

TEST REPORT

CERTIFICATE OF CONFORMITY

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

Report No.: RFBEDV-WTW-P23090682

FCC ID: VKF-MASIFDM1

Product: Masimo Freedom Watch

Brand: Masimo 

Model No.: Freedom Watch

Received Date: 2023/9/28

Test Date: 2023/11/17 ~ 2023/12/19

Issued Date: 2024/1/25

Applicant: Masimo Corporation

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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 (1):

FCC Registration / 427177 / TW0011

Designation Number (2):

Approved by: _____

Jeremy Lin

Date: _____

2024/1/25

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
RFBEDV-WTW-P23090682	Original release.	2024/1/25

1 Certificate

Product: Masimo Freedom Watch

Brand: Masimo 

Test Model: Freedom Watch

Sample Status: Engineering sample

Applicant: Masimo Corporation

Test Date: 2023/11/17 ~ 2023/12/19

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

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 -23.39 dB at 0.42600 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -0.7 dB at 46.74 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -3.6 dB at 2483.50 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	2.79 dB
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.88 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.44 dB
	30 MHz ~ 1 GHz	2.02 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	1.01 dB
	18 GHz ~ 40 GHz	1.15 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	Masimo Freedom Watch
Brand	Masimo 
Test Model	Freedom Watch
Status of EUT	Engineering sample
Power Supply Rating	3.87 Vdc from Battery 5 Vdc from Wireless Charger
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in VHT mode
Modulation Technology	DSSS, OFDM
Transfer Rate	Up to 200 Mbps
Operating Frequency	2.412 GHz ~ 2.462 GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 7
Output Power	97.949 mW (19.91 dBm)

Note:

1. The EUT uses following accessories.

Battery		
Brand	Model	Specification
EVE	EVE443423QH	Power Rating: 3.87 Vdc, 430 mAh, 1.66 Wh
Wireless Charger		
Brand	Model	Specification
Masimo	Masimo Wireless Charger	Power Rating: 5.0 Vdc, 1.5 A

2. Simultaneously transmission condition.

Condition	Technology			
1	WWAN	WLAN 2.4G	-	NFC
2	WWAN	WLAN 5G	BT	NFC

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

3. 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
2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz		
-5.7	-6.0	-6.3	-6.5	-7.2	PIFA	Spring

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

2. The EUT provides 1 completed transmitter and 1 receiver.:

2.4 GHz Band		
Modulation Mode	Tx & Rx Configuration	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
VHT20	1TX	1RX
VHT40	1TX	1RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20 MHz (40 MHz) and VHT mode for 20 MHz (40 MHz), therefore the manufacturer will control the power for 802.11n mode is same as the VHT mode or more lower than it and investigated worst case to representative mode in test report.

3.3 Channel List

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), VHT20:

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), VHT40:

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 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. EUT can be used in the following ways: X/ Y/ Z. Pre-scan in these ways and find the worst case as a representative test condition.
Worst Case:	1. X/ Y/ Z Worst Condition: Z axis. 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	EUT Configure Mode	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power / Power Spectral Density	B	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
		VHT20	1, 6, 11	BPSK	MCS0
		VHT40	3, 6, 9	BPSK	MCS0
6 dB Bandwidth / Conducted Out of Band Emissions	B	802.11b	1, 6, 11	DBPSK	1Mb/s
		802.11g	1, 6, 11	BPSK	6Mb/s
		VHT20	1, 6, 11	BPSK	MCS0
		VHT40	3, 6, 9	BPSK	MCS0
AC Power Conducted Emissions	A	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
		VHT20	1, 6, 11	BPSK	MCS0
		VHT40	3, 6, 9	BPSK	MCS0
EUT Configure Mode:	A	EUT + Wireless Charger + Adapter			
	B	EUT only			

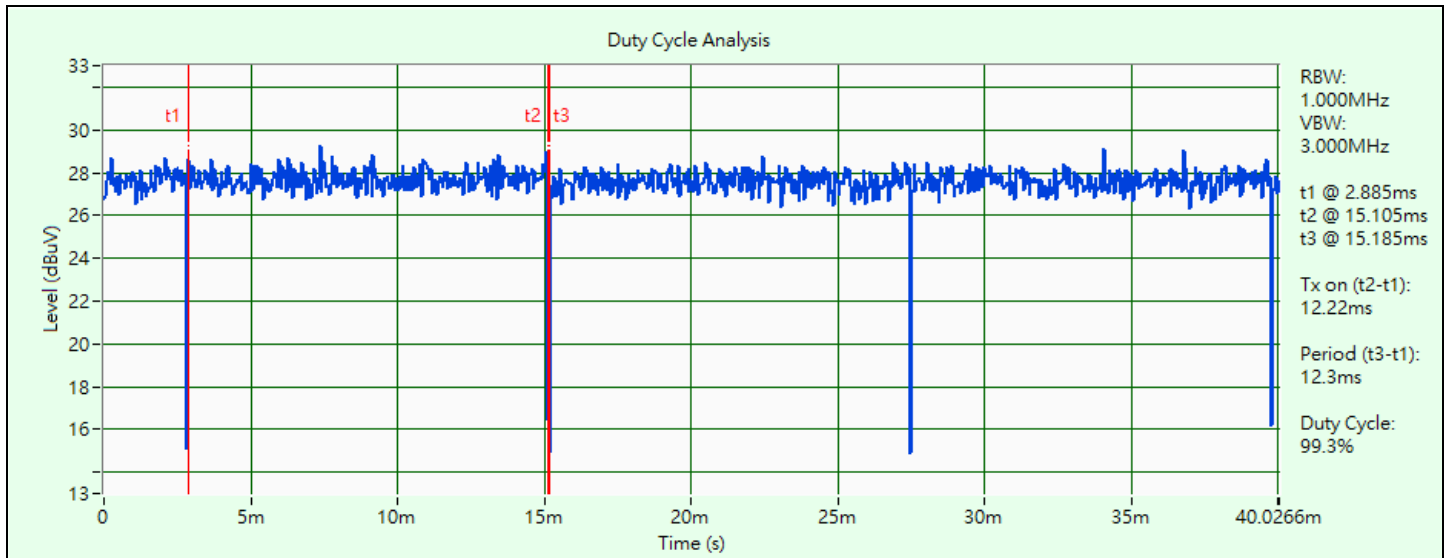
3.5 Duty Cycle of Test Signal

802.11b: Duty cycle = 12.22 ms / 12.3 ms x 100% = 99.3%

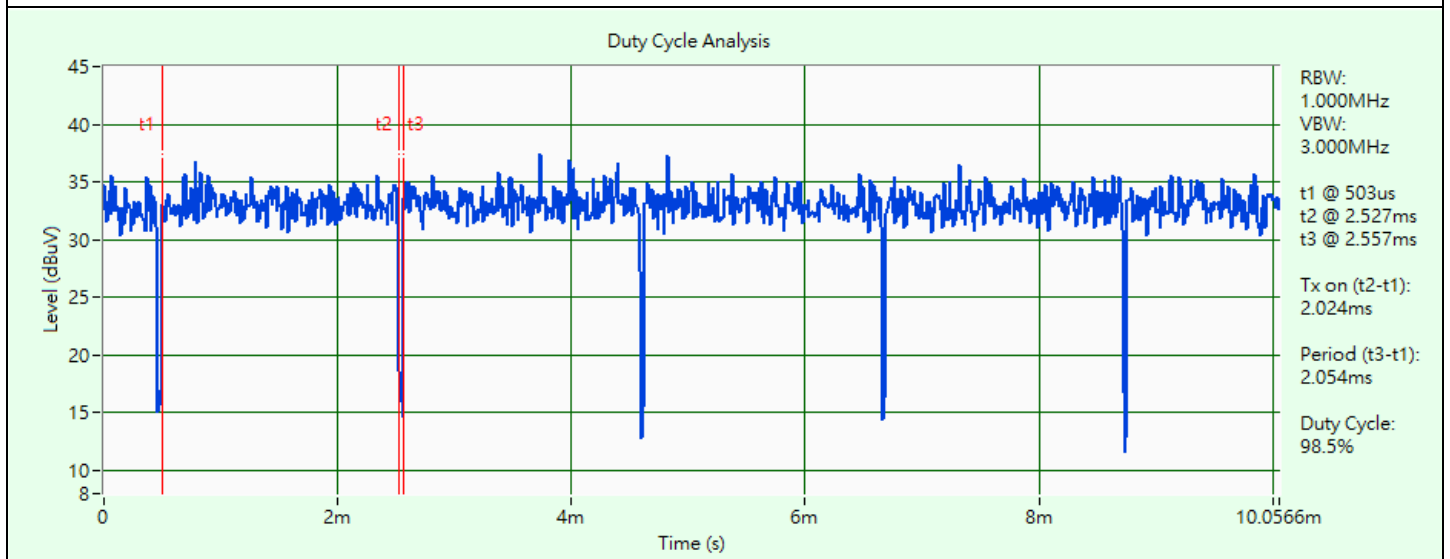
802.11g: Duty cycle = 2.024 ms / 2.054 ms x 100% = 98.5%

VHT20: Duty cycle = 1.903 ms / 1.933 ms x 100% = 98.4%

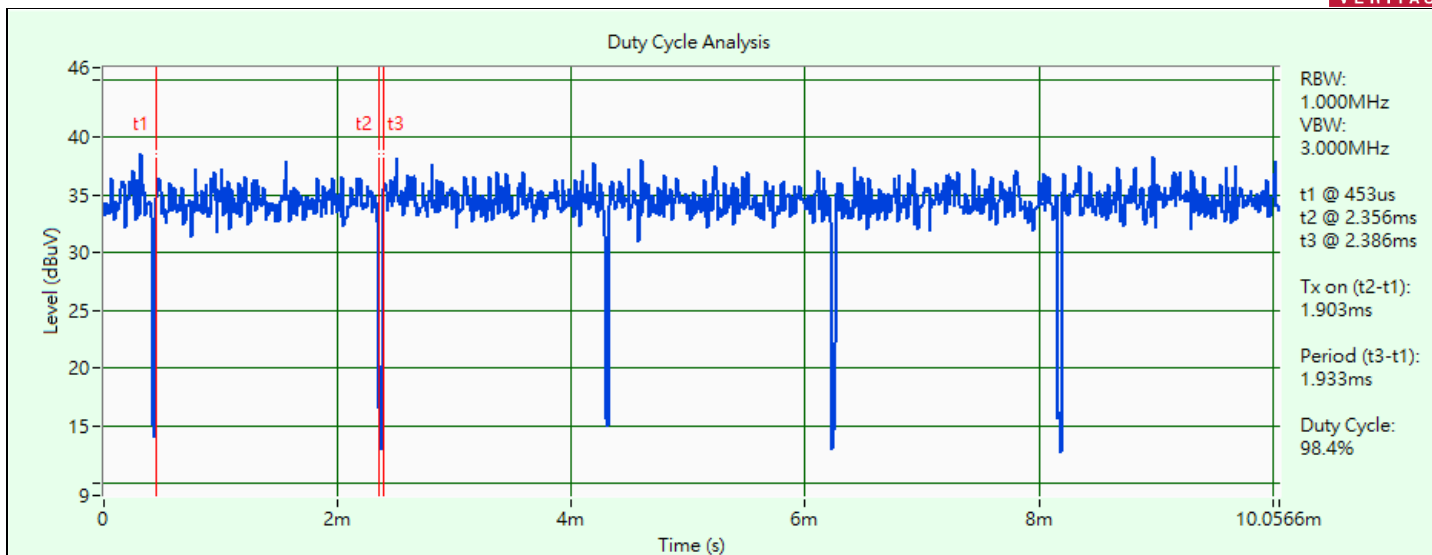
VHT40: Duty cycle = 0.936 ms / 0.976 ms x 100% = 95.9%, duty factor = $10 * \log(1/\text{Duty cycle}) = 0.18 \text{ dB}$



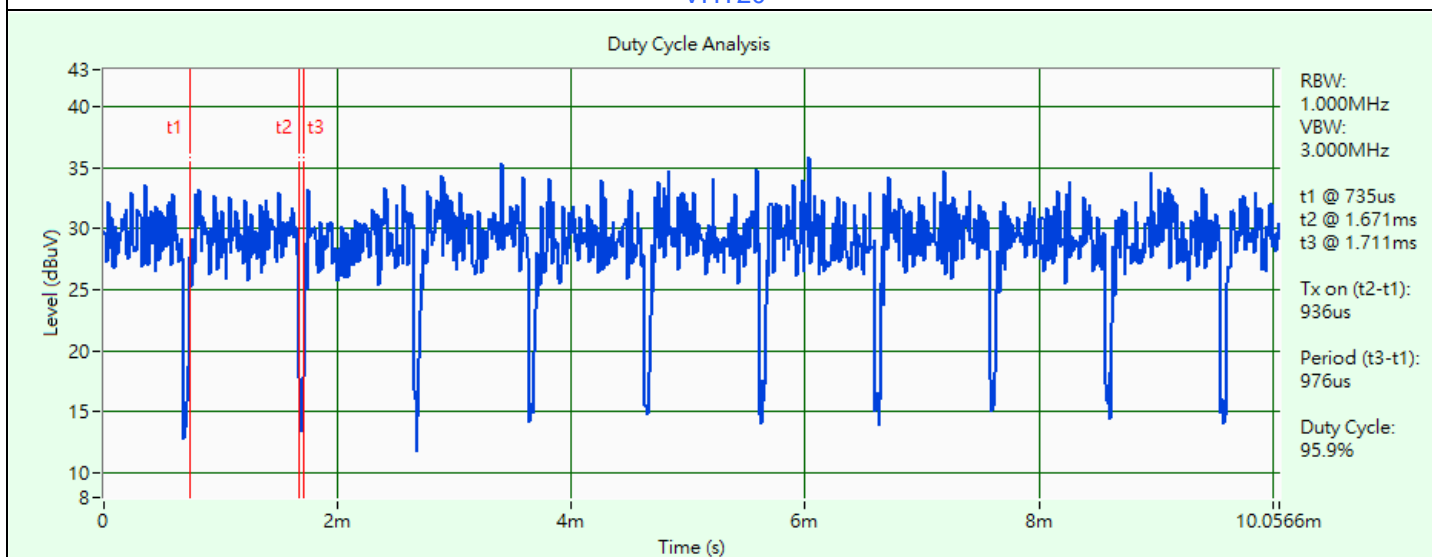
802.11b



802.11g



VHT20

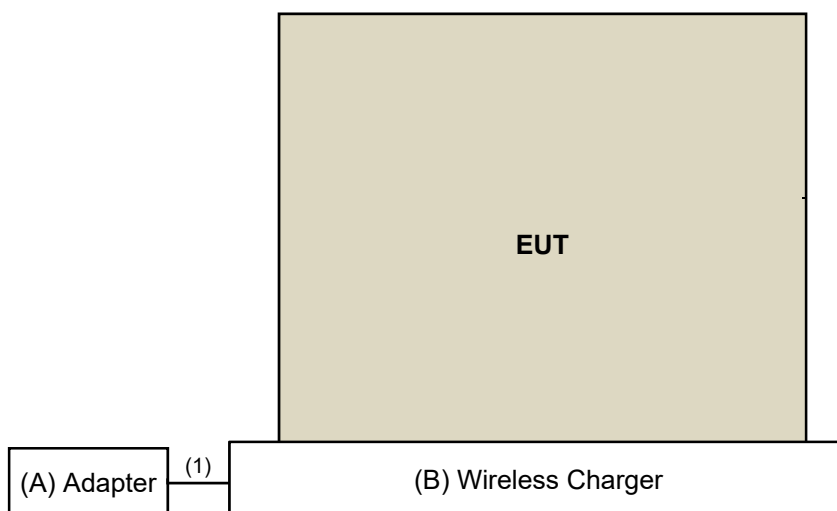


VHT40

3.6 Test Program Used and Operation Descriptions

Controlling software QRCT4 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	Masimo	NY-PW101-05002400	N/A	N/A	Supplied by applicant
B	Wireless Charger	Masimo	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	1	No	0	Supplied by applicant Attached on Wireless Charger

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	2023/1/19	2024/1/18
Wideband Power Sensor Keysight	N1923A	MY58020002	2023/1/18	2024/1/17
		MY58140009	2023/1/18	2024/1/17

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/11/23

4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A
Spectrum Analyzer R&S	FSU43	100115	2023/1/17	2024/1/16

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/11/23

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 HUBER+SUHNER	E1-011276	01	2023/2/1	2024/1/31
	E1-011312	10	2023/1/30	2024/1/29
	E1-011591	17	2023/2/1	2024/1/31
DC-LISN Schwarzbeck	NNBM 8126G	8126G-069	2023/11/7	2024/11/6
EMI Test Receiver R&S	ESR3	102783	2022/12/21	2023/12/20
Fixed Attenuator SGH	BNC10W10dB	PAD-COND2-01	2023/9/2	2024/9/1
LISN R&S	ESH2-Z5	100100	2023/3/7	2024/3/6
	ESH3-Z5	100312	2023/9/12	2024/9/11
RF Coaxial Cable Woken	5D-FB	Cable-cond2-01	2023/9/2	2024/9/1
Software BVADT	BVADT_Cond_ V7.3.7.4	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2023/8/31	2024/8/30

Notes:

1. The test was performed in HY - Conduction 2.
2. Tested Date: 2023/12/11

4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	UNAT_5+	PAD-CH6-01	N/A	N/A
Antenna Tower Controller Max-Full	MF-7802	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-616	2023/10/18	2024/10/17
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Loop Antenna TESEQ	HLA 6121	45745	2023/8/8	2024/8/7
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
Preamplifier Agilent	310N	187226	2023/6/13	2024/6/12
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4)	2023/6/13	2024/6/12
	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2023/6/13	2024/6/12
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	TT-1510	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802	N/A	N/A	N/A

Notes:

1. The test was performed in XD - 966 chamber 6.
2. Tested Date: 2023/12/19

4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	UNAT_5+	PAD-CH6-01	N/A	N/A
Antenna Tower Controller Max-Full	MF-7802	N/A	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	8	N/A	N/A
Horn Antenna ETS-Lindgren	3117	00143293	2023/11/12	2024/11/11
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170241	2023/10/16	2024/10/15
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
Preamplifier Agilent	83017A	MY39501373	2023/6/13	2024/6/12
Preamplifier EMCI	EMC 184045	980116	2023/9/27	2024/9/26
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4)	2023/6/13	2024/6/12
	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2023/6/13	2024/6/12
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	2023/1/7	2024/1/6
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104& EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	2023/1/7	2024/1/6
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	TT-1510	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802	N/A	N/A	N/A

Notes:

1. The test was performed in XD - 966 chamber 6.
2. Tested Date: 2023/11/17

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 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(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 30 dB below the highest level of the desired power:

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

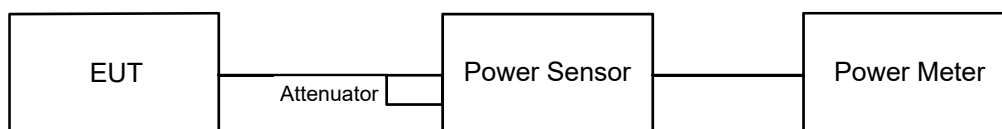
Notes:

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



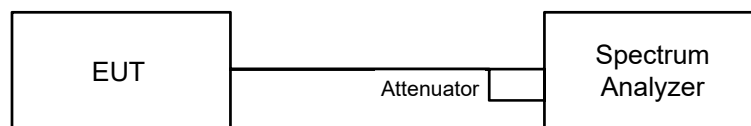
6.1.2 Test Procedure

Average Power:

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



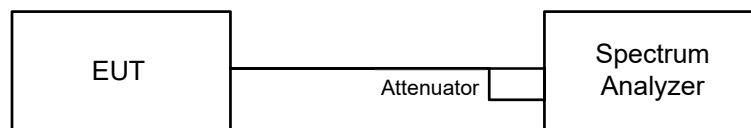
6.2.2 Test Procedure

- 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

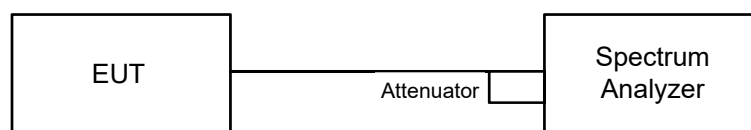


6.3.2 Test Procedure

- 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

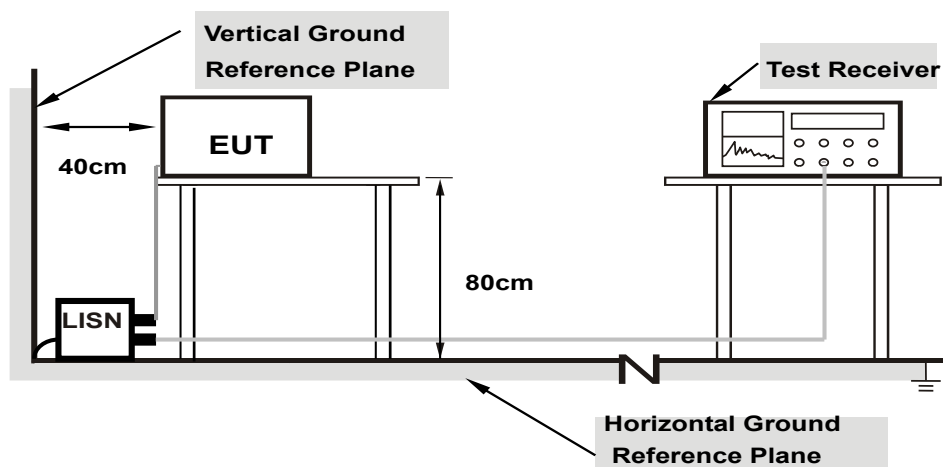
- Set the RBW = 100 kHz.
- Set the VBW ≥ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE 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

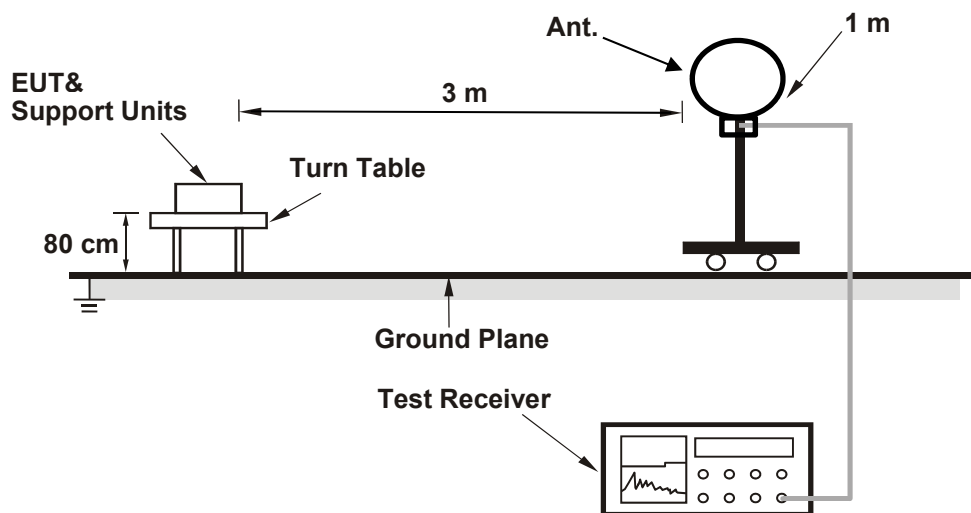
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The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

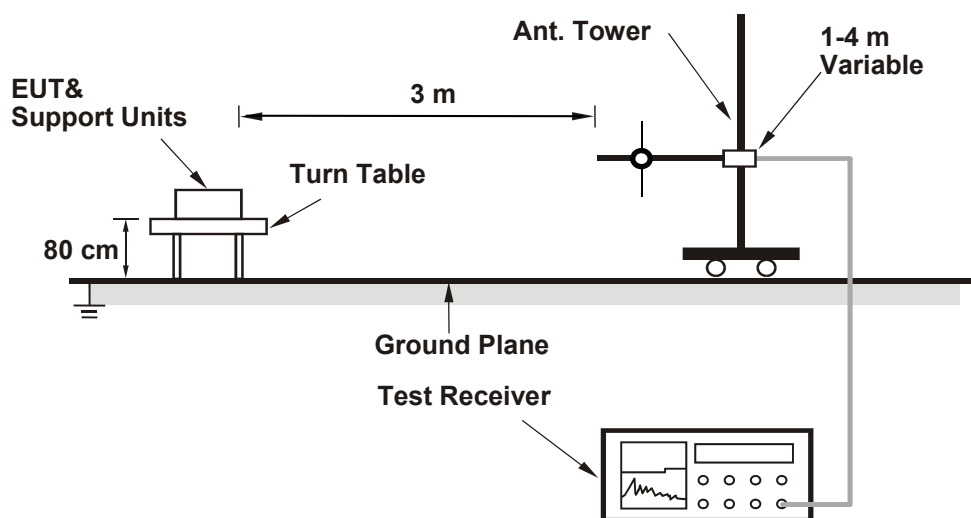
6.6 Unwanted Emissions below 1 GHz

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

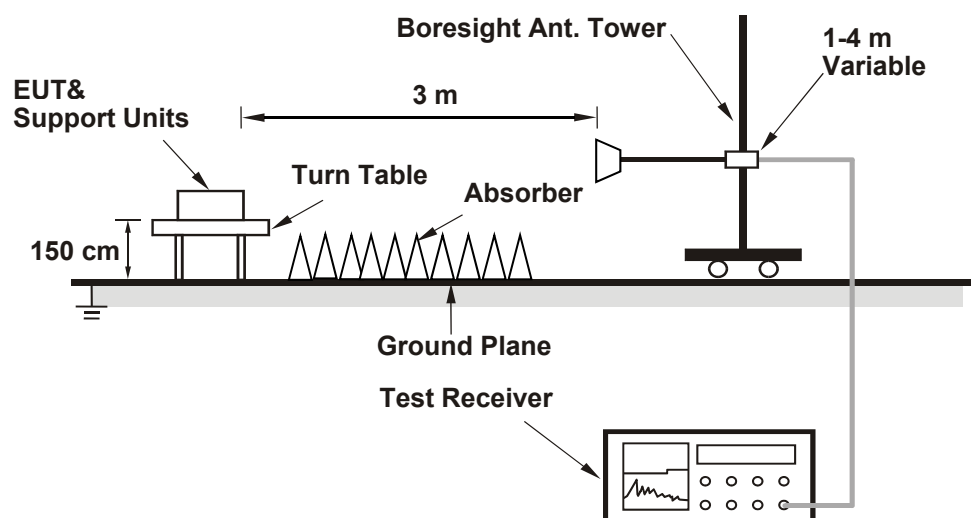
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the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

Input Power:	3.87 Vdc	Environmental Conditions:	25°C, 59% RH	Tested By:	Henry Hsu
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802.11b

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
1	2412	75.336	18.77	30	Pass
6	2437	73.961	18.69	30	Pass
11	2462	74.817	18.74	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
1	2412	97.949	19.91	30	Pass
6	2437	90.573	19.57	30	Pass
11	2462	93.756	19.72	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
1	2412	75.336	18.77	30	Pass
6	2437	78.705	18.96	30	Pass
11	2462	70.795	18.50	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
3	2422	59.979	17.78	30	Pass
6	2437	62.087	17.93	30	Pass
9	2452	56.105	17.49	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

VHT20

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
1	2412	76.033	18.81	30	Pass
6	2437	79.068	18.98	30	Pass
11	2462	71.285	18.53	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

VHT40

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
3	2422	60.395	17.81	30	Pass
6	2437	62.373	17.95	30	Pass
9	2452	56.494	17.52	30	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the output power limit shall not be reduced.

7.2 Power Spectral Density

Input Power:	3.87 Vdc	Environmental Conditions:	25°C, 59% RH	Tested By:	Henry Hsu
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802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
1	2412	-13.08	8	Pass
6	2437	-13.14	8	Pass
11	2462	-13.10	8	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the power density limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
1	2412	-12.70	8	Pass
6	2437	-13.05	8	Pass
11	2462	-12.85	8	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the power density limit shall not be reduced.

VHT20

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
1	2412	-13.06	8	Pass
6	2437	-12.87	8	Pass
11	2462	-13.39	8	Pass

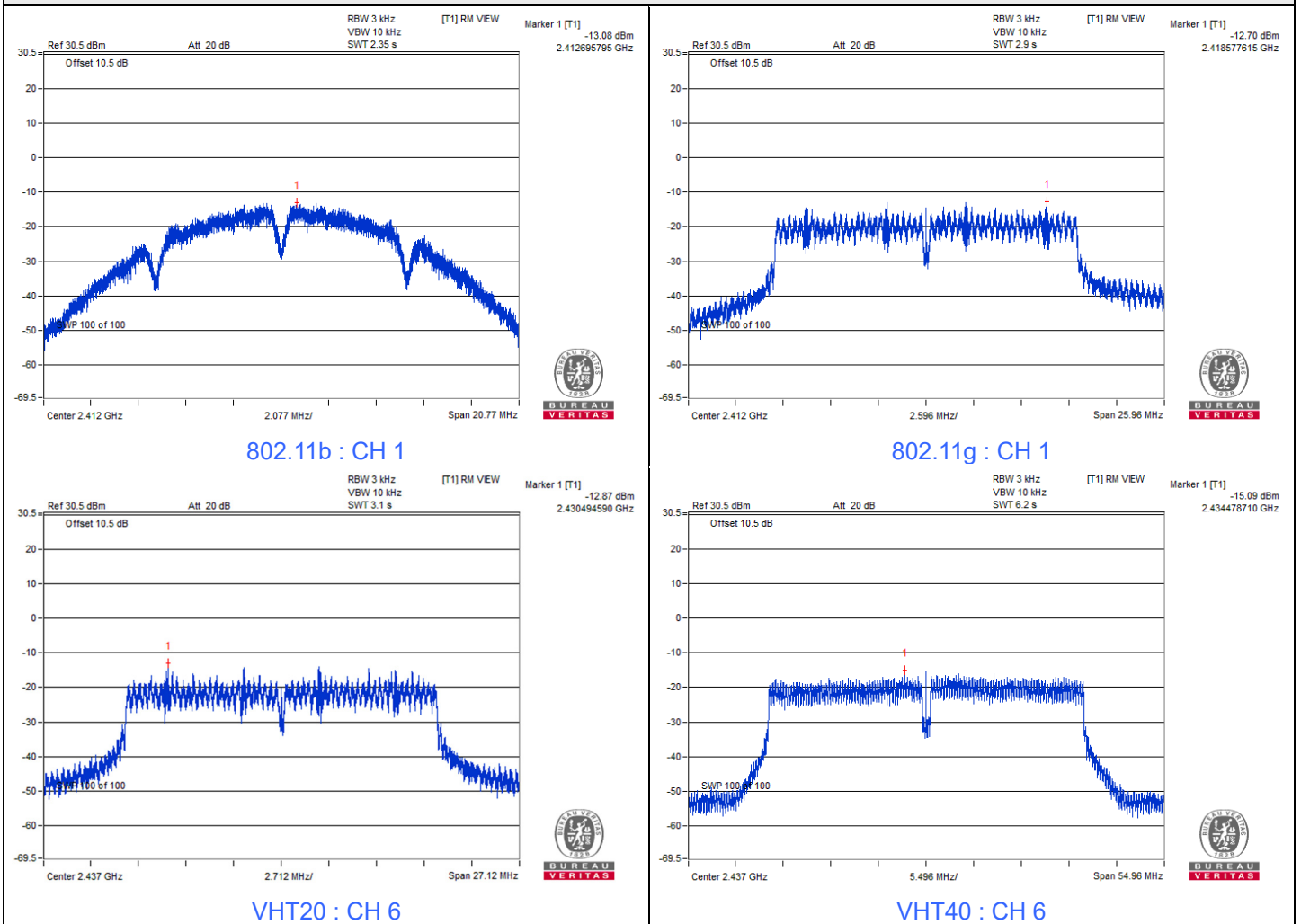
Note: The antenna gain is -5.7 dBi < 6 dBi, so the power density limit shall not be reduced.

VHT40

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
3	2422	-15.15	0.18	-14.97	8	Pass
6	2437	-15.09	0.18	-14.91	8	Pass
9	2452	-15.42	0.18	-15.24	8	Pass

Note: The antenna gain is -5.7 dBi < 6 dBi, so the power density limit shall not be reduced.

Spectrum Plot of Maximum Value



7.3 6 dB Bandwidth

Input Power:	3.87 Vdc	Environmental Conditions:	25°C, 59% RH	Tested By:	Henry Hsu
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802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	8.61	0.5	Pass
6	2437	9.09	0.5	Pass
11	2462	8.6	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	16.54	0.5	Pass
6	2437	16.58	0.5	Pass
11	2462	16.57	0.5	Pass

VHT20

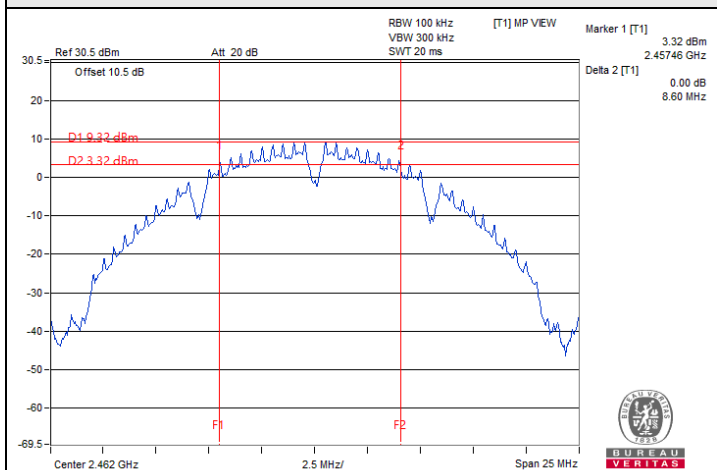
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	16.57	0.5	Pass
6	2437	17.82	0.5	Pass
11	2462	17.82	0.5	Pass

VHT40

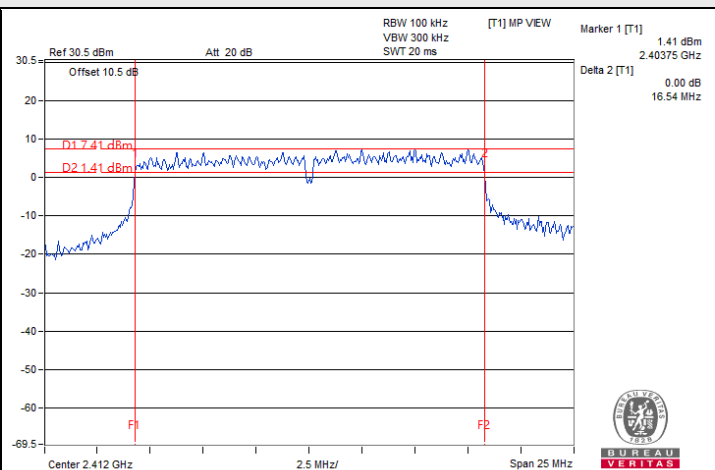
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
3	2422	36.62	0.5	Pass
6	2437	36.46	0.5	Pass
9	2452	36.52	0.5	Pass



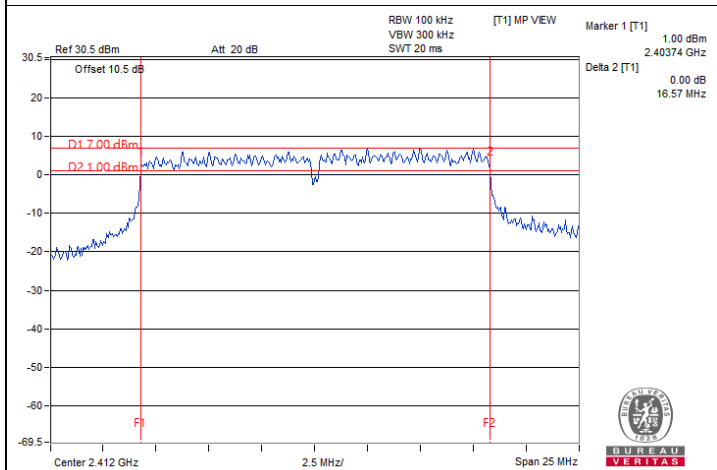
Spectrum Plot of Minimum Value



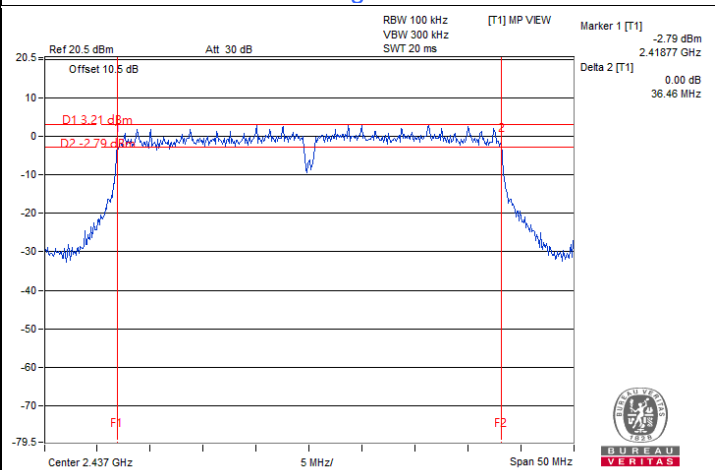
802.11b : CH 11



802.11g : CH 1



VHT20 : CH 1



VHT40 : CH 6



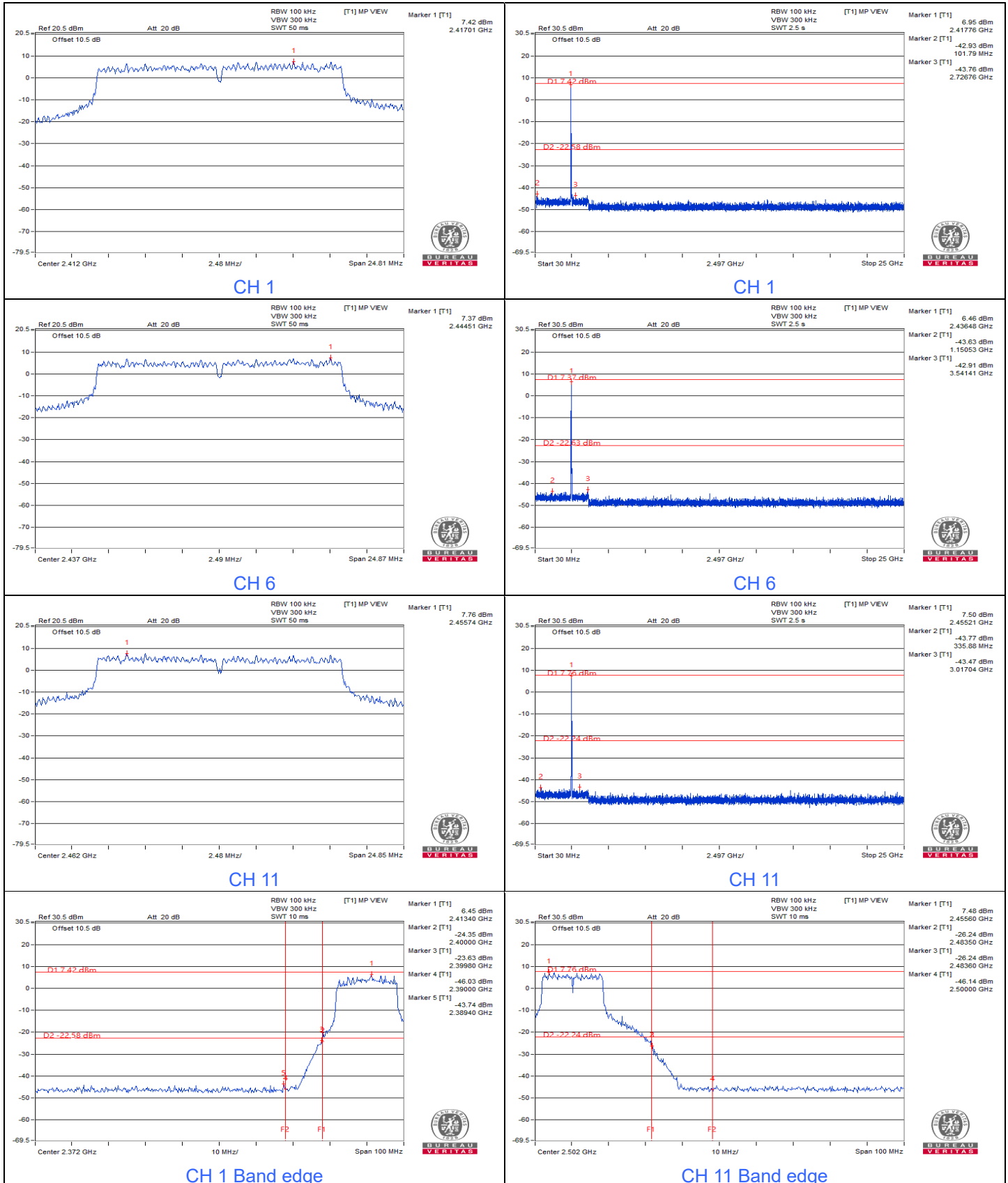
7.4 Conducted Out of Band Emissions

Input Power:	3.87 Vdc	Environmental Conditions:	25°C, 59% RH	Tested By:	Henry Hsu
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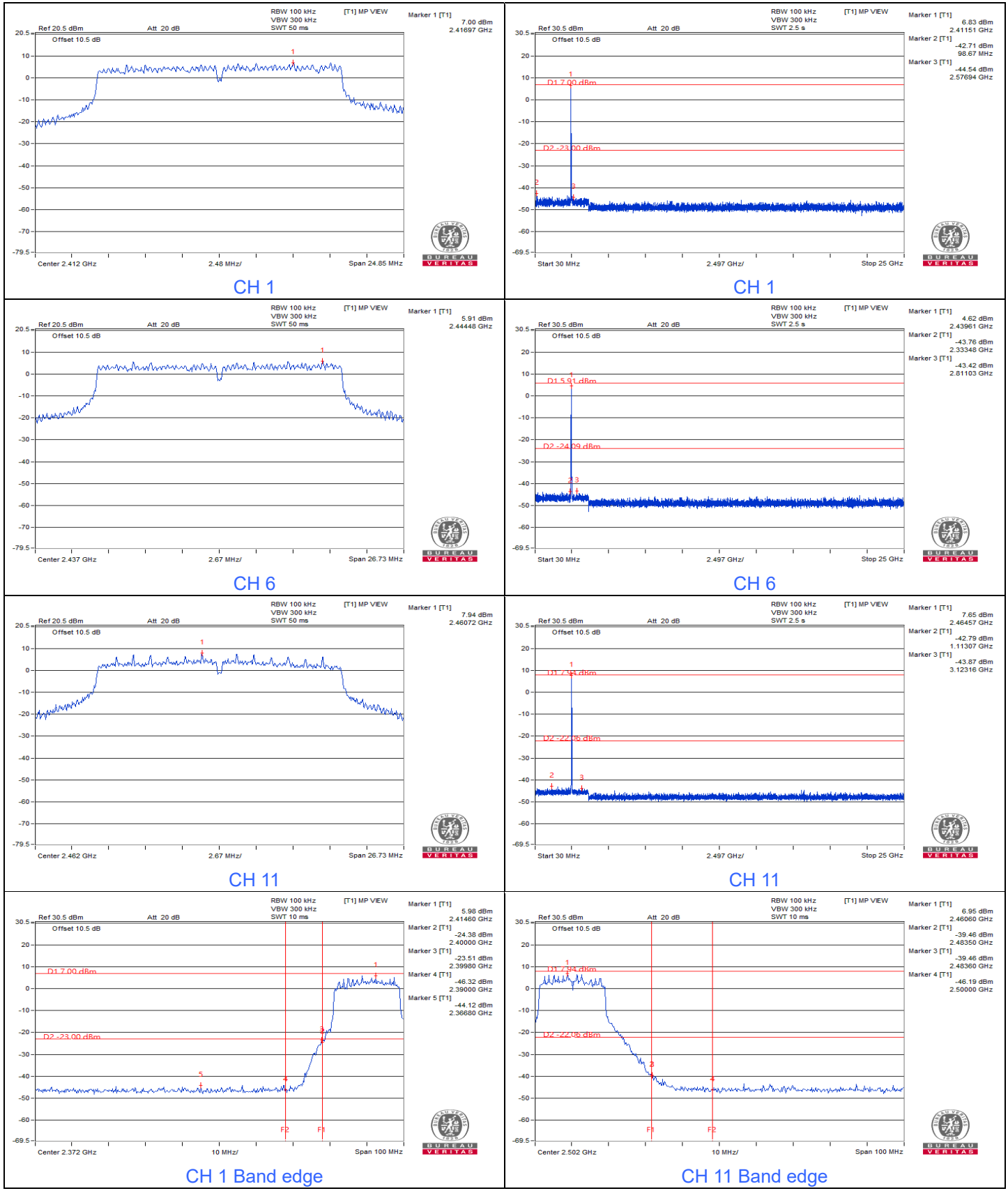
802.11b



802.11g

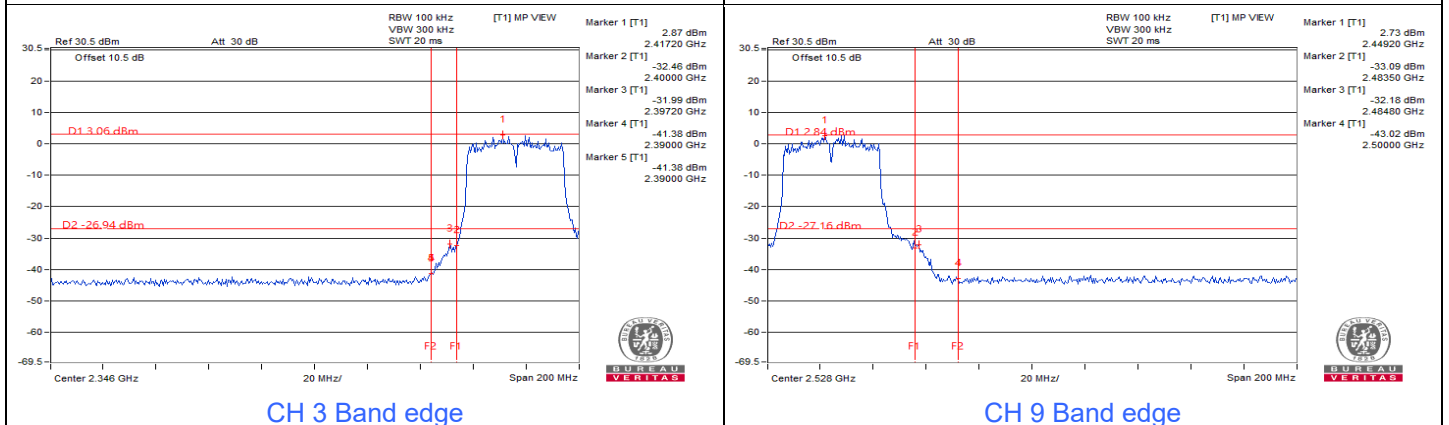
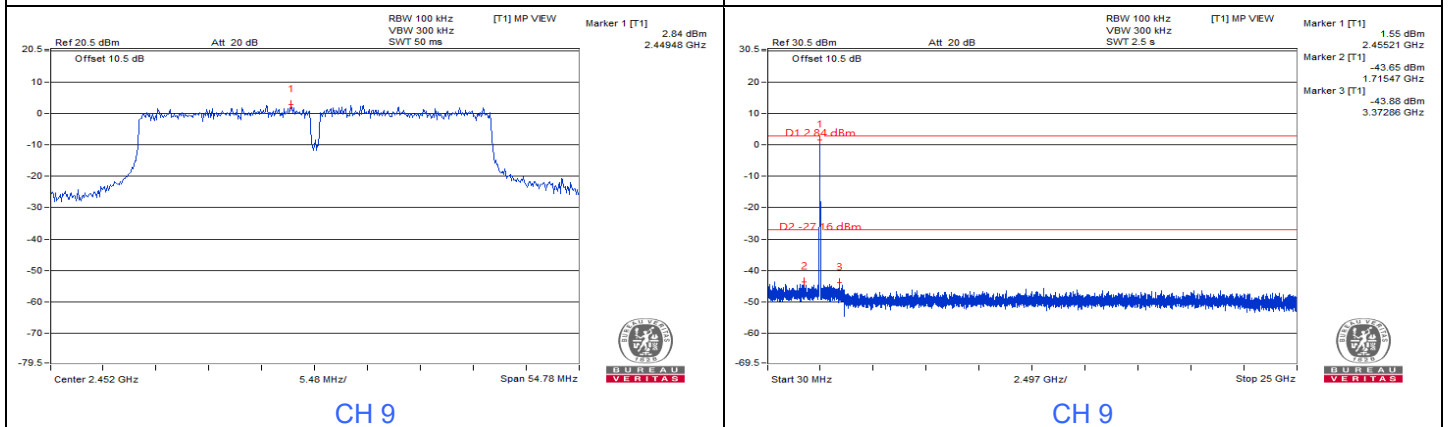
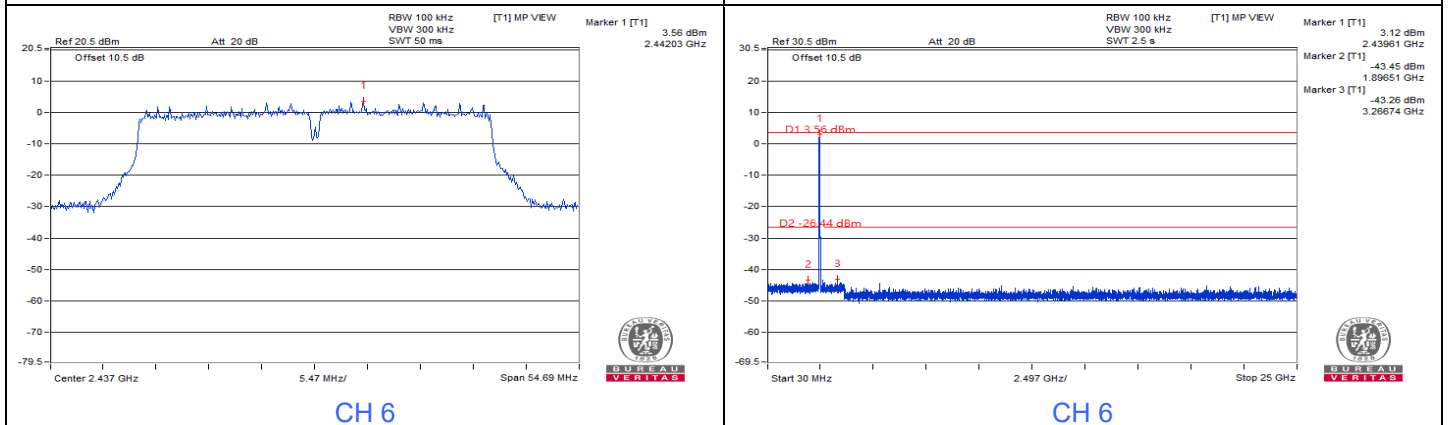
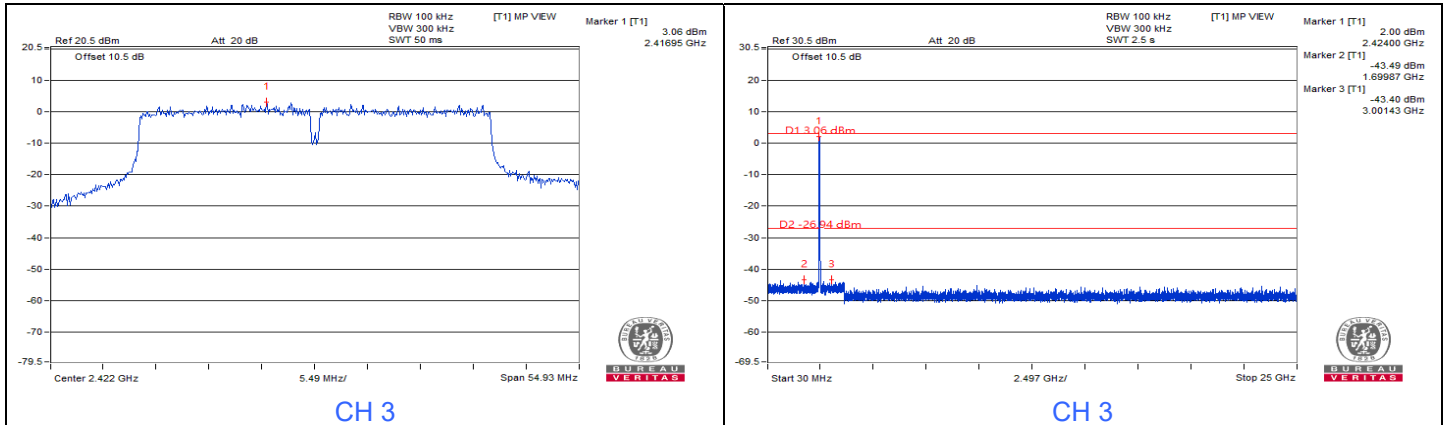


VHT20





VHT40



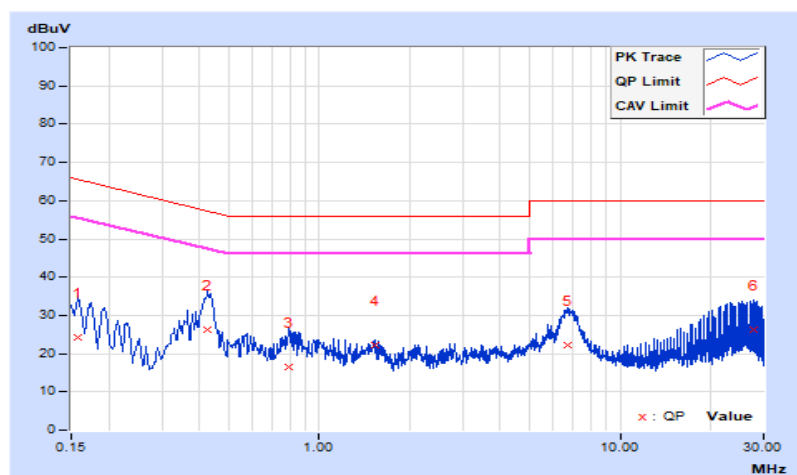
7.5 AC Power Conducted Emissions

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	23°C, 64% RH
Tested By	Vincent Chen		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	10.37	13.98	5.44	24.35	15.81	65.57	55.57	-41.22	-39.76
2	0.42577	10.49	15.89	3.89	26.38	14.38	57.33	47.33	-30.95	-32.95
3	0.79400	10.52	5.82	3.51	16.34	14.03	56.00	46.00	-39.66	-31.97
4	1.53000	10.55	11.70	5.64	22.25	16.19	56.00	46.00	-33.75	-29.81
5	6.71000	10.69	11.40	4.27	22.09	14.96	60.00	50.00	-37.91	-35.04
6	27.71400	10.75	15.63	9.20	26.38	19.95	60.00	50.00	-33.62	-30.05

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

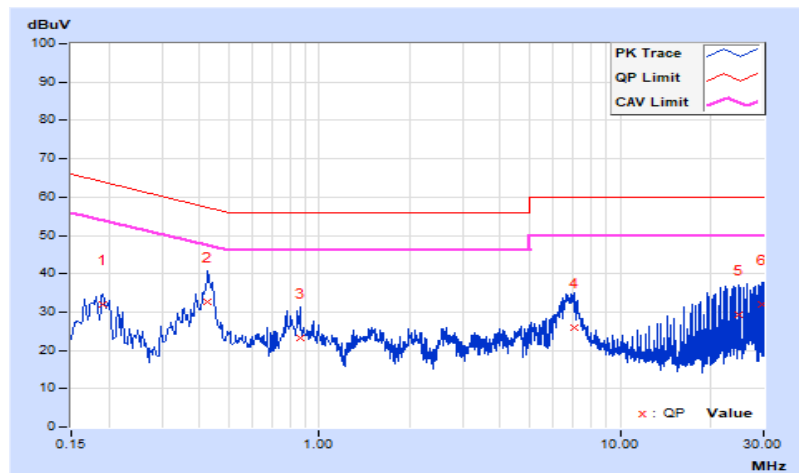


RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 64% RH
Tested By	Vincent Chen		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19000	10.43	21.59	16.75	32.02	27.18	64.04	54.04	-32.02	-26.86
2	0.42600	10.53	21.98	13.41	32.51	23.94	57.33	47.33	-24.82	-23.39
3	0.86200	10.55	12.74	1.95	23.29	12.50	56.00	46.00	-32.71	-33.50
4	7.03400	10.79	15.20	7.06	25.99	17.85	60.00	50.00	-34.01	-32.15
5	24.67000	10.99	18.34	5.37	29.33	16.36	60.00	50.00	-30.67	-33.64
6	29.61000	10.89	21.19	13.68	32.08	24.57	60.00	50.00	-27.92	-25.43

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



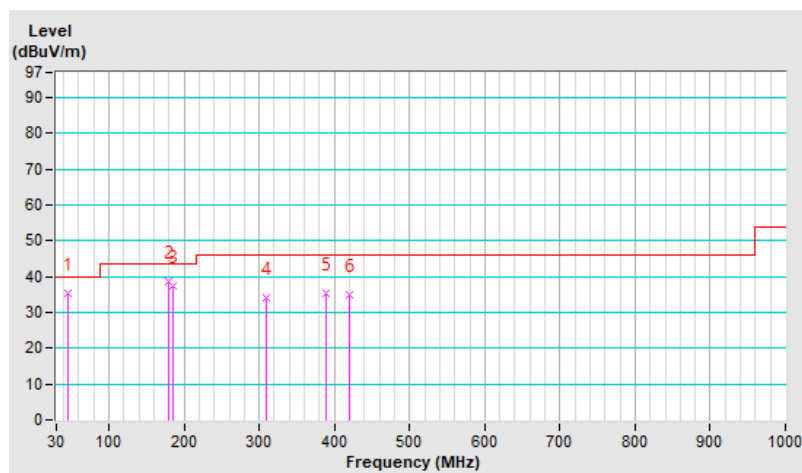
7.6 Unwanted Emissions below 1 GHz

RF Mode	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, 60% RH
Tested By	Charles Hsiao		

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	45.66	35.4 QP	40.0	-4.6	1.45 H	19	53.1	-17.7
2	180.00	38.6 QP	43.5	-4.9	1.59 H	355	57.8	-19.2
3	184.44	37.4 QP	43.5	-6.1	1.41 H	40	57.2	-19.8
4	310.26	34.3 QP	46.0	-11.7	1.56 H	29	51.1	-16.8
5	388.84	35.5 QP	46.0	-10.5	1.55 H	105	50.3	-14.8
6	419.99	35.1 QP	46.0	-10.9	1.54 H	172	49.4	-14.3

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 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.

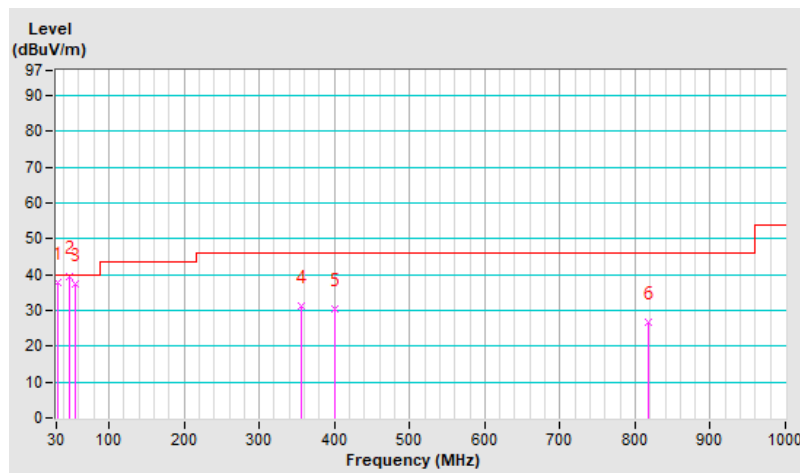


RF Mode	802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Charles Hsiao		

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	32.89	38.0 QP	40.0	-2.0	1.54 V	114	57.2	-19.2
2	46.74	39.3 QP	40.0	-0.7	1.58 V	206	57.1	-17.8
3	54.45	37.2 QP	40.0	-2.8	1.59 V	204	55.2	-18.0
4	356.64	31.4 QP	46.0	-14.6	1.75 V	14	47.2	-15.8
5	400.20	30.6 QP	46.0	-15.4	1.59 V	322	45.2	-14.6
6	817.00	26.8 QP	46.0	-19.2	1.54 V	250	33.8	-7.0

Remarks:

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

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	25°C, 60% RH
Tested By	Karl Lee		

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	53.0 PK	74.0	-21.0	1.43 H	226	46.0	7.0
2	2390.00	41.2 AV	54.0	-12.8	1.43 H	226	34.2	7.0
3	*2412.00	95.1 PK			1.43 H	226	57.2	37.9
4	*2412.00	92.7 AV			1.43 H	226	54.8	37.9
5	4824.00	51.3 PK	74.0	-22.7	2.50 H	142	39.4	11.9
6	4824.00	45.6 AV	54.0	-8.4	2.50 H	142	33.7	11.9
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	53.4 PK	74.0	-20.6	1.05 V	343	46.4	7.0
2	2390.00	43.2 AV	54.0	-10.8	1.05 V	343	36.2	7.0
3	*2412.00	97.1 PK			1.05 V	343	59.2	37.9
4	*2412.00	94.7 AV			1.05 V	343	56.8	37.9
5	4824.00	48.5 PK	74.0	-25.5	2.35 V	192	36.6	11.9
6	4824.00	41.2 AV	54.0	-12.8	2.35 V	192	29.3	11.9

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	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	25°C, 60% RH
Tested By	Karl Lee		

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	95.4 PK			1.37 H	236	57.6	37.8
2	*2437.00	92.9 AV			1.37 H	236	55.1	37.8
3	4874.00	52.2 PK	74.0	-21.8	1.78 H	263	40.1	12.1
4	4874.00	46.3 AV	54.0	-7.7	1.78 H	263	34.2	12.1

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	*2437.00	97.6 PK			1.12 V	330	59.8	37.8
2	*2437.00	95.2 AV			1.12 V	330	57.4	37.8
3	4874.00	48.9 PK	74.0	-25.1	2.14 V	263	36.8	12.1
4	4874.00	41.5 AV	54.0	-12.5	2.14 V	263	29.4	12.1

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	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	25°C, 60% RH
Tested By	Karl Lee		

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	96.8 PK			1.37 H	232	59.0	37.8
2	*2462.00	94.3 AV			1.37 H	232	56.5	37.8
3	2483.50	53.9 PK	74.0	-20.1	1.37 H	232	46.7	7.2
4	2483.50	42.4 AV	54.0	-11.6	1.37 H	232	35.2	7.2
5	4924.00	52.5 PK	74.0	-21.5	1.27 H	234	40.2	12.3
6	4924.00	47.0 AV	54.0	-7.0	1.27 H	234	34.7	12.3

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	*2462.00	98.6 PK			1.24 V	344	60.8	37.8
2	*2462.00	96.3 AV			1.24 V	344	58.5	37.8
3	2483.50	53.9 PK	74.0	-20.1	1.24 V	344	46.7	7.2
4	2483.50	42.5 AV	54.0	-11.5	1.24 V	344	35.3	7.2
5	4924.00	49.9 PK	74.0	-24.1	1.15 V	294	37.6	12.3
6	4924.00	42.3 AV	54.0	-11.7	1.15 V	294	30.0	12.3

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 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	25°C, 60% RH
Tested By	Karl Lee		

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	52.6 PK	74.0	-21.4	1.43 H	226	45.6	7.0
2	2390.00	41.7 AV	54.0	-12.3	1.43 H	226	34.7	7.0
3	*2412.00	97.6 PK			1.43 H	226	59.7	37.9
4	*2412.00	88.9 AV			1.43 H	226	51.0	37.9
5	4824.00	48.4 PK	74.0	-25.6	1.12 H	135	36.5	11.9
6	4824.00	40.7 AV	54.0	-13.3	1.12 H	135	28.8	11.9

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	52.2 PK	74.0	-21.8	1.05 V	343	45.2	7.0
2	2390.00	42.0 AV	54.0	-12.0	1.05 V	343	35.0	7.0
3	*2412.00	98.6 PK			1.05 V	343	60.7	37.9
4	*2412.00	90.6 AV			1.05 V	343	52.7	37.9
5	4824.00	48.6 PK	74.0	-25.4	1.64 V	222	36.7	11.9
6	4824.00	41.0 AV	54.0	-13.0	1.64 V	222	29.1	11.9

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	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=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Karl Lee		

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	101.7 PK			1.37 H	236	63.9	37.8
2	*2437.00	93.4 AV			1.37 H	236	55.6	37.8
3	4874.00	48.5 PK	74.0	-25.5	1.53 H	282	36.4	12.1
4	4874.00	40.9 AV	54.0	-13.1	1.53 H	282	28.8	12.1

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	*2437.00	103.5 PK			1.12 V	330	65.7	37.8
2	*2437.00	94.9 AV			1.12 V	330	57.1	37.8
3	4874.00	49.2 PK	74.0	-24.8	1.66 V	53	37.1	12.1
4	4874.00	41.5 AV	54.0	-12.5	1.66 V	53	29.4	12.1

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	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=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Karl Lee		

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	94.1 PK			1.37 H	232	56.3	37.8
2	*2462.00	85.8 AV			1.37 H	232	48.0	37.8
3	2483.50	60.4 PK	74.0	-13.6	1.37 H	232	53.2	7.2
4	2483.50	47.3 AV	54.0	-6.7	1.37 H	232	40.1	7.2
5	4924.00	50.7 PK	74.0	-23.3	1.94 H	26	38.4	12.3
6	4924.00	43.1 AV	54.0	-10.9	1.94 H	26	30.8	12.3

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	*2462.00	96.3 PK			2.14 V	344	58.5	37.8
2	*2462.00	87.3 AV			2.14 V	344	49.5	37.8
3	2483.50	63.2 PK	74.0	-10.8	2.14 V	344	56.0	7.2
4	2483.50	49.8 AV	54.0	-4.2	2.14 V	344	42.6	7.2
5	4924.00	49.6 PK	74.0	-24.4	1.27 V	142	37.3	12.3
6	4924.00	42.1 AV	54.0	-11.9	1.27 V	142	29.8	12.3

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	VHT20	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	25°C, 60% RH
Tested By	Karl Lee		

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	52.8 PK	74.0	-21.2	1.43 H	226	45.8	7.0
2	2390.00	41.9 AV	54.0	-12.1	1.43 H	226	34.9	7.0
3	*2412.00	96.4 PK			1.43 H	226	58.5	37.9
4	*2412.00	88.5 AV			1.43 H	226	50.6	37.9
5	4824.00	48.9 PK	74.0	-25.1	1.35 H	128	37.0	11.9
6	4824.00	41.2 AV	54.0	-12.8	1.35 H	128	29.3	11.9

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	52.7 PK	74.0	-21.3	1.05 V	343	45.7	7.0
2	2390.00	42.2 AV	54.0	-11.8	1.05 V	343	35.2	7.0
3	*2412.00	98.5 PK			1.05 V	343	60.6	37.9
4	*2412.00	90.3 AV			1.05 V	343	52.4	37.9
5	4824.00	48.4 PK	74.0	-25.6	2.50 V	317	36.5	11.9
6	4824.00	40.7 AV	54.0	-13.3	2.50 V	317	28.8	11.9

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	VHT20	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	25°C, 60% RH
Tested By	Karl Lee		

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	100.1 PK			1.37 H	236	62.3	37.8
2	*2437.00	90.9 AV			1.37 H	236	53.1	37.8
3	4874.00	49.3 PK	74.0	-24.7	1.94 H	211	37.2	12.1
4	4874.00	41.7 AV	54.0	-12.3	1.94 H	211	29.6	12.1

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	*2437.00	100.9 PK			1.12 V	330	63.1	37.8
2	*2437.00	92.5 AV			1.12 V	330	54.7	37.8
3	4874.00	48.8 PK	74.0	-25.2	1.04 V	327	36.7	12.1
4	4874.00	41.1 AV	54.0	-12.9	1.04 V	327	29.0	12.1

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	VHT20	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	25°C, 60% RH
Tested By	Karl Lee		

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	96.6 PK			1.35 H	232	58.8	37.8
2	*2462.00	87.6 AV			1.35 H	232	49.8	37.8
3	2483.50	60.1 PK	74.0	-13.9	1.35 H	232	52.9	7.2
4	2483.50	48.4 AV	54.0	-5.6	1.35 H	232	41.2	7.2
5	4924.00	49.5 PK	74.0	-24.5	1.14 H	14	37.2	12.3
6	4924.00	42.0 AV	54.0	-12.0	1.14 H	14	29.7	12.3
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	*2462.00	97.6 PK			2.14 V	344	59.8	37.8
2	*2462.00	88.9 AV			2.14 V	344	51.1	37.8
3	2483.50	62.3 PK	74.0	-11.7	2.14 V	344	55.1	7.2
4	2483.50	50.1 AV	54.0	-3.9	2.14 V	344	42.9	7.2
5	4924.00	49.4 PK	74.0	-24.6	2.71 V	150	37.1	12.3
6	4924.00	41.8 AV	54.0	-12.2	2.71 V	150	29.5	12.3

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	VHT40	Channel	CH 3 : 2422 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=2 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Karl Lee		

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	53.2 PK	74.0	-20.8	1.47 H	209	46.2	7.0
2	2390.00	41.5 AV	54.0	-12.5	1.47 H	209	34.5	7.0
3	*2422.00	91.4 PK			1.47 H	209	53.6	37.8
4	*2422.00	82.2 AV			1.47 H	209	44.4	37.8
5	2483.50	52.6 PK	74.0	-21.4	1.47 H	209	45.4	7.2
6	2483.50	41.5 AV	54.0	-12.5	1.47 H	209	34.3	7.2
7	4844.00	48.3 PK	74.0	-25.7	1.72 H	155	36.3	12.0
8	4844.00	40.6 AV	54.0	-13.4	1.72 H	155	28.6	12.0
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	52.9 PK	74.0	-21.1	1.05 V	359	45.9	7.0
2	2390.00	41.5 AV	54.0	-12.5	1.05 V	359	34.5	7.0
3	*2422.00	92.9 PK			1.05 V	359	55.1	37.8
4	*2422.00	83.4 AV			1.05 V	359	45.6	37.8
5	2483.50	52.8 PK	74.0	-21.2	1.05 V	359	45.6	7.2
6	2483.50	41.3 AV	54.0	-12.7	1.05 V	359	34.1	7.2
7	4844.00	49.1 PK	74.0	-24.9	1.49 V	243	37.1	12.0
8	4844.00	41.3 AV	54.0	-12.7	1.49 V	243	29.3	12.0

Remarks:

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

RF Mode	VHT40	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=2 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Karl Lee		

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	96.6 PK			1.37 H	236	58.8	37.8
2	*2437.00	88.2 AV			1.37 H	236	50.4	37.8
3	4874.00	48.5 PK	74.0	-25.5	1.55 H	24	36.4	12.1
4	4874.00	40.8 AV	54.0	-13.2	1.55 H	24	28.7	12.1
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	*2437.00	97.9 PK			1.12 V	330	60.1	37.8
2	*2437.00	89.6 AV			1.12 V	330	51.8	37.8
3	4874.00	49.0 PK	74.0	-25.0	2.02 V	118	36.9	12.1
4	4874.00	41.4 AV	54.0	-12.6	2.02 V	118	29.3	12.1

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	VHT40	Channel	CH 9 : 2452 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=2 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 60% RH
Tested By	Karl Lee		

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	53.2 PK	74.0	-20.8	1.00 H	260	46.2	7.0
2	2390.00	41.6 AV	54.0	-12.4	1.00 H	260	34.6	7.0
3	*2452.00	90.1 PK			1.52 H	260	52.3	37.8
4	*2452.00	81.7 AV			1.52 H	260	43.9	37.8
5	2483.50	59.7 PK	74.0	-14.3	1.52 H	260	52.5	7.2
6	2483.50	48.6 AV	54.0	-5.4	1.52 H	260	41.4	7.2
7	4904.00	49.4 PK	74.0	-24.6	1.91 H	254	37.2	12.2
8	4904.00	41.7 AV	54.0	-12.3	1.91 H	254	29.5	12.2

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	52.9 PK	74.0	-21.1	1.76 V	339	45.9	7.0
2	2390.00	41.5 AV	54.0	-12.5	1.76 V	339	34.5	7.0
3	*2452.00	92.0 PK			1.76 V	339	54.2	37.8
4	*2452.00	83.6 AV			1.76 V	339	45.8	37.8
5	2483.50	61.8 PK	74.0	-12.2	1.76 V	339	54.6	7.2
6	2483.50	50.4 AV	54.0	-3.6	1.76 V	339	43.2	7.2
7	4904.00	49.7 PK	74.0	-24.3	1.83 V	16	37.5	12.2
8	4904.00	42.1 AV	54.0	-11.9	1.83 V	16	29.9	12.2

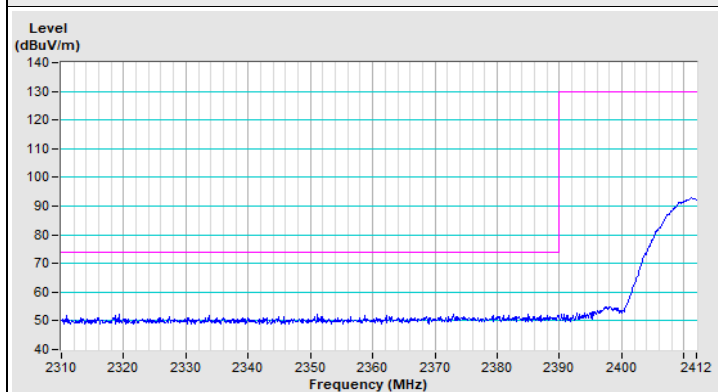
Remarks:

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

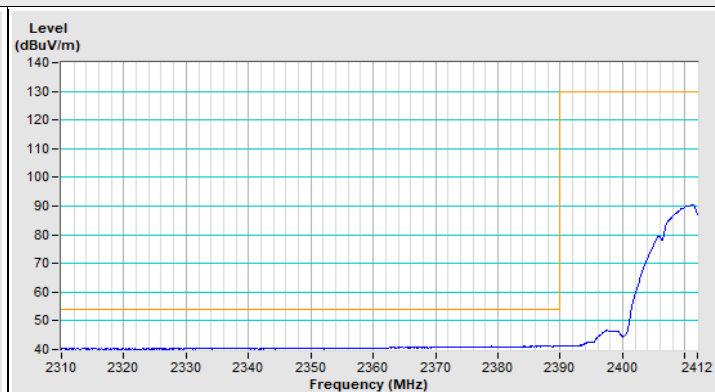


Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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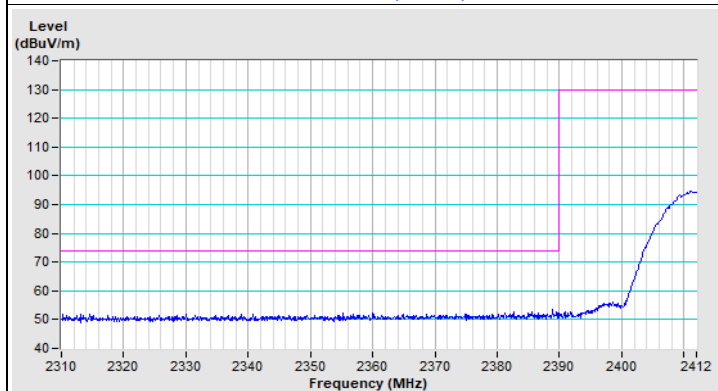
802.11b Channel 1



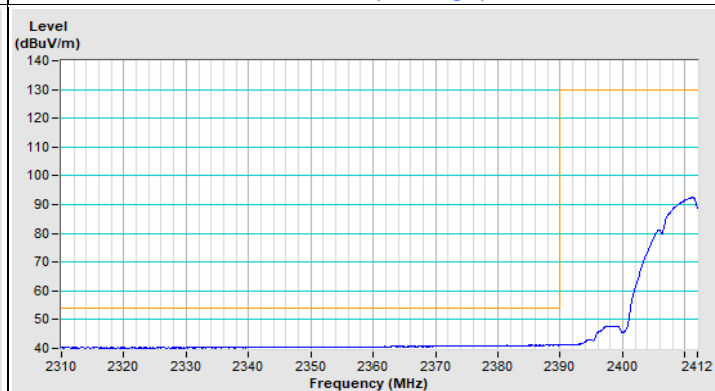
Horizontal (Peak)



Horizontal (Average)



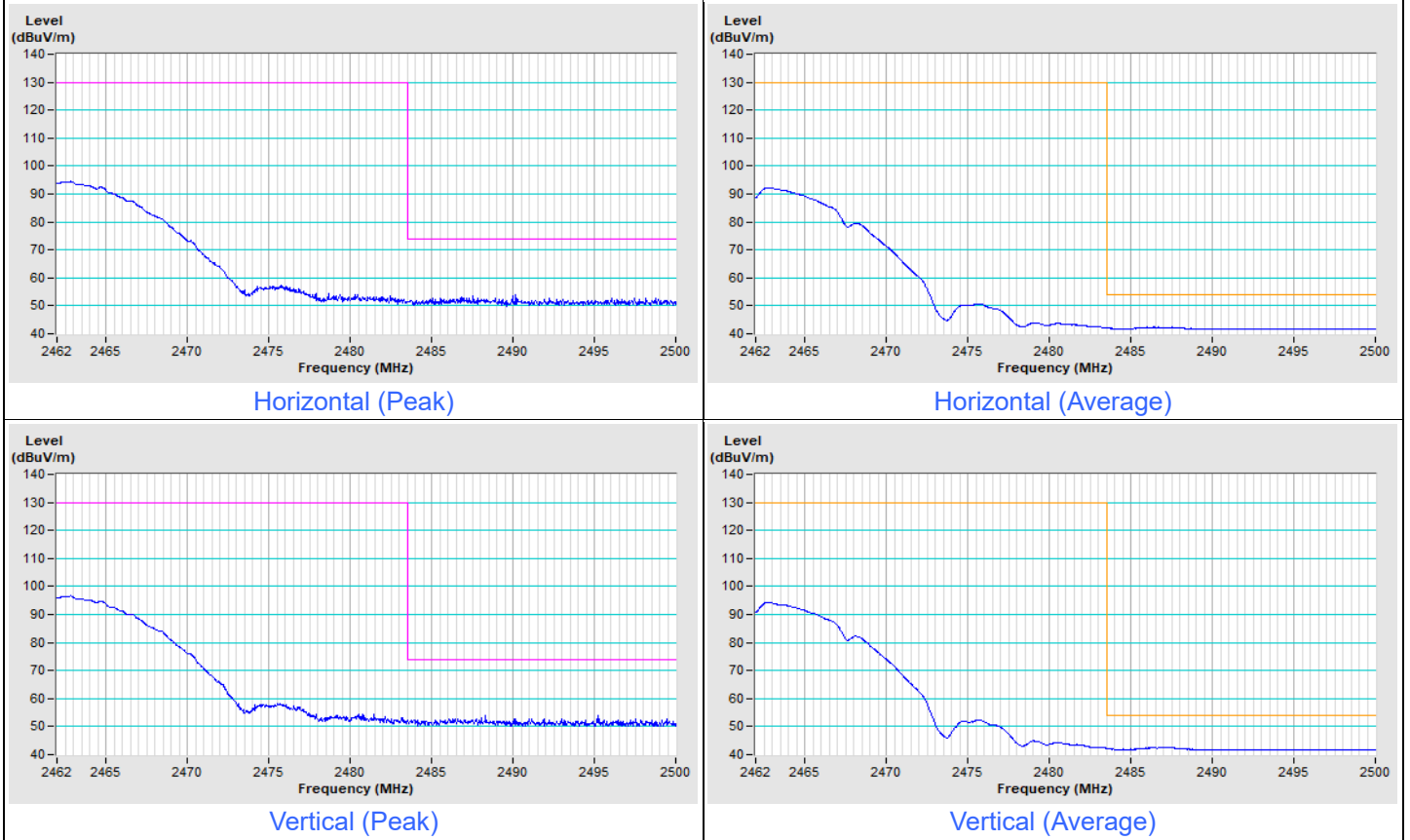
Vertical (Peak)



Vertical (Average)

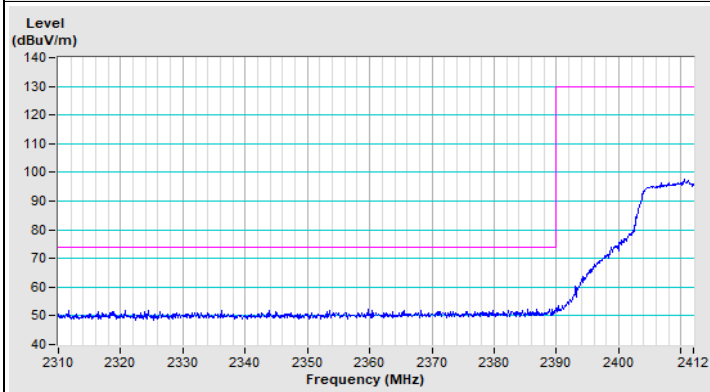
Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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802.11b Channel 11

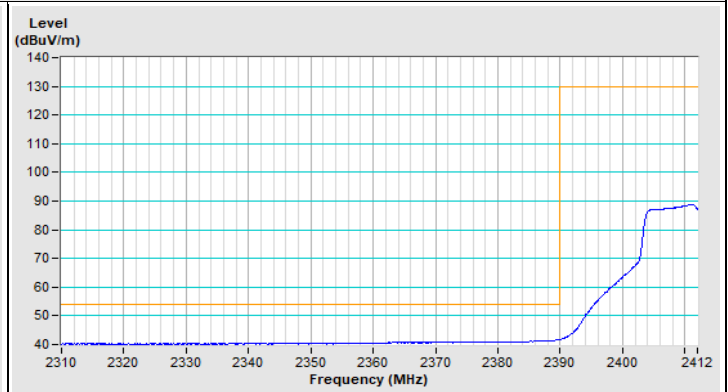


Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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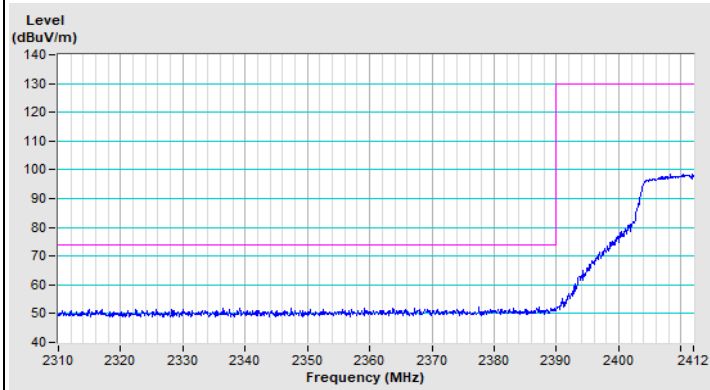
802.11g Channel 1



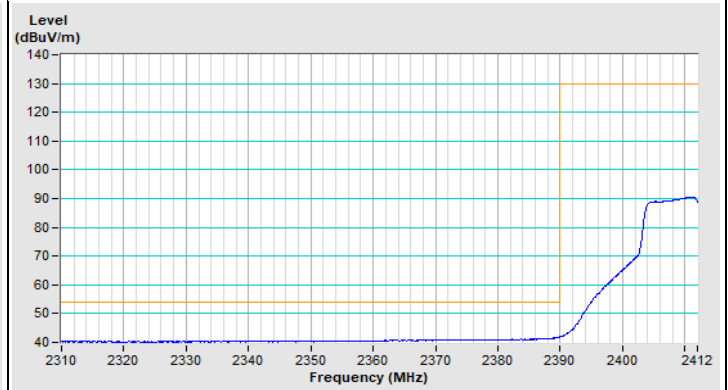
Horizontal (Peak)



Horizontal (Average)



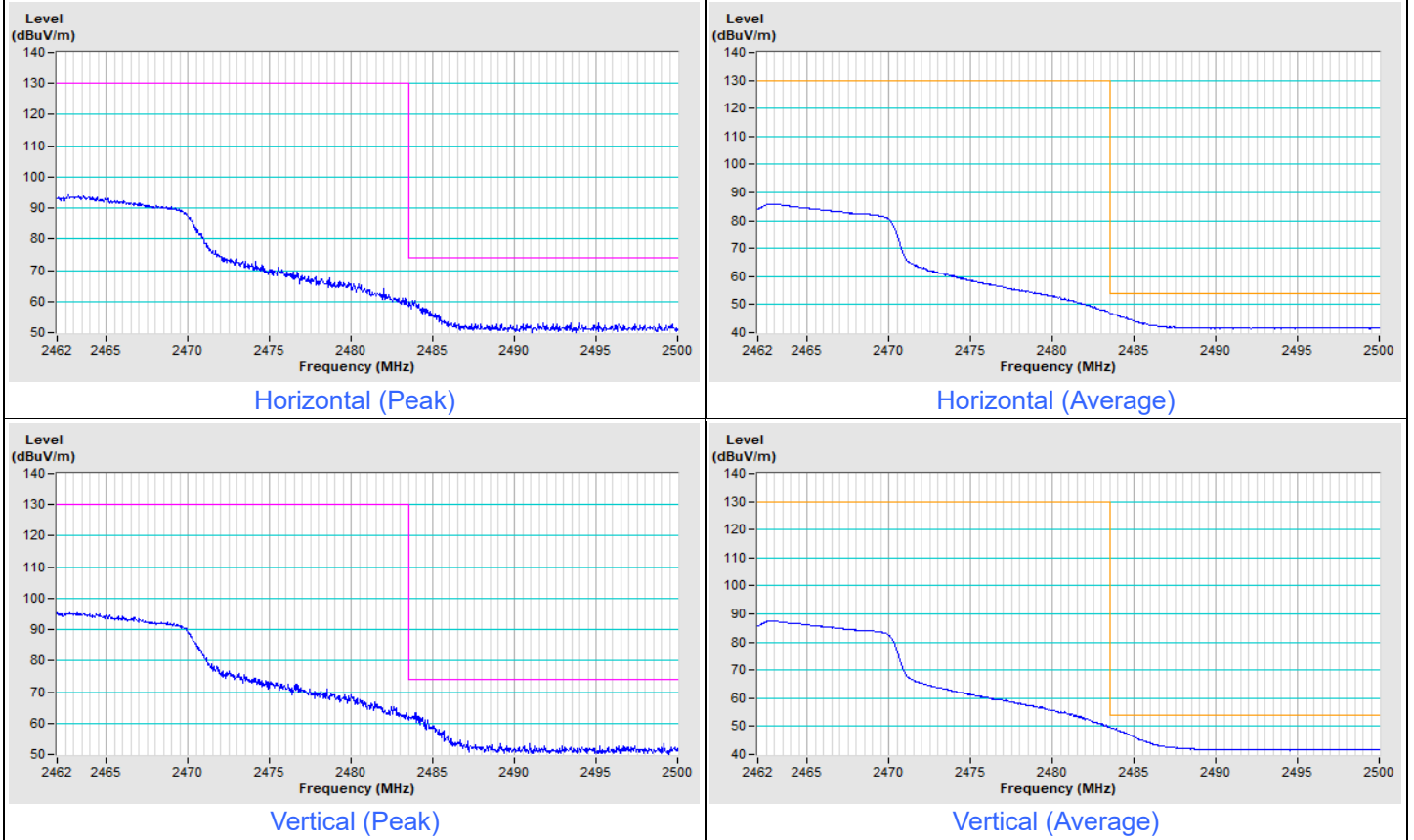
Vertical (Peak)



Vertical (Average)

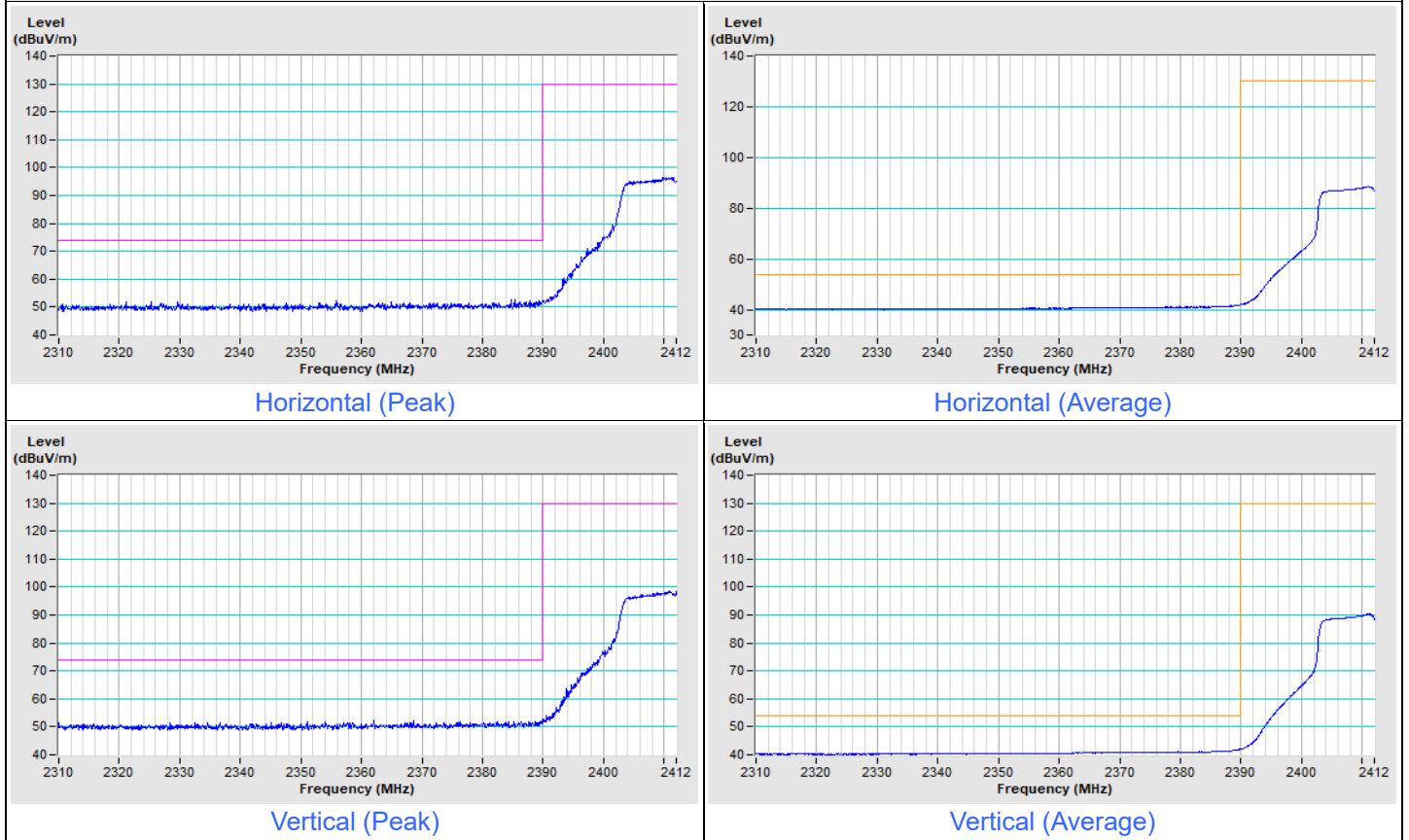
Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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802.11g Channel 11



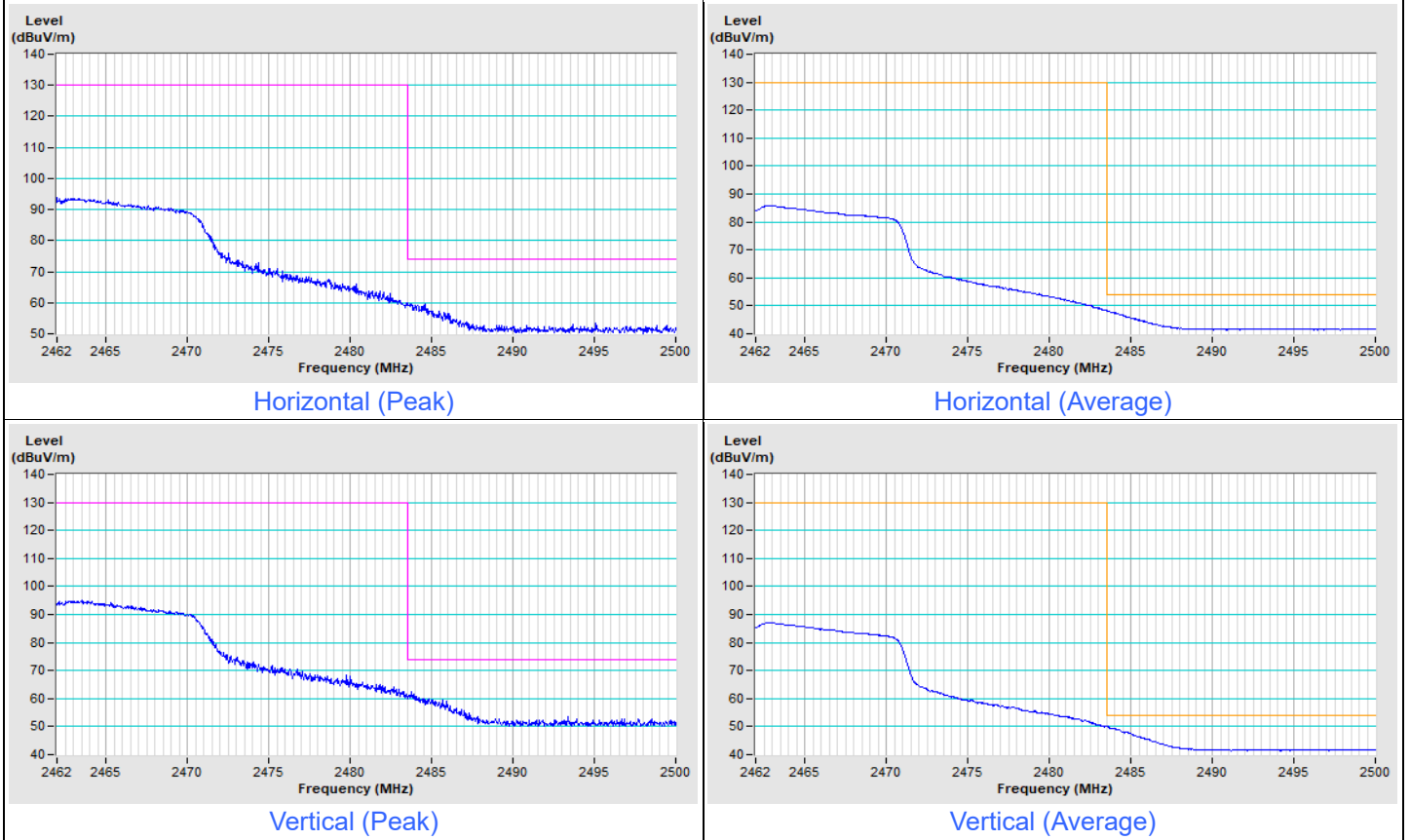
Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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VHT20 Channel 1



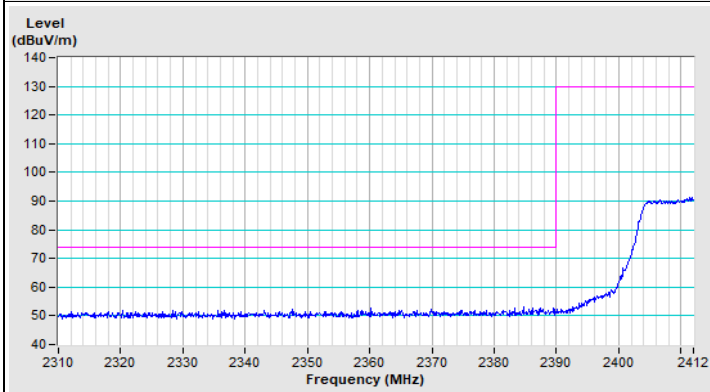
Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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VHT20 Channel 11

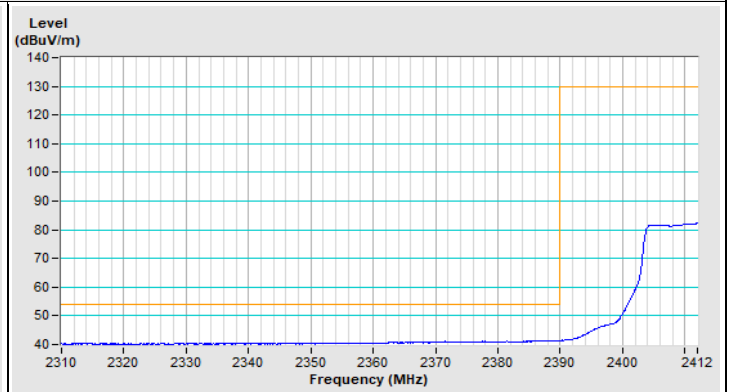


Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=2 kHz, DET=Peak
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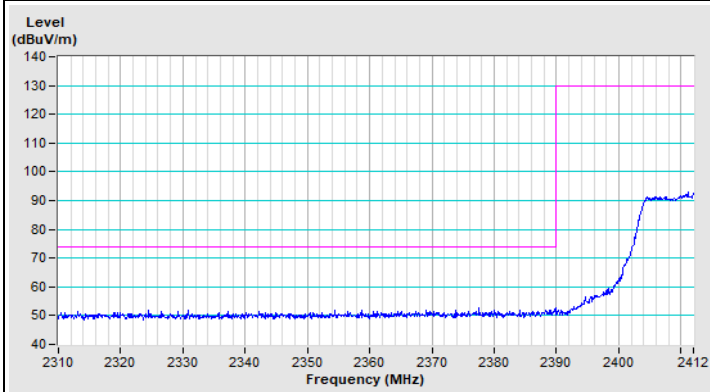
VHT40 Channel 3



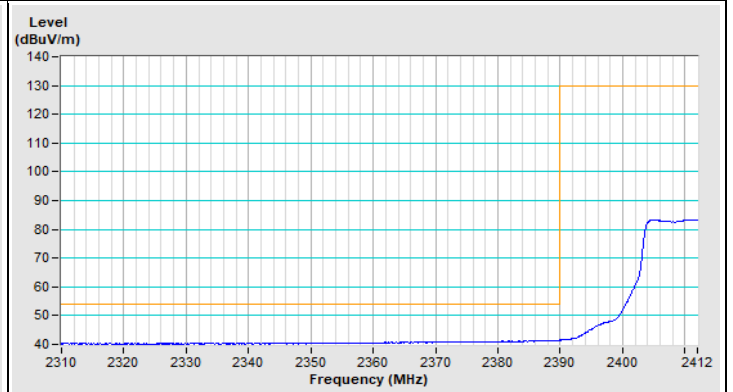
Horizontal (Peak)



Horizontal (Average)



Vertical (Peak)

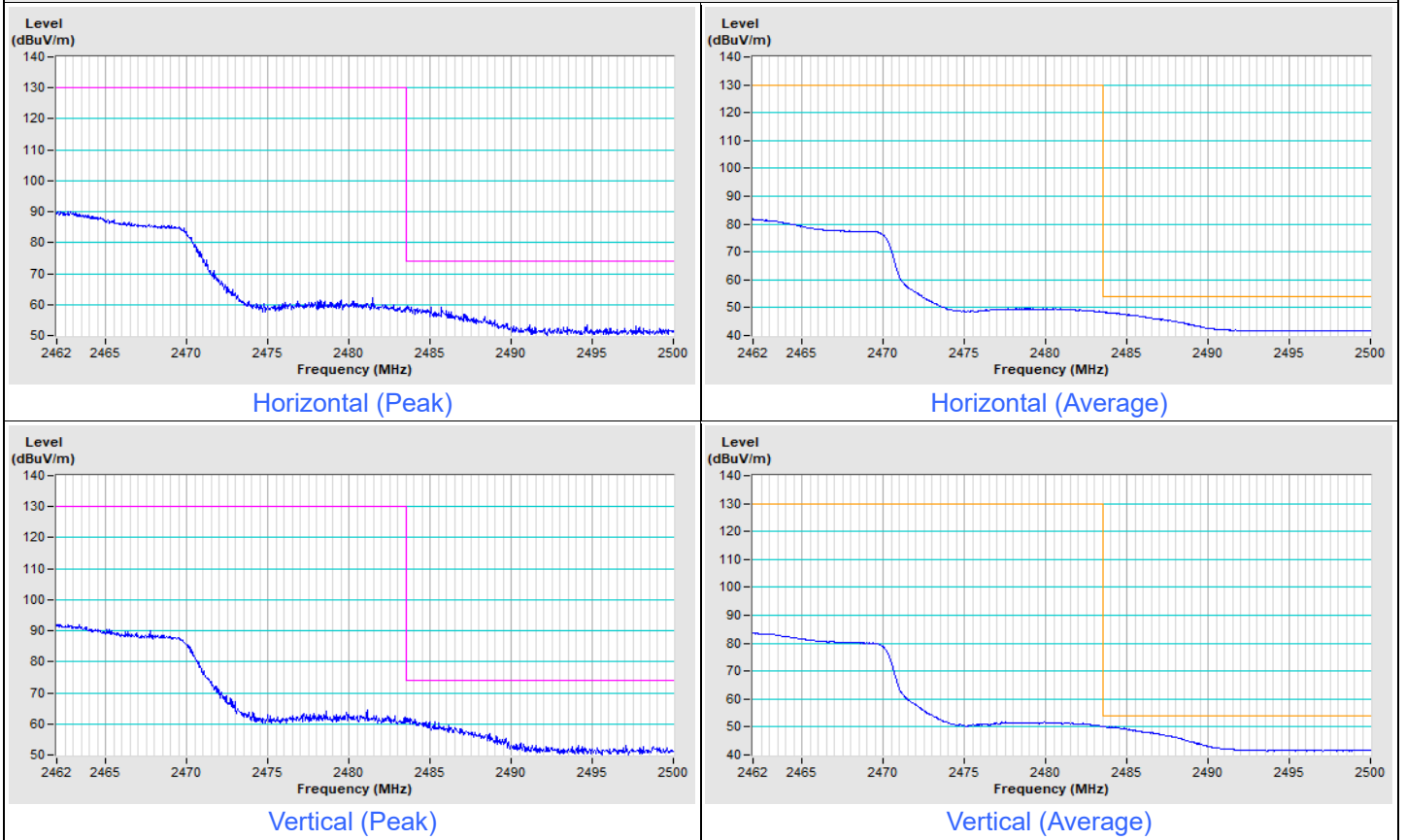


Vertical (Average)



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=2 kHz, DET=Peak
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VHT40 Channel 9



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.

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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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