

TEST REPORT

CERTIFICATE OF CONFORMITY

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

Report No.: RFBARR-WTW-P23100181

FCC ID: C3K2093

Product: Dual-band wireless accessory radio

Brand: Microsoft

Model No.: 2093

Received Date: 2023/9/28

Test Date: 2023/12/4 ~ 2024/1/7

Issued Date: 2024/2/16

Applicant: Microsoft Corporation

Address: One Microsoft Way, Redmond, Washington 98052-6399, United States

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

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FCC Registration / 788550 / TW0003

Designation Number:

Approved by: _____

Jeremy Lin

, Date: _____

2024/2/16

Jeremy Lin / Project Engineer

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Prepared by : Polly Chien / Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBARR-WTW-P23100181	Original release.	2024/2/16

1 Certificate

Product: Dual-band wireless accessory radio

Brand: Microsoft

Test Model: 2093

Sample Status: Engineering sample

Applicant: Microsoft Corporation

Test Date: 2023/12/4 ~ 2024/1/7

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 -10.69 dB at 0.36875 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.6 dB at 53.28 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -1.95 dB at 2483.52 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) (±)
RF Output Power	-	1.371 dB
Power Spectral Density	-	1.017 dB
6 dB Bandwidth	-	206.5 Hz
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	2.95 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 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	Dual-band wireless accessory radio
Brand	Microsoft
Test Model	2093
Status of EUT	Engineering sample
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	OFDM
Transfer Rate	Up to 72.2 Mbps
Operating Frequency	2.412 GHz ~ 2.462 GHz
Number of Channel	802.11n (HT20): 11
Output Power (Average Power)	11.066 mW (10.44 dBm)

Note:

1. There are WLAN (2.4 GHz & 5 GHz) technology used for the EUT.
2. 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.

Antenna No.	RF Chain NO.	Brand	Model	Antenna Type	Connector Type	Frequency range	Gain (dBi)
ACCY1	0	Microsoft	ACC1	PCB	NA	2.4 ~ 2.4835GHz	3.75
						5.15~5.25GHz (5G B1)	2.62
						5.725~5.85GHz (5G B4)	2.5
ACCY2	1	Microsoft	ACC2	PCB	NA	2.4 ~ 2.4835GHz	N/A
						5.15~5.25GHz (5G B1)	5.2
						5.725~5.85GHz (5G B4)	6

*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	
802.11n (HT20)	1TX (Fixed Chain 0)	1RX

3.3 Channel List

11 channels are provided for 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

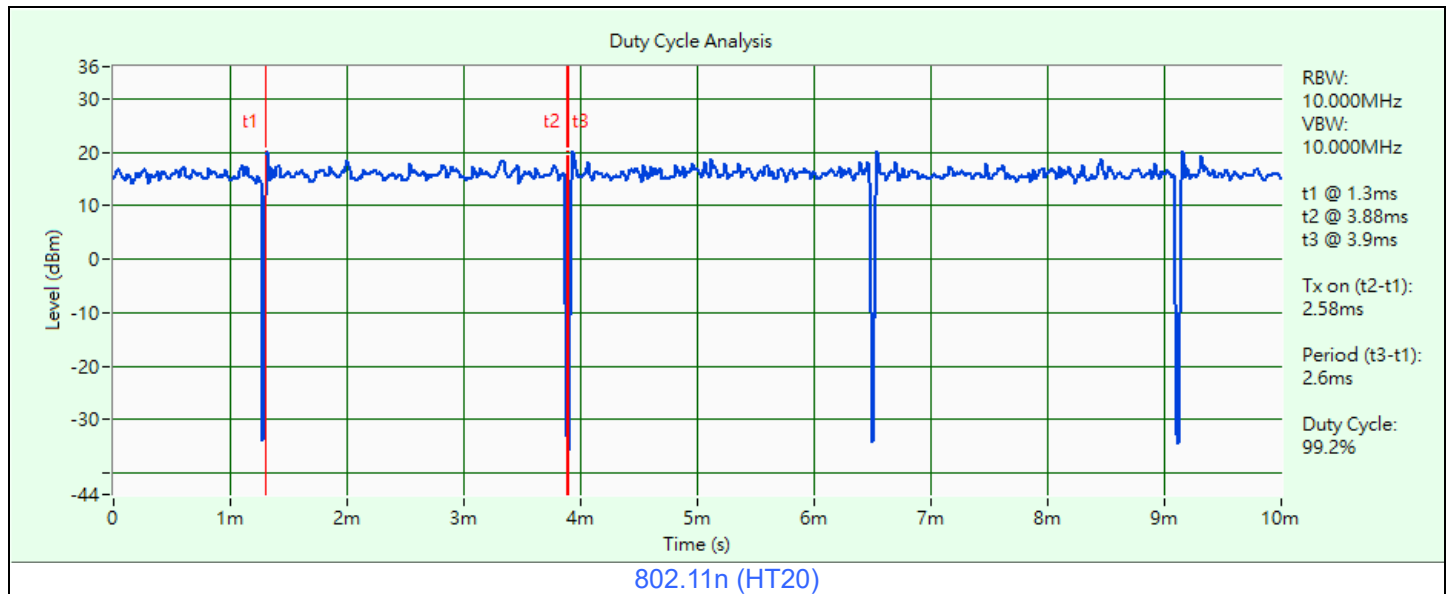
Pre-Scan:	<ol style="list-style-type: none"> EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
Worst Case:	1. X-axis/ Y-axis/ Z-axis Worst Condition: Y-axis

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

Test Item	EUT Configure Mode	Mode	Tx Condition	Tested Channel	Modulation	Data Rate Parameter
RF Output Power / Power Spectral Density	A	802.11n (HT20)	1Tx	1, 6, 11	BPSK	MCS0
6 dB Bandwidth / Conducted Out of Band Emissions	A	802.11n (HT20)	1Tx	1, 6, 11	BPSK	MCS0
AC Power Conducted Emissions	C	802.11n (HT20)	1Tx	6	BPSK	MCS0
Unwanted Emissions below 1 GHz	A, B	802.11n (HT20)	1Tx	6	BPSK	MCS0
Unwanted Emissions above 1 GHz	A, B	802.11n (HT20)	1Tx	1, 6, 11	BPSK	MCS0
EUT Configure Mode:	A	EUT only (remove 50 ohm terminator and Connect to the appropriate equipment)				
	B	EUT with 50 ohm terminator				
	C	EUT with antenna				

3.5 Duty Cycle of Test Signal

802.11n (HT20): Duty cycle = 2.58 ms / 2.6 ms x 100% = 99.2%

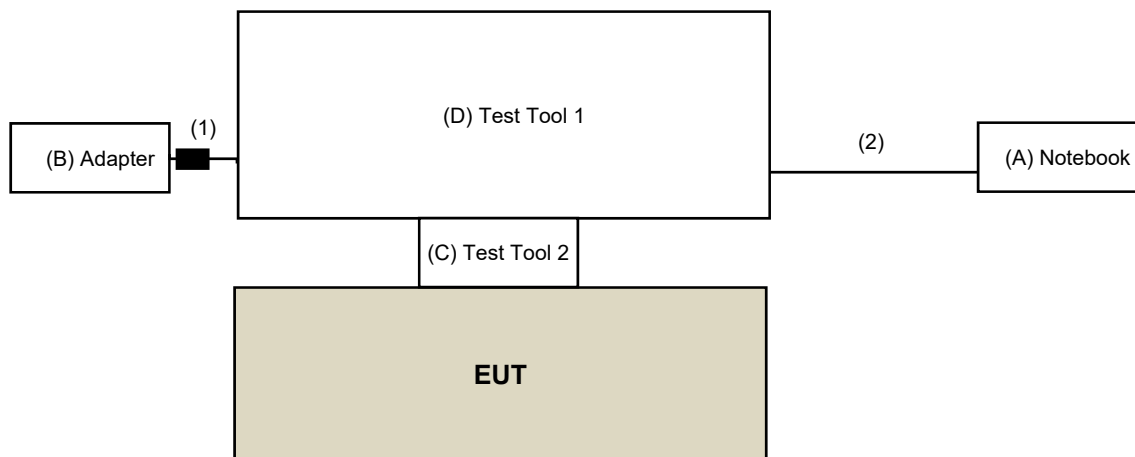


3.6 Test Program Used and Operation Descriptions

Controlling software QA UI(MT7663) Version : 0.0.2.6 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices

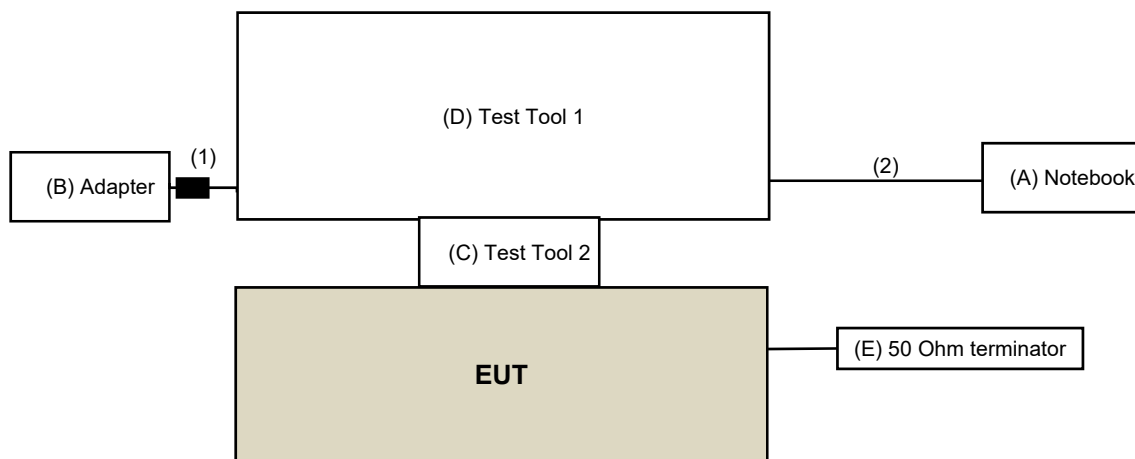
Mode A, C



Under Table

Remote Site

Mode B



Under Table

Remote Site

3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Notebook	DELL	Inspiron 14R	8LRKKW1	N/A	Provided by Lab
B	Adapter	CUI INC	SW112-5-N	N/A	N/A	Supplied by applicant
C	Test Tool 1	MediaTek Inc	N/A	N/A	N/A	Supplied by applicant
D	Test Tool 2	MediaTek Inc	N/A	N/A	N/A	Supplied by applicant
E	50 Ohm terminator	WOKEN	WTER-18S2	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC cable	1	1.5	No	1	Supplied by applicant Attached on the adapter
2	USB cable	1	1.8	Yes	0	Supplied by applicant

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: 2024/1/7

4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSV3044	101504	2023/6/5	2024/6/4
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2024/1/7

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	2023/02/01	2024/01/31
	E1-011312	10	2023/01/30	2024/01/29
	E1-011591	17	2023/02/01	2024/01/31
DC-LISN Schwarzbeck	NNBM 8126G	8126G-069	2023/11/07	2024/11/06
EMI Test Receiver R&S	ESCS 30	100288	2023/01/03	2024/01/02
Fixed Attenuator SGH	BNC10W10dB	PAD-COND2-01	2023/09/02	2024/09/01
LISN R&S	ESH2-Z5	100100	2023/03/07	2024/03/06
	ESH3-Z5	100312	2023/09/12	2024/09/11
RF Coaxial Cable Woken	5D-FB	Cable-cond2-01	2023/09/02	2024/09/01
Software BVADT	BVADT_Cond_ V7.3.7.4	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2023/08/31	2024/08/30

Notes:

1. The test was performed in HY - Conduction 2.
2. Tested Date: 2023/12/14

4.6 Unwanted Emissions below 1 GHz

For Conducted measurement

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSW43	101866	2023/1/10	2024/1/9
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/12/4

For Radiated measurement

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Max-Full	MFA-440H	AT93021705	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-472	2023/10/16	2024/10/15
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/01/03	2024/01/02
Loop Antenna Electro-Metrics	EM-6879	269	2023/09/23	2024/09/22
Loop Antenna TESEQ	HLA 6121	45745	2023/08/08	2024/08/07
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/05/03	2024/05/02
Preamplifier EMCI	EMC 330H	980112	2023/09/27	2024/09/26
	EMC001340	980201	2023/09/27	2024/09/26
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/01/07	2024/01/06
RF Coaxial Cable Woken	8D-FB	Cable-Ch10-01	2023/09/27	2024/09/26
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MG-7802	N/A	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 5.
2. Tested Date: 2023/12/13

4.7 Unwanted Emissions above 1 GHz

For Conducted measurement

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSW43	101866	2023/1/10	2024/1/9
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/12/4 ~ 2023/12/13

For Radiated measurement

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Max-Full	MFA-440H	AT93021705	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	7	N/A	N/A
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/01/03	2024/01/02
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-969	2023/11/12	2024/11/11
	BBHA 9170	148	2023/11/12	2024/11/11
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/05/03	2024/05/02
Notch Filter Micro-Tronics	BRM17690	004	2023/01/11	2024/01/10
	BRM50716	060	2023/01/11	2024/01/10
Preamplifier EMCI	EMC 012645	980115	2023/09/27	2024/09/26
	EMC 184045	980116	2023/09/27	2024/09/26
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	2023/07/08	2024/07/07
	EMC102-KM-KM-3000	150929	2023/07/08	2024/07/07
	EMC104-SM-SM- 8000+3000	171005	2023/09/27	2024/09/26
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	2023/09/27	2024/09/26
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MG-7802	N/A	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 5.
2. Tested Date: 2023/12/13

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

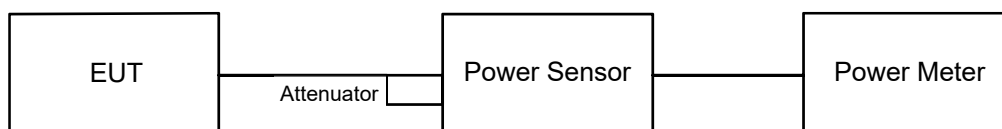
Notes:

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:

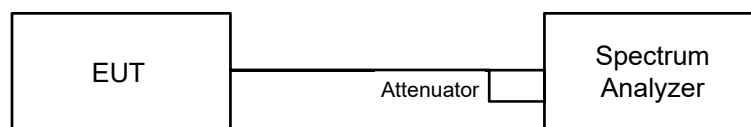
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

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

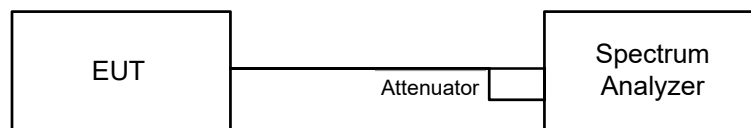


6.2.2 Test Procedure

- 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

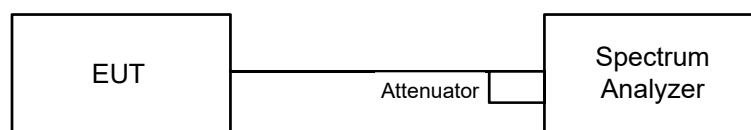


6.3.2 Test Procedure

- 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

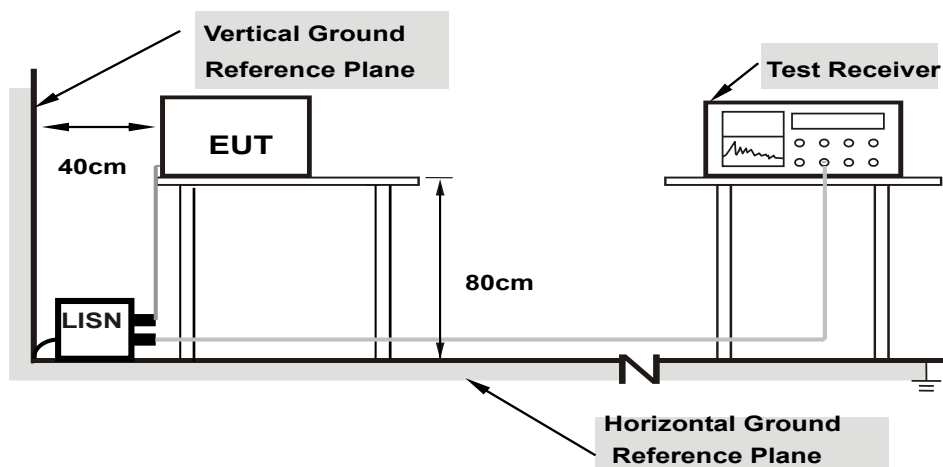
- Set the RBW = 100 kHz.
- Set the VBW ≥ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

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.

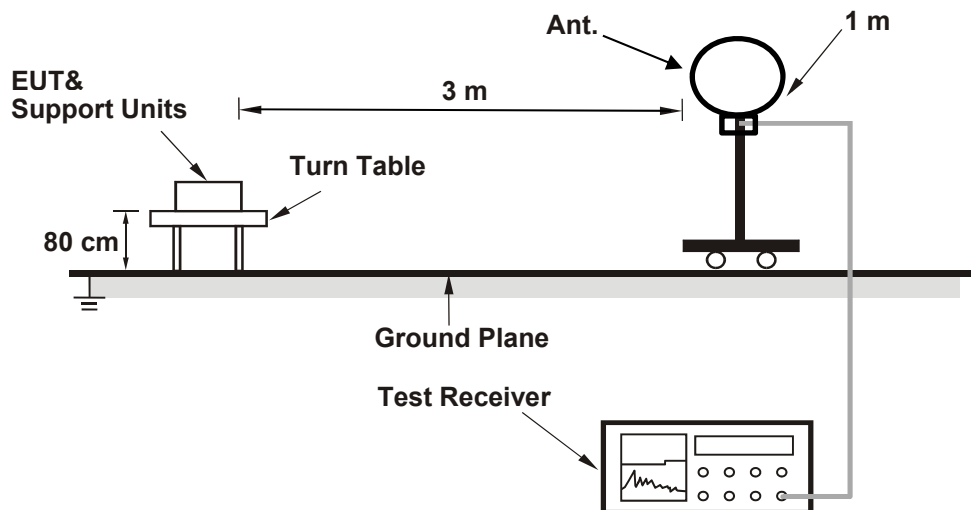
Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.

6.6 Unwanted Emissions below 1 GHz

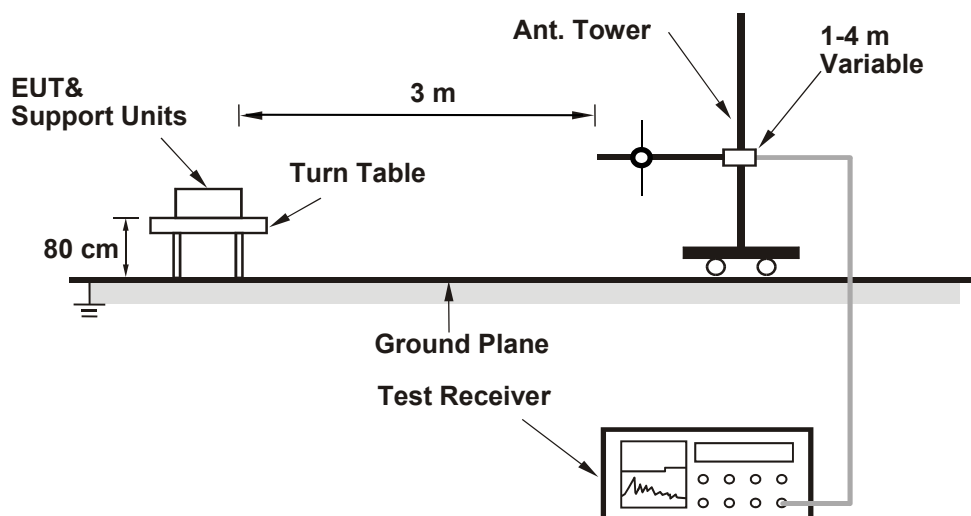
6.6.1 Test Setup

For Radiated Configuration:

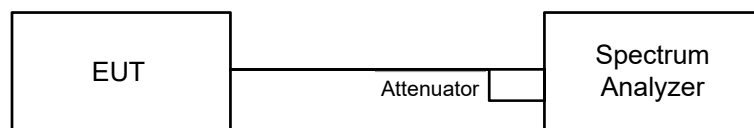
For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



For Conducted Configuration:



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

6.6.2 Test Procedure

Radiated versus Conducted Measurement.

The unwanted emission limits in both the restricted and non-restricted bands are based on antenna-port conducted measurements in conjunction with cabinet emissions tests are permitted to demonstrate compliance.

The following steps was performed:

- a. Cabinet emissions measurements. Radiated measurement was performed to ensure that cabinet emissions are below the emission limits. For the cabinet-emission measurements the antenna was replaced by a termination matching the nominal impedance of the antenna.
- b. Conducted tests was performed using equipment that matches the nominal impedance of the antenna assembly used with the EUT.
- c. EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater.
- d. EIRP adjustments for multiple outputs. (Follow the procedures specified in FCC KDB Publication 662911)
- e. For all of Radiation emission test

For Radiated emission below 30 MHz

- e-1.1. 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.
- e-1.2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- e-1.3. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- e-1.4. 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-1.5. 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

- e-2.1. 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.
- e-2.2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- e-2.3. 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.
- e-2.4. 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-2.5. 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.

Radiated versus Conducted Measurement

For Radiated measurement:

The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).

For Conducted measurement:

The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions).

Conducted Unwanted Emission Convert Formula

- a. Emission Level (dBuV/m) = EIRP Level (dBm) – 20log(d) + 104.8
d = measurement distance in 3 meters.
- b. EIRP Level (dBm) = Raw Value(dBm) + Correction Factor(dB)
- c. Correction Factor is directional gain, and the composite gain will be used when signal support the correlated signal
For the out of band spurious the gain for the specific band may have been used rather than the highest gain across all bands.
For the band edge the gain for the specific band may have been used.

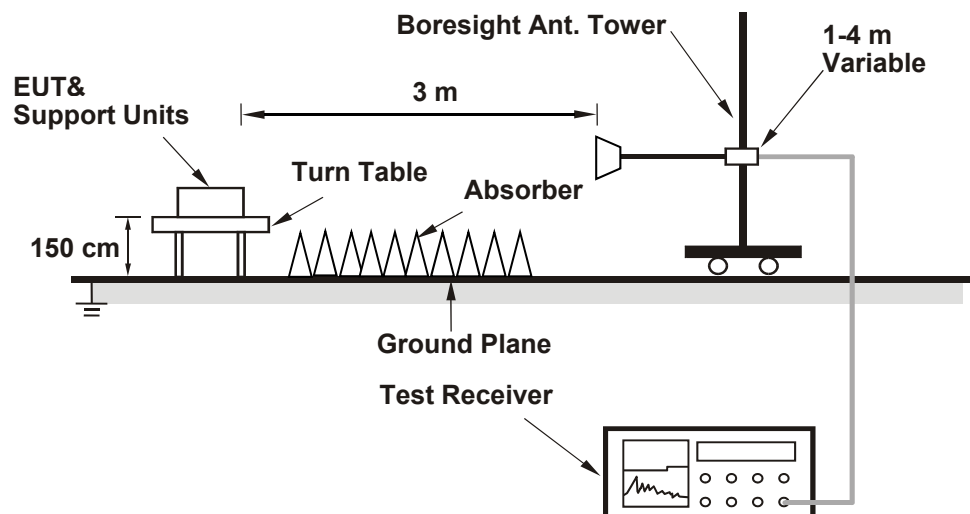
Notes:

1. In restricted bands below 1000 MHz, add upper bound on ground plane reflection:
For frequencies between 30 MHz and 1000 MHz, add 4.7 dB.
2. The conducted emission test was considered some factor to compute test result.

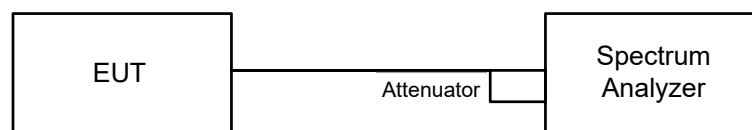
6.7 Unwanted Emissions above 1 GHz

6.7.1 Test Setup

For Radiated Configuration:



For Conducted Configuration:



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

6.7.2 Test Procedure

Radiated versus Conducted Measurement.

The unwanted emission limits in both the restricted and non-restricted bands are based on antenna-port conducted measurements in conjunction with cabinet emissions tests are permitted to demonstrate compliance.

The following steps was performed:

- a. Cabinet emissions measurements. Radiated measurement was performed to ensure that cabinet emissions are below the emission limits. For the cabinet-emission measurements the antenna was replaced by a termination matching the nominal impedance of the antenna.
- b. Conducted tests was performed using equipment that matches the nominal impedance of the antenna assembly used with the EUT.
- c. EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater.
- d. EIRP adjustments for multiple outputs. (Follow the procedures specified in FCC KDB Publication 662911)
- e. For all of Radiation emission test
 - e-1. 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.
 - e-2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
 - e-3. 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.

- e-4. 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-5. 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:

1. 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.
2. 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.
3. All modes of operation were investigated and the worst-case emissions are reported.

Radiated versus Conducted Measurement

For Radiated measurement:

The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).

For Conducted measurement:

The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions).

For Verified radiated measurement:

The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).

Conducted Unwanted Emission Convert Formula

a. Emission Level (dBuV/m) = EIRP Level (dBm) – 20log(d) + 104.8

d = measurement distance in 3 meters.

b. EIRP Level (dBm) = Raw Value(dBm) + Correction Factor(dB).

c. Correction Factor is directional gain, and the composite gain will be used when signal support the correlated signal

For the out of band spurious the gain for the specific band may have been used rather than the highest gain across all bands.

For the band edge the gain for the specific band may have been used.

Note:

The conducted emission test was considered some factor to compute test result.

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Chris Lin
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For Peak Power

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
1	2412	80.168	19.04	30	Pass
6	2437	80.538	19.06	30	Pass
11	2462	89.536	19.52	30	Pass

Note: The antenna gain is 3.75 dBi < 6 dBi, so the output power limit shall not be reduced.

For Average Power

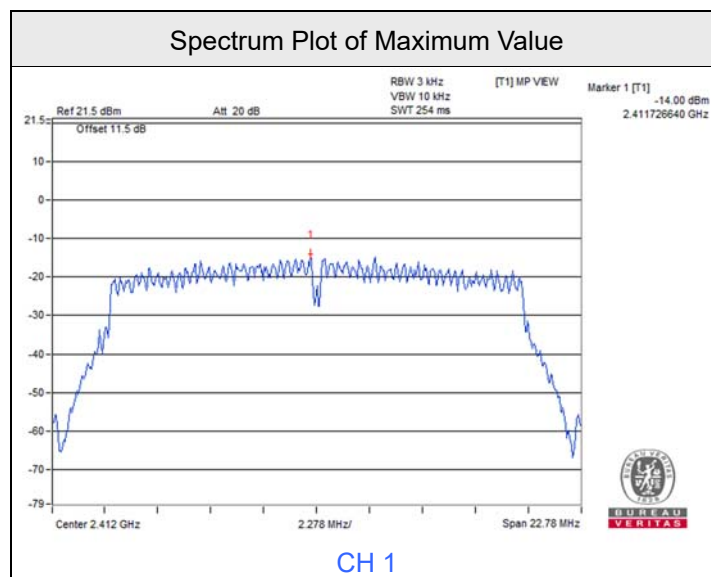
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	10.789	10.33
6	2437	11.066	10.44
11	2462	10.257	10.11

7.2 Power Spectral Density

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Chris Lin
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Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
1	2412	-14.00	8	Pass
6	2437	-15.01	8	Pass
11	2462	-14.77	8	Pass

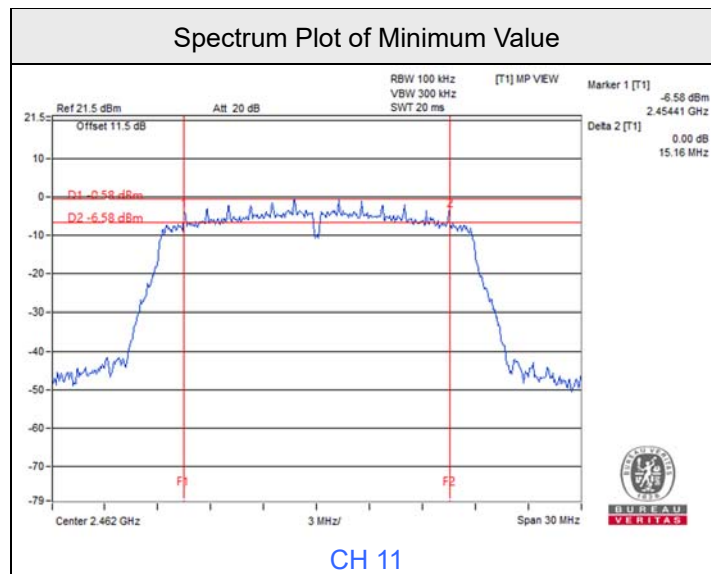
Note: The antenna gain is 3.75 dBi < 6 dBi, so the power density limit shall not be reduced.



7.3 6 dB Bandwidth

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Chris Lin
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Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
1	2412	15.19	0.5	Pass
6	2437	15.2	0.5	Pass
11	2462	15.16	0.5	Pass

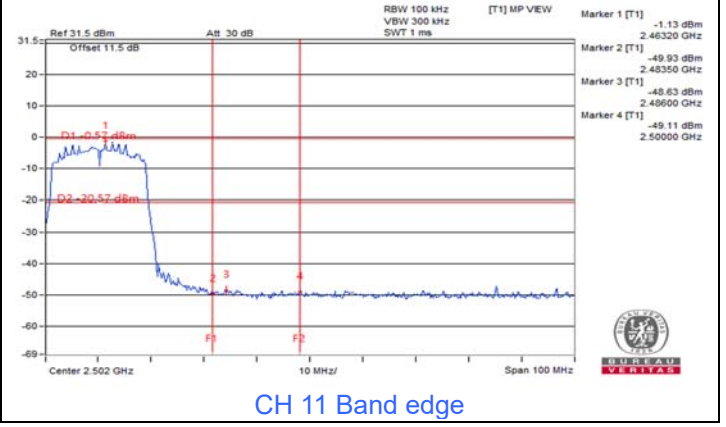
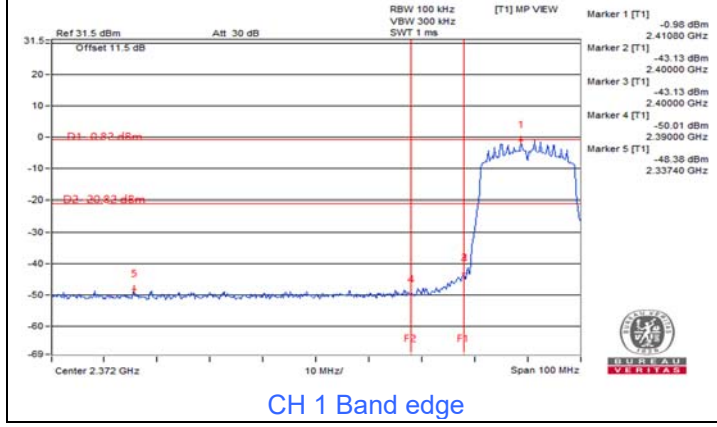
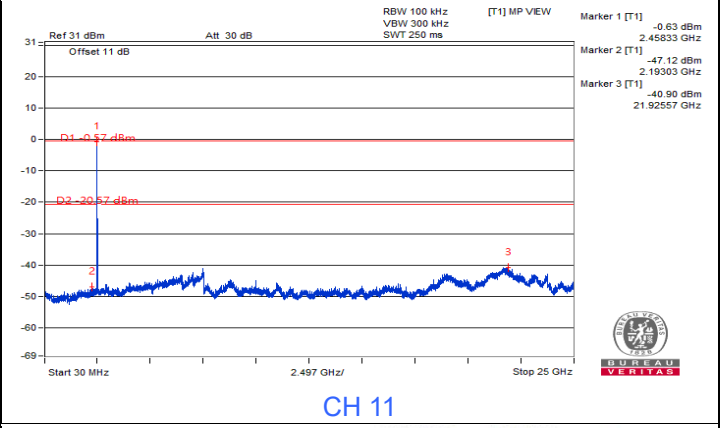
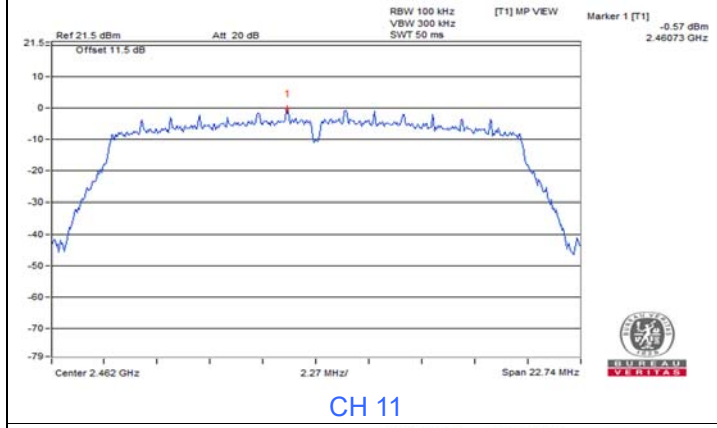
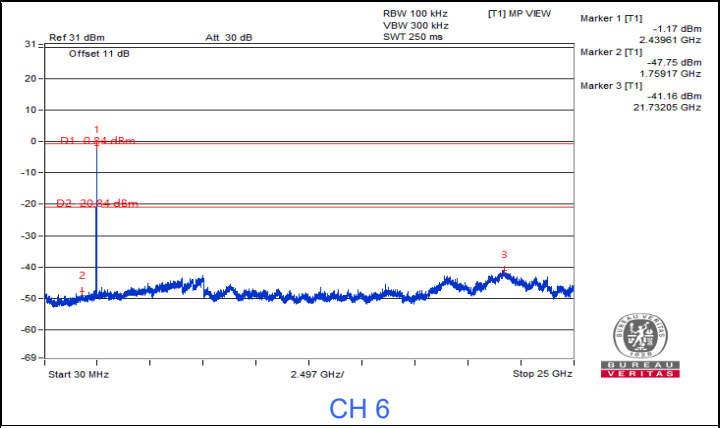
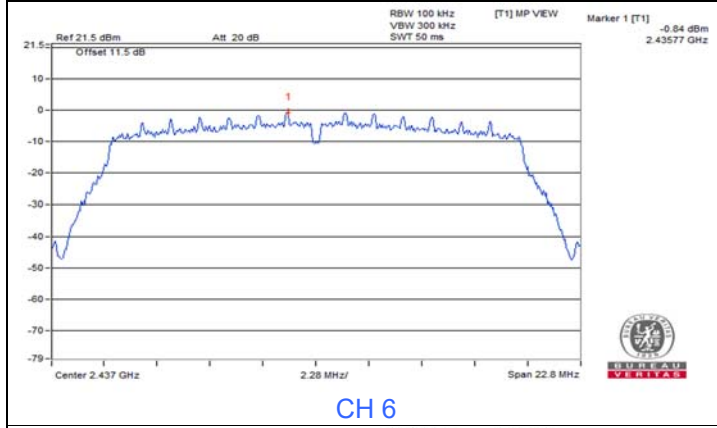
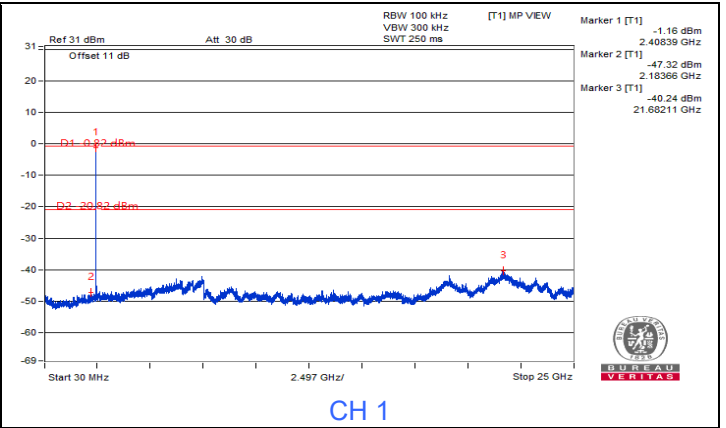
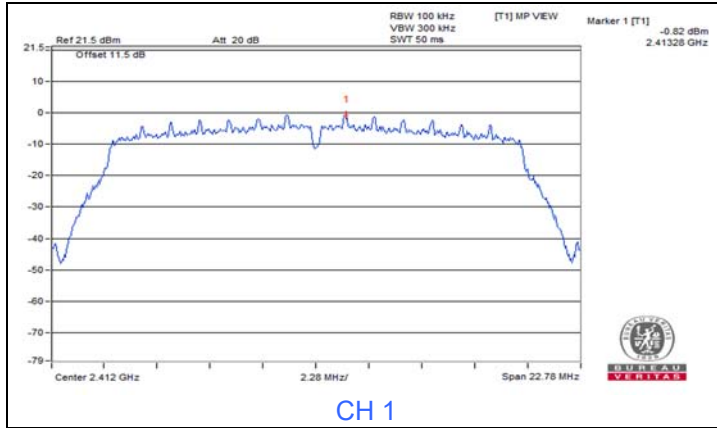




BUREAU VERITAS

7.4 Conducted Out of Band Emissions

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Chris Lin
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7.5 AC Power Conducted Emissions

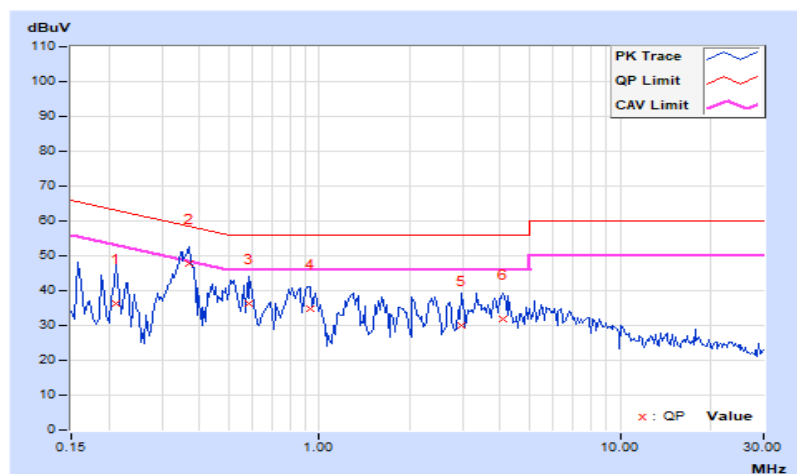
Mode C

RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	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	0.21250	10.41	25.77	6.12	36.18	16.53	63.11	53.11	-26.93	-36.58
2	0.36875	10.48	37.36	17.23	47.84	27.71	58.53	48.53	-10.69	-20.82
3	0.58750	10.51	25.78	9.43	36.29	19.94	56.00	46.00	-19.71	-26.06
4	0.93125	10.53	24.41	5.24	34.94	15.77	56.00	46.00	-21.06	-30.23
5	2.95703	10.60	19.57	3.46	30.17	14.06	56.00	46.00	-25.83	-31.94
6	4.08984	10.66	21.18	2.59	31.84	13.25	56.00	46.00	-24.16	-32.75

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

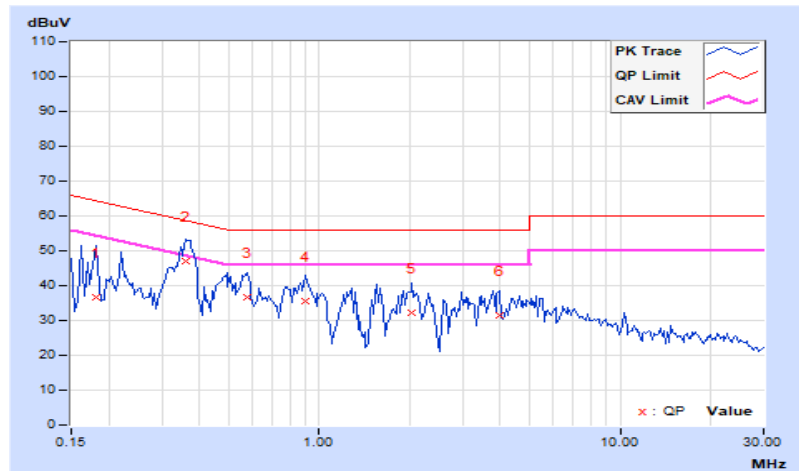


RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 64% RH
Tested By	Vincent Chen		

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	0.18125	10.43	26.17	9.44	36.60	19.87	64.43	54.43	-27.83	-34.56
2	0.36094	10.51	36.51	17.10	47.02	27.61	58.71	48.71	-11.69	-21.10
3	0.57578	10.54	26.22	12.17	36.76	22.71	56.00	46.00	-19.24	-23.29
4	0.90391	10.56	25.07	5.26	35.63	15.82	56.00	46.00	-20.37	-30.18
5	2.03906	10.58	21.69	4.39	32.27	14.97	56.00	46.00	-23.73	-31.03
6	3.95703	10.73	20.74	2.41	31.47	13.14	56.00	46.00	-24.53	-32.86

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

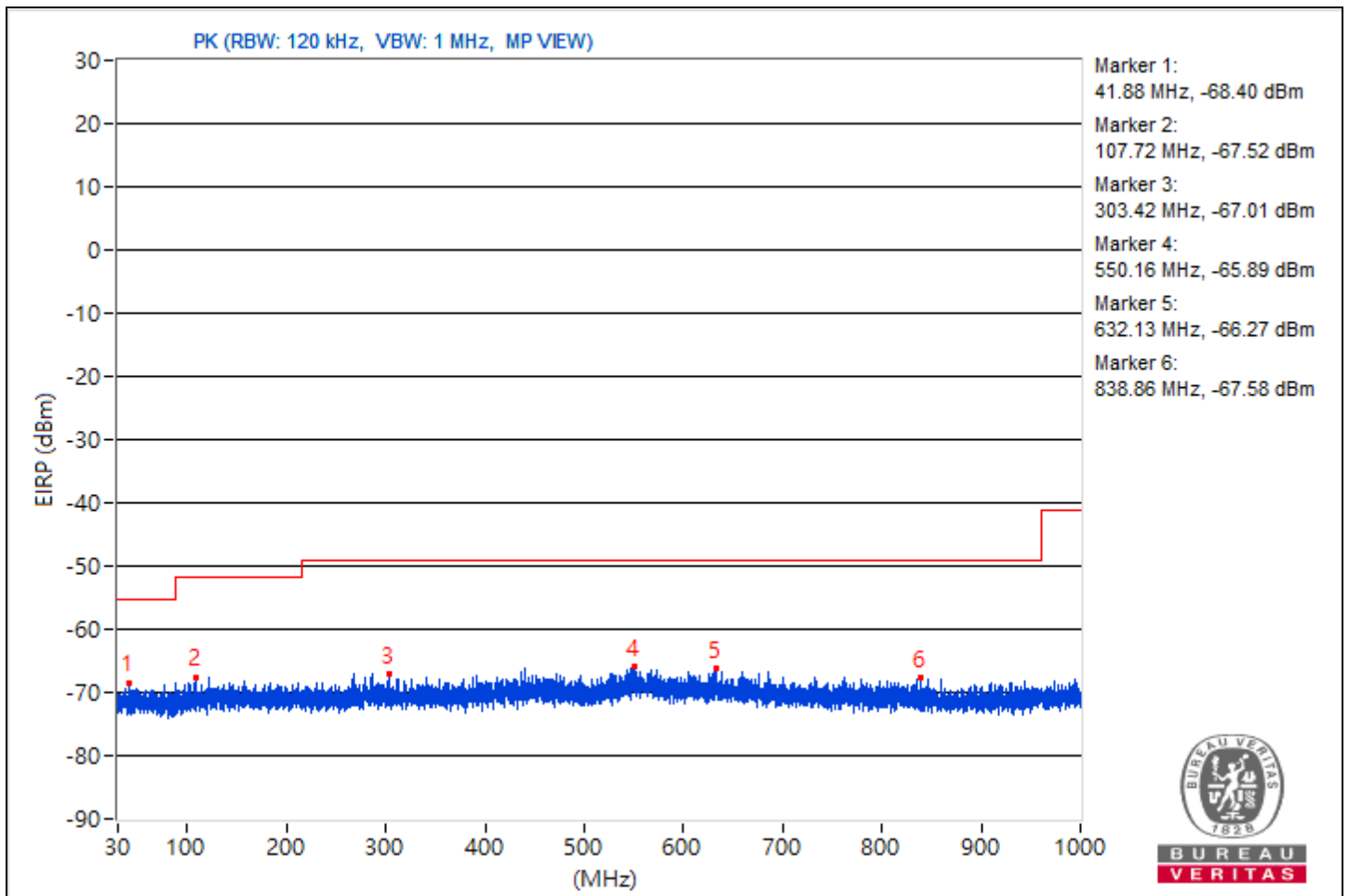
RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	30 MHz ~ 1 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Unwanted Emissions

No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	41.88	26.86 PK	40	-13.14	-77.69	9.29	-68.4
2	107.72	27.74 PK	43.5	-15.76	-76.81	9.29	-67.52
3	303.42	28.25 PK	46	-17.75	-76.3	9.29	-67.01
4	550.16	29.37 PK	46	-16.63	-75.18	9.29	-65.89
5	632.13	28.99 PK	46	-17.01	-75.56	9.29	-66.27
6	838.86	27.68 PK	46	-18.32	-76.87	9.29	-67.58

Notes:

1. Margin value = Emission Level - Limit value
2. 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.



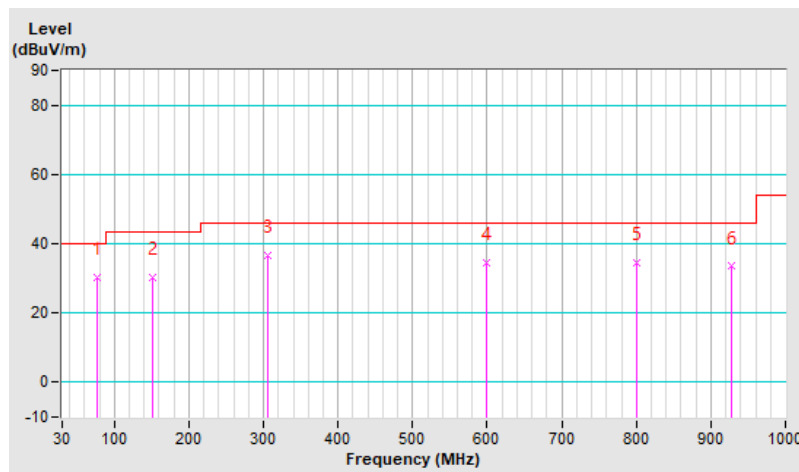
Mode B

RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24°C, 73% RH
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	77.53	30.1 QP	40.0	-9.9	1.00 H	312	46.9	-16.8
2	152.22	30.4 QP	43.5	-13.1	2.00 H	247	43.2	-12.8
3	305.48	36.6 QP	46.0	-9.4	1.00 H	309	48.4	-11.8
4	599.39	34.5 QP	46.0	-11.5	1.50 H	348	39.7	-5.2
5	800.18	34.7 QP	46.0	-11.3	1.50 H	271	35.9	-1.2
6	927.25	33.4 QP	46.0	-12.6	2.00 H	51	33.8	-0.4

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.

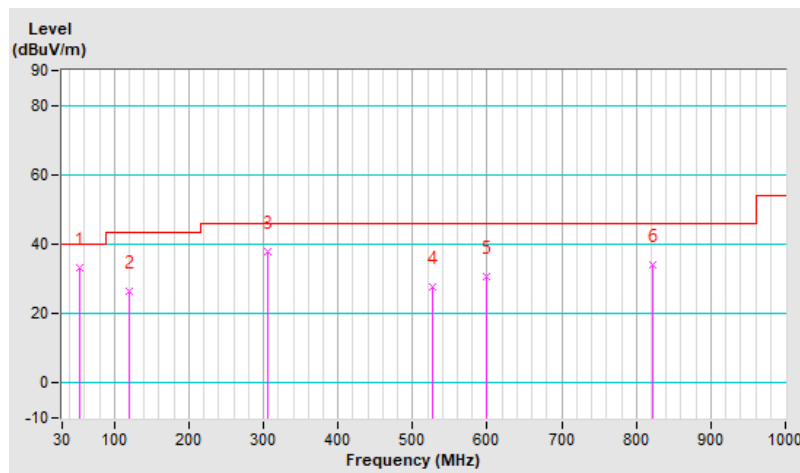


RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24°C, 73% RH
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	53.28	33.4 QP	40.0	-6.6	1.00 V	176	45.9	-12.5
2	120.21	26.4 QP	43.5	-17.1	1.00 V	44	41.0	-14.6
3	305.48	37.9 QP	46.0	-8.1	1.50 V	216	49.7	-11.8
4	527.61	27.6 QP	46.0	-18.4	1.50 V	138	33.9	-6.3
5	599.39	30.7 QP	46.0	-15.3	2.00 V	197	35.9	-5.2
6	822.49	34.2 QP	46.0	-11.8	1.50 V	181	35.1	-0.9

Remarks:

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

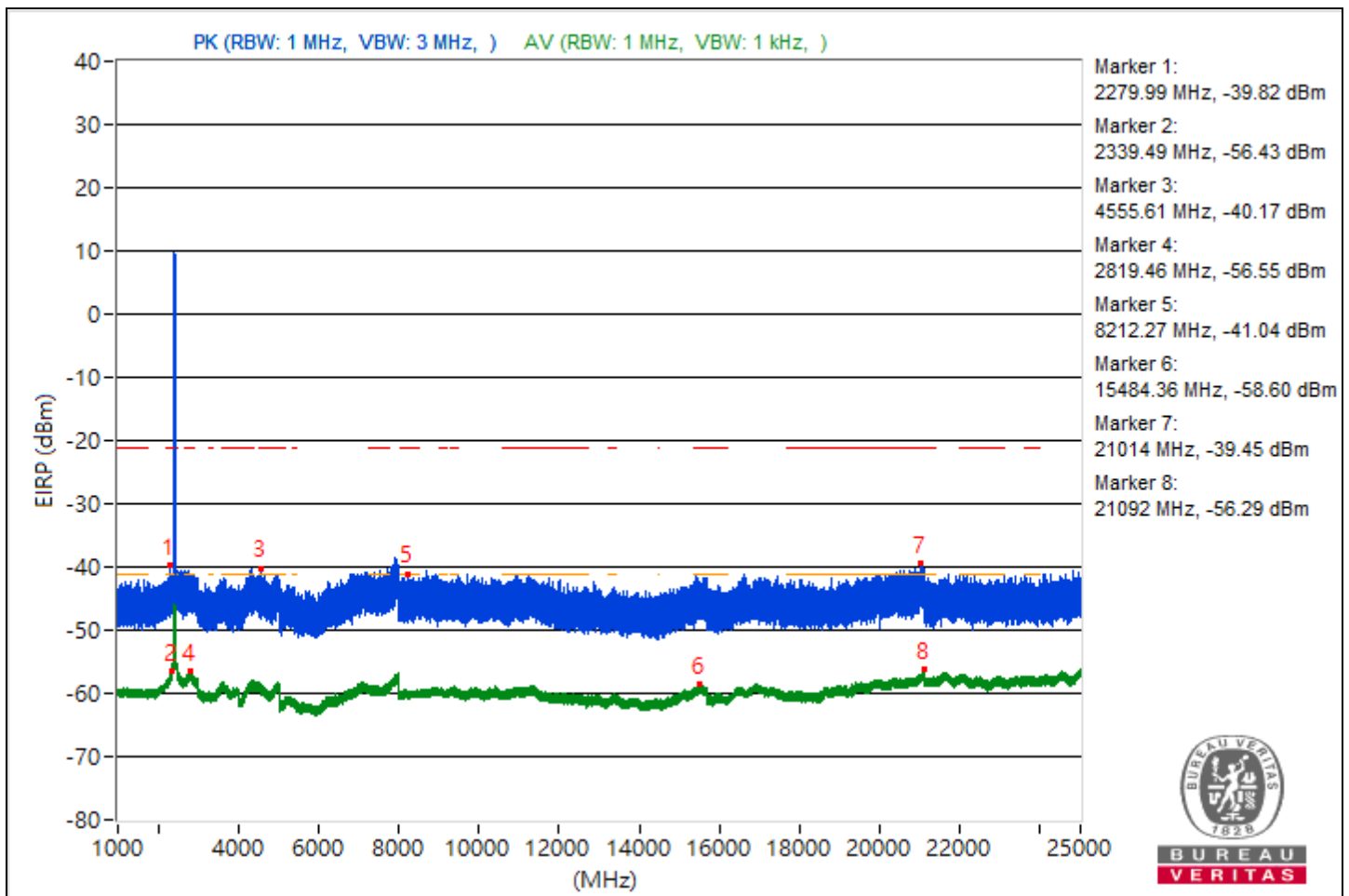
Mode A

Conducted Unwanted Emissions

RF Mode	802.11n (HT20)	Channel	CH 1 : 2412 MHz
Frequency Range	1 GHz ~ 25 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	2279.99	55.44 PK	74	-18.56	-44.41	4.59	-39.82
2	2339.49	38.83 AV	54	-15.17	-61.02	4.59	-56.43
3	4555.61	55.09 PK	74	-18.91	-44.76	4.59	-40.17
4	2819.46	38.71 AV	54	-15.29	-61.14	4.59	-56.55
5	8212.27	54.22 PK	74	-19.78	-45.63	4.59	-41.04
6	15484.36	36.66 AV	54	-17.34	-63.19	4.59	-58.6
7	21014	55.81 PK	74	-18.19	-44.04	4.59	-39.45
8	21092	38.97 AV	54	-15.03	-60.88	4.59	-56.29

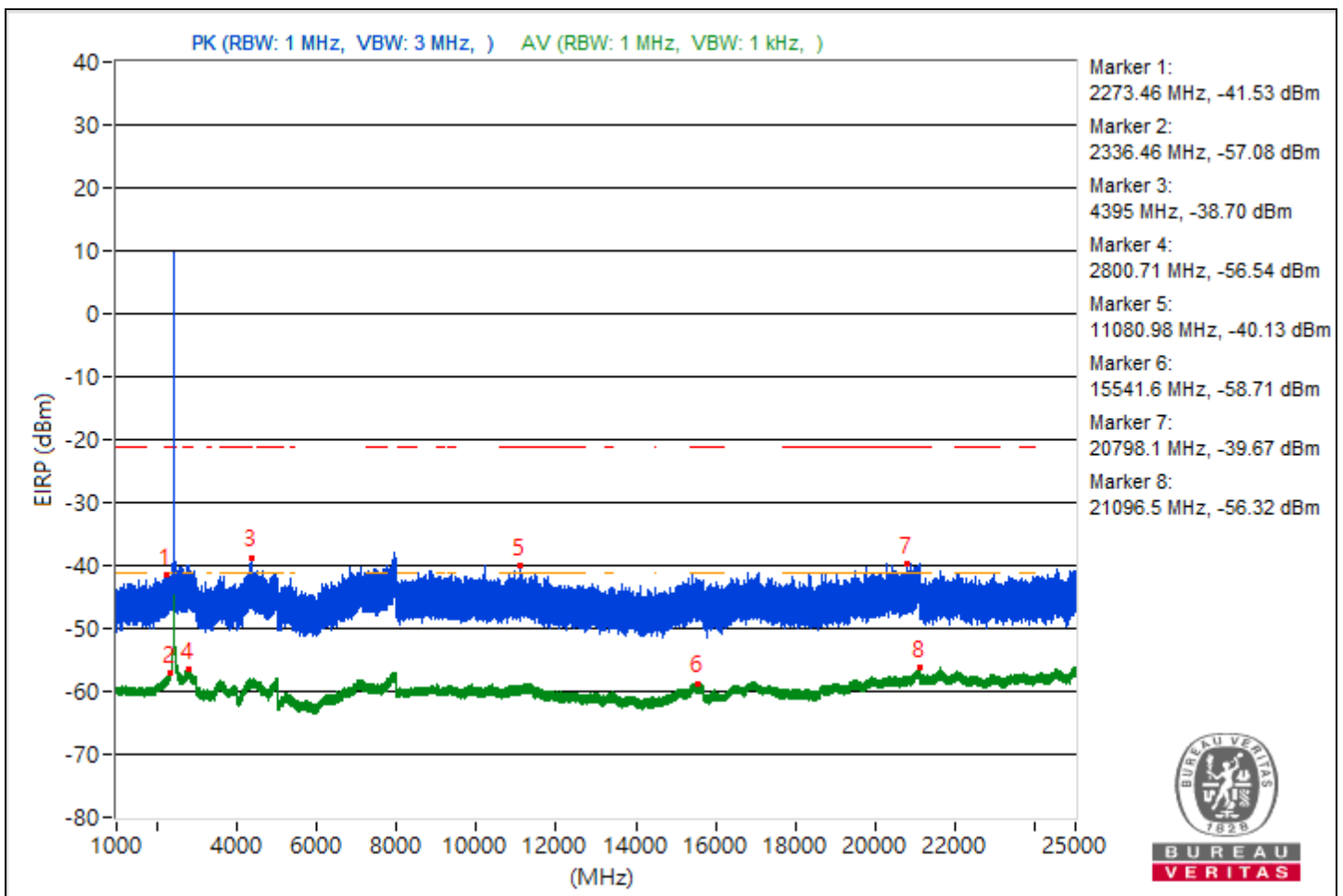
Note: Margin value = Emission Level - Limit value



RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	2273.46	53.73 PK	74	-20.27	-46.12	4.59	-41.53
2	2336.46	38.18 AV	54	-15.82	-61.67	4.59	-57.08
3	4395	56.56 PK	74	-17.44	-43.29	4.59	-38.7
4	2800.71	38.72 AV	54	-15.28	-61.13	4.59	-56.54
5	11080.98	55.13 PK	74	-18.87	-44.72	4.59	-40.13
6	15541.6	36.55 AV	54	-17.45	-63.3	4.59	-58.71
7	20798.1	55.59 PK	74	-18.41	-44.26	4.59	-39.67
8	21096.5	38.94 AV	54	-15.06	-60.91	4.59	-56.32

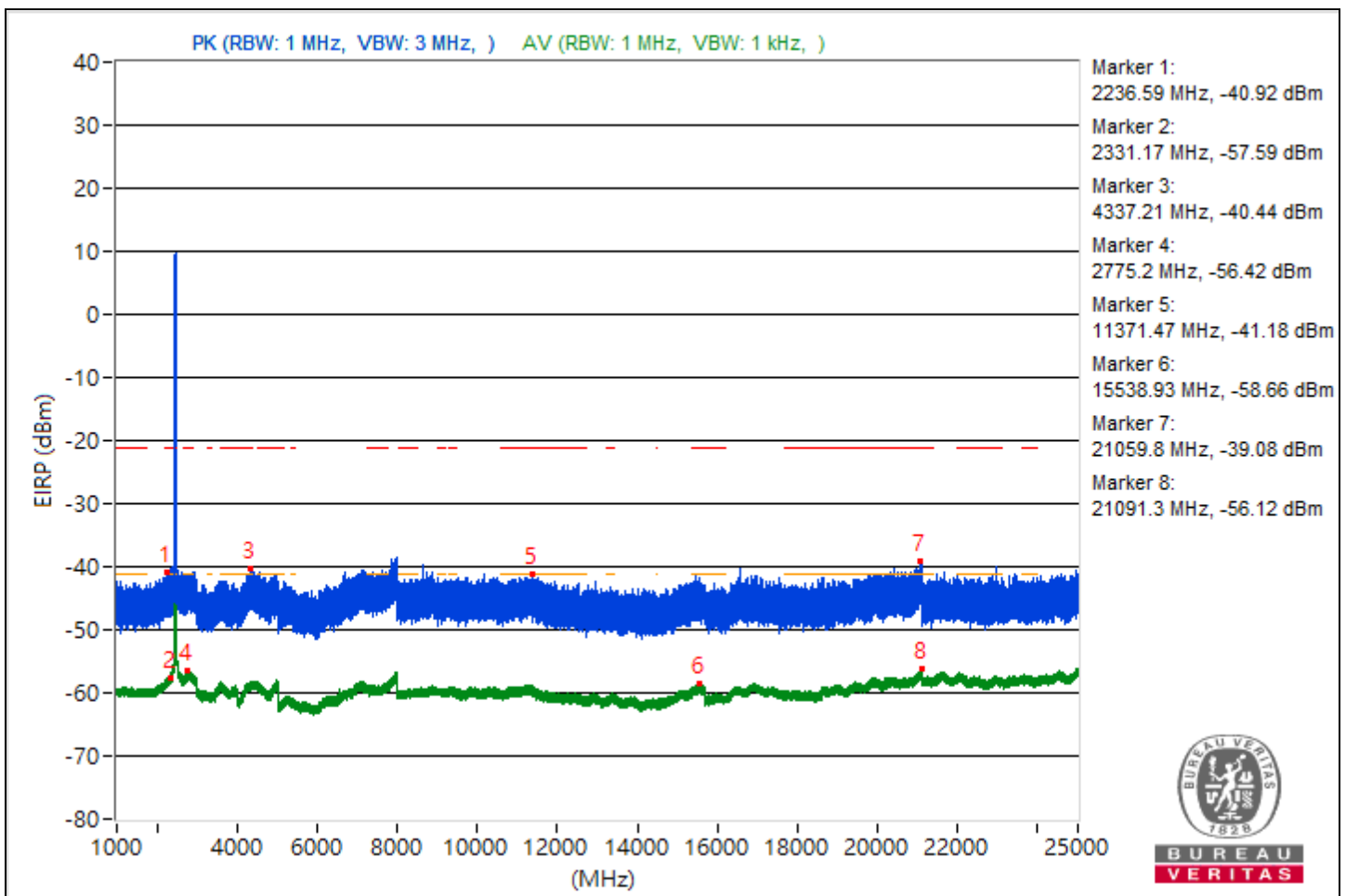
Note: Margin value = Emission Level - Limit value



RF Mode	802.11n (HT20)	Channel	CH 11 : 2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	2236.59	54.34 PK	74	-19.66	-45.51	4.59	-40.92
2	2331.17	37.67 AV	54	-16.33	-62.18	4.59	-57.59
3	4337.21	54.82 PK	74	-19.18	-45.03	4.59	-40.44
4	2775.2	38.84 AV	54	-15.16	-61.01	4.59	-56.42
5	11371.47	54.08 PK	74	-19.92	-45.77	4.59	-41.18
6	15538.93	36.6 AV	54	-17.4	-63.25	4.59	-58.66
7	21059.8	56.18 PK	74	-17.82	-43.67	4.59	-39.08
8	21091.3	39.14 AV	54	-14.86	-60.71	4.59	-56.12

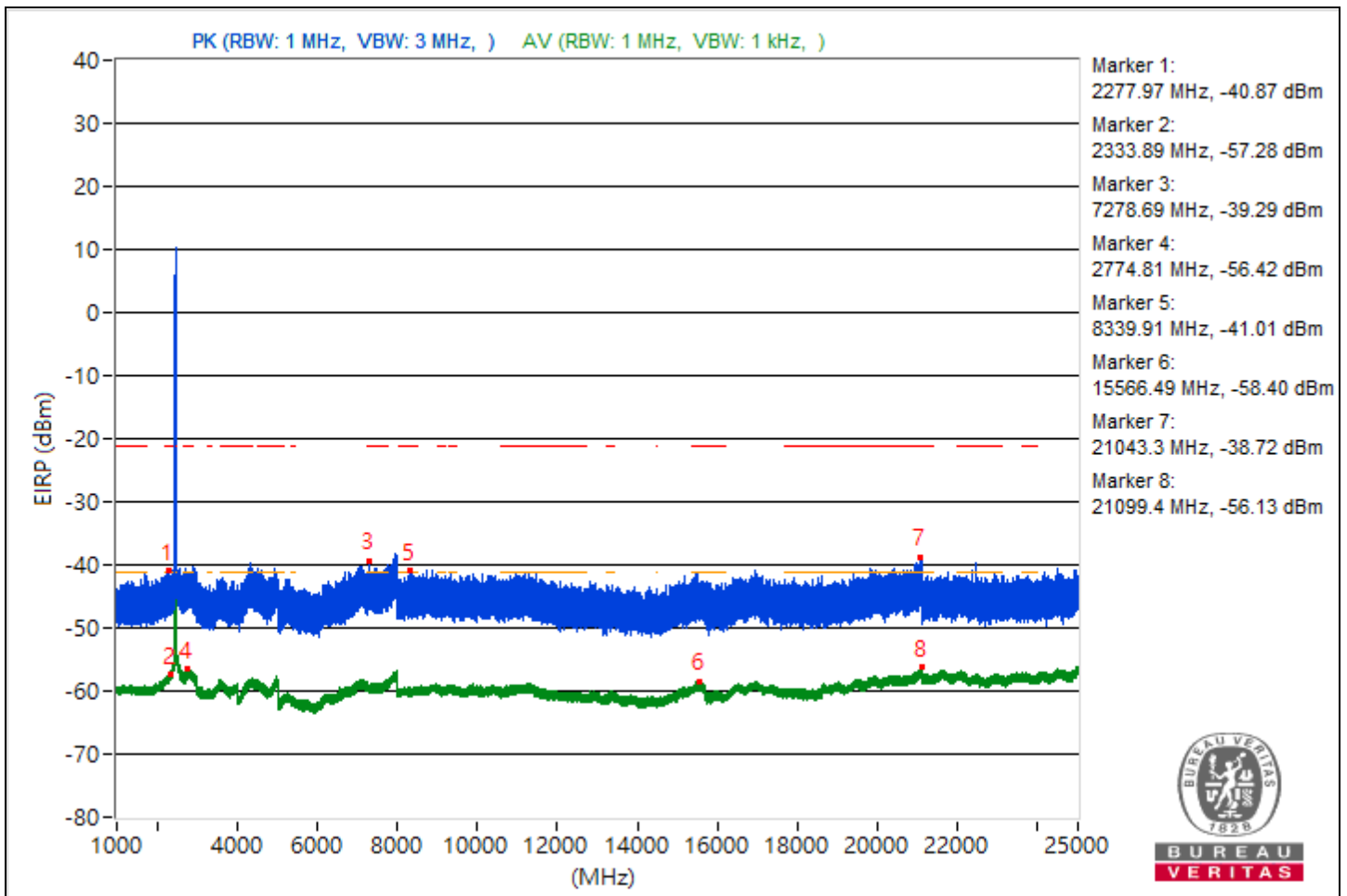
Note: Margin value = Emission Level - Limit value



RF Mode	802.11n (HT20)	Channel	CH 12 : 2467 MHz
Frequency Range	1 GHz ~ 25 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 74% RH	Tested By	Rex Wang

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	2277.97	54.39 PK	74	-19.61	-45.46	4.59	-40.87
2	2333.89	37.98 AV	54	-16.02	-61.87	4.59	-57.28
3	7278.69	55.97 PK	74	-18.03	-43.88	4.59	-39.29
4	2774.81	38.84 AV	54	-15.16	-61.01	4.59	-56.42
5	8339.91	54.25 PK	74	-19.75	-45.6	4.59	-41.01
6	15566.49	36.86 AV	54	-17.14	-62.99	4.59	-58.4
7	21043.3	56.54 PK	74	-17.46	-43.31	4.59	-38.72
8	21099.4	39.13 AV	54	-14.87	-60.72	4.59	-56.13

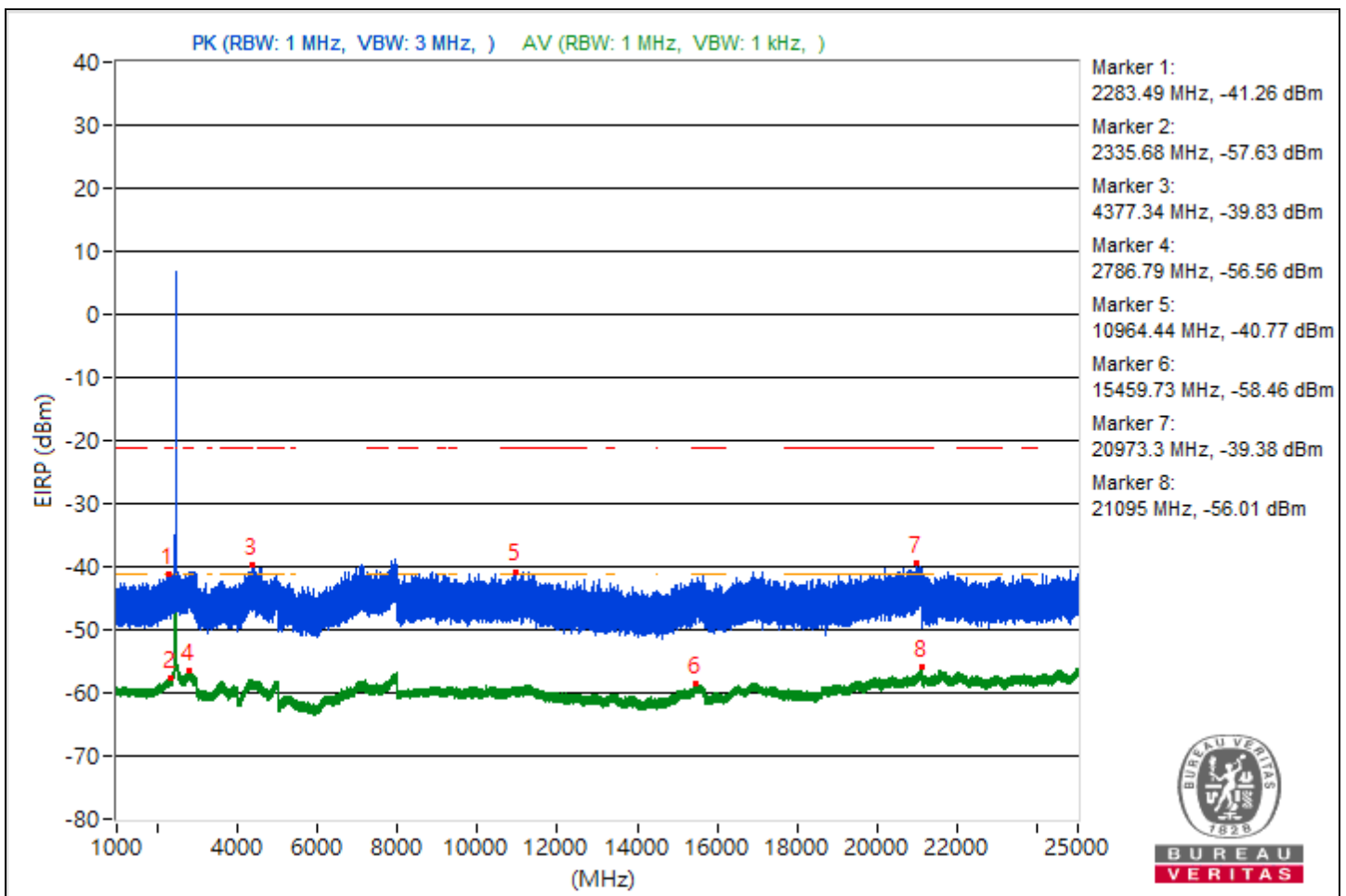
Note: Margin value = Emission Level - Limit value



RF Mode	802.11n (HT20)	Channel	CH 13 : 2472 MHz
Frequency Range	1 GHz ~ 25 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 74% RH	Tested By	Rex Wang

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	2283.49	54 PK	74	-20	-45.85	4.59	-41.26
2	2335.68	37.63 AV	54	-16.37	-62.22	4.59	-57.63
3	4377.34	55.43 PK	74	-18.57	-44.42	4.59	-39.83
4	2786.79	38.7 AV	54	-15.3	-61.15	4.59	-56.56
5	10964.44	54.49 PK	74	-19.51	-45.36	4.59	-40.77
6	15459.73	36.8 AV	54	-17.2	-63.05	4.59	-58.46
7	20973.3	55.88 PK	74	-18.12	-43.97	4.59	-39.38
8	21095	39.25 AV	54	-14.75	-60.6	4.59	-56.01

Note: Margin value = Emission Level - Limit value



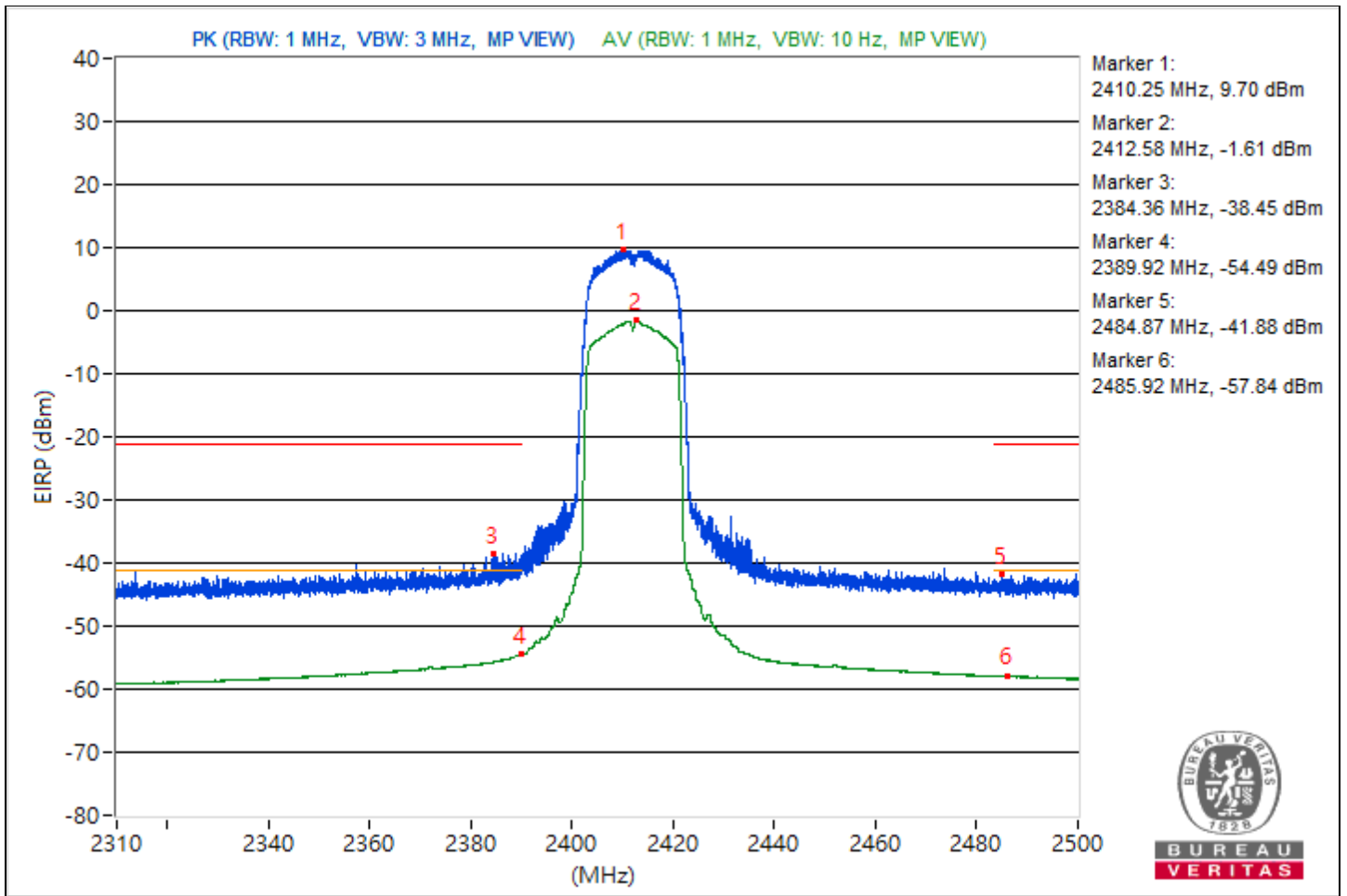
Conducted Band Edges

RF Mode	802.11n (HT20)	Channel	CH 1 : 2412 MHz
Frequency Range	2.31 GHz ~ 2.5 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Band Edge							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	*2410.25	104.96 PK			5.95	3.75	9.7
2	*2412.58	93.65 AV			-5.36	3.75	-1.61
3	2384.36	56.81 PK	74	-17.19	-42.2	3.75	-38.45
4	2389.92	40.77 AV	54	-13.23	-58.24	3.75	-54.49
5	2484.87	53.38 PK	74	-20.62	-45.63	3.75	-41.88
6	2485.92	37.42 AV	54	-16.58	-61.59	3.75	-57.84

Notes:

1. Margin value = Emission Level - Limit value
2. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

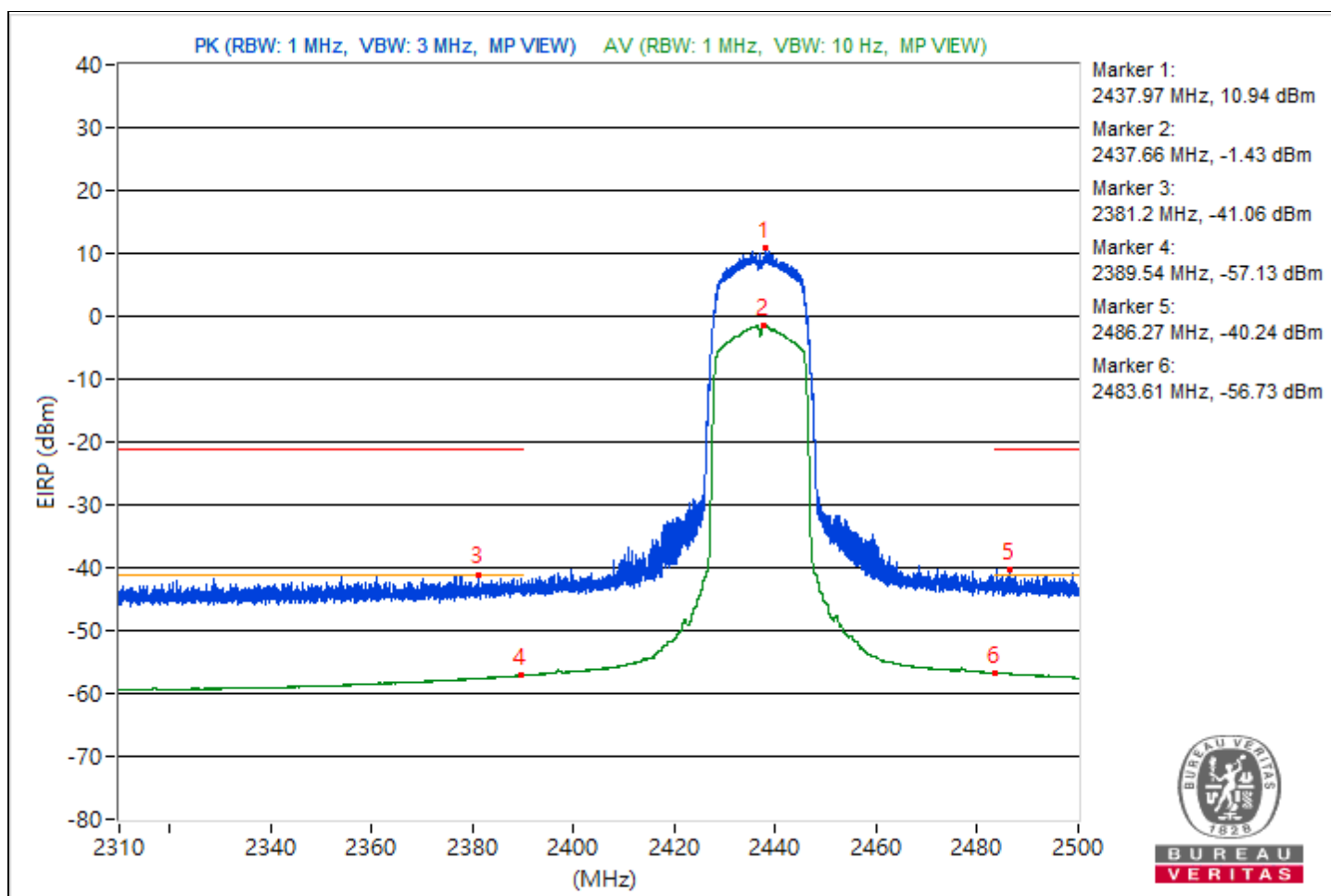


RF Mode	802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	2.31 GHz ~ 2.5 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Band Edge							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	*2437.97	106.2 PK			7.19	3.75	10.94
2	*2437.66	93.83 AV			-5.18	3.75	-1.43
3	2381.2	54.2 PK	74	-19.8	-44.81	3.75	-41.06
4	2389.54	38.13 AV	54	-15.87	-60.88	3.75	-57.13
5	2486.27	55.02 PK	74	-18.98	-43.99	3.75	-40.24
6	2483.61	38.53 AV	54	-15.47	-60.48	3.75	-56.73

Notes:

1. Margin value = Emission Level - Limit value
2. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

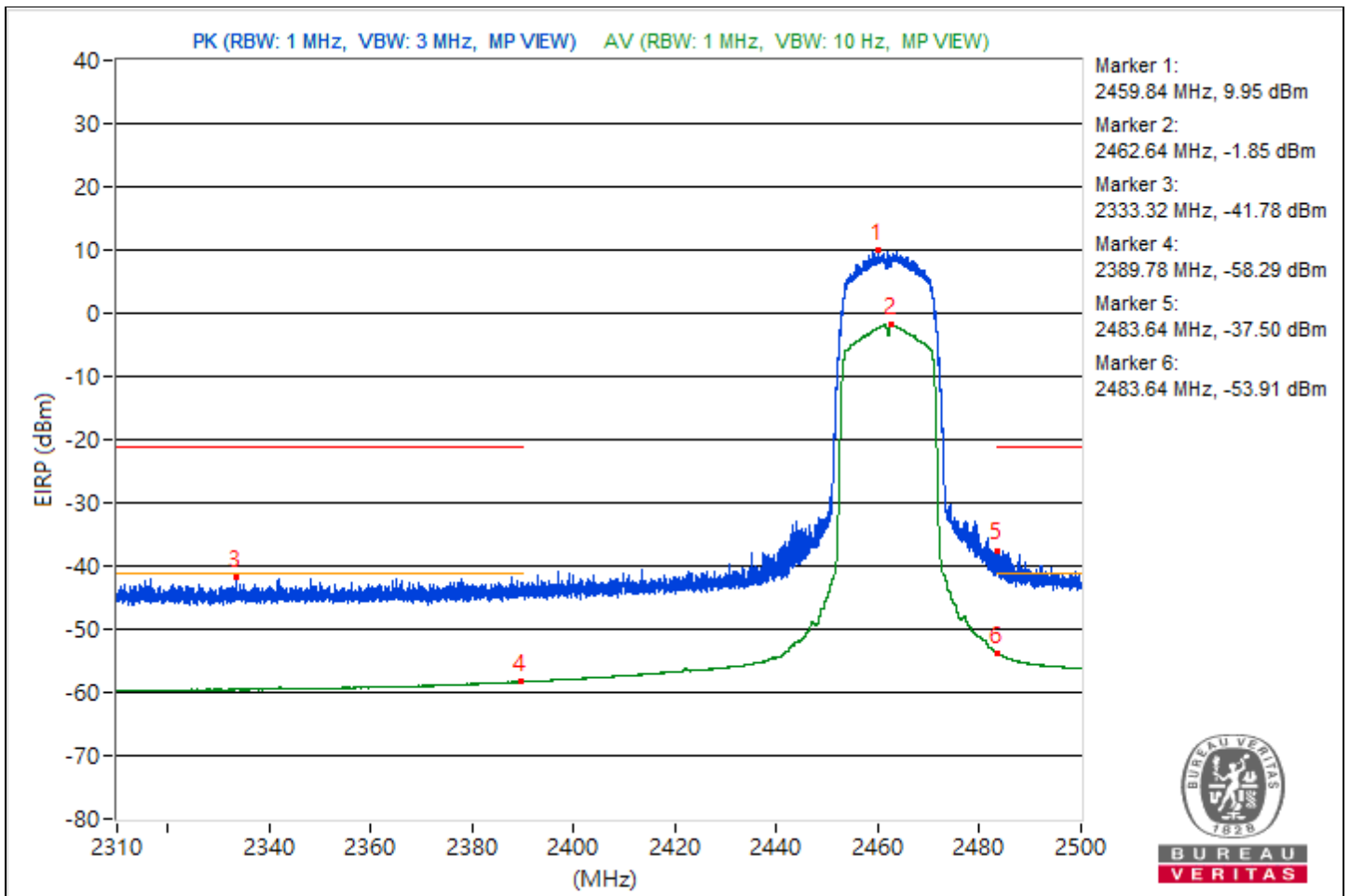


RF Mode	802.11n (HT20)	Channel	CH 11 : 2462 MHz
Frequency Range	2.31 GHz ~ 2.5 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 70% RH	Tested By	Rex Wang

Conducted Band Edge							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	*2459.84	105.21 PK			6.2	3.75	9.95
2	*2462.64	93.41 AV			-5.6	3.75	-1.85
3	2333.32	53.48 PK	74	-20.52	-45.53	3.75	-41.78
4	2389.78	36.97 AV	54	-17.03	-62.04	3.75	-58.29
5	2483.64	57.76 PK	74	-16.24	-41.25	3.75	-37.5
6	2483.64	41.35 AV	54	-12.65	-57.66	3.75	-53.91

Notes:

1. Margin value = Emission Level - Limit value
2. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

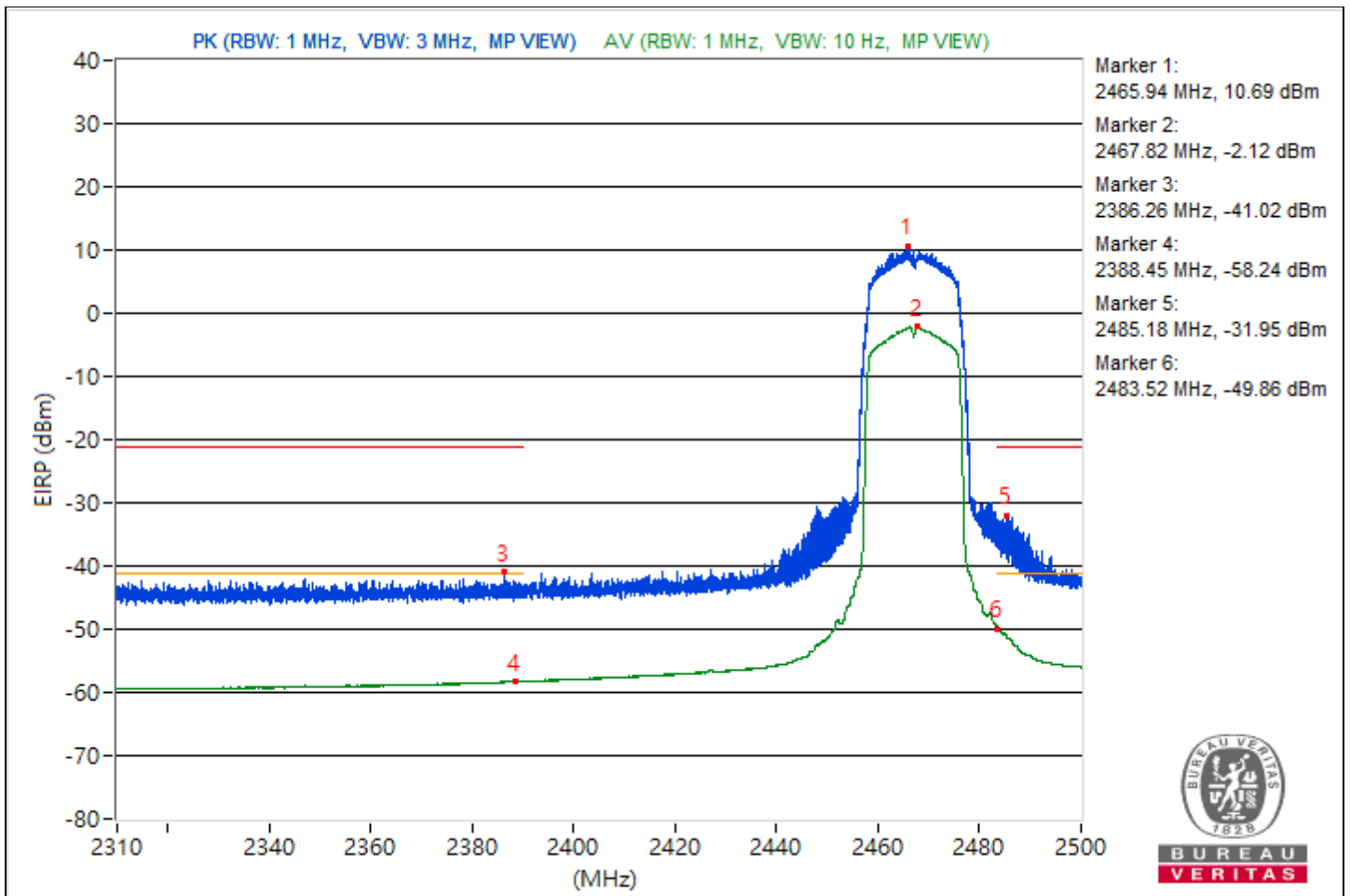


RF Mode	802.11n (HT20)	Channel	CH 12 : 2467 MHz
Frequency Range	2.31 GHz ~ 2.5 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 74% RH	Tested By	Rex Wang

Conducted Band Edge							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	*2465.94	105.95 PK			6.94	3.75	10.69
2	*2467.82	93.14 AV			-5.87	3.75	-2.12
3	2386.26	54.24 PK	74	-19.76	-44.77	3.75	-41.02
4	2388.45	37.02 AV	54	-16.98	-61.99	3.75	-58.24
5	2485.18	63.31 PK	74	-10.69	-35.7	3.75	-31.95
6	2483.52	45.4 AV	54	-8.6	-53.61	3.75	-49.86

Notes:

- Margin value = Emission Level - Limit value
- " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

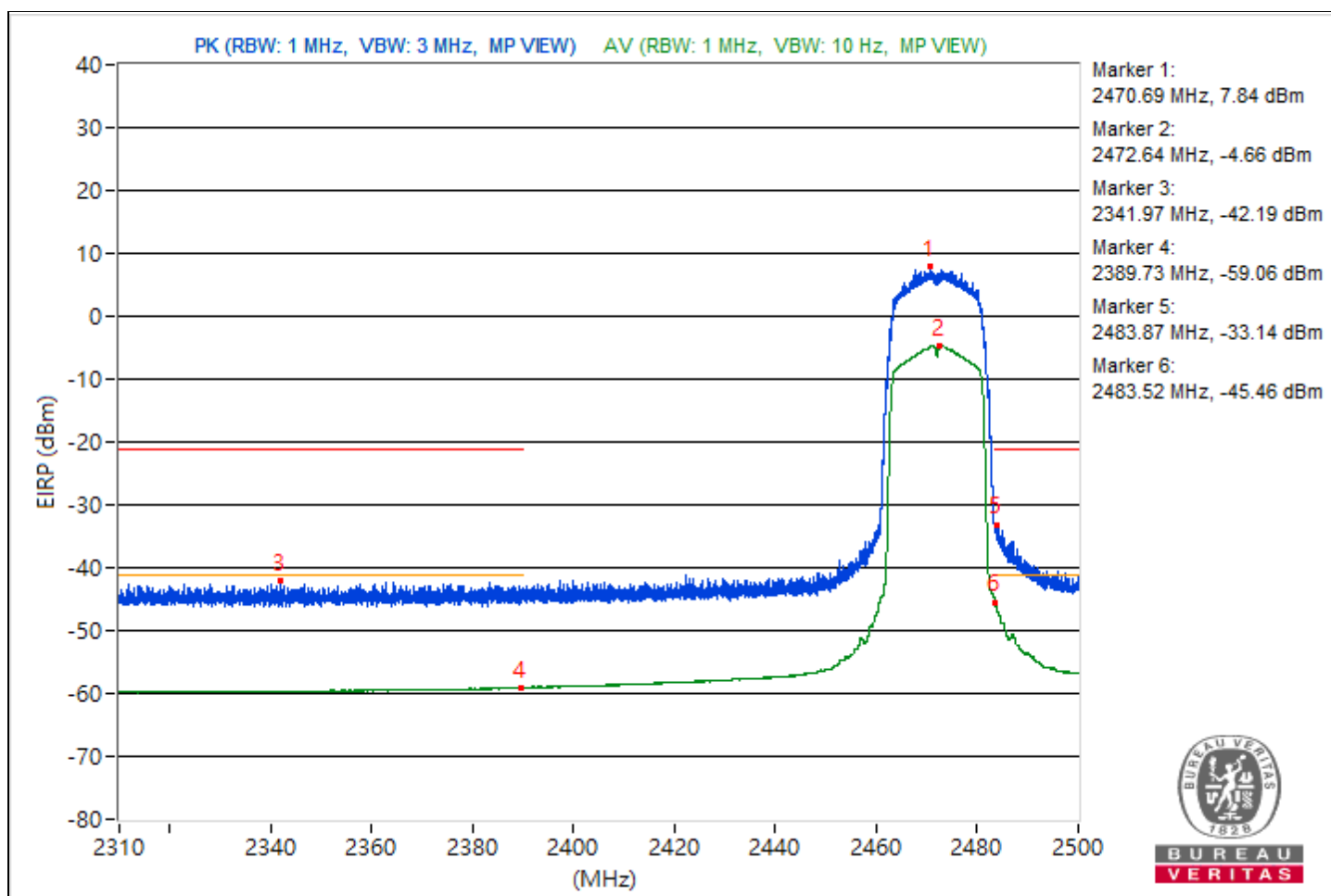


RF Mode	802.11n (HT20)	Channel	CH 13 : 2472 MHz
Frequency Range	2.31 GHz ~ 2.5 GHz	Input Power	3.3 Vdc
Environmental Conditions	22°C, 74% RH	Tested By	Rex Wang

Conducted Band Edge							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	*2470.69	103.1 PK			4.09	3.75	7.84
2	*2472.64	90.6 AV			-8.41	3.75	-4.66
3	2341.97	53.07 PK	74	-20.93	-45.94	3.75	-42.19
4	2389.73	36.2 AV	54	-17.8	-62.81	3.75	-59.06
5	2483.87	62.12 PK	74	-11.88	-36.89	3.75	-33.14
6	2483.52	49.8 AV	54	-4.2	-49.21	3.75	-45.46

Notes:

1. Margin value = Emission Level - Limit value
2. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.



Mode B

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=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24°C, 73% RH
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4824.00	49.8 PK	74.0	-24.2	2.34 H	188	45.5	4.3
2	4824.00	36.1 AV	54.0	-17.9	2.34 H	188	31.8	4.3
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	4824.00	50.6 PK	74.0	-23.4	1.85 V	113	46.3	4.3
2	4824.00	36.7 AV	54.0	-17.3	1.85 V	113	32.4	4.3

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.



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=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24°C, 73% RH
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	49.8 PK	74.0	-24.2	2.65 H	117	45.6	4.2
2	4874.00	35.8 AV	54.0	-18.2	2.65 H	117	31.6	4.2
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	4874.00	50.4 PK	74.0	-23.6	1.83 V	205	46.2	4.2
2	4874.00	36.9 AV	54.0	-17.1	1.83 V	205	32.7	4.2

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.



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=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24°C, 73% RH
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4924.00	49.5 PK	74.0	-24.5	2.68 H	159	45.4	4.1
2	4924.00	36.0 AV	54.0	-18.0	2.68 H	159	31.9	4.1
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	4924.00	50.4 PK	74.0	-23.6	1.83 V	201	46.3	4.1
2	4924.00	36.8 AV	54.0	-17.2	1.83 V	201	32.7	4.1

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.

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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