

## FCC Test Report

**Report No.:** RFBDYS-WTW-P20100844

**FCC ID:** A8J-EWS357APV3A

**Test Model:** EWS357AP v3

**Series Model:** ECW220 v2

**Received Date:** Nov. 01, 2020

**Test Date:** Nov. 04 ~ Nov. 14, 2020

**Issued Date:** Nov. 16, 2020

**Applicant:** EnGenius Technologies

**Address:** 1580 Scenic Avenue, Costa Mesa, CA92626

**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



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### Release Control Record

Issue No.	Description	Date Issued
RFBDYS-WTW-P20100844	Original release	Nov. 16, 2020

## 1 Certificate of Conformity

**Product:** 11ax Indoor Managed AP, 11ax Cloud Managed AP

**Brand:** EnGenius

**Test Model:** EWS357AP v3

**Series Model:** ECW220 v2

**Sample Status:** Engineering sample

**Applicant:** EnGenius Technologies

**Test Date:** Nov. 04 ~ Nov. 14, 2020

**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 :** Pettie Chen , **Date:** Nov. 16, 2020  
Pettie Chen / Senior Specialist

**Approved by :** Bruce Chen , **Date:** Nov. 16, 2020  
Bruce Chen / 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 -8.67dB at 0.52523MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.2dB at 2390.00MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
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	Antenna connector are IPEX not a standard connector.

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) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	11ax Indoor Managed AP, 11ax Cloud Managed AP
Brand	EnGenius
Test Model	EWS357AP v3
Series Model	ECW220 v2
Model Difference	Refer to note
Sample Status	Engineering sample
Power Supply Rating	12Vdc from Adapter 54Vdc from PoE
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: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 400Mbps 802.11ax: up to 574Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20), 802.11n (VHT20), 802.11ax (HE20): 11 802.11n (HT40), 802.11n (VHT40), 802.11ax (HE40): 7
Output Power	CDD Mode: 265.208mW Beamforming Mode: 95.522mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	NA
Cable Supplied	NA

Note:

1. All models are listed as below.

Product	Model	Difference
11ax Indoor Managed AP	EWS357AP v3	All models are electrically identical, different product names and model names are for marketing purpose.
11ax Cloud Managed AP	ECW220 v2	

2. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	Beamforming Mode	TX Function
802.11b	Not Support	2TX
802.11g	Not Support	2TX
802.11n (HT20)	Not Support	2TX
802.11n (HT40)	Not Support	2TX
802.11n (VHT20)	Support	2TX
802.11n (VHT40)	Support	2TX
802.11ax (HE20)	Support	2TX
802.11ax (HE40)	Support	2TX

\* The bandwidth and modulation are similar for HT20/HT40 on 802.11n mode and VHT20/VHT40 on 802.11n mode and HE20/HE40 on 802.11ax mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)

\* For 802.11n, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

3. The EUT consumes power from the following adapter and PoE.

Adapter (support unit only)	
Brand	Asian Power Devices Inc.
Model	WA-30J12R
Input Power	100-240Vac, 50-60Hz, 0.9A Max
Output Power	12Vdc, 2.5A
Power Line	1.45m DC cable without core attached on adapter

PoE (support unit only)	
Brand	SENAO Networks, Inc.
Model	EPA5006GAT
Input Power	100-240Vac, 50-60Hz, 0.8A
Output Power	54Vdc, 0.6A
Power Line	0.5m AC cable without core

4. The following antennas were provided to the EUT.

Antenna Type	PIFA					
Antenna Connector	IPEX					
Antenna No.	Gain (dBi)					
	2400MHz	2450MHz	2500MHz	5150MHz	5500MHz	5850MHz
2G1	3.35	3.46	3.41	-	-	-
2G2	3.13	3.40	3.31	-	-	-
5G1	-	-	-	4.22	4.85	4.75
5G2	-	-	-	4.22	4.52	3.77

\* 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.



### 3.2 Description of Test Modes

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

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

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

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

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	√	√	Power from adapter
B	-	√	√	-	Power from PoE

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement  
 RE<1G: Radiated Emission below 1GHz  
 PLC: Power Line Conducted Emission  
 APCM: Antenna Port Conducted Measurement

Note:

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

#### Radiated Emission Test (Above 1GHz):

- 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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
A	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

#### Radiated Emission Test (Below 1GHz):

- 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)
A, B	802.11ax (HE20)	1 to 11	6	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)
A, B	802.11ax (HE20)	1 to 11	6	OFDMA	BPSK	MCS0

**Bandwidth, Power Spectral Density and Conducted Out of Band Emission 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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
A	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

**Conducted Output Power 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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
A	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
A	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

**Test Condition:**

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	26 deg. C, 67% RH	120Vac, 60Hz	Tank Wu
RE<1G	23 deg. C, 69% RH	120Vac, 60Hz 54Vdc	Willy Cheng
PLC	22 deg. C, 69% RH	120Vac, 60Hz 54Vdc	Willy Cheng
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng

### 3.3 Duty Cycle of Test Signal

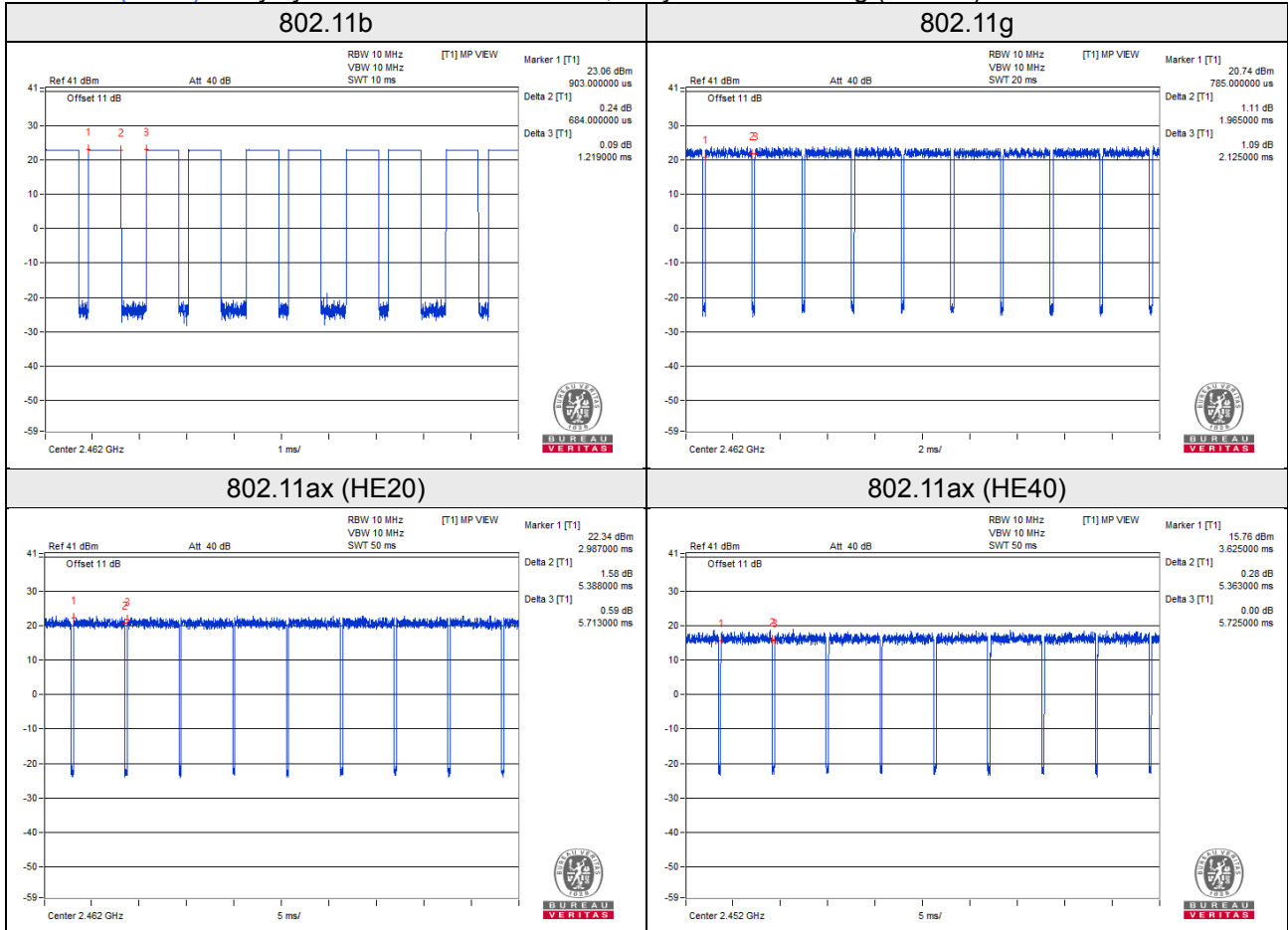
Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle =  $0.684/1.219 = 0.561$ , Duty factor =  $10 * \log(1/0.561) = 2.51$

802.11g: Duty cycle =  $1.965/2.125 = 0.925$ , Duty factor =  $10 * \log(1/0.925) = 0.34$

802.11ax (HE20): Duty cycle =  $5.388/5.713 = 0.943$ , Duty factor =  $10 * \log(1/0.943) = 0.25$

802.11ax (HE40): Duty cycle =  $5.363/5.725 = 0.937$ , Duty factor =  $10 * \log(1/0.937) = 0.28$



### 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	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Adapter	Asian Power Devices Inc.	WA-30J12R	NA	NA	Provided by client
C.	POE	SENAO Networks, Inc.	EPA5006GAT	NA	NA	Provided by client

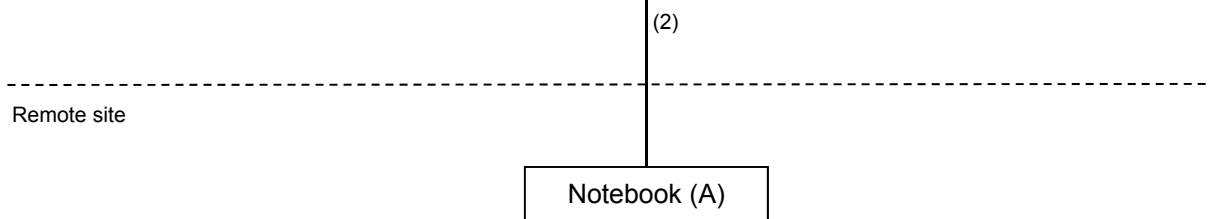
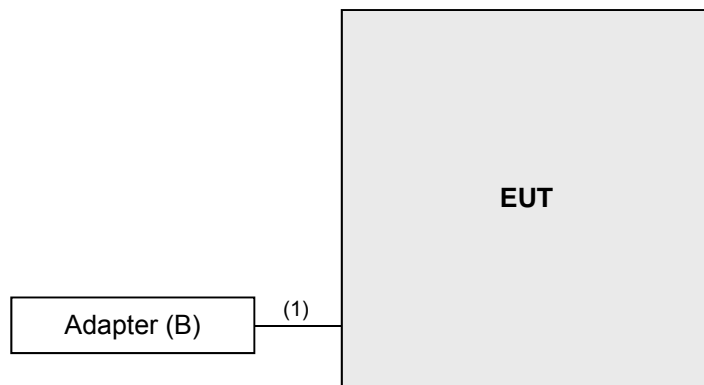
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items A acted as communication partner to transfer data.

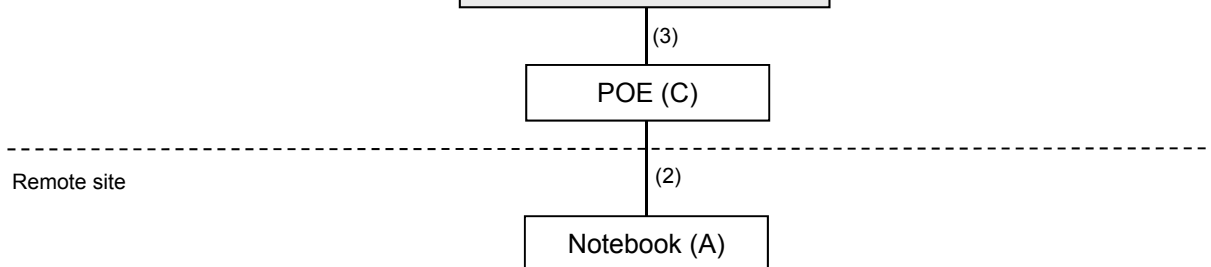
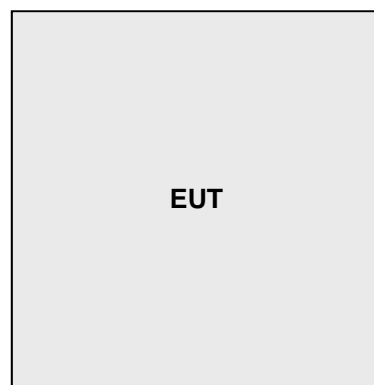
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power Cable	1	1.5	-	0	Provided by client
2.	LAN Cable	1	7.0	N	0	RJ45, Cat5e
3.	LAN Cable	1	1.5	N	0	RJ45, Cat5e

### 3.4.1 Configuration of System under Test

#### Test Mode A



#### Test Mode B



### **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 15.247 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 30dB 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 1000MHz, 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 20dB under any condition of modulation.



#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102579	Jul. 07, 2020	Jul. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 04, 2020	Nov. 03, 2021
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 16, 2020	Aug. 15, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 23, 2020	Mar. 22, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	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 3.

### 4.1.3 Test Procedures

#### For Radiated emission below 30MHz

- 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 9kHz at frequency below 30MHz.

#### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detect 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:

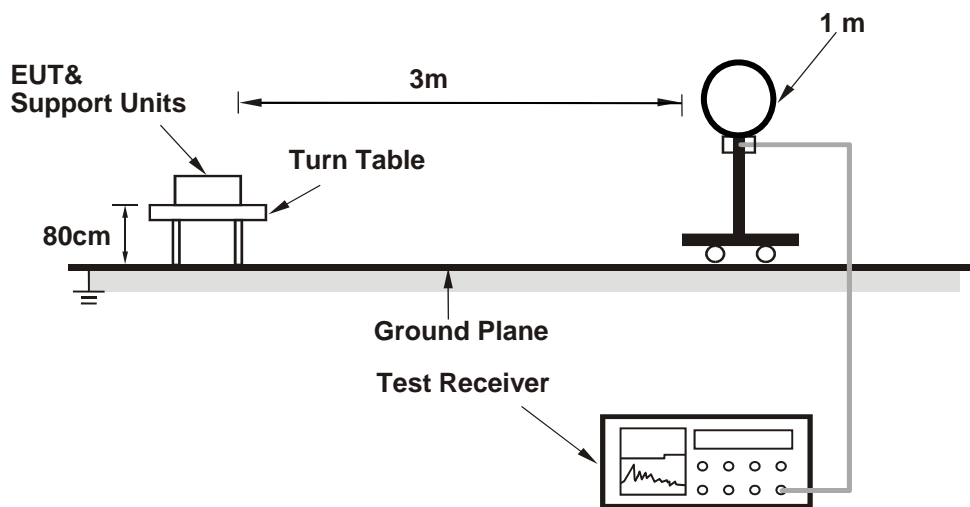
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz. (802.11b: RBW = 1MHz, VBW = 3kHz; 802.11g: RBW = 1MHz, VBW = 1kHz; 802.11ax (HE20): RBW = 1MHz, VBW = 1kHz; 802.11ax (HE40): RBW = 1MHz, VBW = 1kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

### 4.1.4 Deviation from Test Standard

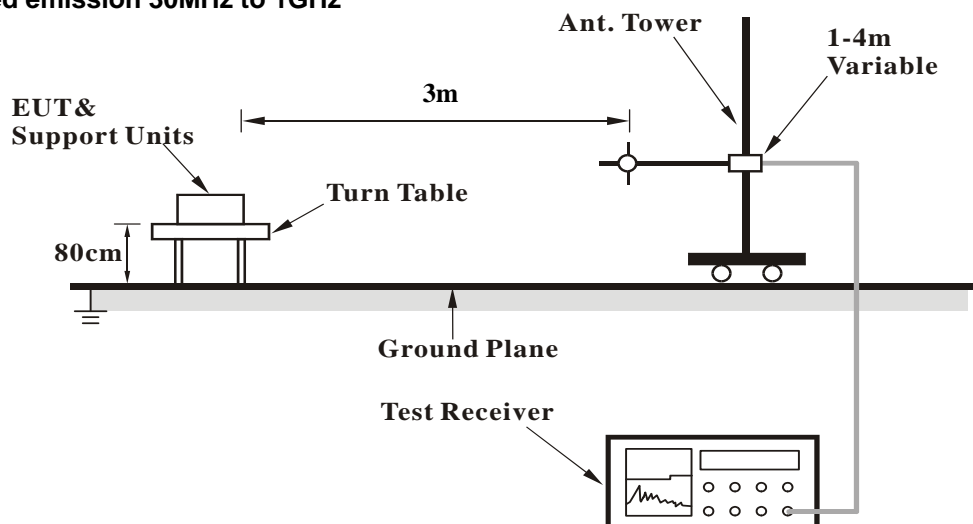
No deviation.

#### 4.1.5 Test Setup

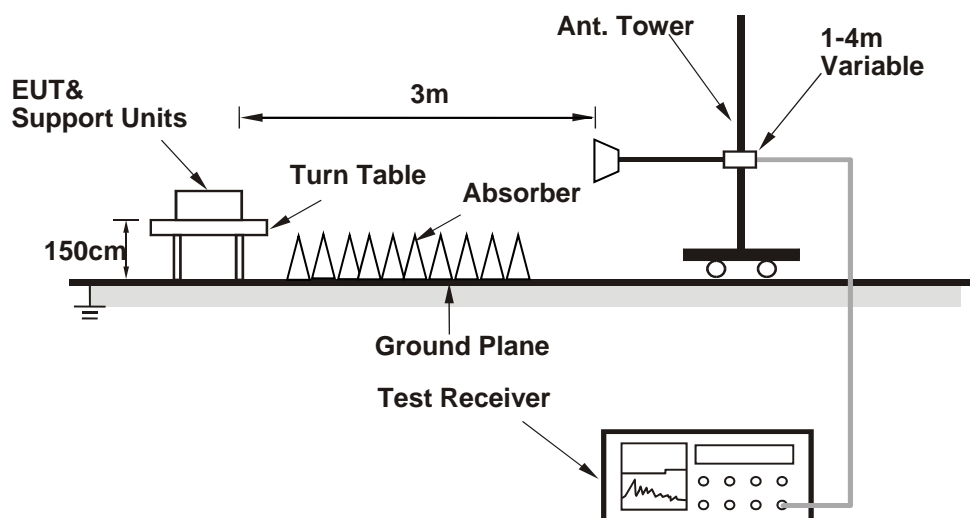
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



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 the testing table.
- b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".

#### 4.1.7 Test Results

##### Above 1GHz 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	61.0 PK	74.0	-13.0	2.79 H	239	29.8	31.2
2	2390.00	52.5 AV	54.0	-1.5	2.79 H	239	21.3	31.2
3	*2412.00	111.0 PK			2.51 H	243	79.9	31.1
4	*2412.00	108.2 AV			2.51 H	243	77.1	31.1
5	4824.00	49.4 PK	74.0	-24.6	1.41 H	336	47.6	1.8
6	4824.00	43.4 AV	54.0	-10.6	1.41 H	336	41.6	1.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.6 PK	74.0	-14.4	1.66 V	349	28.4	31.2
2	2390.00	50.9 AV	54.0	-3.1	1.66 V	349	19.7	31.2
3	*2412.00	109.8 PK			1.56 V	359	78.7	31.1
4	*2412.00	107.3 AV			1.56 V	359	76.2	31.1
5	4824.00	52.5 PK	74.0	-21.5	1.96 V	82	50.7	1.8
6	4824.00	48.9 AV	54.0	-5.1	1.96 V	82	47.1	1.8

##### Remarks:

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

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	112.3 PK			1.98 H	241	81.2	31.1
2	*2437.00	109.8 AV			1.98 H	241	78.7	31.1
3	4874.00	52.9 PK	74.0	-21.1	1.39 H	297	50.9	2.0
4	4874.00	48.7 AV	54.0	-5.3	1.39 H	297	46.7	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	*2437.00	111.3 PK			1.59 V	321	80.2	31.1
2	*2437.00	109.0 AV			1.59 V	321	77.9	31.1
3	4874.00	55.9 PK	74.0	-18.1	1.72 V	71	53.9	2.0
4	4874.00	52.5 AV	54.0	-1.5	1.72 V	71	50.5	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 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	110.3 PK			2.34 H	236	79.2	31.1
2	*2462.00	107.7 AV			2.34 H	236	76.6	31.1
3	2483.50	62.0 PK	74.0	-12.0	2.60 H	237	30.8	31.2
4	2483.50	52.5 AV	54.0	-1.5	2.60 H	237	21.3	31.2
5	4924.00	51.0 PK	74.0	-23.0	1.44 H	321	48.9	2.1
6	4924.00	46.9 AV	54.0	-7.1	1.44 H	321	44.8	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	*2462.00	109.8 PK			1.52 V	297	78.7	31.1
2	*2462.00	107.5 AV			1.52 V	297	76.4	31.1
3	2483.50	61.6 PK	74.0	-12.4	1.59 V	301	30.4	31.2
4	2483.50	52.1 AV	54.0	-1.9	1.59 V	301	20.9	31.2
5	4924.00	54.9 PK	74.0	-19.1	1.76 V	56	52.8	2.1
6	4924.00	51.3 AV	54.0	-2.7	1.76 V	56	49.2	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 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	62.4 PK	74.0	-11.6	2.41 H	250	31.2	31.2
2	2390.00	50.2 AV	54.0	-3.8	2.41 H	250	19.0	31.2
3	*2412.00	110.1 PK			2.49 H	242	79.0	31.1
4	*2412.00	100.1 AV			2.49 H	242	69.0	31.1
5	4824.00	47.1 PK	74.0	-26.9	1.52 H	321	45.3	1.8
6	4824.00	33.2 AV	54.0	-20.8	1.52 H	321	31.4	1.8

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.5 PK	74.0	-8.5	1.61 V	342	34.3	31.2
2	2390.00	52.7 AV	54.0	-1.3	1.61 V	342	21.5	31.2
3	*2412.00	109.4 PK			1.57 V	359	78.3	31.1
4	*2412.00	98.3 AV			1.57 V	359	67.2	31.1
5	4824.00	50.4 PK	74.0	-23.6	1.77 V	81	48.6	1.8
6	4824.00	35.4 AV	54.0	-18.6	1.77 V	81	33.6	1.8

Remarks:

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



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	2390.00	65.4 PK	74.0	-8.6	2.59 H	241	34.2	31.2
2	<b>2390.00</b>	<b>52.8 AV</b>	<b>54.0</b>	<b>-1.2</b>	<b>2.59 H</b>	<b>241</b>	<b>21.6</b>	<b>31.2</b>
3	*2437.00	114.1 PK			2.66 H	237	83.0	31.1
4	*2437.00	103.8 AV			2.66 H	237	72.7	31.1
5	4874.00	53.7 PK	74.0	-20.3	1.49 H	311	51.7	2.0
6	4874.00	39.7 AV	54.0	-14.3	1.49 H	311	37.7	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	67.0 PK	74.0	-7.0	1.41 V	349	35.8	31.2
2	2390.00	52.4 AV	54.0	-1.6	1.41 V	349	21.2	31.2
3	*2437.00	113.0 PK			1.34 V	355	81.9	31.1
4	*2437.00	102.9 AV			1.34 V	355	71.8	31.1
5	4874.00	56.9 PK	74.0	-17.1	1.78 V	92	54.9	2.0
6	4874.00	42.2 AV	54.0	-11.8	1.78 V	92	40.2	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 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	110.1 PK			2.39 H	234	79.0	31.1
2	*2462.00	99.9 AV			2.39 H	234	68.8	31.1
3	2483.50	66.3 PK	74.0	-7.7	2.21 H	237	35.1	31.2
4	2483.50	52.6 AV	54.0	-1.4	2.21 H	237	21.4	31.2
5	4924.00	50.2 PK	74.0	-23.8	1.52 H	303	48.1	2.1
6	4924.00	35.5 AV	54.0	-18.5	1.52 H	303	33.4	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	*2462.00	108.6 PK			1.52 V	356	77.5	31.1
2	*2462.00	98.6 AV			1.52 V	356	67.5	31.1
3	2483.50	65.2 PK	74.0	-8.8	1.61 V	344	34.0	31.2
4	2483.50	52.1 AV	54.0	-1.9	1.61 V	344	20.9	31.2
5	4924.00	53.3 PK	74.0	-20.7	2.01 V	96	51.2	2.1
6	4924.00	38.3 AV	54.0	-15.7	2.01 V	96	36.2	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 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	64.0 PK	74.0	-10.0	1.47 H	91	32.8	31.2
2	2390.00	52.4 AV	54.0	-1.6	1.47 H	91	21.2	31.2
3	*2412.00	112.6 PK			2.28 H	243	81.5	31.1
4	*2412.00	98.8 AV			2.28 H	243	67.7	31.1
5	4824.00	45.8 PK	74.0	-28.2	1.69 H	311	44.0	1.8
6	4824.00	32.8 AV	54.0	-21.2	1.69 H	311	31.0	1.8

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.1 PK	74.0	-9.9	1.41 V	302	32.9	31.2
2	2390.00	51.5 AV	54.0	-2.5	1.41 V	302	20.3	31.2
3	*2412.00	112.0 PK			1.24 V	298	80.9	31.1
4	*2412.00	97.3 AV			1.24 V	298	66.2	31.1
5	4824.00	49.0 PK	74.0	-25.0	1.56 V	302	47.2	1.8
6	4824.00	38.5 AV	54.0	-15.5	1.56 V	302	36.7	1.8

Remarks:

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

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	2390.00	67.1 PK	74.0	-6.9	2.16 H	229	35.9	31.2
2	2390.00	52.4 AV	54.0	-1.6	2.16 H	229	21.2	31.2
3	*2437.00	116.0 PK			2.43 H	239	84.9	31.1
4	*2437.00	102.3 AV			2.43 H	239	71.2	31.1
5	4874.00	52.8 PK	74.0	-21.2	1.59 H	316	50.8	2.0
6	4874.00	36.9 AV	54.0	-17.1	1.59 H	316	34.9	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	66.2 PK	74.0	-7.8	1.22 V	288	35.0	31.2
2	2390.00	51.1 AV	54.0	-2.9	1.22 V	288	19.9	31.2
3	*2437.00	114.3 PK			1.39 V	316	83.2	31.1
4	*2437.00	101.3 AV			1.39 V	316	70.2	31.1
5	4874.00	56.3 PK	74.0	-17.7	1.79 V	65	54.3	2.0
6	4874.00	40.2 AV	54.0	-13.8	1.79 V	65	38.2	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 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	110.7 PK			2.32 H	241	79.6	31.1
2	*2462.00	97.5 AV			2.32 H	241	66.4	31.1
3	2483.50	66.7 PK	74.0	-7.3	2.16 H	225	35.5	31.2
4	2483.50	52.6 AV	54.0	-1.4	2.16 H	225	21.4	31.2
5	4924.00	47.7 PK	74.0	-26.3	1.37 H	299	45.6	2.1
6	4924.00	34.4 AV	54.0	-19.6	1.37 H	299	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	*2462.00	109.2 PK			1.43 V	103	78.1	31.1
2	*2462.00	95.6 AV			1.43 V	103	64.5	31.1
3	2483.50	63.4 PK	74.0	-10.6	1.20 V	313	32.2	31.2
4	2483.50	51.8 AV	54.0	-2.2	1.20 V	313	20.6	31.2
5	4924.00	51.3 PK	74.0	-22.7	1.77 V	56	49.2	2.1
6	4924.00	35.2 AV	54.0	-18.8	1.77 V	56	33.1	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 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	65.2 PK	74.0	-8.8	1.20 H	64	34.0	31.2
2	2390.00	52.5 AV	54.0	-1.5	1.20 H	64	21.3	31.2
3	*2422.00	105.8 PK			1.49 H	96	74.7	31.1
4	*2422.00	93.2 AV			1.49 H	96	62.1	31.1
5	4844.00	46.1 PK	74.0	-27.9	1.89 H	320	44.2	1.9
6	4844.00	32.8 AV	54.0	-21.2	1.89 H	320	30.9	1.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.9 PK	74.0	-8.1	1.29 V	329	34.7	31.2
2	2390.00	52.5 AV	54.0	-1.5	1.29 V	329	21.3	31.2
3	*2422.00	104.7 PK			1.45 V	346	73.6	31.1
4	*2422.00	91.6 AV			1.45 V	346	60.5	31.1
5	4844.00	48.8 PK	74.0	-25.2	1.78 V	65	46.9	1.9
6	4844.00	36.0 AV	54.0	-18.0	1.78 V	65	34.1	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.
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	108.4 PK			1.69 H	263	77.3	31.1
2	*2437.00	95.6 AV			1.69 H	263	64.5	31.1
3	2483.50	65.6 PK	74.0	-8.4	1.20 H	229	34.4	31.2
4	2483.50	52.4 AV	54.0	-1.6	1.20 H	229	21.2	31.2
5	4874.00	47.9 PK	74.0	-26.1	1.89 H	308	45.9	2.0
6	4874.00	33.2 AV	54.0	-20.8	1.89 H	308	31.2	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	*2437.00	107.9 PK			1.49 V	325	76.8	31.1
2	*2437.00	94.5 AV			1.49 V	325	63.4	31.1
3	2483.50	65.4 PK	74.0	-8.6	1.29 V	338	34.2	31.2
4	2483.50	51.1 AV	54.0	-2.9	1.29 V	338	19.9	31.2
5	4874.00	50.5 PK	74.0	-23.5	1.93 V	71	48.5	2.0
6	4874.00	36.6 AV	54.0	-17.4	1.93 V	71	34.6	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 (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	106.7 PK			1.89 H	252	75.6	31.1
2	*2452.00	93.8 AV			1.89 H	252	62.7	31.1
3	2483.50	64.5 PK	74.0	-9.5	1.39 H	229	33.3	31.2
4	2483.50	52.4 AV	54.0	-1.6	1.39 H	229	21.2	31.2
5	4904.00	47.2 PK	74.0	-26.8	1.71 H	302	45.2	2.0
6	4904.00	33.2 AV	54.0	-20.8	1.71 H	302	31.2	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	*2452.00	104.9 PK			1.59 V	342	73.8	31.1
2	*2452.00	91.8 AV			1.59 V	342	60.7	31.1
3	2483.50	65.1 PK	74.0	-8.9	1.44 V	351	33.9	31.2
4	2483.50	51.7 AV	54.0	-2.3	1.44 V	351	20.5	31.2
5	4904.00	50.5 PK	74.0	-23.5	1.76 V	55	48.5	2.0
6	4904.00	35.2 AV	54.0	-18.8	1.76 V	55	33.2	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.



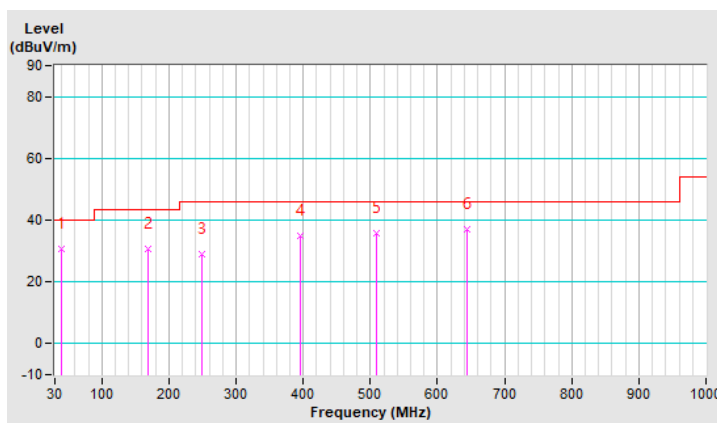
Below 1GHz worst-case data:

RF Mode	TX 802.11ax(HE20)	Channel	CH 6 : 2437 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	39.84	30.7 QP	40.0	-9.3	1.00 H	109	40.3	-9.6
2	169.17	30.7 QP	43.5	-12.8	1.49 H	71	39.5	-8.8
3	249.30	29.0 QP	46.0	-17.0	1.00 H	96	37.8	-8.8
4	395.51	35.0 QP	46.0	-11.0	1.00 H	220	39.7	-4.7
5	509.38	35.9 QP	46.0	-10.1	2.00 H	3	38.1	-2.2
6	644.33	37.0 QP	46.0	-9.0	1.49 H	15	36.1	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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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.

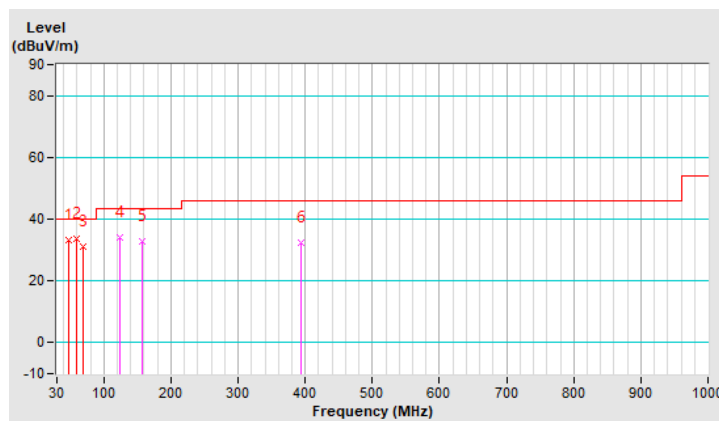


RF Mode	TX 802.11ax(HE20)	Channel	CH 6 : 2437 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	A		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	48.28	33.2 QP	40.0	-6.8	1.48 V	270	42.2	-9.0
2	58.88	33.7 QP	40.0	-6.3	1.00 V	321	42.9	-9.2
3	68.91	31.0 QP	40.0	-9.0	2.00 V	6	41.8	-10.8
4	124.19	34.0 QP	43.5	-9.5	1.49 V	14	44.5	-10.5
5	157.93	32.6 QP	43.5	-10.9	1.00 V	285	40.9	-8.3
6	394.10	32.2 QP	46.0	-13.8	2.00 V	352	36.9	-4.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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.

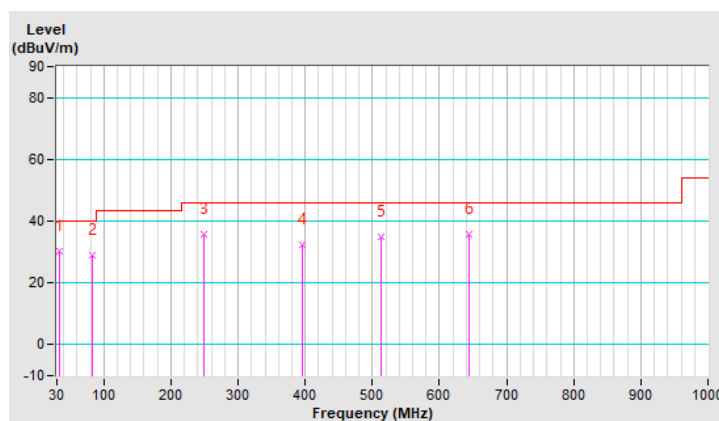


RF Mode	TX 802.11ax(HE20)	Channel	CH 6 : 2437 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	34.22	30.4 QP	40.0	-9.6	2.00 H	93	40.9	-10.5
2	83.42	29.0 QP	40.0	-11.0	2.00 H	99	43.0	-14.0
3	249.30	35.6 QP	46.0	-10.4	1.01 H	256	44.4	-8.8
4	395.51	32.5 QP	46.0	-13.5	1.01 H	17	37.2	-4.7
5	512.19	34.8 QP	46.0	-11.2	1.51 H	350	36.8	-2.0
6	644.33	35.8 QP	46.0	-10.2	1.01 H	15	34.9	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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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.

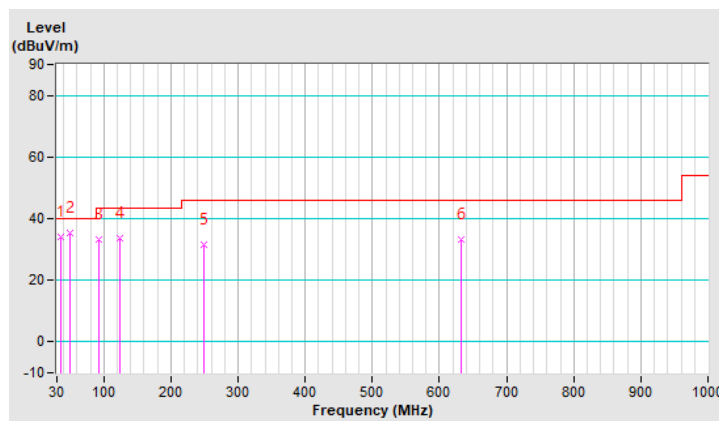


RF Mode	TX 802.11ax(HE20)	Channel	CH 6 : 2437 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	B		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	35.62	34.1 QP	40.0	-5.9	1.00 V	97	44.3	-10.2
2	49.68	35.5 QP	40.0	-4.5	1.00 V	6	44.6	-9.1
3	93.26	33.2 QP	43.5	-10.3	1.00 V	119	47.3	-14.1
4	124.19	33.8 QP	43.5	-9.7	1.49 V	10	44.3	-10.5
5	249.30	31.6 QP	46.0	-14.4	2.00 V	186	40.4	-8.8
6	631.68	33.3 QP	46.0	-12.7	1.00 V	330	32.5	0.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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 0.50MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 17, 2020	Feb. 16, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2020	Sep. 03, 2021
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 20, 2020	Jan. 19, 2021
LISN 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

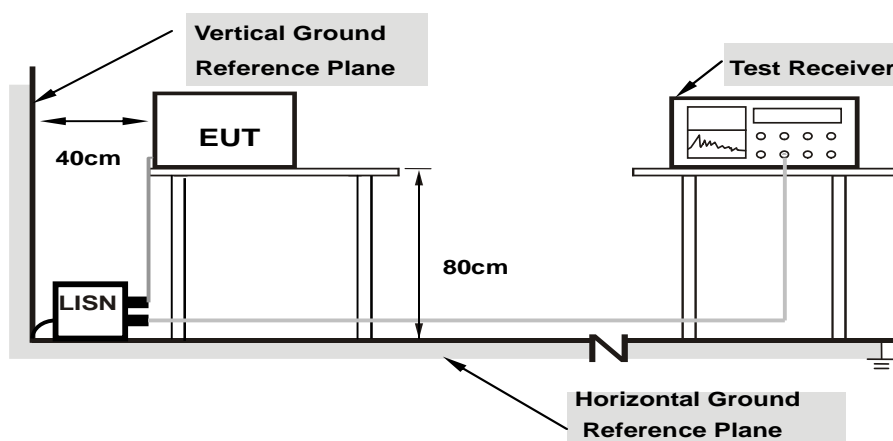
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

### 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

Same as 4.1.6.

#### 4.2.7 Test Results

Worst-case data:

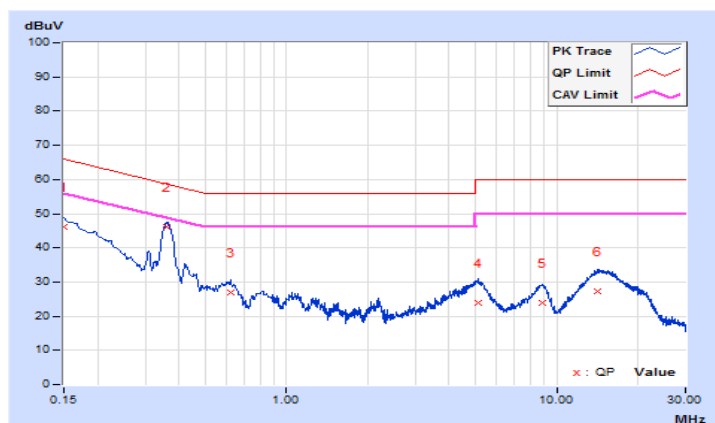
802.11ax (HE20)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.09	36.14	21.58	46.23	31.67	66.00	56.00	-19.77	-24.33
2	0.36006	10.10	35.88	29.45	45.98	39.55	58.73	48.73	-12.75	-9.18
3	0.62250	10.12	16.94	11.55	27.06	21.67	56.00	46.00	-28.94	-24.33
4	5.10000	10.24	13.57	5.72	23.81	15.96	60.00	50.00	-36.19	-34.04
5	8.84625	10.29	13.74	8.85	24.03	19.14	60.00	50.00	-35.97	-30.86
6	14.19450	10.35	16.95	11.09	27.30	21.44	60.00	50.00	-32.70	-28.56

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.

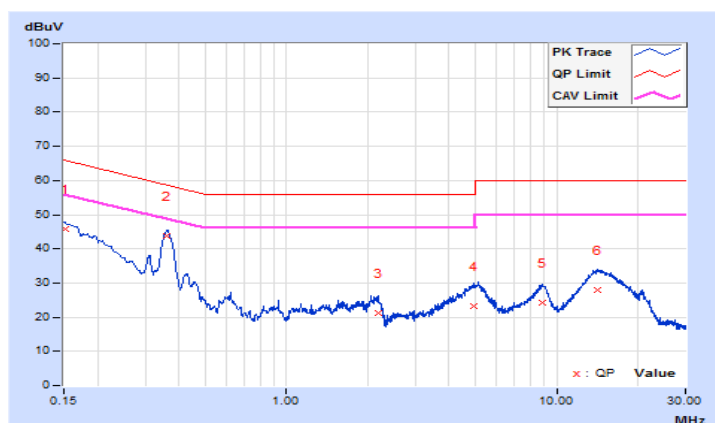


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15225	10.06	35.88	23.33	45.94	33.39	65.88	55.88	-19.94	-22.49
2	0.36101	10.08	33.67	26.82	43.75	36.90	58.71	48.71	-14.96	-11.81
3	2.17725	10.16	11.20	7.44	21.36	17.60	56.00	46.00	-34.64	-28.40
4	4.95600	10.26	13.07	5.43	23.33	15.69	56.00	46.00	-32.67	-30.31
5	8.82600	10.36	13.99	8.98	24.35	19.34	60.00	50.00	-35.65	-30.66
6	14.13150	10.48	17.60	11.45	28.08	21.93	60.00	50.00	-31.92	-28.07

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.



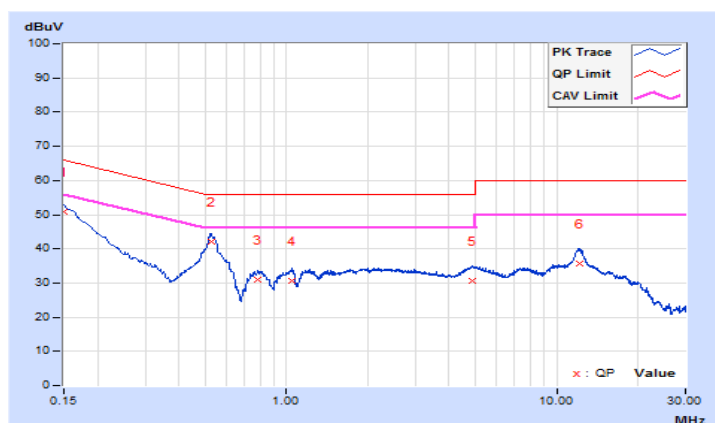


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.04	40.87	23.61	50.91	33.65	66.00	56.00	-15.09	-22.35
2	0.52523	10.08	31.90	26.63	41.98	36.71	56.00	46.00	-14.02	-9.29
3	0.78046	10.10	20.92	17.06	31.02	27.16	56.00	46.00	-24.98	-18.84
4	1.05179	10.11	20.66	15.72	30.77	25.83	56.00	46.00	-25.23	-20.17
5	4.86600	10.20	20.41	15.21	30.61	25.41	56.00	46.00	-25.39	-20.59
6	12.23700	10.31	25.27	20.38	35.58	30.69	60.00	50.00	-24.42	-19.31

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.

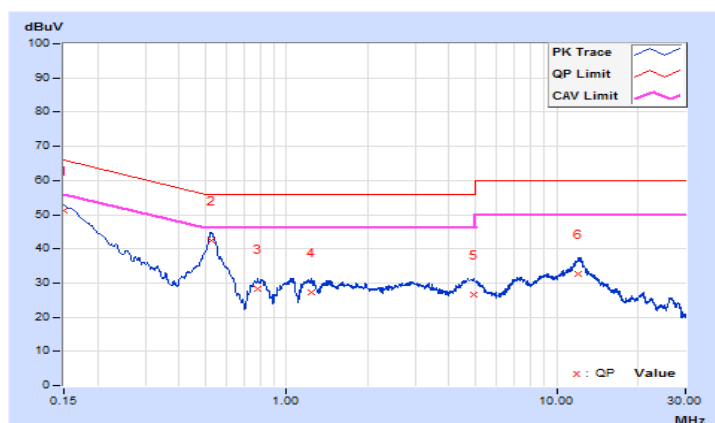


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	10.03	41.18	23.49	51.21	33.52	66.00
<b>2</b>	<b>0.52523</b>	<b>10.06</b>	<b>32.47</b>	<b>27.27</b>	<b>42.53</b>	<b>37.33</b>	<b>56.00</b>	<b>46.00</b>	<b>-13.47</b>	<b>-8.67</b>
3	0.78046	10.08	18.14	14.29	28.22	24.37	56.00	46.00	-27.78	-21.63
4	1.24125	10.10	17.22	12.46	27.32	22.56	56.00	46.00	-28.68	-23.44
5	4.91325	10.21	16.35	10.40	26.56	20.61	56.00	46.00	-29.44	-25.39
6	11.99625	10.37	22.14	16.92	32.51	27.29	60.00	50.00	-27.49	-22.71

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.

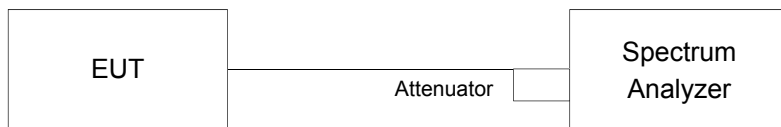


### 4.3 6dB Bandwidth Measurement

#### 4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB 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

- Set resolution bandwidth (RBW) = 100kHz.
- 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.

#### 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 Result

##### 802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.12	8.05	0.5	Pass
6	2437	8.06	7.13	0.5	Pass
11	2462	8.05	7.59	0.5	Pass

##### 802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.61	16.34	0.5	Pass
6	2437	15.68	16.08	0.5	Pass
11	2462	15.77	16.08	0.5	Pass

##### 802.11ax (HE20)

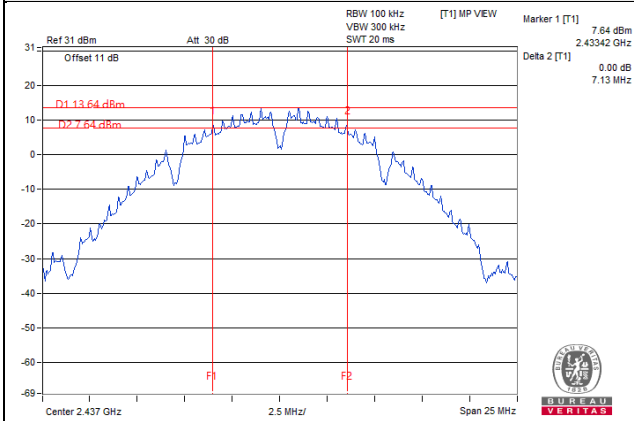
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.58	18.28	0.5	Pass
6	2437	18.06	18.54	0.5	Pass
11	2462	18.57	18.31	0.5	Pass

##### 802.11ax (HE40)

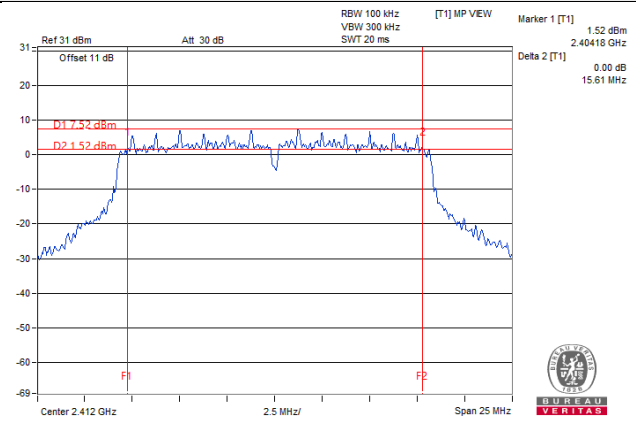
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	38.01	37.43	0.5	Pass
6	2437	37.73	37.62	0.5	Pass
9	2452	37.67	37.50	0.5	Pass

### Spectrum Plot of Worst Value

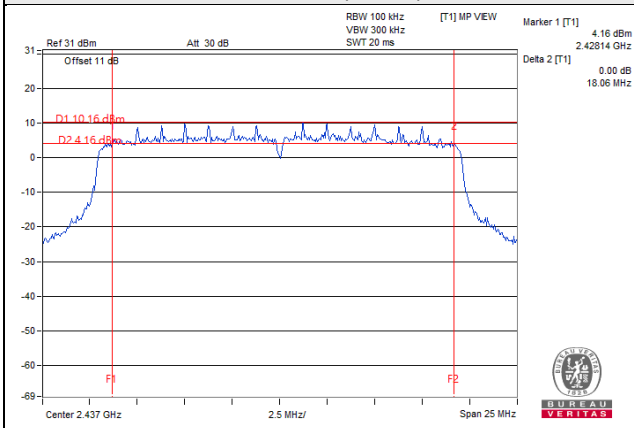
#### 802.11b



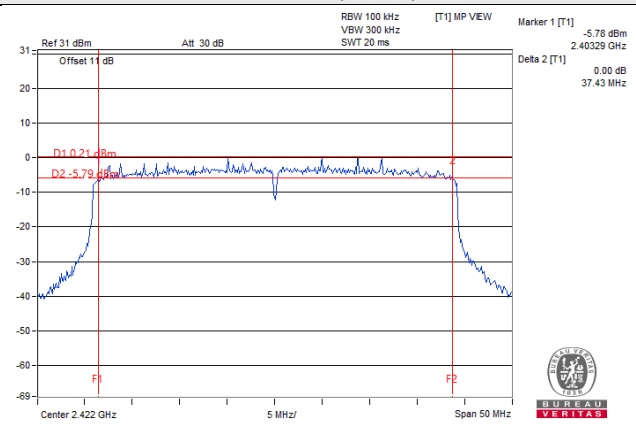
#### 802.11g



#### 802.11ax (HE20)



#### 802.11ax (HE40)



#### 4.4 Conducted Output Power Measurement

##### 4.4.1 Limits of Conducted Output Power Measurement

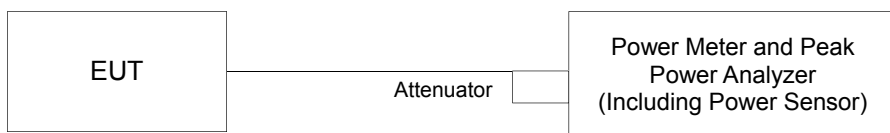
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

- Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;
- Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any  $N_{ANT}$ ;
- Array Gain =  $5 \log(N_{ANT}/N_{SS})$  dB or 3 dB, whichever is less for 20-MHz channel widths with  $N_{ANT} \geq 5$ .

For power measurements on all other devices: Array Gain =  $10 \log(N_{ANT}/N_{SS})$  dB.

##### 4.4.2 Test Setup



##### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

##### 4.4.4 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.

##### 4.4.5 Deviation from Test Standard

No deviation.

##### 4.4.6 EUT Operating Conditions

Same as item 4.3.6.

#### 4.4.7 Test Results

##### CDD Mode

##### 802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.11	19.42	168.969	22.28	30.00	Pass
6	2437	21.00	21.44	<b>265.208</b>	24.24	30.00	Pass
11	2462	20.20	20.11	207.278	23.17	30.00	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	17.33	17.01	104.310	20.18	30.00	Pass
6	2437	20.67	20.88	239.143	23.79	30.00	Pass
11	2462	18.60	18.40	141.627	21.51	30.00	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	15.98	16.01	79.530	19.01	30.00	Pass
6	2437	19.63	19.79	187.113	22.72	30.00	Pass
11	2462	15.97	16.12	80.463	19.06	30.00	Pass

##### 802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	13.25	13.20	42.028	16.24	30.00	Pass
6	2437	16.03	16.09	80.731	19.07	30.00	Pass
9	2452	14.19	13.71	49.739	16.97	30.00	Pass

802.11n (VHT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	16.00	16.05	80.082	19.04	30.00	Pass
6	2437	19.65	19.84	188.640	22.76	30.00	Pass
11	2462	16.01	16.16	81.207	19.10	30.00	Pass

802.11n (VHT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	13.27	13.24	42.319	16.27	30.00	Pass
6	2437	16.06	16.13	81.385	19.11	30.00	Pass
9	2452	14.22	13.75	50.138	17.00	30.00	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	16.05	16.10	81.010	19.09	30.00	Pass
6	2437	19.72	19.88	191.031	22.81	30.00	Pass
11	2462	16.05	16.20	81.959	19.14	30.00	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	13.33	13.40	43.405	16.38	30.00	Pass
6	2437	16.12	16.22	82.805	19.18	30.00	Pass
9	2452	14.30	13.80	50.904	17.07	30.00	Pass



### Beamforming Mode

#### 802.11n (VHT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	12.99	13.04	40.044	16.03	29.56	Pass
6	2437	16.64	16.83	94.327	19.75	29.56	Pass
11	2462	13.00	13.15	40.606	16.09	29.56	Pass

Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power limit shall be reduced to  $30 - (6.44 - 6) = 29.56\text{dBm}$ .

#### 802.11n (VHT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	10.26	10.23	21.161	13.26	29.56	Pass
6	2437	13.05	13.12	40.695	16.10	29.56	Pass
9	2452	11.21	10.74	25.071	13.99	29.56	Pass

Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power limit shall be reduced to  $30 - (6.44 - 6) = 29.56\text{dBm}$ .

#### 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	13.04	13.09	40.508	16.08	29.56	Pass
6	2437	16.71	16.87	<b>95.522</b>	19.80	29.56	Pass
11	2462	13.04	13.19	40.982	16.13	29.56	Pass

Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power limit shall be reduced to  $30 - (6.44 - 6) = 29.56\text{dBm}$ .

#### 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	10.32	10.39	21.704	13.37	29.56	Pass
6	2437	13.11	13.21	41.406	16.17	29.56	Pass
9	2452	11.29	10.79	25.454	14.06	29.56	Pass

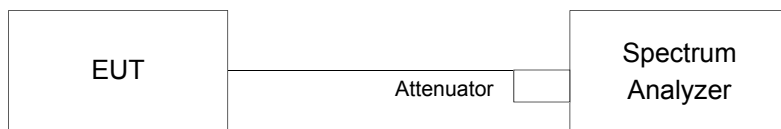
Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power limit shall be reduced to  $30 - (6.44 - 6) = 29.56\text{dBm}$ .

## 4.5 Power Spectral Density Measurement

### 4.5.1 Limits of Power Spectral Density Measurement

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

### 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 Procedure

- a. Measure the duty cycle (x).
- b. Set instrument center frequency to DTS channel center frequency.
- c. Set span to at least 1.5 times the OBW.
- d. Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- e. Set VBW  $\geq 3 \times \text{RBW}$ .
- f. Detector = power averaging (RMS) or sample detector (when RMS not available).
- g. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- 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.

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Condition

Same as item 4.3.6

#### 4.5.7 Test Results

##### 802.11b

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-16.09	3.01	2.51	-10.57	7.56	Pass
	6	2437	-16.31	3.01	2.51	-10.79	7.56	Pass
	11	2462	-18.10	3.01	2.51	-12.58	7.56	Pass
1	1	2412	-17.51	3.01	2.51	-11.99	7.56	Pass
	6	2437	-15.93	3.01	2.51	-10.41	7.56	Pass
	11	2462	-17.09	3.01	2.51	-11.57	7.56	Pass

Note:

- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density, Measure and add 10 log (N<sub>ANT</sub>) dB.
- Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $8 - (6.44 - 6) = 7.56\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

##### 802.11g

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-18.88	3.01	0.34	-15.53	7.56	Pass
	6	2437	-15.30	3.01	0.34	-11.95	7.56	Pass
	11	2462	-17.66	3.01	0.34	-14.31	7.56	Pass
1	1	2412	-18.76	3.01	0.34	-15.41	7.56	Pass
	6	2437	-15.06	3.01	0.34	-11.71	7.56	Pass
	11	2462	-17.38	3.01	0.34	-14.03	7.56	Pass

Note:

- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density, Measure and add 10 log (N<sub>ANT</sub>) dB.
- Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $8 - (6.44 - 6) = 7.56\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-21.62	3.01	0.25	-18.36	7.56	Pass
	6	2437	-17.92	3.01	0.25	-14.66	7.56	Pass
	11	2462	-21.59	3.01	0.25	-18.33	7.56	Pass
1	1	2412	-21.78	3.01	0.25	-18.52	7.56	Pass
	6	2437	-18.02	3.01	0.25	-14.76	7.56	Pass
	11	2462	-21.59	3.01	0.25	-18.33	7.56	Pass

Note:

- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density, Measure and add 10 log (N<sub>ANT</sub>) dB.
- Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $8 - (6.44 - 6) = 7.56\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

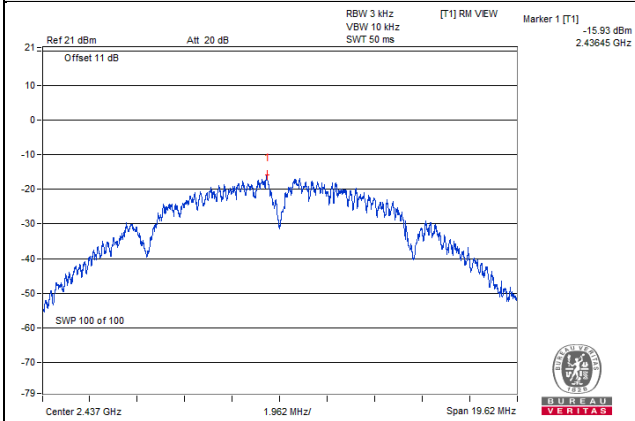
TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-26.87	3.01	0.28	-23.58	7.56	Pass
	6	2437	-24.25	3.01	0.28	-20.96	7.56	Pass
	9	2452	-26.15	3.01	0.28	-22.86	7.56	Pass
1	3	2422	-27.03	3.01	0.28	-23.74	7.56	Pass
	6	2437	-24.38	3.01	0.28	-21.09	7.56	Pass
	9	2452	-26.99	3.01	0.28	-23.70	7.56	Pass

Note:

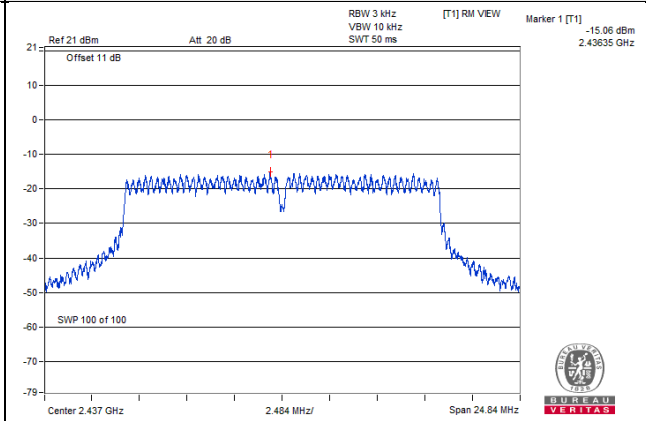
- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density, Measure and add 10 log (N<sub>ANT</sub>) dB.
- Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 6.44\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $8 - (6.44 - 6) = 7.56\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

### Spectrum Plot of Worst Value

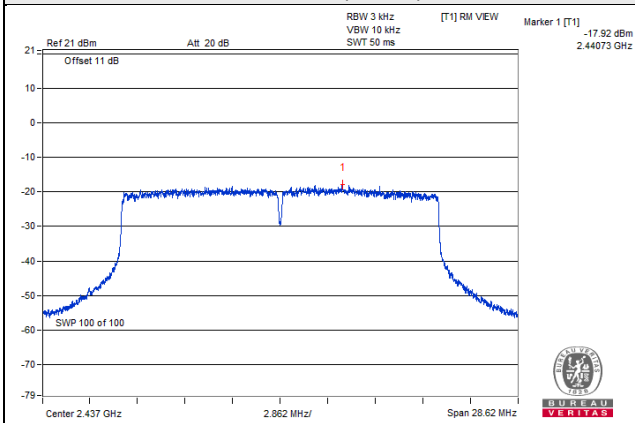
#### 802.11b



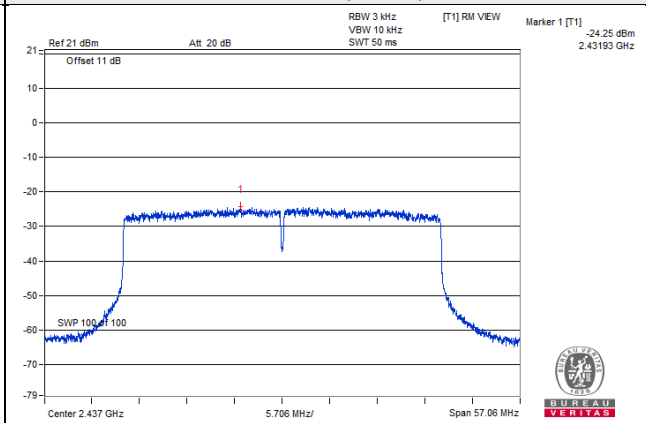
#### 802.11g



#### 802.11ax (HE20)



#### 802.11ax (HE40)

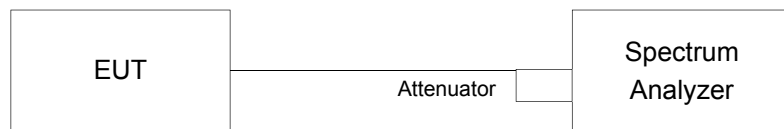


## 4.6 Conducted Out of Band Emission Measurement

### 4.6.1 Limits of Conducted Out of Band Emission Measurement

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

### 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

#### MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW  $\geq$  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  $\geq$  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.

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

Same as item 4.3.6

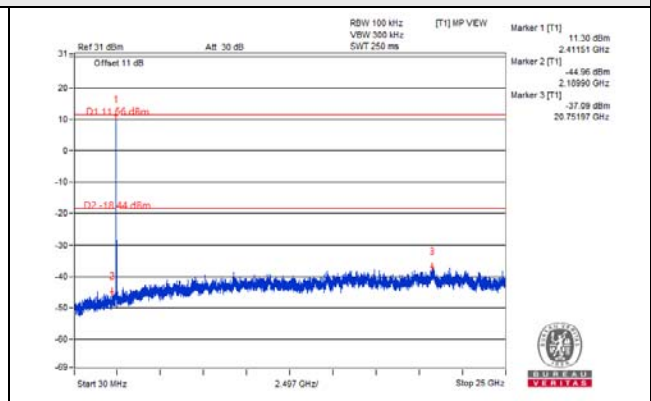
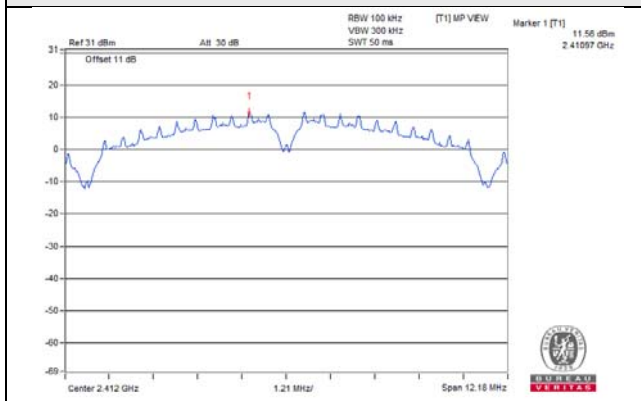
### 4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

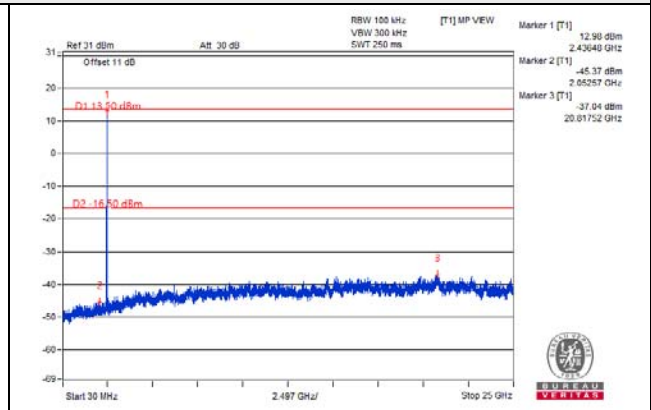
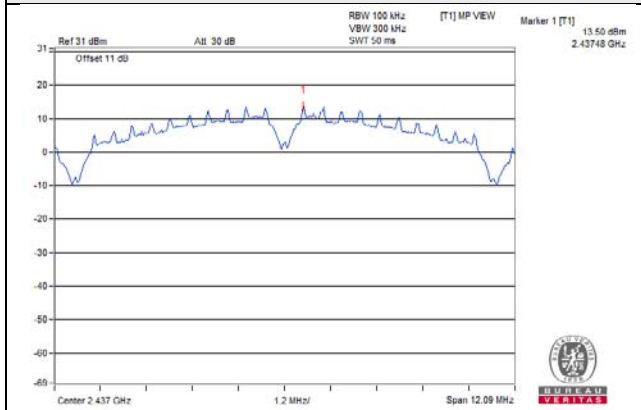
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b\_Chain 0

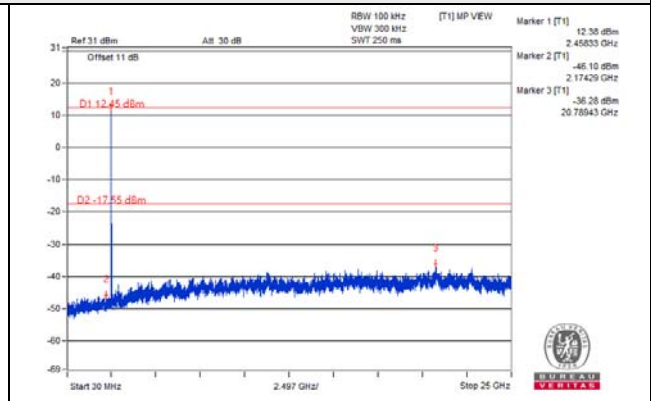
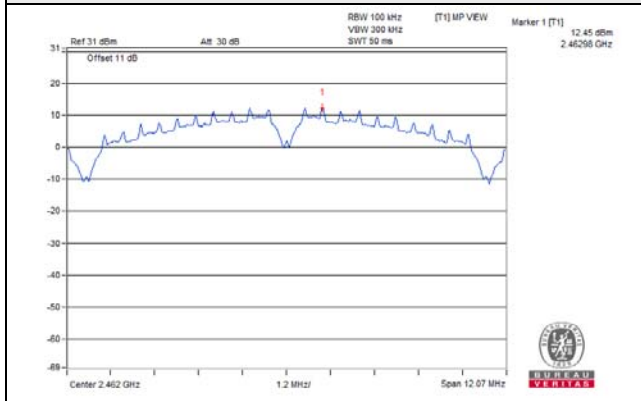
CH 1



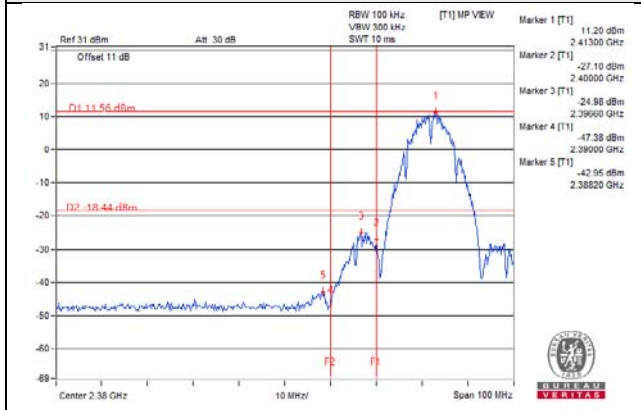
CH 6



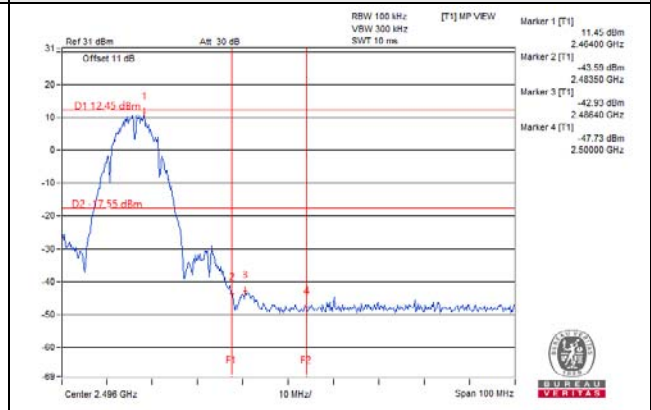
CH 11



CH 1 Band edge

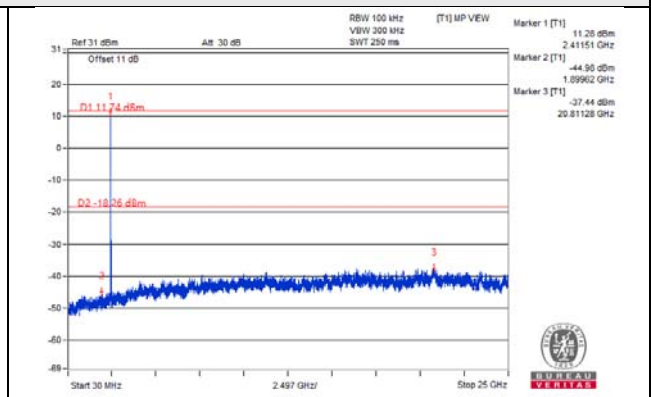
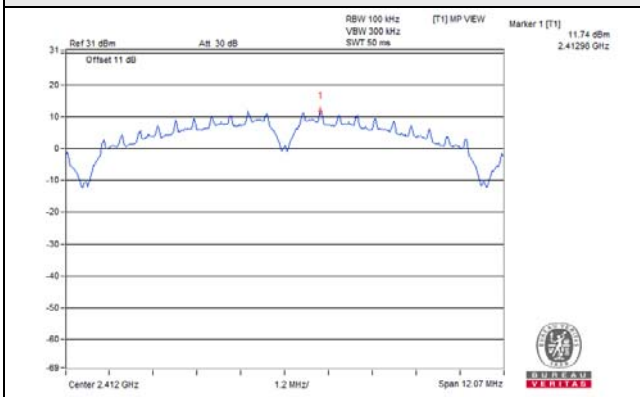


CH 11 Band edge

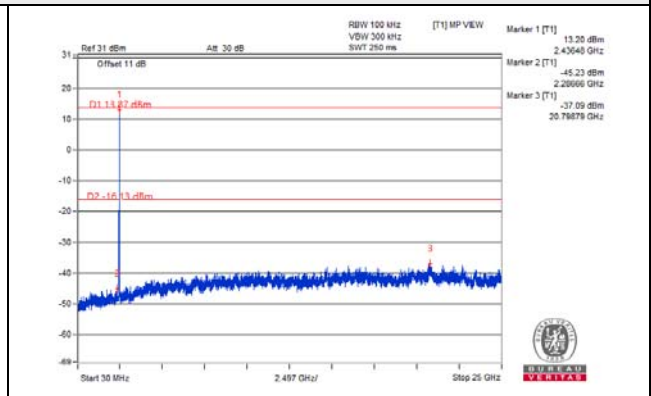
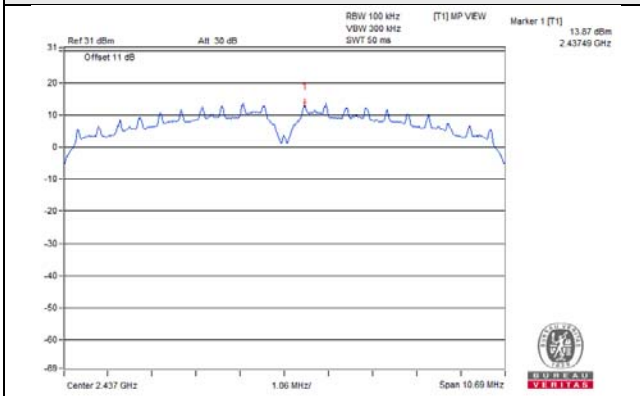


802.11b\_Chain 1

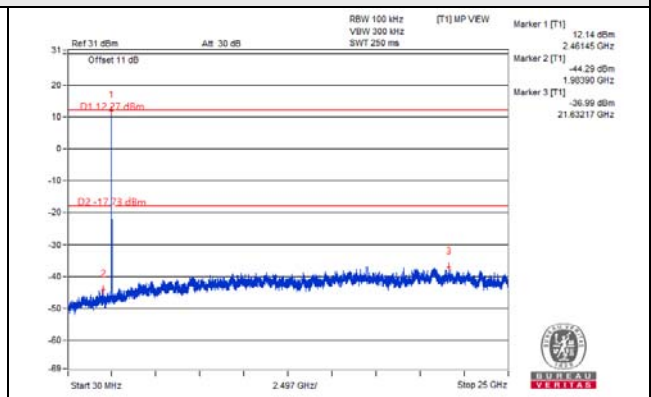
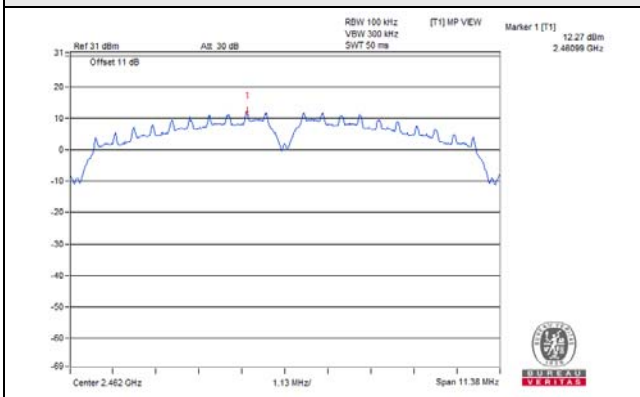
CH 1



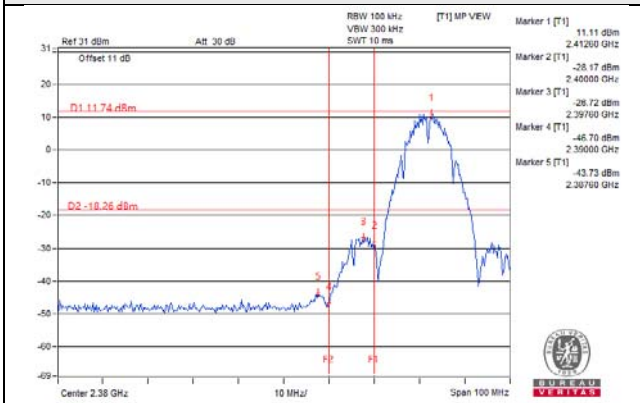
CH 6



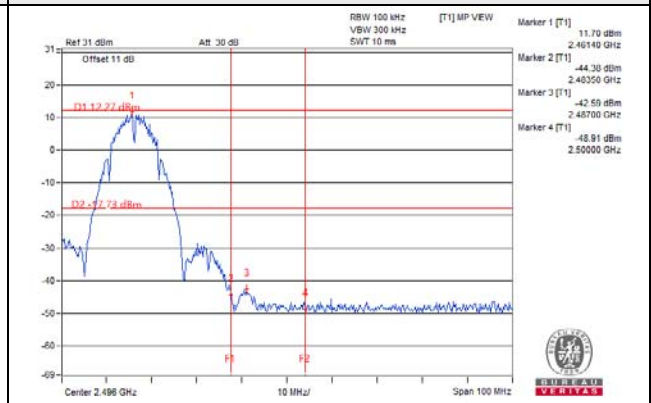
CH 11



CH 1 Band edge



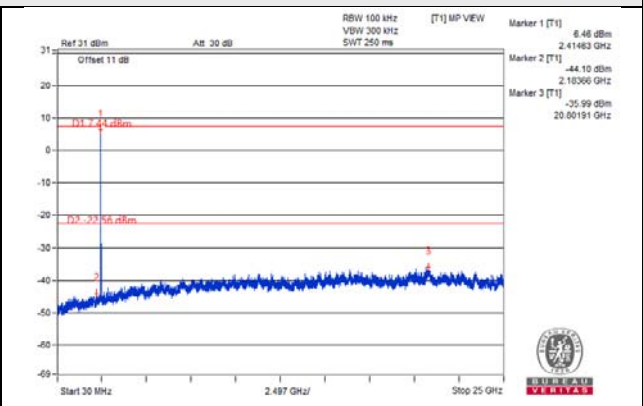
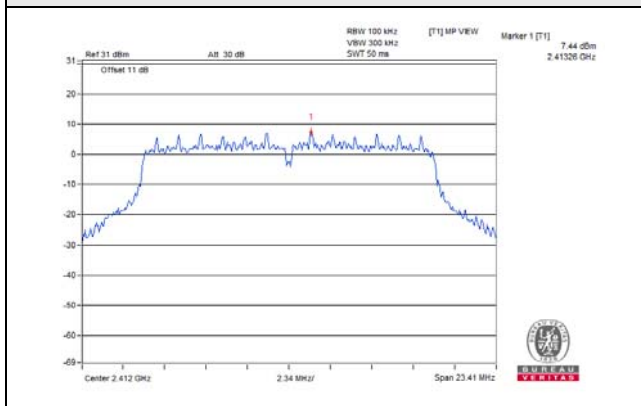
CH 11 Band edge



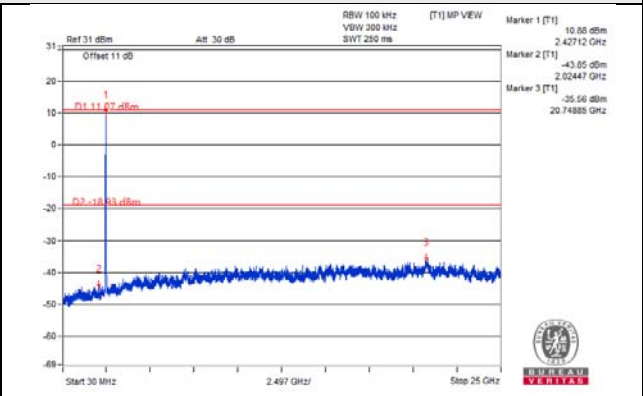
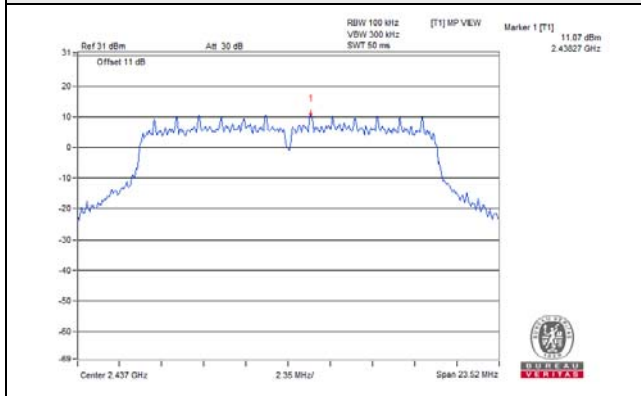


802.11g\_Chain 0

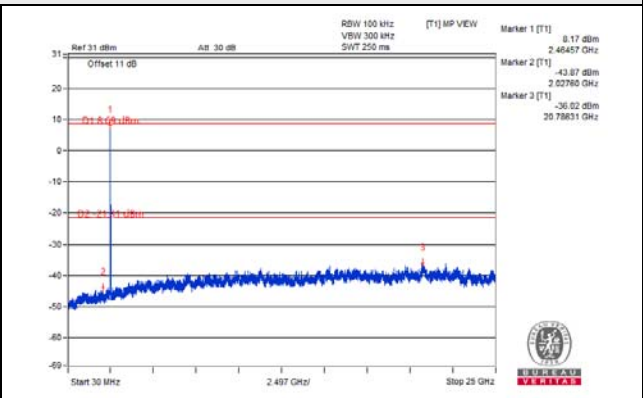
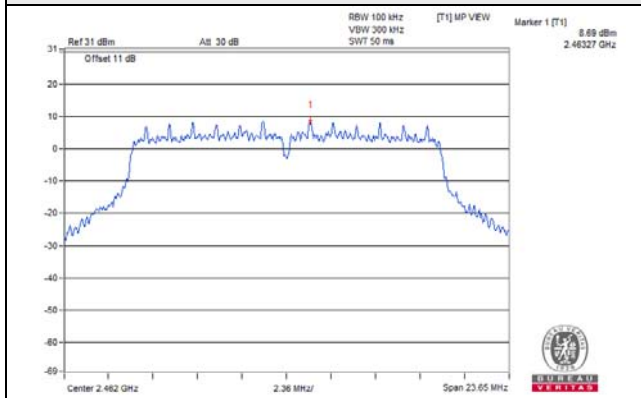
CH 1



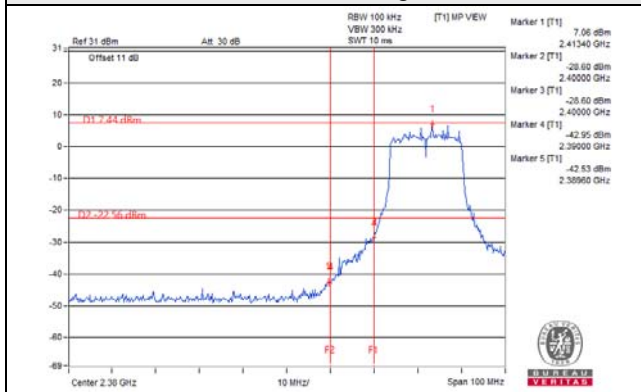
CH 6



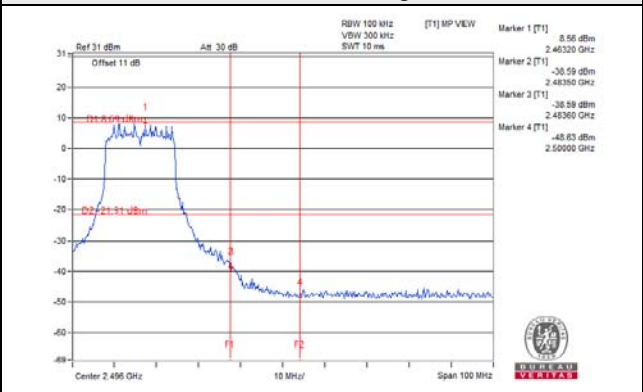
CH 11



CH 1 Band edge

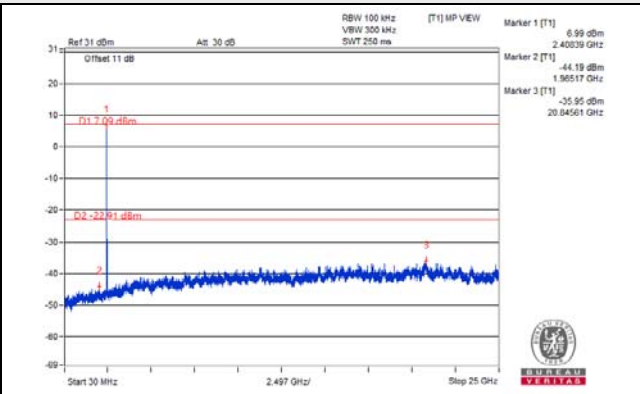
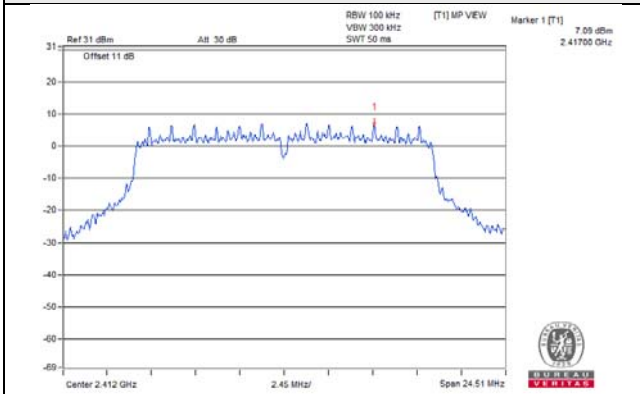


CH 11 Band edge

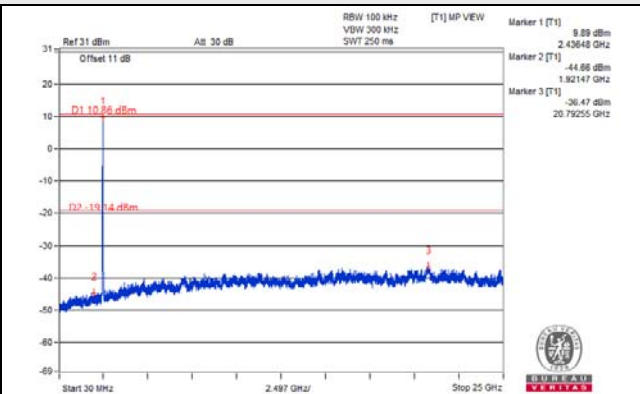
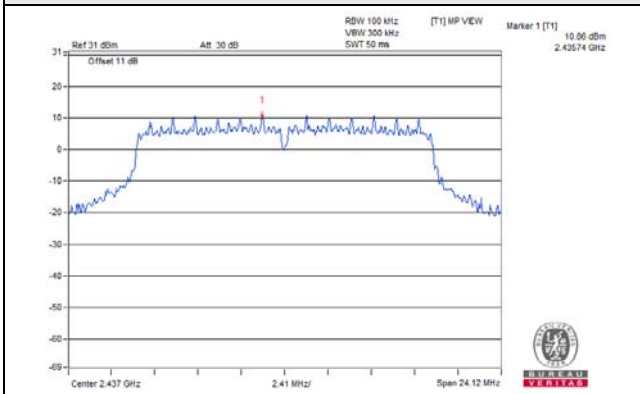


802.11g\_Chain 1

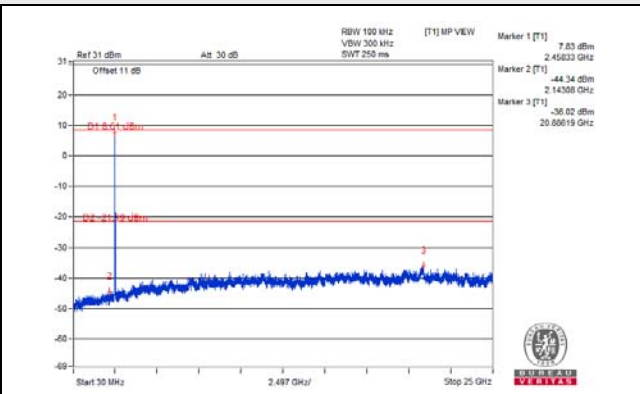
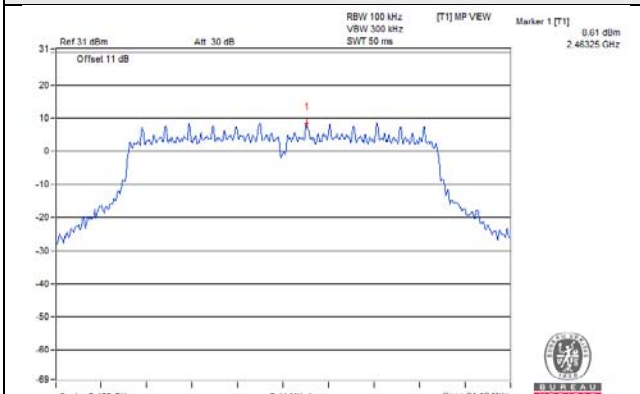
CH 1



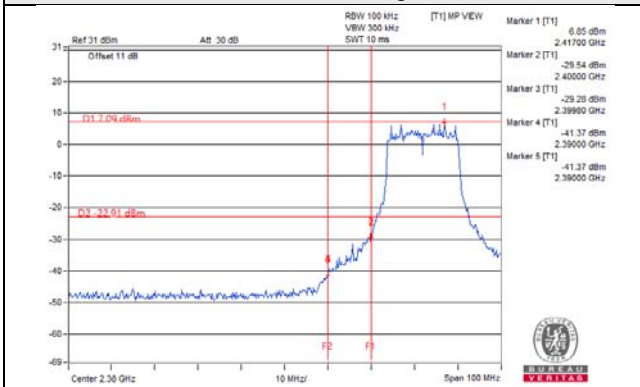
CH 6



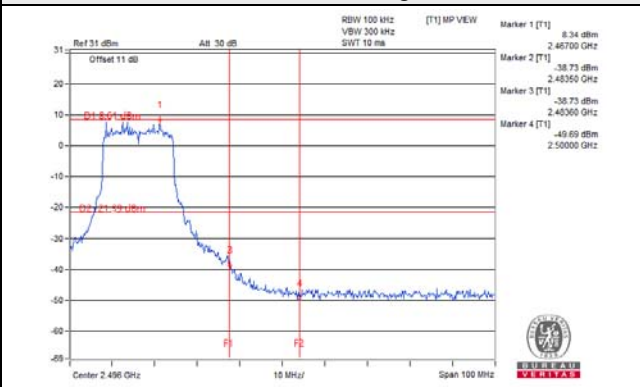
CH 11



CH 1 Band edge

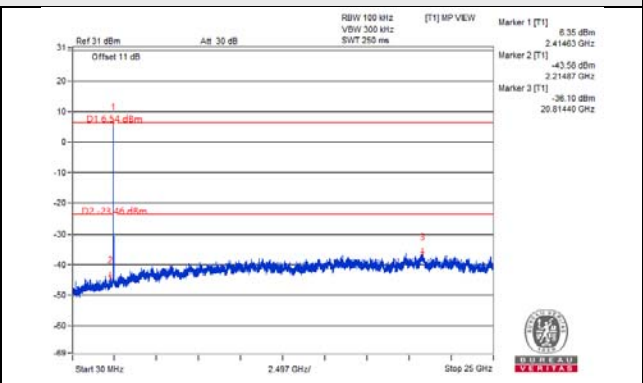
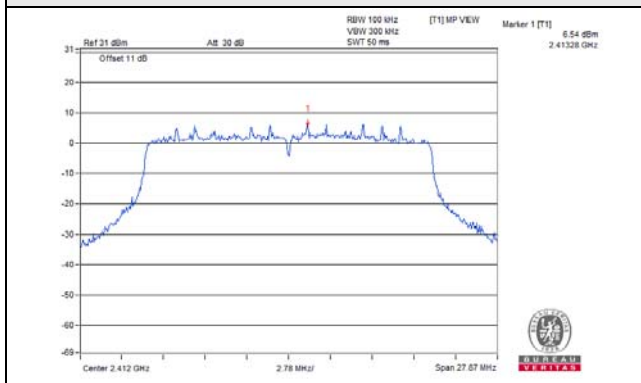


CH 11 Band edge

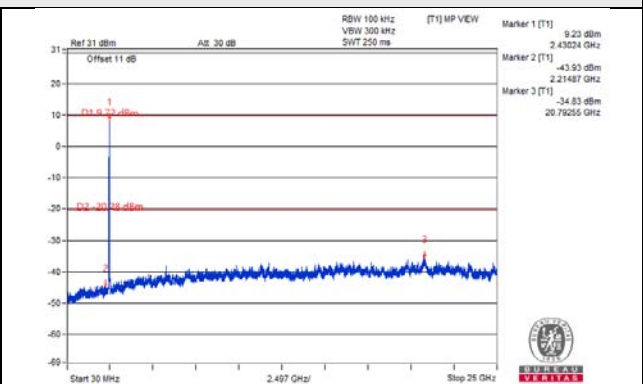
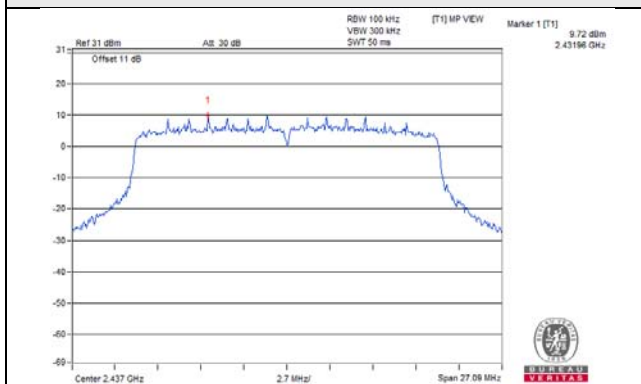


802.11ax (HE20)\_Chain 0

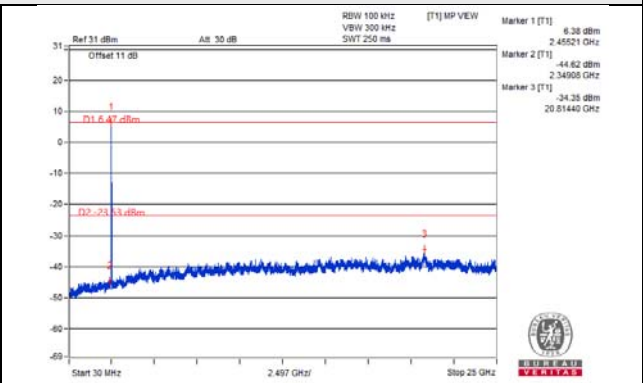
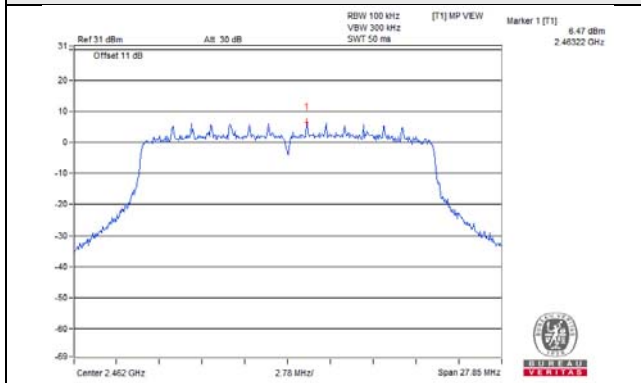
CH 1



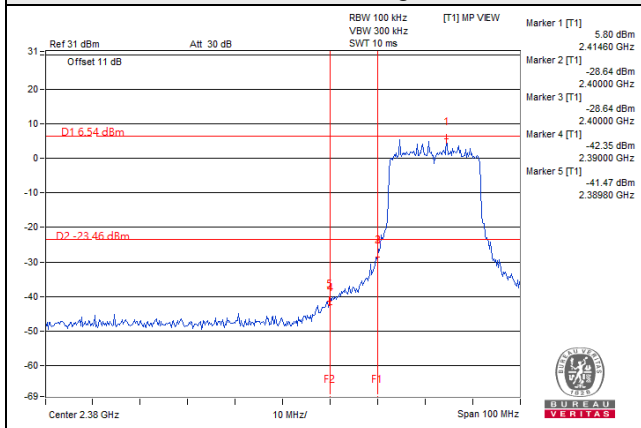
CH 6



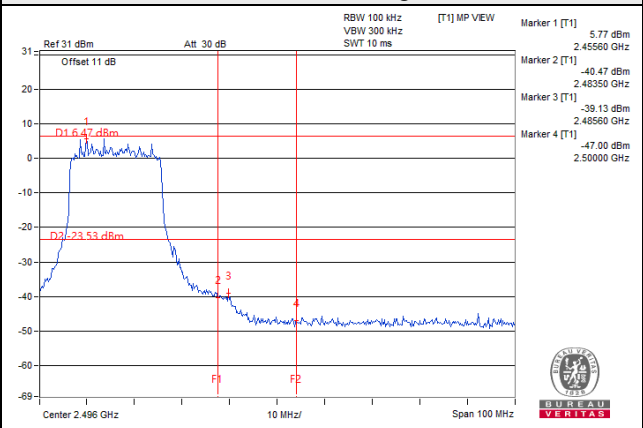
CH 11



CH 1 Band edge

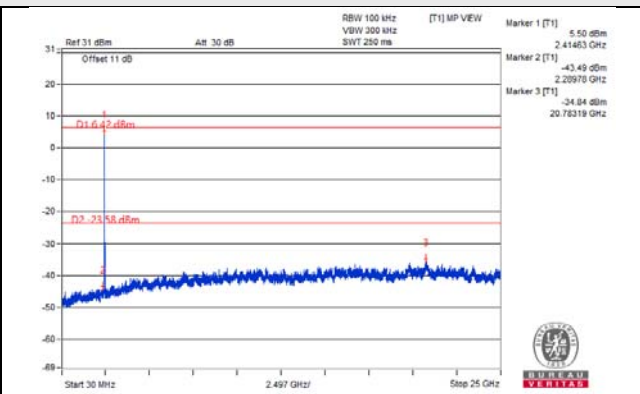
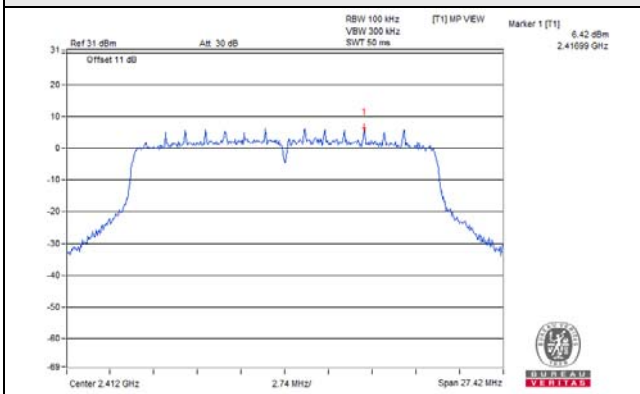


CH 11 Band edge

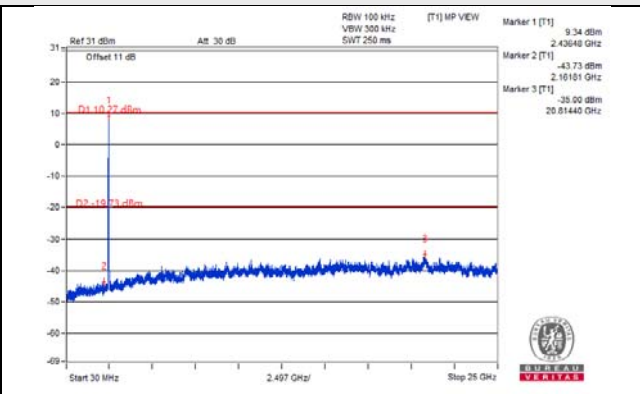
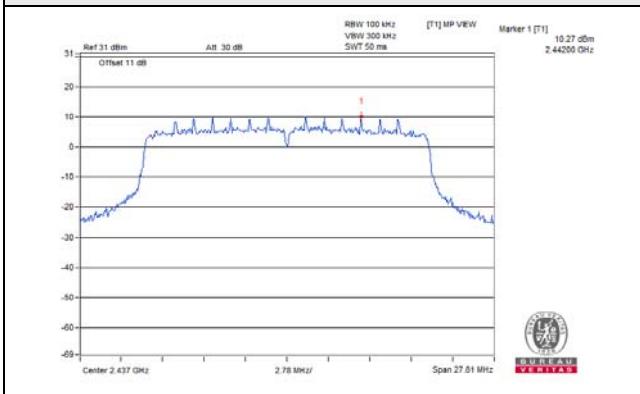


802.11ax (HE20)\_Chain 1

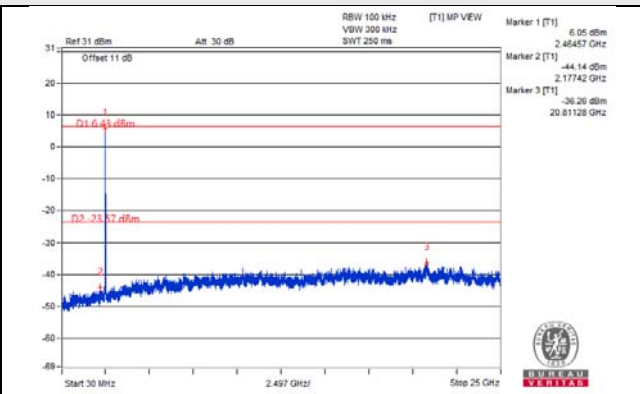
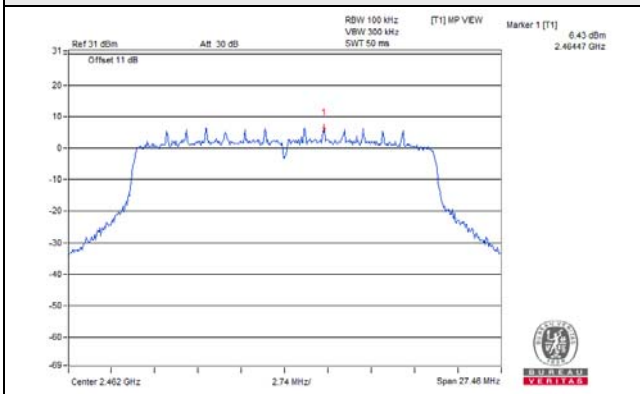
CH 1



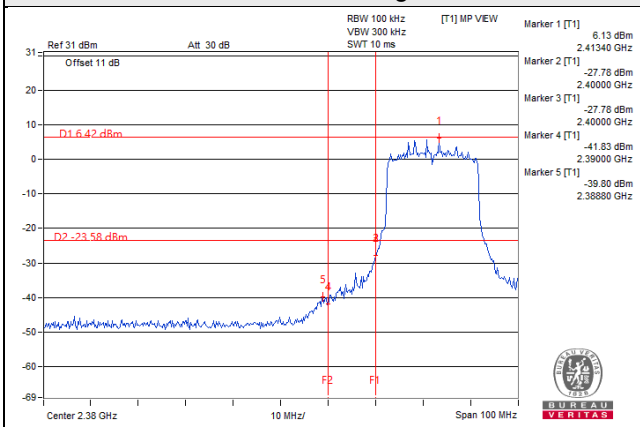
CH 6



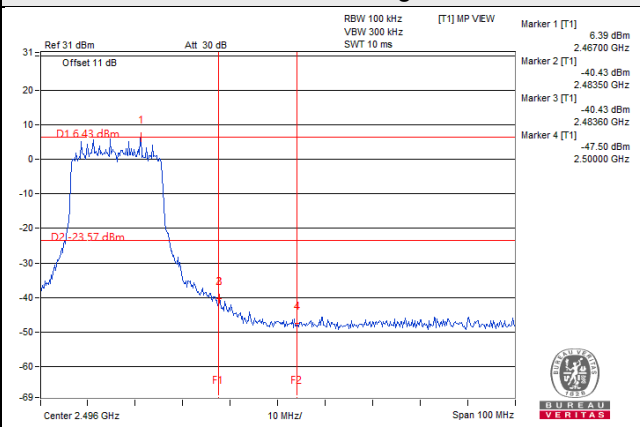
CH 11



CH 1 Band edge

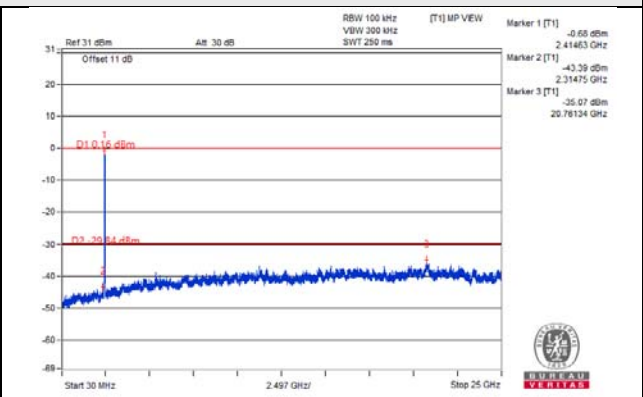
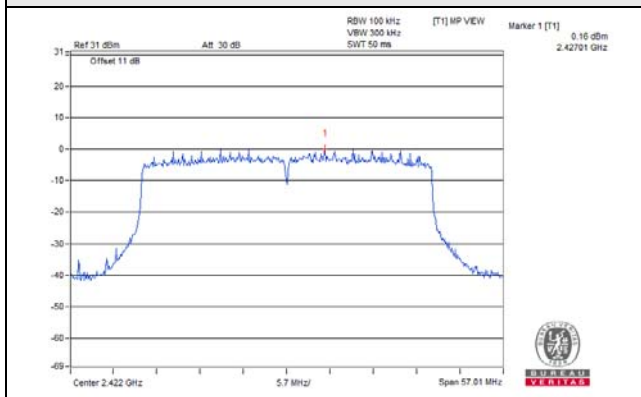


CH 11 Band edge

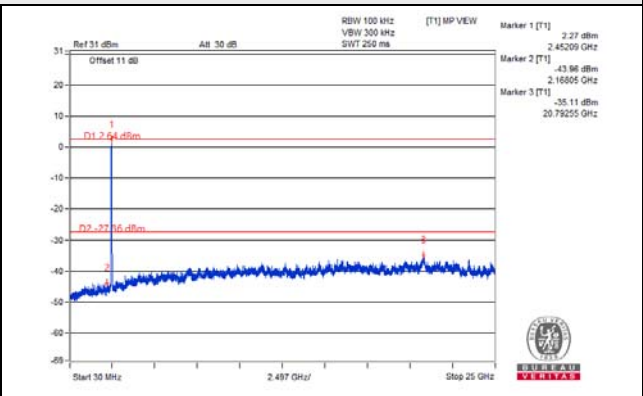
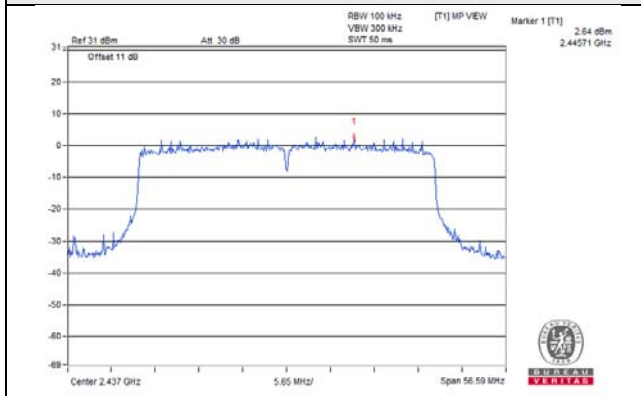


802.11ax (HE40)\_Chain 0

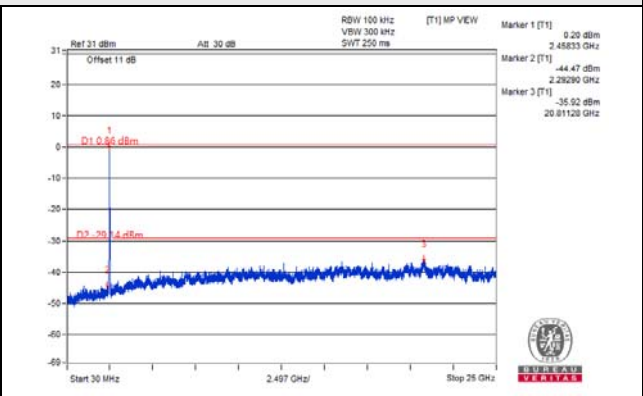
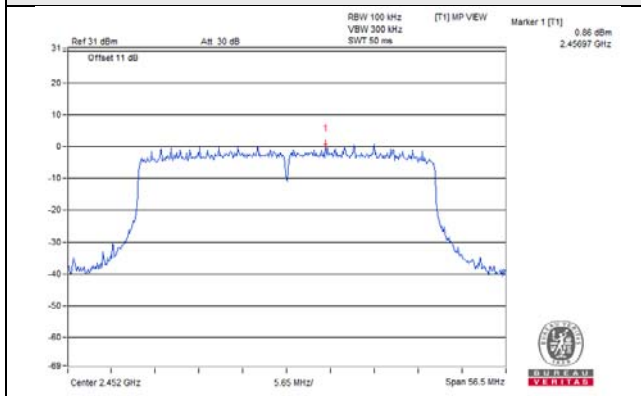
CH 3



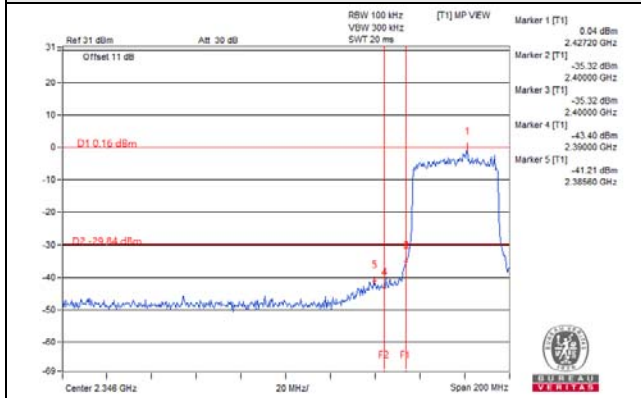
CH 6



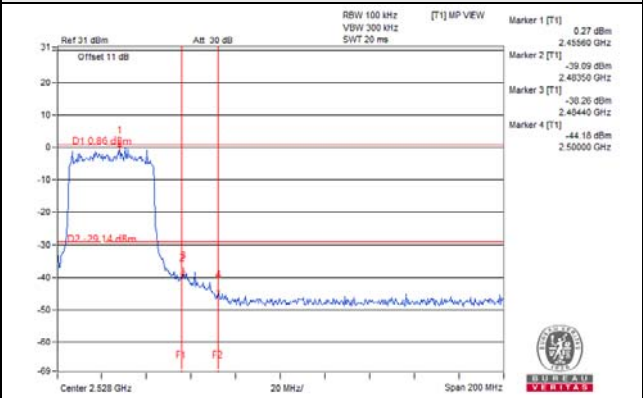
CH 9



CH 3 Band edge

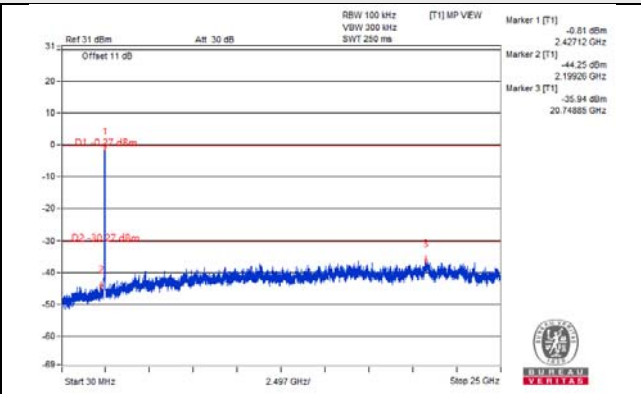
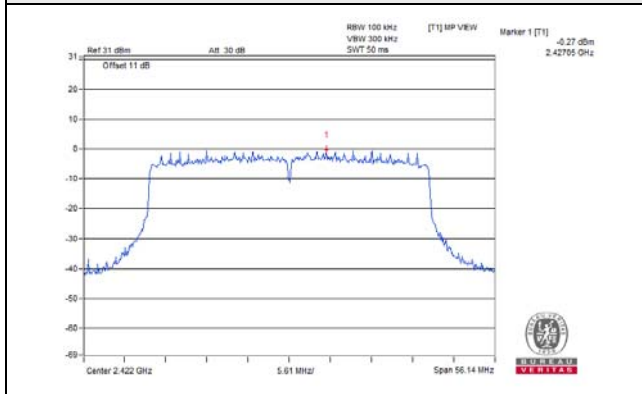


CH 9 Band edge

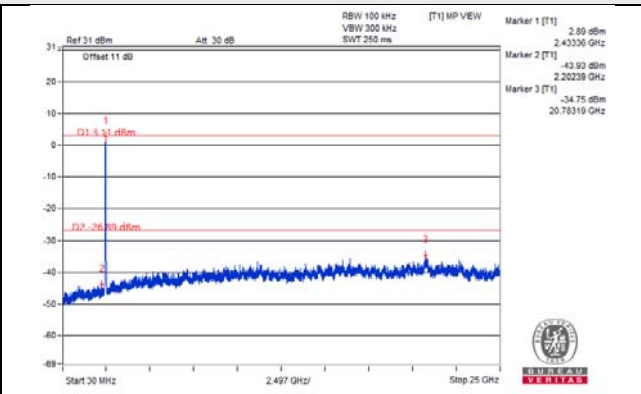
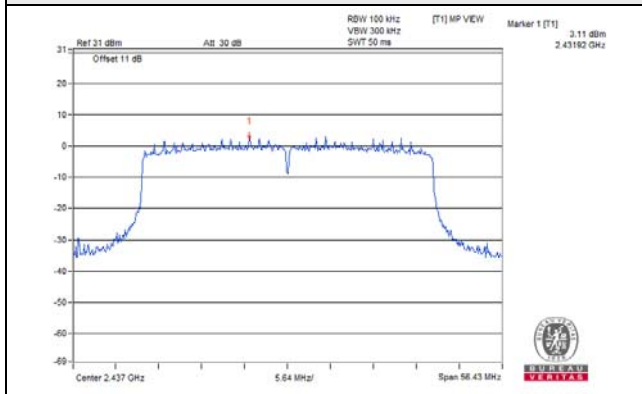


802.11ax (HE40)\_Chain 1

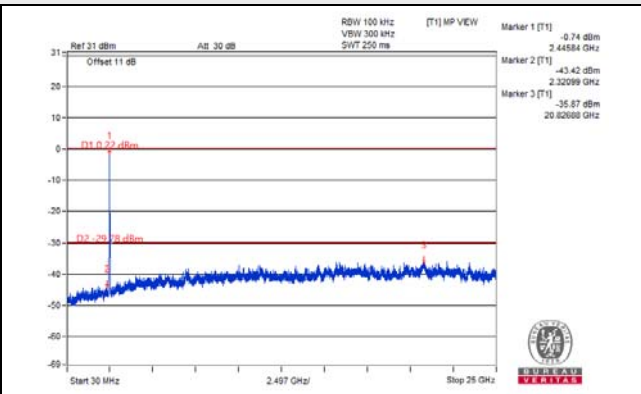
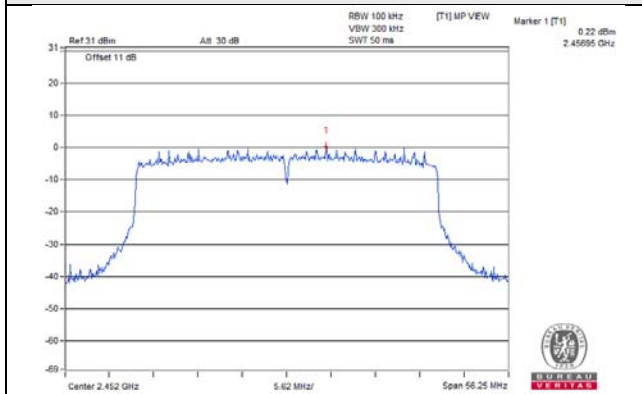
CH 3



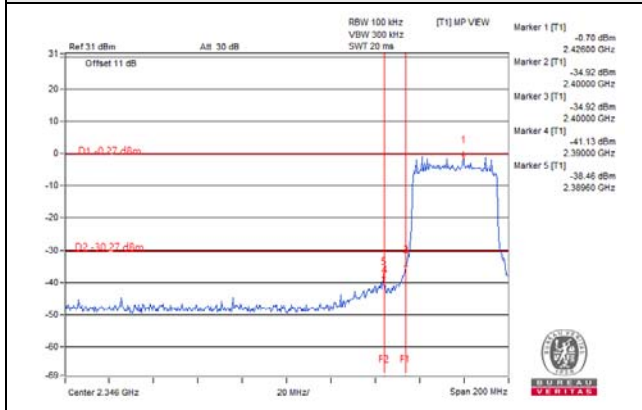
CH 6



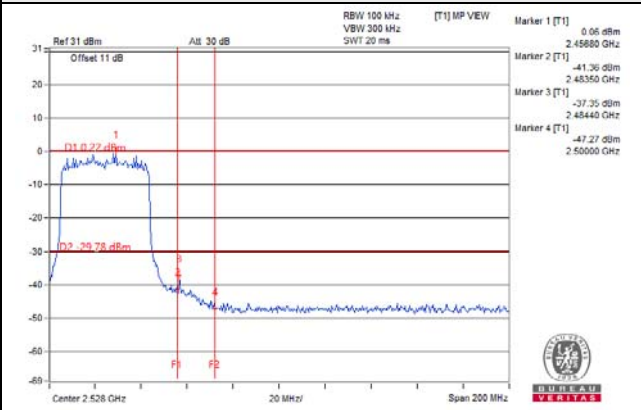
CH 9



CH 3 Band edge



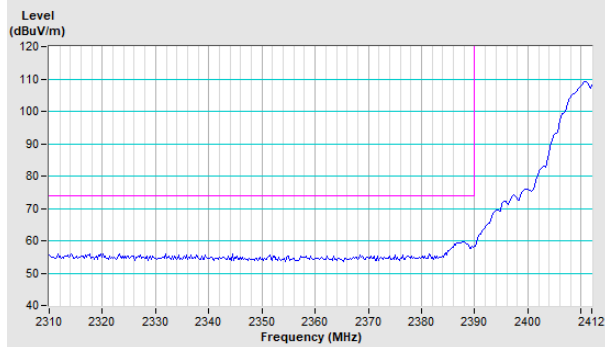
CH 9 Band edge



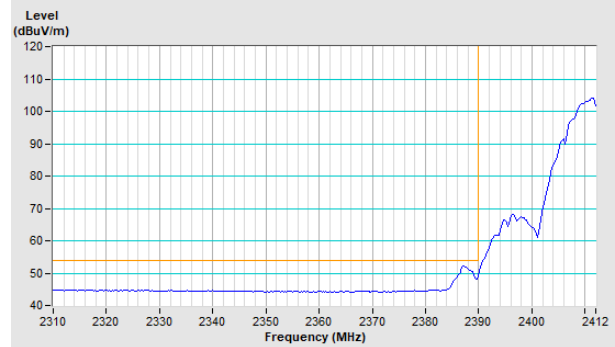
## Annex A - Band Edge Measurement

### 802.11b Channel 1

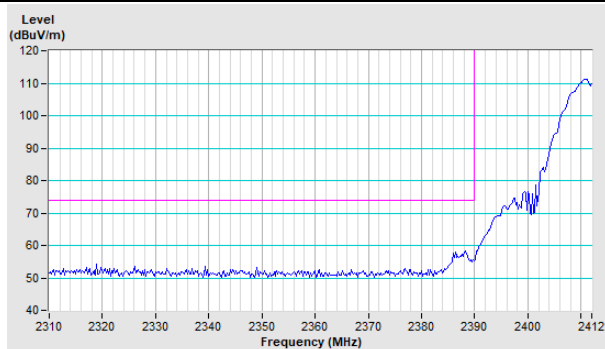
Horizontal (Peak)



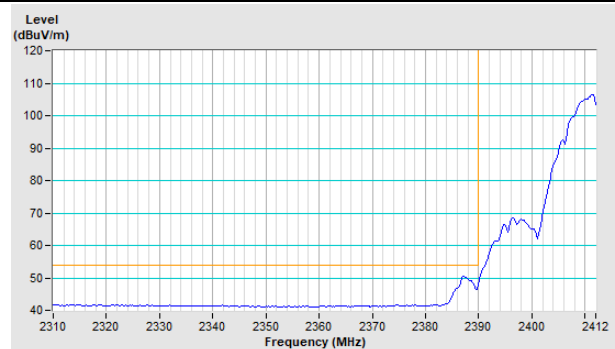
Horizontal (Average)



Vertical (Peak)

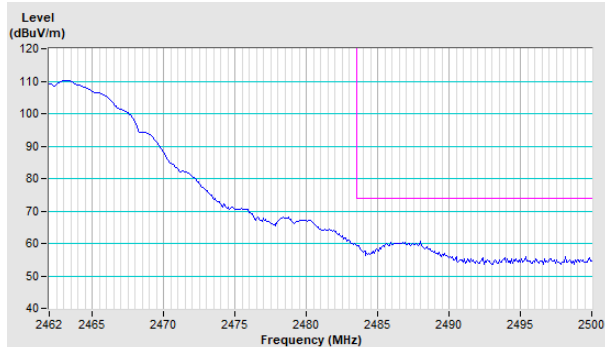


Vertical (Average)

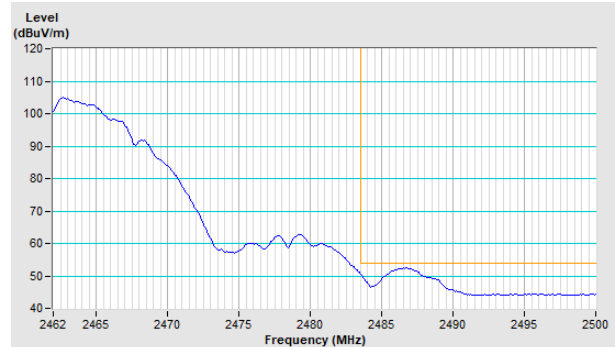


### 802.11b Channel 11

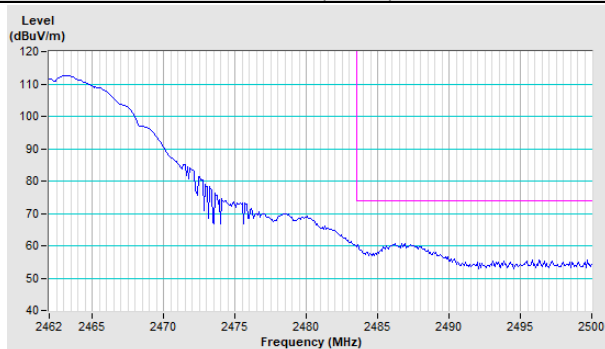
Horizontal (Peak)



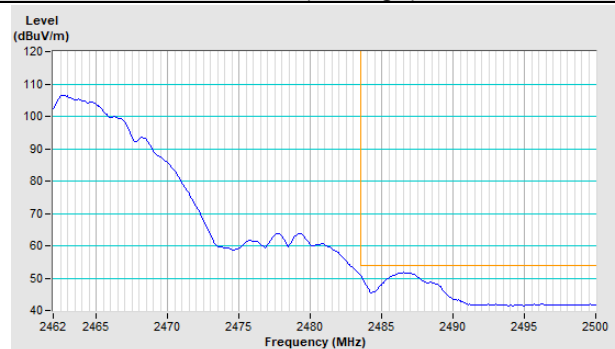
Horizontal (Average)



Vertical (Peak)

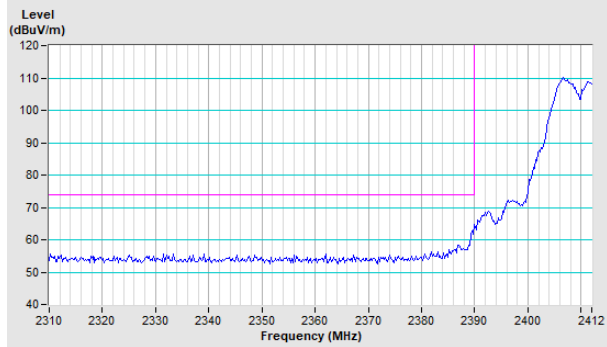


Vertical (Average)

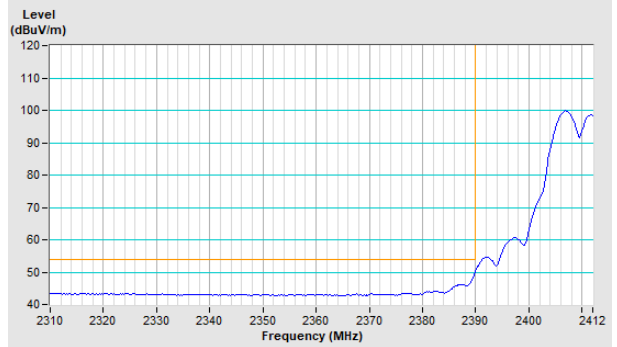


### 802.11g Channel 1

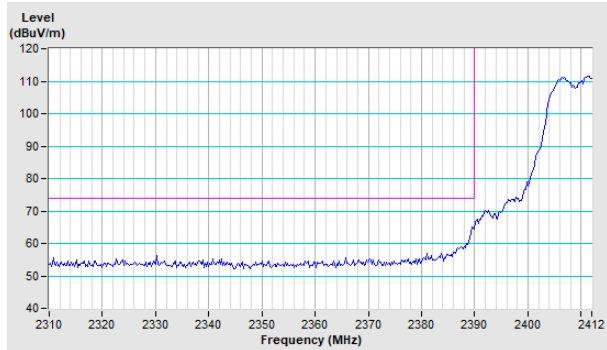
Horizontal (Peak)



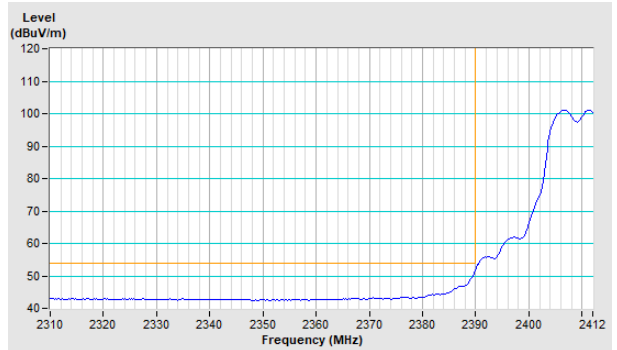
Horizontal (Average)



Vertical (Peak)

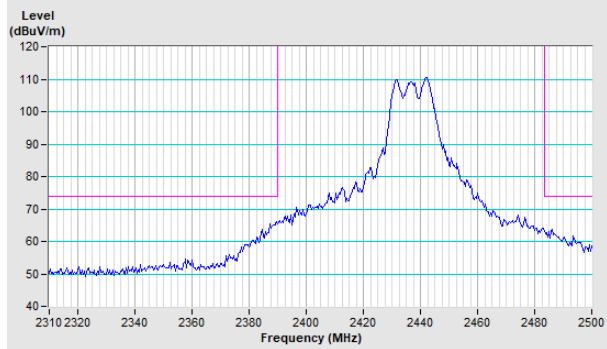


Vertical (Average)

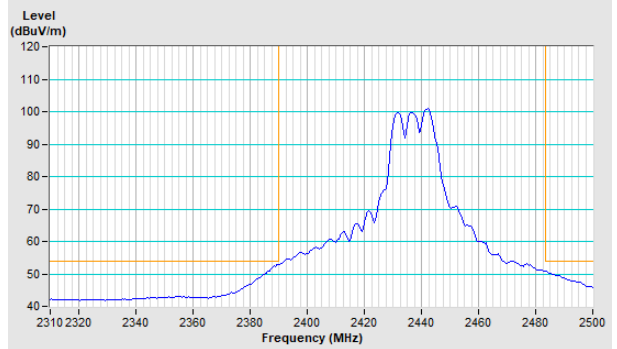


### 802.11g Channel 6

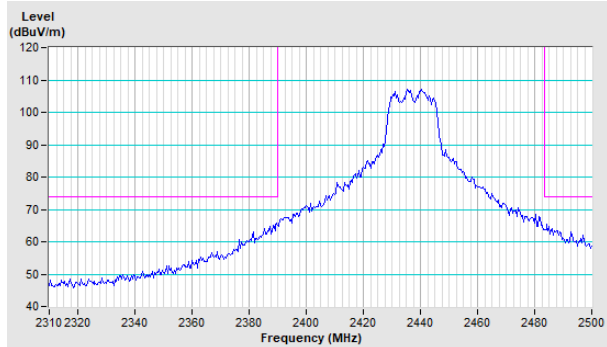
Horizontal (Peak)



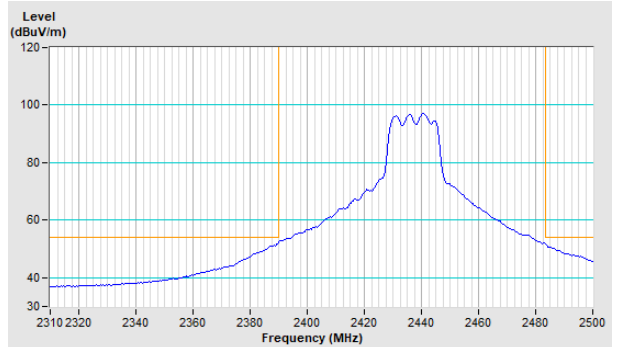
Horizontal (Average)



Vertical (Peak)



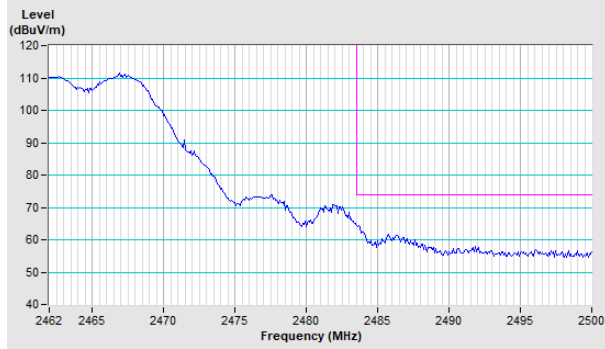
Vertical (Average)



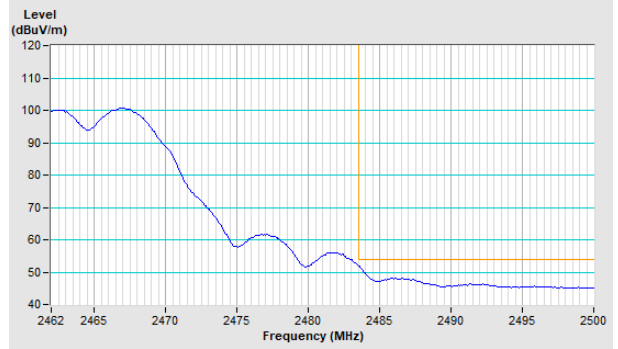


### 802.11g Channel 11

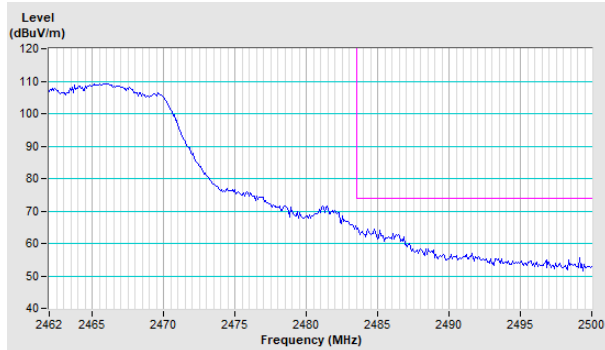
Horizontal (Peak)



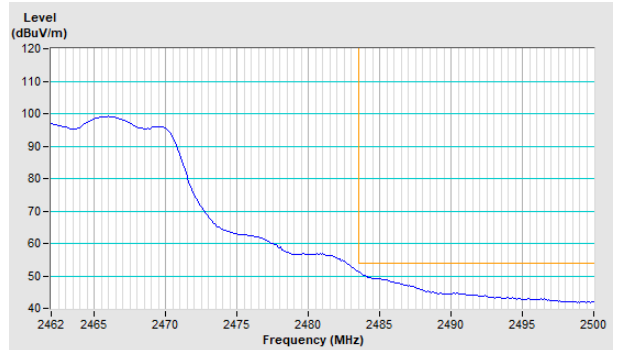
Horizontal (Average)



Vertical (Peak)

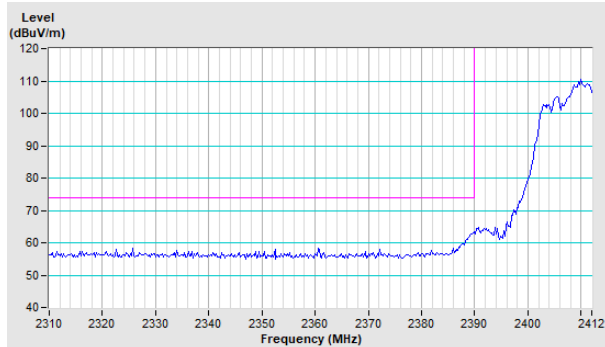


Vertical (Average)

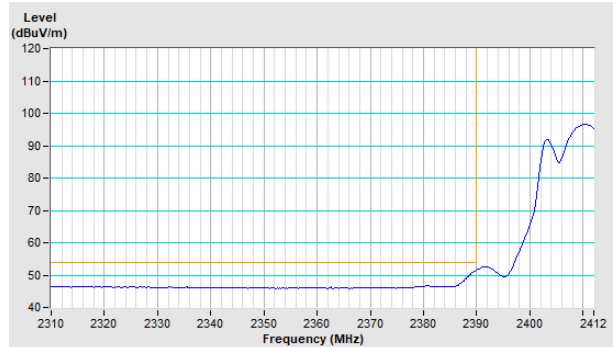


### 802.11ax (HE20) Channel 1

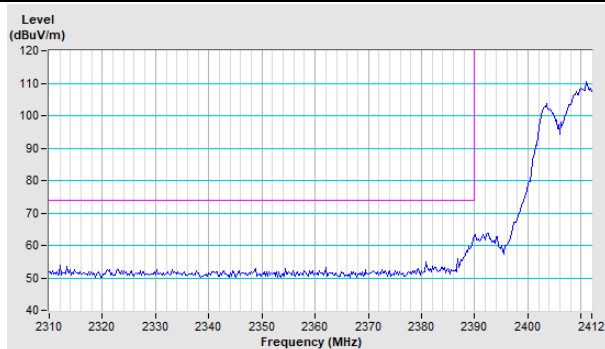
Horizontal (Peak)



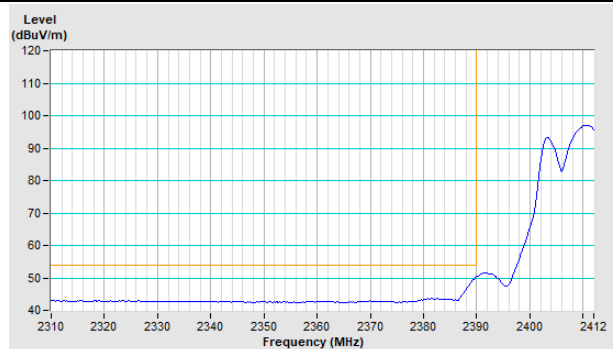
Horizontal (Average)



Vertical (Peak)

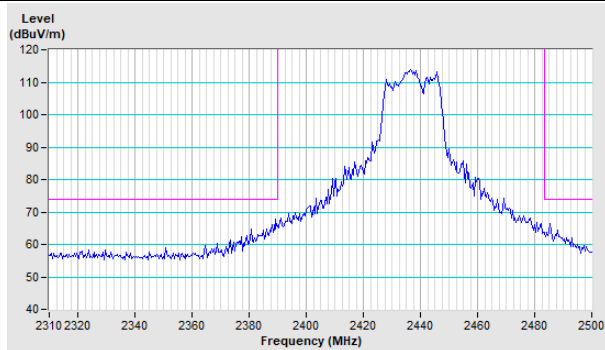


Vertical (Average)

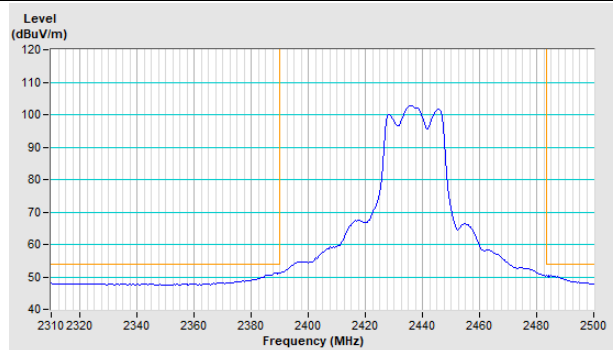


### 802.11ax (HE20) Channel 6

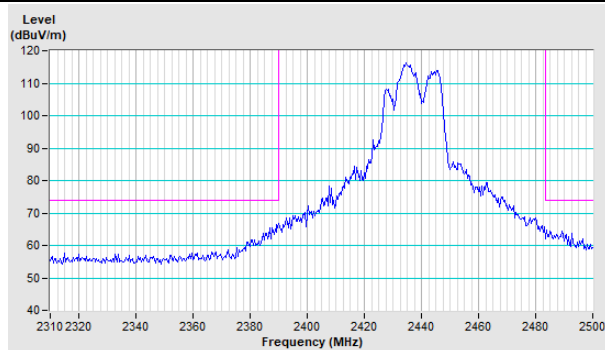
Horizontal (Peak)



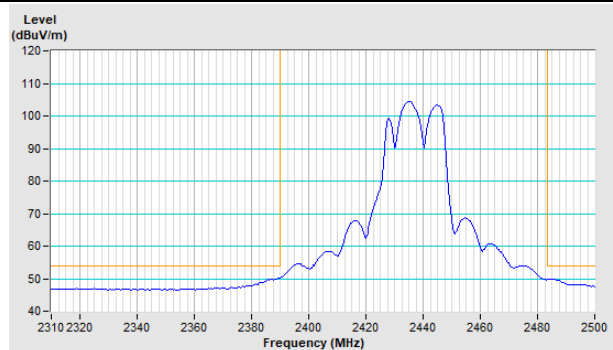
Horizontal (Average)



Vertical (Peak)

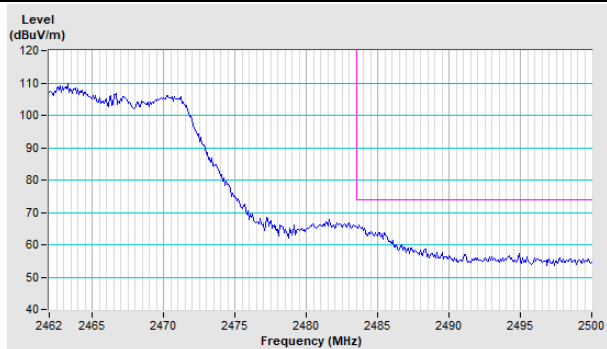


Vertical (Average)

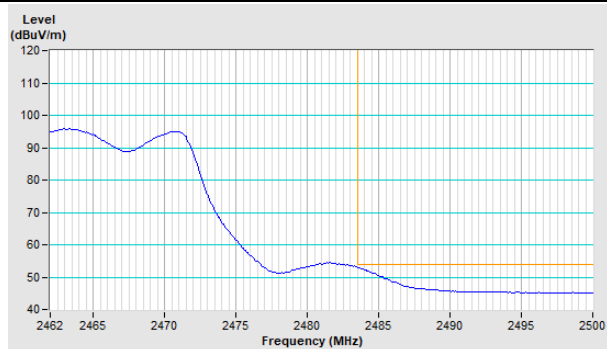


### 802.11ax (HE20) Channel 11

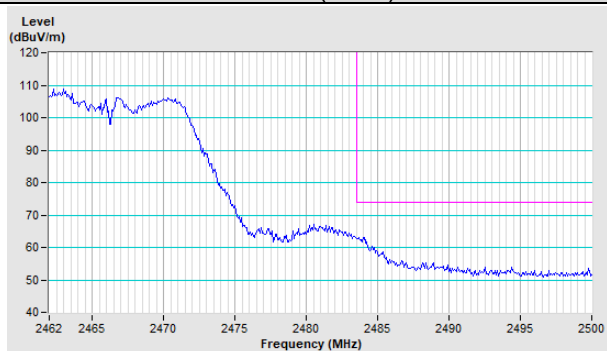
**Horizontal (Peak)**



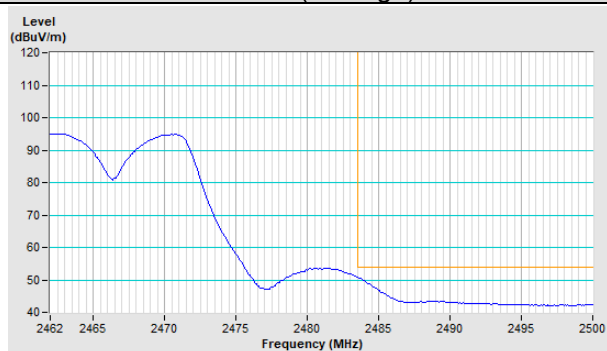
**Horizontal (Average)**



**Vertical (Peak)**

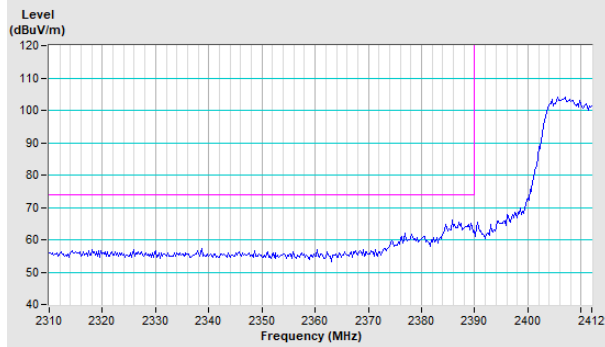


**Vertical (Average)**

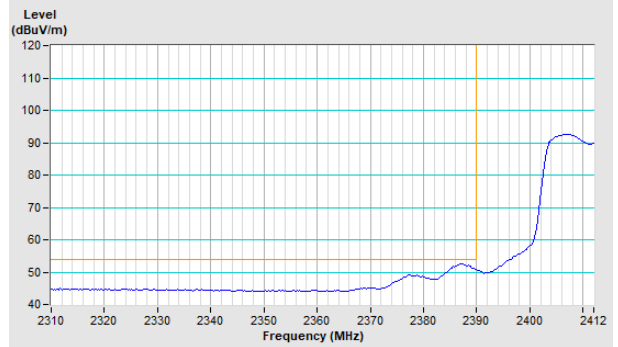


### 802.11ax (HE40) Channel 3

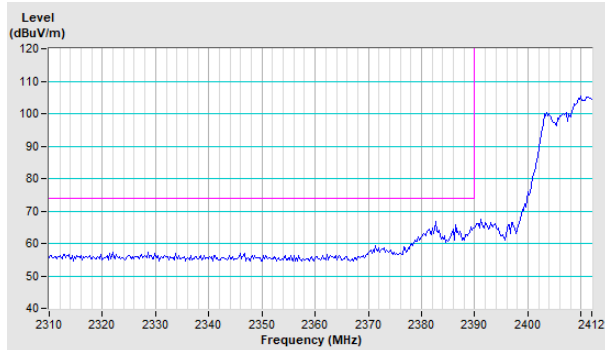
Horizontal (Peak)



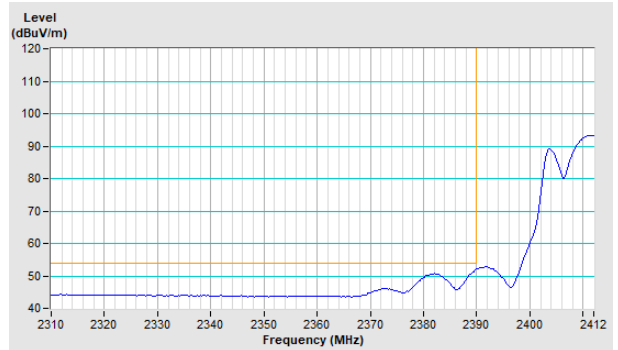
Horizontal (Average)



Vertical (Peak)

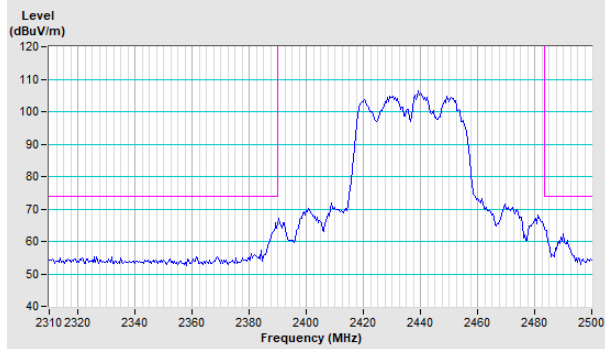


Vertical (Average)

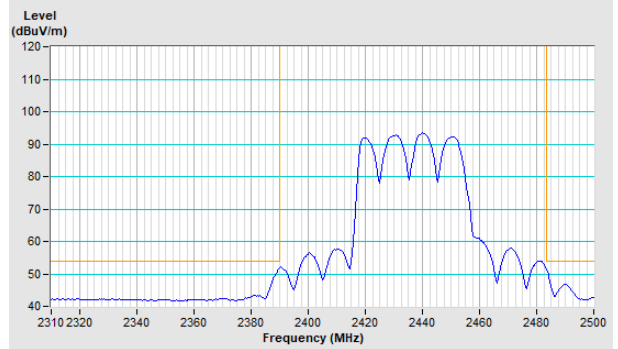


### 802.11ax (HE40) Channel 6

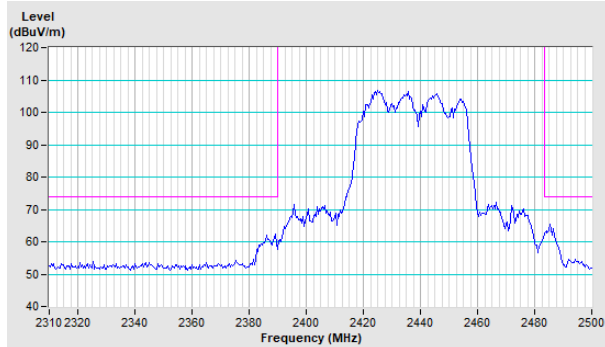
Horizontal (Peak)



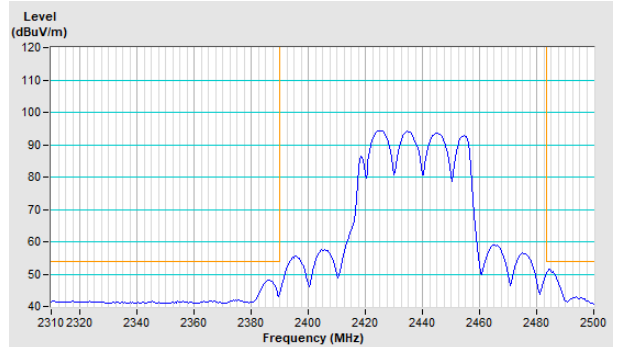
Horizontal (Average)



Vertical (Peak)

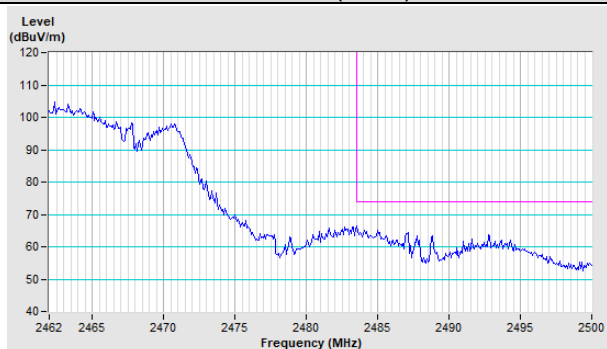


Vertical (Average)

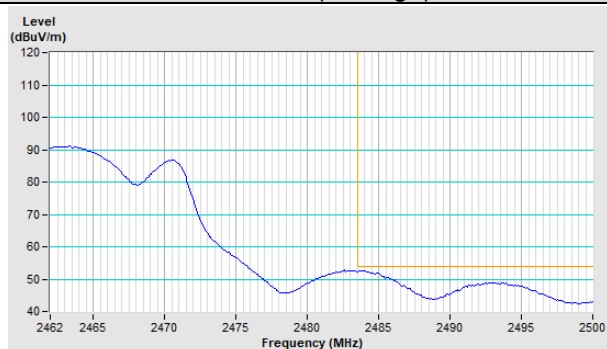


### 802.11ax (HE40) Channel 9

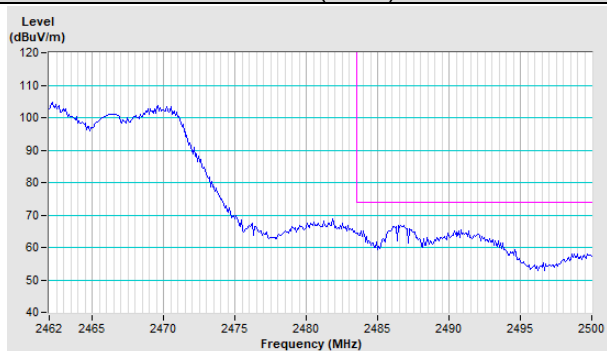
Horizontal (Peak)



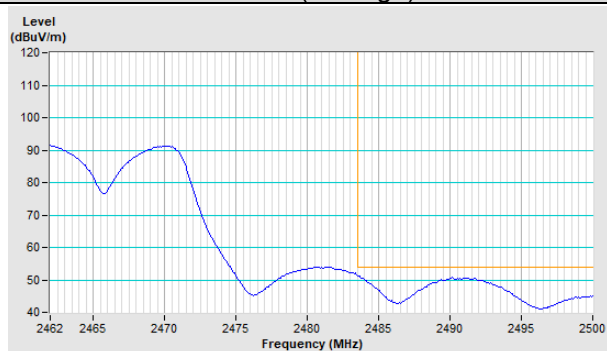
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



## 5 Pictures of Test Arrangements

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

## 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 and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

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