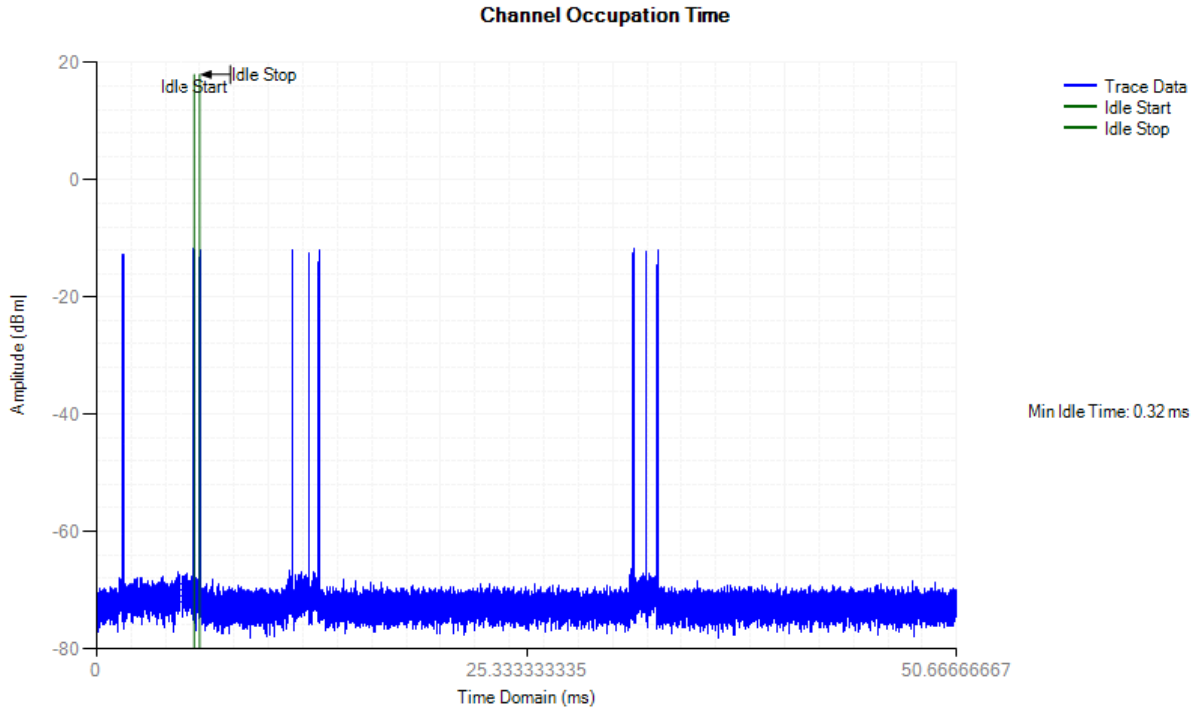
Idle NVNT 802.11g 2472MHz



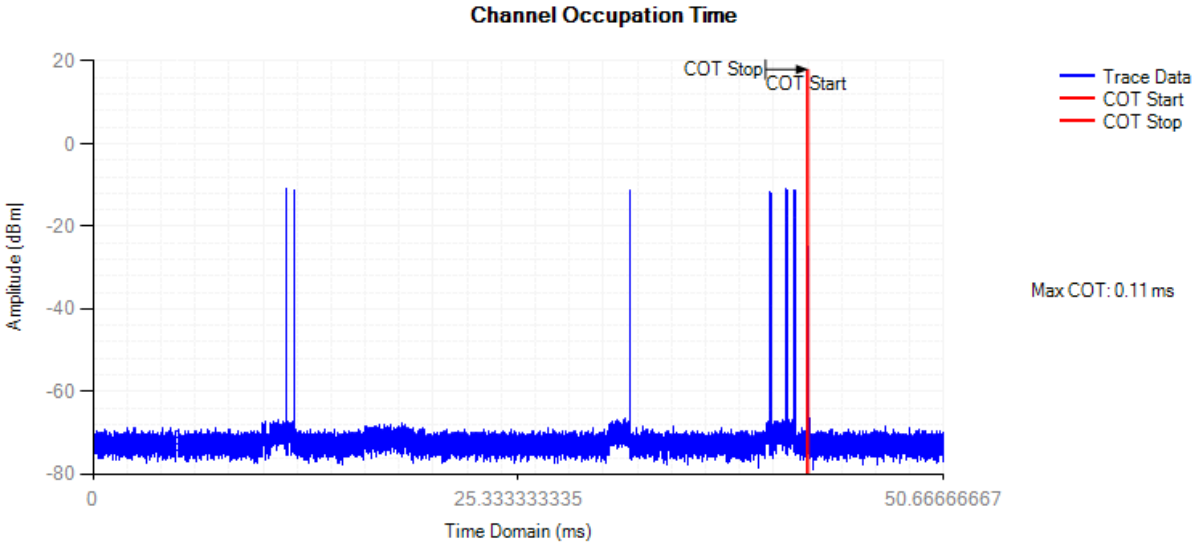
COT NVNT 802.11n(HT20) 2412MHz



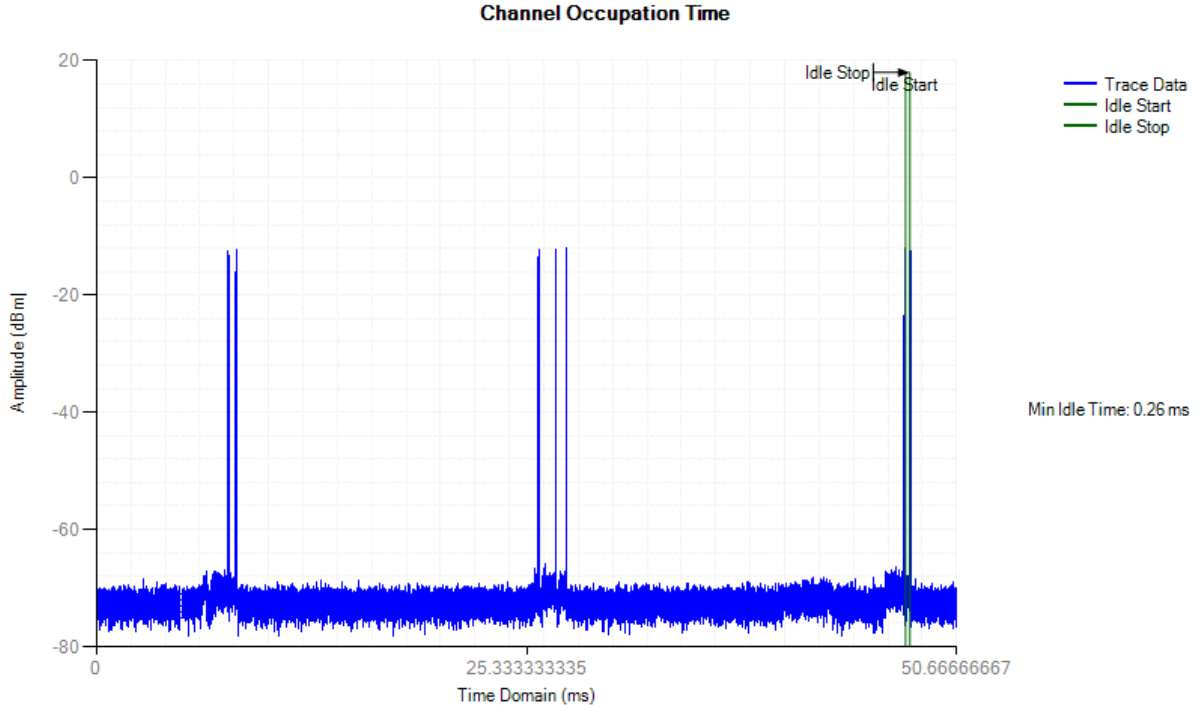
Idle NVNT 802.11n(HT20) 2412MHz



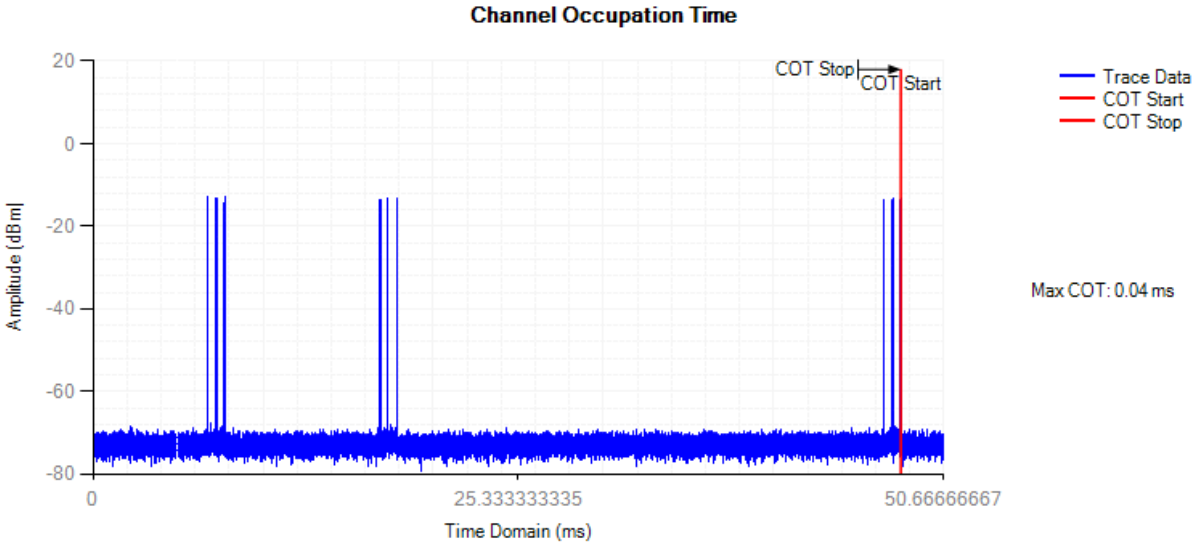
COT NVNT 802.11n(HT20) 2472MHz



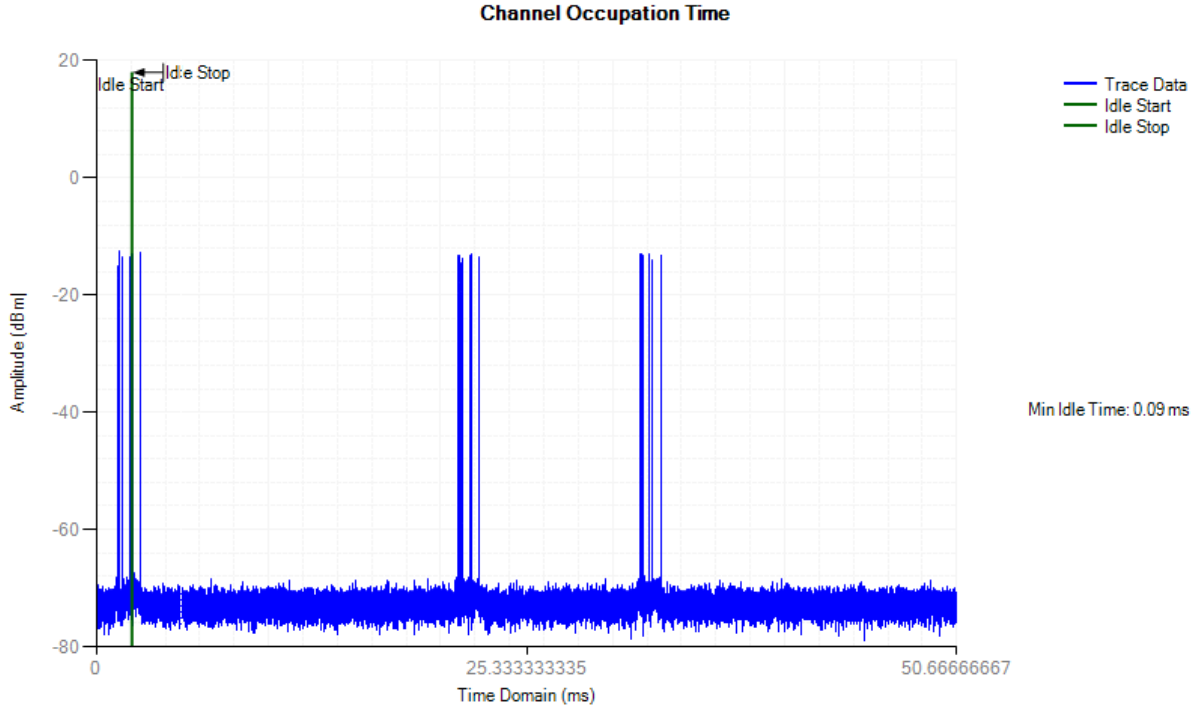
Idle NVNT 802.11n(HT20) 2472MHz



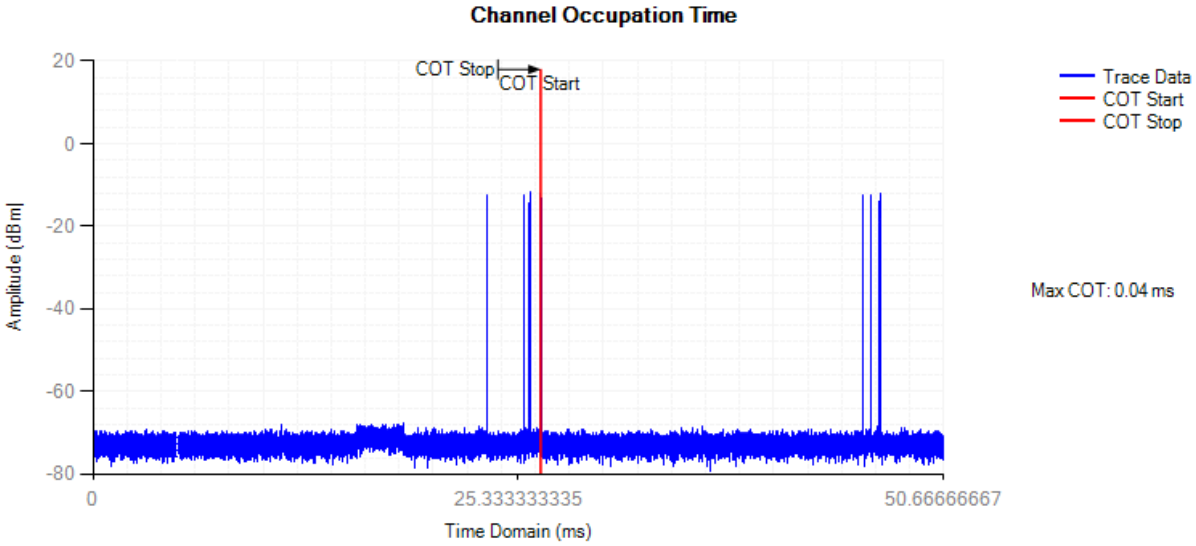
COT NVNT 802.11n(HT40) 2422MHz



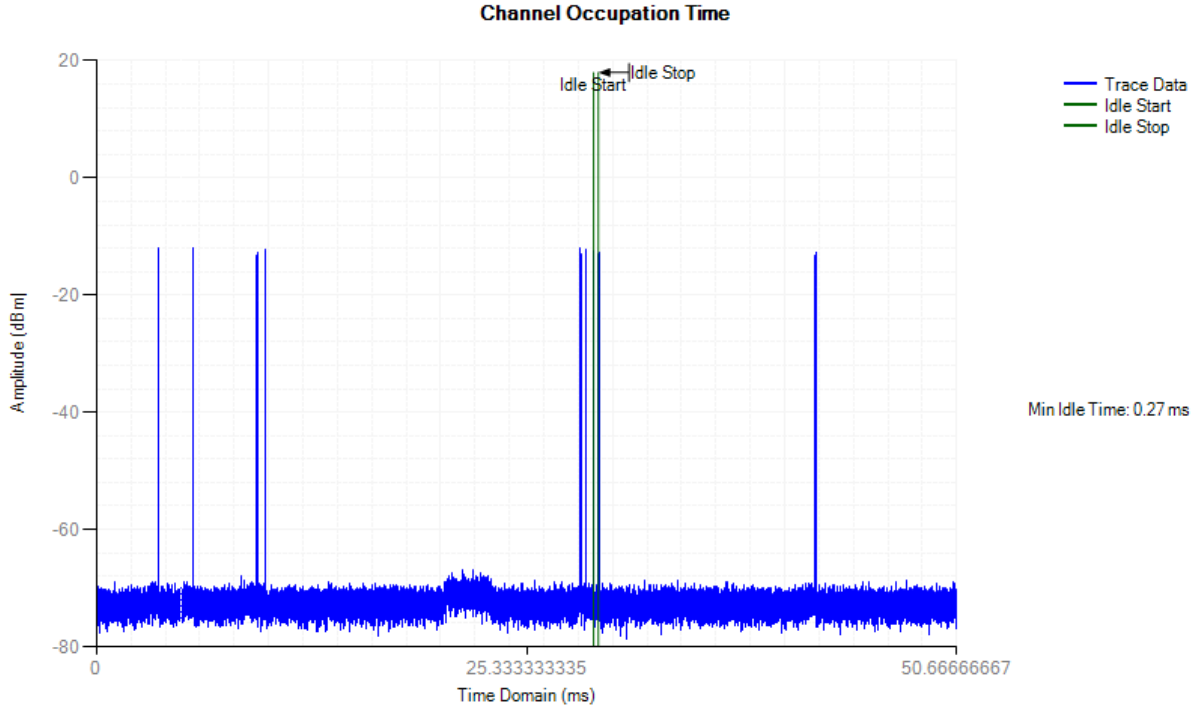
Idle NVNT 802.11n(HT40) 2422MHz



COT NVNT 802.11n(HT40) 2462MHz



Idle NVNT 802.11n(HT40) 2462MHz



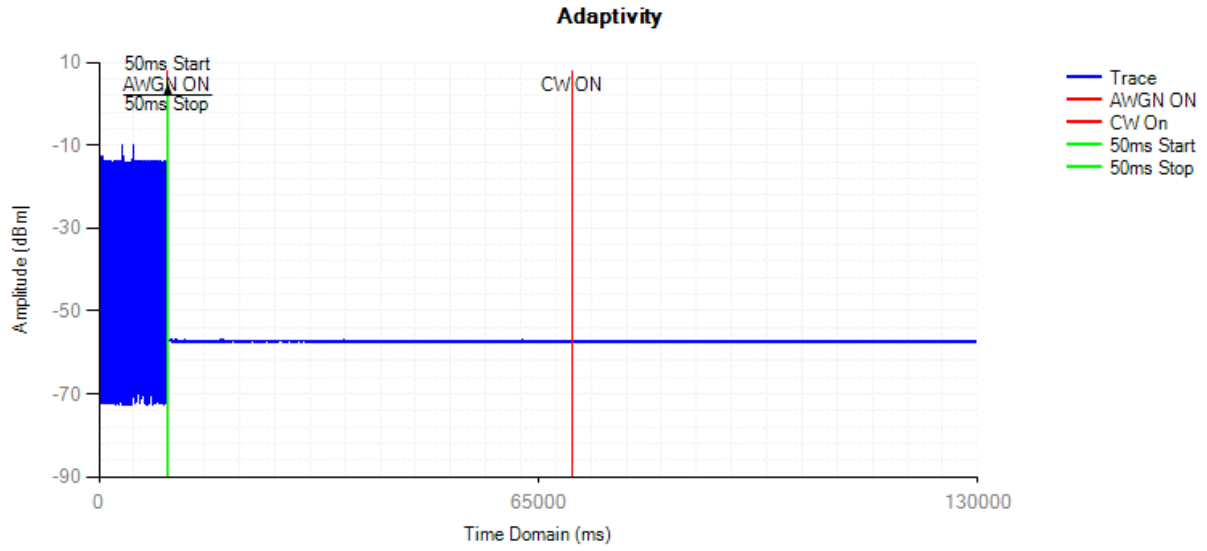
PCB Antenna

Note: 802.11n(HT20), 802.11n(HT40) power less than 10dBm, not apply.

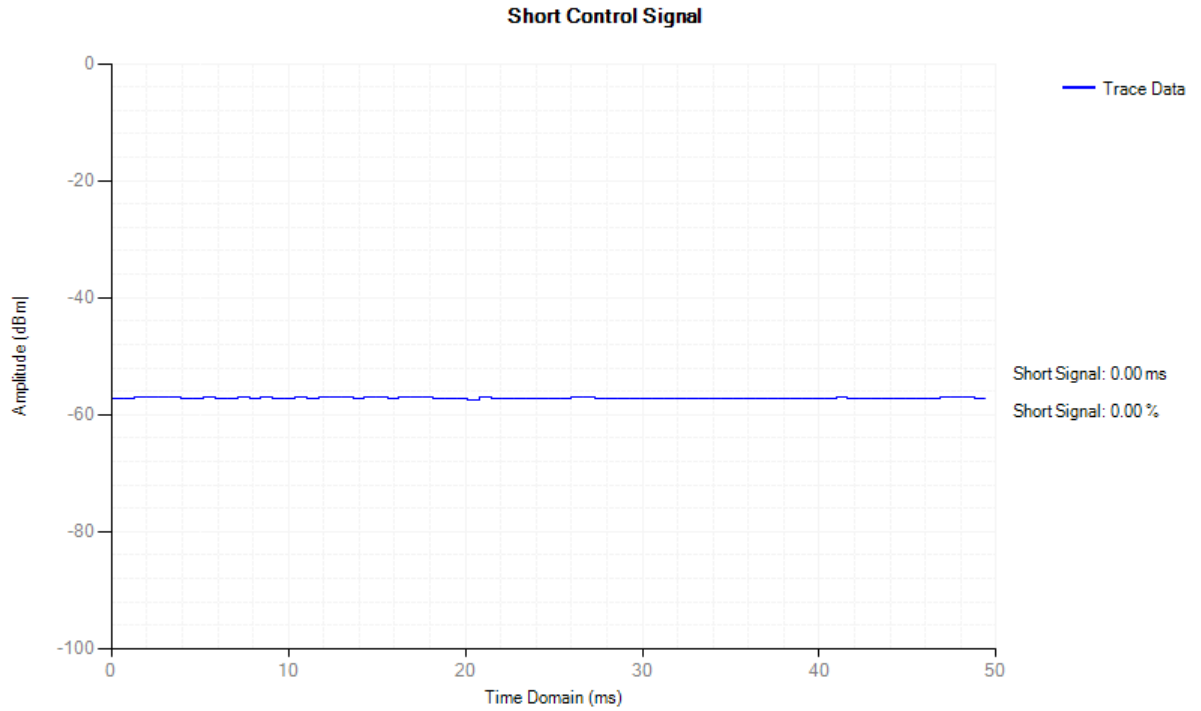
Adaptivity

Condition	Mode	Frequency (MHz)	AWGN Level (dBm)	CW Level (dBm)	Short Control Width (ms)	Short Control Ratio(%)	Limit (%)	Verdict
NVNT	802.11b	2412	-60.15	-35	0	0	<=10	Pass
NVNT	802.11b	2472	-60.23	-35	0	0	<=10	Pass
NVNT	802.11g	2412	-59.2	-35	0	0	<=10	Pass
NVNT	802.11g	2442	-60.09	-35	0	0	<=10	Pass
NVNT	802.11g	2474	-59.22	-35	0	0	<=10	Pass

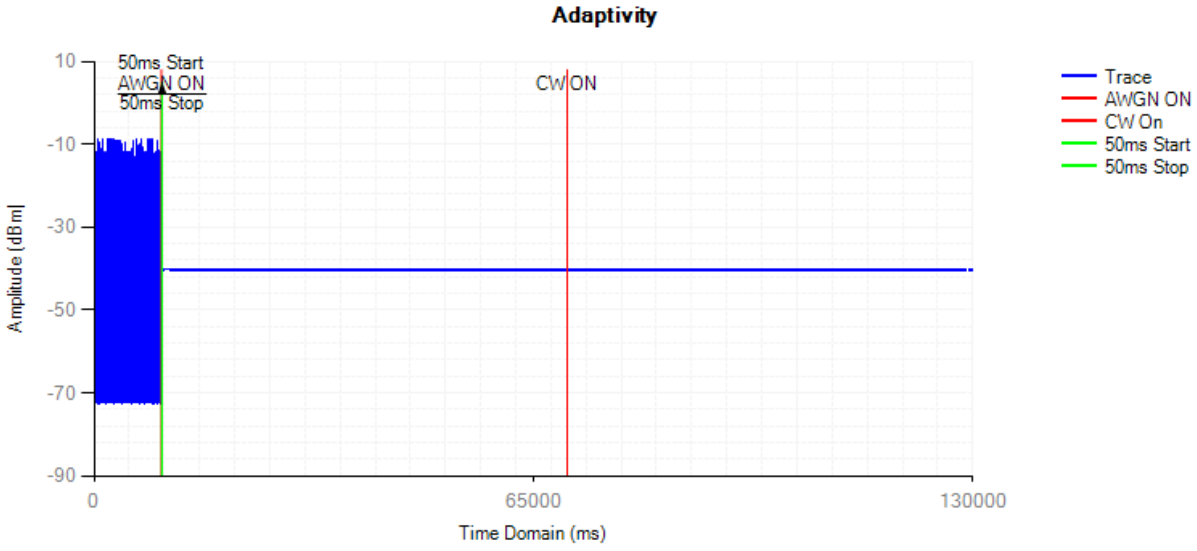
Adaptivity NVNT 802.11b 2412MHz



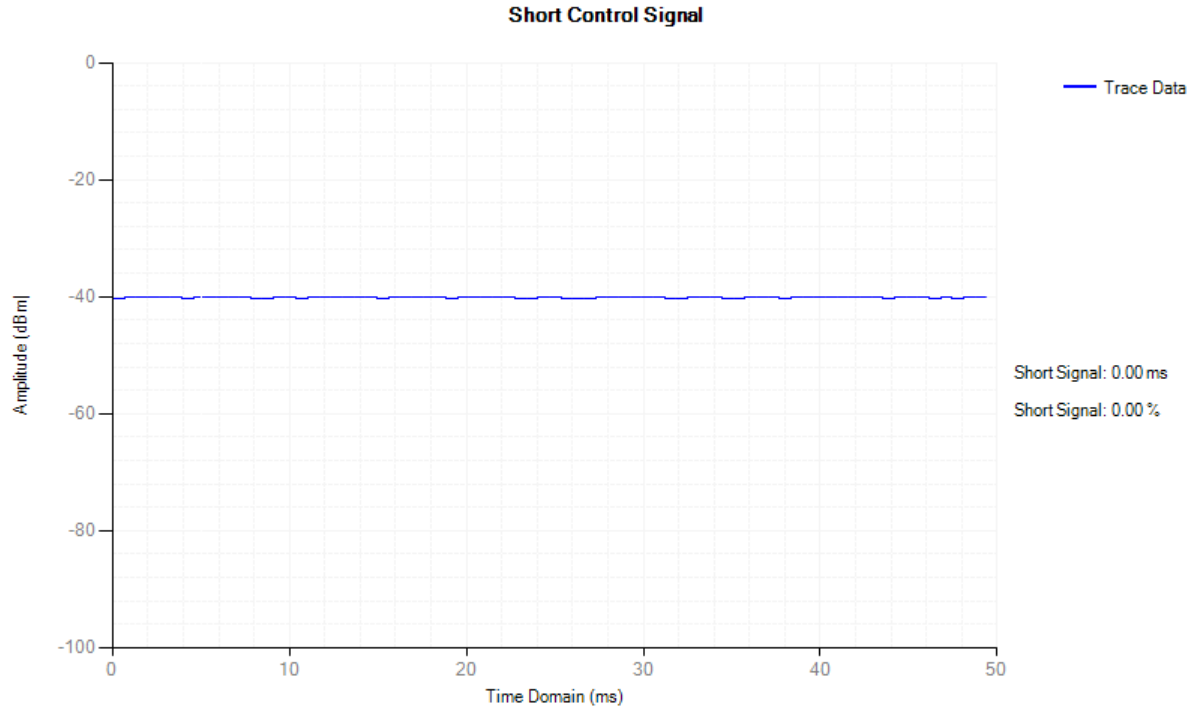
Control Signal NVNT 802.11b 2412MHz



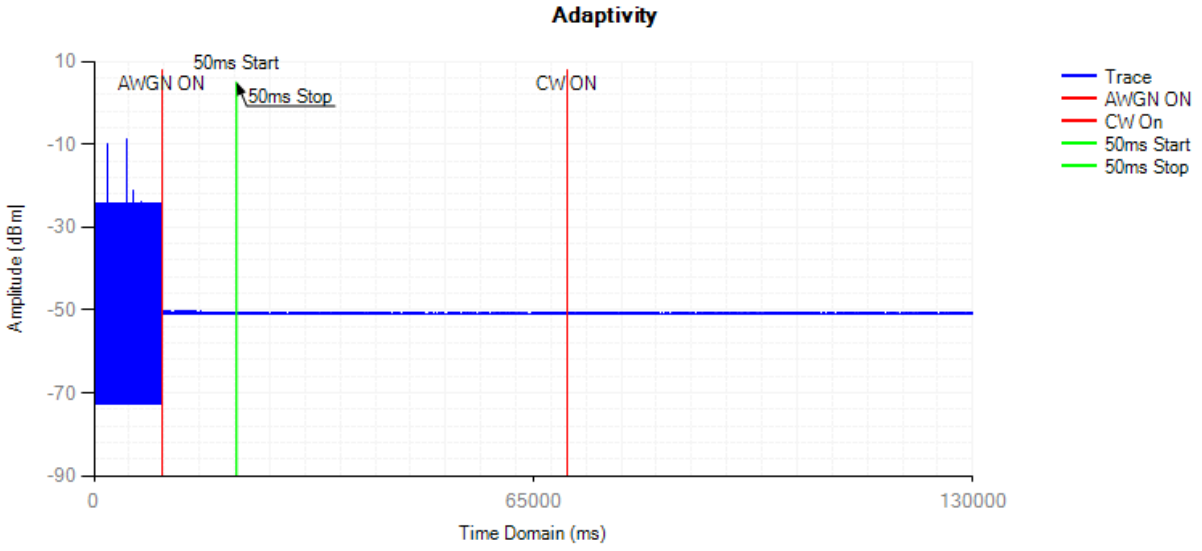
Adaptivity NVNT 802.11b 2472MHz



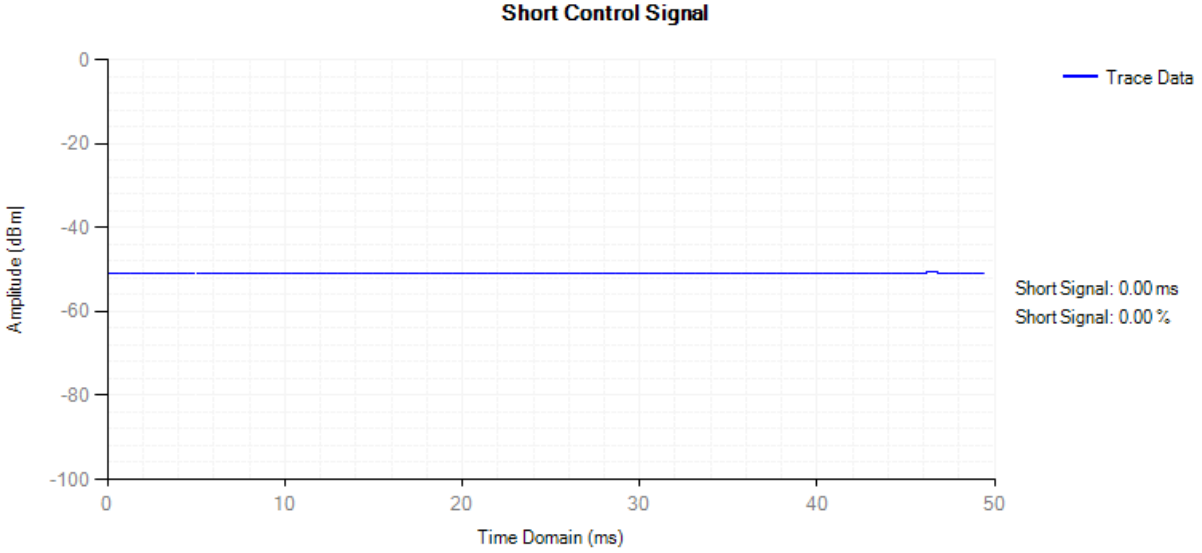
Control Signal NVNT 802.11b 2472MHz



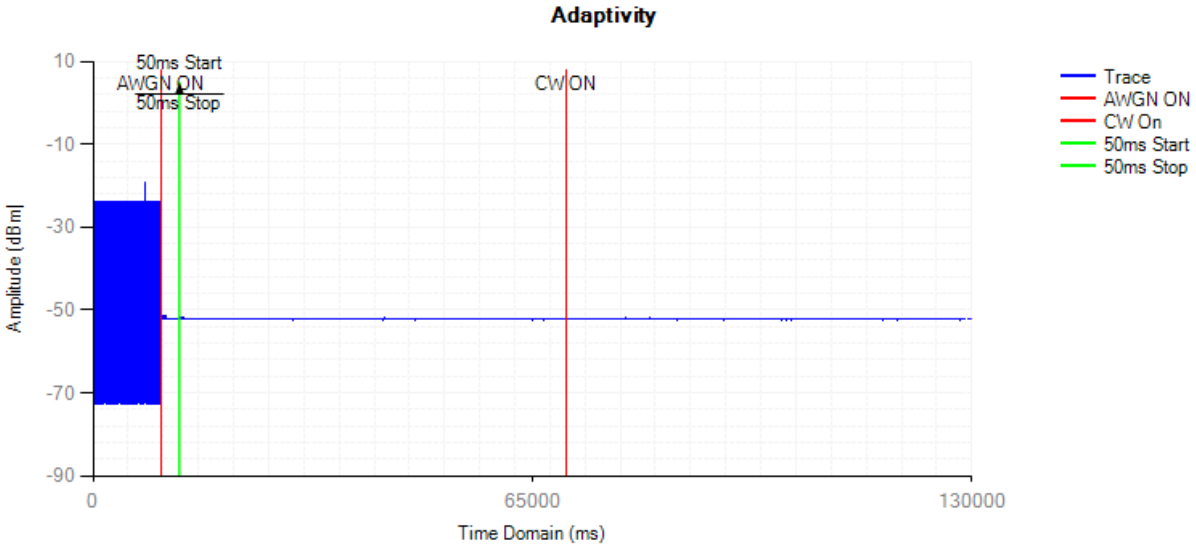
Adaptivity NVNT 802.11g 2412MHz



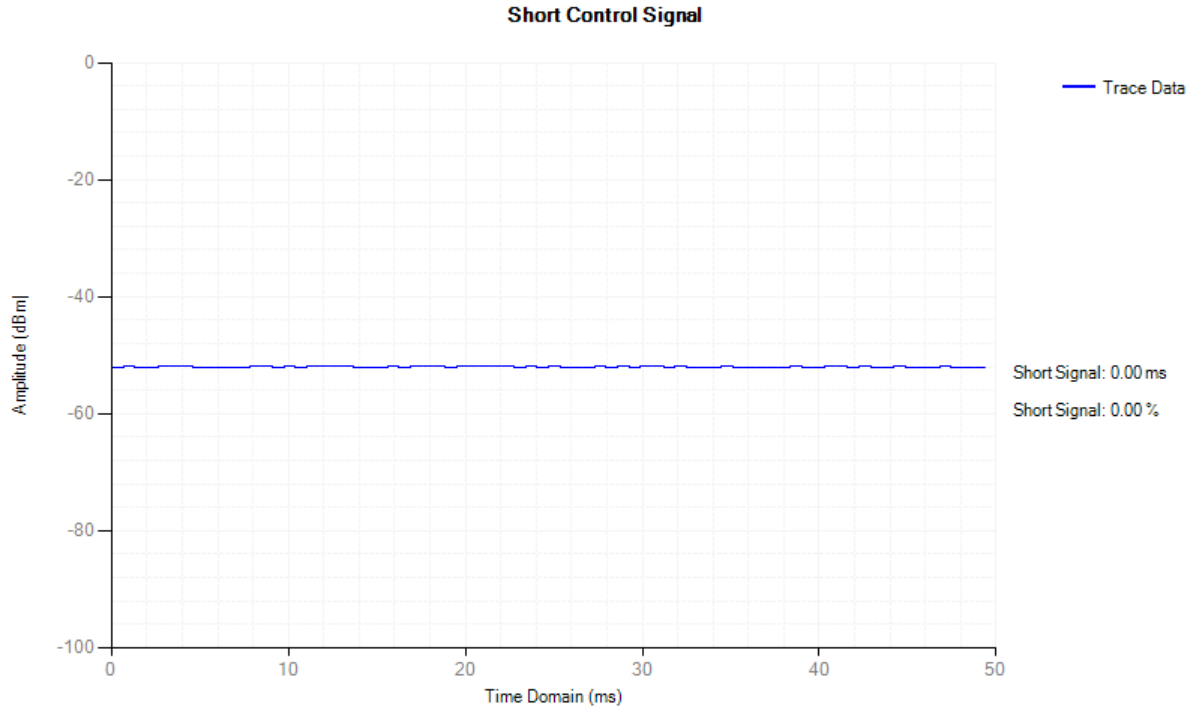
Control Signal NVNT 802.11g 2412MHz



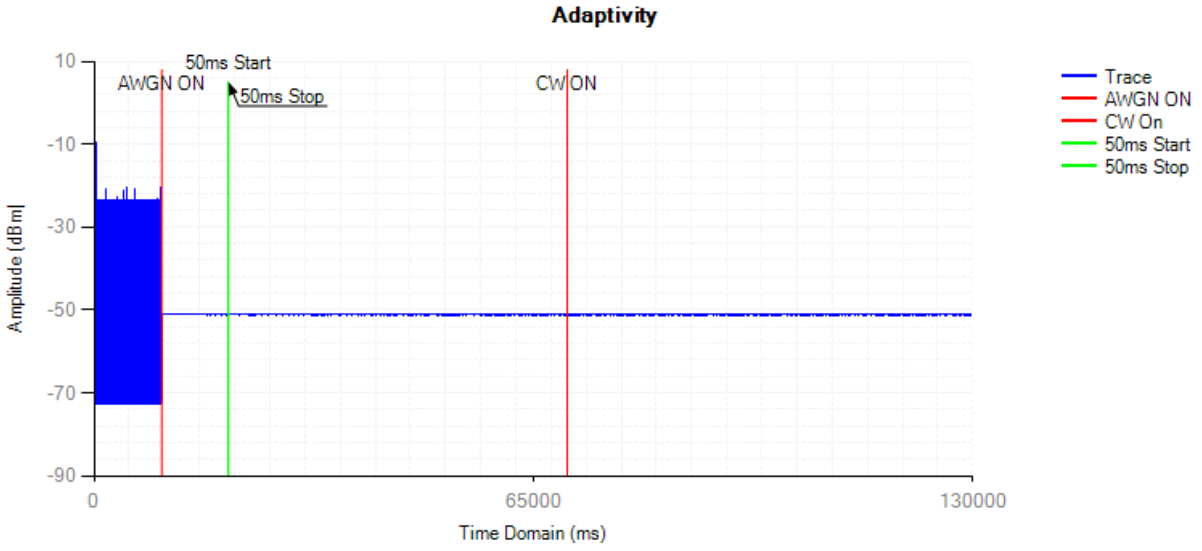
Adaptivity NVNT 802.11g 2442MHz



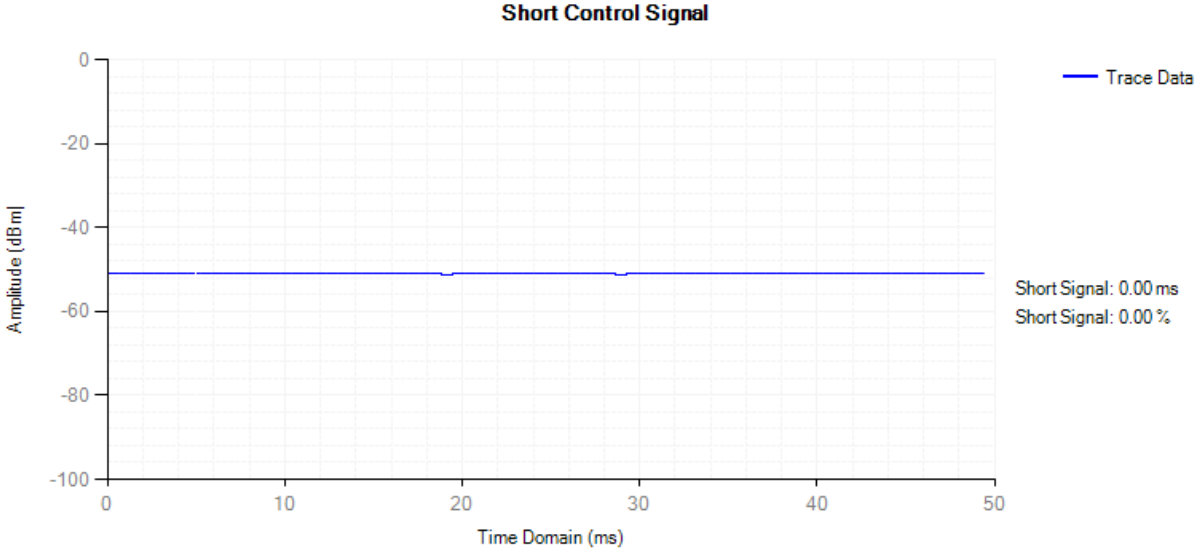
Control Signal NVNT 802.11g 2442MHz



Adaptivity NVNT 802.11g 2472MHz



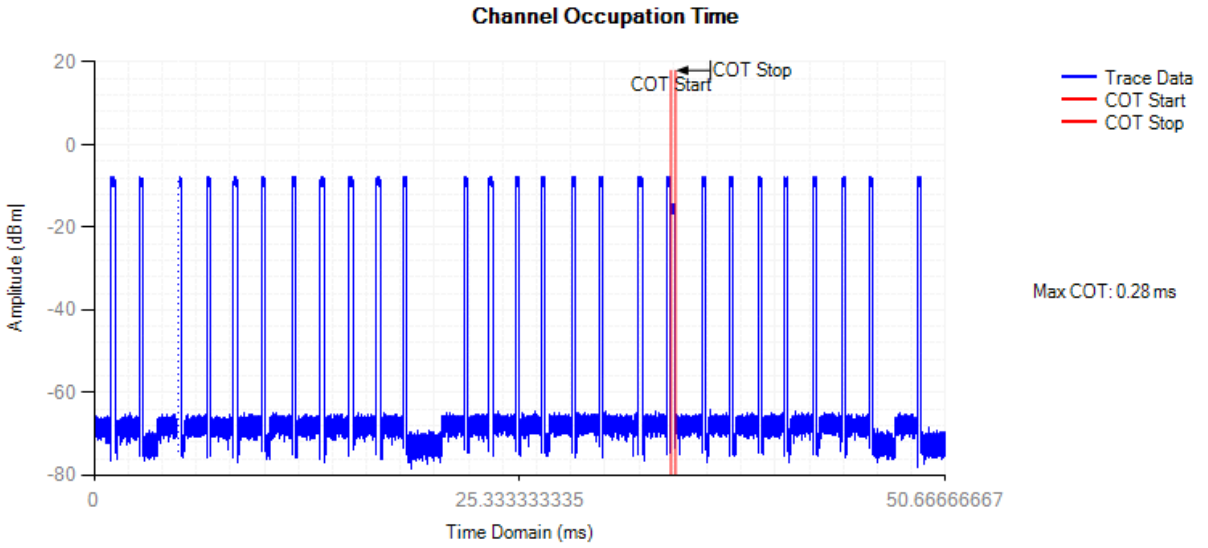
Control Signal NVNT 802.11g 2472MHz



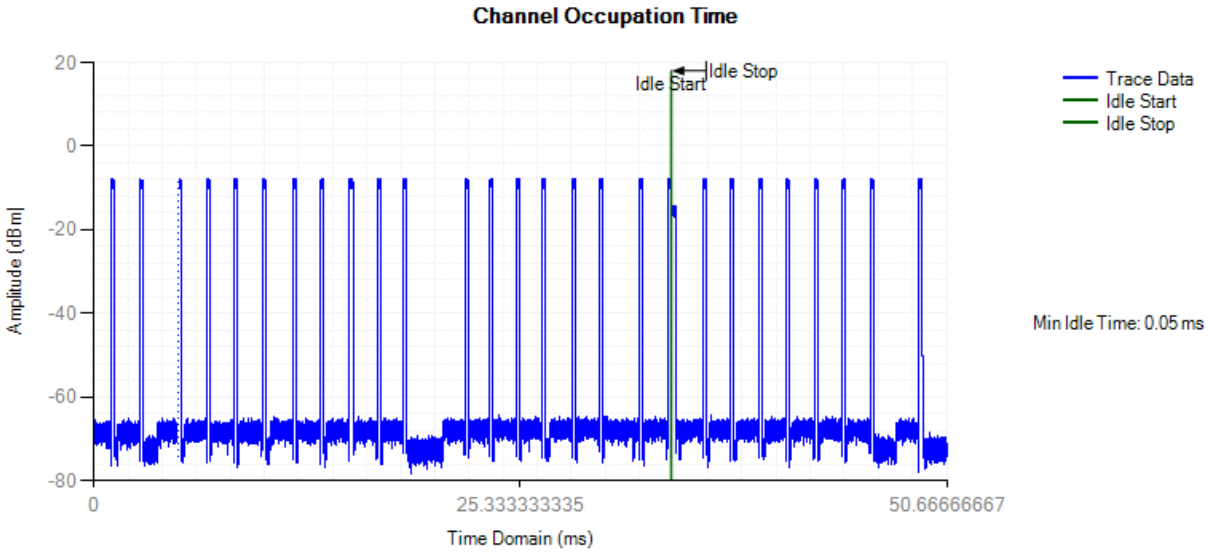
Adaptivity COT Channel Occupancy Time

Condition	Mode	Frequency (MHz)	Max COT (ms)	Limit COT (ms)	Min Idle Time (ms)	Limit Idle Time (ms)	Verdict
NVNT	802.11b	2412	0.281	<=13	0.052	>0.018	Pass
NVNT	802.11b	2472	0.204	<=13	1.129	>0.018	Pass
NVNT	802.11g	2412	0.115	<=13	0.041	>0.018	Pass
NVNT	802.11g	2442	0.029	<=13	0.269	>0.018	Pass
NVNT	802.11g	2472	0.068	<=13	0.317	>0.018	Pass

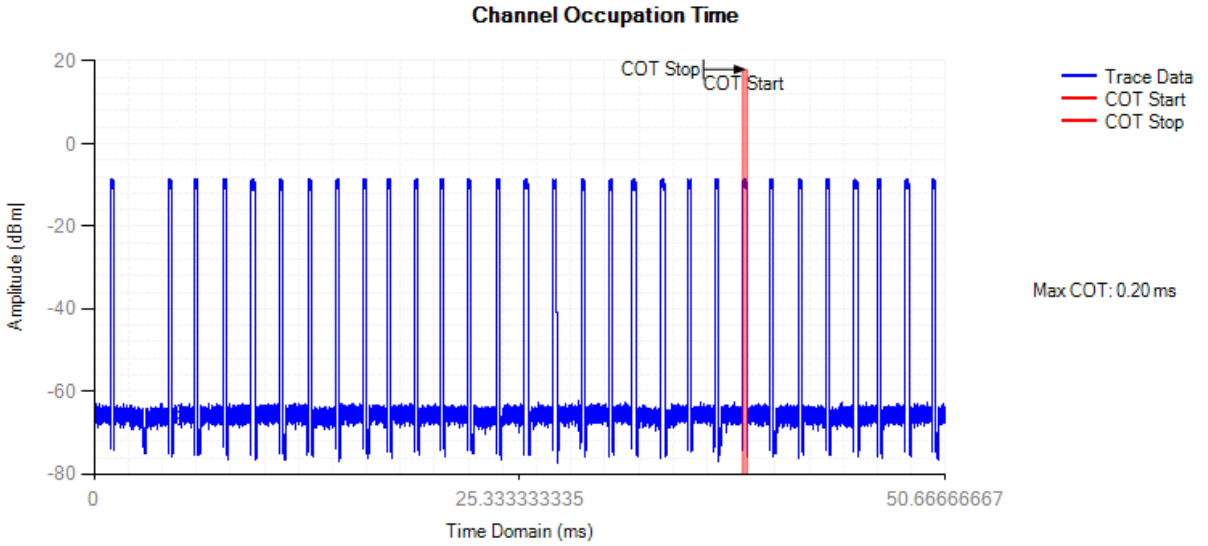
COT NVNT 802.11b 2412MHz



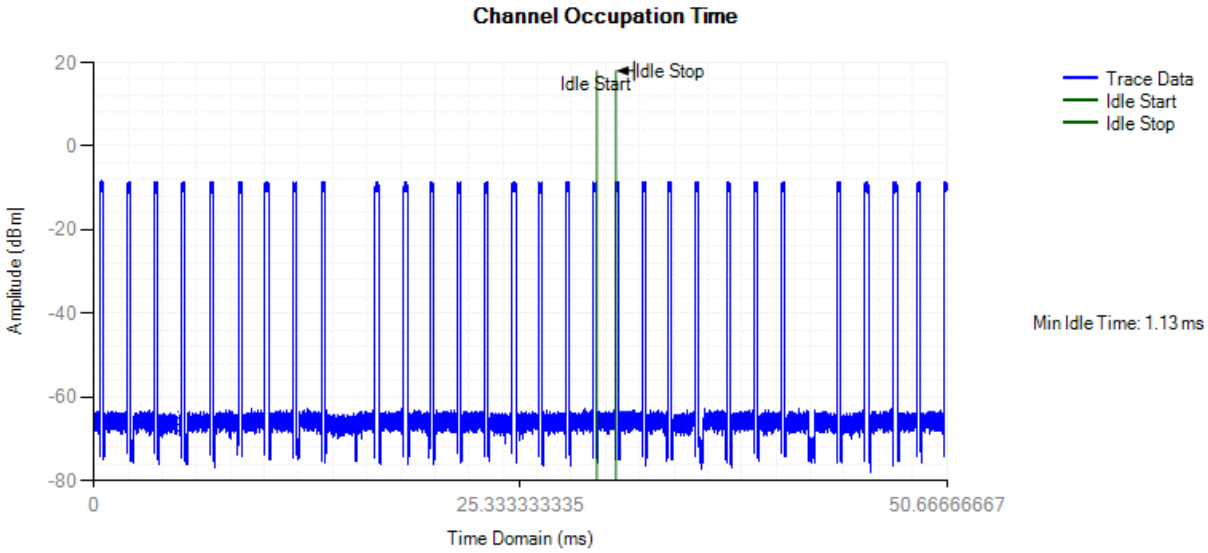
Idle NVNT 802.11b 2412MHz



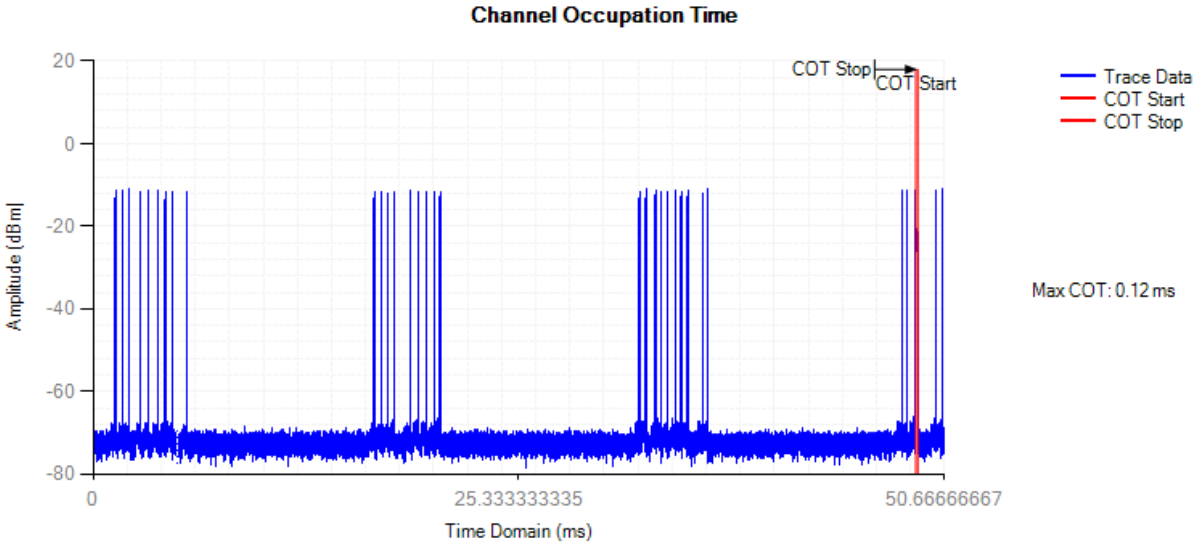
COT NVNT 802.11b 2472MHz



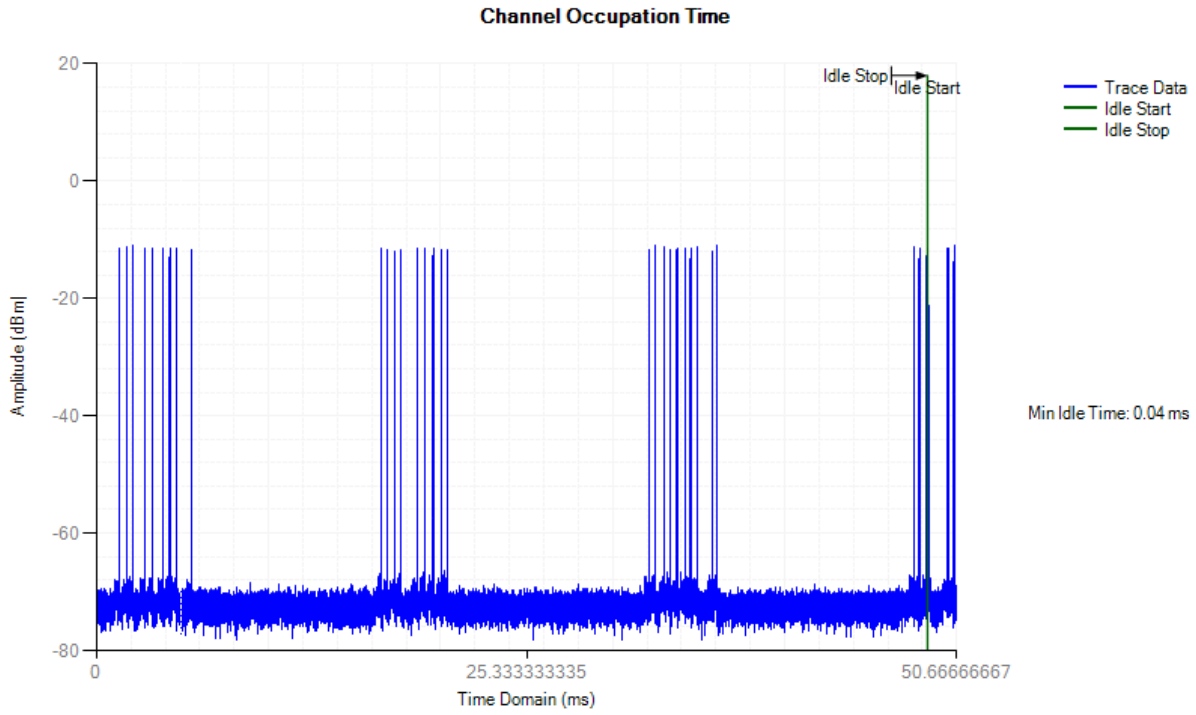
Idle NVNT 802.11b 2472MHz



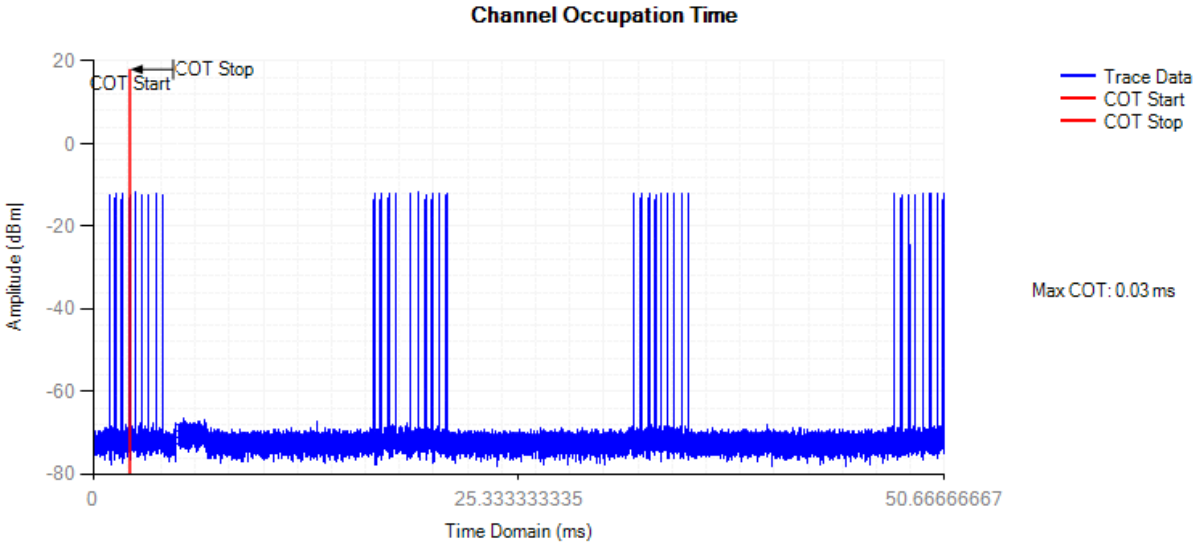
COT NVNT 802.11g 2412MHz



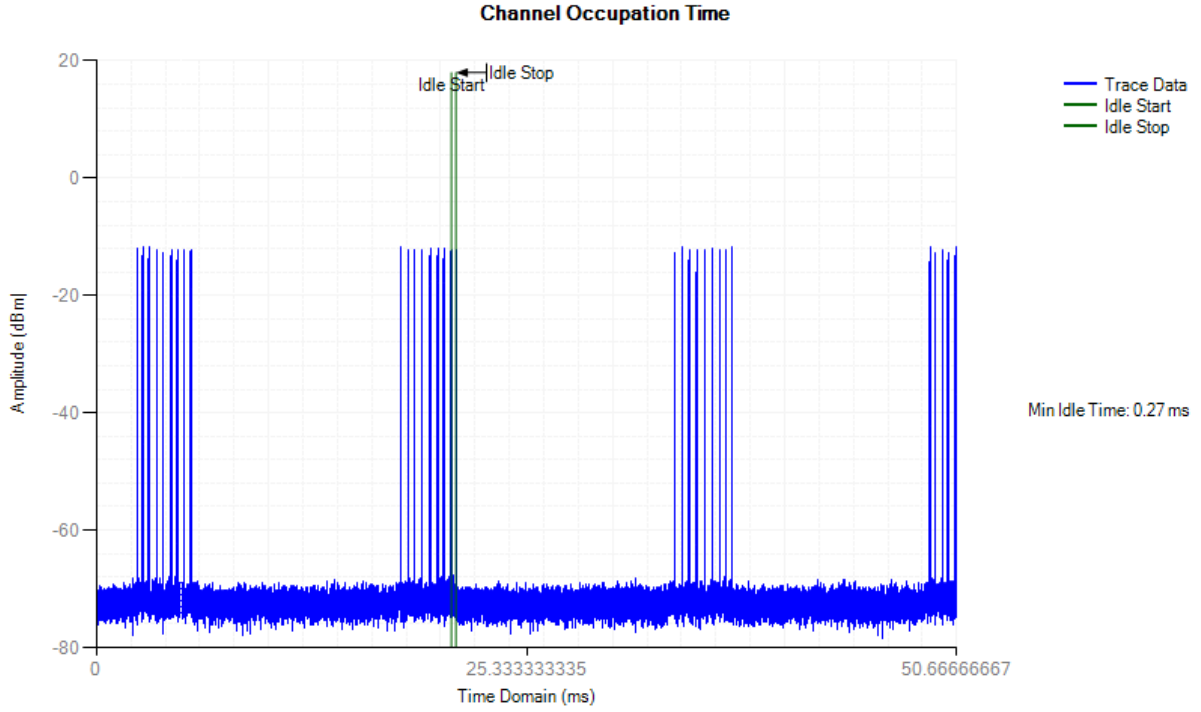
Idle NVNT 802.11g 2412MHz



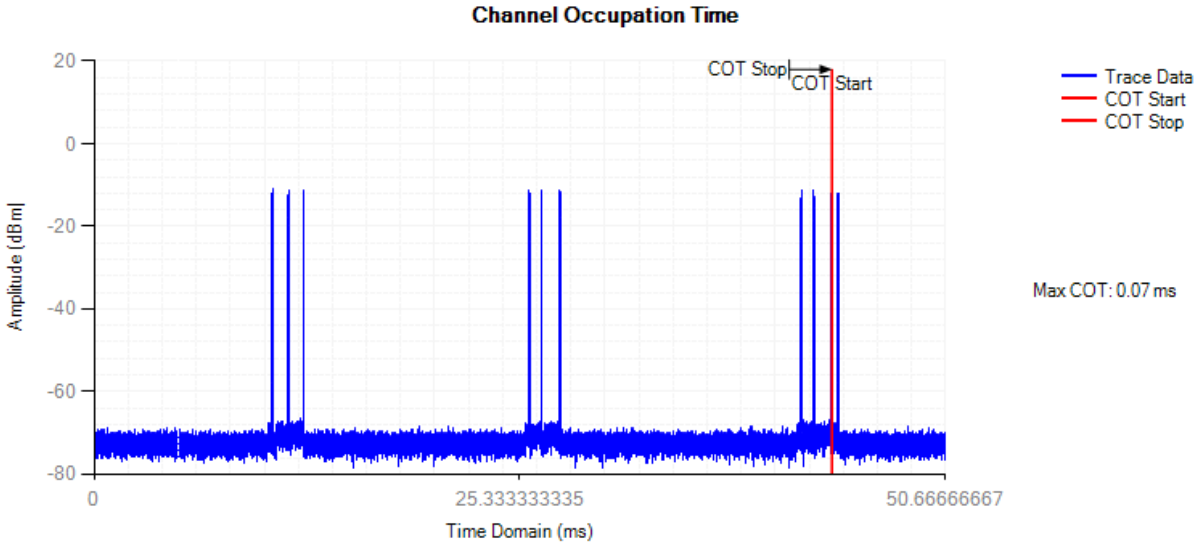
COT NVNT 802.11g 2442MHz



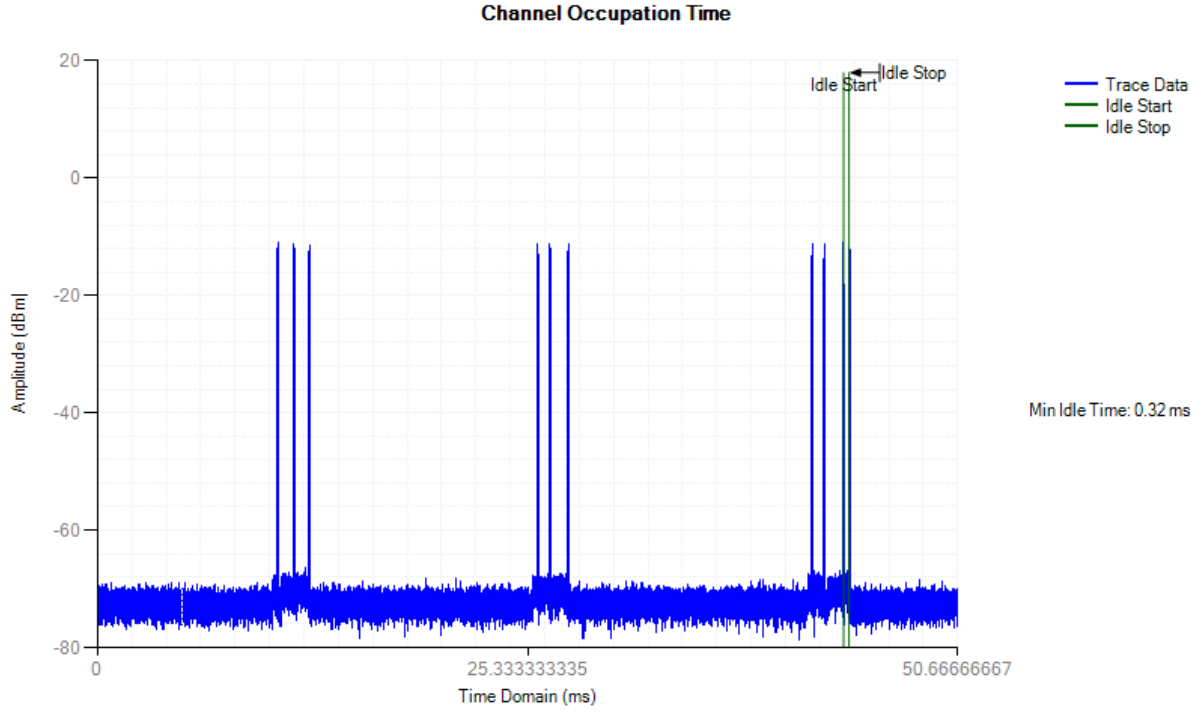
Idle NVNT 802.11g 2442MHz



COT NVNT 802.11g 2472MHz



Idle NVNT 802.11g 2472MHz



8. SPURIOUS EMISSIONS – TRANSMITTER

8.1 LIMIT

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
470 MHz to 694 MHz	-36 dBm	100 KHz
694 MHz to 1 GHz	-54 dBm	100 KHz
862 MHz to 1 GHz	-36 dBm	100 KHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

8.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.9.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.9.2 for the measurement method.

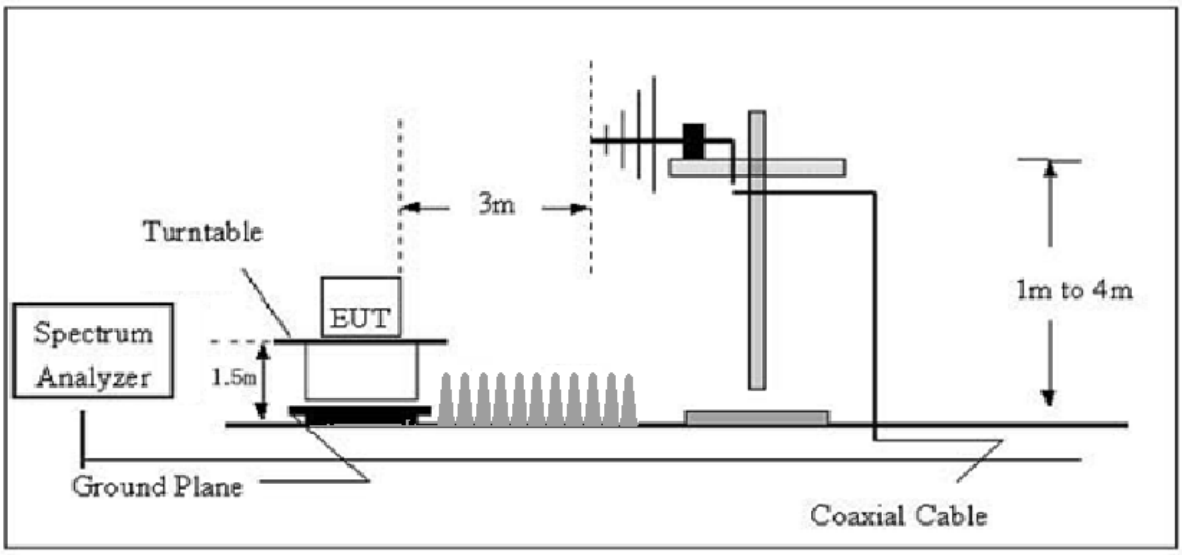
The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	⩾ 19 400 (Set as 20000)	⩾ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

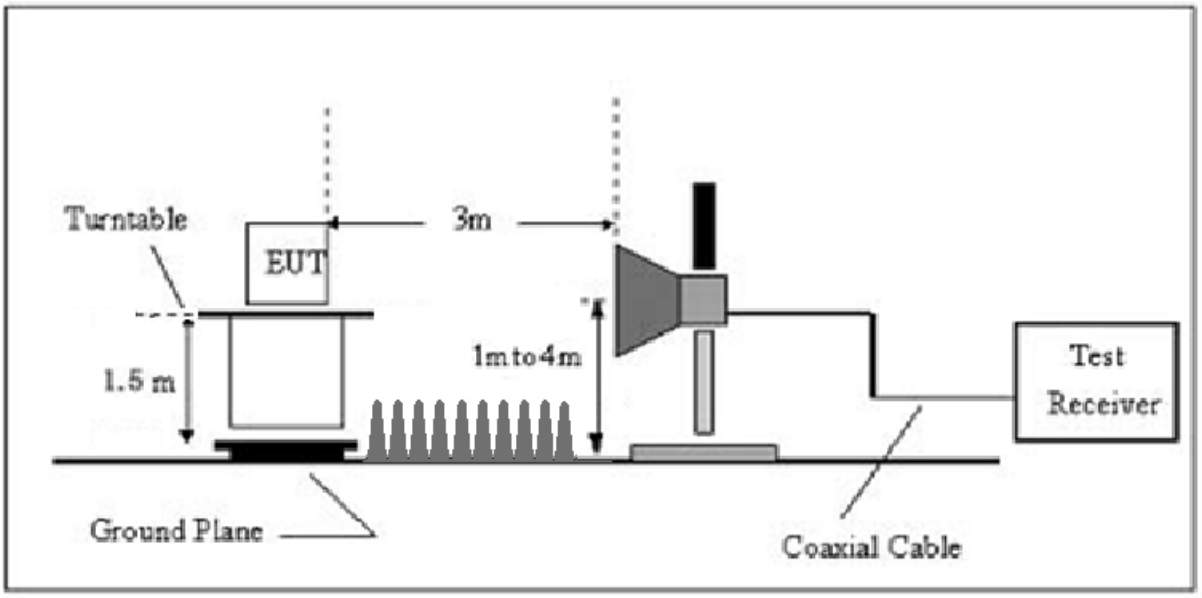
a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. This measurement shall be repeated with the transmitter in standby mode where applicable.
d. For 30~12750MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
f. Replace the EUT by standard antenna and feed the RF port by signal generator.
g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
l. EUT Orthogonal Axis:
“X” - denotes Laid on Table; “Y” - denotes Vertical Stand; “Z” - denotes Side Stand.

8.3 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



8.4 EUT OPERATION DURING TEST

1. The EUT was programmed to be in continuous transmitting mode.
2. For the initial investigation on the highest, lowest frequency, no significant differences in spurious emissions were observed between these 2 channels. The worst test data was shown in report.
3. There is a filter used during the test, the fundamental signals will be not shown in the plot.

8.5 TEST RESULTS

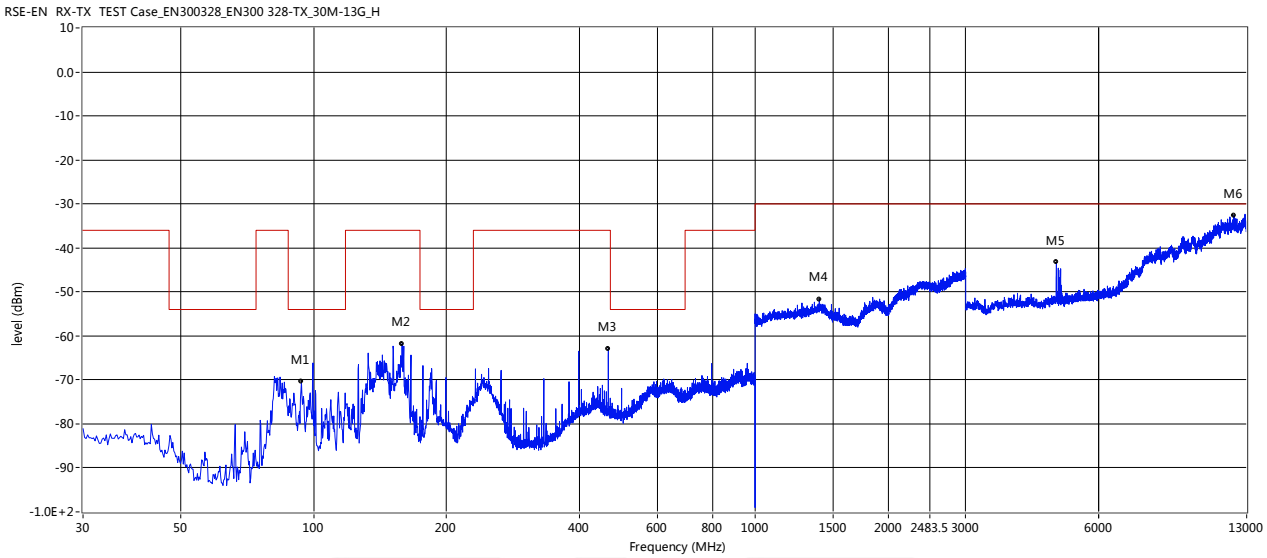
Remark: Scan with 802.11b, 802.11g, 802.11n (HT-20), 802.11n (HT-40), the worst case is 802.11b.

External Antenna

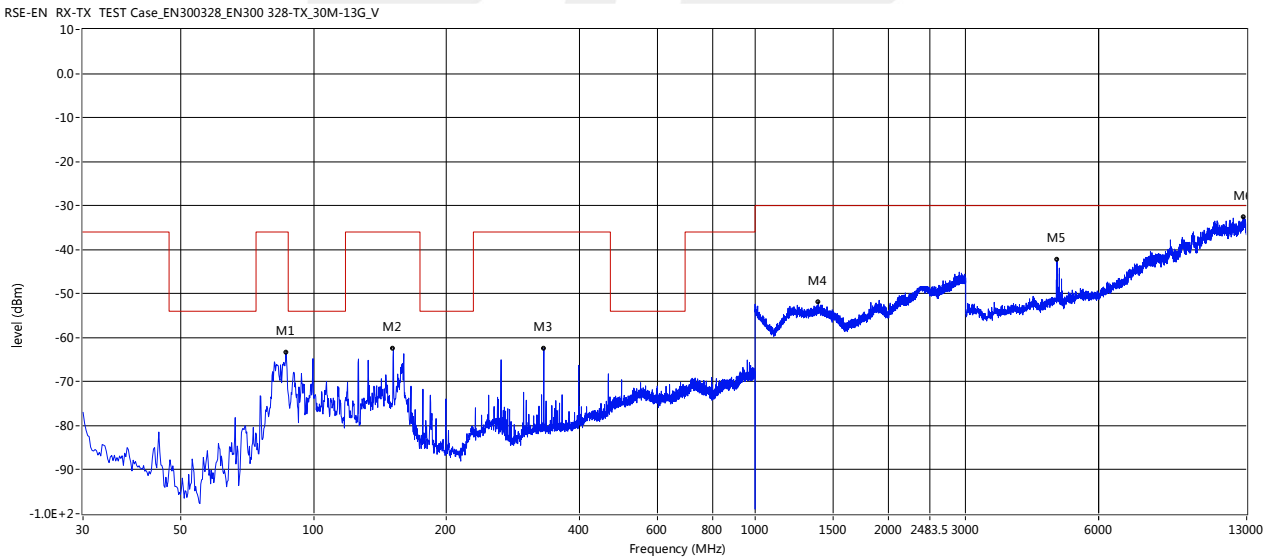
Radiated Emissions:

TX 802.11 b/2412MHz

Horizontal

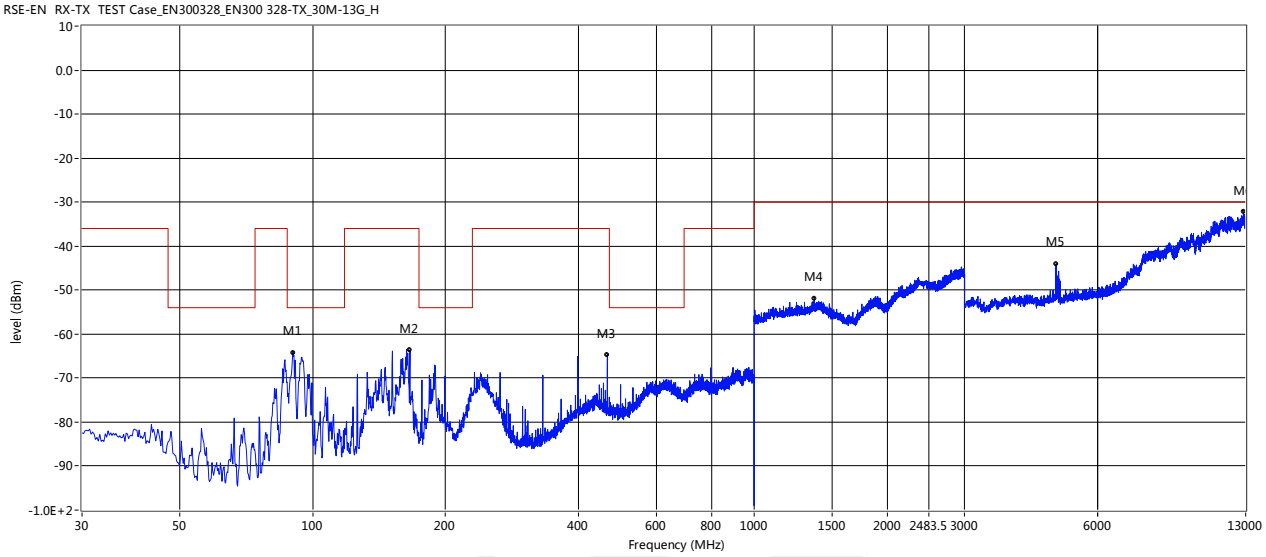


Vertical

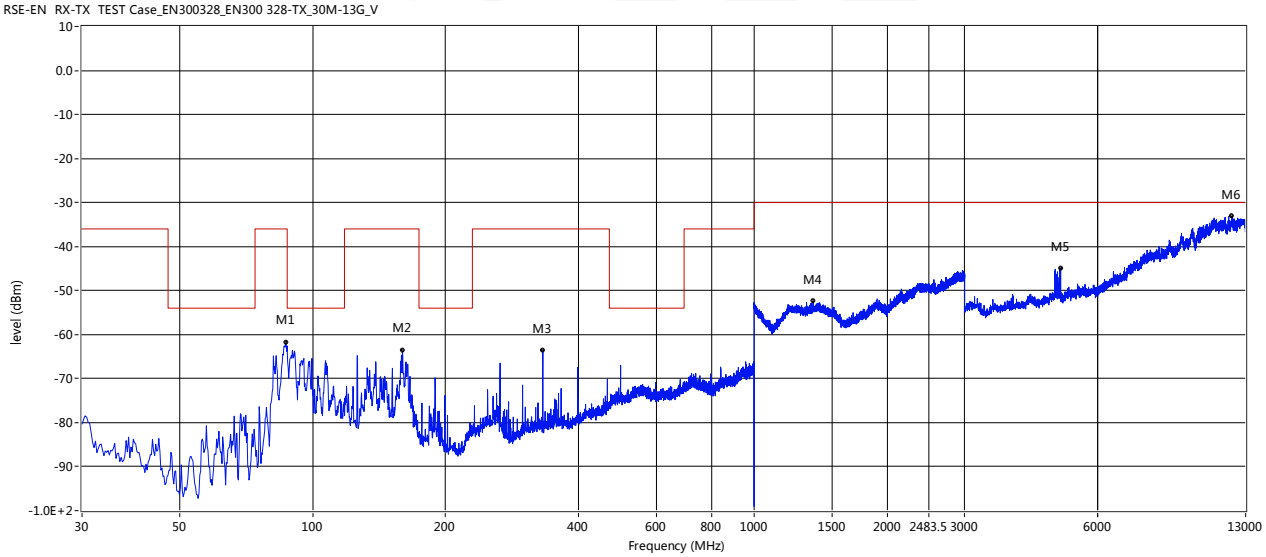


TX 802.11 b/2472MHz

Horizontal



Vertical

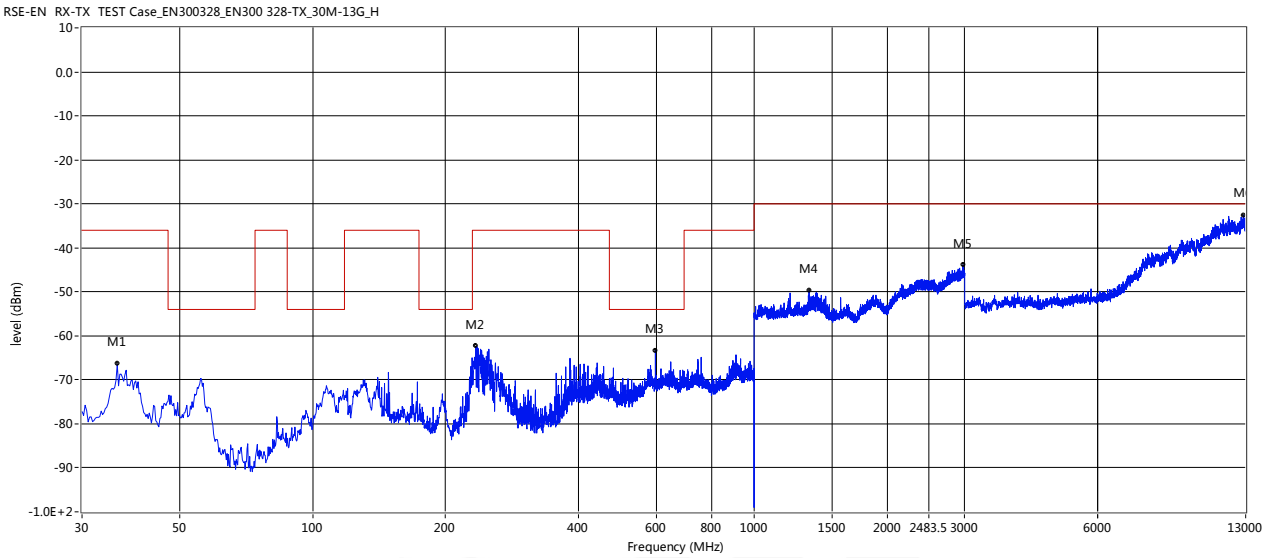


PCB Antenna

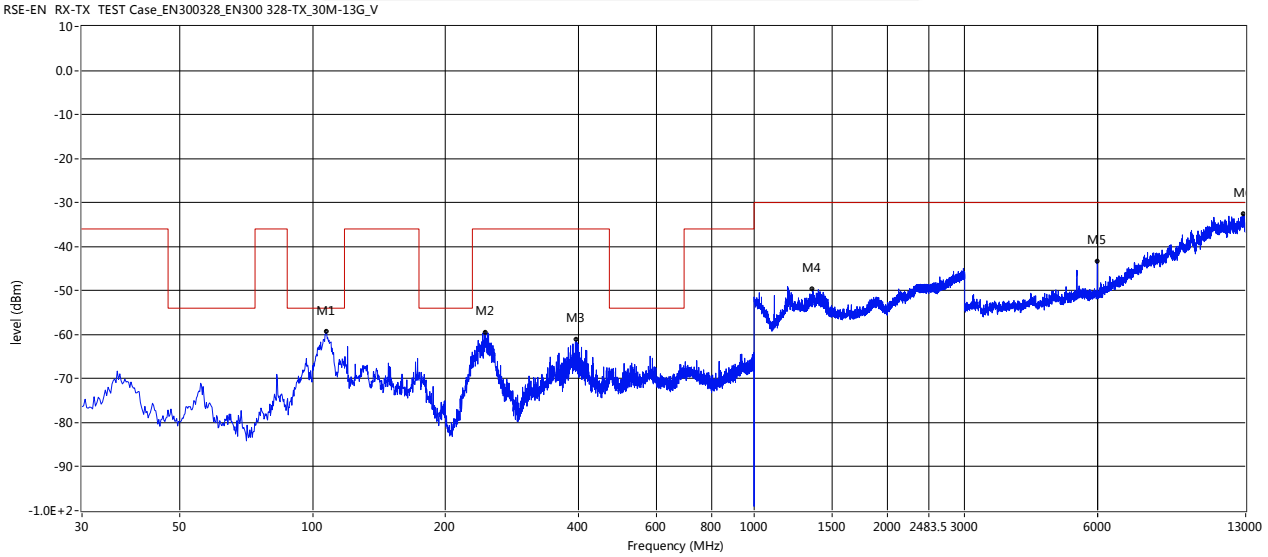
Radiated Emissions:

TX 802.11 b/2412MHz

Horizontal

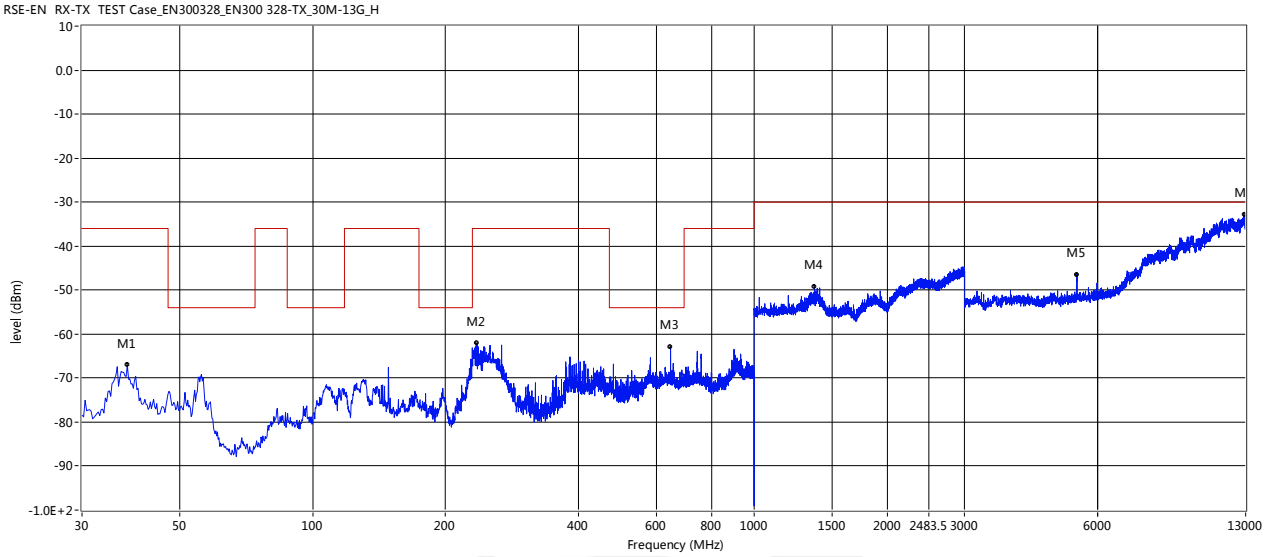


Vertical

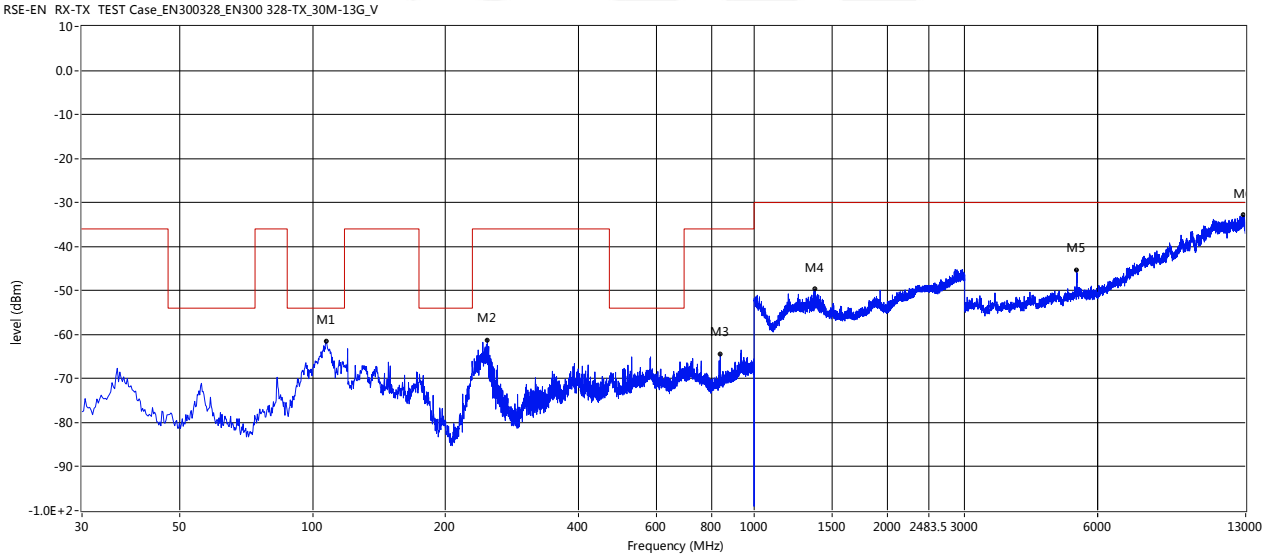


TX 802.11 b/2472MHz

Horizontal



Vertical



9. SPURIOUS EMISSIONS – RECEIVER

9.1 LIMIT

Clause	Test Item	Frequency(MHz)	Limit
4.3.2.10.3	Spurious emissions (radiated)	30-1000	-57dBm
		1000-12750	-47dBm

9.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.10.2 for the measurement method.

The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	⩾ 19 400 (Set as 20000)	⩾ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. For 30~12750MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. .
d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
e. Replace the EUT by standard antenna and feed the RF port by signal generator.
f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
i. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
j. EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.

9.3 TEST SETUP

This test setup layout is the same as that shown in section 8.4

9.4 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously receiving mode.

9.5 TEST RESULTS

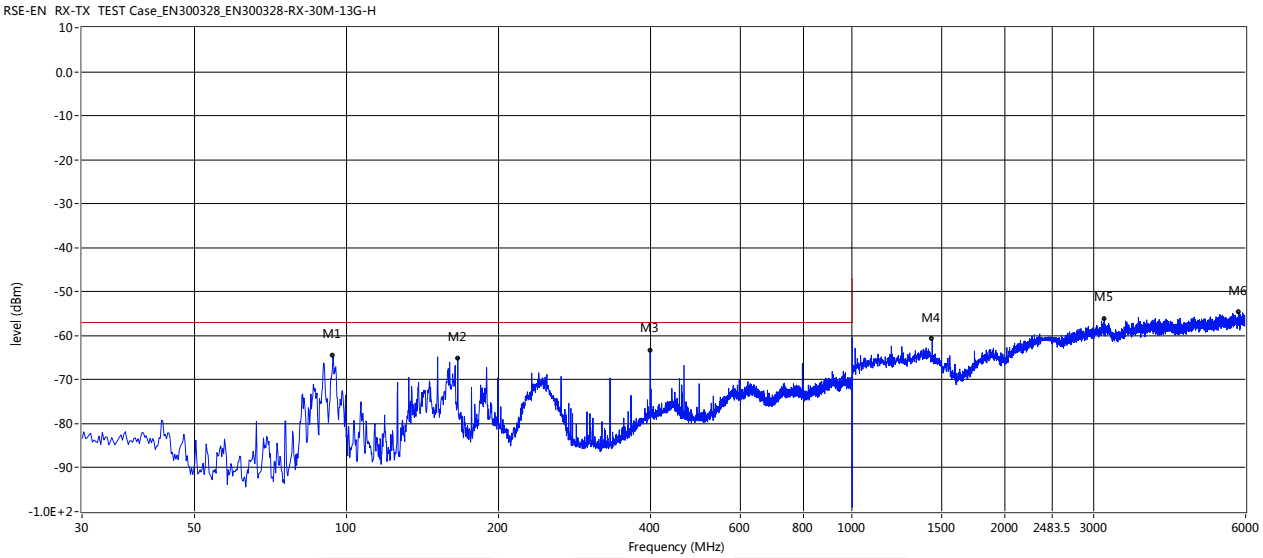
Remark: The all data rate modes had been test, but only worse test data was recorded in the test report.

External Antenna

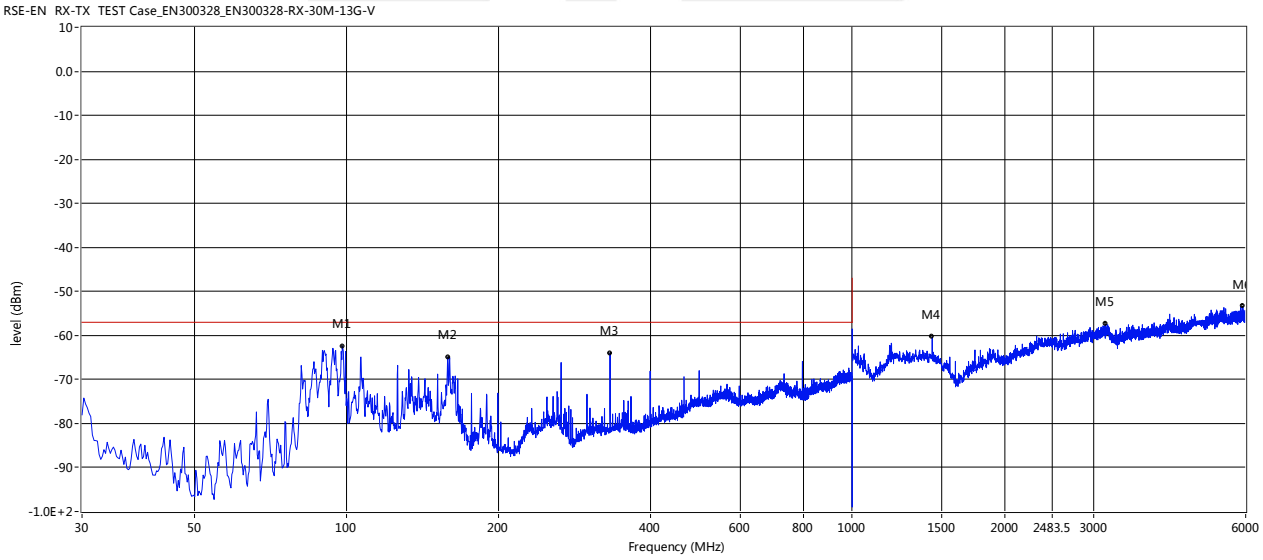
Radiated Emissions:

RX

Horizontal



Vertical

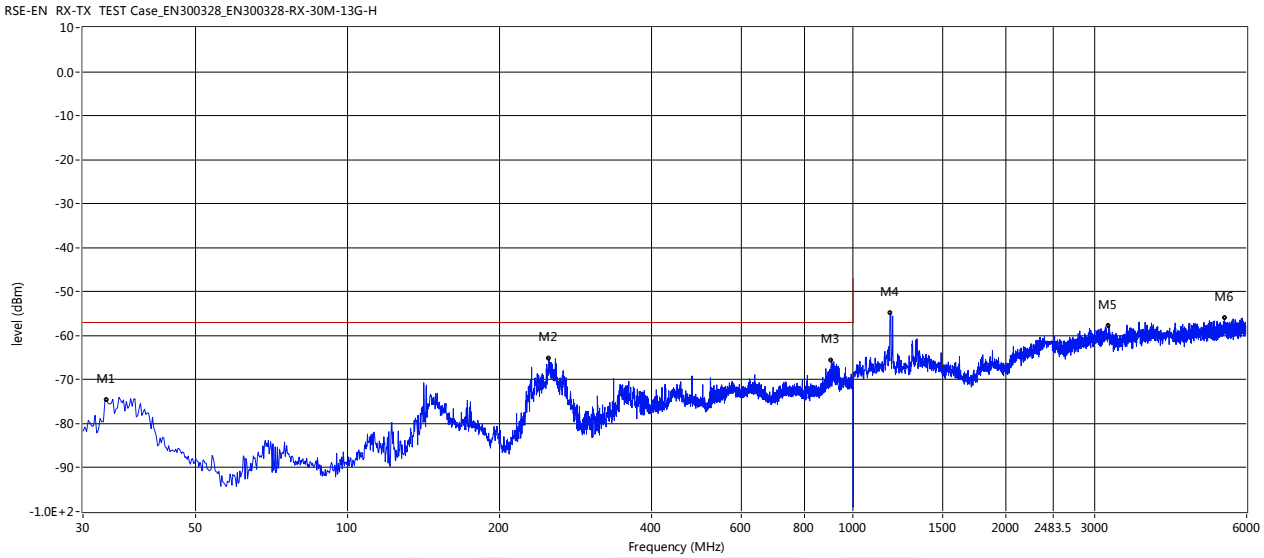


PCB Antenna

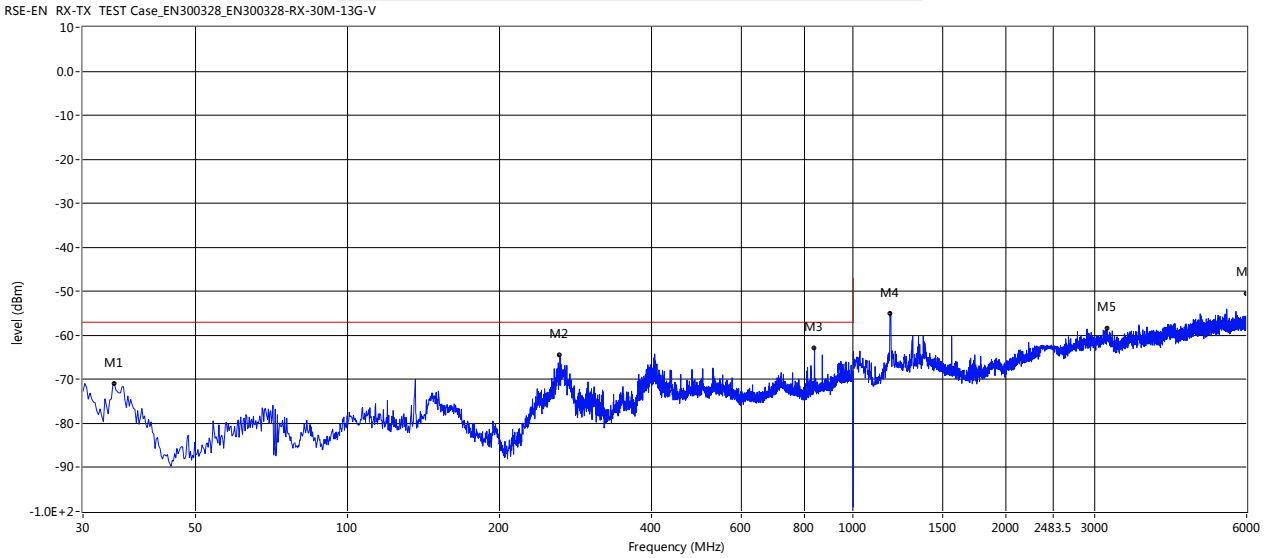
Radiated Emissions:

RX

Horizontal



Vertical



10. RECEIVER BLOCKING

10.1 LIMIT

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, 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 6, table 7 or table 8.

Receiver Category 1

Table 6: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 2

Table 7: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log10(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 3

Table 8: Receiver Blocking parameters receiver Category 3 equipment

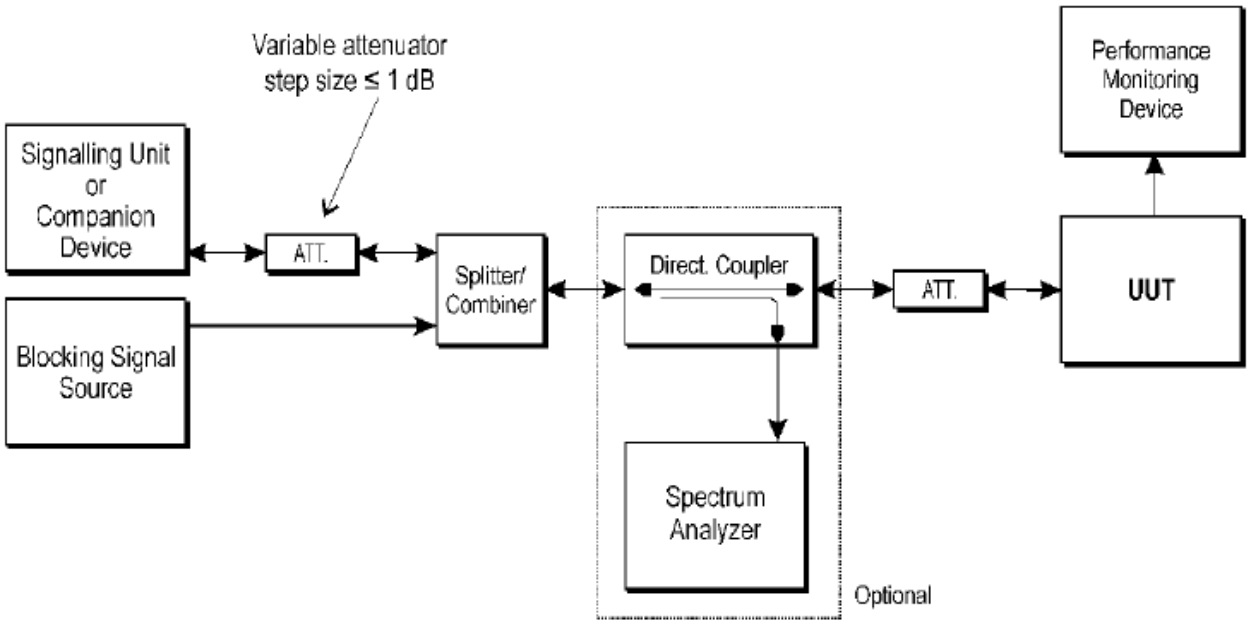
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking Signal
(-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

10.2 TEST PROCEDURES

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.11.1 for the test conditions.

2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.11.2 for the measurement method.

10.3 TEST SETUP



10.4 TEST RESULTS

External Antenna

Note: 1. The power more than 10dBm, belong to category 1.
2. Measurement of smallest channel bandwidth and the lowest rate according to EN 300328 V2.2.2, section 5.4.11.1, so, 40MHz mode is not measured.

802.11b, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-68	Low	2380	-34	0.39%	⩽ 10%	PASS
	High	2504		0.45%		
-74	Low	2300		0.38%		
		2330		0.71%		
		2360		0.22%		
	High	2524		0.52%		
		2584		0.25%		
		2674		0.31%		

NOTE 1: OCBW is 14711000Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

802.11g, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-68	Low	2380	-34	0.48%	⩽ 10%	PASS
	High	2504		0.66%		
-74	Low	2300		0.53%		
		2330		0.75%		
		2360		0.25%		
	High	2524		0.31%		
		2584		0.50%		
		2674		0.53%		

NOTE 1: OCBW is 16565000Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

802.11n20, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-68	Low	2380	-34	0.41%	⩽ 10%	PASS
	High	2504		0.33%		
-74	Low	2300		0.47%		
		2330		0.21%		
		2360		0.33%		
	High	2524		0.37%		
		2584		0.75%		
		2674		0.53%		

NOTE 1: OCBW is 17753000Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

PCB Antenna

Note: 1. 802.11b power more than 10dBm, belong to category 1.802.11g. 802.11n(HT20), 802.11n(HT40) power more than 0dBm, less than 10dBm, belong to category 2.
2. Measurement of smallest channel bandwidth and the lowest rate according to EN 300328 V2.1.1, section 5.4.11.1, so, 40MHz mode is not measured.

802.11b, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-68	Low	2380	-34	0.46%	⩽ 10%	PASS
	High	2504		0.57%		
-74	Low	2300		0.33%		
		2330		0.68%		
		2360		0.10%		
	High	2524		0.59%		
		2584		0.38%		
		2674		0.23%		

NOTE 1: OCBW is 14441000Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

802.11g, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-68	Low	2380	-34	0.43%	⩽ 10%	PASS
	High	2504		0.73%		
-74	Low	2300		0.38%		
		2330		0.65%		
		2360		0.22%		
	High	2524		0.30%		
		2584		0.61%		
		2674		0.53%		

NOTE 1: OCBW is 16675000Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

802.11n20, 2412MHz

Wanted signal mean power from companion device (dBm)	Test Channel	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER	Limit	Results
-66.49	Low	2300	-34	0.31%	⩽ 10%	PASS
		2380		0.20%		
	High	2504		0.34%		
		2584		0.32%		

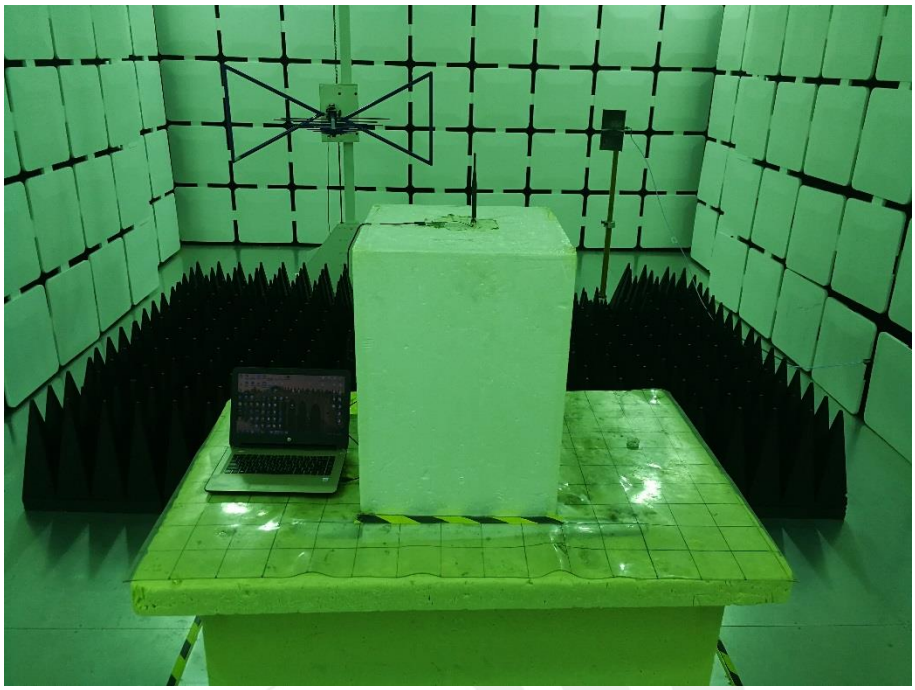
NOTE 1: OCBW is 1782900Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

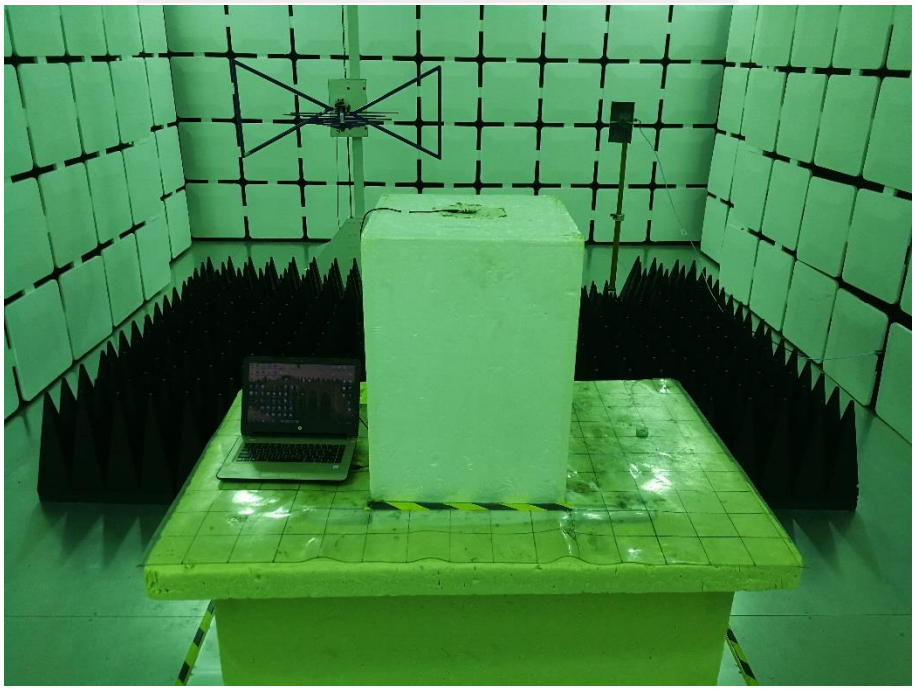
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Test Setup Photos

External Antenna



PCB Antenna



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