

TEST REPORT

CERTIFICATE OF CONFORMITY

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

Report No.: RFBEMI-WTW-P23040655-2

FCC ID: NOIKBN428

Product: Electronic Display Device

Brand: Rakuten kobo

Model No.: N428

Received Date: 2023/5/4

Test Date: 2023/5/16 ~ 2023/6/1

Issued Date: 2023/10/6

Applicant: NETRONIX, INC.

Address: No. 945, Boai St., Jubei City, Hsin-Chu, 30265, Taiwan

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

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

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

FCC Registration / 198487 / TW2021

Designation Number:

Approved by: Jeremy Lin, **Date:** 2023/10/6
Jeremy Lin / Project Engineer

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Prepared by : Jessica Cheng / Senior Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBEMI-WTW-P23040655-2	Original release.	2023/10/6

1 Certificate

Product: Electronic Display Device

Brand: Rakuten kobo

Test Model: N428

Sample Status: Engineering sample

Applicant: NETRONIX, INC.

Test Date: 2023/5/16 ~ 2023/6/1

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

Measurement ANSI C63.10-2013

procedure: KDB 558074 D01 15.247 Meas Guidance v05r02

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 -9.28 dB at 3.75786 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -3.6 dB at 33.69 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -0.4 dB at 4874.00 MHz
15.203	Antenna Requirement	Pass	No antenna connector is used.

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	2.63 dB
AC Power Conducted Emissions	9 kHz ~ 30 MHz	3.00 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.38 dB
	30 MHz ~ 1 GHz	5.7 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 6 GHz	4.83 dB
	6 GHz ~ 18 GHz	5.37 dB
	18 GHz ~ 40 GHz	5.24 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	Electronic Display Device
Brand	Rakuten kobo
Test Model	N428
Status of EUT	Engineering sample
Power Supply Rating	3.87Vdc from Battery or 5Vdc from USB port
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	Up to 72.2 Mbps
Operating Frequency	2.412 GHz ~ 2.462 GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20):11
Output Power	165.196 mW (22.18 dBm)

Note:

- The EUT has black & white, which are electrically identical to each other except for exterior color.
- The EUT could be supplied with USB cable and different models could be chosen:

Brand	Model	Material	Color	Remark
Yih Fone	SH-0418	TPE	Black	Shielded:Y, 1.0M, Core:N/A
	SH-0420		White	

Both USB cables are identical to each other except for exterior color and model names

- The EUT has two eMMC as below table:

No	Model	Remark
1	PTE7A0YJ-32GE	1st source eMMC
2	MKEMF032GT1E-C	2nd source eMMC

From the above eMMC, the worst case was found in **No. 1**. Therefore only the test data of mode was recorded in this report.

- There are Bluetooth and WLAN (2.4 GHz & 5 GHz) technology used for the EUT.
- Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4 GHz)	Bluetooth
2	WLAN (5 GHz)	Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

- 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.

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Gain (dBi)	Antenna Type	Connector Type
3.91	Chip	none

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2. The EUT incorporates a SISO function:

2.4 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX

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		

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	<p>1. The eMMC has the following models: PTE7A0YJ-32GE/MKEMF032GT1E-C. Pre-scan these models of eMMC and find the worst case as a representative test condition.</p> <p>2. For Radiated, pre-scan AC Adapter via USB Cable/Laptop via USB Cable/Battery and find the worst case as a representative test condition.</p> <p>3. EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition.</p> <p>4. 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).</p>
Worst Case:	<p>1. eMMC Worst Condition: PTE7A0YJ-32GE.</p> <p>2. For Radiated Worst Condition: Laptop via USB Cable.</p> <p>3. X-axis/ Y-axis/ Z-axis Worst Condition: X-axis.</p>

Following channel(s) was (were) selected for the final test as listed below:

Test Item	EUT Configure Mode	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power / Power Spectral Density	A	802.11b	1, 6, 11	DBPSK	1Mb/s
		802.11g	1, 6, 11	BPSK	6Mb/s
		802.11n (HT20)	1, 6, 11	BPSK	MCS0
6 dB Bandwidth / Conducted Out of Band Emissions	A	802.11b	1, 6, 11	DBPSK	1Mb/s
		802.11g	1, 6, 11	BPSK	6Mb/s
		802.11n (HT20)	1, 6, 11	BPSK	MCS0
AC Power Conducted Emissions	A	802.11g	1	BPSK	6Mb/s
	B	802.11g	1	BPSK	6Mb/s
Unwanted Emissions below 1 GHz	A	802.11g	1	BPSK	6Mb/s
Unwanted Emissions above 1 GHz	A	802.11b	1, 6, 11	DBPSK	1Mb/s
		802.11g	1, 6, 11	BPSK	6Mb/s
		802.11n (HT20)	1, 6, 11	BPSK	MCS0
EUT Configure Mode:	A	Laptop via USB Cable			
	B	AC Adapter via USB Cable			
Note: The USB Cable has the following models: SH-0418.					

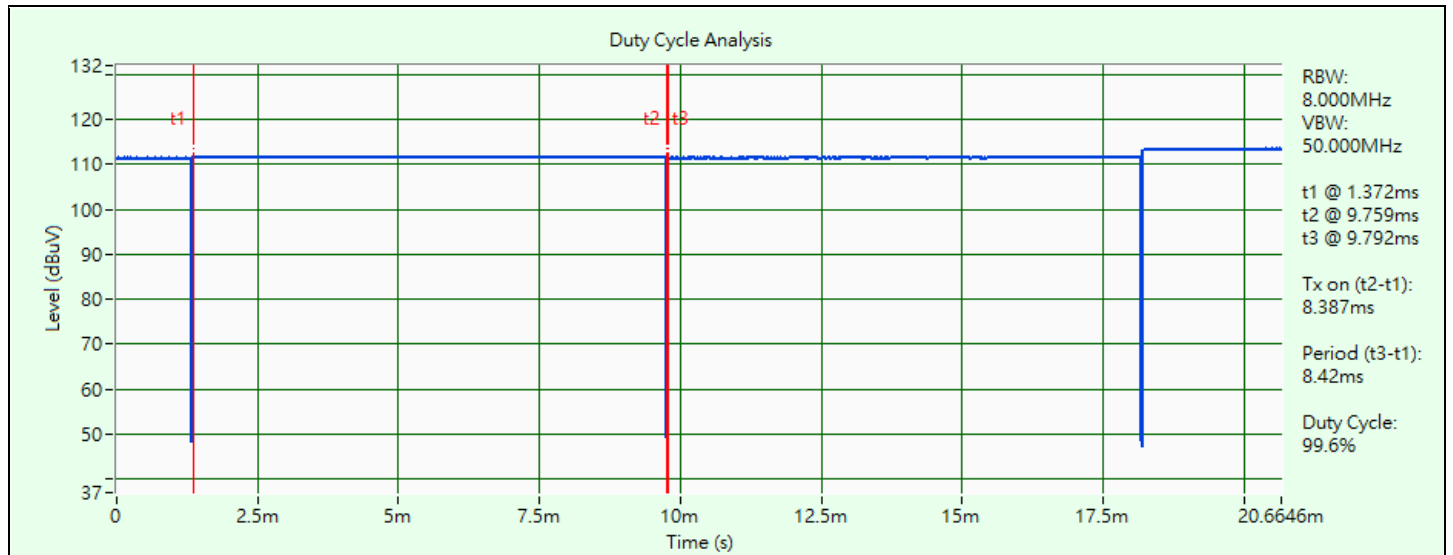
3.5 Duty Cycle of Test Signal

Mode A

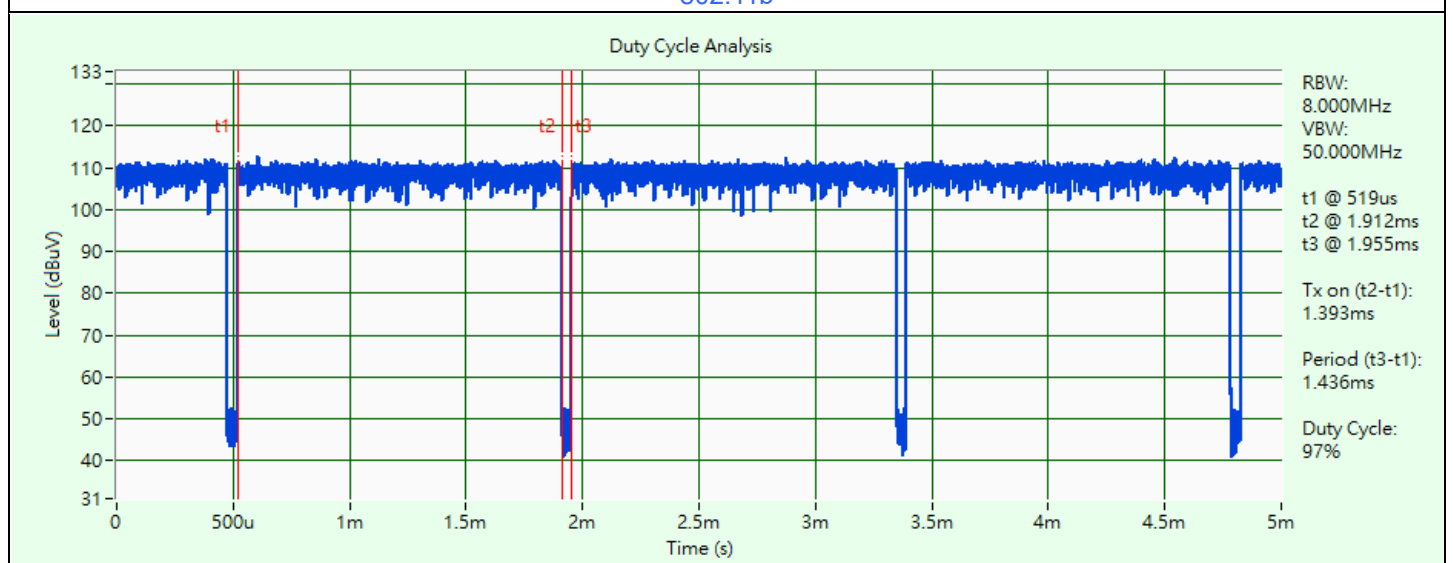
802.11b: Duty cycle = 8.387 ms / 8.42 ms x 100% = 99.6%

802.11g: Duty cycle = 1.393 ms / 1.436 ms x 100% = 97.0%, duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.13 \text{ dB}$

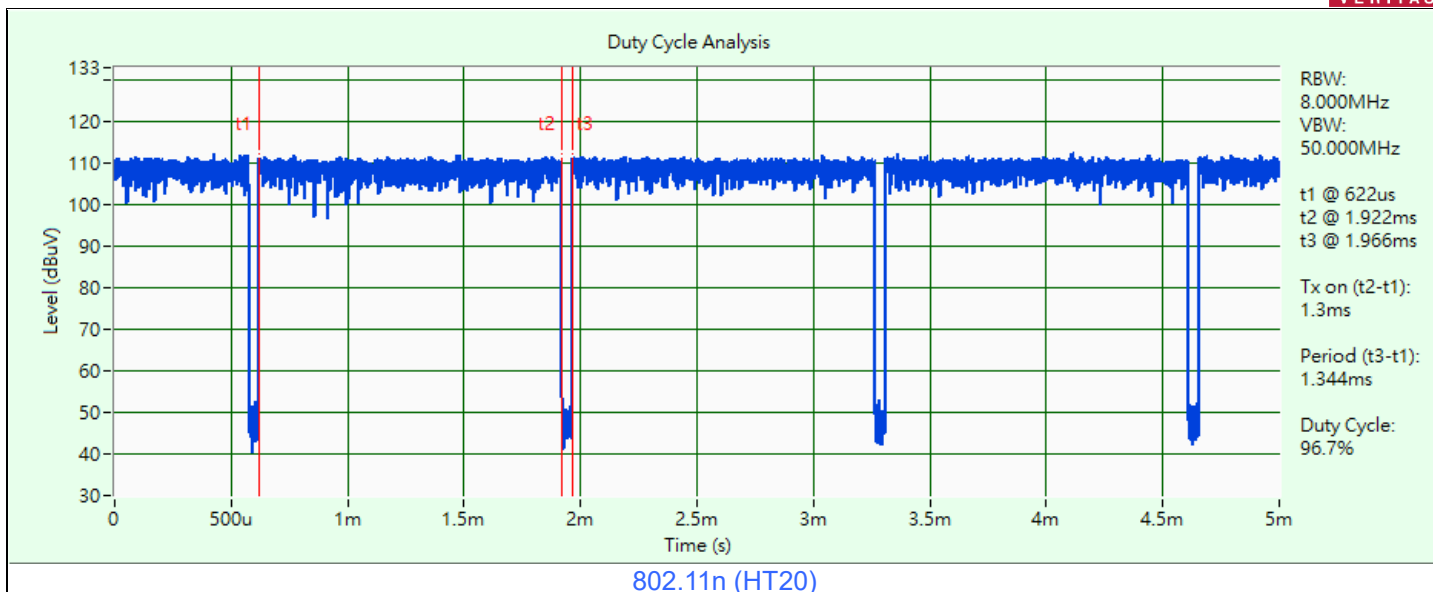
802.11n (HT20): Duty cycle = 1.3 ms / 1.344 ms x 100% = 96.7%, duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.14 \text{ dB}$



802.11b



802.11g

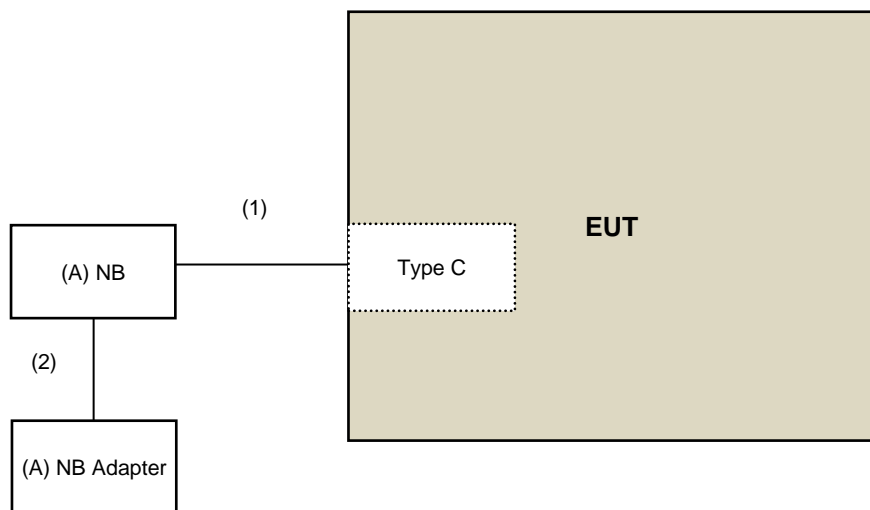


3.6 Test Program Used and Operation Descriptions

Controlling software (Tera Term V4.8) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

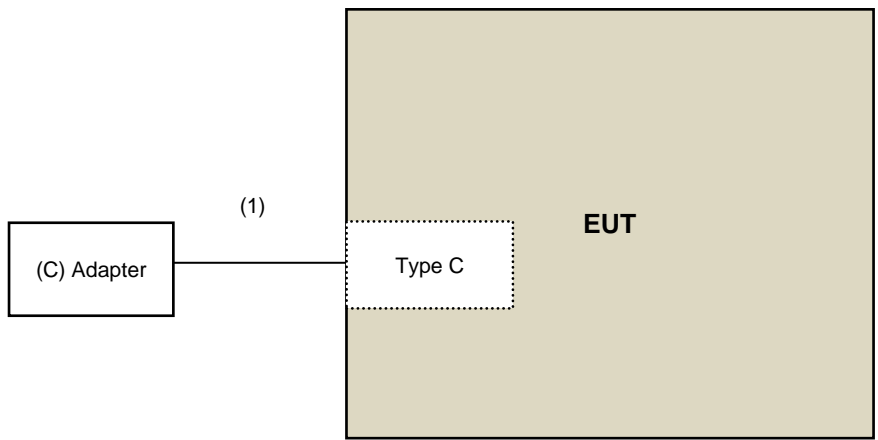
3.7 Connection Diagram of EUT and Peripheral Devices

Mode A



Remote Site

Mode B



----- Remote Site

3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	NB	LENOVO	IdeaPad 5 15ITL05	N/A	N/A	Provided by Lab
B	NB Adapter	LENOVO	ADLX65CLGU2A	N/A	N/A	Provided by Lab
C	Adapter	APPLE	A1385	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Type-A to C Cable	1	1	Y	0	Supplied by applicant
2	DC Cable	1	2	N	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
Power Meter Anritsu	ML2495A	0842014	2023/5/5	2024/5/4
Pulse Power Sensor Anritsu	MA2411B	0738404	2023/5/5	2024/5/4
USB Wideband Power Sensor Keysight	U2021XA	U2021XA_001	2022/6/13	2023/6/12

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2023/6/1

4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer Keysight	N9030A	MY54490260	2022/7/14	2023/7/13
Signal Analyzer R&S	FSV40	101042	2022/9/5	2023/9/4
		101544	2023/5/9	2024/5/8
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2023/6/1

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
50 ohm terminal resistance LYNICS	0900510	E1-01-305	2023/2/13	2024/2/12
		E1-011285	2022/9/19	2023/9/18
		E1-011286	2022/9/19	2023/9/18
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Coupling / Decoupling Network TESEQ	CDN A201A	44601	2022/12/14	2023/12/13
DC LISN R&S	ESH3-Z6	100219	2022/8/2	2023/8/1
		844950/018	2022/8/2	2023/8/1
EMI Test Receiver R&S	ESR3	102413	2023/2/7	2024/2/6
Fixed Attenuator STI	STI02-2200-10	NO.3	2022/10/21	2023/10/20
High Voltage Probe Schwarzbeck	TK9420	00982	2022/12/14	2023/12/13
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
LISN EMCO	3825/2	9204-1964	2022/6/17	2023/6/16
		9504-2359	2022/8/2	2023/8/1
LISN R&S	ENV216	101195	2022/8/1	2023/7/31
		101196	2022/5/24	2023/5/23
		101197	2022/7/5	2023/7/4
LISN Schwarzbeck	NNLK 8121	8121-731	2022/5/26	2023/5/25
		8121-00759	2022/8/18	2023/8/17
	NNLK 8129	8129229	2022/6/8	2023/6/7
RF Coaxial Cable PEWC	5D-FB	Cable-CO3-01	2022/9/14	2023/9/13
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Conduction 3.
2. Tested Date: 2023/5/16

4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
* Loop Antenna EMCI	LPA600	270	2021/9/2	2023/9/1
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2022/10/21	2023/10/20
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2022/6/9	2023/6/8
Preamplifier EMCI	EMC001340	980269	2022/6/28	2023/6/27
Preamplifier HP	8447D	2432A03504	2023/2/16	2024/2/15
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2022/6/30	2023/6/29
Signal Analyzer R&S	FSV40	101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

- * The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA
- The test was performed in Linkou 966 Chamber 6 (CH 6).
- Tested Date: 2023/5/16

4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Band Pass Filter Micro-Tronics	BRM17690	005	2022/5/26	2023/5/25
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2022/5/26	2023/5/25
Horn Antenna EMCO	3115	00028257	2022/11/13	2023/11/12
Horn Antenna ETS-Lindgren	3117-PA	00215857	2022/11/13	2023/11/12
Horn Antenna Schwarzbeck	BBHA 9170	212	2022/10/20	2023/10/19
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2022/6/9	2023/6/8
Notch Filter Micro-Tronics	BRC50703-01	010	2022/5/26	2023/5/25
Preamplifier EMCI	EMC0126545 EMC184045B	980076	2023/2/16	2024/2/15
		980175	2022/9/3	2023/9/2
		980235	2023/2/16	2024/2/15
Preamplifier HP	8449B	3008A01201	2023/2/16	2024/2/15
RF Coaxial Cable EM	EM102-KMKM-3.5+1M	EM102-KMKM-3.5+1M-01	2022/7/7	2023/7/6
RF Coaxial Cable EMCI	EMC104	190801	2022/9/20	2023/9/19
		190804	2022/9/20	2023/9/19
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2022/9/20	2023/9/19
Signal Analyzer R&S	FSV40	101042	2022/9/5	2023/9/4
		101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2023/5/23 ~ 2023/5/24

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)

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 20 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 20 dB below the highest level of the desired power:

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

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 20 dB below the highest level of the desired power:

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

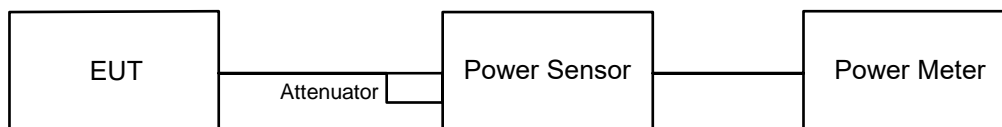
Notes:

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

Peak Power:

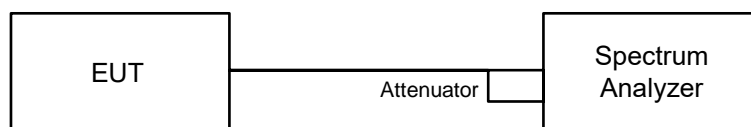
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average Power:

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

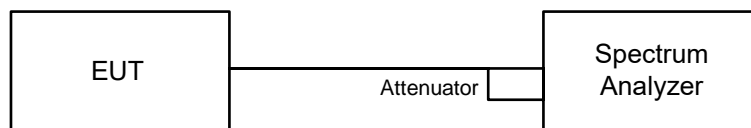


6.2.2 Test Procedure

- a. 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.
- d. Set the VBW $\geq 3 \times$ 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.

6.3 6 dB Bandwidth

6.3.1 Test Setup

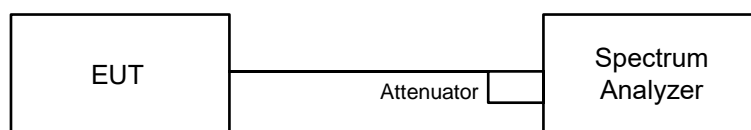


6.3.2 Test Procedure

- 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

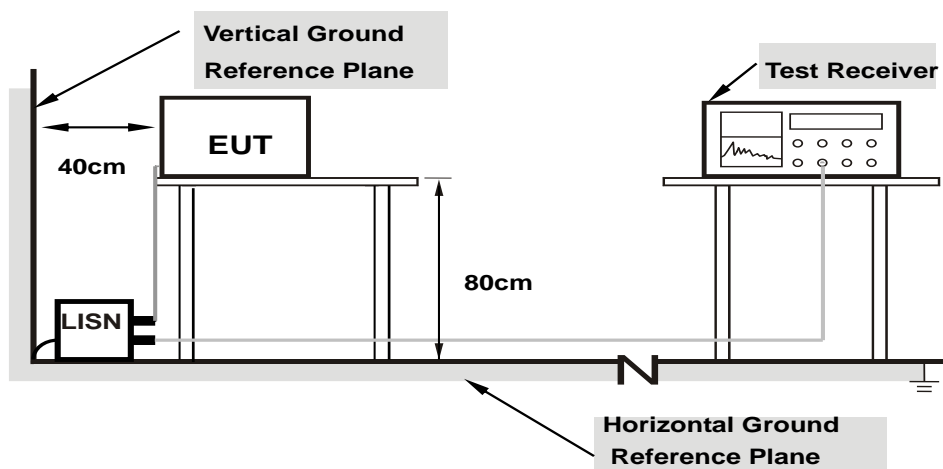
- Set the RBW = 100 kHz.
- Set the VBW ≥ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- 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

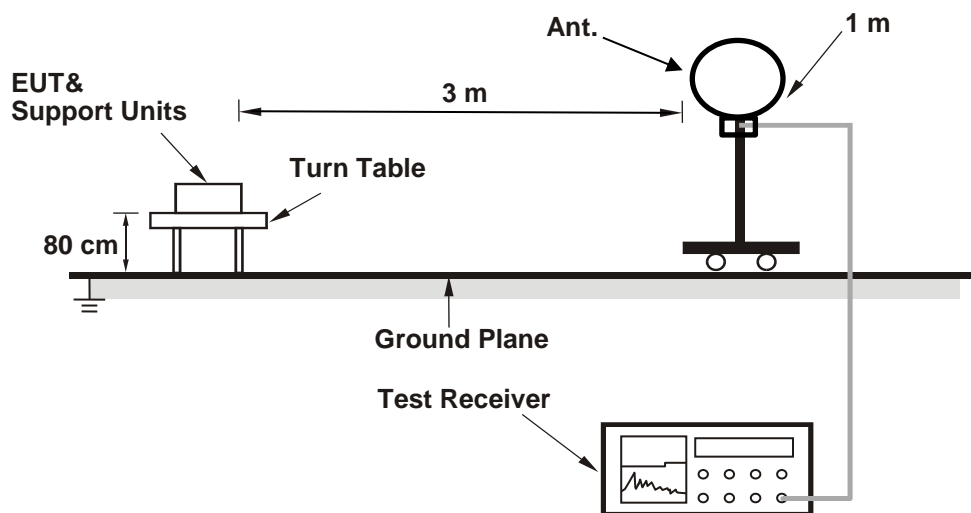
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The 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.

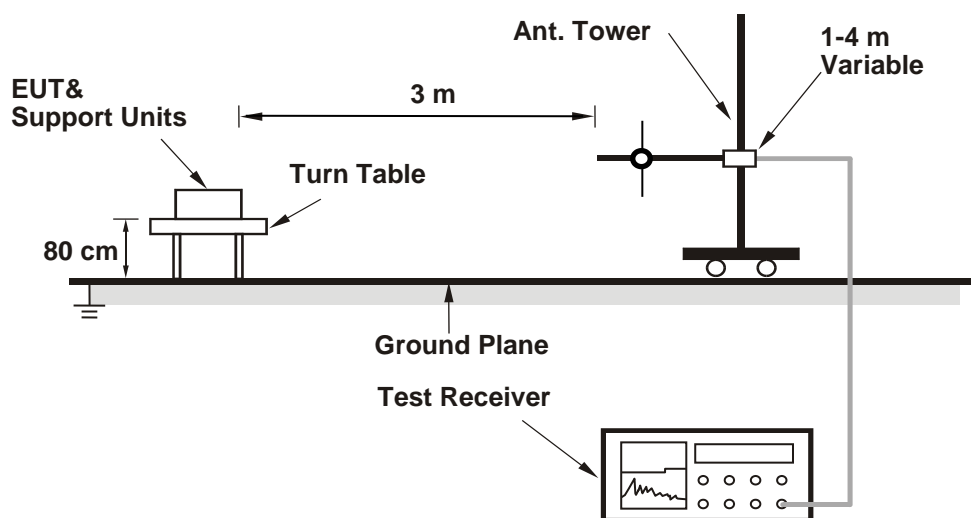
6.6 Unwanted Emissions below 1 GHz

6.6.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



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

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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

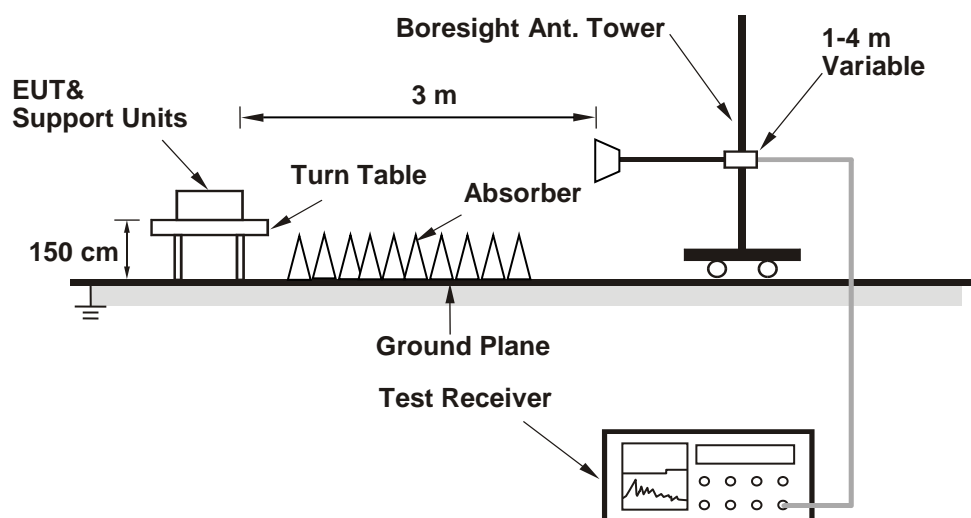
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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 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

Mode A

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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For Peak Power

802.11b

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
1	2412	34.914	15.43	30	Pass
6	2437	35.156	15.46	30	Pass
11	2462	33.651	15.27	30	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
1	2412	165.196	22.18	30	Pass
6	2437	163.305	22.13	30	Pass
11	2462	160.694	22.06	30	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
1	2412	137.721	21.39	30	Pass
6	2437	136.144	21.34	30	Pass
11	2462	133.968	21.27	30	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the output power limit shall not be reduced.

For Average Power

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	19.679	12.94
6	2437	19.724	12.95
11	2462	18.836	12.75

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	19.543	12.91
6	2437	19.409	12.88
11	2462	18.967	12.78

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	19.588	12.92
6	2437	19.454	12.89
11	2462	19.011	12.79

7.2 Power Spectral Density

Mode A

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
Chain 0	1	2412	-9.24	8	Pass
	6	2437	-9.24	8	Pass
	11	2462	-9.47	8	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the power density limit shall not be reduced.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
Chain 0	1	2412	-11.33	8	Pass
	6	2437	-11.36	8	Pass
	11	2462	-11.57	8	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the power density limit shall not be reduced.

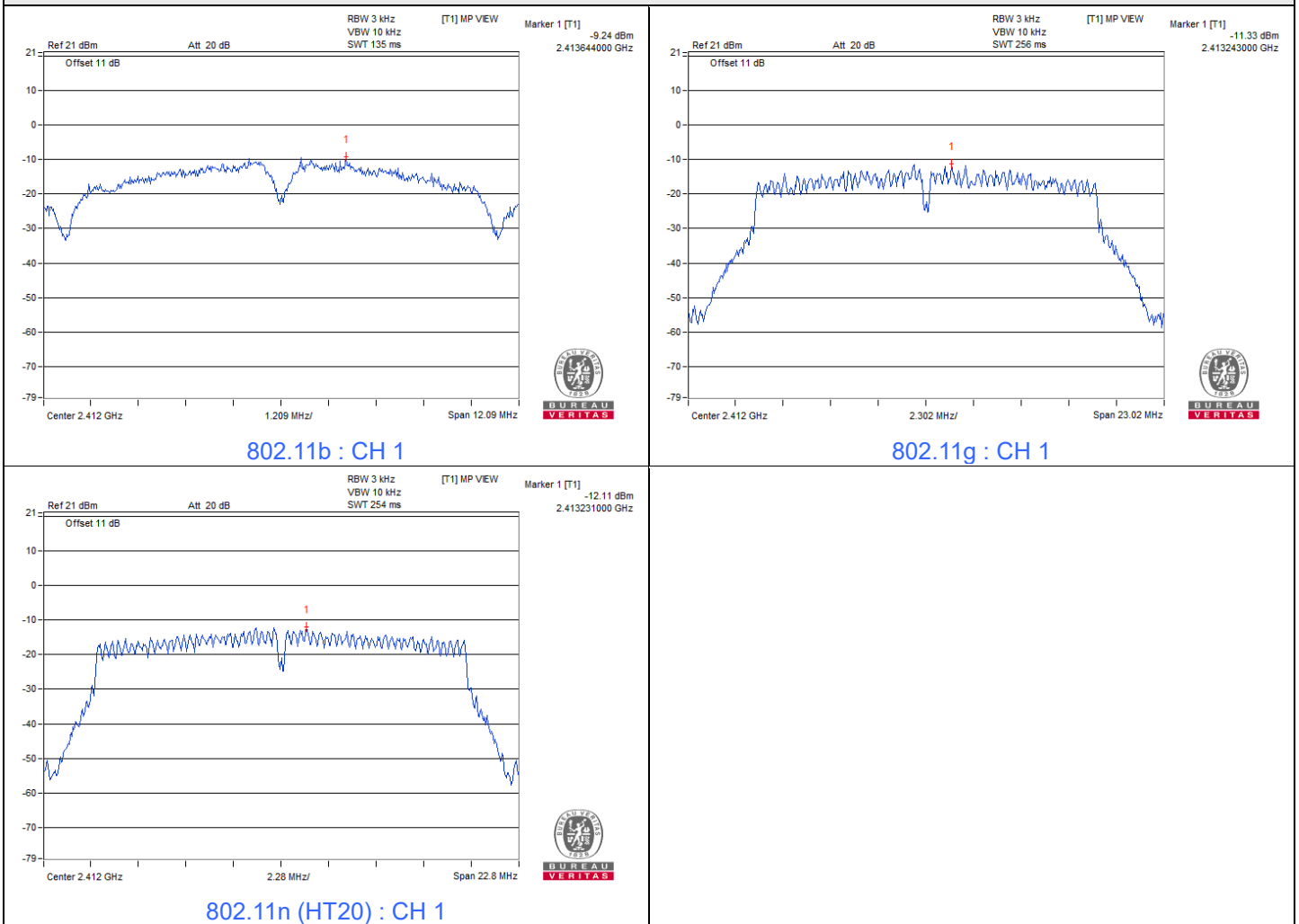
802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
Chain 0	1	2412	-12.11	8	Pass
	6	2437	-12.14	8	Pass
	11	2462	-12.4	8	Pass

Note: The antenna gain is 3.91 dBi < 6 dBi, so the power density limit shall not be reduced.



Spectrum Plot of Maximum Value



7.3 6 dB Bandwidth

Mode A

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	8.06	0.5	Pass
6	2437	8.08	0.5	Pass
11	2462	8.08	0.5	Pass

802.11g

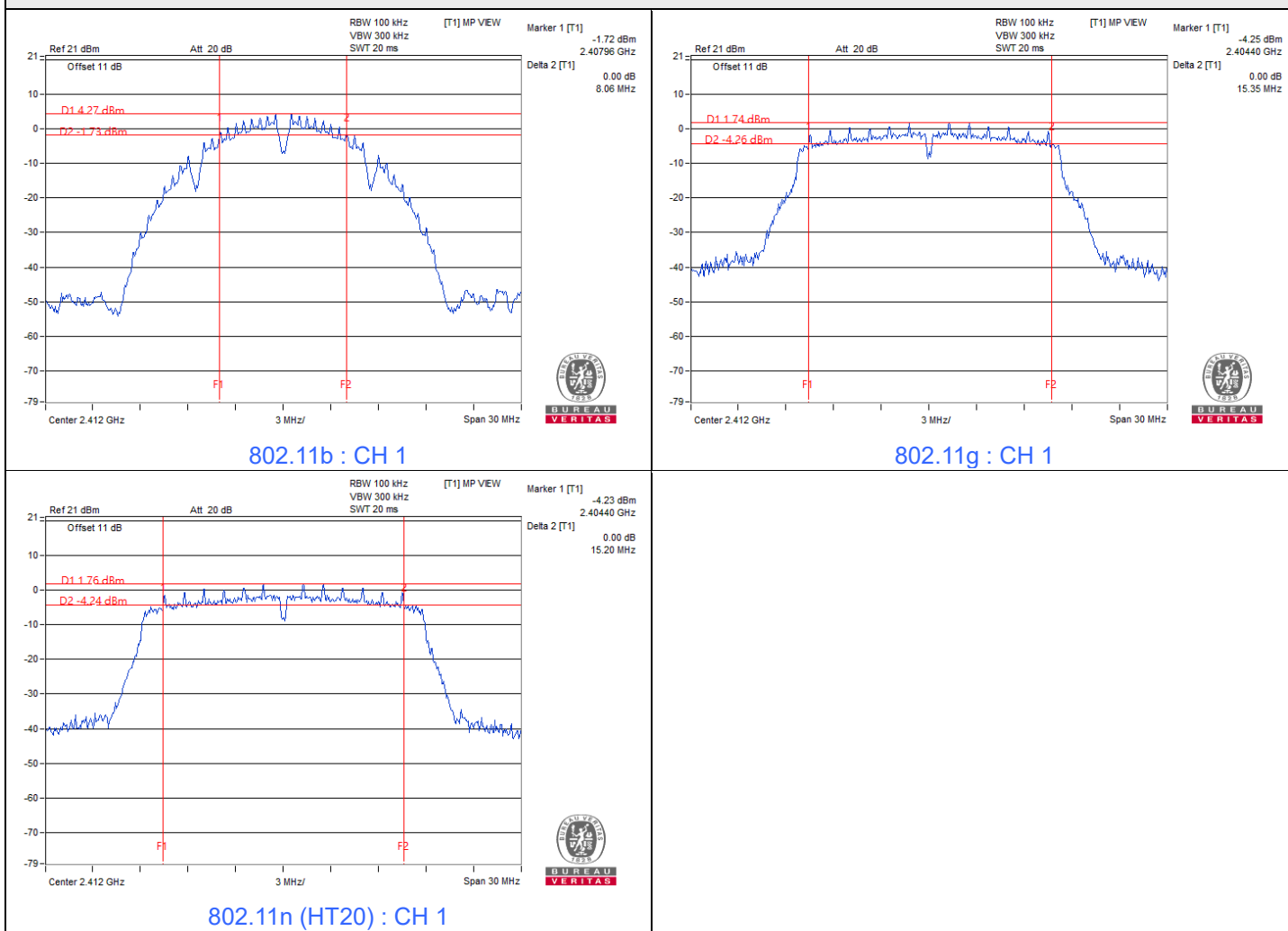
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	15.35	0.5	Pass
6	2437	15.51	0.5	Pass
11	2462	15.46	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	15.2	0.5	Pass
6	2437	15.2	0.5	Pass
11	2462	15.2	0.5	Pass



Spectrum Plot of Minimum Value

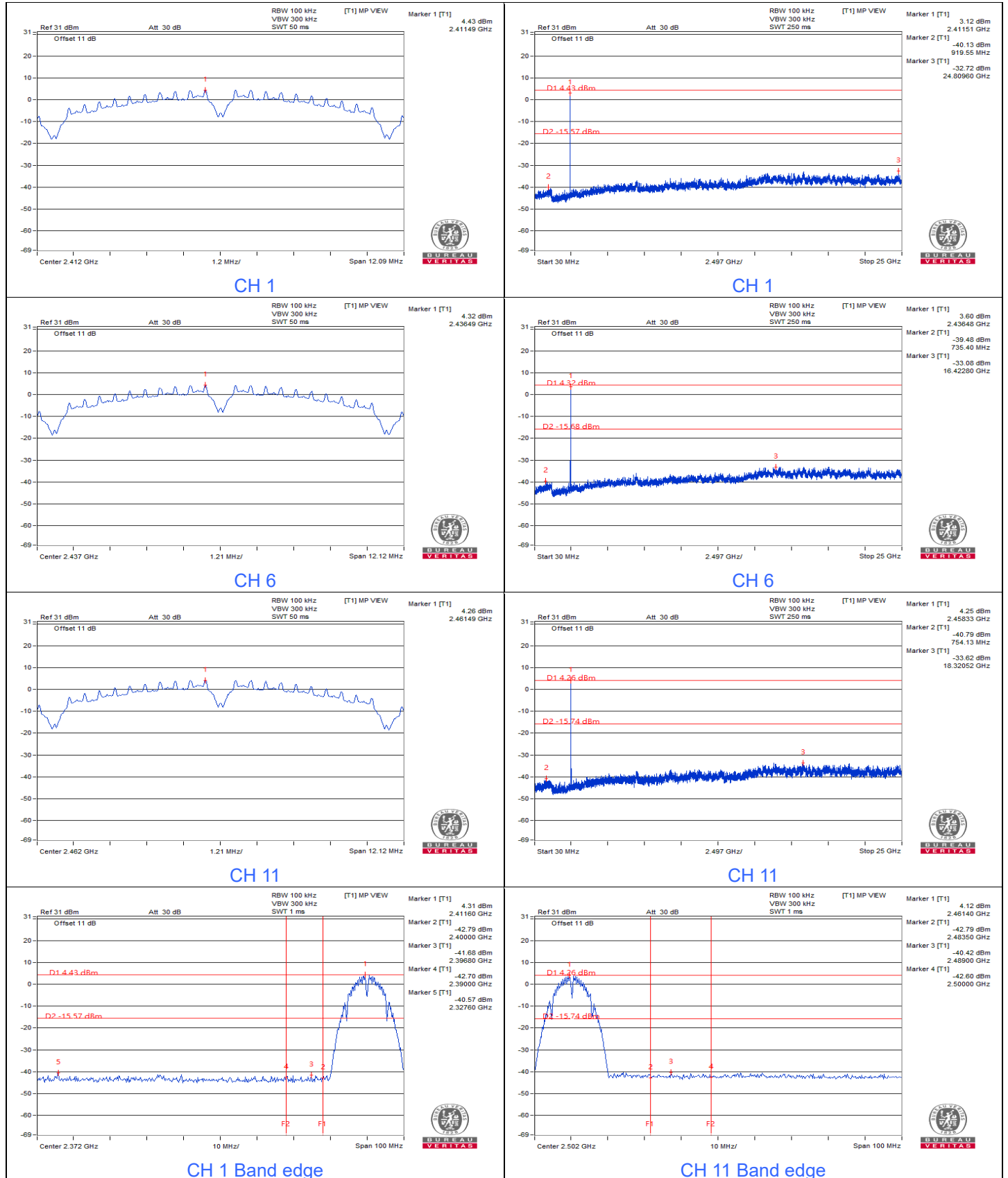


7.4 Conducted Out of Band Emissions

Mode A

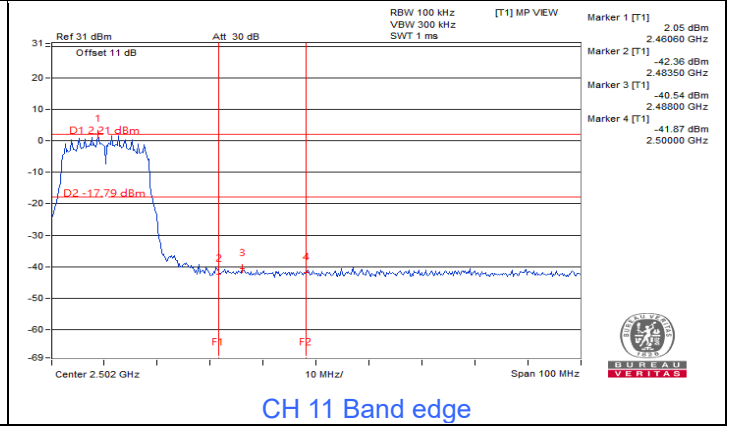
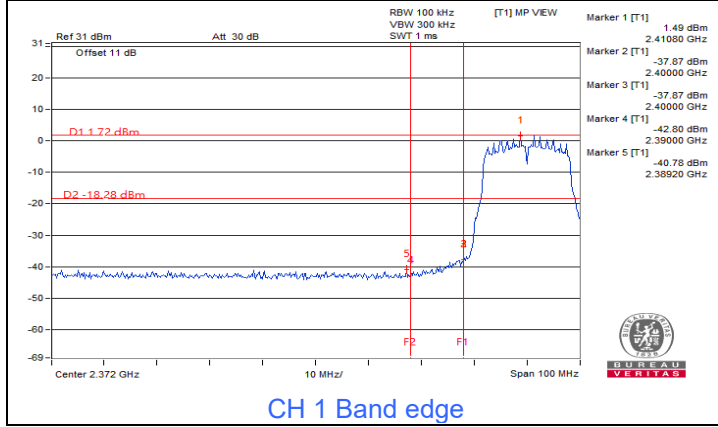
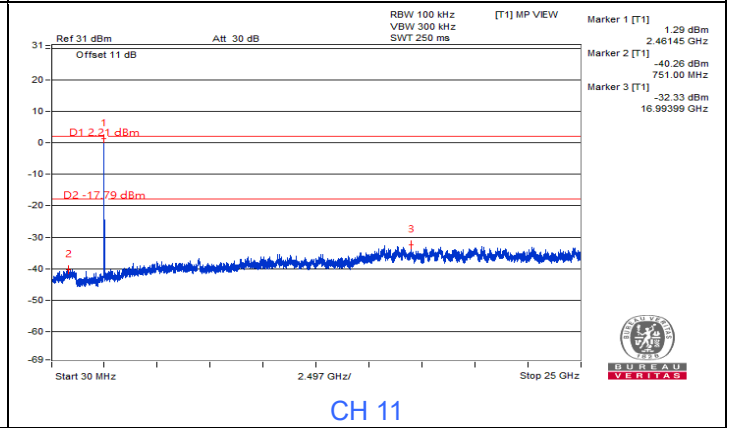
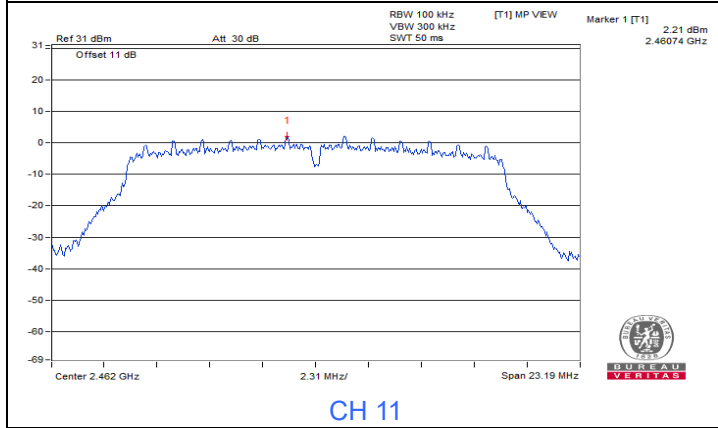
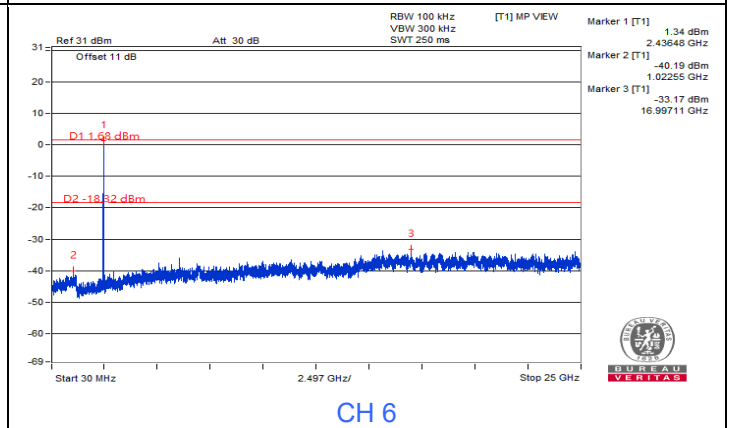
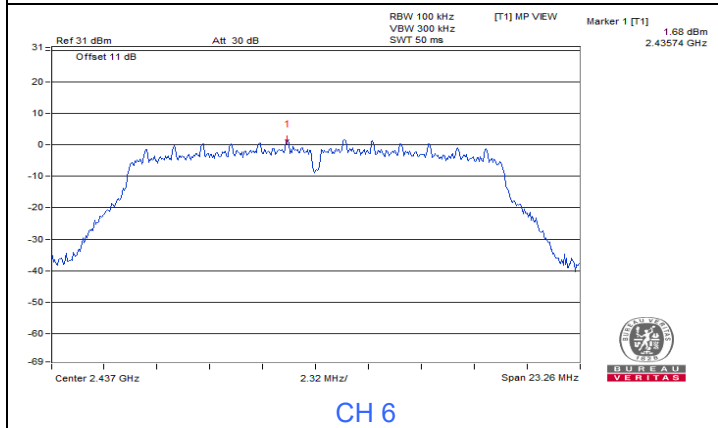
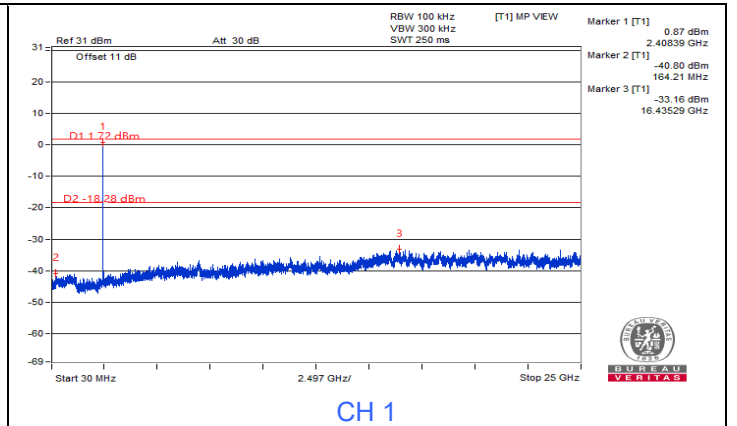
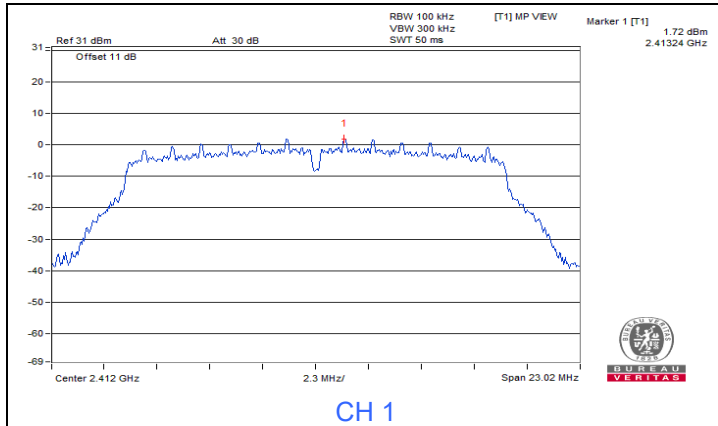
Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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802.11b



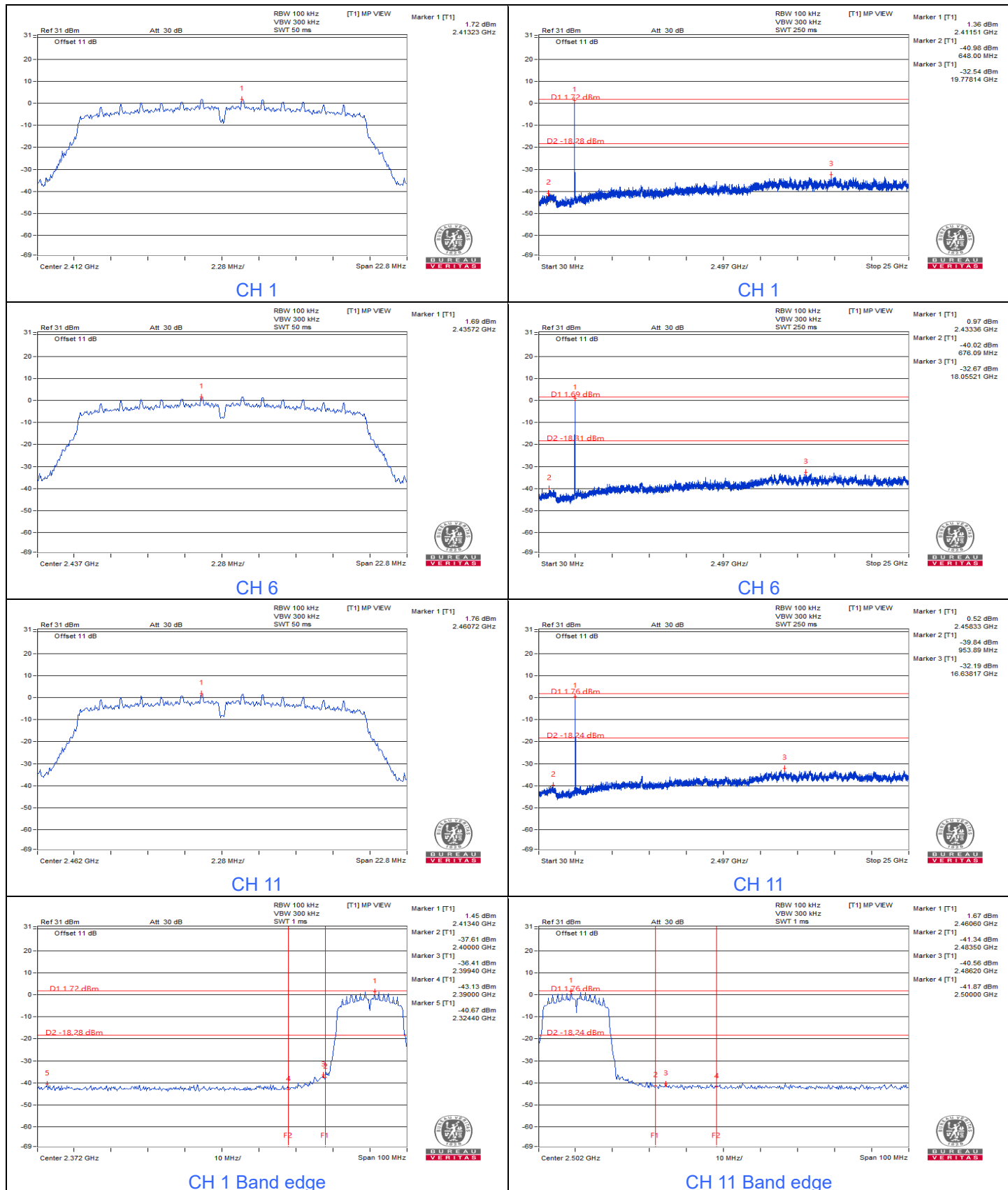


802.11g





802.11n (HT20)



7.5 AC Power Conducted Emissions

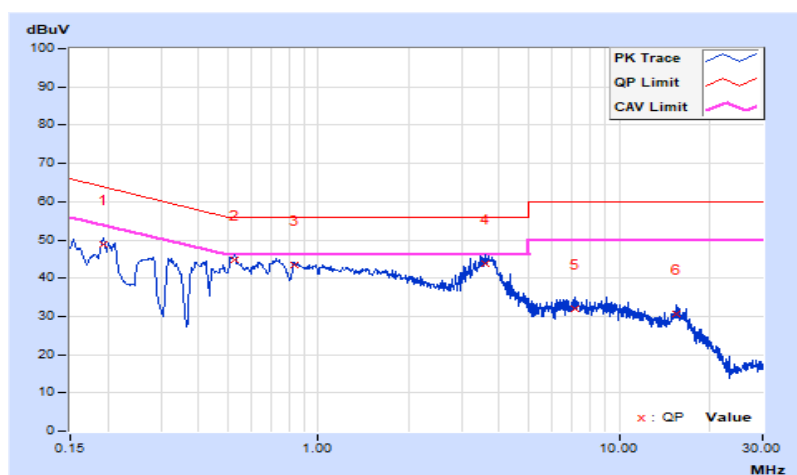
Mode A

RF Mode	802.11g	Channel	CH 1 : 2412 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, 75% RH
Tested By	Jed Wu		

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	0.19302	9.77	39.18	28.15	48.95	37.92	63.91	53.91	-14.96	-15.99
2	0.52684	9.82	34.97	21.55	44.79	31.37	56.00	46.00	-11.21	-14.63
3	0.83110	9.85	33.60	20.29	43.45	30.14	56.00	46.00	-12.55	-15.86
4	3.61707	9.99	33.79	21.10	43.78	31.09	56.00	46.00	-12.22	-14.91
5	7.17061	10.11	21.74	14.68	31.85	24.79	60.00	50.00	-28.15	-25.21
6	15.54015	10.29	20.47	15.11	30.76	25.40	60.00	50.00	-29.24	-24.60

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

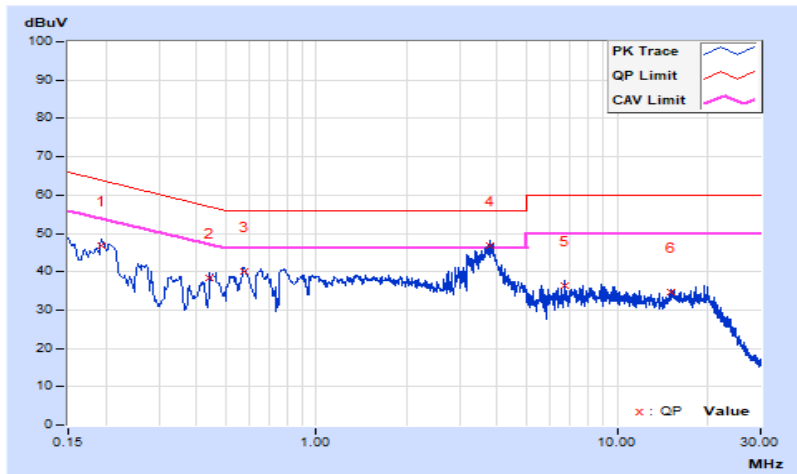


RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	Jed Wu		

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	0.19302	9.77	36.95	22.99	46.72	32.76	63.91	53.91	-17.19	-21.15
2	0.44333	9.79	28.66	12.67	38.45	22.46	57.00	47.00	-18.55	-24.54
3	0.57319	9.81	30.16	15.85	39.97	25.66	56.00	46.00	-16.03	-20.34
4	3.75786	10.01	36.71	22.40	46.72	32.41	56.00	46.00	-9.28	-13.59
5	6.69737	10.11	26.10	18.94	36.21	29.05	60.00	50.00	-23.79	-20.95
6	15.16469	10.35	24.19	19.01	34.54	29.36	60.00	50.00	-25.46	-20.64

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



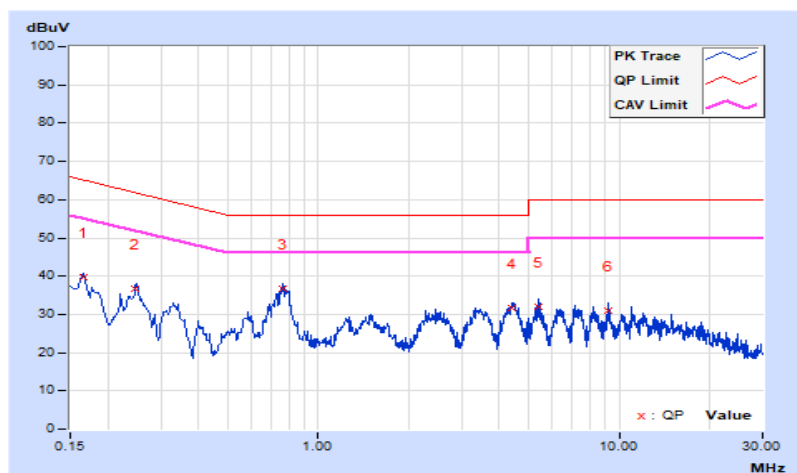
Mode B

RF Mode	802.11g	Channel	CH 1 : 2412 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, 75% RH
Tested By	Jed Wu		

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	0.16526	9.75	29.88	11.33	39.63	21.08	65.20	55.20	-25.57	-34.12
2	0.24777	9.78	26.76	11.26	36.54	21.04	61.83	51.83	-25.29	-30.79
3	0.76204	9.84	26.83	20.52	36.67	30.36	56.00	46.00	-19.33	-15.64
4	4.40318	10.02	21.74	15.99	31.76	26.01	56.00	46.00	-24.24	-19.99
5	5.38719	10.05	21.97	16.22	32.02	26.27	60.00	50.00	-27.98	-23.73
6	9.23561	10.17	20.72	14.55	30.89	24.72	60.00	50.00	-29.11	-25.28

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

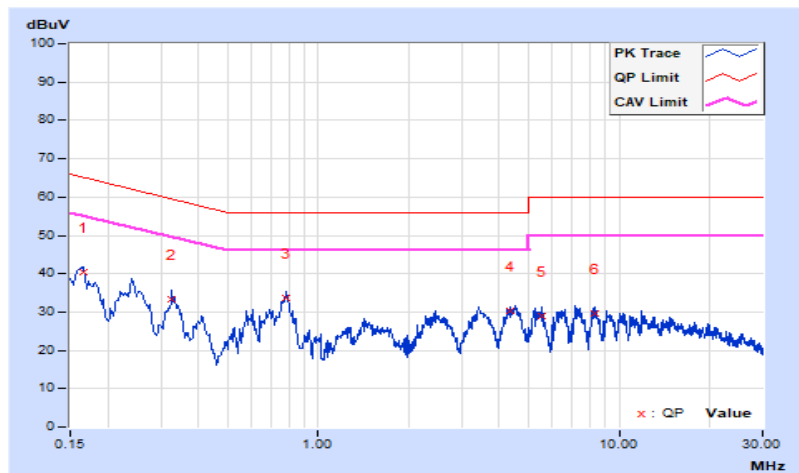


RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	Jed Wu		

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	0.16526	9.75	30.79	10.70	40.54	20.45	65.20	55.20	-24.66	-34.75
2	0.32599	9.78	23.48	6.67	33.26	16.45	59.55	49.55	-26.29	-33.10
3	0.78550	9.83	23.83	17.64	33.66	27.47	56.00	46.00	-22.34	-18.53
4	4.37580	10.03	20.11	14.60	30.14	24.63	56.00	46.00	-25.86	-21.37
5	5.57101	10.07	19.05	13.76	29.12	23.83	60.00	50.00	-30.88	-26.17
6	8.35564	10.17	19.40	14.16	29.57	24.33	60.00	50.00	-30.43	-25.67

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

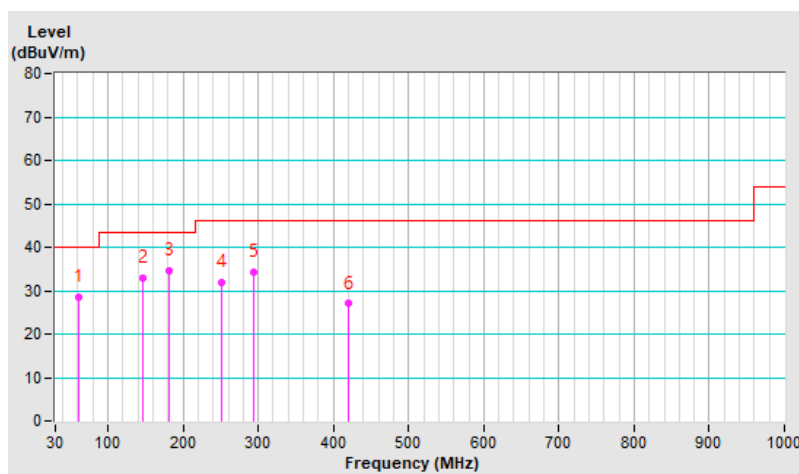
Mode A

RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 73% RH
Tested By	William Su		

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	60.51	28.5 QP	40.0	-11.5	1.66 H	136	37.9	-9.4
2	146.69	32.9 QP	43.5	-10.6	1.52 H	160	41.3	-8.4
3	181.32	34.7 QP	43.5	-8.8	1.48 H	197	44.5	-9.8
4	252.08	31.8 QP	46.0	-14.2	1.75 H	112	40.1	-8.3
5	294.47	34.2 QP	46.0	-11.8	1.12 H	177	40.5	-6.3
6	419.12	27.0 QP	46.0	-19.0	1.08 H	12	30.4	-3.4

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 frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

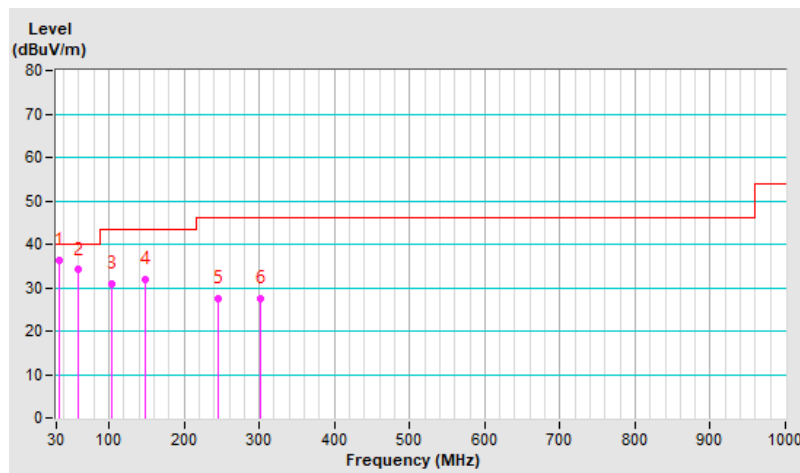


RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 73% RH
Tested By	William Su		

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	33.69	36.4 QP	40.0	-3.6	1.13 V	19	46.9	-10.5
2	59.44	34.1 QP	40.0	-5.9	1.58 V	225	43.2	-9.1
3	104.20	30.9 QP	43.5	-12.6	1.09 V	99	43.4	-12.5
4	148.24	31.9 QP	43.5	-11.6	1.27 V	288	40.4	-8.5
5	244.85	27.6 QP	46.0	-18.4	1.34 V	102	36.2	-8.6
6	301.31	27.4 QP	46.0	-18.6	1.68 V	337	33.5	-6.1

Remarks:

1. Emission Level(dBUV/m) = Raw Value(dBUV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



7.7 Unwanted Emissions above 1 GHz

Mode A

RF Mode	802.11b	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	58.0 PK	74.0	-16.0	2.24 H	175	45.3	12.7
2	2390.00	44.5 AV	54.0	-9.5	2.24 H	175	31.8	12.7
3	*2412.00	107.6 PK			2.24 H	175	94.7	12.9
4	*2412.00	104.2 AV			2.24 H	175	91.3	12.9
5	4824.00	57.2 PK	74.0	-16.8	2.83 H	241	43.9	13.3
6	4824.00	49.9 AV	54.0	-4.1	2.83 H	241	36.6	13.3

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	57.5 PK	74.0	-16.5	2.72 V	94	44.8	12.7
2	2390.00	44.1 AV	54.0	-9.9	2.72 V	94	31.4	12.7
3	*2412.00	106.3 PK			2.72 V	94	93.4	12.9
4	*2412.00	102.9 AV			2.72 V	94	90.0	12.9
5	4824.00	58.4 PK	74.0	-15.6	2.57 V	175	45.1	13.3
6	4824.00	53.1 AV	54.0	-0.9	2.57 V	175	39.8	13.3

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	802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	112.0 PK			2.20 H	172	99.0	13.0
2	*2437.00	108.7 AV			2.20 H	172	95.7	13.0
3	4874.00	57.8 PK	74.0	-16.2	2.95 H	266	44.2	13.6
4	4874.00	49.9 AV	54.0	-4.1	2.95 H	266	36.3	13.6
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	110.7 PK			2.68 V	91	97.7	13.0
2	*2437.00	107.4 AV			2.68 V	91	94.4	13.0
3	4874.00	59.0 PK	74.0	-15.0	2.69 V	200	45.4	13.6
4	4874.00	53.1 AV	54.0	-0.9	2.69 V	200	39.5	13.6

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	802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	109.9 PK			2.37 H	171	96.8	13.1
2	*2462.00	106.5 AV			2.37 H	171	93.4	13.1
3	2483.50	59.0 PK	74.0	-15.0	2.37 H	171	45.9	13.1
4	2483.50	45.1 AV	54.0	-8.9	2.37 H	171	32.0	13.1
5	4924.00	58.7 PK	74.0	-15.3	2.96 H	237	45.0	13.7
6	4924.00	50.1 AV	54.0	-3.9	2.96 H	237	36.4	13.7

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	108.6 PK			2.85 V	90	95.5	13.1
2	*2462.00	105.3 AV			2.85 V	90	92.2	13.1
3	2483.50	58.9 PK	74.0	-15.1	2.85 V	90	45.8	13.1
4	2483.50	44.9 AV	54.0	-9.1	2.85 V	90	31.8	13.1
5	4924.00	59.8 PK	74.0	-14.2	2.62 V	185	46.1	13.7
6	4924.00	53.3 AV	54.0	-0.7	2.62 V	185	39.6	13.7

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, the limit was restricted at the RF Output Power.



RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	72.7 PK	74.0	-1.3	2.46 H	168	60.0	12.7
2	2390.00	52.8 AV	54.0	-1.2	2.46 H	168	40.1	12.7
3	*2412.00	114.6 PK			2.46 H	168	101.7	12.9
4	*2412.00	104.3 AV			2.46 H	168	91.4	12.9
5	4824.00	55.5 PK	74.0	-18.5	3.05 H	234	42.2	13.3
6	4824.00	39.4 AV	54.0	-14.6	3.05 H	234	26.1	13.3

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	72.4 PK	74.0	-1.6	2.94 V	87	59.7	12.7
2	2390.00	51.9 AV	54.0	-2.1	2.94 V	87	39.2	12.7
3	*2412.00	113.4 PK			2.94 V	87	100.5	12.9
4	*2412.00	102.9 AV			2.94 V	87	90.0	12.9
5	4824.00	56.3 PK	74.0	-17.7	2.58 V	179	43.0	13.3
6	4824.00	40.8 AV	54.0	-13.2	2.58 V	179	27.5	13.3

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	802.11g	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	120.4 PK			2.41 H	170	107.4	13.0
2	*2437.00	110.5 AV			2.41 H	170	97.5	13.0
3	4874.00	66.7 PK	74.0	-7.3	3.00 H	235	53.1	13.6
4	4874.00	50.4 AV	54.0	-3.6	3.00 H	235	36.8	13.6

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	119.1 PK			2.89 V	89	106.1	13.0
2	*2437.00	109.2 AV			2.89 V	89	96.2	13.0
3	4874.00	67.9 PK	74.0	-6.1	2.67 V	185	54.3	13.6
4	4874.00	53.6 AV	54.0	-0.4	2.67 V	185	40.0	13.6

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	802.11g	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	115.1 PK			2.38 H	168	102.0	13.1
2	*2462.00	104.6 AV			2.38 H	168	91.5	13.1
3	2483.50	72.8 PK	74.0	-1.2	2.38 H	168	59.7	13.1
4	2483.50	53.3 AV	54.0	-0.7	2.38 H	168	40.2	13.1
5	4924.00	55.3 PK	74.0	-18.7	2.97 H	234	41.6	13.7
6	4924.00	39.8 AV	54.0	-14.2	2.97 H	234	26.1	13.7

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	114.2 PK			2.86 V	87	101.1	13.1
2	*2462.00	103.6 AV			2.86 V	87	90.5	13.1
3	2483.50	72.3 PK	74.0	-1.7	2.86 V	87	59.2	13.1
4	2483.50	52.7 AV	54.0	-1.3	2.86 V	87	39.6	13.1
5	4924.00	56.0 PK	74.0	-18.0	2.71 V	168	42.3	13.7
6	4924.00	40.7 AV	54.0	-13.3	2.71 V	168	27.0	13.7

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, the limit was restricted at the RF Output Power.



RF Mode	802.11n (HT20)	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	72.7 PK	74.0	-1.3	2.42 H	132	60.0	12.7
2	2390.00	53.3 AV	54.0	-0.7	2.42 H	132	40.6	12.7
3	*2412.00	113.0 PK			2.42 H	132	100.1	12.9
4	*2412.00	102.5 AV			2.42 H	132	89.6	12.9
5	4824.00	53.9 PK	74.0	-20.1	3.01 H	198	40.6	13.3
6	4824.00	38.8 AV	54.0	-15.2	3.01 H	198	25.5	13.3

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	71.7 PK	74.0	-2.3	2.90 V	51	59.0	12.7
2	2390.00	51.2 AV	54.0	-2.8	2.90 V	51	38.5	12.7
3	*2412.00	111.4 PK			2.90 V	51	98.5	12.9
4	*2412.00	101.2 AV			2.90 V	51	88.3	12.9
5	4824.00	54.8 PK	74.0	-19.2	2.54 V	143	41.5	13.3
6	4824.00	39.7 AV	54.0	-14.3	2.54 V	143	26.4	13.3

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	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	70.7 PK	74.0	-3.3	2.20 H	171	58.0	12.7
2	2390.00	52.8 AV	54.0	-1.2	2.20 H	171	40.1	12.7
3	*2437.00	119.4 PK			2.20 H	171	106.4	13.0
4	*2437.00	109.4 AV			2.20 H	171	96.4	13.0
5	4874.00	63.8 PK	74.0	-10.2	2.87 H	245	50.2	13.6
6	4874.00	47.1 AV	54.0	-6.9	2.87 H	245	33.5	13.6

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	69.7 PK	74.0	-4.3	2.98 V	84	57.0	12.7
2	2390.00	50.9 AV	54.0	-3.1	2.98 V	84	38.2	12.7
3	*2437.00	118.6 PK			2.98 V	84	105.6	13.0
4	*2437.00	108.3 AV			2.98 V	84	95.3	13.0
5	4874.00	65.0 PK	74.0	-9.0	2.54 V	175	51.4	13.6
6	4874.00	50.7 AV	54.0	-3.3	2.54 V	175	37.1	13.6

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	802.11n (HT20)	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	16.3°C, 60.2% RH
Tested By	Jed Wu		

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	113.8 PK			2.37 H	170	100.7	13.1
2	*2462.00	103.7 AV			2.37 H	170	90.6	13.1
3	2483.50	71.1 PK	74.0	-2.9	2.37 H	170	58.0	13.1
4	2483.50	53.1 AV	54.0	-0.9	2.37 H	170	40.0	13.1
5	4924.00	56.9 PK	74.0	-17.1	2.96 H	232	43.2	13.7
6	4924.00	40.8 AV	54.0	-13.2	2.96 H	232	27.1	13.7

Antenna Polarity & Test Distance : Vertical at 3 m

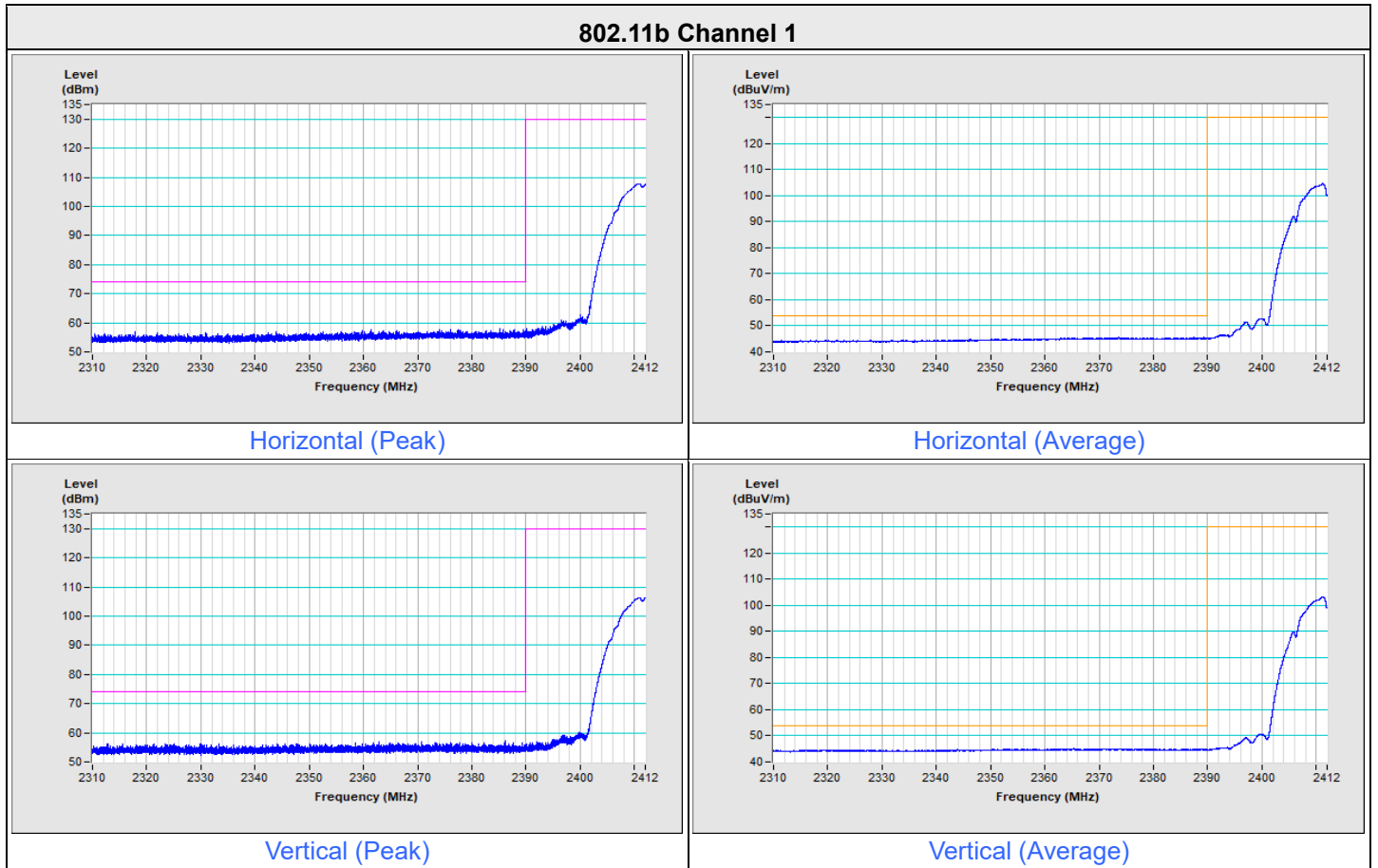
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1	*2462.00	112.5 PK			2.85 V	89	99.4	13.1
2	*2462.00	102.0 AV			2.85 V	89	88.9	13.1
3	2483.50	69.7 PK	74.0	-4.3	2.85 V	89	56.6	13.1
4	2483.50	51.9 AV	54.0	-2.1	2.85 V	89	38.8	13.1
5	4924.00	57.5 PK	74.0	-16.5	2.49 V	177	43.8	13.7
6	4924.00	42.0 AV	54.0	-12.0	2.49 V	177	28.3	13.7

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, the limit was restricted at the RF Output Power.

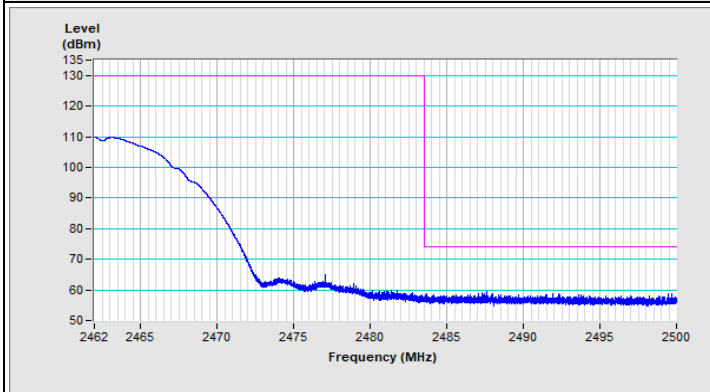
Plot of Band Edge_Mode A

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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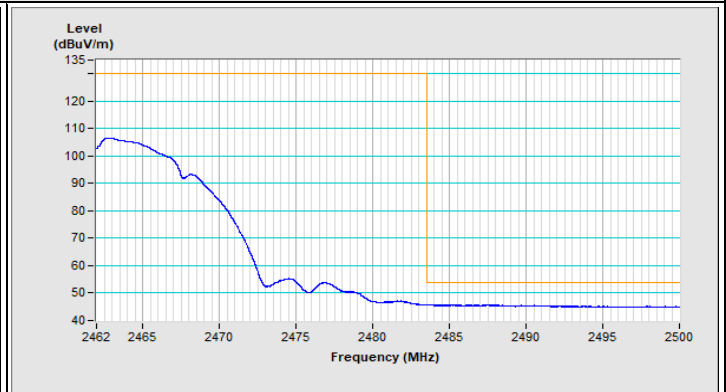


Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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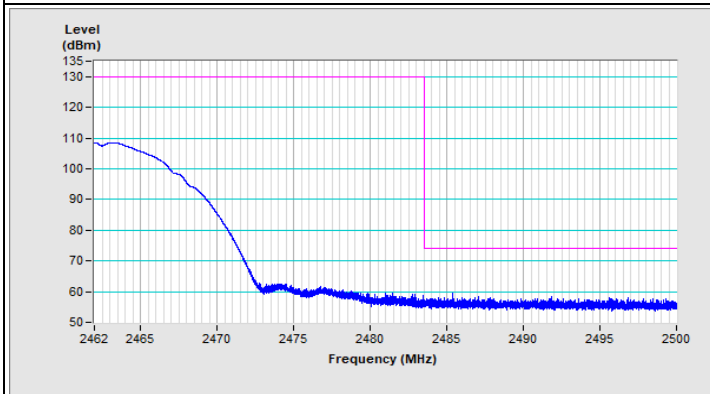
802.11b Channel 11



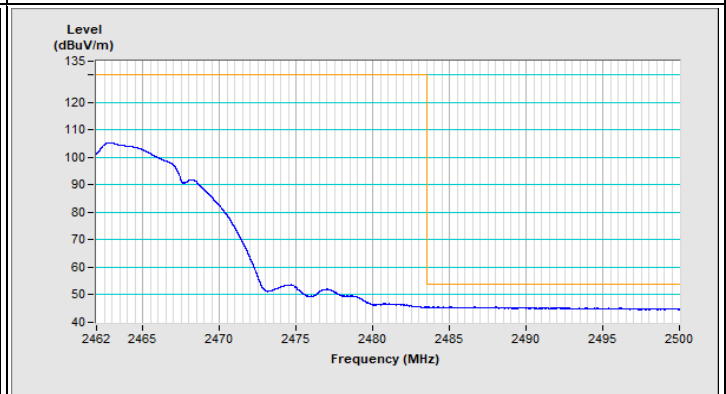
Horizontal (Peak)



Horizontal (Average)



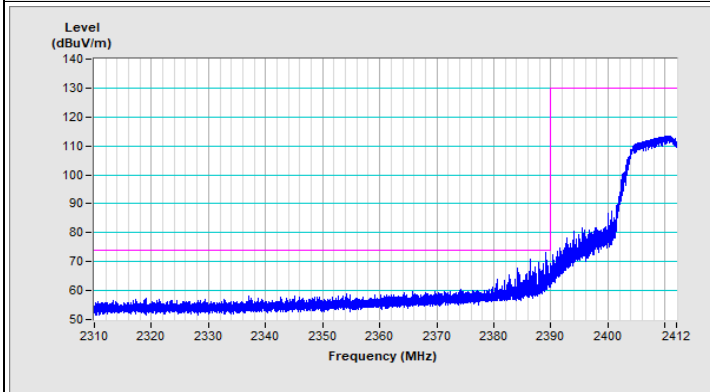
Vertical (Peak)



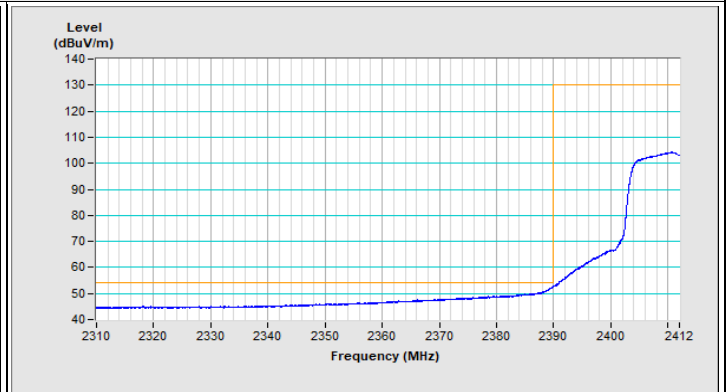
Vertical (Average)

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
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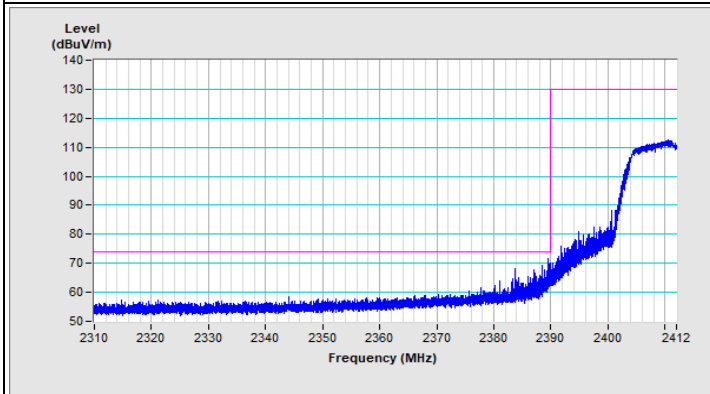
802.11g Channel 1



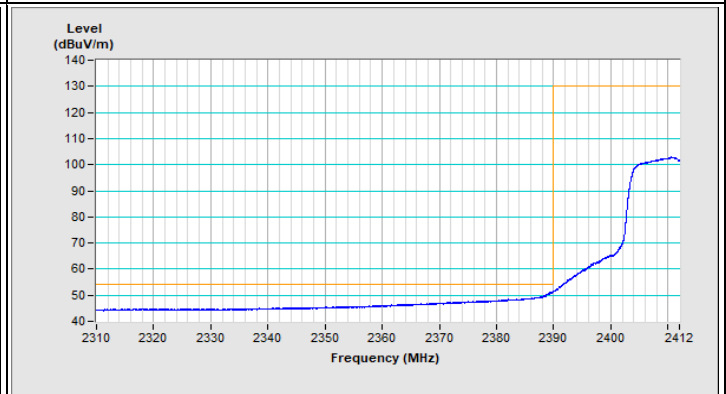
Horizontal (Peak)



Horizontal (Average)



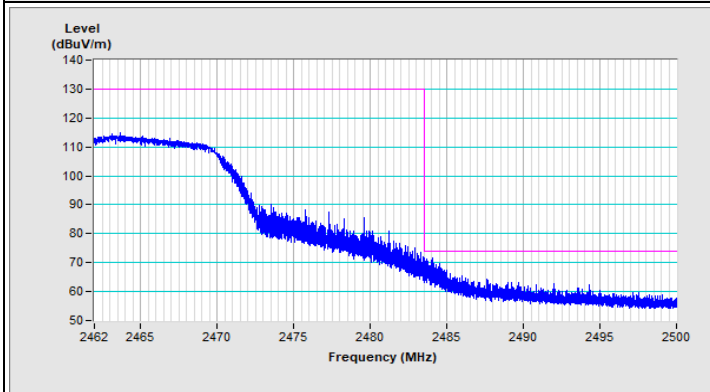
Vertical (Peak)



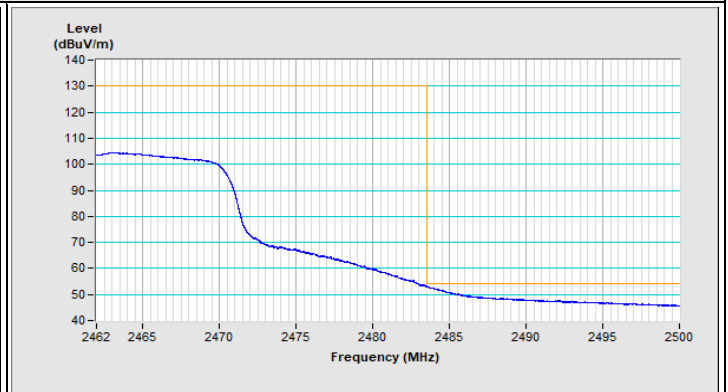
Vertical (Average)

Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
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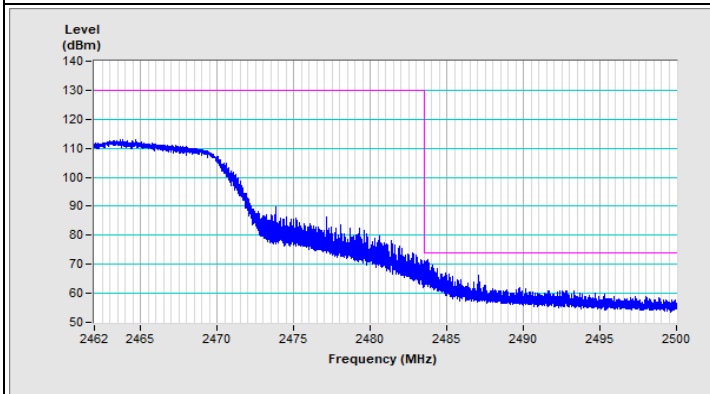
802.11g Channel 11



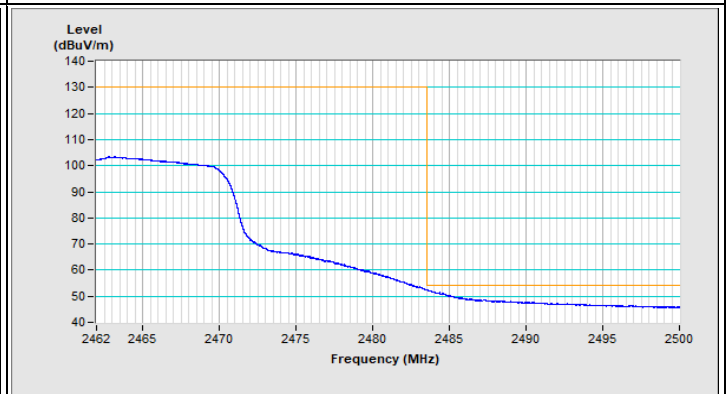
Horizontal (Peak)



Horizontal (Average)



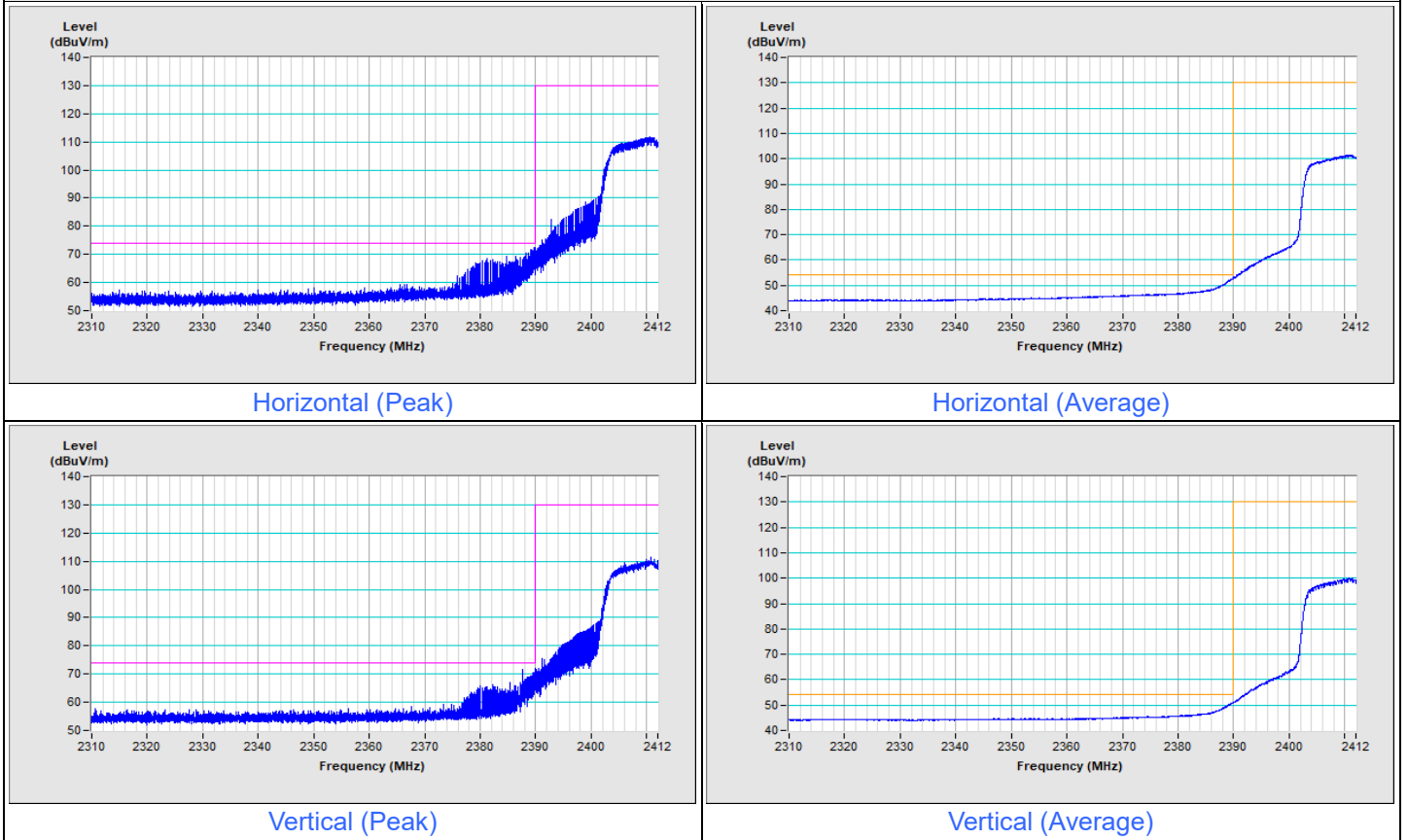
Vertical (Peak)



Vertical (Average)

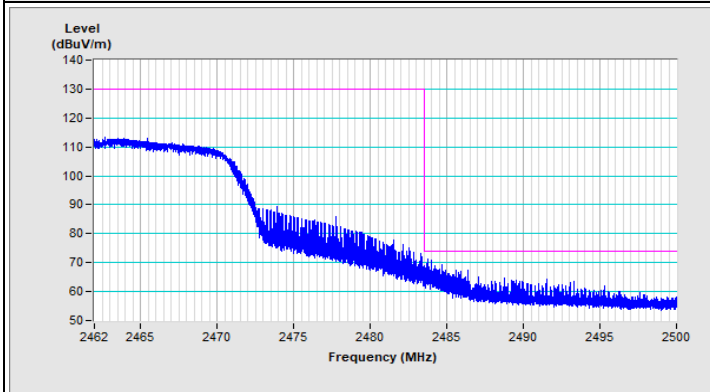
Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
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802.11n (HT20) Channel 1

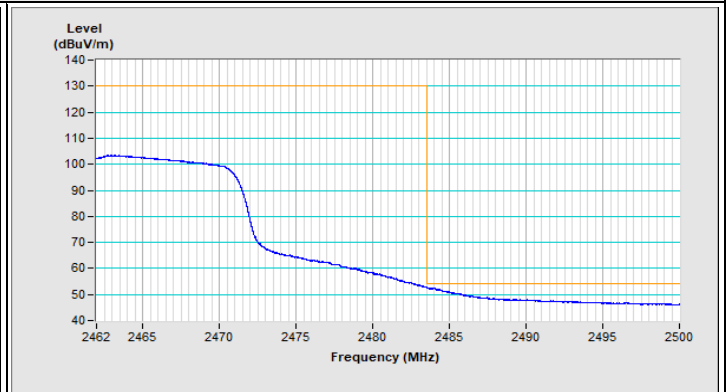


Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
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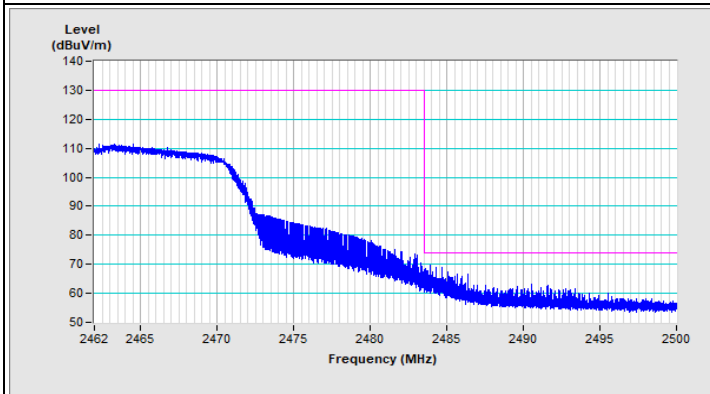
802.11n (HT20) Channel 11



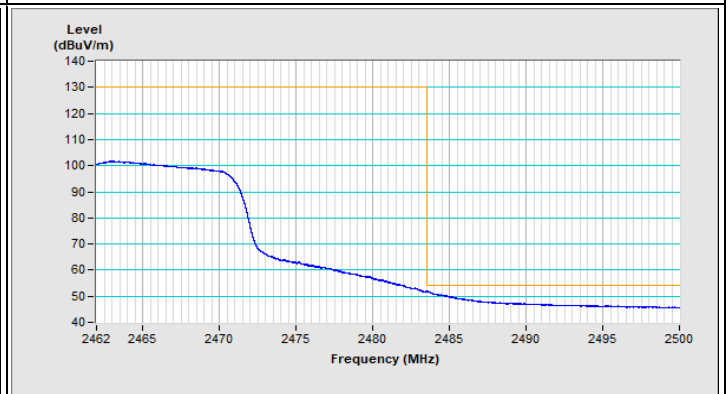
Horizontal (Peak)



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

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