FCC Test Report

Report No.: RFBBEB-WTW-P21031098

FCC ID: 2AUAE-M350

Test Model: M350-W6

Series Model: M350-6

Received Date: 2021/9/2

Test Date: 2021/10/12 ~ 2021/11/1

Issued Date: 2022/1/14

Applicant: Proscend Communications Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

FCC Registration / Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RFBBEB-WTW-P21031098	Original release.	2022/1/14

1 Certificate of Conformity

Product:	Industrial Dual SIM CAT6 Cellular Router, Industrial Dual SIM CAT6 Cellular Router w/WiFi
Brand:	PROSCEND
Test Model:	M350-W6
Series Model:	M350-6
Sample Status:	Engineering sample
Applicant:	Proscend Communications Inc.
Test Date:	2021/10/12 ~ 2021/11/1
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 EMC characteristics under the conditions specified in this report.

Prepared by : Vivian Huang , **Date:** 2022/1/14

Vivian Huang / Specialist

Approved by : , **Date:** 2022/1/14

Clark Lin / Technical Manager

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 -15.83 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 -1.0 dB at 189.39 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
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	Antenna connector is R-SMA not a standard connector.

Note:

1. For 2.4 GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
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	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Industrial Dual SIM CAT6 Cellular Router, Industrial Dual SIM CAT6 Cellular Router w/WiFi
Brand	PROSCEND
Test Model	M350-W6
Series Model	M350-6
Status of EUT	Engineering sample
Power Supply Rating	12 Vdc from DC Jack or 8~48 Vdc from DI/DO interface
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to 144.4 Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11
Output Power	**CDD Mode:** 277.564 mW **Beamforming Mode:** 277.564 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Product name	Brand	Model No.	Difference
Industrial Dual SIM CAT6 Cellular Router	PROSCEND	M350-6	with CAT6 module
Industrial Dual SIM CAT6 Cellular Router w/WiFi		M350-W6	with CAT6 & Wi-Fi module

From the above models, model: **M350-W6** was selected as representative model for the test and its data was recorded in this report.

2. The EUT contains certified WWAN module which FCC ID: XMR201906EM06A
3. The EUT has below radios as following table:

Radio 1	Radio 2
WWAN(LTE) + GPS	WLAN (2.4GHz + 5GHz)

4. Simultaneously transmission condition.

Condition	Technology	
1	WWAN(LTE)	WLAN (2.4GHz)
2	WWAN(LTE)	WLAN (5GHz)
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

5. The EUT was pre-tested under the following test modes :

Pre-test Mode	Description
Mode A	**Adapter mode**
Mode B	DC Power supply 8V
Mode C	DC Power supply 48V
The worst radiated emissions and conducted emissions were found in **Mode A**. Therefore only the test data of the modes were recorded in this report.	

6. The antennas provided to the EUT, please refer to the following table:

Antenna No.	RF Chain No.	Model	Antenna Net Gain(dBi)	Frequency Range	Antenna Type	Antenna Connector
WIFI Ant1	Chain0	WLN98002-A	1	2.4~2.4835 GHz	Dipole	R-SMA
			1.8	5.15~5.85 GHz		
WIFI Ant2	Chain1	WLN98002-A	1	2.4~2.4835 GHz	Dipole	R-SMA
			1.8	5.15~5.85 GHz		
LTE Ant1	Chain0	AN0727-64SP6BSM	2.89	1710~1785 MHz 1850 ~1915 MHz 1920 ~2010 MHz 2300~2400 MHz 2496~2690 MHz	Dipole	SMA
			-0.46	698~748 MHz 777~787 MHz 814 ~862 MHz 880~915 MHz		
LTE Ant2	Chain1	AN0727-64SP6BSM	2.89	1710~1785 MHz 1850 ~1915 MHz 1920 ~2010 MHz 2300~2400 MHz 2496~2690 MHz	Dipole	SMA
			-0.46	698~748 MHz 777~787 MHz 814 ~862 MHz 880~915 MHz		
GPS Ant	Chain0	GPS-21951	5.2	1575~1602 MHz	Dipole	SMA

7. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	1TX Diversity	1RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX

Note:
1. All of modulation mode support beamforming function except 802.11b/g modulation mode.
2. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.

8. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
9. 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.

3.2 Description of Test Modes

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

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

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 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

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 **X-plane**.

Radiated Emission Test (Above 1GHz):

☒ 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.

For 1 Tx					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
For 2 Tx - CDD Mode					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Radiated Emission Test (Below 1GHz):

☒ 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.

For 1 Tx					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11b	1 to 11	11	DSSS	DBPSK	1

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.

For 1 Tx					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11b	1 to 11	11	DSSS	DBPSK	1

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.

For 1 Tx					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
For 2 Tx - CDD Mode					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
For 2 Tx - Beamforming Mode					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**DATA RATE (Mbps)**
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

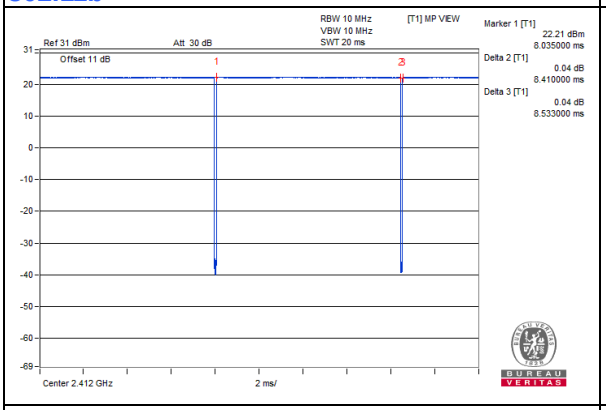
Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE≥1G	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
RE<1G	25deg. C, 69%RH	120Vac, 60Hz	Sampson
PLC	25deg. C, 68%RH	120Vac, 60Hz	Sampson Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jim Hung

3.3 Duty Cycle of Test Signal

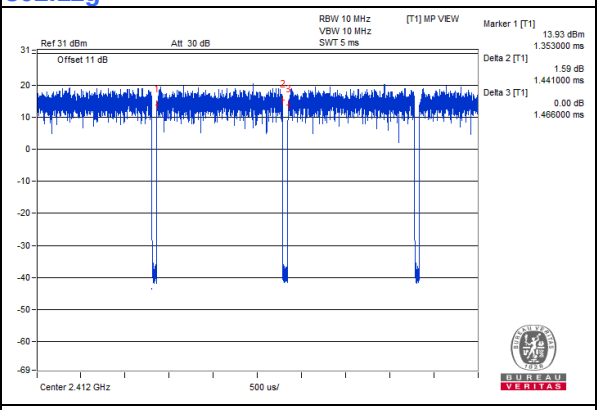
Duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11b: Duty cycle = 8.41 ms/8.533 ms = 0.986
802.11g: Duty cycle = 1.441 ms/1.466 ms = 0.983
802.11n (HT20): Duty cycle = 1.393ms/1.419 ms = 0.982

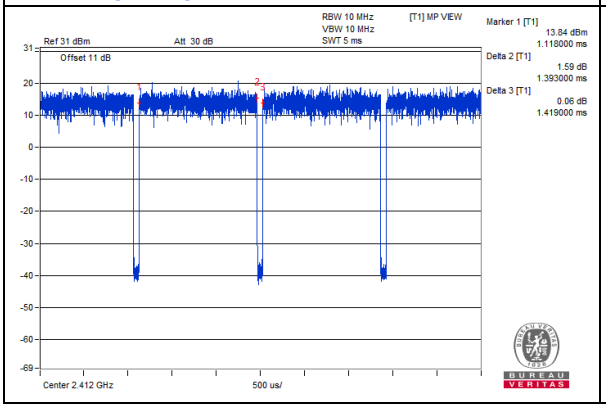
802.11b



802.11g



802.11n (HT20)



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
A.	Laptop	Lenovo	80WG	YD025N5Q	PD93165NGU	Provided by Lab
B.	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	NA	Provided by Lab
C.	Switch	D-Link	DGS-1005D	DR8WC92000523	NA	Provided by Lab
D.	Adapter	DEE VAN	DSA-24PFS-12 FUS	NA	NA	Supplied by applicant
E.	Load	tend	TBR-10A	NA	NA	Supplied by applicant
F.	SIM Card	R&S	CRT-Z3	NA	NA	Provided by Lab
G.	SIM Card	KeysSight	E7515-10910	NA	NA	Provided by Lab
H.	SD Card	Kingston	SDCS/16GB	NA	NA	Provided by Lab

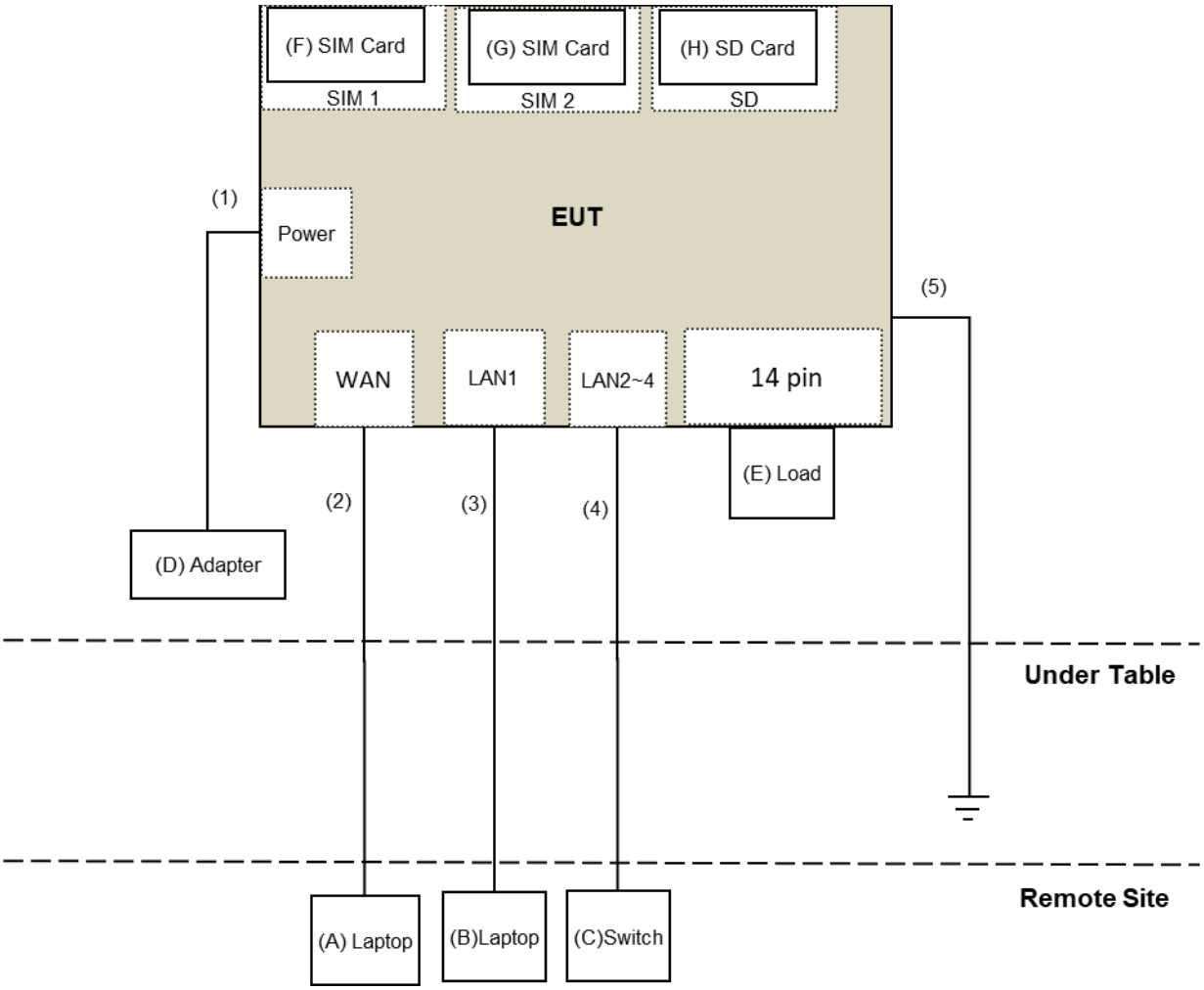
Note:

1. All power cords of the above support units are non-shielded (1.8m).

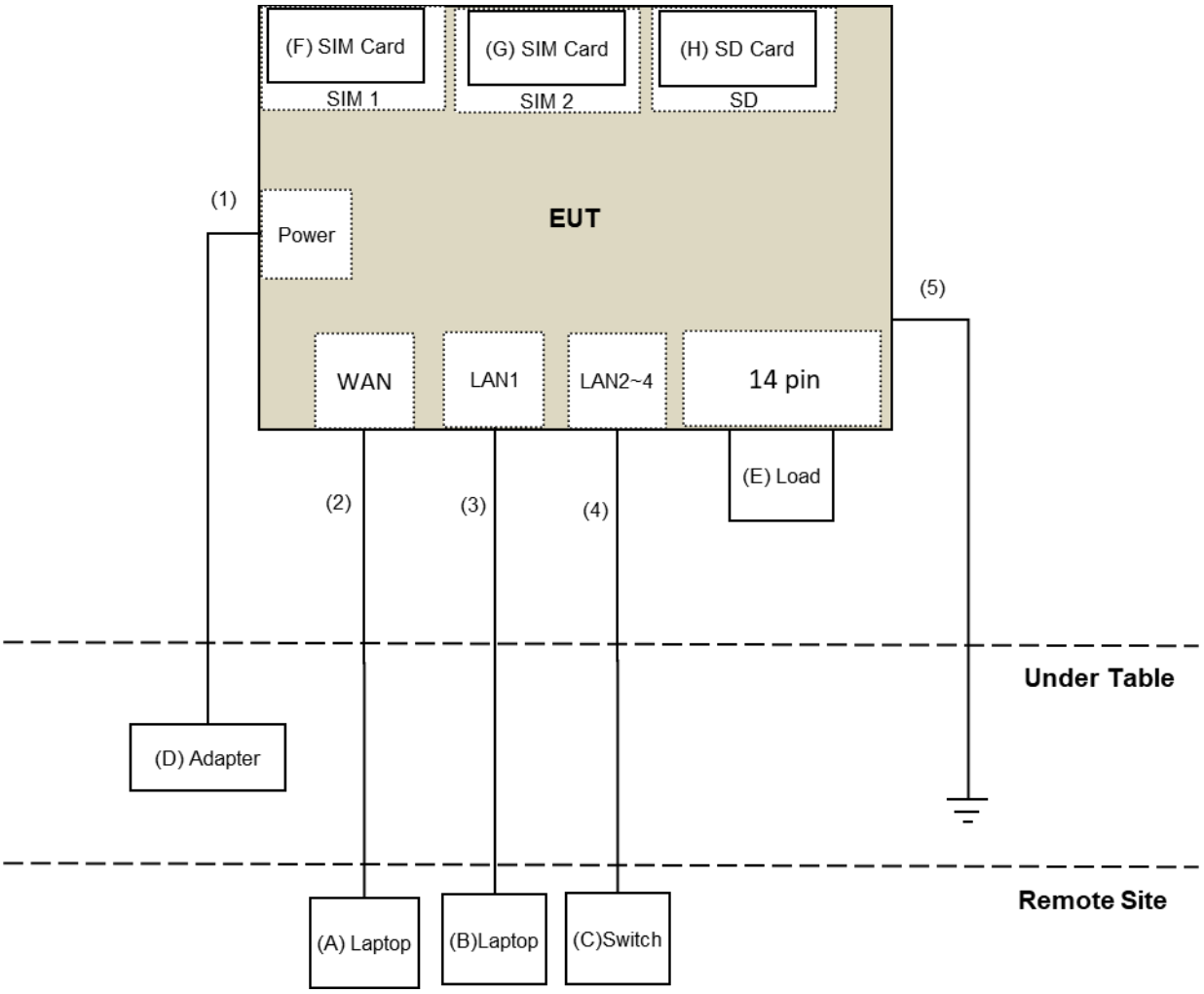
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.4	No	0	Supplied by applicant
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	RJ-45 Cable	3	10	No	0	Provided by Lab
5.	Ground Cable	1	3	Yes	0	Provided by Lab

3.4.1 Configuration of System under Test

For Conducted emission:



For Radiated emission:



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 15.247 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 20dB 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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

For Radiated emission& Bandedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	2021/7/22	2022/7/21
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	2020/10/20	2021/10/19
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	2020/11/5	2021/11/4
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2021/3/16	2022/3/15
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2021/9/23	2022/9/22
Horn Antenna Schwarzbeck	BBHA9120-D	9120D-406	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC12630SE	980384	2021/1/11	2022/1/10
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180504	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180601	2021/6/8	2022/6/7
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	210201	2021/5/13	2022/5/12
Fix tool for Boresight antenna tower LIOW GUU	FBA-01	FBA_SIP01	NA	NA
Spectrum Analyzer Keysight	N9030A	MY54490679	2021/7/9	2022/7/8
Pre_Amplifier EMCI	EMC184045SE	980387	2021/1/11	2022/1/10
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170519	2020/11/22	2021/11/21
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2021/1/11	2022/1/10
RF cable (40GHz) EMCI	EMC-KM-KM-4000	200214	2021/3/10	2022/3/9

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 966 Chamber No. 3.
3. Tested Date: 2021/10/12 ~ 2021/10/15

For other test items test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Power Meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE:
1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/11/1

4.1.3 Test Procedures

For Radiated emission below 30MHz

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 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detects 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:

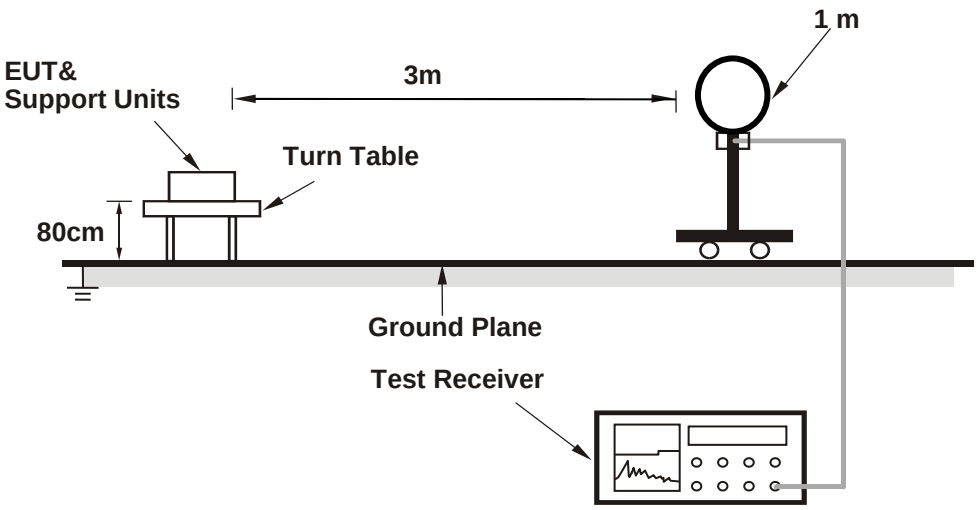
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

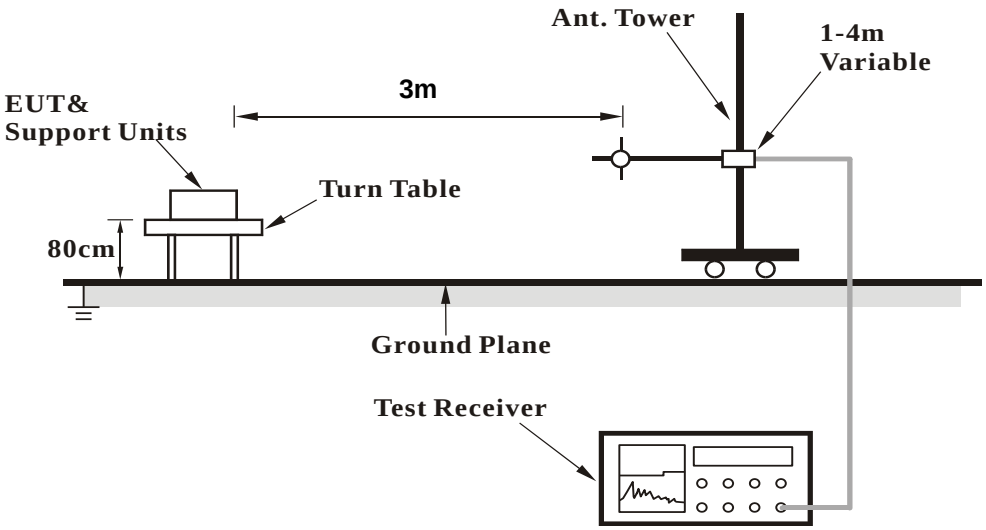
No deviation.

4.1.5 Test Setup

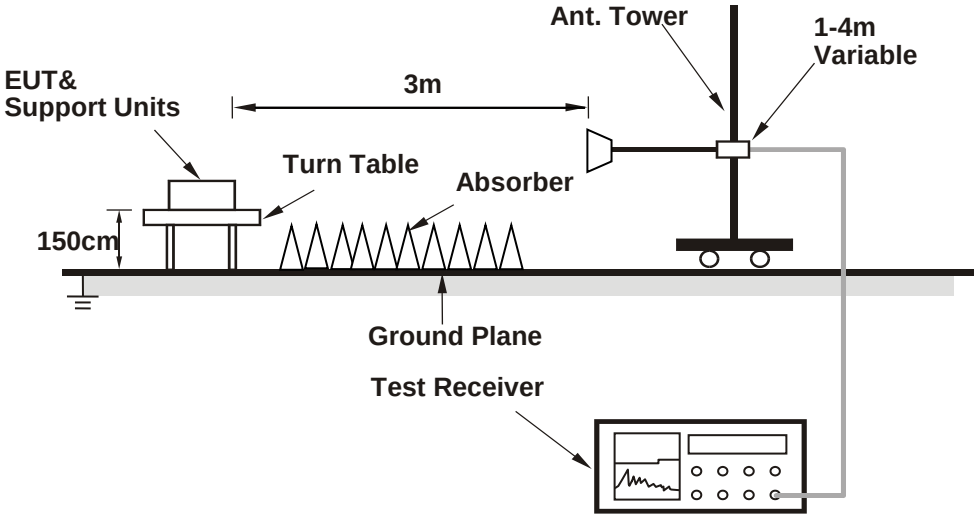
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Laptop Computer which is placed on remote site.
b. Controlling software (HyperTerminal paste RF command.txt command) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

RF Mode	TX 802.11b	**Channel**	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

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	2384.30	56.8 PK	74.0	-17.2	1.43 H	337	58.0	-1.2
2	2384.30	44.9 AV	54.0	-9.1	1.43 H	337	46.1	-1.2
3	*2412.00	96.2 PK			1.43 H	337	97.4	-1.2
4	*2412.00	94.0 AV			1.43 H	337	95.2	-1.2
5	4824.00	38.5 PK	74.0	-35.5	1.53 H	309	34.8	3.7
6	4824.00	29.2 AV	54.0	-24.8	1.53 H	309	25.5	3.7
Antenna Polarity & Test Distance : Vertical 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	58.5 PK	74.0	-15.5	1.30 V	92	59.7	-1.2
2	2390.00	46.8 AV	54.0	-7.2	1.30 V	92	48.0	-1.2
3	*2412.00	106.3 PK			1.30 V	92	107.5	-1.2
4	*2412.00	104.1 AV			1.30 V	92	105.3	-1.2
5	4824.00	42.0 PK	74.0	-32.0	1.08 V	41	38.3	3.7
6	4824.00	37.5 AV	54.0	-16.5	1.08 V	41	33.8	3.7

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.

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

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	54.9 PK	74.0	-19.1	1.39 H	322	56.1	-1.2
2	2390.00	43.4 AV	54.0	-10.6	1.39 H	322	44.6	-1.2
3	*2437.00	96.3 PK			1.39 H	322	97.5	-1.2
4	*2437.00	93.9 AV			1.39 H	322	95.1	-1.2
5	2483.50	55.9 PK	74.0	-18.1	1.39 H	322	57.1	-1.2
6	2483.50	43.6 AV	54.0	-10.4	1.39 H	322	44.8	-1.2
7	4874.00	38.5 PK	74.0	-35.5	1.50 H	298	34.7	3.8
8	4874.00	29.2 AV	54.0	-24.8	1.50 H	298	25.4	3.8
9	7311.00	42.3 PK	74.0	-31.7	2.37 H	196	32.6	9.7
10	7311.00	32.1 AV	54.0	-21.9	2.37 H	196	22.4	9.7
Antenna Polarity & Test Distance : Vertical 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	54.7 PK	74.0	-19.3	1.39 V	112	55.9	-1.2
2	2390.00	43.1 AV	54.0	-10.9	1.39 V	112	44.3	-1.2
3	*2437.00	106.4 PK			1.39 V	112	107.6	-1.2
4	*2437.00	103.8 AV			1.39 V	112	105.0	-1.2
5	2483.50	55.6 PK	74.0	-18.4	1.39 V	112	56.8	-1.2
6	2483.50	43.3 AV	54.0	-10.7	1.39 V	112	44.5	-1.2
7	4874.00	41.6 PK	74.0	-32.4	1.01 V	45	37.8	3.8
8	4874.00	37.1 AV	54.0	-16.9	1.01 V	45	33.3	3.8
9	7311.00	44.4 PK	74.0	-29.6	3.97 V	272	34.7	9.7
10	7311.00	34.2 AV	54.0	-19.8	3.97 V	272	24.5	9.7

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.

RF Mode	TX 802.11b	**Channel**	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

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	95.3 PK			1.32 H	335	96.5	-1.2
2	*2462.00	93.2 AV			1.32 H	335	94.4	-1.2
3	2483.50	55.9 PK	74.0	-18.1	1.32 H	335	57.1	-1.2
4	2483.50	44.0 AV	54.0	-10.0	1.32 H	335	45.2	-1.2
5	4924.00	38.1 PK	74.0	-35.9	1.49 H	311	34.2	3.9
6	4924.00	28.8 AV	54.0	-25.2	1.49 H	311	24.9	3.9
7	7386.00	41.6 PK	74.0	-32.4	2.41 H	210	31.9	9.7
8	7386.00	31.6 AV	54.0	-22.4	2.41 H	210	21.9	9.7
Antenna Polarity & Test Distance : Vertical 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	106.5 PK			1.62 V	94	107.7	-1.2
2	*2462.00	104.3 AV			1.62 V	94	105.5	-1.2
3	2487.50	58.6 PK	74.0	-15.4	1.62 V	94	59.8	-1.2
4	2487.50	47.8 AV	54.0	-6.2	1.62 V	94	49.0	-1.2
5	4924.00	41.8 PK	74.0	-32.2	1.01 V	54	37.9	3.9
6	4924.00	37.3 AV	54.0	-16.7	1.01 V	54	33.4	3.9
7	7386.00	45.0 PK	74.0	-29.0	3.97 V	266	35.3	9.7
8	7386.00	34.6 AV	54.0	-19.4	3.97 V	266	24.9	9.7

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.

RF Mode	TX 802.11g	**Channel**	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

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	57.0 PK	74.0	-17.0	3.43 H	200	58.2	-1.2
2	2390.00	43.6 AV	54.0	-10.4	3.43 H	200	44.8	-1.2
3	*2412.00	96.3 PK			3.43 H	200	97.5	-1.2
4	*2412.00	86.7 AV			3.43 H	200	87.9	-1.2
5	4824.00	37.3 PK	74.0	-36.7	1.56 H	298	33.6	3.7
6	4824.00	28.2 AV	54.0	-25.8	1.56 H	298	24.5	3.7
Antenna Polarity & Test Distance : Vertical 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	59.5 PK	74.0	-14.5	1.51 V	93	60.7	-1.2
2	2390.00	45.3 AV	54.0	-8.7	1.51 V	93	46.5	-1.2
3	*2412.00	106.6 PK			1.51 V	93	107.8	-1.2
4	*2412.00	96.9 AV			1.51 V	93	98.1	-1.2
5	4824.00	41.8 PK	74.0	-32.2	1.03 V	56	38.1	3.7
6	4824.00	30.3 AV	54.0	-23.7	1.03 V	56	26.6	3.7

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.

RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

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	54.8 PK	74.0	-19.2	3.41 H	189	56.0	-1.2
2	2390.00	43.1 AV	54.0	-10.9	3.41 H	189	44.3	-1.2
3	*2437.00	95.8 PK			3.41 H	189	97.0	-1.2
4	*2437.00	86.0 AV			3.41 H	189	87.2	-1.2
5	2483.50	55.1 PK	74.0	-18.9	3.41 H	189	56.3	-1.2
6	2483.50	42.9 AV	54.0	-11.1	3.41 H	189	44.1	-1.2
7	4874.00	37.4 PK	74.0	-36.6	1.57 H	307	33.6	3.8
8	4874.00	28.5 AV	54.0	-25.5	1.57 H	307	24.7	3.8
9	7311.00	42.0 PK	74.0	-32.0	2.47 H	211	32.3	9.7
10	7311.00	32.1 AV	54.0	-21.9	2.47 H	211	22.4	9.7
Antenna Polarity & Test Distance : Vertical 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	54.5 PK	74.0	-19.5	1.48 V	84	55.7	-1.2
2	2390.00	43.0 AV	54.0	-11.0	1.48 V	84	44.2	-1.2
3	*2437.00	106.9 PK			1.48 V	84	108.1	-1.2
4	*2437.00	97.2 AV			1.48 V	84	98.4	-1.2
5	2483.50	54.9 PK	74.0	-19.1	1.48 V	84	56.1	-1.2
6	2483.50	42.9 AV	54.0	-11.1	1.48 V	84	44.1	-1.2
7	4874.00	42.8 PK	74.0	-31.2	1.05 V	55	39.0	3.8
8	4874.00	31.1 AV	54.0	-22.9	1.05 V	55	27.3	3.8
9	7311.00	41.2 PK	74.0	-32.8	4.00 V	264	31.5	9.7
10	7311.00	30.8 AV	54.0	-23.2	4.00 V	264	21.1	9.7

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.

RF Mode	TX 802.11g	**Channel**	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

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	95.2 PK			2.44 H	324	96.4	-1.2
2	*2462.00	85.2 AV			2.44 H	324	86.4	-1.2
3	2483.50	56.0 PK	74.0	-18.0	2.44 H	324	57.2	-1.2
4	2483.50	43.4 AV	54.0	-10.6	2.44 H	324	44.6	-1.2
5	4924.00	37.6 PK	74.0	-36.4	1.55 H	300	33.7	3.9
6	4924.00	28.5 AV	54.0	-25.5	1.55 H	300	24.6	3.9
7	7386.00	41.8 PK	74.0	-32.2	2.45 H	200	32.1	9.7
8	7386.00	31.7 AV	54.0	-22.3	2.45 H	200	22.0	9.7
Antenna Polarity & Test Distance : Vertical 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	106.7 PK			1.59 V	95	107.9	-1.2
2	*2462.00	97.1 AV			1.59 V	95	98.3	-1.2
3	2483.50	58.7 PK	74.0	-15.3	1.59 V	95	59.9	-1.2
4	2483.50	45.5 AV	54.0	-8.5	1.59 V	95	46.7	-1.2
5	4924.00	42.3 PK	74.0	-31.7	1.01 V	65	38.4	3.9
6	4924.00	30.6 AV	54.0	-23.4	1.01 V	65	26.7	3.9
7	7386.00	41.6 PK	74.0	-32.4	4.00 V	258	31.9	9.7
8	7386.00	31.3 AV	54.0	-22.7	4.00 V	258	21.6	9.7

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.

RF Mode	TX 802.11n (HT20)	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

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	56.4 PK	74.0	-17.6	3.39 H	201	57.6	-1.2
2	2390.00	43.6 AV	54.0	-10.4	3.39 H	201	44.8	-1.2
3	*2412.00	94.6 PK			3.39 H	201	95.8	-1.2
4	*2412.00	85.9 AV			3.39 H	201	87.1	-1.2
5	4824.00	37.3 PK	74.0	-36.7	1.58 H	298	33.6	3.7
6	4824.00	28.3 AV	54.0	-25.7	1.58 H	298	24.6	3.7
Antenna Polarity & Test Distance : Vertical 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	59.1 PK	74.0	-14.9	1.23 V	88	60.3	-1.2
2	2390.00	45.7 AV	54.0	-8.3	1.23 V	88	46.9	-1.2
3	*2412.00	106.1 PK			1.23 V	88	107.3	-1.2
4	*2412.00	96.5 AV			1.23 V	88	97.7	-1.2
5	4824.00	42.3 PK	74.0	-31.7	1.17 V	39	38.6	3.7
6	4824.00	30.4 AV	54.0	-23.6	1.17 V	39	26.7	3.7

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.

RF Mode	TX 802.11n (HT20)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

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	54.5 PK	74.0	-19.5	3.41 H	188	55.7	-1.2
2	2390.00	43.0 AV	54.0	-11.0	3.41 H	188	44.2	-1.2
3	*2437.00	94.4 PK			3.41 H	188	95.6	-1.2
4	*2437.00	85.2 AV			3.41 H	188	86.4	-1.2
5	2483.50	54.3 PK	74.0	-19.7	3.41 H	188	55.5	-1.2
6	2483.50	42.4 AV	54.0	-11.6	3.41 H	188	43.6	-1.2
7	4874.00	37.6 PK	74.0	-36.4	1.53 H	300	33.8	3.8
8	4874.00	28.8 AV	54.0	-25.2	1.53 H	300	25.0	3.8
9	7311.00	41.7 PK	74.0	-32.3	2.48 H	203	32.0	9.7
10	7311.00	31.9 AV	54.0	-22.1	2.48 H	203	22.2	9.7
Antenna Polarity & Test Distance : Vertical 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	54.5 PK	74.0	-19.5	1.59 V	74	55.7	-1.2
2	2390.00	42.7 AV	54.0	-11.3	1.59 V	74	43.9	-1.2
3	*2437.00	105.7 PK			1.59 V	74	106.9	-1.2
4	*2437.00	96.1 AV			1.59 V	74	97.3	-1.2
5	2483.50	55.0 PK	74.0	-19.0	1.59 V	74	56.2	-1.2
6	2483.50	42.9 AV	54.0	-11.1	1.59 V	74	44.1	-1.2
7	4874.00	42.8 PK	74.0	-31.2	1.11 V	51	39.0	3.8
8	4874.00	30.9 AV	54.0	-23.1	1.11 V	51	27.1	3.8
9	7311.00	41.8 PK	74.0	-32.2	3.99 V	271	32.1	9.7
10	7311.00	31.3 AV	54.0	-22.7	3.99 V	271	21.6	9.7

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.

RF Mode	TX 802.11n (HT20)	**Channel**	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

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	93.9 PK			2.49 H	321	95.1	-1.2
2	*2462.00	84.8 AV			2.49 H	321	86.0	-1.2
3	2483.50	56.2 PK	74.0	-17.8	2.49 H	321	57.4	-1.2
4	2483.50	43.4 AV	54.0	-10.6	2.49 H	321	44.6	-1.2
5	4924.00	37.1 PK	74.0	-36.9	1.52 H	307	33.2	3.9
6	4924.00	28.1 AV	54.0	-25.9	1.52 H	307	24.2	3.9
7	7386.00	41.6 PK	74.0	-32.4	2.49 H	193	31.9	9.7
8	7386.00	31.5 AV	54.0	-22.5	2.49 H	193	21.8	9.7
Antenna Polarity & Test Distance : Vertical 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	105.8 PK			1.60 V	89	107.0	-1.2
2	*2462.00	96.3 AV			1.60 V	89	97.5	-1.2
3	2483.50	62.7 PK	74.0	-11.3	1.60 V	89	63.9	-1.2
4	2483.50	45.8 AV	54.0	-8.2	1.60 V	89	47.0	-1.2
5	4924.00	42.3 PK	74.0	-31.7	1.06 V	59	38.4	3.9
6	4924.00	30.4 AV	54.0	-23.6	1.06 V	59	26.5	3.9
7	7386.00	41.6 PK	74.0	-32.4	4.00 V	273	31.9	9.7
8	7386.00	31.2 AV	54.0	-22.8	4.00 V	273	21.5	9.7

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.

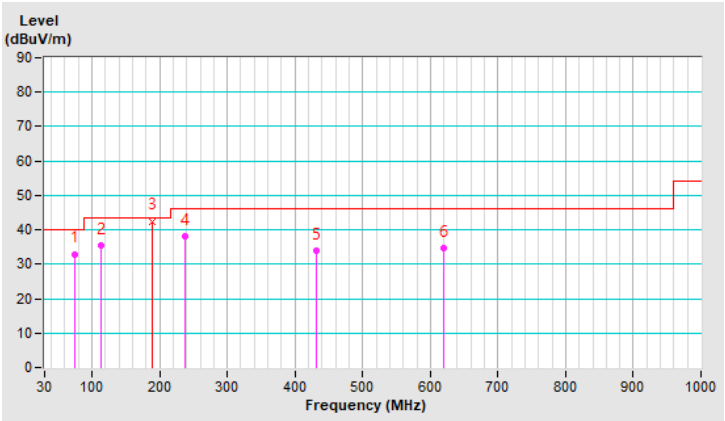
Below 1GHz Data:

RF Mode	TX 802.11b	**Channel**	CH 11：2462 MHz
Frequency Range	9kHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 69% RH
Tested By	Sampson Chen		

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	73.92	33.0 QP	40.0	-7.0	2.00 H	243	44.5	-11.5
2	112.74	35.5 QP	43.5	-8.0	1.00 H	235	46.0	-10.5
3	**189.39**	**42.5 QP**	**43.5**	**-1.0**	**1.33 H**	**250**	**52.7**	**-10.2**
4	237.48	38.2 QP	46.0	-7.8	1.00 H	105	47.4	-9.2
5	431.29	33.8 QP	46.0	-12.2	1.00 H	359	36.4	-2.6
6	618.84	34.5 QP	46.0	-11.5	1.50 H	66	32.7	1.8

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.

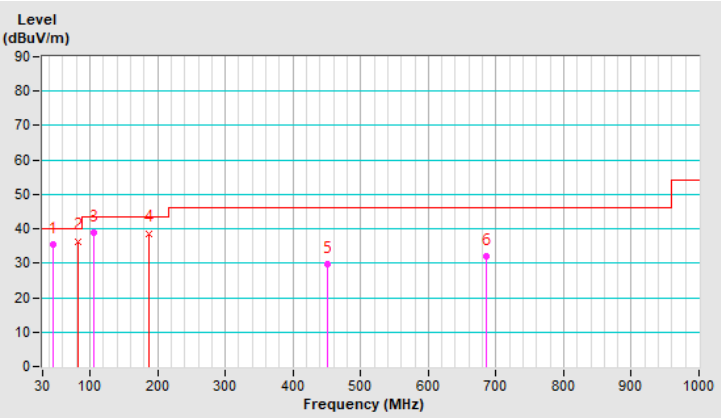


RF Mode	TX 802.11b	**Channel**	CH 11：2462 MHz
Frequency Range	9kHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 69% RH
Tested By	Sampson Chen		

Antenna Polarity & Test Distance : Vertical 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	45.84	35.6 QP	40.0	-4.4	1.50 V	169	43.7	-8.1
2	81.99	36.4 QP	40.0	-3.6	1.00 V	244	49.7	-13.3
3	104.71	38.7 QP	43.5	-4.8	1.50 V	266	50.2	-11.5
4	187.35	38.7 QP	43.5	-4.8	1.00 V	0	48.7	-10.0
5	450.06	29.6 QP	46.0	-16.4	1.00 V	106	31.6	-2.0
6	685.87	32.1 QP	46.0	-13.9	3.00 V	360	29.2	2.9

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 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	2021/10/13	2022/10/12
LISN R&S	ESH3-Z5	848773/004	2020/10/27	2021/10/26
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator	50	3	2020/10/26	2021/10/25
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2021/9/25	2022/9/24
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3 Tested Date: 2021/10/14

4.2.3 Test Procedures

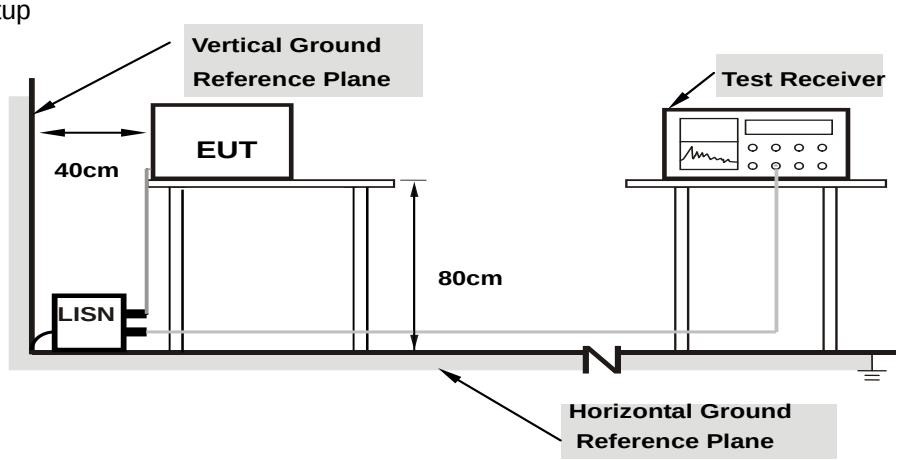
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

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

Same as 4.1.6.

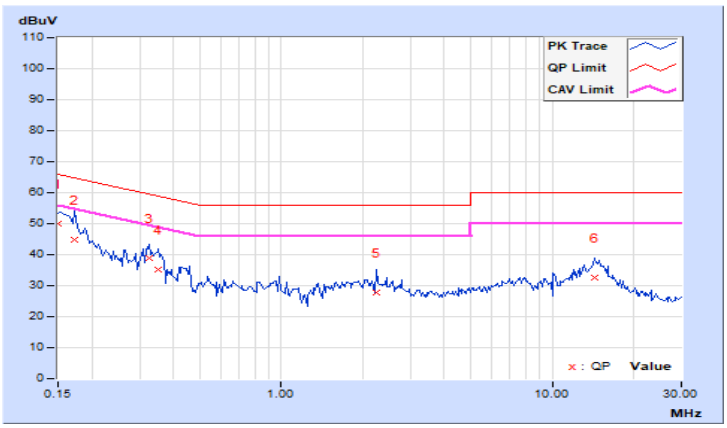
4.2.7 Test Results

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power (System)	120Vac, 60Hz	Environmental Conditions	25 °C, 68% RH
Tested By	Sampson Chen		

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**	**10.05**	**40.12**	**23.09**	**50.17**	**33.14**	**66.00**	**56.00**	**-15.83**	**-22.86**
2	0.17344	10.06	34.81	18.73	44.87	28.79	64.79	54.79	-19.92	-26.00
3	0.32578	10.08	28.97	22.07	39.05	32.15	59.56	49.56	-20.51	-17.41
4	0.35313	10.09	25.25	18.51	35.34	28.60	58.89	48.89	-23.55	-20.29
5	2.24219	10.21	17.59	10.65	27.80	20.86	56.00	46.00	-28.20	-25.14
6	14.43750	11.20	21.41	16.57	32.61	27.77	60.00	50.00	-27.39	-22.23

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

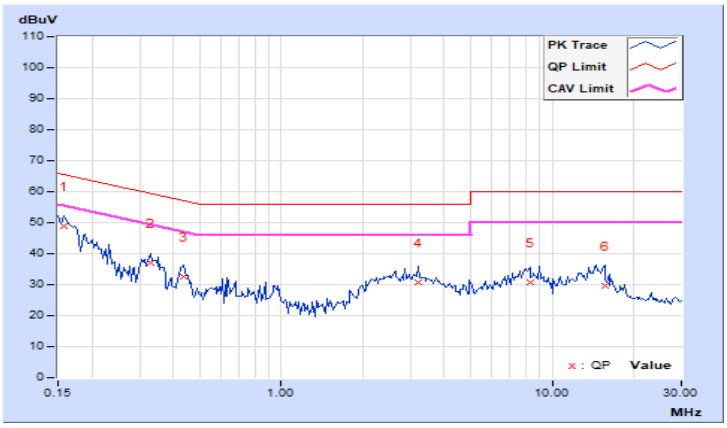


RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power (System)	120Vac, 60Hz	Environmental Conditions	25 °C, 68% RH
Tested By	Sampson Chen		

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	0.15781	10.07	38.71	23.04	48.78	33.11	65.58	55.58	-16.80	-22.47
2	0.32969	10.11	26.81	19.67	36.92	29.78	59.46	49.46	-22.54	-19.68
3	0.43516	10.12	22.54	16.28	32.66	26.40	57.15	47.15	-24.49	-20.75
4	3.18750	10.31	20.26	14.86	30.57	25.17	56.00	46.00	-25.43	-20.83
5	8.30078	10.62	20.21	14.29	30.83	24.91	60.00	50.00	-29.17	-25.09
6	15.60156	11.09	18.70	13.84	29.79	24.93	60.00	50.00	-30.21	-25.07

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

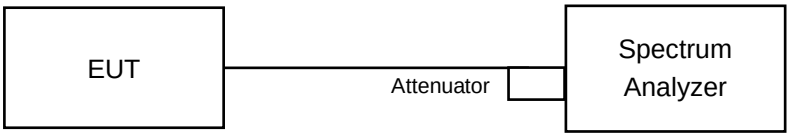


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB 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) = 100kHz
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 Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	7.1	0.5	Pass
6	2437	7.54	0.5	Pass
11	2462	7.13	0.5	Pass

802.11g

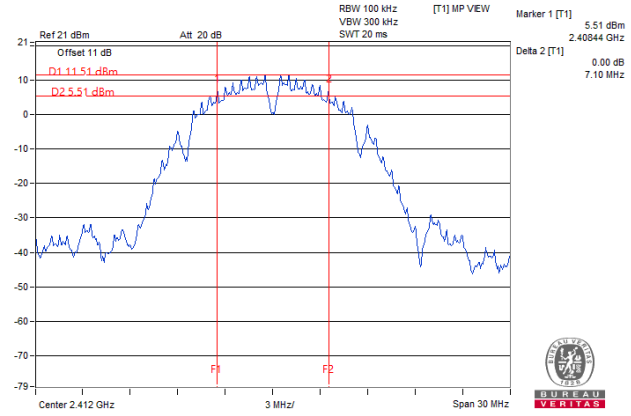
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.39	16.4	0.5	Pass
6	2437	16.4	16.4	0.5	Pass
11	2462	16.39	16.38	0.5	Pass

802.11n (HT20)

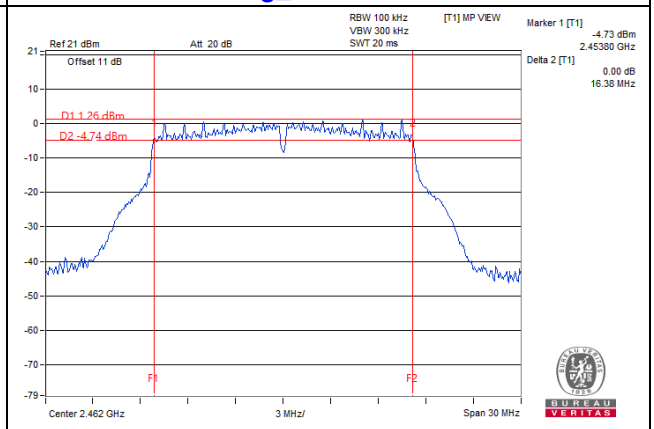
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.63	17.65	0.5	Pass
6	2437	17.66	17.65	0.5	Pass
11	2462	17.64	17.68	0.5	Pass

Spectrum Plot of Worst Value

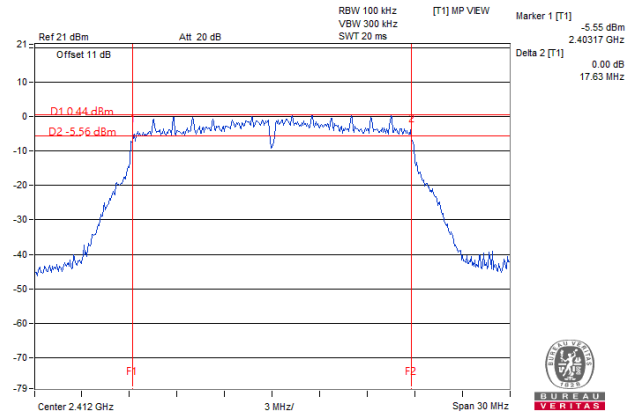
802.11b / CH1



802.11g_Chain 1 / CH11



802.11n (HT20)_Chain 0 / CH1



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

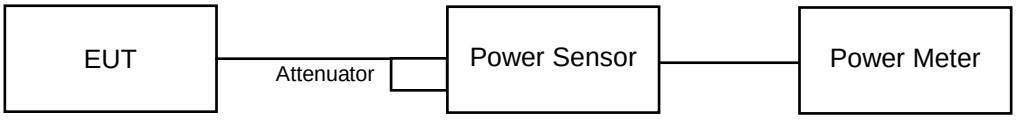
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

CDD Mode

802.11b

Chan.	Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	161.808	22.09	30	Pass
6	2437	158.855	22.01	30	Pass
11	2462	183.654	22.64	30	Pass

802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.09	21.25	261.881	24.18	30	Pass
6	2437	21.11	21.19	260.644	24.16	30	Pass
11	2462	21.18	21.32	266.739	24.26	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.20	21.51	273.405	24.37	30	Pass
6	2437	21.05	21.38	264.755	24.23	30	Pass
11	2462	21.25	21.59	277.564	24.43	30	Pass

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.20	21.51	273.405	24.37	30	Pass
6	2437	21.05	21.38	264.755	24.23	30	Pass
11	2462	21.25	21.59	277.564	24.43	30	Pass

Note: The directional gain = 1dBi + 10log(2) = 4.01 dBi < 6dBi, so the output power limit shall not be reduced.

FOR AVERAGE POWER

CDD Mode

802.11b

Chan.	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	84.333	19.26
6	2437	81.47	19.11
11	2462	90.782	19.58

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.53	12.90	37.405	15.73
6	2437	12.54	12.75	36.784	15.66
11	2462	12.65	13.06	38.638	15.87

802.11n (HT20)

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.40	12.89	36.832	15.66
6	2437	12.21	12.67	35.127	15.46
11	2462	12.48	12.96	37.471	15.74

Beamforming Mode

802.11n (HT20)

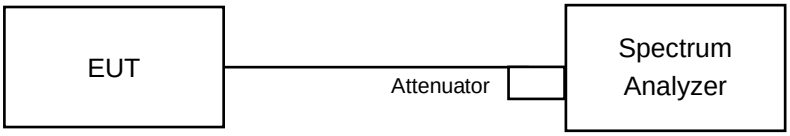
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.40	12.89	36.832	15.66
6	2437	12.21	12.67	35.127	15.46
11	2462	12.48	12.96	37.471	15.74

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

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 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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-3.11	8.00	Pass
6	2437	-2.03	8.00	Pass
11	2462	-2.25	8.00	Pass

802.11g

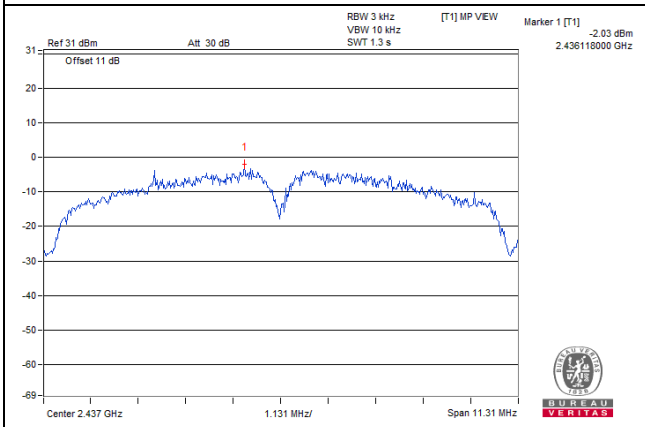
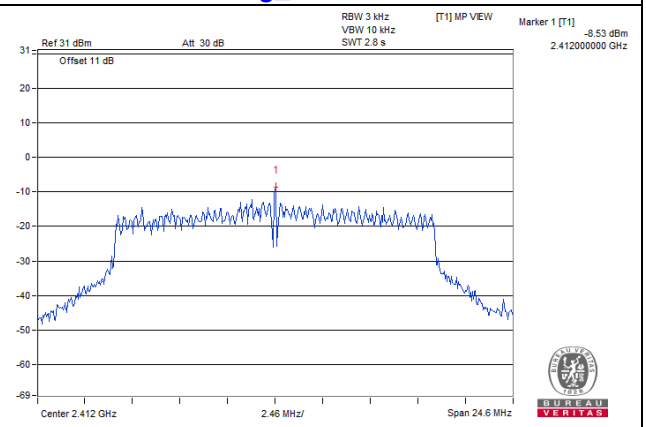
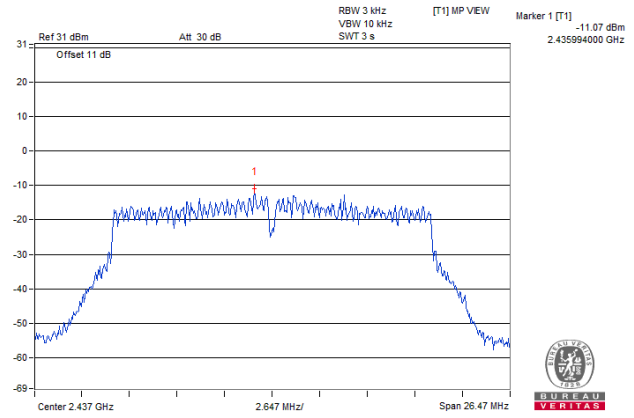
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1			
1	2412	-10.75	-8.53	-6.49	8.00	Pass
6	2437	-11.72	-10.64	-8.14	8.00	Pass
11	2462	-11.40	-11.51	-8.44	8.00	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. The directional gain = 1dBi + 10log(2) = 4.01 dBi < 6dBi, so the power density limit shall not be reduced.

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1			
1	2412	-13.17	-12.03	-9.55	8.00	Pass
6	2437	-12.80	-11.07	-8.84	8.00	Pass
11	2462	-12.03	-11.50	-8.75	8.00	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. The directional gain = 1dBi + 10log(2) = 4.01 dBi < 6dBi, so the power density limit shall not be reduced.

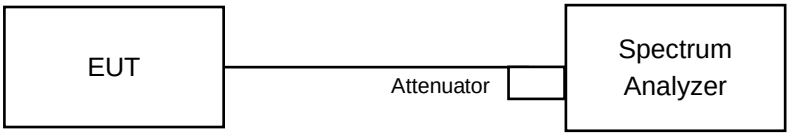
Spectrum Plot of Worst Value	
802.11b / CH6	**802.11g_Chain 1 / CH1**
	
802.11n (HT20)_Chain 1 / CH6	
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

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

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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

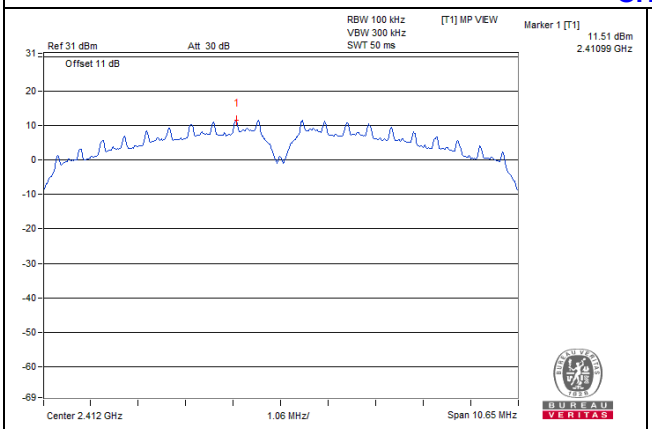
Same as Item 4.3.6

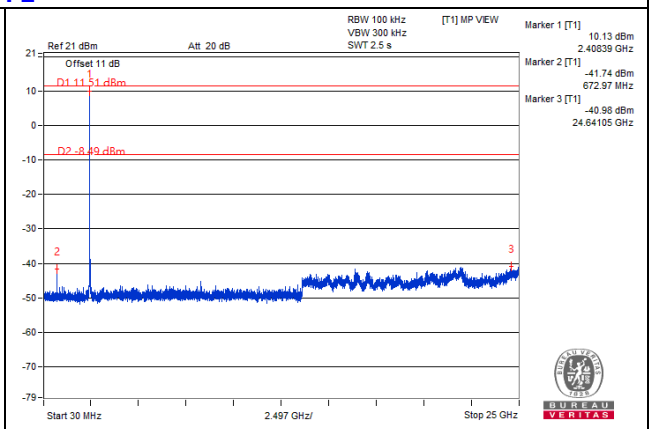
4.6.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

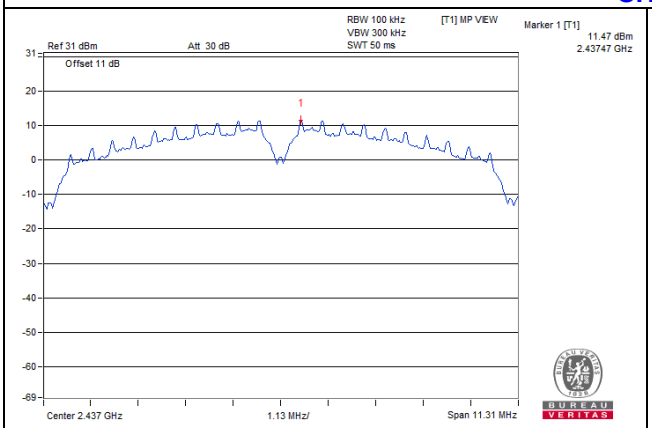
802.11b

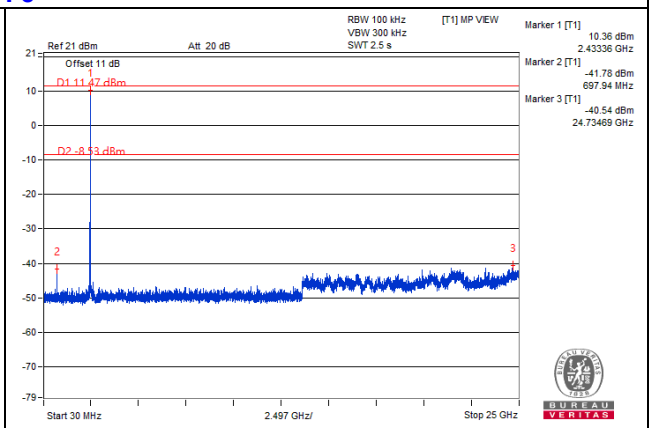
CH 1



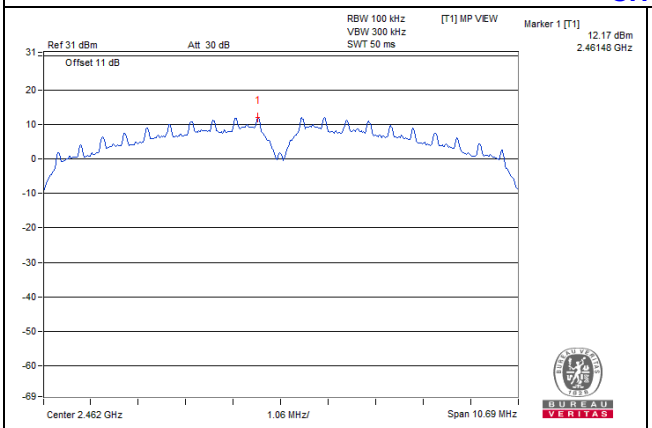


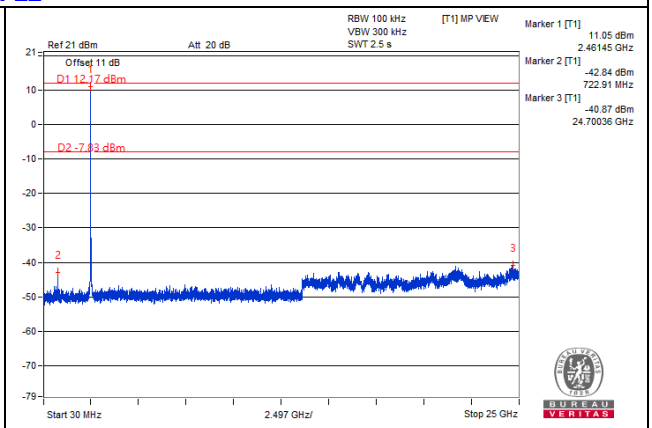
CH 6



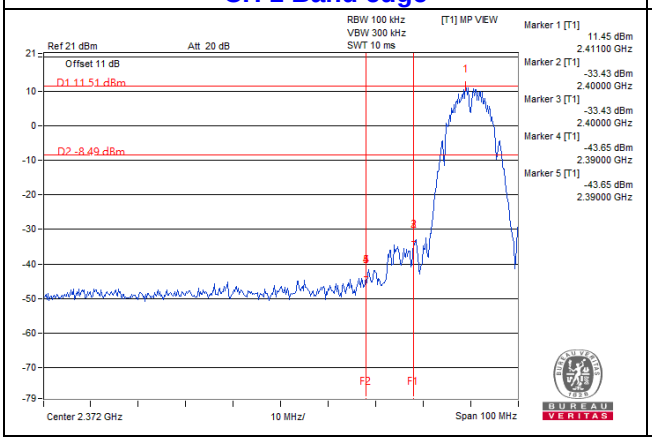


CH 11

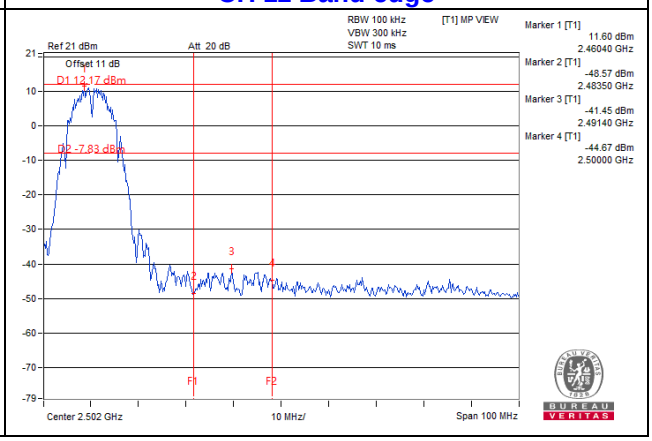




CH 1 Band edge

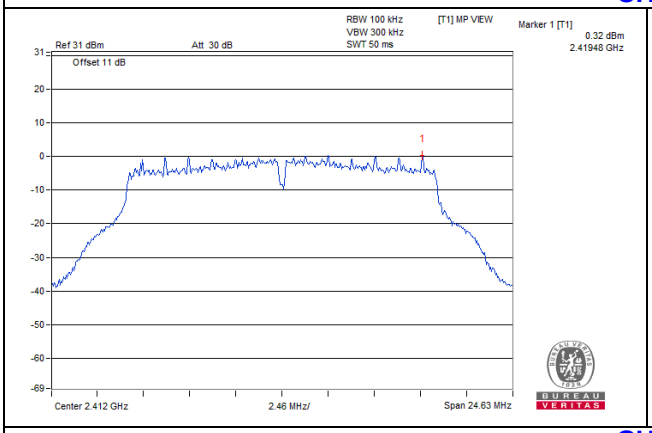


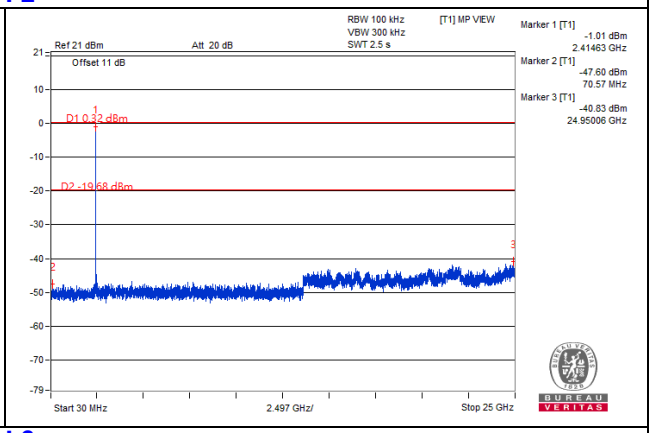
CH 11 Band edge



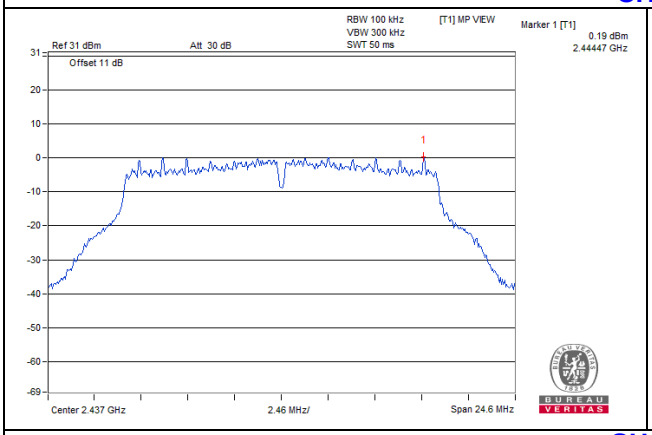
802.11g
CHAIN 0

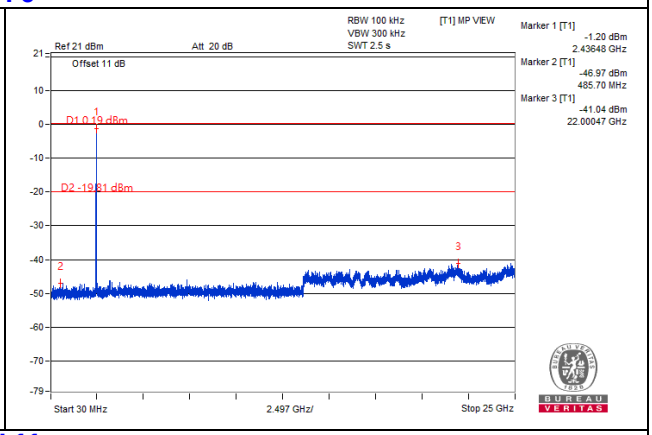
CH 1



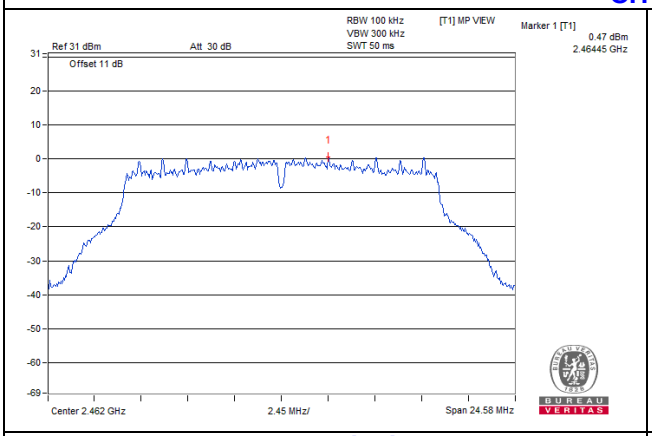


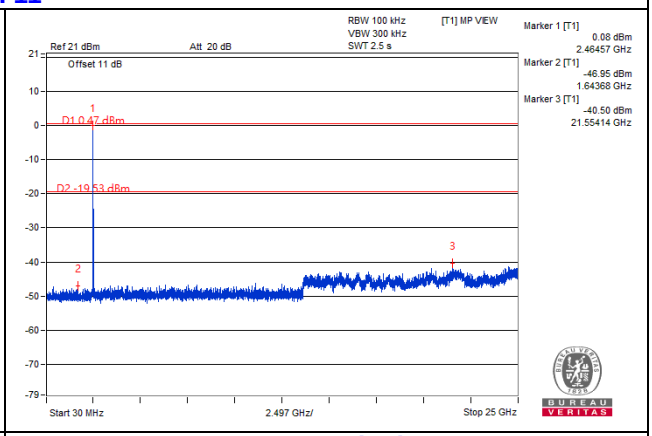
CH 6



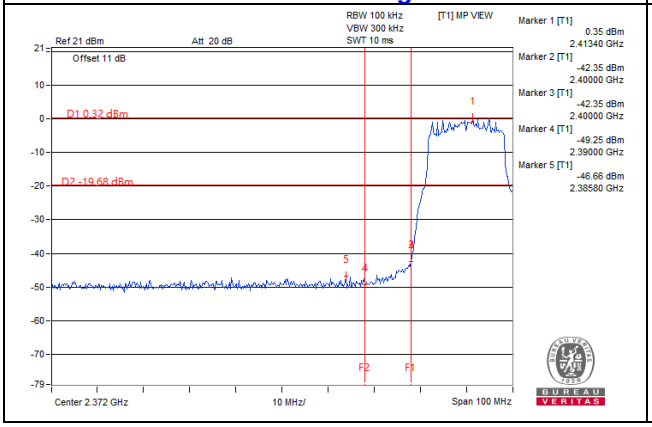


CH 11

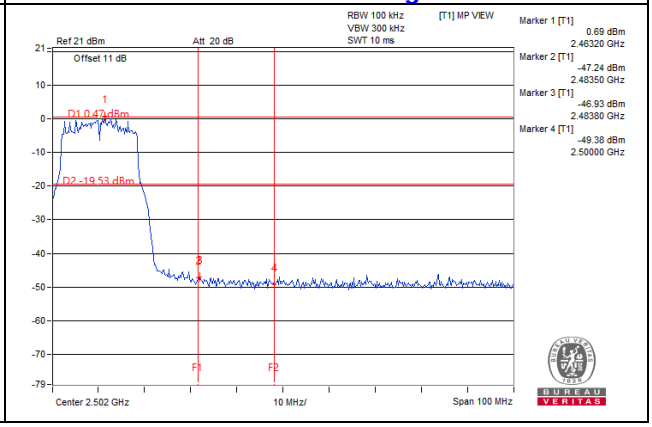




CH 1 Band edge

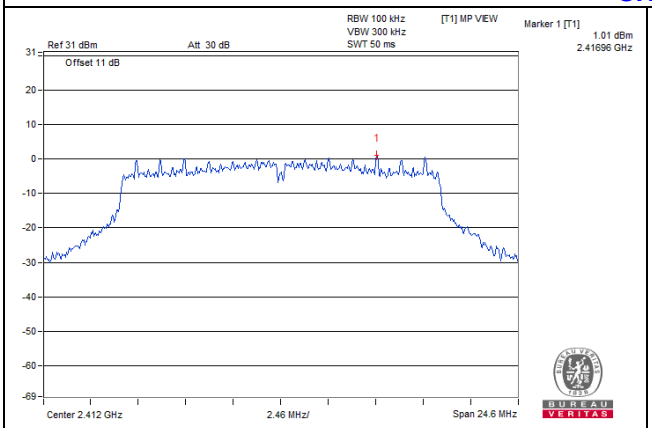


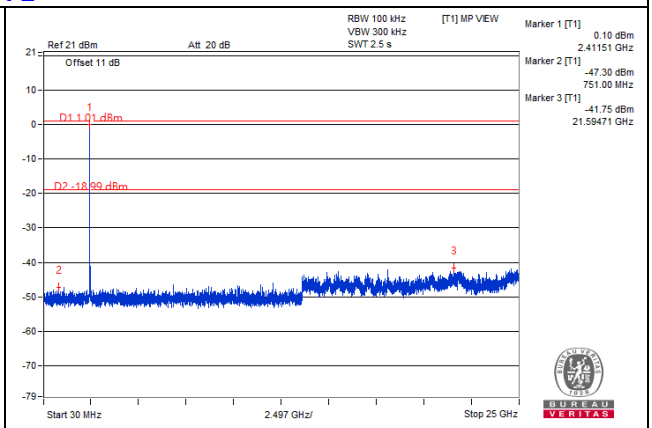
CH 11 Band edge



CHAIN 1

CH 1





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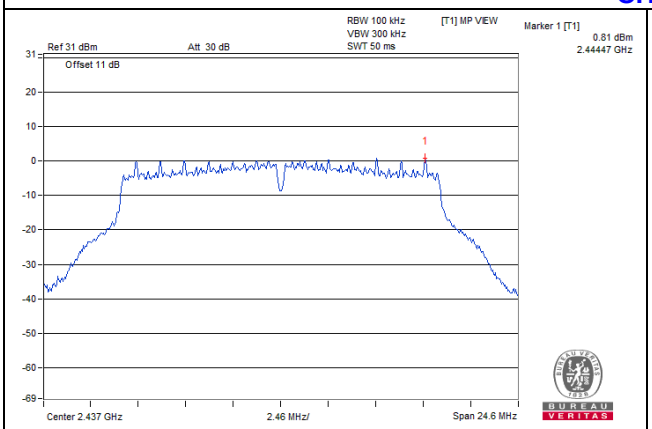
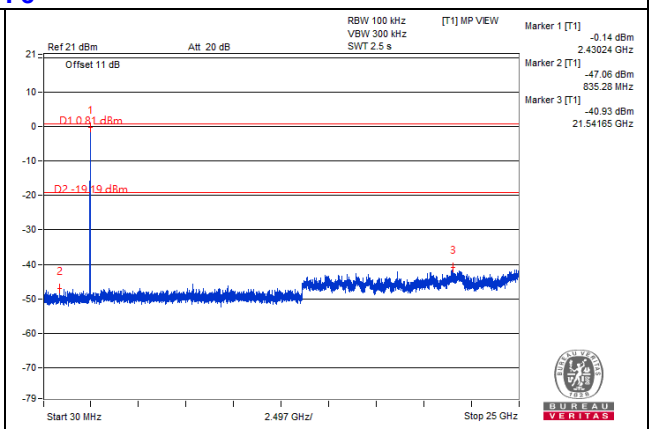
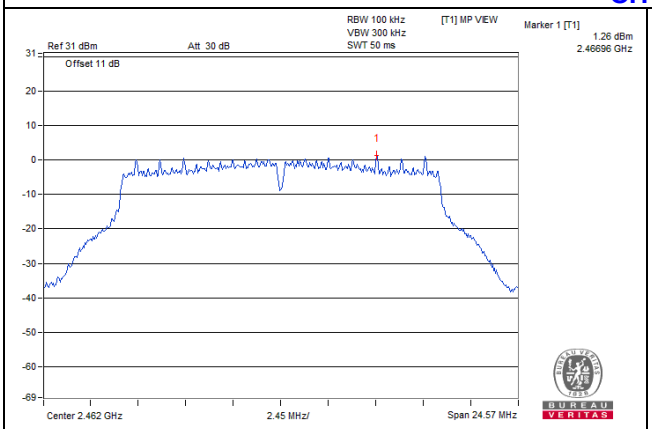
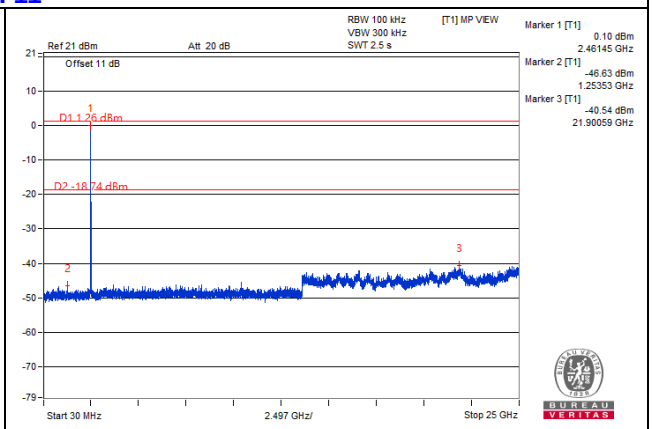


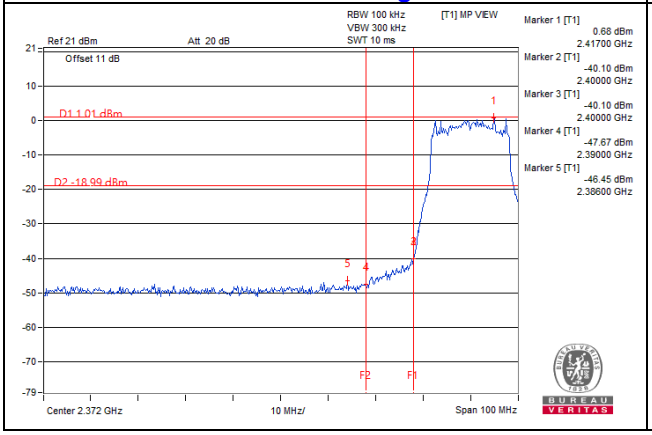


CH 11

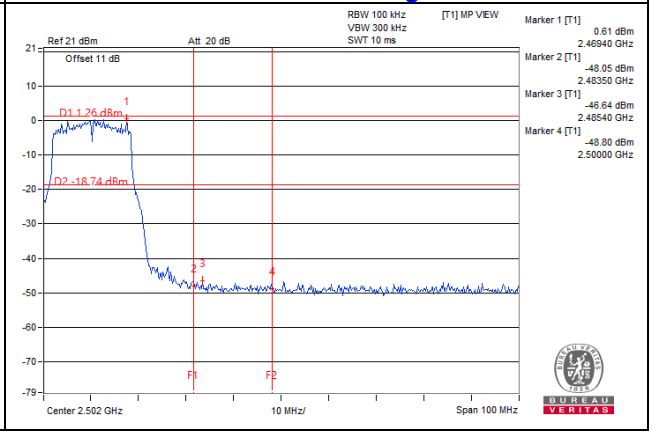




CH 1 Band edge

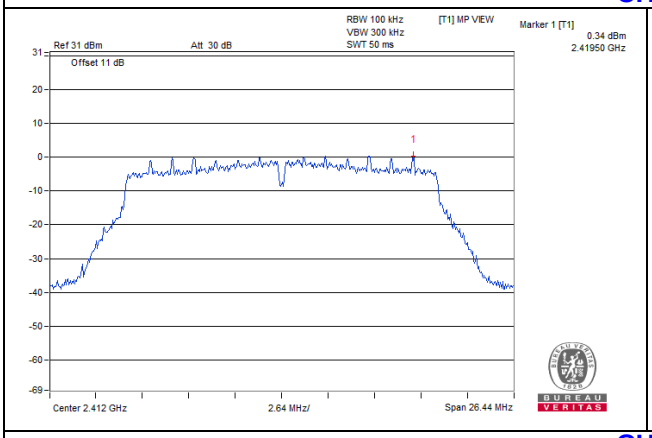


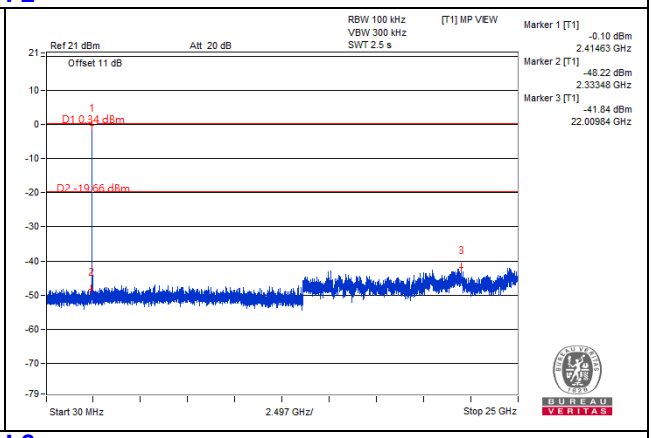
CH 11 Band edge



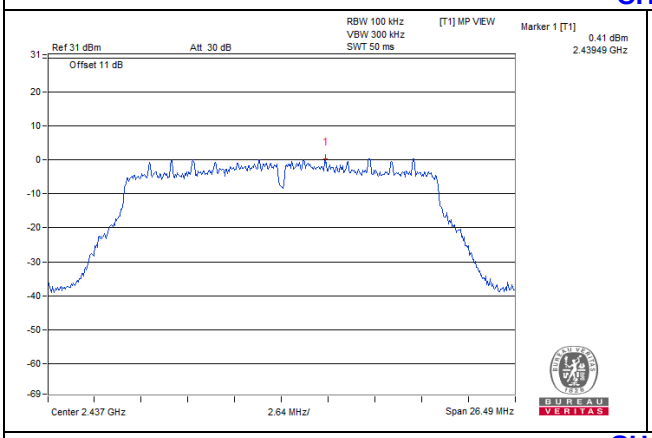
802.11n (HT20)
CHAIN 0

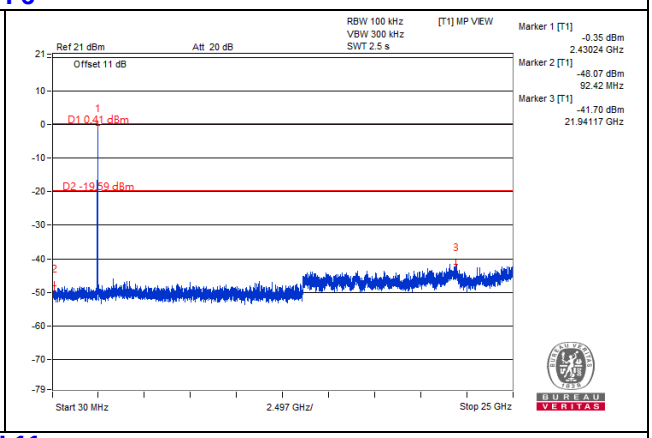
CH 1





CH 6





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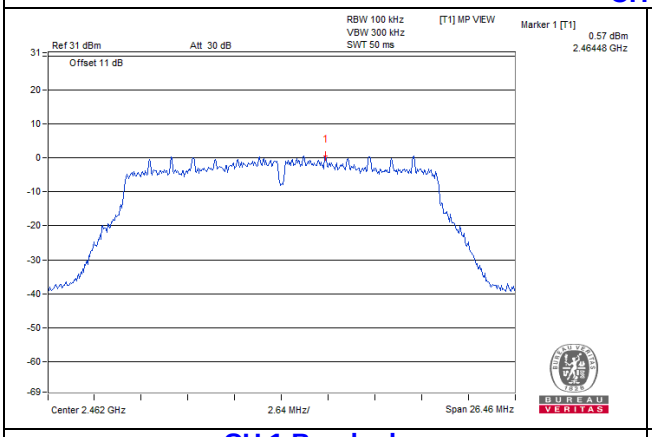
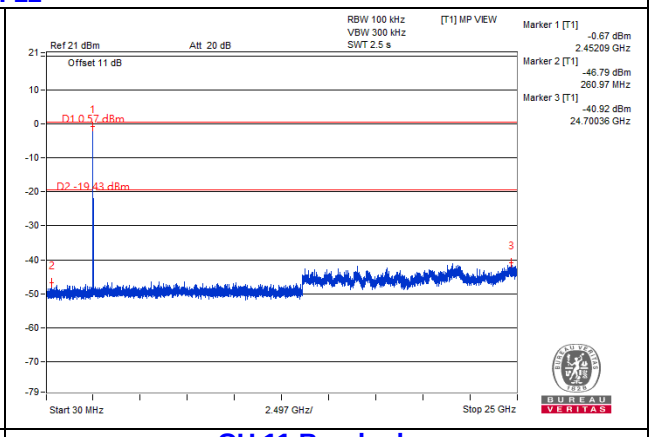
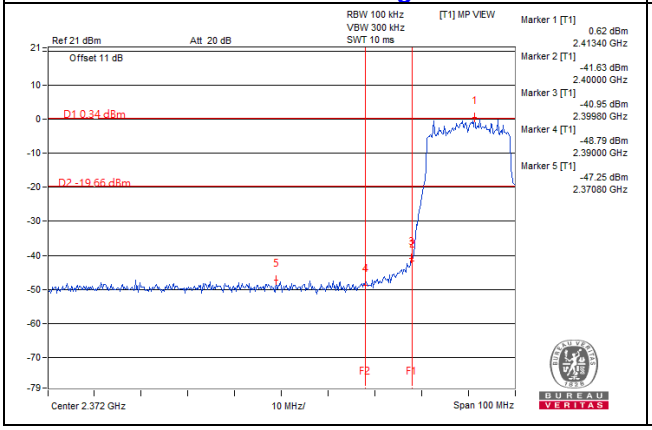
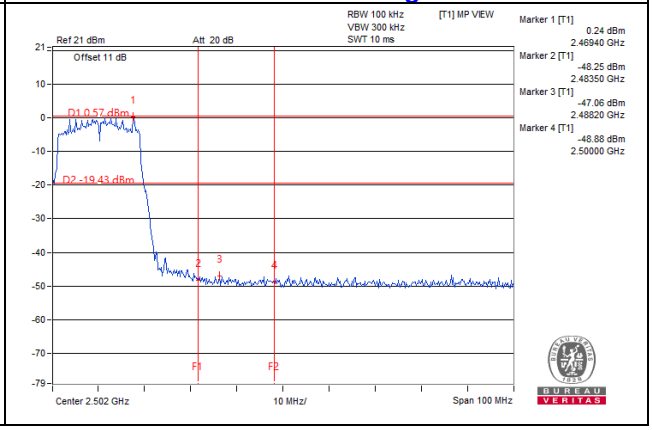




CH 1 Band edge

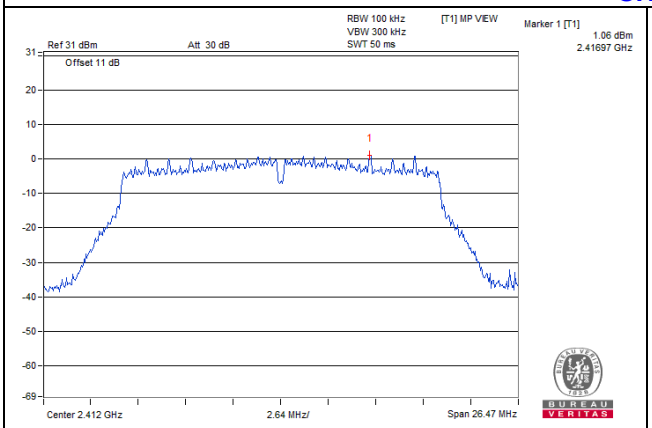


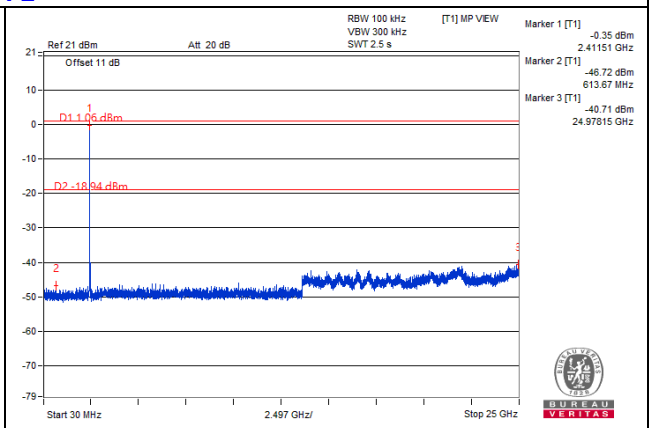
CH 11 Band edge



CHAIN 1

CH 1





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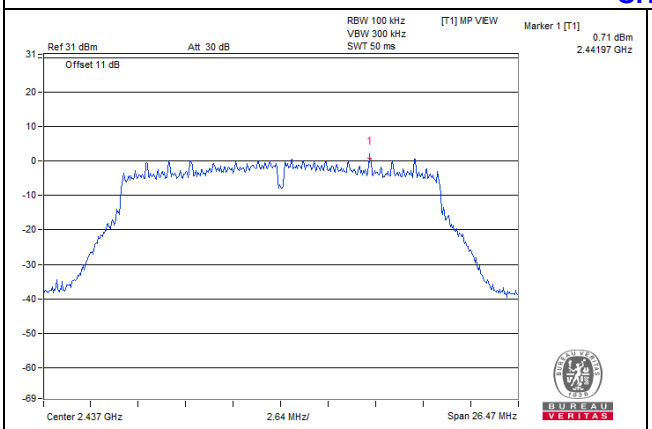
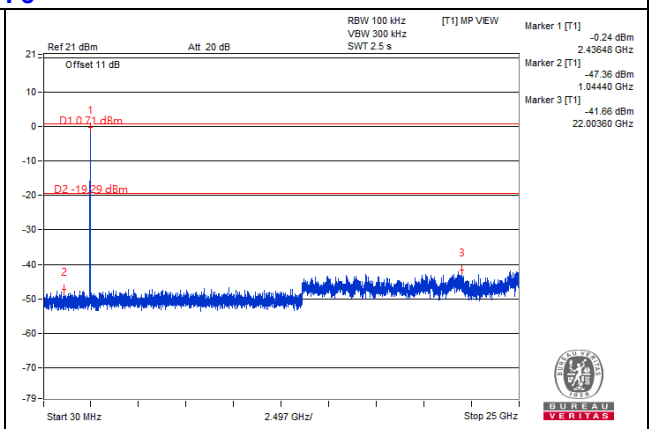
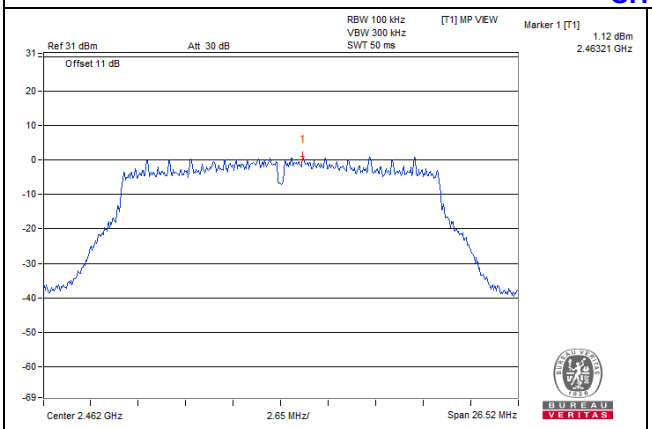
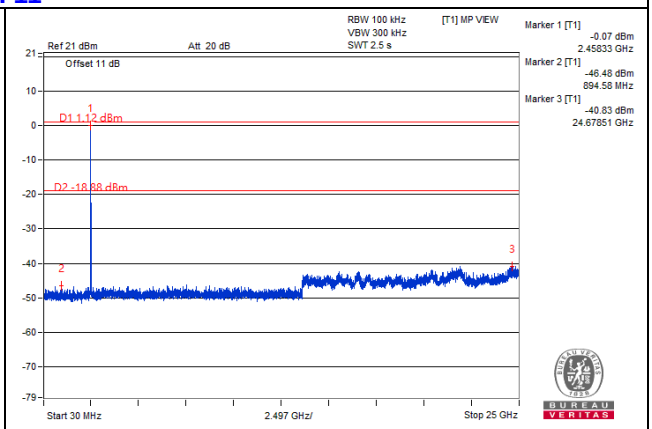


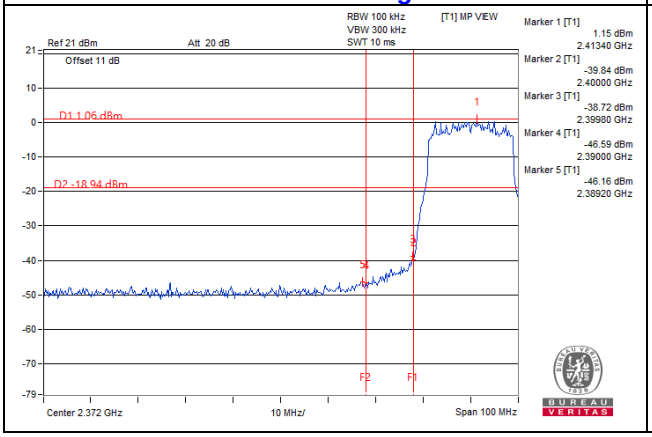


CH 11

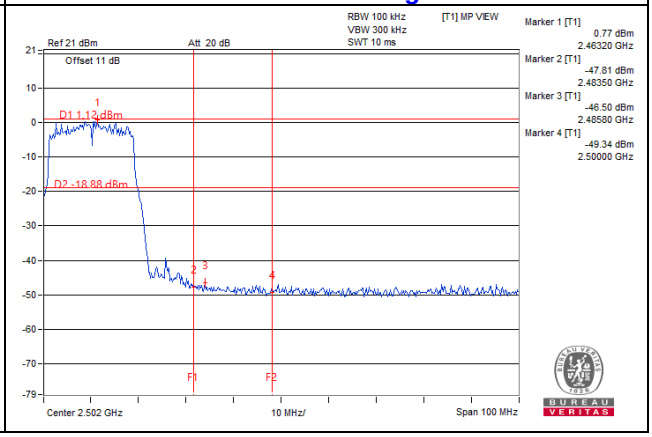




CH 1 Band edge



CH 11 Band edge



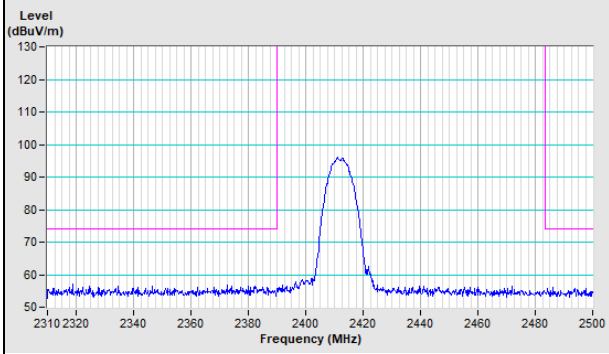
5 Pictures of Test Arrangements

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

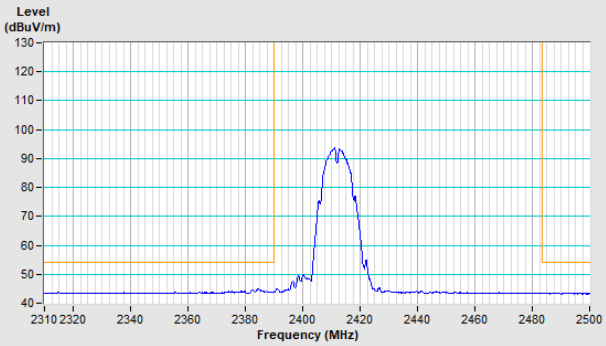
Annex A - Band-Edge Measurement

802.11b Channel 1

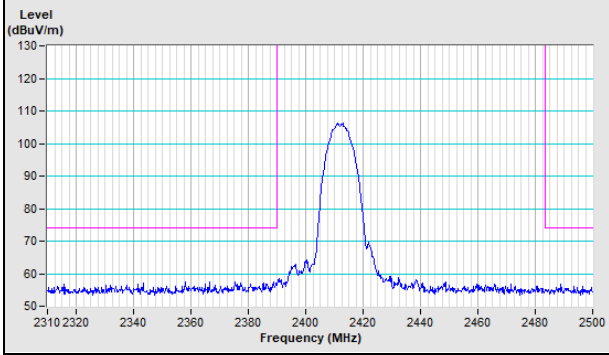
Horizontal (Peak)



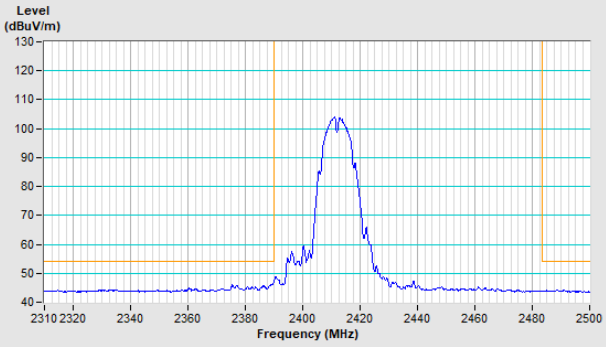
Horizontal (Average)



Vertical (Peak)

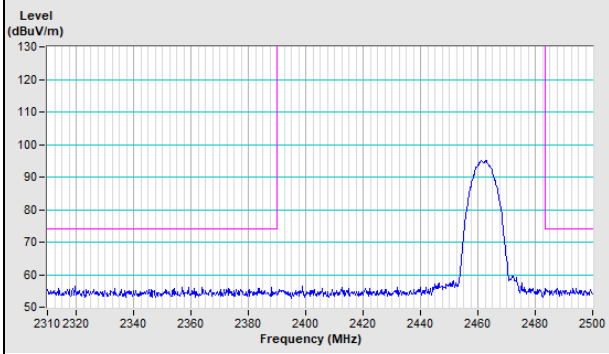


Vertical (Average)

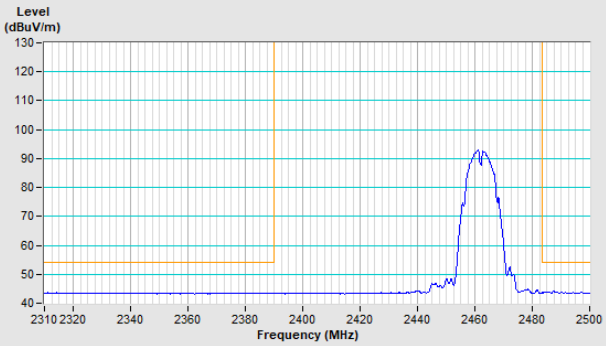


802.11b Channel 11

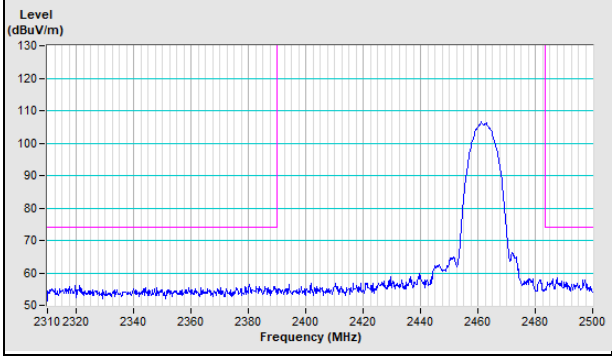
Horizontal (Peak)



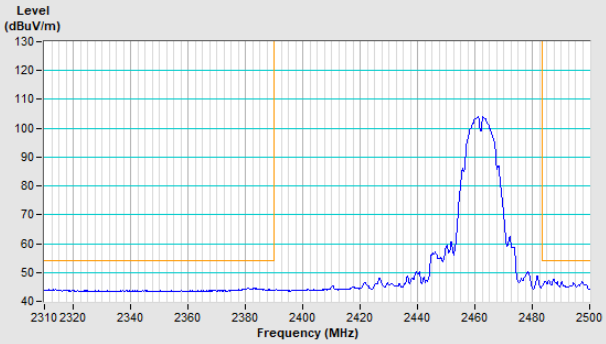
Horizontal (Average)



Vertical (Peak)

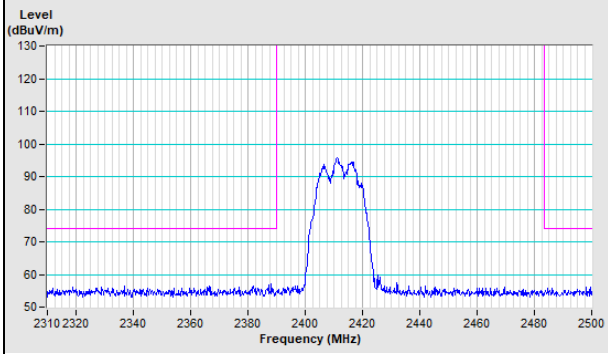


Vertical (Average)

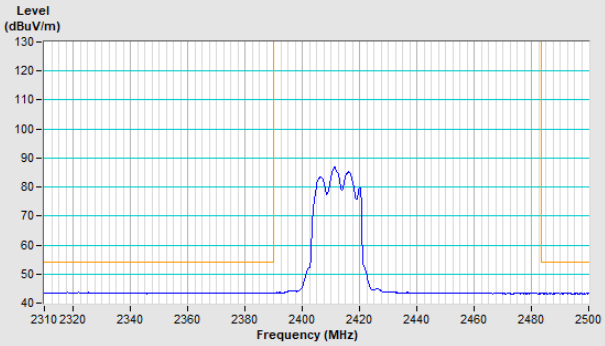


802.11g Channel 1

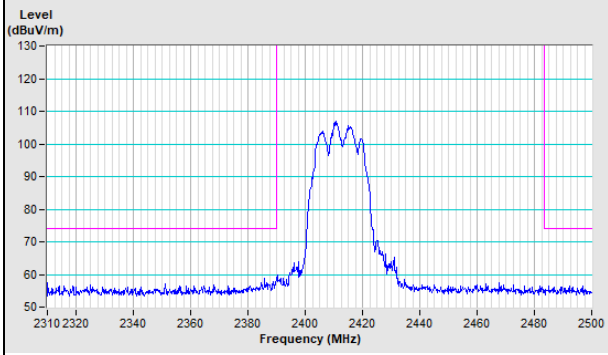
Horizontal (Peak)



Horizontal (Average)



Vertical (Peak)



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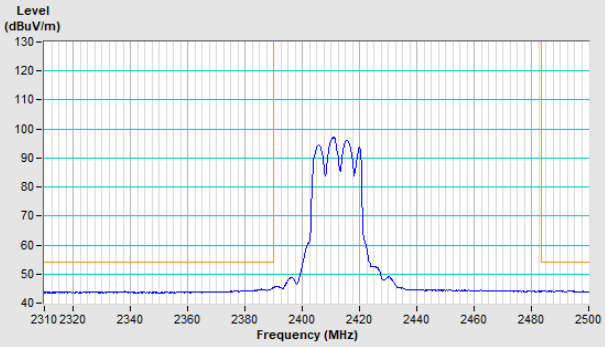
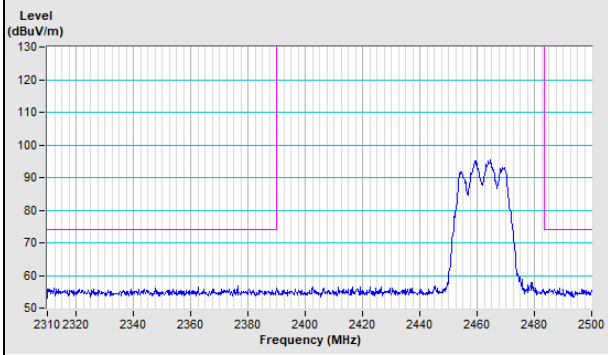
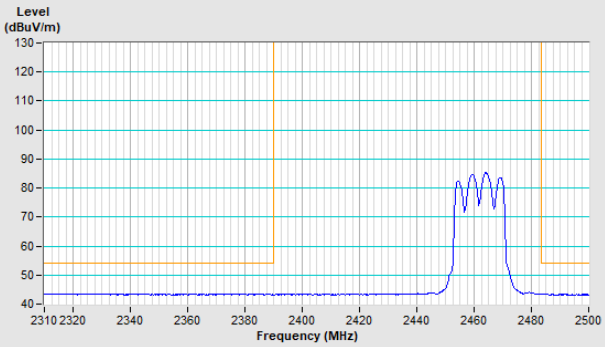


802.11g Channel 11

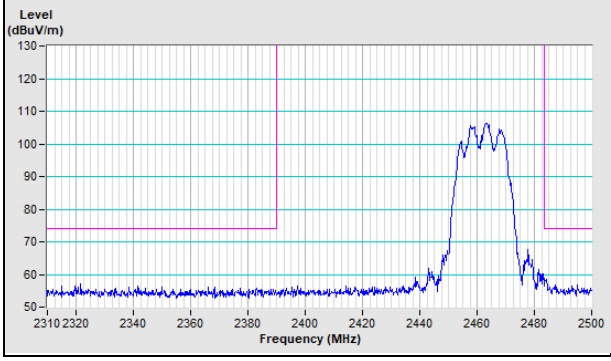
Horizontal (Peak)



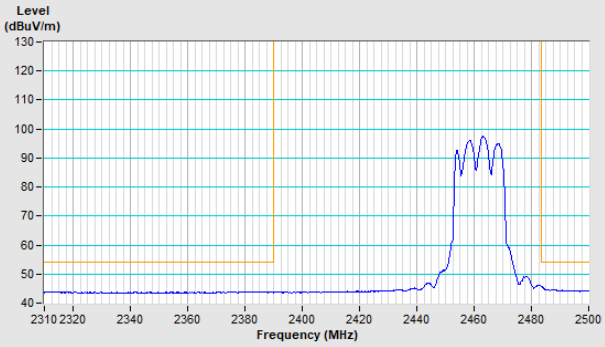
Horizontal (Average)



Vertical (Peak)

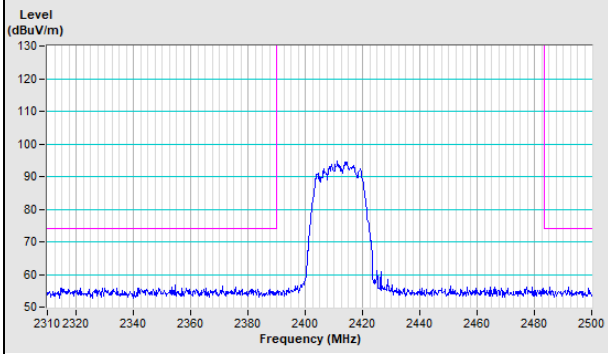


Vertical (Average)

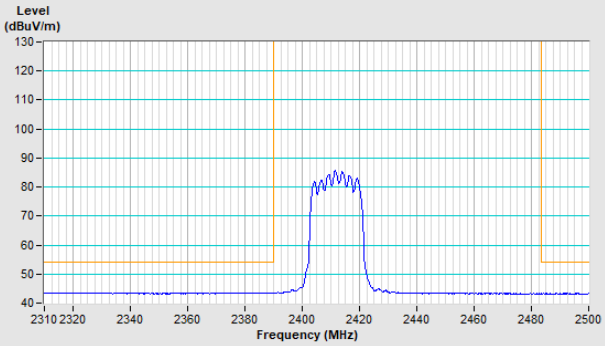


802.11n (HT20) Channel 1

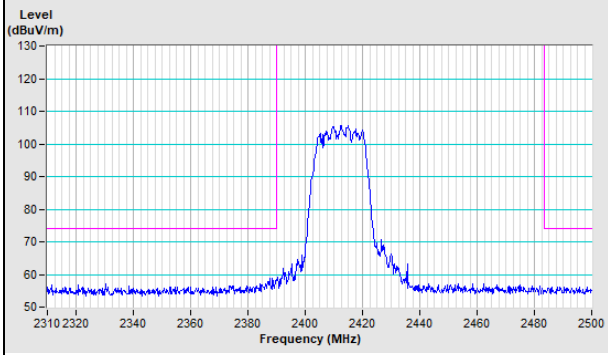
Horizontal (Peak)



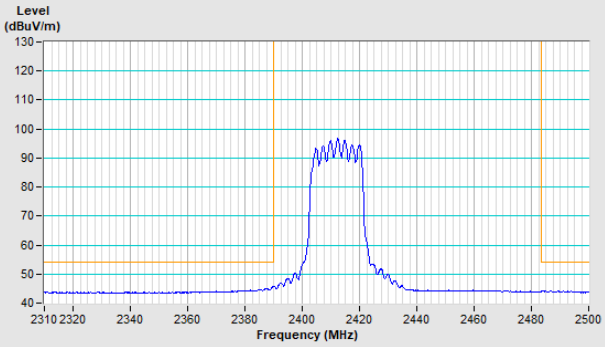
Horizontal (Average)



Vertical (Peak)

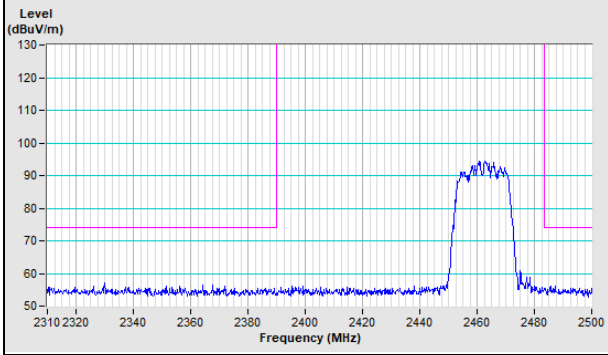


Vertical (Average)

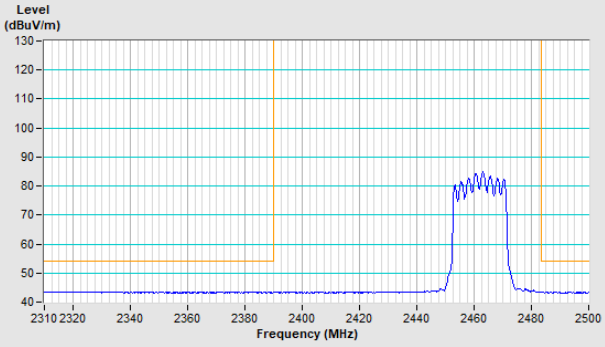


802.11n (HT20) Channel 11

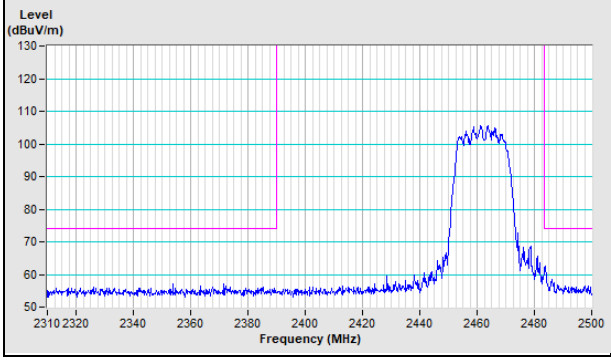
Horizontal (Peak)



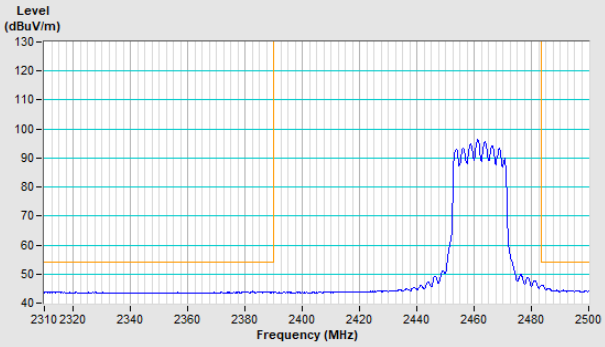
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



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.

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Web Site: www.bureauveritas-adt.com

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

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