

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)

Report No.: RFBCKS-WTW-P22040853

FCC ID: 2AAAS-NM02

Model No.: NM02

Received Date: 2022/4/28

Test Date: 2022/4/29 ~ 2022/6/10

Issued Date: 2022/7/19

Applicant: Vivint, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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FCC Registration / 788550 / TW0003

Designation Number:

Approved by:

Jeremy Lin

, Date:

2022/7/19

Jeremy Lin / Project Engineer

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Prepared by : Celine Chou / Senior Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P22040853	Original release.	2022/7/19

1 Certificate

Product: Vivint 2.4GHz/5GHz WiFi Module

Brand: Vivint

Test Model: NM02

Sample Status: Engineering sample

Applicant: Vivint, Inc.

Test Date: 2022/4/29 ~ 2022/6/10

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)

Measurement procedure: ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Standard / Clause	Test Item	Result	Remark
15.247(b)	RF Output Power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -18.82 dB at 0.50530 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -3.1 dB at 43.58 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -0.5 dB at 2390.00 MHz
15.203	Antenna Requirement	Pass	Antenna connector is ipex(MHF) not a standard connector.

Note: 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	Specification	Expanded Uncertainty (k=2) (±)
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.79 dB
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.79 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.00 dB
	30 MHz ~ 1 GHz	3.60 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	Vivint 2.4GHz/5GHz WiFi Module
Brand	Vivint
Test Model	NM02
Status of EUT	Engineering sample
Power Supply Rating	3.3Vdc
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	255.814 mW (24.08 dBm)

Note: 2.4GHz & 5GHz technology cannot transmit at same time.

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

No.	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type	Cable Length (mm)	Cable Loss (dB)	Excluding cable loss Antenna Gain (dBi)
1	Chain 0	NA	TE 2108517-1	2.5	2.4~2.4835GHz	PIFA	ipex(MHF)	60	0.5	3.0
				2.0	5.15~5.85GHz	PIFA	ipex(MHF)		1.0	3.0
2	Chain 1	NA	TE 2108517-1	2.0	2.4~2.4835GHz	PIFA	ipex(MHF)	230	1.0	3.0
				1.5	5.15~5.85GHz	PIFA	ipex(MHF)		1.5	3.0

* The above Antenna information refers to the manufacturer's antenna specifications, the laboratory shall not be held responsible.

2. The EUT incorporates a MIMO function:

2.4GHz Band		
Modulation Mode	Tx & Rx Configuration	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX

3.3 Channel List

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

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

7 channels are provided for 802.11n (HT40):

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

3.4 Power Setting

Power Setting					
Channel	802.11b	802.11g	802.11n (HT20)	Channel	802.11n (HT40)
1	27	1E	21	3	1E
6	2A	25	28	6	21
11	24	1D	1E	9	1A

3.5 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan in these ways and find the worst case as a representative test condition.
Worst Case:	1. The worst case was found when positioned on Z-plane. 2. 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:

Test Item	Mode	Tested Channel	Modulation	Data Rate Parameter
AC Power Conducted Emissions	802.11b	6	DBPSK	1Mb/s
Unwanted Emissions below 1 GHz	802.11b	6	DBPSK	1Mb/s
Unwanted Emissions above 1 GHz	802.11b	1, 6, 11	DBPSK	1Mb/s
	802.11g	1, 6, 11	BPSK	6Mb/s
	802.11n (HT20)	1, 6, 11	BPSK	MCS0
	802.11n (HT40)	3, 6, 9	BPSK	MCS0
RF Output Power / Power Spectral Density	802.11b	1, 6, 11	DBPSK	1Mb/s
	802.11g	1, 6, 11	BPSK	6Mb/s
	802.11n (HT20)	1, 6, 11	BPSK	MCS0
	802.11n (HT40)	3, 6, 9	BPSK	MCS0
6 dB Bandwidth / Conducted Out of Band Emissions	802.11b	1, 6, 11	DBPSK	1Mb/s
	802.11g	1, 6, 11	BPSK	6Mb/s
	802.11n (HT20)	1, 6, 11	BPSK	MCS0
	802.11n (HT40)	3, 6, 9	BPSK	MCS0

3.6 Duty Cycle of Test Signal

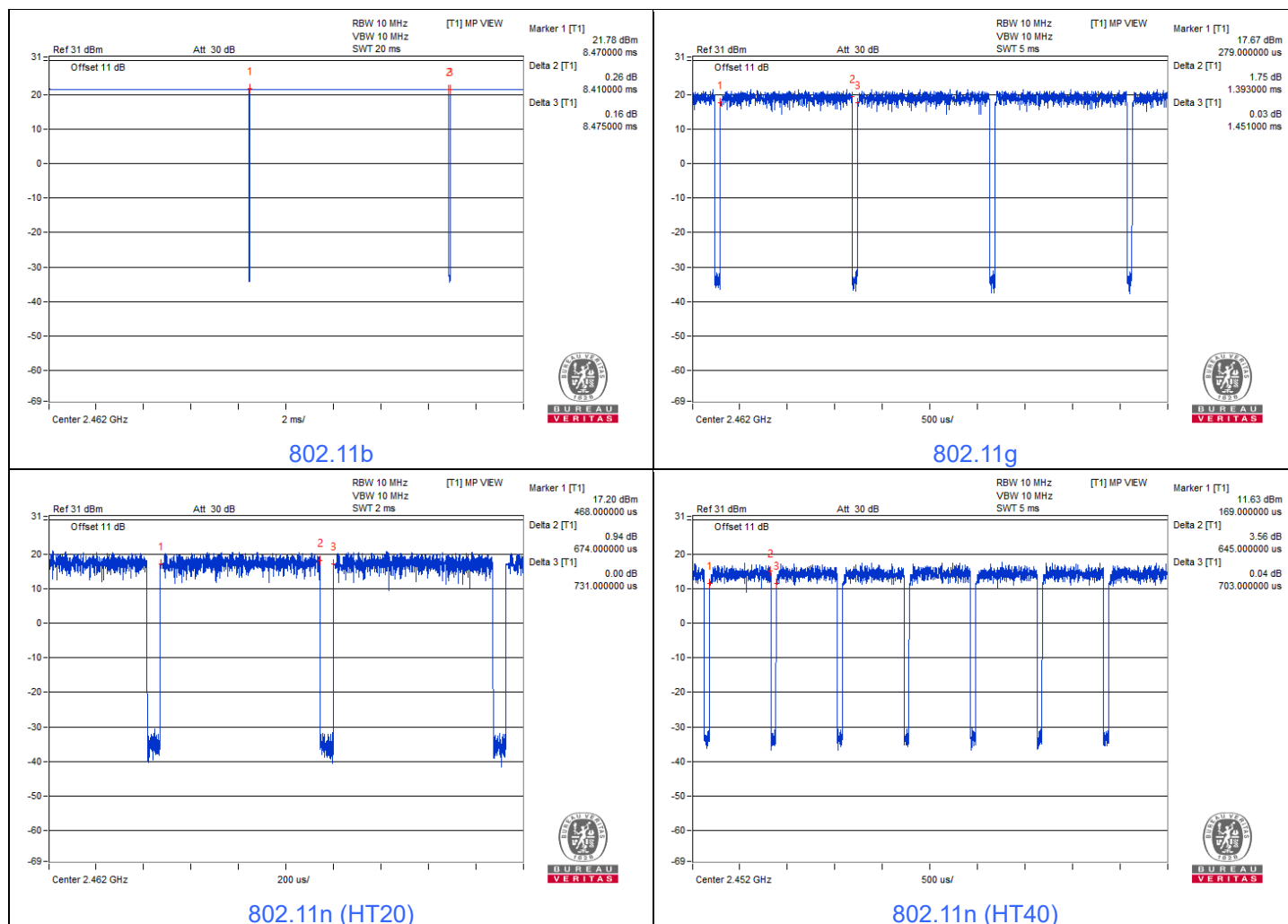
Duty cycle of test signal is $\geq 98\%$, duty factor is not required.
Duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11b: Duty cycle = $8.41 \text{ ms} / 8.475 \text{ ms} \times 100\% = 99.2\%$

802.11g: Duty cycle = $1.393 \text{ ms} / 1.451 \text{ ms} \times 100\% = 96.0\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 0.18 \text{ dB}$

802.11n (HT20): Duty cycle = $0.674 \text{ ms} / 0.731 \text{ ms} \times 100\% = 92.2\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 0.35 \text{ dB}$

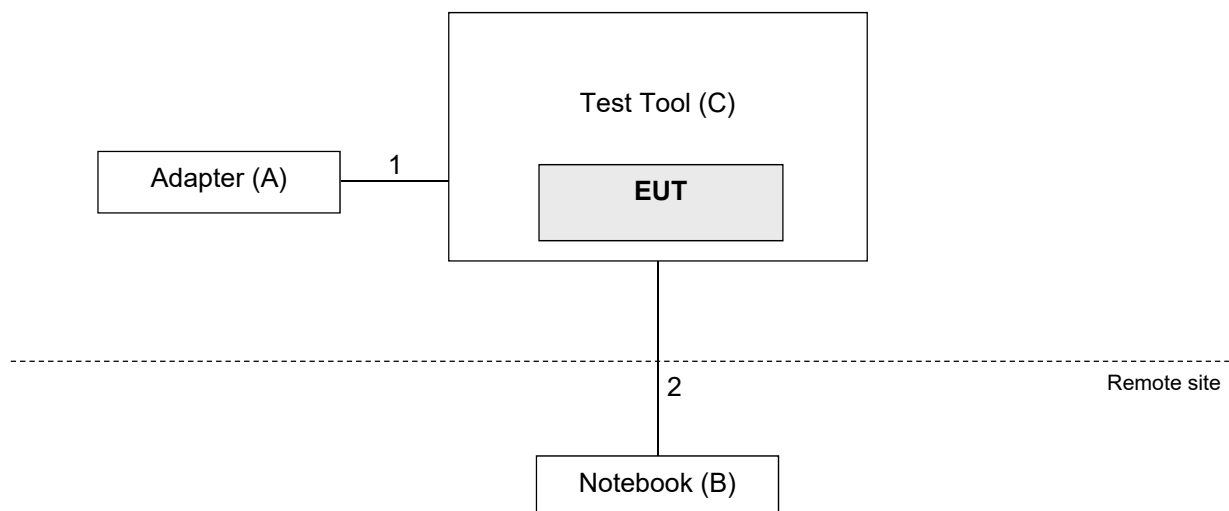
802.11n (HT40): Duty cycle = $0.645 \text{ ms} / 0.703 \text{ ms} \times 100\% = 91.7\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 0.37 \text{ dB}$



3.7 Test Program Used and Operation Descriptions

Controlling software (MT7615 QA0.02.0) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.8 Connection Diagram of EUT and Peripheral Devices



3.9 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	ADP	WB-18Q12FU	N/A	N/A	Provided by Client
B	Notebook	Lenovo	L440	R90J29AA	DoC	Provided by Lab
C	Test Tool	N/A	N/A	N/A	N/A	Provided by Client

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Power Cable	1	1.4	No	0	Provided by Client
2	RJ-45 Cable	1	10	No	0	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	2022/1/18	2023/1/17
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	2021/7/12	2022/7/11
Wideband Power Sensor(N1923A) KEYSIGHT	N1923A	MY58020002	2022/1/17	2023/1/16

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2022/6/5

4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Software BV	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A
Spectrum Analyzer R&S	FSV40	100979	2022/3/25	2023/3/24

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2022/6/5

4.3 6 dB Bandwidth

Refer to section 4.2 to get information of the instruments.

4.4 Conducted Out of Band Emissions

Refer to section 4.2 to get information of the instruments.

4.5 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
DC LISN R&S	ESH3-Z6	100219	2021/7/25	2022/7/24
		844950/018	2021/7/25	2022/7/24
DC-LISN SCHWARZBECK MESS- ELETRONIK	NNBM 8126G	8126G-069	2021/11/10	2022/11/9
LISN R&S	ESH2-Z5	100100	2022/2/17	2023/2/16
	ESH3-Z5	100312	2021/9/17	2022/9/16
	ENV216	100072	2021/6/16	2022/6/15
RF Coaxial Cable WORKEN	5D-FB	Cable-cond2-01	2021/9/4	2022/9/3
Software BVADT	BVADT_Conf_ V7.3.7.4	N/A	N/A	N/A
Test Receiver R&S	ESR3	102783	2021/12/20	2022/12/19
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2021/8/20	2022/8/19

Notes:

1. The test was performed in HY - Conduction 2.
2. Tested Date: 2022/4/29

4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Max-Full	MFA-440H	AT93021705	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB9168	9168-472	2021/10/28	2022/10/27
Loop Antenna TESEQ	HLA 6121	45745	2021/7/21	2022/7/20
Loop Antenna EMCI	EM-6879	269	2021/9/16	2022/9/15
Pre-Amplifier EMCI	EMC 330H	980112	2021/10/5	2022/10/4
Pre-amplifier EMCI	EMC001340	980201	2021/9/15	2022/9/14
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2022/1/15	2023/1/14
RF Coaxial Cable WORKEN	8D-FB	Cable-Ch10-01	2021/10/5	2022/10/4
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Test Receiver Agilent	N9038A	MY51210203	2021/9/22	2022/9/21
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MG-7802	N/A	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 5.
2. Tested Date: 2022/6/10

4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Max-Full	MFA-440H	AT93021705	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	7	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-969	2021/11/14	2022/11/13
	BBHA 9170	148	2021/11/14	2022/11/13
Pre-Amplifier EMCI	EMC 012645	980115	2021/10/5	2022/10/4
	EMC 184045	980116	2021/10/5	2022/10/4
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	2021/10/5	2022/10/4
RF Coaxial Cable HUBER SUHNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	2021/10/5	2022/10/4
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	2021/7/24	2022/7/23
	EMC102-KM-KM-3000	150929	2021/7/24	2022/7/23
RF FILTER MICRO-TRONICS	BRM50716	060	2022/1/10	2023/1/9
	BRM17690	004	2022/1/10	2023/1/9
Signal Analyzer Agilent	N9010A	MY52220314	2021/12/3	2022/12/2
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MG-7802	N/A	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 5.
2. Tested Date: 2022/5/24 ~ 2022/5/25

5 Limits of Test Items

5.1 RF Output Power

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 $N_{ANT} \leq 4$;

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.

5.2 Power Spectral Density

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

5.3 6 dB Bandwidth

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

5.4 Conducted Out of Band Emissions

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

5.5 AC Power Conducted Emissions

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

Notes:

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.

5.6 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30 dB below the highest level of the desired power:

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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = $20 \log$ Emission level (uV/m).

5.7 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

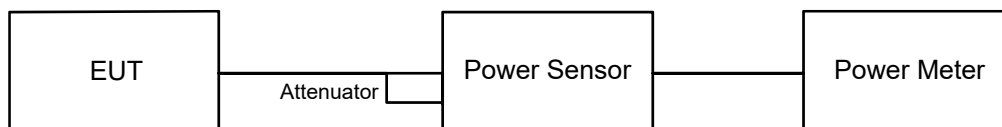
Notes:

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.

6 Test Arrangements

6.1 RF Output Power

6.1.1 Test Setup

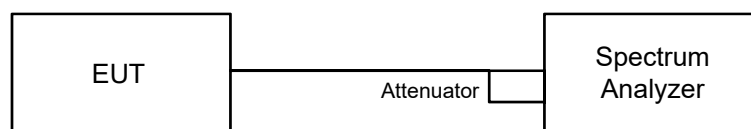


6.1.2 Test Procedure

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.

6.2 Power Spectral Density

6.2.1 Test Setup



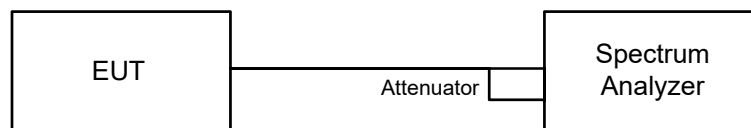
6.2.2 Test Procedure

- 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.
- e. Set VBW $\geq 3 \times$ RBW.
- f. Detector = power averaging (RMS) or sample detector (when RMS not available).
- g. Ensure that the number of measurement points in the sweep $\geq 2 \times$ 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.

Note: If Duty cycle < 98%, 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.

6.3 6 dB Bandwidth

6.3.1 Test Setup

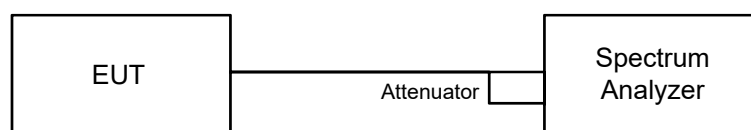


6.3.2 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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.

6.4 Conducted Out of Band Emissions

6.4.1 Test Setup



6.4.2 Test Procedure

MEASUREMENT PROCEDURE REF

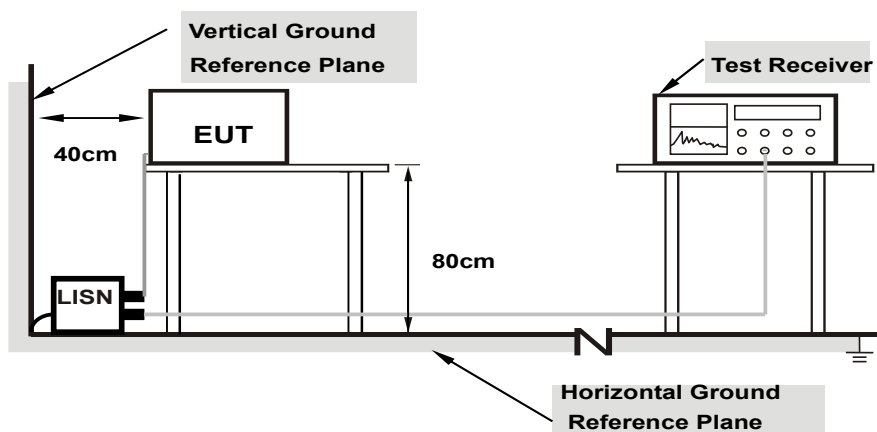
- Set the RBW = 100 kHz.
- Set the VBW ≥ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

- Set RBW = 100 kHz.
- Set VBW ≥ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

6.5 AC Power Conducted Emissions

6.5.1 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).

6.5.2 Test Procedure

- 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.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

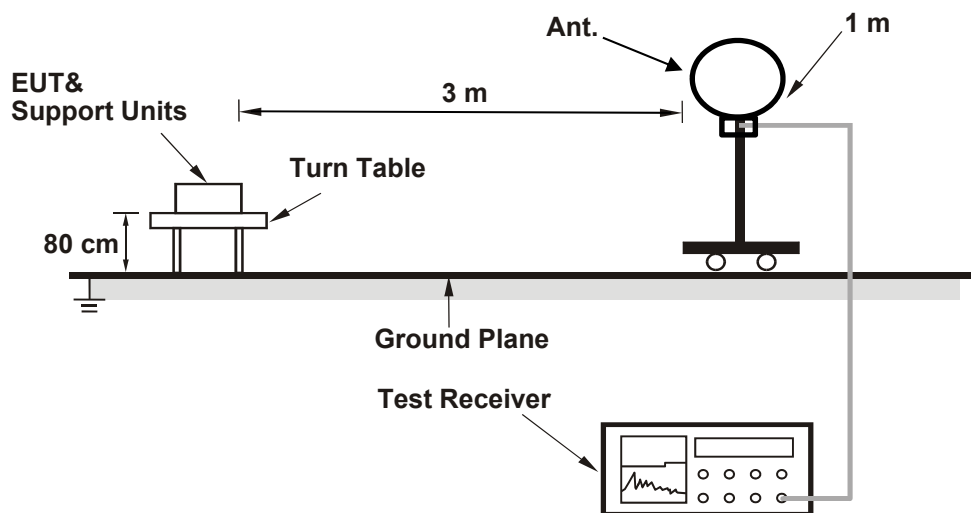
Note:

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.

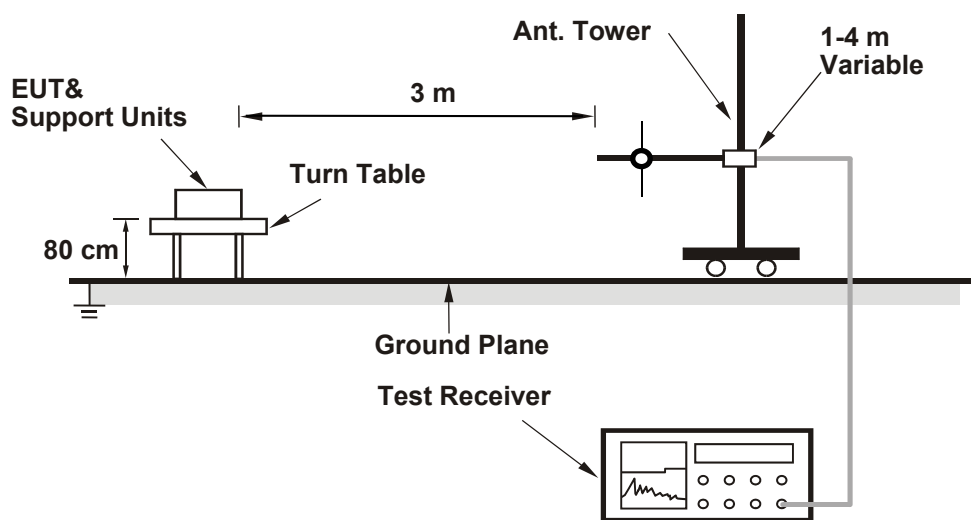
6.6 Unwanted Emissions below 1 GHz

6.6.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



6.6.2 Test Procedure

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 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. 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.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters 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.

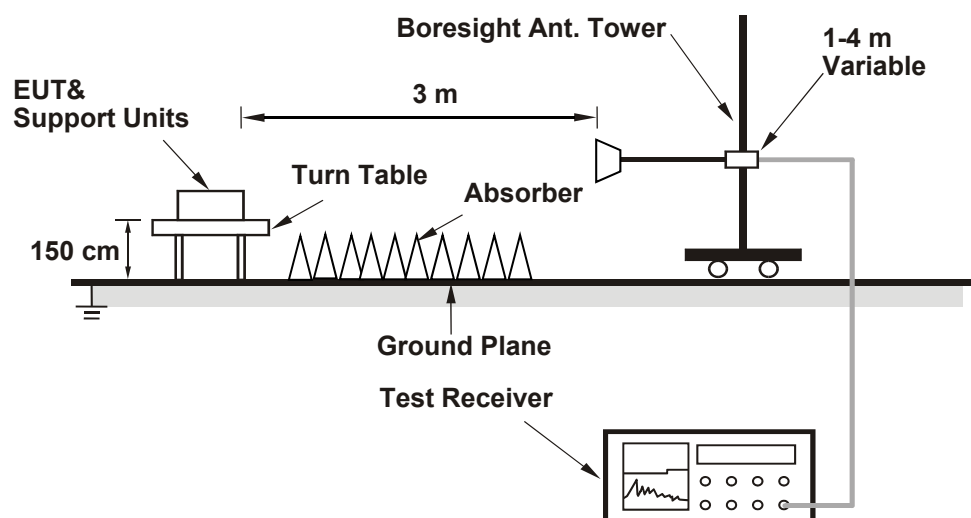
Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

6.7 Unwanted Emissions above 1 GHz

6.7.1 Test Setup

For Radiated emission above 1 GHz



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

6.7.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.

Notes:

- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
- For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Jisyong Wang
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802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
1	2412	19.71	19.37	180.037	22.55	30	Pass
6	2437	21.25	20.88	255.814	24.08	30	Pass
11	2462	19.32	18.46	155.652	21.92	30	Pass

Notes:

1. Directional gain is the maximum gain of antennas.
2. The maximum gain is 2.5 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
1	2412	15.58	15.16	68.951	18.39	30	Pass
6	2437	18.95	18.25	145.358	21.62	30	Pass
11	2462	15.84	15.21	71.56	18.55	30	Pass

Notes:

1. Directional gain is the maximum gain of antennas.
2. The maximum gain is 2.5 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
1	2412	16.18	15.60	77.803	18.91	30	Pass
6	2437	19.37	18.78	162.006	22.10	30	Pass
11	2462	15.21	14.65	62.364	17.95	30	Pass

Notes:

1. Directional gain is the maximum gain of antennas.
2. The maximum gain is 2.5 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
3	2422	15.14	14.65	61.833	17.91	30	Pass
6	2437	16.67	15.98	86.079	19.35	30	Pass
9	2452	13.46	12.99	42.089	16.24	30	Pass

Notes:

1. Directional gain is the maximum gain of antennas.
2. The maximum gain is 2.5 dBi < 6 dBi, so the output power limit shall not be reduced.

7.2 Power Spectral Density

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Jisyong Wang
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802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
		Chain 0	Chain 1			
1	2412	-11.41	-11.59	-8.49	8.00	Pass
6	2437	-10.75	-10.90	-7.81	8.00	Pass
11	2462	-12.04	-12.18	-9.10	8.00	Pass

Notes:

1. Method E) 2) b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{\text{Chain0}/20} + 10^{\text{Chain1}/20})^2 / 2]$
3. The directional gain is 5.26 dBi < 6 dBi, so the power density limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
		Chain 0	Chain 1				
1	2412	-15.59	-16.63	0.18	-12.89	8.00	Pass
6	2437	-12.71	-13.49	0.18	-9.89	8.00	Pass
11	2462	-16.23	-16.96	0.18	-13.39	8.00	Pass

Notes:

1. Method E) 2) b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{\text{Chain0}/20} + 10^{\text{Chain1}/20})^2 / 2]$
3. The directional gain is 5.26 dBi < 6 dBi, so the power density limit shall not be reduced.

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
		Chain 0	Chain 1				
1	2412	-16.32	-16.72	0.35	-13.15	8.00	Pass
6	2437	-13.40	-13.84	0.35	-10.25	8.00	Pass
11	2462	-18.34	-18.81	0.35	-15.21	8.00	Pass

Notes:

1. Method E) 2) b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{\text{Chain0}/20} + 10^{\text{Chain1}/20})^2 / 2]$
3. The directional gain is 5.26 dBi < 6 dBi, so the power density limit shall not be reduced.

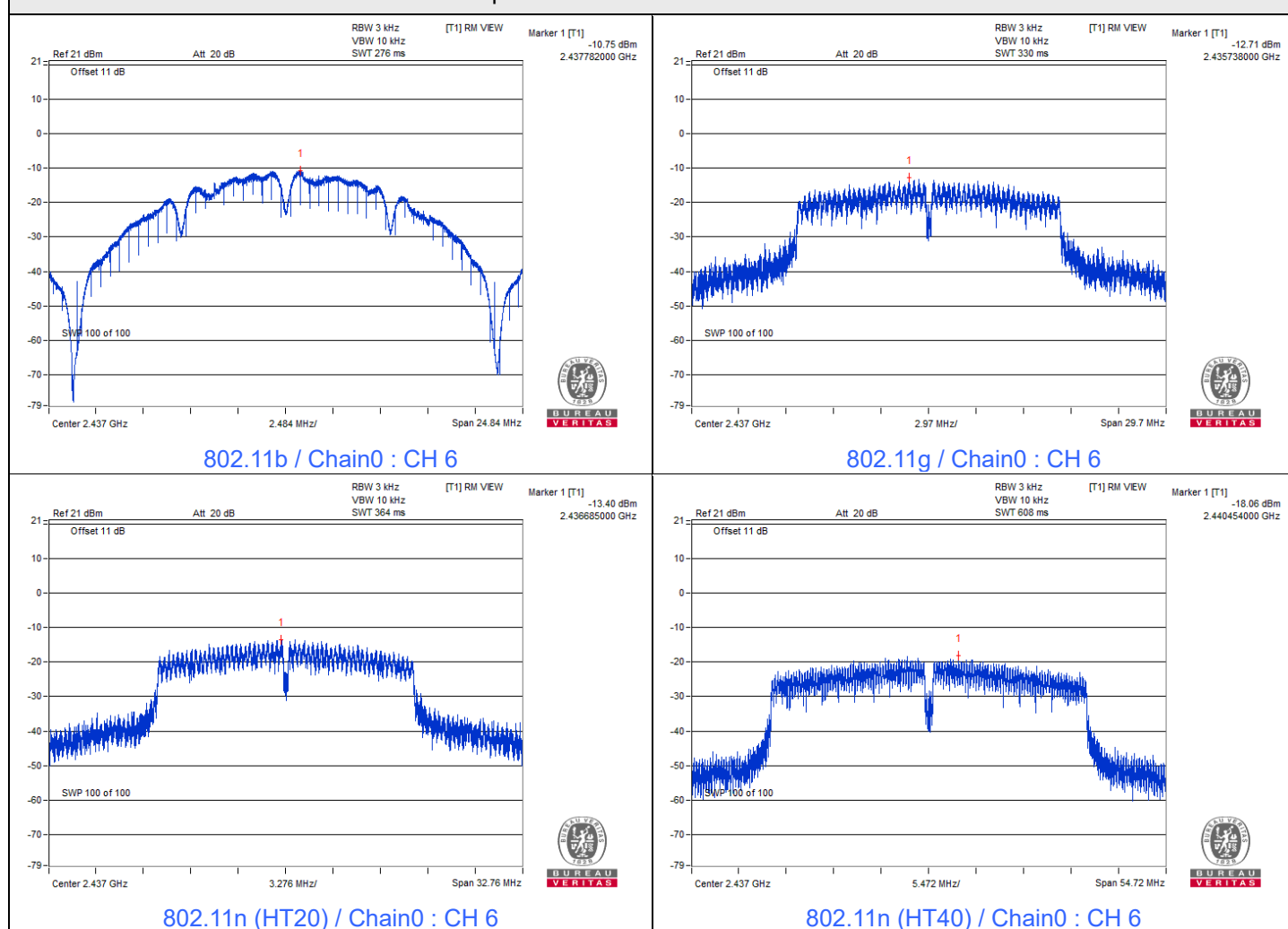
802.11n (HT40)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
		Chain 0	Chain 1				
3	2422	-18.86	-19.87	0.37	-15.95	8.00	Pass
6	2437	-18.06	-18.61	0.37	-14.94	8.00	Pass
9	2452	-22.16	-22.63	0.37	-19.00	8.00	Pass

Notes:

- Method E) 2) b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
- Directional gain = $10 \log[(10^{\text{Chain0}/20} + 10^{\text{Chain1}/20})^2 / 2]$
- The directional gain is 5.26 dBi < 6 dBi, so the power density limit shall not be reduced.

Spectrum Plot of Maximum Value



7.3 6 dB Bandwidth

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Jisyong Wang
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802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Test Result
		Chain 0	Chain 1		
1	2412	9.63	9.64	0.5	Pass
6	2437	9.63	10.13	0.5	Pass
11	2462	9.16	9.15	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Test Result
		Chain 0	Chain 1		
1	2412	15.18	15.18	0.5	Pass
6	2437	15.15	15.19	0.5	Pass
11	2462	15.18	15.19	0.5	Pass

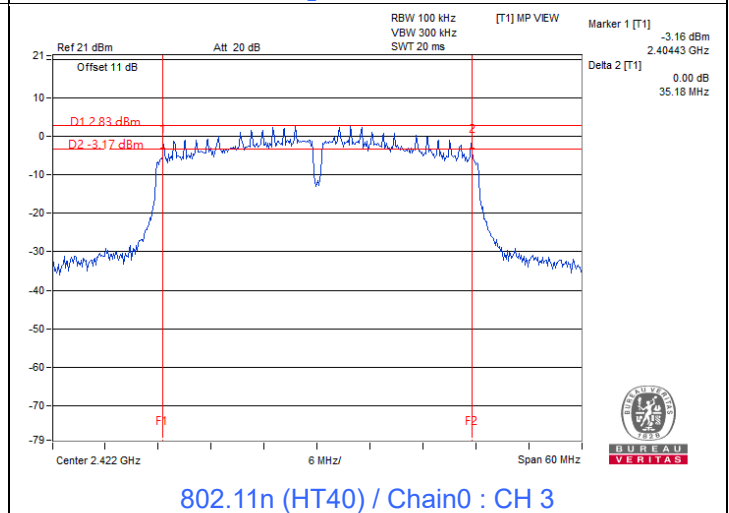
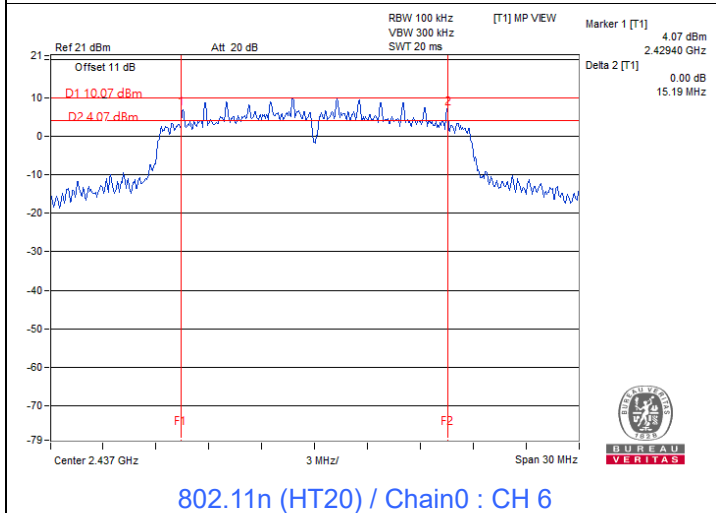
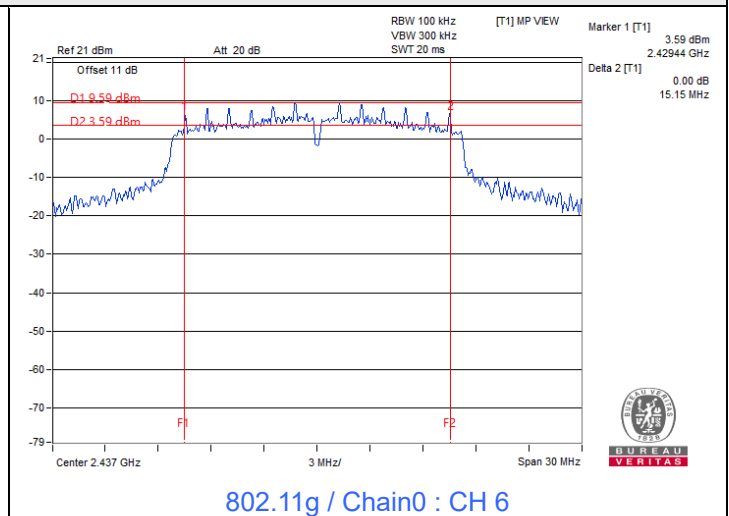
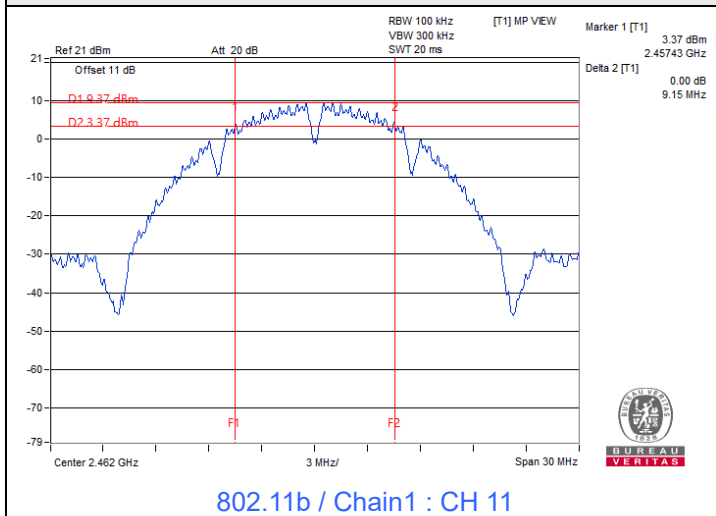
802.11n (HT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Test Result
		Chain 0	Chain 1		
1	2412	15.20	15.20	0.5	Pass
6	2437	15.19	15.19	0.5	Pass
11	2462	15.19	15.19	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Test Result
		Chain 0	Chain 1		
3	2422	35.18	35.18	0.5	Pass
6	2437	35.18	35.20	0.5	Pass
9	2452	35.18	35.20	0.5	Pass

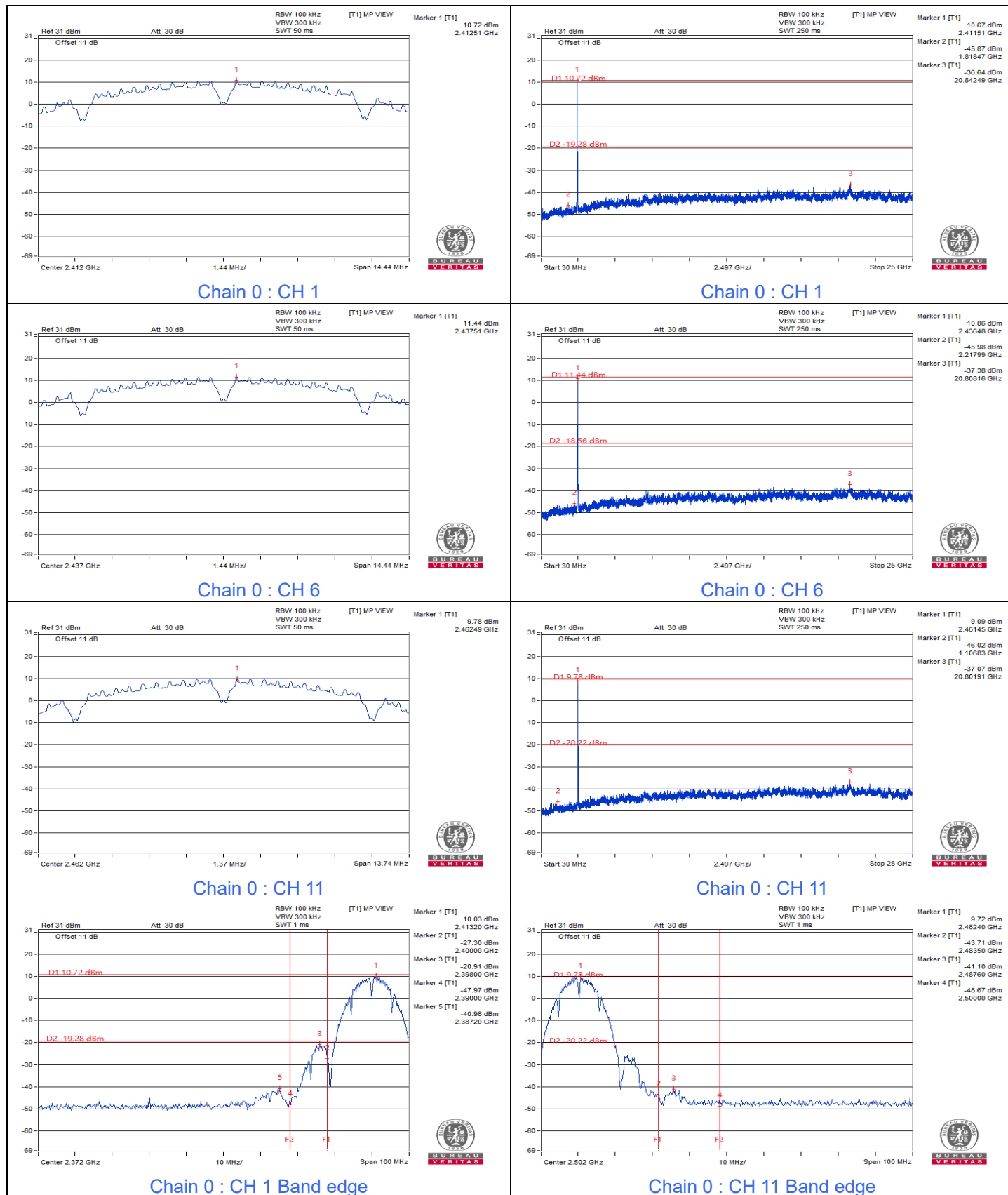
Spectrum Plot of Minimum Value

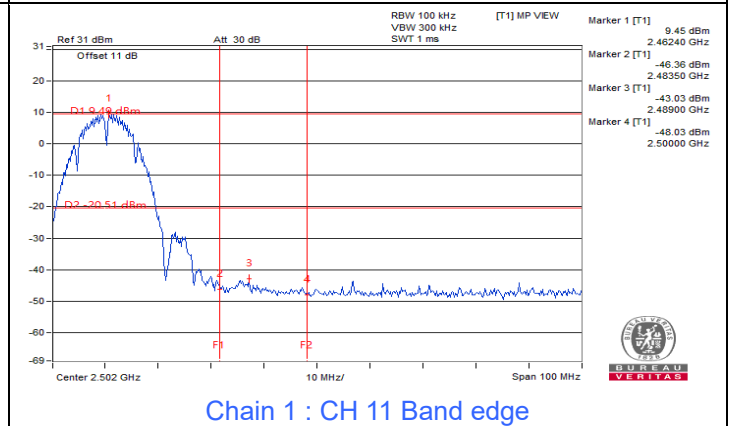
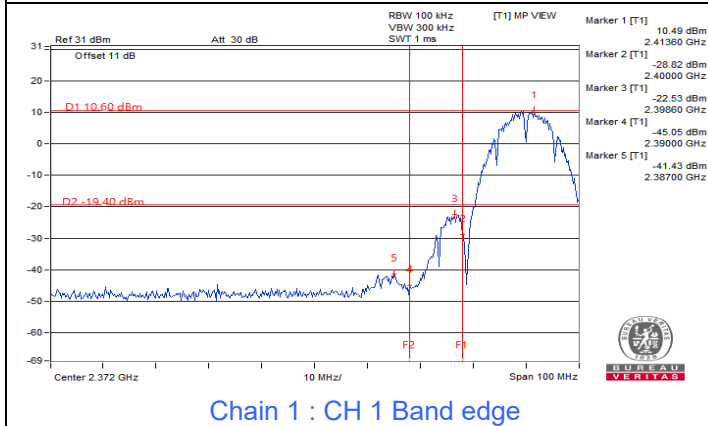
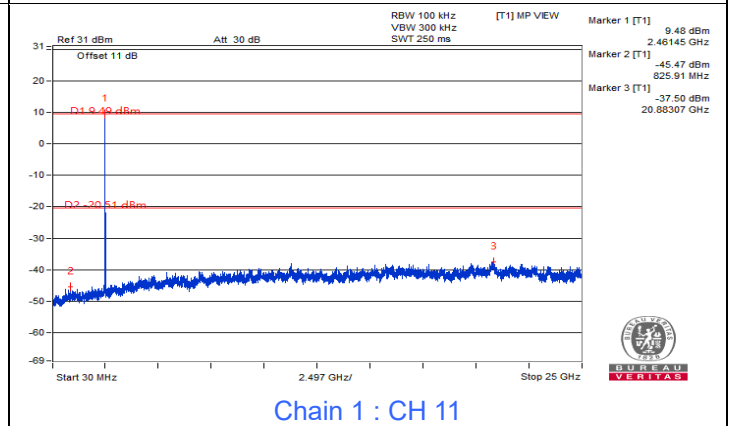
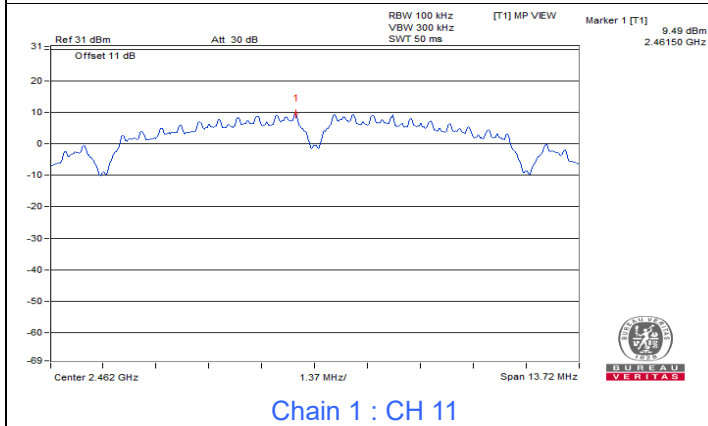
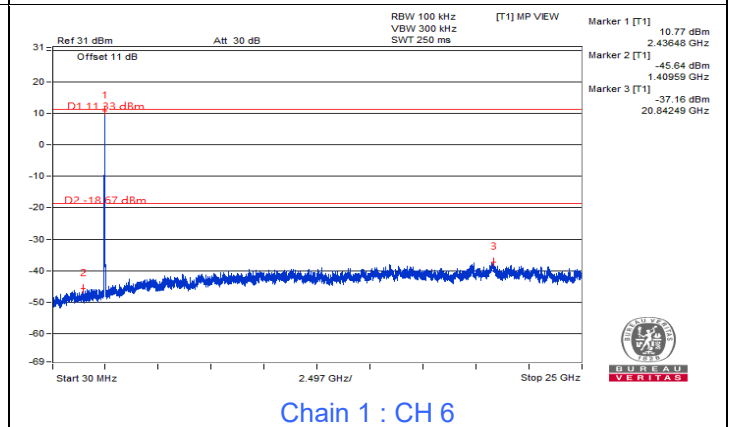
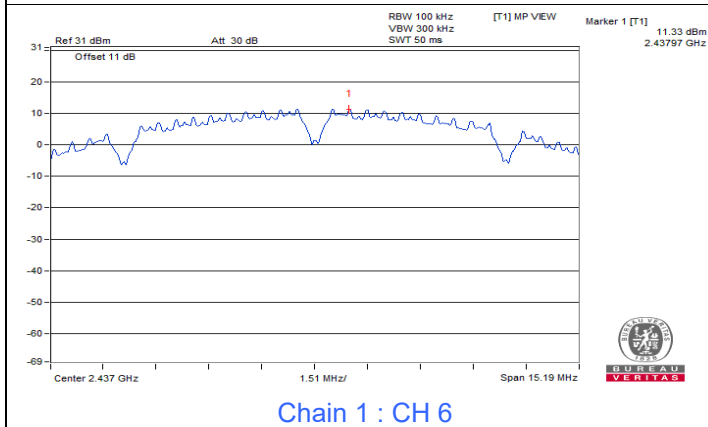
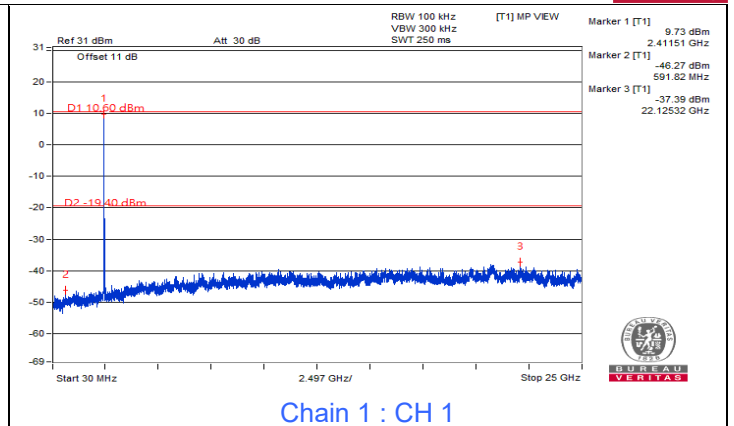
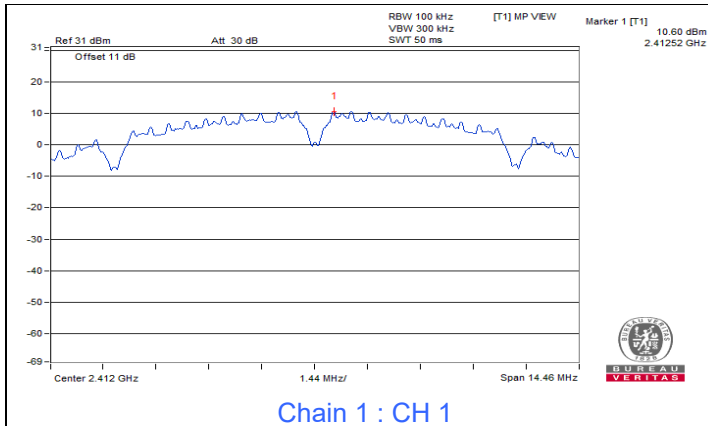


7.4 Conducted Out of Band Emissions

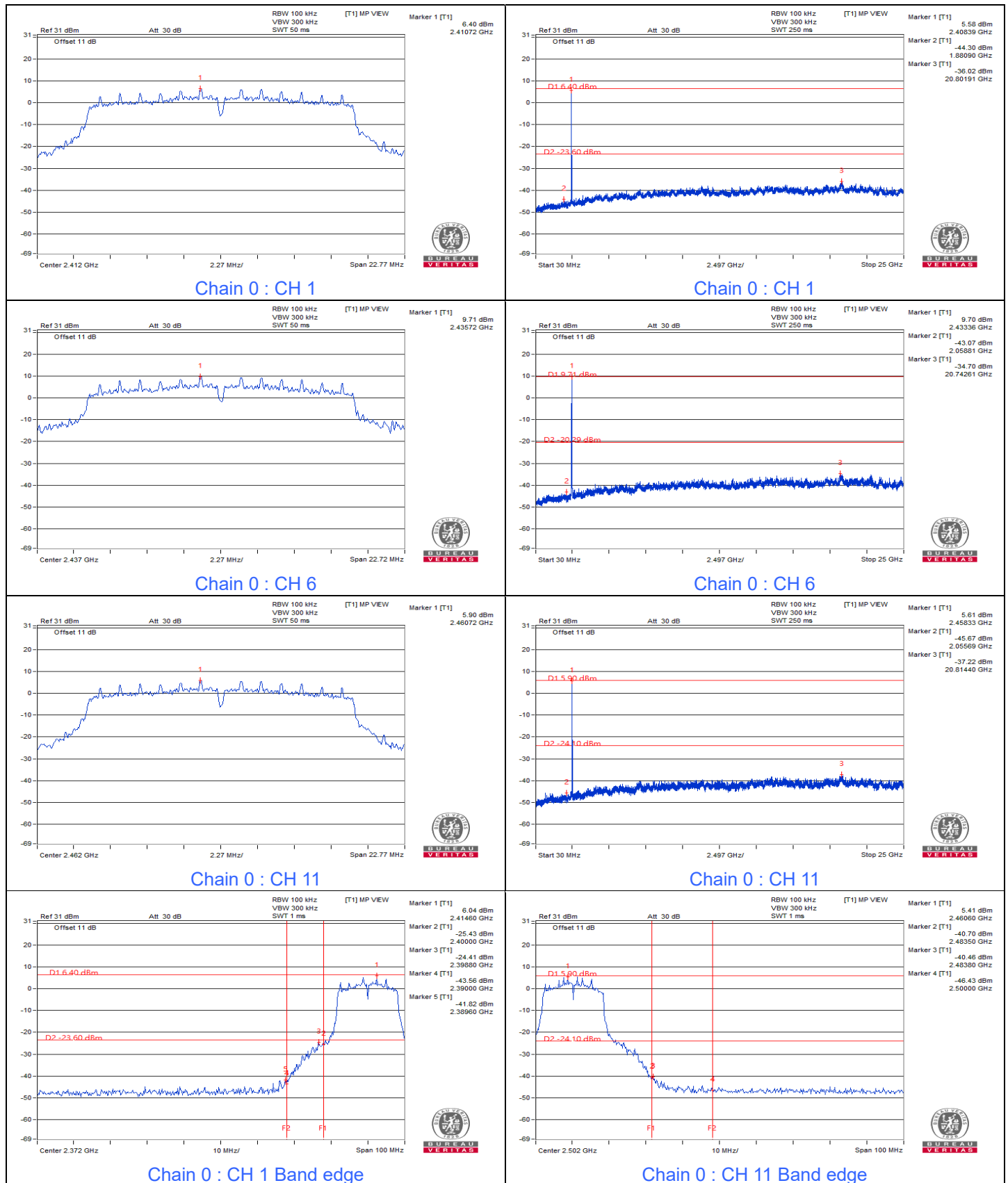
Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Jisyoung Wang
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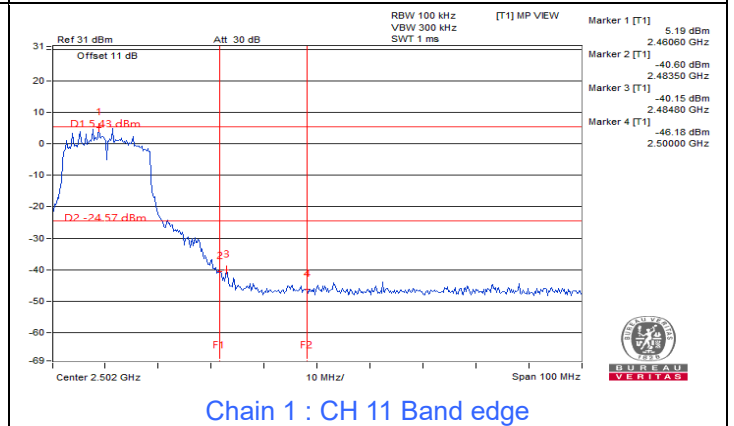
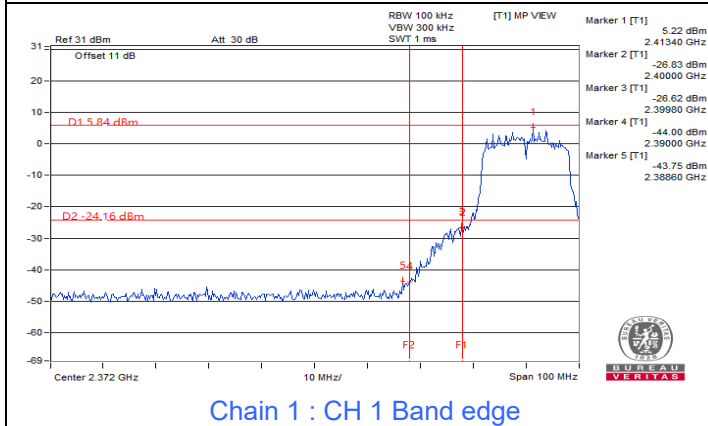
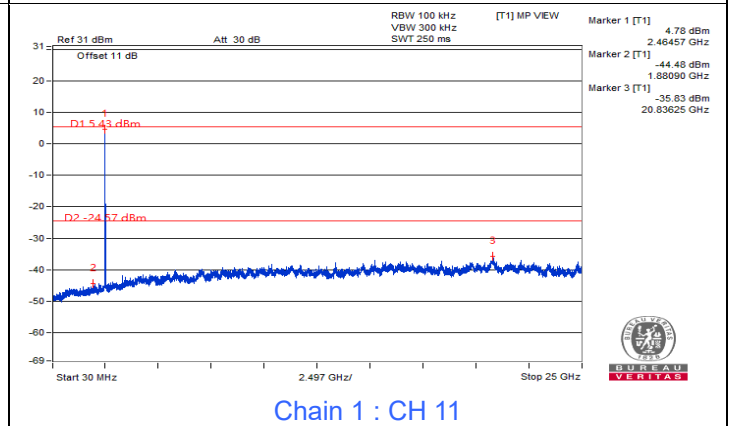
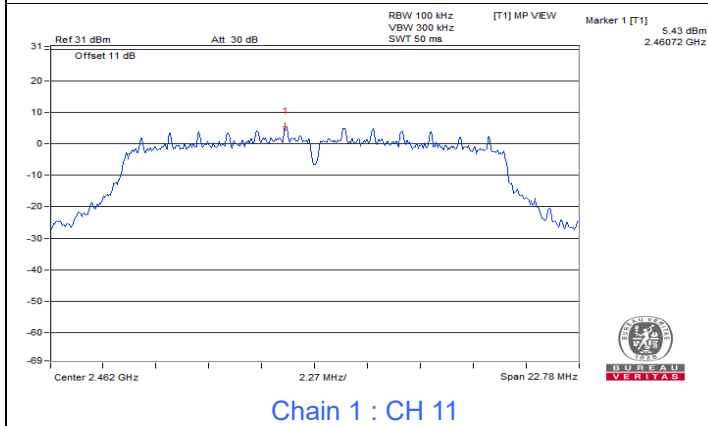
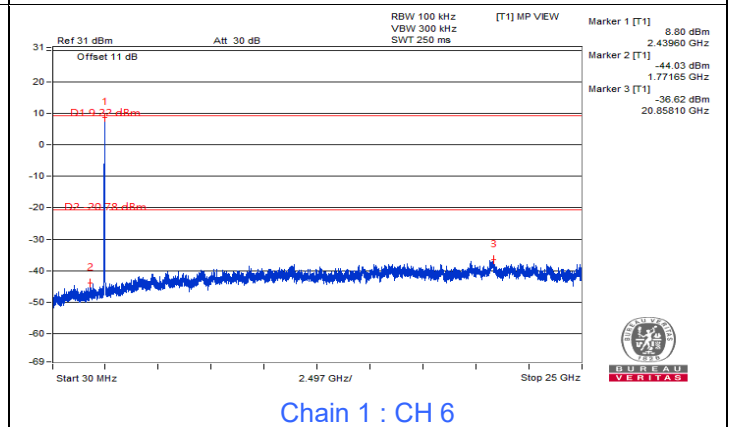
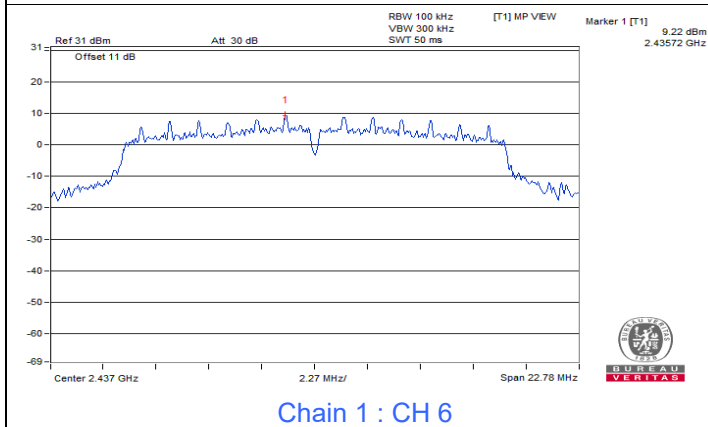
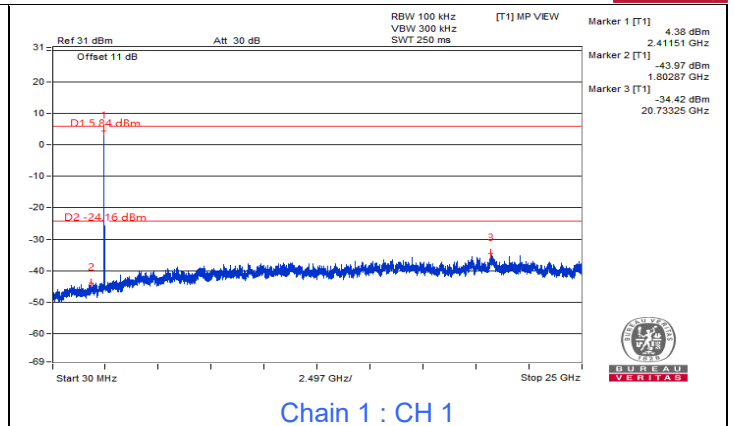
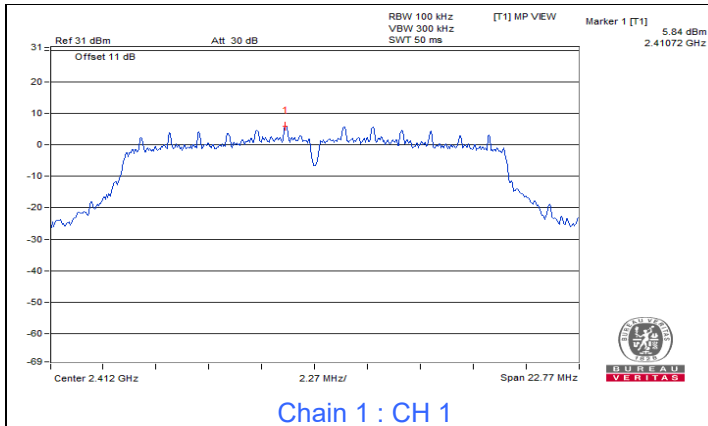
802.11b



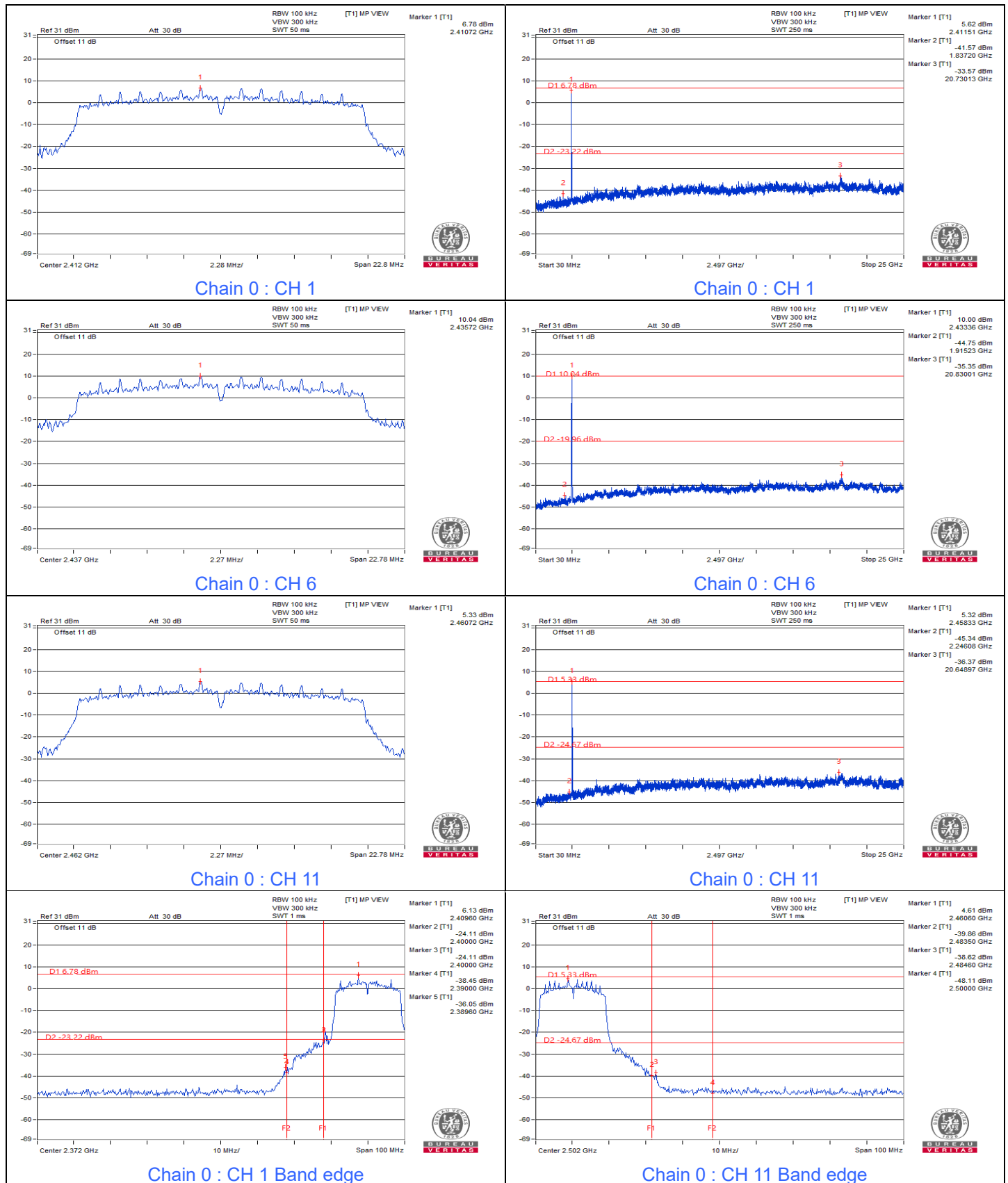


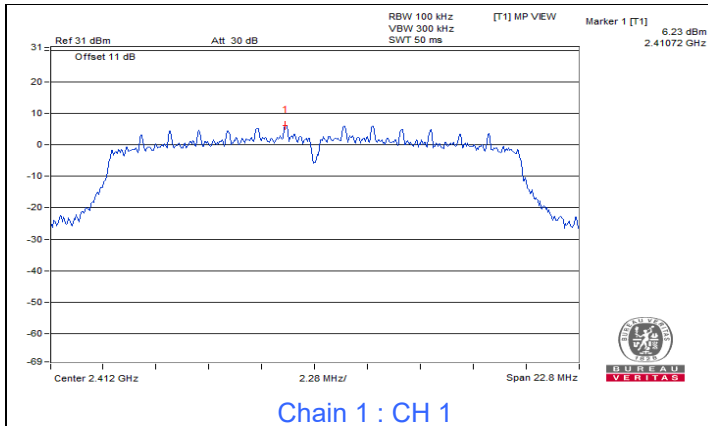
802.11g



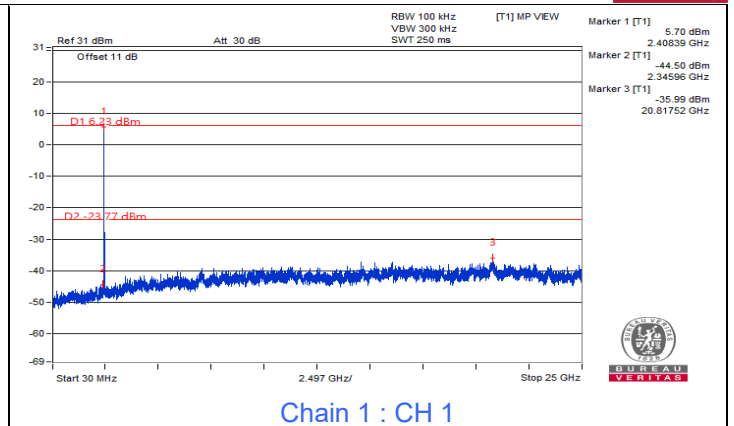


802.11n (HT20)

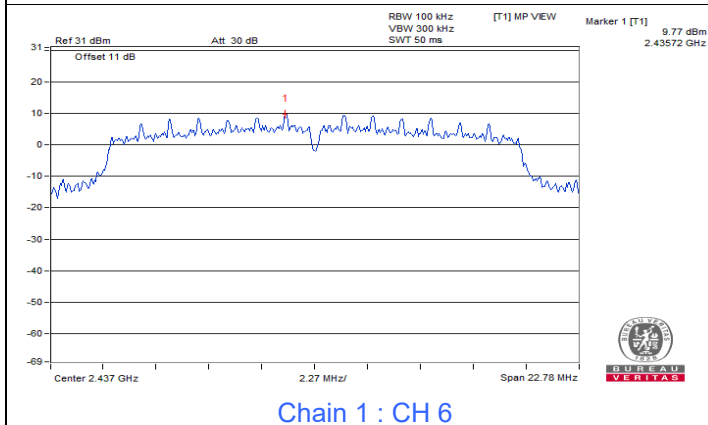




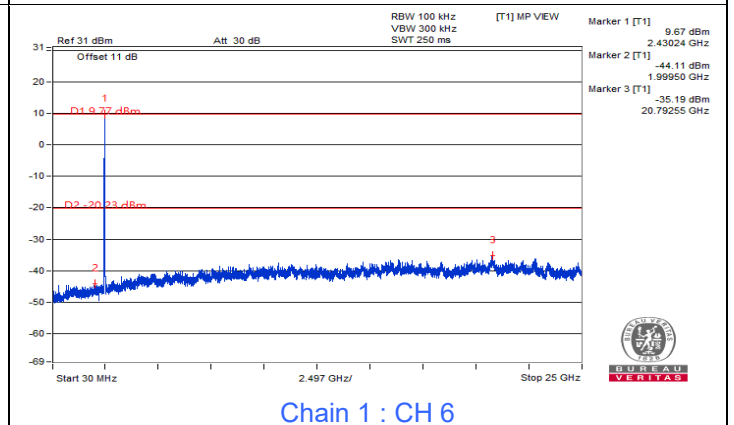
Chain 1 : CH 1



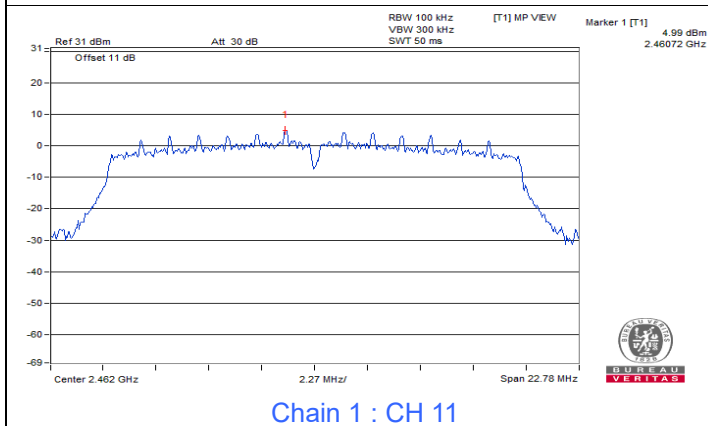
Chain 1 : CH 1



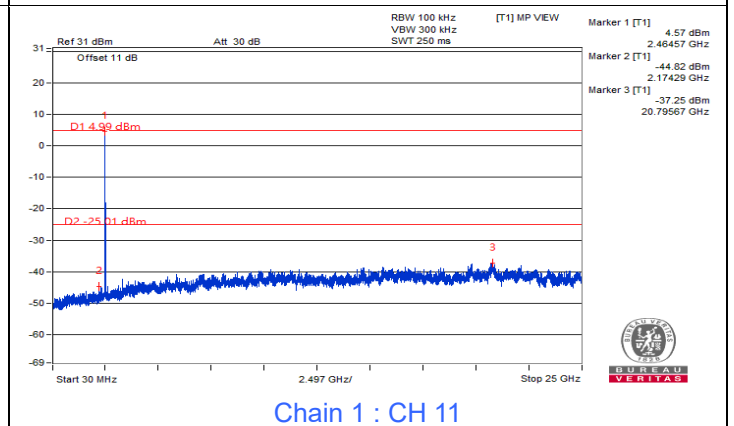
Chain 1 : CH 6



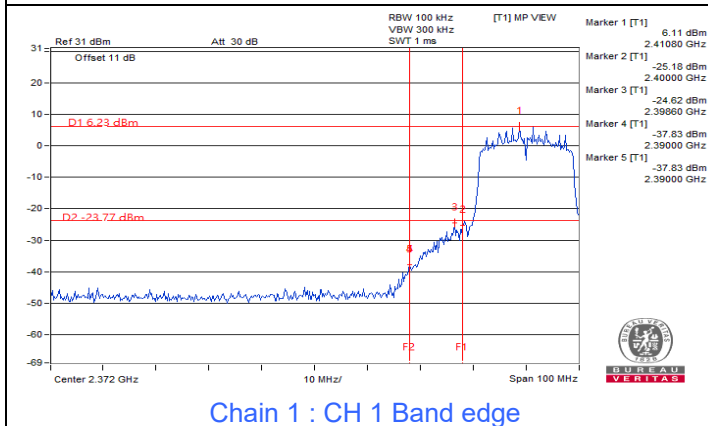
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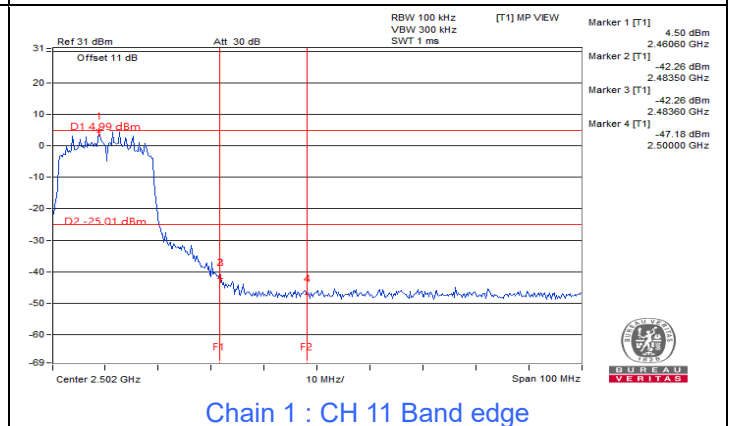
Chain 1 : CH 11



Chain 1 : CH 11

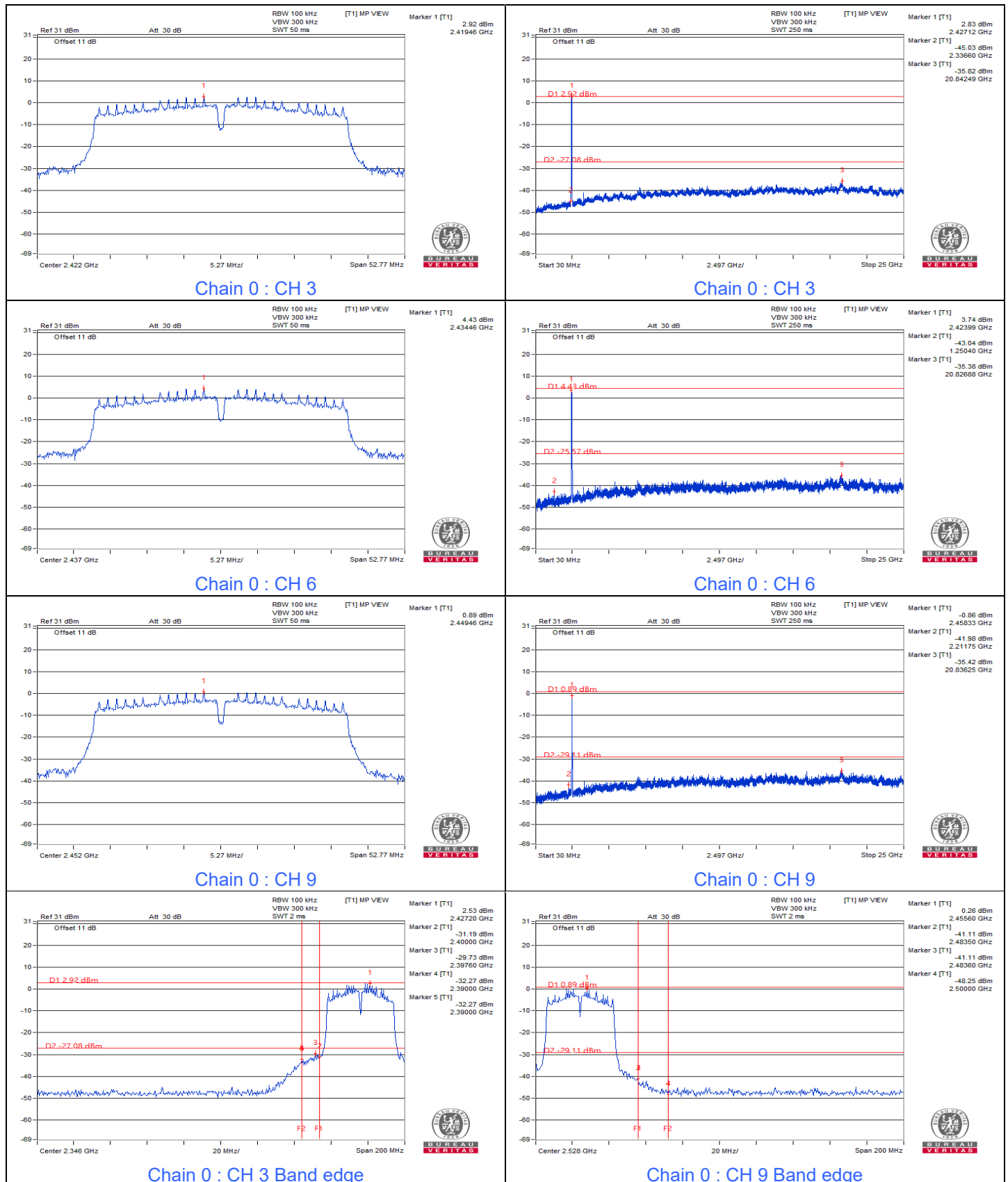


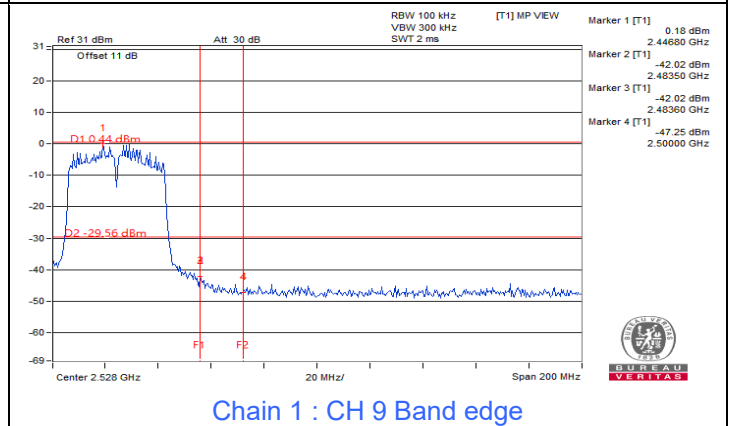
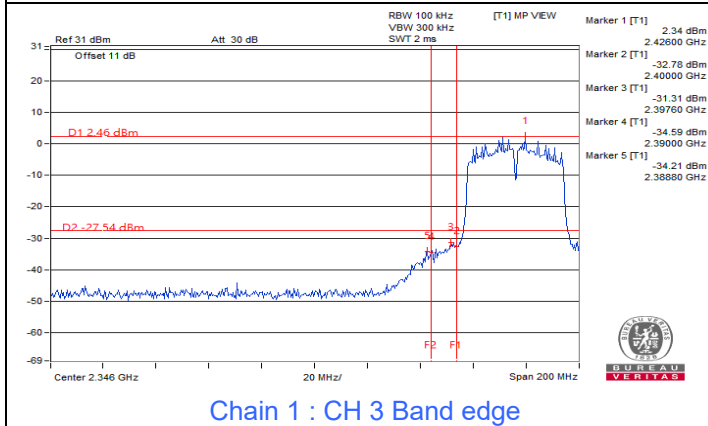
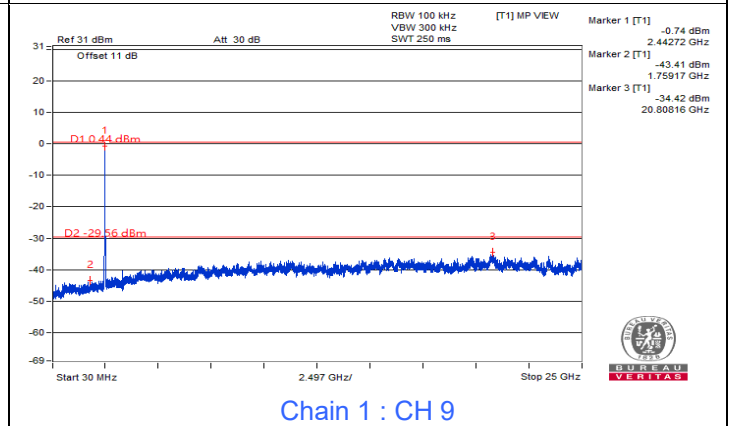
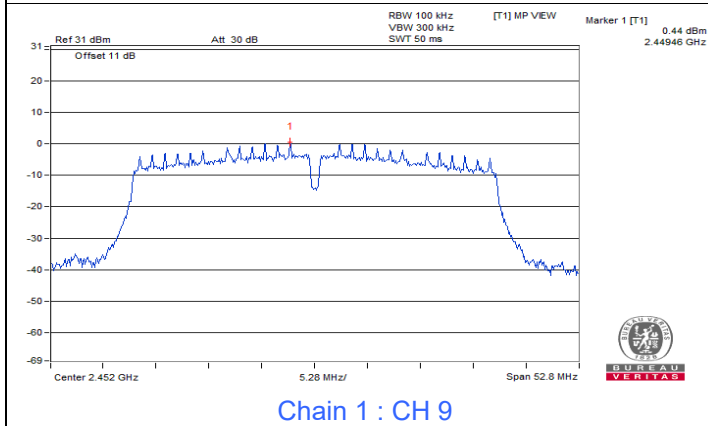
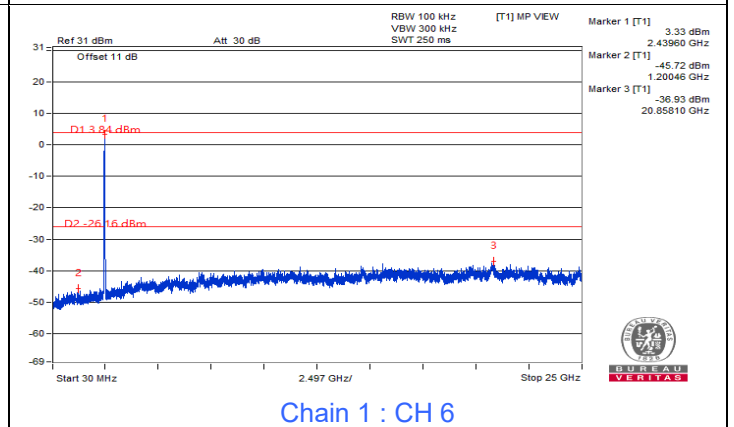
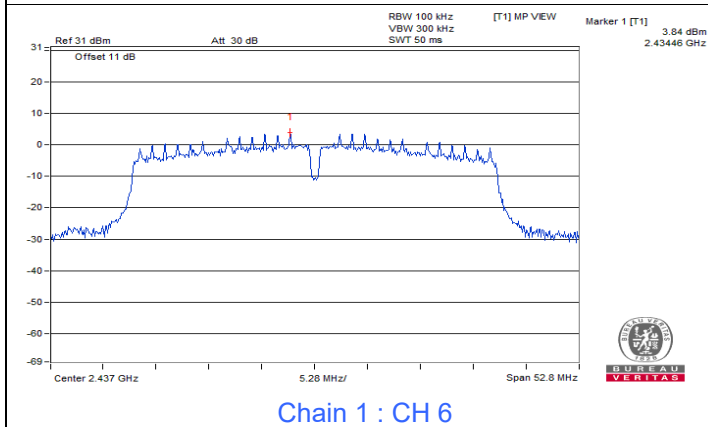
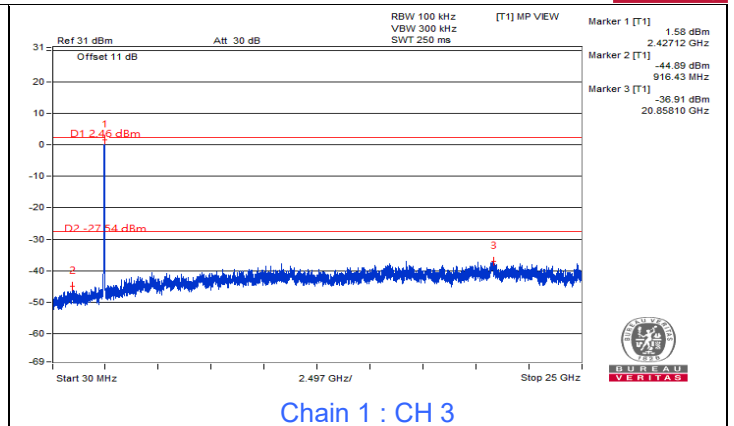
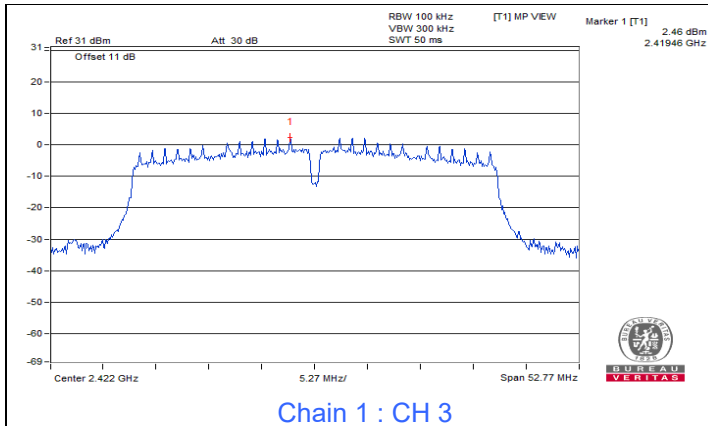
Chain 1 : CH 1 Band edge



Chain 1 : CH 11 Band edge

802.11n (HT40)





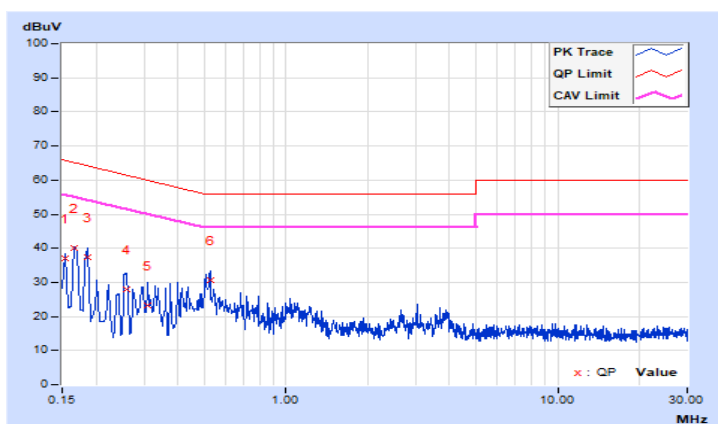
7.5 AC Power Conducted Emissions

RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 72% RH
Tested By	Luis Lee		

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	0.15400	10.13	27.02	15.74	37.15	25.87	65.78	55.78	-28.63	-29.91
2	0.16600	10.14	30.03	14.30	40.17	24.44	65.16	55.16	-24.99	-30.72
3	0.18600	10.15	27.10	11.13	37.25	21.28	64.21	54.21	-26.96	-32.93
4	0.25742	10.18	17.69	4.96	27.87	15.14	61.51	51.51	-33.64	-36.37
5	0.31000	10.20	12.90	2.92	23.10	13.12	59.97	49.97	-36.87	-36.85
6	0.52567	10.25	20.35	12.21	30.60	22.46	56.00	46.00	-25.40	-23.54

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

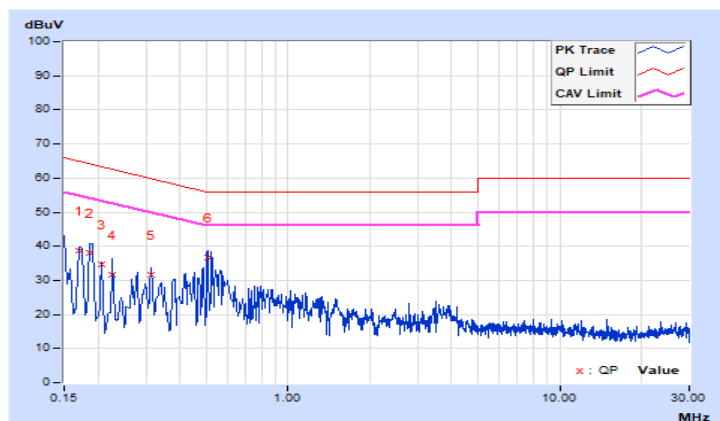


RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 72% RH
Tested By	Luis Lee		

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	0.17000	10.16	28.57	14.62	38.73	24.78	64.96	54.96	-26.23	-30.18
2	0.18600	10.18	27.89	12.38	38.07	22.56	64.21	54.21	-26.14	-31.65
3	0.20600	10.19	24.47	8.65	34.66	18.84	63.37	53.37	-28.71	-34.53
4	0.22600	10.20	21.46	5.74	31.66	15.94	62.60	52.60	-30.94	-36.66
5	0.31400	10.23	21.49	9.96	31.72	20.19	59.86	49.86	-28.14	-29.67
6	0.50530	10.27	26.50	16.91	36.77	27.18	56.00	46.00	-19.23	-18.82

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



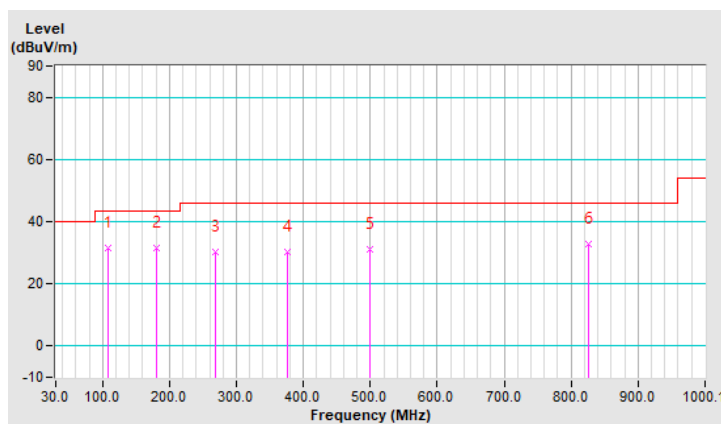
7.6 Unwanted Emissions below 1 GHz

RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	21°C, 68% RH
Tested By	Thomas Cheng		

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	107.61	31.5 QP	43.5	-12.0	2.30 H	241	46.9	-15.4
2	181.34	31.6 QP	43.5	-11.9	2.95 H	257	46.1	-14.5
3	268.64	30.3 QP	46.0	-15.7	1.88 H	101	43.8	-13.5
4	375.36	30.3 QP	46.0	-15.7	1.33 H	270	39.9	-9.6
5	499.53	30.9 QP	46.0	-15.1	2.12 H	298	37.0	-6.1
6	825.48	33.0 QP	46.0	-13.0	3.67 H	336	32.2	0.8

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 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

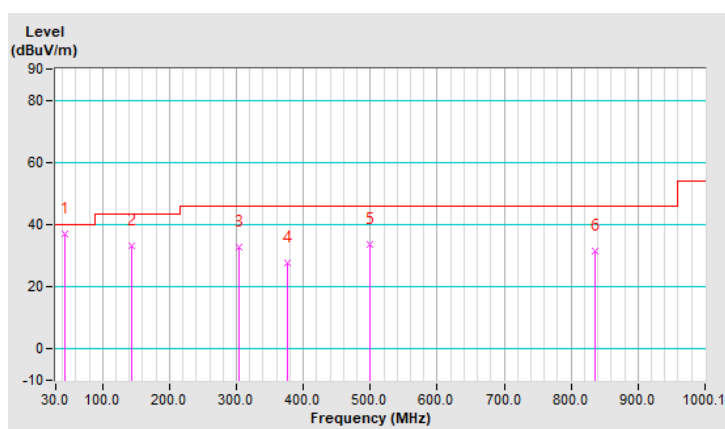


RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	21°C, 68% RH
Tested By	Thomas Cheng		

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	43.58	36.9 QP	40.0	-3.1	1.04 V	348	49.8	-12.9
2	143.50	33.4 QP	43.5	-10.1	1.53 V	128	45.7	-12.3
3	304.54	32.7 QP	46.0	-13.3	2.12 V	23	44.6	-11.9
4	375.36	27.6 QP	46.0	-18.4	1.28 V	39	37.2	-9.6
5	499.53	33.8 QP	46.0	-12.2	2.32 V	345	39.9	-6.1
6	836.15	31.4 QP	46.0	-14.6	3.61 V	160	30.3	1.1

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 of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



7.7 Unwanted Emissions above 1 GHz

RF Mode	TX 802.11b	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	2387.00	59.5 PK	74.0	-14.5	2.94 H	71	28.3	31.2
2	2387.00	52.0 AV	54.0	-2.0	2.94 H	71	20.8	31.2
3	*2412.00	108.3 PK			2.94 H	71	77.2	31.1
4	*2412.00	106.2 AV			2.94 H	71	75.1	31.1
5	4824.00	46.1 PK	74.0	-27.9	2.60 H	161	62.2	-16.1
6	4824.00	36.2 AV	54.0	-17.8	2.60 H	161	52.3	-16.1
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	2387.00	60.2 PK	74.0	-13.8	2.08 V	280	29.0	31.2
2	2387.00	52.8 AV	54.0	-1.2	2.08 V	280	21.6	31.2
3	*2412.00	109.1 PK			2.08 V	280	78.0	31.1
4	*2412.00	106.9 AV			2.08 V	280	75.8	31.1
5	4824.00	47.2 PK	74.0	-26.8	2.32 V	127	63.3	-16.1
6	4824.00	36.5 AV	54.0	-17.5	2.32 V	127	52.6	-16.1

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, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	57.7 PK	74.0	-16.3	2.97 H	62	26.5	31.2
2	2390.00	46.8 AV	54.0	-7.2	2.97 H	62	15.6	31.2
3	*2437.00	109.4 PK			2.97 H	62	78.3	31.1
4	*2437.00	107.2 AV			2.97 H	62	76.1	31.1
5	2485.00	61.1 PK	74.0	-12.9	2.97 H	62	30.0	31.1
6	2485.00	53.2 AV	54.0	-0.8	2.97 H	62	22.1	31.1
7	4874.00	45.5 PK	74.0	-28.5	2.69 H	352	61.4	-15.9
8	4874.00	36.4 AV	54.0	-17.6	2.69 H	352	52.3	-15.9
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	2389.00	58.6 PK	74.0	-15.4	2.05 V	283	27.4	31.2
2	2389.00	50.3 AV	54.0	-3.7	2.05 V	283	19.1	31.2
3	*2437.00	110.2 PK			2.05 V	283	79.1	31.1
4	*2437.00	108.0 AV			2.05 V	283	76.9	31.1
5	2483.50	61.2 PK	74.0	-12.8	2.05 V	283	30.1	31.1
6	2483.50	53.3 AV	54.0	-0.7	2.05 V	283	22.2	31.1
7	4874.00	46.4 PK	74.0	-27.6	2.61 V	266	62.3	-15.9
8	4874.00	36.7 AV	54.0	-17.3	2.61 V	266	52.6	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	108.3 PK			2.96 H	61	77.2	31.1
2	*2462.00	106.0 AV			2.96 H	61	74.9	31.1
3	2487.00	60.7 PK	74.0	-13.3	2.96 H	61	29.5	31.2
4	2487.00	52.8 AV	54.0	-1.2	2.96 H	61	21.6	31.2
5	4924.00	46.1 PK	74.0	-27.9	1.91 H	331	62.0	-15.9
6	4924.00	35.6 AV	54.0	-18.4	1.91 H	331	51.5	-15.9
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	109.3 PK			2.56 V	272	78.2	31.1
2	*2462.00	107.1 AV			2.56 V	272	76.0	31.1
3	2487.00	61.4 PK	74.0	-12.6	2.56 V	272	30.2	31.2
4	2487.00	53.1 AV	54.0	-0.9	2.56 V	272	21.9	31.2
5	4924.00	47.6 PK	74.0	-26.4	2.72 V	251	63.5	-15.9
6	4924.00	37.0 AV	54.0	-17.0	2.72 V	251	52.9	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	67.1 PK	74.0	-6.9	2.97 H	63	35.9	31.2
2	2390.00	53.1 AV	54.0	-0.9	2.97 H	63	21.9	31.2
3	*2412.00	106.5 PK			2.97 H	63	75.4	31.1
4	*2412.00	99.1 AV			2.97 H	63	68.0	31.1
5	4824.00	42.8 PK	74.0	-31.2	1.90 H	136	58.9	-16.1
6	4824.00	32.2 AV	54.0	-21.8	1.90 H	136	48.3	-16.1
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	67.3 PK	74.0	-6.7	2.05 V	281	36.1	31.2
2	2390.00	53.4 AV	54.0	-0.6	2.05 V	281	22.2	31.2
3	*2412.00	107.5 PK			2.05 V	281	76.4	31.1
4	*2412.00	100.4 AV			2.05 V	281	69.3	31.1
5	4824.00	43.0 PK	74.0	-31.0	3.92 V	158	59.1	-16.1
6	4824.00	32.3 AV	54.0	-21.7	3.92 V	158	48.4	-16.1

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, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11g	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	*2437.00	109.5 PK			2.86 H	48	78.4	31.1
2	*2437.00	102.0 AV			2.86 H	48	70.9	31.1
3	4874.00	41.6 PK	74.0	-32.4	3.77 H	188	57.5	-15.9
4	4874.00	31.6 AV	54.0	-22.4	3.77 H	188	47.5	-15.9
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	*2437.00	110.5 PK			2.01 V	283	79.4	31.1
2	*2437.00	103.0 AV			2.01 V	283	71.9	31.1
3	4874.00	41.8 PK	74.0	-32.2	3.99 V	290	57.7	-15.9
4	4874.00	31.9 AV	54.0	-22.1	3.99 V	290	47.8	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11g	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	106.4 PK			2.95 H	76	75.3	31.1
2	*2462.00	99.6 AV			2.95 H	76	68.5	31.1
3	2483.50	65.8 PK	74.0	-8.2	2.95 H	76	34.7	31.1
4	2483.50	52.8 AV	54.0	-1.2	2.95 H	76	21.7	31.1
5	4924.00	43.0 PK	74.0	-31.0	2.65 H	134	58.9	-15.9
6	4924.00	32.2 AV	54.0	-21.8	2.65 H	134	48.1	-15.9
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	107.2 PK			1.98 V	281	76.1	31.1
2	*2462.00	100.1 AV			1.98 V	281	69.0	31.1
3	2483.50	66.0 PK	74.0	-8.0	1.98 V	281	34.9	31.1
4	2483.50	53.0 AV	54.0	-1.0	1.98 V	281	21.9	31.1
5	4924.00	43.2 PK	74.0	-30.8	1.46 V	296	59.1	-15.9
6	4924.00	32.4 AV	54.0	-21.6	1.46 V	296	48.3	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11n (HT20)	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	1.02 H	23	33.7	31.2
2	2390.00	51.3 AV	54.0	-2.7	1.02 H	23	20.1	31.2
3	*2412.00	101.8 PK			1.02 H	23	70.7	31.1
4	*2412.00	94.1 AV			1.02 H	23	63.0	31.1
5	4824.00	42.4 PK	74.0	-31.6	1.98 H	344	58.5	-16.1
6	4824.00	30.5 AV	54.0	-23.5	1.98 H	344	46.6	-16.1
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	65.7 PK	74.0	-8.3	2.05 V	283	34.5	31.2
2	2390.00	53.5 AV	54.0	-0.5	2.05 V	283	22.3	31.2
3	*2412.00	104.0 PK			2.05 V	283	72.9	31.1
4	*2412.00	96.3 AV			2.05 V	283	65.2	31.1
5	4824.00	42.5 PK	74.0	-31.5	1.47 V	129	58.6	-16.1
6	4824.00	31.2 AV	54.0	-22.8	1.47 V	129	47.3	-16.1

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, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	*2437.00	105.2 PK			1.02 H	6	74.1	31.1
2	*2437.00	97.4 AV			1.02 H	6	66.3	31.1
3	4874.00	41.5 PK	74.0	-32.5	3.51 H	325	57.4	-15.9
4	4874.00	30.7 AV	54.0	-23.3	3.51 H	325	46.6	-15.9
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	*2437.00	107.6 PK			2.00 V	281	76.5	31.1
2	*2437.00	100.3 AV			2.00 V	281	69.2	31.1
3	4874.00	42.1 PK	74.0	-31.9	3.00 V	317	58.0	-15.9
4	4874.00	31.9 AV	54.0	-22.1	3.00 V	317	47.8	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11n (HT20)	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	101.1 PK			1.15 H	21	70.0	31.1
2	*2462.00	93.9 AV			1.15 H	21	62.8	31.1
3	2483.50	66.0 PK	74.0	-8.0	1.15 H	21	34.9	31.1
4	2483.50	52.2 AV	54.0	-1.8	1.15 H	21	21.1	31.1
5	4924.00	42.2 PK	74.0	-31.8	1.26 H	352	58.1	-15.9
6	4924.00	30.9 AV	54.0	-23.1	1.26 H	352	46.8	-15.9
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	103.5 PK			1.95 V	281	72.4	31.1
2	*2462.00	95.9 AV			1.95 V	281	64.8	31.1
3	2483.50	66.9 PK	74.0	-7.1	1.95 V	281	35.8	31.1
4	2483.50	53.0 AV	54.0	-1.0	1.95 V	281	21.9	31.1
5	4924.00	42.3 PK	74.0	-31.7	2.36 V	104	58.2	-15.9
6	4924.00	31.9 AV	54.0	-22.1	2.36 V	104	47.8	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11n (HT40)	Channel	CH 3 : 2422 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 2 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	64.3 PK	74.0	-9.7	1.02 H	22	33.1	31.2
2	2390.00	51.2 AV	54.0	-2.8	1.02 H	22	20.0	31.2
3	*2422.00	97.9 PK			1.02 H	22	66.8	31.1
4	*2422.00	90.4 AV			1.02 H	22	59.3	31.1
5	4844.00	42.3 PK	74.0	-31.7	3.81 H	107	58.1	-15.8
6	4844.00	31.6 AV	54.0	-22.4	3.81 H	107	47.4	-15.8
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	66.5 PK	74.0	-7.5	1.97 V	280	35.3	31.2
2	2390.00	53.2 AV	54.0	-0.8	1.97 V	280	22.0	31.2
3	*2422.00	99.7 PK			1.97 V	280	68.6	31.1
4	*2422.00	92.3 AV			1.97 V	280	61.2	31.1
5	4844.00	43.0 PK	74.0	-31.0	2.23 V	3	58.8	-15.8
6	4844.00	32.7 AV	54.0	-21.3	2.23 V	3	48.5	-15.8

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	TX 802.11n (HT40)	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 2 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	59.5 PK	74.0	-14.5	1.00 H	6	28.3	31.2
2	2390.00	47.6 AV	54.0	-6.4	1.00 H	6	16.4	31.2
3	*2437.00	99.8 PK			1.00 H	6	68.7	31.1
4	*2437.00	92.2 AV			1.00 H	6	61.1	31.1
5	2483.50	63.6 PK	74.0	-10.4	1.00 H	6	32.5	31.1
6	2483.50	52.0 AV	54.0	-2.0	1.00 H	6	20.9	31.1
7	4874.00	41.9 PK	74.0	-32.1	2.06 H	278	57.8	-15.9
8	4874.00	30.9 AV	54.0	-23.1	2.06 H	278	46.8	-15.9
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	60.0 PK	74.0	-14.0	1.99 V	280	28.8	31.2
2	2390.00	48.9 AV	54.0	-5.1	1.99 V	280	17.7	31.2
3	*2437.00	101.7 PK			1.99 V	280	70.6	31.1
4	*2437.00	94.6 AV			1.99 V	280	63.5	31.1
5	2483.50	66.5 PK	74.0	-7.5	1.99 V	280	35.4	31.1
6	2483.50	53.1 AV	54.0	-0.9	1.99 V	280	22.0	31.1
7	4874.00	43.2 PK	74.0	-30.8	2.81 V	272	59.1	-15.9
8	4874.00	31.8 AV	54.0	-22.2	2.81 V	272	47.7	-15.9

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.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

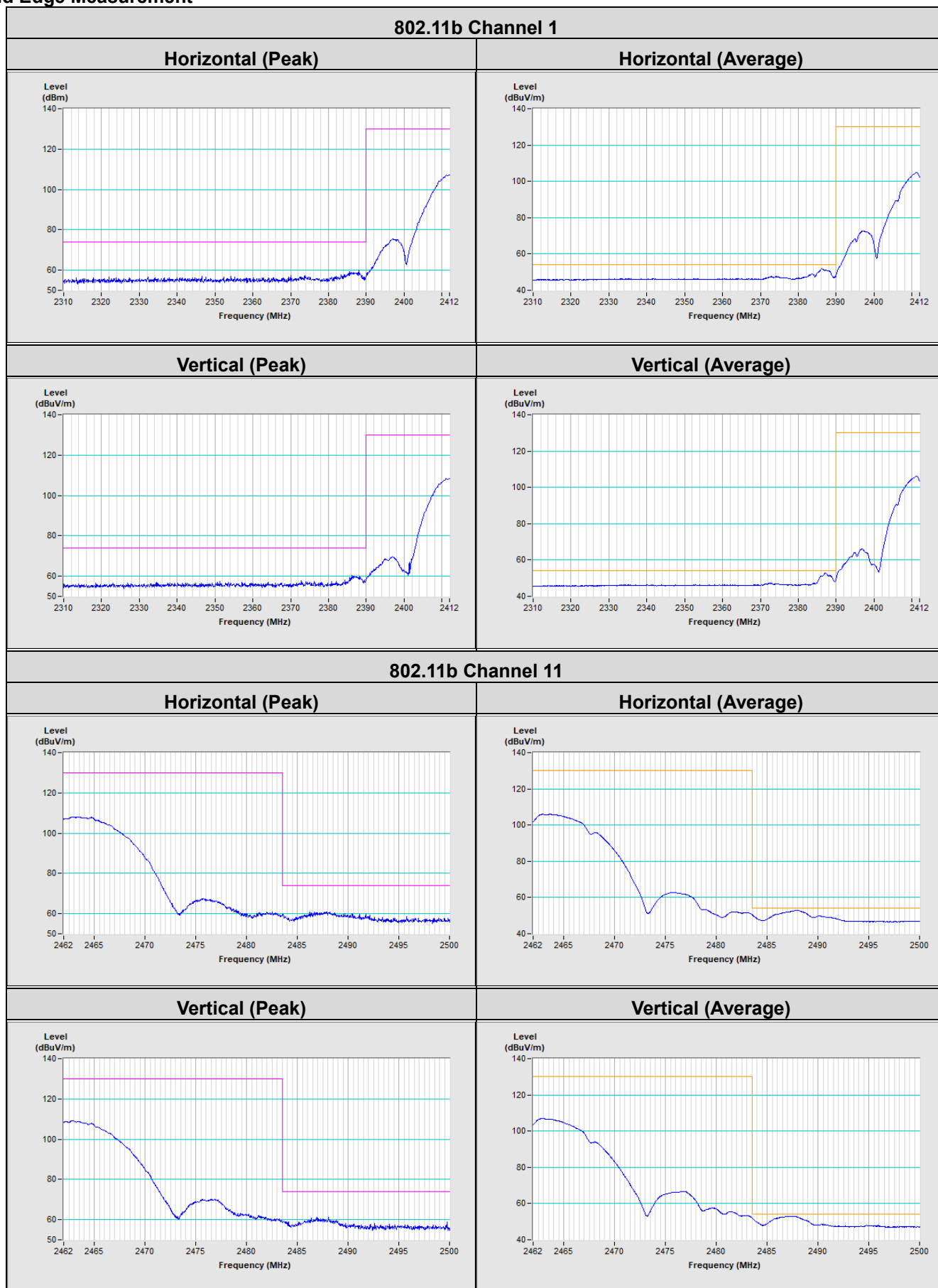
RF Mode	TX 802.11n (HT40)	Channel	CH 9 : 2452 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 2 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22.7°C, 71.8% RH
Tested By	Thomas Cheng		

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	97.3 PK			1.01 H	6	66.2	31.1
2	*2452.00	89.8 AV			1.01 H	6	58.7	31.1
3	2484.00	66.3 PK	74.0	-7.7	1.01 H	6	35.2	31.1
4	2484.00	52.1 AV	54.0	-1.9	1.01 H	6	21.0	31.1
5	4904.00	43.0 PK	74.0	-31.0	3.91 H	96	58.9	-15.9
6	4904.00	30.9 AV	54.0	-23.1	3.91 H	96	46.8	-15.9
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	*2452.00	99.1 PK			1.94 V	282	68.0	31.1
2	*2452.00	91.4 AV			1.94 V	282	60.3	31.1
3	2484.00	66.7 PK	74.0	-7.3	1.94 V	282	35.6	31.1
4	2484.00	53.0 AV	54.0	-1.0	1.94 V	282	21.9	31.1
5	4904.00	43.1 PK	74.0	-30.9	3.85 V	38	59.0	-15.9
6	4904.00	32.2 AV	54.0	-21.8	3.85 V	38	48.1	-15.9

Remarks:

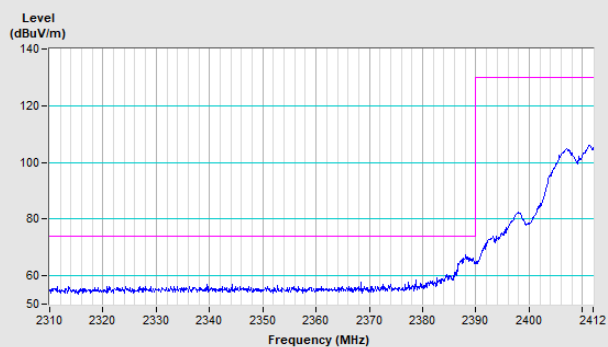
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency,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

Band Edge Measurement

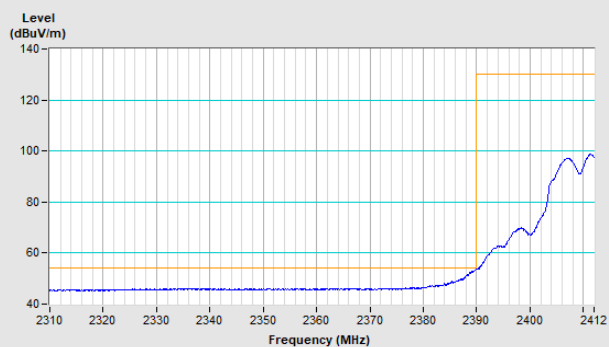


802.11g Channel 1

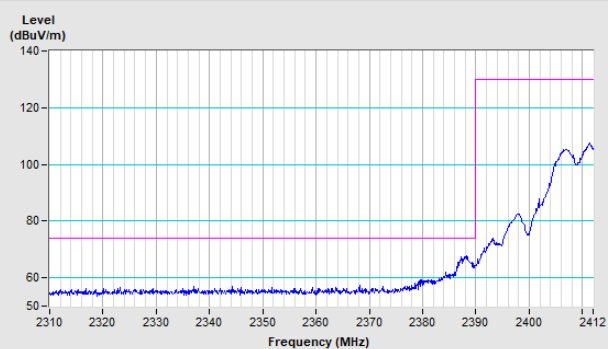
Horizontal (Peak)



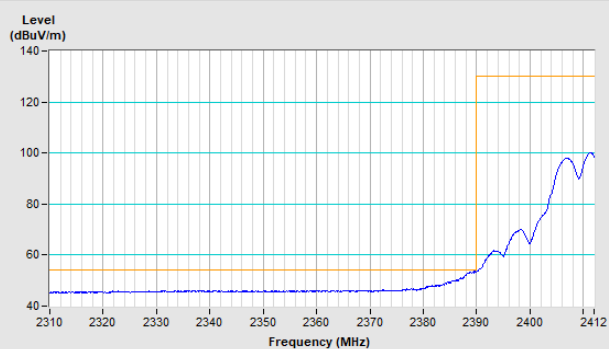
Horizontal (Average)



Vertical (Peak)

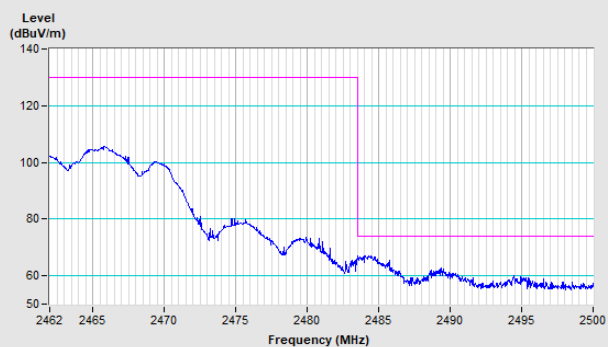


Vertical (Average)

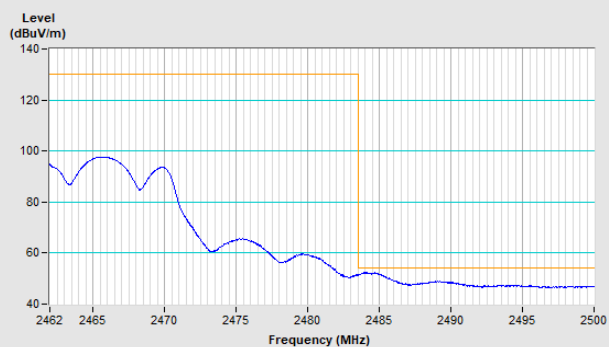


802.11g Channel 11

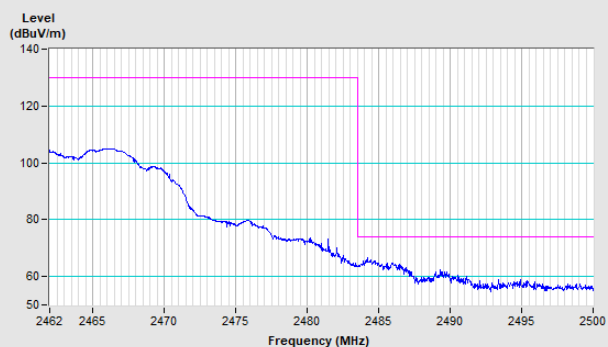
Horizontal (Peak)



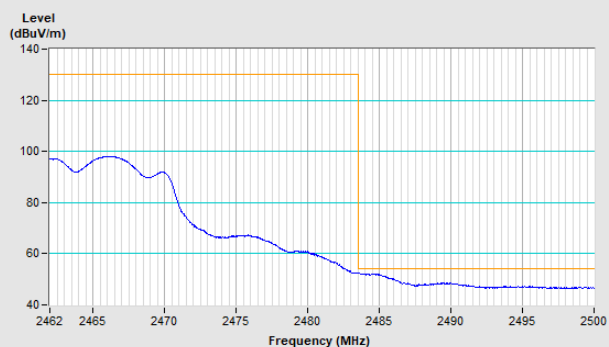
Horizontal (Average)



Vertical (Peak)

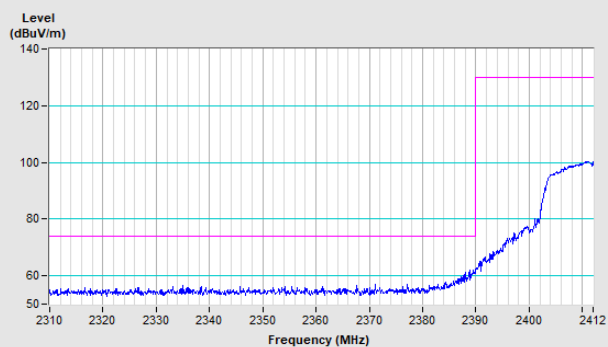


Vertical (Average)

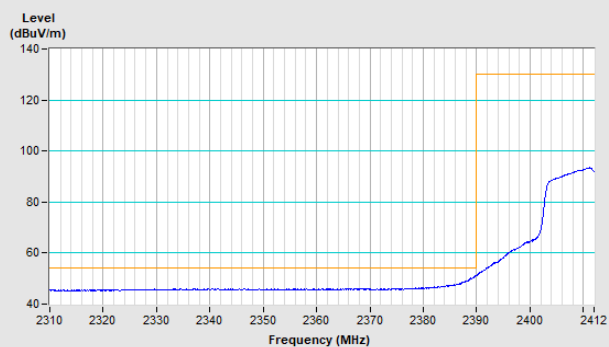


802.11n (HT20) Channel 1

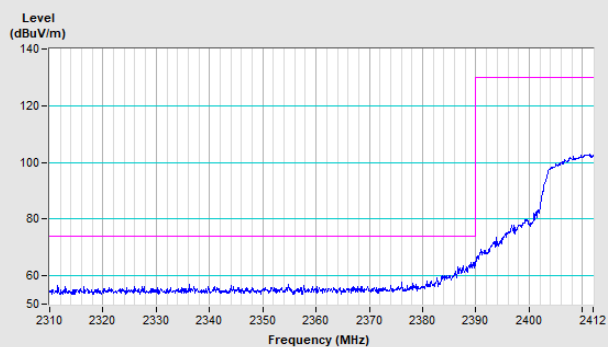
Horizontal (Peak)



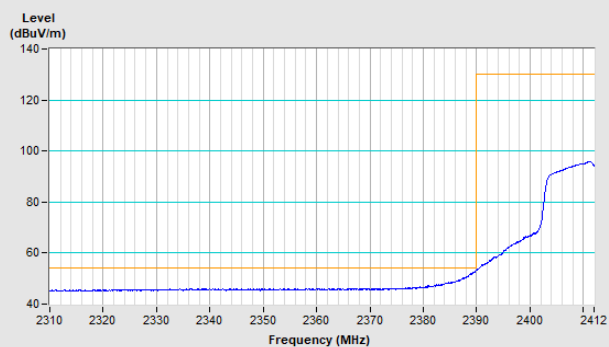
Horizontal (Average)



Vertical (Peak)

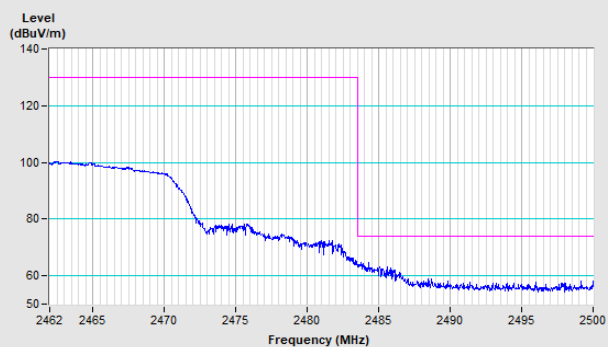


Vertical (Average)

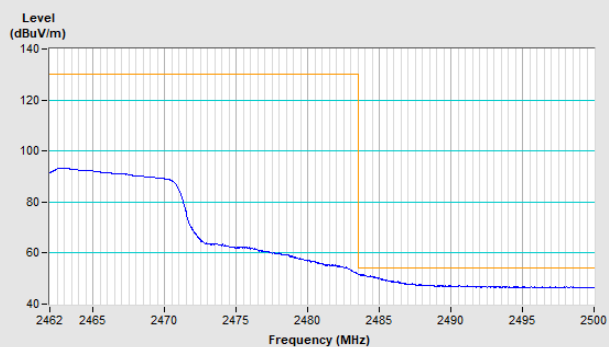


802.11n (HT20) Channel 11

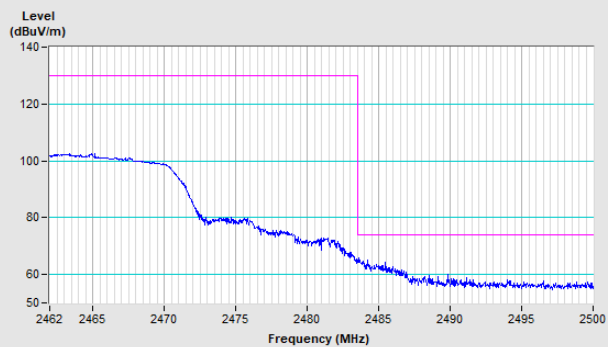
Horizontal (Peak)



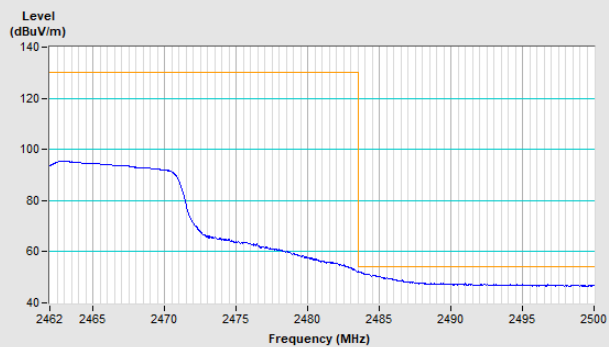
Horizontal (Average)



Vertical (Peak)

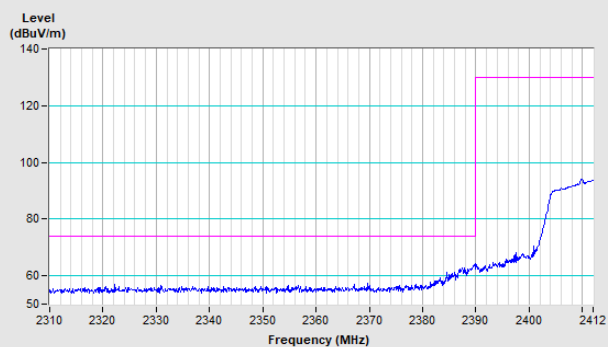


Vertical (Average)

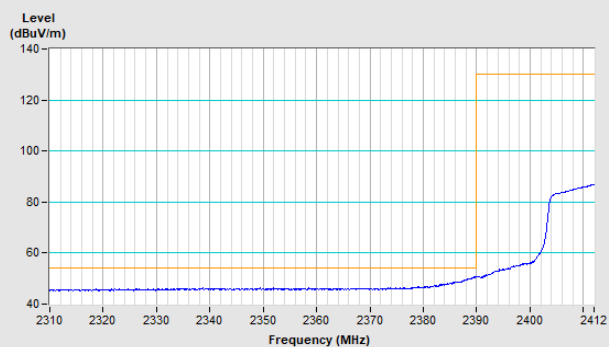


802.11n (HT40) Channel 3

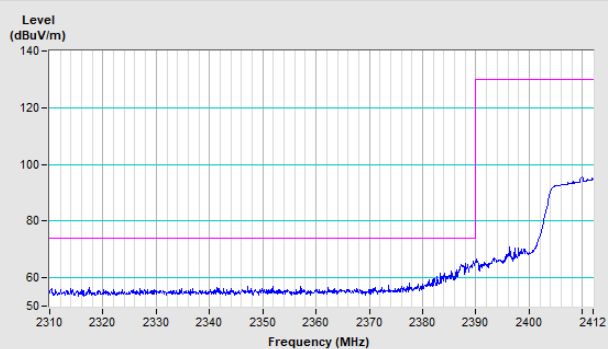
Horizontal (Peak)



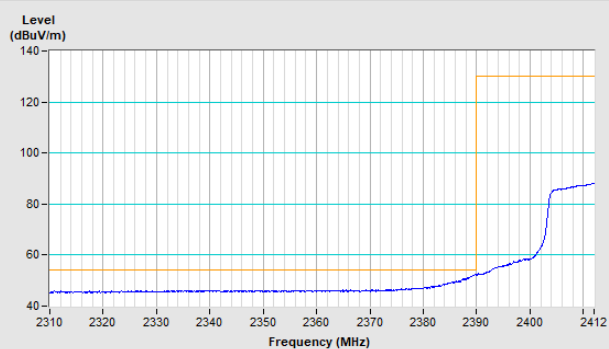
Horizontal (Average)



Vertical (Peak)

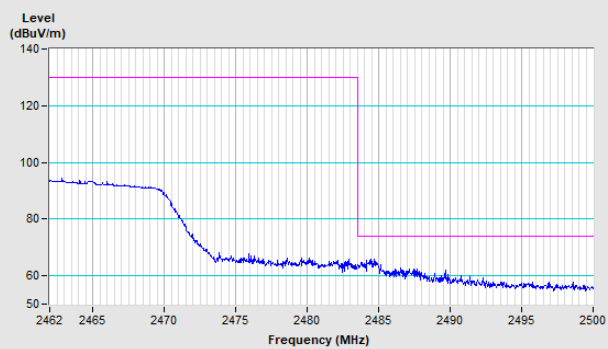


Vertical (Average)

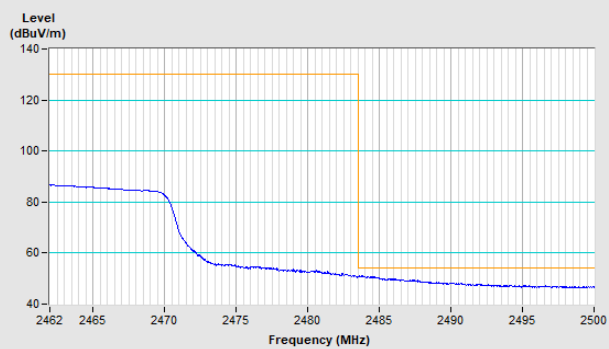


802.11n (HT40) Channel 9

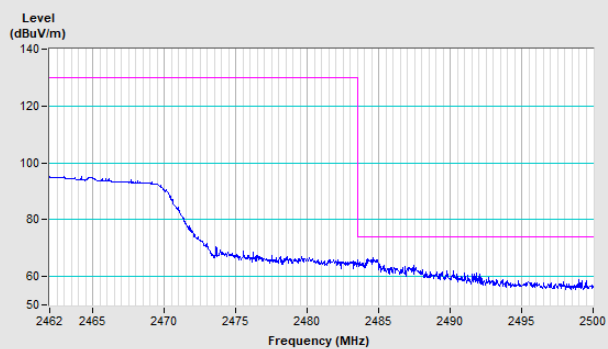
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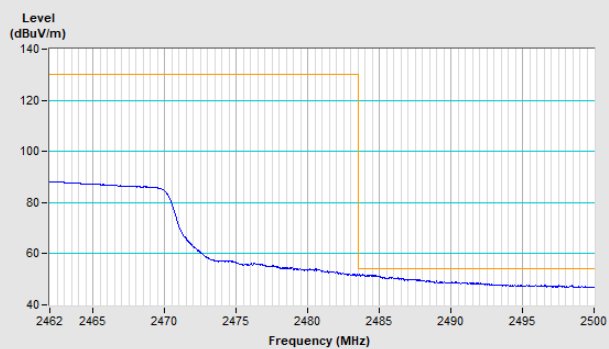
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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:

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Email: service.adt@bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

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

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