RF Test Report

Report No.: AGC09377170502EE05

PRODUCT DESIGNATION	:	Tablet PC
BRAND NAME	:	Vonino
MODEL NAME	:	Navo S
CLIENT	:	Vonino Electronics (HK) Limited
DATE OF ISSUE	:	May. 10, 2017
STANDARD(S)	:	EN 300 328 V1.9.1 (2015-02)
REPORT VERSION		V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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No.16 E

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May. 10, 2017	Valid	Re-certification Report

Note: The report of the model (Navo S) is based on the original report- No. AGC06327160802EE05, which was named after (K701X), with some changed basic information. The Tablet PC shut down the function of Bluetooth by software. All the test data is refer to the original report.

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1. TEST REPORT CERTIFICATION

Applicant	Vonino Electronics (HK) Limited
Address	#1109, 11/F, Kowloon Center 33 Ashley Road , Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer	Vonino Electronics (HK) Limited
Address	#1109, 11/F, Kowloon Center 33 Ashley Road , Tsim Sha Tsui, Kowloon, Hong Kong
Product Designation	Tablet PC
Brand Name	Vonino
Test Model	Navo S
Date of test	Aug.09,2016 to Aug.17,2016
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-EC-BGN/RF

We, Attestation of Global Compliance (Shenzhen) Co., Ltd., for compliance with the requirements set forth in the European Standard ETSI EN 300 328 V1.9.1. The results of testing in this report apply to the product /system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By	Dota Zhang	
	Dota Zhang(Zhang Jianfeng)	Aug.17,2016
Reviewed By	Bart Xie	
	Bart Xie(Xie Xiaobin)	May. 10, 2017
Approved By	Solger Zhang	
	Solger Zhang(Zhang Hongyi) Authorized Officer	May. 10, 2017

2. GENERAL INFORMATION

2.1. DESCRIPTION OF EUT

Note: the following data is based on the information by the applicant.

Hardware Version	YK86VS-3126-816-V1.0	
Software Version	vonino_v1.1.0_20170328	
Operating Frequency	2.412 GHz～2.472GHz	
Support Channels	13 Channels (IEEE802.11b/g/n)	
Modulation	CCK,OFDM,BPSK,GPSK,16-QAM,64-QAM	
Adaptive / non-adaptive equipment	Adaptive Equipment	
Antenna Type	PIFA antenna	
Antenna Gain	0.7dBi	
Power Supply	Normal Voltage: DC 3.7V	
Channels Frequency	01: 2412MHZ 02: 2417MHZ 03: 2422MHZ 04: 2427MHZ 05: 2432MHZ 06: 2437MHZ 07: 2442MHZ	08: 2447MHZ 09: 2452MHZ 10: 2457MHZ 11: 2462MHZ 12: 2467MHZ 13: 2472MHZ

Note:

1. For 802.11b, 802.11g, 802.11n 20MHZ bandwidth system use Channel 1 to Channel 13.
2. For 802.11n 40MHZ bandwidth system use Channel 3 to Channel 11.
3. Please refer to Appendix Ⅰ for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.

2.2. OBJECTIVE

Perform Radio Spectrum tests for CE Marking according to the provisions of article 3.2 of the R&TTE Directive (1999/5/EC) for the Bluetooth function of the EUT.

2.3. TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 300 328 V1.9.1

ETSI EN 300 328 V1.9.1 (2015-02)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques: Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

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2.4. TEST ITEMS AND THE RESULTS

No.	Basic Standard	Test Type	Result
1	ETSI EN 300 328 4.3.2.2	RF Output Power	Pass
2	ETSI EN 300 328 4.3.2.3	Power Spectral Density	Pass
3	ETSI EN 300 328 4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A
4	ETSI EN 300 328 4.3.2.4	Medium Utilisation(MU) factor	N/A
5	ETSI EN 300 328 4.3.2.6	Adaptivity	Pass
6	ETSI EN 300 328 4.3.2.7	Occupied Channel Bandwidth	Pass
7	ETSI EN 300 328 4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Pass
8	ETSI EN 300 328 4.3.2.9	Transmitter unwanted emissions in the spurious domain	Pass
9	ETSI EN 300 328 4.3.2.10	Receiver spurious emissions	Pass
10	ETSI EN 300 328 4.3.2.11	Receiver Blocking	Pass
12	ETSI EN 300328 4.3.1.13	Geo-location capability	N/A

Note:
1. N/A- Not Applicable.
2. The latest versions of basic standards are applied.

2.5. ENVIRONMENTAL CONDITIONS

- Temperature: -20-55ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

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3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Radio Frequency, Uc=±1 x 10-7
- Uncertainty of total RF power, conducted, Uc = ±0.8dB
- Uncertainty of RF power density, conducted, Uc = ±2.6dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of spurious emissions, radiated, Uc = ±5.4dB
- Uncertainty of Temperature: ±0.5˚C
- Uncertainty of Humidity: ±1 %
- Uncertainty of DC and low frequency voltages: ±2%

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4. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Company Name:	Attestation of Global Compliance (Shenzhen) Co., Ltd.
Address 1:	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
Address 2:	B112-B113, Building 12, Baoan Building Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen, Guangdong, P.R.China

List of Equipments Used

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
SIGNAL ANALYZER	Agilent	N9020A	MY49100060	Nov.09,2015	Nov.08,2016
SIGNAL GENERATOR	Agilent	N5182A	MY50140530	Oct.16, 2015	Oct.15,2016
SIGNAL GENERATOR	Agilent	E8257D	MY45141029	Oct.16, 2015	Oct.15,2016
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Oct.16, 2015	Oct. 15,2016
USB Wideband Power Sensor	Agilent	U2021XA	MY54110009	Oct.16, 2015	Oct.15,2016
USB Wideband Power Sensor	Agilent	U2021XA	MY54110014	Oct.16, 2015	Oct.15,2016
USB Wideband Power Sensor	Agilent	U2021XA	MY54110012	Oct.16, 2015	Oct.15,2016
USB Simultaneous Sampling Multifunction DAQ	Agilent	U2531A	MY5211038	Oct.16, 2015	Oct.15,2016
2.4 GHz Filter	Micro-Tronics	BRM50702	017	Mar.01,2016	Feb.28,2017
VECTOR ANALYZER	Agilent	E4440A	MY44303916	July 02, 2016	July 01,2017
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-492	Mar.01, 2016	Feb.28,2017
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-494	Mar.12,2016	Mar.11,2017
Amplifier	EM	EM30180	060552	Feb.29,2016	Feb.28,2017
Horn Antenna	EM	EM-AH-10180	67	Mar.01,2016	Feb.28,2017

5. ETSI EN 300 328 REQUIREMENTS

5.1. RF OUTPUT POWER

5.1.1 LIMIT

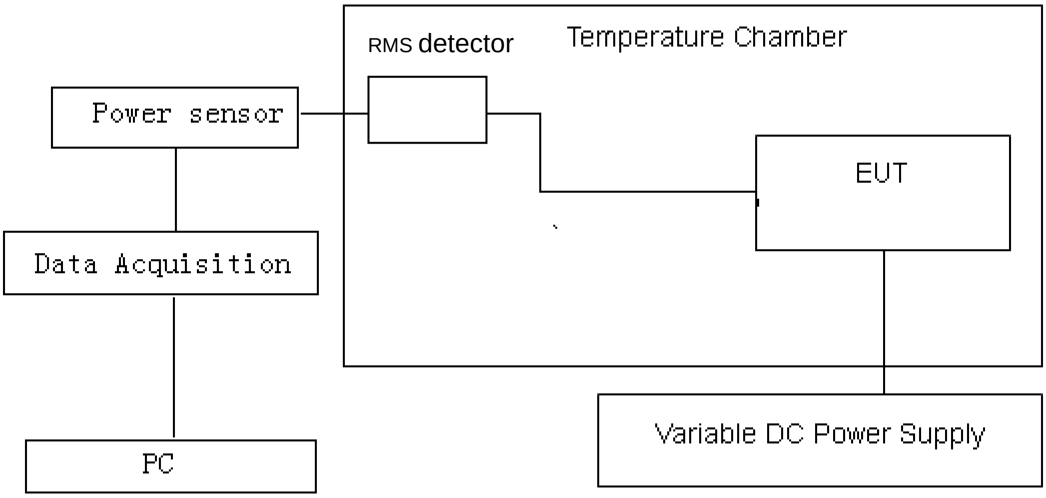
RF Output Power <= 100mW (20dBm) over Normal and Extreme conditions.

5.1.2 MEASUREMENT PROCEDURE

1) Use a fast power sensor and set the samples speed 1MS/s or faster.
2) Connect one power sensor to each transmit port, Trigger the power sensors so that they start sampling at the same time. For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.
3) Find the start and stop times of each burst in the stored measurement samples.
4) Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these Pburst values, as well as the start and stop times for each burst.
5) The highest of all Pburst values (Value “A” in dBm) will be used for maximum e.i.r.p calculations.
6) The cable loss and attenuator factor shall be considered to the value “A”.
6) Add the (stated) antenna assembly gain “G” in dBi of the individual antenna. If applicable, add the additional beamforming gain “Y” in dB.
7) The RF output power (P) shall be calculated using the formula: P=A+G+Y

5.1.3 TEST CONFIGURATION

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



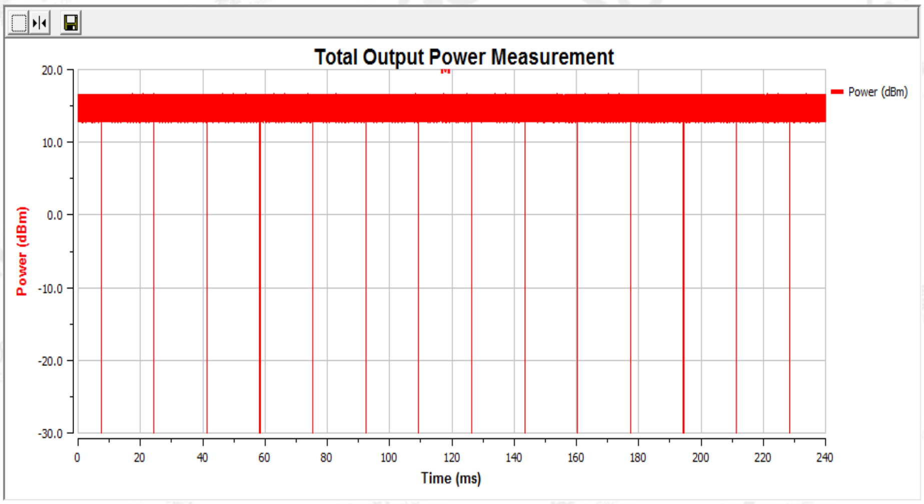
5.1.4 MEASUREMENT RESULTS

Operation Mode	Single TX	**Test Date**	Aug.17,2016
Temperature	23.6°C	**Tested by**	Dota
Humidity	50.1 % RH	**Polarity**	--
Antenna assembly Gain		= 0.7dBi	
Cable Loss		=1.0dB	
Beamforming gain		=0dB	
EIRP		= P+ Gain+Y	

TEST CONDITIONS		IEEE 802.11b TRANSMITTER POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER	DC 3.7V	DC 3.7V	DC 3.7V
CH 01	EIRP	**13.15**	12.94	12.91
CH 07	EIRP	**12.92**	12.64	12.69
CH 13	EIRP	12.24	**12.62**	12.27
Limit		20dBm		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		Only the worst case data is reported as below.		

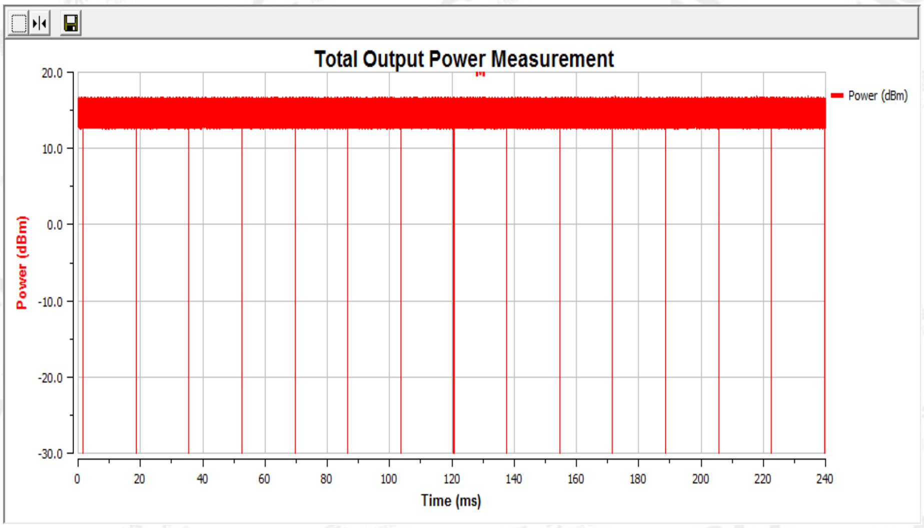
1*802.11 b:CH Low-2412: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Low-2412	Normal	12.45	13.15



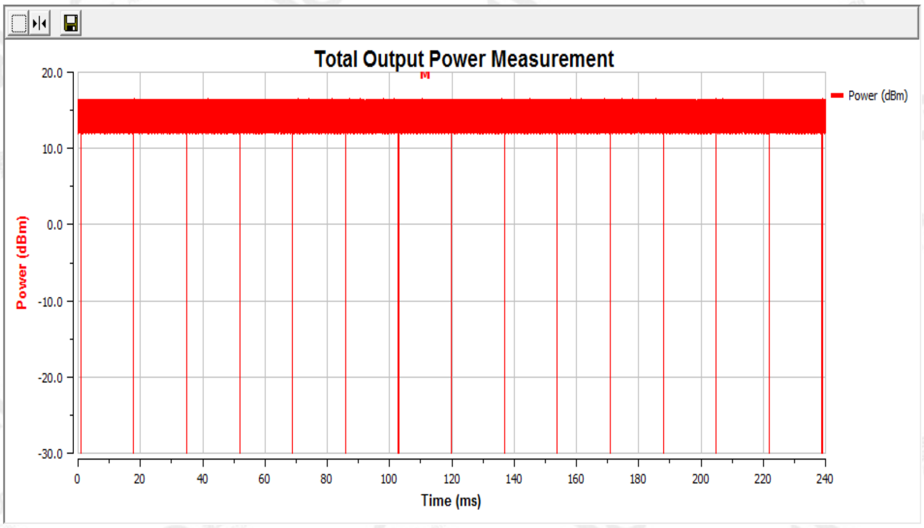
2*802.11 b:CH Mid-2442: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Mid-2442	Normal	12.22	12.92



3*802.11 b:CH High-2472: (Temp - Low)

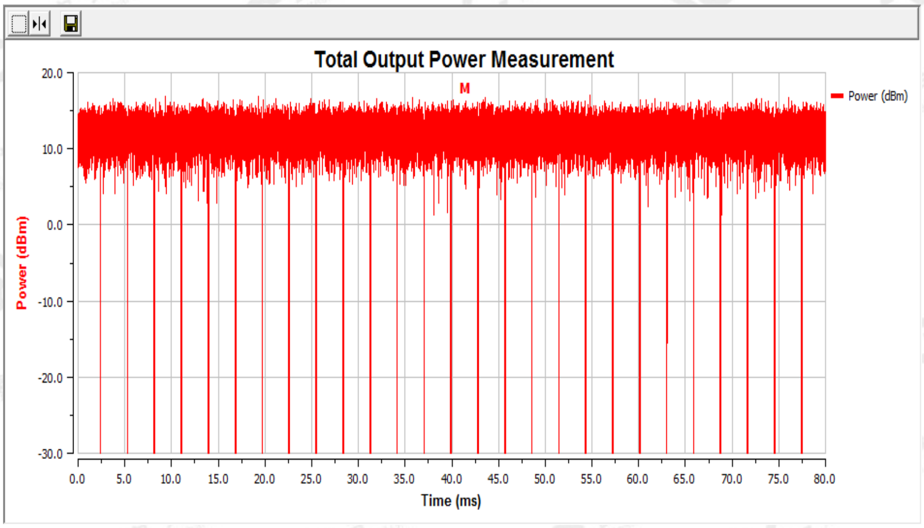
Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH High-2472	Normal	11.92	12.62



TEST CONDITIONS		IEEE 802.11g TRANSMITTER POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER	DC 3.7V	DC 3.7V	DC 3.7V
CH 01	EIRP	**10.62**	10.27	10.26
CH 07	EIRP	**10.98**	10.69	10.73
CH 13	EIRP	10.48	**10.81**	10.44
Limit		20dBm		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		Only the worst case data is reported as below.		

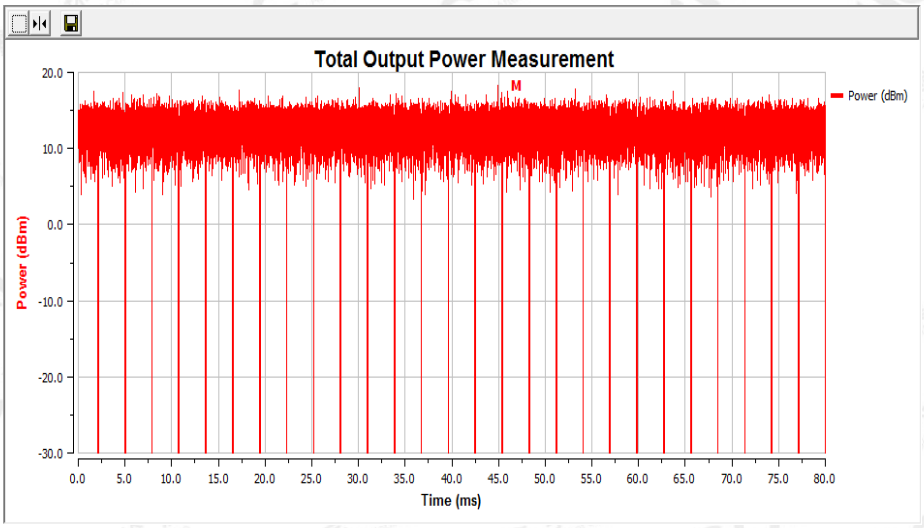
4*802.11 g:CH Low-2412: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Low-2412	Normal	9.92	10.62



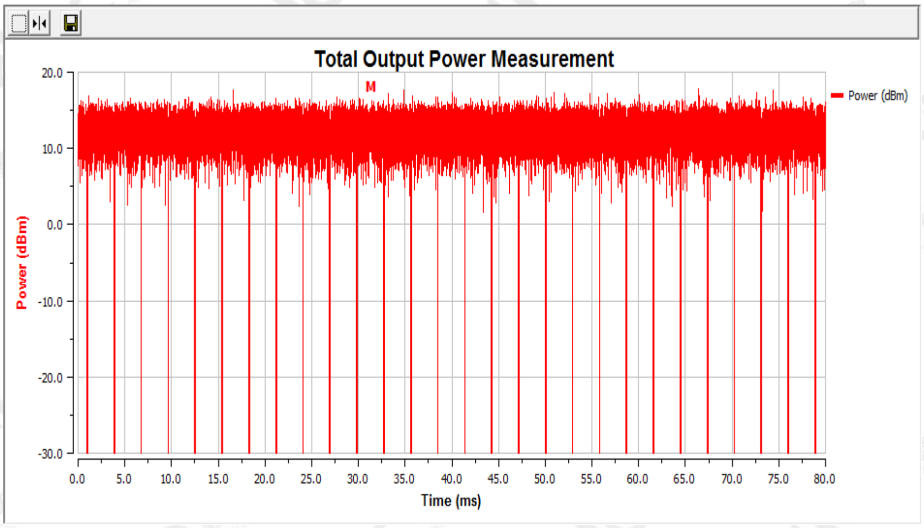
5*802.11 g:CH Mid-2442: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Mid-2442	Normal	10.28	10.98



6*802.11 g:CH High-2472: (Temp - Low)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH High-2472	Normal	10.11	10.81



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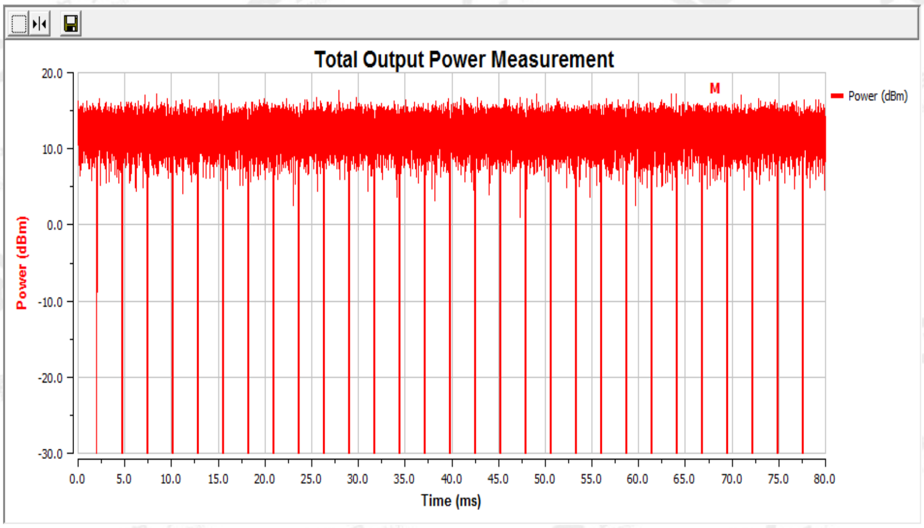
TEST CONDITIONS		IEEE 802.11n(20) TRANSMITTER POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER	DC 3.7V	DC 3.7V	DC 3.7V
CH 01	EIRP	**10.68**	10.27	10.35
CH 07	EIRP	**10.98**	10.66	10.63
CH 13	EIRP	10.38	10.41	**10.72**
Limit		20dBm		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		Only the worst case data is reported as below.		

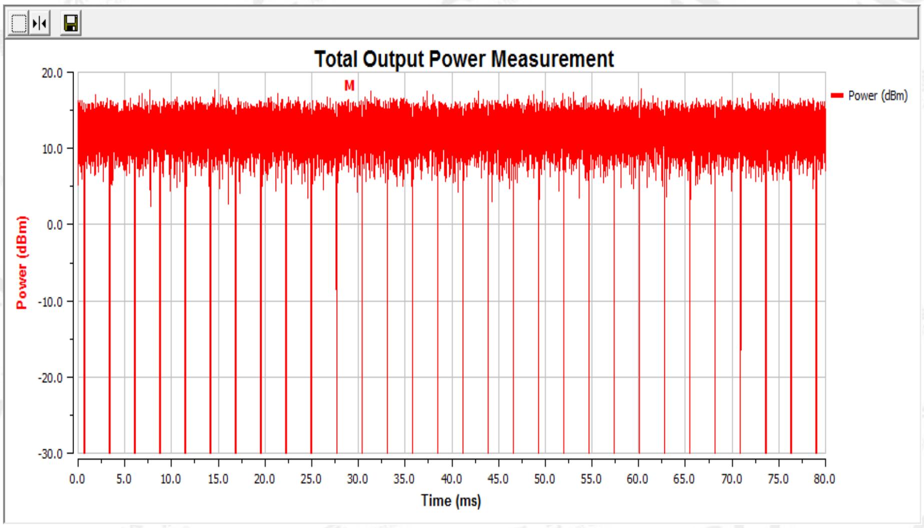
7*802.11 n20:CH Low-2412: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Low-2412	Normal	9.98	10.68



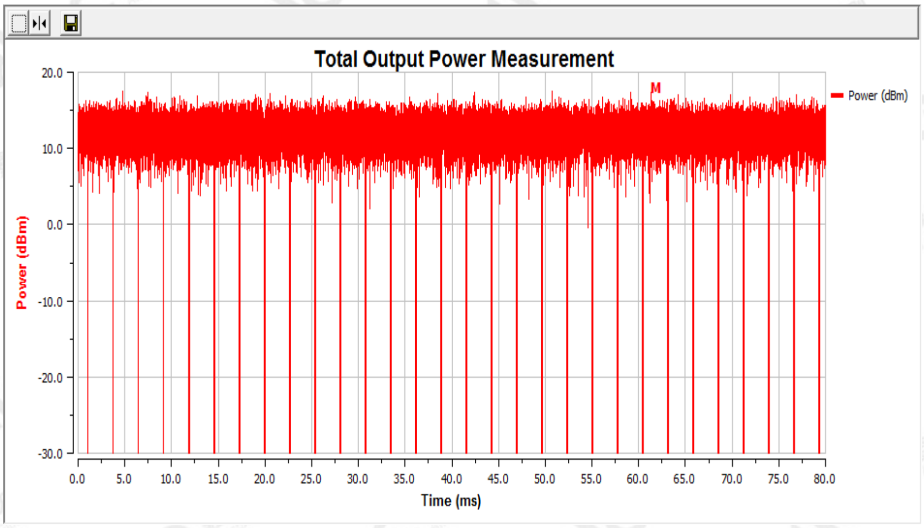
8*802.11 n20:CH Mid-2442: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Mid-2442	Normal	10.28	10.98



9*802.11 n20:CH High-2472: (Temp - High)

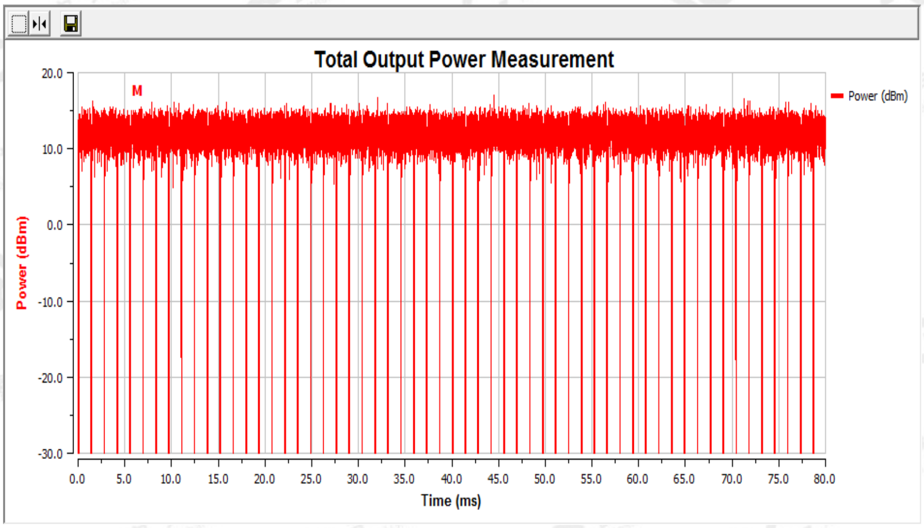
Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH High-2472	Normal	10.02	10.72



TEST CONDITIONS		IEEE 802.11n(40) TRANSMITTER POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER	DC 3.7V	DC 3.7V	DC 3.7V
CH 03	EIRP	**9.43**	9.12	9.15
CH 07	EIRP	**9.62**	9.24	9.27
CH 11	EIRP	**9.35**	9.04	9.06
Limit		20dBm		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		Only the worst case data is reported as below.		

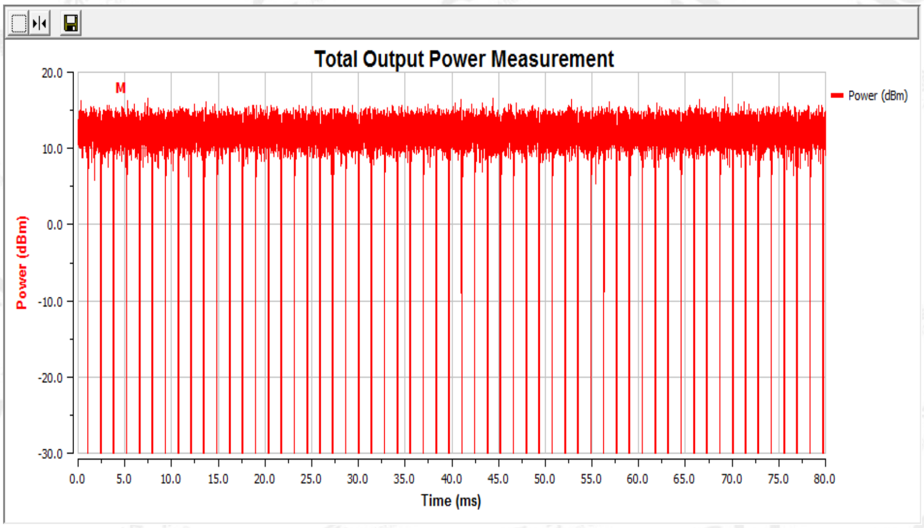
10*802.11 n40:CH Low-2422: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Low-2422	Normal	8.73	9.43



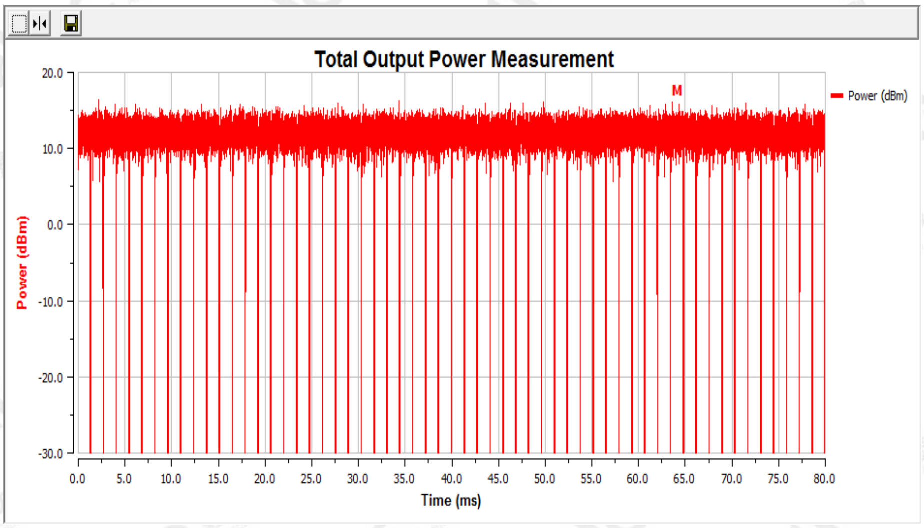
11*802.11 n40:CH Mid-2442: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH Mid-2442	Normal	8.92	9.62



12*802.11 n40:CH High-2462: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
CH High-2462	Normal	8.65	9.35



Conclusion: PASS

5.2. POWER SPECTRAL DENSITY

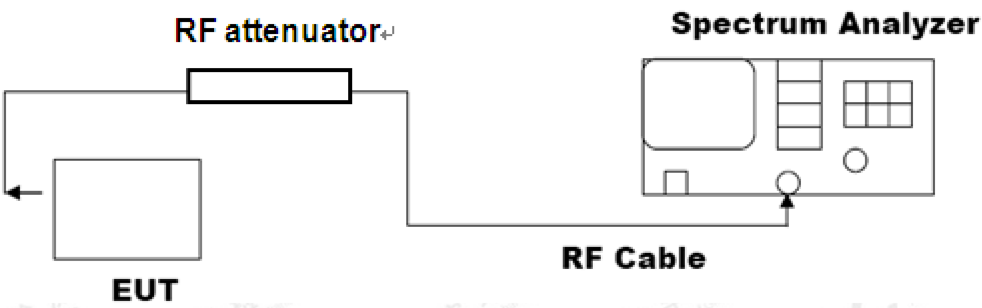
5.2.1 LIMIT

For non-adaptive equipment using wide band modulations other than FHSS, The maximum Power spectral density is limited to 10mW Per MHz

5.2.2 TEST PROCEDURE

1) Set the frequency from 2400MHz to 2483.5MHz, use 10kHz RBW and 30kHz VBW for pre-scan. The number of sweep points shall be more than 8350. Wait for the trace to be completed and save the (trace) data set to a file.
2) Add up the values for amplitude (power) for all the samples in the file.
3) Normalize the individual values for amplitude so that the sum is equal to the RF Output Power(e.i.r.p) measured in 5.1.
4)Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1MHz 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 1MHz segment which shall be recorded.
5) Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 4(i.e. sample #2 to #101).
6) Repeat step 5 until the end of the data set and record the radiated power spectral Density values for each of the 1MHz segments.
7) The cable loss and attenuator factor shall be considered to the test result.
8) The highest value shall be recorded in the test report.

5.2.3 TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.3.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.3.2 for the measurement method.
3 The equipment setting as following

Start Frequency: 2 400 MHz

• Stop Frequency: 2 483,5 MHz

• Resolution BW: 10 kHz

• Video BW: 30 kHz

• Sweep Points: >8350

Detector: RMS

• Trace Mode: Max Hold

• Sweep time: 10s

5.2.4 TEST RESULTS

IEEE 802.11b Power Spectral Density			
Channel Tested	**Power Density (dBm/MHz)**	**Test Limit (dBm/MHz)**	**Pass / Fail**
CH 01	4.46	10	Pass
CH 07	4.28	10	Pass
CH 13	4.29	10	Pass

IEEE 802.11g Power Spectral Density			
Channel Tested	**Power Density (dBm/MHz)**	**Test Limit (dBm/MHz)**	**Pass / Fail**
CH 01	0.41	10	Pass
CH 07	0.22	10	Pass
CH 13	0.49	10	Pass

IEEE 802.11n(20) Power Spectral Density			
Channel Tested	**Power Density (dBm/MHz)**	**Test Limit (dBm/MHz)**	**Pass / Fail**
CH 01	-0.62	10	Pass
CH 07	-0.40	10	Pass
CH 13	-0.46	10	Pass

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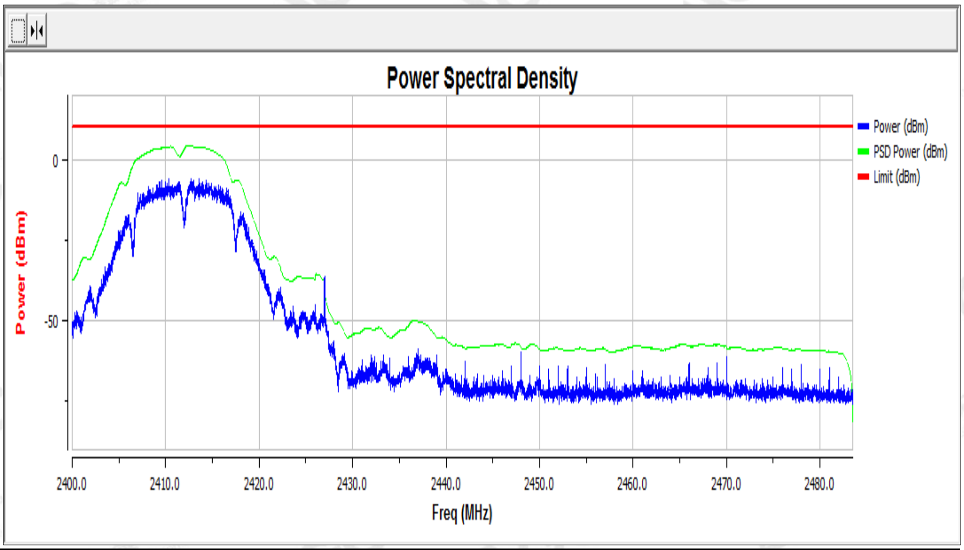
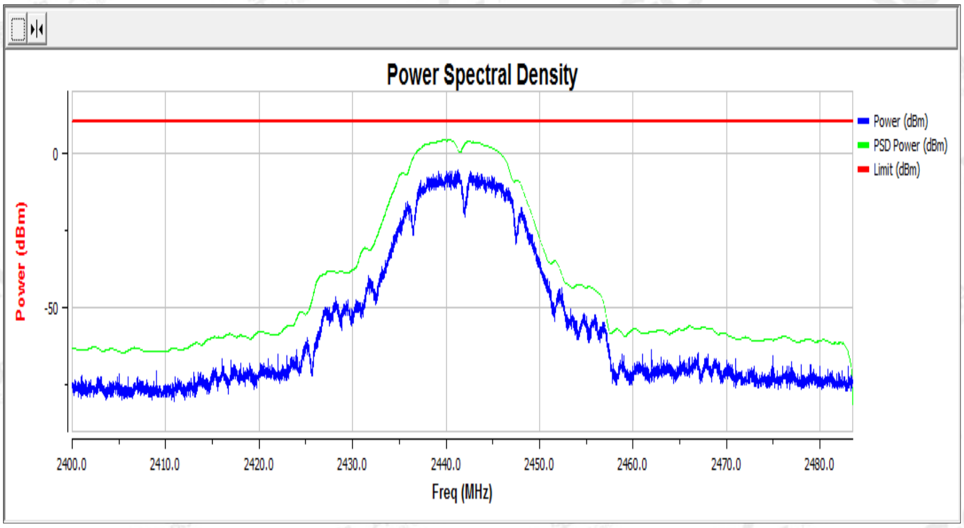
IEEE 802.11n(40) Power Spectral Density			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
CH 03	-3.32	10	Pass
CH 07	-3.87	10	Pass
CH 11	-4.13	10	Pass

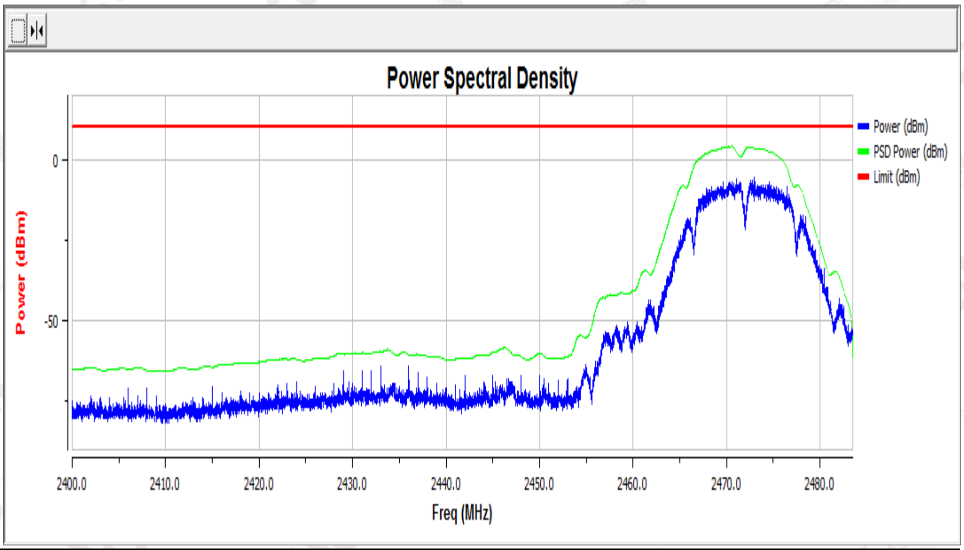
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Low-2412	4.46



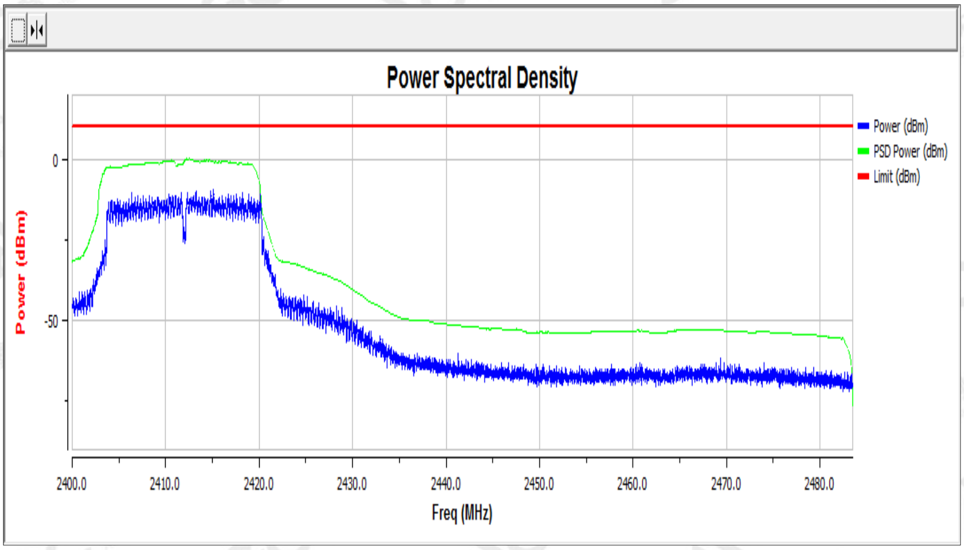
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Mid-2442	4.28



Channel	Max Power Spectral Density Level (dBm/MHz)
CH High-2472	4.29



Channel	Max Power Spectral Density Level (dBm/MHz)
CH Low-2412	0.41



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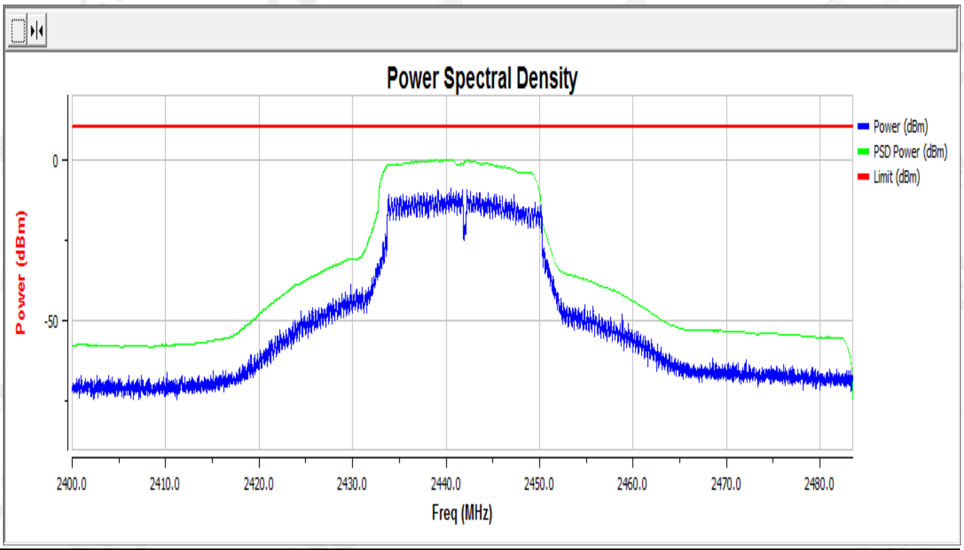
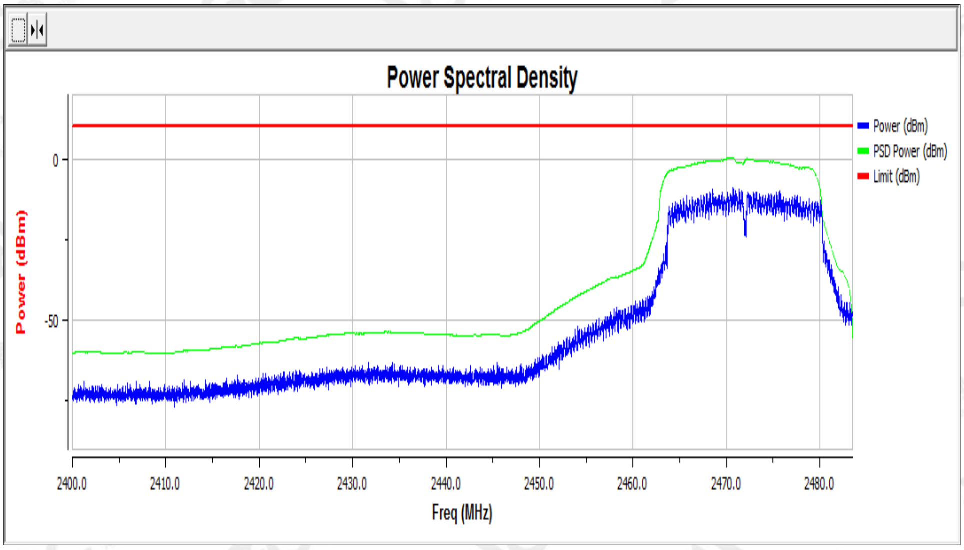
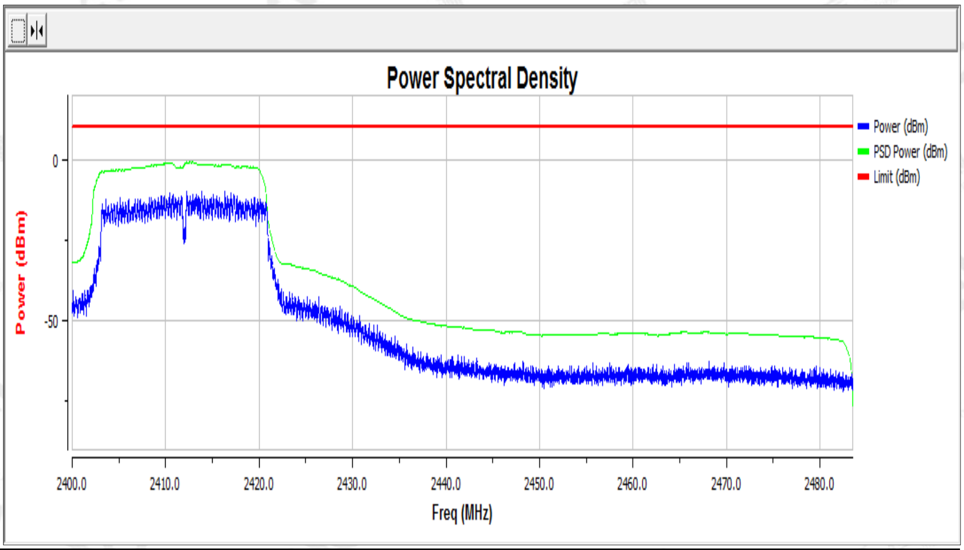
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Mid-2442	0.22



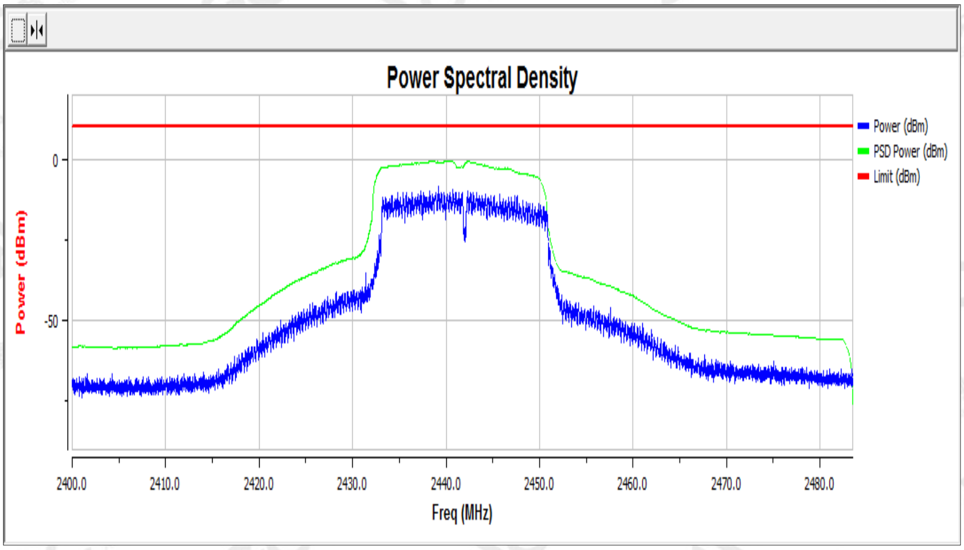
Channel	Max Power Spectral Density Level (dBm/MHz)
CH High-2472	0.49



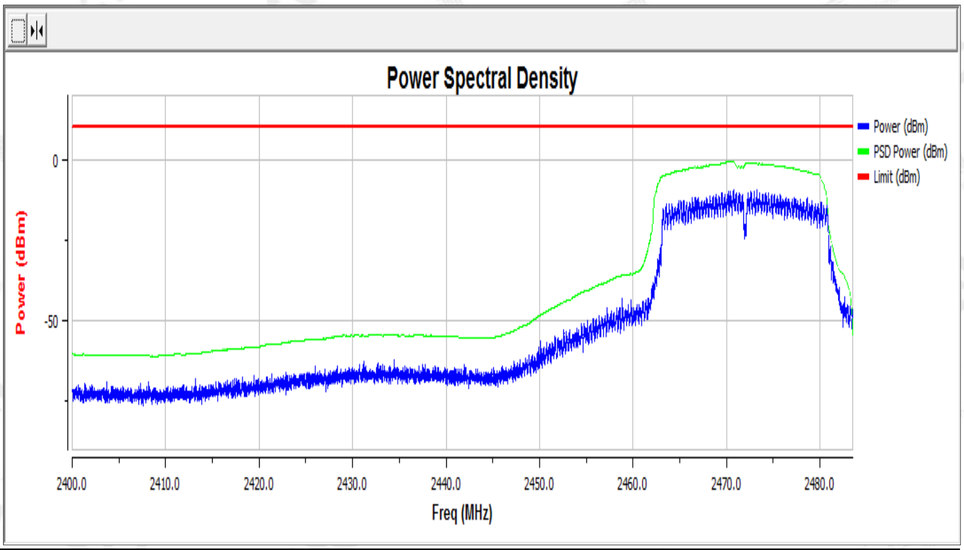
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Low-2412	-0.62



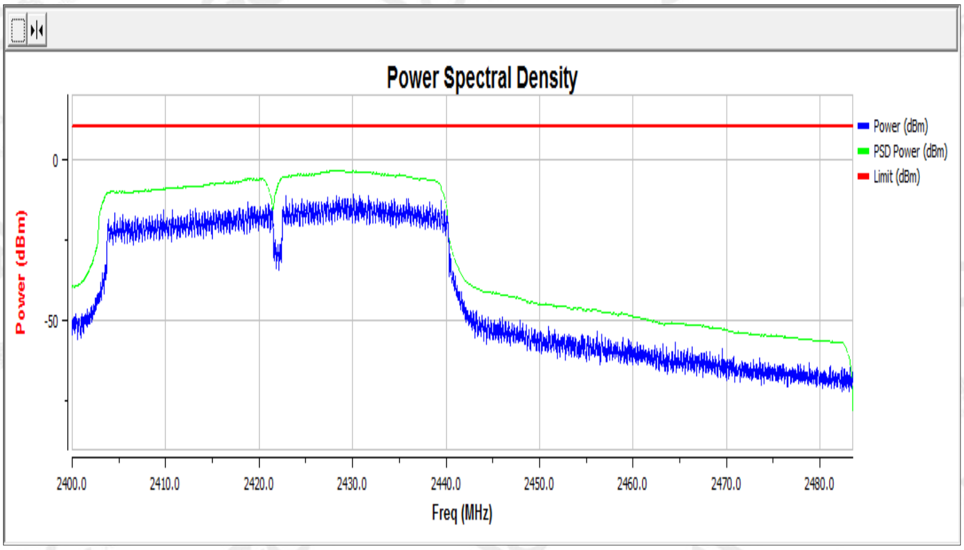
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Mid-2442	-0.40



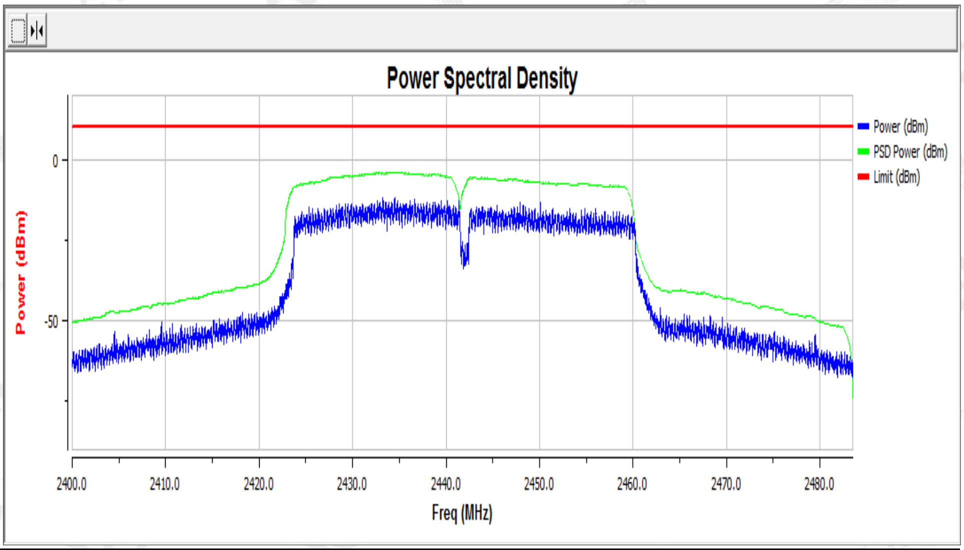
Channel	Max Power Spectral Density Level (dBm/MHz)
CH High-2472	-0.46



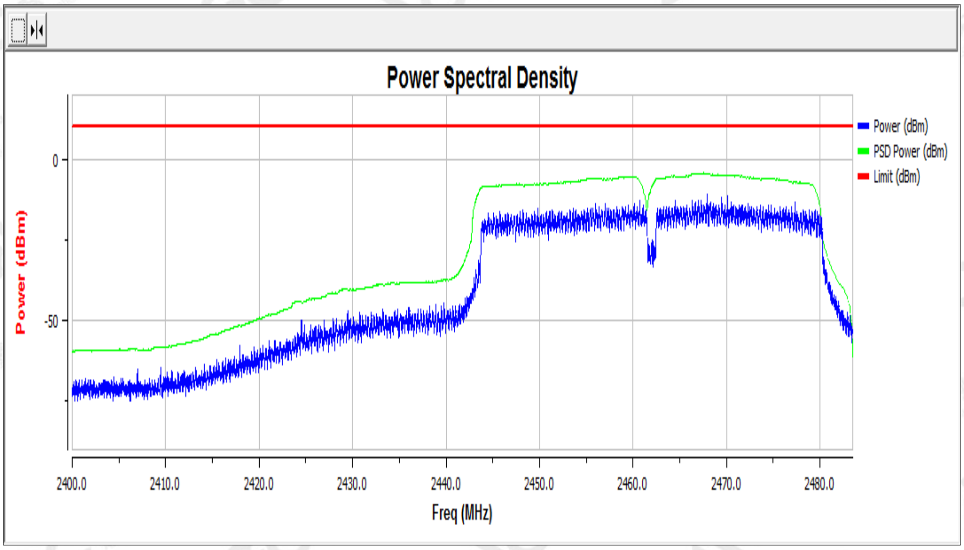
Channel	Max Power Spectral Density Level (dBm/MHz)
CH Low-2422	-3.32



Channel	Max Power Spectral Density Level (dBm/MHz)
CH Mid-2442	-3.87



Channel	Max Power Spectral Density Level (dBm/MHz)
CH High-2462	-4.13



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5.3. ADAPTIVITY AND RECEIVER BLOCKING

The method of adaptivity is using LBT based DAA

5.3.1 LIMIT

The Channel Occupancy Time shall be less than 13ms (the value of q equal to 32 which declared by manufacturer).

If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

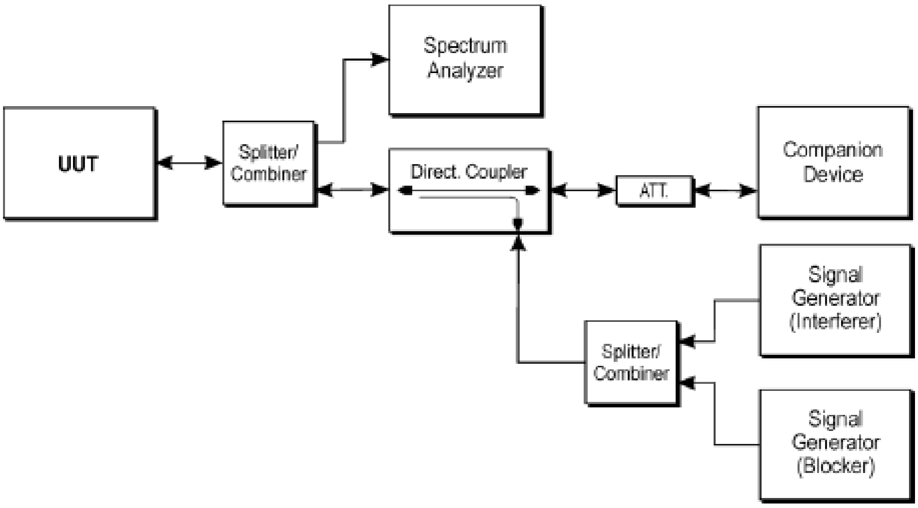
Table 6: Receiver Blocking parameters

Equipment Type (LBT / non- LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest blocking frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.3.7.1.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

5.3.2 TEST PROCEDURE

1) The EuT connect to a companion device during the test. Adjust the received signal level at the EuT to the value of -50dBm/MHz.
2) the analyzer shall be set as below: RBW>=Occupied Channel Bandwidth and VBW>=3×RBW.
3) Configure the EuT for normal transmission with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the channel being tested.
4) Adding the interference signal and blocking signal.
5) Record the data.

5.3.3 TEST CONFIGURATION



The analyser shall be set as follows:

- RBW: use next available RBW setting below the measured Occupied Channel Bandwidth
- Filter type: Channel Filter
- VBW: ≥ RBW
- 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

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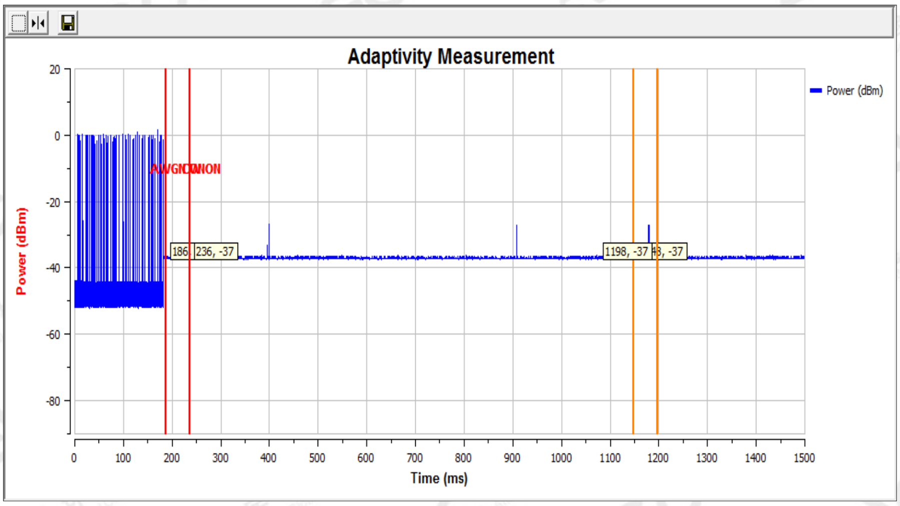
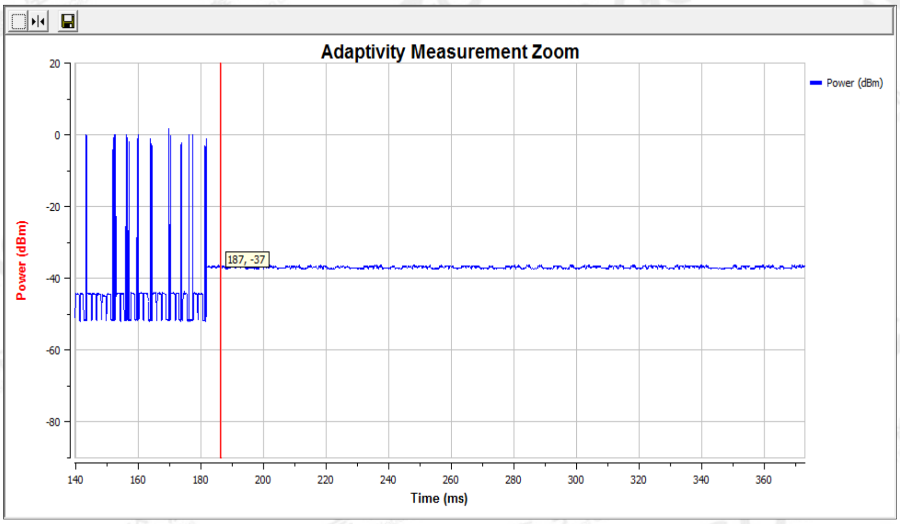
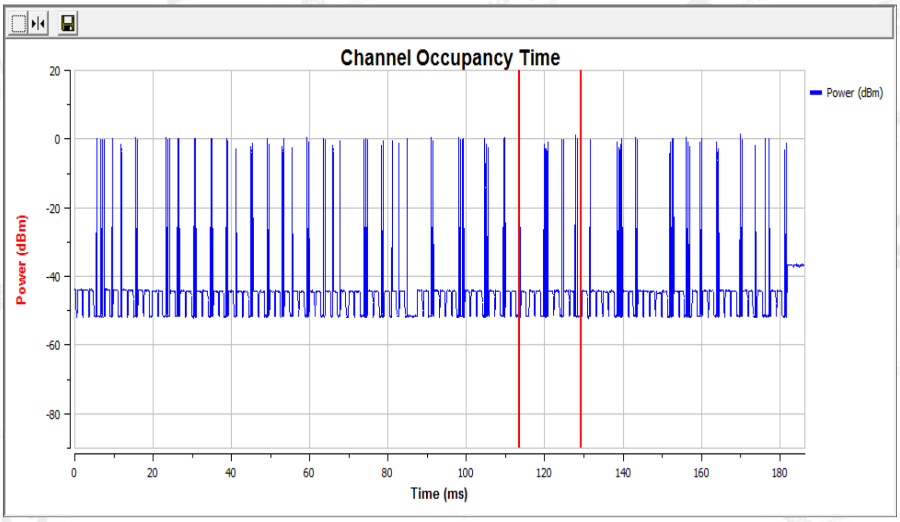
5.3.4 TEST RESULTS

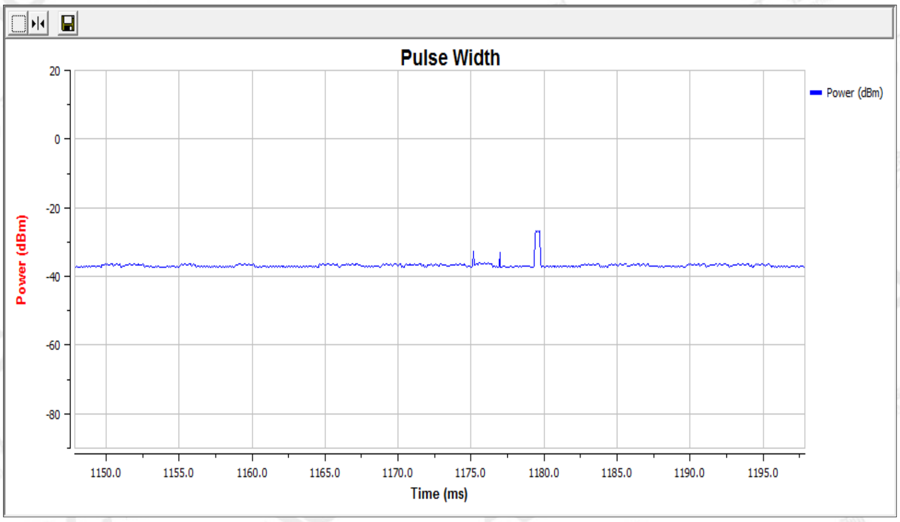
Test Channel	802.11b - 2412MHz
Threshold Level (dBm/MHz)	-63.15
Blocking Interference Level (dBm)	-35.00
Traffic Load	33.3%
Max COT (ms)	0.18
Idle Time (ms)	0.30
Pulse width (ms)	0.36
Duty Cycle (%)	0.72

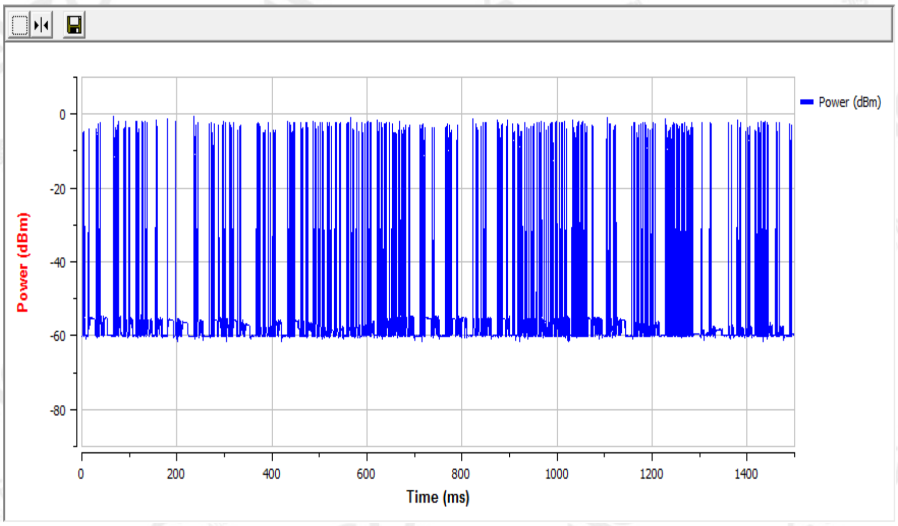
Note: 1)TL = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm)
2)The UUT does not resume any normal transmission when adding the blocking signal at the frequency of 2488.5MHZ.It is deemed to comply with the receiver bloking requirement











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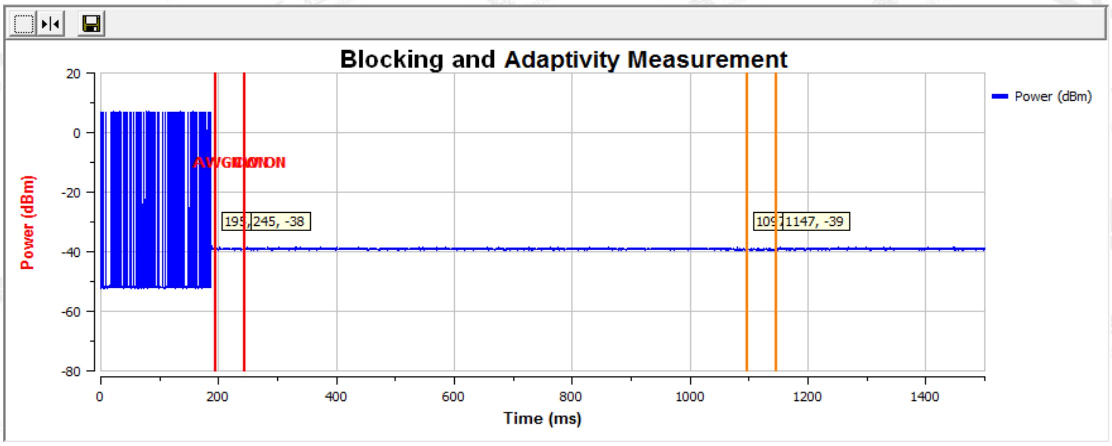
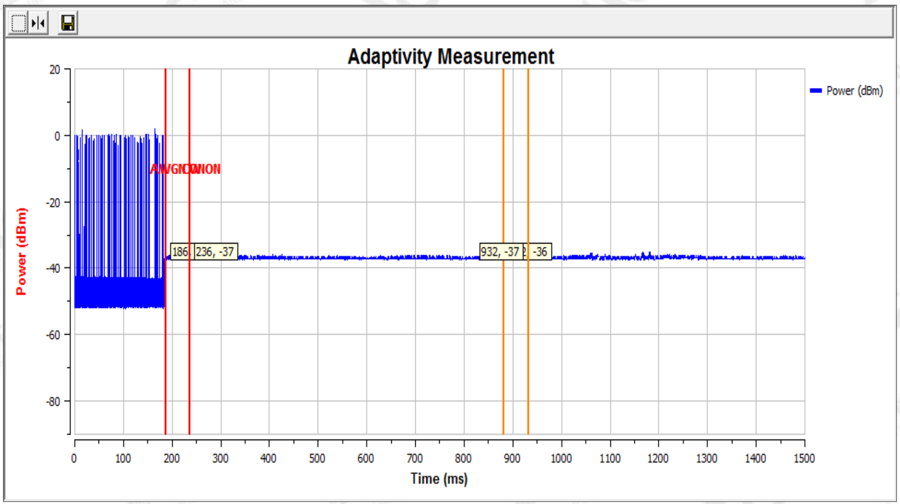
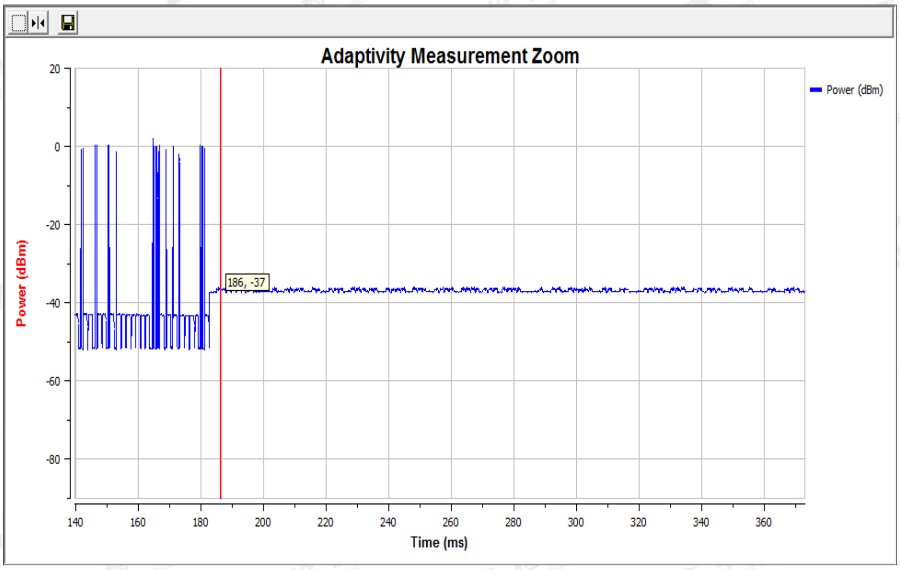
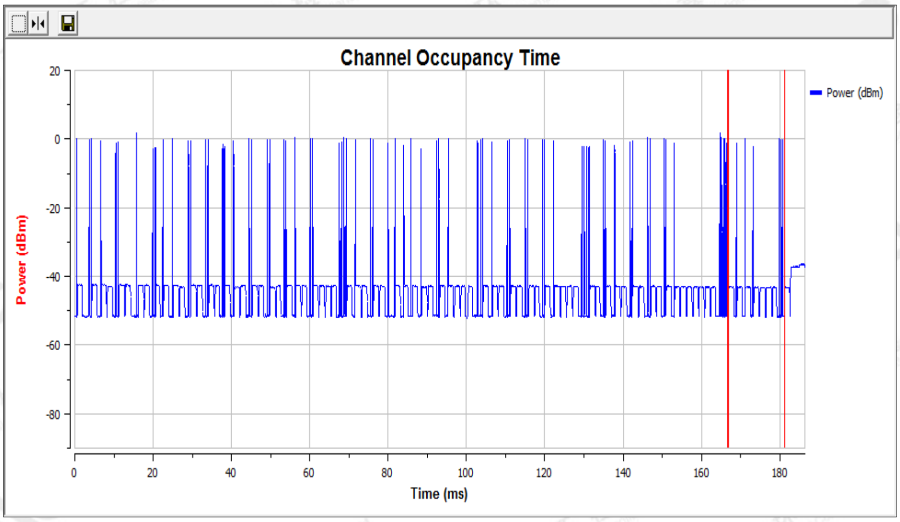


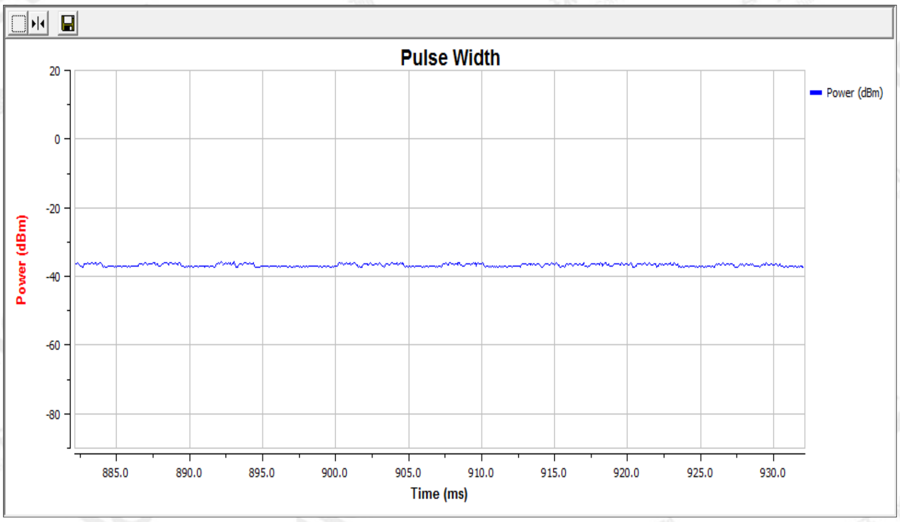
Test Channel	802.11b - 2472MHz
Threshold Level (dBm/MHz)	-62.62
Blocking Interference Level (dBm)	-35.00
Traffic Load	32.8%
Max COT (ms)	0.06
Idle Time (ms)	0.36
Pulse width (ms)	0
Duty Cycle (%)	0

Note: 1)TL = -70 dBm/MHz + (20 dBm - Pout e.i.r.p)/1 MHz (Pout in dBm)
2)The UUT does not resume any normal transmission when adding the blocking signal at the frequency of 2395MHZ.It is deemed to comply with the receiver bloking requirement









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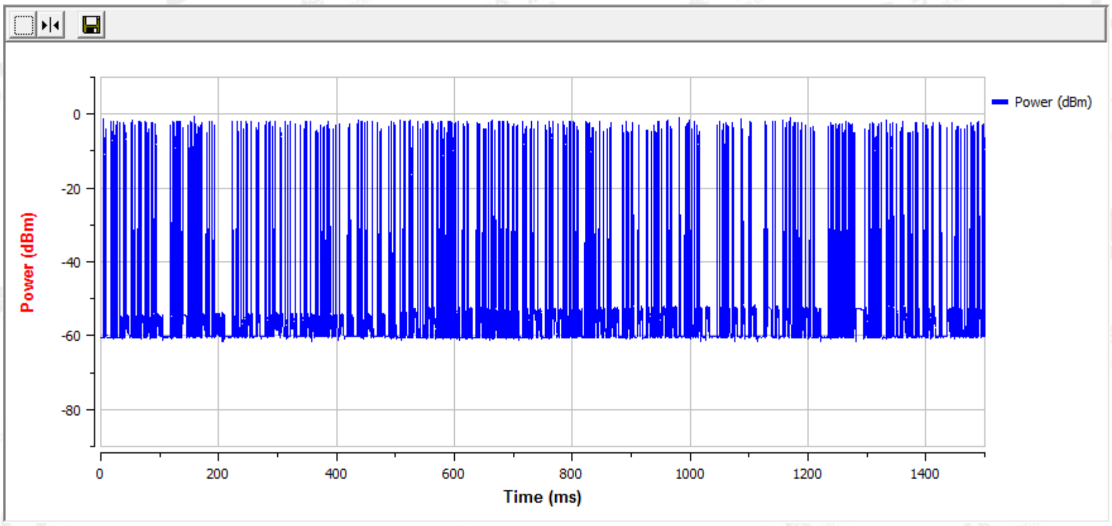
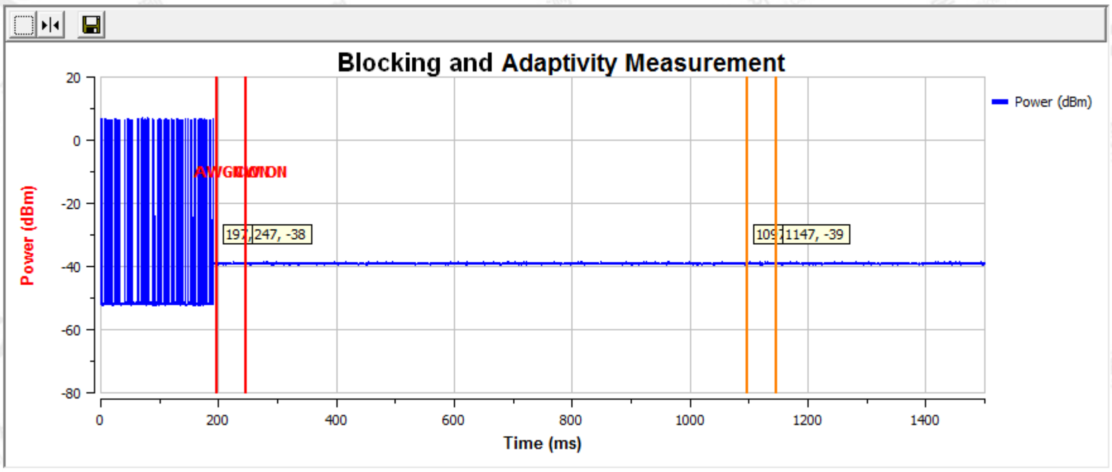




Note: 1)All the modes had been tested, but only the worst data recorded in the report.

2)When removal of the interference and blocking signal the UUT will be transmitting again on this channel.

Conclusion: PASS

5.4. OCCUPIED CHANNEL BANDWIDTH

5.4.1 LIMIT

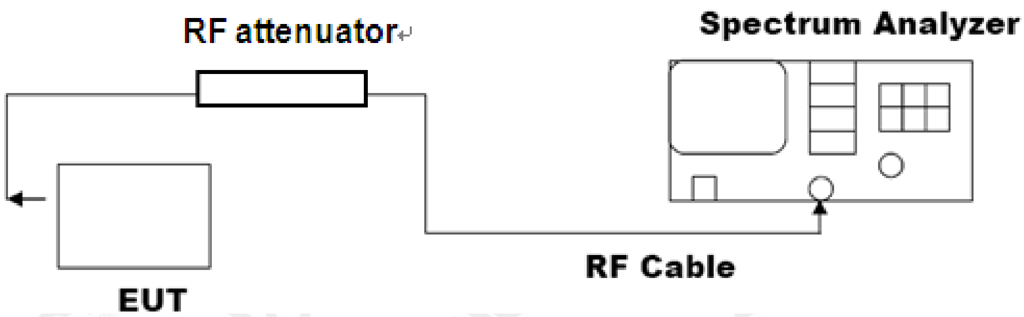
The Occupied Channel Bandwidth shall fall completely within the band 2400MHz to 2483.5MHz.

5.4.2 TEST PROCEDURE

The spectrum analyser shall be used the following settings:

- Centre Frequency: The centre frequency of the channel under test
- Resolution BW: ~ 1 % of the span without going below 1 %
- Video BW: 3 × RBW
- 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)
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep time: 1 s

5.4.3 TEST CONFIGURATION



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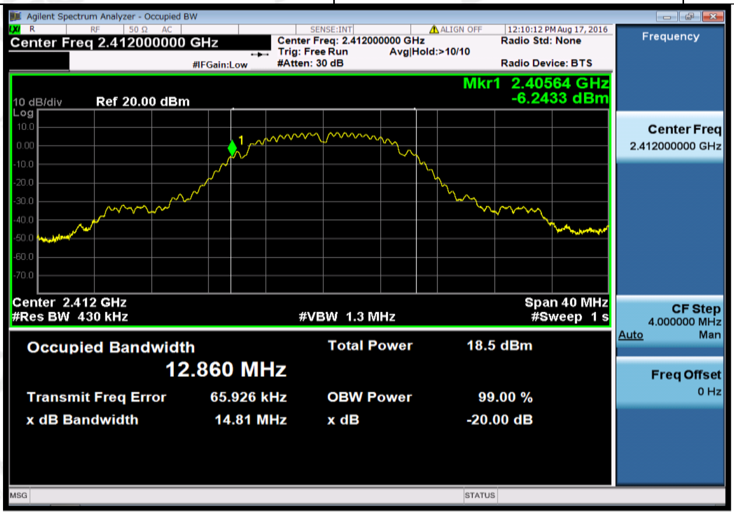
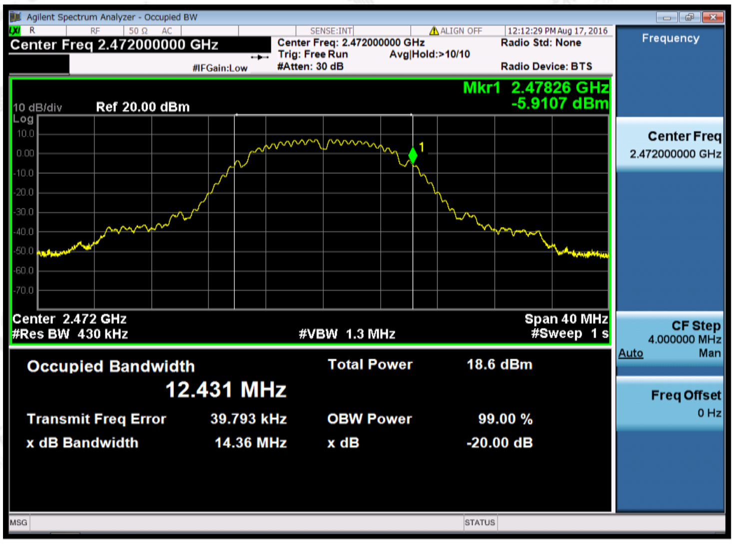
5.4.4 TEST RESULTS

TEST ITEM	99% BANDWIDTH
TEST MODE	802.11b with data rate 11

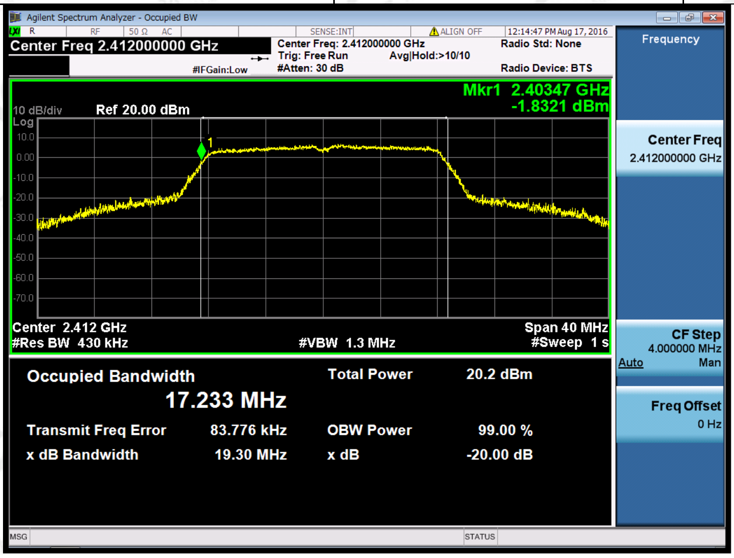
LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (MHz)		**Criteria**
2400MHz-2483.5MHz	Low Channel	12.860	PASS
	High Channel	12.431	PASS

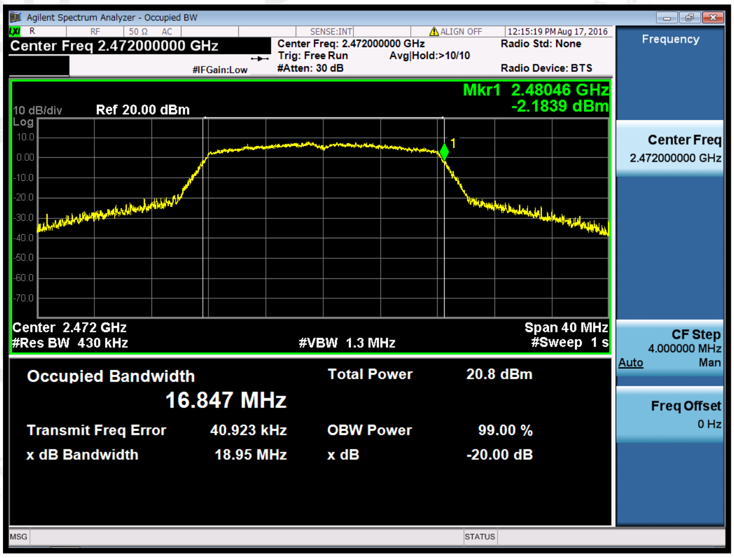




TEST ITEM	99% BANDWIDTH
TEST MODE	802.11g with data rate 54

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
2400MHz-2483.5MHz	Low Channel	17.233	PASS
	High Channel	16.847	PASS





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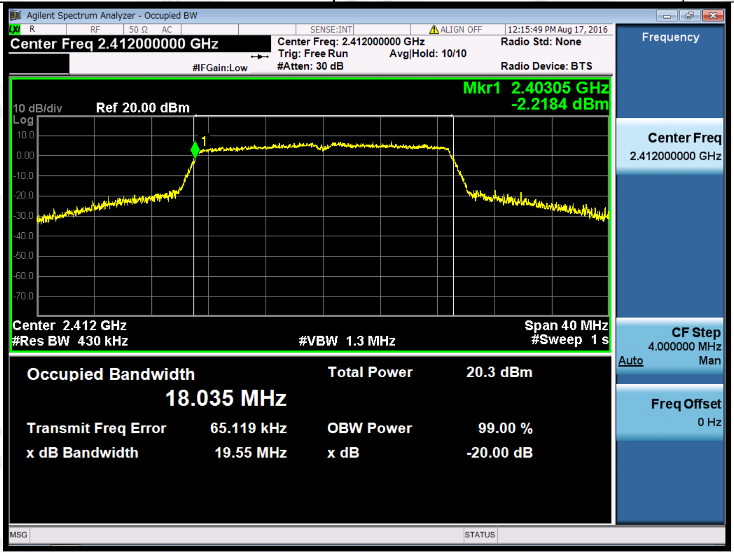
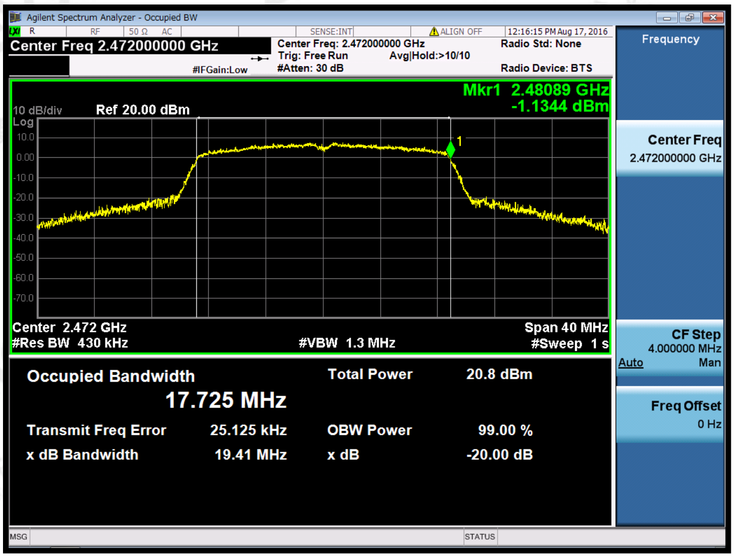
TEST ITEM	99% BANDWIDTH
TEST MODE	802.11n(20) with data rate 65

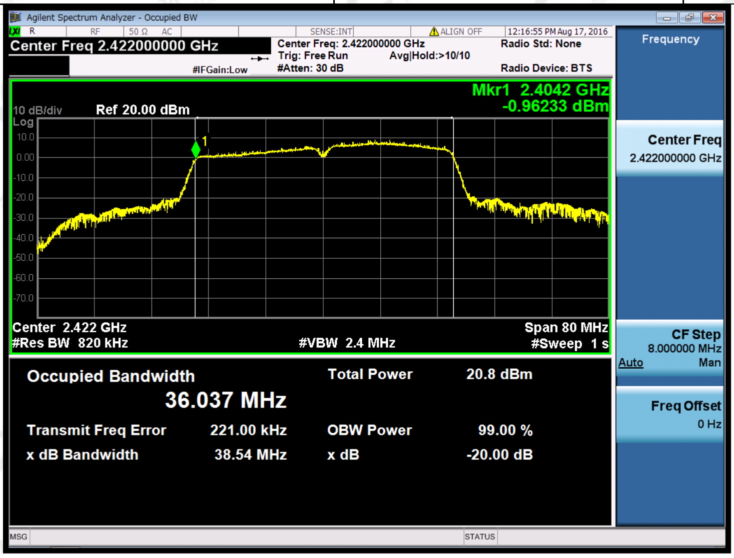
LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
2400MHz-2483.5MHz	Low Channel	18.035	PASS
	High Channel	17.725	PASS

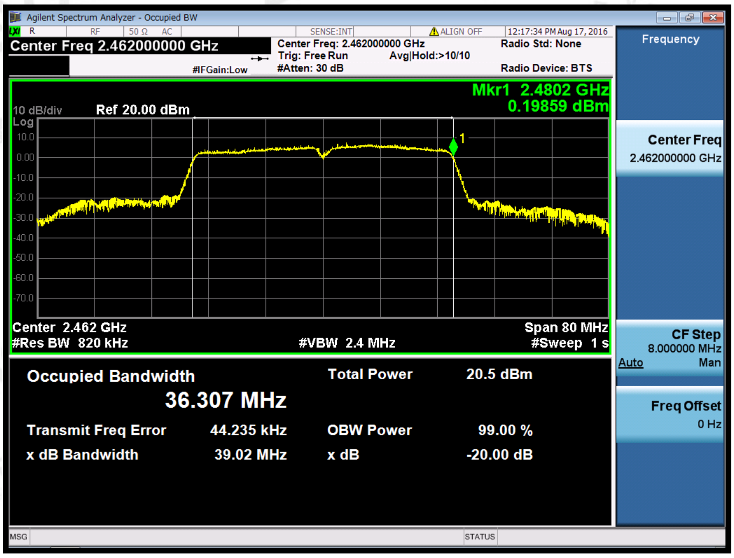




TEST ITEM	99% BANDWIDTH
TEST MODE	802.11n(40) with data rate 135

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
2400MHz-2483.5MHz	Low Channel	36.037	PASS
	High Channel	36.307	PASS





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

5.5.1 LIMIT

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask.

5.5.2 TEST PROCEDURE

1) The spectrum analyser shall be used 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 μs) or 5 000 whichever is greater
- Trigger Mode: Video trigger
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

2) (segment 2 483.5 MHz to 2 483.5 MHz + BW)
Adjust the trigger level to select the transmissions with the highest power level.
Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483.5 MHz to 2 483.5 MHz + BW.

3) Segment 2 483.5 MHz + BW to 2 483.5 MHz + 2BW
Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483.5 MHz + BW to 2 483.5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW – 0.5 MHz. (which means this may partly overlap with the previous 1 MHz segment).

4) Segment 2 400 MHz - BW to 2 400 MHz
Change the centre frequency of the analyser to 2 399.5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0.5 MHz. (which means this may partly overlap with the previous 1 MHz segment).

5) Segment 2 400 MHz - 2BW to 2 400 MHz - BW
Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0.5 MHz. (which means this may partly overlap with the previous 1 MHz segment).

6) The cable loss and attenuator factor shall be considered to the test result.

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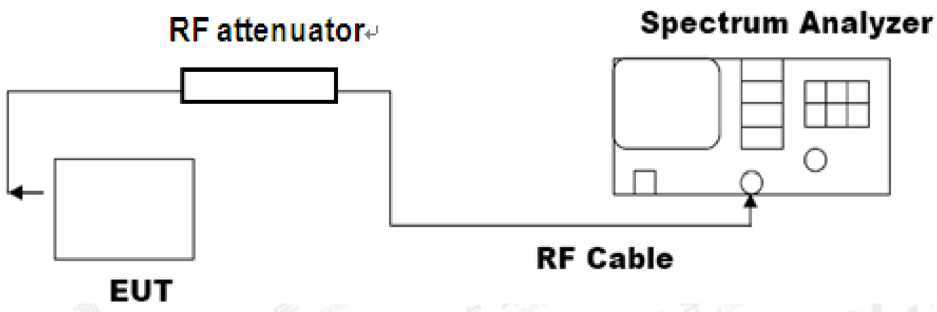
5.5.3 TEST CONFIGURATION



5.5.4 TEST RESULT

TEST CONDITIONS	IEEE 802.11b OUT-OF-BAND DOMAIN		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	DC 3.7V	DC 3.7V	DC 3.7V
Low channel	PASS	PASS	PASS
High channel	PASS	PASS	PASS

TEST CONDITIONS	IEEE 802.11g OUT-OF-BAND DOMAIN		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	DC 3.7V	DC 3.7V	DC 3.7V
Low channel	PASS	PASS	PASS
High channel	PASS	PASS	PASS

TEST CONDITIONS	IEEE 802.11n(20) OUT-OF-BAND DOMAIN		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	DC 3.7V	DC 3.7V	DC 3.7V
Low channel	PASS	PASS	PASS
High channel	PASS	PASS	PASS

TEST CONDITIONS	IEEE 802.11(40) OUT-OF-BAND DOMAIN		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	DC 3.7V	DC 3.7V	DC 3.7V
Low channel	PASS	PASS	PASS
High channel	PASS	PASS	PASS

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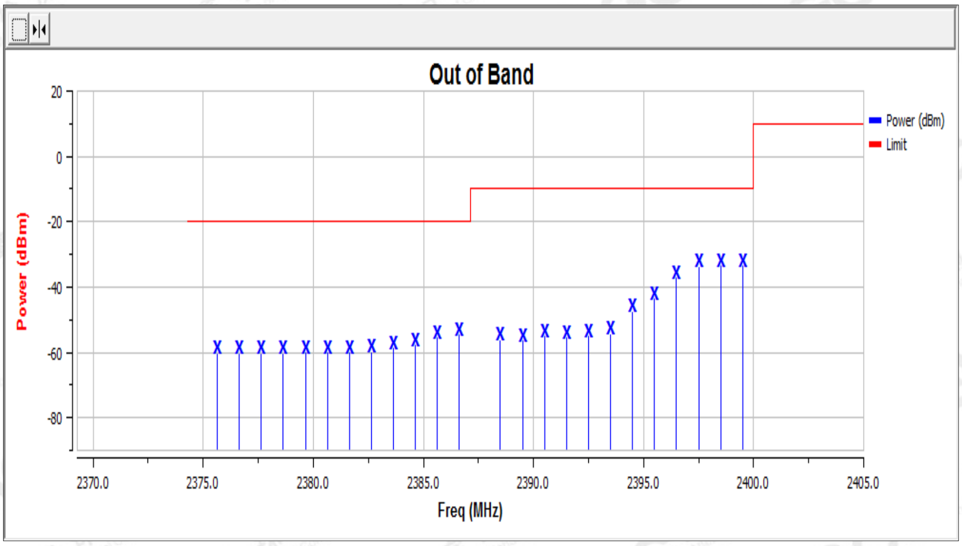
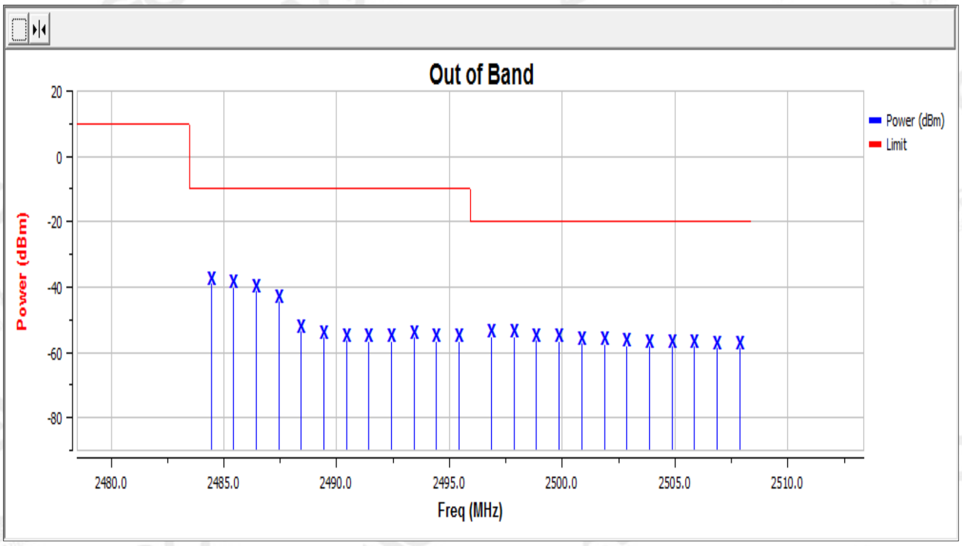
CH Low-2412（802.11b）



CH High-2472（802.11b）



Note: All the modes had been tested, but only the worst data recorded in the report.

5.6 TRANSMITTER SPURIOUS EMISSIONS

Spurious emissions are emissions outside the frequency range(s) of the equipment as defined

in Clause 4.3.1.10.Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as indicated in figure 1 when the equipment is in Transmit mode.

The spurious emissions of the transmitter shall not exceed the values in tables in the indicated bands: Limit

Frequency Range	Maximum Power e.r.p(<=1GHz)/e.i.r.p(>1GHz)	Bandwidth
30MHZ to 47MHZ	-36dBm	100kHz
47MHZ to 74MHZ	-54dBm	100kHz
74MHZ to 87.5MHZ	-36dBm	100kHz
87.5MHZ to 118MHZ	-54dBm	100kHz
118MHZ to 174MHZ	-36dBm	100kHz
174 MHZ to 230MHZ	-54dBm	100kHz
230 MHZ to 470MHZ	-36dBm	100kHz
470 MHZ to 862MHZ	-54dBm	100kHz
862 MHZ to 1GHZ	-36dBm	100kHz
1 GHZ to 12.75GHZ	-30dBm	1MHz

Note: In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

TEST PROCEDURE

Refer to chapter 5.3.10.2 of ETSI EN 300 328 V1.9.1

Measurement

Measurement	
☒Conducted measurement	☒Radiated measurement

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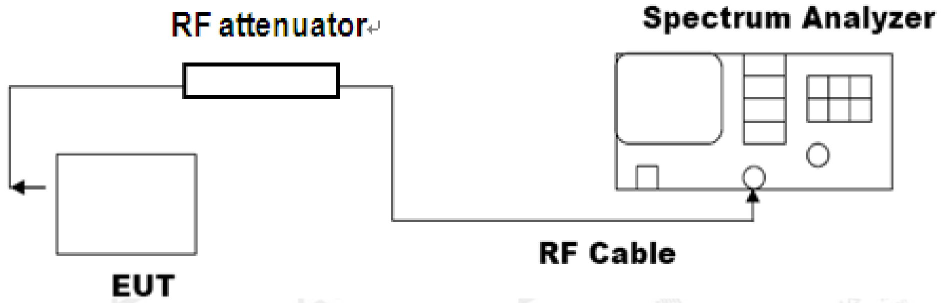
CONDUCTED MEASUREMENT

TEST CONFIGURATION

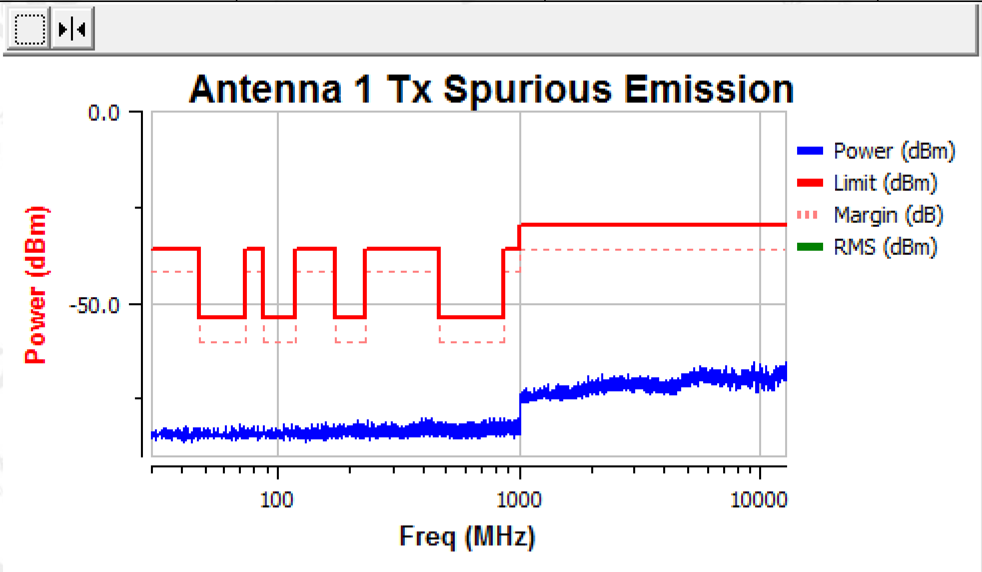


TEST RESULT

(Worst Case: Low channel, 11B)

Channel	Peak Result	RMS Result
CH Low-2412	Pass	-

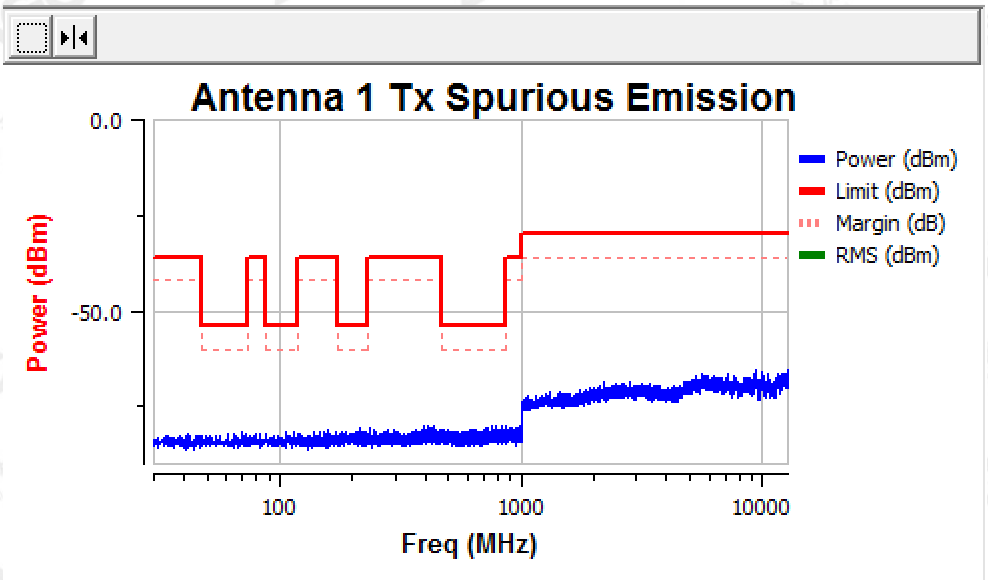
Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
792.185	-80.12	-54.00	-26.12	Pass
837.912	-79.79	-54.00	-25.79	Pass
9321.000	-65.48	-30.00	-35.48	Pass
9376.000	-65.12	-30.00	-35.12	Pass



(Worst Case: High channel, 11B)

Channel	Peak Result	RMS Result
CH High-2472	Pass	-

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
790.725	-79.73	-54.00	-25.73	Pass
828.182	-74.68	-54.00	-20.68	Pass
5644.000	-65.31	-30.00	-35.31	Pass
6339.000	-65.25	-30.00	-35.25	Pass



Note: 1. All the modes had been test but only the worst data record in the report.

2.The 2.4G fundamental frequency is filtered out.

3. The effective radiated power has been considered in this test.

Conclusion: PASS

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RADIATED MEASUREMENT

TEST SETUP

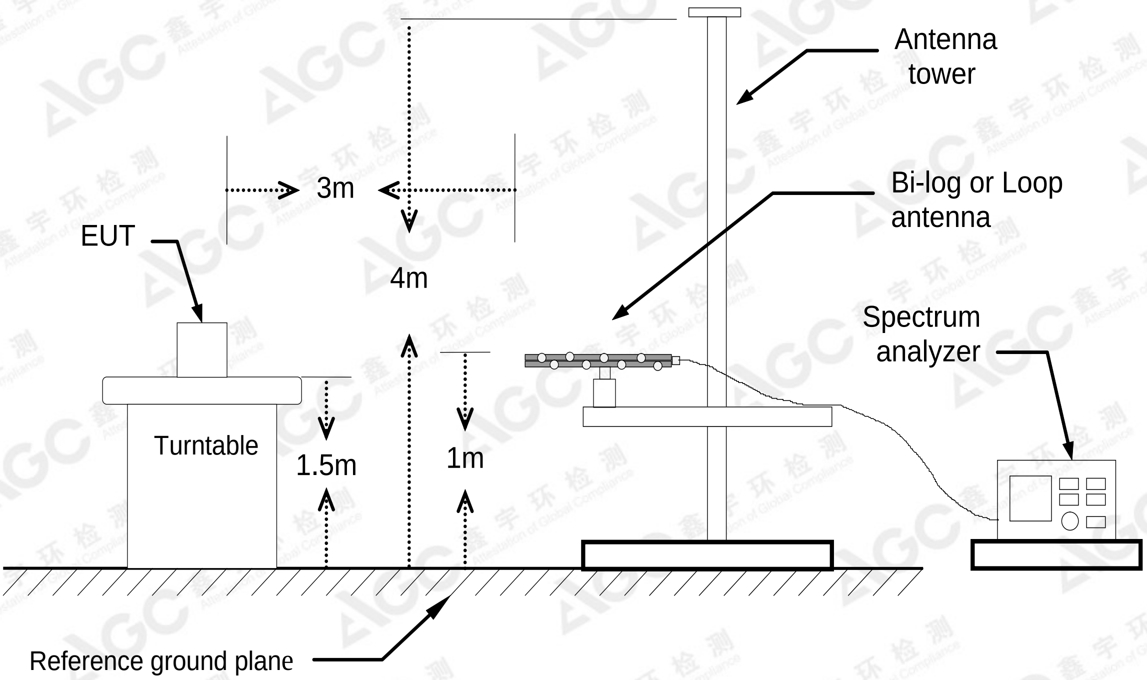
1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

2. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.

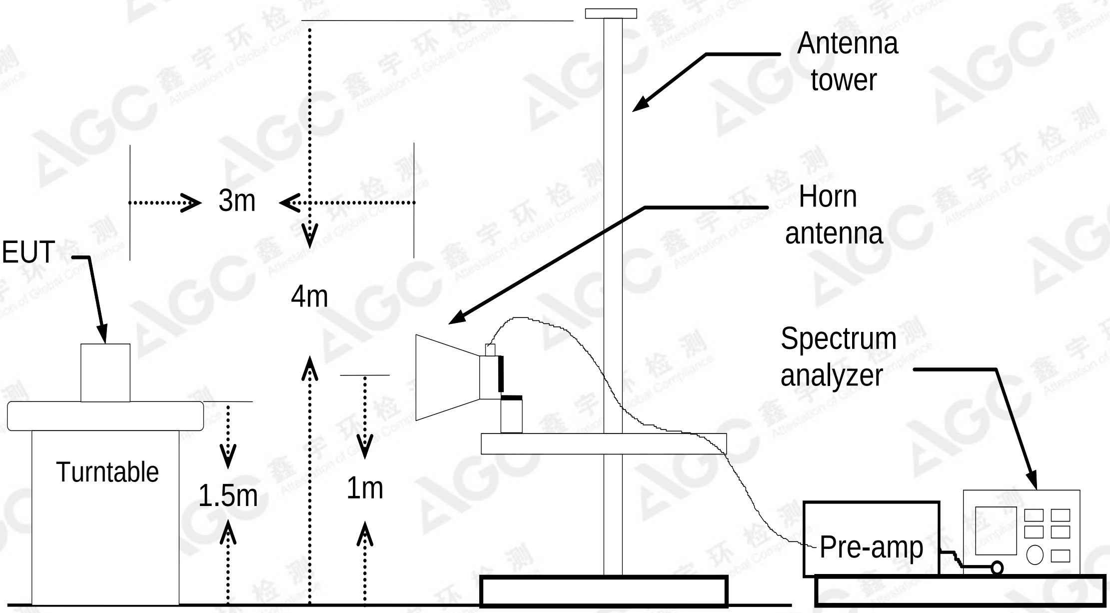
3. The equipment was configured to operate under its worst case situation with respect to output power.

4. The test setup has been constructed as the normal use condition. Controlling software (Button Function) has been activated to set the EUT on specific status.

Below 1GHz



Above 1GHz



Radiated Method

TEST RESULTS for Radiated Method

Transmitter Operating Mode (Worst case: 11B)

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	Low	
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
39.67	H	-63.9	-36	-27.9
66.17	H	-69.53	-54	-15.53
163.45	H	-64.5	-36	-28.5
386.27	H	-71.59	-36	-35.59
796.82	H	-70.03	-54	-16.03
878.43	H	-65.13	-36	-29.13
52.59	V	-70.97	-54	-16.97
180.21	V	-66.82	-54	-12.82
123.19	V	-64.37	-36	-28.37
200.58	V	-68.45	-54	-14.45
333.75	V	-71.13	-36	-35.13
879.46	V	-64.96	-36	-28.96
30MHz ~ 1GHz	H	--	-36	>10
30MHz ~ 1GHz	V	--	-36	>10
30MHz ~ 1GHz	H	--	-54	>10
30MHz ~ 1GHz	V	--	-54	>10

NOTE: 1.The emission behavior belongs to narrowband spurious emission.

2. The margins of the other spectrum below 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	High	
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
39.7	H	-64.09	-36	-28.09
55.46	H	-68.66	-54	-14.66
144.14	H	-62.42	-36	-26.42
363.19	H	-70.93	-36	-34.93
735.32	H	-67.39	-54	-13.39
895.29	H	-63.22	-36	-27.22
70.67	V	-69	-54	-15
213.41	V	-67.68	-54	-13.68
138.91	V	-64.37	-36	-28.37
176.51	V	-66.01	-54	-12.01
362.52	V	-74.18	-36	-38.18
949.47	V	-66.11	-36	-30.11
30MHz ~ 1GHz	H	--	-36	>10
30MHz ~ 1GHz	V	--	-36	>10
30MHz ~ 1GHz	H	--	-54	>10
30MHz ~ 1GHz	V	--	-54	>10

NOTE: 1.The emission behavior belongs to narrowband spurious emission.

2. The margins of the other spectrum below 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

Standby Mode:

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
Standby Mode ,Antenna Polarization: Vertical					
1	30-1000	100	\	-54	>20
2	30-1000	100	\	-36	>20
Standby Mode ,Antenna Polarization: Horizontal					
1	30-1000	100	\	-54	>20
2	30-1000	100	\	-36	>20

Conclusion: PASS

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Above 1GHz (1GHz-12.75GHz)

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	EIRP	dBm	dB
TX:2412MHz ,Antenna Polarization: Vertical					
1	4824	1000	-48.93	-30	>10
2	7236	1000	-51.64	-30	>10
3	9648	1000	\	-30	>40
4	12060	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2412MHz ,Antenna Polarization: Horizontal					
1	4824	1000	-52.77	-30	>10
2	7236	1000	-49.67	-30	>10
3	9648	1000	\	-30	>40
4	12060	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2442MHz ,Antenna Polarization: Vertical					
1	4884	1000	-51.98	-30	>10
2	7326	1000	-54.34	-30	>10
3	9768	1000	\	-30	>40
4	12210	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2442MHz ,Antenna Polarization: Horizontal					
1	4884	1000	-53.53	-30	>10
2	7326	1000	-50.51	-30	>10
3	9768	1000	\	-30	>40
4	12210	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2472MHz ,Antenna Polarization: Vertical					
1	4944	1000	-55.44	-30	>10
2	7416	1000	-56.04	-30	>10
3	9888	1000	\	-30	>40

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4	12360	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2472MHz ,Antenna Polarization: Horizontal					
1	4944	1000	-51.52	-30	>10
2	7416	1000	-51.43	-30	>10
3	9888	1000	\	-30	>40
4	12360	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
Measurement uncertainty:±3.2dB					

Standby Mode:

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
Standby Mode ,Antenna Polarization: Vertical					
1	1000-12750	1000	\	-30	>20
Standby Mode ,Antenna Polarization: Horizontal					
1	1000-12750	1000	\	-30	>20

Conclusion: PASS

5.7 RECEIVER SPURIOUS EMISSIONS

The level of spurious emissions shall be measured as, either:
a) Their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
b) Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors.
Testing shall be performed when the equipment is in a receive-only mode.

LIMIT

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

Note: In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

TEST PROCEDURE

Refer to chapter 5.3.11.2 of ETSI EN 300 328 V1.9.1

Measurement

Measurement	
☒Conducted measurement	☒Radiated measurement

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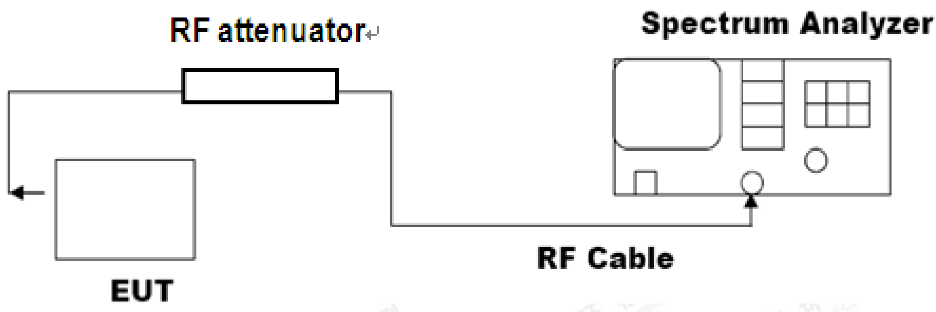
CONDUCTED MEASUREMENT

TEST CONFIGURATION

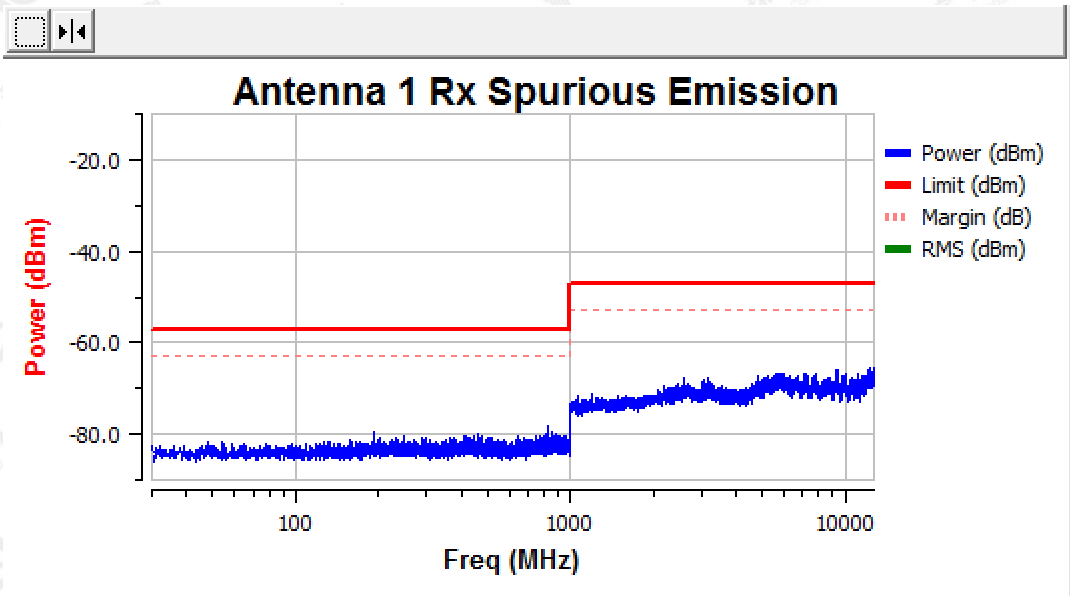


TEST RESULT

(Worst Case: Low channel, 11B)

Channel	Peak Result	RMS Result
CH Low-2412	Pass	-

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
829.058	-77.70	-57.00	-20.70	Pass
860.386	-79.28	-57.00	-22.28	Pass
12289.000	-64.91	-47.00	-17.91	Pass
12653.000	-64.90	-47.00	-17.90	Pass



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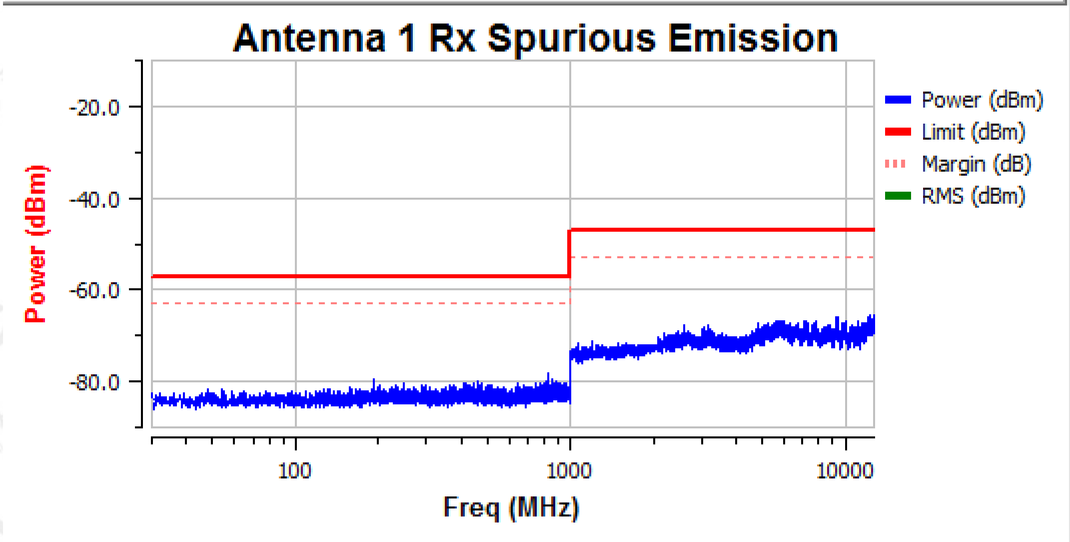
(Worst Case: High channel, 11B)

Channel	Peak Result	RMS Result
CH High-2472	Pass	-

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
856.397	-79.13	-57.00	-22.13	Pass
860.386	-79.28	-57.00	-22.28	Pass
7062.000	-64.84	-47.00	-17.84	Pass
12654.000	-65.25	-47.00	-18.25	Pass



Note: 1. All the modes had been test but only the worst data record in the report.

2. The effective radiated power has been considered in this test.

Conclusion: PASS

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RADIATED MEASUREMENT

TEST SETUP

1 For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

2 Testing was performed when the equipment was in a receive-only mode.

3 The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.

4 The test setup has been constructed as the normal use condition. Controlling software (Button Function) has been activated to set the EUT on specific status.

TEST CONFIGURATION

Radiated Method: Same as section 4.6 in this test report

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<u>TEST RESULTS for Radiated Method</u> (Worst case : 11B)

Low Channel: Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
84.39	30.37	V	-70.25	0.23	0.55	-69.93	-57	-12.93
129.59	30.89	V	-71.27	0.3	0.42	-71.15	-57	-14.15
239.7	30.46	V	-70.07	0.39	0.31	-70.15	-57	-13.15
325.23	30.65	V	-69.46	0.55	0.84	-69.17	-57	-12.17
334.22	30.73	V	-70.06	0.59	0.35	-70.3	-57	-13.3
827.67	30	V	-70.12	0.73	0.81	-70.04	-57	-13.04
83.12	30.13	H	-70.71	0.2	0.69	-70.22	-57	-13.22
130.25	29.88	H	-69.27	0.34	0.28	-69.33	-57	-12.33
242.29	30.35	H	-70.35	0.46	0.39	-70.42	-57	-13.42
325.22	30.83	H	-70.22	0.48	0.41	-70.29	-57	-13.29
734.39	30.78	H	-70.76	0.68	0.45	-70.99	-57	-13.99
827.14	30.26	H	-70.08	0.71	0.6	-70.19	-57	-13.19
30MHz ~ 1GHz	--	V	--	--	--	--	-57	>10
30MHz ~ 1GHz	--	H	--	--	--	--	-57	>10

Note: The margins of the other spectrum below 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

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High Channel: Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
84.08	31.2	V	-70.62	0.21	0.37	-70.46	-57	-13.46
129.47	31.16	V	-71.27	0.28	0.46	-71.09	-57	-14.09
239.78	30.07	V	-69.45	0.37	0.34	-69.48	-57	-12.48
325.82	30.13	V	-70.37	0.53	0.85	-70.05	-57	-13.05
334.44	30.85	V	-70.49	0.57	0.42	-70.64	-57	-13.64
827.48	31.22	V	-70.75	0.71	0.86	-70.6	-57	-13.6
83.1	31.17	H	-69.43	0.18	0.72	-68.89	-57	-11.89
130.44	29.82	H	-70.76	0.32	0.33	-70.75	-57	-13.75
242.09	30.53	H	-70.46	0.44	0.45	-70.45	-57	-13.45
325.17	29.99	H	-70.56	0.46	0.49	-70.53	-57	-13.53
734.37	30.57	H	-69.99	0.66	0.47	-70.18	-57	-13.18
827.74	31.14	H	-70.37	0.69	0.64	-70.42	-57	-13.42
30MHz ~ 1GHz	--	V	--	--	--	--	-57	>10
30MHz ~ 1GHz	--	H	--	--	--	--	-57	>10

Note: The margins of the other spectrum below 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

Low Channel: Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1347.84	38.1	V	-62.86	2.18	0.72	-64.32	-47	-17.32
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
1447.82	38.43	H	-62.23	2.37	0.24	-64.36	-47	-17.36
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
1GHz-12.75 GHz	--	V	--	--	--	--	-47	>10
1GHz-12.75 GHz	--	H	--	--	--	--	-47	>10

Note: The margins of the other spectrum above 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

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High Channel: Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1347.71	38.35	V	-62.83	2.18	0.47	-64.54	-47	-17.54
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
1447.31	38.48	H	-62.25	2.44	0.22	-64.47	-47	-17.47
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
1GHz-12.75 GHz	--	V	--	--	--	--	-47	>10
1GHz-12.75 GHz	--	H	--	--	--	--	-47	>10

Note: The margins of the other spectrum above 1GHz are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

Remarks:

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

Conclusion: PASS

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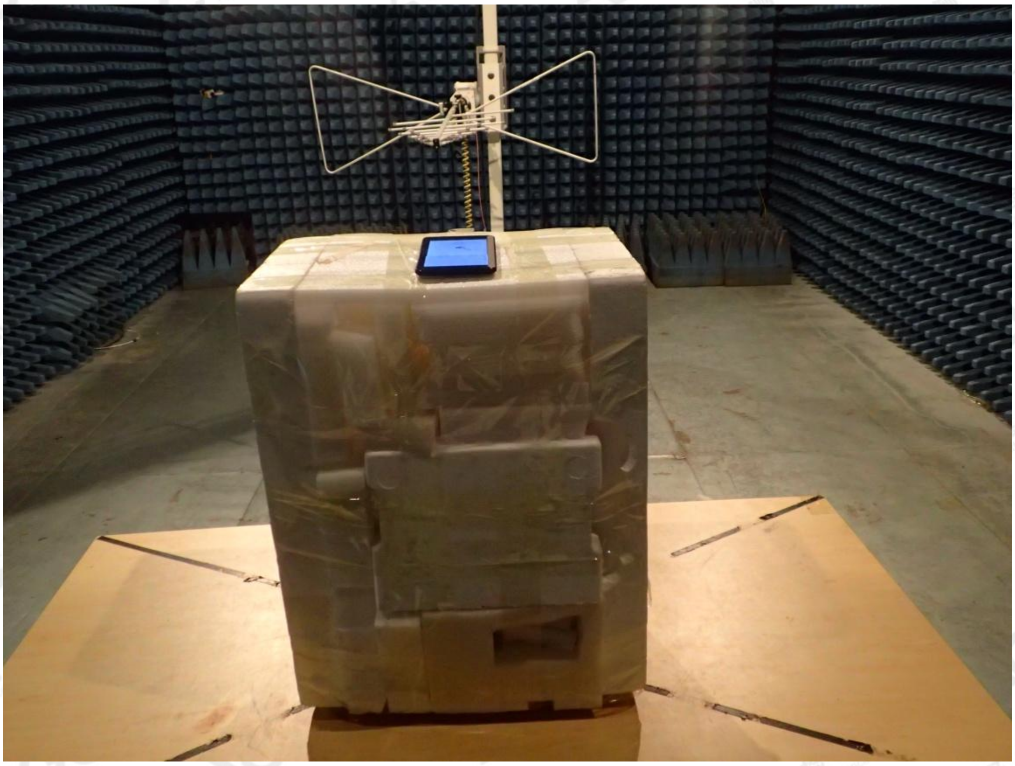
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED SPURIOUS EMISSION TEST SETUP



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