FCC Test Report

Report No.:	RF200203E11
FCC ID:	2AF5PML2410
Test Model:	ML2410
Series Model:	ML2410XY (where both X and Y can be A, B, C, D or blank)
Received Date:	Feb. 03, 2020
Test Date:	Feb. 13 to Mar. 05, 2020
Issued Date:	Mar. 31, 2020
Applicant:	MTRLC LLC
Address:	225 Franklin Street, 26th Floor, Boston, MA 02110 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF200203E11	Original release.	Mar. 31, 2020

1 Certificate of Conformity

Product:	AC1900 LTE Router
Brand:	Motorola
Test Model:	ML2410
Series Model:	ML2410XY (where both X and Y can be A, B, C, D or blank)
Sample Status:	ENGINEERING SAMPLE
Applicant:	MTRLC LLC
Test Date:	Feb. 13 to Mar. 05, 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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Mar. 31, 2020

Joyce Kuo / Specialist

Approved by : _____ , **Date:** Mar. 31, 2020

Clark Lin / Technical Manager

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 -5.02dB at 19.84766MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2dB at 2483.5MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is i-pex(MHF) not a standard connector.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Conducted Emissions	-	3.1 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	5.1 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	5.0dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	AC1900 LTE Router
Brand	Motorola
Test Model	ML2410
Series Model	ML2410XY (where both X and Y can be A, B, C, D or blank)
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter or 7.2Vdc from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 450 Mbps 802.11ac: up to 1300 Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 7 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	**CDD Mode:** **2.412 ~ 2.462 GHz:** 938.289 mW **5.18 ~ 5.24GHz:** 807.114mW **5.745 ~ 5.825GHz:** 969.735mW **Beamforming Mode:** **2.412 ~ 2.462 GHz:** 499.446 mW **5.18 ~ 5.24GHz:** 465.097mW **5.745 ~ 5.825GHz:** 411.179mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter × 1, Battery x1
Data Cable Supplied	Ethernet cable x1 (Unshielded, 1.5m)

Note:

1. This report is record DTS-WLAN band test, NII (U-NII-1 and U-NII-3) band test is record in Report No.: RF200203E11-1 and NII (U-NII-2A and U-NII-2C) band test is record in Report No.: RF200203E11A-1.

2. The EUT contains certified WWAN module which FCC ID: XMR201808EC25AF (Brand: Quectel; Model: EC25-AF)
3. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Brand	Model No.	Description
Motorola	ML2410	For marketing purposes of identical hardware.
	ML2410XY (where both X and Y can be A, B, C, D or blank)	

From the above models, model: **ML2410** was selected as representative model for the test and its data was recorded in this report.

4. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3
WLAN (2.4GHz)	WLAN (5GHz)	WWAN

5. Simultaneously transmission condition.

Condition	Technology
1	WWAN + WLAN (2.4GHz) + WLAN (5GHz)
2	WWAN + WLAN (2.4GHz)
3	WWAN + WLAN (5GHz)
4	WLAN (2.4GHz) + WLAN (5GHz)
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.	

6. The EUT must be supplied with a power and the following different models could be chosen:

Adapter			
No	Brand	Model No.	Spec.
1	T&W ELECTRONICS	S36B52-120A300-04	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
2	HON-KWANG ELECTRIC CO., LTD.	HK-BE-120A300-US (HKSC-190178)	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
3	HON-KWANG ELECTRIC CO., LTD.	HK-BE-120A300-US (HKSC-190147)	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
Battery			
No	Brand	Model No.	Spec.
1	Getac Technolog(Kunshan) Co.,LTD	BP-15033-22/2150 S	7.2V 4.3Ah 30.96Wh

Note:
1. The adapter 3 is as same as adapter 2; except for DC plug is different.
2. From the above adapters, the AC Power Conducted Emissions test worst case was found in **Adapter No.: 1**. Therefore only the test data of the mode was recorded in this report.
3. From the above adapters and battery, the Radiated Emissions test worst case was found in **Adapter No.: 1**. Therefore only the test data of the mode was recorded in this report.

7. The antennas provided to the EUT, please refer to the following table:

WLAN Antenna							
Ant. No.	RF Chain No.	Brand	Ant. Net Gain	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
1	WiFi Chain0	Airgain	4.3 dBi, 4.3 dBi, 5.5 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	140
2	WiFi Chain1	Airgain	3.2 dBi, 4.4 dBi, 4.1 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	170
3	WiFi Chain2	Airgain	4.6 dBi, 4.9 dBi, 5.4 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	100
WWAN Antenna							
Ant. No.	RF Chain No.	Brand	Ant. Net Gain	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length (mm)
1	LTE MAIN	Cortec	1.08 dBi 3.19 dBi	617 ~ 894 1710 ~ 2200	Dipole	SMA	280
2	LTE AUX	Cortec	1.08 dBi 3.19 dBi	617 ~ 894 1710 ~ 2200	Dipole	SMA	200

8. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	3TX	3RX
802.11g	3TX	3RX
802.11n (HT20)	3TX	3RX
802.11n (HT40)	3TX	3RX
VHT20	3TX	3RX
VHT40	3TX	3RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	3TX	3RX
802.11n (HT20)	3TX	3RX
802.11n (HT40)	3TX	3RX
802.11ac (VHT20)	3TX	3RX
802.11ac (VHT40)	3TX	3RX
802.11ac (VHT80)	3TX	3RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and non-beamforming mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and VHT mode for 20MHz (40MHz), the manufacturer will control the power for 802.11n mode is the same as the VHT mode or more lower than it and investigated worst case to representative mode in test report. (Final test mode refer to section 3.2.1)

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

3.2 Description of Test Modes

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

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

CDD Mode					
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

CDD Mode					
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

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.

CDD Mode					
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

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.

CDD Mode					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**Data Rate (Mbps)**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5
Beamforming Mode (output power only)					
Mode	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**Data Rate (Mbps)**
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

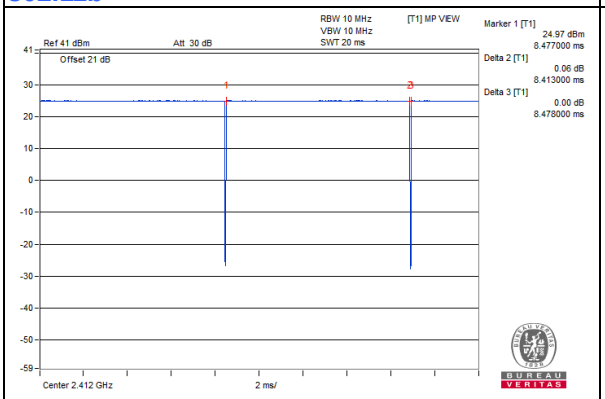
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	23deg. C, 67%RH	120Vac, 60Hz	Ryan Du
RE<1G	23deg. C, 63%RH	120Vac, 60Hz	Kevin Ko
PLC	25deg. C, 75%RH	120Vac, 60Hz	Kevin Ko
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

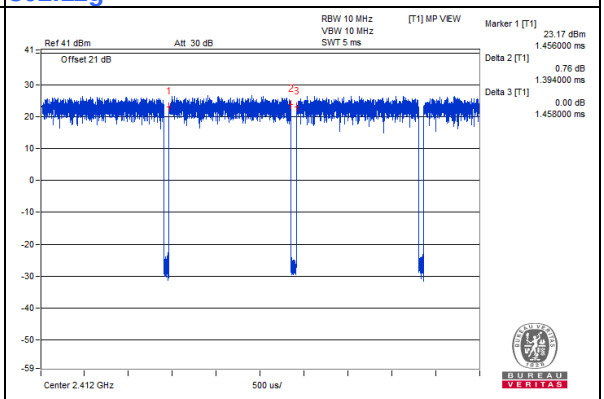
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 8.413/8.478 = 0.992
802.11g: Duty cycle = 1.394/1.458 = 0.956, Duty factor = 10 * log(1/Duty cycle) = 0.19
VHT20: Duty cycle = 1.308/1.368 = 0.956, Duty factor = 10 * log(1/Duty cycle) = 0.19
VHT40: Duty cycle = 0.646/0.709 = 0.911, Duty factor = 10 * log(1/Duty cycle) = 0.40

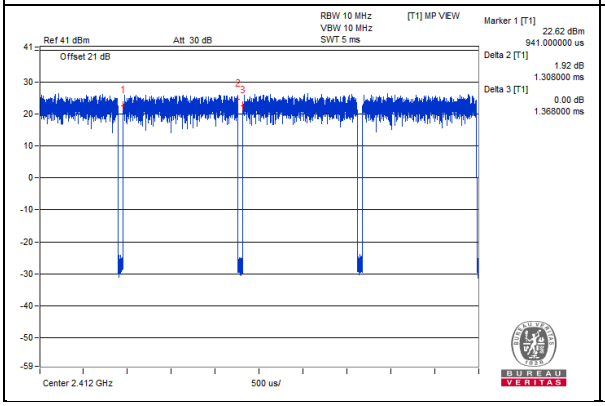
802.11b



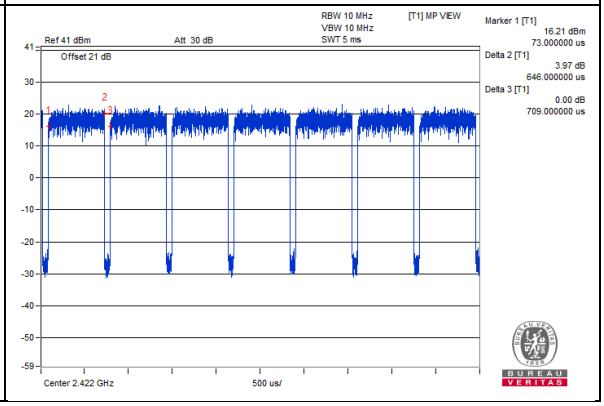
802.11g



VHT20



VHT40



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.

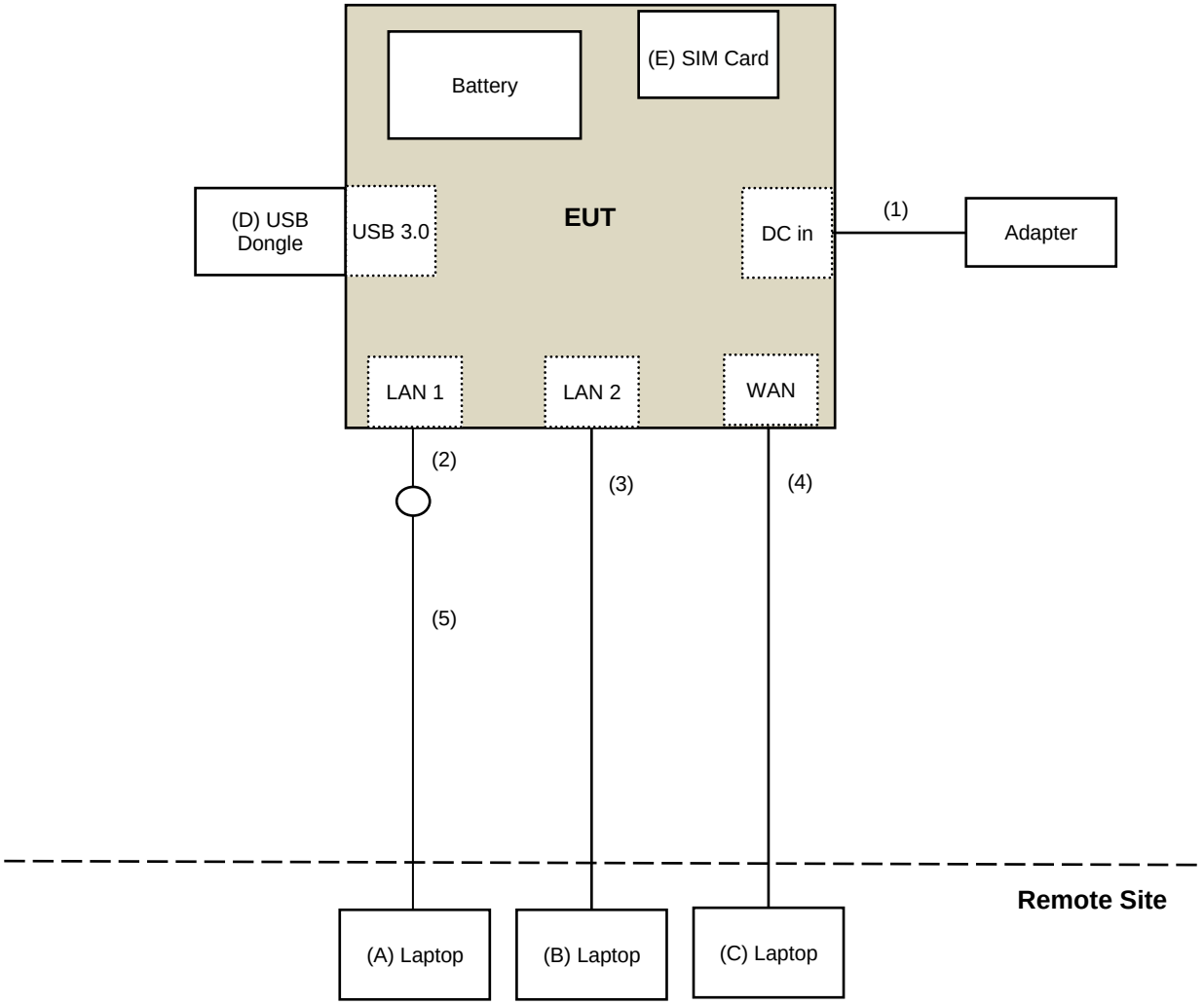
ID	Product	Brand	Model No.	Serial No	FCC ID	Remarks
A.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B.	Laptop	SONY	SVS151A12P	275548477001150	NA	Provided by Lab
C.	Laptop	DELL	E5430	4N1SKV1	FCC DoC	Provided by Lab
D.	USB Dongle	Sandisk	128G	NA	NA	Provided by Lab
E.	SIM Card	Anritsu	NA	NA	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.5m).

ID	Descriptions (Cables)	Qty	Length (m)	Shielding (Yes/No)	Cores (Number)	Remarks
1	DC Cable	1	1.5	No	0	Supplied by client
2	RJ-45 Cable	1	1.5	No	0	Supplied by client
3	RJ-45 Cable	1	10	No	0	Provided by Lab
4	RJ-45 Cable	1	10	No	0	Provided by Lab
5	RJ-45 Cable	1	10	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

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

Test standard:

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

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

References Test Guidance :

KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated DATE	Calibrated Until
Test Receiver Keysight	N9038A	MY54450088	July 03, 2019	July 02, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	Apr. 30, 2019	Apr. 29, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-3-1	Mar. 18, 2019	Mar. 17, 2020
RF Cable	8D	966-3-2	Mar. 18, 2019	Mar. 17, 2020
RF Cable	8D	966-3-3	Mar. 18, 2019	Mar. 17, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-1200	160922	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180601	June 10, 2019	June 09, 2020
RF Cable	EMC104-SM-SM-6000	180602	June 10, 2019	June 09, 2020
Spectrum Analyzer Keysight	N9030A	MY54490679	July 17, 2019	July 16, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC102-KM-KM-4500	181205	Aug. 26, 2019	Aug. 25, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

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 966 Chamber No. 3.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Feb. 26 to Mar. 5, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

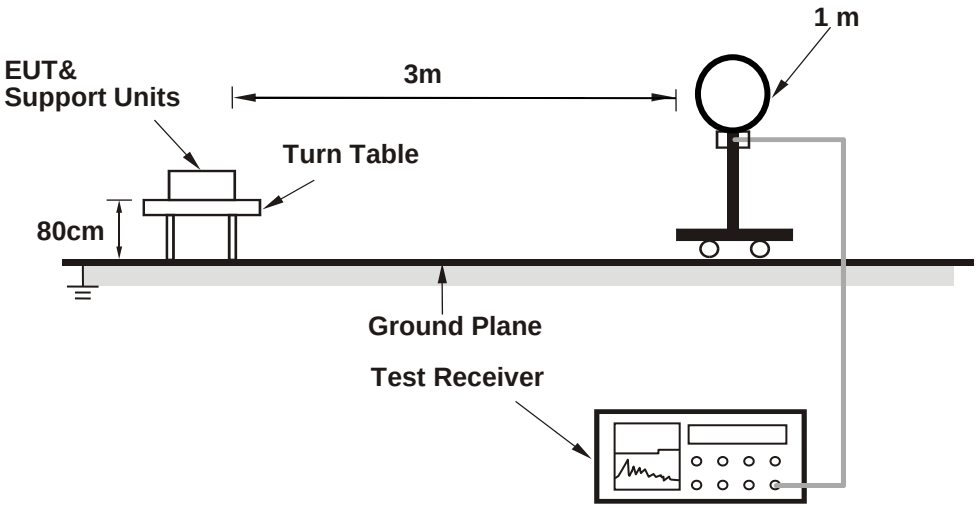
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

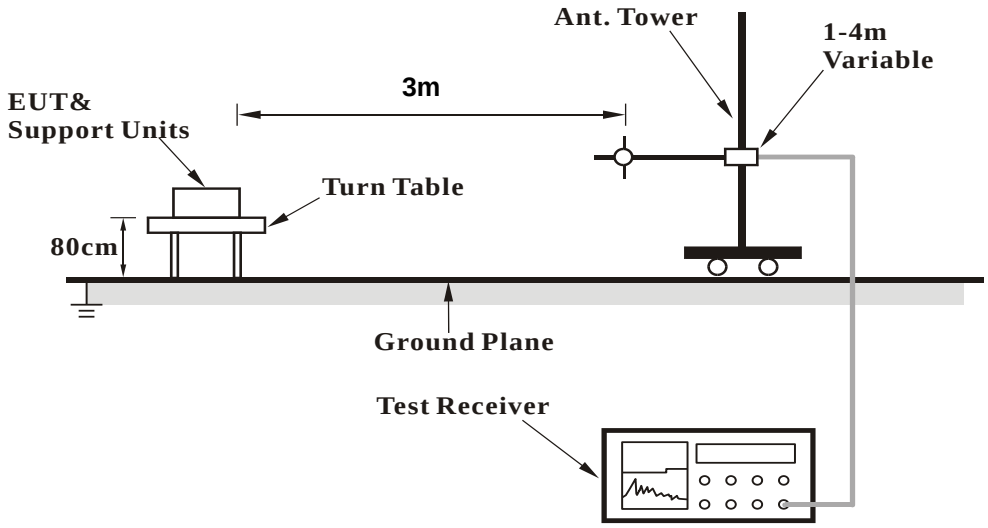
No deviation.

4.1.5 Test Setup

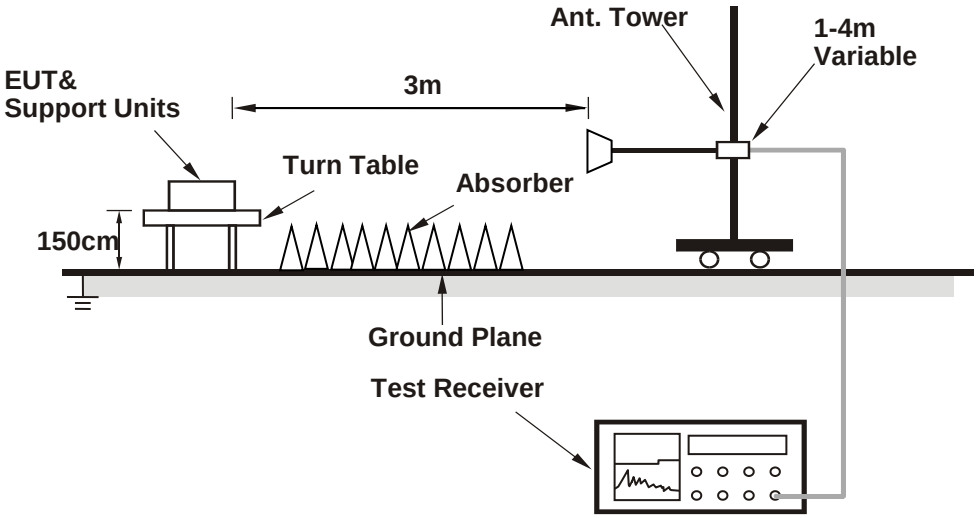
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Laptop which is placed on remote site.
b. Controlling software (Package_UIv2.05_DLLv4.08_20190312) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

ABOVE 1GHz 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.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	54.1 PK	74.0	-19.9	1.47 H	199	56.5	-2.4
2	2390.00	42.0 AV	54.0	-12.0	1.47 H	199	44.4	-2.4
3	*2412.00	110.3 PK			1.47 H	199	112.7	-2.4
4	*2412.00	107.9 AV			1.47 H	199	110.3	-2.4
5	4824.00	51.8 PK	74.0	-22.2	1.04 H	149	49.6	2.2
6	4824.00	49.6 AV	54.0	-4.4	1.04 H	149	47.4	2.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	55.1 PK	74.0	-18.9	1.00 V	124	57.5	-2.4
2	2390.00	44.0 AV	54.0	-10.0	1.00 V	124	46.4	-2.4
3	*2412.00	118.2 PK			1.00 V	124	120.6	-2.4
4	*2412.00	115.8 AV			1.00 V	124	118.2	-2.4
5	4824.00	54.5 PK	74.0	-19.5	3.97 V	140	52.3	2.2
6	4824.00	52.8 AV	54.0	-1.2	3.97 V	140	50.6	2.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	53.7 PK	74.0	-20.3	1.49 H	195	56.1	-2.4
2	2390.00	41.1 AV	54.0	-12.9	1.49 H	195	43.5	-2.4
3	*2437.00	110.5 PK			1.49 H	195	112.9	-2.4
4	*2437.00	108.0 AV			1.49 H	195	110.4	-2.4
5	2483.50	54.0 PK	74.0	-20.0	1.49 H	195	56.5	-2.5
6	2483.50	41.3 AV	54.0	-12.7	1.49 H	195	43.8	-2.5
7	4874.00	51.4 PK	74.0	-22.6	1.09 H	162	49.3	2.1
8	4874.00	49.4 AV	54.0	-4.6	1.09 H	162	47.3	2.1
9	7311.00	44.4 PK	74.0	-29.6	2.31 H	215	36.3	8.1
10	7311.00	33.0 AV	54.0	-21.0	2.31 H	215	24.9	8.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	53.8 PK	74.0	-20.2	1.00 V	135	56.2	-2.4
2	2390.00	41.3 AV	54.0	-12.7	1.00 V	135	43.7	-2.4
3	*2437.00	118.0 PK			1.00 V	135	120.4	-2.4
4	*2437.00	115.6 AV			1.00 V	135	118.0	-2.4
5	2483.50	54.2 PK	74.0	-19.8	1.00 V	135	56.7	-2.5
6	2483.50	41.5 AV	54.0	-12.5	1.00 V	135	44.0	-2.5
7	4874.00	54.2 PK	74.0	-19.8	3.98 V	125	52.1	2.1
8	4874.00	52.8 AV	54.0	-1.2	3.98 V	125	50.7	2.1
9	7311.00	44.1 PK	74.0	-29.9	2.42 V	274	36.0	8.1
10	7311.00	32.6 AV	54.0	-21.4	2.42 V	274	24.5	8.1

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.0 PK			1.42 H	202	112.5	-2.5
2	*2462.00	107.4 AV			1.42 H	202	109.9	-2.5
3	2483.50	54.5 PK	74.0	-19.5	1.42 H	202	57.0	-2.5
4	2483.50	41.9 AV	54.0	-12.1	1.42 H	202	44.4	-2.5
5	4924.00	50.8 PK	74.0	-23.2	1.03 H	152	48.7	2.1
6	4924.00	49.0 AV	54.0	-5.0	1.03 H	152	46.9	2.1
7	7386.00	43.9 PK	74.0	-30.1	2.30 H	219	35.6	8.3
8	7386.00	32.5 AV	54.0	-21.5	2.30 H	219	24.2	8.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.3 PK			1.00 V	138	119.8	-2.5
2	*2462.00	115.1 AV			1.00 V	138	117.6	-2.5
3	2483.50	55.3 PK	74.0	-18.7	1.00 V	138	57.8	-2.5
4	2483.50	43.9 AV	54.0	-10.1	1.00 V	138	46.4	-2.5
5	4924.00	54.4 PK	74.0	-19.6	3.96 V	115	52.3	2.1
6	4924.00	53.1 AV	54.0	-0.9	3.96 V	115	51.0	2.1
7	7386.00	44.4 PK	74.0	-29.6	2.37 V	287	36.1	8.3
8	7386.00	32.9 AV	54.0	-21.1	2.37 V	287	24.6	8.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.8 PK	74.0	-7.2	1.44 H	195	69.2	-2.4
2	2390.00	49.1 AV	54.0	-4.9	1.44 H	195	51.5	-2.4
3	*2412.00	113.2 PK			1.44 H	195	115.6	-2.4
4	*2412.00	104.6 AV			1.44 H	195	107.0	-2.4
5	4824.00	44.0 PK	74.0	-30.0	1.04 H	175	41.8	2.2
6	4824.00	31.7 AV	54.0	-22.3	1.04 H	175	29.5	2.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.2 PK	74.0	-3.8	1.62 V	156	72.6	-2.4
2	2390.00	52.8 AV	54.0	-1.2	1.62 V	156	55.2	-2.4
3	*2412.00	121.0 PK			1.62 V	156	123.4	-2.4
4	*2412.00	112.1 AV			1.62 V	156	114.5	-2.4
5	4824.00	46.3 PK	74.0	-27.7	3.93 V	126	44.1	2.2
6	4824.00	34.3 AV	54.0	-19.7	3.93 V	126	32.1	2.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.4 PK	74.0	-18.6	1.48 H	208	57.8	-2.4
2	2390.00	43.8 AV	54.0	-10.2	1.48 H	208	46.2	-2.4
3	*2437.00	113.6 PK			1.48 H	208	116.0	-2.4
4	*2437.00	104.8 AV			1.48 H	208	107.2	-2.4
5	2483.50	56.5 PK	74.0	-17.5	1.48 H	208	59.0	-2.5
6	2483.50	44.0 AV	54.0	-10.0	1.48 H	208	46.5	-2.5
7	4874.00	44.2 PK	74.0	-29.8	1.03 H	165	42.1	2.1
8	4874.00	31.8 AV	54.0	-22.2	1.03 H	165	29.7	2.1
9	7311.00	44.1 PK	74.0	-29.9	2.29 H	205	36.0	8.1
10	7311.00	32.7 AV	54.0	-21.3	2.29 H	205	24.6	8.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.7 PK	74.0	-18.3	1.57 V	150	58.1	-2.4
2	2390.00	44.5 AV	54.0	-9.5	1.57 V	150	46.9	-2.4
3	*2437.00	121.4 PK			1.57 V	150	123.8	-2.4
4	*2437.00	112.5 AV			1.57 V	150	114.9	-2.4
5	2483.50	57.4 PK	74.0	-16.6	1.57 V	150	59.9	-2.5
6	2483.50	44.8 AV	54.0	-9.2	1.57 V	150	47.3	-2.5
7	4874.00	46.6 PK	74.0	-27.4	3.90 V	103	44.5	2.1
8	4874.00	34.5 AV	54.0	-19.5	3.90 V	103	32.4	2.1
9	7311.00	44.2 PK	74.0	-29.8	2.42 V	280	36.1	8.1
10	7311.00	32.5 AV	54.0	-21.5	2.42 V	280	24.4	8.1

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.8 PK			1.41 H	189	114.3	-2.5
2	*2462.00	102.5 AV			1.41 H	189	105.0	-2.5
3	2483.50	67.4 PK	74.0	-6.6	1.41 H	189	69.9	-2.5
4	2483.50	49.5 AV	54.0	-4.5	1.41 H	189	52.0	-2.5
5	4924.00	42.8 PK	74.0	-31.2	1.15 H	172	40.7	2.1
6	4924.00	30.0 AV	54.0	-24.0	1.15 H	172	27.9	2.1
7	7386.00	43.8 PK	74.0	-30.2	2.29 H	203	35.5	8.3
8	7386.00	32.5 AV	54.0	-21.5	2.29 H	203	24.2	8.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	119.0 PK			1.48 V	146	121.5	-2.5
2	*2462.00	109.8 AV			1.48 V	146	112.3	-2.5
3	2483.50	72.2 PK	74.0	-1.8	1.48 V	146	74.7	-2.5
4	2483.50	53.6 AV	54.0	-0.4	1.48 V	146	56.1	-2.5
5	4924.00	45.2 PK	74.0	-28.8	3.98 V	109	43.1	2.1
6	4924.00	32.7 AV	54.0	-21.3	3.98 V	109	30.6	2.1
7	7386.00	44.5 PK	74.0	-29.5	2.37 V	274	36.2	8.3
8	7386.00	33.0 AV	54.0	-21.0	2.37 V	274	24.7	8.3

REMARKS:

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

VHT20

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.3 PK	74.0	-7.7	1.43 H	196	68.7	-2.4
2	2390.00	49.2 AV	54.0	-4.8	1.43 H	196	51.6	-2.4
3	*2412.00	112.6 PK			1.43 H	196	115.0	-2.4
4	*2412.00	102.9 AV			1.43 H	196	105.3	-2.4
5	4824.00	44.5 PK	74.0	-29.5	1.14 H	156	42.3	2.2
6	4824.00	32.1 AV	54.0	-21.9	1.14 H	156	29.9	2.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.4 PK	74.0	-3.6	1.56 V	156	72.8	-2.4
2	2390.00	53.6 AV	54.0	-0.4	1.56 V	156	56.0	-2.4
3	*2412.00	119.8 PK			1.56 V	156	122.2	-2.4
4	*2412.00	110.5 AV			1.56 V	156	112.9	-2.4
5	4824.00	46.7 PK	74.0	-27.3	3.97 V	108	44.5	2.2
6	4824.00	34.6 AV	54.0	-19.4	3.97 V	108	32.4	2.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.8 PK	74.0	-19.2	1.49 H	192	57.2	-2.4
2	2390.00	42.4 AV	54.0	-11.6	1.49 H	192	44.8	-2.4
3	*2437.00	113.7 PK			1.49 H	192	116.1	-2.4
4	*2437.00	103.8 AV			1.49 H	192	106.2	-2.4
5	2483.50	58.3 PK	74.0	-15.7	1.49 H	192	60.8	-2.5
6	2483.50	44.5 AV	54.0	-9.5	1.49 H	192	47.0	-2.5
7	4874.00	44.2 PK	74.0	-29.8	1.11 H	159	42.1	2.1
8	4874.00	32.1 AV	54.0	-21.9	1.11 H	159	30.0	2.1
9	7311.00	44.2 PK	74.0	-29.8	2.35 H	222	36.1	8.1
10	7311.00	32.9 AV	54.0	-21.1	2.35 H	222	24.8	8.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.1 PK	74.0	-18.9	1.53 V	156	57.5	-2.4
2	2390.00	43.8 AV	54.0	-10.2	1.53 V	156	46.2	-2.4
3	*2437.00	120.5 PK			1.53 V	156	122.9	-2.4
4	*2437.00	111.2 AV			1.53 V	156	113.6	-2.4
5	2483.50	60.6 PK	74.0	-13.4	1.53 V	156	63.1	-2.5
6	2483.50	45.1 AV	54.0	-8.9	1.53 V	156	47.6	-2.5
7	4874.00	46.1 PK	74.0	-27.9	3.94 V	120	44.0	2.1
8	4874.00	33.7 AV	54.0	-20.3	3.94 V	120	31.6	2.1
9	7311.00	44.2 PK	74.0	-29.8	2.35 V	295	36.1	8.1
10	7311.00	32.8 AV	54.0	-21.2	2.35 V	295	24.7	8.1

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.6 PK			1.43 H	203	114.1	-2.5
2	*2462.00	101.2 AV			1.43 H	203	103.7	-2.5
3	2483.50	66.8 PK	74.0	-7.2	1.43 H	203	69.3	-2.5
4	2483.50	49.6 AV	54.0	-4.4	1.43 H	203	52.1	-2.5
5	4924.00	44.5 PK	74.0	-29.5	1.12 H	148	42.4	2.1
6	4924.00	32.3 AV	54.0	-21.7	1.12 H	148	30.2	2.1
7	7386.00	44.1 PK	74.0	-29.9	2.28 H	209	35.8	8.3
8	7386.00	32.9 AV	54.0	-21.1	2.28 H	209	24.6	8.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.9 PK			1.44 V	147	120.4	-2.5
2	*2462.00	108.4 AV			1.44 V	147	110.9	-2.5
3	2483.50	71.7 PK	74.0	-2.3	1.44 V	147	74.2	-2.5
4	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**1.44 V**	**147**	**56.3**	**-2.5**
5	4924.00	46.5 PK	74.0	-27.5	3.97 V	113	44.4	2.1
6	4924.00	33.4 AV	54.0	-20.6	3.97 V	113	31.3	2.1
7	7386.00	44.3 PK	74.0	-29.7	2.38 V	297	36.0	8.3
8	7386.00	32.7 AV	54.0	-21.3	2.38 V	297	24.4	8.3

REMARKS:

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

VHT40

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.1 PK	74.0	-6.9	1.42 H	186	69.5	-2.4
2	2390.00	49.8 AV	54.0	-4.2	1.42 H	186	52.2	-2.4
3	*2422.00	110.6 PK			1.42 H	186	113.0	-2.4
4	*2422.00	100.1 AV			1.42 H	186	102.5	-2.4
5	4844.00	44.9 PK	74.0	-29.1	1.04 H	148	42.7	2.2
6	4844.00	32.5 AV	54.0	-21.5	1.04 H	148	30.3	2.2
7	7266.00	44.2 PK	74.0	-29.8	2.26 H	202	36.2	8.0
8	7266.00	32.7 AV	54.0	-21.3	2.26 H	202	24.7	8.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.0 PK	74.0	-3.0	1.55 V	164	73.4	-2.4
2	2390.00	53.6 AV	54.0	-0.4	1.55 V	164	56.0	-2.4
3	*2422.00	115.2 PK			1.55 V	164	117.6	-2.4
4	*2422.00	107.2 AV			1.55 V	164	109.6	-2.4
5	4844.00	46.0 PK	74.0	-28.0	4.00 V	117	43.8	2.2
6	4844.00	32.9 AV	54.0	-21.1	4.00 V	117	30.7	2.2
7	7266.00	44.4 PK	74.0	-29.6	2.37 V	299	36.4	8.0
8	7266.00	33.0 AV	54.0	-21.0	2.37 V	299	25.0	8.0

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.3 PK	74.0	-13.7	1.41 H	191	62.7	-2.4
2	2390.00	47.5 AV	54.0	-6.5	1.41 H	191	49.9	-2.4
3	*2437.00	112.5 PK			1.41 H	191	114.9	-2.4
4	*2437.00	101.8 AV			1.41 H	191	104.2	-2.4
5	2483.50	67.7 PK	74.0	-6.3	1.41 H	191	70.2	-2.5
6	2483.50	50.2 AV	54.0	-3.8	1.41 H	191	52.7	-2.5
7	4874.00	45.3 PK	74.0	-28.7	1.14 H	154	43.2	2.1
8	4874.00	32.9 AV	54.0	-21.1	1.14 H	154	30.8	2.1
9	7311.00	44.2 PK	74.0	-29.8	2.33 H	203	36.1	8.1
10	7311.00	32.9 AV	54.0	-21.1	2.33 H	203	24.8	8.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.9 PK	74.0	-9.1	1.59 V	154	67.3	-2.4
2	2390.00	51.6 AV	54.0	-2.4	1.59 V	154	54.0	-2.4
3	*2437.00	117.0 PK			1.59 V	154	119.4	-2.4
4	*2437.00	108.7 AV			1.59 V	154	111.1	-2.4
5	2483.50	70.2 PK	74.0	-3.8	1.59 V	154	72.7	-2.5
6	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**1.59 V**	**154**	**56.3**	**-2.5**
7	4874.00	46.3 PK	74.0	-27.7	3.95 V	114	44.2	2.1
8	4874.00	33.1 AV	54.0	-20.9	3.95 V	114	31.0	2.1
9	7311.00	44.3 PK	74.0	-29.7	2.31 V	293	36.2	8.1
10	7311.00	33.1 AV	54.0	-20.9	2.31 V	293	25.0	8.1

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	104.9 PK			1.47 H	194	107.4	-2.5
2	*2452.00	96.6 AV			1.47 H	194	99.1	-2.5
3	2483.50	61.3 PK	74.0	-12.7	1.47 H	194	63.8	-2.5
4	2483.50	49.2 AV	54.0	-4.8	1.47 H	194	51.7	-2.5
5	4904.00	43.0 PK	74.0	-31.0	1.12 H	170	41.0	2.0
6	4904.00	29.8 AV	54.0	-24.2	1.12 H	170	27.8	2.0
7	7356.00	44.2 PK	74.0	-29.8	2.29 H	224	36.0	8.2
8	7356.00	32.8 AV	54.0	-21.2	2.29 H	224	24.6	8.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	111.3 PK			1.52 V	147	113.8	-2.5
2	*2452.00	103.2 AV			1.52 V	147	105.7	-2.5
3	2483.50	64.9 PK	74.0	-9.1	1.52 V	147	67.4	-2.5
4	2483.50	53.7 AV	54.0	-0.3	1.52 V	147	56.2	-2.5
5	4904.00	43.2 PK	74.0	-30.8	3.98 V	126	41.2	2.0
6	4904.00	30.1 AV	54.0	-23.9	3.98 V	126	28.1	2.0
7	7356.00	44.4 PK	74.0	-29.6	2.34 V	281	36.2	8.2
8	7356.00	32.8 AV	54.0	-21.2	2.34 V	281	24.6	8.2

REMARKS:

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

Below 1GHz Data:

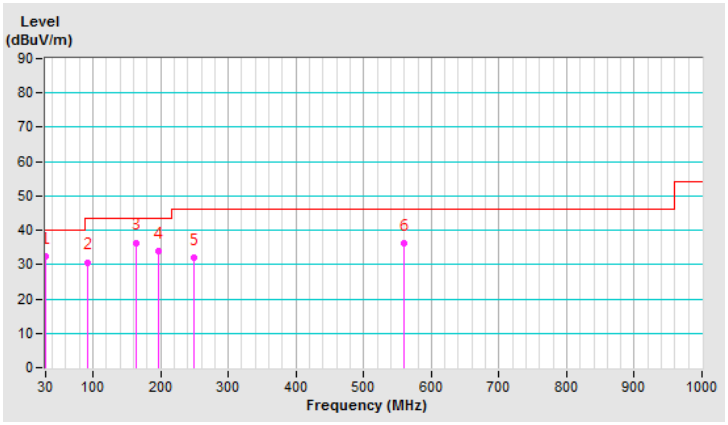
802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	30.19	32.3 QP	40.0	-7.7	1.00 H	201	41.0	-8.7
2	92.08	30.7 QP	43.5	-12.8	1.50 H	64	43.8	-13.1
3	164.61	36.4 QP	43.5	-7.1	1.50 H	105	43.8	-7.4
4	197.59	34.0 QP	43.5	-9.5	1.00 H	76	44.3	-10.3
5	250.02	31.9 QP	46.0	-14.1	1.00 H	107	40.3	-8.4
6	560.01	36.2 QP	46.0	-9.8	1.00 H	263	36.4	-0.2

REMARKS:

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

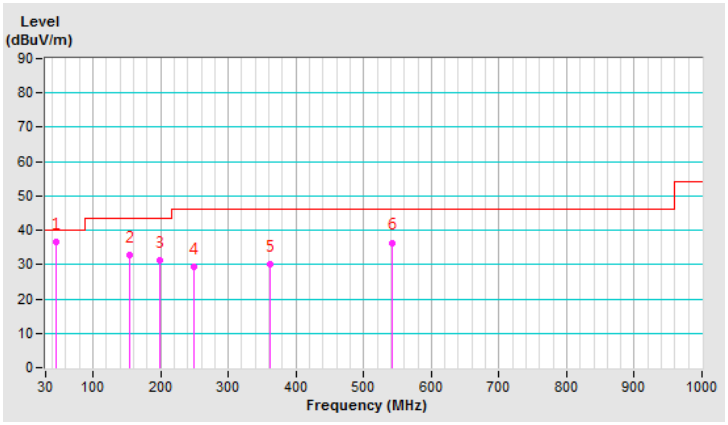


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	46.44	36.7 QP	40.0	-3.3	1.00 V	360	44.5	-7.8
2	153.31	32.8 QP	43.5	-10.7	1.50 V	139	39.9	-7.1
3	198.17	31.3 QP	43.5	-12.2	1.50 V	0	41.7	-10.4
4	250.00	29.3 QP	46.0	-16.7	2.00 V	127	37.7	-8.4
5	361.98	30.2 QP	46.0	-15.8	1.00 V	342	34.9	-4.7
6	542.50	36.4 QP	46.0	-9.6	1.00 V	140	37.2	-0.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3 Tested Date: Mar. 3, 2020

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/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

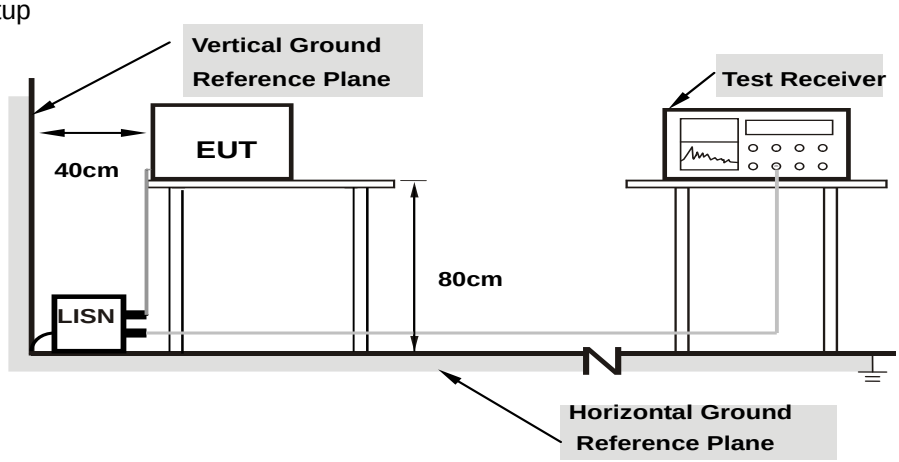
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

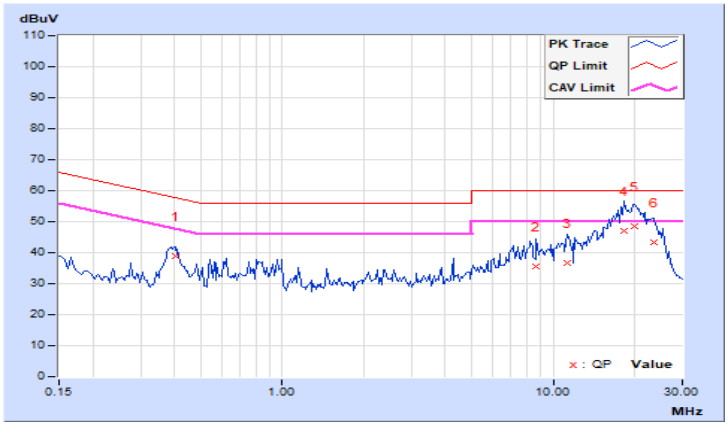
4.2.7 Test Results

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

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	0.40391	10.00	28.87	20.73	38.87	30.73	57.77	47.77	-18.90	-17.04
2	8.64844	10.56	25.02	18.88	35.58	29.44	60.00	50.00	-24.42	-20.56
3	11.30859	10.75	25.87	19.38	36.62	30.13	60.00	50.00	-23.38	-19.87
4	18.17188	11.24	35.68	29.96	46.92	41.20	60.00	50.00	-13.08	-8.80
5	19.95703	11.37	37.19	31.84	48.56	43.21	60.00	50.00	-11.44	-6.79
6	23.55469	11.50	31.93	25.82	43.43	37.32	60.00	50.00	-16.57	-12.68

Remarks:

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

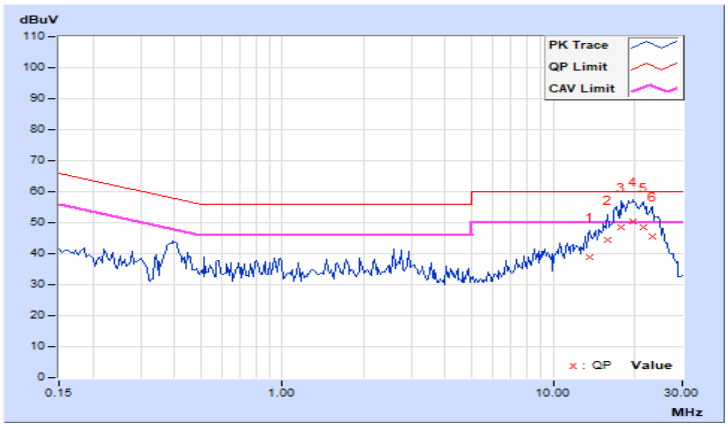


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	13.57422	10.77	28.10	22.40	38.87	33.17	60.00	50.00	-21.13	-16.83
2	15.96484	10.90	33.63	27.74	44.53	38.64	60.00	50.00	-15.47	-11.36
3	17.81641	11.00	37.39	31.84	48.39	42.84	60.00	50.00	-11.61	-7.16
4	**19.84766**	**11.10**	**39.24**	**33.88**	**50.34**	**44.98**	**60.00**	**50.00**	**-9.66**	**-5.02**
5	21.51953	11.15	37.43	32.18	48.58	43.33	60.00	50.00	-11.42	-6.67
6	23.29688	11.19	34.54	28.52	45.73	39.71	60.00	50.00	-14.27	-10.29

Remarks:

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

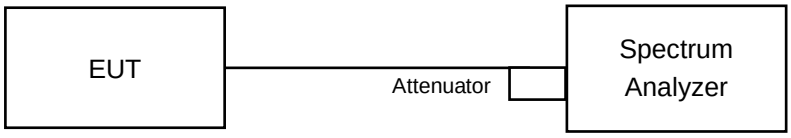


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz
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 Result

CDD Mode

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	7.65	9.62	8.63	0.5	Pass
6	2437	9.13	9.62	8.62	0.5	Pass
11	2462	9.11	9.63	9.55	0.5	Pass

802.11g

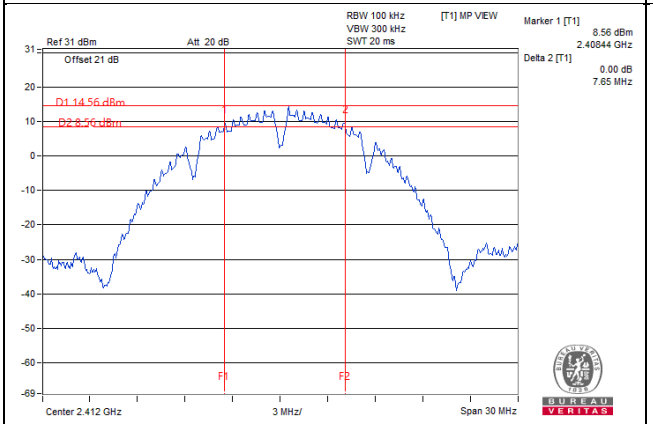
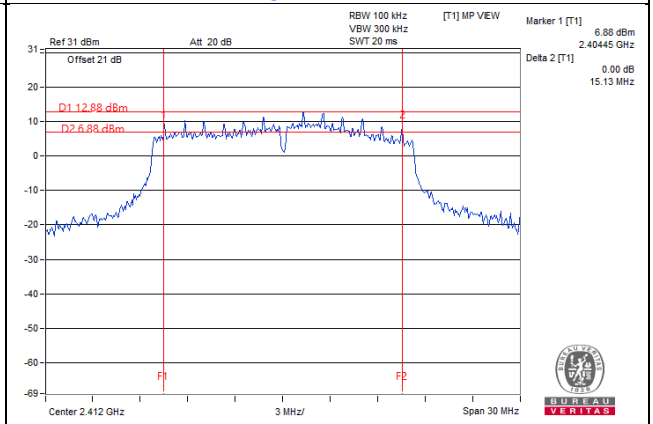
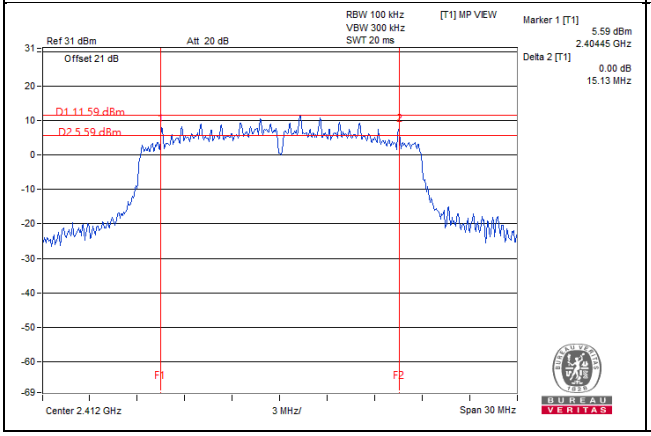
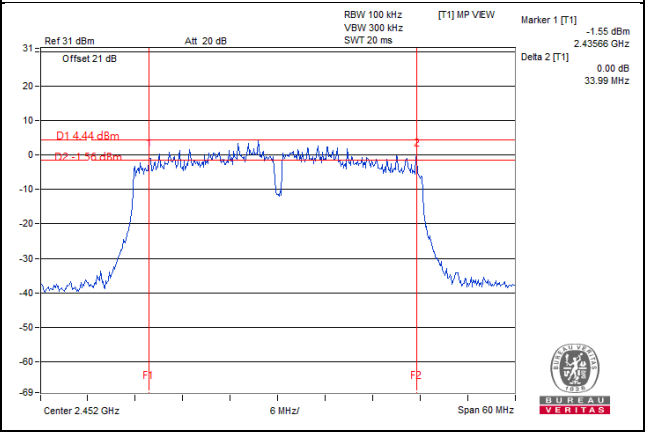
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	15.19	15.13	15.18	0.5	Pass
6	2437	15.14	15.17	15.18	0.5	Pass
11	2462	15.16	15.17	15.17	0.5	Pass

VHT20

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	15.18	15.74	15.13	0.5	Pass
6	2437	15.16	15.79	15.16	0.5	Pass
11	2462	15.17	15.76	15.16	0.5	Pass

VHT40

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	35.24	35.08	35.13	0.5	Pass
6	2437	35.12	35.24	35.2	0.5	Pass
9	2452	35.17	33.99	35.12	0.5	Pass

Spectrum Plot of Worst Value	
802.11b_Chain 0 / CH1	**802.11g_Chain 1 / CH1**
	
VHT20_Chain 2 / CH1	**VHT40_Chain 1 / CH9**
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

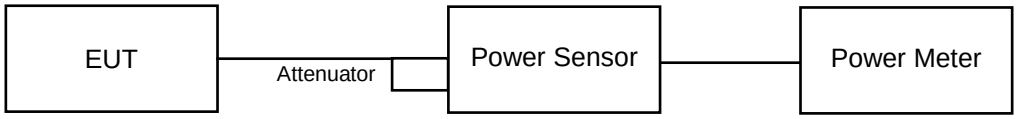
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

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

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

CDD Mode

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	23.83	24.25	23.45	728.928	28.63	30.00	Pass
6	2437	25.61	25.11	23.98	938.289	29.72	30.00	Pass
11	2462	24.76	24.02	23.32	766.358	28.84	30.00	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	22.32	22.81	22.07	522.658	27.18	30.00	Pass
6	2437	23.85	23.47	22.38	637.974	28.05	30.00	Pass
11	2462	21.87	20.96	20.39	387.949	25.89	30.00	Pass

VHT20

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	21.52	22.26	21.33	446.005	26.49	30.00	Pass
6	2437	23.53	23.26	22.45	613.052	27.87	30.00	Pass
11	2462	21.22	20.57	19.68	339.356	25.31	30.00	Pass

VHT40

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	20.29	20.87	20.11	331.651	25.21	30.00	Pass
6	2437	22.23	22.07	21.02	454.647	26.58	30.00	Pass
9	2452	17.27	16.75	16.03	140.735	21.48	30.00	Pass

Beamforming Mode

VHT20

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	21.52	22.26	21.33	446.005	26.49	27.17	Pass
6	2437	22.66	22.34	21.57	499.446	26.98	27.17	Pass
11	2462	21.22	20.57	19.68	339.356	25.31	27.17	Pass

Note: 1. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 30.00-(8.83-6) = 27.17dBm

VHT40

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	20.29	20.87	20.11	331.651	25.21	27.17	Pass
6	2437	22.23	22.07	21.02	454.647	26.58	27.17	Pass
9	2452	17.27	16.75	16.03	140.735	21.48	27.17	Pass

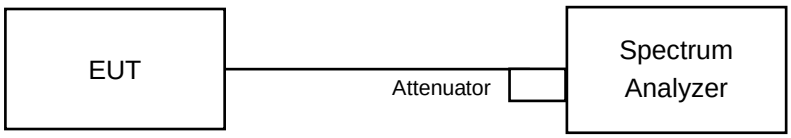
Note: 1. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 30.00-(8.83-6) = 27.17dBm

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For 802.11b:

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 802.11g, VHT20, VHT40:

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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)			Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1	Chain2				
1	2412	-8.38	-6.30	-8.20	0.5309	-2.75	5.17	PASS
6	2437	-6.09	-7.75	-7.14	0.6067	-2.17	5.17	PASS
11	2462	-7.30	-7.93	-9.07	0.471	-3.27	5.17	PASS

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 8-(8.83-6) = 5.17dBm.

802.11g

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
1	2412	-10.52	-8.80	-9.39	0.19	0.35075	-4.55	5.17	PASS
6	2437	-7.69	-8.55	-9.94	0.19	0.4295	-3.67	5.17	PASS
11	2462	-10.26	-10.42	-12.20	0.19	0.25645	-5.91	5.17	PASS

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 8-(8.83-6) = 5.17dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

VHT20

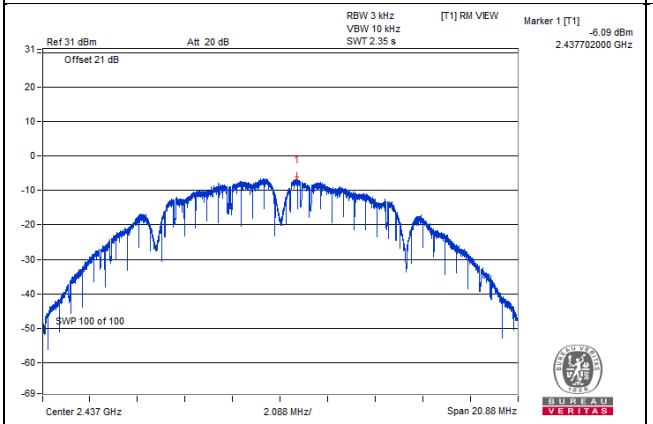
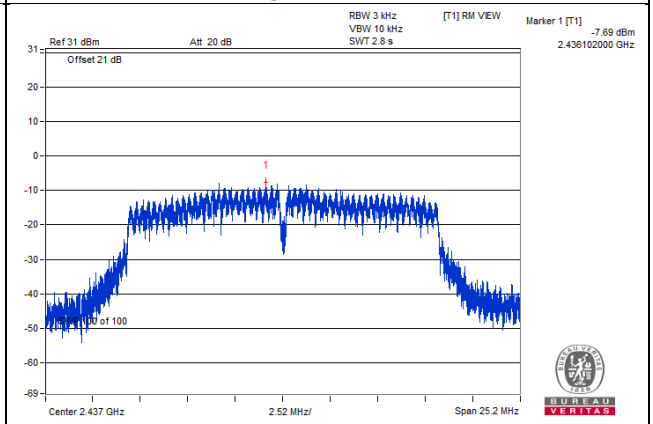
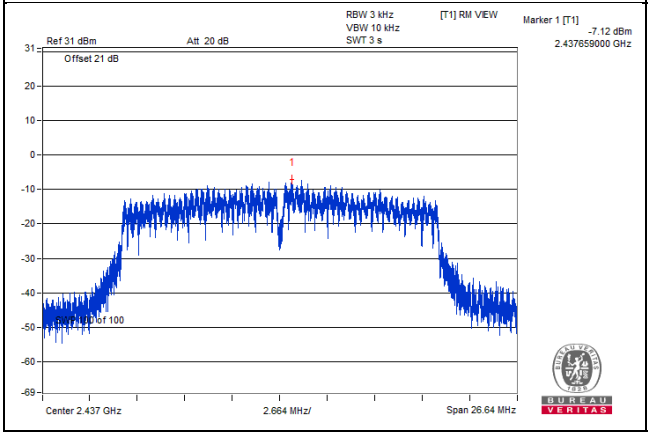
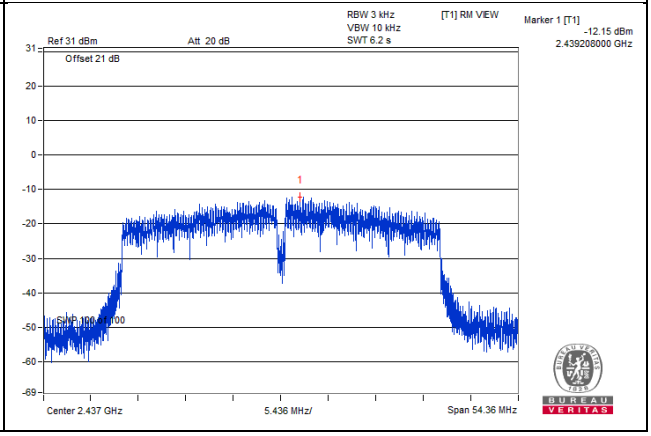
Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
1	2412	-10.98	-8.21	-10.00	0.19	0.34594	-4.61	5.17	PASS
6	2437	-7.12	-8.12	-9.74	0.19	0.4742	-3.24	5.17	PASS
11	2462	-10.82	-10.80	-12.05	0.19	0.23878	-6.22	5.17	PASS

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 8-(8.83-6) = 5.17dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

VHT40

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
3	2422	-14.81	-13.82	-15.07	0.40	0.11588	-9.36	5.17	PASS
6	2437	-12.15	-12.89	-13.99	0.40	0.16711	-7.77	5.17	PASS
9	2452	-16.93	-18.42	-18.63	0.40	0.05309	-12.75	5.17	PASS

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2$ / 3] = 8.83dBi > 6dBi, so the power limit shall be reduced to 8-(8.83-6) = 5.17dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

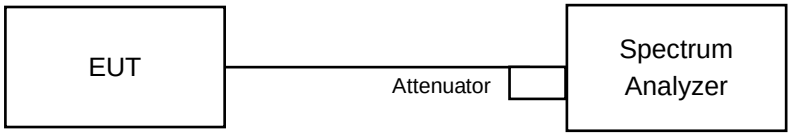
Spectrum Plot of Worst Value	
802.11b_Chain 0 / CH6	**802.11g_Chain 0 / CH6**
	
VHT20_Chain 0 / CH6	**VHT40_Chain 0 / CH6**
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

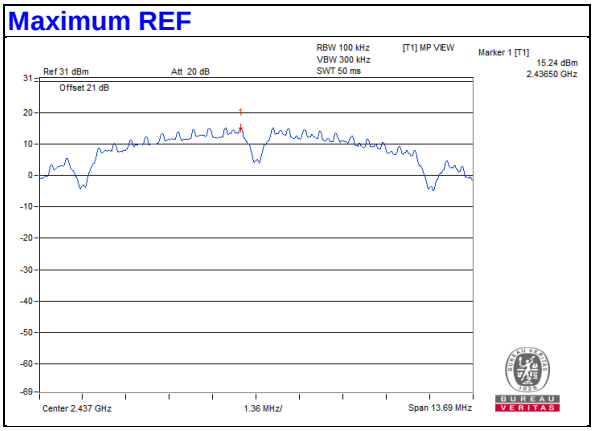
Same as Item 4.3.6

4.6.7 Test Results

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

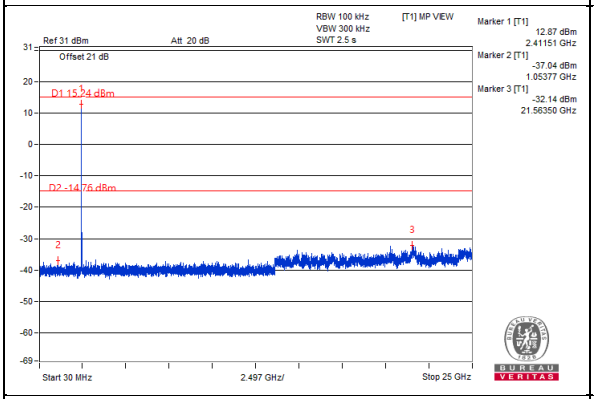
802.11b

Maximum REF

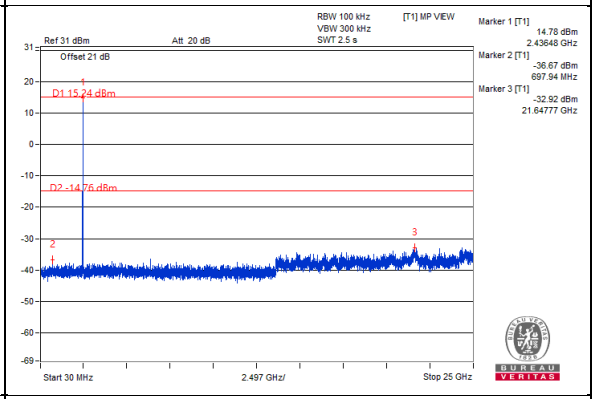


Chain 0

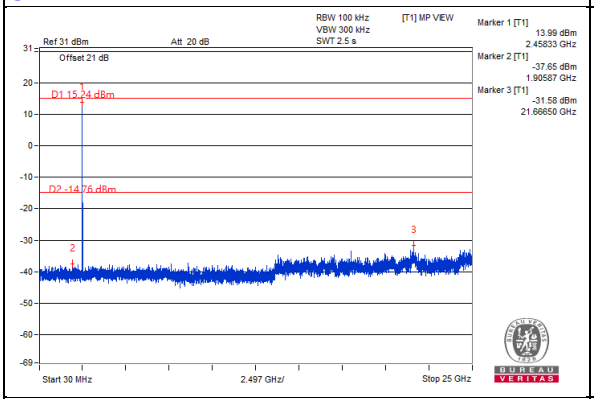
CH 1



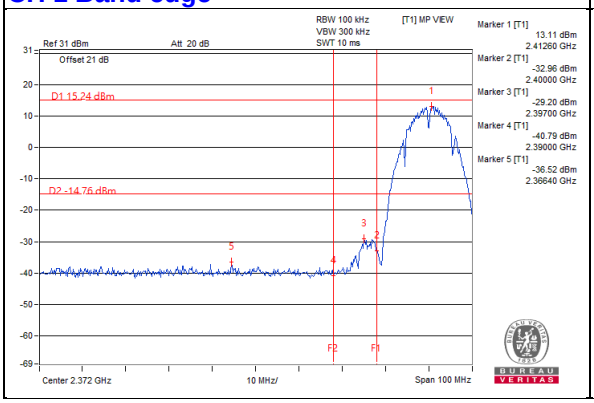
CH 6



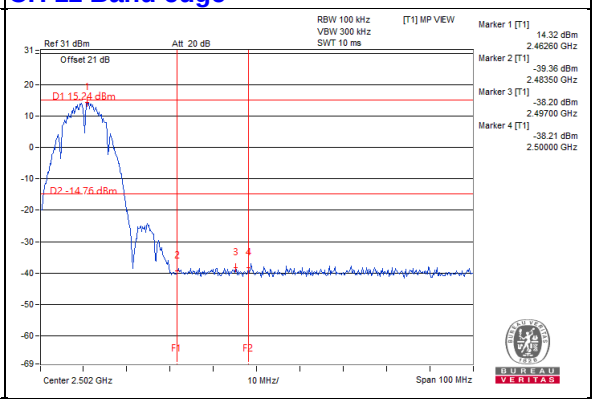
CH 11



CH 1 Band edge

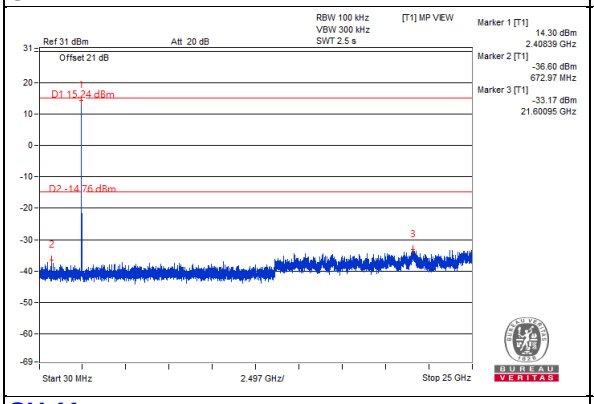


CH 11 Band edge

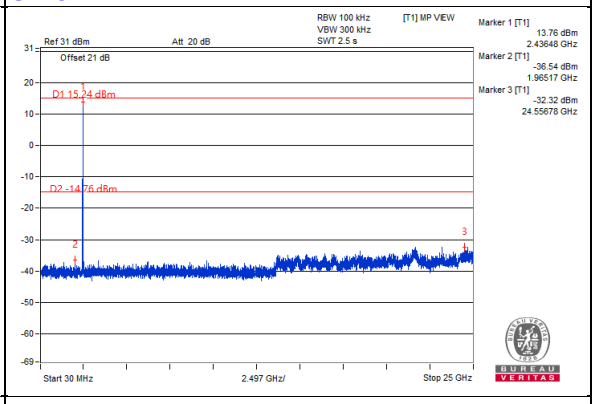


Chain 1

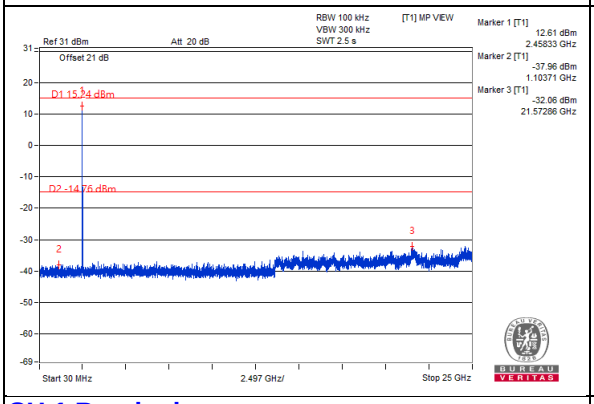
CH 1



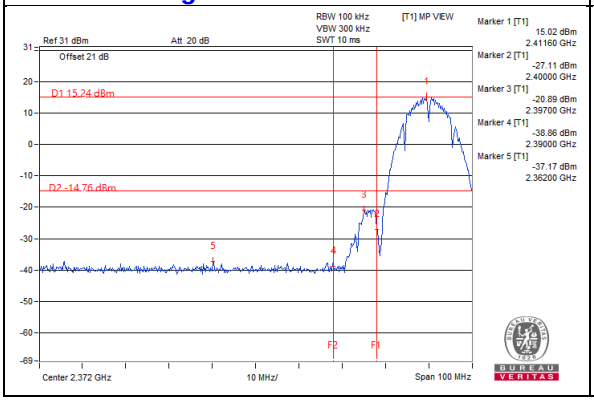
CH 6



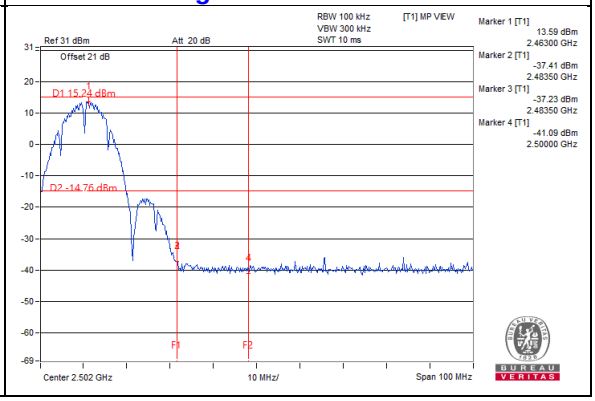
CH 11



CH 1 Band edge

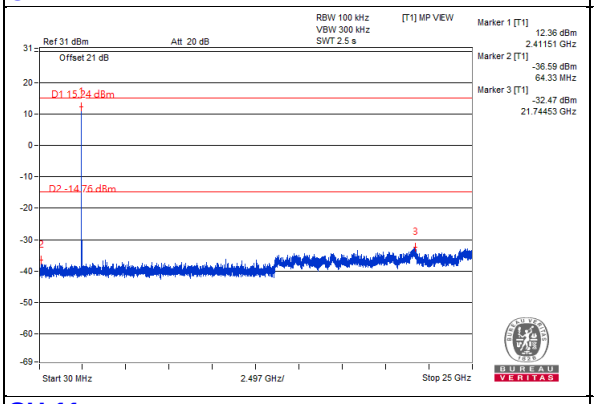


CH 11 Band edge

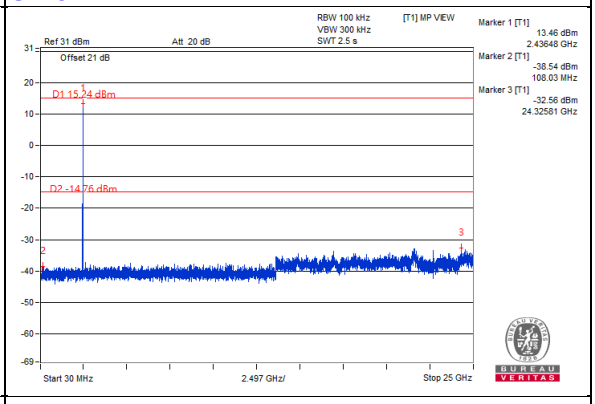


Chain 2

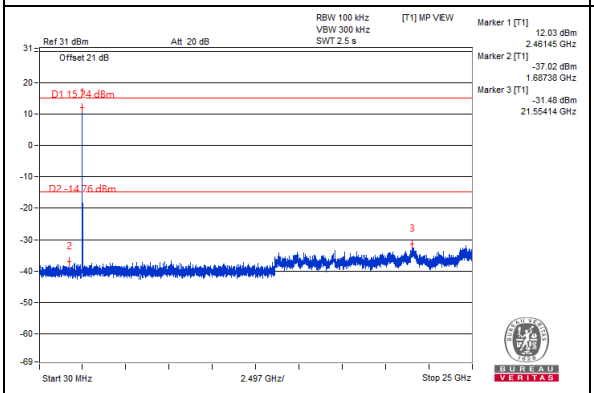
CH 1



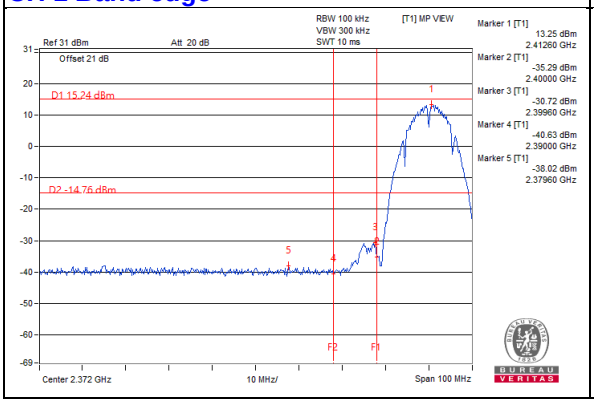
CH 6



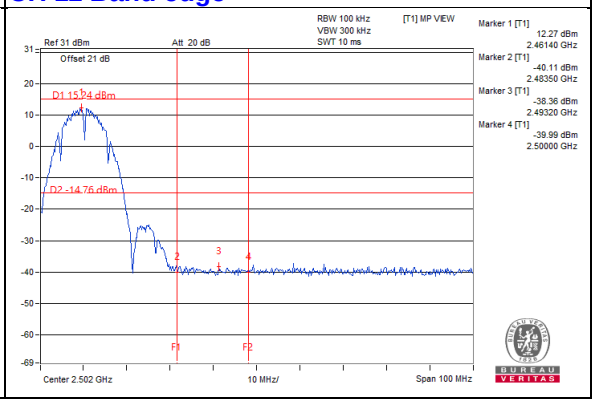
CH 11



CH 1 Band edge

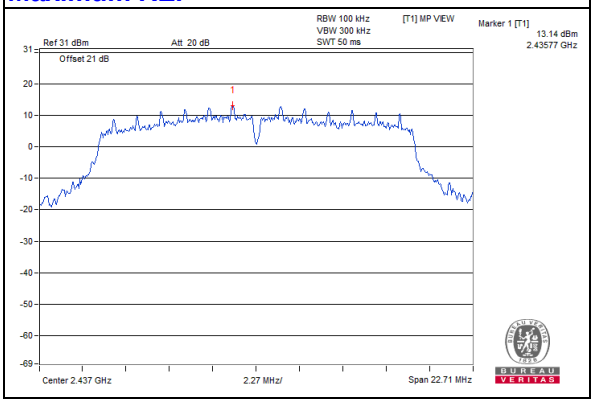


CH 11 Band edge



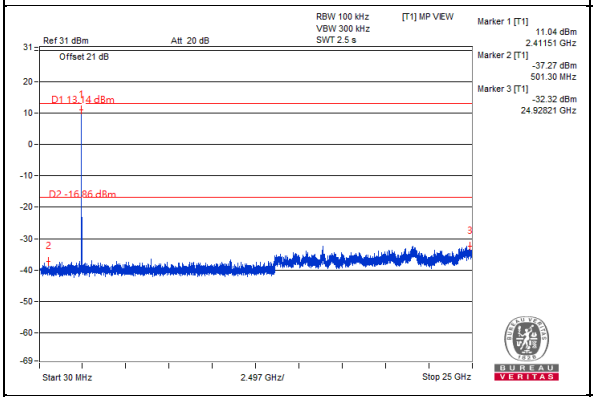
802.11g

Maximum REF

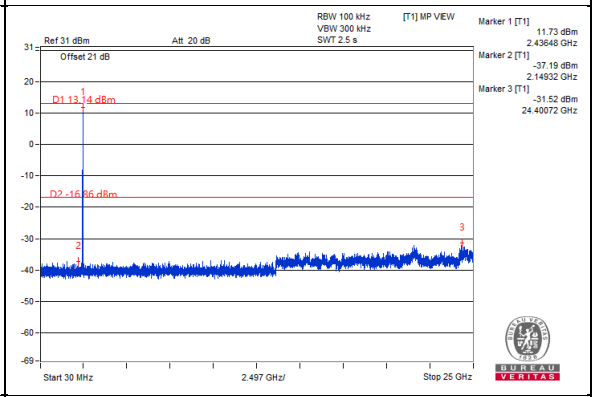


Chain 0

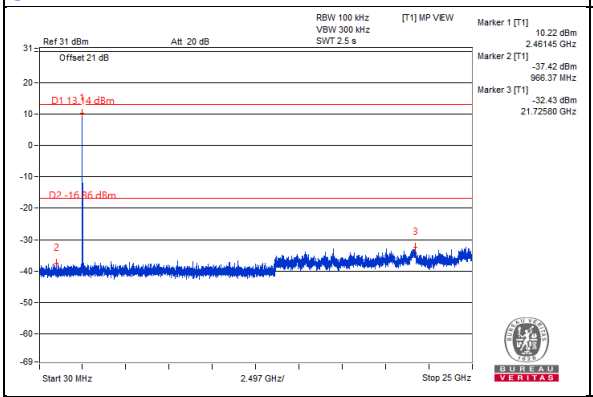
CH 1



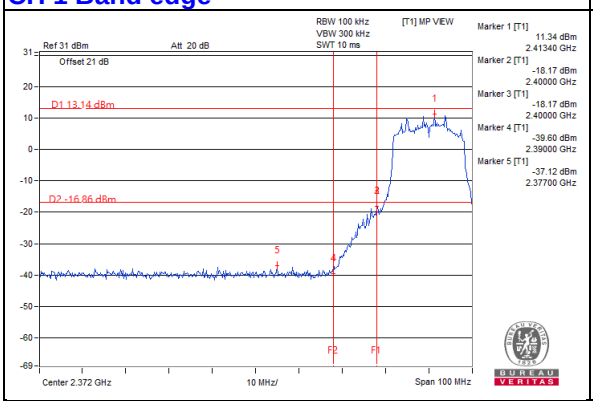
CH 6



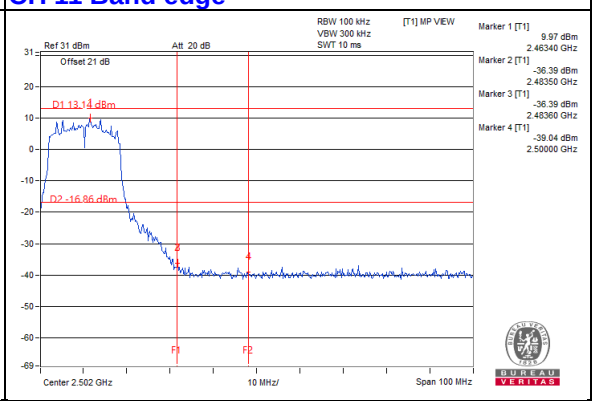
CH 11



CH 1 Band edge

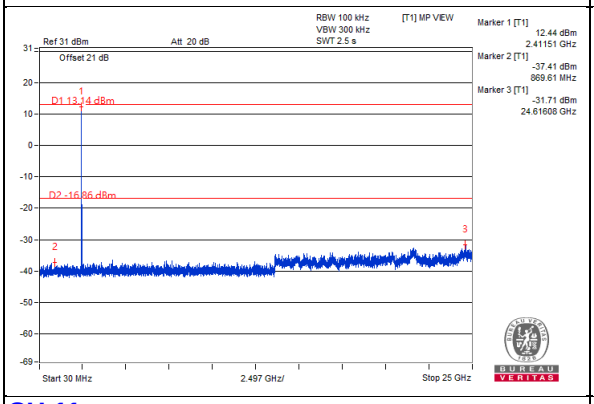


CH 11 Band edge

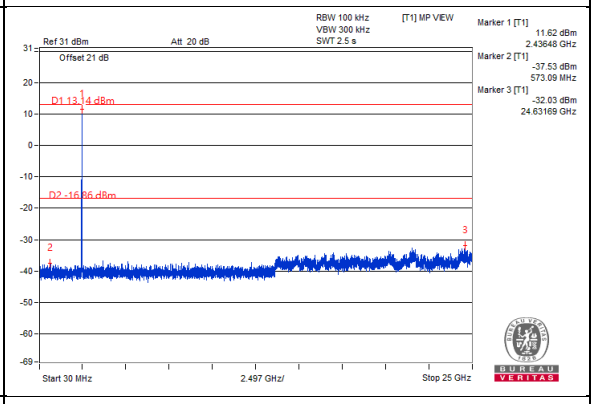


Chain 1

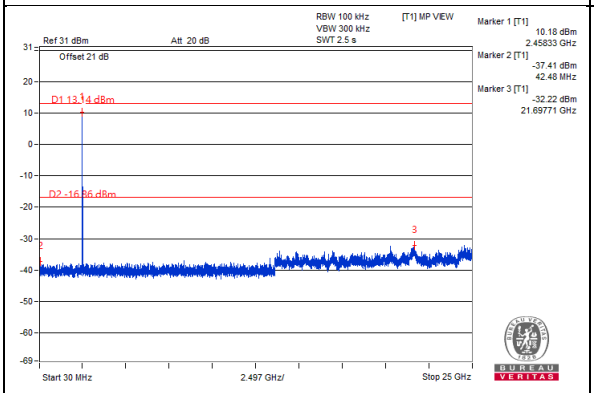
CH 1



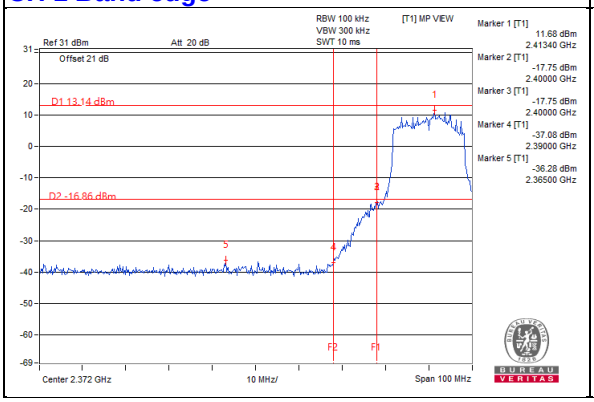
CH 6



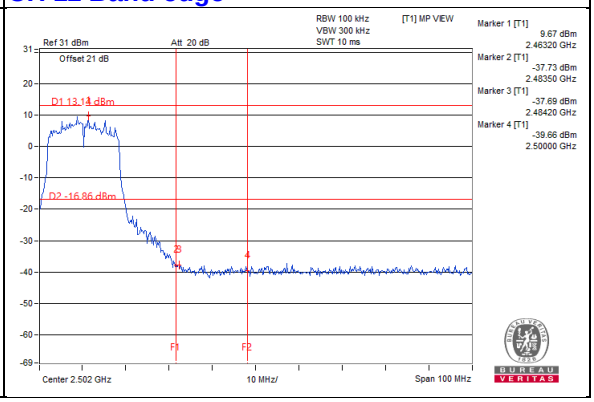
CH 11



CH 1 Band edge

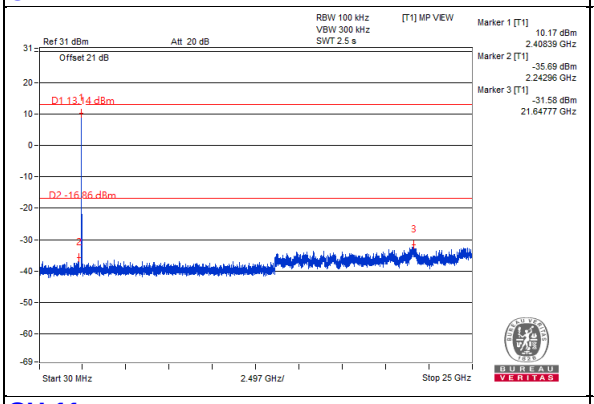


CH 11 Band edge

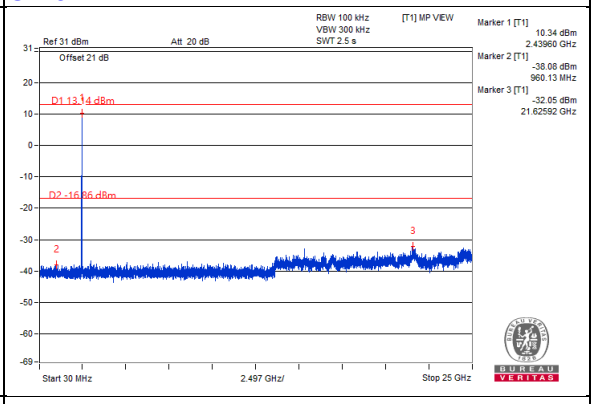


Chain 2

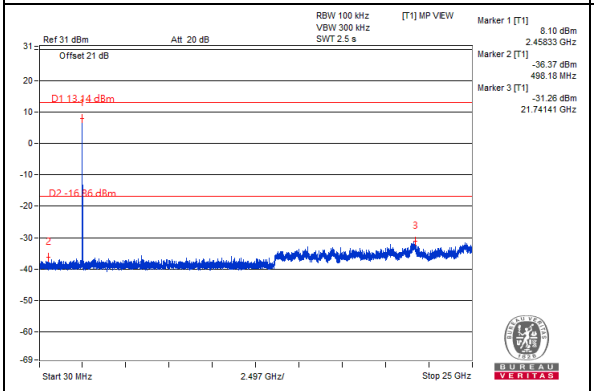
CH 1



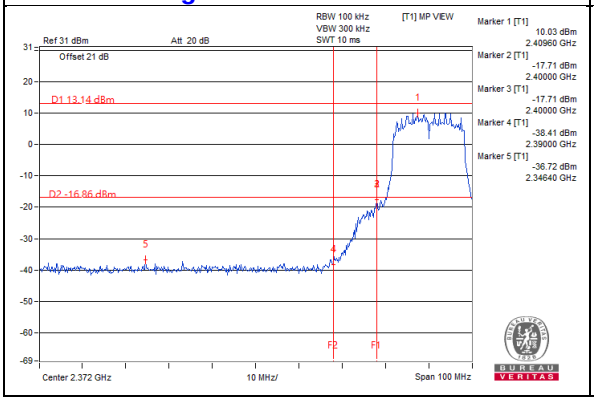
CH 6



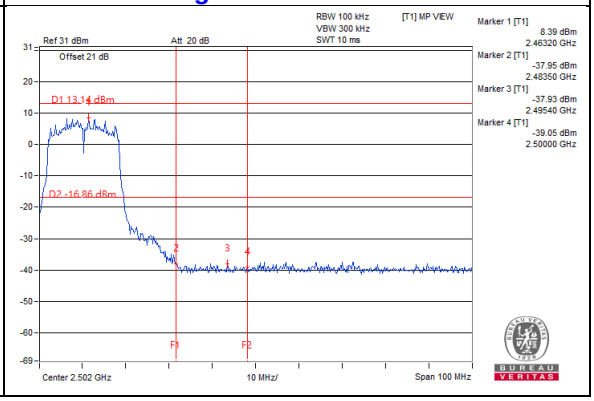
CH 11



CH 1 Band edge

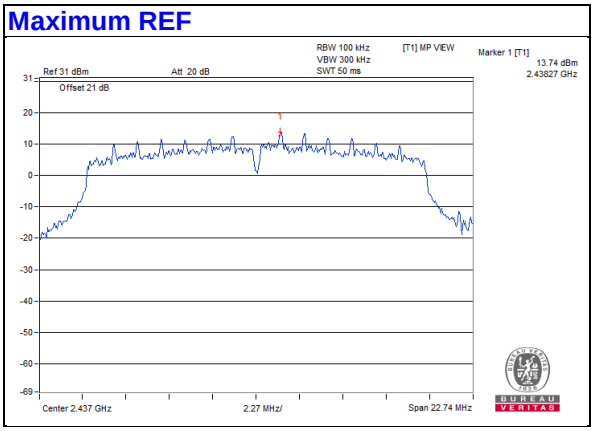


CH 11 Band edge



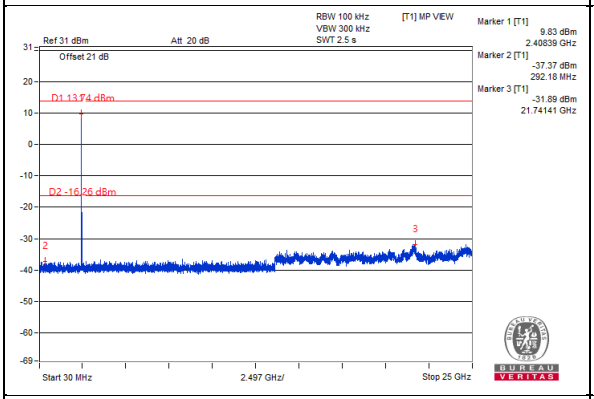
VHT20

Maximum REF

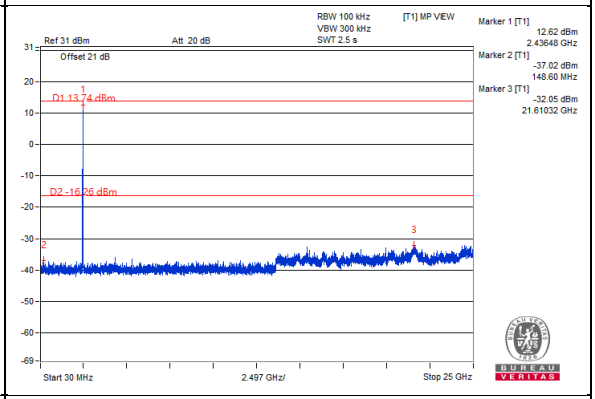


Chain 0

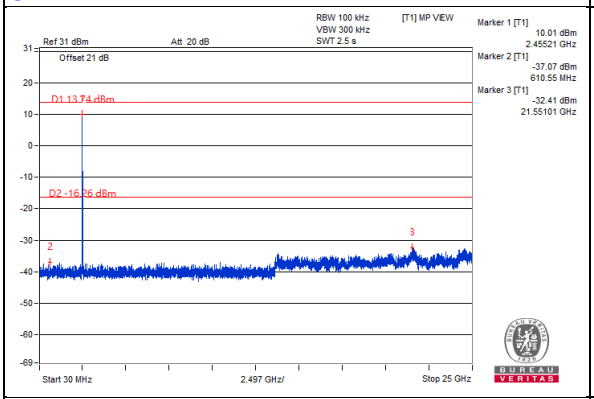
CH 1



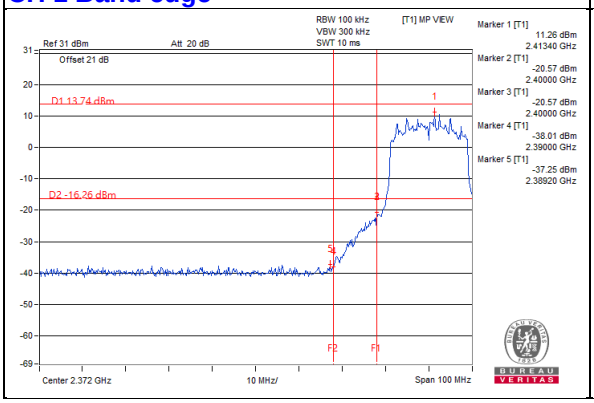
CH 6



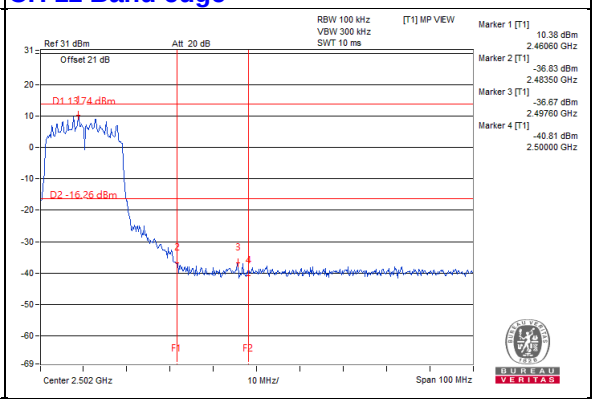
CH 11



CH 1 Band edge

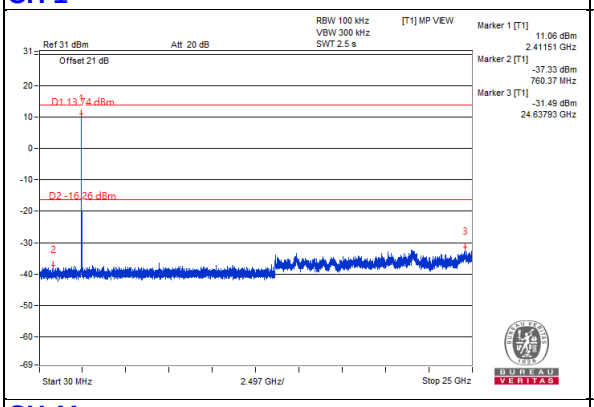


CH 11 Band edge

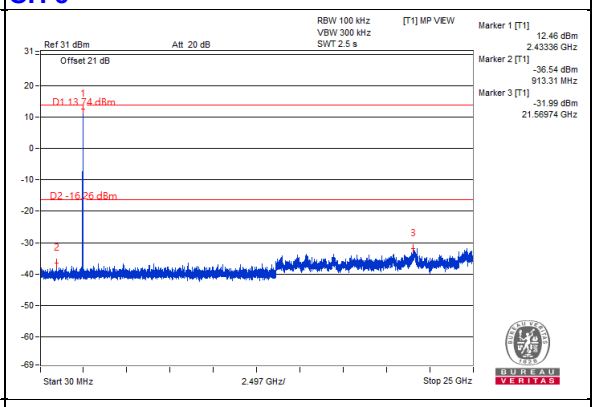


Chain 1

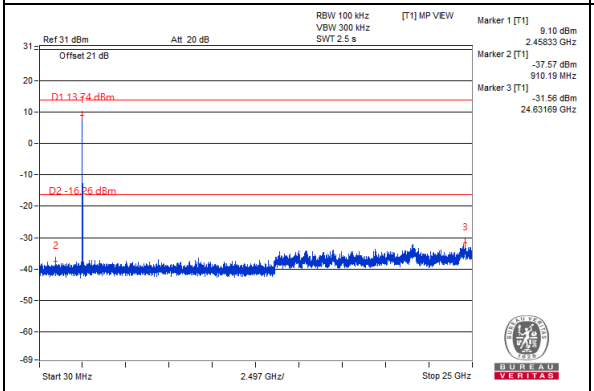
CH 1



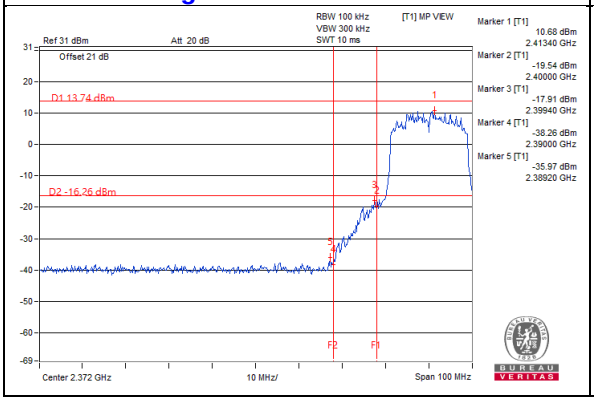
CH 6



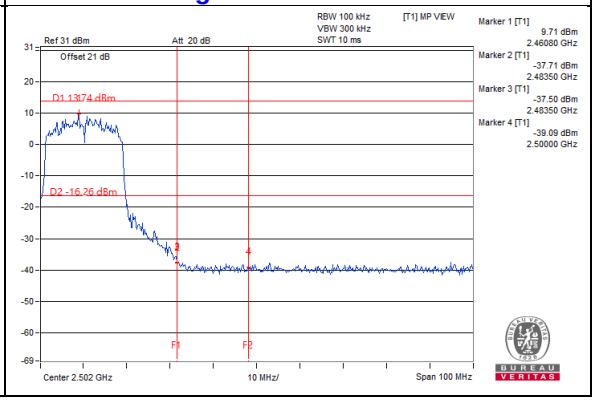
CH 11



CH 1 Band edge

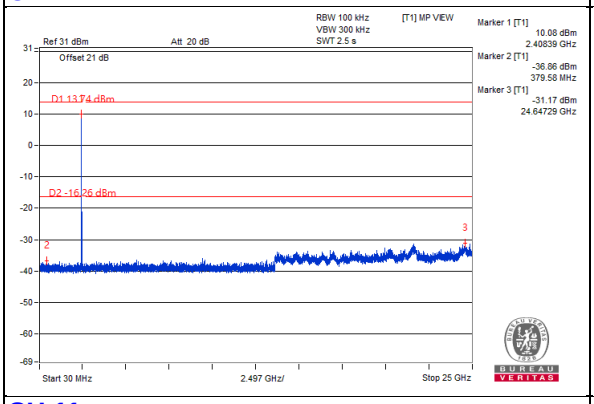


CH 11 Band edge

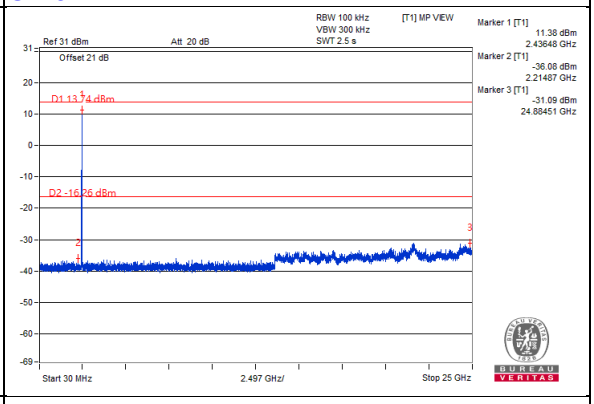


Chain 2

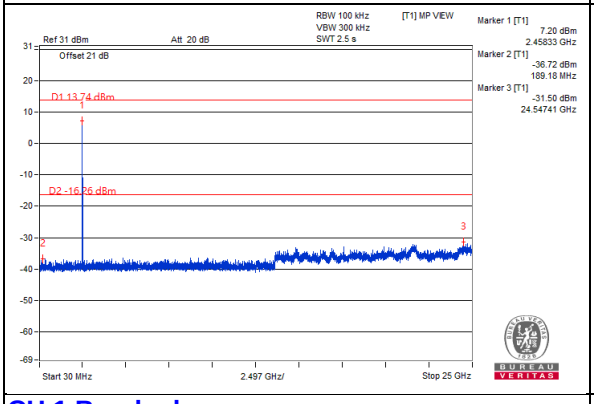
CH 1



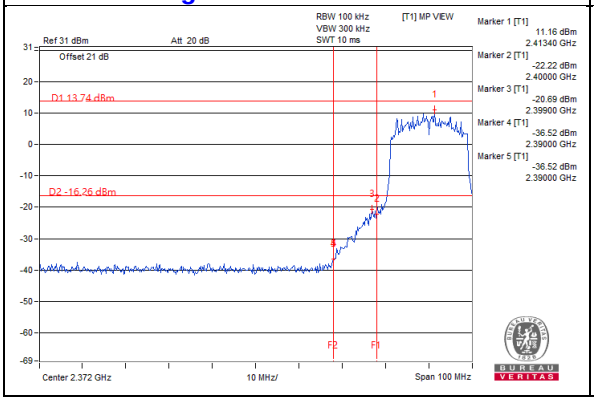
CH 6



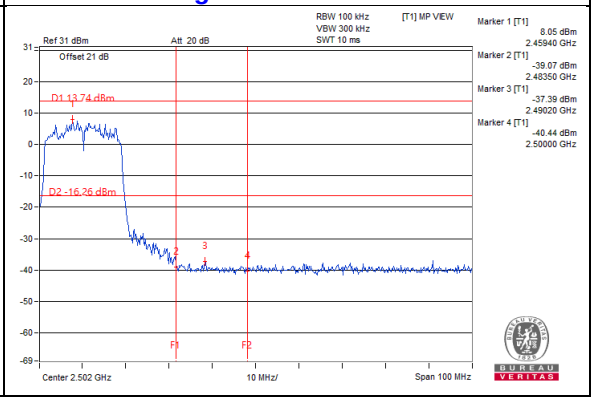
CH 11



CH 1 Band edge

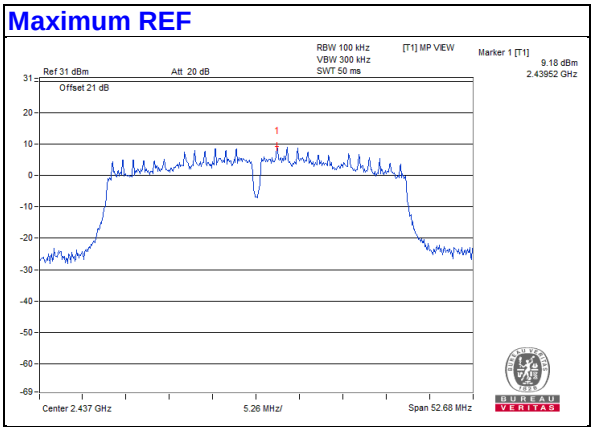


CH 11 Band edge



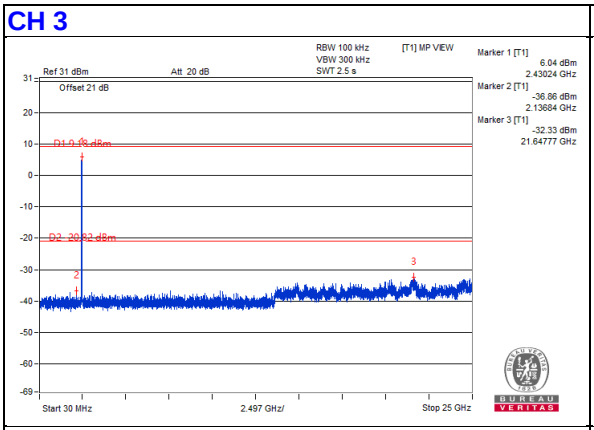
VHT40

Maximum REF

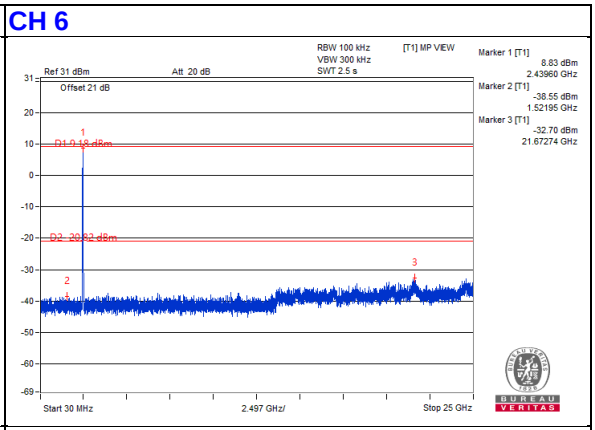


Chain 0

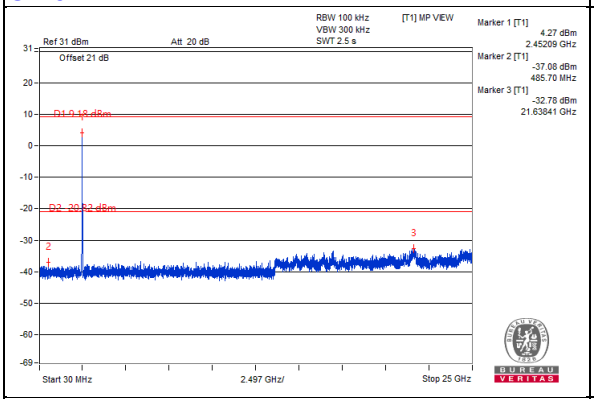
CH 3



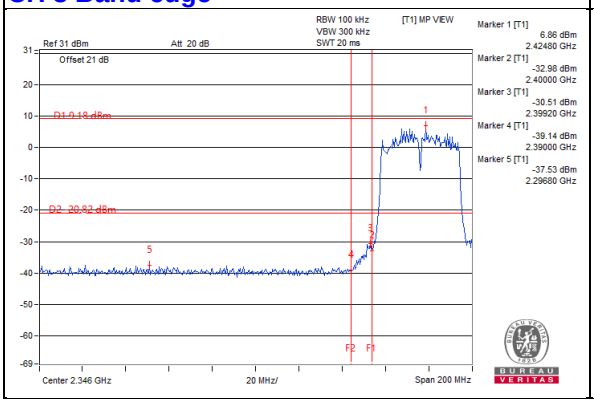
CH 6



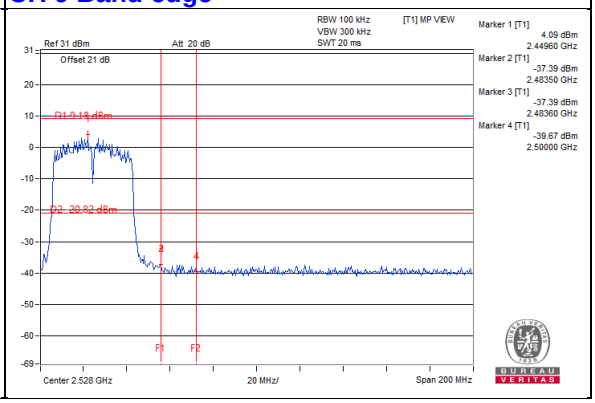
CH 9



CH 3 Band edge

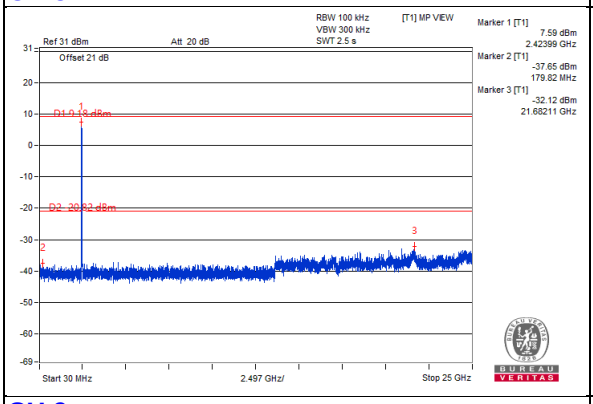


CH 9 Band edge

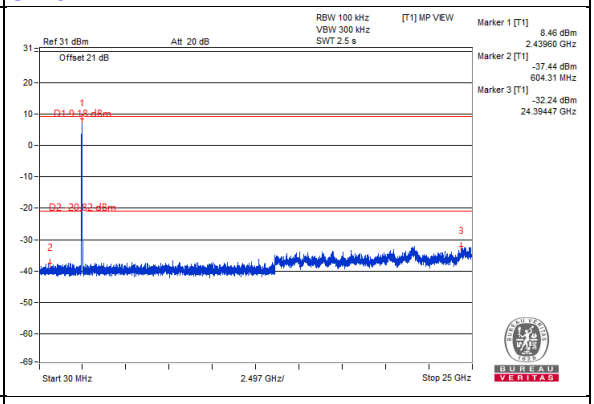


Chain 1

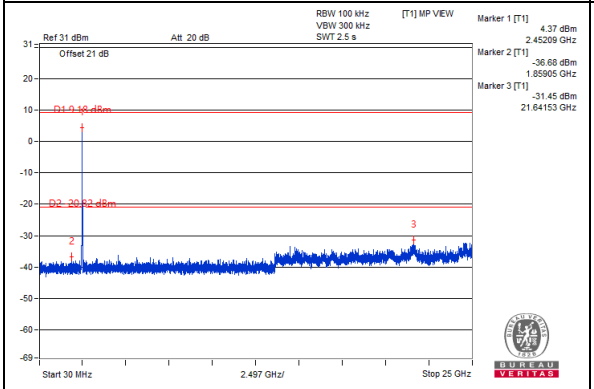
CH 3



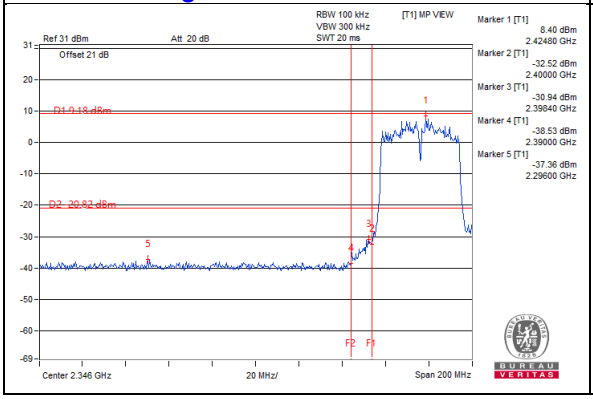
CH 6



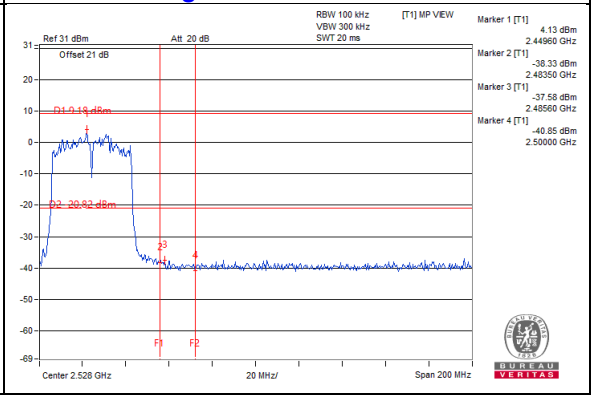
CH 9



CH 3 Band edge

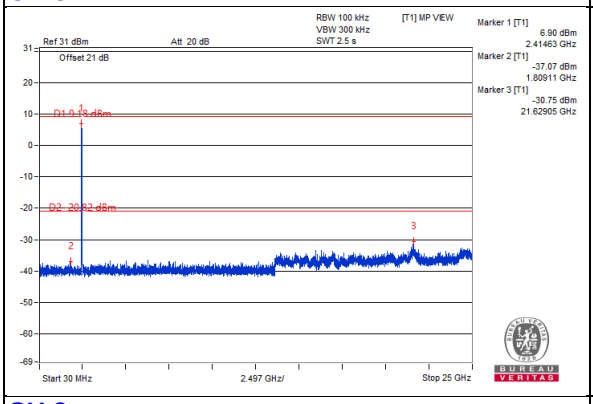


CH 9 Band edge

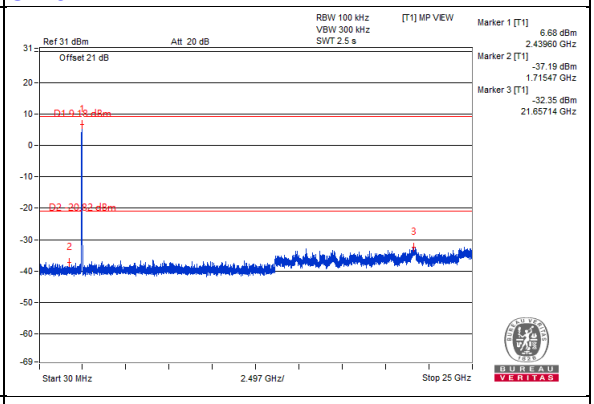


Chain 2

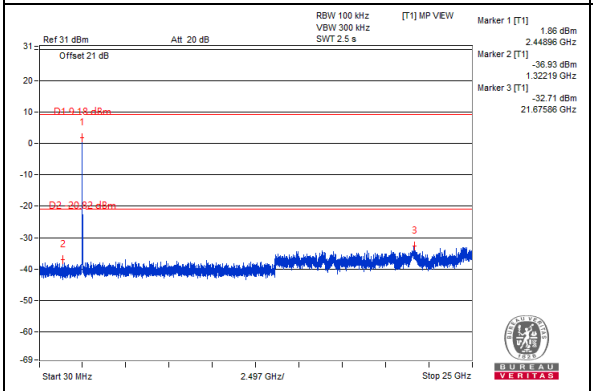
CH 3



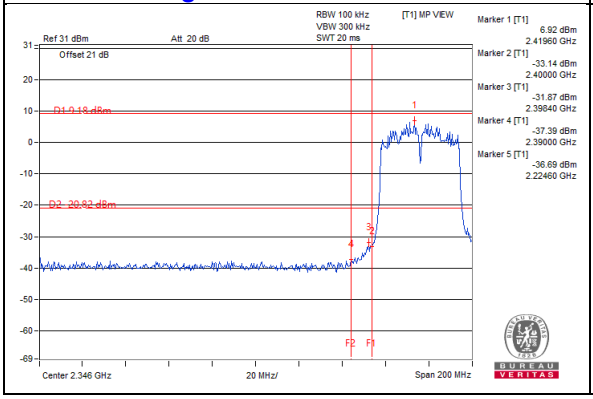
CH 6



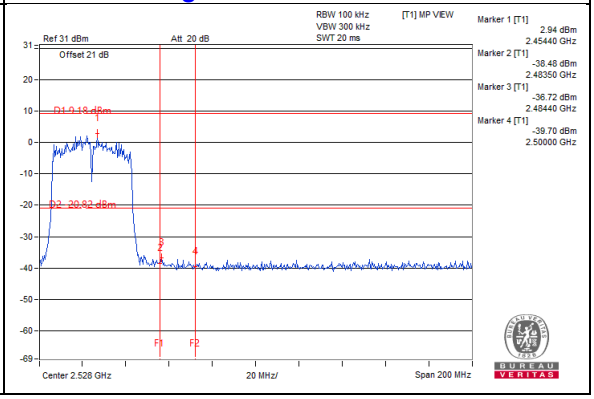
CH 9



CH 3 Band edge

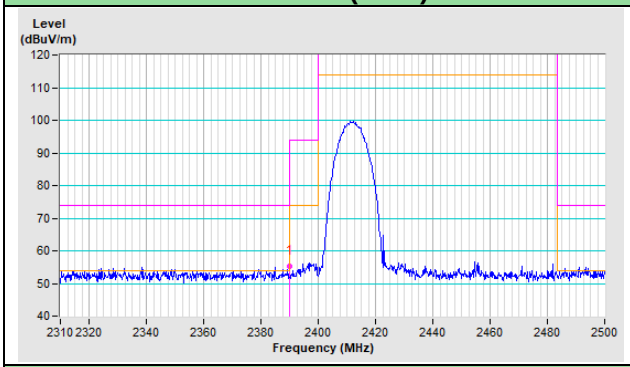
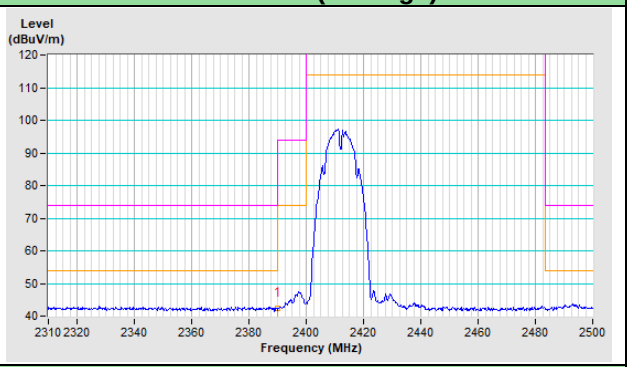
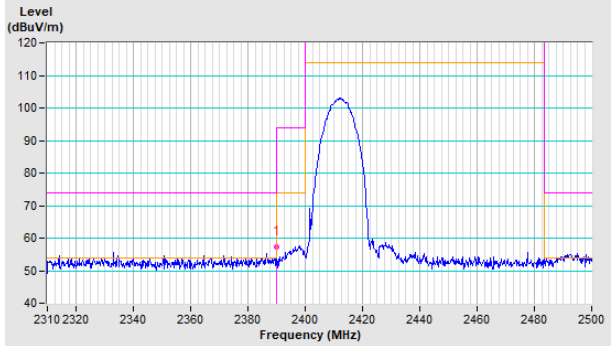
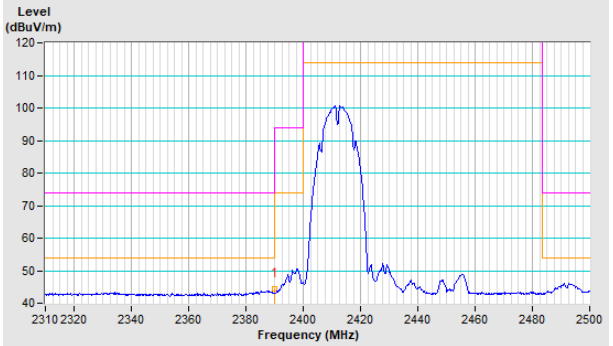
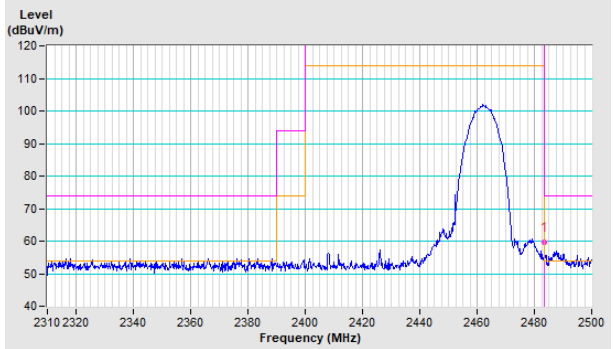
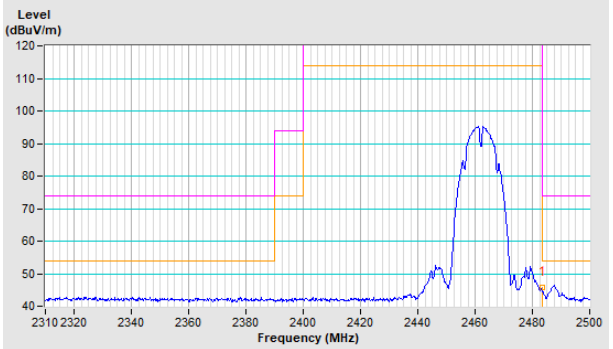
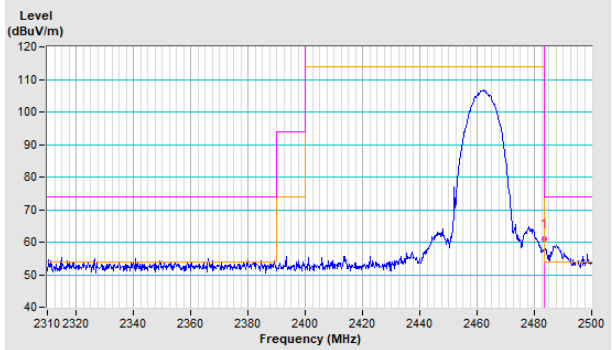
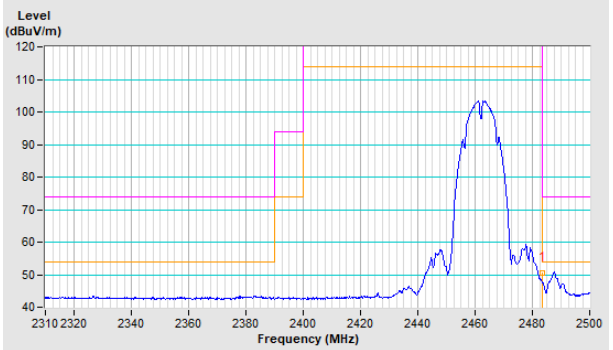


CH 9 Band edge



Annex A - Radiated Band-edge Measurement for Restricted Frequencies

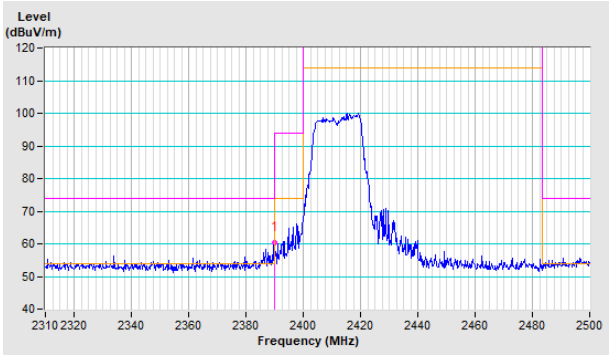
802.11b

Channel 1	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	
Channel 11	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

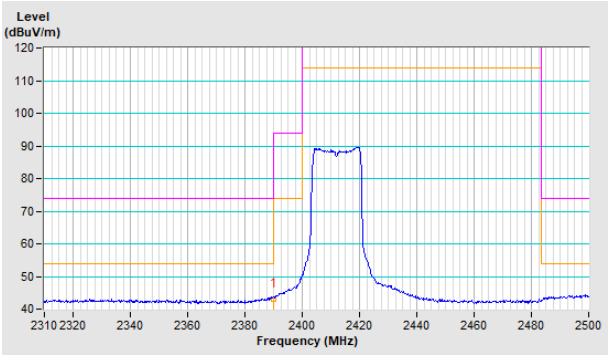
802.11g

Channel 1

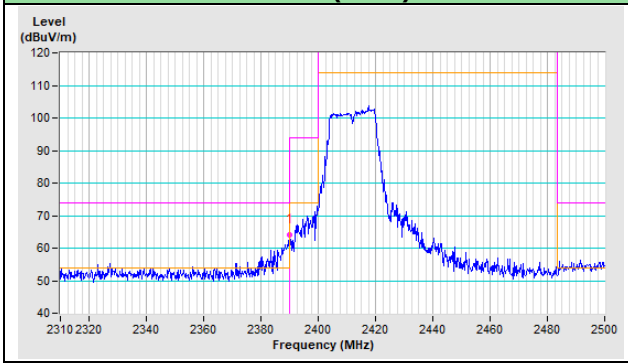
Horizontal (Peak)



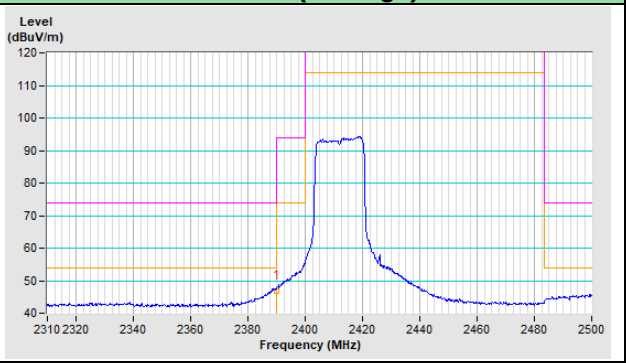
Horizontal (Average)



Vertical (Peak)

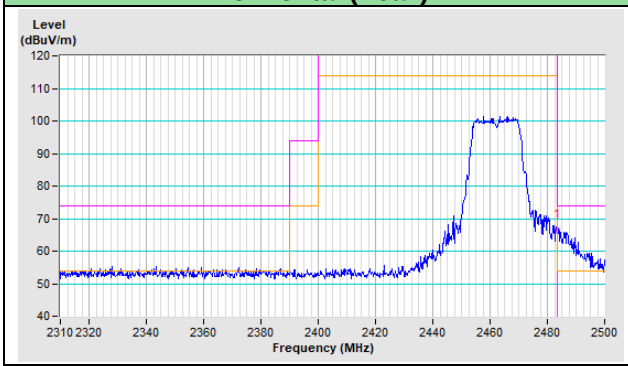


Vertical (Average)

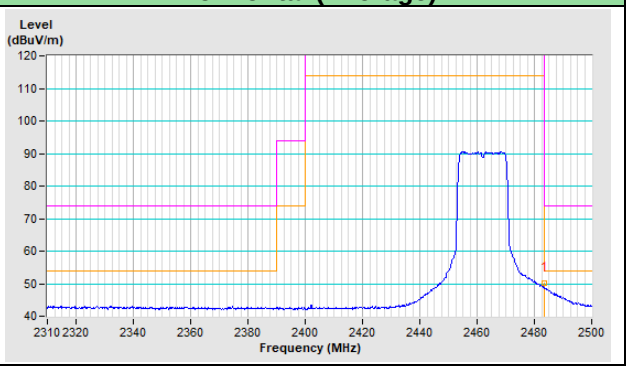


Channel 11

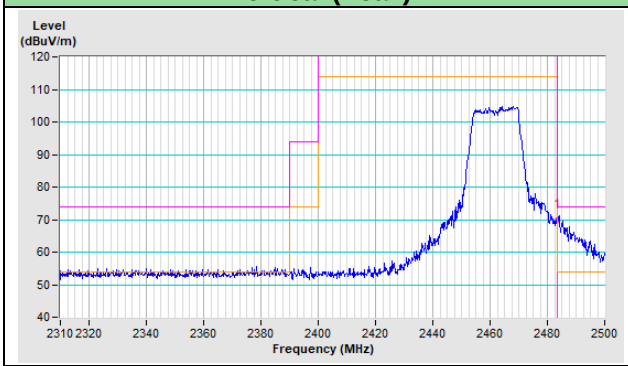
Horizontal (Peak)



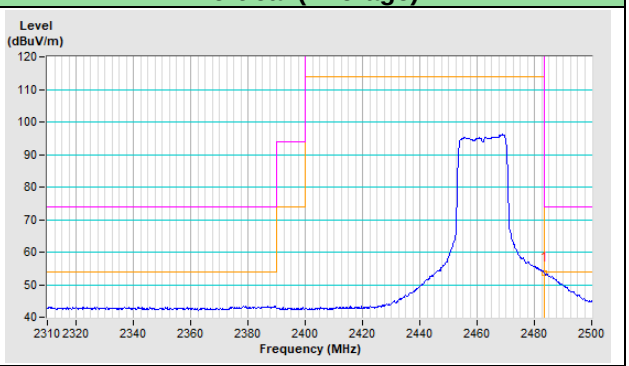
Horizontal (Average)



Vertical (Peak)



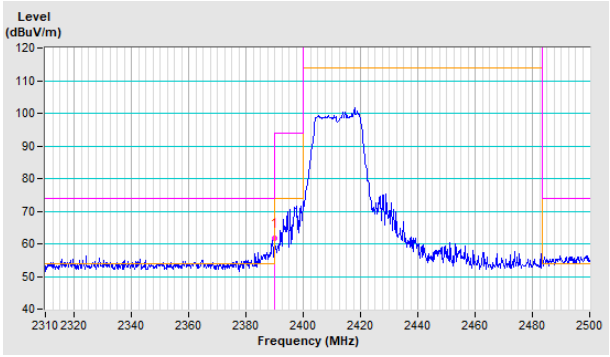
Vertical (Average)



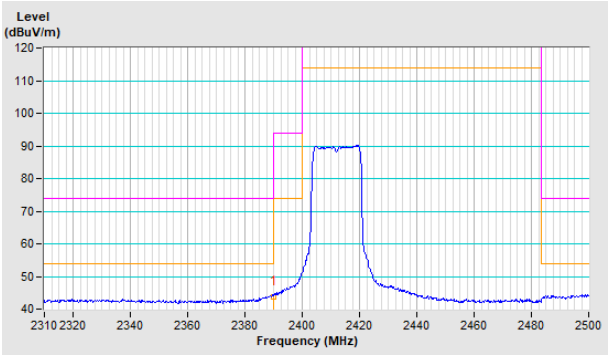
802.11n (HT20)

Channel 1

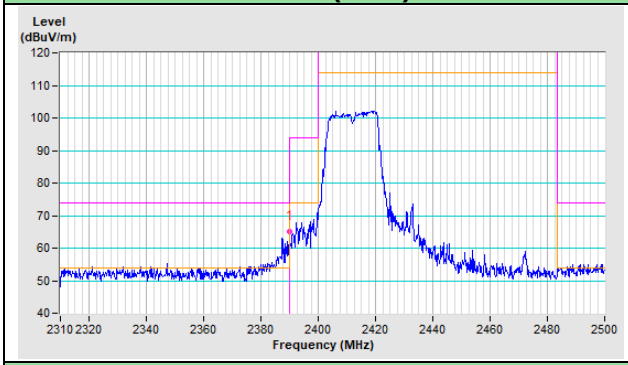
Horizontal (Peak)



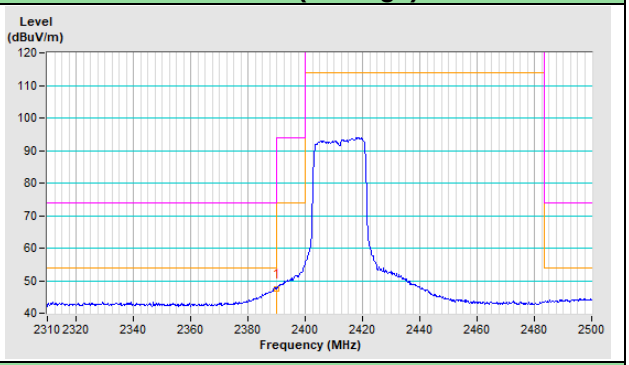
Horizontal (Average)



Vertical (Peak)

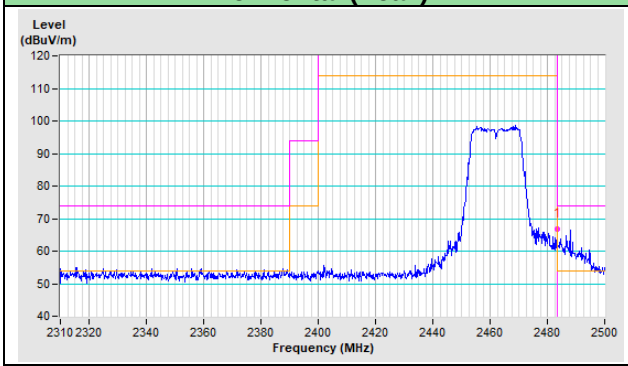


Vertical (Average)

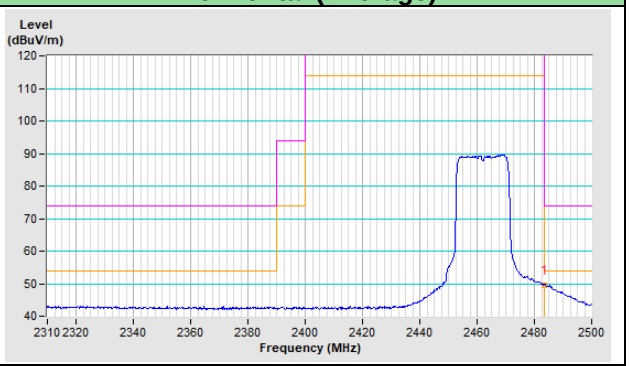


Channel 11

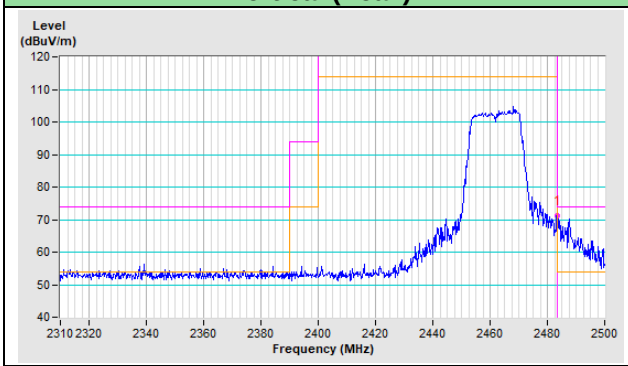
Horizontal (Peak)



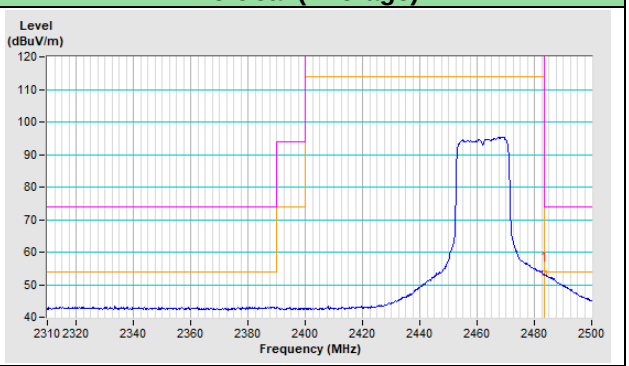
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

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