FCC Test Report

Report No.: RFDLK-WTW-P20070248

FCC ID: KA2APX2810A1

Test Model: DAP-X2810

Received Date: Jul. 14, 2020

Test Date: Jul. 28 ~ Nov. 24, 2020

Issued Date: Nov. 26, 2020

Applicant: D-Link Corporation

Address: 17595 Mt. Herrmann, Fountain Valley, California, United States, 92708

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

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

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 13

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 18
4.1.5 Test Set Up 18
4.1.6 EUT Operating Conditions 19
4.1.7 Test Results 20
4.2 Conducted Emission Measurement 38
4.2.1 Limits of Conducted Emission Measurement 38
4.2.2 Test Instruments 38
4.2.3 Test Procedures 39
4.2.4 Deviation from Test Standard 39
4.2.5 Test Setup 39
4.2.6 EUT Operating Conditions 39
4.2.7 Test Results 40
4.3 6 dB Bandwidth Measurement 46
4.3.1 Limits of 6 dB Bandwidth Measurement 46
4.3.2 Test Setup 46
4.3.3 Test Instruments 46
4.3.4 Test Procedure 46
4.3.5 Deviation from Test Standard 46
4.3.6 EUT Operating Conditions 46
4.3.7 Test Results 47
4.4 Occupied Bandwidth Measurement 49
4.4.1 Test Setup 49
4.4.2 Test Instruments 49
4.4.3 Test Procedure 49
4.4.4 Deviation from Test Standard 49
4.4.5 EUT Operating Conditions 49
4.4.6 Test Results 50
4.5 Conducted Output Power Measurement 52
4.5.1 Limits of Conducted Output Power Measurement 52
4.5.2 Test Setup 52
4.5.3 Test Instruments 52
4.5.4 Test Procedures 52
4.5.5 Deviation from Test Standard 52
4.5.6 EUT Operating Conditions 52
4.5.7 Test Results 53

4.6 Power Spectral Density Measurement 57
4.6.1 Limits of Power Spectral Density Measurement 57
4.6.2 Test Setup 57
4.6.3 Test Instruments 57
4.6.4 Test Procedure 57
4.6.5 Deviation from Test Standard 58
4.6.6 EUT Operating Condition 58
4.6.7 Test Results 59
4.7 Conducted Out of Band Emission Measurement 62
4.7.1 Limits of Conducted Out of Band Emission Measurement 62
4.7.2 Test Setup 62
4.7.3 Test Instruments 62
4.7.4 Test Procedure 62
4.7.5 Deviation from Test Standard 62
4.7.6 EUT Operating Condition 62
4.7.7 Test Results 63

5 Pictures of Test Arrangements 79

Annex A- Band Edge Measurement 80

Appendix – Information of the Testing Laboratories 88

Release Control Record

Issue No.	Description	Date Issued
RFDLK-WTW-P20070248	Original Release	Nov. 26, 2020

1 Certificate of Conformity

Product: Nuclias Connect AX1800 Access Point

Brand: D-Link Corporation

Test Model: DAP-X2810

Sample Status: Engineering Sample

Applicant: D-Link Corporation

Test Date: Jul. 28 ~ Nov. 24, 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:** Nov. 26, 2020
Gina Liu / Specialist

Approved by : _____ , **Date:** Nov. 26, 2020
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -4.7 dB at 0.57342 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1 dB at 2483.5 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex(MHF) 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) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nuclias Connect AX1800 Access Point
Brand	D-Link Corporation
Test Model	DAP-X2810
Status of EUT	Engineering Sample
Power Supply Rating	12 Vdc (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: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 400 Mbps 802.11ax: up to 573.5 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20), (VHT20), 802.11ax (HE20) 7 for 802.11n (HT40), (VHT40), 802.11ax (HE40)
Output Power	CDD Mode: 831.023 mW Beamforming Mode: 262.014 mW
Antenna Type	PIFA antenna with 3.1 dBi gain (Chain 1) PIFA antenna with 3.2 dBi gain (Chain 2)
Antenna Connector	i-pex(MHF)
Accessory Device	Refer to Note as below
Data Cable Supplied	N/A

Note:

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

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

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

*For 802.11n and 802.11ax, 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 EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	ASIAN	WB-18Q12FU1 (US)	I/P: 100-240 Vac, 50-60 Hz, 0.6 A O/P: 12 Vdc, 1.5 A
Adapter 2	ASIAN	WA-30P12R	I/P: 100-240 Vac, 50-60 Hz, 0.9 A O/P: 12 Vdc, 2.5 A
Console cable	N/A	N/A	--

3. 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.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

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

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT with Adapter (WB18Q12FU1)
B	-	√	√	-	EUT with POE
C	-	√	√	-	EUT with Adapter (WA-30P12R)

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

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

Radiated Emission Test (Above 1 GHz):

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

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

Radiated Emission Test (Below 1 GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A~C	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)
A~C	802.11b	1 to 11	6	DSSS	DBPSK	1.0

Bandedge Measurement:

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

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

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	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 (HT20)	1 to 13	1, 7, 13	OFDM	BPSK	6.5
	802.11n (HT40)	3 to 11	3, 7, 11	OFDM	BPSK	13.5
	802.11n (VHT20)	1 to 13	1, 7, 13	OFDM	BPSK	7.2
	802.11n (VHT40)	3 to 11	3, 7, 11	OFDM	BPSK	15.0
	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	22 deg. C, 67 % RH	120 Vac, 60 Hz	Greg Lin
RE<1G	22 deg. C, 67 % RH	120 Vac, 60 Hz	Greg Lin
PLC	25 deg. C, 75 % RH	120 Vac, 60 Hz	Greg Lin
APCM	25 deg. C, 60 % RH	120 Vac, 60 Hz	Ivan Tseng

3.3 Duty Cycle of Test Signal

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

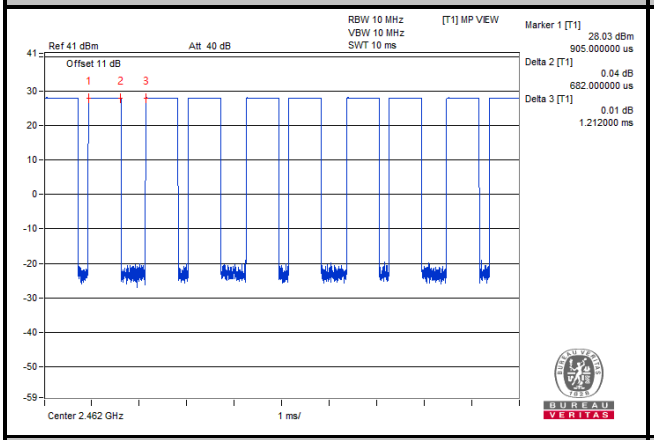
802.11b: Duty cycle = 0.682/1.212 = 0.563, Duty factor = 10 * log(1/0.563) = 2.50

802.11g: Duty cycle = 1.96/2.105 = 0.931, Duty factor = 10 * log(1/0.931) = 0.31

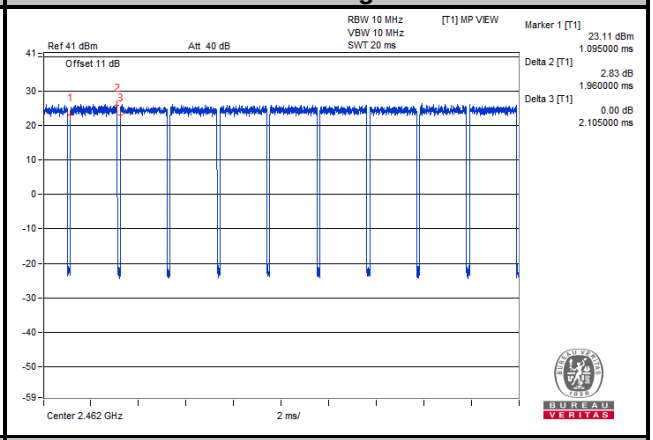
802.11ax (HE20): Duty cycle = 5.413/5.688 = 0.952, Duty factor = 10 * log(1/0.952) = 0.22

802.11ax (HE40): Duty cycle = 5.413/5.85 = 0.925, Duty factor = 10 * log(1/0.925) = 0.34

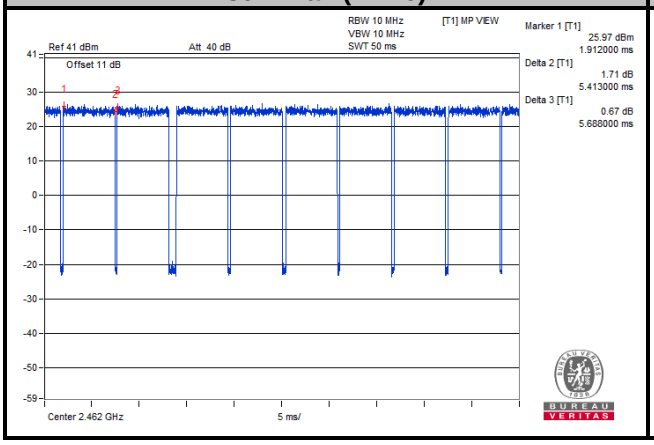
802.11b



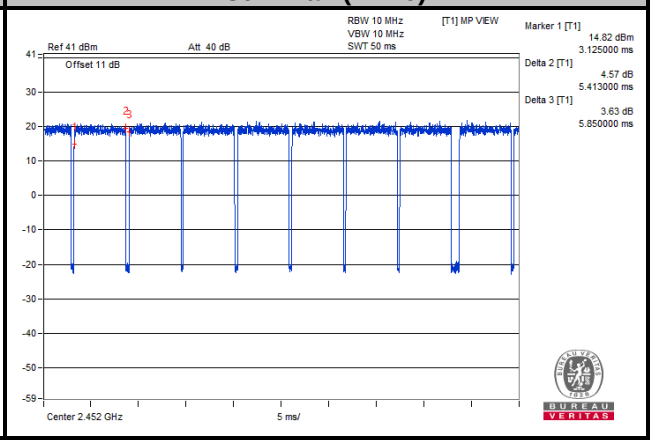
802.11g



802.11ax (HE20)



802.11ax (HE40)



3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Lenovo	81A4	YD02TWF5	PPD-QCNFA435	--
B.	POE	UBIQUITI	GP-H480-050G	N/A	N/A	Provided by client
C.	Load	N/A	N/A	N/A	N/A	--

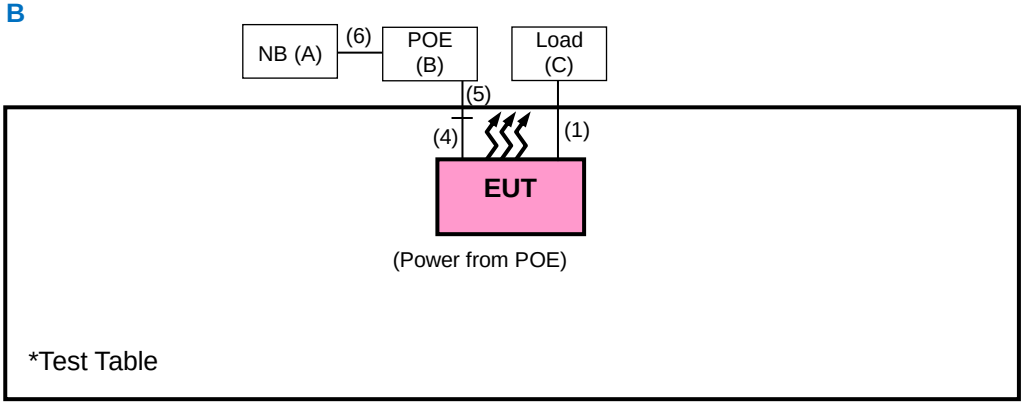
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Console Cable	1	1.8	N	0	Accessory of the EUT
2.	LAN Cable	1	10	N	0	RJ45
3.	Adapter Cable	1	1.0	N	0	Accessory of the EUT
4.	LAN Cable	1	1.5	N	0	RJ45
5.	LAN Cable	1	1.5	N	0	RJ45
6.	LAN Cable	1	1.0	N	0	RJ45

Note:

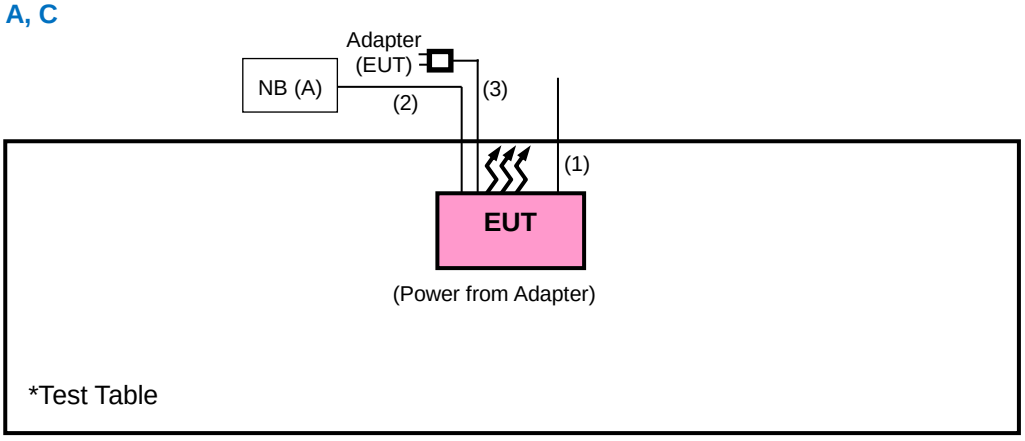
1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as communication partner to transfer data.

3.4.1 Configuration of System under Test

Mode B



Mode A, C



3.5 General Description of Applied Standards and References

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

Test Standard:

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

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

References Test Guidance:

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100980	Apr. 20, 2020	Apr. 19, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
			Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
			Nov. 22, 2020	Nov. 29, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
			Nov. 22, 2020	Nov. 29, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
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/MY55190004/MY55190007/MY55210005	Jul. 13, 2020	Jul. 12, 2021

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

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated Emission above 30 MHz

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

Note:

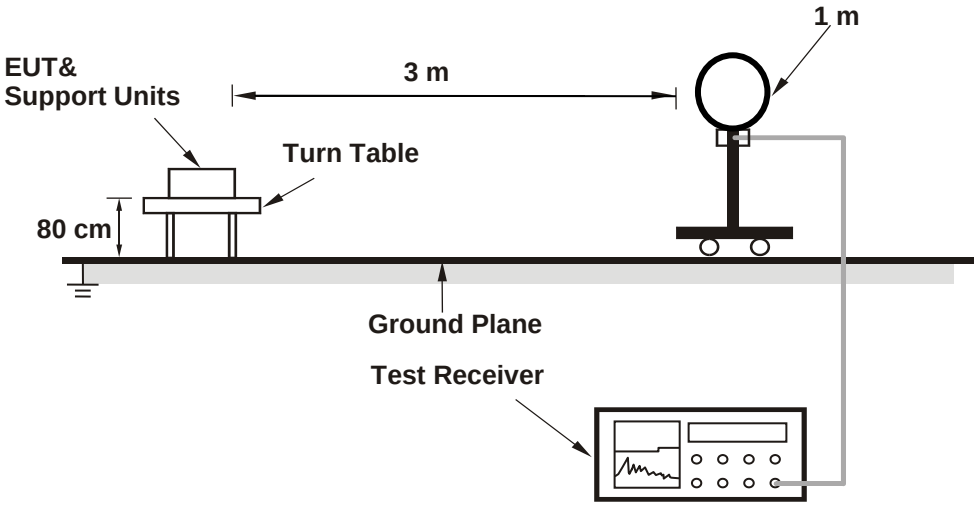
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

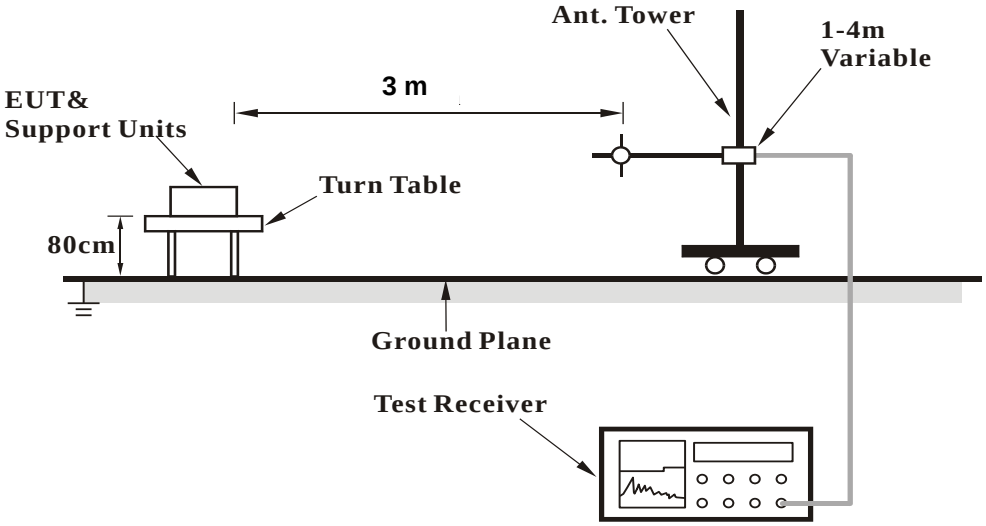
No deviation.

4.1.5 Test Set Up

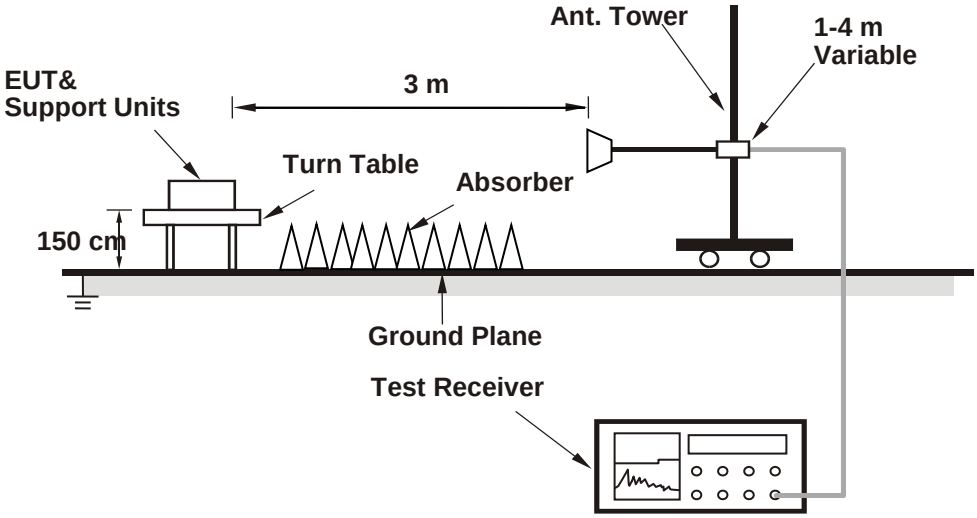
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data：

802.11b

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

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	56.3 PK	74.0	-17.7	2.54 H	282	25.1	31.2
2	2390.00	45.6 AV	54.0	-8.4	2.54 H	282	14.4	31.2
3	*2412.00	107.7 PK			2.54 H	282	76.6	31.1
4	*2412.00	103.7 AV			2.54 H	282	72.6	31.1
5	4824.00	44.3 PK	74.0	-29.7	3.43 H	217	42.5	1.8
6	4824.00	33.5 AV	54.0	-20.5	3.43 H	217	31.7	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	57.5 PK	74.0	-16.5	3.10 V	340	26.3	31.2
2	2390.00	47.3 AV	54.0	-6.7	3.10 V	340	16.1	31.2
3	*2412.00	114.8 PK			3.10 V	340	83.7	31.1
4	*2412.00	110.8 AV			3.10 V	340	79.7	31.1
5	4824.00	45.5 PK	74.0	-28.5	2.61 V	338	43.7	1.8
6	4824.00	36.4 AV	54.0	-17.6	2.61 V	338	34.6	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.

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

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	109.5 PK			2.68 H	293	78.4	31.1
2	*2437.00	105.6 AV			2.68 H	293	74.5	31.1
3	4874.00	44.3 PK	74.0	-29.7	3.49 H	220	42.3	2.0
4	4874.00	33.5 AV	54.0	-20.5	3.49 H	220	31.5	2.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	116.9 PK			3.10 V	337	85.8	31.1
2	*2437.00	112.9 AV			3.10 V	337	81.8	31.1
3	4874.00	45.9 PK	74.0	-28.1	2.53 V	334	43.9	2.0
4	4874.00	36.7 AV	54.0	-17.3	2.53 V	334	34.7	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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.5 PK			2.52 H	289	78.4	31.1
2	*2462.00	105.5 AV			2.52 H	289	74.4	31.1
3	2483.50	57.4 PK	74.0	-16.6	2.52 H	289	26.2	31.2
4	2483.50	45.9 AV	54.0	-8.1	2.52 H	289	14.7	31.2
5	4924.00	44.7 PK	74.0	-29.3	3.54 H	221	42.6	2.1
6	4924.00	33.9 AV	54.0	-20.1	3.54 H	221	31.8	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	116.7 PK			2.98 V	337	85.6	31.1
2	*2462.00	112.8 AV			2.98 V	337	81.7	31.1
3	2483.50	62.3 PK	74.0	-11.7	2.98 V	337	31.1	31.2
4	**2483.50**	**52.9 AV**	**54.0**	**-1.1**	**2.98 V**	**337**	**21.7**	**31.2**
5	4924.00	46.4 PK	74.0	-27.6	2.62 V	331	44.3	2.1
6	4924.00	37.0 AV	54.0	-17.0	2.62 V	331	34.9	2.1

Remarks:

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

802.11g

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

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	58.4 PK	74.0	-15.6	2.56 H	280	27.2	31.2
2	2390.00	46.1 AV	54.0	-7.9	2.56 H	280	14.9	31.2
3	*2412.00	106.3 PK			2.56 H	280	75.2	31.1
4	*2412.00	96.2 AV			2.56 H	280	65.1	31.1
5	4824.00	42.6 PK	74.0	-31.4	3.56 H	218	40.8	1.8
6	4824.00	29.3 AV	54.0	-24.7	3.56 H	218	27.5	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	3.06 V	315	34.3	31.2
2	2390.00	52.5 AV	54.0	-1.5	3.06 V	315	21.3	31.2
3	*2412.00	113.5 PK			3.06 V	315	82.4	31.1
4	*2412.00	103.3 AV			3.06 V	315	72.2	31.1
5	4824.00	43.1 PK	74.0	-30.9	2.56 V	328	41.3	1.8
6	4824.00	30.1 AV	54.0	-23.9	2.56 V	328	28.3	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.

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

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	108.1 PK			2.55 H	285	77.0	31.1
2	*2437.00	98.5 AV			2.55 H	285	67.4	31.1
3	4874.00	42.7 PK	74.0	-31.3	3.43 H	215	40.7	2.0
4	4874.00	29.4 AV	54.0	-24.6	3.43 H	215	27.4	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	115.8 PK			3.00 V	315	84.7	31.1
2	*2437.00	105.9 AV			3.00 V	315	74.8	31.1
3	4874.00	43.6 PK	74.0	-30.4	2.53 V	337	41.6	2.0
4	4874.00	30.5 AV	54.0	-23.5	2.53 V	337	28.5	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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	108.5 PK			2.46 H	279	77.4	31.1
2	*2462.00	98.4 AV			2.46 H	279	67.3	31.1
3	2483.50	62.9 PK	74.0	-11.1	2.46 H	279	31.7	31.2
4	2483.50	49.5 AV	54.0	-4.5	2.46 H	279	18.3	31.2
5	4924.00	43.0 PK	74.0	-31.0	3.42 H	216	40.9	2.1
6	4924.00	29.9 AV	54.0	-24.1	3.42 H	216	27.8	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	115.7 PK			2.93 V	315	84.6	31.1
2	*2462.00	105.6 AV			2.93 V	315	74.5	31.1
3	2483.50	66.6 PK	74.0	-7.4	2.93 V	315	35.4	31.2
4	2483.50	52.5 AV	54.0	-1.5	2.93 V	315	21.3	31.2
5	4924.00	43.9 PK	74.0	-30.1	2.57 V	328	41.8	2.1
6	4924.00	30.7 AV	54.0	-23.3	2.57 V	328	28.6	2.1

Remarks:

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

802.11ax (HE20)

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

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	60.6 PK	74.0	-13.4	2.53 H	281	29.4	31.2
2	2390.00	47.6 AV	54.0	-6.4	2.53 H	281	16.4	31.2
3	*2412.00	108.3 PK			2.53 H	281	77.2	31.1
4	*2412.00	95.4 AV			2.53 H	281	64.3	31.1
5	4824.00	43.1 PK	74.0	-30.9	3.43 H	218	41.3	1.8
6	4824.00	29.7 AV	54.0	-24.3	3.43 H	218	27.9	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	64.3 PK	74.0	-9.7	3.02 V	306	33.1	31.2
2	2390.00	51.5 AV	54.0	-2.5	3.02 V	306	20.3	31.2
3	*2412.00	115.4 PK			3.02 V	306	84.3	31.1
4	*2412.00	102.5 AV			3.02 V	306	71.4	31.1
5	4824.00	44.0 PK	74.0	-30.0	2.48 V	331	42.2	1.8
6	4824.00	30.6 AV	54.0	-23.4	2.48 V	331	28.8	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.

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

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	109.1 PK			2.50 H	287	78.0	31.1
2	*2437.00	96.3 AV			2.50 H	287	65.2	31.1
3	4874.00	43.3 PK	74.0	-30.7	3.46 H	227	41.3	2.0
4	4874.00	30.1 AV	54.0	-23.9	3.46 H	227	28.1	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	*2437.00	116.2 PK			3.06 V	312	85.1	31.1
2	*2437.00	103.4 AV			3.06 V	312	72.3	31.1
3	4874.00	44.4 PK	74.0	-29.6	2.57 V	339	42.4	2.0
4	4874.00	30.9 AV	54.0	-23.1	2.57 V	339	28.9	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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.5 PK			2.52 H	279	78.4	31.1
2	*2462.00	96.8 AV			2.52 H	279	65.7	31.1
3	2483.50	63.4 PK	74.0	-10.6	2.52 H	279	32.2	31.2
4	2483.50	49.7 AV	54.0	-4.3	2.52 H	279	18.5	31.2
5	4924.00	42.9 PK	74.0	-31.1	3.52 H	237	40.8	2.1
6	4924.00	30.0 AV	54.0	-24.0	3.52 H	237	27.9	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	*2462.00	116.6 PK			2.97 V	313	85.5	31.1
2	*2462.00	104.0 AV			2.97 V	313	72.9	31.1
3	2483.50	65.8 PK	74.0	-8.2	2.97 V	313	34.6	31.2
4	2483.50	52.4 AV	54.0	-1.6	2.97 V	313	21.2	31.2
5	4924.00	44.2 PK	74.0	-29.8	2.43 V	327	42.1	2.1
6	4924.00	30.8 AV	54.0	-23.2	2.43 V	327	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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11ax (HE40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2.56 H	287	32.8	31.2
2	2390.00	51.0 AV	54.0	-3.0	2.56 H	287	19.8	31.2
3	*2422.00	105.9 PK			2.56 H	287	74.8	31.1
4	*2422.00	93.3 AV			2.56 H	287	62.2	31.1
5	4844.00	42.5 PK	74.0	-31.5	3.52 H	231	40.6	1.9
6	4844.00	29.3 AV	54.0	-24.7	3.52 H	231	27.4	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	65.6 PK	74.0	-8.4	3.00 V	332	34.4	31.2
2	2390.00	52.6 AV	54.0	-1.4	3.00 V	332	21.4	31.2
3	*2422.00	113.0 PK			3.00 V	332	81.9	31.1
4	*2422.00	100.3 AV			3.00 V	332	69.2	31.1
5	4844.00	43.6 PK	74.0	-30.4	2.49 V	325	41.7	1.9
6	4844.00	30.3 AV	54.0	-23.7	2.49 V	325	28.4	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.

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

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	104.6 PK			2.62 H	294	73.5	31.1
2	*2437.00	93.7 AV			2.62 H	294	62.6	31.1
3	2483.50	63.6 PK	74.0	-10.4	2.62 H	294	32.4	31.2
4	2483.50	50.0 AV	54.0	-4.0	2.62 H	294	18.8	31.2
5	4874.00	42.4 PK	74.0	-31.6	3.53 H	238	40.4	2.0
6	4874.00	29.4 AV	54.0	-24.6	3.53 H	238	27.4	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	111.6 PK			3.00 V	341	80.5	31.1
2	*2437.00	100.9 AV			3.00 V	341	69.8	31.1
3	2483.50	65.4 PK	74.0	-8.6	3.00 V	341	34.2	31.2
4	2483.50	52.5 AV	54.0	-1.5	3.00 V	341	21.3	31.2
5	4874.00	43.6 PK	74.0	-30.4	2.51 V	336	41.6	2.0
6	4874.00	30.3 AV	54.0	-23.7	2.51 V	336	28.3	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.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	103.9 PK			2.61 H	290	72.8	31.1
2	*2452.00	91.2 AV			2.61 H	290	60.1	31.1
3	2483.50	62.3 PK	74.0	-11.7	2.61 H	290	31.1	31.2
4	2483.50	49.3 AV	54.0	-4.7	2.61 H	290	18.1	31.2
5	4904.00	42.3 PK	74.0	-31.7	3.37 H	216	40.3	2.0
6	4904.00	29.1 AV	54.0	-24.9	3.37 H	216	27.1	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	111.3 PK			2.96 V	313	80.2	31.1
2	*2452.00	98.4 AV			2.96 V	313	67.3	31.1
3	2483.50	66.3 PK	74.0	-7.7	2.96 V	313	35.1	31.2
4	2483.50	52.7 AV	54.0	-1.3	2.96 V	313	21.5	31.2
5	4904.00	43.0 PK	74.0	-31.0	2.66 V	347	41.0	2.0
6	4904.00	30.2 AV	54.0	-23.8	2.66 V	347	28.2	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.

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

802.11b

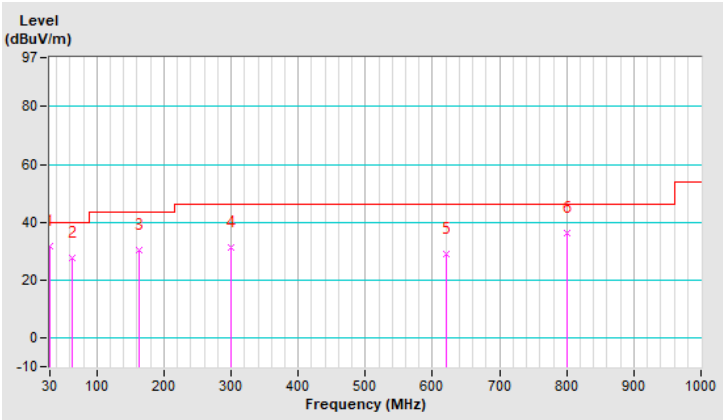
Mode A

CHANNEL	TX Channel 6	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	30.00	31.8 QP	40.0	-8.2	1.25 H	322	42.3	-10.5
2	63.95	27.8 QP	40.0	-12.2	1.00 H	81	37.7	-9.9
3	162.89	30.2 QP	43.5	-13.3	1.00 H	242	38.7	-8.5
4	299.66	31.4 QP	46.0	-14.6	1.00 H	145	38.5	-7.1
5	620.73	29.2 QP	46.0	-16.8	1.50 H	319	29.6	-0.4
6	800.18	36.3 QP	46.0	-9.7	1.00 H	97	33.5	2.8

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 of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

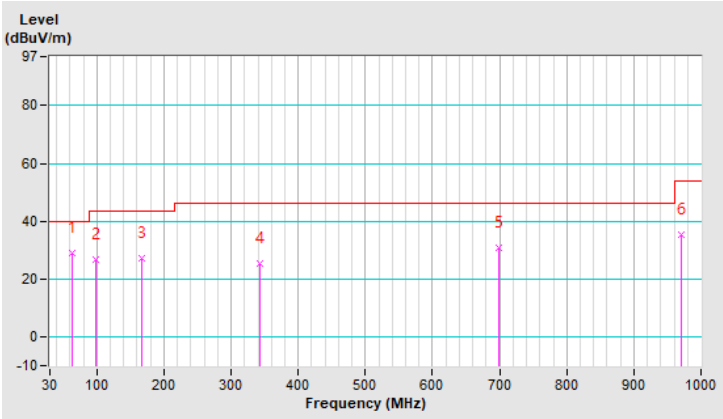


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	63.95	29.2 QP	40.0	-10.8	1.50 V	103	39.1	-9.9
2	97.90	26.9 QP	43.5	-16.6	1.25 V	174	40.7	-13.8
3	166.77	27.1 QP	43.5	-16.4	1.00 V	252	35.9	-8.8
4	343.31	25.5 QP	46.0	-20.5	1.50 V	203	31.6	-6.1
5	699.30	31.0 QP	46.0	-15.0	1.00 V	300	30.2	0.8
6	969.93	35.4 QP	54.0	-18.6	1.25 V	200	29.6	5.8

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 of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



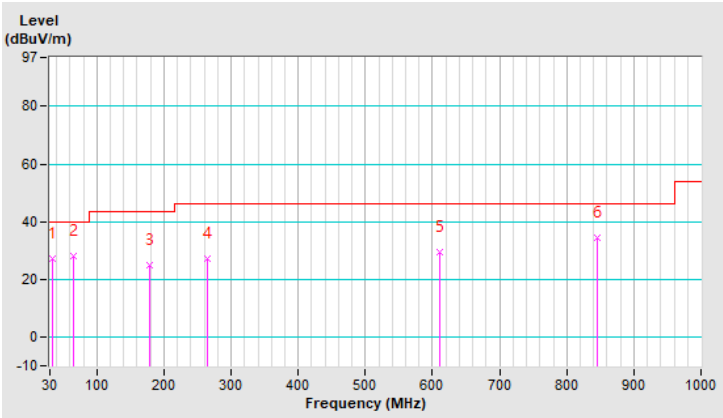
Mode B

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	33.88	27.1 QP	40.0	-12.9	1.25 H	72	37.7	-10.6
2	64.92	28.1 QP	40.0	-11.9	1.00 H	121	38.5	-10.4
3	178.41	24.9 QP	43.5	-18.6	1.50 H	285	34.7	-9.8
4	264.74	27.0 QP	46.0	-19.0	1.00 H	112	35.2	-8.2
5	611.03	29.5 QP	46.0	-16.5	1.00 H	349	30.0	-0.5
6	844.80	34.6 QP	46.0	-11.4	1.25 H	178	31.1	3.5

Remarks:

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

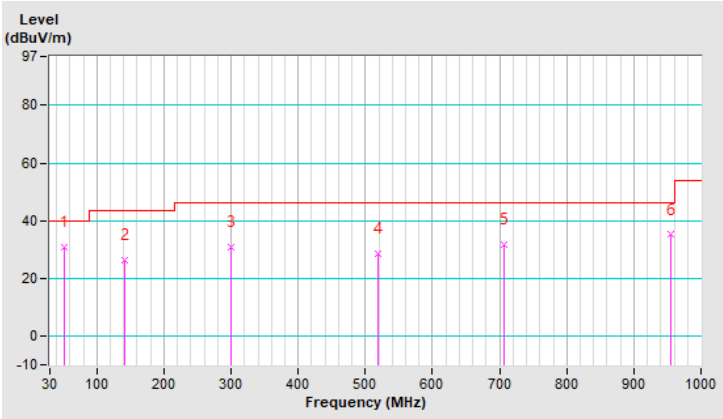


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	51.34	31.0 QP	40.0	-9.0	1.00 V	73	40.2	-9.2
2	140.58	26.4 QP	43.5	-17.1	1.00 V	181	35.6	-9.2
3	299.66	30.7 QP	46.0	-15.3	1.00 V	70	37.8	-7.1
4	518.88	28.5 QP	46.0	-17.5	1.00 V	217	31.2	-2.7
5	706.09	31.6 QP	46.0	-14.4	1.00 V	179	30.7	0.9
6	955.38	35.1 QP	46.0	-10.9	1.00 V	47	29.5	5.6

Remarks:

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



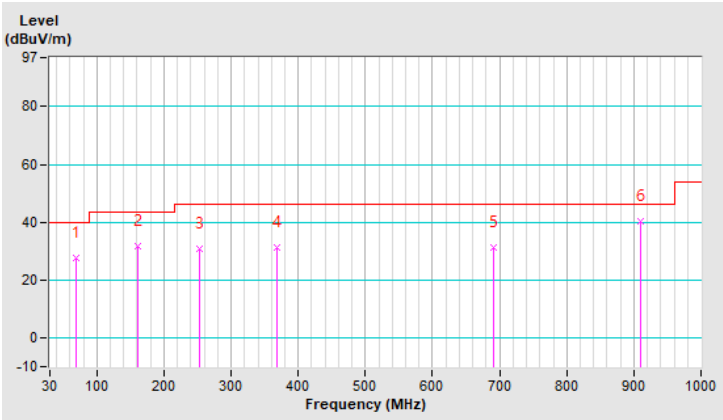
Mode C

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	69.77	27.6 QP	40.0	-12.4	1.00 H	14	38.5	-10.9
2	160.95	31.7 QP	43.5	-11.8	1.00 H	139	40.3	-8.6
3	252.13	30.7 QP	46.0	-15.3	1.25 H	113	39.6	-8.9
4	368.53	31.4 QP	46.0	-14.6	1.50 H	73	36.9	-5.5
5	691.54	31.2 QP	46.0	-14.8	1.25 H	248	30.5	0.7
6	909.79	40.2 QP	46.0	-5.8	1.50 H	102	35.3	4.9

Remarks:

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

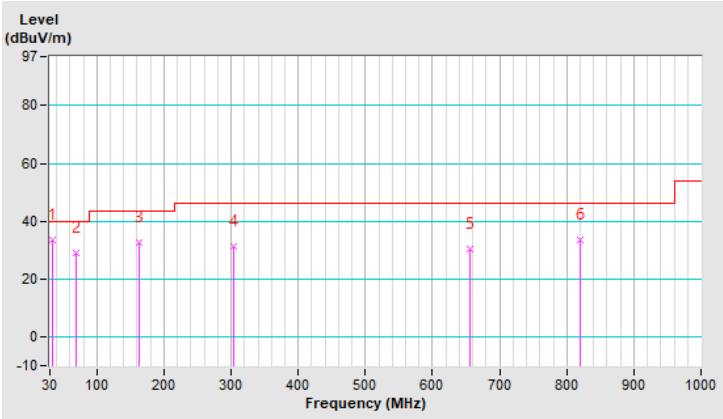


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	33.88	33.7 QP	40.0	-6.3	1.00 V	126	44.3	-10.6
2	68.80	29.0 QP	40.0	-11.0	1.00 V	7	39.9	-10.9
3	163.86	32.6 QP	43.5	-10.9	1.50 V	111	41.3	-8.7
4	304.51	31.3 QP	46.0	-14.7	1.00 V	174	38.3	-7.0
5	656.62	30.5 QP	46.0	-15.5	1.00 V	32	30.3	0.2
6	819.58	33.3 QP	46.0	-12.7	1.00 V	240	30.2	3.1

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 of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
			Sep. 04, 2020	Sep. 03, 2021
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
V-LISN SCHWARZBECK (Peripheral)	NNBL 8226-2	8226-142	Jul. 31, 2020	Jul. 30, 2021
Software ADT	BV ADT_Cond_ V7.3.7.3	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 1 (Conduction 1).
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

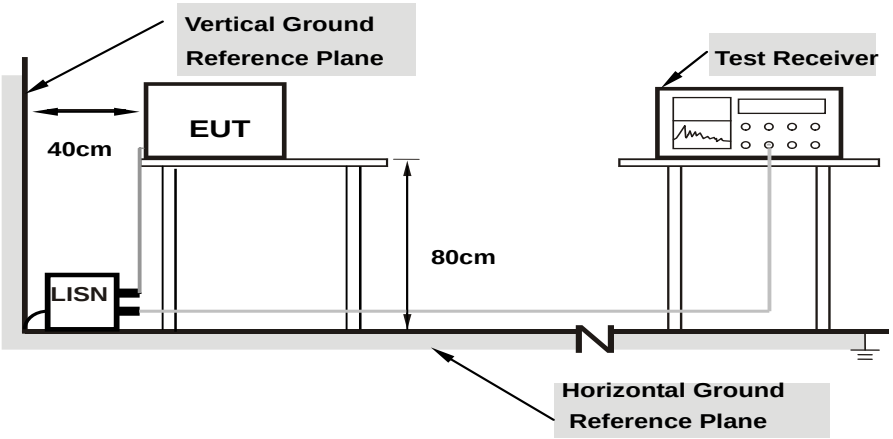
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

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

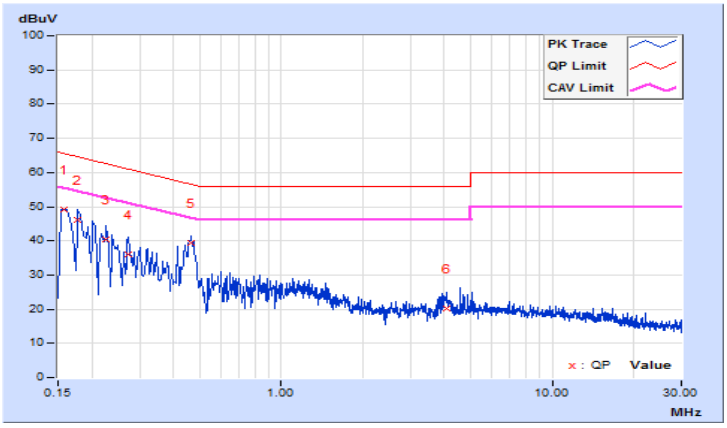
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Greg Lin	**Test Date**	2020/8/7
Test Mode	Mode A		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15853	9.63	39.40	25.10	49.03	34.73	65.54	55.54	-16.51	-20.81
2	0.17800	9.62	36.52	21.76	46.14	31.38	64.58	54.58	-18.44	-23.20
3	0.22600	9.62	30.78	17.71	40.40	27.33	62.60	52.60	-22.20	-25.27
4	0.27400	9.63	26.25	13.81	35.88	23.44	61.00	51.00	-25.12	-27.56
5	0.46567	9.65	29.78	24.86	39.43	34.51	56.59	46.59	-17.16	-12.08
6	4.06600	9.79	10.58	2.48	20.37	12.27	56.00	46.00	-35.63	-33.73

Remarks:

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

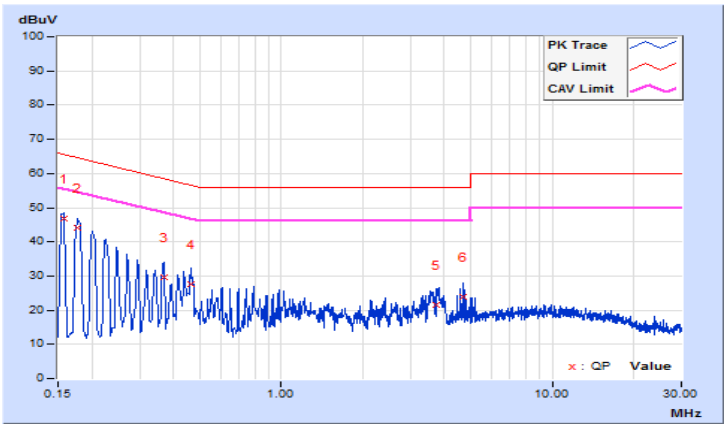


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	19℃, 68%RH
Tested by	Greg Lin	**Test Date**	2020/8/7
Test Mode	Mode A		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15728	9.68	37.01	22.53	46.69	32.21	65.61	55.61	-18.92	-23.40
2	0.17800	9.68	34.27	19.19	43.95	28.87	64.58	54.58	-20.63	-25.71
3	0.37000	9.68	19.82	5.16	29.50	14.84	58.50	48.50	-29.00	-33.66
4	0.46600	9.68	17.82	10.23	27.50	19.91	56.58	46.58	-29.08	-26.67
5	3.73400	9.76	11.66	2.02	21.42	11.78	56.00	46.00	-34.58	-34.22
6	4.67000	9.78	14.11	3.33	23.89	13.11	56.00	46.00	-32.11	-32.89

Remarks:

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

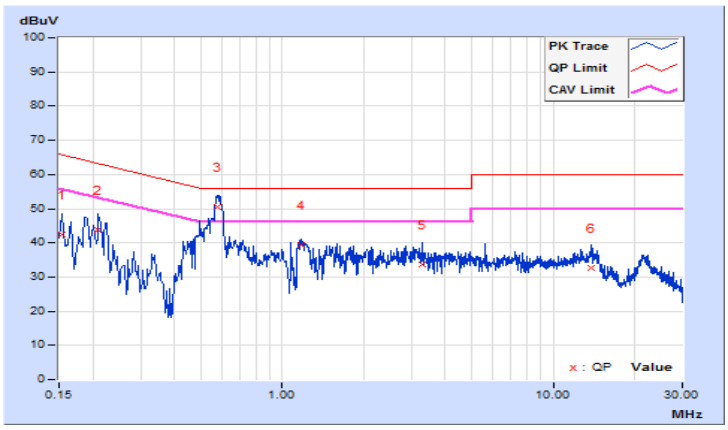


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Greg Lin	**Test Date**	2020/11/23
Test Mode	Mode B		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15400	9.58	32.82	27.18	42.40	36.76	65.78	55.78	-23.38	-19.02
2	0.21000	9.59	34.30	20.83	43.89	30.42	63.21	53.21	-19.32	-22.79
3	**0.57342**	**9.59**	**40.91**	**31.71**	**50.50**	**41.30**	**56.00**	**46.00**	**-5.50**	**-4.70**
4	1.18200	9.61	29.68	21.83	39.29	31.44	56.00	46.00	-16.71	-14.56
5	3.29000	9.66	23.87	17.06	33.53	26.72	56.00	46.00	-22.47	-19.28
6	13.75000	9.76	23.01	16.76	32.77	26.52	60.00	50.00	-27.23	-23.48

Remarks:

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

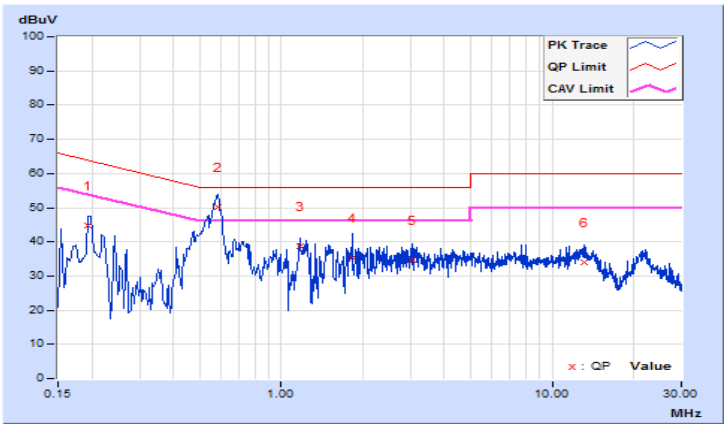


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Greg Lin	**Test Date**	2020/11/23
Test Mode	Mode B		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.19418	9.57	35.17	20.43	44.74	30.00	63.86	53.86	-19.12	-23.86
2	0.58102	9.57	40.75	31.52	50.32	41.09	56.00	46.00	-5.68	-4.91
3	1.17400	9.58	29.07	21.21	38.65	30.79	56.00	46.00	-17.35	-15.21
4	1.82600	9.60	25.75	16.63	35.35	26.23	56.00	46.00	-20.65	-19.77
5	3.03800	9.63	25.20	18.17	34.83	27.80	56.00	46.00	-21.17	-18.20
6	13.06600	9.76	24.25	17.62	34.01	27.38	60.00	50.00	-25.99	-22.62

Remarks:

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

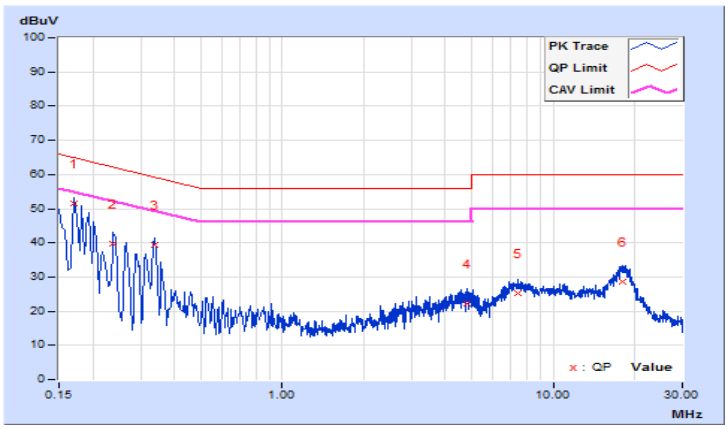


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Greg Lin	**Test Date**	2020/8/7
Test Mode	Mode C		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.17000	9.63	41.77	27.00	51.40	36.63	64.96	54.96	-13.56	-18.33
2	0.23800	9.63	30.12	18.00	39.75	27.63	62.17	52.17	-22.42	-24.54
3	0.33800	9.64	29.81	24.55	39.45	34.19	59.25	49.25	-19.80	-15.06
4	4.79000	9.80	12.39	3.41	22.19	13.21	56.00	46.00	-33.81	-32.79
5	7.43000	9.84	15.53	8.13	25.37	17.97	60.00	50.00	-34.63	-32.03
6	18.11000	9.91	18.74	12.39	28.65	22.30	60.00	50.00	-31.35	-27.70

Remarks:

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

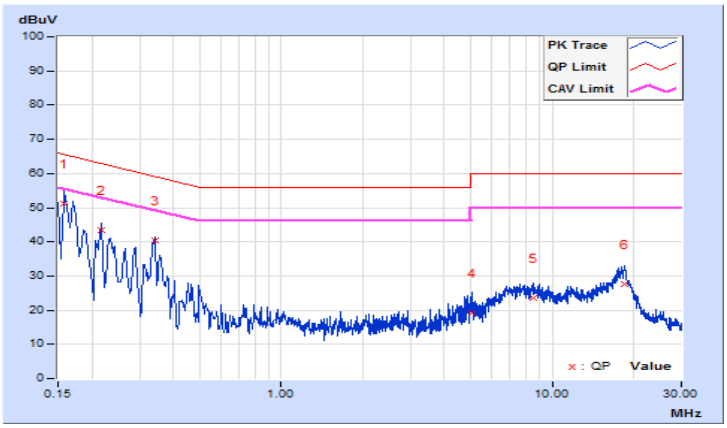


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Greg Lin	**Test Date**	2020/8/7
Test Mode	Mode C		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15800	9.66	41.41	27.85	51.07	37.51	65.57	55.57	-14.50	-18.06
2	0.21800	9.64	33.64	21.73	43.28	31.37	62.89	52.89	-19.61	-21.52
3	0.34124	9.66	30.80	24.87	40.46	34.53	59.17	49.17	-18.71	-14.64
4	5.08600	9.84	9.45	0.77	19.29	10.61	60.00	50.00	-40.71	-39.39
5	8.55000	9.89	13.79	6.70	23.68	16.59	60.00	50.00	-36.32	-33.41
6	18.56200	10.02	17.65	11.49	27.67	21.51	60.00	50.00	-32.33	-28.49

Remarks:

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

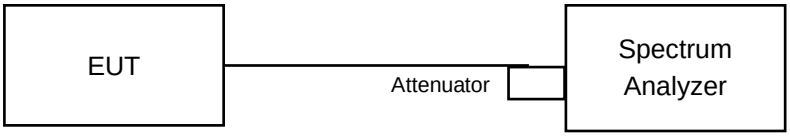


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	10.02	8.07	0.5	Pass
6	2437	9.54	10.09	0.5	Pass
11	2462	8.59	8.03	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.81	15.96	0.5	Pass
6	2437	15.81	16.08	0.5	Pass
11	2462	15.70	16.07	0.5	Pass

802.11ax (HE20)

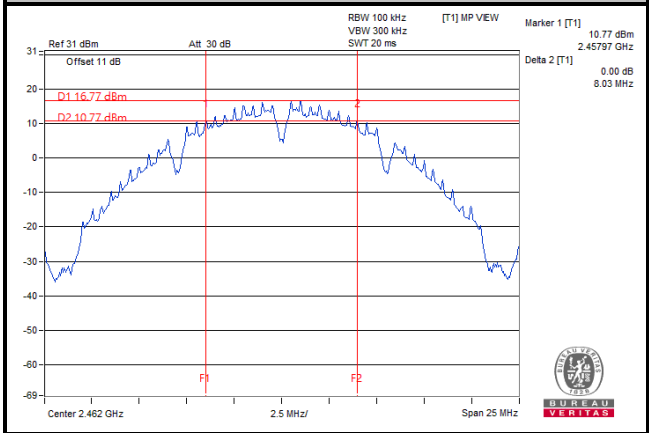
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.48	18.00	0.5	Pass
6	2437	18.61	18.45	0.5	Pass
11	2462	18.42	18.09	0.5	Pass

802.11ax (HE40)

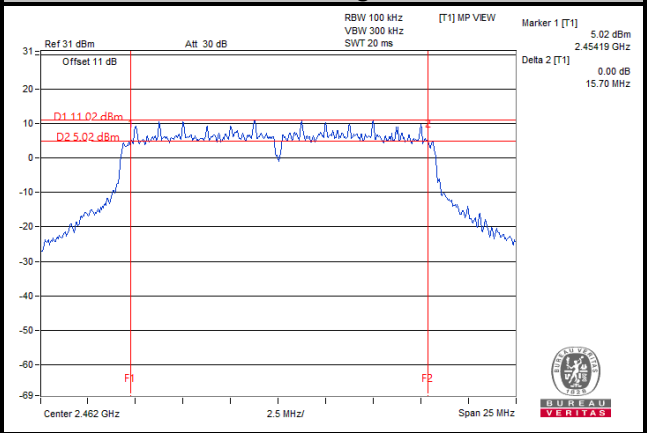
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	37.56	37.71	0.5	Pass
6	2437	37.87	37.67	0.5	Pass
9	2452	38.00	37.62	0.5	Pass

Spectrum Plot of Worst Value

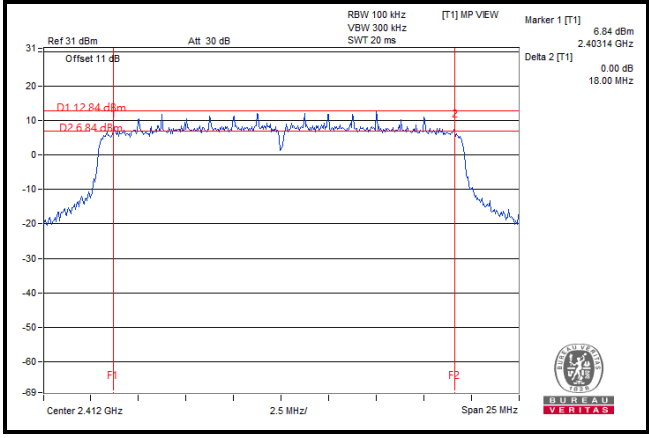
802.11b



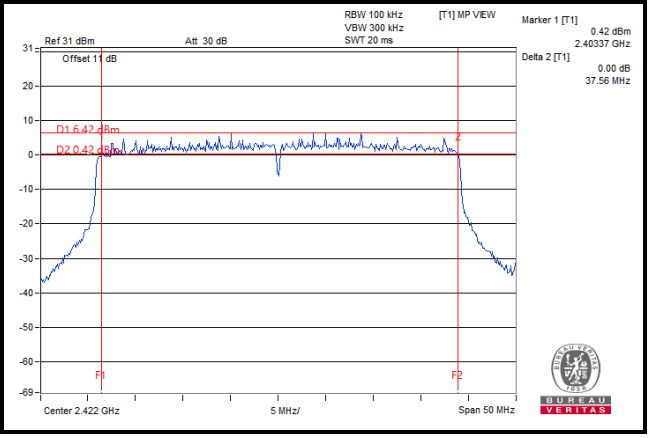
802.11g



802.11ax (HE20)

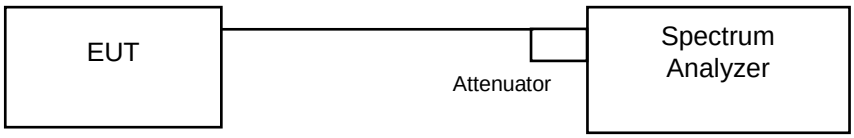


802.11ax (HE40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

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

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.70	14.26	Pass
6	2437	15.05	16.68	Pass
11	2462	15.00	13.68	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.86	16.52	Pass
6	2437	17.04	16.92	Pass
11	2462	16.56	16.56	Pass

802.11ax (HE20)

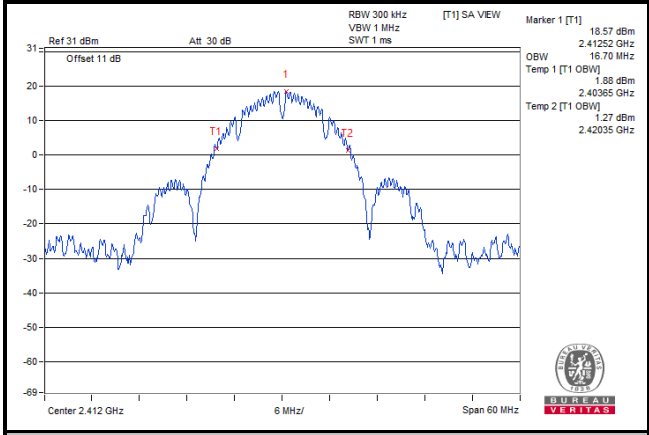
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	18.96	19.08	Pass
6	2437	19.32	19.32	Pass
11	2462	19.05	18.96	Pass

802.11ax (HE40)

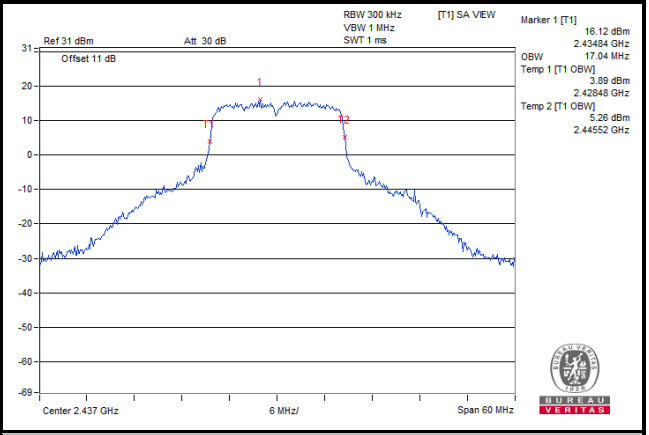
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	37.92	38.04	Pass
6	2437	38.04	38.04	Pass
9	2452	38.04	38.04	Pass

Spectrum Plot of Worst Value

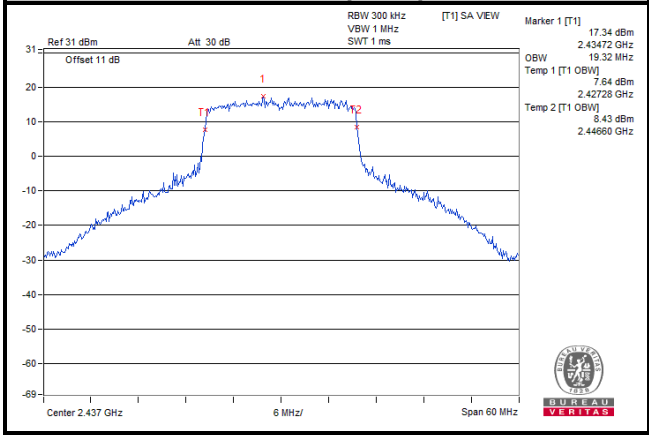
802.11b



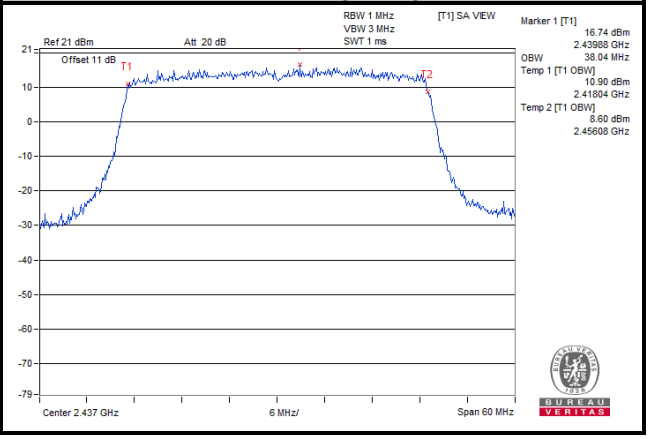
802.11g



802.11ax (HE20)



802.11ax (HE40)



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

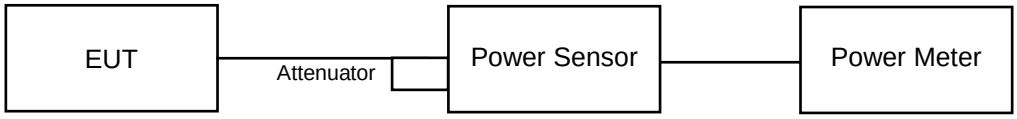
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20 MHz channel widths with NANT ≥ 5.

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

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	24.54	23.86	527.667	27.22	30	Pass
6	2437	26.27	26.10	831.023	29.20	30	Pass
11	2462	23.85	23.79	481.993	26.83	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	23.38	23.20	426.701	26.30	30	Pass
6	2437	24.38	24.12	532.383	27.26	30	Pass
11	2462	21.65	21.61	291.095	24.64	30	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	23.00	22.59	381.078	25.81	30	Pass
6	2437	24.31	23.97	519.233	27.15	30	Pass
11	2462	20.30	20.11	209.717	23.22	30	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	20.23	20.00	205.439	23.13	30	Pass
6	2437	20.31	20.21	212.353	23.27	30	Pass
9	2452	17.14	16.96	101.42	20.06	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	22.97	22.56	378.454	25.78	30	Pass
6	2437	24.28	23.94	515.659	27.12	30	Pass
11	2462	20.27	20.06	207.805	23.18	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	20.20	19.97	204.024	23.10	30	Pass
6	2437	20.27	20.18	210.646	23.24	30	Pass
9	2452	17.11	16.93	100.722	20.03	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	23.04	22.63	384.604	25.85	30	Pass
6	2437	24.33	24.01	522.787	27.18	30	Pass
11	2462	20.34	20.16	211.896	23.26	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	20.27	20.02	206.876	23.16	30	Pass
6	2437	20.34	20.25	214.069	23.31	30	Pass
9	2452	17.16	16.97	101.773	20.08	30	Pass

Beamforming Mode

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	19.99	19.58	190.552	22.80	29.84	Pass
6	2437	21.30	20.96	259.635	24.14	29.84	Pass
11	2462	17.29	17.10	104.866	20.21	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 > 6 dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 dBm.

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	17.22	16.99	102.726	20.12	29.84	Pass
6	2437	17.30	17.20	106.184	20.26	29.84	Pass
9	2452	14.13	13.95	50.713	17.05	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 > 6 dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 dBm.

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	19.96	19.55	189.24	22.77	29.84	Pass
6	2437	21.27	20.93	257.847	24.11	29.84	Pass
11	2462	17.26	17.05	103.91	20.17	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 > 6 dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 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	17.19	16.96	102.019	20.09	29.84	Pass
6	2437	17.26	17.17	105.33	20.23	29.84	Pass
9	2452	14.10	13.92	50.364	17.02	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 > 6 dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 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	20.04	19.63	192.759	22.85	29.84	Pass
6	2437	21.33	21.01	262.014	24.18	29.84	Pass
11	2462	17.34	17.16	106.2	20.26	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}] = 6.16 > 6$ dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 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	17.27	17.02	103.684	20.16	29.84	Pass
6	2437	17.34	17.25	107.289	20.31	29.84	Pass
9	2452	14.16	13.97	51.007	17.08	29.84	Pass

Note: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}] = 6.16 > 6$ dBi, so the power density limit shall be reduced to 30-(6.16-6) = 29.84 dBm.

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

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

4.6.2 Test Setup

4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

For Average Power (Duty cycle ≥ 98%)

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

For Average Power (Duty cycle < 98%)

a. Measure the duty cycle (x).
b. Set instrument center frequency to DTS channel center frequency.
c. Set span to at least 1.5 times the OBW.
d. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e. Set VBW ≥3 x RBW.
f. Detector = power averaging (RMS) or sample detector (when RMS not available).
g. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h. Sweep time = auto couple.
i. Do not use sweep triggering. Allow sweep to “free run”.
j. Employ trace averaging (RMS) mode over a minimum of 100 traces.
k. Use the peak marker function to determine the maximum amplitude level.
l. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

802.11b

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-9.95	3.01	2.5	-4.44	7.84	Pass
	6	2437	-11.69	3.01	2.5	-6.18	7.84	Pass
	11	2462	-12.87	3.01	2.5	-7.36	7.84	Pass
1	1	2412	-12.75	3.01	2.5	-7.24	7.84	Pass
	6	2437	-11.54	3.01	2.5	-6.03	7.84	Pass
	11	2462	-13.42	3.01	2.5	-7.91	7.84	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 dBi > 6 dBi, so the power density limit shall be reduced to 8-(6.16-6) = 7.84 dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-12.58	3.01	0.31	-9.26	7.84	Pass
	6	2437	-12.1	3.01	0.31	-8.78	7.84	Pass
	11	2462	-14.84	3.01	0.31	-11.52	7.84	Pass
1	1	2412	-13.3	3.01	0.31	-9.98	7.84	Pass
	6	2437	-11.94	3.01	0.31	-8.62	7.84	Pass
	11	2462	-14.55	3.01	0.31	-11.23	7.84	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 dBi > 6 dBi, so the power density limit shall be reduced to 8-(6.16-6) = 7.84 dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-15.72	3.01	0.22	-12.49	7.84	Pass
	6	2437	-14.06	3.01	0.22	-10.83	7.84	Pass
	11	2462	-17.93	3.01	0.22	-14.7	7.84	Pass
1	1	2412	-15.7	3.01	0.22	-12.47	7.84	Pass
	6	2437	-14.5	3.01	0.22	-11.27	7.84	Pass
	11	2462	-18.14	3.01	0.22	-14.91	7.84	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 dBi > 6 dBi, so the power density limit shall be reduced to 8-(6.16-6) = 7.84 dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

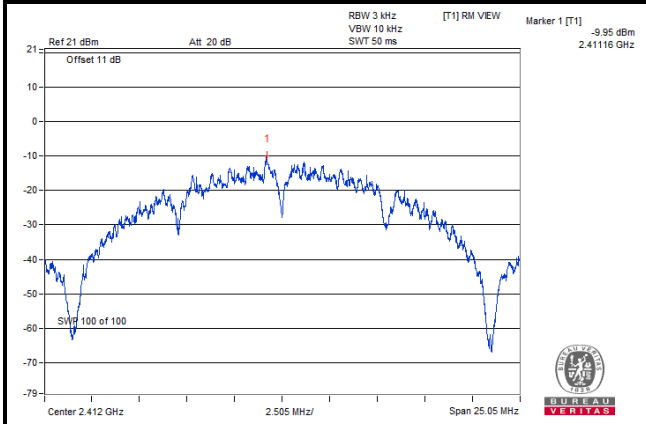
TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-20.57	3.01	0.34	-17.22	7.84	Pass
	6	2437	-21.23	3.01	0.34	-17.88	7.84	Pass
	9	2452	-23.85	3.01	0.34	-20.5	7.84	Pass
1	3	2422	-21.3	3.01	0.34	-17.95	7.84	Pass
	6	2437	-21.45	3.01	0.34	-18.1	7.84	Pass
	9	2452	-24.31	3.01	0.34	-20.96	7.84	Pass

NOTE:

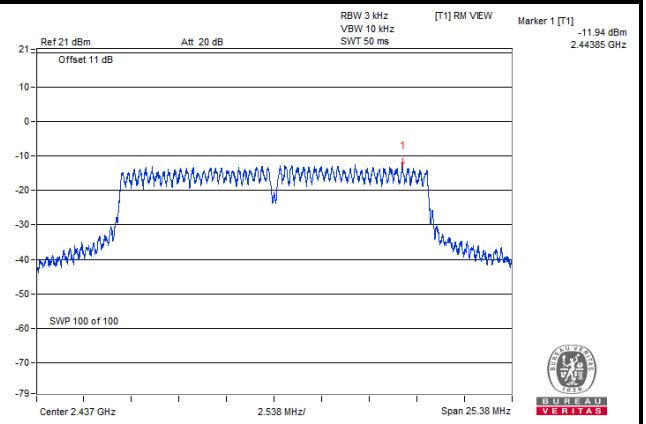
1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = 6.16 dBi > 6 dBi, so the power density limit shall be reduced to 8-(6.16-6) = 7.84 dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

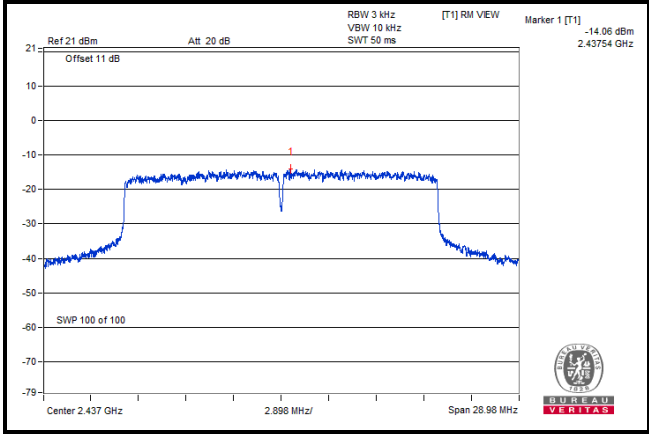
802.11b



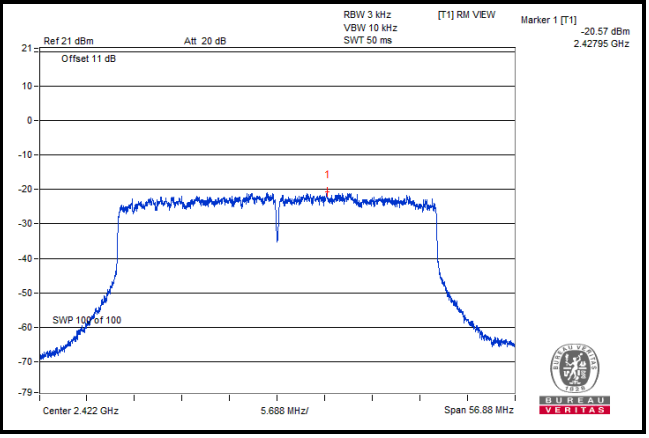
802.11g



802.11ax (HE20)



802.11ax (HE40)

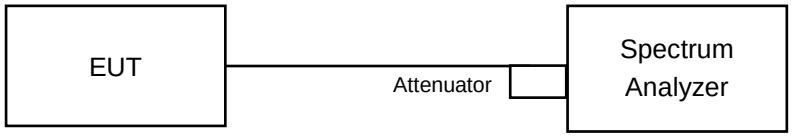


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

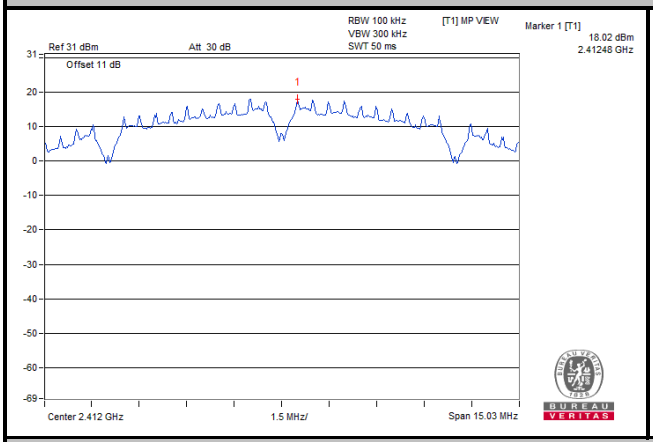
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

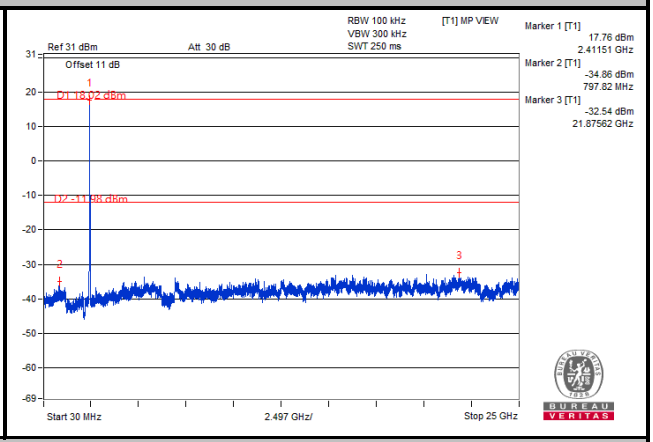
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

802.11b

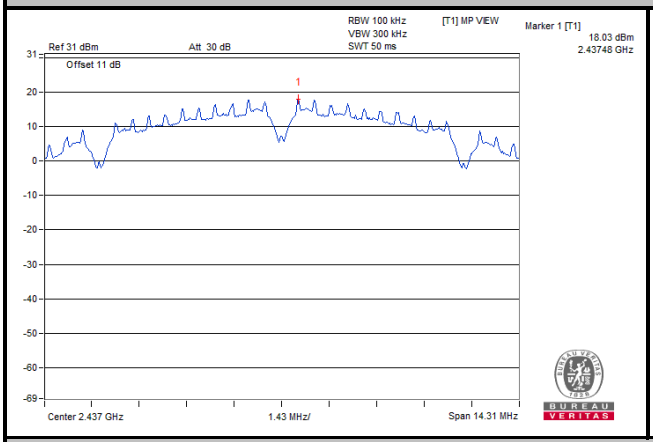
CHAIN 0

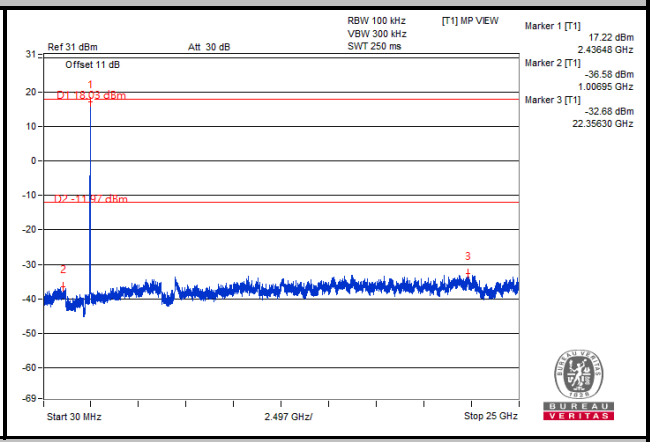
Ch 1



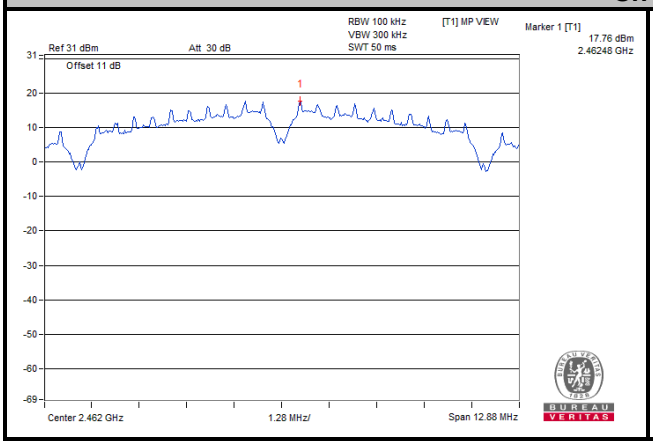


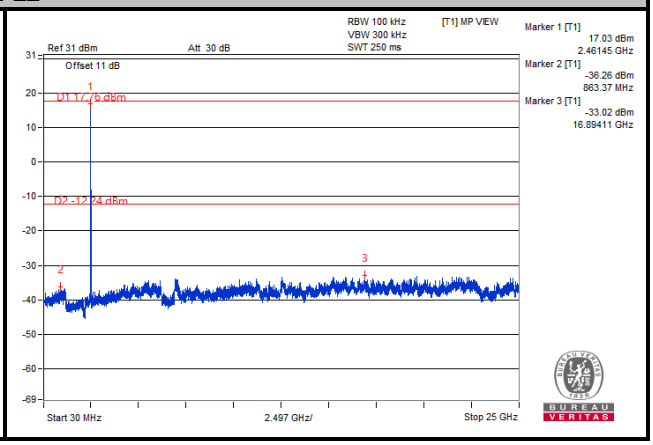
Ch 6

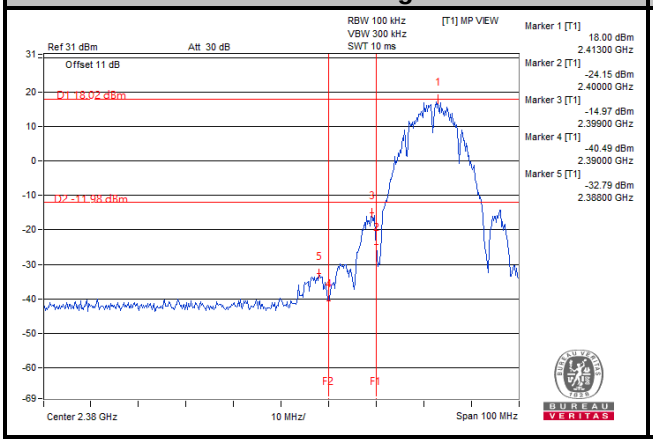
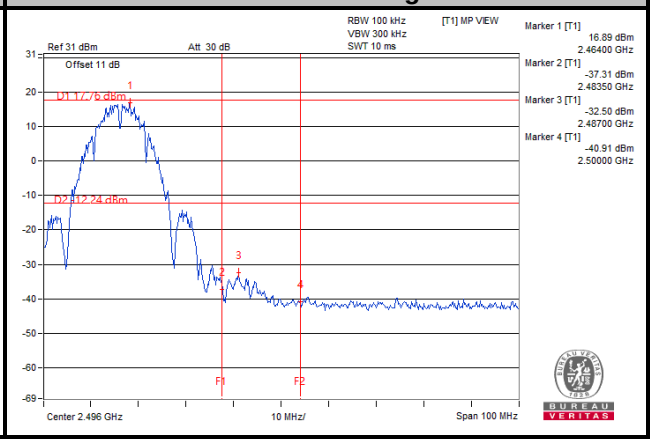




Ch 11

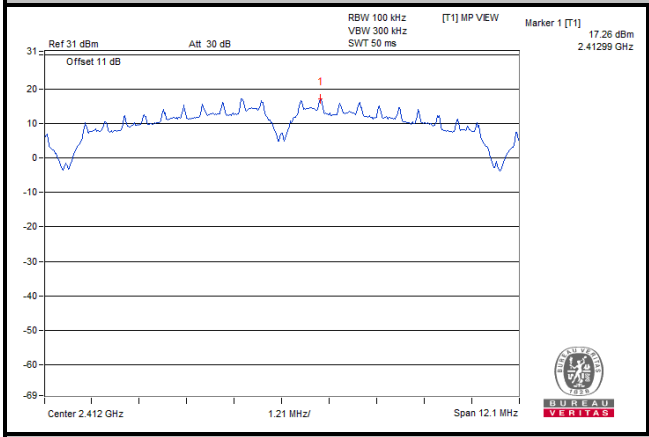


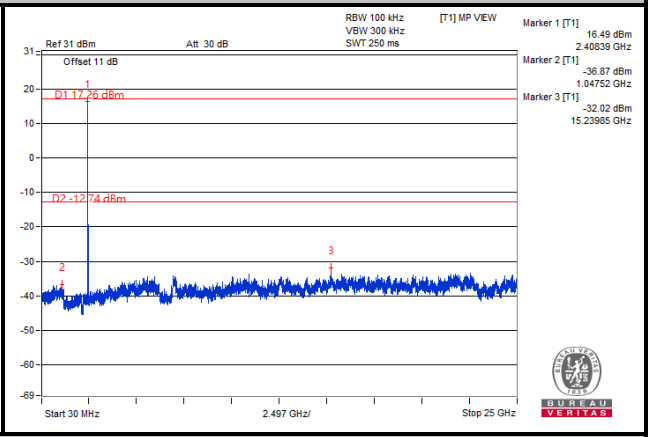


Ch 1 Band Edge	Ch 11 Band Edge
	

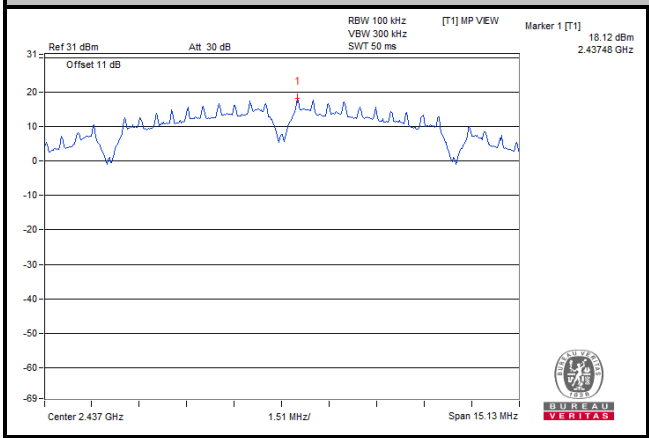
CHAIN 1

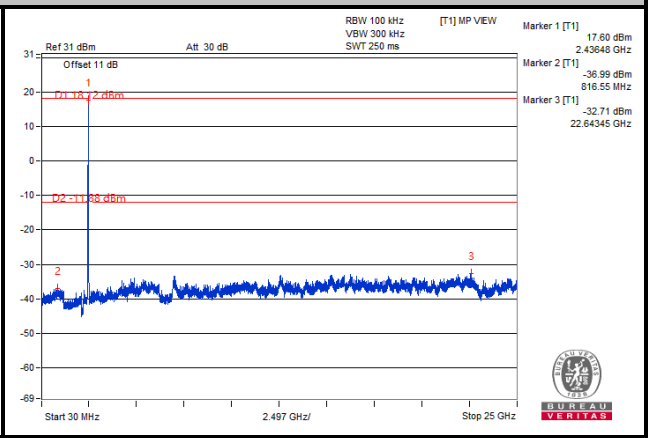
Ch 1



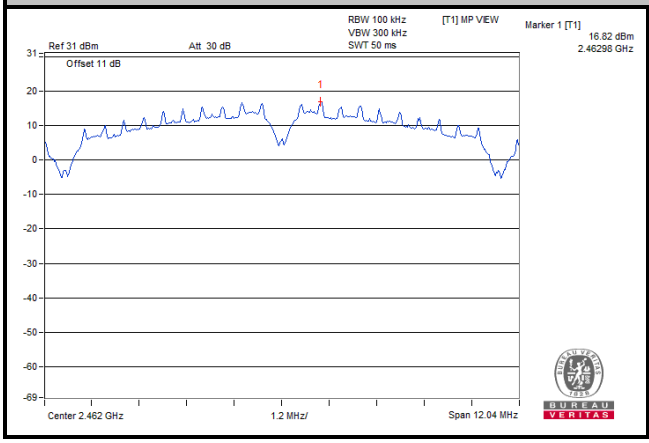


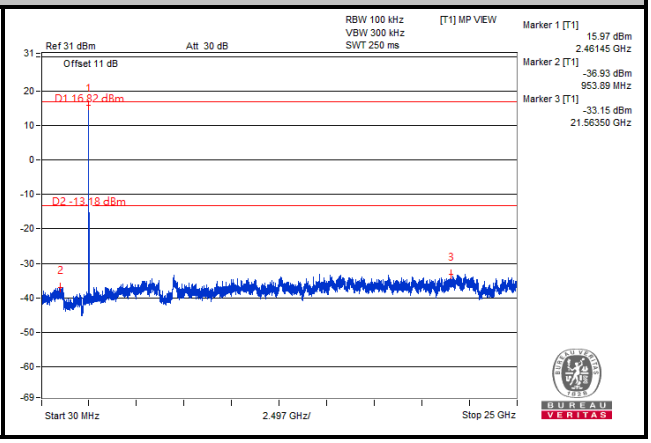
Ch 6

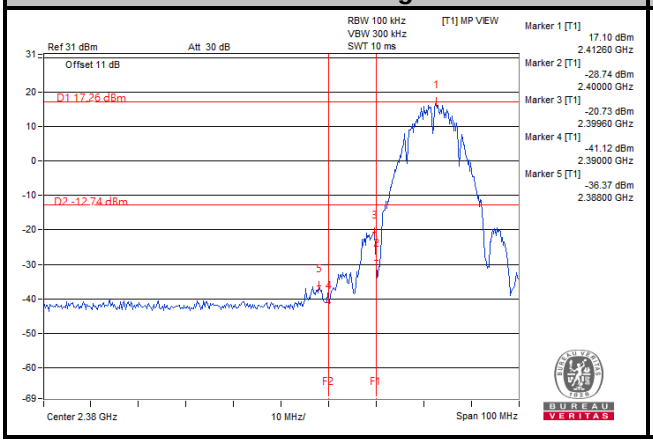
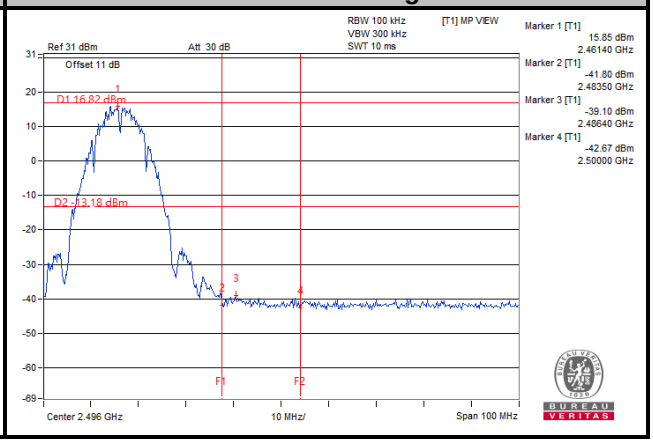




Ch 11



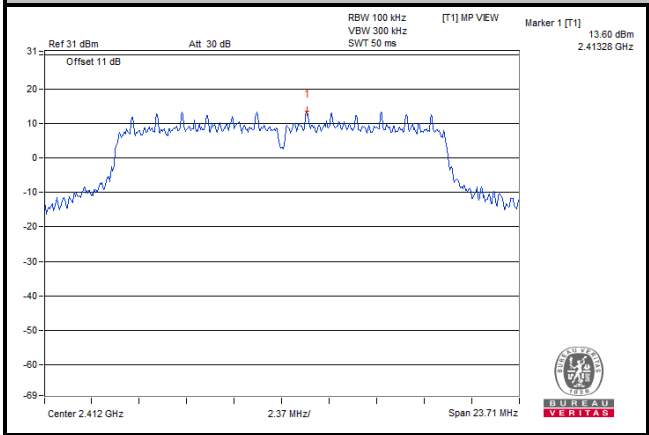


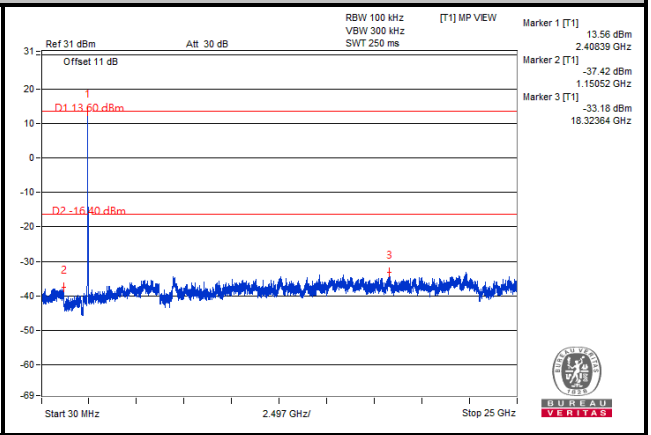
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11g

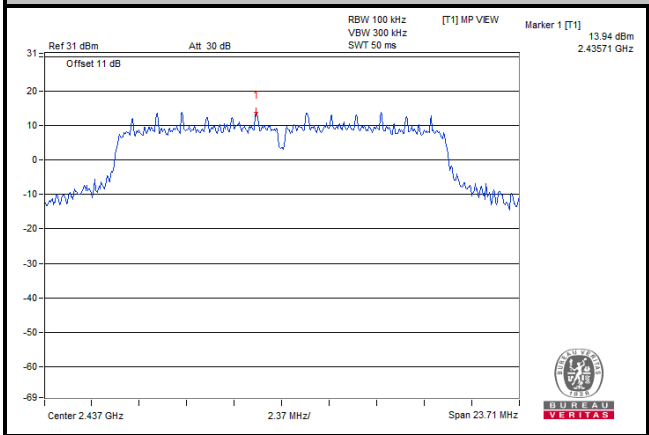
CHAIN 0

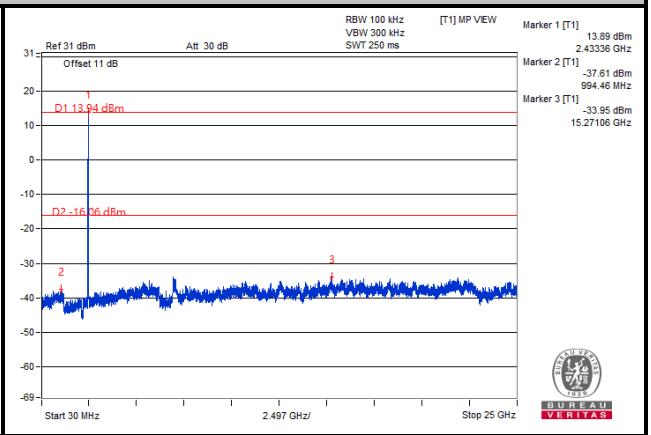
Ch 1



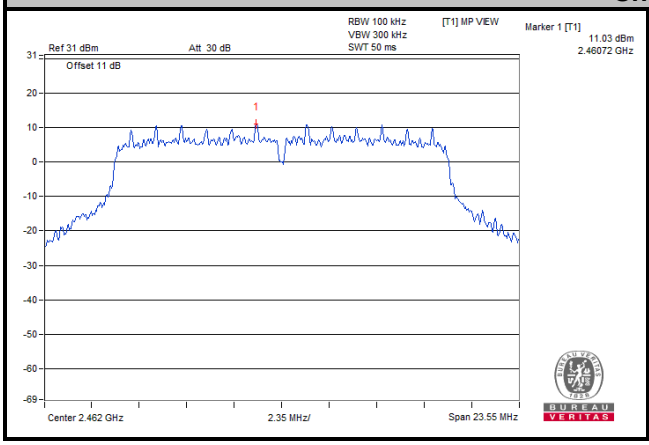


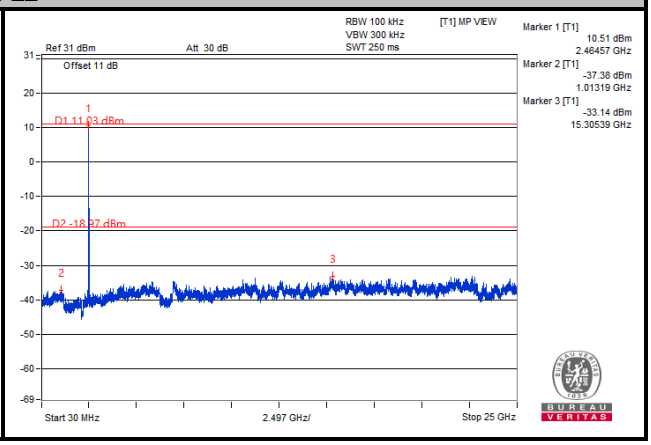
Ch 6

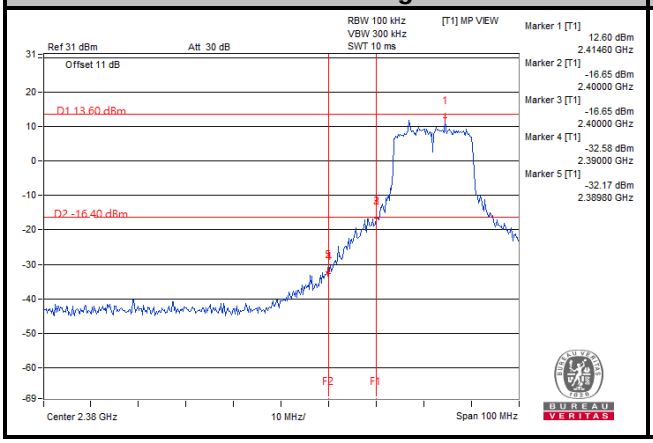
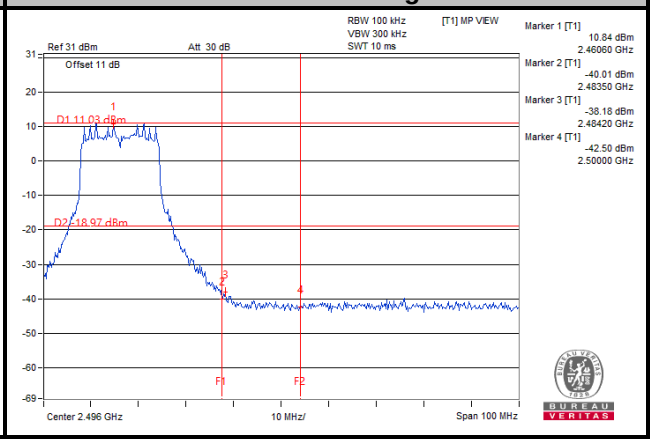




Ch 11

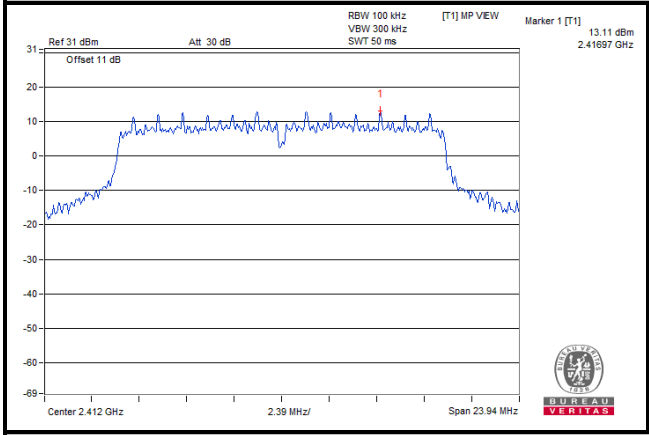


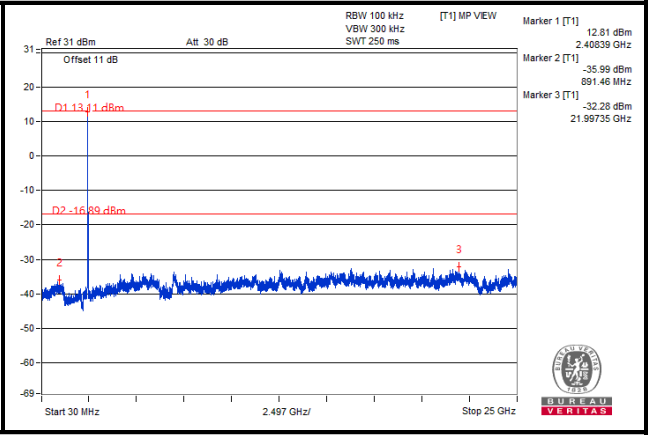


Ch 1 Band Edge	Ch 11 Band Edge
	

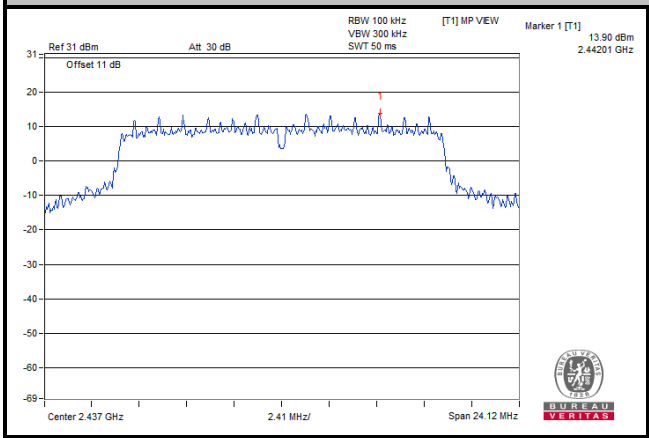
CHAIN 1

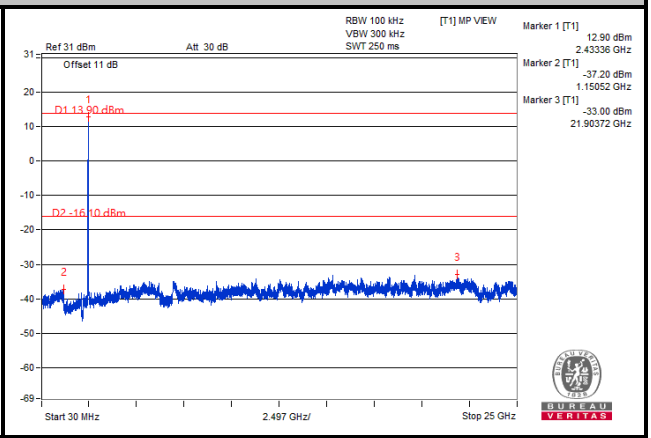
Ch 1



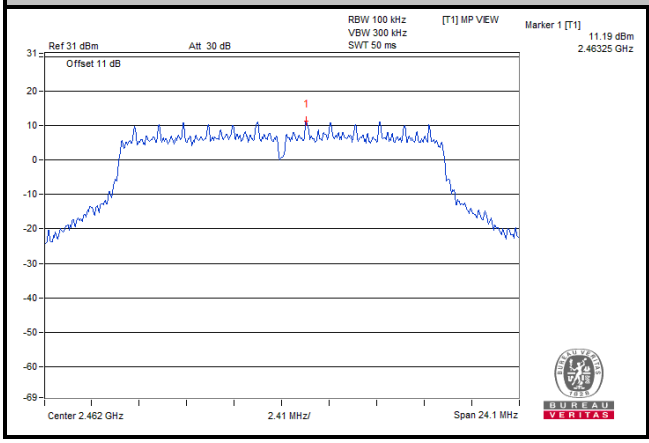


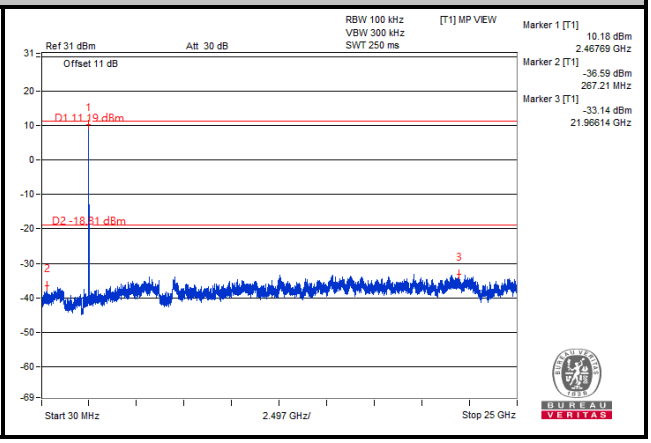
Ch 6

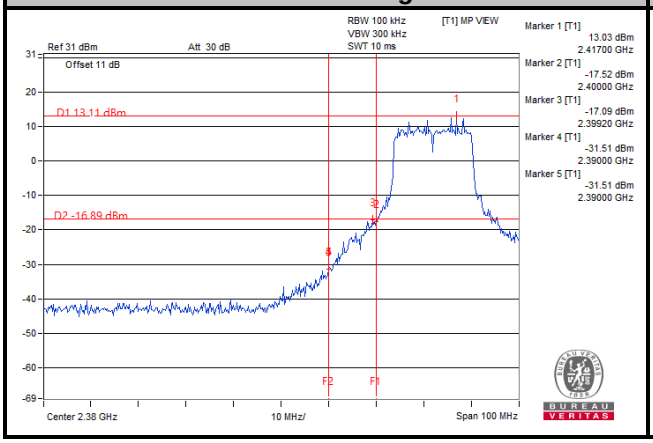
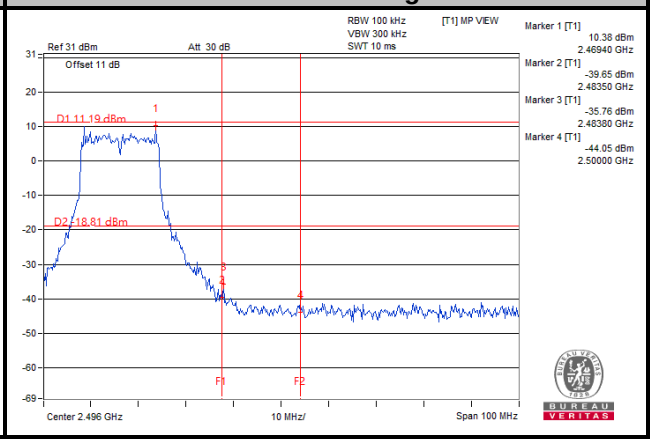




Ch 11



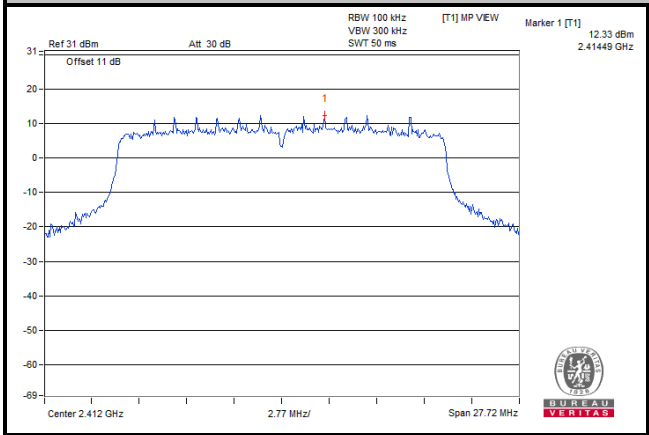


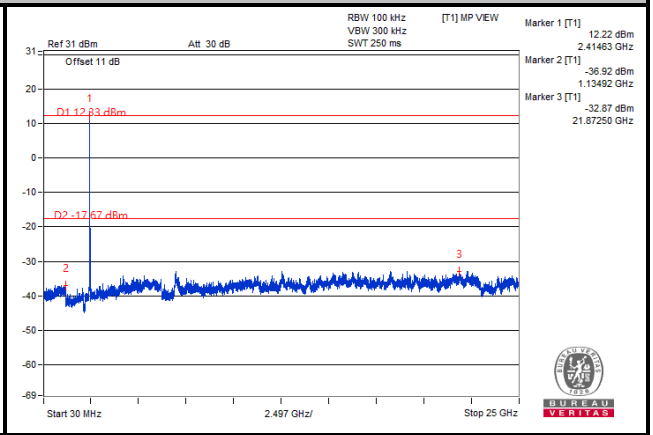
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11ax (HE20)

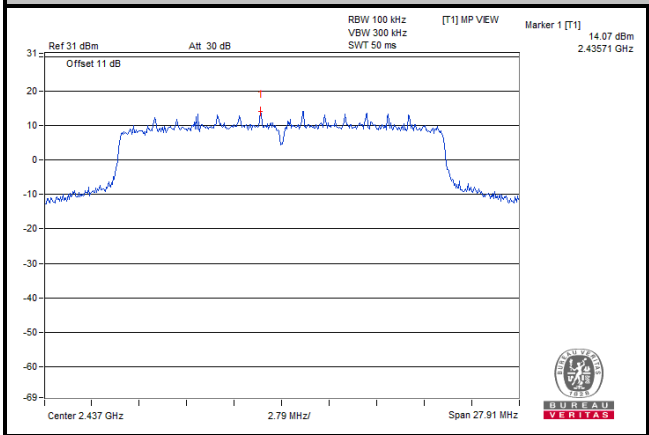
CHAIN 0

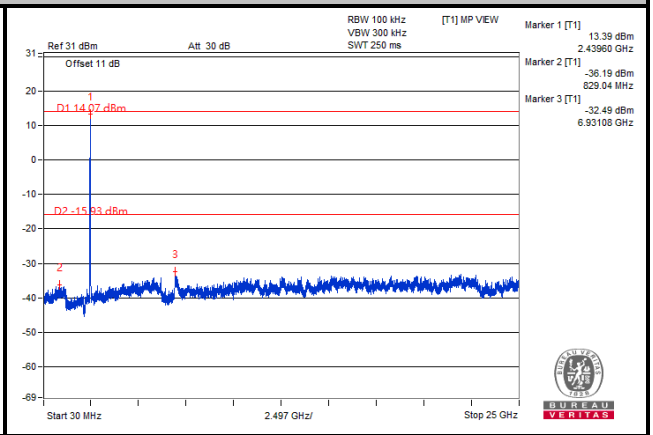
Ch 1



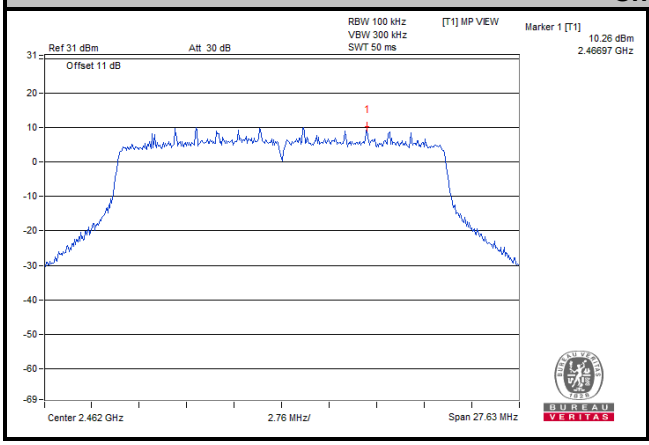


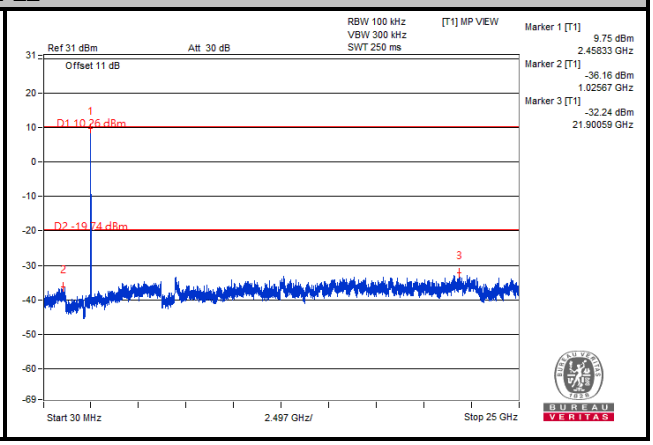
Ch 6

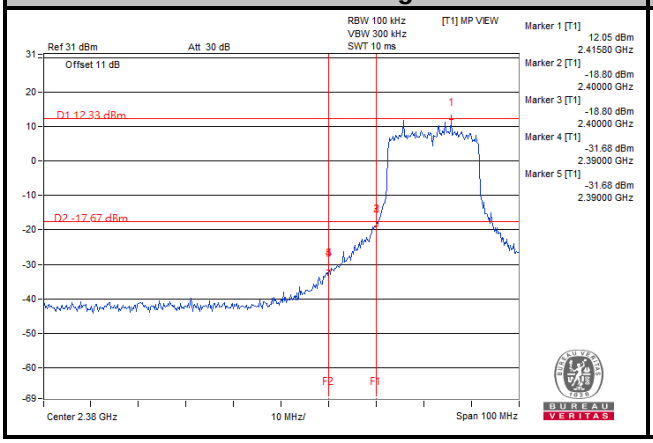
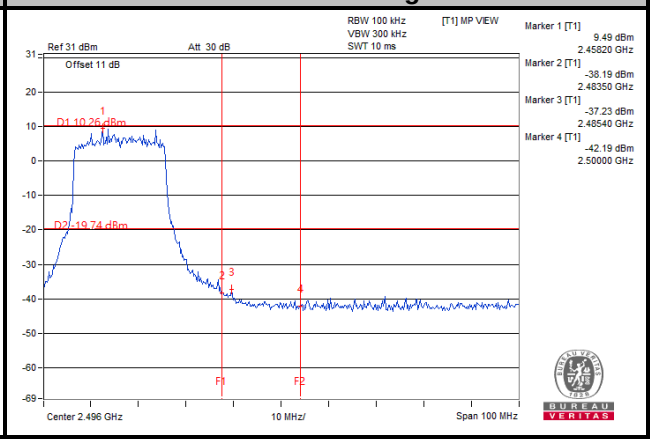




Ch 11

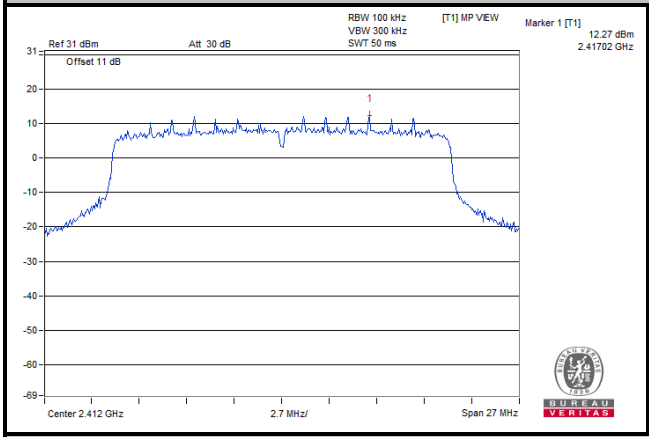


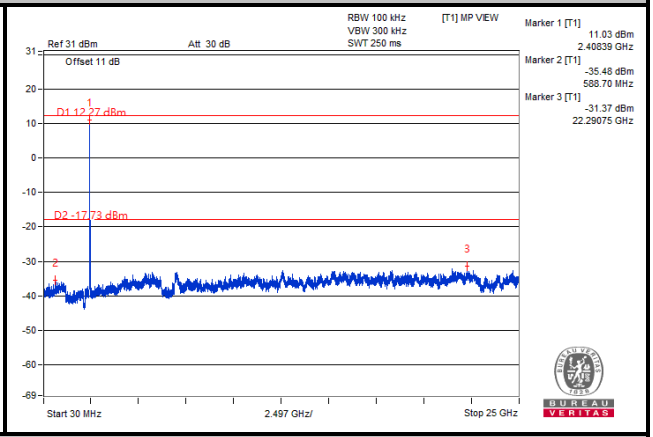


Ch 1 Band Edge	Ch 11 Band Edge
	

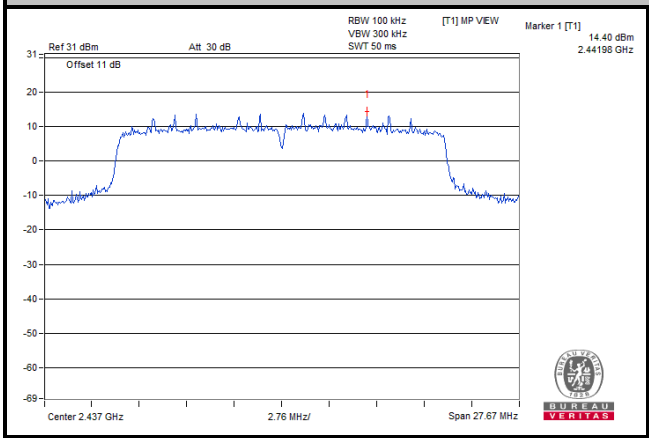
CHAIN 1

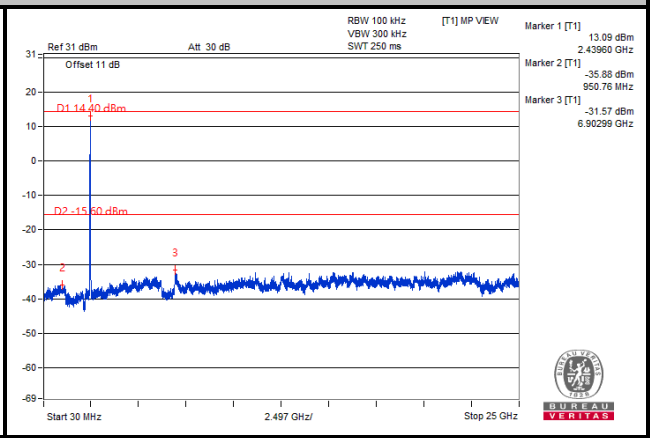
Ch 1



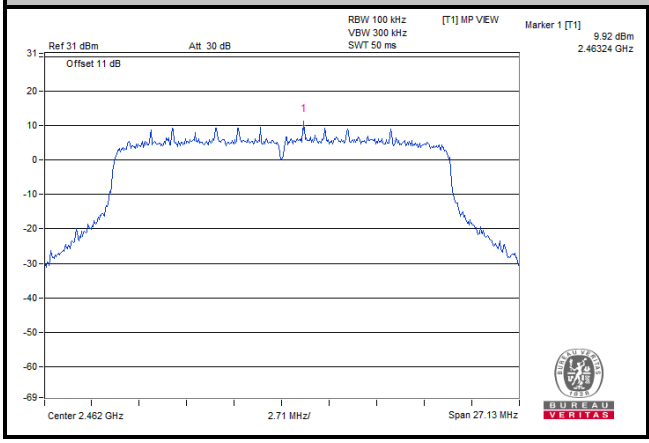


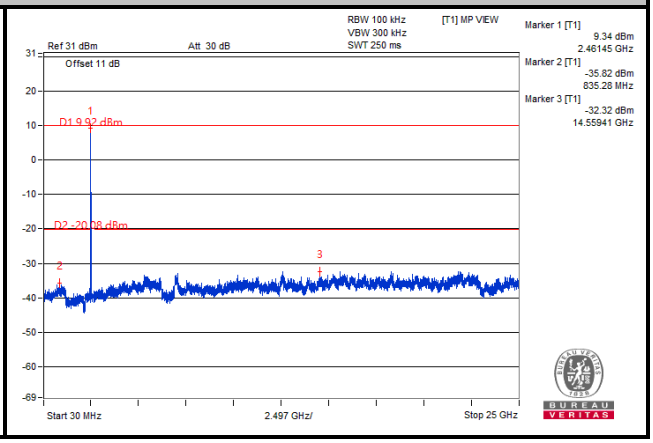
Ch 6

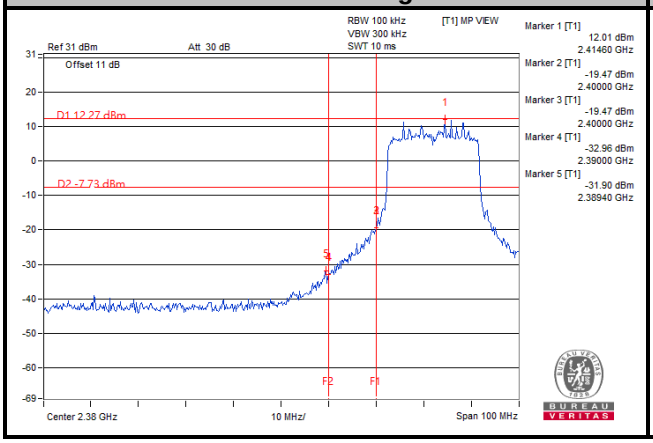
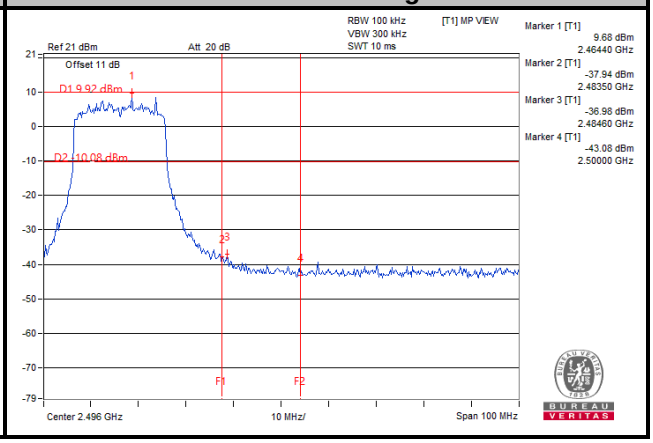




Ch 11



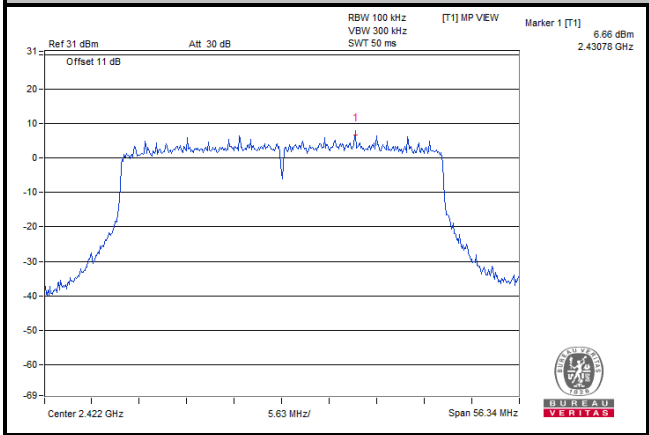


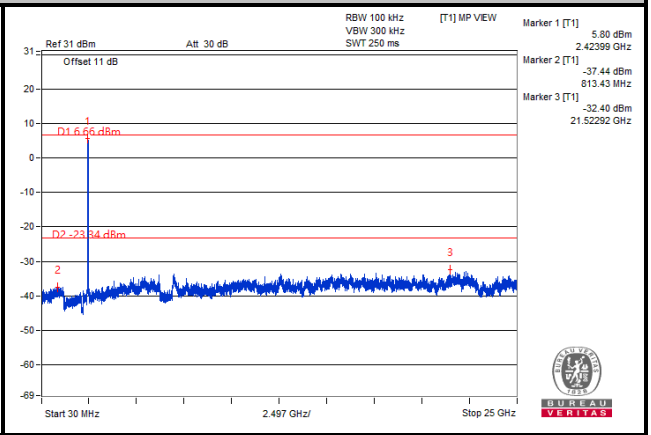
Ch 1 Band Edge	Ch 11 Band Edge
	

802.11ax (HE40)

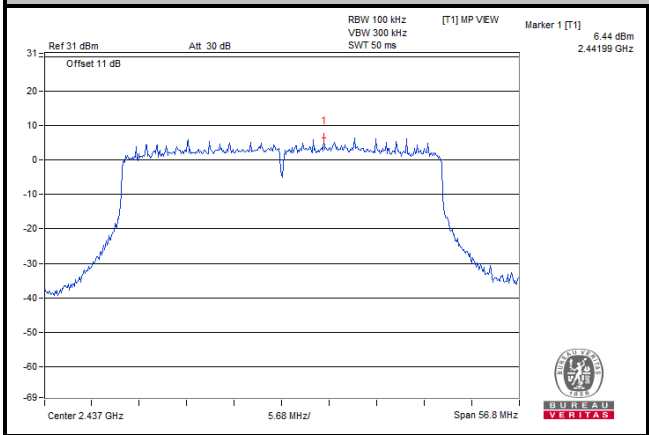
CHAIN 0

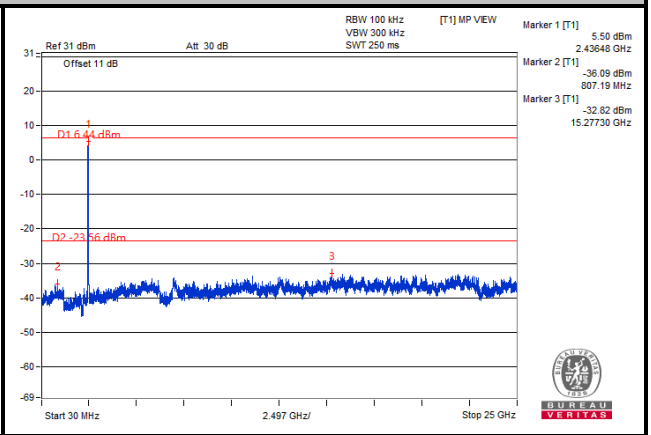
Ch 3



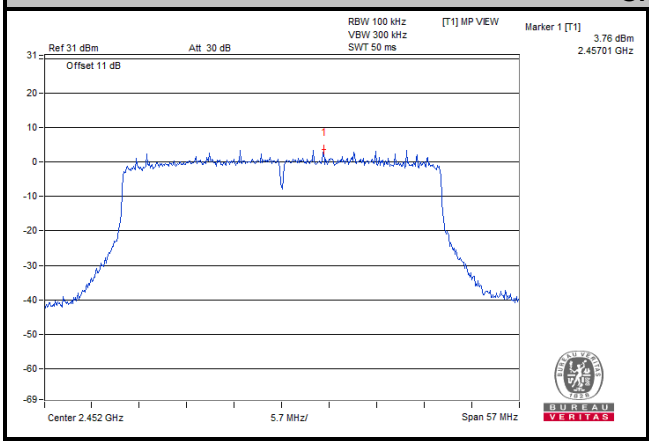


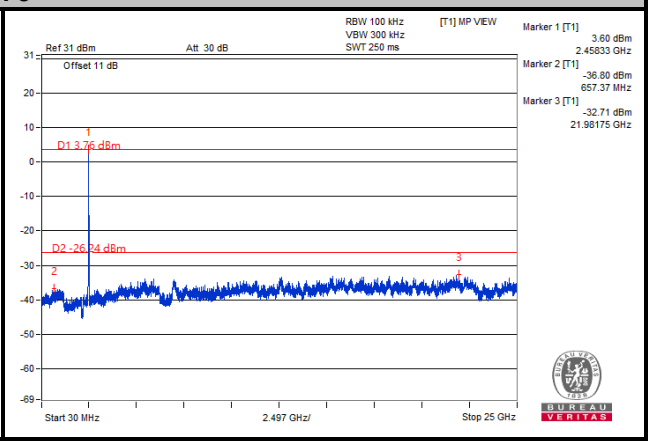
Ch 6

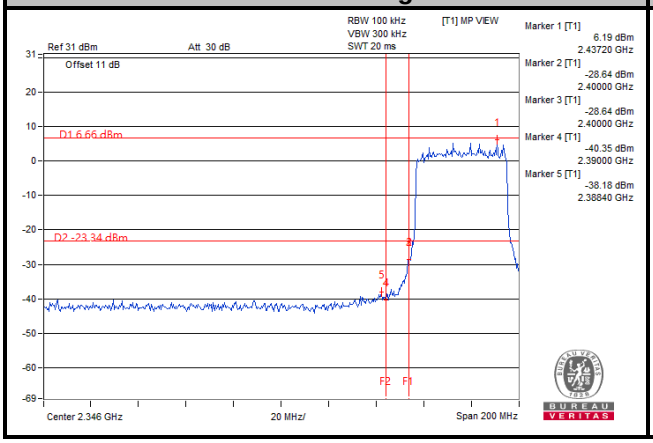
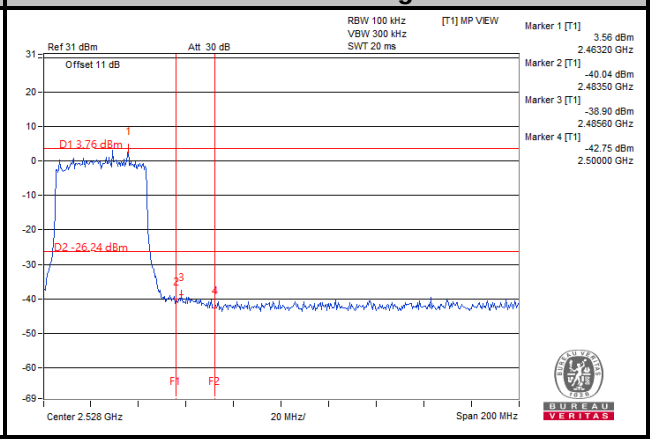




Ch 9

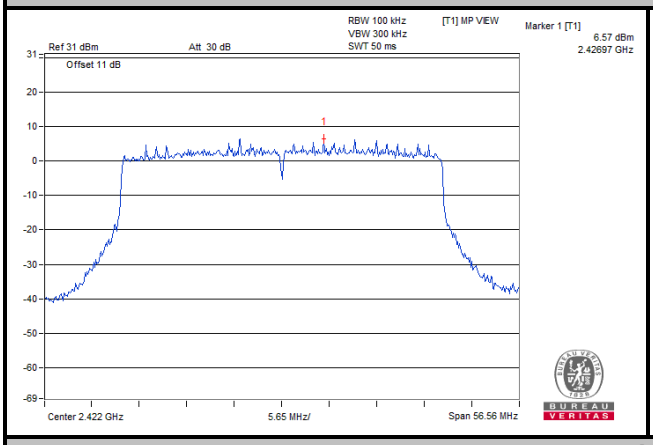


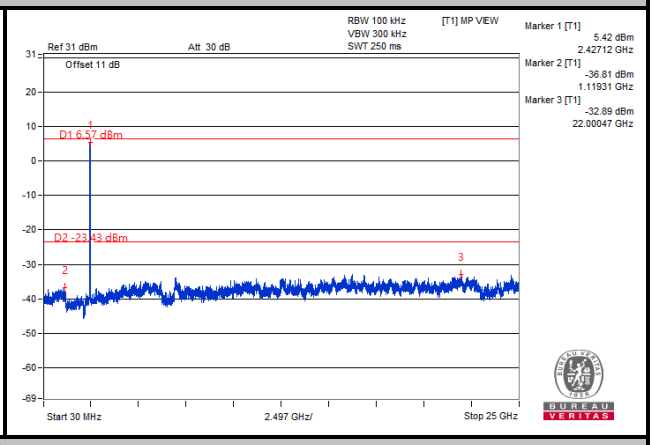


Ch 3 Band Edge	Ch 9 Band Edge
	

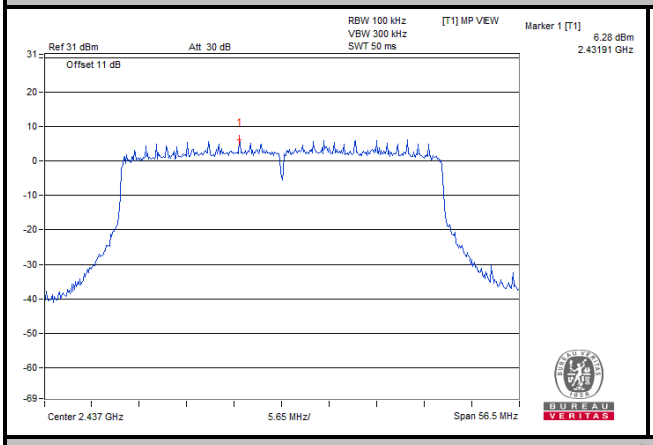
CHAIN 1

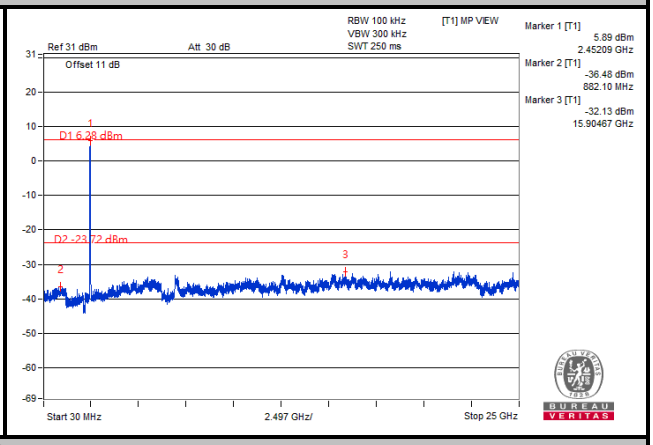
Ch 3



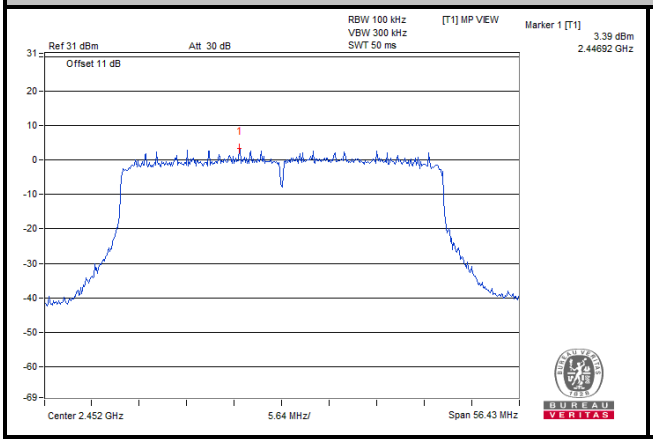


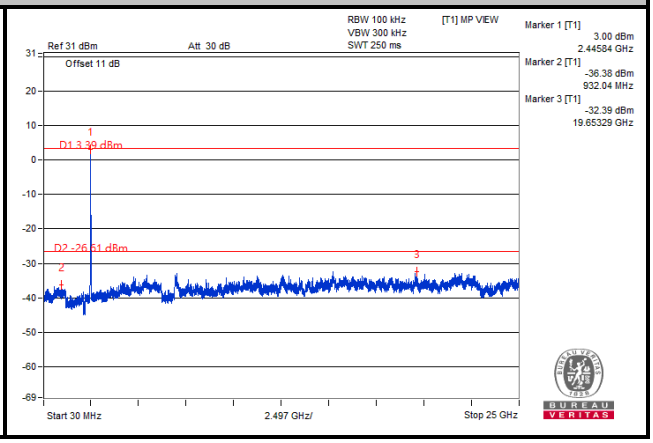
Ch 6

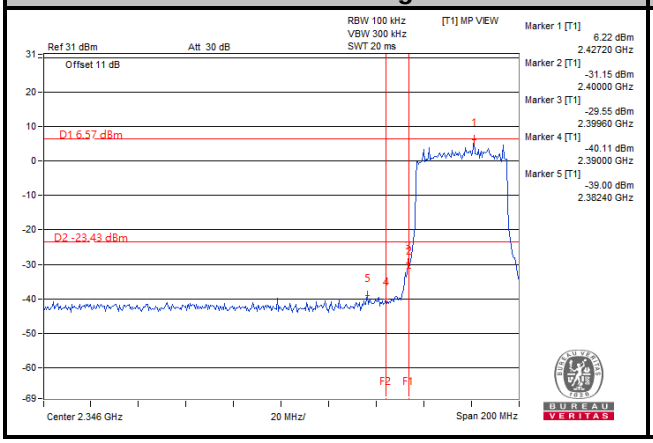
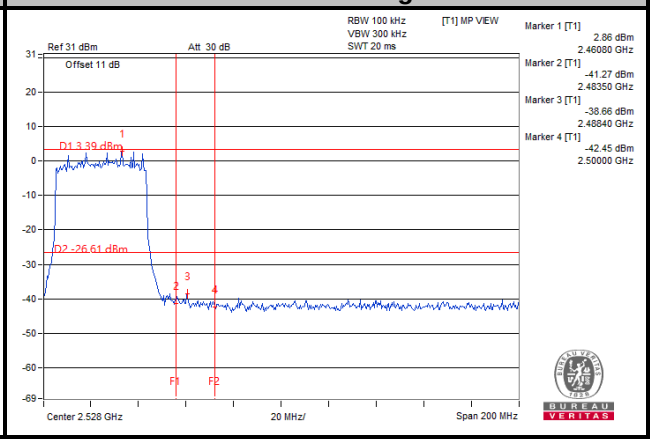




Ch 9





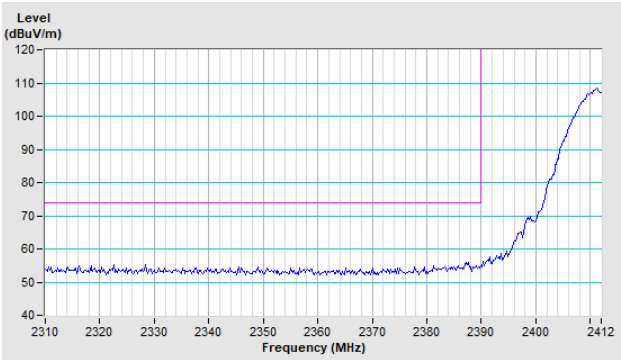
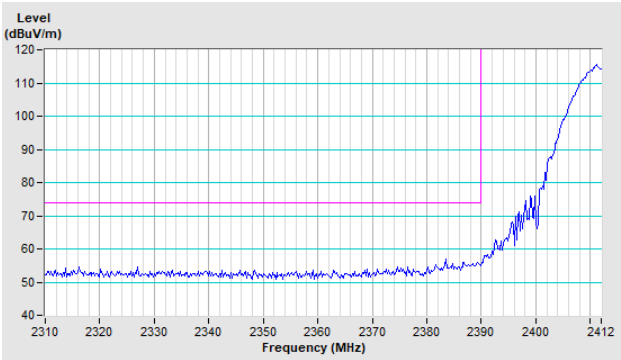
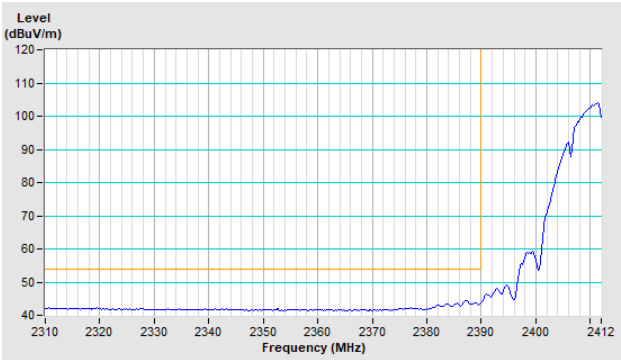
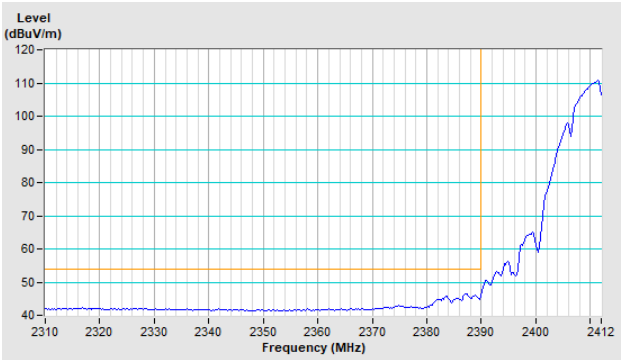
Ch 3 Band Edge	Ch 9 Band Edge
	

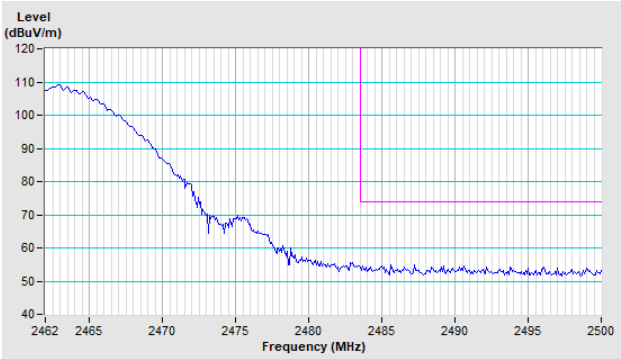
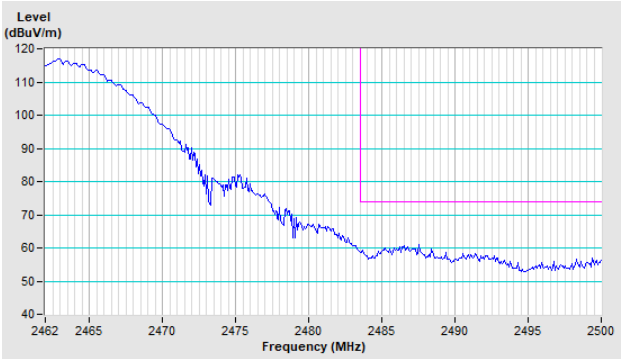
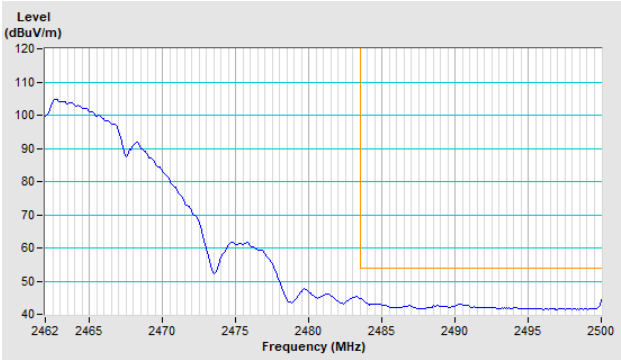
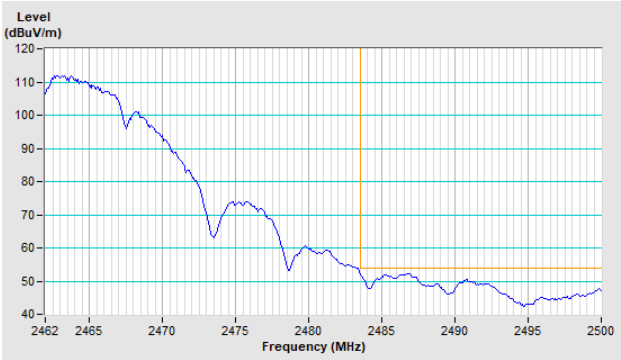
5 Pictures of Test Arrangements

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

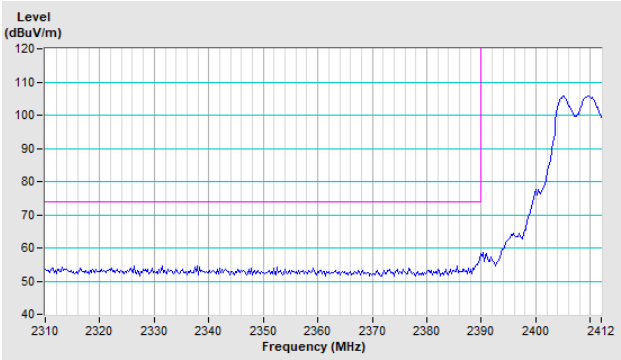
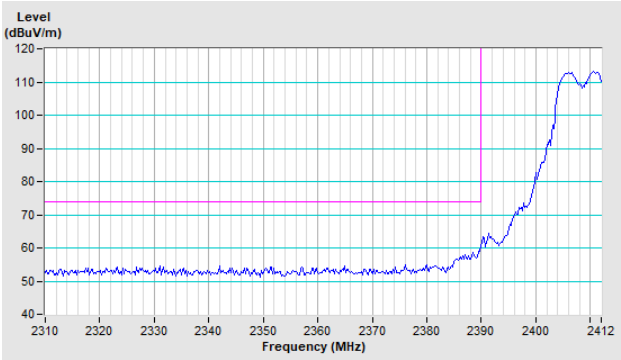
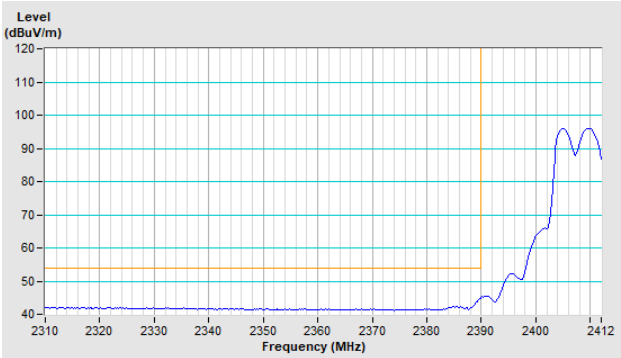
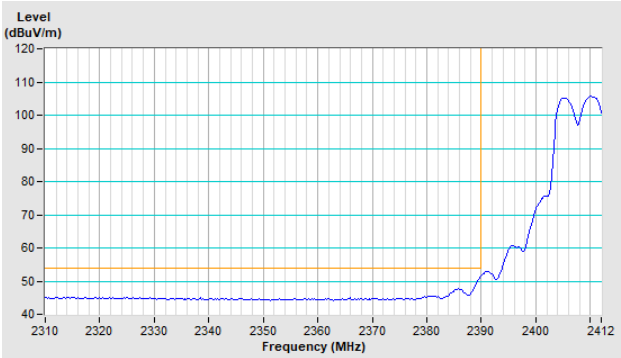
Annex A- Band Edge Measurement

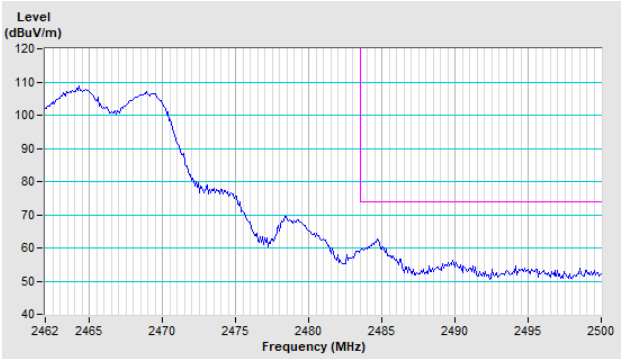
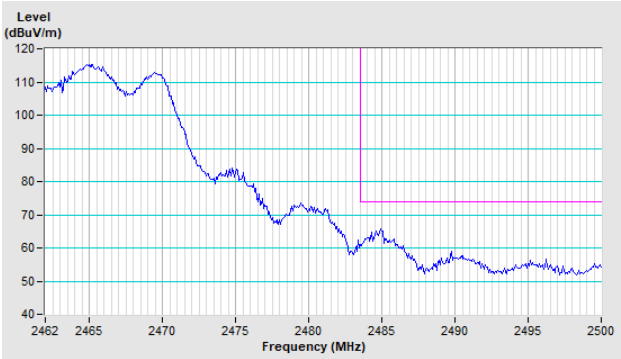
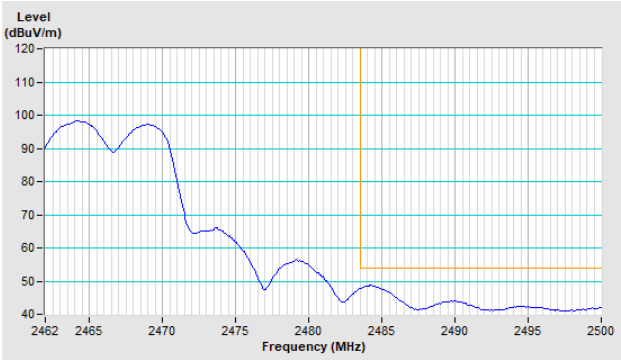
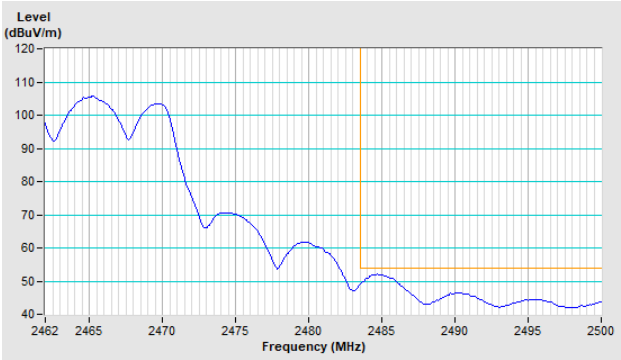
802.11b

CH 1 2412 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

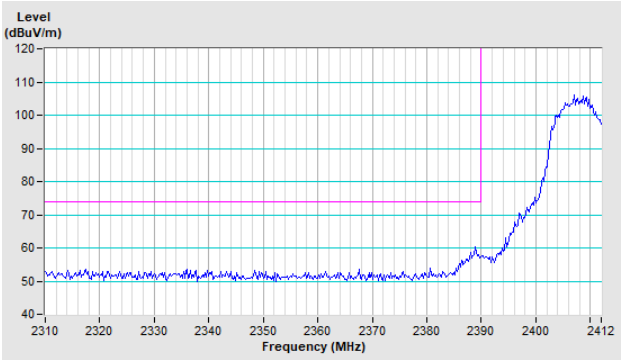
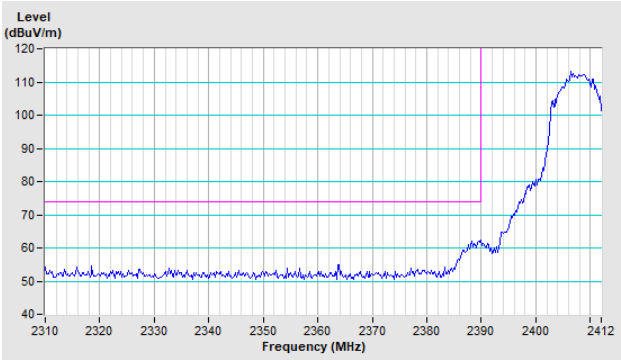
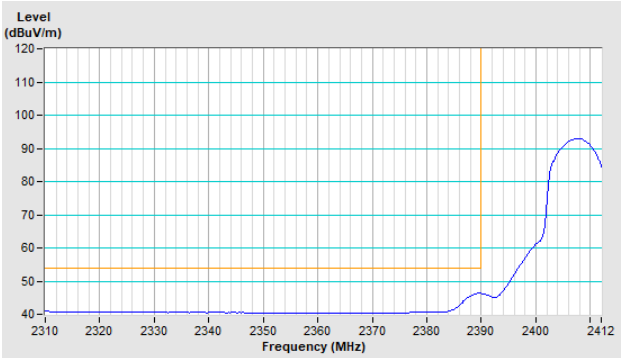
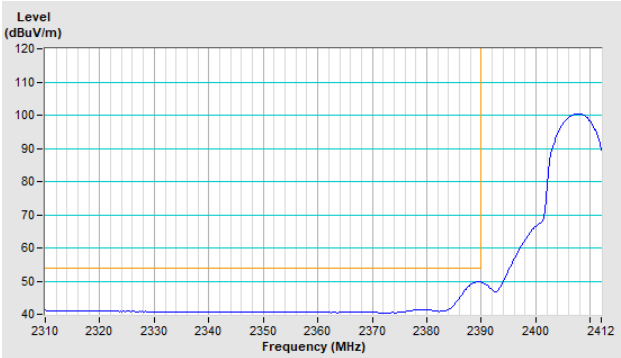
CH 11 2462 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

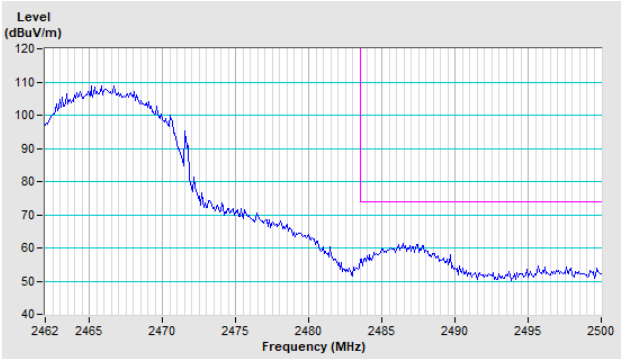
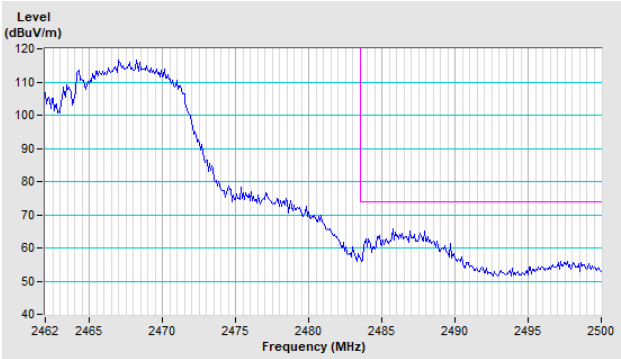
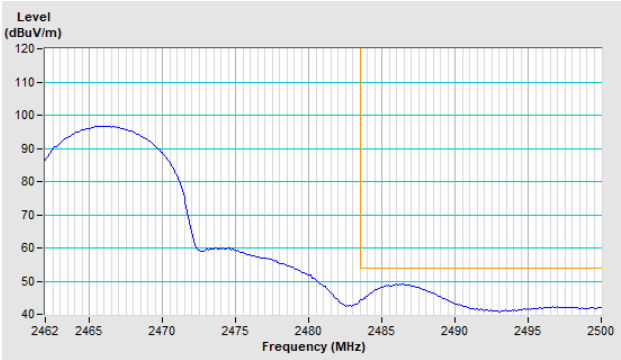
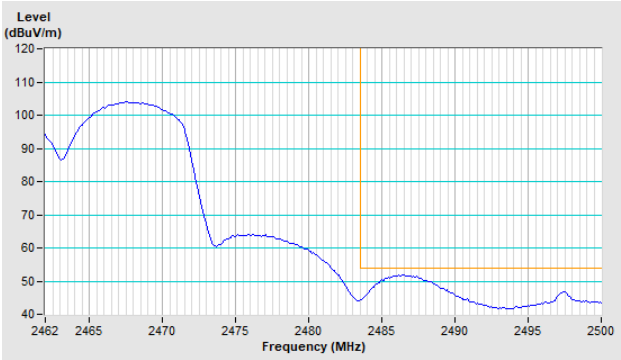
802.11g

CH 1 2412 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

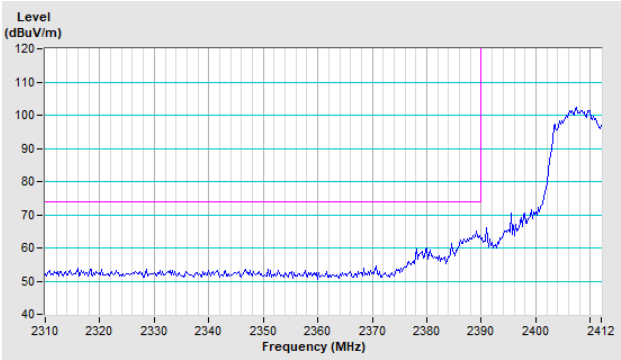
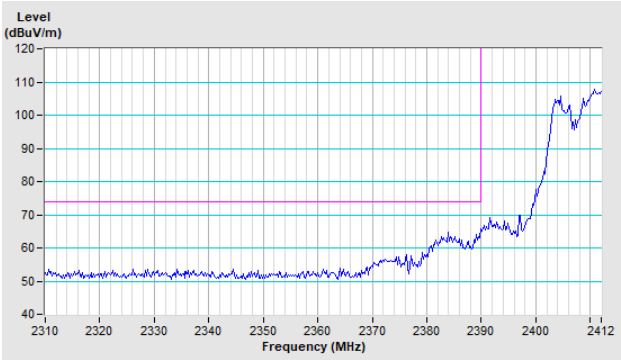
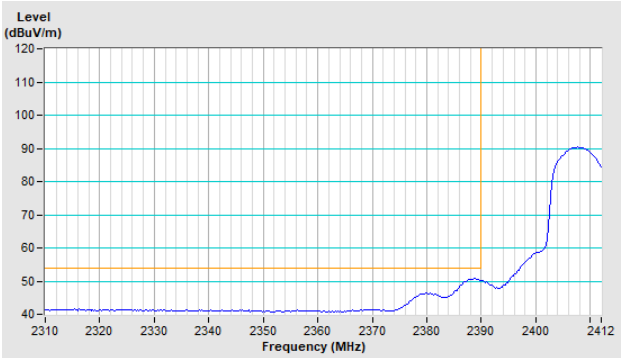
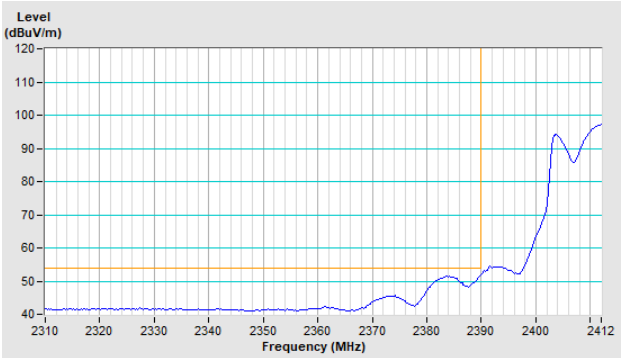
CH 11 2462 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

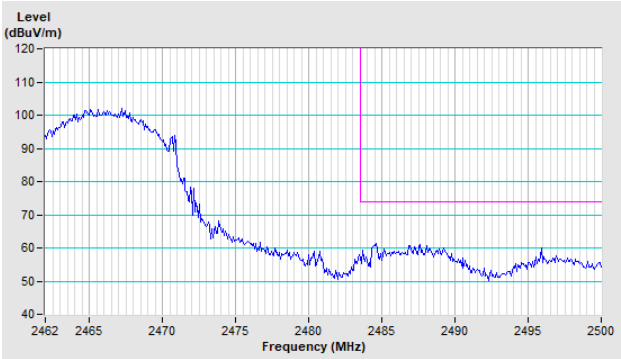
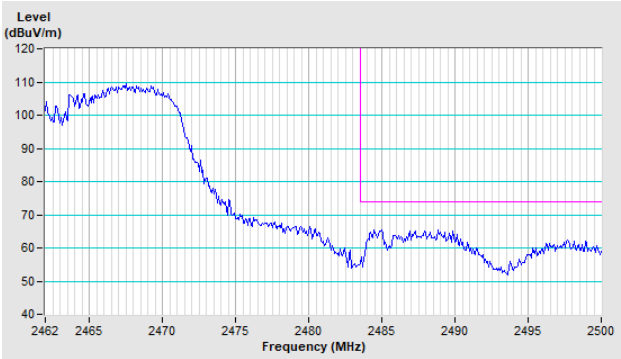
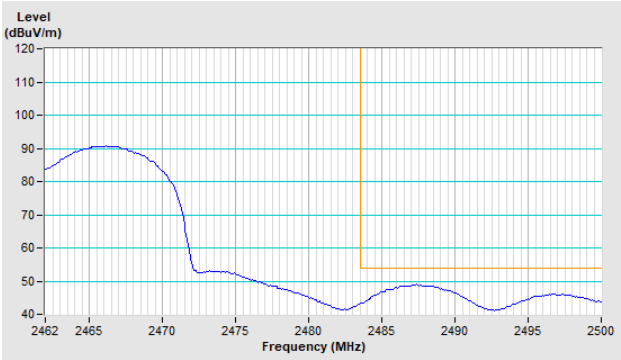
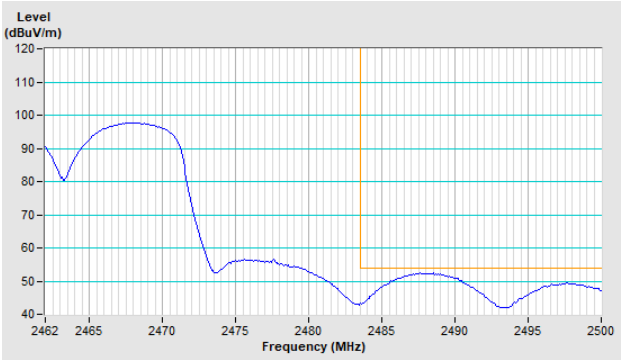
802.11ax (HE20)

CH 1 2412 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

CH 11 2462 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

802.11ax (HE40)

CH 3 2422 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

CH 9 2452 MHz	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

Appendix – Information of the Testing Laboratories

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

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

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---