

FCC Test Report

Report No.: RFBHAT-WTW-P20110381

FCC ID: R68OQ865S

Test Model: Open-Q 865XR SOM

Received Date: Nov. 12, 2020

Test Date: Nov. 30 ~ Dec. 16, 2020

Issued Date: Jan. 04, 2021

Applicant: Lantronix

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Designation Number:



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	9
3.2.1 Test Mode Applicability and Tested Channel Detail	10
3.3 Duty Cycle of Test Signal	12
3.4 Description of Support Units	13
3.4.1 Configuration of System under Test	13
3.5 General Description of Applied Standards and References	14
4 Test Types and Results	15
4.1 Radiated Emission and Bandedge Measurement	15
4.1.1 Limits of Radiated Emission and Bandedge Measurement	15
4.1.2 Test Instruments	16
4.1.3 Test Procedures	17
4.1.4 Deviation from Test Standard	17
4.1.5 Test Setup	18
4.1.6 EUT Operating Conditions	19
4.1.7 Test Results	20
4.2 Conducted Emission Measurement	34
4.2.1 Limits of Conducted Emission Measurement	34
4.2.2 Test Instruments	34
4.2.3 Test Procedures	35
4.2.4 Deviation from Test Standard	35
4.2.5 Test Setup	35
4.2.6 EUT Operating Conditions	35
4.2.7 Test Results	36
4.3 6dB Bandwidth Measurement	38
4.3.1 Limits of 6dB Bandwidth Measurement	38
4.3.2 Test Setup	38
4.3.3 Test Instruments	38
4.3.4 Test Procedure	38
4.3.5 Deviation from Test Standard	38
4.3.6 EUT Operating Conditions	38
4.3.7 Test Result	39
4.4 Conducted Output Power Measurement	41
4.4.1 Limits of Conducted Output Power Measurement	41
4.4.2 Test Setup	41
4.4.3 Test Instruments	41
4.4.4 Test Procedures	41
4.4.5 Deviation from Test Standard	41
4.4.6 EUT Operating Conditions	41
4.4.7 Test Results	42
4.5 Power Spectral Density Measurement	45
4.5.1 Limits of Power Spectral Density Measurement	45
4.5.2 Test Setup	45
4.5.3 Test Instruments	45
4.5.4 Test Procedure	45
4.5.5 Deviation from Test Standard	45
4.5.6 EUT Operating Condition	45

4.5.7 Test Results	46
4.6 Conducted Out of Band Emission Measurement.....	49
4.6.1 Limits of Conducted Out of Band Emission Measurement	49
4.6.2 Test Setup.....	49
4.6.3 Test Instruments	49
4.6.4 Test Procedure	49
4.6.5 Deviation from Test Standard	50
4.6.6 EUT Operating Condition	50
4.6.7 Test Results	50
Annex A- Band Edge Measurement.....	59
5 Pictures of Test Arrangements.....	63
Appendix – Information of the Testing Laboratories	64

Release Control Record

Issue No.	Description	Date Issued
RFBHAT-WTW-P20110381	Original release.	Jan. 04, 2021

1 Certificate of Conformity

Product: Open-Q 865 SOM

Brand: Lantronix

Test Model: Open-Q 865XR SOM

Sample Status: Engineering sample

Applicant: Lantronix

Test Date: Nov. 30 ~ Dec. 16, 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 : , **Date:** Jan. 04, 2021
Polly Chien / Specialist

Approved by : , **Date:** Jan. 04, 2021
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 -32.43dB at 0.39400MHz.
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 is U.FL not a standard connector.

Note:

- 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.
- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 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	Open-Q 865 SOM
Brand	Lantronix
Test Model	Open-Q 865XR SOM
Sample Status	Engineering sample
Power Supply Rating	12Vdc (adapter)
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), 802.11ac (VHT20), 802.11ax (HE20): 11 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 7
Output Power	CDD Mode: 391.412mW Beamforming Mode: 342.004mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. 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/ 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 and 802.11ac, 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.

2. The following antennas were provided to the EUT.

2. The following antennas were provided to the EOI.		
Ant. Type	Flexible Dipole Antenna	
Connector Type	U.FL	
Antenna Gain (dBi)		
Item	2.4~2.5G	4.9~5.8G
Ant 1	3.32	6.11
Ant 2	3.32	6.11

*BT is transmitted through antenna 1.

*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. The EUT contains following adapter. (Support unit)

Brand	YINGHUIYUAN
Model	YHY-12003000
Input Power	100-240Vac, 50-60Hz, 1.2A
Output Power	12Vdc, 13.0A
Power cable	1.2m shielded power cable with 1 core

4. The BT could transmit simultaneously either with WLAN 2.4GHz or 5GHz at the same time.
The WLAN 2.4GHz and 5GHz could transmit at the same time.

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	
-	√	√	√	√	-

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. Radiated emission test (below 1GHz) and power line conducted emission test items chosen the worst fundamental frequency emission level.
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)	Remark
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	-
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	-
	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0	-
	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0	-

Radiated Emission Test (Below 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)	Remark
-	802.11b	1 to 11	6	DSSS	DBPSK	1.0	-

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)	Remark
-	802.11b	1 to 11	6	DSSS	DBPSK	1.0	-

Conducted 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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (VHT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (VHT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
-	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
-	802.11ax (HE40)	3 to 9	3, 6, 9	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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
-	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 1G	22 deg. C, 68% RH	120Vac, 60Hz	Greg Lin
RE<1G	21 deg. C, 68% RH	120Vac, 60Hz	Han Wu
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Greg Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ted Chang

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

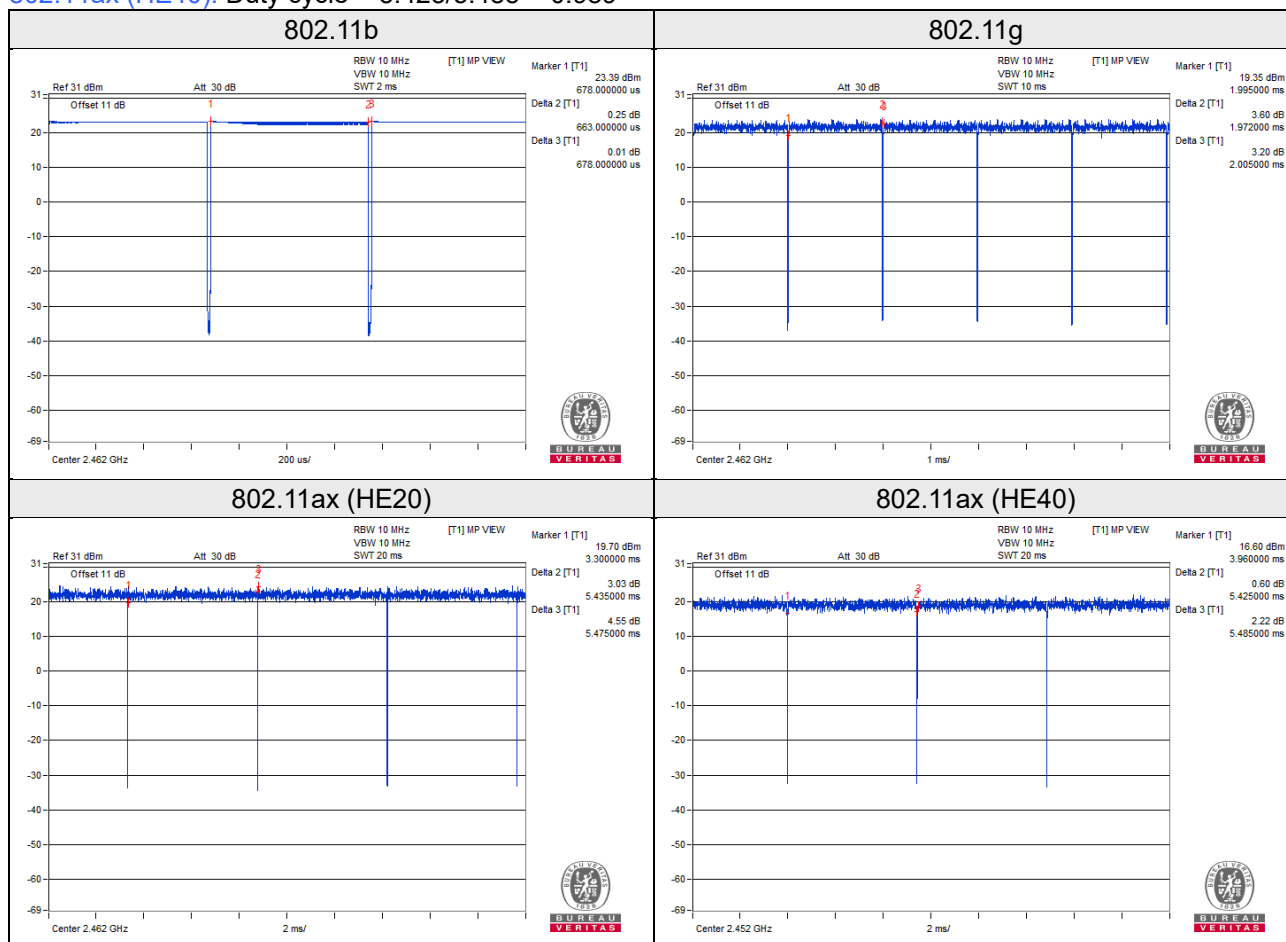
Duty cycle of test signal is $< 98\%$, duty factor is required.

802.11b: Duty cycle = $0.663/0.678 = 0.978$, Duty factor = $10 * \log(1/0.978) = 0.10$

802.11g: Duty cycle = $1.972/2.005 = 0.984$

802.11ax (HE20): Duty cycle = $5.435/5.475 = 0.993$

802.11ax (HE40): Duty cycle = $5.425/5.485 = 0.989$



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.

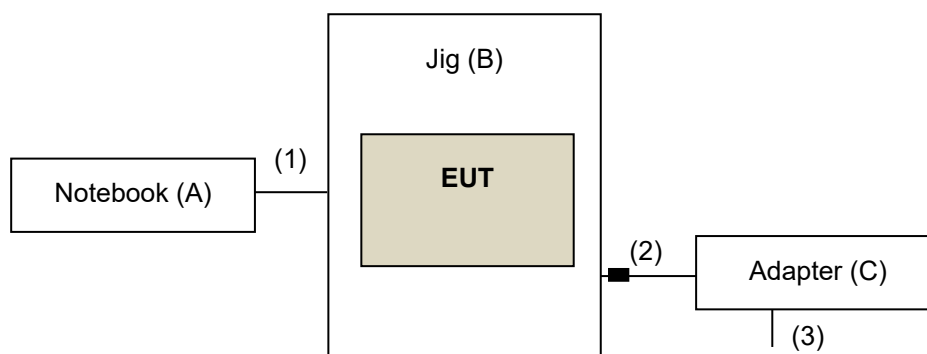
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Lenovo	81A4	YD02TWF5	FCC DoC Approved	-
B.	Jig	N/A	N/A	N/A	N/A	Provided by client
C.	Adapter	YINGHUIYUAN	YHY-12003000	N/A	N/A	Provided by client

Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Type C USB Cable	1	1	Y	0	Provided by client
2.	Adapter Cable	1	1.2	Y	1	Provided by client
3.	Power Cable	1	1.15	N	0	Provided by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

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

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 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 KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8 000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519000 4/MY55190007/MY55210 005	Jul. 13, 2020	Jul. 12, 2021

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

4.1.3 Test Procedures

For Radiated emission below 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:

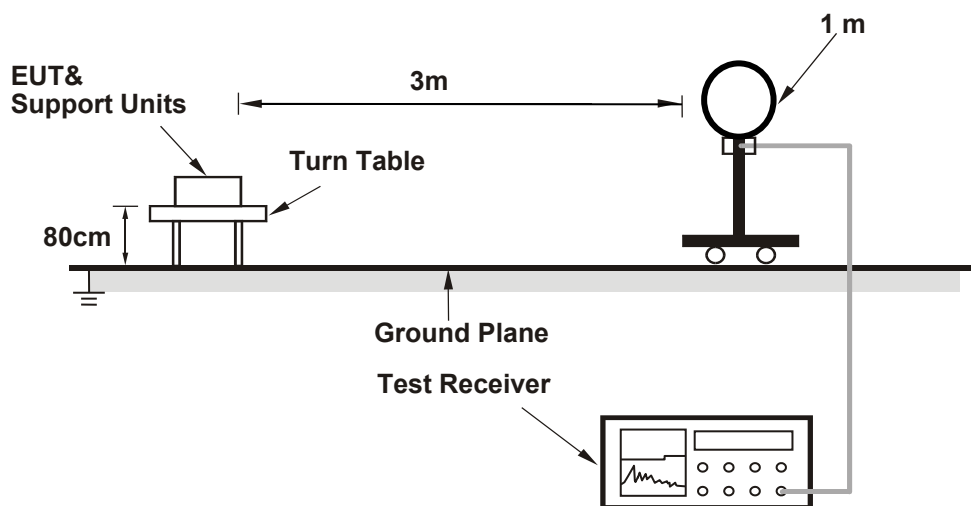
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

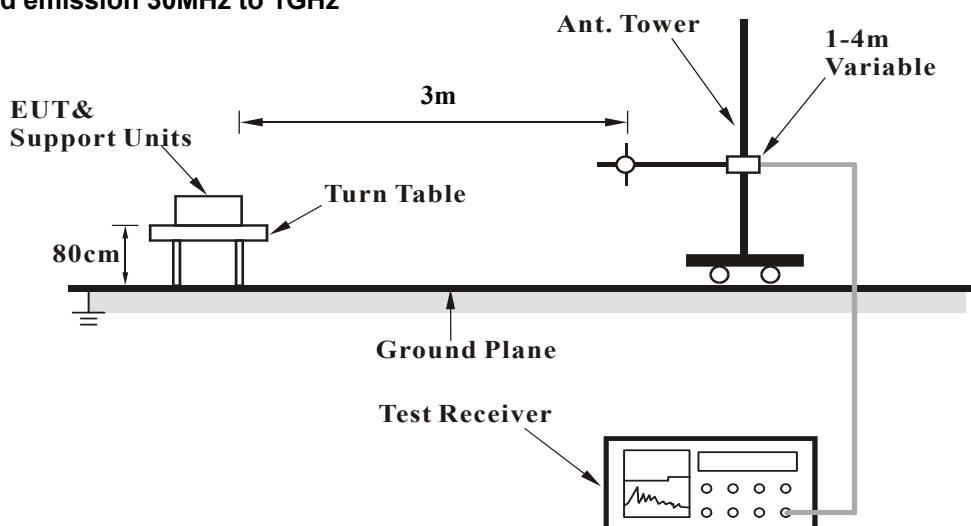
No deviation.

4.1.5 Test Setup

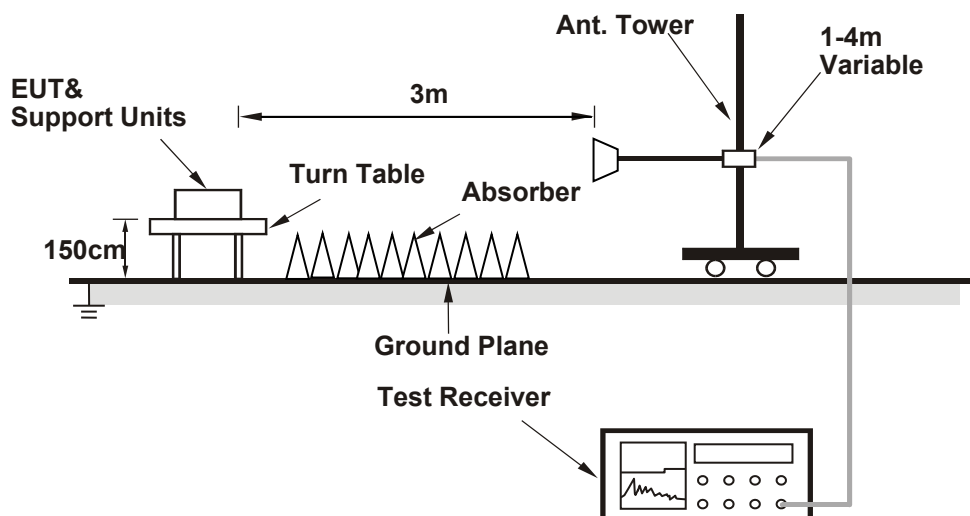
For Radiated emission below 30MHz



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

- Installed the EUT into the jig.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via USB cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz worst-Case data:

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	61.4 PK	74.0	-12.6	1.21 H	31	30.2	31.2
2	2390.00	52.6 AV	54.0	-1.4	1.21 H	31	21.4	31.2
3	*2412.00	114.6 PK			1.21 H	31	83.4	31.2
4	*2412.00	110.8 AV			1.21 H	31	79.6	31.2
5	4824.00	43.8 PK	74.0	-30.2	3.51 H	180	41.8	2.0
6	4824.00	31.8 AV	54.0	-22.2	3.51 H	180	29.8	2.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.6 PK	74.0	-17.4	3.10 V	211	25.4	31.2
2	2390.00	46.5 AV	54.0	-7.5	3.10 V	211	15.3	31.2
3	*2412.00	108.1 PK			3.10 V	211	76.9	31.2
4	*2412.00	104.2 AV			3.10 V	211	73.0	31.2
5	4824.00	42.5 PK	74.0	-31.5	2.92 V	72	40.5	2.0
6	4824.00	30.6 AV	54.0	-23.4	2.92 V	72	28.6	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	115.5 PK			1.17 H	30	84.4	31.1
2	*2437.00	111.6 AV			1.17 H	30	80.5	31.1
3	4874.00	44.3 PK	74.0	-29.7	3.53 H	179	42.2	2.1
4	4874.00	32.0 AV	54.0	-22.0	3.53 H	179	29.9	2.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	108.8 PK			3.08 V	207	77.7	31.1
2	*2437.00	104.9 AV			3.08 V	207	73.8	31.1
3	4874.00	42.9 PK	74.0	-31.1	2.97 V	68	40.8	2.1
4	4874.00	30.9 AV	54.0	-23.1	2.97 V	68	28.8	2.1

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	113.5 PK			1.13 H	31	82.4	31.1
2	*2462.00	110.0 AV			1.13 H	31	78.9	31.1
3	2483.50	60.7 PK	74.0	-13.3	1.13 H	31	29.6	31.1
4	2483.50	52.5 AV	54.0	-1.5	1.13 H	31	21.4	31.1
5	4924.00	43.8 PK	74.0	-30.2	3.49 H	174	41.6	2.2
6	4924.00	31.7 AV	54.0	-22.3	3.49 H	174	29.5	2.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	107.3 PK			3.06 V	219	76.2	31.1
2	*2462.00	103.4 AV			3.06 V	219	72.3	31.1
3	2483.50	58.6 PK	74.0	-15.4	3.06 V	219	27.5	31.1
4	2483.50	50.7 AV	54.0	-3.3	3.06 V	219	19.6	31.1
5	4924.00	42.9 PK	74.0	-31.1	2.87 V	69	40.7	2.2
6	4924.00	30.5 AV	54.0	-23.5	2.87 V	69	28.3	2.2

Remarks:

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

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	66.8 PK	74.0	-7.2	3.87 H	191	35.6	31.2
2	2390.00	52.6 AV	54.0	-1.4	3.87 H	191	21.4	31.2
3	*2412.00	115.1 PK			3.87 H	191	83.9	31.2
4	*2412.00	105.1 AV			3.87 H	191	73.9	31.2
5	4824.00	42.6 PK	74.0	-31.4	3.49 H	187	40.6	2.0
6	4824.00	28.8 AV	54.0	-25.2	3.49 H	187	26.8	2.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	66.0 PK	74.0	-8.0	3.13 V	217	34.8	31.2
2	2390.00	50.6 AV	54.0	-3.4	3.13 V	217	19.4	31.2
3	*2412.00	108.4 PK			3.13 V	217	77.2	31.2
4	*2412.00	98.3 AV			3.13 V	217	67.1	31.2
5	4824.00	42.1 PK	74.0	-31.9	2.86 V	73	40.1	2.0
6	4824.00	28.2 AV	54.0	-25.8	2.86 V	73	26.2	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	118.4 PK			3.37 H	192	87.3	31.1
2	*2437.00	108.3 AV			3.37 H	192	77.2	31.1
3	4874.00	43.2 PK	74.0	-30.8	3.56 H	182	41.1	2.1
4	4874.00	29.5 AV	54.0	-24.5	3.56 H	182	27.4	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	*2437.00	111.5 PK			3.04 V	219	80.4	31.1
2	*2437.00	101.4 AV			3.04 V	219	70.3	31.1
3	4874.00	42.3 PK	74.0	-31.7	3.01 V	86	40.2	2.1
4	4874.00	28.6 AV	54.0	-25.4	3.01 V	86	26.5	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	114.8 PK			3.70 H	189	83.7	31.1
2	*2462.00	104.7 AV			3.70 H	189	73.6	31.1
3	2483.50	65.5 PK	74.0	-8.5	3.70 H	189	34.4	31.1
4	2483.50	52.5 AV	54.0	-1.5	3.70 H	189	21.4	31.1
5	4924.00	42.9 PK	74.0	-31.1	3.43 H	172	40.7	2.2
6	4924.00	29.3 AV	54.0	-24.7	3.43 H	172	27.1	2.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	107.9 PK			3.14 V	221	76.8	31.1
2	*2462.00	97.9 AV			3.14 V	221	66.8	31.1
3	2483.50	59.5 PK	74.0	-14.5	3.14 V	221	28.4	31.1
4	2483.50	46.4 AV	54.0	-7.6	3.14 V	221	15.3	31.1
5	4924.00	42.4 PK	74.0	-31.6	3.03 V	81	40.2	2.2
6	4924.00	28.6 AV	54.0	-25.4	3.03 V	81	26.4	2.2

Remarks:

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

802.11ax (HE20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	68.1 PK	74.0	-5.9	3.88 H	192	36.9	31.2
2	2390.00	52.8 AV	54.0	-1.2	3.88 H	192	21.6	31.2
3	*2412.00	118.0 PK			3.88 H	192	86.8	31.2
4	*2412.00	104.7 AV			3.88 H	192	73.5	31.2
5	4824.00	42.8 PK	74.0	-31.2	3.46 H	193	40.8	2.0
6	4824.00	29.2 AV	54.0	-24.8	3.46 H	193	27.2	2.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.9 PK	74.0	-12.1	3.17 V	205	30.7	31.2
2	2390.00	46.7 AV	54.0	-7.3	3.17 V	205	15.5	31.2
3	*2412.00	111.0 PK			3.17 V	205	79.8	31.2
4	*2412.00	97.8 AV			3.17 V	205	66.6	31.2
5	4824.00	42.2 PK	74.0	-31.8	2.98 V	71	40.2	2.0
6	4824.00	28.5 AV	54.0	-25.5	2.98 V	71	26.5	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	119.5 PK			3.33 H	190	88.4	31.1
2	*2437.00	106.7 AV			3.33 H	190	75.6	31.1
3	4874.00	43.4 PK	74.0	-30.6	3.45 H	177	41.3	2.1
4	4874.00	29.6 AV	54.0	-24.4	3.45 H	177	27.5	2.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	110.9 PK			3.12 V	216	79.8	31.1
2	*2437.00	97.8 AV			3.12 V	216	66.7	31.1
3	4874.00	42.7 PK	74.0	-31.3	2.95 V	78	40.6	2.1
4	4874.00	28.5 AV	54.0	-25.5	2.95 V	78	26.4	2.1

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	116.9 PK			3.40 H	201	85.8	31.1
2	*2462.00	104.0 AV			3.40 H	201	72.9	31.1
3	2483.50	67.4 PK	74.0	-6.6	3.40 H	201	36.3	31.1
4	2483.50	52.4 AV	54.0	-1.6	3.40 H	201	21.3	31.1
5	4924.00	43.5 PK	74.0	-30.5	3.55 H	174	41.3	2.2
6	4924.00	29.3 AV	54.0	-24.7	3.55 H	174	27.1	2.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.9 PK			3.13 V	217	78.8	31.1
2	*2462.00	97.0 AV			3.13 V	217	65.9	31.1
3	2483.50	64.2 PK	74.0	-9.8	3.13 V	217	33.1	31.1
4	2483.50	48.5 AV	54.0	-5.5	3.13 V	217	17.4	31.1
5	4924.00	42.6 PK	74.0	-31.4	2.97 V	76	40.4	2.2
6	4924.00	28.8 AV	54.0	-25.2	2.97 V	76	26.6	2.2

Remarks:

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

802.11ax (HE40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	66.3 PK	74.0	-7.7	3.49 H	210	35.1	31.2
2	2390.00	52.5 AV	54.0	-1.5	3.49 H	210	21.3	31.2
3	*2422.00	112.9 PK			3.49 H	210	81.7	31.2
4	*2422.00	100.8 AV			3.49 H	210	69.6	31.2
5	4844.00	42.7 PK	74.0	-31.3	3.58 H	191	40.6	2.1
6	4844.00	28.4 AV	54.0	-25.6	3.58 H	191	26.3	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	2390.00	62.4 PK	74.0	-11.6	3.18 V	226	31.2	31.2
2	2390.00	47.5 AV	54.0	-6.5	3.18 V	226	16.3	31.2
3	*2422.00	106.1 PK			3.18 V	226	74.9	31.2
4	*2422.00	93.9 AV			3.18 V	226	62.7	31.2
5	4844.00	41.7 PK	74.0	-32.3	2.99 V	78	39.6	2.1
6	4844.00	28.3 AV	54.0	-25.7	2.99 V	78	26.2	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2437.00	114.7 PK			3.36 H	196	83.6	31.1
2	*2437.00	102.5 AV			3.36 H	196	71.4	31.1
3	2483.50	67.8 PK	74.0	-6.2	3.36 H	196	36.7	31.1
4	2483.50	52.3 AV	54.0	-1.7	3.36 H	196	21.2	31.1
5	4874.00	42.6 PK	74.0	-31.4	3.67 H	188	40.5	2.1
6	4874.00	28.8 AV	54.0	-25.2	3.67 H	188	26.7	2.1
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	*2437.00	105.9 PK			3.06 V	206	74.8	31.1
2	*2437.00	94.6 AV			3.06 V	206	63.5	31.1
3	2483.50	64.4 PK	74.0	-9.6	3.06 V	206	33.3	31.1
4	2483.50	48.3 AV	54.0	-5.7	3.06 V	206	17.2	31.1
5	4874.00	45.6 PK	74.0	-28.4	2.67 V	88	43.5	2.1
6	4874.00	30.8 AV	54.0	-23.2	2.67 V	88	28.7	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 9	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	114.0 PK			3.37 H	200	82.9	31.1
2	*2452.00	101.5 AV			3.37 H	200	70.4	31.1
3	2483.50	69.5 PK	74.0	-4.5	3.37 H	200	38.4	31.1
4	2483.50	52.1 AV	54.0	-1.9	3.37 H	200	21.0	31.1
5	4904.00	42.2 PK	74.0	-31.8	3.44 H	189	40.2	2.0
6	4904.00	28.1 AV	54.0	-25.9	3.44 H	189	26.1	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	105.9 PK			3.01 V	206	74.8	31.1
2	*2452.00	93.6 AV			3.01 V	206	62.5	31.1
3	2483.50	62.4 PK	74.0	-11.6	3.01 V	206	31.3	31.1
4	2483.50	46.7 AV	54.0	-7.3	3.01 V	206	15.6	31.1
5	4904.00	41.8 PK	74.0	-32.2	2.96 V	81	39.8	2.0
6	4904.00	28.0 AV	54.0	-26.0	2.96 V	81	26.0	2.0

Remarks:

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

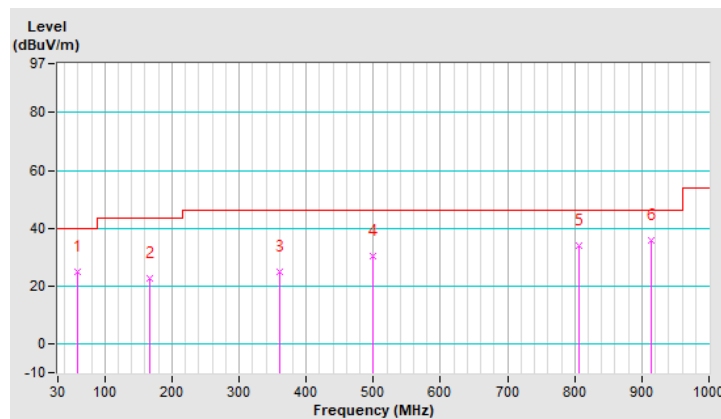
Below 1GHz worst-case data: 802.11b

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	59.10	25.1 QP	40.0	-14.9	1.50 H	243	34.4	-9.3
2	167.74	22.8 QP	43.5	-20.7	1.00 H	227	31.3	-8.5
3	359.80	25.1 QP	46.0	-20.9	2.00 H	20	30.6	-5.5
4	499.48	30.4 QP	46.0	-15.6	1.50 H	22	33.1	-2.7
5	806.00	34.0 QP	46.0	-12.0	1.25 H	274	30.7	3.3
6	914.64	35.8 QP	46.0	-10.2	1.50 H	61	30.3	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. 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.

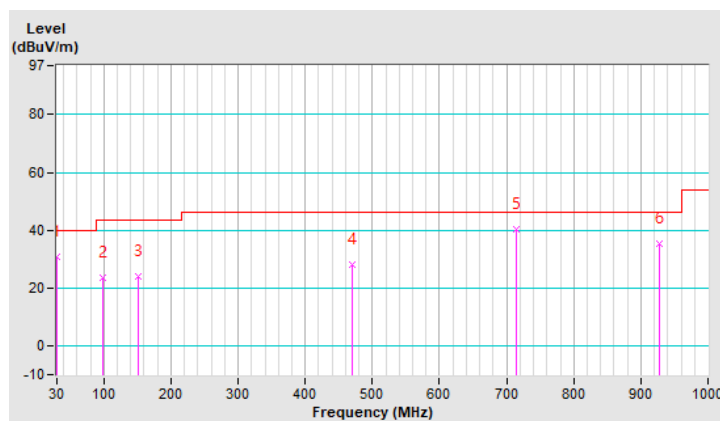


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	30.00	30.8 QP	40.0	-9.2	1.00 V	314	41.1	-10.3
2	97.90	23.7 QP	43.5	-19.8	1.50 V	314	37.2	-13.5
3	152.22	24.2 QP	43.5	-19.3	1.25 V	17	32.6	-8.4
4	470.38	28.1 QP	46.0	-17.9	1.50 V	9	31.1	-3.0
5	714.82	40.4 QP	46.0	-5.6	2.00 V	145	39.0	1.4
6	928.22	35.5 QP	46.0	-10.5	1.50 V	9	29.8	5.7

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.



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_Conc_ 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

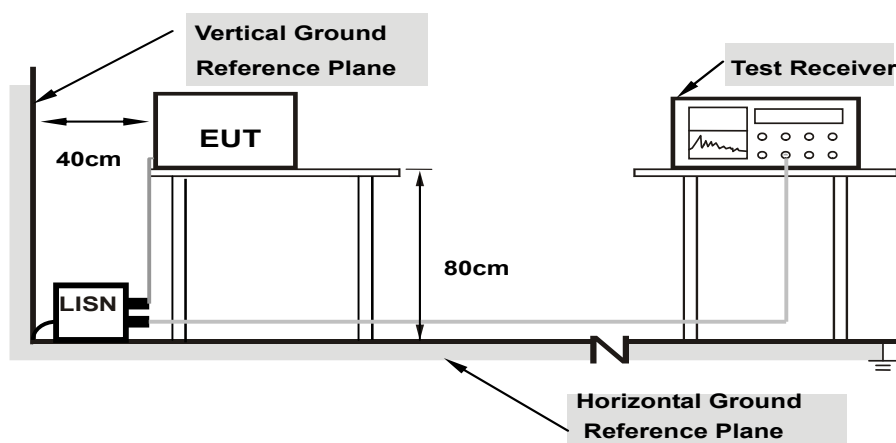
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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

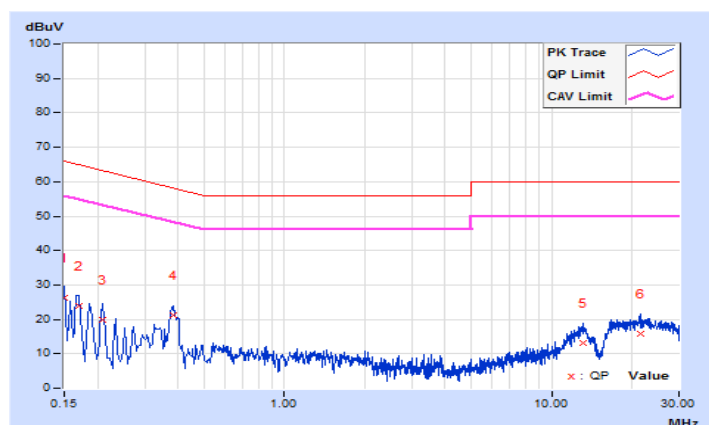
Worst-case data: 802.11b

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

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	0.08	26.04	9.21	26.12	9.29	66.00	56.00	-39.88	-46.71
2	0.17000	0.09	23.65	7.76	23.74	7.85	64.96	54.96	-41.22	-47.11
3	0.20960	0.10	19.81	4.58	19.91	4.68	63.22	53.22	-43.31	-48.54
4	0.38600	0.12	21.18	11.17	21.30	11.29	58.15	48.15	-36.85	-36.86
5	13.13000	0.36	12.84	6.68	13.20	7.04	60.00	50.00	-46.80	-42.96
6	21.60200	0.39	15.35	9.14	15.74	9.53	60.00	50.00	-44.26	-40.47

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.

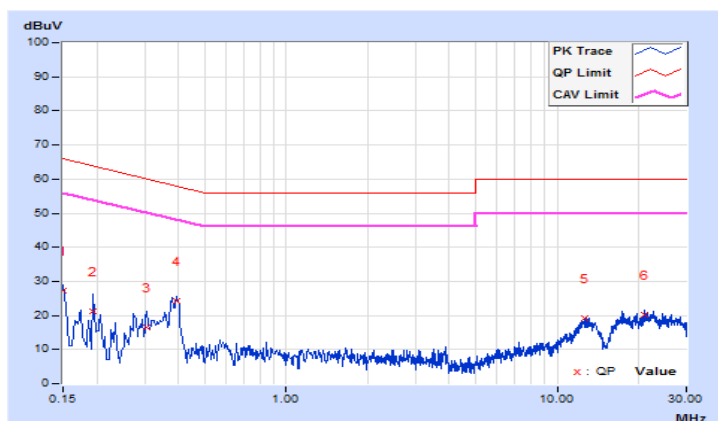


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

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	0.07	27.28	9.88	27.35	9.95	66.00	56.00	-38.65	-46.05
2	0.19400	0.08	21.05	5.61	21.13	5.69	63.86	53.86	-42.73	-48.17
3	0.30600	0.09	16.43	6.32	16.52	6.41	60.08	50.08	-43.56	-43.67
4	0.39400	0.10	24.15	15.45	24.25	15.55	57.98	47.98	-33.73	-32.43
5	12.69800	0.43	18.92	5.54	19.35	5.97	60.00	50.00	-40.65	-44.03
6	21.06600	0.53	19.77	7.55	20.30	8.08	60.00	50.00	-39.70	-41.92

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.

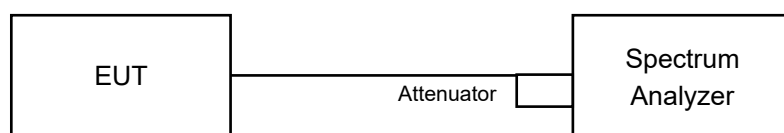


4.3 6dB Bandwidth Measurement

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	8.13	8.13	0.5	Pass
6	2437	9.12	8.09	0.5	Pass
11	2462	8.12	8.13	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.08	15.97	0.5	Pass
6	2437	15.81	16.07	0.5	Pass
11	2462	16.09	16.36	0.5	Pass

802.11ax (HE20)

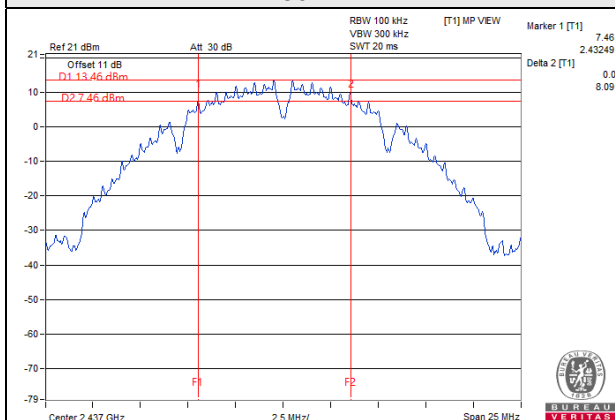
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.63	18.74	0.5	Pass
6	2437	17.92	18.26	0.5	Pass
11	2462	18.64	18.47	0.5	Pass

802.11ax (HE40)

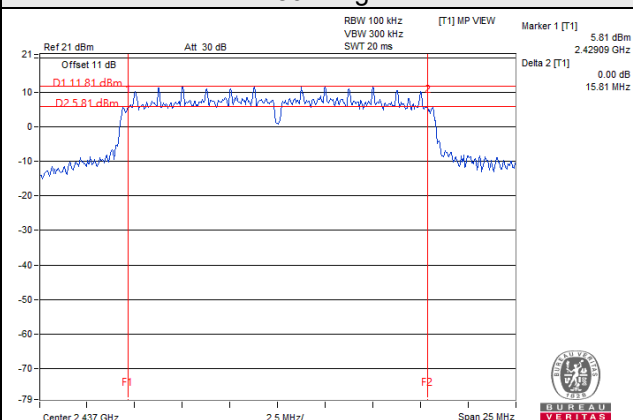
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	37.80	37.51	0.5	Pass
6	2437	36.39	37.38	0.5	Pass
9	2452	37.17	36.87	0.5	Pass

Spectrum Plot of Worst Value

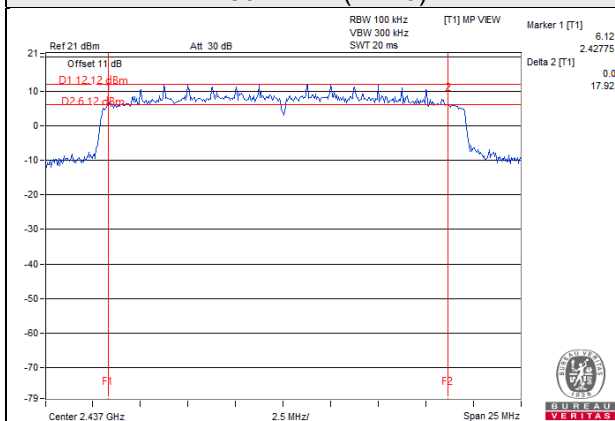
802.11b



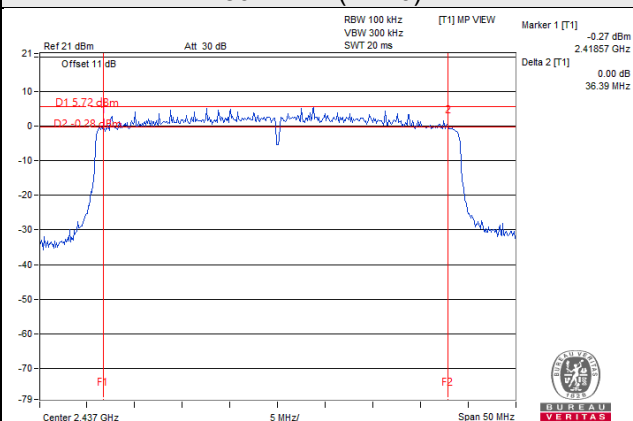
802.11g



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,

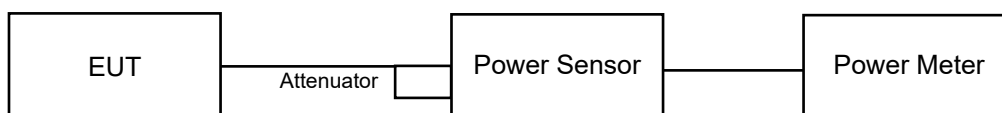
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 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	21.17	21.43	269.913	24.31	30	Pass
6	2437	22.82	23.01	391.412	25.93	30	Pass
11	2462	21.39	21.42	276.397	24.42	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.76	19.21	158.530	22.00	30	Pass
6	2437	22.21	22.37	338.925	25.30	30	Pass
11	2462	18.80	18.84	152.417	21.83	30	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	17.91	18.29	129.254	21.11	30	Pass
6	2437	22.22	22.26	334.992	25.25	30	Pass
11	2462	18.15	18.22	131.687	21.20	30	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	17.62	17.85	118.763	20.75	30	Pass
6	2437	18.85	19.40	163.833	22.14	30	Pass
9	2452	17.46	17.68	114.332	20.58	30	Pass

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	17.98	18.32	130.726	21.16	30	Pass
6	2437	22.32	22.34	342.004	25.34	30	Pass
11	2462	18.22	18.26	133.363	21.25	30	Pass

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.67	17.88	119.855	20.79	30	Pass
6	2437	18.87	19.47	165.602	22.19	30	Pass
9	2452	17.49	17.71	115.125	20.61	30	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	17.91	18.29	129.254	21.11	29.67	Pass
6	2437	22.22	22.26	334.992	25.25	29.67	Pass
11	2462	18.15	18.22	131.687	21.20	29.67	Pass

Note: Beamforming Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.33 - 6) = 29.67\text{dBm}$.

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	17.62	17.85	118.763	20.75	29.67	Pass
6	2437	18.85	19.40	163.833	22.14	29.67	Pass
9	2452	17.46	17.68	114.332	20.58	29.67	Pass

Note: Beamforming Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.33 - 6) = 29.67\text{dBm}$.

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	17.98	18.32	130.726	21.16	29.67	Pass
6	2437	22.32	22.34	342.004	25.34	29.67	Pass
11	2462	18.22	18.26	133.363	21.25	29.67	Pass

Note: Beamforming Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.33 - 6) = 29.67\text{dBm}$.

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	17.67	17.88	119.855	20.79	29.67	Pass
6	2437	18.87	19.47	165.602	22.19	29.67	Pass
9	2452	17.49	17.71	115.125	20.61	29.67	Pass

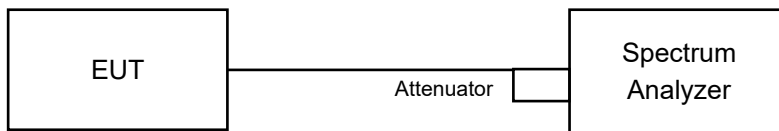
Note: Beamforming Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.33 - 6) = 29.67\text{dBm}$.

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 band during any time interval of continuous transmission.

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

For Average Power (Duty cycle > 98%)

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

For Average Power (Duty cycle < 98%)

- Measure the duty cycle (x).
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Do not use sweep triggering. Allow sweep to "free run".
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- 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	-12.03	3.01	0.10	-8.92	7.67	Pass
	6	2437	-10.26	3.01	0.10	-7.15	7.67	Pass
	11	2462	-11.56	3.01	0.10	-8.45	7.67	Pass
1	1	2412	-11.96	3.01	0.10	-8.85	7.67	Pass
	6	2437	-10.37	3.01	0.10	-7.26	7.67	Pass
	11	2462	-11.63	3.01	0.10	-8.52	7.67	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power spectral density limit shall be reduced to $8 - (6.33 - 6) = 7.67\text{dBm}$
3. 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	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-17.16	3.01	-14.15	7.67	Pass
	6	2437	-13.98	3.01	-10.97	7.67	Pass
	11	2462	-17.58	3.01	-14.57	7.67	Pass
1	1	2412	-17.20	3.01	-14.19	7.67	Pass
	6	2437	-14.29	3.01	-11.28	7.67	Pass
	11	2462	-17.77	3.01	-14.76	7.67	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power spectral density limit shall be reduced to $8 - (6.33 - 6) = 7.67\text{dBm}$

802.11ax (HE20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-19.93	3.01	-16.92	7.67	Pass
	6	2437	-15.48	3.01	-12.47	7.67	Pass
	11	2462	-19.05	3.01	-16.04	7.67	Pass
1	1	2412	-19.65	3.01	-16.64	7.67	Pass
	6	2437	-15.71	3.01	-12.70	7.67	Pass
	11	2462	-19.36	3.01	-16.35	7.67	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power spectral density limit shall be reduced to $8 - (6.33 - 6) = 7.67\text{dBm}$

802.11ax (HE40)

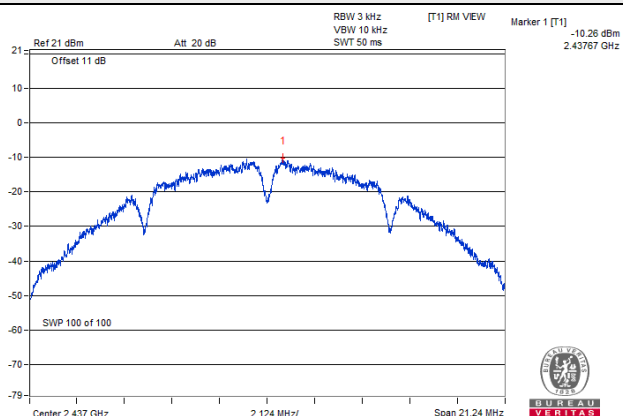
TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-22.55	3.01	-19.54	7.67	Pass
	6	2437	-20.98	3.01	-17.97	7.67	Pass
	9	2452	-22.31	3.01	-19.30	7.67	Pass
1	3	2422	-22.48	3.01	-19.47	7.67	Pass
	6	2437	-21.35	3.01	-18.34	7.67	Pass
	9	2452	-22.63	3.01	-19.62	7.67	Pass

Note:

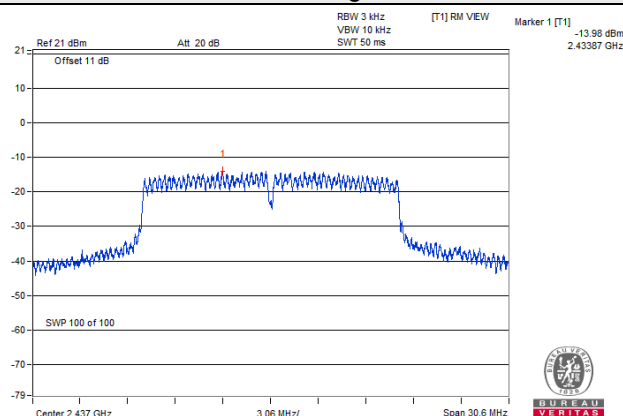
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.32\text{dBi} + 10\log(2) = 6.33\text{dBi} > 6\text{dBi}$, so the power spectral density limit shall be reduced to $8 - (6.33 - 6) = 7.67\text{dBm}$

Spectrum Plot of Worst Value

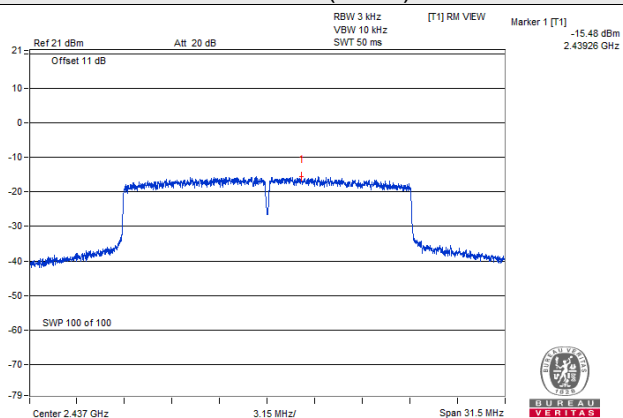
802.11b



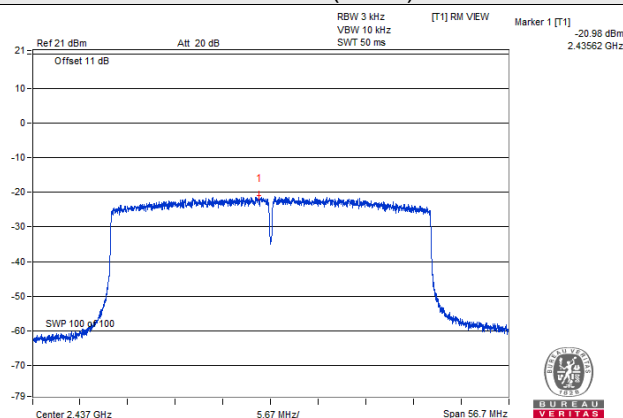
802.11g



802.11ax (HE20)



802.11ax (HE40)

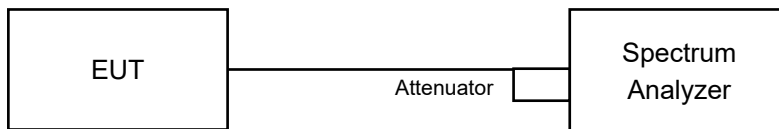


4.6 Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE OOB

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as item 4.3.6.

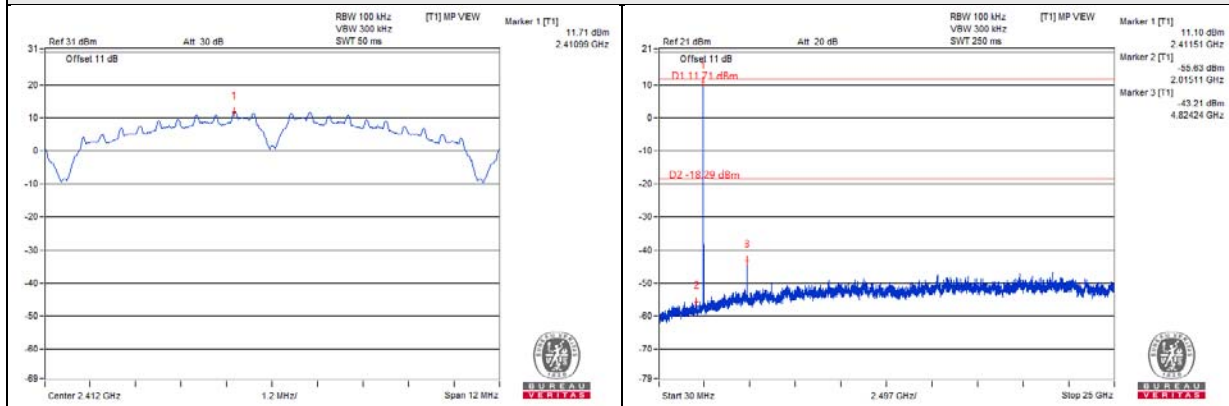
4.6.7 Test Results

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

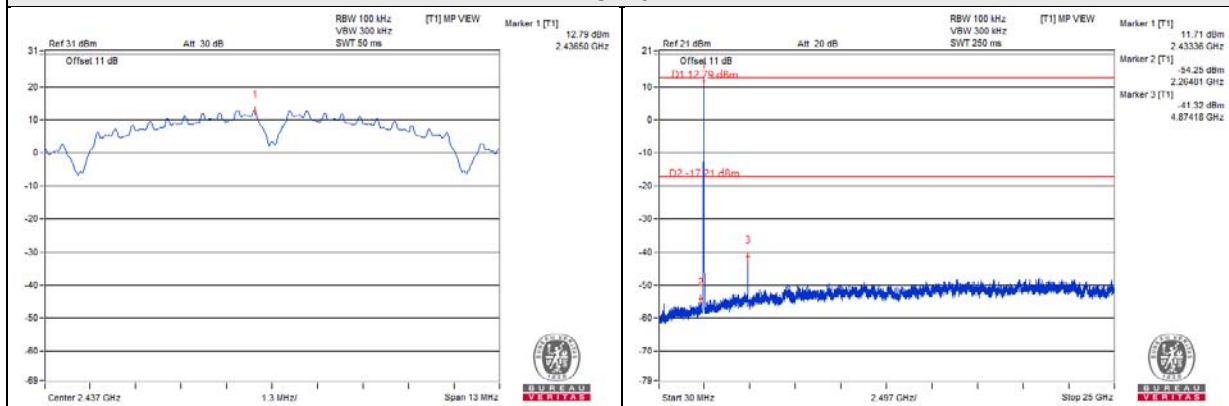
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

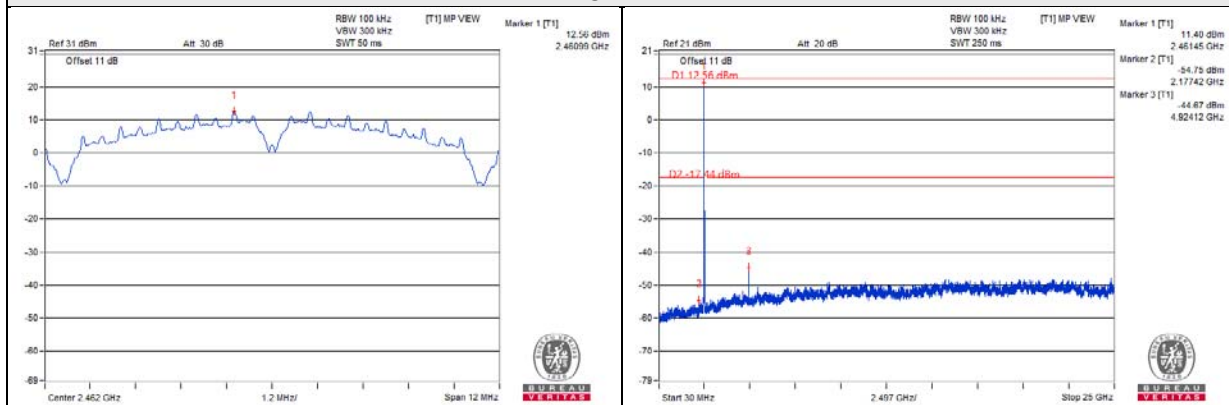
CH 1



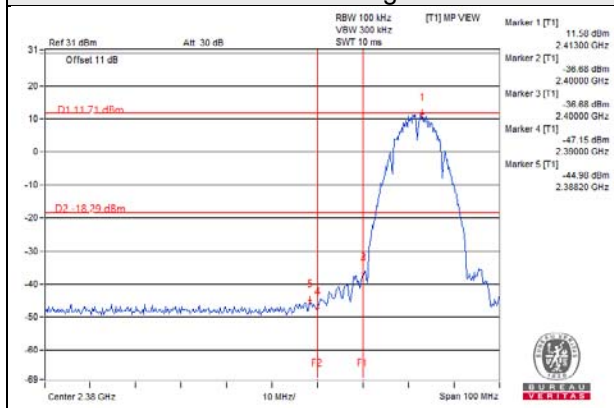
CH 6



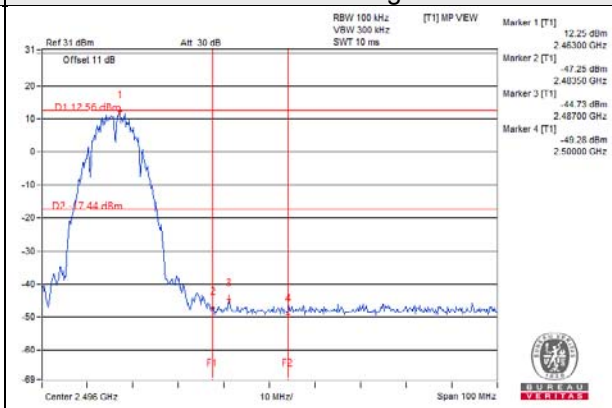
CH 11



CH 1 Band edge

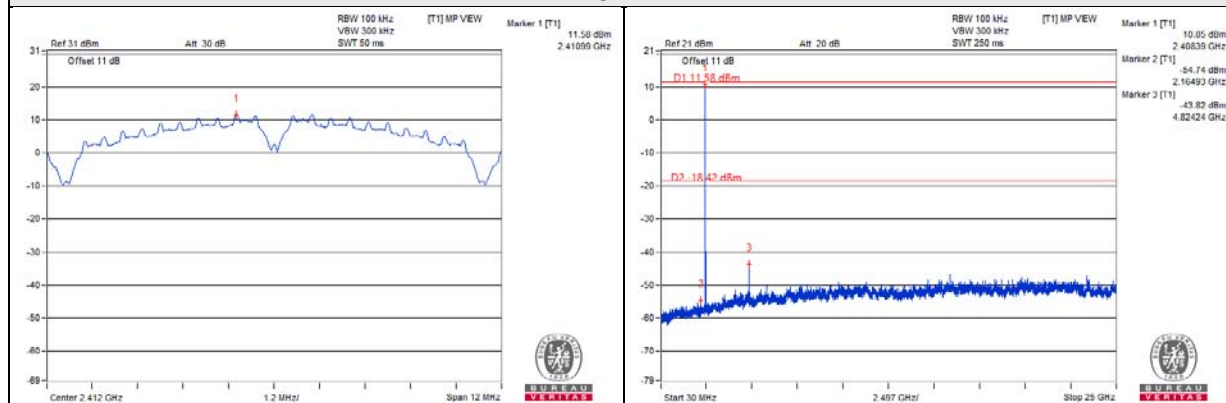


CH 11 Band edge

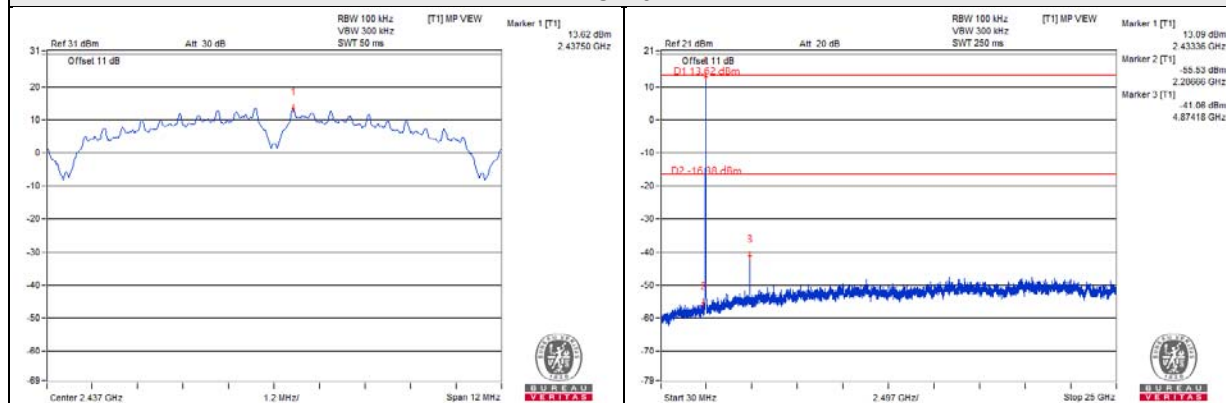


802.11b_Chain 1

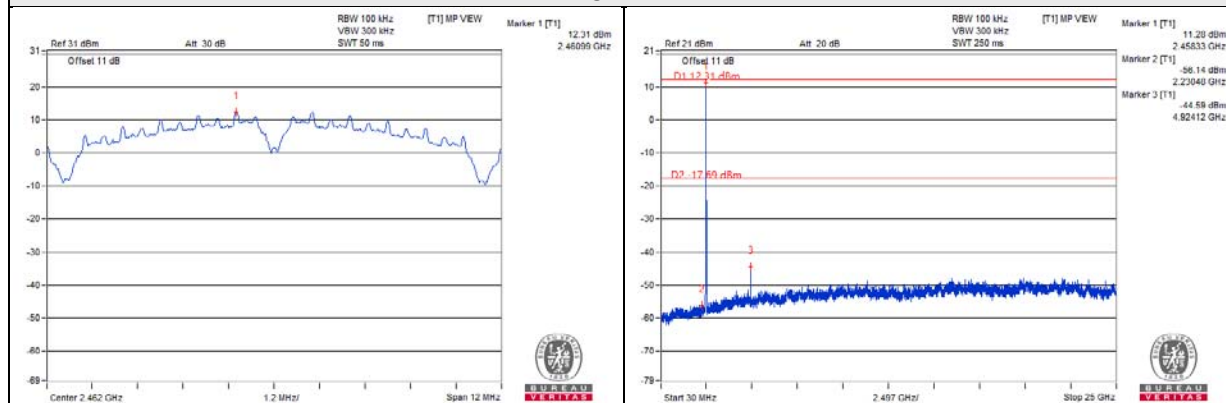
CH 1



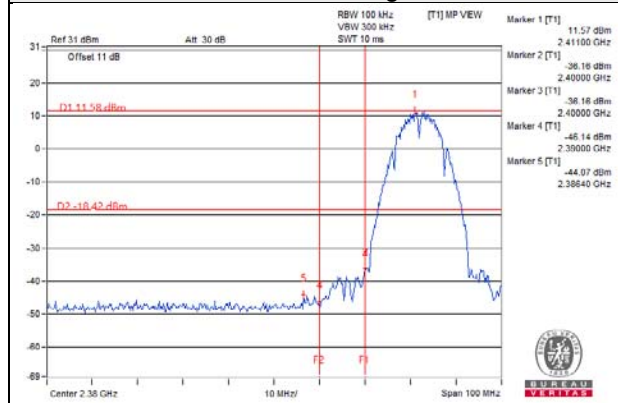
CH 6



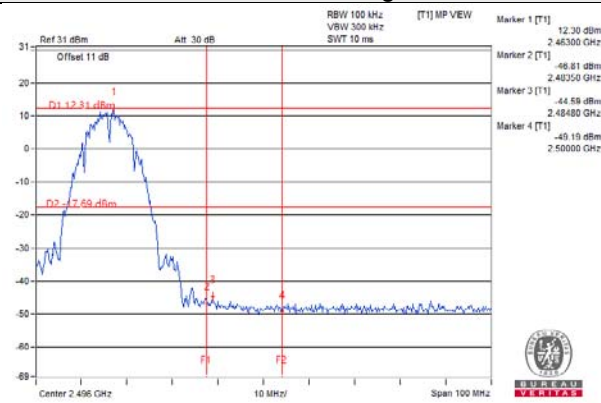
CH 11



CH 1 Band edge

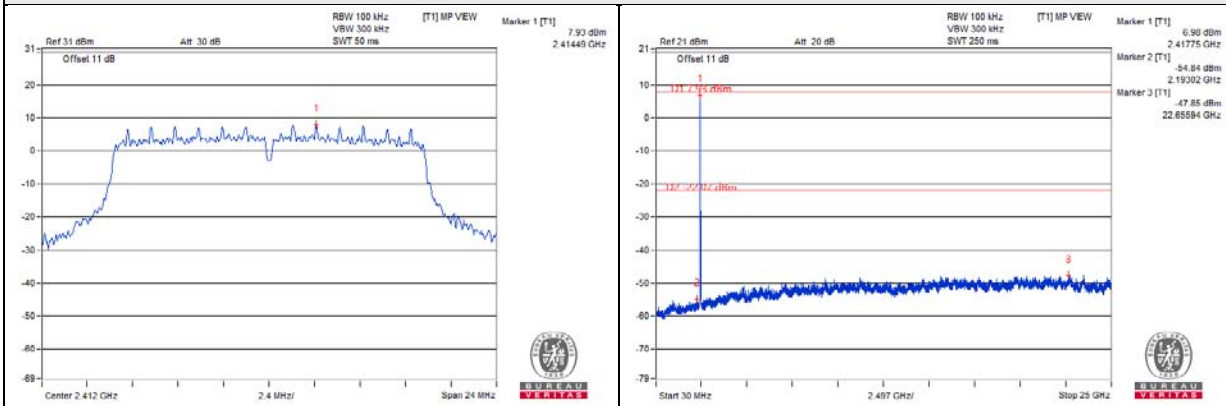


CH 11 Band edge

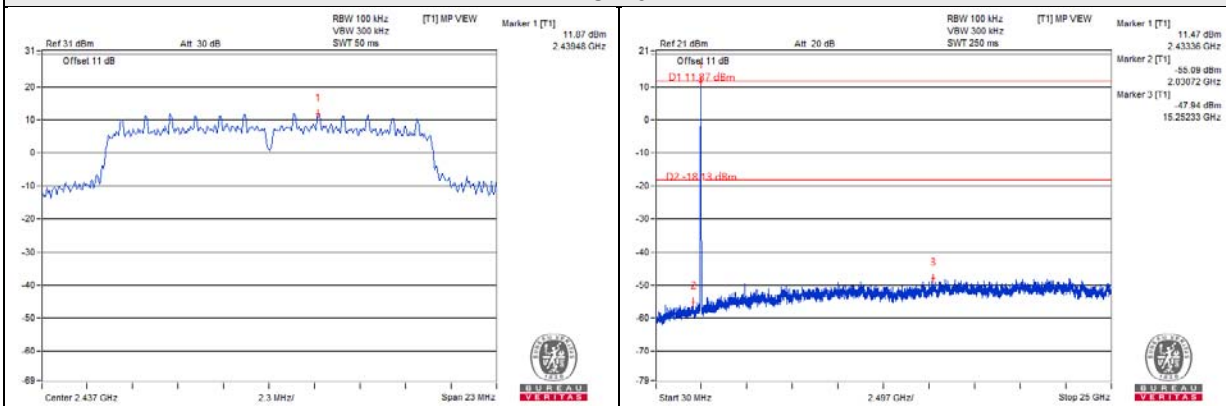


802.11g_Chain 0

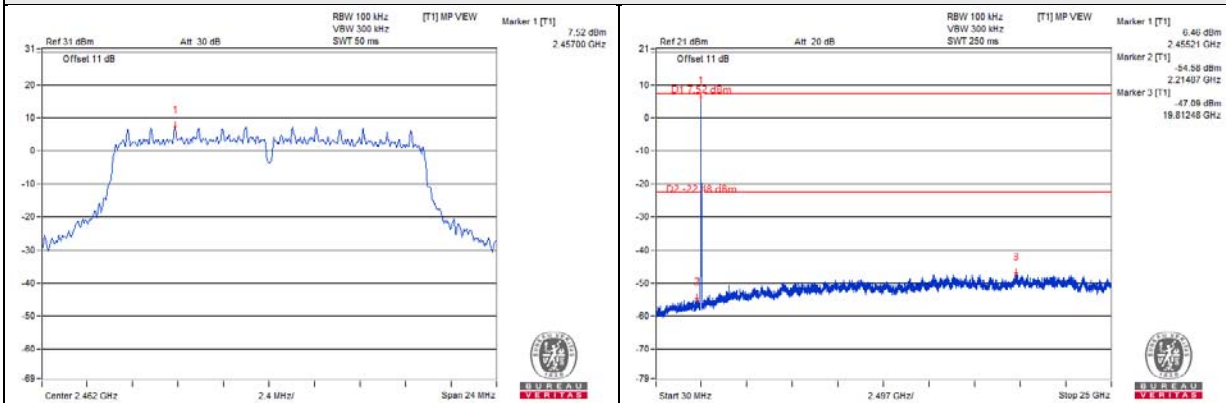
CH 1



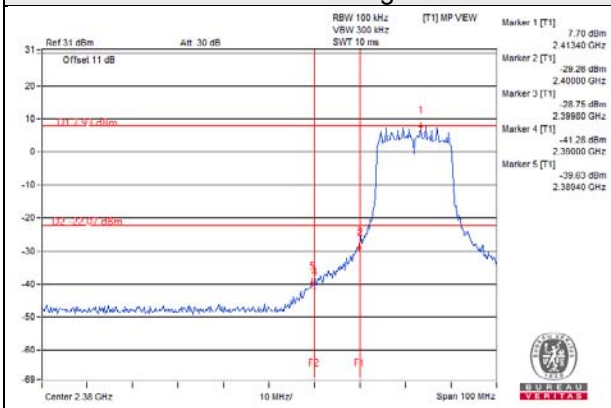
CH 6



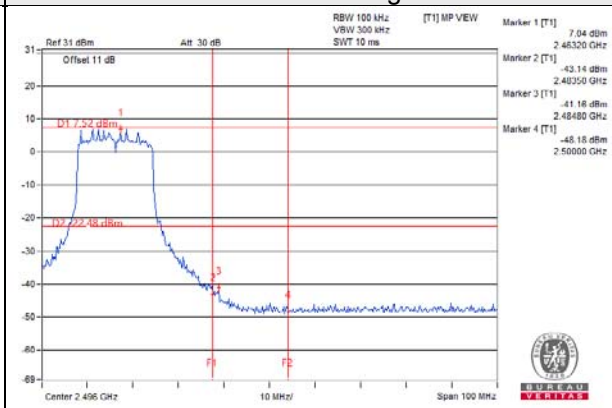
CH 11



CH 1 Band edge

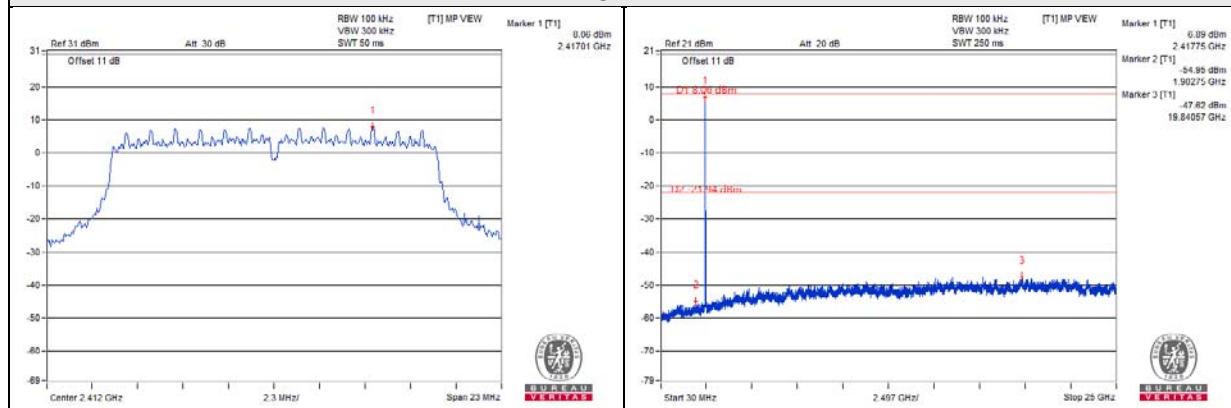


CH 11 Band edge

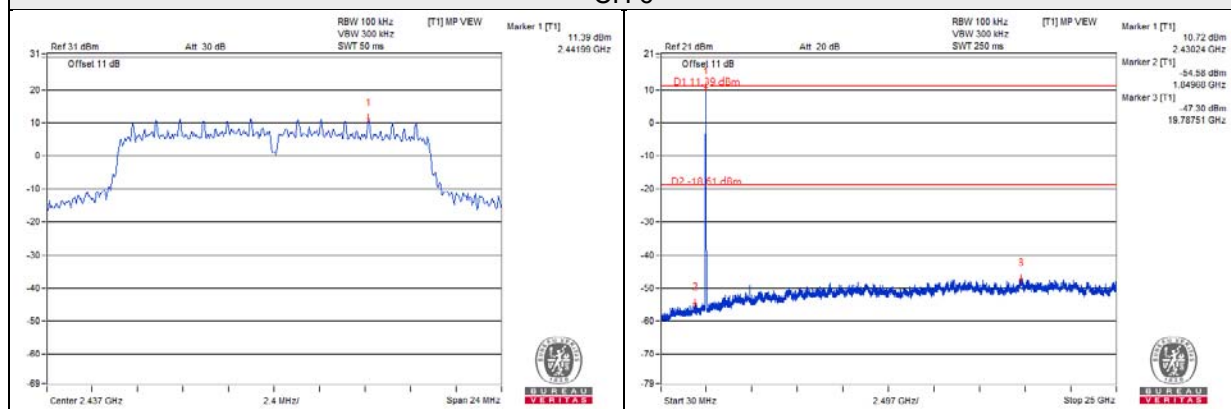


802.11g_Chain 1

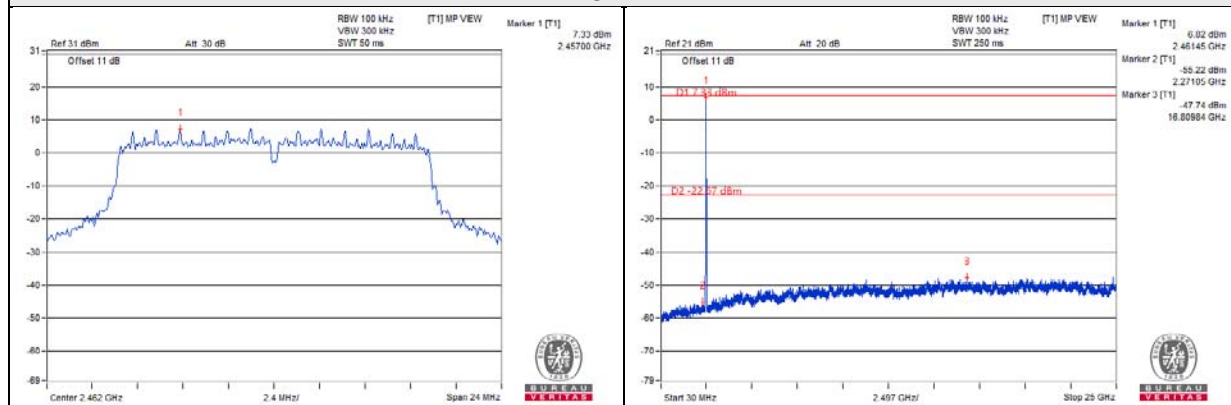
CH 1



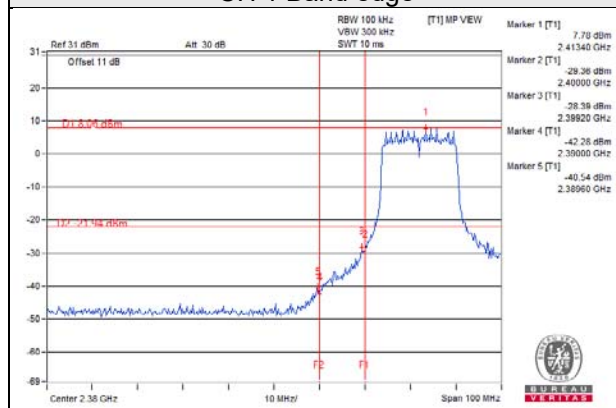
CH 6



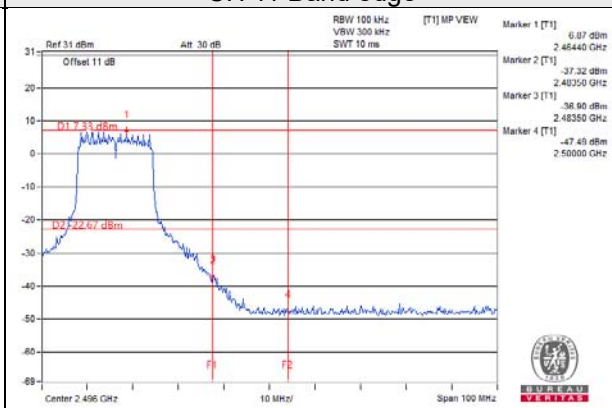
CH 11



CH 1 Band edge

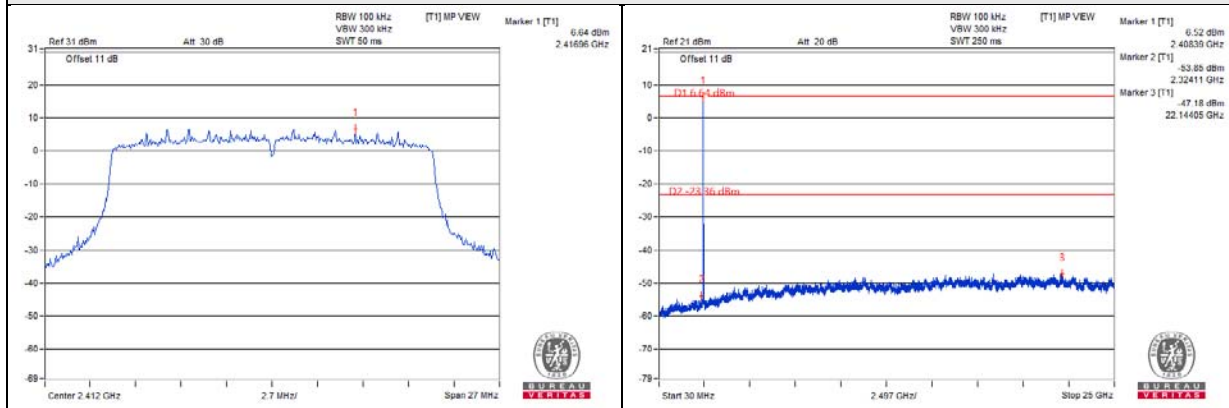


CH 11 Band edge

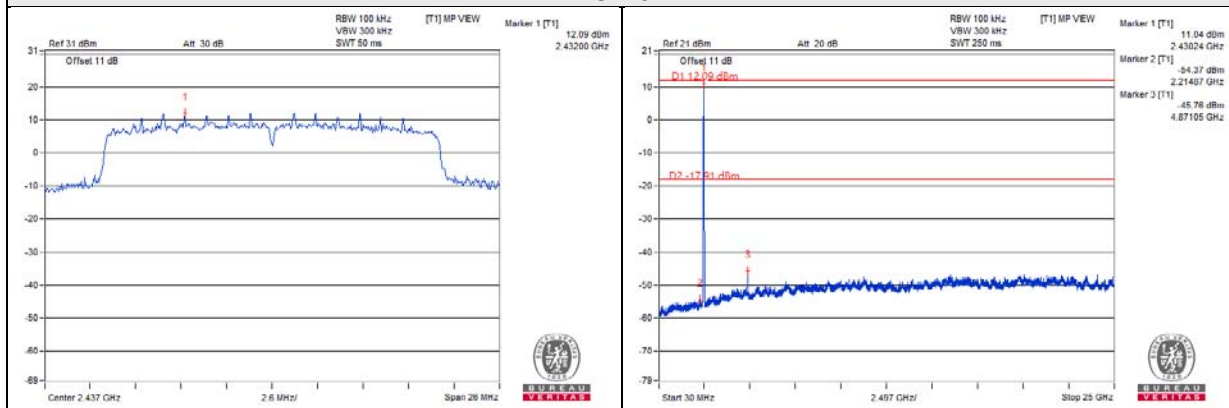


802.11ax (HE20)_Chain 0

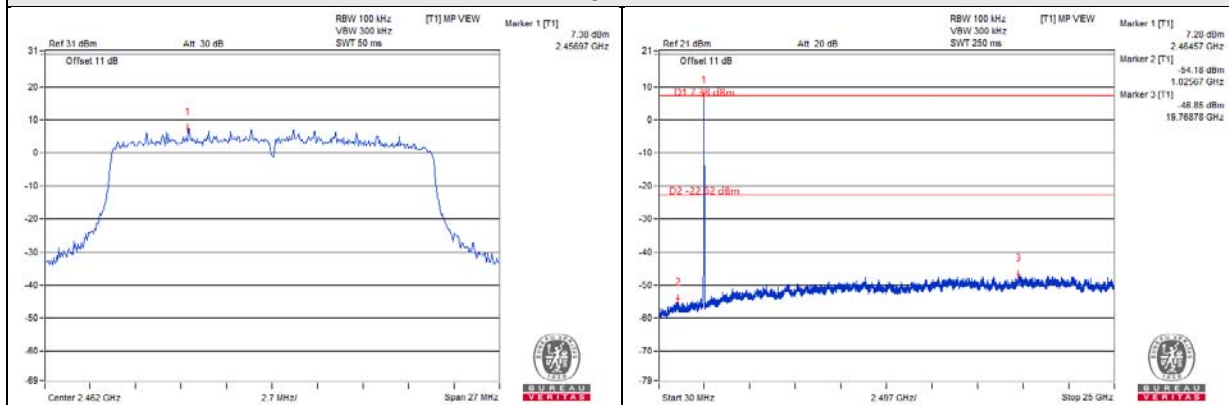
CH 1



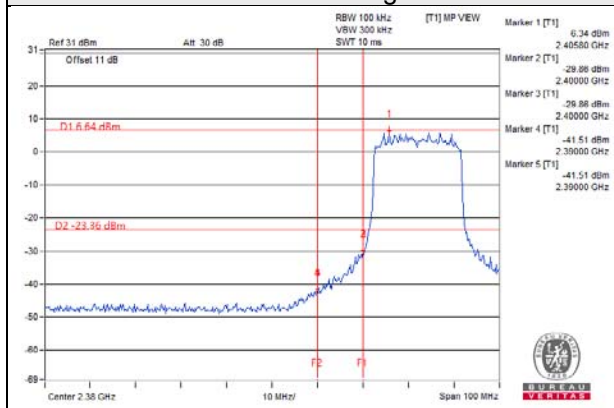
CH 6



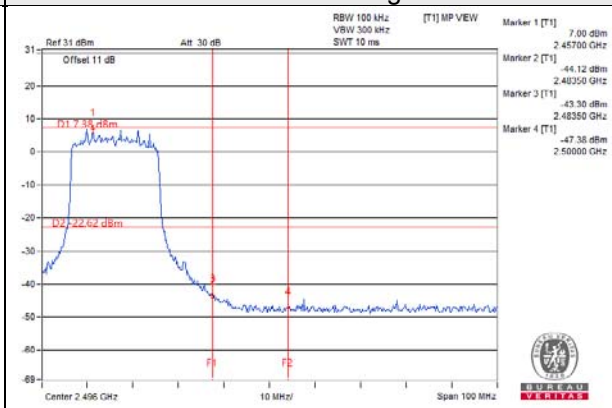
CH 11



CH 1 Band edge

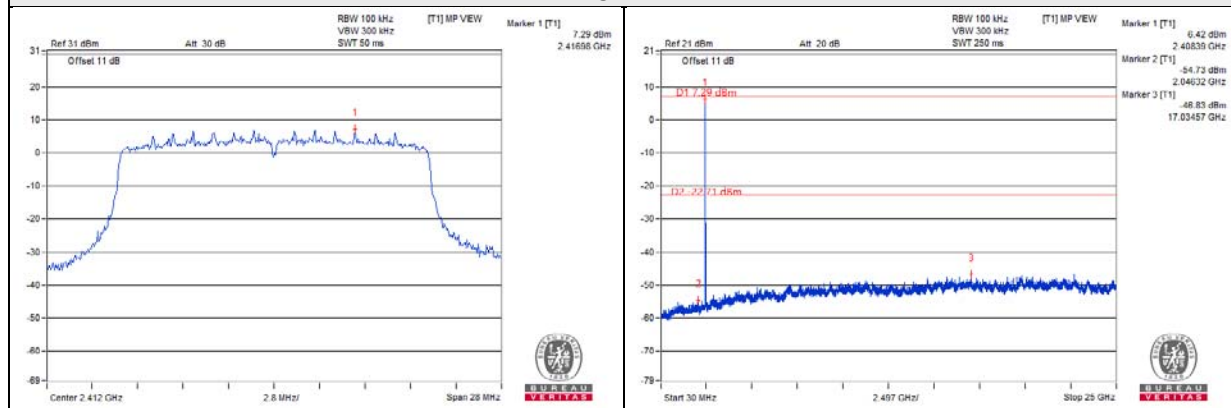


CH 11 Band edge

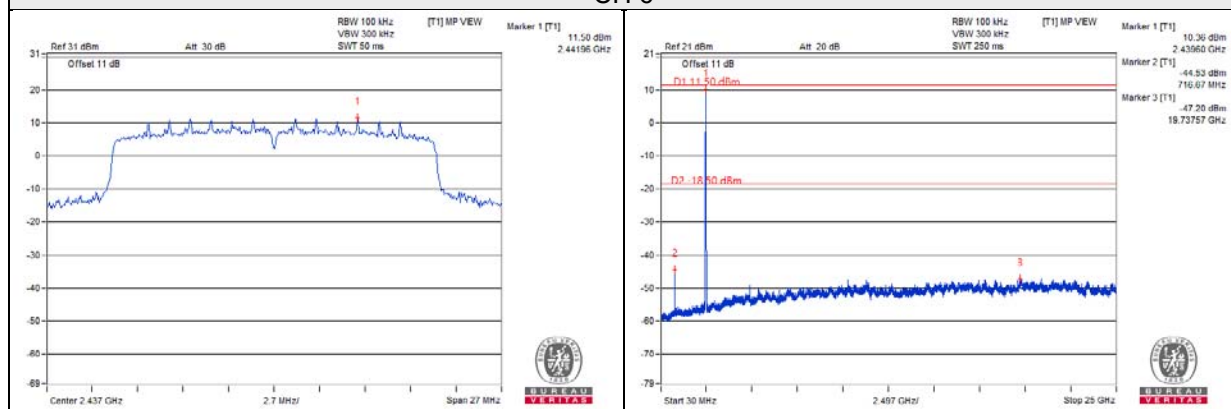


802.11ax (HE20)_Chain 1

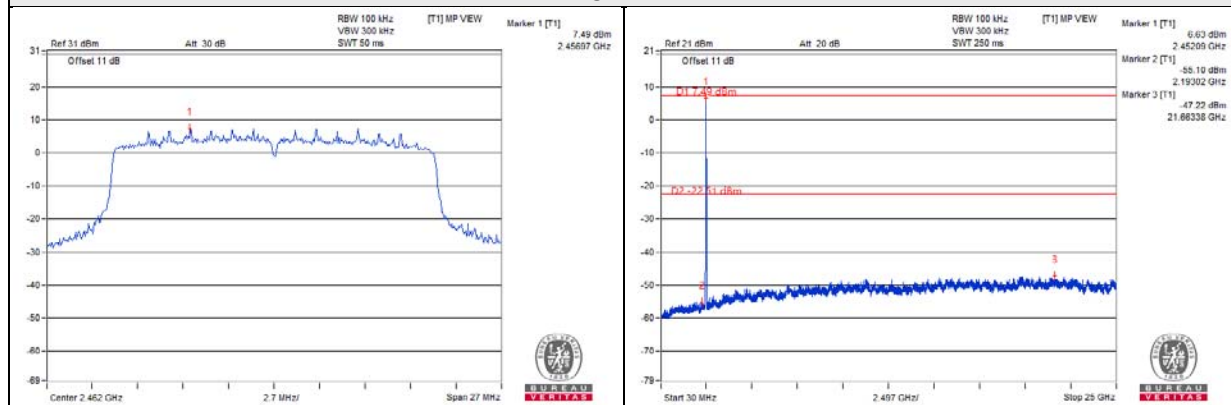
CH 1



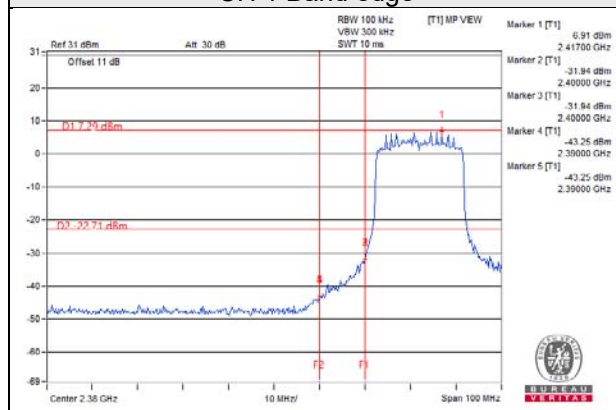
CH 6



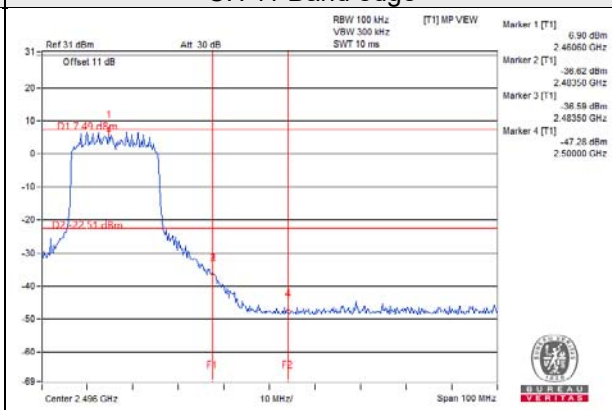
CH 11



CH 1 Band edge

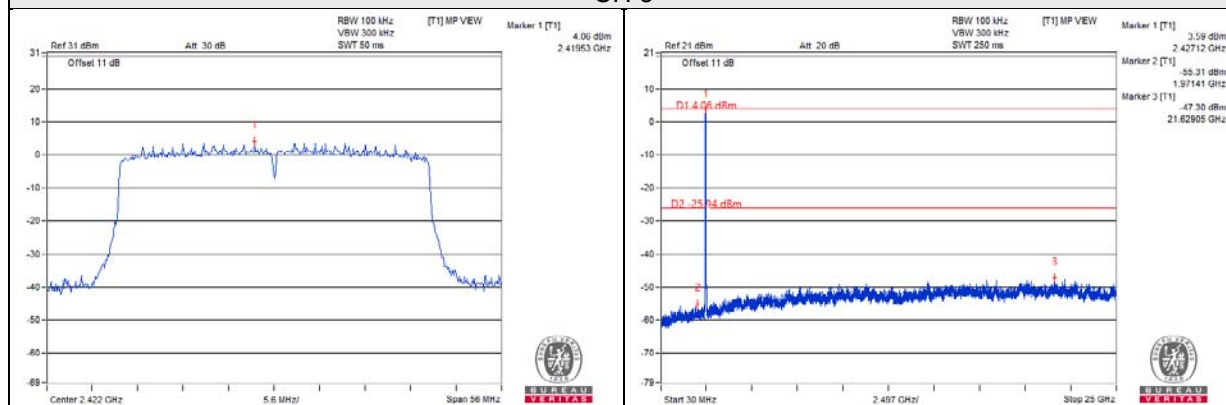


CH 11 Band edge

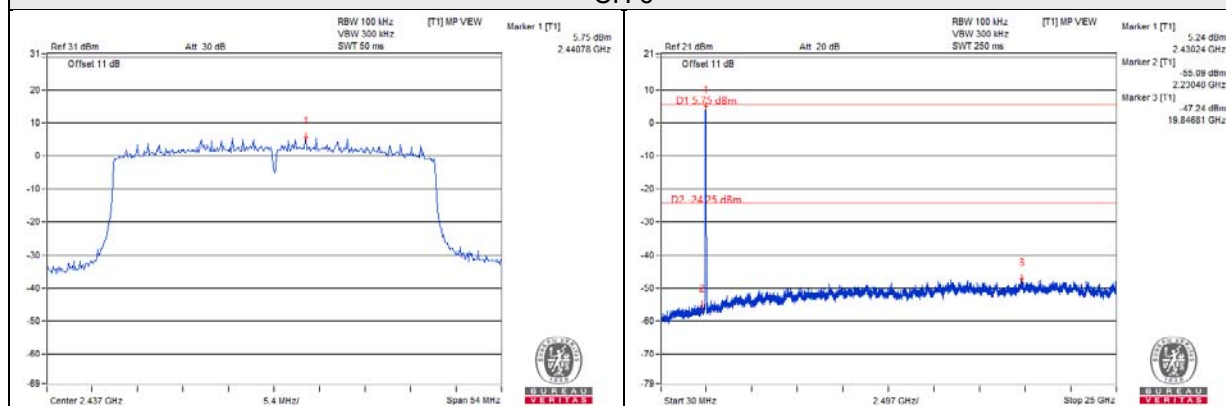


802.11ax (HE40)_Chain 0

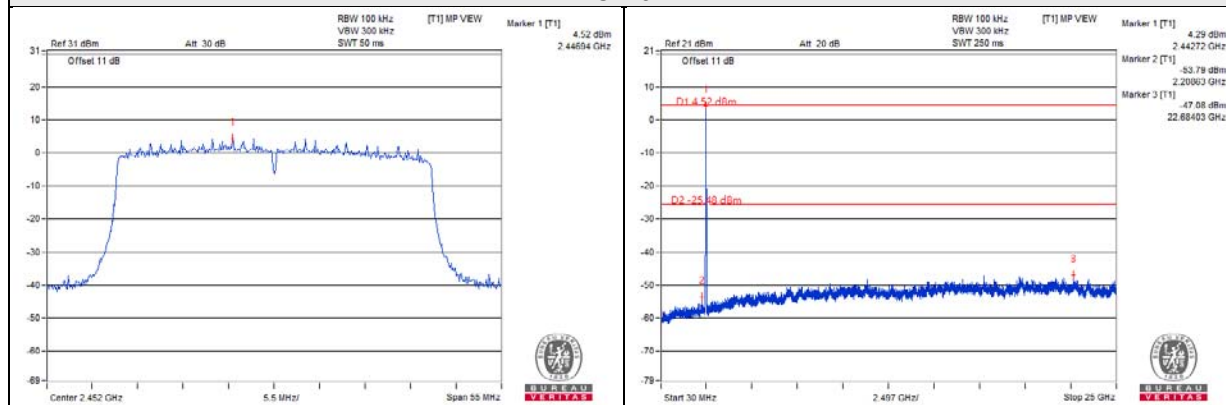
CH 3



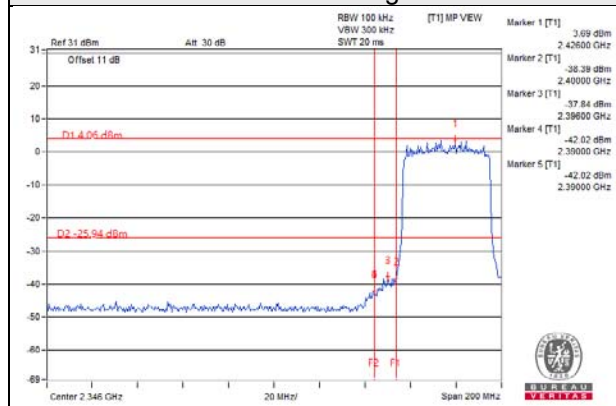
CH 6



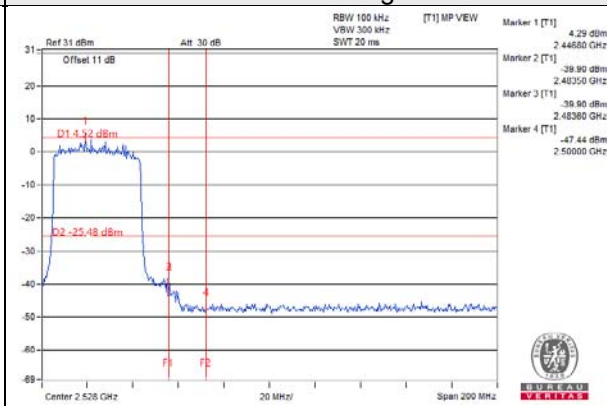
CH 9



CH 3 Band edge

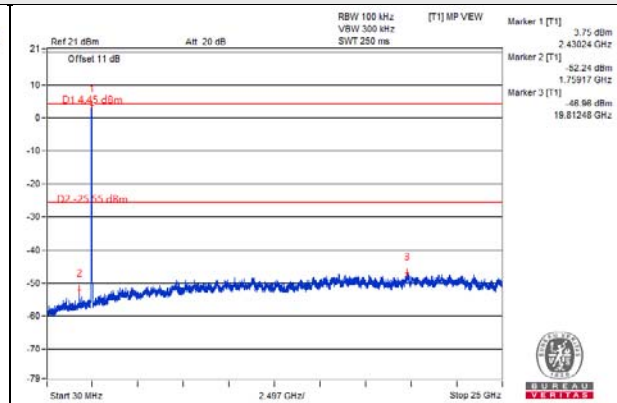
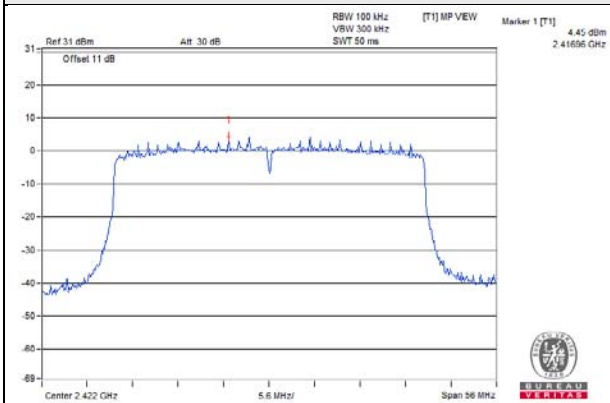


CH 9 Band edge

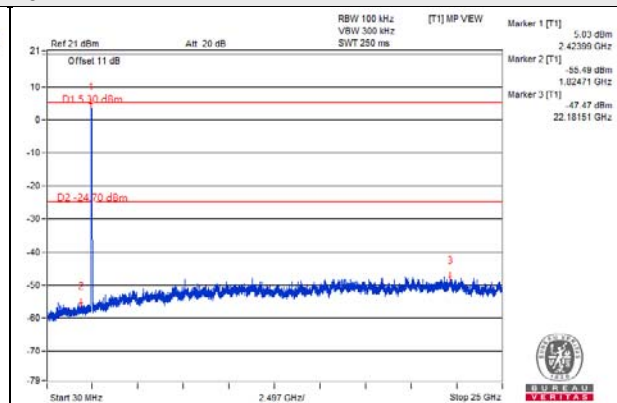
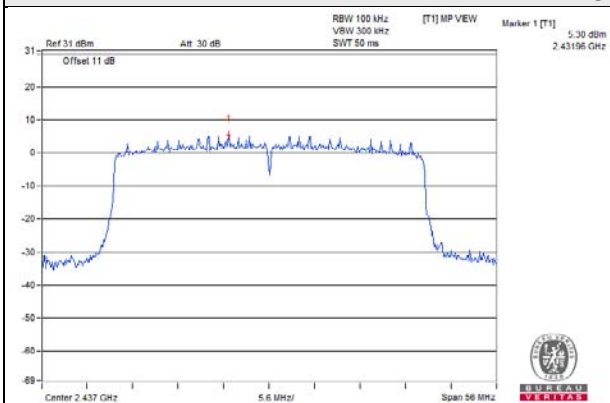


802.11ax (HE40)_Chain 1

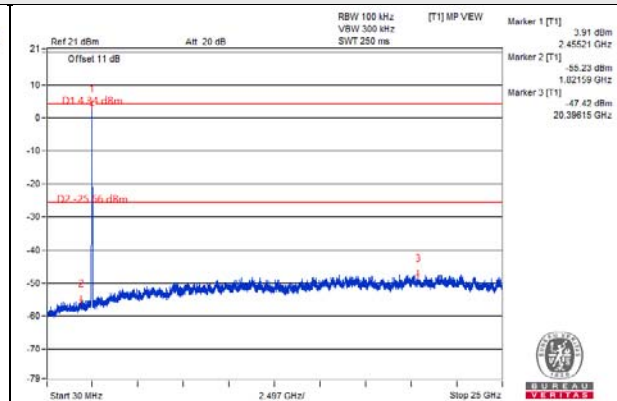
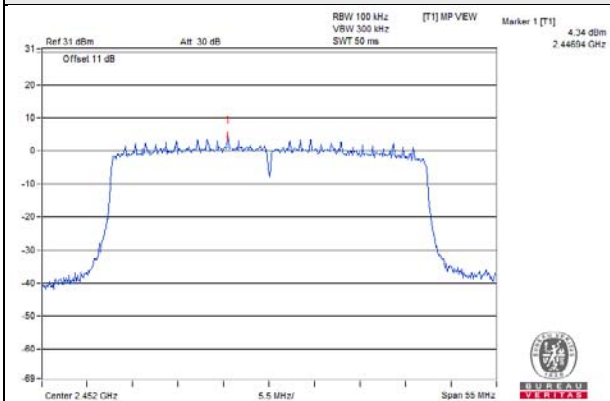
CH 3



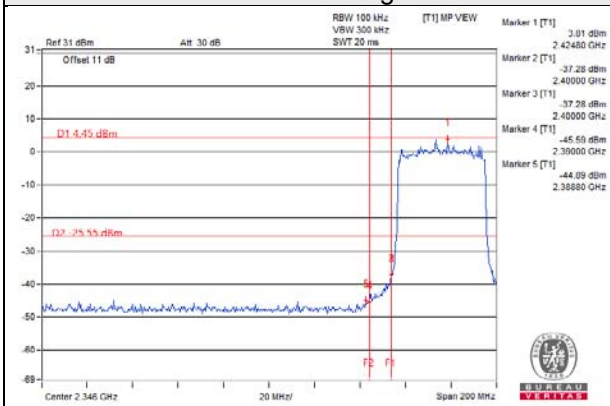
CH 6



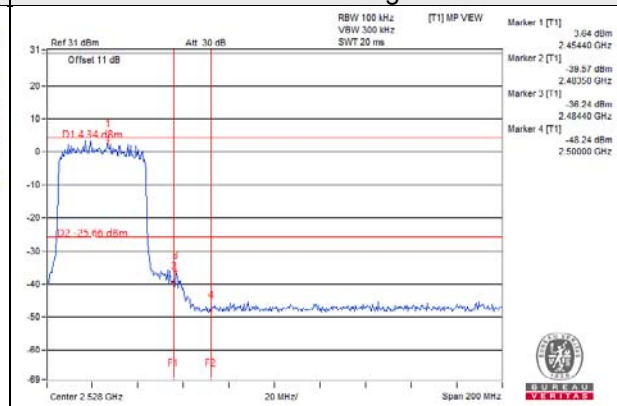
CH 9



CH 3 Band edge

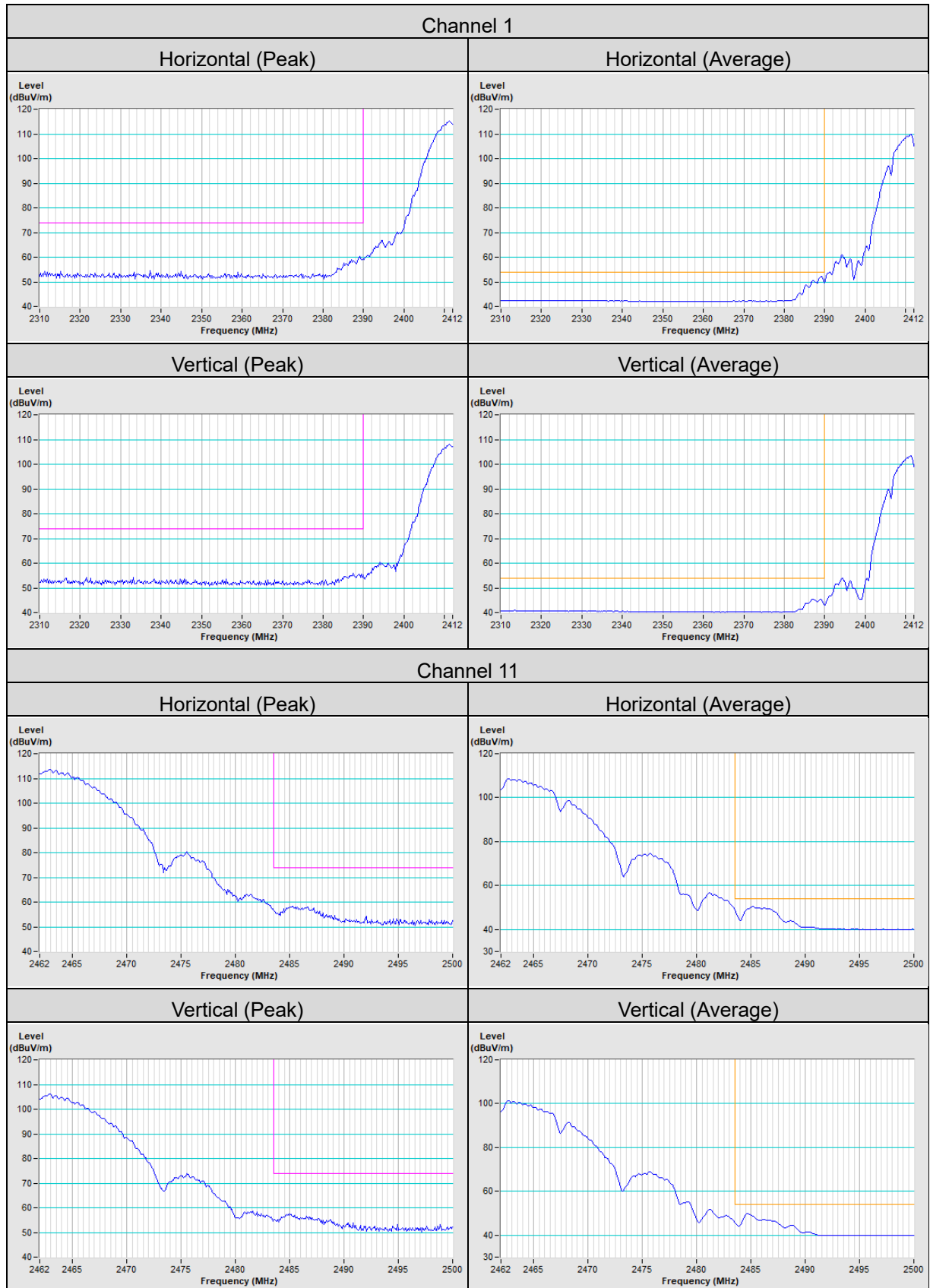


CH 9 Band edge

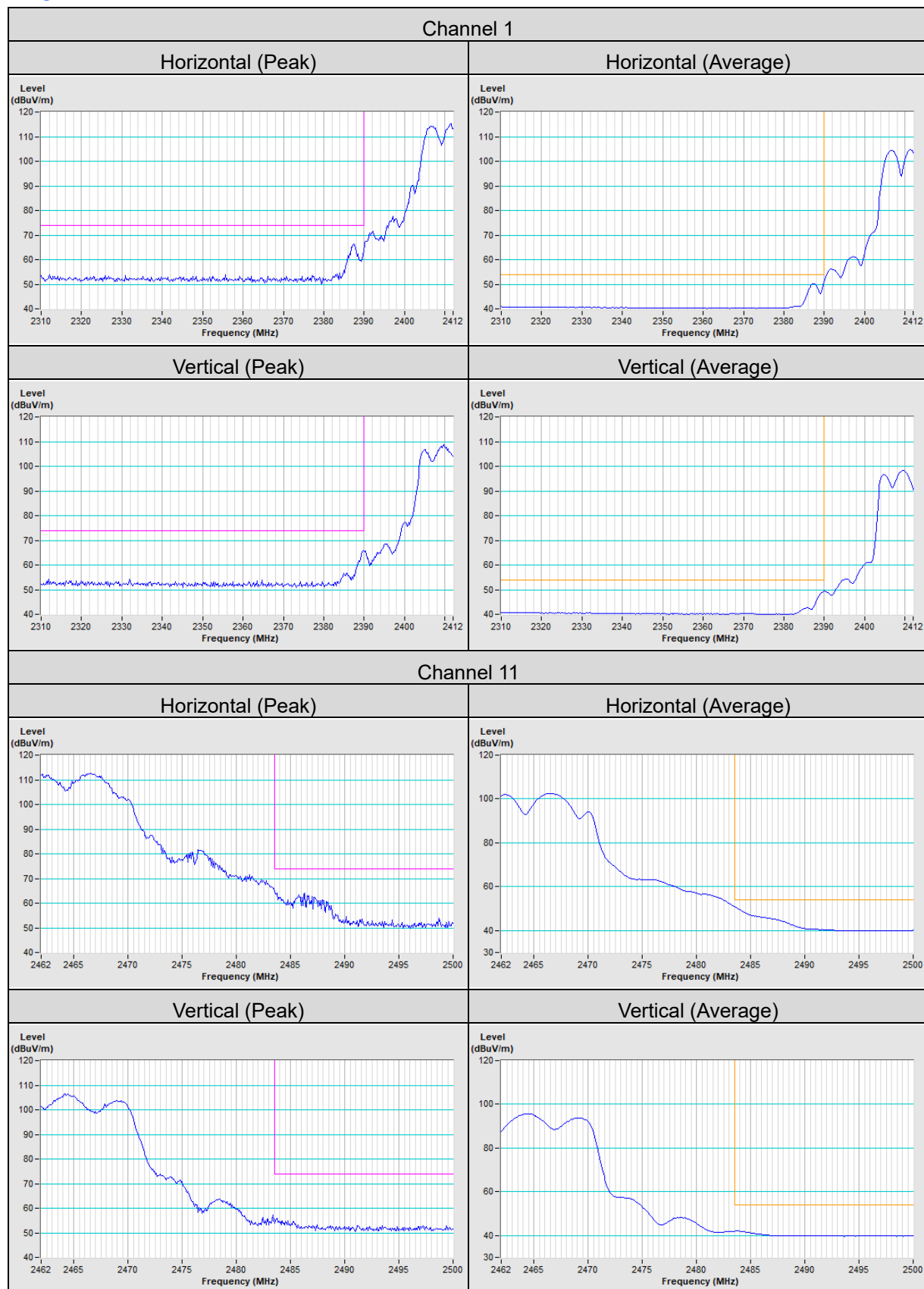


Annex A- Band Edge Measurement

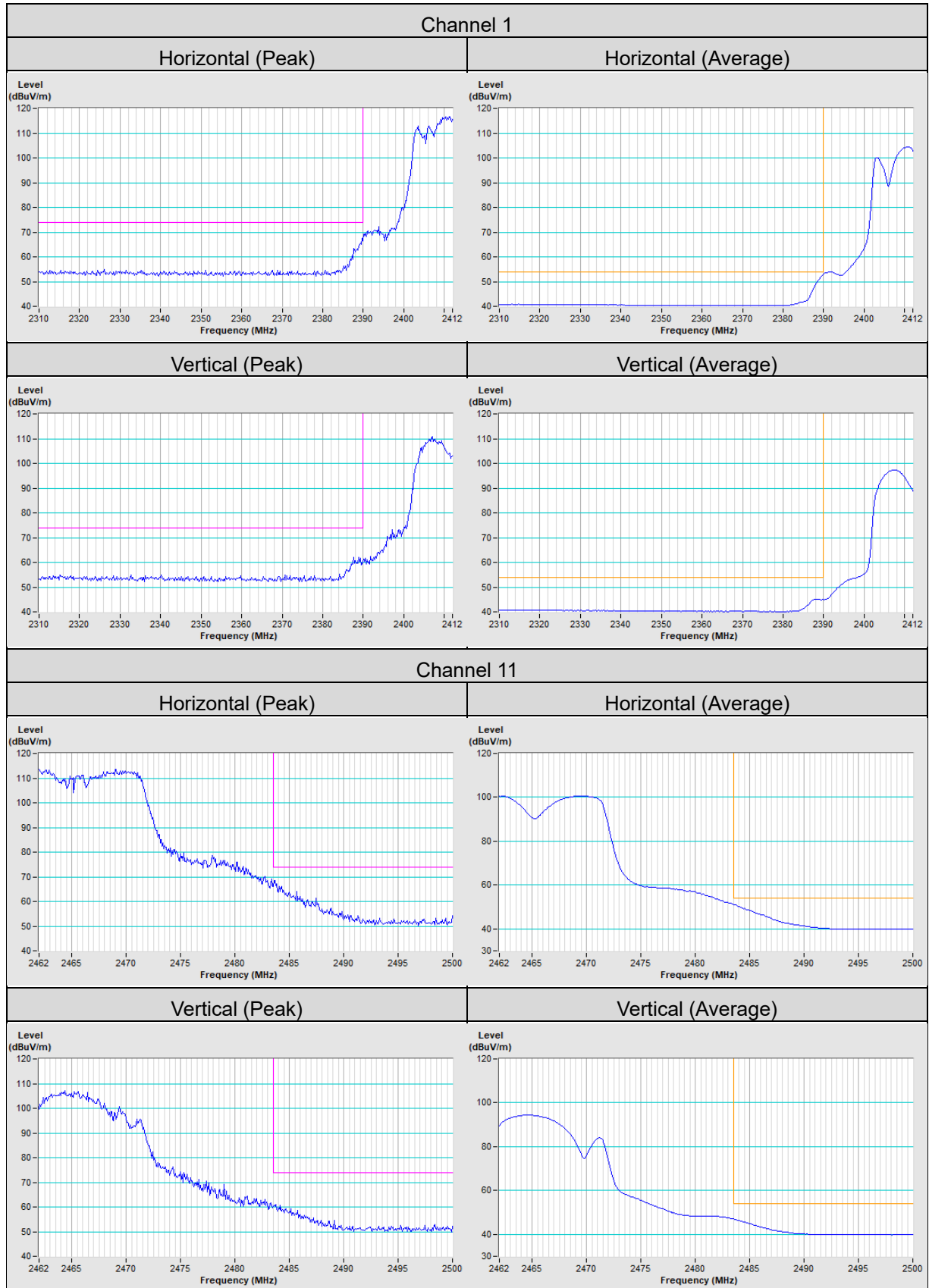
802.11b



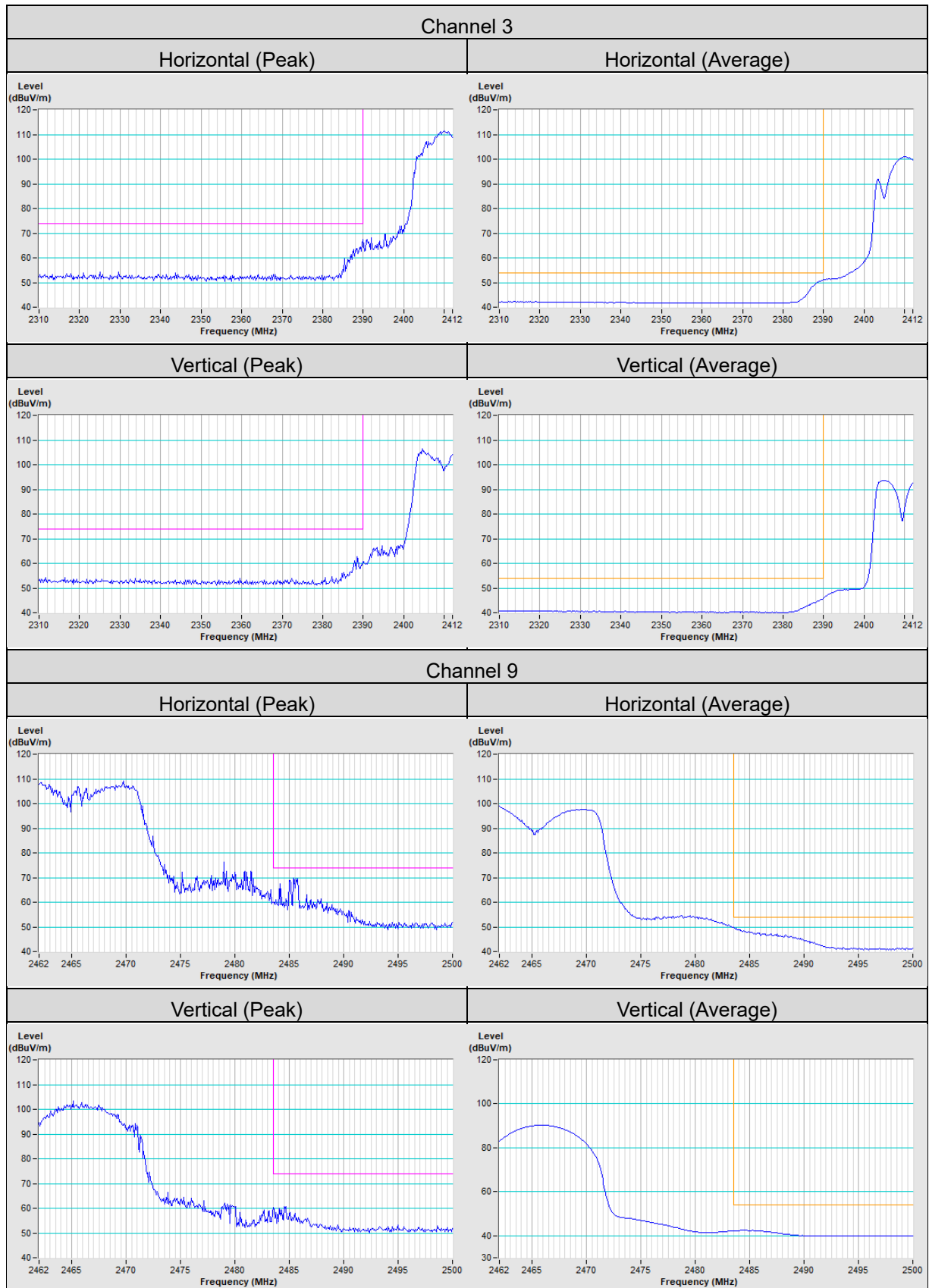
802.11g



802.11ax (HE20)



802.11ax (HE40)



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

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