FCC Test Report

Report No.: RF200717C08

FCC ID: 2AKCZ-101

Test Model: APL57-0F2, APL57-101 (refer to item 3.1 for more details)

Received Date: Jul. 17, 2020

Test Date: Aug. 24, 2020 ~ Sep. 25, 2020

Issued Date: Oct. 08, 2020

Applicant: SonicWall Inc.

Address: 1033 McCarthy Blvd., Milpitas, CA 95035, USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan

FCC Registration / Designation Number: 788550 / TW0003

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

Table of Contents

Release Control Record **4**

1 Certificate of Conformity **5**

2 Summary of Test Results **6**

2.1 Measurement Uncertainty 6
2.2 Modification Record 6

3 General Information **7**

3.1 General Description of EUT 7
3.2 Description of Test Modes 9
3.2.1 Test Mode Applicability and Tested Channel Detail 10
3.3 Duty Cycle of Test Signal 12
3.4 Description of Support Units 13
3.4.1 Configuration of System under Test 13
3.5 General Description of Applied Standards and References 14

4 Test Types and Results **15**

4.1 Radiated Emission and Bandedge Measurement 15
4.1.1 Limits of Radiated Emission and Bandedge Measurement 15
4.1.2 Test Instruments 16
4.1.3 Test Procedures 17
4.1.4 Deviation from Test Standard 18
4.1.5 Test Set Up 18
4.1.6 EUT Operating Conditions 19
4.1.7 Test Results 20
4.2 Conducted Emission Measurement 34
4.2.1 Limits of Conducted Emission Measurement 34
4.2.2 Test Instruments 34
4.2.3 Test Procedures 35
4.2.4 Deviation from Test Standard 35
4.2.5 Test Setup 35
4.2.6 EUT Operating Conditions 35
4.2.7 Test Results 36
4.3 6 dB Bandwidth Measurement 38
4.3.1 Limits of 6 dB Bandwidth Measurement 38
4.3.2 Test Setup 38
4.3.3 Test Instruments 38
4.3.4 Test Procedure 38
4.3.5 Deviation from Test Standard 38
4.3.6 EUT Operating Conditions 38
4.3.7 Test Results 39
4.4 Occupied Bandwidth Measurement 41
4.4.1 Test Setup 41
4.4.2 Test Instruments 41
4.4.3 Test Procedure 41
4.4.4 Deviation from Test Standard 41
4.4.5 EUT Operating Conditions 41
4.4.6 Test Results 42
4.5 Conducted Output Power Measurement 44
4.5.1 Limits of Conducted Output Power Measurement 44
4.5.2 Test Setup 44
4.5.3 Test Instruments 44
4.5.4 Test Procedures 44
4.5.5 Deviation from Test Standard 44
4.5.6 EUT Operating Conditions 44
4.5.7 Test Results 45

4.6 Power Spectral Density Measurement 47
4.6.1 Limits of Power Spectral Density Measurement 47
4.6.2 Test Setup 47
4.6.3 Test Instruments 47
4.6.4 Test Procedure 47
4.6.5 Deviation from Test Standard 48
4.6.6 EUT Operating Condition 48
4.6.7 Test Results 49
4.7 Conducted Out of Band Emission Measurement 52
4.7.1 Limits of Conducted Out of Band Emission Measurement 52
4.7.2 Test Setup 52
4.7.3 Test Instruments 52
4.7.4 Test Procedure 52
4.7.5 Deviation from Test Standard 52
4.7.6 EUT Operating Condition 52
4.7.7 Test Results 53

5 Pictures of Test Arrangements 69

Annex A- Band Edge Measurement 70

Appendix – Information of the Testing Laboratories 78

Release Control Record

Issue No.	Description	Date Issued
RF200717C08	Original Release	Oct. 08, 2020

1 Certificate of Conformity

Product: Wireless Network Security Appliance

Brand: SONICWALL

Test Model: APL57-0F2, APL57-101 (refer to item 3.1 for more details)

Sample Status: Engineering Sample

Applicant: SonicWall Inc.

Test Date: Aug. 24, 2020 ~ Sep. 25, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Vera Huang , **Date:** Oct. 08, 2020

Vera Huang / Specialist

Approved by : , **Date:** Oct. 08, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -19.11 dB at 0.15000 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1 dB at 2483.50 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note:

1. For 2.4G band compliance with rule 15.247(d)of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless Network Security Appliance
Brand	SONICWALL
Test Model	APL57-0F2, APL57-101
Model Difference	Refer to note for more details
Status of EUT	Engineering Sample
Power Supply Rating	12 Vdc (adapter)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	CDD Mode: 225.17mW Beamforming Mode: 49.748mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The following models are provided to this EUT. The model 'APL57-0F2' was chosen for final tests.
   (a) The EUT using the same PCB Layout.
   (b) Due to series models, the parts are different as below:

Model	APL57-0F2	APL57-101
PSE Out	N/A	N/A
Copper Ports	x8 GbE	x8 GbE
SFP Ports	x2 SFP (Max: 2.5Gbps)	NO
mPCIe WiFi Module	2x2 11ac Wave 2 (Module)	2x2 11ac Wave 2 (Module)
WiFi SPEC	2.4G+5G 11ac+abgn support Beamforming	2.4G+5G 11ac+abgn support Beamforming
ANT for WiFi	x2 ANTs (EXT)	x2 ANTs (EXT)
Console (RJ45)	YES	YES
USB Port	3.0 x2	3.0 x2
FAN(s)	YES	YES
Outer covering	Metal	Metal
CPU	1.4GHz	1.2GHz

2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function	Beamforming
802.11b	2TX	Not Support
802.11g	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support

3. The EUT uses following antennas.

Ant. Type	Dipole					
Ant. Connector	RP-SMA					
Frequency (MHz)	2400	2450	2500	5150	5550	5850
Peak Gain (dBi)	3.19	3.10	3.05	5.85	5.73	5.03

* The max. gain was chosen for final tests.

4. The EUT consumes power from the following adapters.

Product	Brand	Model	Description
Adapter 1	Sunny COMPUTER TECHNOLOGY CO.,LTD.	SYS1546-3612-T3	I/P: 100-240 Vac, 50-60 Hz, 1.5 A O/P: 12 Vdc, 3 A 1.85m power cable with 1 core
Adapter 2 (Support unit only)	BILLION	BA040-120300MAX	I/P: 100-240 Vac, 50/60 Hz, 1 A O/P: 12 Vdc, 3 A 1.46m power cable without core

* After the pretesting, the adapter 1 was chosen for final test.

5. WLAN 2.4GHz & WLAN 5GHz technology cannot transmit at same time.
6. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.
7. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
8. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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

7 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1 GHz **RE<1G:** Radiated Emission below 1 GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.
NOTE: "-"means no effect.

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Bandedge Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 9	OFDM	BPSK	13.5

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	23 deg. C, 66 % RH	120 Vac, 60 Hz	Titan Hsu
RE<1G	23 deg. C, 66 % RH	120 Vac, 60 Hz	Greg Lin
PLC	25 deg. C, 75 % RH	120 Vac, 60 Hz	Greg Lin
APCM	25 deg. C, 60 % RH	120 Vac, 60 Hz	Ivan Tseng

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is ≥ 98 %, duty factor is not required.

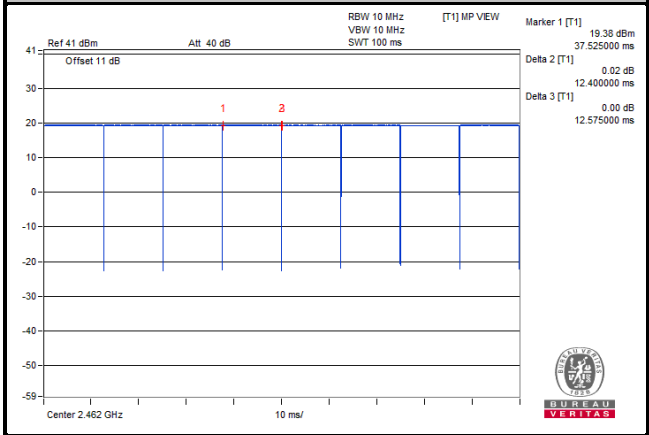
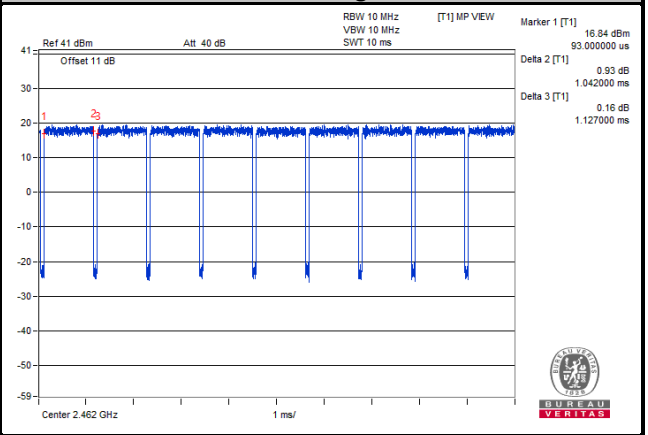
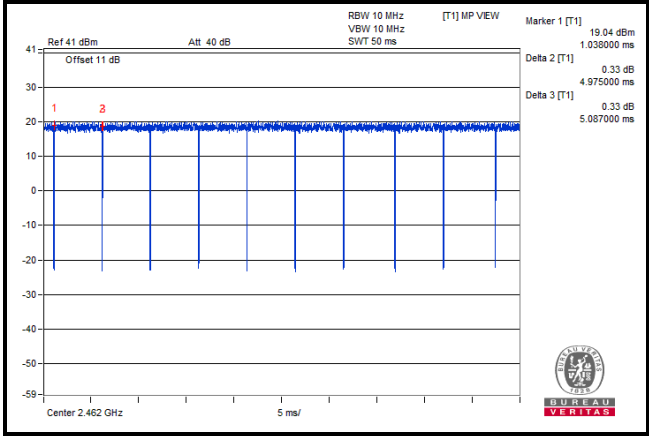
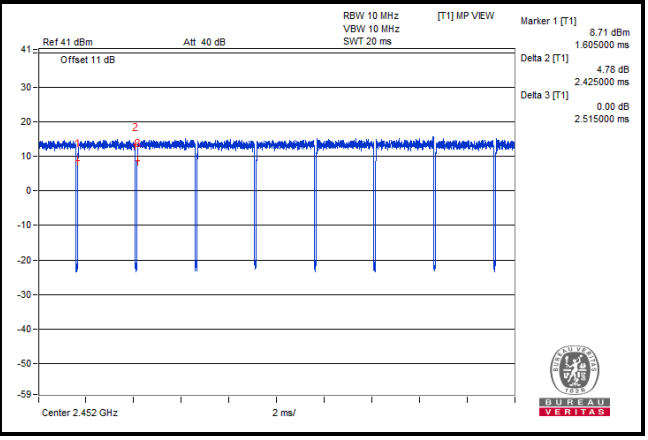
Duty cycle of test signal is < 98 %, duty factor shall be considered.

802.11b: Duty cycle = 12.4/12.575 = 0.986

802.11g: Duty cycle = 1.042/1.127 = 0.925, Duty factor = 10 * log(1/0.925) = 0.34

802.11n (HT20): Duty cycle = 4.975/5.087 = 0.978, Duty factor = 10 * log(1/0.978) = 0.10

802.11n (HT40): Duty cycle = 2.425/2.515 = 0.964, Duty factor = 10 * log(1/0.964) = 0.16

802.11b	802.11g
	
802.11n (HT20)	**802.11n (HT40)**
	

3.4 Description of Support Units

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

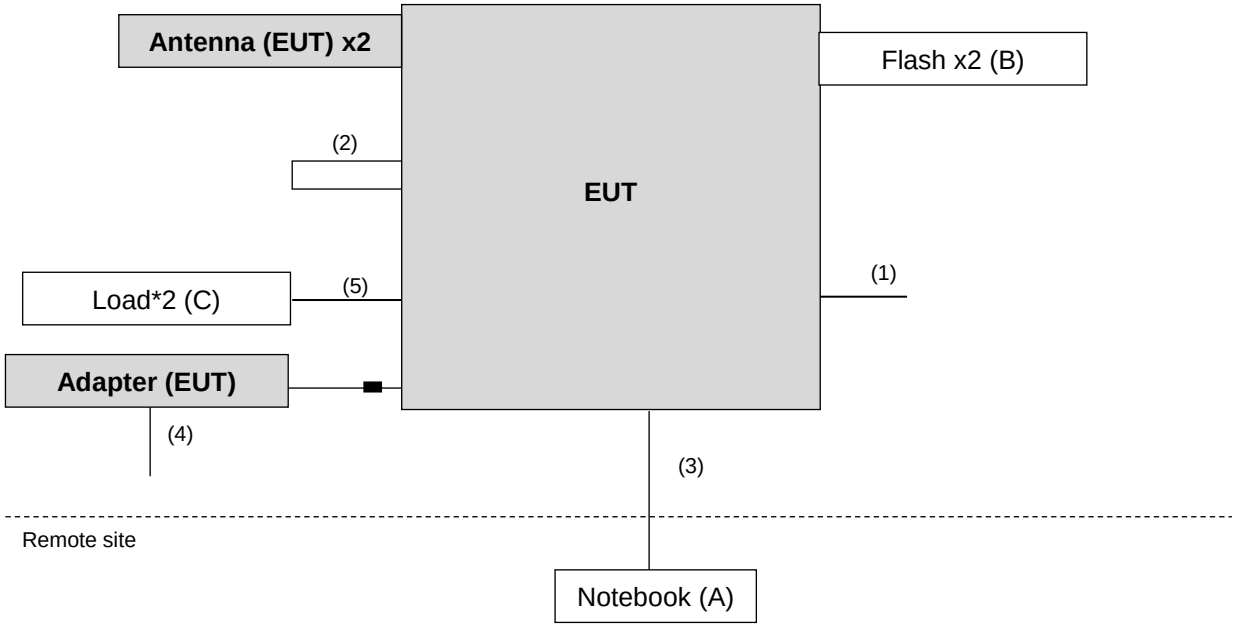
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
1.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
2.	Flash	HP	v250W	05	NA	-
	Flash	HP	v250W	03	NA	-
3.	Load*2	NA	NA	NA	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Console cable	1	1.15	N	0	Accessory of EUT
2.	Fiber cable	1	3	N	0	Provided by client
3.	LAN cable	1	6	N	0	RJ45, Cat5e
4.	Power cord	1	0.9	N	0	Accessory of EUT
5.	LAN cable	7	1.5	N	0	RJ45, Cat5e

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESR3	102579	Jul. 07, 2020	Jul. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
			Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 16, 2020	Aug. 15, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 23, 2020	Mar. 22, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55 190004/MY551900 07/MY55210005	Jul. 13, 2020	Jul. 12, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. Test Date: 2020/08/24 ~ 2020/09/21

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

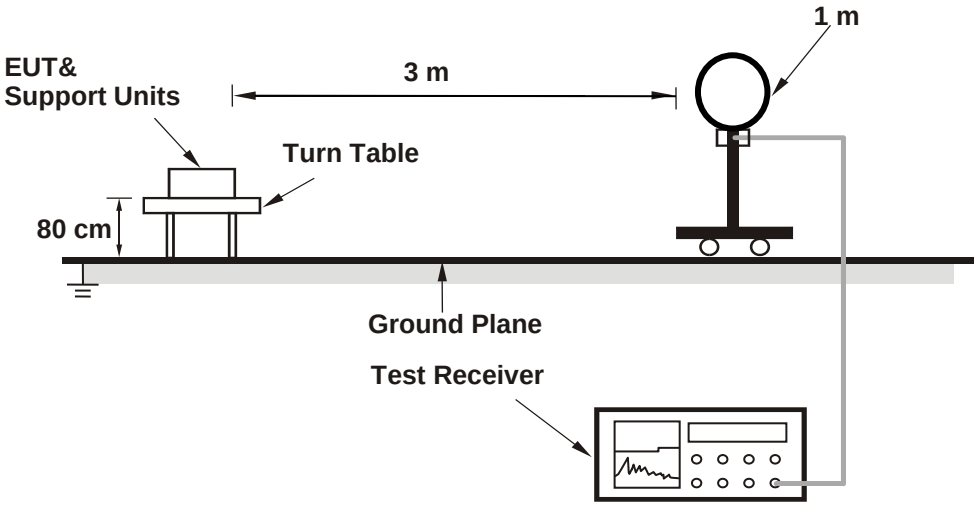
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
   (11b: RBW = 1 MHz, VBW =10 Hz ; 11g: RBW = 1 MHz, VBW = 1 kHz ;
   11n (HT20): RBW = 1 MHz, VBW = 1 kHz ; 11n (HT40): RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

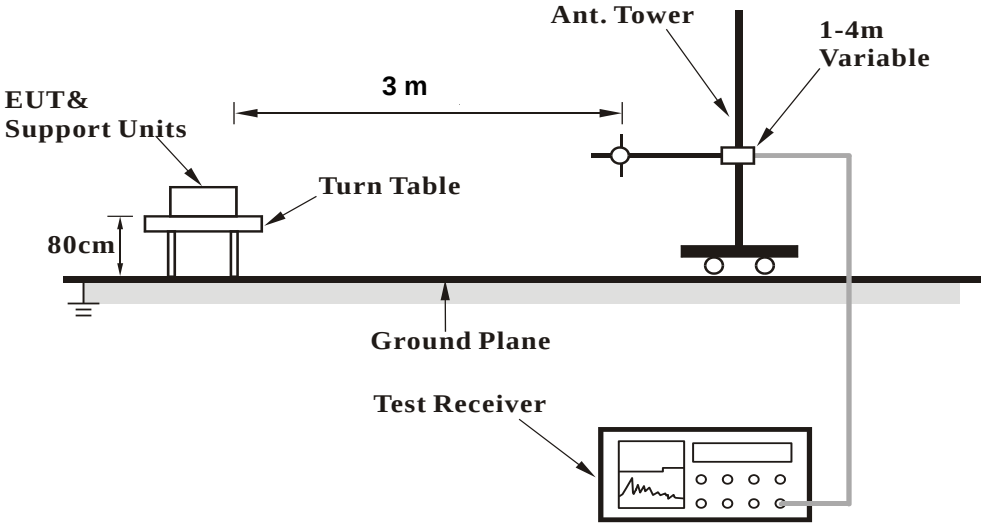
No deviation.

4.1.5 Test Set Up

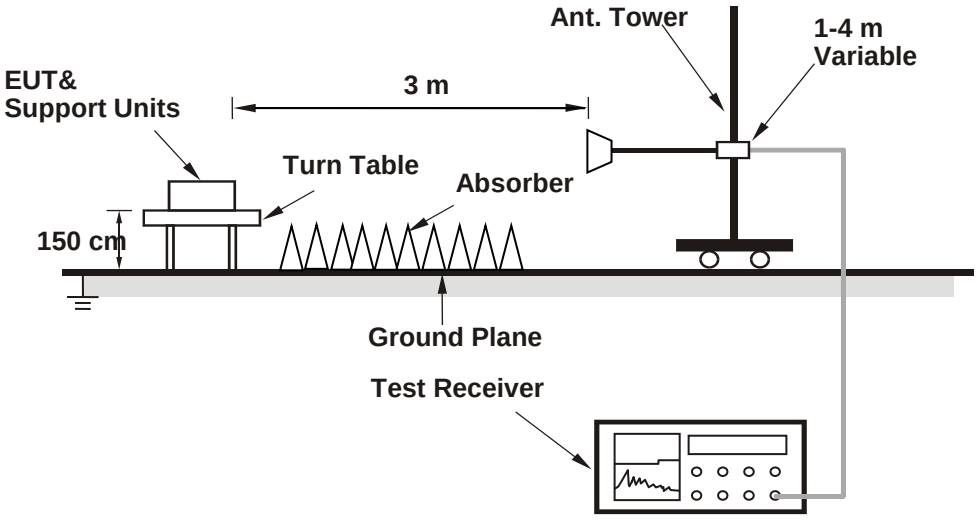
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on a testing table.
b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data：

802.11b

Channel	TX Channel 1	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.5 PK	74.0	-9.5	1.61 H	334	30.2	34.3
2	2390.00	52.3 AV	54.0	-1.7	1.61 H	334	18.0	34.3
3	*2412.00	119.1 PK			1.63 H	334	84.8	34.3
4	*2412.00	115.2 AV			1.63 H	334	80.9	34.3
5	4824.00	50.4 PK	74.0	-23.6	1.32 H	183	44.2	6.2
6	4824.00	42.0 AV	54.0	-12.0	1.32 H	183	35.8	6.2
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.3 PK	74.0	-12.7	3.91 V	261	27.0	34.3
2	2390.00	49.6 AV	54.0	-4.4	3.91 V	261	15.3	34.3
3	*2412.00	113.0 PK			3.96 V	257	78.7	34.3
4	*2412.00	109.1 AV			3.96 V	257	74.8	34.3
5	4824.00	49.5 PK	74.0	-24.5	1.79 V	88	43.3	6.2
6	4824.00	36.3 AV	54.0	-17.7	1.79 V	88	30.1	6.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 6	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	63.5 PK	74.0	-10.5	1.11 H	333	29.2	34.3
2	2390.00	52.3 AV	54.0	-1.7	1.11 H	333	18.0	34.3
3	*2437.00	116.9 PK			1.77 H	329	82.6	34.3
4	*2437.00	112.0 AV			1.77 H	329	77.7	34.3
5	4874.00	54.6 PK	74.0	-19.4	1.65 H	183	48.5	6.1
6	4874.00	47.5 AV	54.0	-6.5	1.65 H	183	41.4	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.0 PK	74.0	-13.0	3.87 V	251	26.7	34.3
2	2390.00	48.9 AV	54.0	-5.1	3.87 V	251	14.6	34.3
3	*2437.00	108.2 PK			3.90 V	256	73.9	34.3
4	*2437.00	104.3 AV			3.90 V	256	70.0	34.3
5	4874.00	53.2 PK	74.0	-20.8	1.82 V	96	47.1	6.1
6	4874.00	42.4 AV	54.0	-11.6	1.82 V	96	36.3	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 11	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	118.9 PK			1.71 H	331	84.5	34.4
2	*2462.00	114.3 AV			1.71 H	331	79.9	34.4
3	2483.50	68.7 PK	74.0	-5.3	1.59 H	332	34.3	34.4
4	2483.50	52.8 AV	54.0	-1.2	1.59 H	332	18.4	34.4
5	4924.00	53.5 PK	74.0	-20.5	1.72 H	198	47.4	6.1
6	4924.00	45.7 AV	54.0	-8.3	1.72 H	198	39.6	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	111.3 PK			3.77 V	253	76.9	34.4
2	*2462.00	107.4 AV			3.77 V	253	73.0	34.4
3	2483.50	61.3 PK	74.0	-12.7	2.85 V	259	26.9	34.4
4	2483.50	49.4 AV	54.0	-4.6	2.85 V	259	15.0	34.4
5	4924.00	52.0 PK	74.0	-22.0	1.71 V	77	45.9	6.1
6	4924.00	40.8 AV	54.0	-13.2	1.71 V	77	34.7	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11g

Channel	TX Channel 1	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.5 PK	74.0	-9.5	2.16 H	331	30.2	34.3
2	2390.00	52.3 AV	54.0	-1.7	2.16 H	331	18.0	34.3
3	*2412.00	116.1 PK			1.11 H	330	81.8	34.3
4	*2412.00	105.9 AV			1.11 H	330	71.6	34.3
5	4824.00	49.2 PK	74.0	-24.8	1.56 H	193	43.0	6.2
6	4824.00	35.0 AV	54.0	-19.0	1.56 H	193	28.8	6.2
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.9 PK	74.0	-13.1	3.91 V	263	26.6	34.3
2	2390.00	48.6 AV	54.0	-5.4	3.91 V	263	14.3	34.3
3	*2412.00	111.3 PK			3.95 V	258	77.0	34.3
4	*2412.00	101.3 AV			3.95 V	258	67.0	34.3
5	4824.00	48.7 PK	74.0	-25.3	1.66 V	30	42.5	6.2
6	4824.00	34.9 AV	54.0	-19.1	1.66 V	30	28.7	6.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 6	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.6 PK	74.0	-9.4	1.66 H	334	30.3	34.3
2	2390.00	52.3 AV	54.0	-1.7	1.66 H	334	18.0	34.3
3	*2437.00	117.3 PK			1.16 H	323	83.0	34.3
4	*2437.00	106.6 AV			1.16 H	323	72.3	34.3
5	2483.50	63.2 PK	74.0	-10.8	1.52 H	327	28.8	34.4
6	2483.50	51.0 AV	54.0	-3.0	1.52 H	327	16.6	34.4
7	4874.00	49.3 PK	74.0	-24.7	1.60 H	191	43.2	6.1
8	4874.00	35.1 AV	54.0	-18.9	1.60 H	191	29.0	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.9 PK	74.0	-13.1	3.91 V	255	26.6	34.3
2	2390.00	48.8 AV	54.0	-5.2	3.91 V	255	14.5	34.3
3	*2437.00	111.7 PK			3.85 V	252	77.4	34.3
4	*2437.00	100.8 AV			3.85 V	252	66.5	34.3
5	2483.50	61.4 PK	74.0	-12.6	2.88 V	250	27.0	34.4
6	2483.50	49.3 AV	54.0	-4.7	2.88 V	250	14.9	34.4
7	4874.00	49.0 PK	74.0	-25.0	1.75 V	49	42.9	6.1
8	4874.00	34.9 AV	54.0	-19.1	1.75 V	49	28.8	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 11	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	114.9 PK			1.72 H	324	80.5	34.4
2	*2462.00	104.7 AV			1.72 H	324	70.3	34.4
3	2483.50	65.9 PK	74.0	-8.1	1.24 H	323	31.5	34.4
4	2483.50	52.7 AV	54.0	-1.3	1.24 H	323	18.3	34.4
5	4924.00	48.7 PK	74.0	-25.3	1.47 H	188	42.6	6.1
6	4924.00	35.6 AV	54.0	-18.4	1.47 H	188	29.5	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	110.2 PK			3.79 V	256	75.8	34.4
2	*2462.00	99.7 AV			3.79 V	256	65.3	34.4
3	2483.50	62.9 PK	74.0	-11.1	3.72 V	259	28.5	34.4
4	2483.50	50.9 AV	54.0	-3.1	3.72 V	259	16.5	34.4
5	4924.00	48.4 PK	74.0	-25.6	1.70 V	22	42.3	6.1
6	4924.00	35.1 AV	54.0	-18.9	1.70 V	22	29.0	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11n (HT20)

Channel	TX Channel 1	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.9 PK	74.0	-9.1	1.71 H	331	30.6	34.3
2	2390.00	52.3 AV	54.0	-1.7	1.71 H	331	18.0	34.3
3	*2412.00	116.7 PK			1.56 H	329	82.4	34.3
4	*2412.00	105.3 AV			1.56 H	329	71.0	34.3
5	4824.00	48.8 PK	74.0	-25.2	1.61 H	189	42.6	6.2
6	4824.00	34.8 AV	54.0	-19.2	1.61 H	189	28.6	6.2
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.6 PK	74.0	-13.4	3.95 V	265	26.3	34.3
2	2390.00	49.0 AV	54.0	-5.0	3.95 V	265	14.7	34.3
3	*2412.00	110.8 PK			3.99 V	258	76.5	34.3
4	*2412.00	100.6 AV			3.99 V	258	66.3	34.3
5	4824.00	48.7 PK	74.0	-25.3	1.65 V	32	42.5	6.2
6	4824.00	34.7 AV	54.0	-19.3	1.65 V	32	28.5	6.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 6	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.8 PK	74.0	-9.2	2.04 H	324	30.5	34.3
2	2390.00	52.4 AV	54.0	-1.6	2.04 H	324	18.1	34.3
3	*2437.00	116.3 PK			2.05 H	329	82.0	34.3
4	*2437.00	105.9 AV			2.05 H	329	71.6	34.3
5	2483.50	63.4 PK	74.0	-10.6	1.92 H	336	29.0	34.4
6	2483.50	50.9 AV	54.0	-3.1	1.92 H	336	16.5	34.4
7	4874.00	49.2 PK	74.0	-24.8	1.52 H	193	43.1	6.1
8	4874.00	34.9 AV	54.0	-19.1	1.52 H	193	28.8	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.7 PK	74.0	-13.3	2.91 V	251	26.4	34.3
2	2390.00	48.8 AV	54.0	-5.2	2.91 V	251	14.5	34.3
3	*2437.00	110.7 PK			3.85 V	254	76.4	34.3
4	*2437.00	99.7 AV			3.85 V	254	65.4	34.3
5	2483.50	61.3 PK	74.0	-12.7	3.88 V	261	26.9	34.4
6	2483.50	49.4 AV	54.0	-4.6	3.88 V	261	15.0	34.4
7	4874.00	49.0 PK	74.0	-25.0	1.72 V	41	42.9	6.1
8	4874.00	35.0 AV	54.0	-19.0	1.72 V	41	28.9	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 11	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	115.1 PK			1.37 H	339	80.7	34.4
2	*2462.00	103.8 AV			1.37 H	339	69.4	34.4
3	2483.50	64.9 PK	74.0	-9.1	1.35 H	334	30.5	34.4
4	2483.50	52.4 AV	54.0	-1.6	1.35 H	334	18.0	34.4
5	4874.00	49.5 PK	74.0	-24.5	1.52 H	185	43.4	6.1
6	4874.00	35.5 AV	54.0	-18.5	1.52 H	185	29.4	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	106.1 PK			3.83 V	258	71.7	34.4
2	*2462.00	94.7 AV			3.83 V	258	60.3	34.4
3	2483.50	61.4 PK	74.0	-12.6	2.93 V	263	27.0	34.4
4	2483.50	49.1 AV	54.0	-4.9	2.93 V	263	14.7	34.4
5	4874.00	49.1 PK	74.0	-24.9	1.59 V	44	43.0	6.1
6	4874.00	35.2 AV	54.0	-18.8	1.59 V	44	29.1	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11n (HT40)

Channel	TX Channel 3	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.8 PK	74.0	-8.2	1.41 H	329	31.5	34.3
2	2390.00	52.7 AV	54.0	-1.3	1.41 H	329	18.4	34.3
3	*2422.00	110.3 PK			1.99 H	325	76.0	34.3
4	*2422.00	100.6 AV			1.99 H	325	66.3	34.3
5	4844.00	48.6 PK	74.0	-25.4	1.57 H	201	42.5	6.1
6	4844.00	35.1 AV	54.0	-18.9	1.57 H	201	29.0	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.4 PK	74.0	-12.6	3.98 V	263	27.1	34.3
2	2390.00	49.8 AV	54.0	-4.2	3.98 V	263	15.5	34.3
3	*2422.00	105.0 PK			3.91 V	259	70.7	34.3
4	*2422.00	95.3 AV			3.91 V	259	61.0	34.3
5	4844.00	48.2 PK	74.0	-25.8	1.75 V	22	42.1	6.1
6	4844.00	34.8 AV	54.0	-19.2	1.75 V	22	28.7	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 6	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.5 PK	74.0	-12.5	2.53 H	348	27.2	34.3
2	2390.00	50.5 AV	54.0	-3.5	2.53 H	348	16.2	34.3
3	*2437.00	111.0 PK			1.38 H	326	76.7	34.3
4	*2437.00	100.8 AV			1.38 H	326	66.5	34.3
5	2483.50	66.0 PK	74.0	-8.0	1.10 H	324	31.6	34.4
6	**2483.50**	**52.9 AV**	**54.0**	**-1.1**	**1.10 H**	**324**	**18.5**	**34.4**
7	4874.00	49.0 PK	74.0	-25.0	1.72 H	184	42.9	6.1
8	4874.00	35.1 AV	54.0	-18.9	1.72 H	184	29.0	6.1
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.2 PK	74.0	-12.8	3.85 V	260	26.9	34.3
2	2390.00	48.8 AV	54.0	-5.2	3.85 V	260	14.5	34.3
3	*2437.00	106.3 PK			3.91 V	258	72.0	34.3
4	*2437.00	95.9 AV			3.91 V	258	61.6	34.3
5	2483.50	61.3 PK	74.0	-12.7	3.99 V	255	26.9	34.4
6	2483.50	49.6 AV	54.0	-4.4	3.99 V	255	15.2	34.4
7	4874.00	49.2 PK	74.0	-24.8	1.78 V	39	43.1	6.1
8	4874.00	34.9 AV	54.0	-19.1	1.78 V	39	28.8	6.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 9	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2452.00	110.5 PK			2.18 H	321	76.2	34.3
2	*2452.00	100.0 AV			2.18 H	321	65.7	34.3
3	2483.50	65.9 PK	74.0	-8.1	2.83 H	333	31.5	34.4
4	2483.50	52.5 AV	54.0	-1.5	2.83 H	333	18.1	34.4
5	4904.00	48.9 PK	74.0	-25.1	1.64 H	188	42.9	6.0
6	4904.00	35.3 AV	54.0	-18.7	1.64 H	188	29.3	6.0
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2452.00	102.5 PK			3.91 V	238	68.2	34.3
2	*2452.00	92.8 AV			3.91 V	238	58.5	34.3
3	2483.50	64.9 PK	74.0	-9.1	3.84 V	243	30.5	34.4
4	2483.50	49.4 AV	54.0	-4.6	3.84 V	243	15.0	34.4
5	4904.00	48.6 PK	74.0	-25.4	1.66 V	37	42.6	6.0
6	4904.00	34.9 AV	54.0	-19.1	1.66 V	37	28.9	6.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

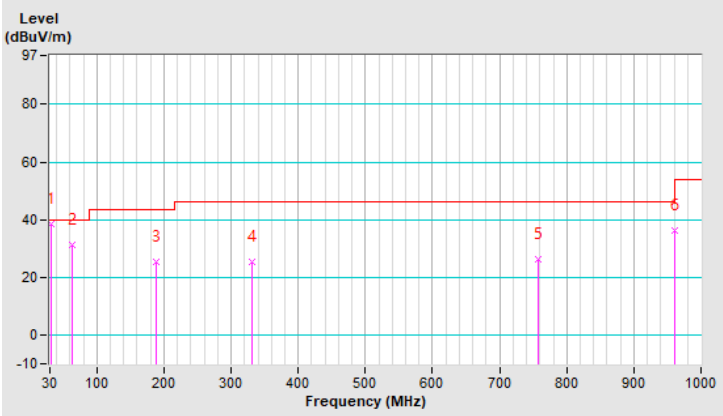
802.11b

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.94	38.5 QP	40.0	-1.5	1.50 H	169	51.8	-13.3
2	63.95	31.4 QP	40.0	-8.6	1.00 H	41	44.0	-12.6
3	188.11	25.4 QP	43.5	-18.1	1.25 H	348	39.8	-14.4
4	330.70	25.5 QP	46.0	-20.5	1.25 H	108	36.0	-10.5
5	757.50	26.2 QP	46.0	-19.8	1.00 H	159	29.8	-3.6
6	960.23	36.1 QP	54.0	-17.9	1.50 H	200	36.6	-0.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

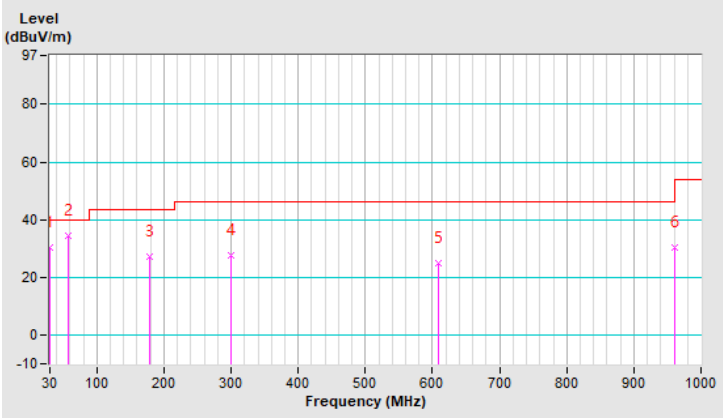


Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	30.97	30.5 QP	40.0	-9.5	1.25 V	160	44.1	-13.6
2	58.13	34.6 QP	40.0	-5.4	1.00 V	166	46.7	-12.1
3	178.41	27.4 QP	43.5	-16.1	1.50 V	117	40.6	-13.2
4	299.66	27.5 QP	46.0	-18.5	1.00 V	174	38.6	-11.1
5	608.12	24.7 QP	46.0	-21.3	1.00 V	9	30.7	-6.0
6	960.23	30.2 QP	54.0	-23.8	1.25 V	218	30.7	-0.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
V-LISN/AMN SCHWARZBECK (Peripheral)	NNBL 8226-2	8226-142	Jul. 31, 2020	Jul. 30, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-12040.
4. Test Date: 2020/8/25

4.2.3 Test Procedures

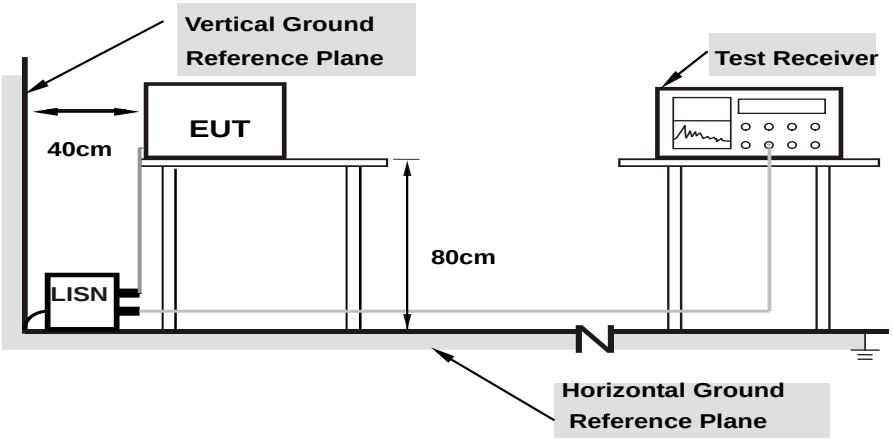
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

a. Placed the EUT on a testing table.
b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

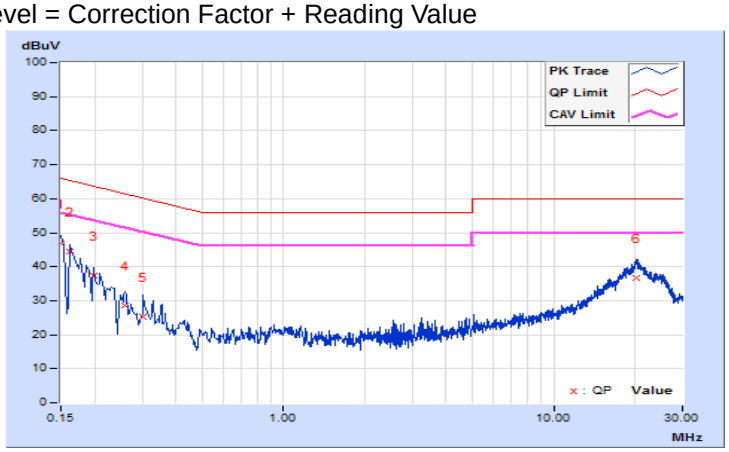
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 75%RH
Tested by	Greg Lin	Test Date	2020/8/25

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15000**	**9.56**	**37.33**	**23.34**	**46.89**	**32.90**	**66.00**	**56.00**	**-19.11**	**-23.10**
2	0.16200	9.56	34.81	20.74	44.37	30.30	65.36	55.36	-20.99	-25.06
3	0.19800	9.55	27.85	13.68	37.40	23.23	63.69	53.69	-26.29	-30.46
4	0.25800	9.56	19.08	7.87	28.64	17.43	61.50	51.50	-32.86	-34.07
5	0.30200	9.56	15.68	5.14	25.24	14.70	60.19	50.19	-34.95	-35.49
6	20.32600	9.83	27.00	20.75	36.83	30.58	60.00	50.00	-23.17	-19.42

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

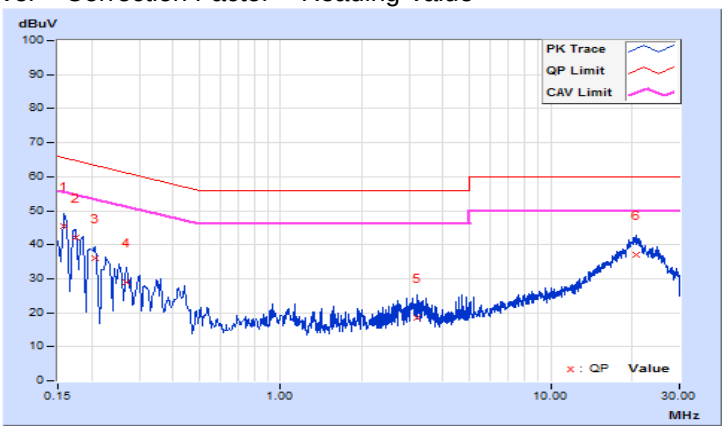


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 75%RH
Tested by	Greg Lin	Test Date	2020/8/25

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	9.54	35.78	22.09	45.32	31.63	65.57	55.57	-20.25	-23.94
2	0.17384	9.54	32.63	18.70	42.17	28.24	64.77	54.77	-22.60	-26.53
3	0.20577	9.53	26.56	12.93	36.09	22.46	63.37	53.37	-27.28	-30.91
4	0.26992	9.54	19.51	9.84	29.05	19.38	61.12	51.12	-32.07	-31.74
5	3.21400	9.67	8.83	0.30	18.50	9.97	56.00	46.00	-37.50	-36.03
6	20.74600	9.88	27.07	20.74	36.95	30.62	60.00	50.00	-23.05	-19.38

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

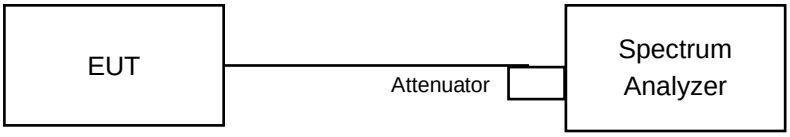


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.11	8.11	0.5	Pass
6	2437	6.63	7.08	0.5	Pass
11	2462	7.13	9.11	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.83	15.98	0.5	Pass
6	2437	16.01	16.31	0.5	Pass
11	2462	15.79	15.75	0.5	Pass

802.11n (HT20)

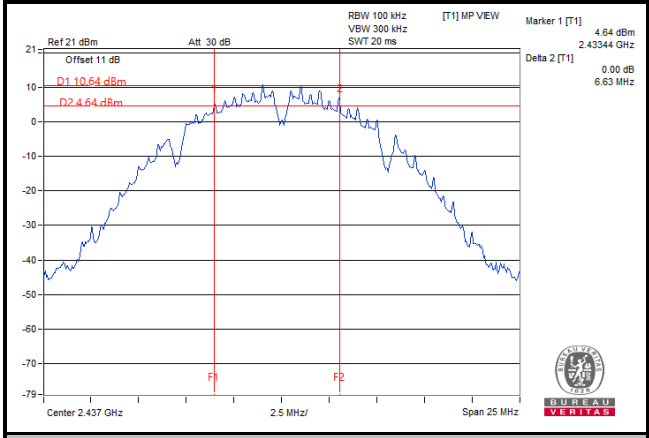
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.77	15.74	0.5	Pass
6	2437	15.79	16.02	0.5	Pass
11	2462	15.79	15.75	0.5	Pass

802.11n (HT40)

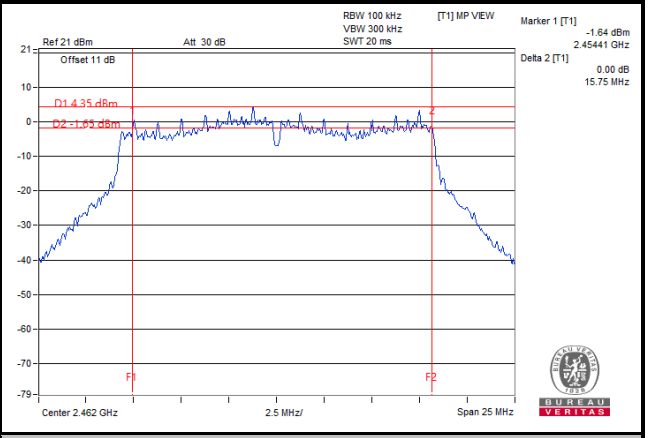
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.89	35.83	0.5	Pass
6	2437	35.85	35.88	0.5	Pass
9	2452	35.84	36.04	0.5	Pass

Spectrum Plot of Worst Value

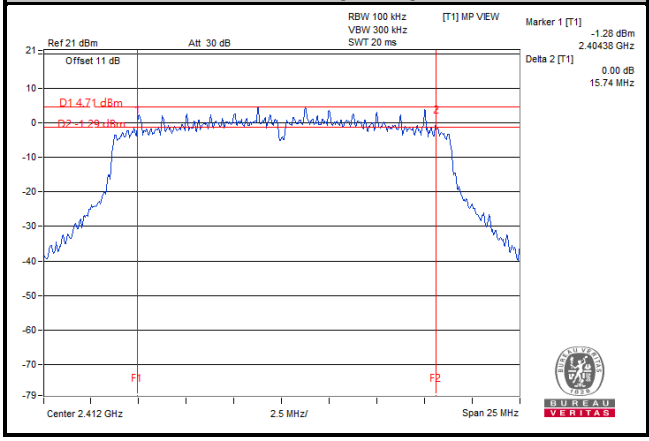
802.11b



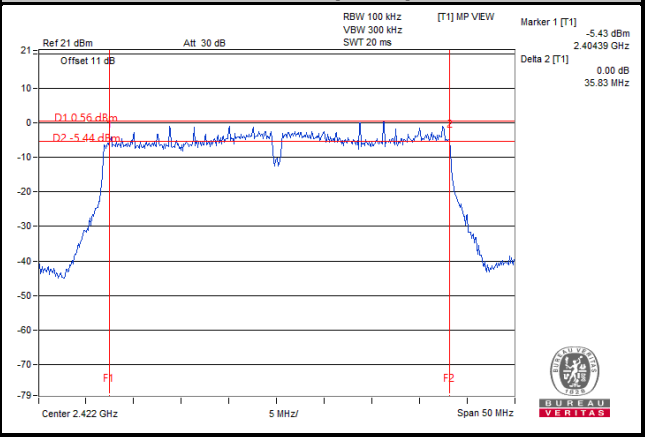
802.11g



802.11n (HT20)

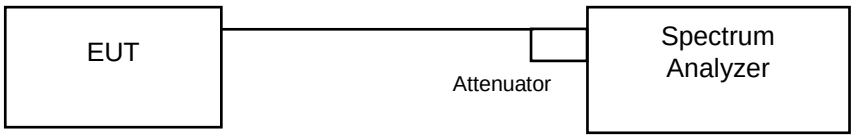


802.11n (HT40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	12.95	13.22	Pass
6	2437	12.24	12.12	Pass
11	2462	12.48	13.80	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.56	16.56	Pass
6	2437	16.56	16.56	Pass
11	2462	16.56	16.56	Pass

802.11n (HT20)

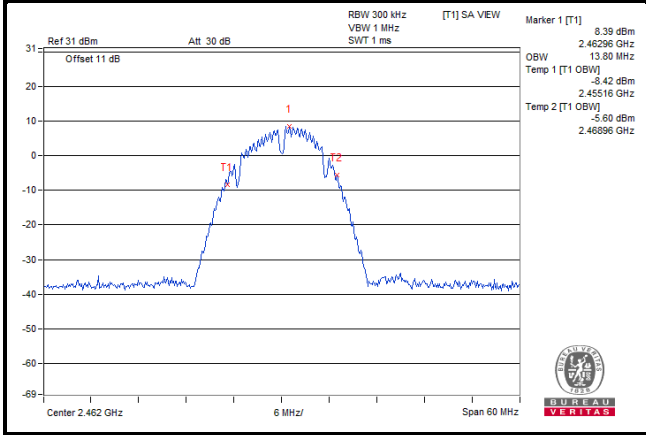
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	17.52	17.52	Pass
6	2437	17.40	17.40	Pass
11	2462	17.40	17.40	Pass

802.11n (HT40)

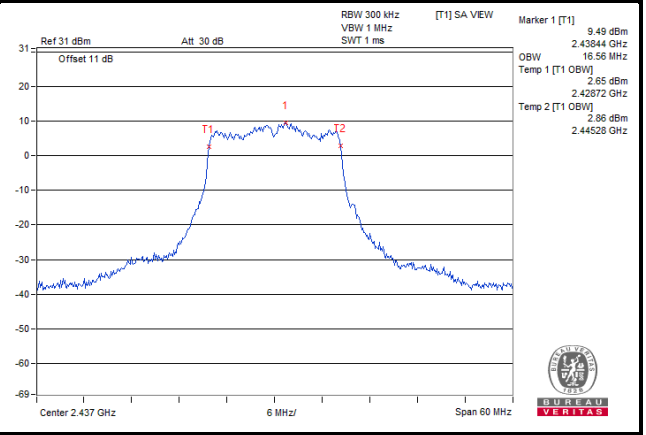
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	36.44	36.48	Pass
6	2437	36.44	36.48	Pass
9	2452	36.48	36.48	Pass

Spectrum Plot of Worst Value

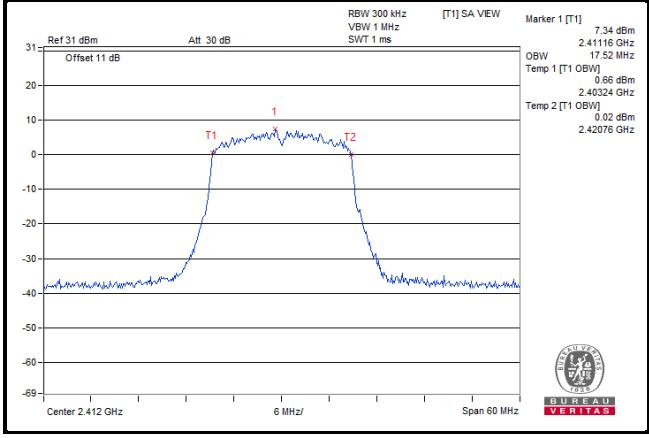
802.11b



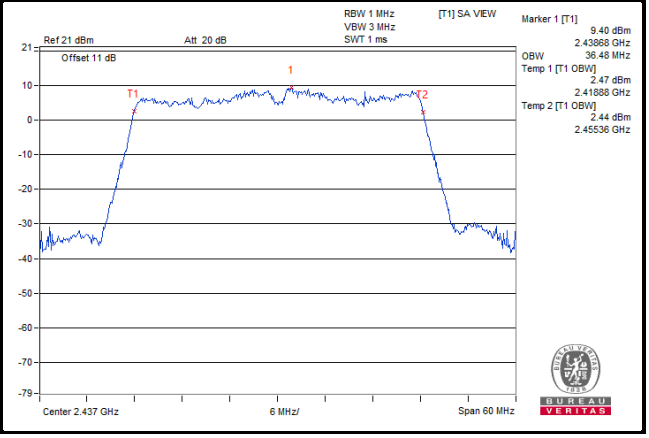
802.11g



802.11n (HT20)



802.11n (HT40)



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)
Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

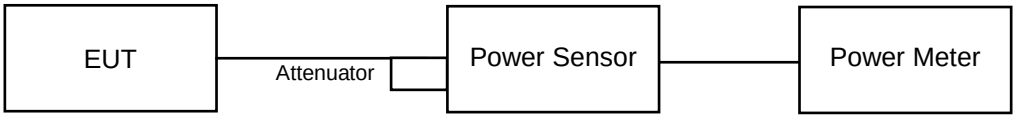
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20 MHz channel widths with NANT ≥ 5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) dB.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

An Average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor. Record the power level.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

CDD Mode

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.08	20.91	225.17	23.53	30	Pass
6	2437	18.12	17.02	115.214	20.62	30	Pass
11	2462	16.71	16.47	91.242	19.60	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.92	14.62	60.019	17.78	30	Pass
6	2437	16.65	16.72	93.228	19.70	30	Pass
11	2462	13.81	13.59	46.9	16.71	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.82	14.91	61.313	17.88	30	Pass
6	2437	16.82	17.11	99.488	19.98	30	Pass
11	2462	13.85	13.93	48.983	16.90	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	13.47	13.39	44.06	16.44	30	Pass
6	2437	13.11	13.37	42.191	16.25	30	Pass
9	2452	12.35	12.45	34.758	15.41	30	Pass

Beamforming Mode

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	11.81	11.90	30.659	14.87	29.80	Pass
6	2437	13.81	14.10	49.748	16.97	29.80	Pass
11	2462	10.84	10.92	24.493	13.89	29.80	Pass

Note: Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the limit shall be reduced to 30-(6.20-6) = 29.80dBm.

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	10.46	10.38	22.032	13.43	29.80	Pass
6	2437	10.10	10.36	21.097	13.24	29.80	Pass
9	2452	9.34	9.44	17.38	12.40	29.80	Pass

Note: Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the limit shall be reduced to 30-(6.20-6) = 29.80dBm.

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.6.2 Test Setup

4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

For Average Power (Duty cycle ≥ 98%)

a. Set instrument center frequency to DTS channel center frequency.
b. Set span to at least 1.5 times the OBW.
c. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set VBW ≥3 x RBW.
e. Detector = power averaging (RMS) or sample detector (when RMS not available).
f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g. Sweep time = auto couple.
h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
i. Use the peak marker function to determine the maximum amplitude level.

For Average Power (Duty cycle < 98%)

a. Measure the duty cycle (x).

b. Set instrument center frequency to DTS channel center frequency.

c. Set span to at least 1.5 times the OBW.

d. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

e. Set VBW ≥3 x RBW.

f. Detector = power averaging (RMS) or sample detector (when RMS not available).

g. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.

h. Sweep time = auto couple.

i. Do not use sweep triggering. Allow sweep to “free run”.

j. Employ trace averaging (RMS) mode over a minimum of 100 traces.

k. Use the peak marker function to determine the maximum amplitude level.

l. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 Test Results

802.11b

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-12.03	3.01	-9.02	7.80	Pass
	6	2437	-14.01	3.01	-11	7.80	Pass
	11	2462	-15.51	3.01	-12.5	7.80	Pass
1	1	2412	-12.07	3.01	-9.06	7.80	Pass
	6	2437	-14.77	3.01	-11.76	7.80	Pass
	11	2462	-16.58	3.01	-13.57	7.80	Pass

NOTE:

1. Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the power density limit shall be reduced to 8-(6.20-6) = 7.80dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/ 3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/ 3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-20.17	3.01	0.34	-16.82	7.80	Pass
	6	2437	-17.72	3.01	0.34	-14.37	7.80	Pass
	11	2462	-20.91	3.01	0.34	-17.56	7.80	Pass
1	1	2412	-20.13	3.01	0.34	-16.78	7.80	Pass
	6	2437	-17.73	3.01	0.34	-14.38	7.80	Pass
	11	2462	-21.35	3.01	0.34	-18	7.80	Pass

NOTE:

1. Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the power density limit shall be reduced to 8-(6.20-6) = 7.80dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/ 3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/ 3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-20.46	3.01	0.1	-17.35	7.80	Pass
	6	2437	-18.77	3.01	0.1	-15.66	7.80	Pass
	11	2462	-21.08	3.01	0.1	-17.97	7.80	Pass
1	1	2412	-21.02	3.01	0.1	-17.91	7.80	Pass
	6	2437	-18.52	3.01	0.1	-15.41	7.80	Pass
	11	2462	-21.29	3.01	0.1	-18.18	7.80	Pass

NOTE:

1. Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the power density limit shall be reduced to 8-(6.20-6) = 7.80dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

802.11n (HT40)

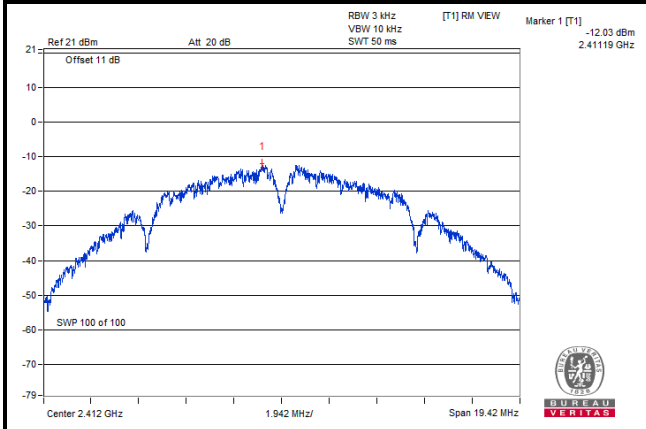
TX Chain	Channel	Freq. (MHz)	PSD (dBm/ 3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/ 3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-25.96	3.01	0.16	-22.79	7.80	Pass
	6	2437	-26.15	3.01	0.16	-22.98	7.80	Pass
	9	2452	-26.61	3.01	0.16	-23.44	7.80	Pass
1	3	2422	-25.91	3.01	0.16	-22.74	7.80	Pass
	6	2437	-25.45	3.01	0.16	-22.28	7.80	Pass
	9	2452	-26.56	3.01	0.16	-23.39	7.80	Pass

NOTE:

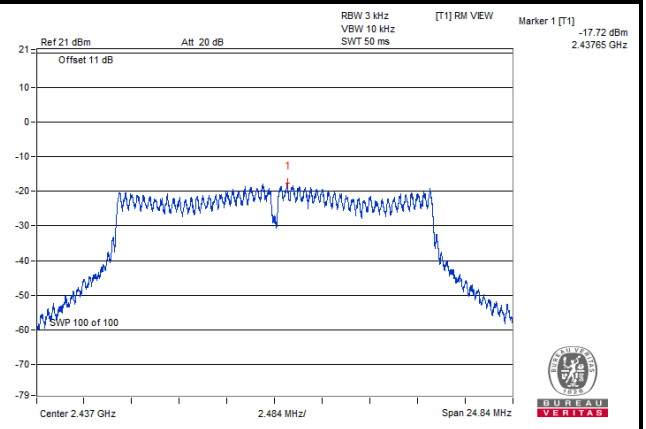
1. Directional gain = 3.19dBi +10log(2) = 6.20dBi>6dBi, so the power density limit shall be reduced to 8-(6.20-6) = 7.80dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

Spectrum Plot of Worst Value

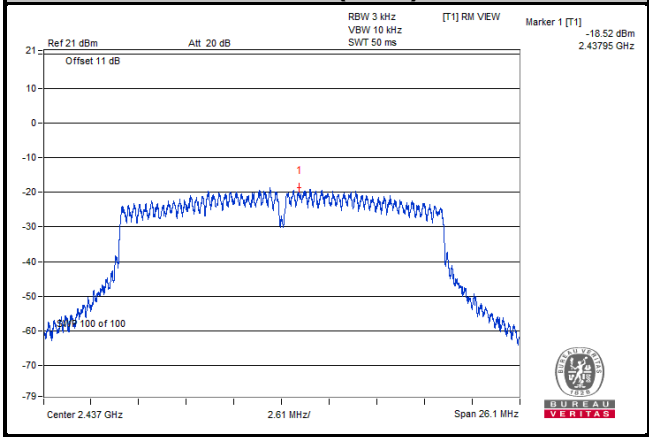
802.11b



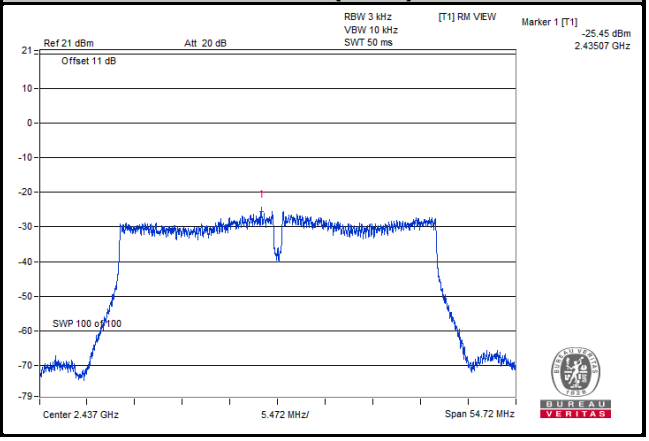
802.11g



802.11n (HT20)



802.11n (HT40)

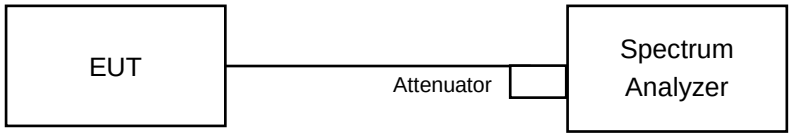


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

Below -30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

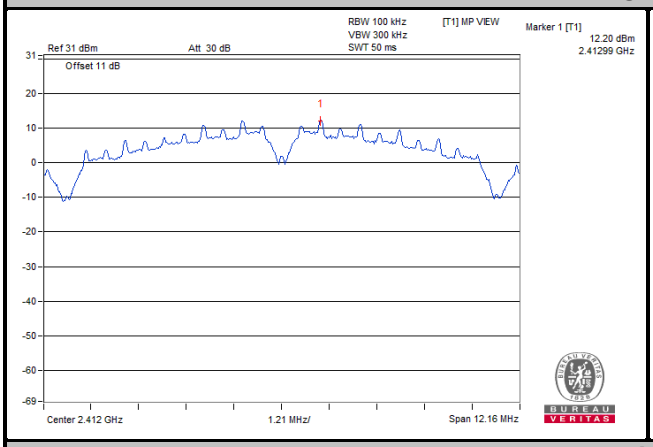
4.7.7 Test Results

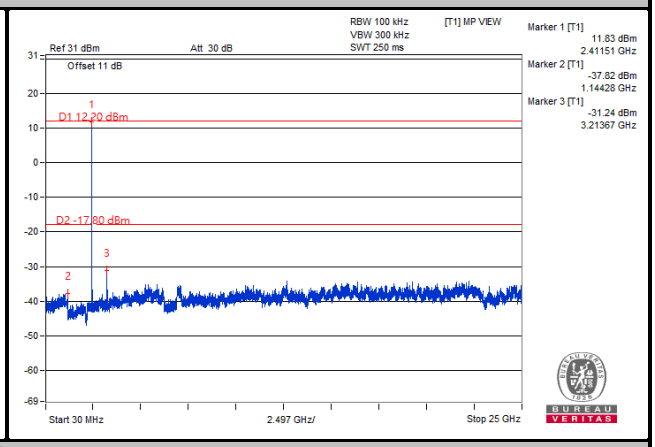
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

802.11b

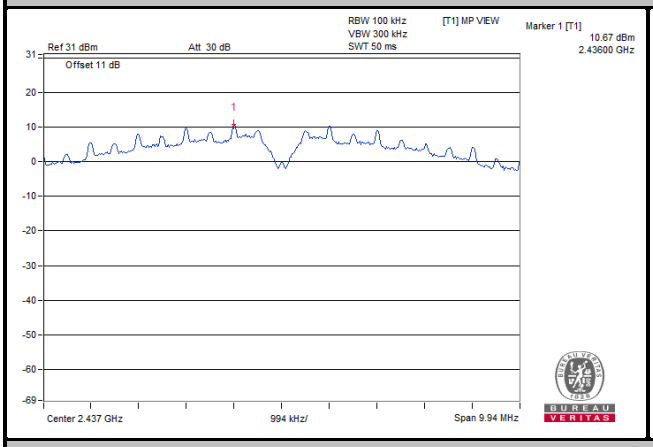
CHAIN 0

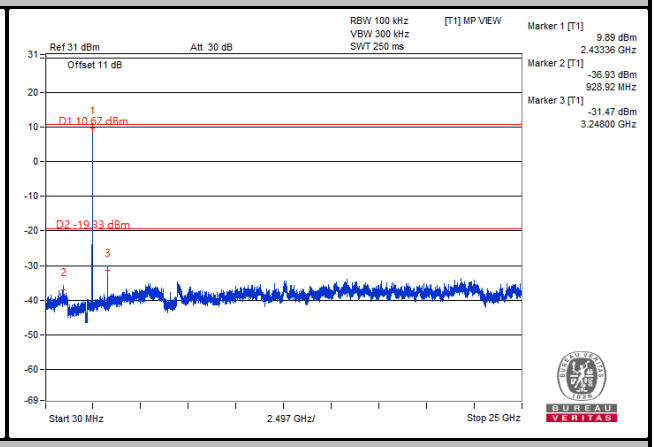
Ch 1



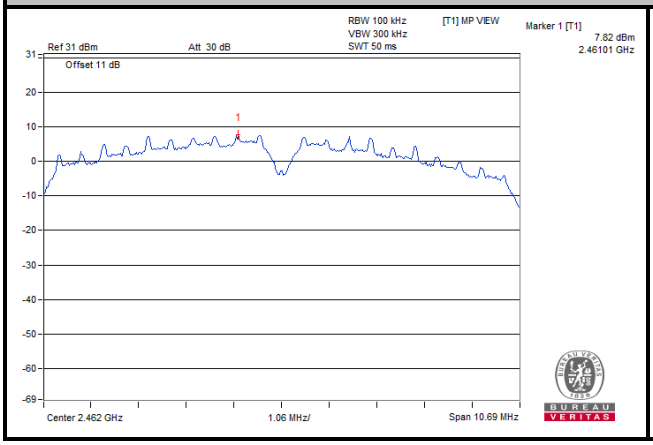


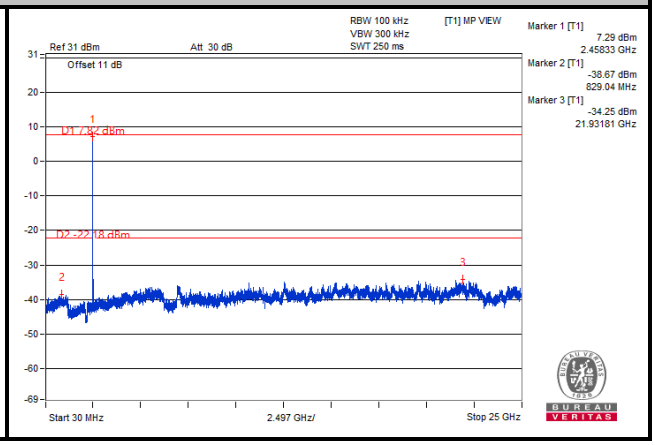
Ch 6

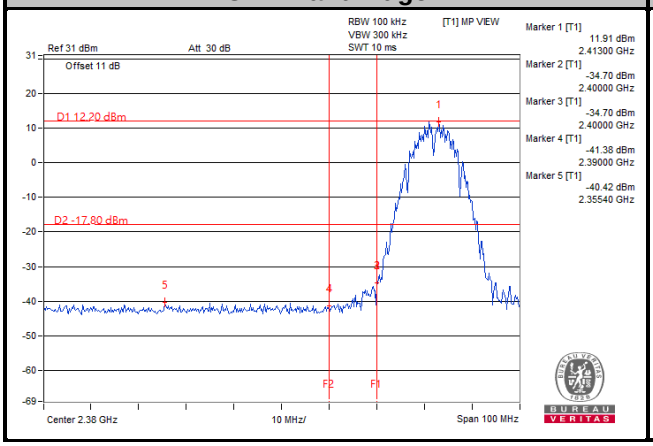
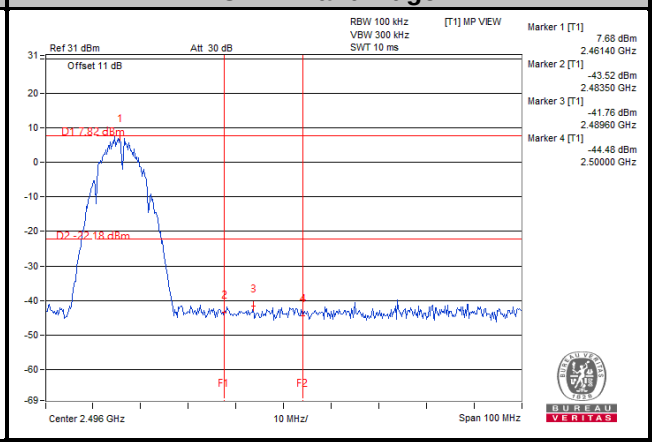




Ch 11

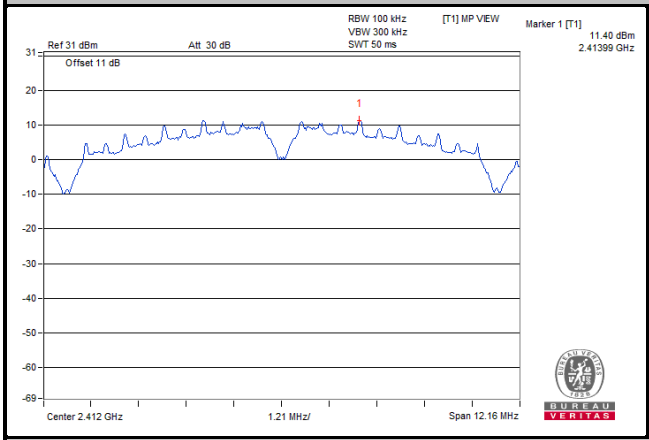


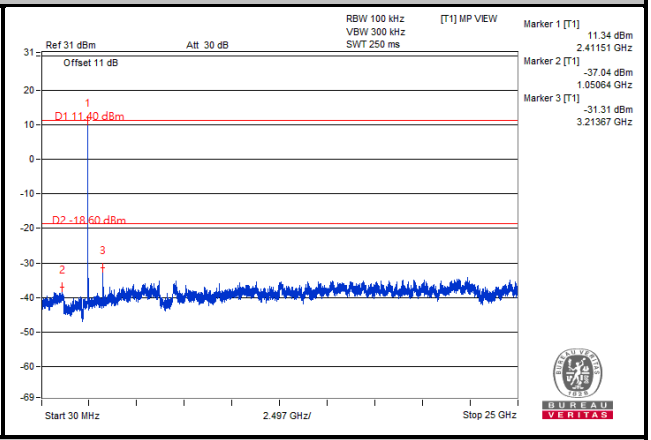


Ch 1 Band Edge	Ch 11 Band Edge
	

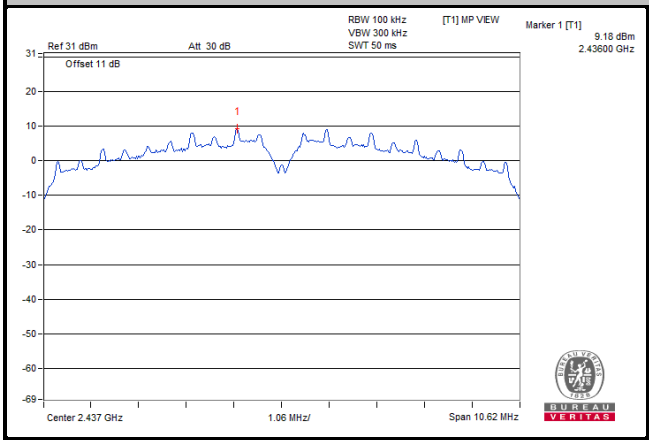
CHAIN 1

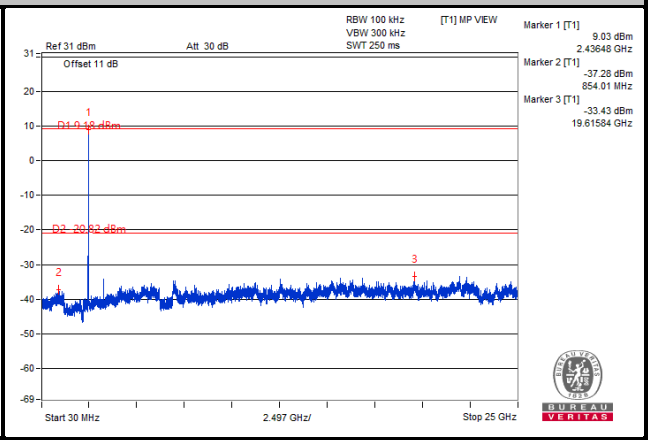
Ch 1



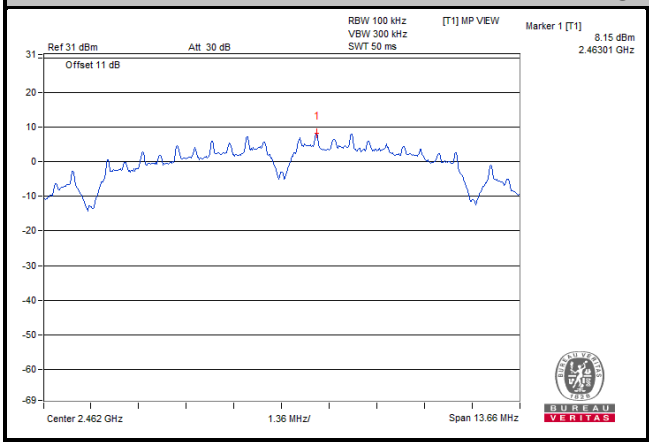


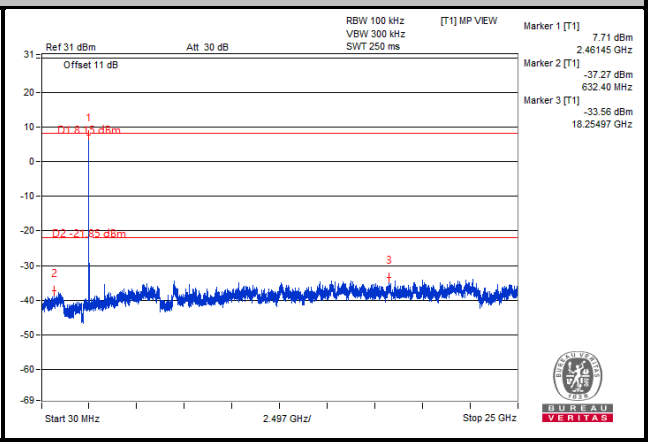
Ch 6

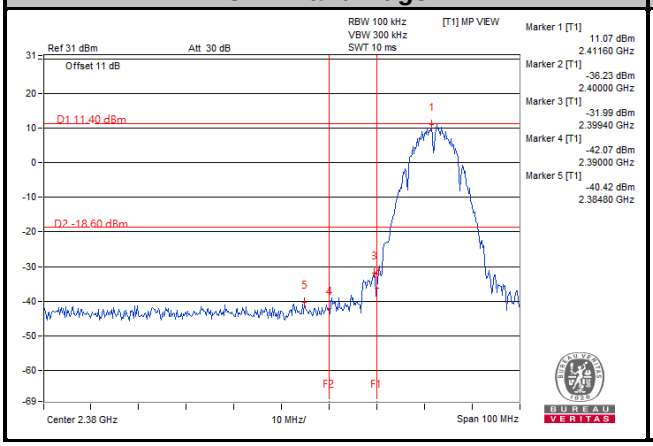
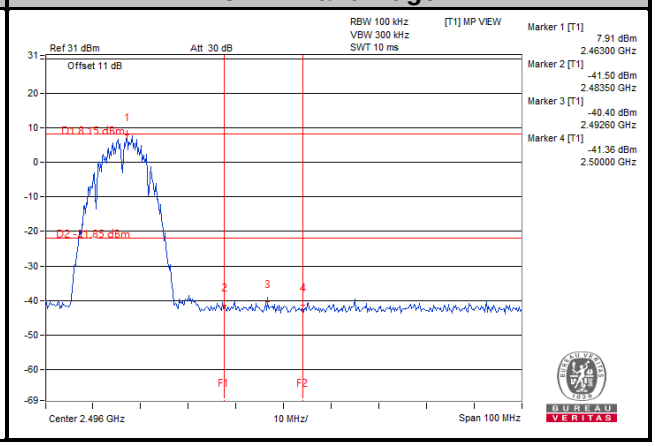




Ch 11



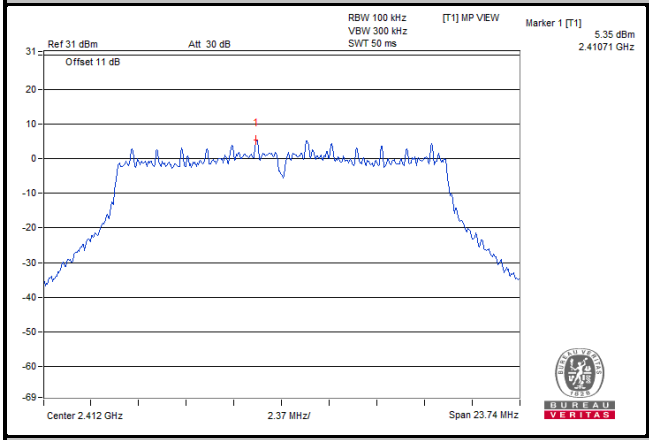


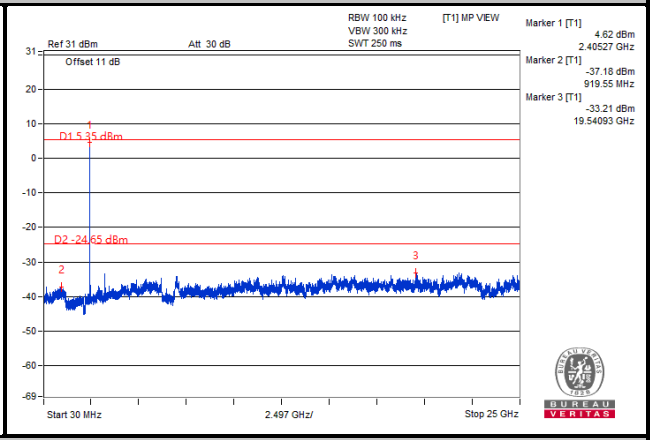
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11g

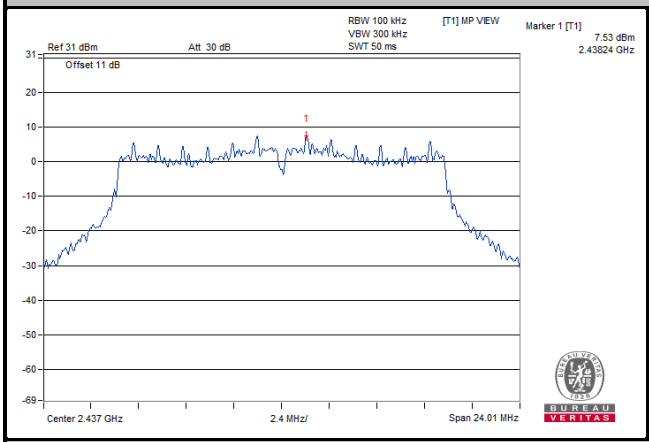
CHAIN 0

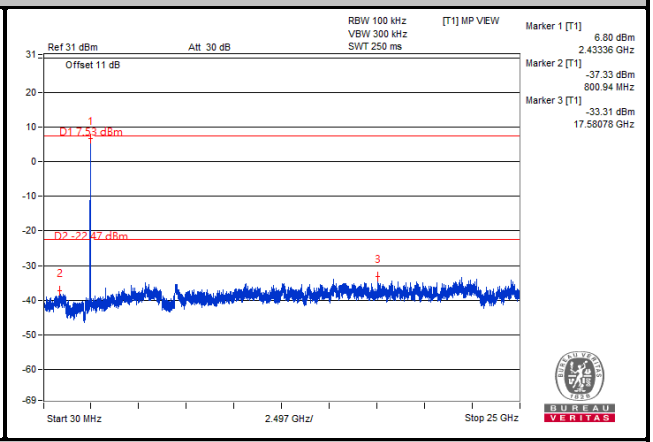
Ch 1



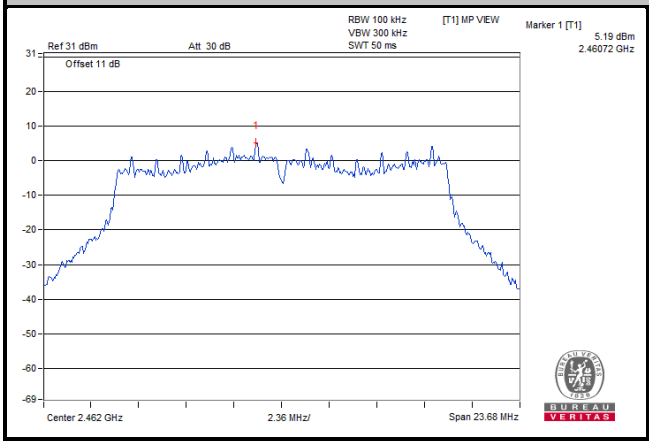


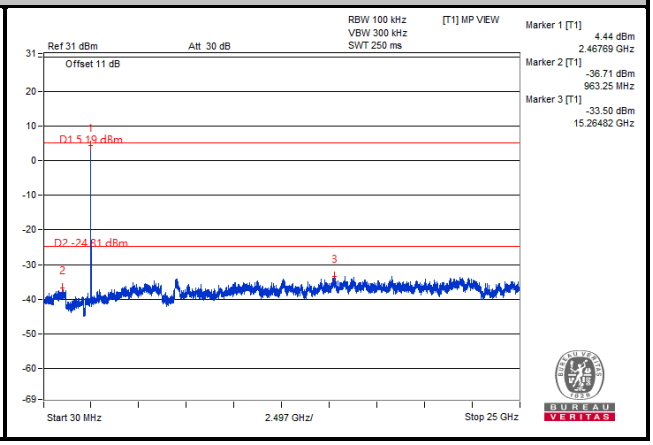
Ch 6

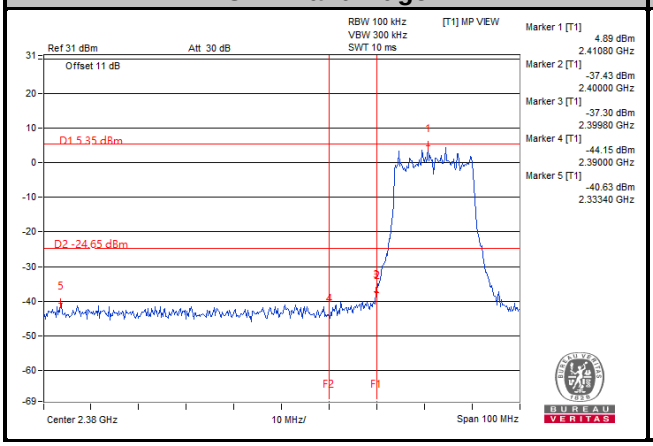
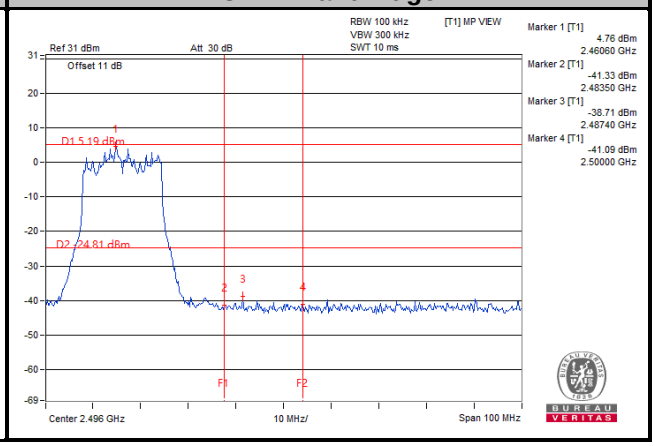




Ch 11

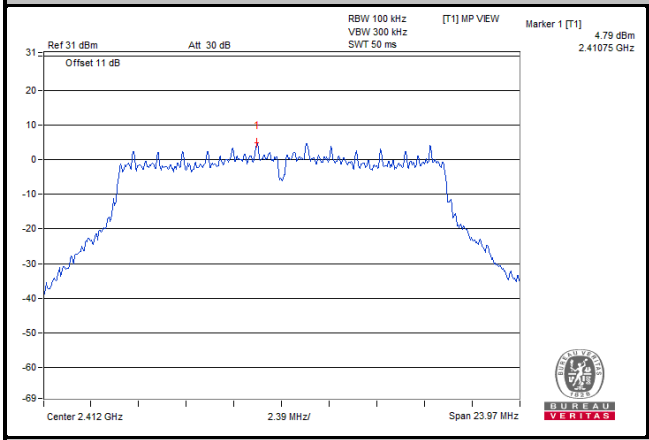


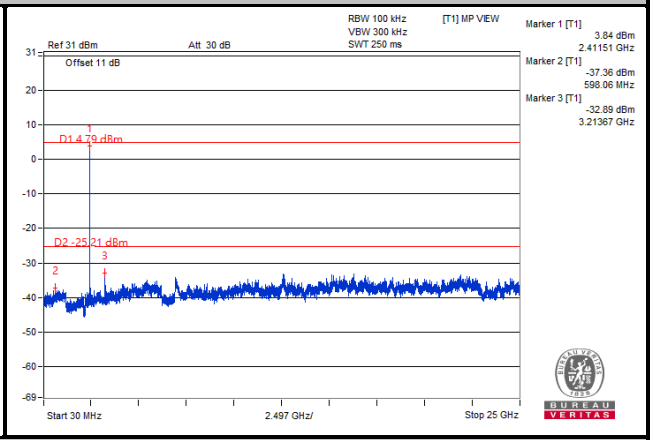


Ch 1 Band Edge	Ch 11 Band Edge
	

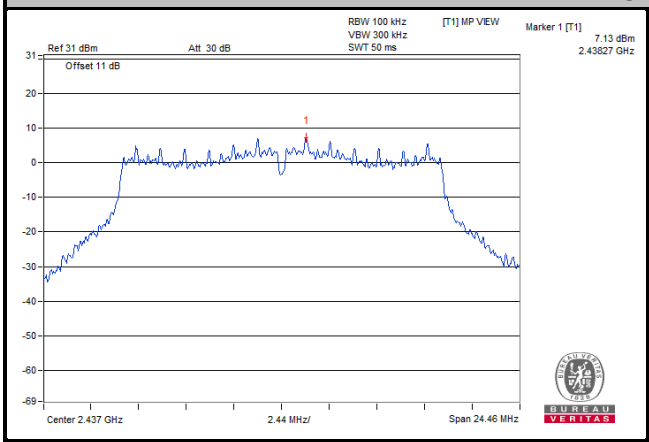
CHAIN 1

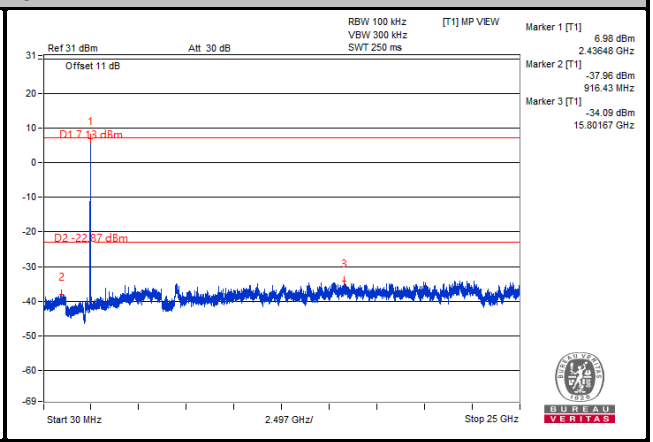
Ch 1



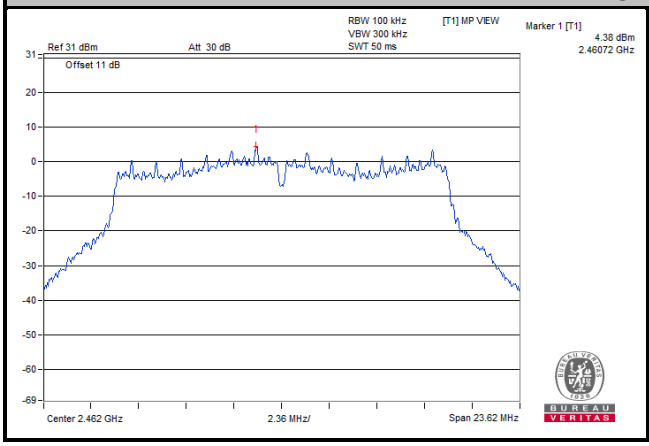


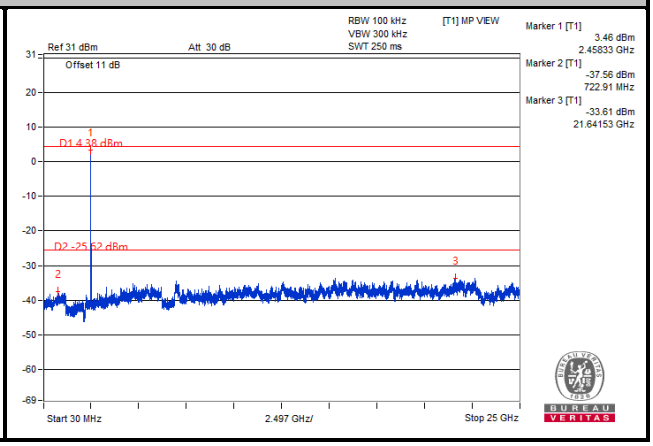
Ch 6

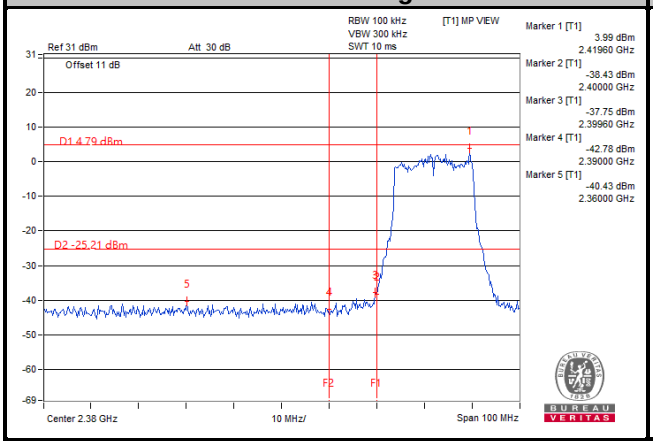
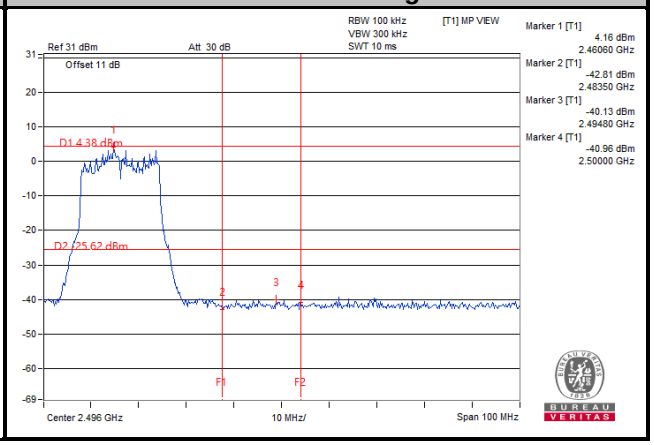




Ch 11



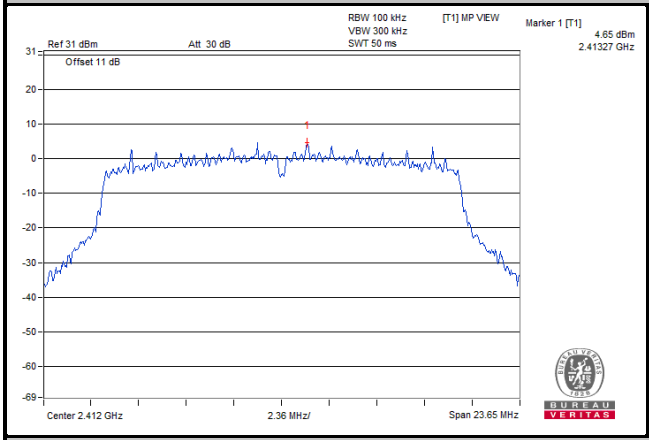


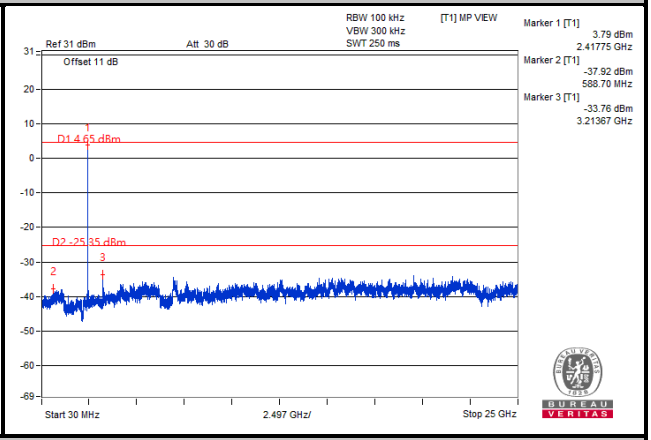
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11n (HT20)

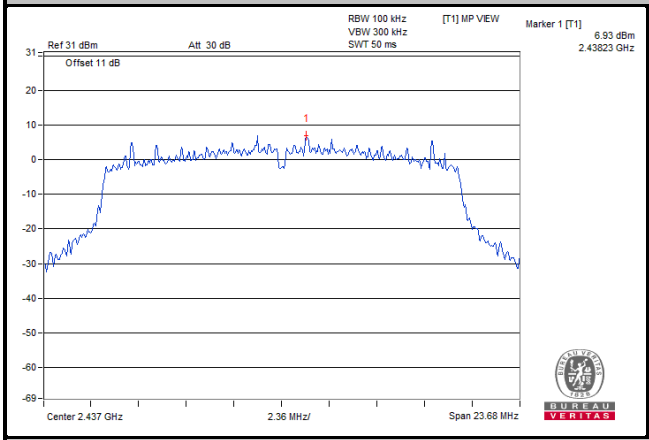
CHAIN 0

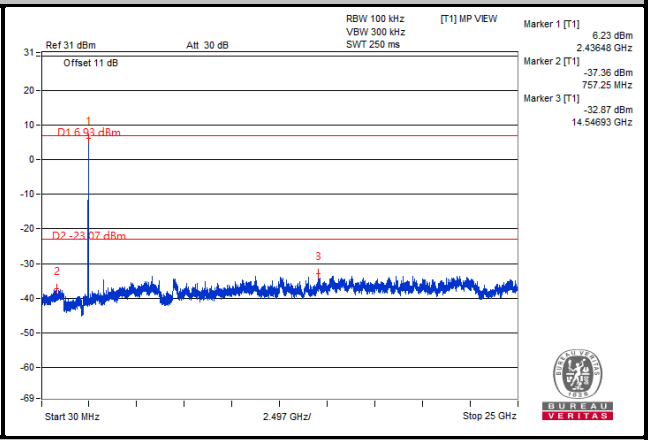
Ch 1



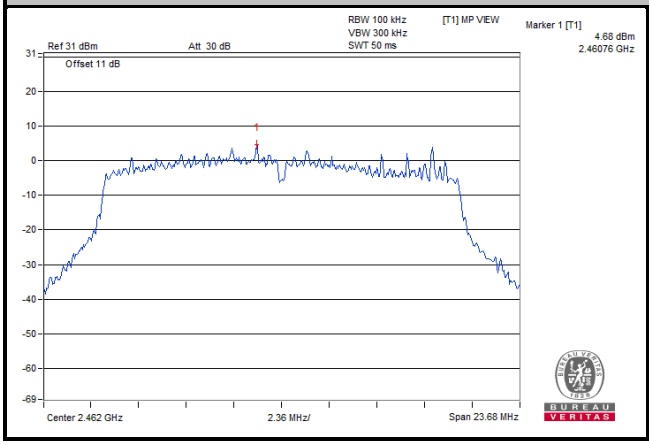


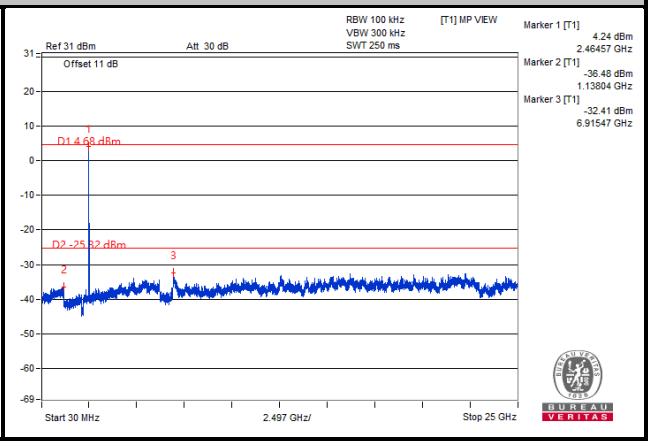
Ch 6

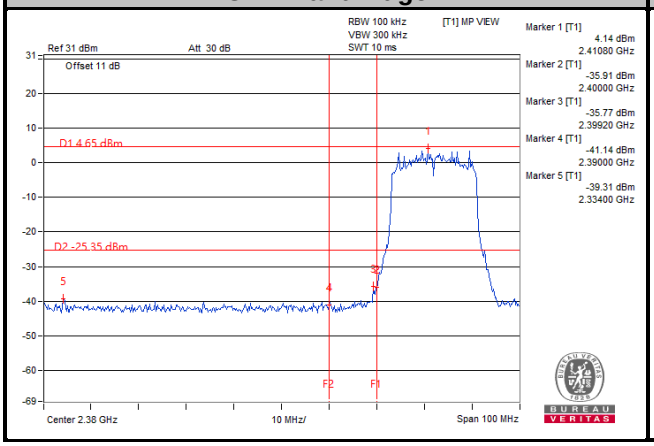
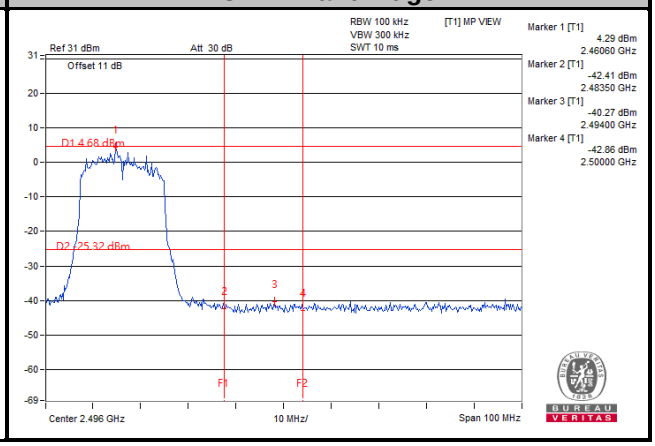




Ch 11

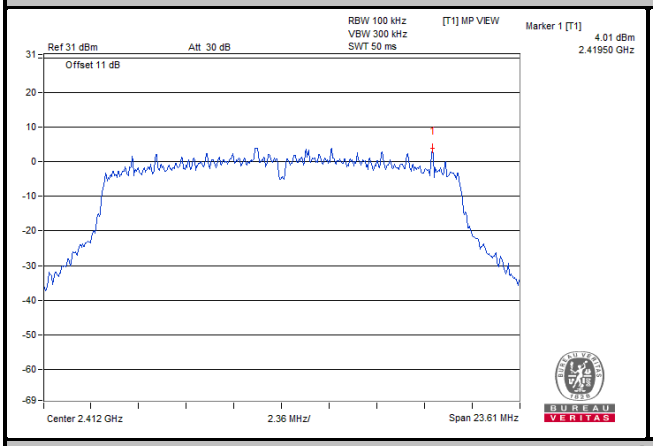


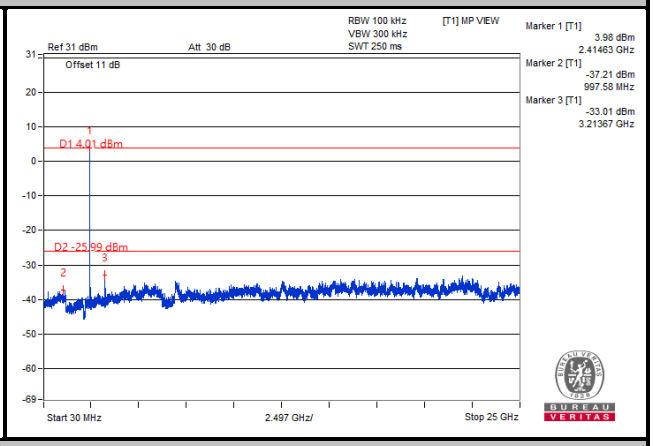


Ch 1 Band Edge	Ch 11 Band Edge
	

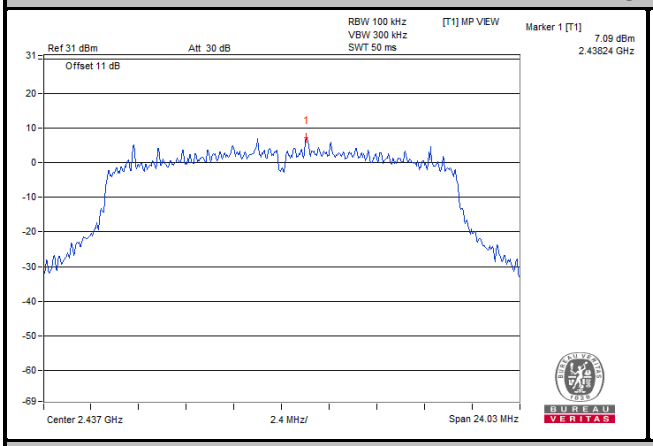
CHAIN 1

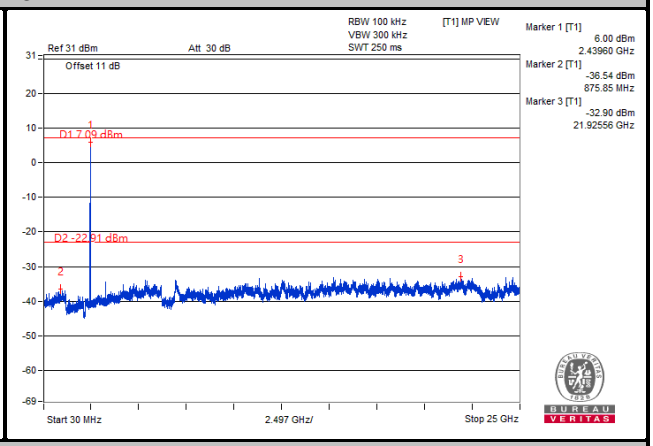
Ch 1



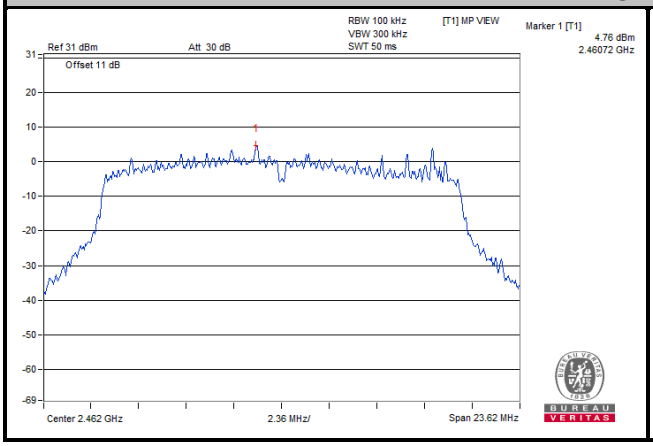


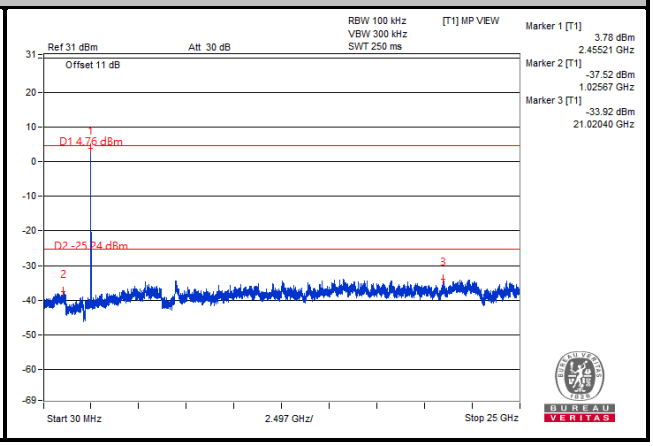
Ch 6

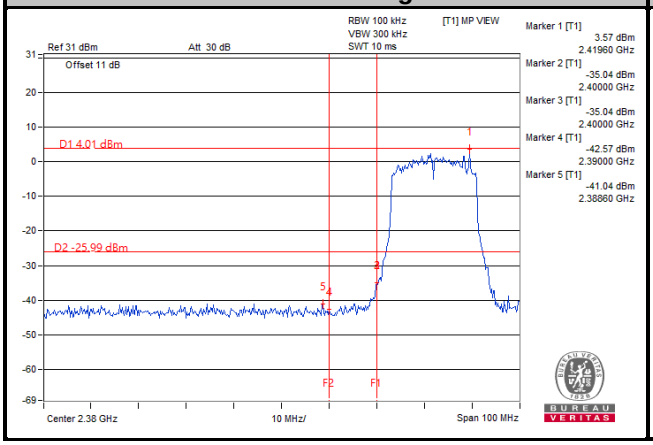
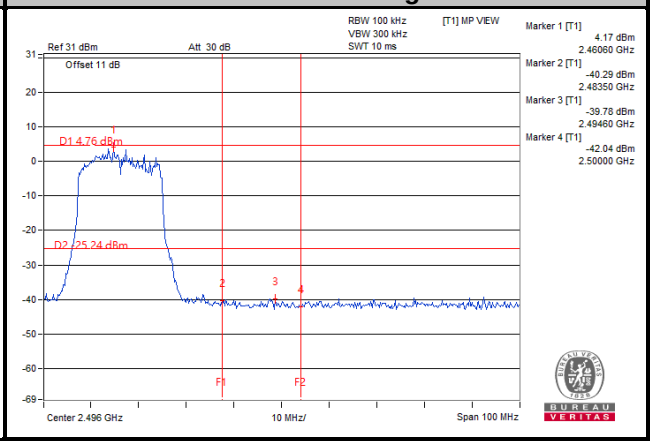




Ch 11



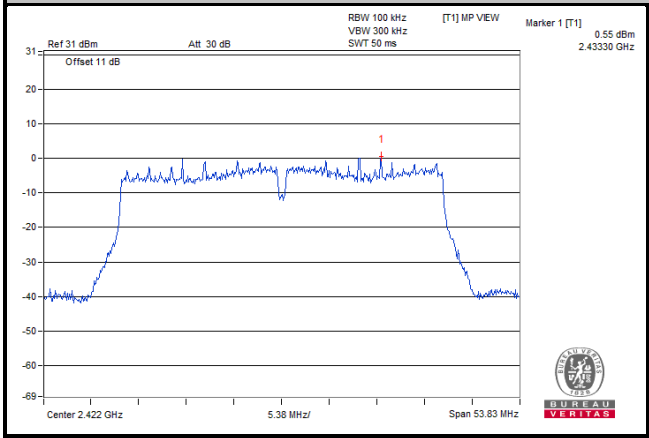


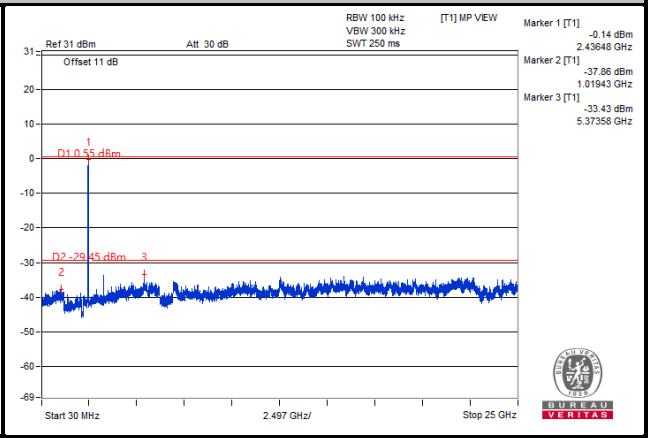
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11n (HT40)

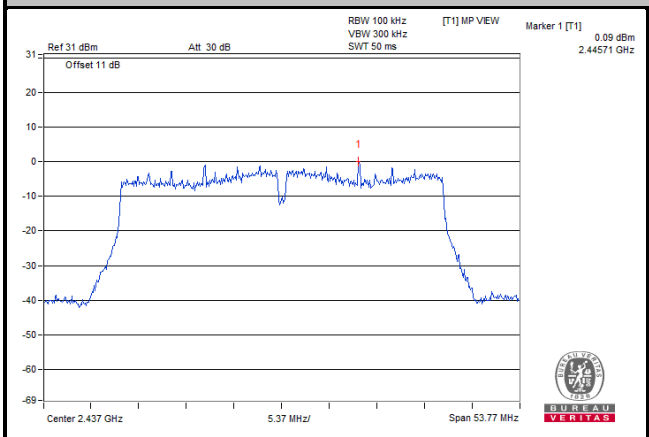
CHAIN 0

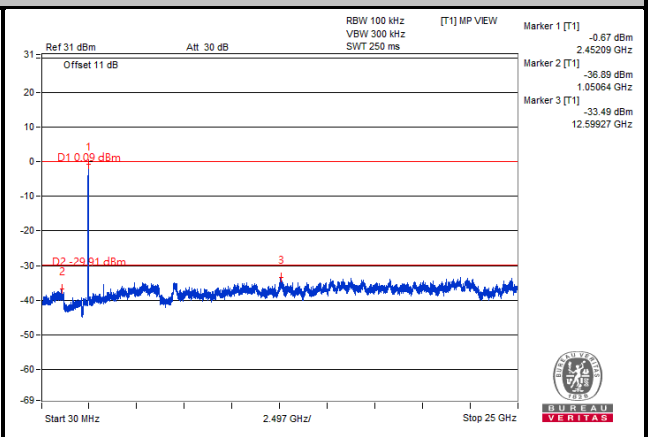
Ch 3



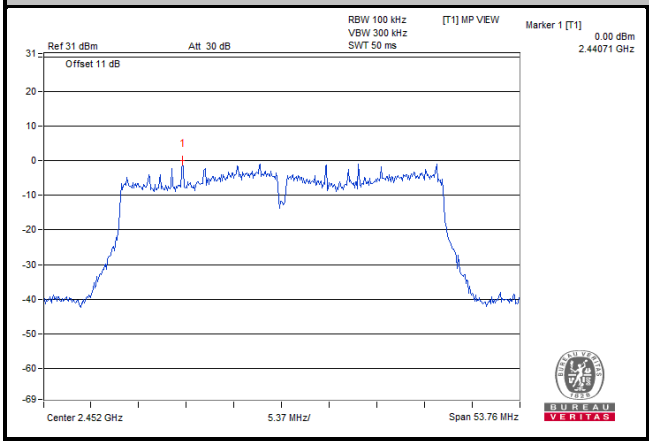


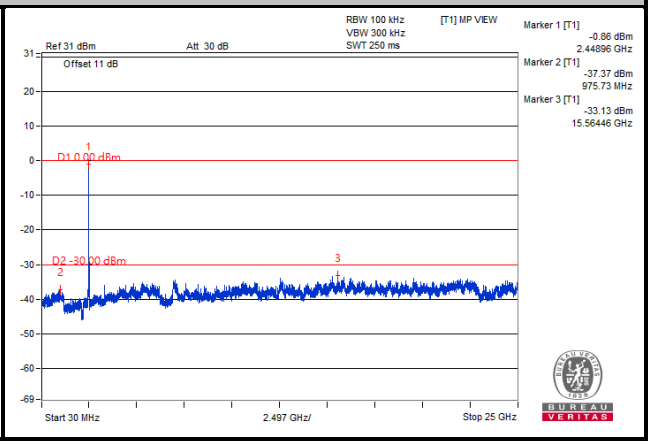
Ch 6

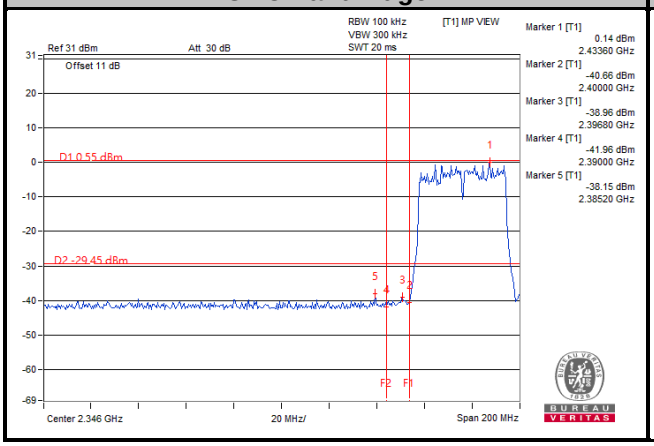
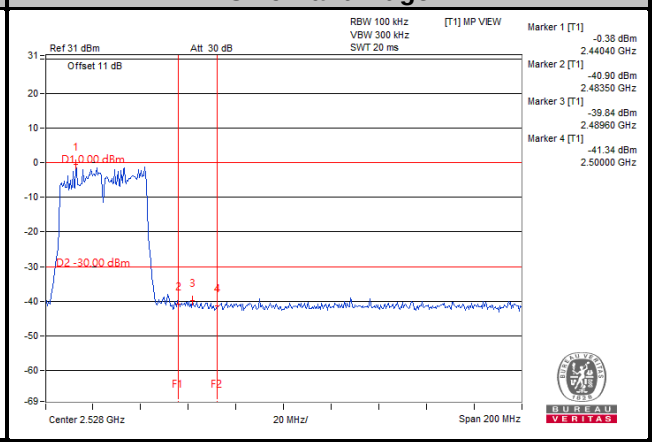




Ch 9

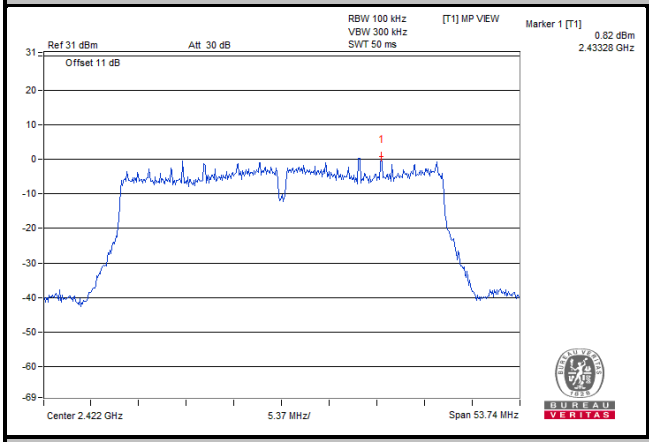


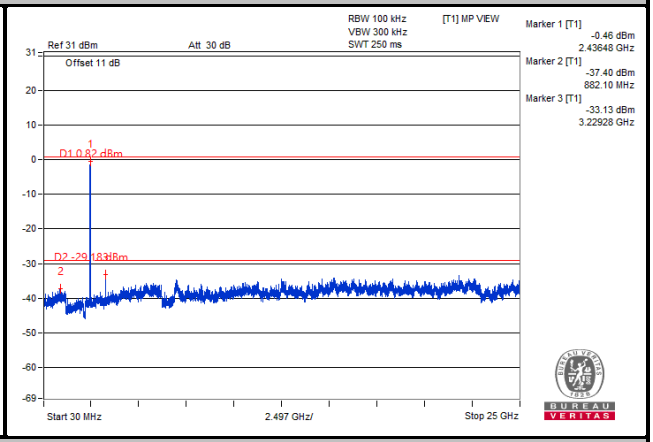


Ch 3 Band Edge	Ch 9 Band Edge
	

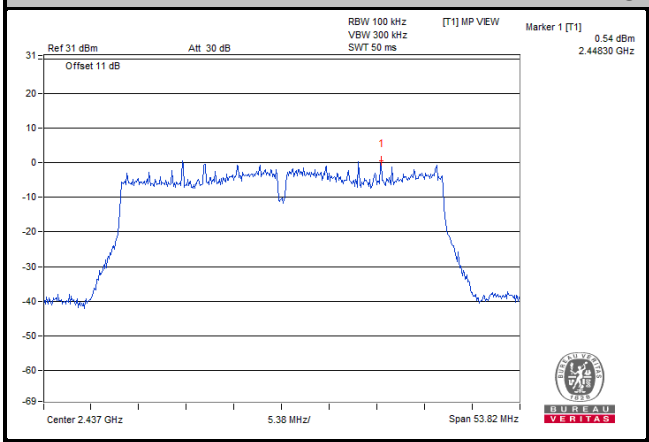
CHAIN 1

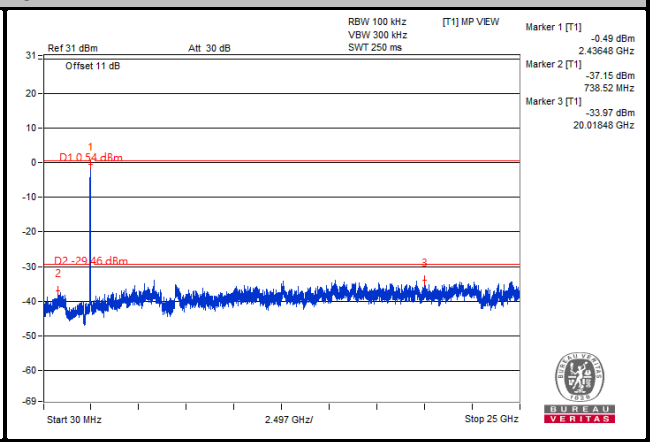
Ch 3



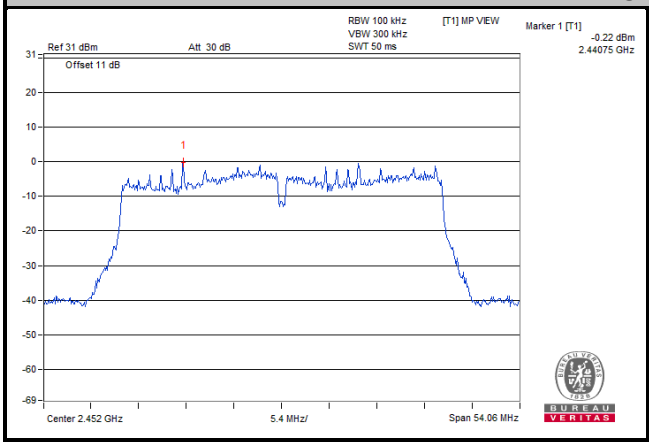


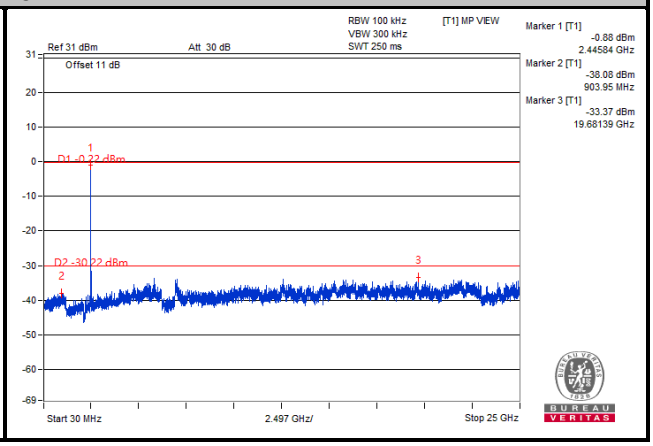
Ch 6

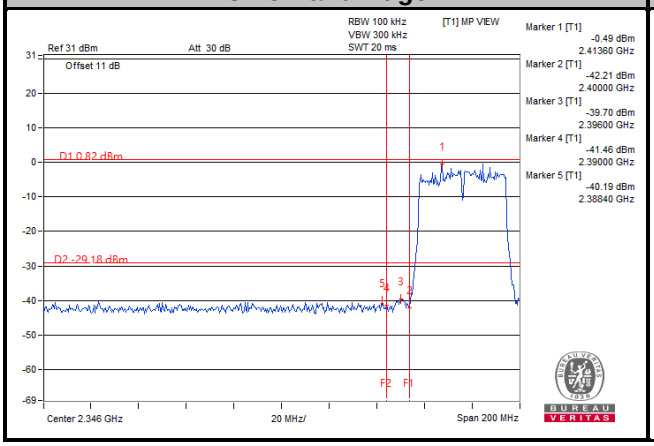
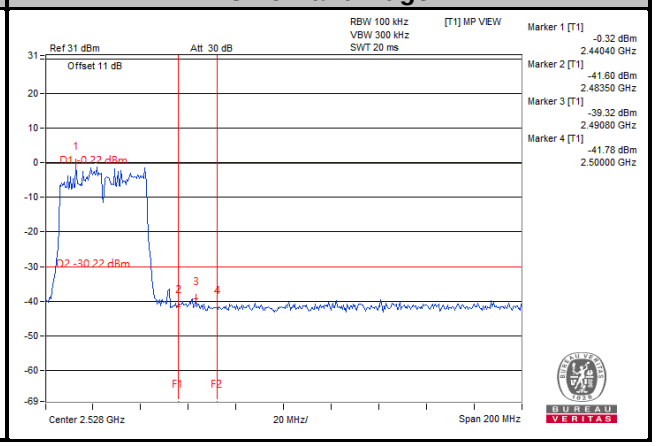




Ch 9





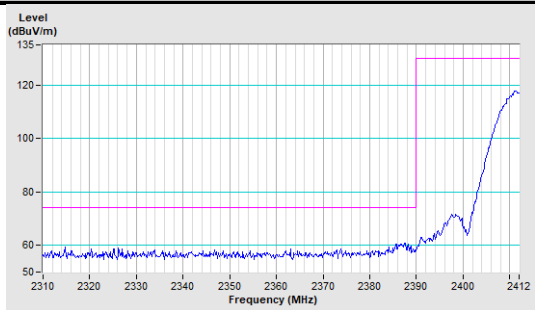
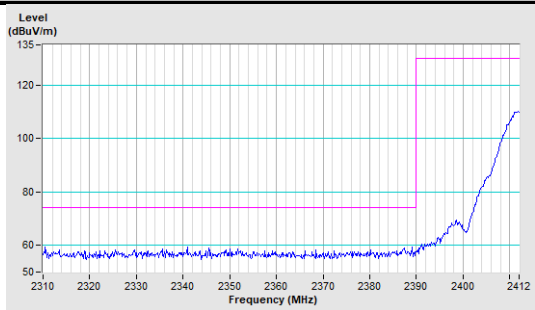
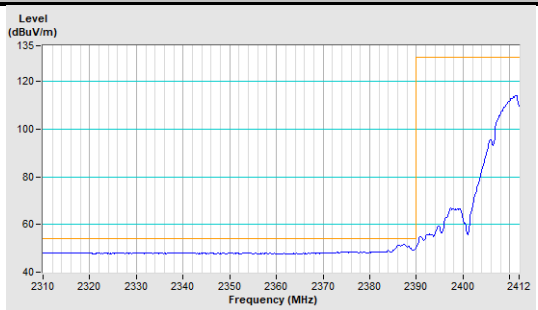
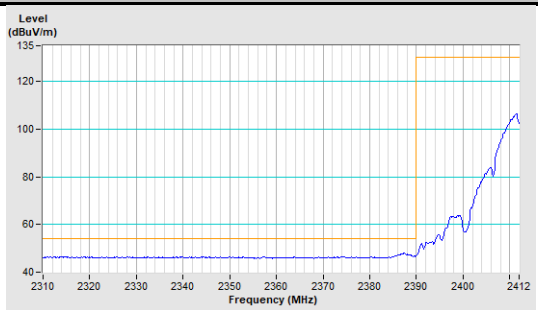
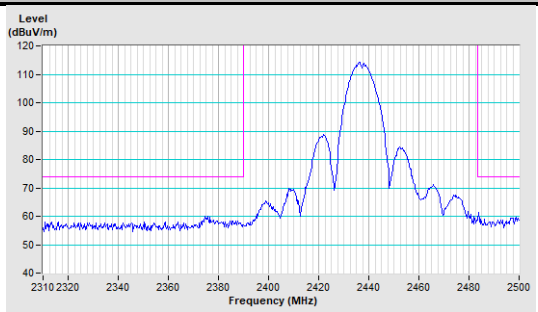
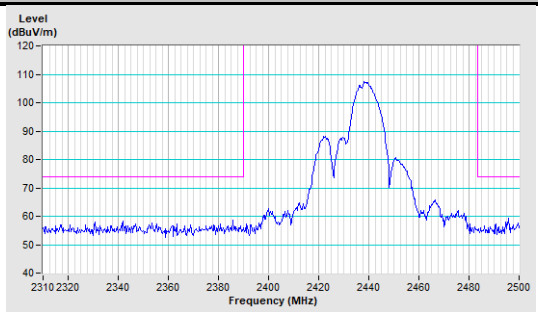
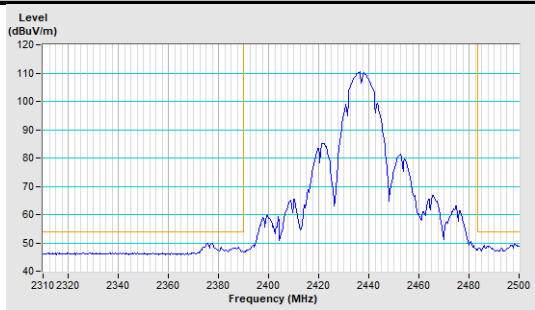
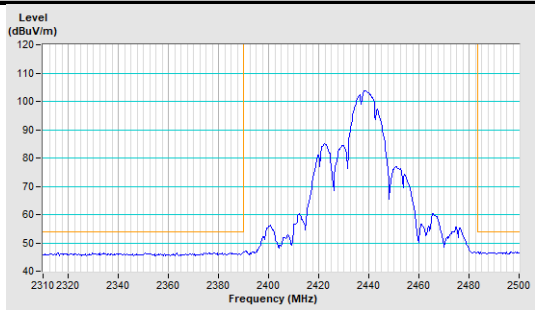
Ch 3 Band Edge	Ch 9 Band Edge
	

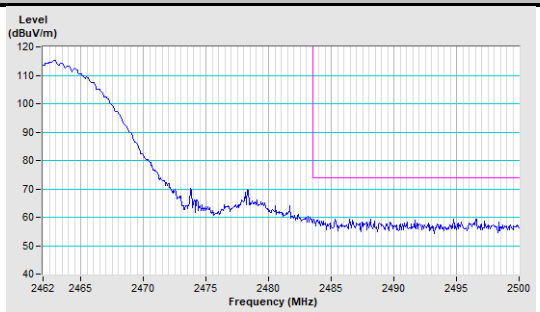
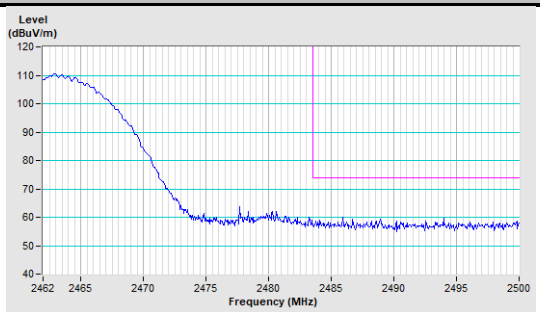
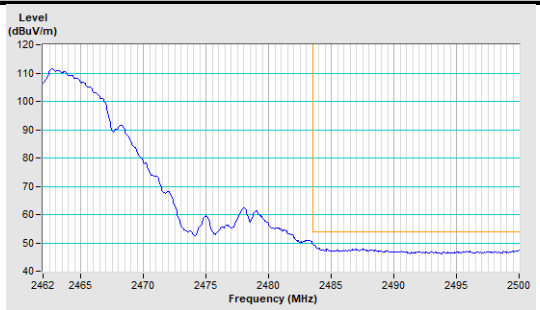
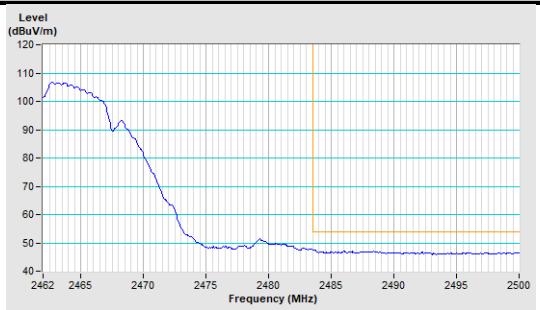
5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

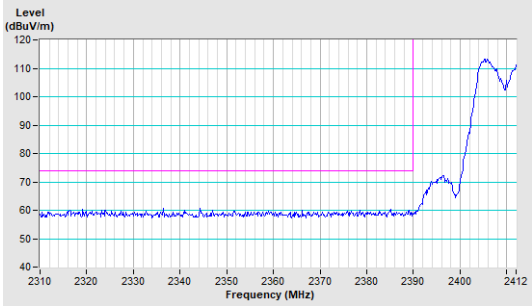
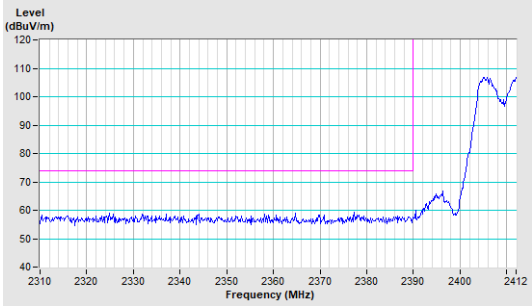
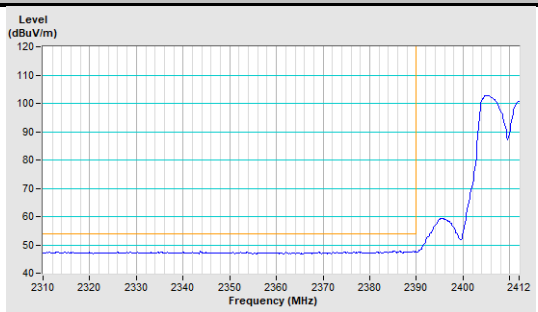
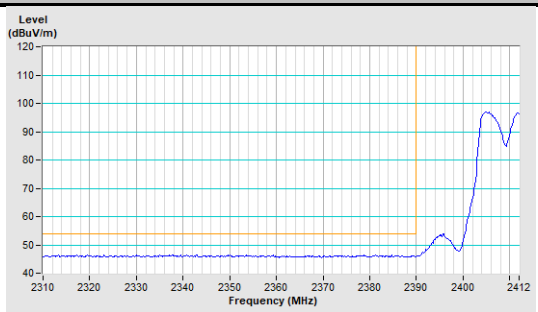
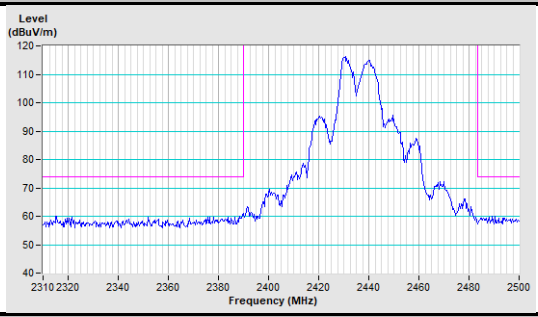
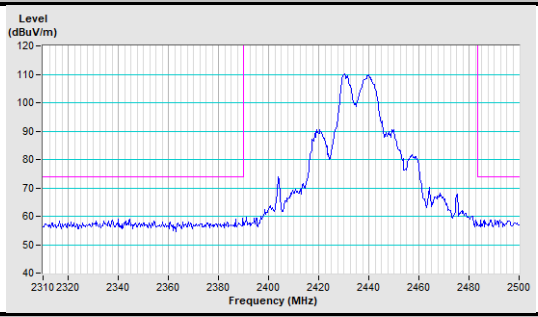
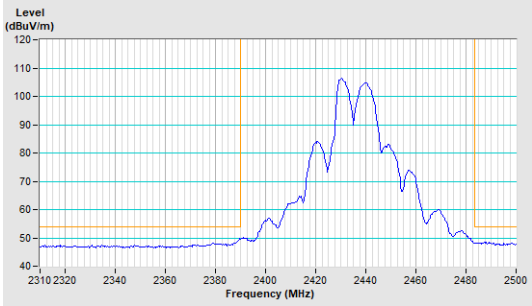
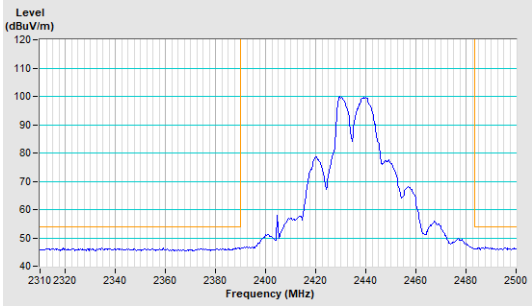
Annex A- Band Edge Measurement

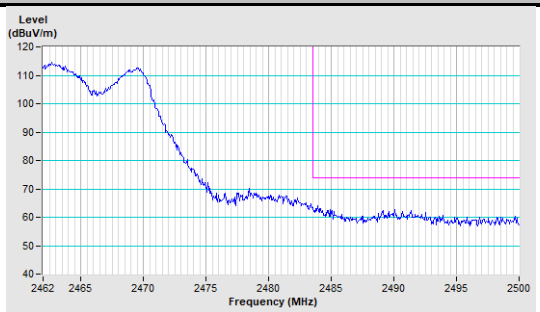
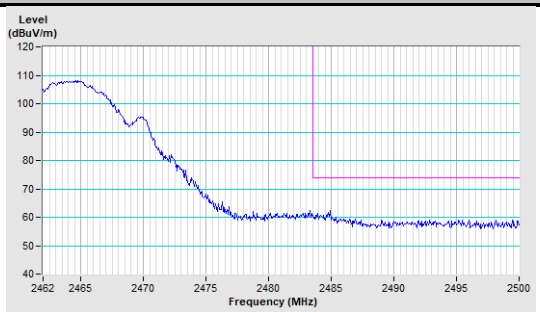
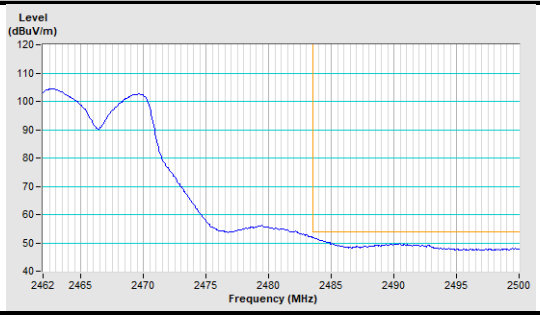
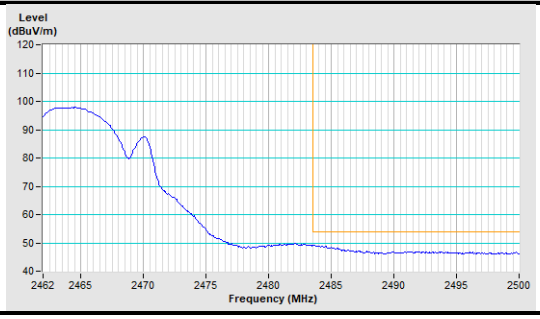
802.11b

Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	
Ch 6	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

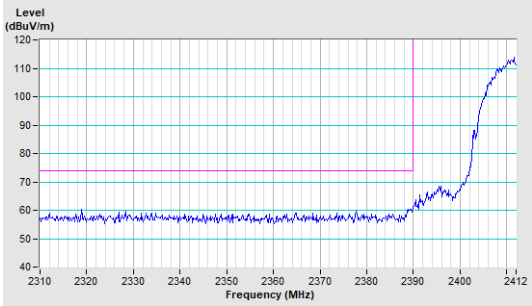
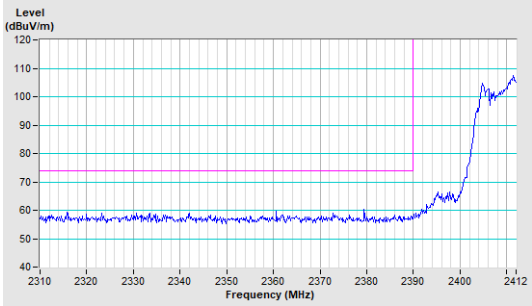
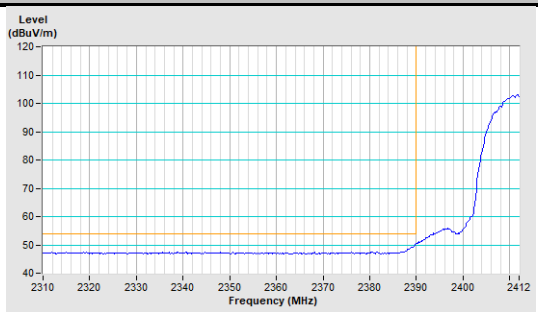
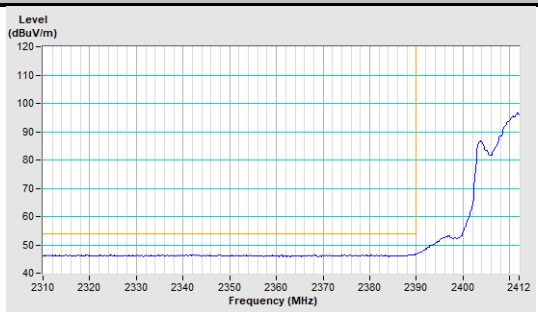
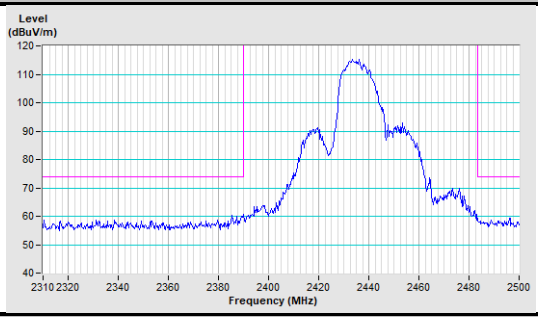
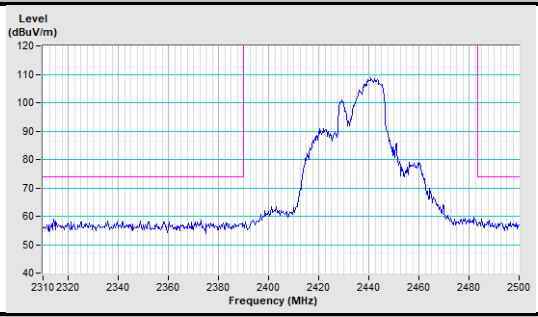
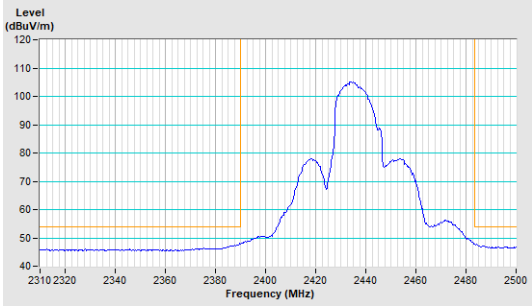
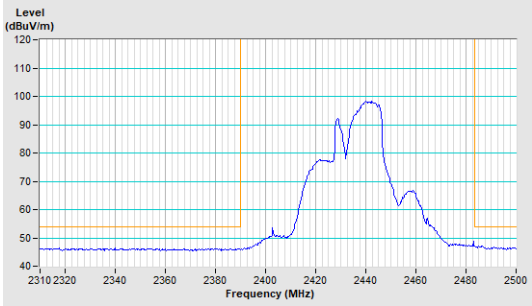
Ch 11	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

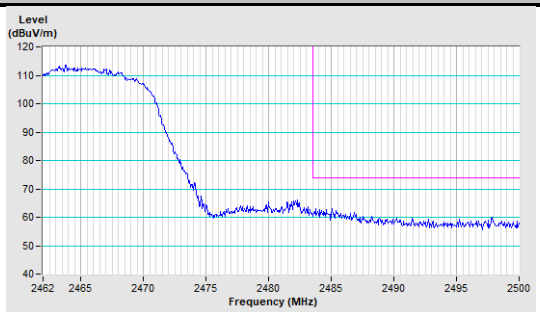
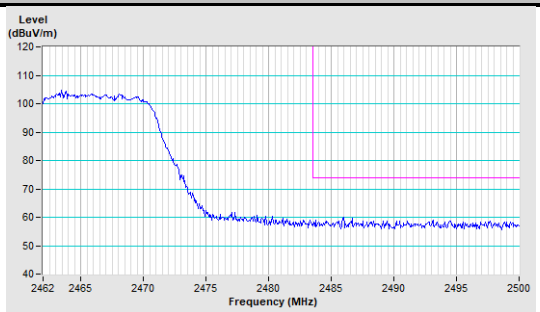
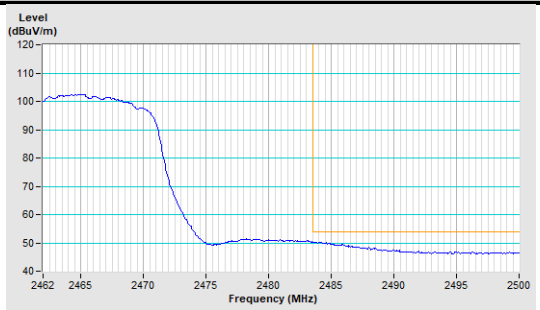
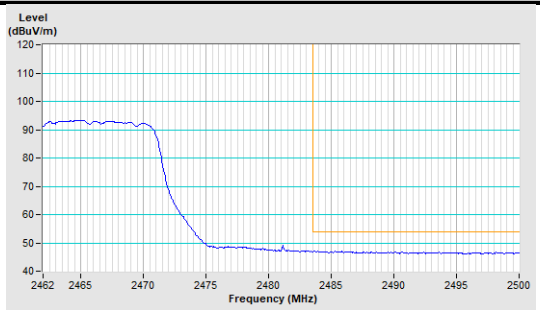
802.11g

Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	
Ch 6	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

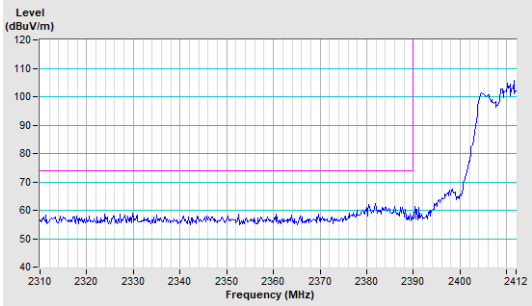
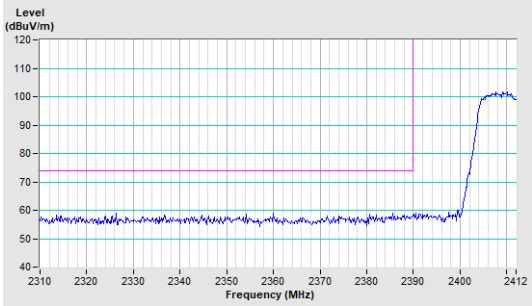
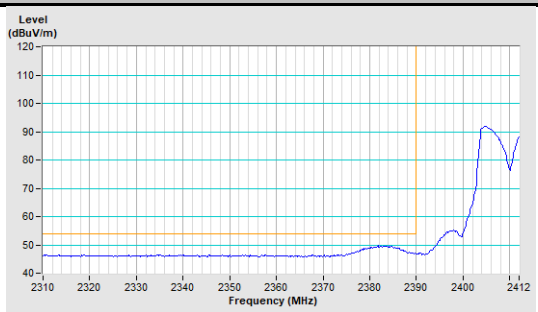
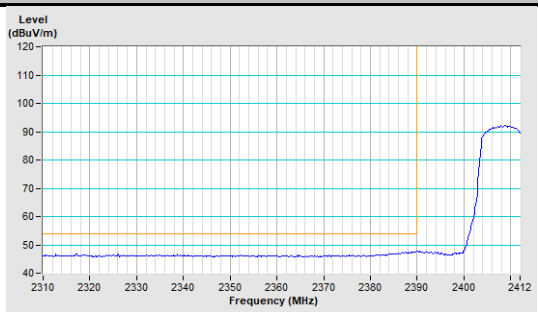
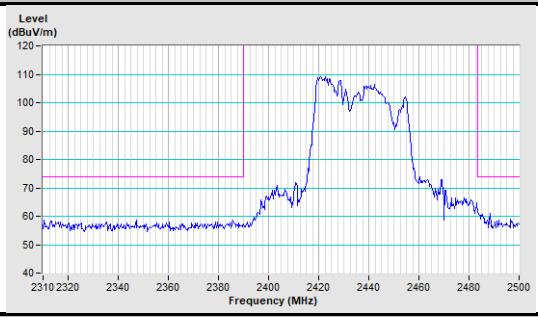
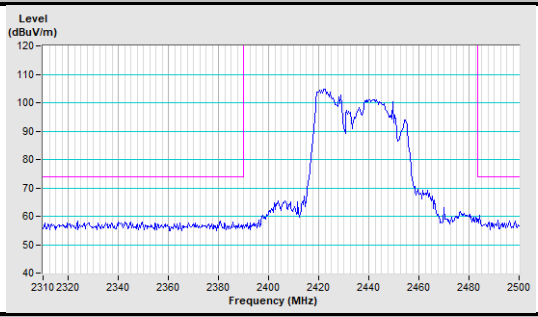
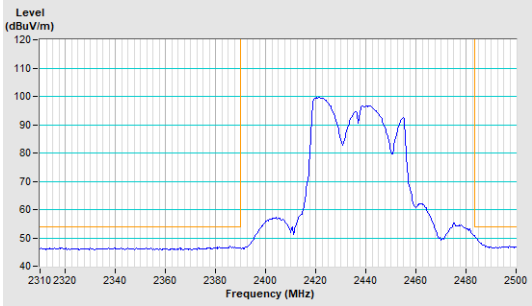
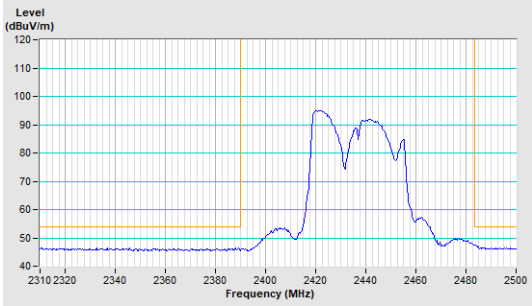
Ch 11	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

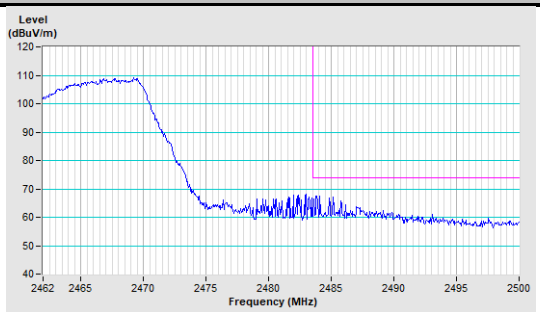
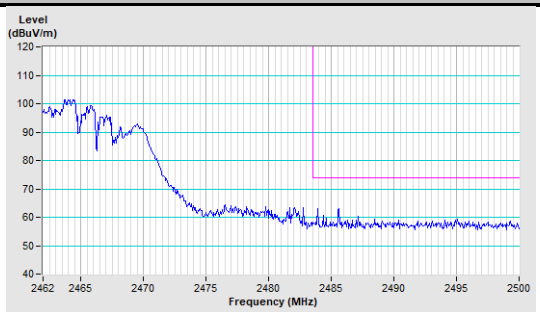
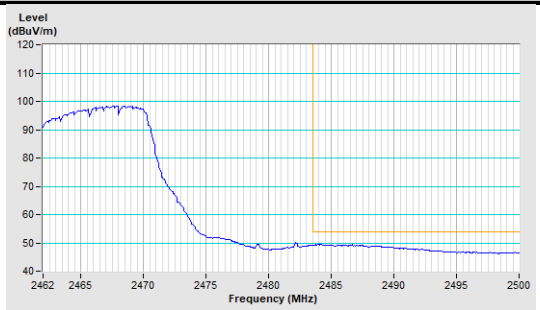
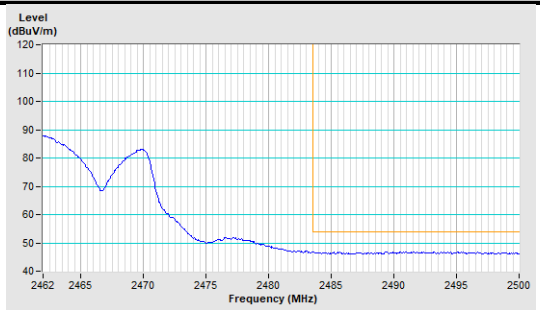
802.11n (HT20)

Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	
Ch 6	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

Ch 11	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

802.11n (HT40)

Ch 3	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	
Ch 6	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

Ch 9	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---