FCC Test Report

Report No.:	RFBCBB-WTW-P20120637-3
FCC ID:	NM82QA4100
Test Model:	2QA4100
Received Date:	Dec. 18, 2020
Test Date:	Dec. 28, 2020 ~ Jan. 27, 2021
Issued Date:	Feb. 05, 2021
Applicant:	HTC Corporation
Address:	No. 88, Sec. 3, Zhongxing Rd. Xindian Dist., New Taipei City 231, Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBCBB-WTW-P20120637-3	Original Release	Feb. 05, 2021

1 Certificate of Conformity

Product:	Headset
Brand:	VIVE
Test Model:	2QA4100
Sample Status:	Identical Prototype
Applicant:	HTC Corporation
Test Date:	Dec. 28, 2020 ~ Jan. 27, 2021
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu , **Date:** Feb. 05, 2021

Gina Liu / Specialist

Approved by : , **Date:** Feb. 05, 2021

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -14.29 dB at 10.022 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.4 dB at 885.54 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note:

1. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	3.59 dB
	200 MHz ~ 1000 MHz	3.60 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Headset
Brand	VIVE
Test Model	2QA4100
Status of EUT	Identical Prototype
Power Supply Rating	11.0 Vdc
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps 802.11ac: up to 400.0 Mbps 802.11ax: up to 574.0 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) (VHT20), 802.11ax (HE20) 7 for 802.11n (HT40) (VHT40), 802.11ax (HE40)
Output Power	94.535 mW
Antenna Type	Dipole antenna with 1 dBi gain
Antenna Connector	N/A
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function
802.11b	1Tx Diversity
802.11g	2TX
802.11n (HT20) (VHT20)	2TX
802.11n (HT40) (VHT40)	2TX
802.11ax (HE20)	2TX
802.11ax (HE40)	2TX

   * The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40, VHT20 / VHT40 and 802.11ax mode for HE20 / HE40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
2. The EUT accessories list refers to EUT Photo.pdf.
3. We had pre-tested all modes at 240V/60Hz and 120V/60Hz, test mode at 120V/60Hz was the worst case and only this mode was presented in the report.
4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20) (VHT20) and 802.11ax (HE20):

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

7 channels are provided for 802.11n (HT40) (VHT40) and 802.11ax (HE40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1 GHz **RE<1G:** Radiated Emission below 1 GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
NOTE: "-"means no effect.

Radiated Emission Test (Above 1 GHz):

☒ 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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
-	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Radiated Emission Test (Below 1 GHz):

☒ 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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11ax (HE20)	1 to 11	1	OFDMA	BPSK	MCS0

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11ax (HE20)	1 to 11	1	OFDMA	BPSK	MCS0

Bandedge Measurement:

☒ 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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
-	802.11ax (HE20)	1 to 11	1, 11	OFDMA	BPSK	MCS0
-	802.11ax (HE40)	3 to 9	3, 9	OFDMA	BPSK	MCS0

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
-	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Han Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Rex Wang
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Rex Wang
APCM	25 deg. C, 65 % RH	11 Vdc	Chris Lin

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

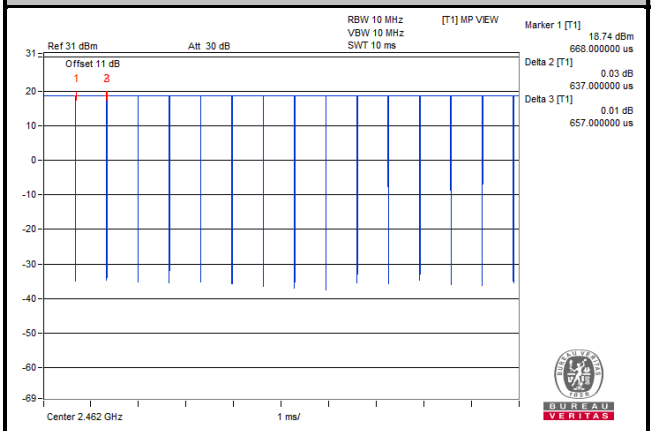
802.11b: Duty cycle = 0.637/0.657 = 0.970, Duty factor = 10 * log(1/0.970) = 0.13

802.11g: Duty cycle = 2.091/2.114 = 0.989, Duty cycle of test signal is ≥ 98 %, duty factor is not required.

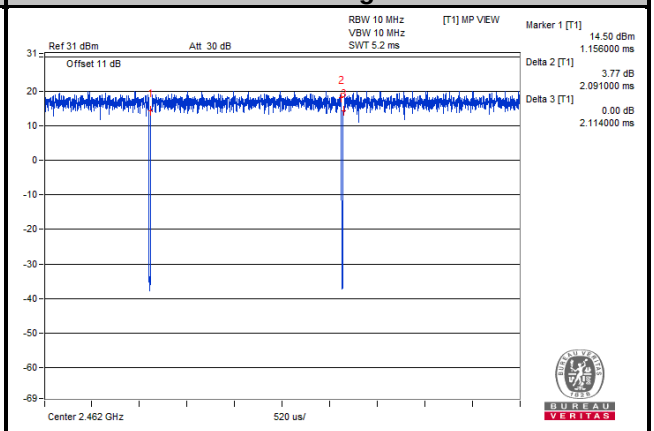
802.11ax (HE20): Duty cycle = 5.2/5.244 = 0.992, Duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11ax (HE40): Duty cycle = 5.206/5.246 = 0.992, Duty cycle of test signal is ≥ 98 %, duty factor is not required.

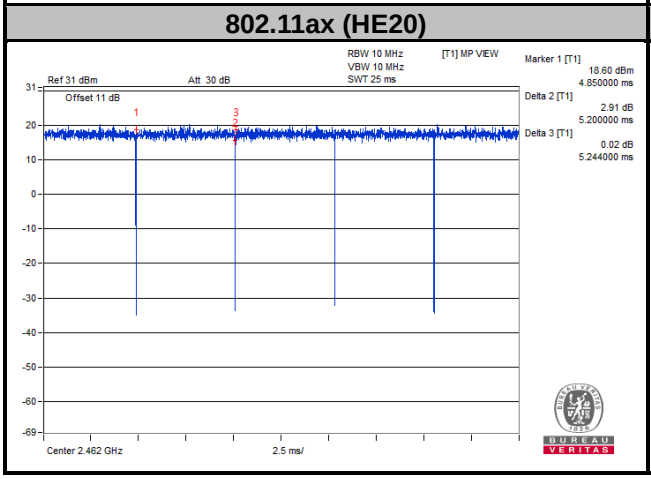
802.11b



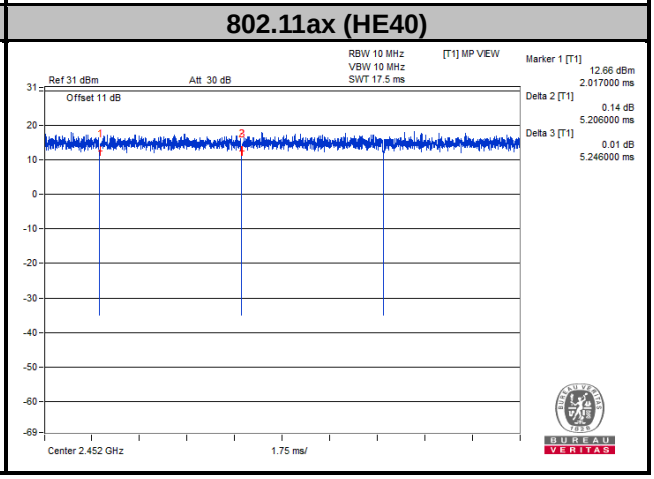
802.11g



802.11ax (HE20)



802.11ax (HE40)



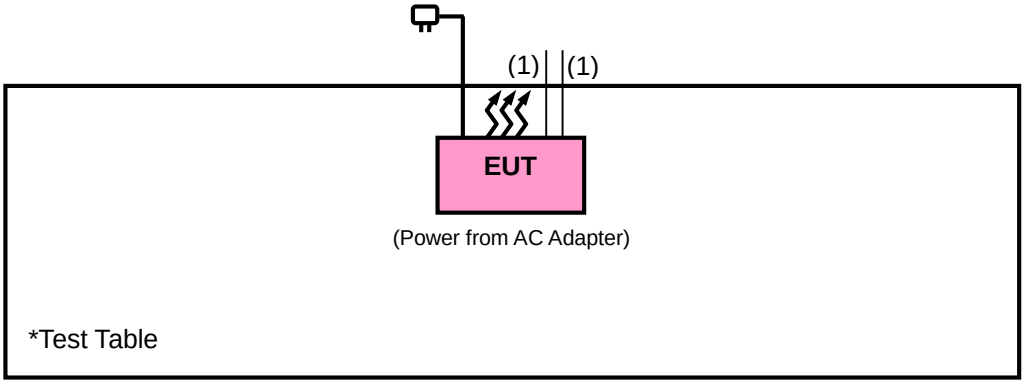
3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Type C Cable	2	1.15	Y	0	Provided by client

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

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 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

NOTE:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
			Jan. 16, 2021	Jan. 15, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
			Jan. 16, 2021	Jan. 15, 2022
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 13, 2020	Jul. 12, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.

4.1.3 Test Procedures

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 a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

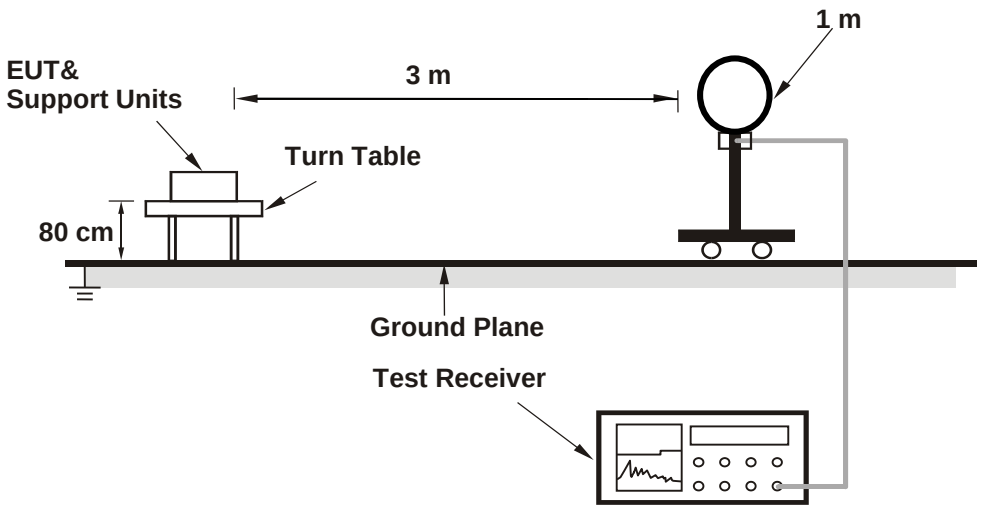
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz. (11b: RBW = 1 MHz, VBW =3 kHz ; 11g: RBW = 1 MHz, VBW = 10 Hz ;
   11ax (HE20): RBW = 1 MHz, VBW = 10 Hz ; 11ax (HE40): RBW = 1 MHz, VBW = 10 Hz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

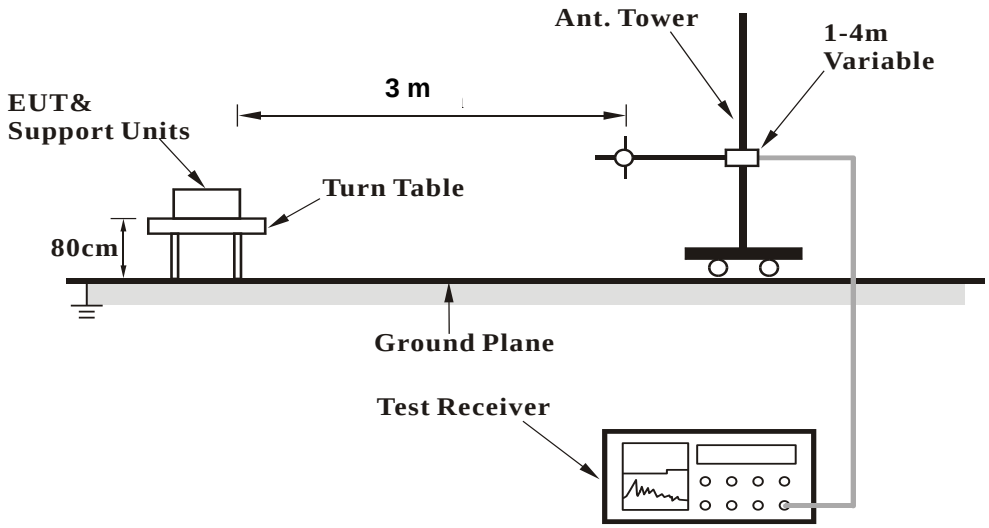
No deviation.

4.1.5 Test Set Up

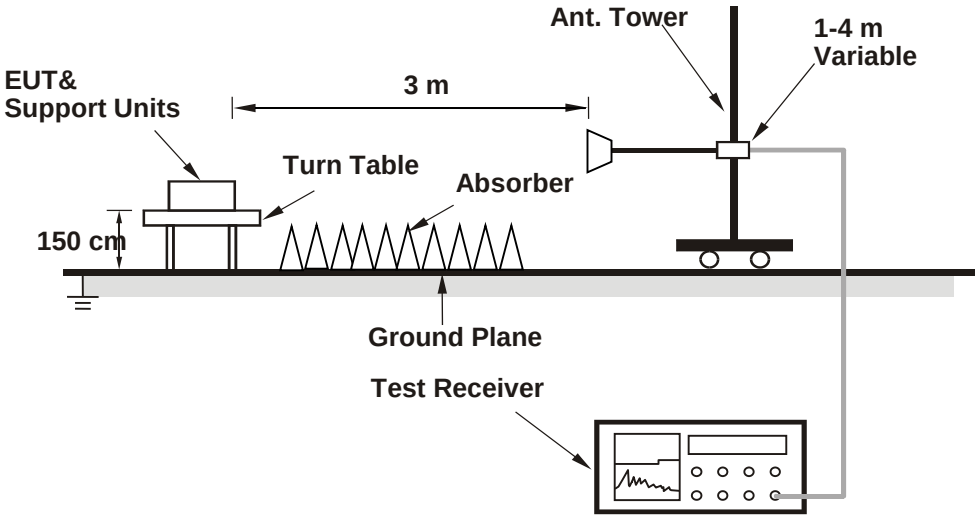
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on a testing table.
b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data：

RF Mode	TX 802.11b	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	55.0 PK	74.0	-19.0	1.24 H	171	23.8	31.2
2	2390.00	43.8 AV	54.0	-10.2	1.24 H	171	12.6	31.2
3	*2412.00	112.0 PK			1.24 H	171	80.8	31.2
4	*2412.00	108.3 AV			1.24 H	171	77.1	31.2
5	4824.00	47.9 PK	74.0	-26.1	2.29 H	152	45.9	2.0
6	4824.00	43.2 AV	54.0	-10.8	2.29 H	152	41.2	2.0
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	55.0 PK	74.0	-19.0	1.00 V	267	23.8	31.2
2	2390.00	44.0 AV	54.0	-10.0	1.00 V	267	12.8	31.2
3	*2412.00	103.7 PK			1.00 V	267	72.5	31.2
4	*2412.00	100.1 AV			1.00 V	267	68.9	31.2
5	4824.00	47.3 PK	74.0	-26.7	1.07 V	322	45.3	2.0
6	4824.00	43.5 AV	54.0	-10.5	1.07 V	322	41.5	2.0

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.

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	108.4 PK			1.24 H	171	77.3	31.1
2	*2437.00	104.9 AV			1.24 H	171	73.8	31.1
3	4874.00	42.9 PK	74.0	-31.1	2.27 H	172	40.8	2.1
4	4874.00	34.4 AV	54.0	-19.6	2.27 H	172	32.3	2.1
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	101.0 PK			1.10 V	263	69.9	31.1
2	*2437.00	97.9 AV			1.10 V	263	66.8	31.1
3	4874.00	43.3 PK	74.0	-30.7	1.07 V	314	41.2	2.1
4	4874.00	36.0 AV	54.0	-18.0	1.07 V	314	33.9	2.1

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.

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.6 PK			1.20 H	174	78.5	31.1
2	*2462.00	106.0 AV			1.20 H	174	74.9	31.1
3	2483.50	54.7 PK	74.0	-19.3	1.20 H	174	23.6	31.1
4	2483.50	43.7 AV	54.0	-10.3	1.20 H	174	12.6	31.1
5	4924.00	44.8 PK	74.0	-29.2	2.27 H	156	42.6	2.2
6	4924.00	38.5 AV	54.0	-15.5	2.27 H	156	36.3	2.2
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	*2462.00	104.4 PK			1.04 V	279	73.3	31.1
2	*2462.00	100.8 AV			1.04 V	279	69.7	31.1
3	2483.50	54.8 PK	74.0	-19.2	1.04 V	279	23.7	31.1
4	2483.50	43.5 AV	54.0	-10.5	1.04 V	279	12.4	31.1
5	4924.00	48.6 PK	74.0	-25.4	1.06 V	312	46.4	2.2
6	4924.00	44.3 AV	54.0	-9.7	1.06 V	312	42.1	2.2

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.

RF Mode	TX 802.11g	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	53.6 PK	74.0	-20.4	1.24 H	170	22.4	31.2
2	2390.00	43.4 AV	54.0	-10.6	1.24 H	170	12.2	31.2
3	*2412.00	108.4 PK			1.24 H	170	77.2	31.2
4	*2412.00	98.6 AV			1.24 H	170	67.4	31.2
5	4824.00	40.0 PK	74.0	-34.0	2.24 H	155	38.0	2.0
6	4824.00	27.9 AV	54.0	-26.1	2.24 H	155	25.9	2.0
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	54.6 PK	74.0	-19.4	1.09 V	285	23.4	31.2
2	2390.00	43.4 AV	54.0	-10.6	1.09 V	285	12.2	31.2
3	*2412.00	104.4 PK			1.09 V	285	73.2	31.2
4	*2412.00	94.3 AV			1.09 V	285	63.1	31.2
5	4824.00	40.9 PK	74.0	-33.1	1.18 V	213	38.9	2.0
6	4824.00	29.8 AV	54.0	-24.2	1.18 V	213	27.8	2.0

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.

RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	106.4 PK			1.23 H	195	75.3	31.1
2	*2437.00	96.7 AV			1.23 H	195	65.6	31.1
3	4874.00	41.5 PK	74.0	-32.5	2.25 H	156	39.4	2.1
4	4874.00	28.1 AV	54.0	-25.9	2.25 H	156	26.0	2.1
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	103.1 PK			1.11 V	281	72.0	31.1
2	*2437.00	92.6 AV			1.11 V	281	61.5	31.1
3	4874.00	40.8 PK	74.0	-33.2	1.17 V	210	38.7	2.1
4	4874.00	28.4 AV	54.0	-25.6	1.17 V	210	26.3	2.1

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.

RF Mode	TX 802.11g	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	108.3 PK			1.21 H	175	77.2	31.1
2	*2462.00	99.6 AV			1.21 H	175	68.5	31.1
3	2483.50	54.5 PK	74.0	-19.5	1.21 H	175	23.4	31.1
4	2483.50	43.6 AV	54.0	-10.4	1.21 H	175	12.5	31.1
5	4924.00	41.1 PK	74.0	-32.9	2.17 H	156	38.9	2.2
6	4924.00	27.9 AV	54.0	-26.1	2.17 H	156	25.7	2.2
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	*2462.00	105.5 PK			1.07 V	283	74.4	31.1
2	*2462.00	95.0 AV			1.07 V	283	63.9	31.1
3	2483.50	54.8 PK	74.0	-19.2	1.07 V	283	23.7	31.1
4	2483.50	43.4 AV	54.0	-10.6	1.07 V	283	12.3	31.1
5	4924.00	40.8 PK	74.0	-33.2	1.12 V	206	38.6	2.2
6	4924.00	28.3 AV	54.0	-25.7	1.12 V	206	26.1	2.2

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.

RF Mode	TX 802.11ax (HE20)	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	55.8 PK	74.0	-18.2	1.23 H	173	24.6	31.2
2	2390.00	47.5 AV	54.0	-6.5	1.23 H	173	16.3	31.2
3	*2412.00	109.3 PK			1.23 H	173	78.1	31.2
4	*2412.00	99.5 AV			1.23 H	173	68.3	31.2
5	4824.00	43.4 PK	74.0	-30.6	2.19 H	151	41.4	2.0
6	4824.00	30.5 AV	54.0	-23.5	2.19 H	151	28.5	2.0
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	54.5 PK	74.0	-19.5	1.20 V	267	23.3	31.2
2	2390.00	43.4 AV	54.0	-10.6	1.20 V	267	12.2	31.2
3	*2412.00	105.5 PK			1.20 V	267	74.3	31.2
4	*2412.00	95.0 AV			1.20 V	267	63.8	31.2
5	4824.00	41.3 PK	74.0	-32.7	1.21 V	198	39.3	2.0
6	4824.00	29.0 AV	54.0	-25.0	1.21 V	198	27.0	2.0

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.

RF Mode	TX 802.11ax (HE20)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	106.9 PK			1.35 H	140	75.8	31.1
2	*2437.00	96.8 AV			1.35 H	140	65.7	31.1
3	4874.00	40.9 PK	74.0	-33.1	2.22 H	152	38.8	2.1
4	4874.00	28.1 AV	54.0	-25.9	2.22 H	152	26.0	2.1
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	103.0 PK			1.37 V	284	71.9	31.1
2	*2437.00	93.0 AV			1.37 V	284	61.9	31.1
3	4874.00	42.4 PK	74.0	-31.6	1.20 V	209	40.3	2.1
4	4874.00	29.9 AV	54.0	-24.1	1.20 V	209	27.8	2.1

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.

RF Mode	TX 802.11ax (HE20)	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	108.1 PK			1.23 H	152	77.0	31.1
2	*2462.00	98.4 AV			1.23 H	152	67.3	31.1
3	2483.50	54.9 PK	74.0	-19.1	1.23 H	152	23.8	31.1
4	2483.50	43.2 AV	54.0	-10.8	1.23 H	152	12.1	31.1
5	4924.00	41.7 PK	74.0	-32.3	2.22 H	156	39.5	2.2
6	4924.00	28.6 AV	54.0	-25.4	2.22 H	156	26.4	2.2
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	*2462.00	105.2 PK			1.09 V	280	74.1	31.1
2	*2462.00	95.3 AV			1.09 V	280	64.2	31.1
3	2483.50	55.3 PK	74.0	-18.7	1.09 V	280	24.2	31.1
4	2483.50	43.9 AV	54.0	-10.1	1.09 V	280	12.8	31.1
5	4924.00	43.0 PK	74.0	-31.0	1.18 V	211	40.8	2.2
6	4924.00	30.2 AV	54.0	-23.8	1.18 V	211	28.0	2.2

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.

RF Mode	TX 802.11ax (HE40)	Channel	CH 3：2422 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	55.5 PK	74.0	-18.5	1.27 H	173	24.3	31.2
2	2390.00	46.9 AV	54.0	-7.1	1.27 H	173	15.7	31.2
3	*2422.00	106.6 PK			1.27 H	173	75.4	31.2
4	*2422.00	96.8 AV			1.27 H	173	65.6	31.2
5	4844.00	41.1 PK	74.0	-32.9	2.14 H	159	39.0	2.1
6	4844.00	28.8 AV	54.0	-25.2	2.14 H	159	26.7	2.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	54.7 PK	74.0	-19.3	1.10 V	282	23.5	31.2
2	2390.00	43.3 AV	54.0	-10.7	1.10 V	282	12.1	31.2
3	*2422.00	103.2 PK			1.10 V	283	72.0	31.2
4	*2422.00	92.7 AV			1.10 V	283	61.5	31.2
5	4844.00	40.1 PK	74.0	-33.9	1.18 V	184	38.0	2.1
6	4844.00	28.7 AV	54.0	-25.3	1.18 V	184	26.6	2.1

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.

RF Mode	TX 802.11ax (HE40)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	103.8 PK			1.27 H	185	72.7	31.1
2	*2437.00	94.5 AV			1.27 H	185	63.4	31.1
3	4874.00	40.9 PK	74.0	-33.1	2.23 H	158	38.8	2.1
4	4874.00	28.7 AV	54.0	-25.3	2.23 H	158	26.6	2.1
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	100.1 PK			1.01 V	262	69.0	31.1
2	*2437.00	90.5 AV			1.01 V	262	59.4	31.1
3	4874.00	40.6 PK	74.0	-33.4	1.16 V	188	38.5	2.1
4	4874.00	28.5 AV	54.0	-25.5	1.16 V	188	26.4	2.1

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.

RF Mode	TX 802.11ax (HE40)	Channel	CH 9：2452 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2452.00	105.2 PK			1.18 H	178	74.1	31.1
2	*2452.00	96.0 AV			1.18 H	178	64.9	31.1
3	2483.50	58.8 PK	74.0	-15.2	1.18 H	178	27.7	31.1
4	2483.50	45.7 AV	54.0	-8.3	1.18 H	178	14.6	31.1
5	4904.00	41.1 PK	74.0	-32.9	2.15 H	164	39.1	2.0
6	4904.00	28.8 AV	54.0	-25.2	2.15 H	164	26.8	2.0
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	*2452.00	101.7 PK			1.00 V	282	70.6	31.1
2	*2452.00	92.6 AV			1.00 V	282	61.5	31.1
3	2483.50	56.0 PK	74.0	-18.0	1.00 V	282	24.9	31.1
4	2483.50	44.3 AV	54.0	-9.7	1.00 V	282	13.2	31.1
5	4904.00	40.9 PK	74.0	-33.1	1.14 V	185	38.9	2.0
6	4904.00	28.8 AV	54.0	-25.2	1.14 V	185	26.8	2.0

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.

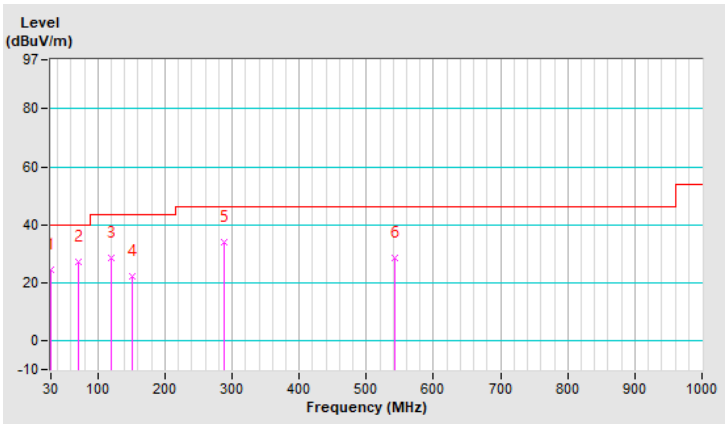
30 MHz ~ 1 GHz Worst-Case Data:

RF Mode	TX 802.11ax (HE20)	Channel	CH 1：2412 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.00	24.3 QP	40.0	-15.7	1.50 H	12	34.6	-10.3
2	70.74	27.0 QP	40.0	-13.0	1.00 H	241	37.9	-10.9
3	120.21	28.4 QP	43.5	-15.1	1.25 H	4	39.2	-10.8
4	152.22	22.3 QP	43.5	-21.2	2.00 H	287	30.7	-8.4
5	288.02	34.1 QP	46.0	-11.9	1.00 H	145	41.1	-7.0
6	543.13	28.7 QP	46.0	-17.3	1.25 H	174	30.6	-1.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

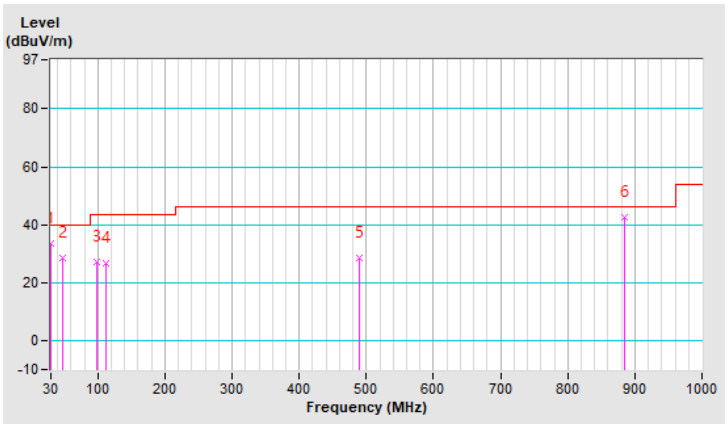


RF Mode	TX 802.11ax (HE20)	Channel	CH 1：2412 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.97	33.4 QP	40.0	-6.6	1.50 V	177	44.0	-10.6
2	48.43	28.6 QP	40.0	-11.4	1.00 V	103	37.6	-9.0
3	97.90	27.4 QP	43.5	-16.1	2.00 V	105	40.9	-13.5
4	112.45	26.8 QP	43.5	-16.7	1.25 V	3	38.2	-11.4
5	489.78	28.5 QP	46.0	-17.5	1.50 V	39	31.3	-2.8
6	**885.54**	**42.6 QP**	**46.0**	**-3.4**	**1.00 V**	**124**	**38.1**	**4.5**

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESR3	102783	Jan. 06, 2021	Jan. 05, 2022
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2020	Sep. 03, 2021
V-LISN SCHWARZBECK (EUT)	NNBL 8226-2	8226-142	Jul. 31, 2020	Jul. 30, 2021
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 18, 2020	Aug. 17, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 2 (Conduction 2).
3. The VCCI Site Registration No. is C-12047.

4.2.3 Test Procedures

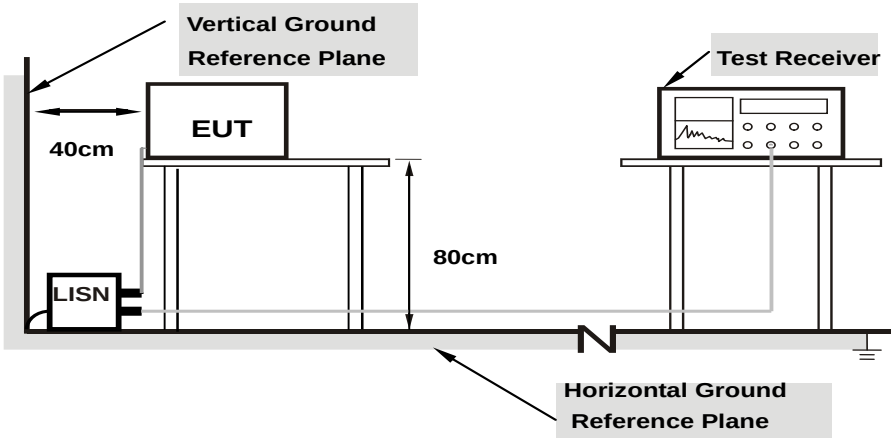
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 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.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

a. Placed the EUT on a testing table.
b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

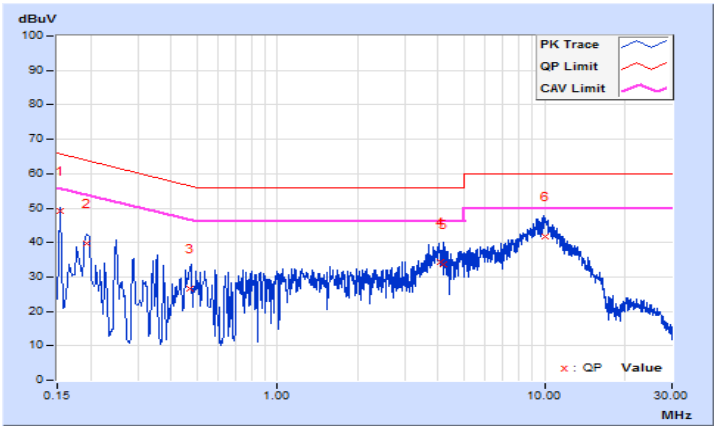
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Rex Wang	**Test Date**	2021/1/27

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15400	9.71	39.57	21.70	49.28	31.41	65.78	55.78	-16.50	-24.37
2	0.19265	9.74	30.12	17.37	39.86	27.11	63.92	53.92	-24.06	-26.81
3	0.47185	9.79	16.86	1.59	26.65	11.38	56.48	46.48	-29.83	-35.10
4	4.05800	10.01	24.23	16.47	34.24	26.48	56.00	46.00	-21.76	-19.52
5	4.16200	10.01	23.80	9.82	33.81	19.83	56.00	46.00	-22.19	-26.17
6	**10.02200**	**10.14**	**31.58**	**25.57**	**41.72**	**35.71**	**60.00**	**50.00**	**-18.28**	**-14.29**

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

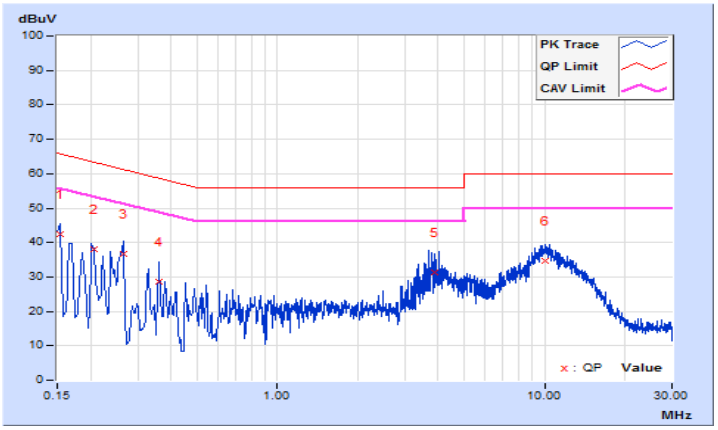


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Rex Wang	**Test Date**	2021/1/27

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	0.15400	9.70	32.60	14.85	42.30	24.55	65.78	55.78	-23.48	-31.23
2	0.20600	9.74	28.15	12.21	37.89	21.95	63.37	53.37	-25.48	-31.42
3	0.26429	9.74	26.91	12.64	36.65	22.38	61.30	51.30	-24.65	-28.92
4	0.35876	9.75	18.94	3.93	28.69	13.68	58.76	48.76	-30.07	-35.08
5	3.86200	10.01	21.35	8.23	31.36	18.24	56.00	46.00	-24.64	-27.76
6	10.01400	10.15	24.40	16.25	34.55	26.40	60.00	50.00	-25.45	-23.60

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

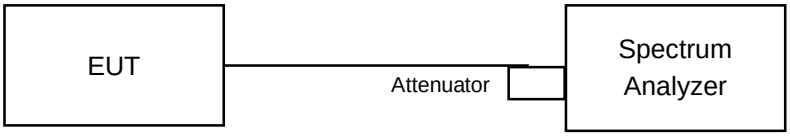


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.09	0.5	Pass
6	2437	8.07	0.5	Pass
11	2462	8.06	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.05	16.08	0.5	Pass
6	2437	16.37	16.38	0.5	Pass
11	2462	16.37	16.37	0.5	Pass

802.11ax (HE20)

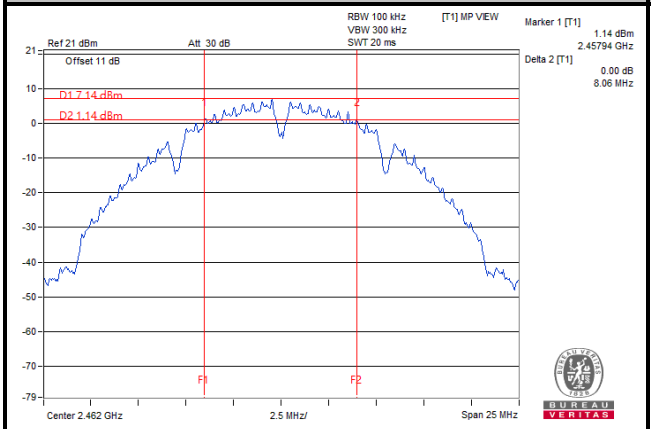
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.25	18.68	0.5	Pass
6	2437	18.94	18.84	0.5	Pass
11	2462	18.99	18.99	0.5	Pass

802.11ax (HE40)

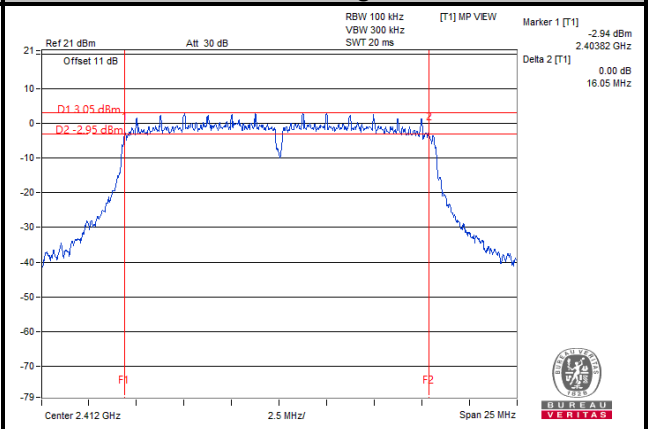
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.31	36.55	0.5	Pass
6	2437	37.51	37.49	0.5	Pass
9	2452	37.37	37.36	0.5	Pass

Spectrum Plot of Worst Value

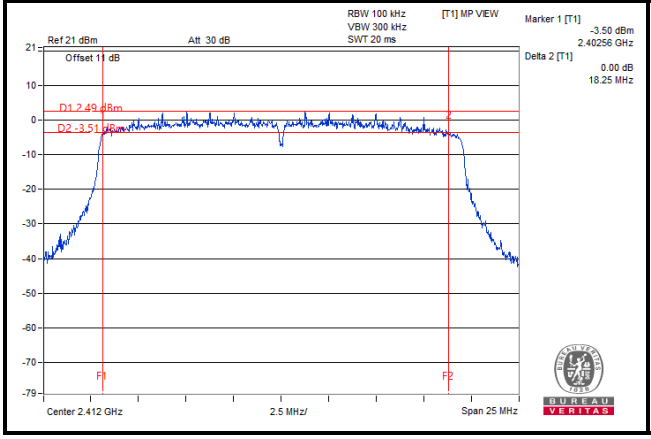
802.11b



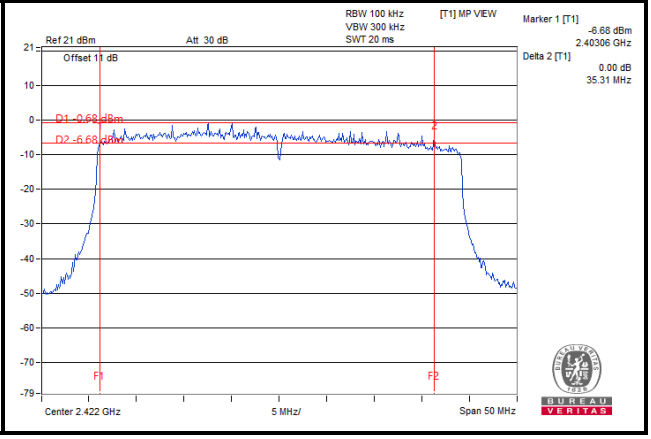
802.11g



802.11ax (HE20)

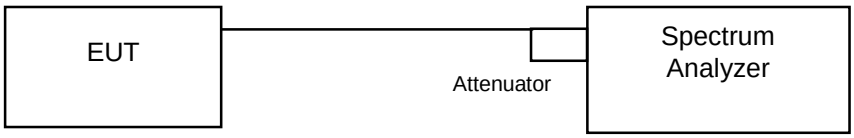


802.11ax (HE40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	12.90	Pass
6	2437	13.20	Pass
11	2462	13.20	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.38	16.32	Pass
6	2437	16.44	16.44	Pass
11	2462	16.56	16.44	Pass

802.11ax (HE20)

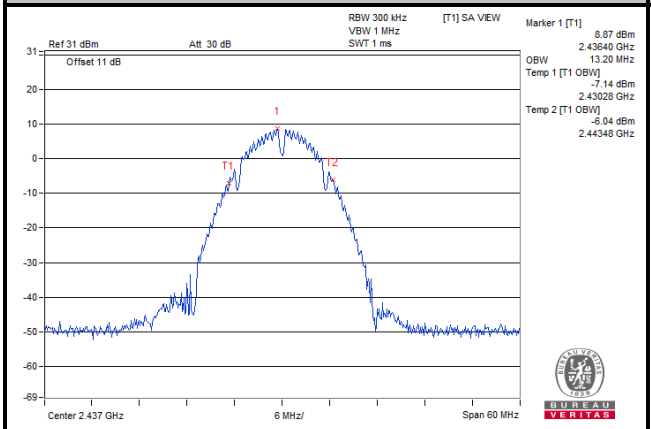
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	18.84	18.96	Pass
6	2437	18.96	18.96	Pass
11	2462	19.08	18.96	Pass

802.11ax (HE40)

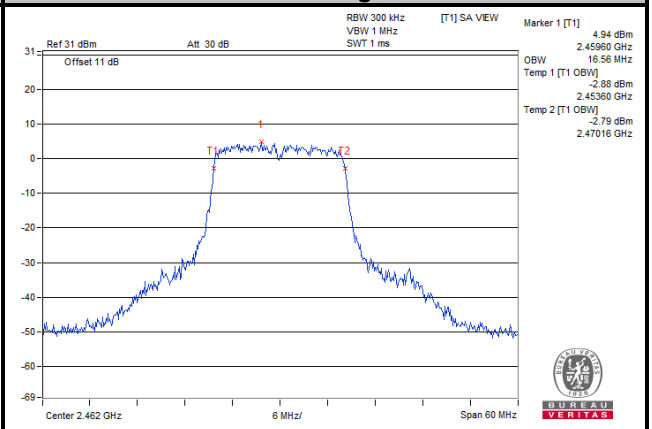
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	37.80	37.80	Pass
6	2437	38.04	38.04	Pass
9	2452	37.92	37.92	Pass

Spectrum Plot of Worst Value

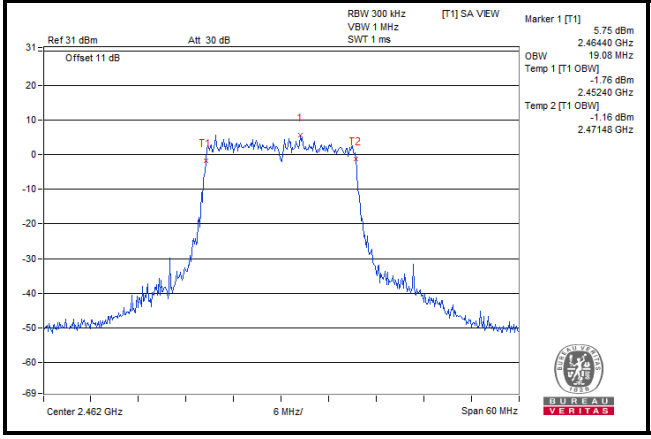
802.11b



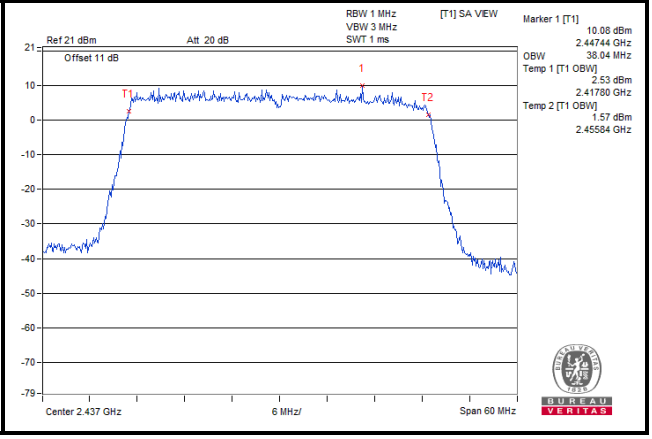
802.11g



802.11ax (HE20)



802.11ax (HE40)



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)
Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;
Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20 MHz channel widths with NANT ≥ 5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) dB.

4.5.2 Test Setup

4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	48.084	16.82	30	Pass
6	2437	47.534	16.77	30	Pass
11	2462	45.814	16.61	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.56	14.91	59.55	17.75	30	Pass
6	2437	14.31	14.96	58.31	17.66	30	Pass
11	2462	14.37	14.91	58.327	17.66	30	Pass

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.62	14.98	60.451	17.81	30	Pass
6	2437	14.72	14.94	60.837	17.84	30	Pass
11	2462	14.77	14.96	61.324	17.88	30	Pass

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	14.66	14.91	60.216	17.80	30	Pass
6	2437	14.55	14.99	60.06	17.79	30	Pass
9	2452	14.72	14.98	61.126	17.86	30	Pass

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.6.2 Test Setup

4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

For Average Power (Duty cycle ≥ 98%)

a. Set instrument center frequency to DTS channel center frequency.
b. Set span to at least 1.5 times the OBW.
c. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set VBW ≥3 x RBW.
e. Detector = power averaging (RMS) or sample detector (when RMS not available).
f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g. Sweep time = auto couple.
h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
i. Use the peak marker function to determine the maximum amplitude level.

For Average Power (Duty cycle < 98%)

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 ≤ RBW ≤ 100 kHz.
e. Set VBW ≥3 x RBW.
f. Detector = power averaging (RMS) or sample detector (when RMS not available).
g. Ensure that the number of measurement points in the sweep ≥ 2 x 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.
l. 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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 Test Results

802.11b

Channel	Freq. (MHz)	PSD (dBm/3 kHz)	Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-15.13	0.13	-15.00	8	Pass
6	2437	-16.11	0.13	-15.98	8	Pass
11	2462	-15.97	0.13	-15.84	8	Pass

NOTE:

1. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-22.10	3.01	-19.09	8	Pass
	6	2437	-22.20	3.01	-19.19	8	Pass
	11	2462	-22.50	3.01	-19.49	8	Pass
1	1	2412	-22.79	3.01	-19.78	8	Pass
	6	2437	-23.25	3.01	-20.24	8	Pass
	11	2462	-23.39	3.01	-20.38	8	Pass

NOTE:

1. Directional gain = 1 dBi + 10log(2) = 4.01 dBi < 6 dBi, so the limit no need to be reduced.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

802.11ax (HE20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-24.31	3.01	-21.3	8	Pass
	6	2437	-24.81	3.01	-21.8	8	Pass
	11	2462	-24.51	3.01	-21.5	8	Pass
1	1	2412	-24.38	3.01	-21.37	8	Pass
	6	2437	-24.30	3.01	-21.29	8	Pass
	11	2462	-24.80	3.01	-21.79	8	Pass

NOTE:

1. Directional gain = 1 dBi + 10log(2) = 4.01 dBi < 6 dBi, so the limit no need to be reduced.
2. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.

802.11ax (HE40)

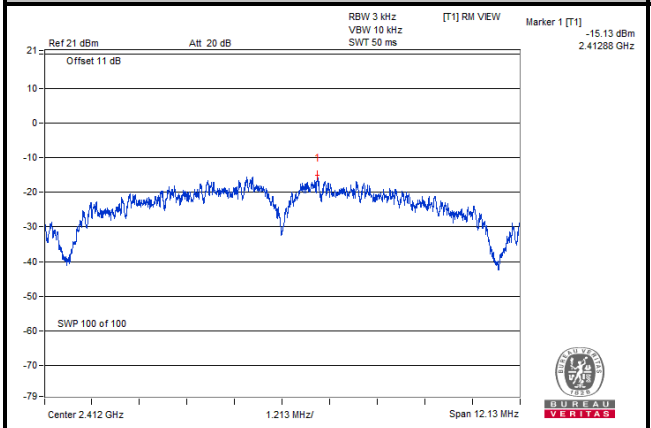
TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-27.65	3.01	-24.64	8	Pass
	6	2437	-27.97	3.01	-24.96	8	Pass
	9	2452	-27.29	3.01	-24.28	8	Pass
1	3	2422	-27.65	3.01	-24.64	8	Pass
	6	2437	-27.79	3.01	-24.78	8	Pass
	9	2452	-26.56	3.01	-23.55	8	Pass

NOTE:

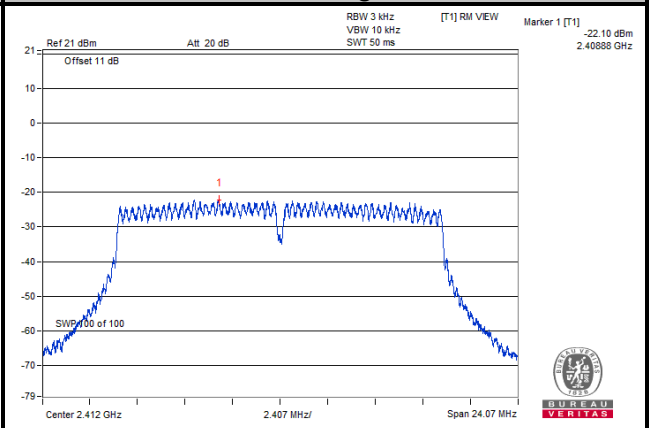
1. Directional gain = 1 dBi + 10log(2) = 4.01 dBi < 6 dBi, so the limit no need to be reduced.
2. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.

Spectrum Plot of Worst Value

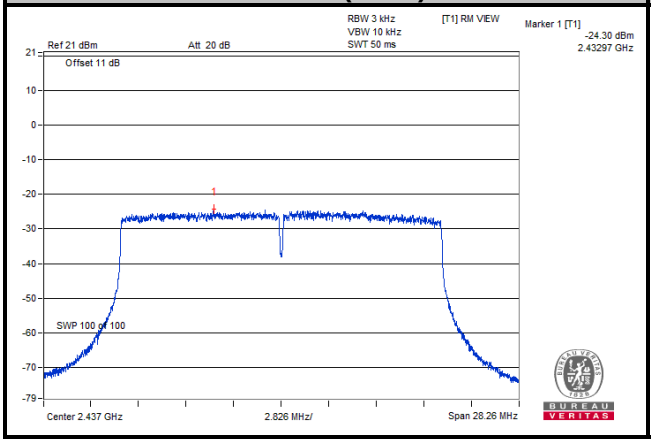
802.11b



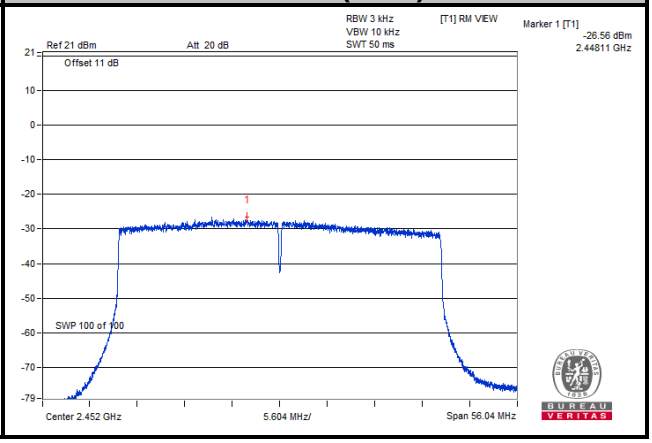
802.11g



802.11ax (HE20)



802.11ax (HE40)

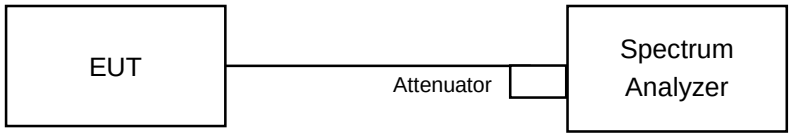


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

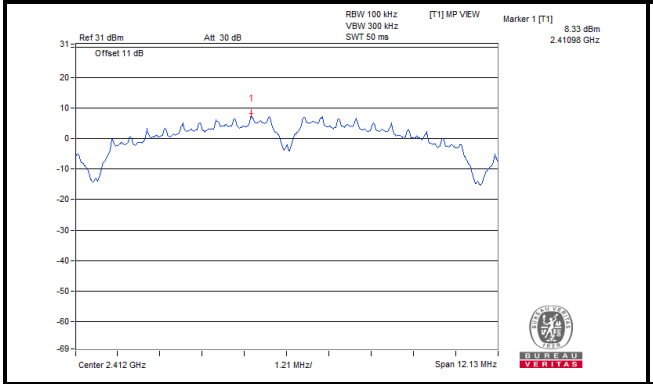
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

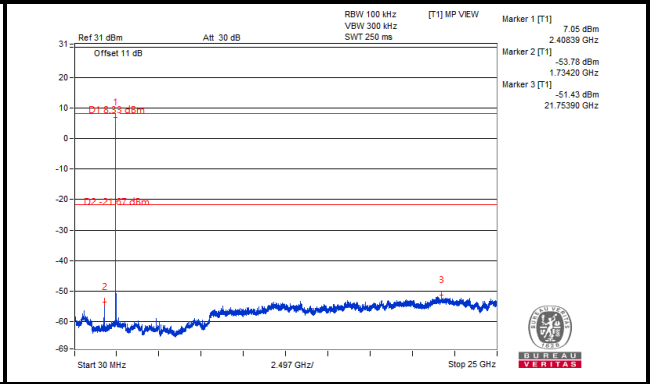
4.7.7 Test Results

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

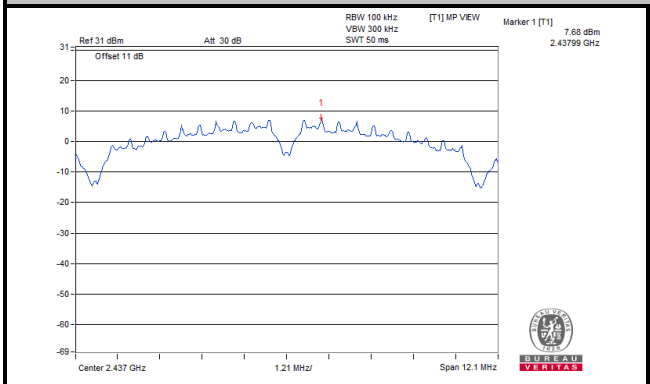
802.11b

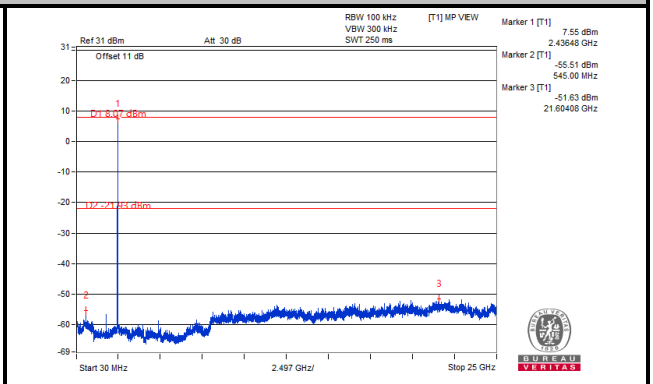
Ch 1



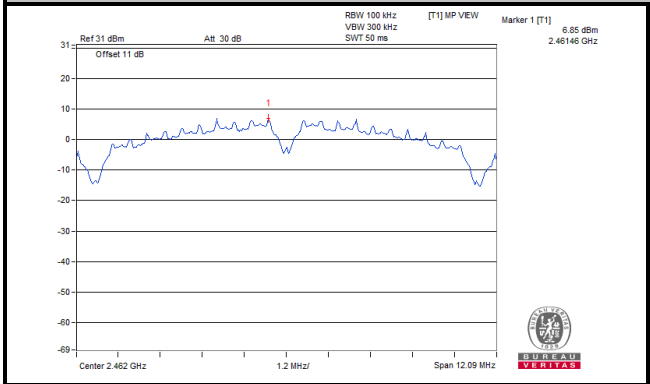


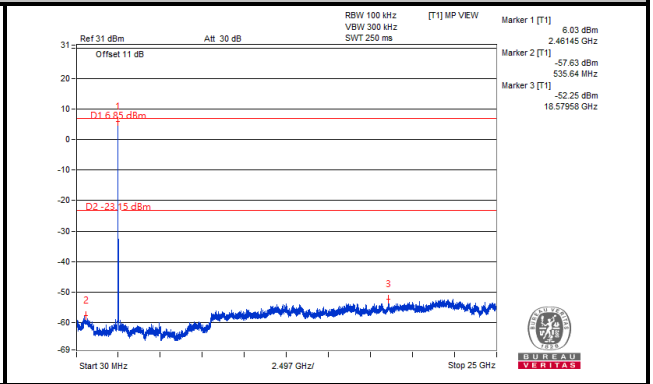
Ch 6



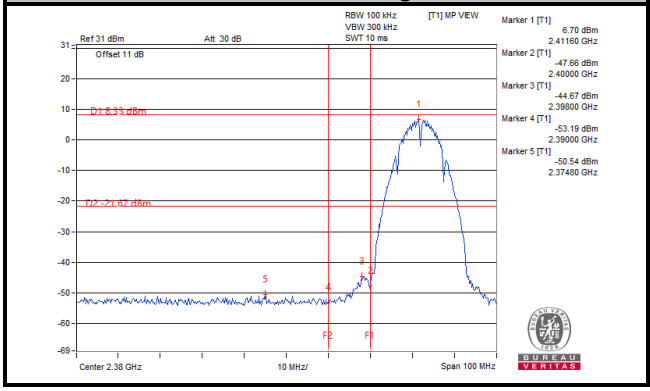


Ch 11

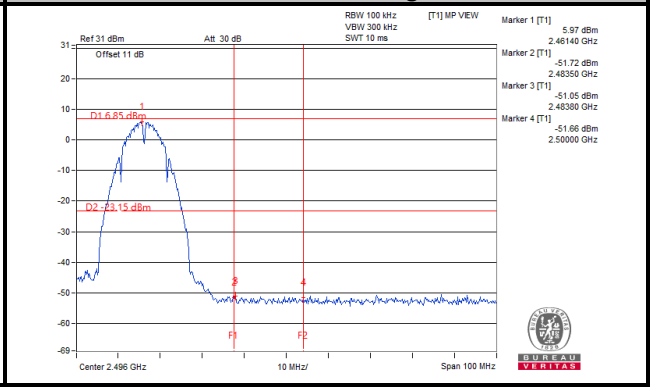




Ch 1 Band Edge

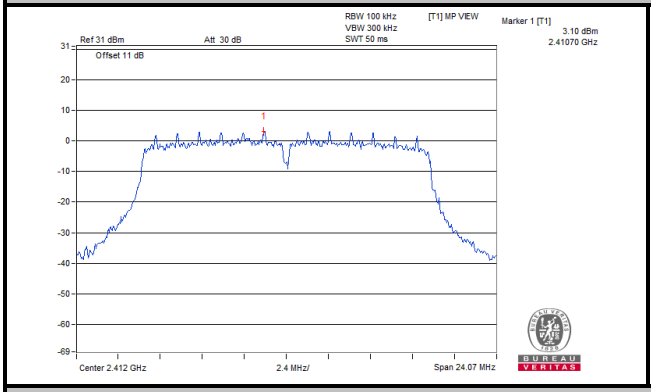


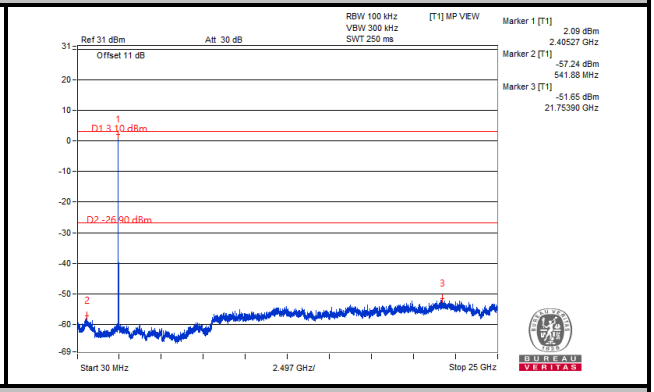
Ch 11 Band Edge



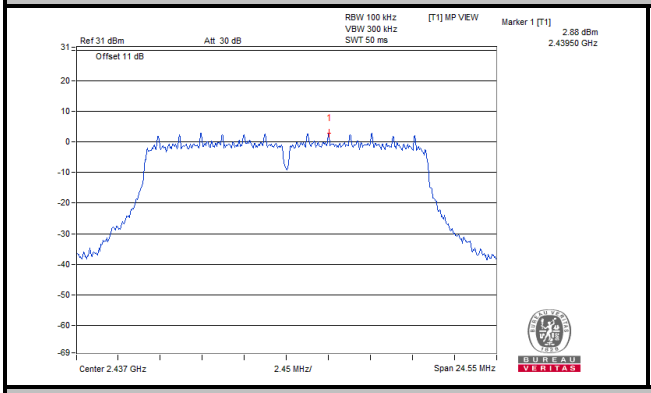
802.11g_CHAIN 0

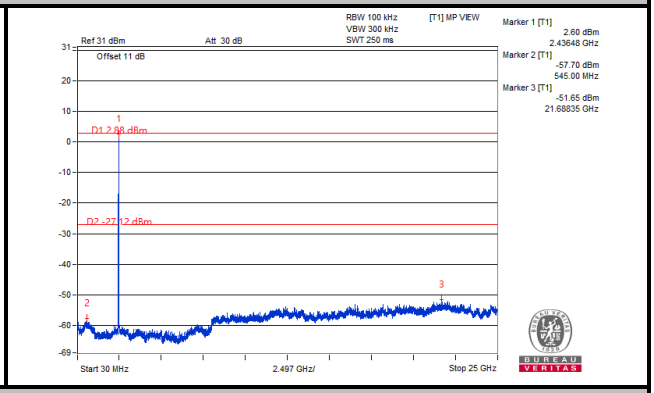
Ch 1



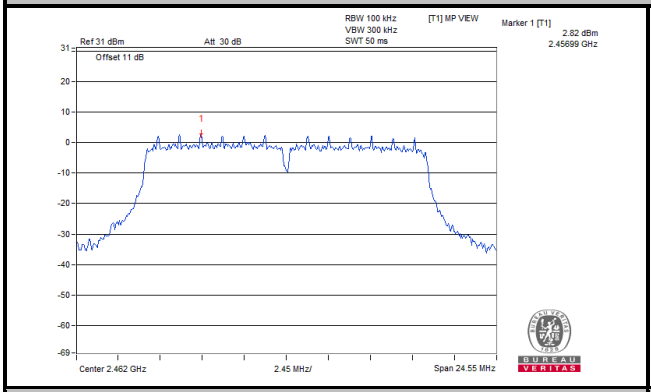


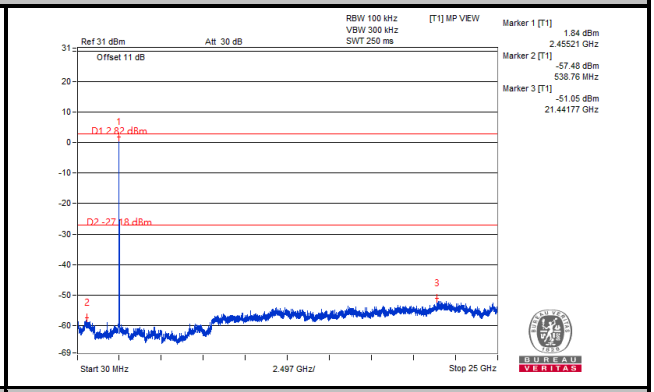
Ch 6



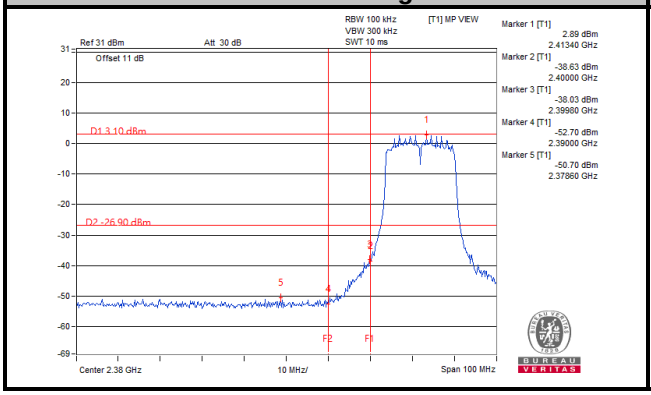


Ch 11

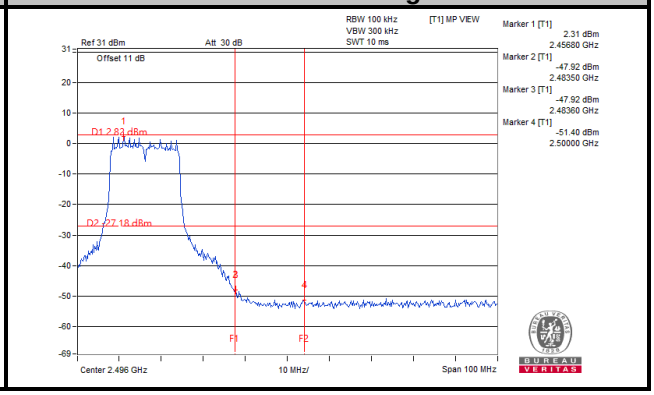




Ch 1 Band Edge

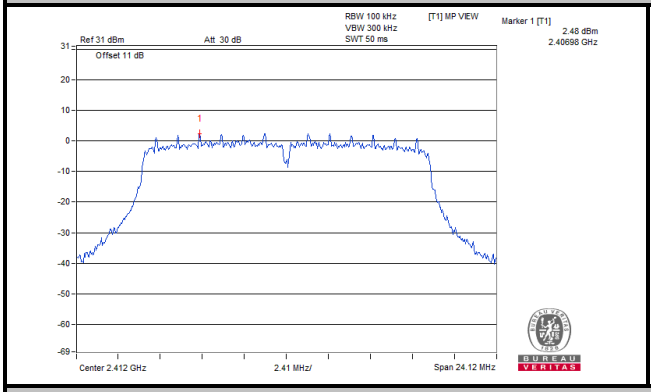


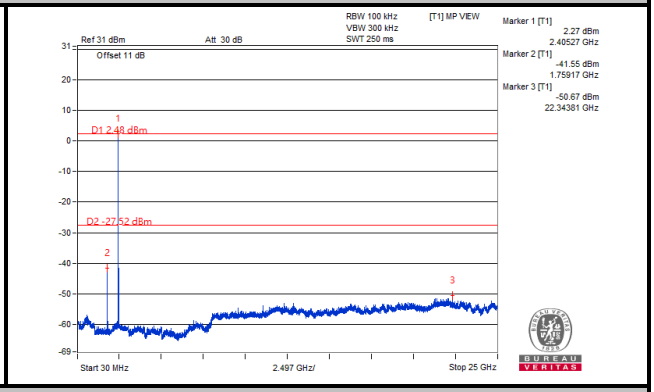
Ch 11 Band Edge



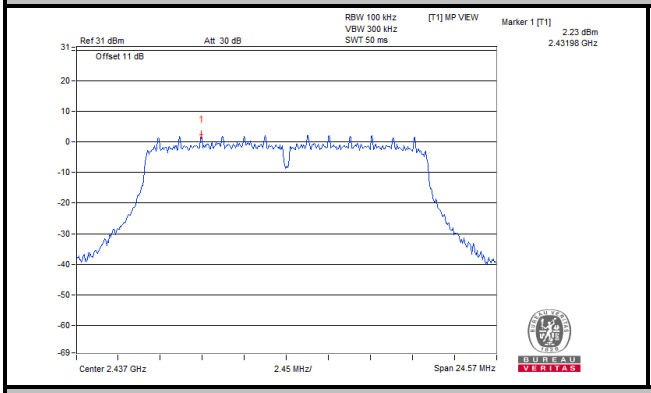
802.11g_CHAIN 1

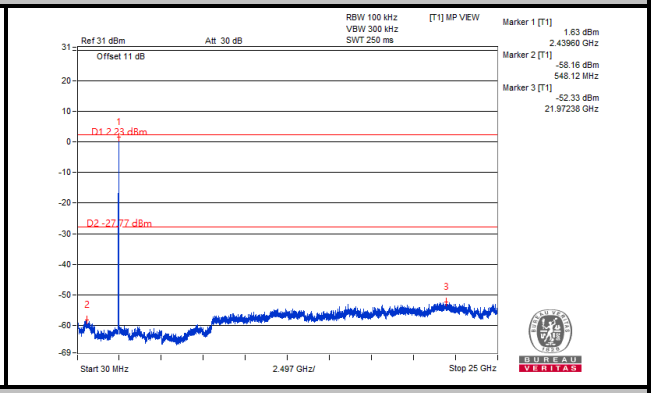
Ch 1



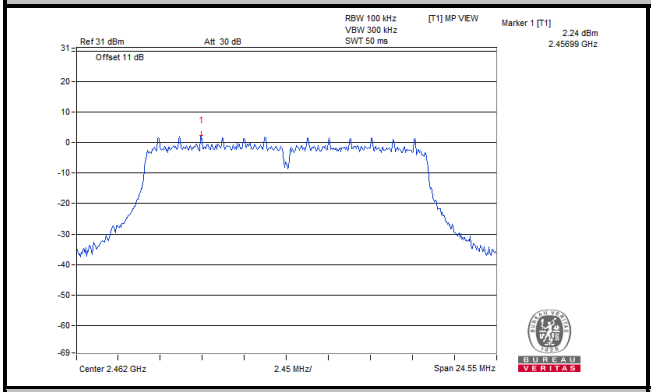


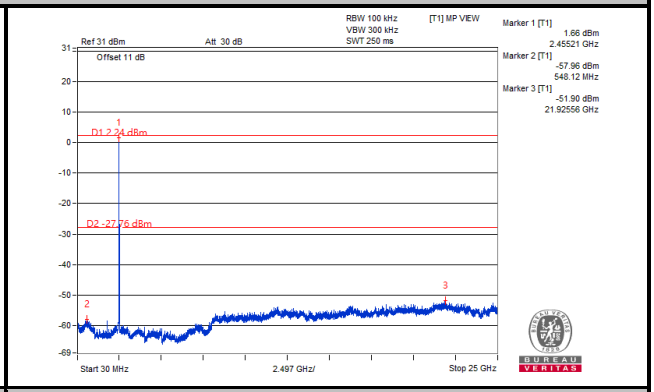
Ch 6



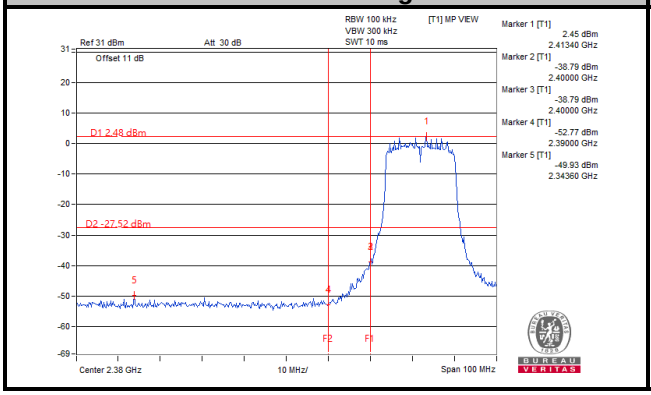


Ch 11

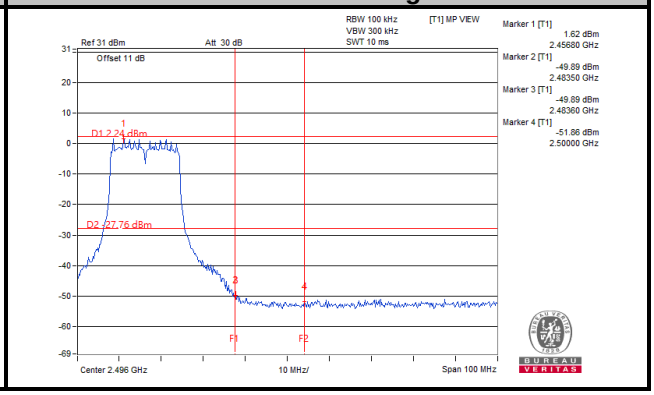




Ch 1 Band Edge

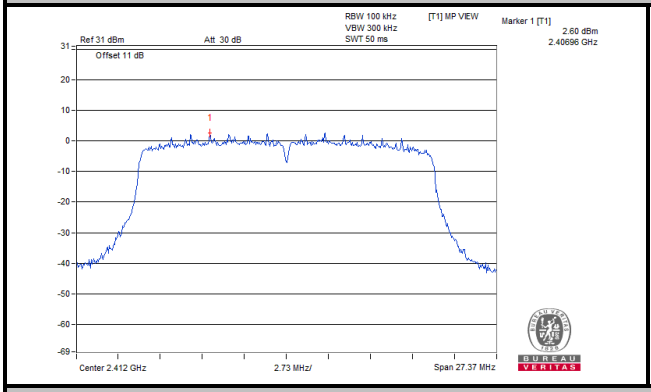


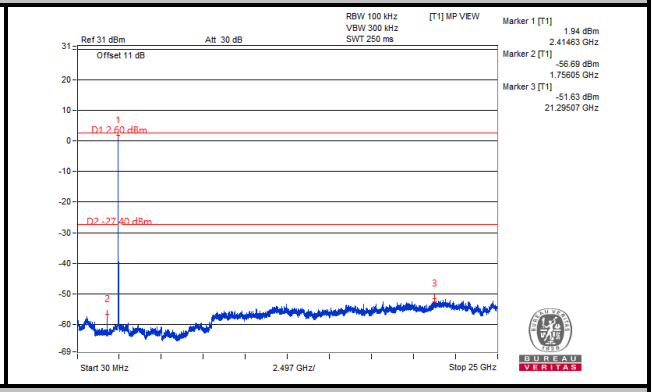
Ch 11 Band Edge



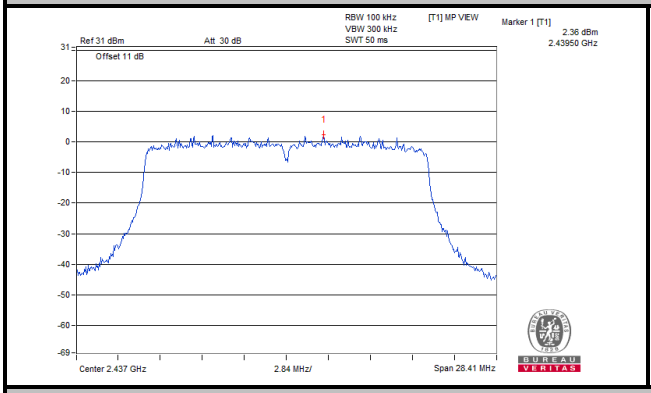
802.11ax (HE20)_CHAIN 0

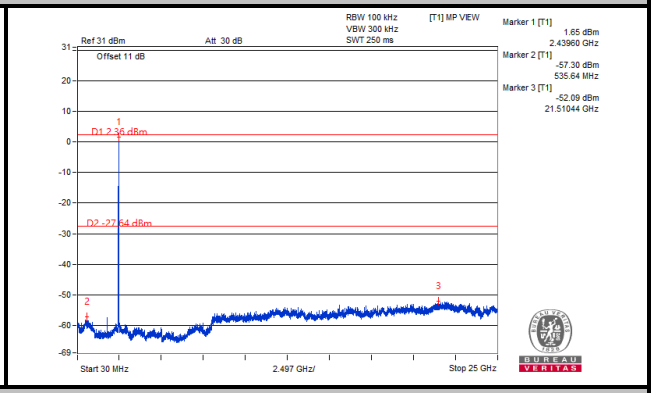
Ch 1



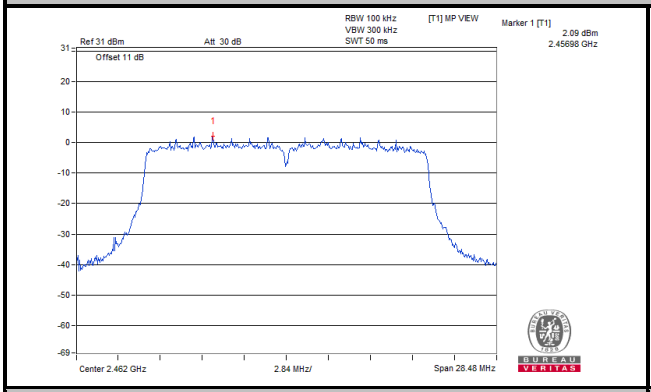


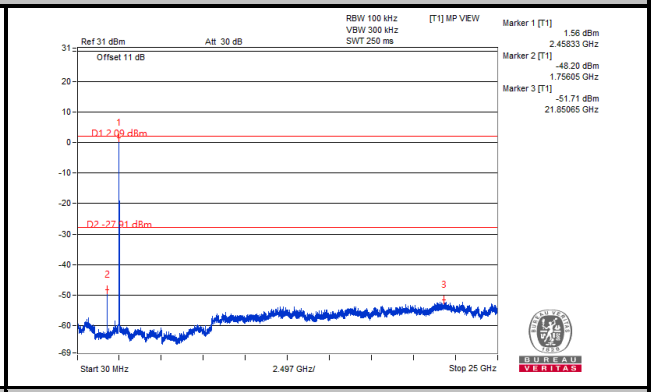
Ch 6



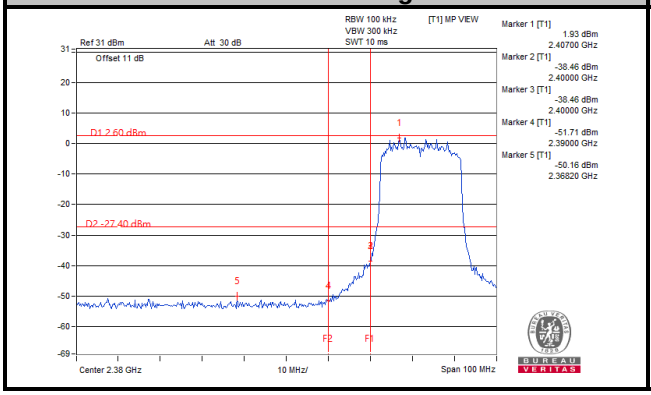


Ch 11

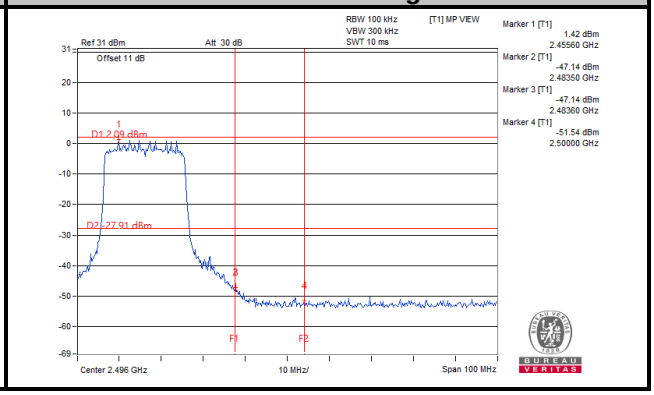




Ch 1 Band Edge

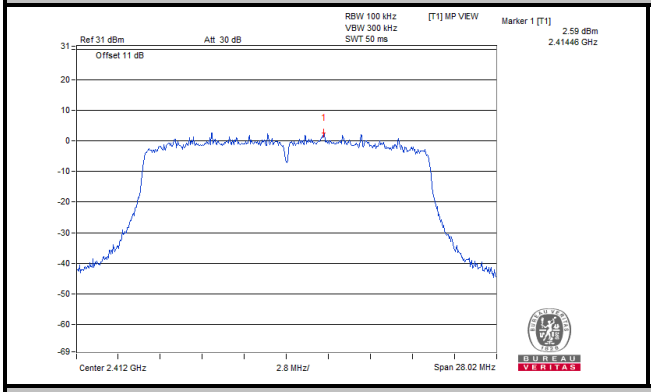


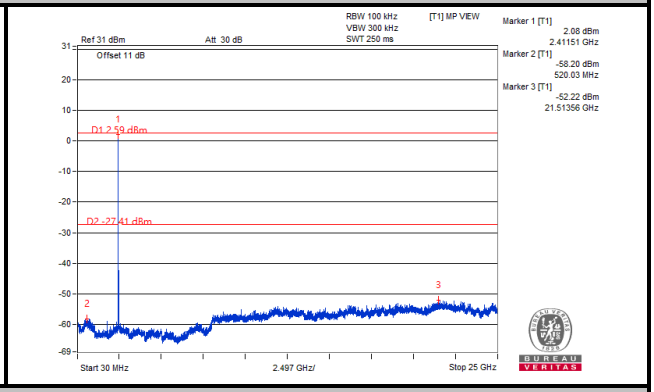
Ch 11 Band Edge



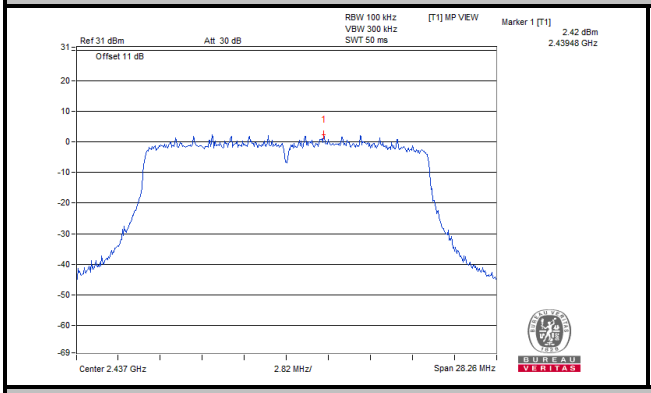
802.11ax (HE20)_CHAIN 1

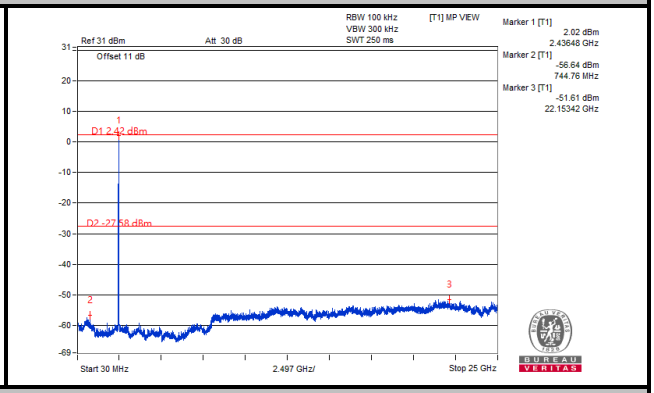
Ch 1



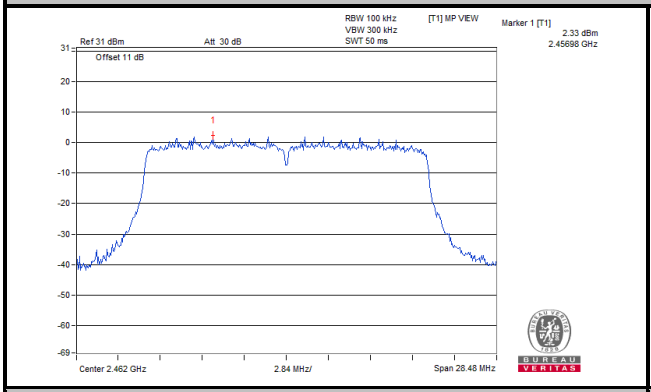


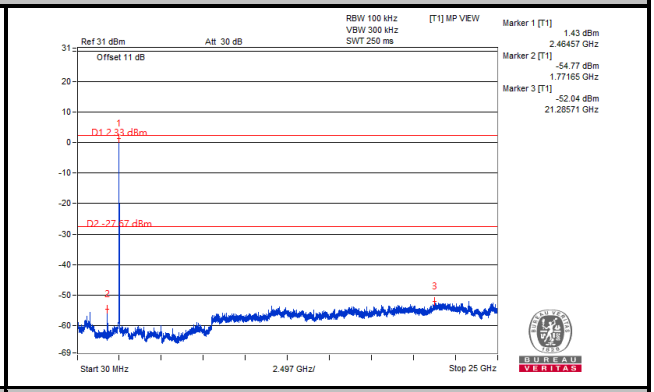
Ch 6



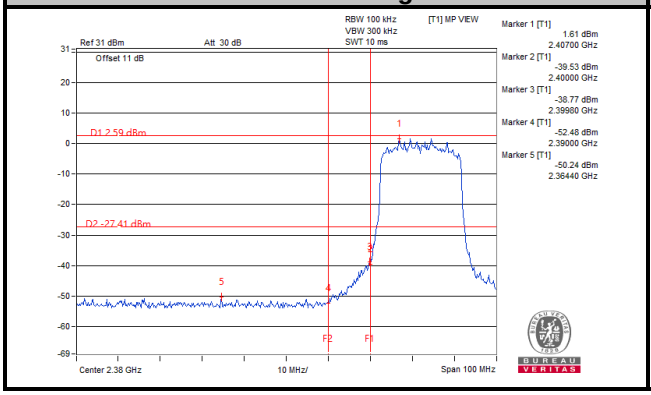


Ch 11

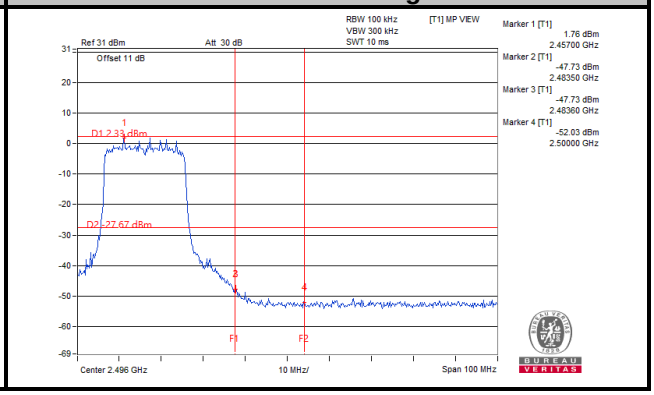




Ch 1 Band Edge

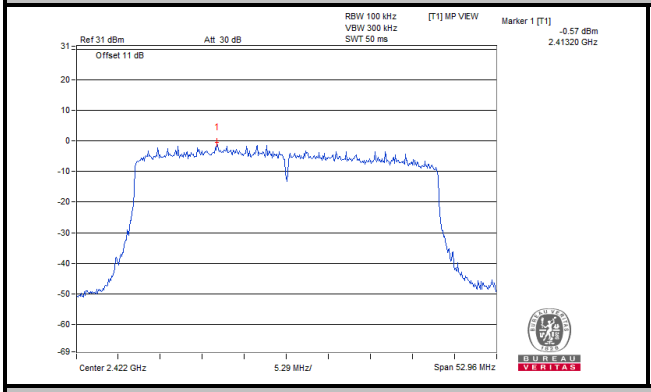


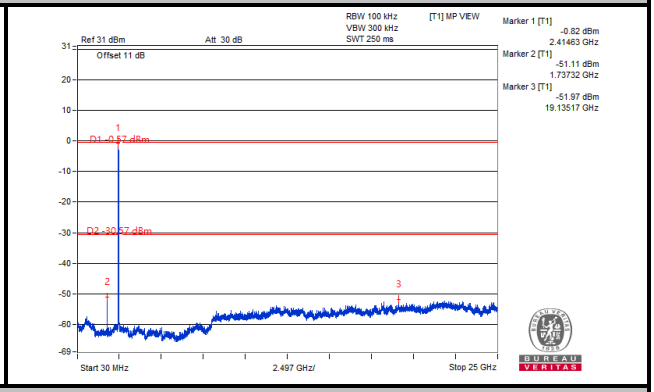
Ch 11 Band Edge



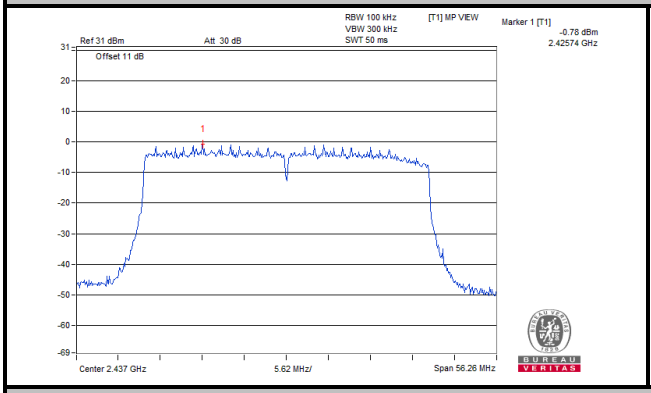
802.11ax (HE40)_CHAIN 0

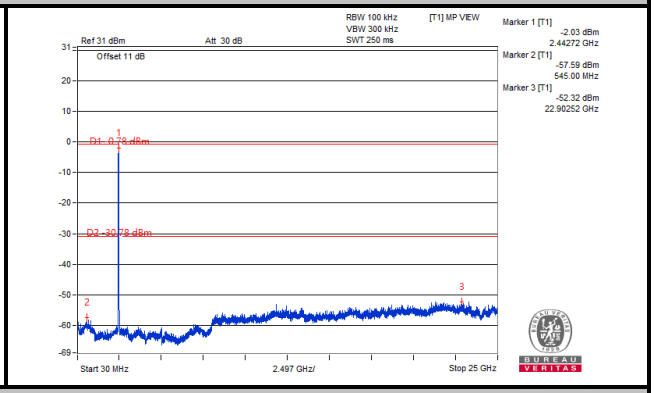
Ch 3



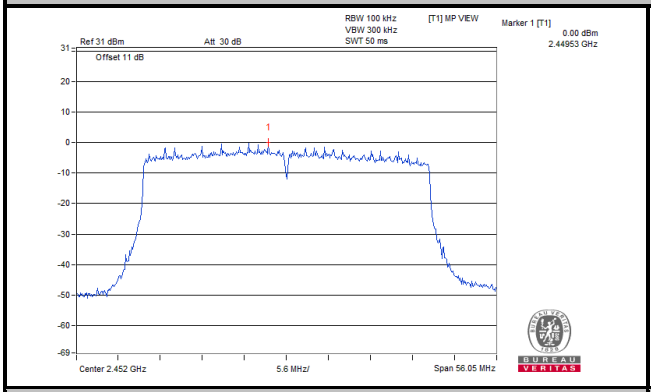


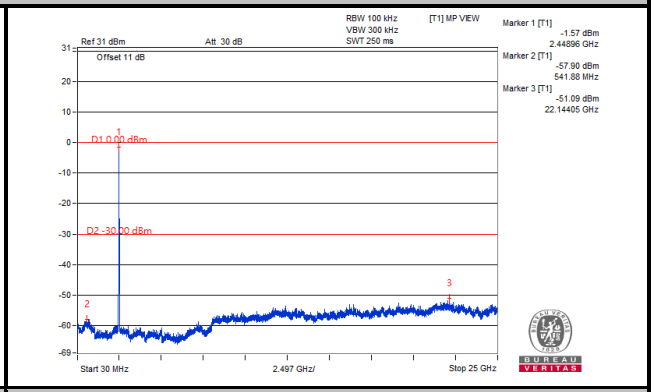
Ch 6



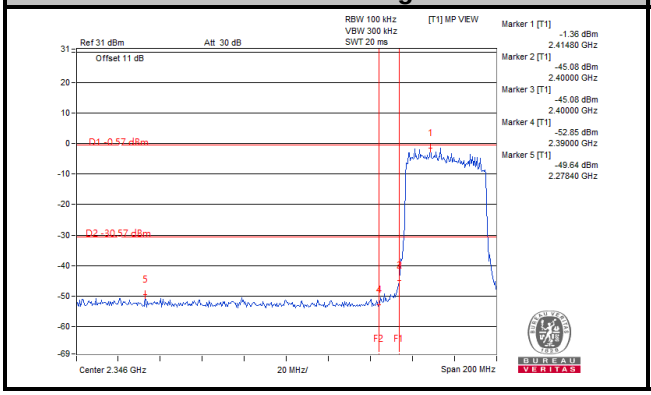


Ch 9

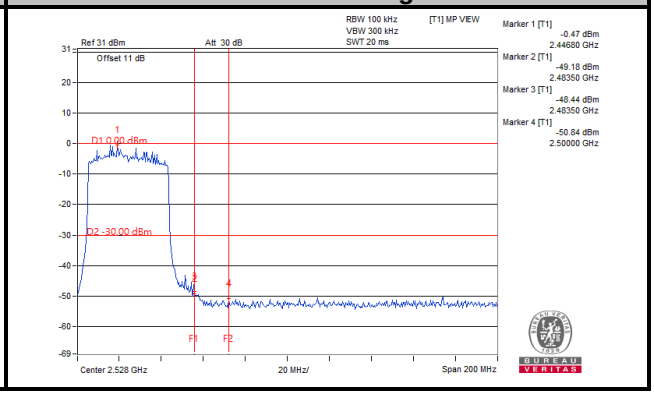




Ch 3 Band Edge

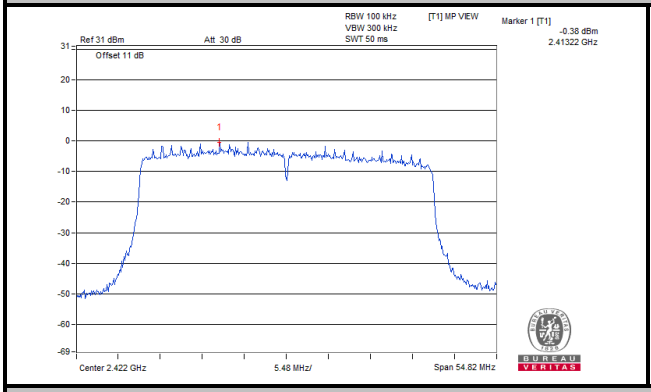


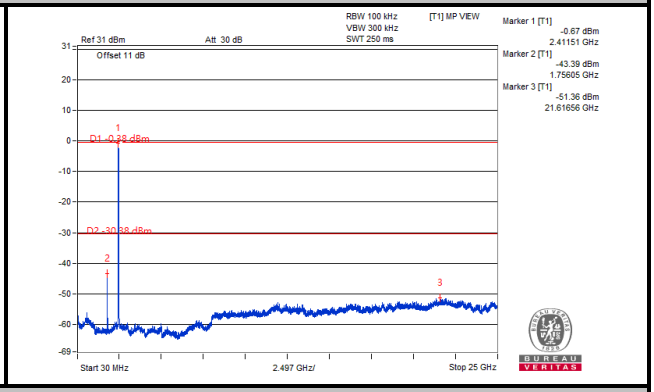
Ch 9 Band Edge



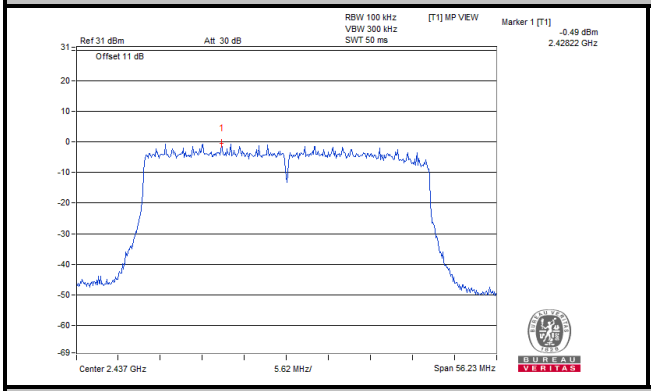
802.11ax (HE40)_CHAIN 1

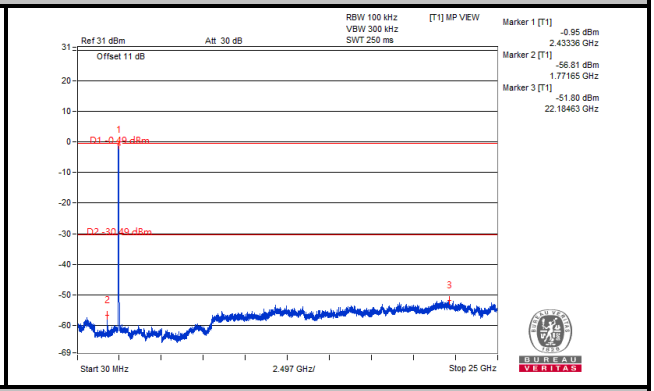
Ch 3



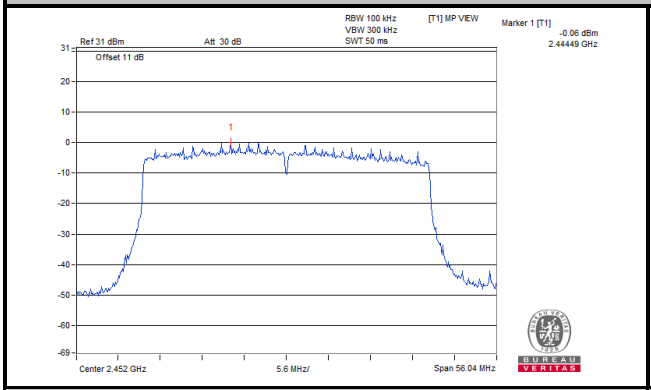


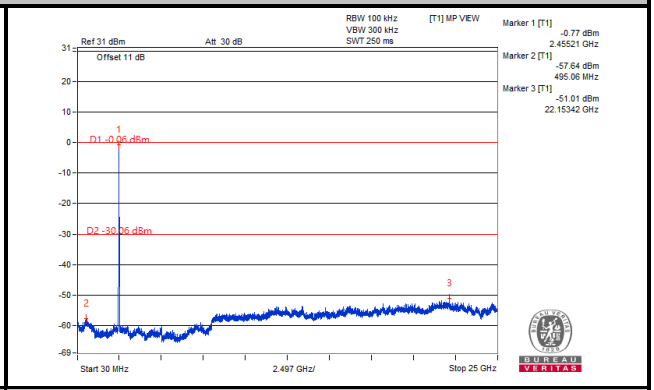
Ch 6



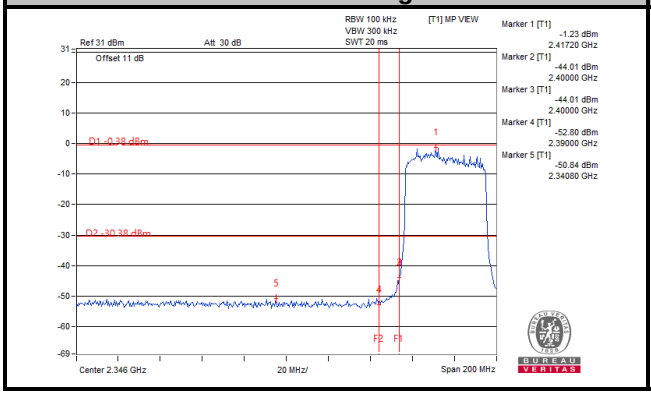


Ch 9

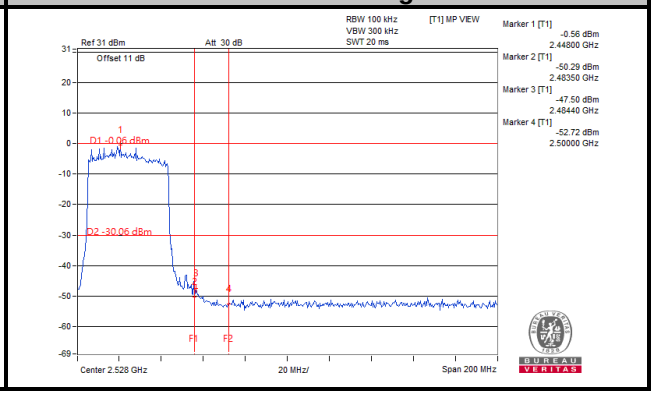




Ch 3 Band Edge



Ch 9 Band Edge



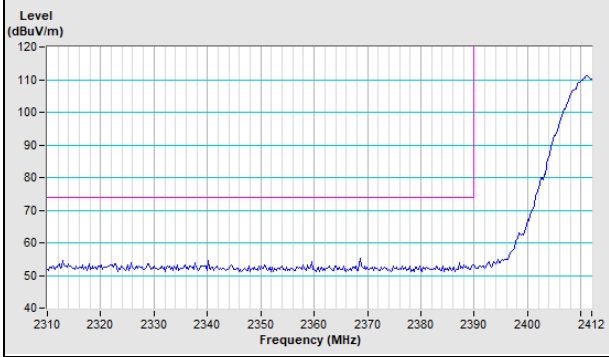
5 Pictures of Test Arrangements

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

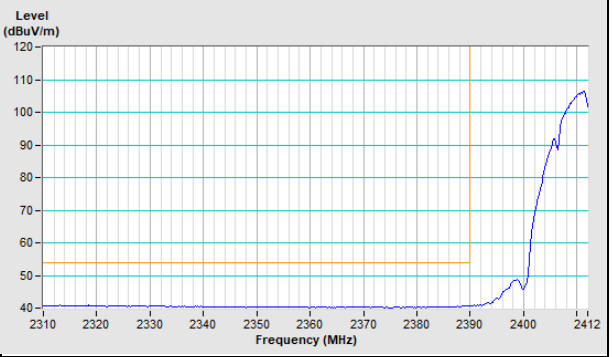
Annex A- Band Edge Measurement

802.11b Channel 1

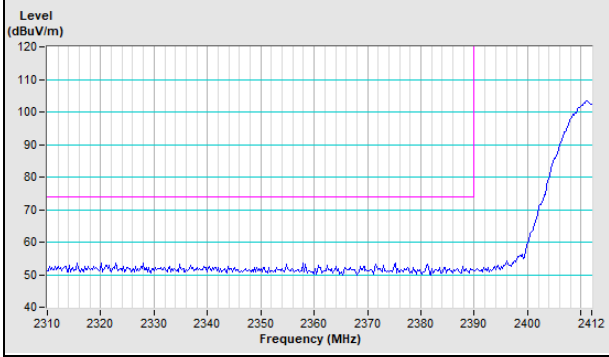
Horizontal (Peak)



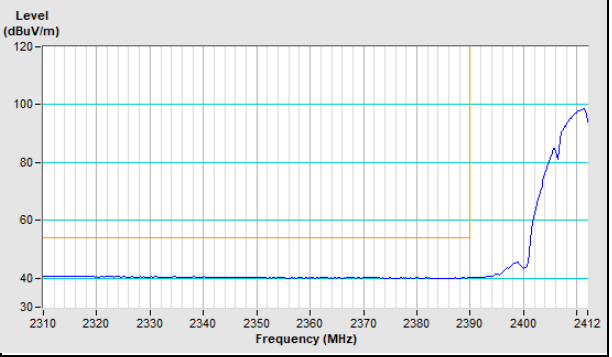
Horizontal (Average)



Vertical (Peak)

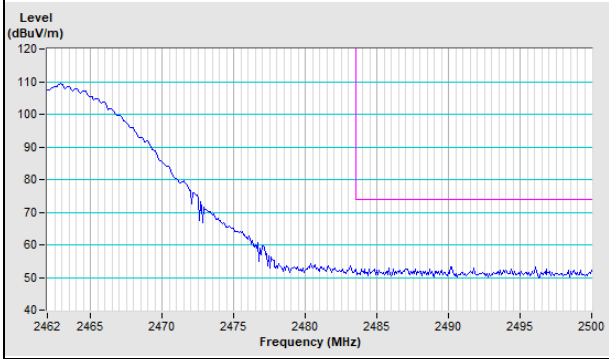


Vertical (Average)

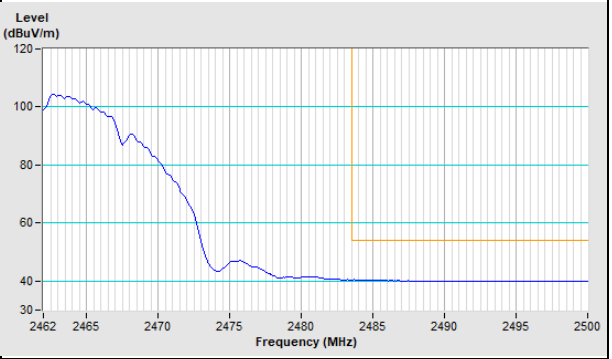


802.11b Channel 11

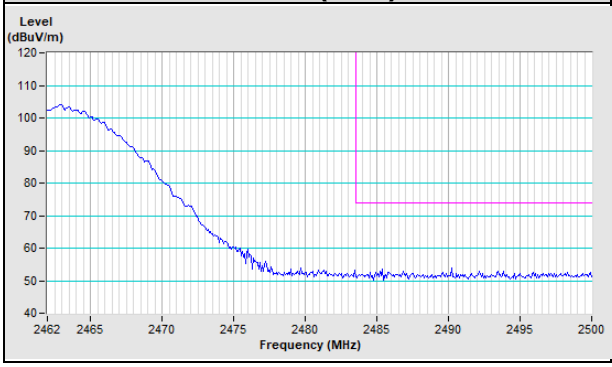
Horizontal (Peak)



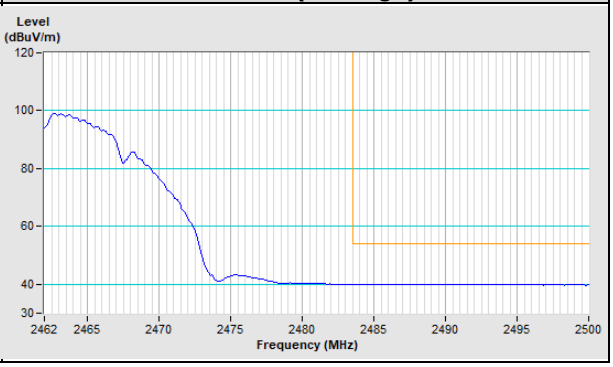
Horizontal (Average)



Vertical (Peak)

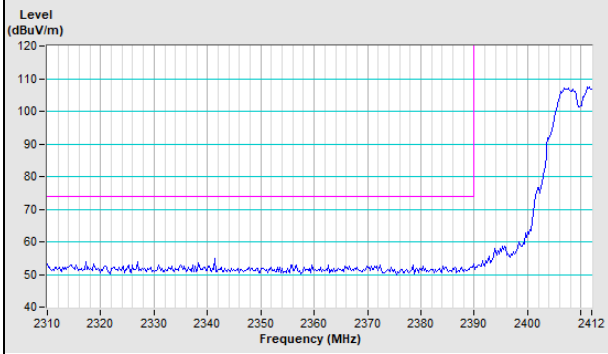


Vertical (Average)

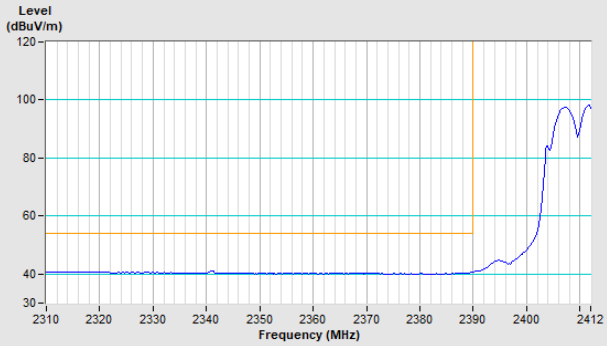


802.11g Channel 1

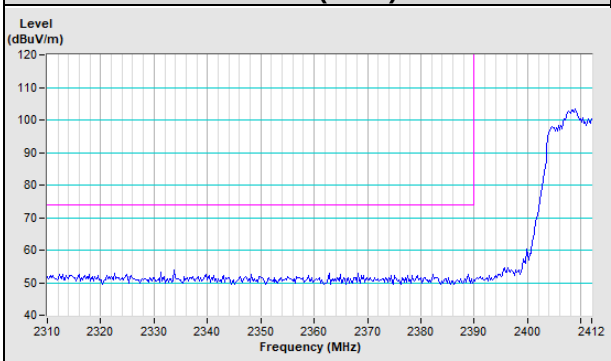
Horizontal (Peak)



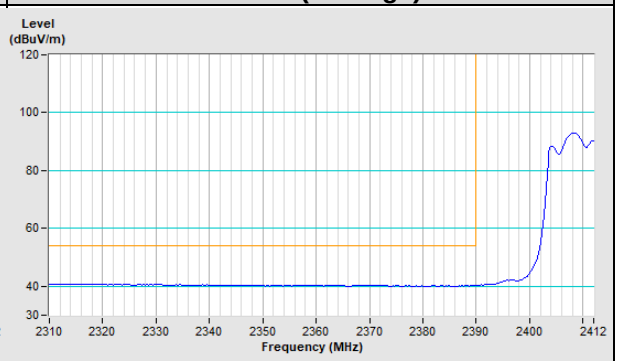
Horizontal (Average)



Vertical (Peak)

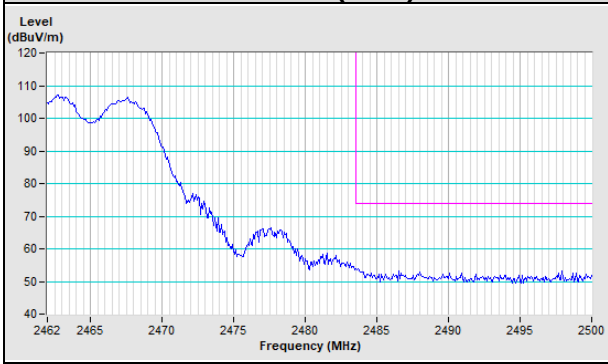


Vertical (Average)

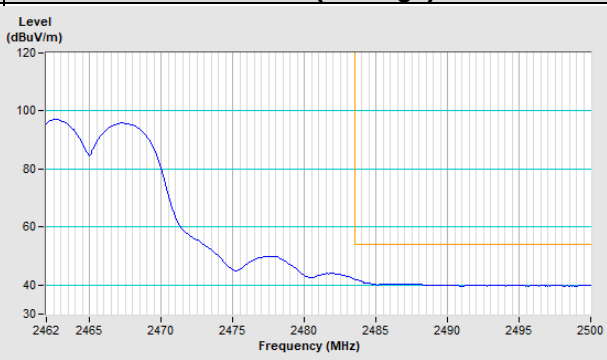


802.11g Channel 11

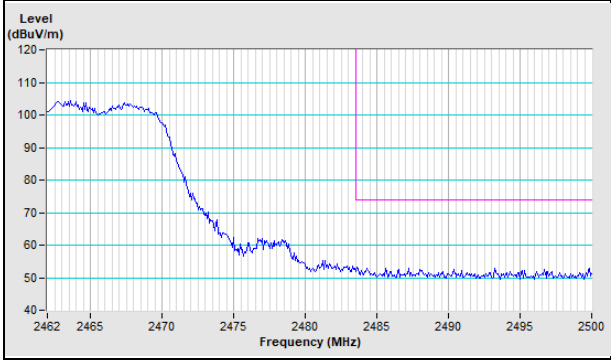
Horizontal (Peak)



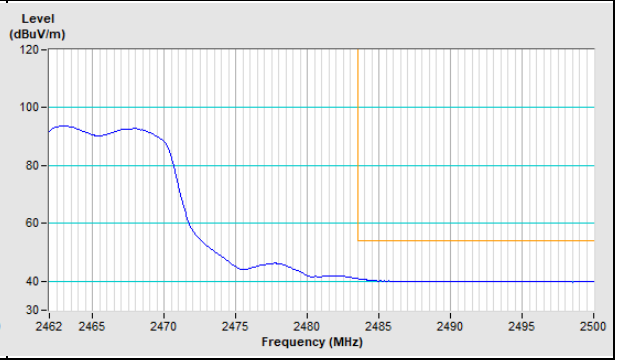
Horizontal (Average)



Vertical (Peak)

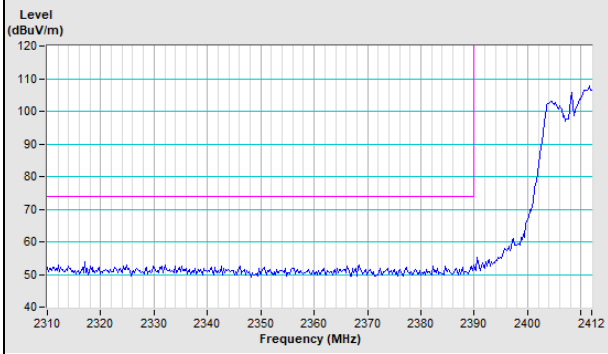


Vertical (Average)

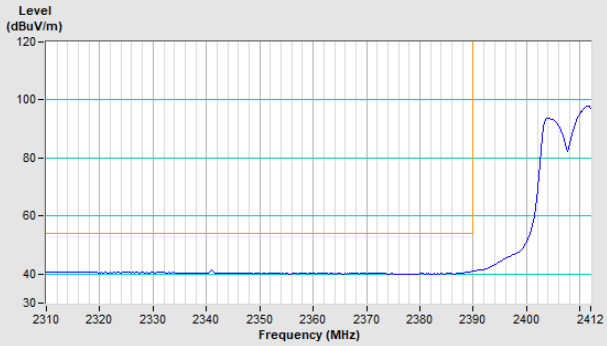


802.11ax (HE20) Channel 1

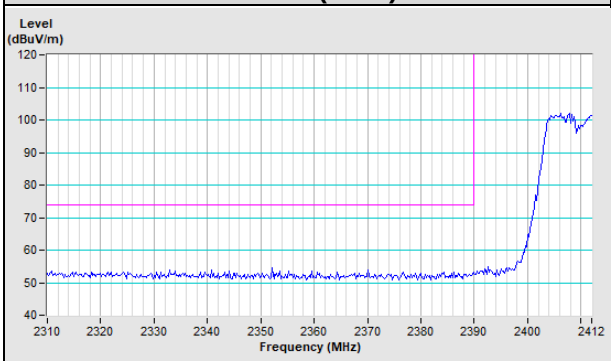
Horizontal (Peak)



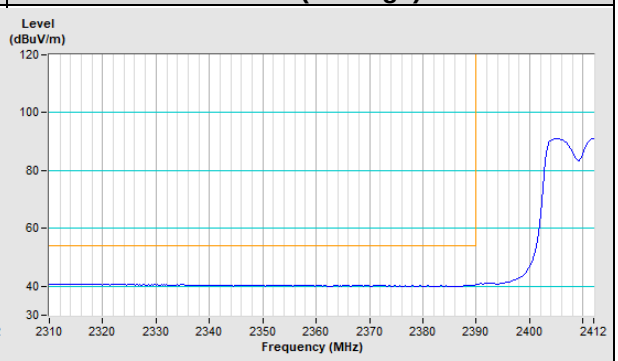
Horizontal (Average)



Vertical (Peak)

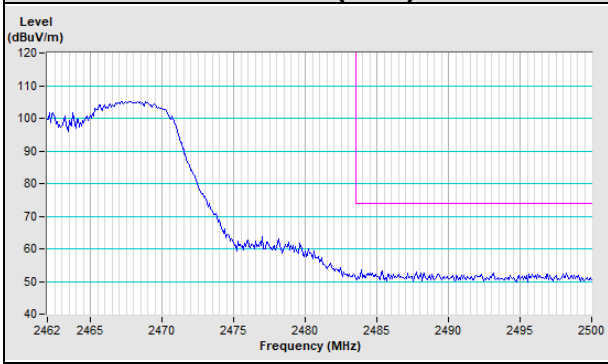


Vertical (Average)

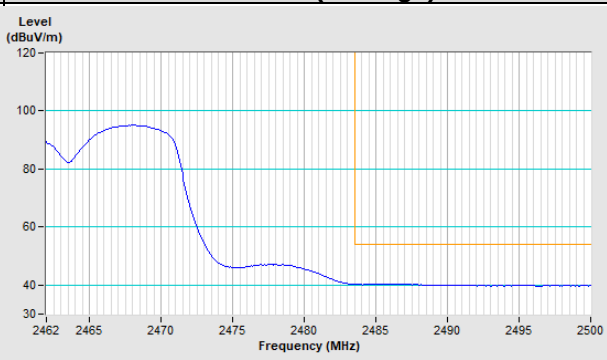


802.11ax (HE20) Channel 11

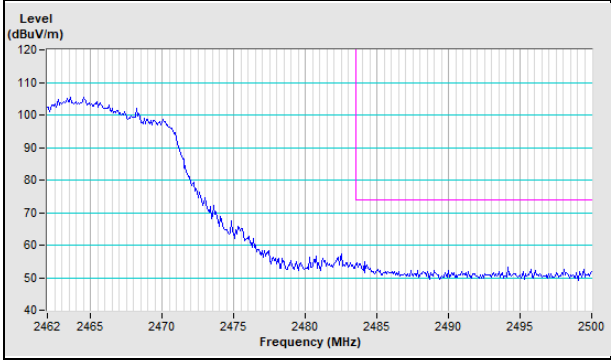
Horizontal (Peak)



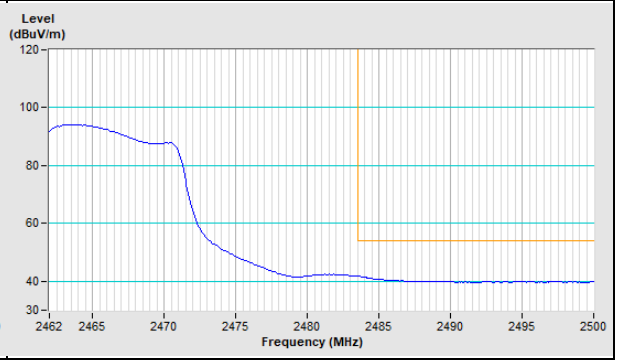
Horizontal (Average)



Vertical (Peak)

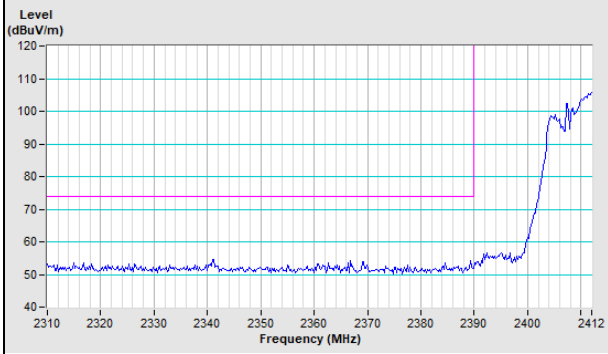


Vertical (Average)

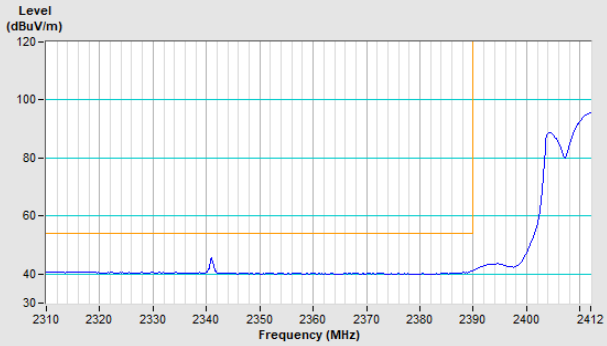


802.11ax (HE40) Channel 3

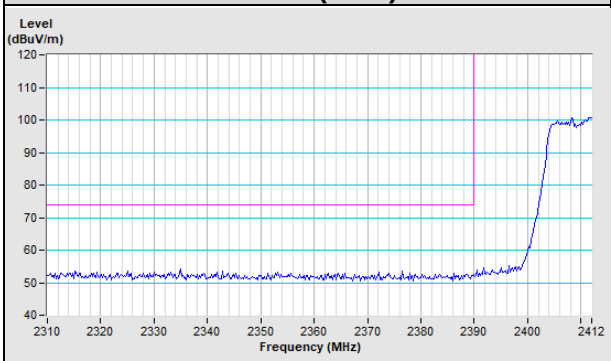
Horizontal (Peak)



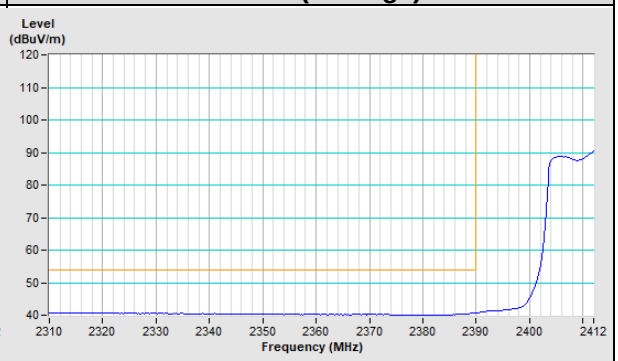
Horizontal (Average)



Vertical (Peak)

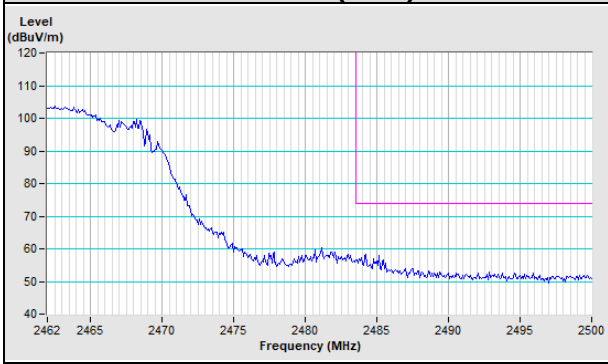


Vertical (Average)

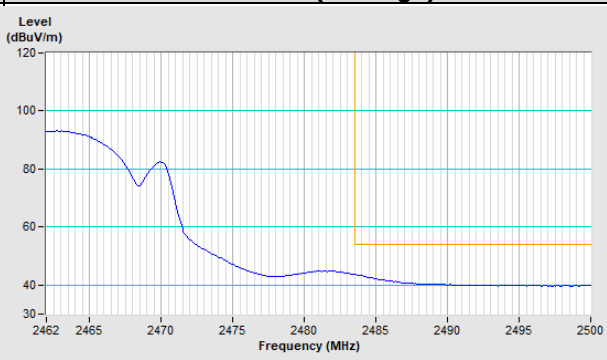


802.11ax (HE40) Channel 9

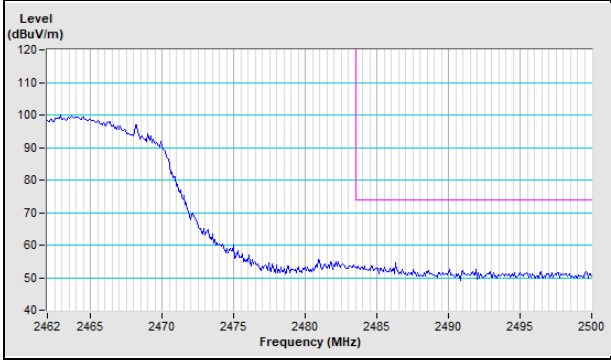
Horizontal (Peak)



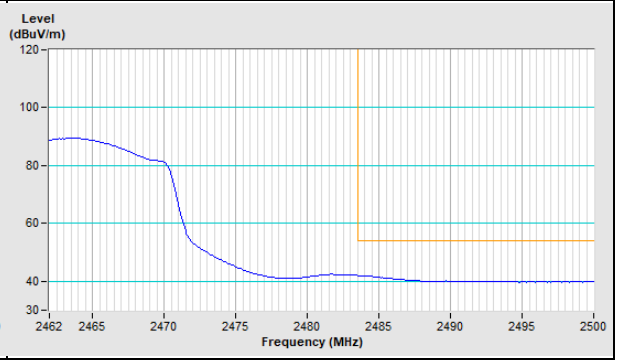
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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