FCC Test Report

Report No.:	RF200703E03
FCC ID:	UXX-S5A036A
Test Model:	S5A037A
Series Model:	S5A036A
Received Date:	July 03, 2020
Test Date:	July 08 to 27, 2020
Issued Date:	Aug. 11, 2020
Applicant:	Cradlepoint, Inc
Address:	1111 W. Jefferson Street Suite 400 Boise, ID 83702 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
RF200703E03	Original release.	Aug. 11, 2020

1 Certificate of Conformity

Product:	Enterprise Branch Router
Brand:	cradlepoint
Test Model:	S5A037A
Series Model:	S5A036A
Sample Status:	ENGINEERING SAMPLE
Applicant:	Cradlepoint, Inc
Test Date:	July 08 to 27, 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 : Vivian Huang , **Date:** Aug. 11, 2020

Vivian Huang / Specialist

Approved by : , **Date:** Aug. 11, 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 -5.25dB at 0.36094MHz.
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 2483.50MHz.
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:
1. For 2.4GHz 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	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	Enterprise Branch Router
Brand	cradlepoint
Test Model	S5A037A
Series Model	S5A036A
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter or 7.26Vdc 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 300 Mbps 802.11ac: up to 866.7 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:** 678.631 mW **5.18 ~ 5.24GHz:** 245.002mW **5.745 ~ 5.825GHz:** 248.321mW **Beamforming Mode:** **2.412 ~ 2.462 GHz:** 678.631 mW **5.18 ~ 5.24GHz:** 245.002mW **5.745 ~ 5.825GHz:** 248.321mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter × 1, Battery x1
Data Cable Supplied	NA

Note:

1. There are WLAN and LTE technology used for the EUT.
2. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Brand	Product Marketing Name (PMN)	Model	Wi-Fi Function	Embedded Radio (WWAN Module)	Description
cradlepoint	E110-C4D	S5A036A	Yes	Brand: Quectel Model: EC-25AF Contains FCC ID: XMR201808EC25AF Contains IC: 10224A-2018EC25AF	1. Different location of LED. 2. GPS antenna: Bulit in: S5A036A, External: S5A037A 3. Different housing.
	E100-C4D	S5A037A	Yes		
Note: The EUT was pre-tested with above models, the worst case was found in S5A037A. Therefore only the test data of the model was recorded in this report.					

3. The EUT has below radios as following table:

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

4. Simultaneously transmission condition.

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

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

Adapter			
No	Brand	Model No.	Spec.
1	KUANTECH	KSA-36W-120300D5	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
2	Asian Power Devices	WA-36A12R	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
3	Asian Power Devices	WA-36N12R	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
Battery			
No	Brand	Model No.	Spec.
1	Getac	170848-000	7.26V 7800Ah 56.62Wh

Note:
1. From the above adapters, the AC Power Conducted Emissions test worst case was found in **Adapter No.: 3**. Therefore only the test data of the mode was recorded in this report.
2. 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.

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

WLAN Antenna								
Ant. No.	RF Chain No.	Brand	Ant. Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)	Cable Loss (dB)
1	WiFi Chain0	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	130	Including
			2.8	5.15~5.25				
			3.1	5.725~5.85				
2	WiFi Chain1	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	230	Including
			2.8	5.15~5.25				
			3.1	5.725~5.85				

WWAN Antenna				
Antenna No.	Band	Freq. Range (MHz)	Gain (dBi)	Antenna Type
1	WCDMA Band 2	1850~1910	1.4	Dipole
	WCDMA Band 4	1710~1755	1.4	
	WCDMA Band 5	824~849	0.72	
	LTE Band 2	1850~1910	1.54	
	LTE Band 4	1710~1755	1.54	
	LTE Band 5	824~849	0.7	
	LTE Band 12	688~716	0.7	
	LTE Band 13	777~787	0.7	
	LTE Band 14	788~798	0.7	
	LTE Band 66	1710~1780	1.54	
	LTE Band 71	663~698	0.7	
2	WCDMA Band 2	1850~1910	1.26	Dipole
	WCDMA Band 4	1710~1755	1.26	
	WCDMA Band 5	824~849	0.65	
	LTE Band 2	1850~1910	1.53	
	LTE Band 4	1710~1755	1.53	
	LTE Band 5	824~849	0.7	
	LTE Band 12	688~716	0.7	
	LTE Band 13	777~787	0.7	
	LTE Band 14	788~798	0.7	
	LTE Band 66	1710~1780	1.53	
	LTE Band 71	663~698	0.7	

7. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX

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)

8. 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.
9. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

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

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane.**

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)
VHT20	1 to 11	6	OFDM	BPSK	6.5

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)
VHT20	1 to 11	6	OFDM	BPSK	6.5

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:

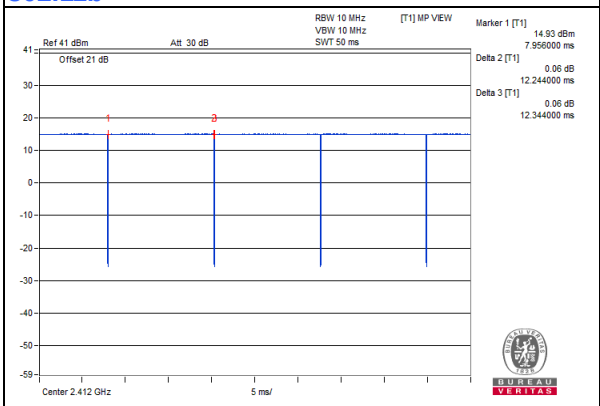
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 75%RH	120Vac, 60Hz	Ryan Du
RE<1G	28deg. C, 68%RH	120Vac, 60Hz	Kevin Ko
PLC	25deg. C, 75%RH	120Vac, 60Hz	Kevin Ko
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

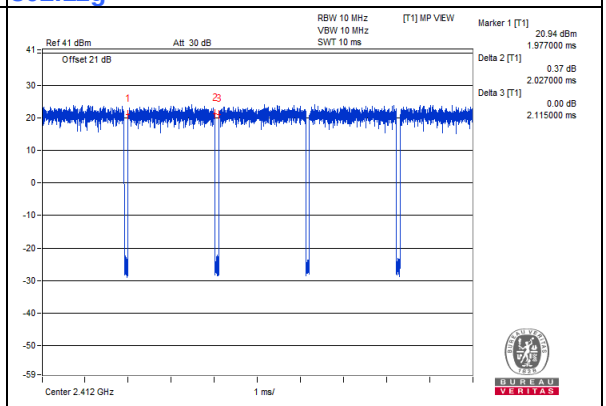
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.244/12.344 = 0.992
802.11g: Duty cycle = 2.027/2.115 = 0.958, Duty factor = 10 * log(1/Duty cycle) = 0.18 dB
VHT20: Duty cycle = 4.97/5.64 = 0.881, Duty factor = 10 * log(1/Duty cycle) = 0.55 dB
VHT40: Duty cycle = 2.415/3.083 = 0.783, Duty factor = 10 * log(1/Duty cycle) = 1.06 dB

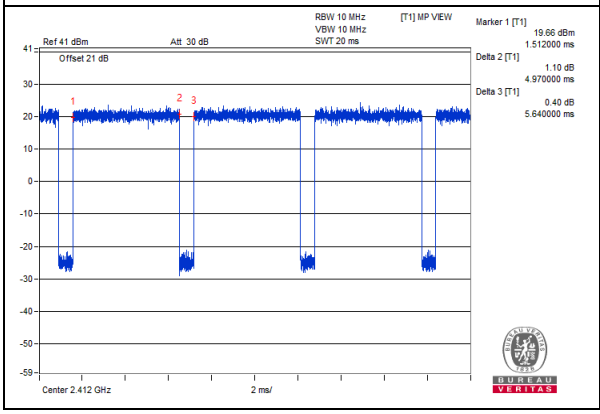
802.11b



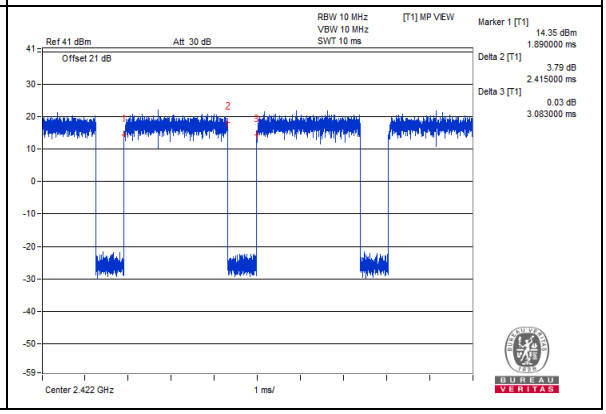
802.11g



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.

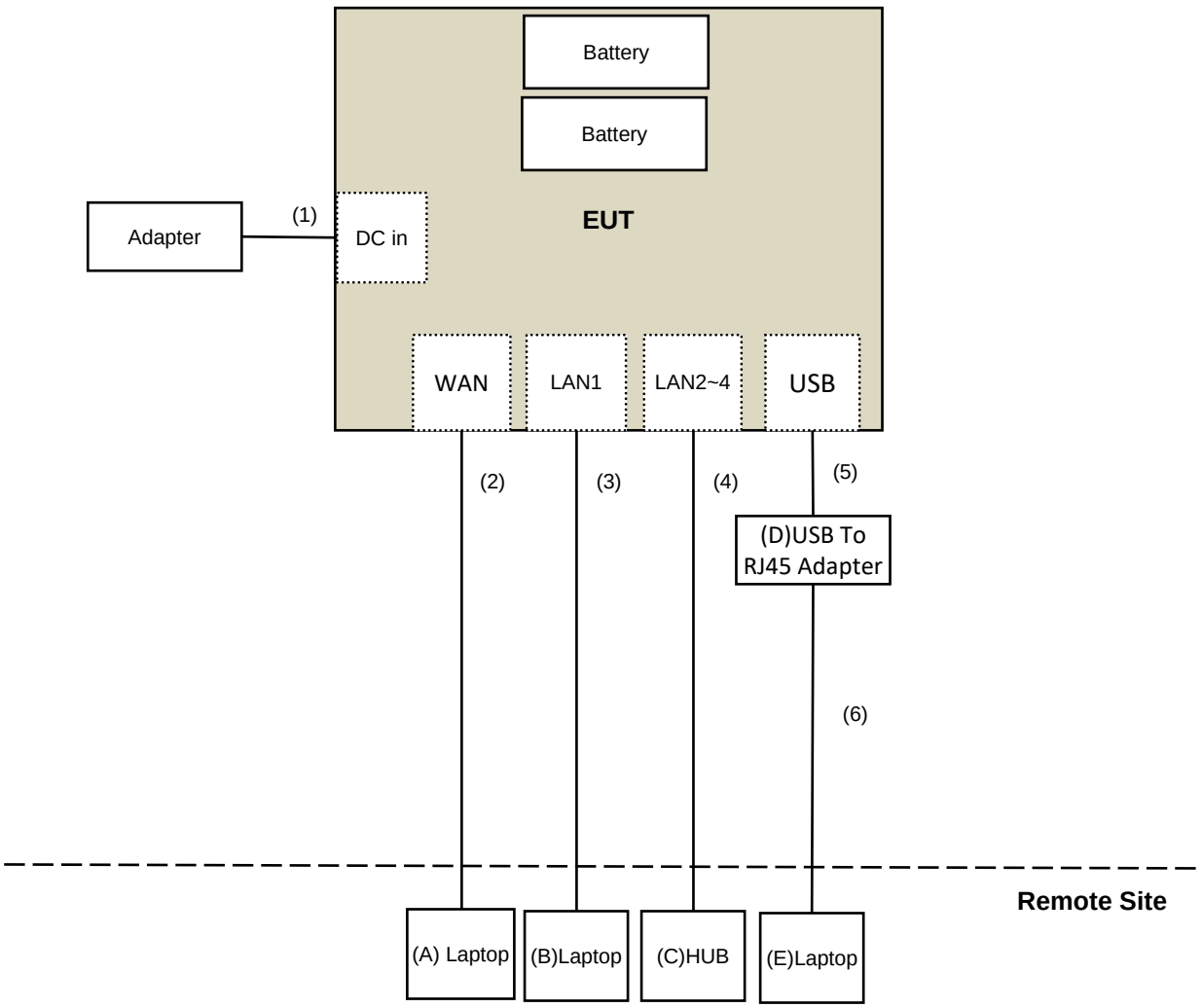
ID	Product	Brand	Model No.	Serial No	FCC ID	Remarks
A.	Laptop	DELL	Latitude E5440	519OP32	FCC DoC	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	GS1100-16	S150H44000046	FCC DoC	Provided by Lab
D.	USB To RJ45 Adapter	Uptech	NET130	NA	NA	Supplied by client
E.	Laptop	DELL	E5430	GM1SKV1	FCC DoC	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	10	No	0	Provided by Lab
3	RJ-45 Cable	1	10	No	0	Provided by Lab
4	RJ-45 Cable	3	10	No	0	Provided by Lab
5	USB Cable	1	0.1	Yes	0	Supplied by client
6	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 20dB 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

For radiated emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
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. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-3-1	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-2	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-3	Mar. 17, 2020	Mar. 16, 2021
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 09, 2020	June 08, 2021
RF Cable	EMC104-SM-SM-6000	180602	June 09, 2020	June 08, 2021
Spectrum Analyzer Keysight	N9030A	MY54490679	July 13, 2020	July 12, 2021
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	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
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

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. Tested Date: July 22, 2020

For bandedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
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 09, 2020	June 08, 2021
RF Cable	EMC104-SM-SM-6000	180602	June 09, 2020	June 08, 2021
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	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
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

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. Tested Date: July 08, 2020

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: July 27, 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:

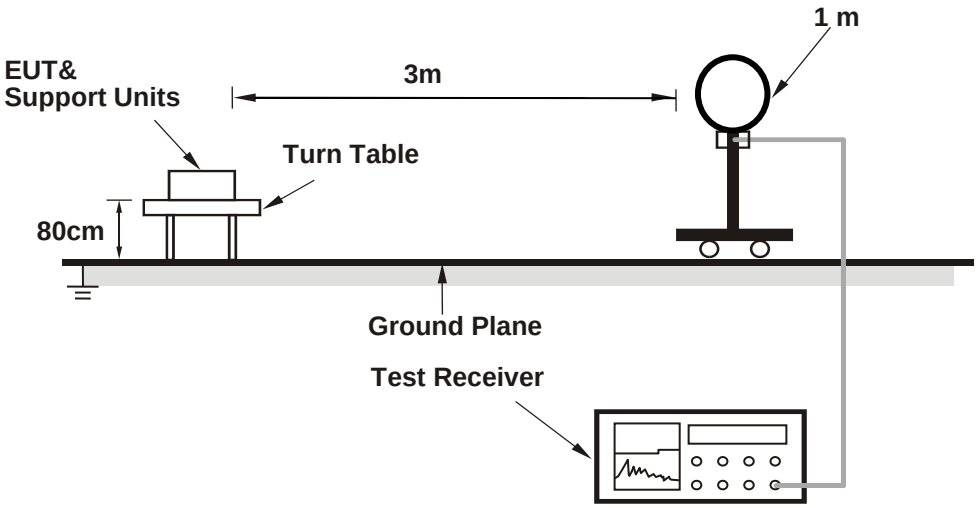
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

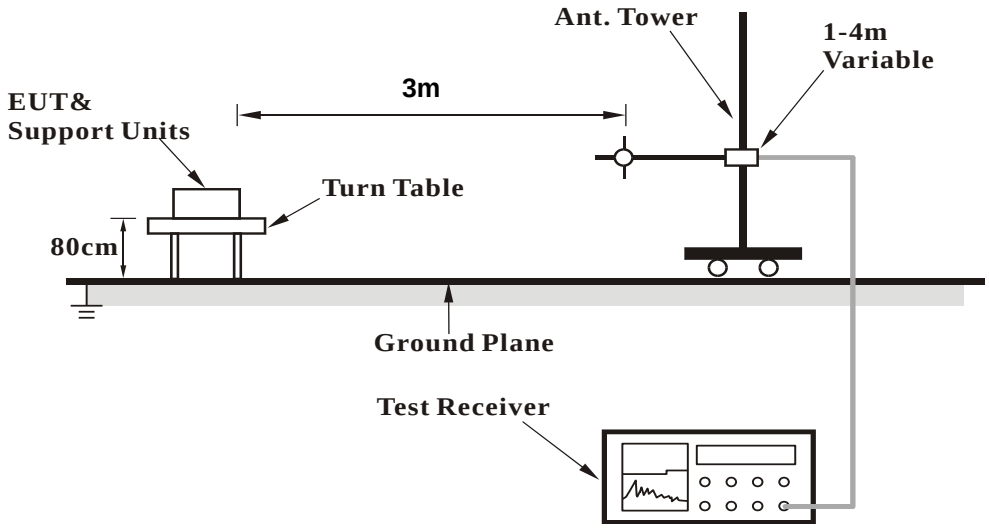
No deviation.

4.1.5 Test Setup

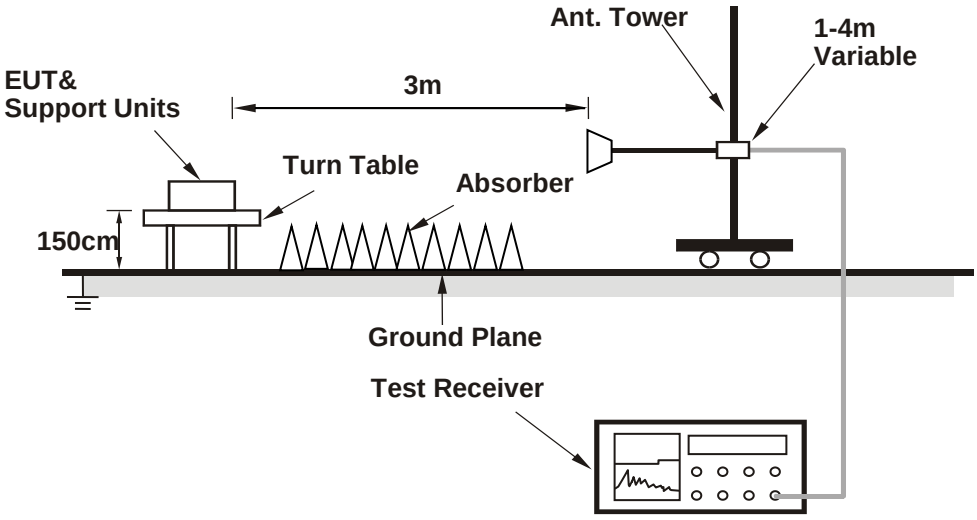
For Radiated emission below 30MHz



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 (QDART_1.0.44) 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	**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	58.6 PK	74.0	-15.4	2.66 H	201	60.5	-1.9
2	2390.00	45.6 AV	54.0	-8.4	2.66 H	201	47.5	-1.9
3	*2412.00	109.0 PK			2.66 H	201	110.9	-1.9
4	*2412.00	105.8 AV			2.66 H	201	107.7	-1.9
5	4824.00	54.8 PK	74.0	-19.2	1.06 H	35	51.9	2.9
6	4824.00	52.8 AV	54.0	-1.2	1.06 H	35	49.9	2.9
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	58.6 PK	74.0	-15.4	1.09 V	277	60.5	-1.9
2	2390.00	45.6 AV	54.0	-8.4	1.09 V	277	47.5	-1.9
3	*2412.00	101.6 PK			1.09 V	277	103.5	-1.9
4	*2412.00	98.1 AV			1.09 V	277	100.0	-1.9
5	4824.00	54.1 PK	74.0	-19.9	1.68 V	360	51.2	2.9
6	4824.00	52.2 AV	54.0	-1.8	1.68 V	360	49.3	2.9

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	2390.00	57.4 PK	74.0	-16.6	1.90 H	203	59.3	-1.9
2	2390.00	44.2 AV	54.0	-9.8	1.90 H	203	46.1	-1.9
3	*2437.00	108.6 PK			1.90 H	203	110.6	-2.0
4	*2437.00	105.5 AV			1.90 H	203	107.5	-2.0
5	2483.50	57.2 PK	74.0	-16.8	1.90 H	203	59.1	-1.9
6	2483.50	44.4 AV	54.0	-9.6	1.90 H	203	46.3	-1.9
7	3666.00	48.3 PK	74.0	-25.7	2.34 H	11	47.8	0.5
8	3666.00	46.8 AV	54.0	-7.2	2.34 H	11	46.3	0.5
9	4874.00	54.4 PK	74.0	-19.6	1.29 H	34	51.6	2.8
10	4874.00	52.8 AV	54.0	-1.2	1.29 H	34	50.0	2.8
11	7311.00	51.4 PK	74.0	-22.6	1.07 H	77	42.5	8.9
12	7311.00	44.9 AV	54.0	-9.1	1.07 H	77	36.0	8.9
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	56.8 PK	74.0	-17.2	1.12 V	276	58.7	-1.9
2	2390.00	43.8 AV	54.0	-10.2	1.12 V	276	45.7	-1.9
3	*2437.00	100.5 PK			1.12 V	276	102.5	-2.0
4	*2437.00	97.6 AV			1.12 V	276	99.6	-2.0
5	2483.50	56.3 PK	74.0	-17.7	1.12 V	276	58.2	-1.9
6	2483.50	43.7 AV	54.0	-10.3	1.12 V	276	45.6	-1.9
7	3666.00	51.8 PK	74.0	-22.2	1.02 V	339	51.3	0.5
8	3666.00	50.8 AV	54.0	-3.2	1.02 V	339	50.3	0.5
9	4874.00	53.9 PK	74.0	-20.1	1.73 V	358	51.1	2.8
10	4874.00	52.0 AV	54.0	-2.0	1.73 V	358	49.2	2.8
11	7311.00	49.8 PK	74.0	-24.2	1.49 V	333	40.9	8.9
12	7311.00	41.7 AV	54.0	-12.3	1.49 V	333	32.8	8.9

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 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	108.1 PK			2.57 H	204	110.0	-1.9
2	*2462.00	105.2 AV			2.57 H	204	107.1	-1.9
3	2483.50	58.4 PK	74.0	-15.6	2.57 H	204	60.3	-1.9
4	2483.50	47.5 AV	54.0	-6.5	2.57 H	204	49.4	-1.9
5	4924.00	54.8 PK	74.0	-19.2	1.13 H	33	52.1	2.7
6	4924.00	53.1 AV	54.0	-0.9	1.13 H	33	50.4	2.7
7	7386.00	51.6 PK	74.0	-22.4	1.03 H	65	42.6	9.0
8	7386.00	45.2 AV	54.0	-8.8	1.03 H	65	36.2	9.0
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	*2462.00	101.1 PK			1.29 V	273	103.0	-1.9
2	*2462.00	97.8 AV			1.29 V	273	99.7	-1.9
3	2483.50	59.2 PK	74.0	-14.8	1.29 V	273	61.1	-1.9
4	2483.50	45.5 AV	54.0	-8.5	1.29 V	273	47.4	-1.9
5	4924.00	54.1 PK	74.0	-19.9	1.68 V	360	51.4	2.7
6	4924.00	52.4 AV	54.0	-1.6	1.68 V	360	49.7	2.7
7	7386.00	49.6 PK	74.0	-24.4	1.47 V	331	40.6	9.0
8	7386.00	41.8 AV	54.0	-12.2	1.47 V	331	32.8	9.0

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.

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	69.8 PK	74.0	-4.2	1.53 H	196	71.7	-1.9
2	2390.00	53.0 AV	54.0	-1.0	1.53 H	196	54.9	-1.9
3	*2412.00	117.3 PK			1.53 H	196	119.2	-1.9
4	*2412.00	106.9 AV			1.53 H	196	108.8	-1.9
5	4824.00	63.5 PK	74.0	-10.5	1.41 H	16	60.6	2.9
6	4824.00	52.3 AV	54.0	-1.7	1.41 H	16	49.4	2.9
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	60.1 PK	74.0	-13.9	1.04 V	275	62.0	-1.9
2	2390.00	47.4 AV	54.0	-6.6	1.04 V	275	49.3	-1.9
3	*2412.00	111.5 PK			1.04 V	275	113.4	-1.9
4	*2412.00	101.7 AV			1.04 V	275	103.6	-1.9
5	4824.00	62.6 PK	74.0	-11.4	1.78 V	353	59.7	2.9
6	4824.00	51.8 AV	54.0	-2.2	1.78 V	353	48.9	2.9

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	2390.00	58.1 PK	74.0	-15.9	2.16 H	200	60.0	-1.9
2	2390.00	45.3 AV	54.0	-8.7	2.16 H	200	47.2	-1.9
3	*2437.00	117.0 PK			2.16 H	200	119.0	-2.0
4	*2437.00	107.7 AV			2.16 H	200	109.7	-2.0
5	2483.50	59.8 PK	74.0	-14.2	2.16 H	200	61.7	-1.9
6	2483.50	46.5 AV	54.0	-7.5	2.16 H	200	48.4	-1.9
7	3666.00	48.3 PK	74.0	-25.7	2.34 H	17	47.8	0.5
8	3666.00	46.5 AV	54.0	-7.5	2.34 H	17	46.0	0.5
9	4874.00	63.1 PK	74.0	-10.9	1.37 H	30	60.3	2.8
10	4874.00	52.1 AV	54.0	-1.9	1.37 H	30	49.3	2.8
11	7311.00	66.2 PK	74.0	-7.8	1.16 H	39	57.3	8.9
12	7311.00	53.3 AV	54.0	-0.7	1.16 H	39	44.4	8.9
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	57.8 PK	74.0	-16.2	1.12 V	275	59.7	-1.9
2	2390.00	44.5 AV	54.0	-9.5	1.12 V	275	46.4	-1.9
3	*2437.00	110.3 PK			1.12 V	275	112.3	-2.0
4	*2437.00	100.8 AV			1.12 V	275	102.8	-2.0
5	2483.50	58.0 PK	74.0	-16.0	1.12 V	275	59.9	-1.9
6	2483.50	44.6 AV	54.0	-9.4	1.12 V	275	46.5	-1.9
7	3666.00	51.8 PK	74.0	-22.2	1.02 V	328	51.3	0.5
8	3666.00	51.0 AV	54.0	-3.0	1.02 V	328	50.5	0.5
9	4874.00	62.8 PK	74.0	-11.2	1.83 V	359	60.0	2.8
10	4874.00	52.0 AV	54.0	-2.0	1.83 V	359	49.2	2.8
11	7311.00	65.6 PK	74.0	-8.4	1.43 V	335	56.7	8.9
12	7311.00	52.4 AV	54.0	-1.6	1.43 V	335	43.5	8.9

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 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	114.0 PK			1.51 H	204	115.9	-1.9
2	*2462.00	104.7 AV			1.51 H	204	106.6	-1.9
3	2483.50	70.8 PK	74.0	-3.2	1.51 H	204	72.7	-1.9
4	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**1.51 H**	**204**	**55.7**	**-1.9**
5	4924.00	63.0 PK	74.0	-11.0	1.40 H	41	60.3	2.7
6	4924.00	51.3 AV	54.0	-2.7	1.40 H	41	48.6	2.7
7	7386.00	65.8 PK	74.0	-8.2	1.19 H	53	56.8	9.0
8	7386.00	52.2 AV	54.0	-1.8	1.19 H	53	43.2	9.0
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	*2462.00	107.4 PK			1.30 V	273	109.3	-1.9
2	*2462.00	97.4 AV			1.30 V	273	99.3	-1.9
3	2483.50	62.5 PK	74.0	-11.5	1.30 V	273	64.4	-1.9
4	2483.50	48.6 AV	54.0	-5.4	1.30 V	273	50.5	-1.9
5	4924.00	62.1 PK	74.0	-11.9	1.77 V	360	59.4	2.7
6	4924.00	50.9 AV	54.0	-3.1	1.77 V	360	48.2	2.7
7	7386.00	64.9 PK	74.0	-9.1	1.38 V	350	55.9	9.0
8	7386.00	51.8 AV	54.0	-2.2	1.38 V	350	42.8	9.0

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.

VHT20

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	70.5 PK	74.0	-3.5	1.55 H	201	72.4	-1.9
2	2390.00	53.1 AV	54.0	-0.9	1.55 H	201	55.0	-1.9
3	*2412.00	116.5 PK			1.55 H	201	118.4	-1.9
4	*2412.00	106.2 AV			1.55 H	201	108.1	-1.9
5	4824.00	62.9 PK	74.0	-11.1	1.45 H	34	60.0	2.9
6	4824.00	51.3 AV	54.0	-2.7	1.45 H	34	48.4	2.9
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	59.2 PK	74.0	-14.8	1.05 V	279	61.1	-1.9
2	2390.00	46.4 AV	54.0	-7.6	1.05 V	279	48.3	-1.9
3	*2412.00	107.8 PK			1.05 V	279	109.7	-1.9
4	*2412.00	98.3 AV			1.05 V	279	100.2	-1.9
5	4824.00	62.3 PK	74.0	-11.7	1.72 V	360	59.4	2.9
6	4824.00	50.8 AV	54.0	-3.2	1.72 V	360	47.9	2.9

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	2390.00	56.6 PK	74.0	-17.4	1.47 H	163	58.5	-1.9
2	2390.00	44.1 AV	54.0	-9.9	1.47 H	163	46.0	-1.9
3	*2437.00	117.4 PK			1.47 H	163	119.4	-2.0
4	*2437.00	107.8 AV			1.47 H	163	109.8	-2.0
5	2483.50	61.9 PK	74.0	-12.1	1.47 H	163	63.8	-1.9
6	2483.50	46.1 AV	54.0	-7.9	1.47 H	163	48.0	-1.9
7	4874.00	62.7 PK	74.0	-11.3	1.45 H	50	59.9	2.8
8	4874.00	50.9 AV	54.0	-3.1	1.45 H	50	48.1	2.8
9	7311.00	66.3 PK	74.0	-7.7	1.20 H	56	57.4	8.9
10	7311.00	52.5 AV	54.0	-1.5	1.20 H	56	43.6	8.9
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	57.0 PK	74.0	-17.0	1.08 V	274	58.9	-1.9
2	2390.00	44.2 AV	54.0	-9.8	1.08 V	274	46.1	-1.9
3	*2437.00	110.6 PK			1.08 V	274	112.6	-2.0
4	*2437.00	100.8 AV			1.08 V	274	102.8	-2.0
5	2483.50	56.8 PK	74.0	-17.2	1.08 V	274	58.7	-1.9
6	2483.50	44.7 AV	54.0	-9.3	1.08 V	274	46.6	-1.9
7	4874.00	62.4 PK	74.0	-11.6	1.68 V	359	59.6	2.8
8	4874.00	50.7 AV	54.0	-3.3	1.68 V	359	47.9	2.8
9	7311.00	65.0 PK	74.0	-9.0	1.35 V	344	56.1	8.9
10	7311.00	51.8 AV	54.0	-2.2	1.35 V	344	42.9	8.9

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 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	114.5 PK			2.11 H	191	116.4	-1.9
2	*2462.00	103.5 AV			2.11 H	191	105.4	-1.9
3	2483.50	70.1 PK	74.0	-3.9	2.11 H	191	72.0	-1.9
4	2483.50	53.4 AV	54.0	-0.6	2.11 H	191	55.3	-1.9
5	4924.00	62.8 PK	74.0	-11.2	1.46 H	50	60.1	2.7
6	4924.00	51.0 AV	54.0	-3.0	1.46 H	50	48.3	2.7
7	7386.00	66.3 PK	74.0	-7.7	1.17 H	45	57.3	9.0
8	7386.00	52.5 AV	54.0	-1.5	1.17 H	45	43.5	9.0
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	*2462.00	105.7 PK			1.13 V	268	107.6	-1.9
2	*2462.00	95.9 AV			1.13 V	268	97.8	-1.9
3	2483.50	59.4 PK	74.0	-14.6	1.13 V	268	61.3	-1.9
4	2483.50	45.7 AV	54.0	-8.3	1.13 V	268	47.6	-1.9
5	4924.00	62.3 PK	74.0	-11.7	1.63 V	360	59.6	2.7
6	4924.00	50.7 AV	54.0	-3.3	1.63 V	360	48.0	2.7
7	7386.00	65.3 PK	74.0	-8.7	1.33 V	332	56.3	9.0
8	7386.00	52.2 AV	54.0	-1.8	1.33 V	332	43.2	9.0

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.

VHT40

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	66.0 PK	74.0	-8.0	1.44 H	192	67.9	-1.9
2	2390.00	53.1 AV	54.0	-0.9	1.44 H	192	55.0	-1.9
3	*2422.00	113.7 PK			1.44 H	192	115.6	-1.9
4	*2422.00	104.2 AV			1.44 H	192	106.1	-1.9
5	4844.00	63.2 PK	74.0	-10.8	1.44 H	47	60.3	2.9
6	4844.00	51.3 AV	54.0	-2.7	1.44 H	47	48.4	2.9
7	7266.00	66.4 PK	74.0	-7.6	1.21 H	47	57.6	8.8
8	7266.00	52.8 AV	54.0	-1.2	1.21 H	47	44.0	8.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.4 PK	74.0	-14.6	1.00 V	272	61.3	-1.9
2	2390.00	47.8 AV	54.0	-6.2	1.00 V	272	49.7	-1.9
3	*2422.00	107.5 PK			1.03 V	272	109.4	-1.9
4	*2422.00	97.9 AV			1.03 V	272	99.8	-1.9
5	4844.00	62.6 PK	74.0	-11.4	1.58 V	357	59.7	2.9
6	4844.00	50.8 AV	54.0	-3.2	1.58 V	357	47.9	2.9
7	7266.00	65.1 PK	74.0	-8.9	1.36 V	320	56.3	8.8
8	7266.00	52.0 AV	54.0	-2.0	1.36 V	320	43.2	8.8

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	2390.00	58.3 PK	74.0	-15.7	1.46 H	200	60.2	-1.9
2	2390.00	46.4 AV	54.0	-7.6	1.46 H	200	48.3	-1.9
3	*2437.00	111.6 PK			1.46 H	200	113.6	-2.0
4	*2437.00	102.2 AV			1.46 H	200	104.2	-2.0
5	2483.50	69.1 PK	74.0	-4.9	1.46 H	200	71.0	-1.9
6	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**1.46 H**	**200**	**55.7**	**-1.9**
7	4874.00	63.5 PK	74.0	-10.5	1.44 H	46	60.7	2.8
8	4874.00	51.4 AV	54.0	-2.6	1.44 H	46	48.6	2.8
9	7311.00	66.7 PK	74.0	-7.3	1.13 H	49	57.8	8.9
10	7311.00	52.8 AV	54.0	-1.2	1.13 H	49	43.9	8.9
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	56.1 PK	74.0	-17.9	1.22 V	275	58.0	-1.9
2	2390.00	44.7 AV	54.0	-9.3	1.22 V	275	46.6	-1.9
3	*2437.00	105.2 PK			1.22 V	275	107.2	-2.0
4	*2437.00	96.1 AV			1.22 V	275	98.1	-2.0
5	2483.50	60.6 PK	74.0	-13.4	1.22 V	275	62.5	-1.9
6	2483.50	46.7 AV	54.0	-7.3	1.22 V	275	48.6	-1.9
7	4874.00	62.3 PK	74.0	-11.7	1.73 V	347	59.5	2.8
8	4874.00	50.3 AV	54.0	-3.7	1.73 V	347	47.5	2.8
9	7311.00	65.0 PK	74.0	-9.0	1.30 V	338	56.1	8.9
10	7311.00	52.0 AV	54.0	-2.0	1.30 V	338	43.1	8.9

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 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	109.8 PK			1.19 H	190	111.7	-1.9
2	*2452.00	100.4 AV			1.19 H	190	102.3	-1.9
3	2483.50	68.7 PK	74.0	-5.3	1.19 H	190	70.6	-1.9
4	2483.50	53.1 AV	54.0	-0.9	1.19 H	190	55.0	-1.9
5	4904.00	63.3 PK	74.0	-10.7	1.49 H	35	60.6	2.7
6	4904.00	51.2 AV	54.0	-2.8	1.49 H	35	48.5	2.7
7	7356.00	66.7 PK	74.0	-7.3	1.19 H	37	57.8	8.9
8	7356.00	52.9 AV	54.0	-1.1	1.19 H	37	44.0	8.9
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	*2452.00	102.9 PK			1.02 V	275	104.8	-1.9
2	*2452.00	93.4 AV			1.02 V	275	95.3	-1.9
3	2483.50	58.9 PK	74.0	-15.1	1.02 V	275	60.8	-1.9
4	2483.50	46.9 AV	54.0	-7.1	1.02 V	275	48.8	-1.9
5	4904.00	62.1 PK	74.0	-11.9	1.76 V	353	59.4	2.7
6	4904.00	50.1 AV	54.0	-3.9	1.76 V	353	47.4	2.7
7	7356.00	64.5 PK	74.0	-9.5	1.32 V	345	55.6	8.9
8	7356.00	51.6 AV	54.0	-2.4	1.32 V	345	42.7	8.9

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.

Below 1GHz Data:

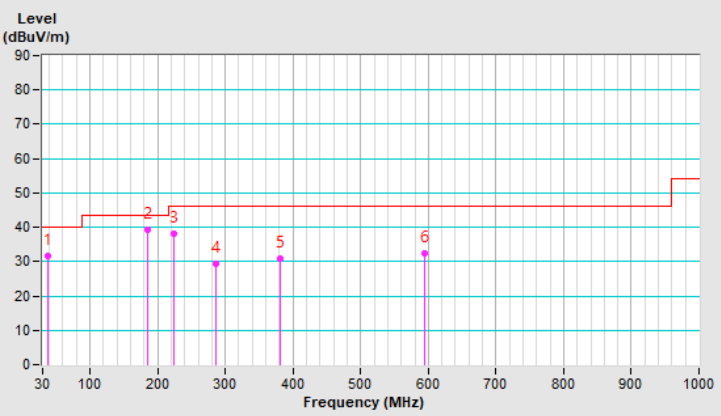
VHT20

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	36.89	31.7 QP	40.0	-8.3	3.00 H	112	40.2	-8.5
2	185.01	39.2 QP	43.5	-4.3	1.50 H	88	48.1	-8.9
3	224.53	38.2 QP	46.0	-7.8	1.50 H	82	47.9	-9.7
4	285.86	29.3 QP	46.0	-16.7	1.00 H	51	35.7	-6.4
5	380.56	30.7 QP	46.0	-15.3	1.00 H	307	34.3	-3.6
6	594.64	32.2 QP	46.0	-13.8	3.00 H	65	30.1	2.1

REMARKS:

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

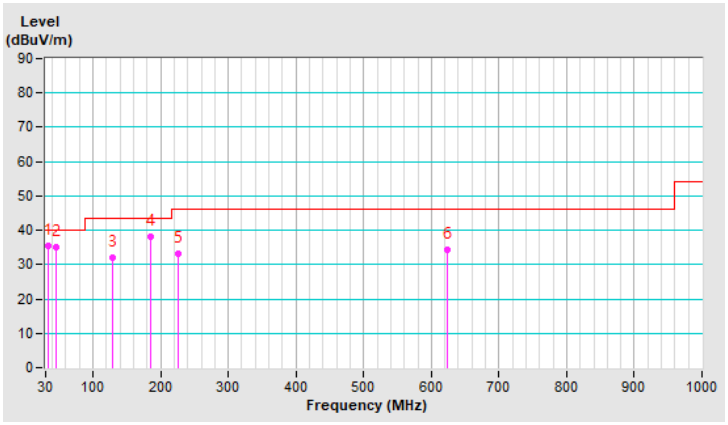


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	34.83	35.4 QP	40.0	-4.6	1.00 V	360	44.0	-8.6
2	46.27	35.2 QP	40.0	-4.8	1.00 V	254	42.9	-7.7
3	128.16	31.9 QP	43.5	-11.6	1.50 V	360	40.2	-8.3
4	184.23	38.1 QP	43.5	-5.4	1.00 V	269	47.0	-8.9
5	226.23	33.0 QP	46.0	-13.0	1.00 V	306	42.5	-9.5
6	622.86	34.4 QP	46.0	-11.6	1.00 V	295	31.7	2.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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. 19, 2020	Mar. 18, 2021
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	Aug. 30, 2019	Aug. 29, 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: July 23, 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.

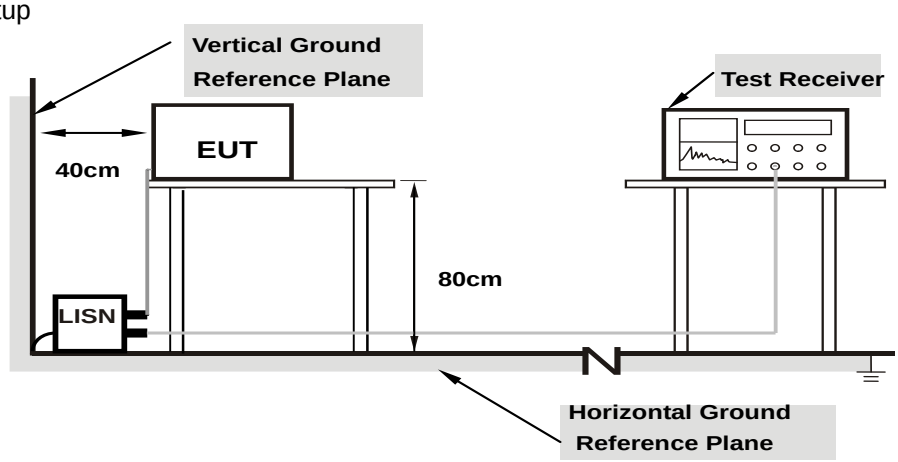
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

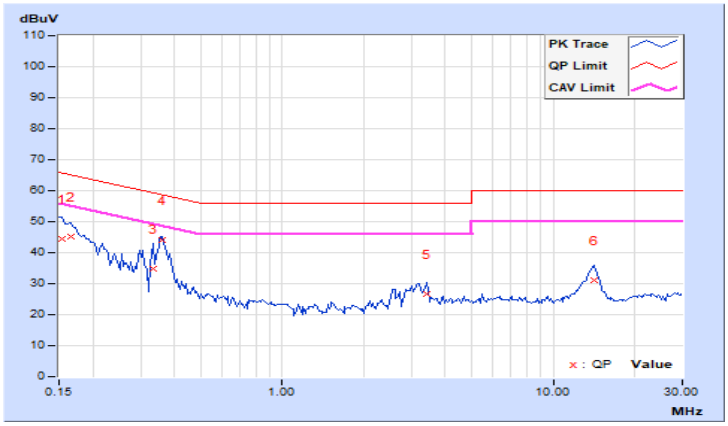
4.2.7 Test Results

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	0.15391	9.98	34.29	15.96	44.27	25.94	65.79	55.79	-21.52	-29.85
2	0.16562	9.98	35.25	26.29	45.23	36.27	65.18	55.18	-19.95	-18.91
3	0.33359	10.00	24.78	19.86	34.78	29.86	59.36	49.36	-24.58	-19.50
4	**0.36094**	**10.01**	**34.03**	**33.45**	**44.04**	**43.46**	**58.71**	**48.71**	**-14.67**	**-5.25**
5	3.40625	10.23	16.47	6.85	26.70	17.08	56.00	46.00	-29.30	-28.92
6	14.11328	10.97	20.09	13.93	31.06	24.90	60.00	50.00	-28.94	-25.10

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

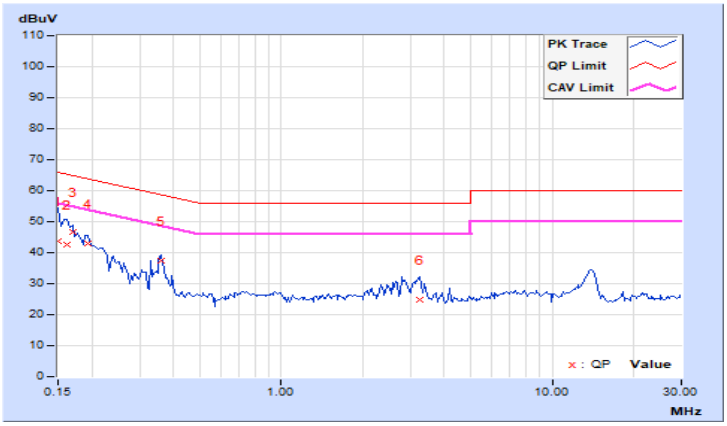


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.15000	9.99	33.62	22.20	43.61	32.19	66.00	56.00	-22.39	-23.81
2	0.16172	9.99	32.66	20.38	42.65	30.37	65.38	55.38	-22.73	-25.01
3	0.16953	9.99	36.52	26.63	46.51	36.62	64.98	54.98	-18.47	-18.36
4	0.19297	10.00	32.85	24.05	42.85	34.05	63.91	53.91	-21.06	-19.86
5	0.36094	10.02	27.36	26.49	37.38	36.51	58.71	48.71	-21.33	-12.20
6	3.22656	10.23	14.45	2.06	24.68	12.29	56.00	46.00	-31.32	-33.71

Remarks:

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

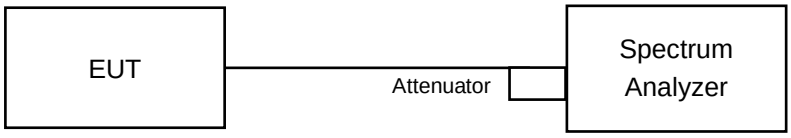


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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		
1	2412	8.55	8.07	0.5	Pass
6	2437	8.08	8.54	0.5	Pass
11	2462	8.57	8.59	0.5	Pass

802.11g

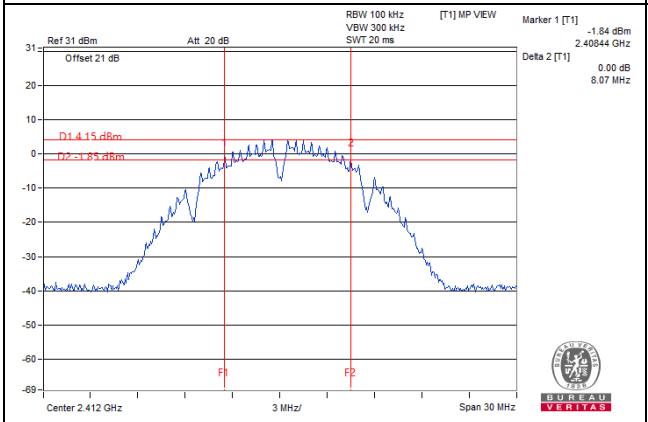
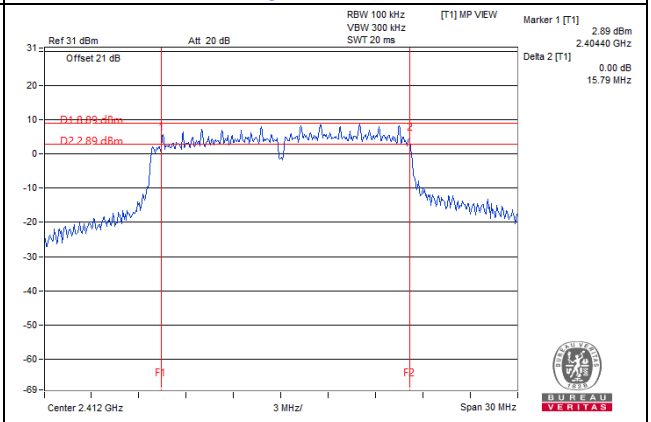
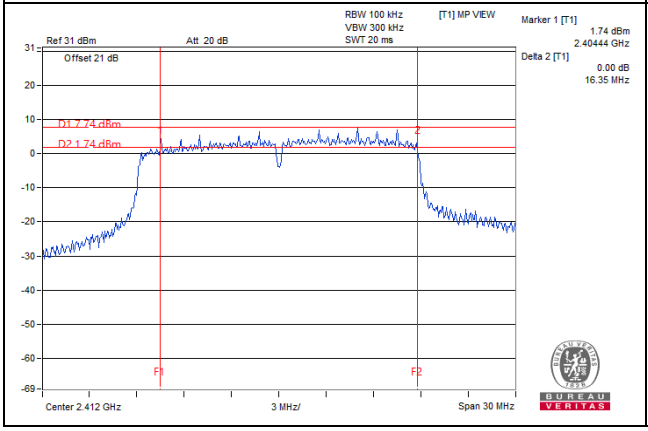
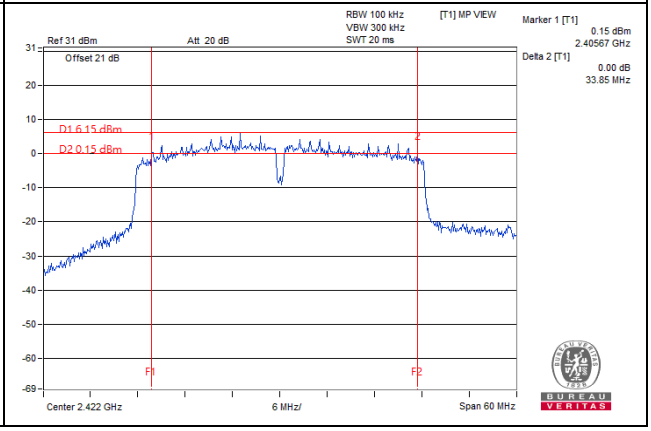
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.42	15.79	0.5	Pass
6	2437	16.39	16.4	0.5	Pass
11	2462	16.37	16.41	0.5	Pass

VHT20

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.65	16.35	0.5	Pass
6	2437	17.62	17.64	0.5	Pass
11	2462	17.69	17.66	0.5	Pass

VHT40

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	33.98	33.85	0.5	Pass
6	2437	34.07	36.08	0.5	Pass
9	2452	35.55	34.03	0.5	Pass

Spectrum Plot of Worst Value	
802.11b_Chain 1 / CH1	**802.11g_Chain 1 / CH1**
	
VHT20_Chain 1 / CH1	**VHT40_Chain 1 / CH3**
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

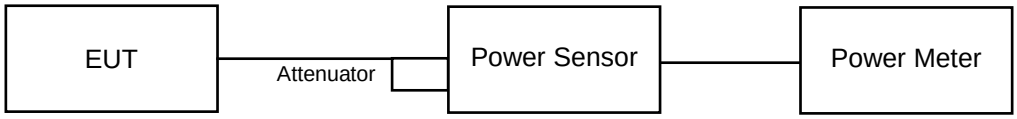
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

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

FOR PEAK POWER

802.11b

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	15.10	15.08	64.57	18.10	30	Pass
6	2437	15.19	15.23	66.38	18.22	30	Pass
11	2462	14.27	14.37	54.083	17.33	30	Pass

802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.98	24.88	622.385	27.94	30	Pass
6	2437	25.16	25.26	663.833	28.22	30	Pass
11	2462	23.89	23.83	486.452	26.87	30	Pass

VHT20

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.11	24.32	528.028	27.23	30	Pass
6	2437	25.40	25.21	678.631	28.32	30	Pass
11	2462	22.28	22.55	348.931	25.43	30	Pass

VHT40

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	24.77	24.35	572.186	27.58	30	Pass
6	2437	24.10	24.07	512.31	27.10	30	Pass
9	2452	22.64	22.65	367.731	25.66	30	Pass

FOR AVERAGE POWER

802.11b

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.79	12.51	36.835	15.66
6	2437	12.79	12.90	38.509	15.86
11	2462	11.82	11.99	31.018	14.92

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	19.83	19.72	189.917	22.79
6	2437	19.94	20.14	201.904	23.05
11	2462	17.04	16.94	100.014	20.00

VHT20

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	18.02	18.06	127.36	21.05
6	2437	20.43	20.53	223.387	23.49
11	2462	15.56	15.52	71.62	18.55

VHT40

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	18.26	18.23	133.516	21.26
6	2437	17.53	17.54	113.378	20.55
9	2452	15.21	15.28	66.918	18.26

Beamforming Mode
FOR PEAK POWER

VHT20

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.11	24.32	528.028	27.23	30	Pass
6	2437	25.40	25.21	678.631	28.32	30	Pass
11	2462	22.28	22.55	348.931	25.43	30	Pass

Note: 1. Directional gain = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power limit shall not be reduced.

VHT40

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	24.77	24.35	572.186	27.58	30	Pass
6	2437	24.10	24.07	512.31	27.10	30	Pass
9	2452	22.64	22.65	367.731	25.66	30	Pass

Note: 1. Directional gain = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power limit shall not be reduced.

FOR AVERAGE POWER

VHT20

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	18.02	18.06	127.36	21.05
6	2437	20.43	20.53	223.387	23.49
11	2462	15.56	15.52	71.62	18.55

VHT40

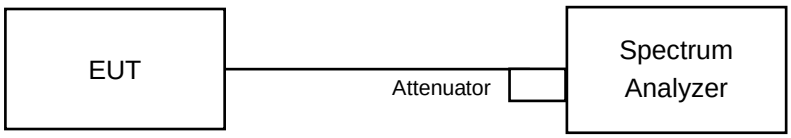
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	18.26	18.23	133.516	21.26
6	2437	17.53	17.54	113.378	20.55
9	2452	15.21	15.28	66.918	18.26

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

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				
1	2412	-9.47	-9.74	0.2193	-6.59	8.00	PASS
6	2437	-9.30	-10.02	0.21727	-6.63	8.00	PASS
11	2462	-10.67	-10.84	0.16827	-7.74	8.00	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 = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power density limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
1	2412	-5.39	-5.49	0.5715	-2.43	8.00	PASS
6	2437	-5.83	-4.00	0.6592	-1.81	8.00	PASS
11	2462	-6.47	-8.20	0.3767	-4.24	8.00	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 = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power density limit shall not be reduced.

VHT20

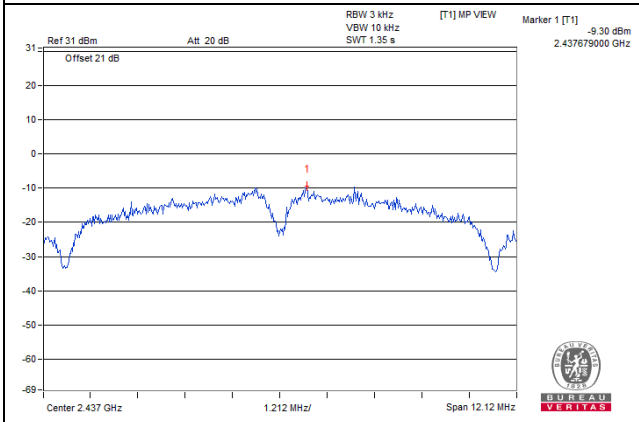
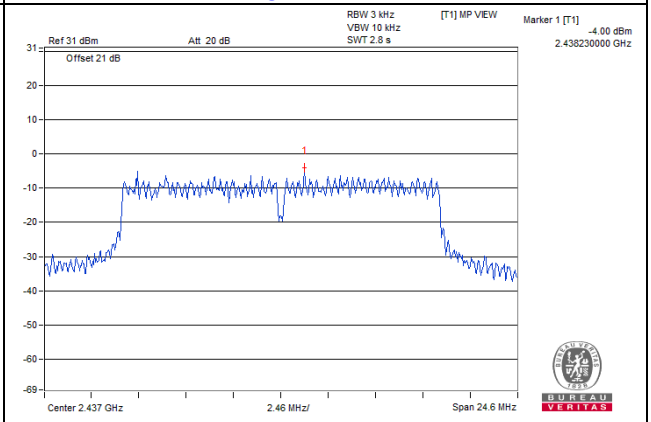
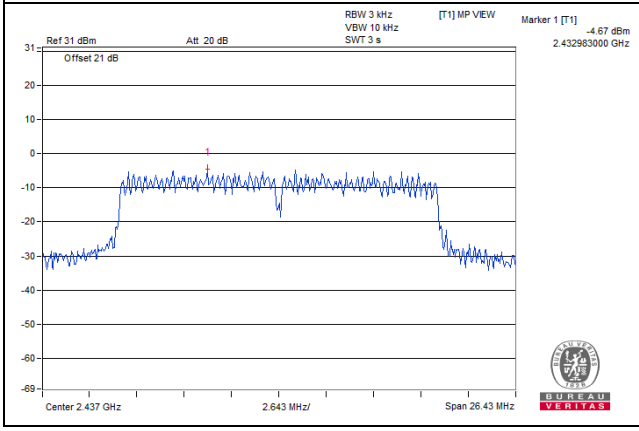
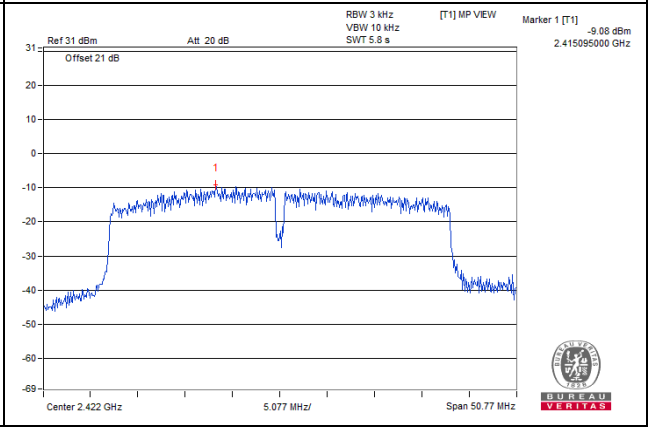
Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
1	2412	-6.68	-7.71	0.3846	-4.15	8.00	PASS
6	2437	-4.67	-5.49	0.6237	-2.05	8.00	PASS
11	2462	-8.41	-9.89	0.2466	-6.08	8.00	PASS

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 = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power density limit shall not be reduced.

VHT40

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
3	2422	-10.23	-9.08	0.21827	-6.61	8.00	PASS
6	2437	-10.41	-9.63	0.19999	-6.99	8.00	PASS
9	2452	-12.51	-11.88	0.12106	-9.17	8.00	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 = 2.9dBi + 10log(2) = 5.91dBi < 6dBi , so the power density limit shall not be reduced.

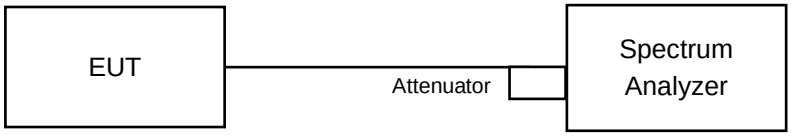
Spectrum Plot of Worst Value	
802.11b_Chain 0 / CH6	**802.11g_Chain 1 / CH6**
	
VHT20_Chain 0 / CH6	**VHT40_Chain 1 / CH3**
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below -20dB 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

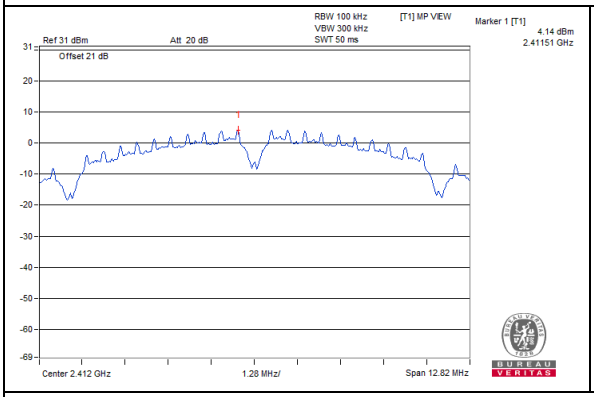
4.6.7 Test Results

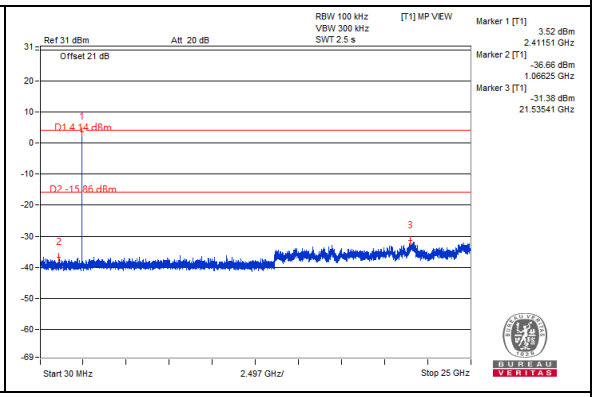
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

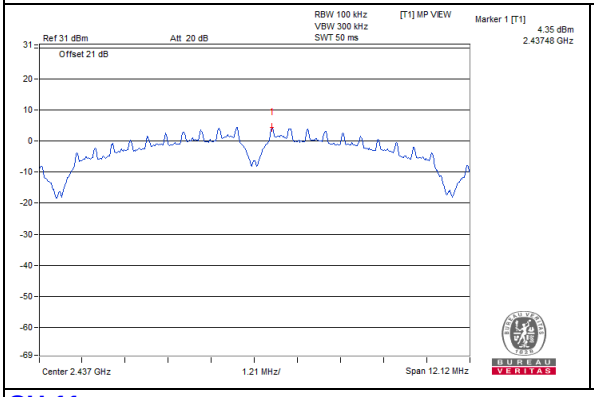
Chain 0

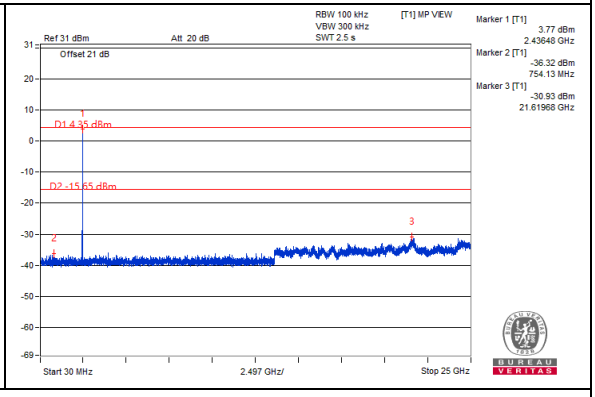
CH 1



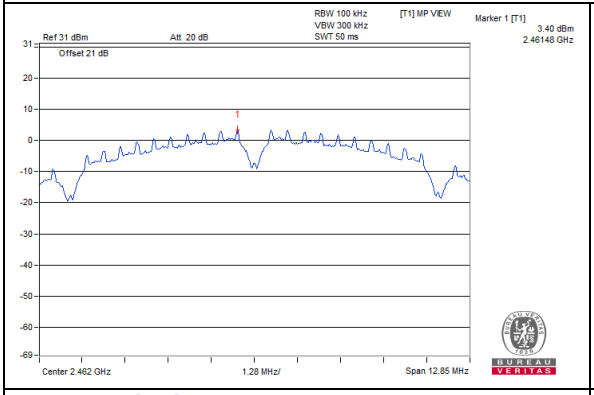


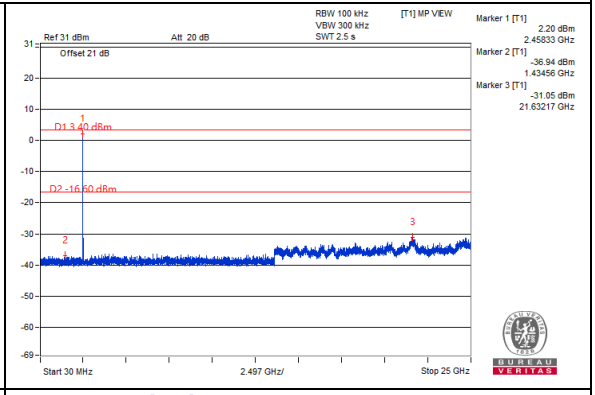
CH 6



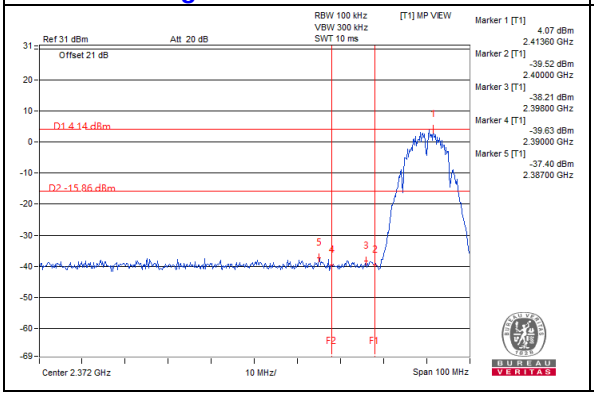


CH 11

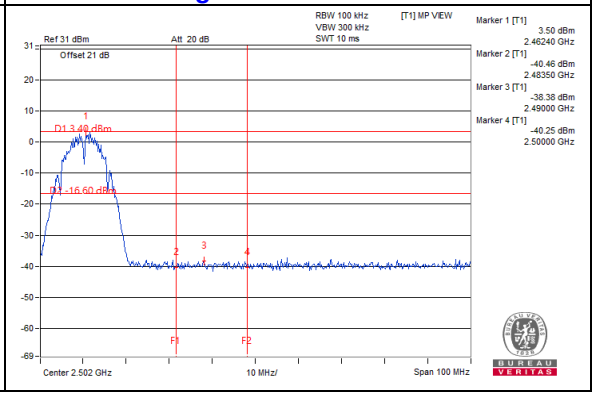




CH 1 Band edge

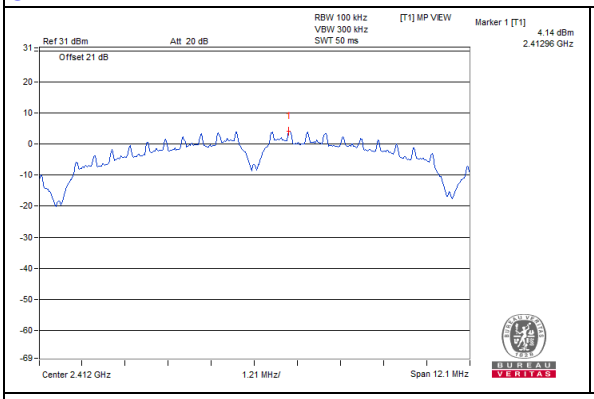


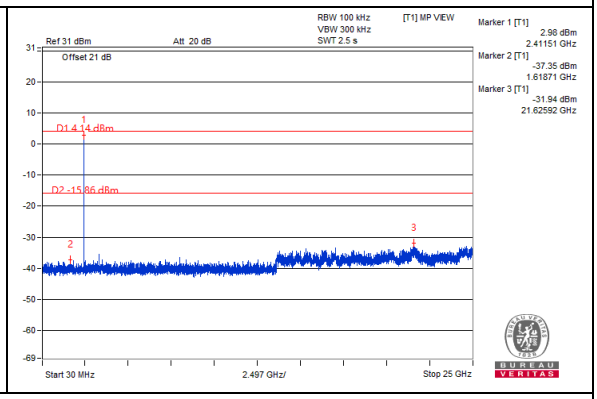
CH 11 Band edge



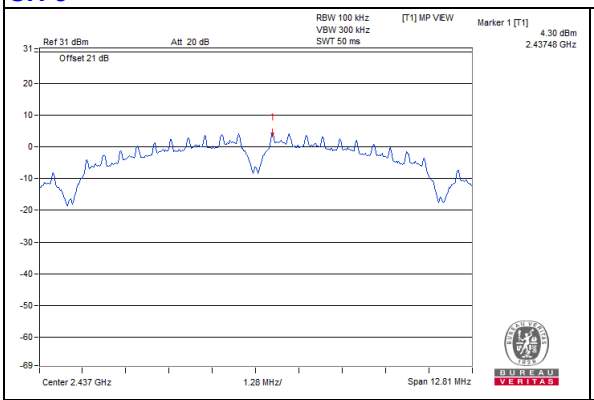
Chain 1

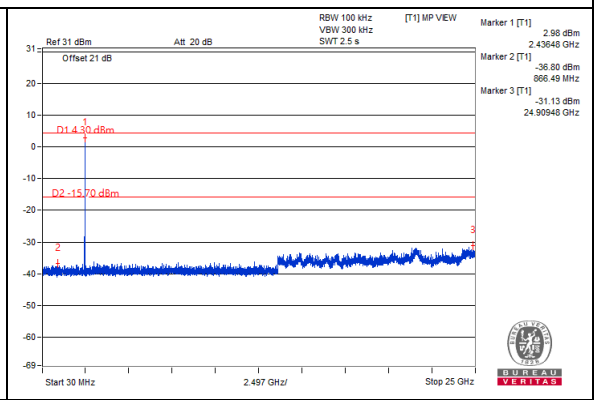
CH 1



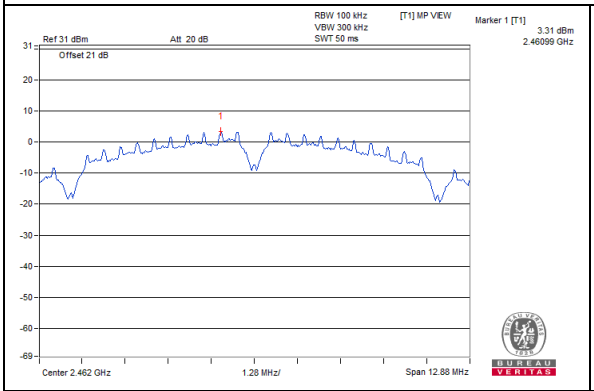


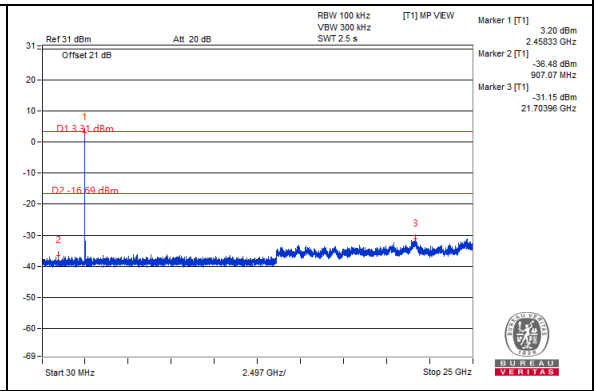
CH 6



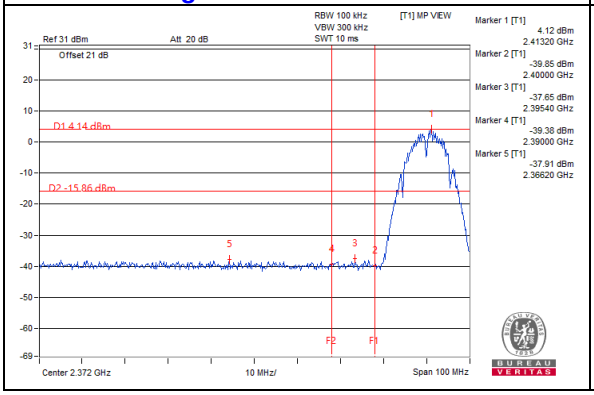


CH 11

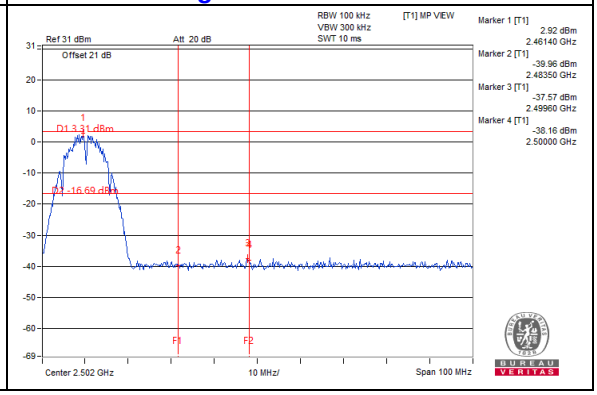




CH 1 Band edge



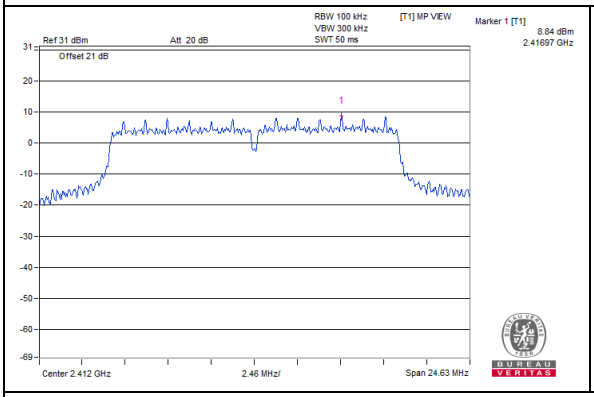
CH 11 Band edge

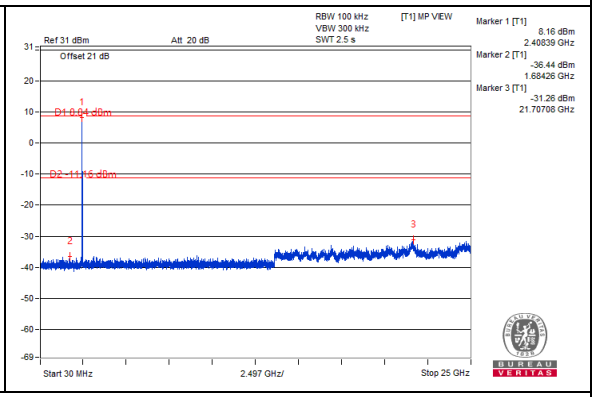


802.11g

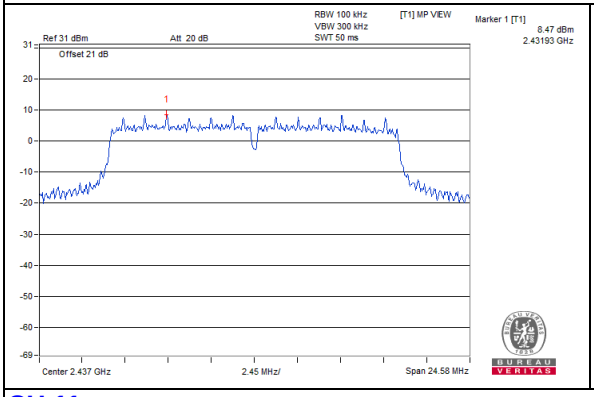
Chain 0

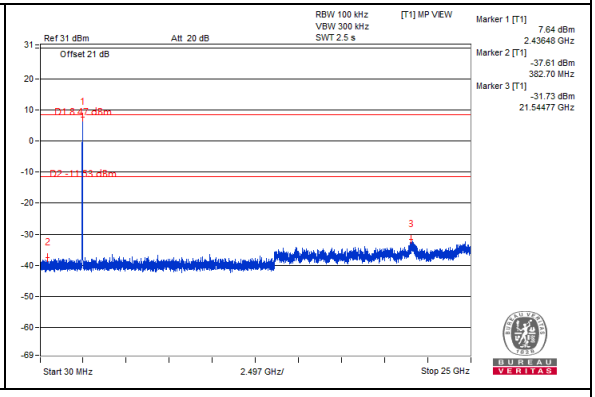
CH 1



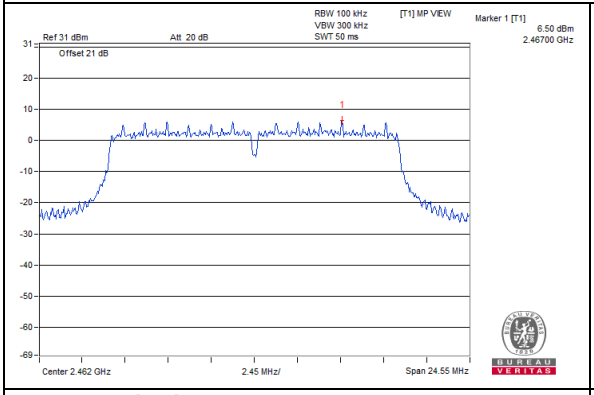


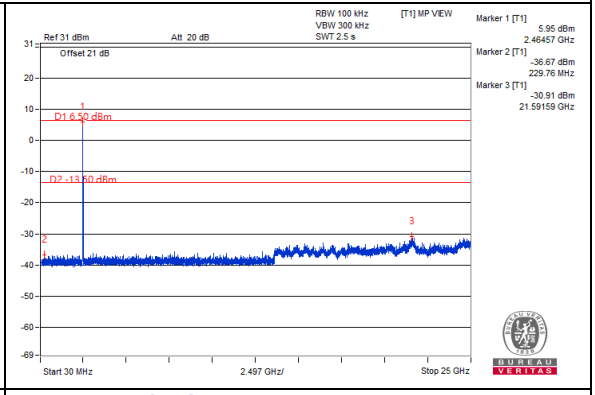
CH 6



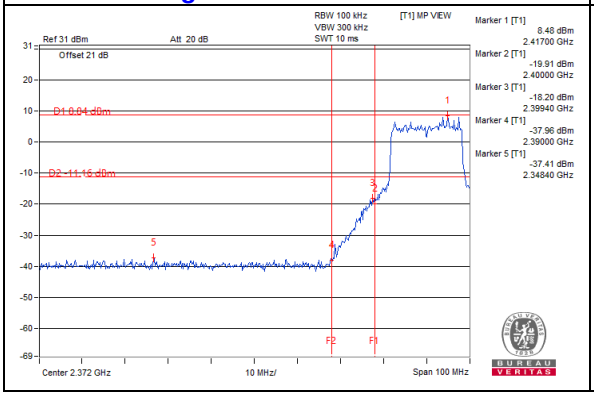


CH 11

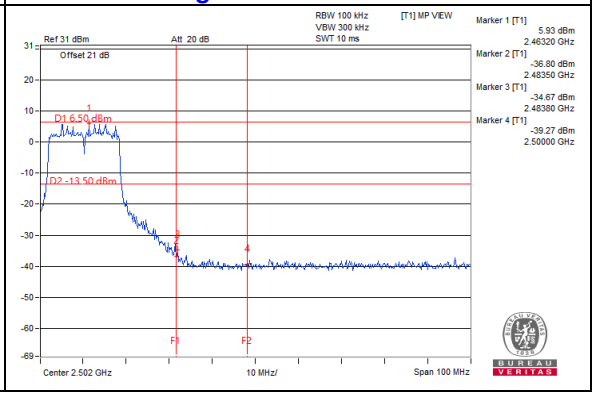




CH 1 Band edge

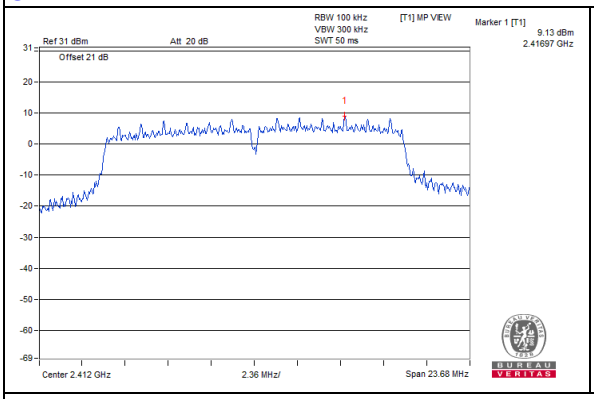


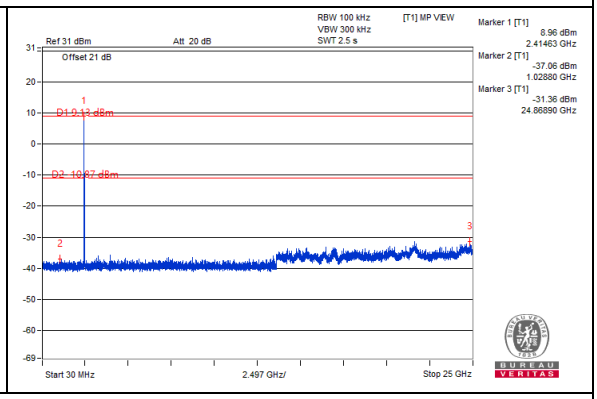
CH 11 Band edge



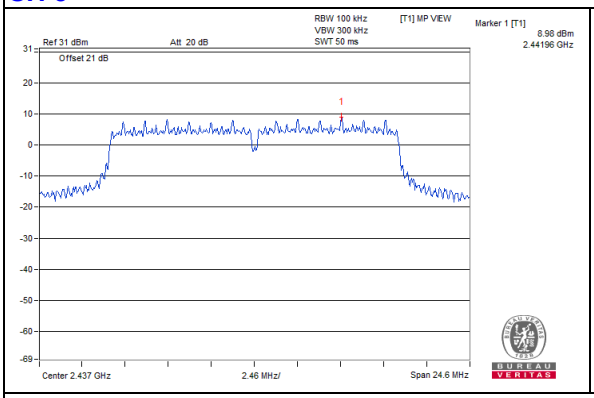
Chain 1

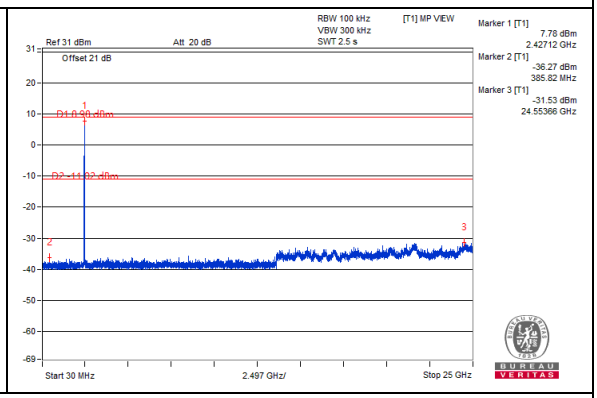
CH 1



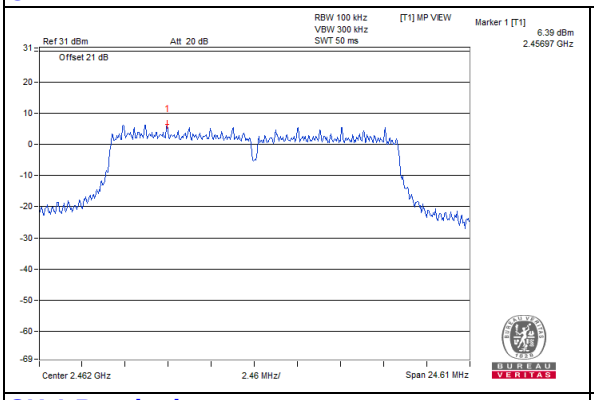


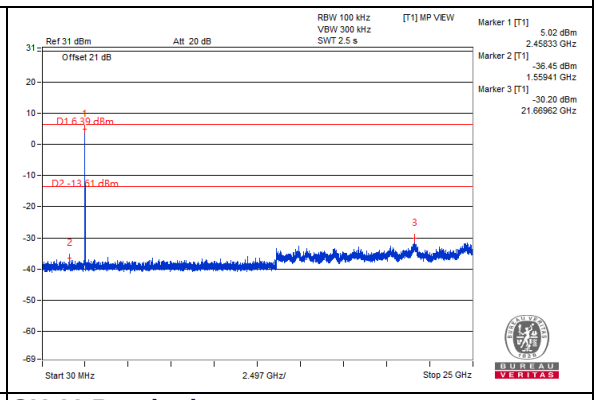
CH 6



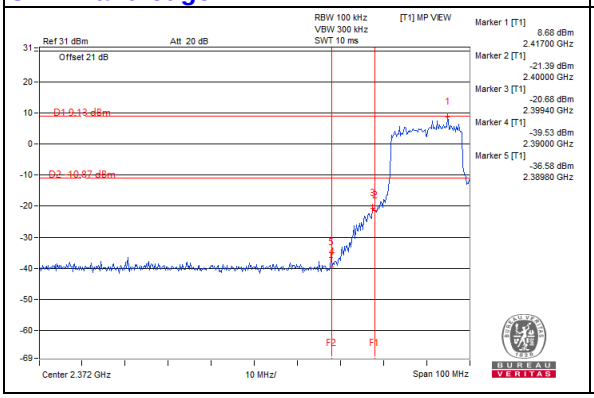


CH 11

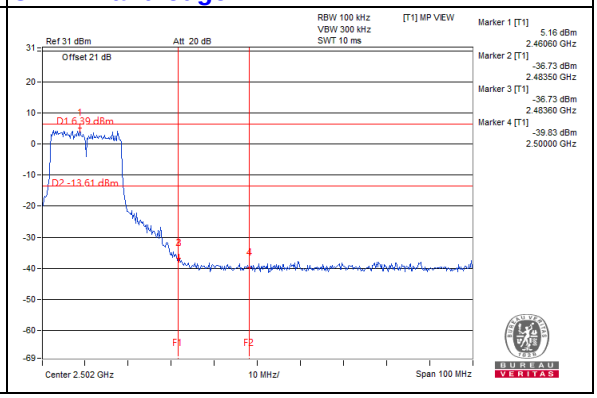




CH 1 Band edge



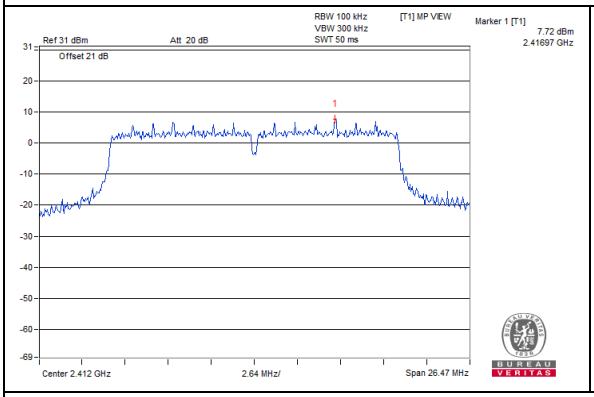
CH 11 Band edge

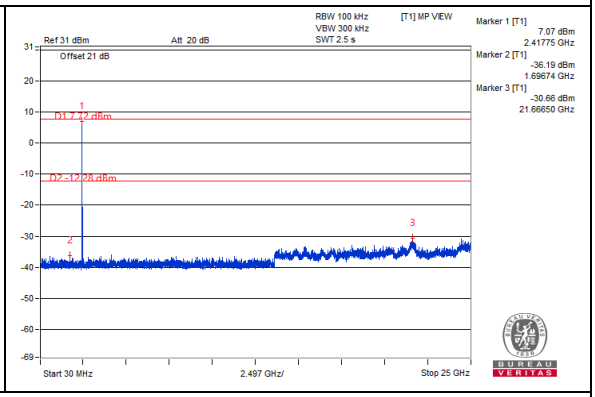


VHT20

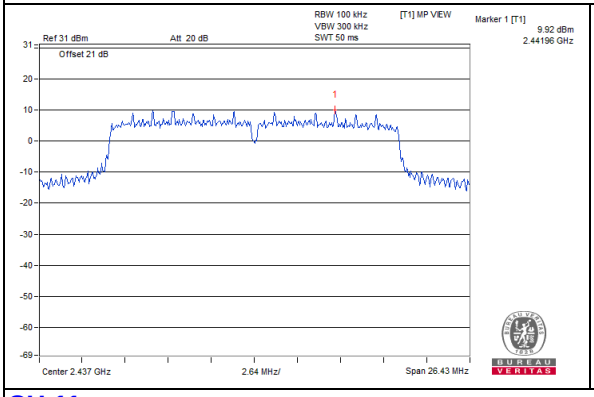
Chain 0

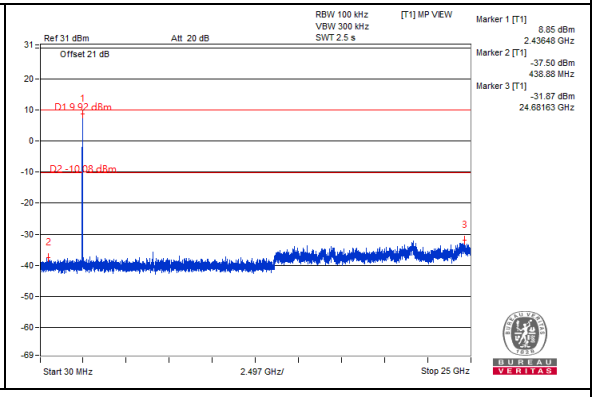
CH 1



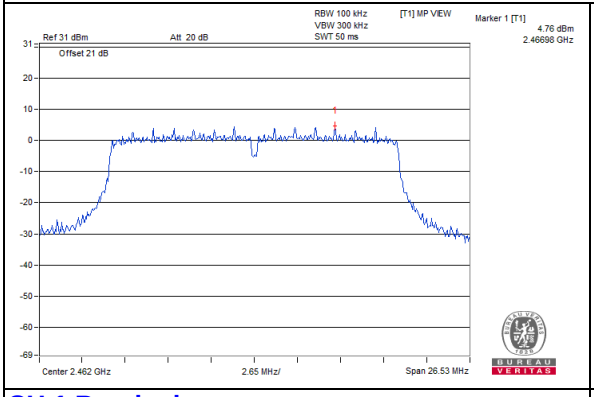


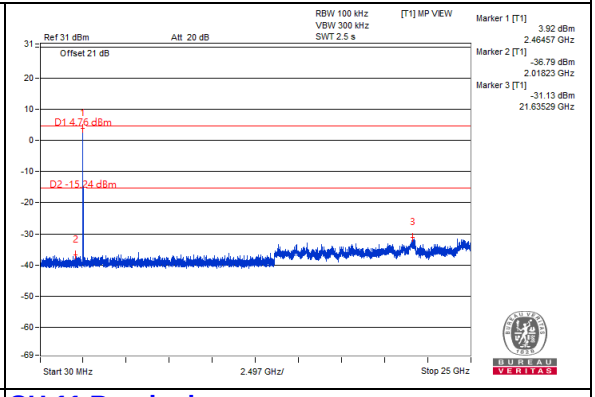
CH 6



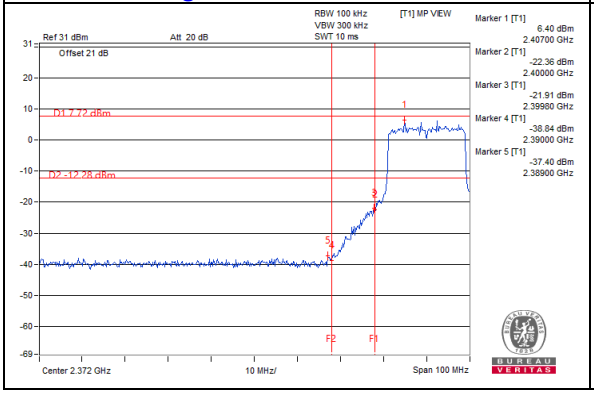


CH 11

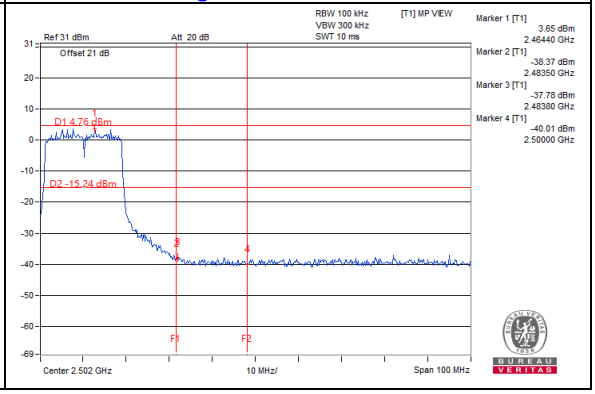




CH 1 Band edge

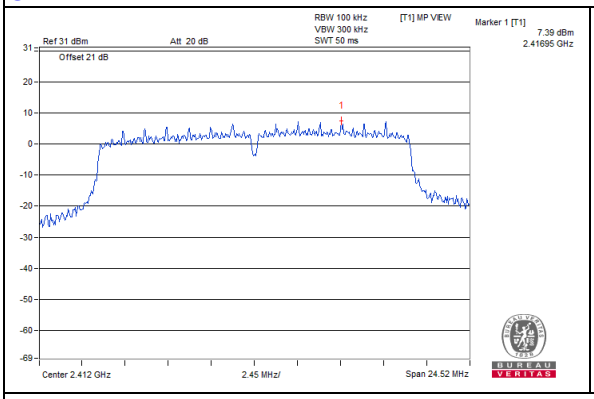


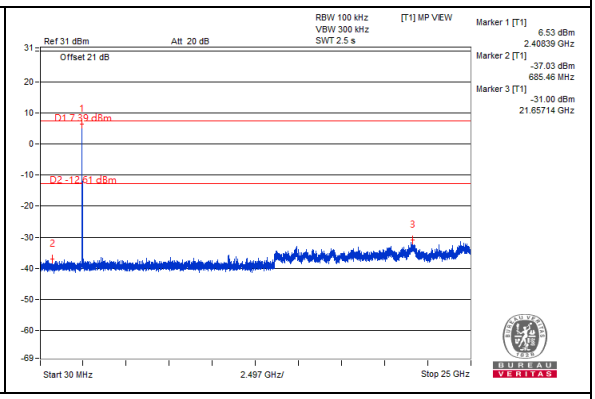
CH 11 Band edge



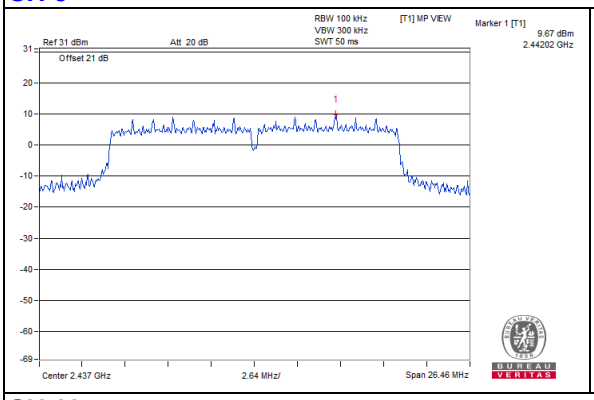
Chain 1

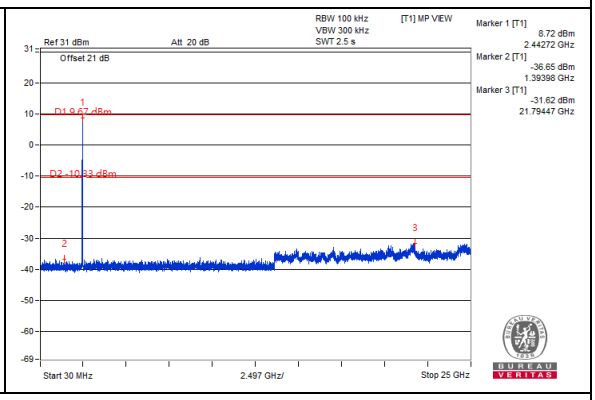
CH 1



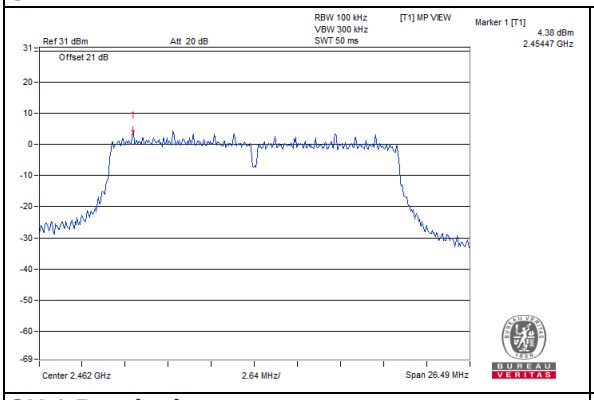


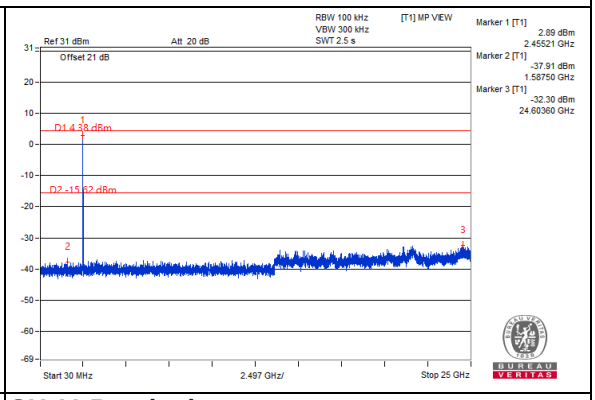
CH 6



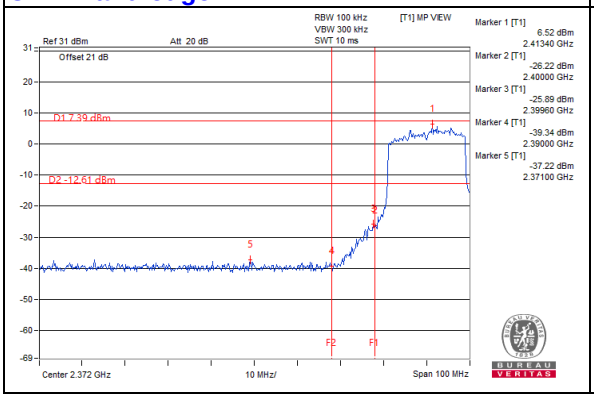


CH 11

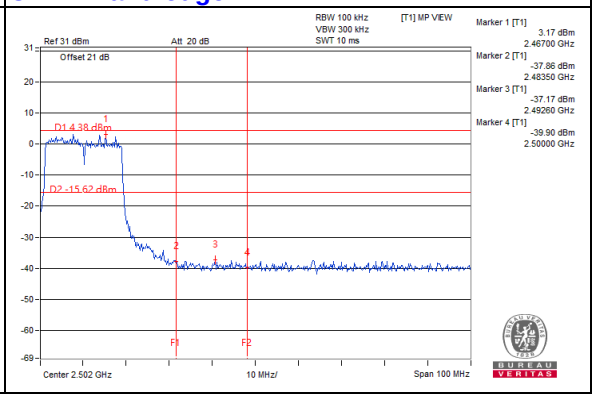




CH 1 Band edge



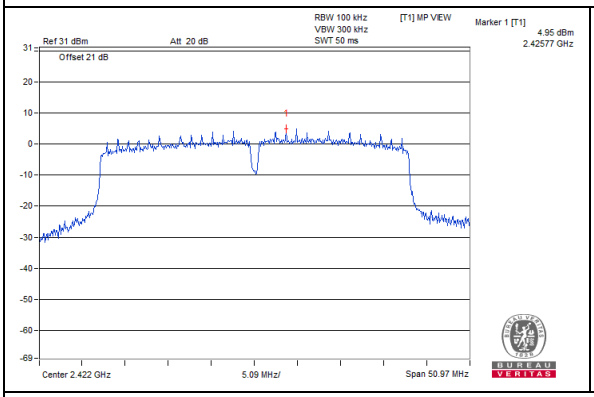
CH 11 Band edge

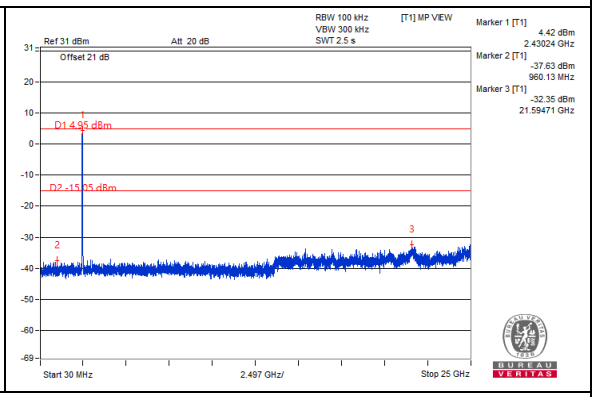


VHT40

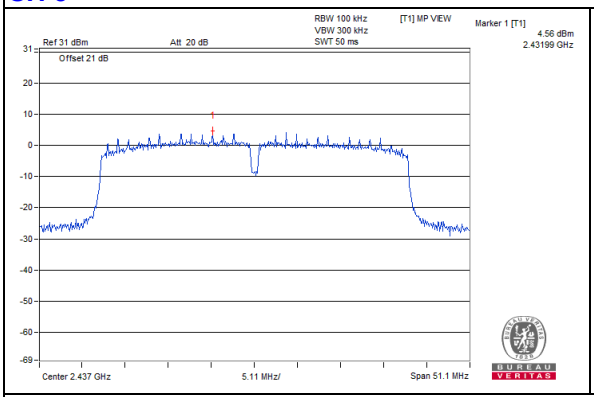
Chain 0

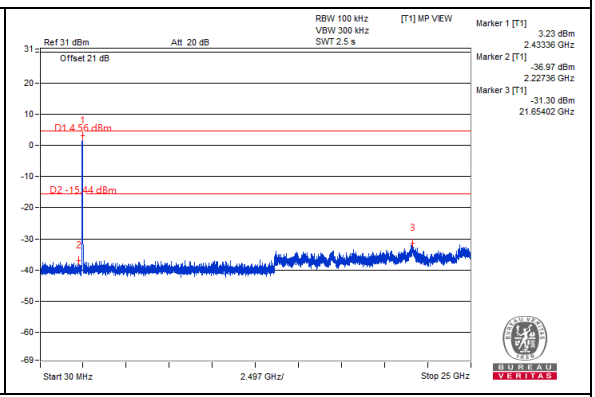
CH 3



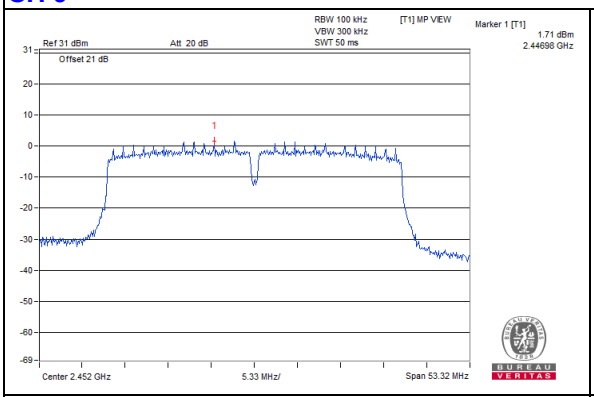


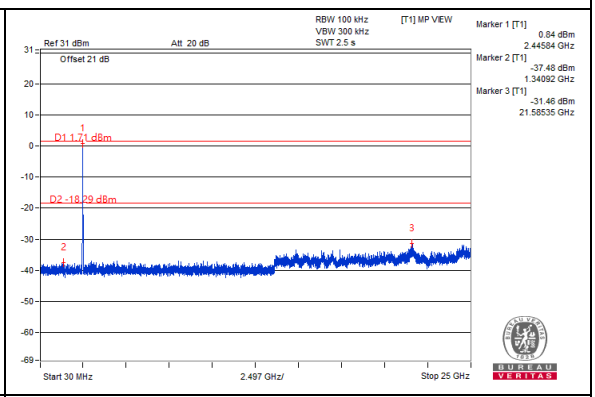
CH 6



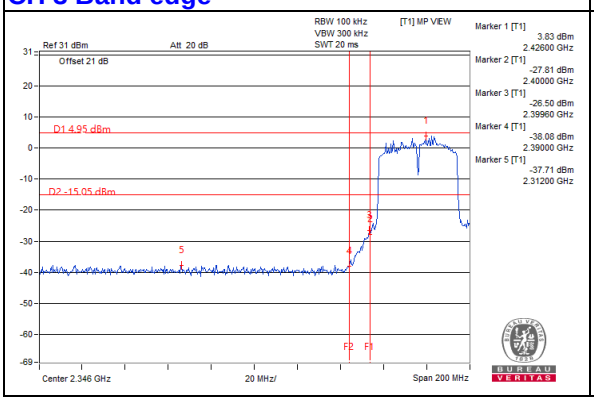


CH 9

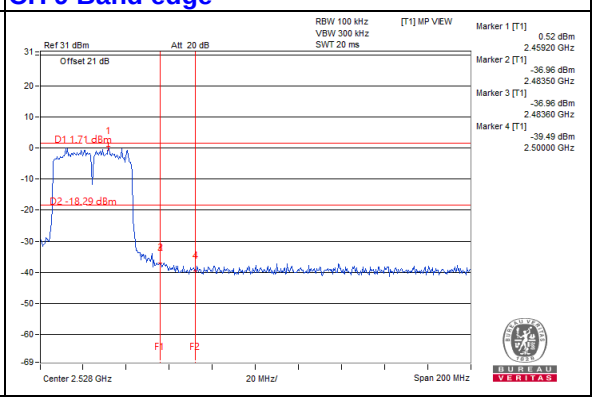




CH 3 Band edge

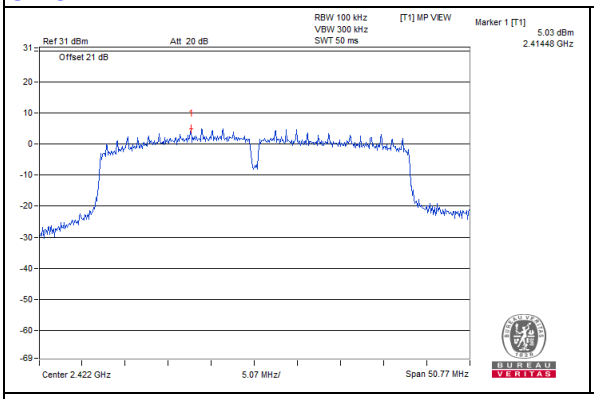


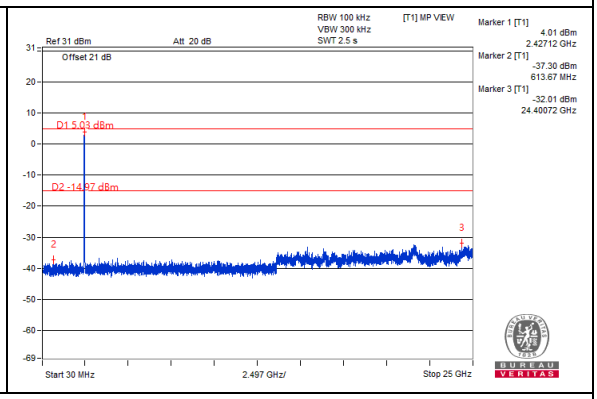
CH 9 Band edge



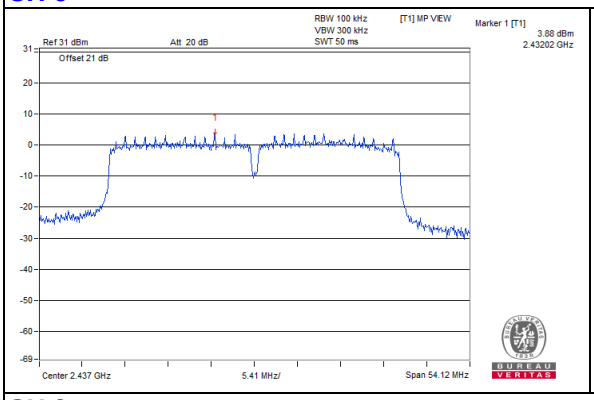
Chain 1

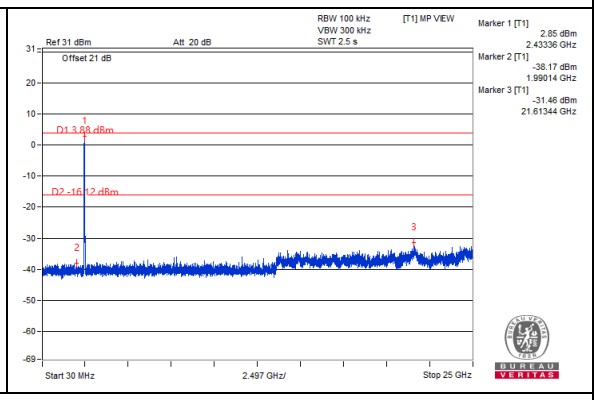
CH 3



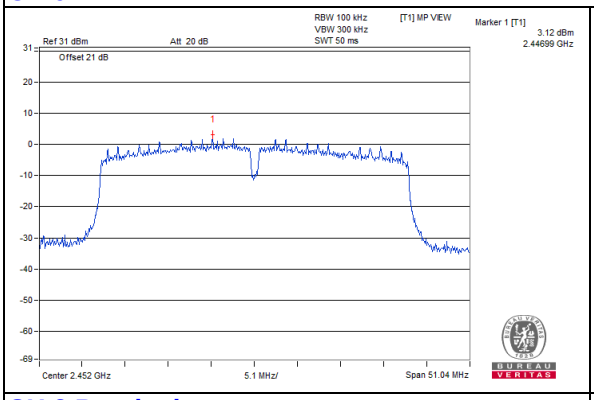


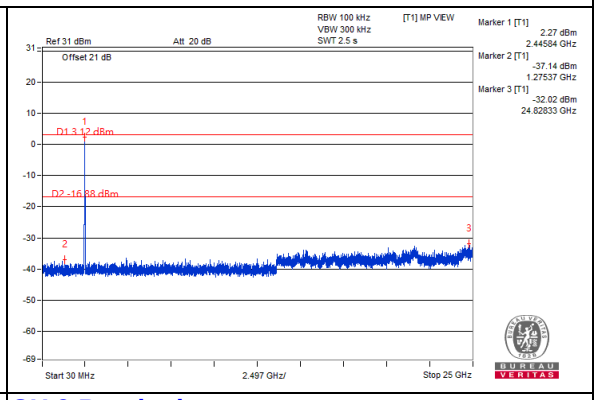
CH 6



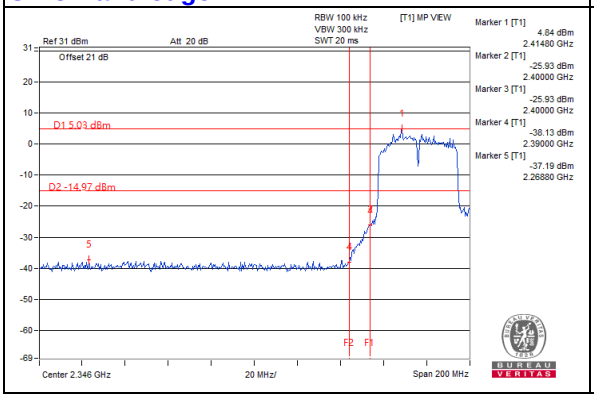


CH 9

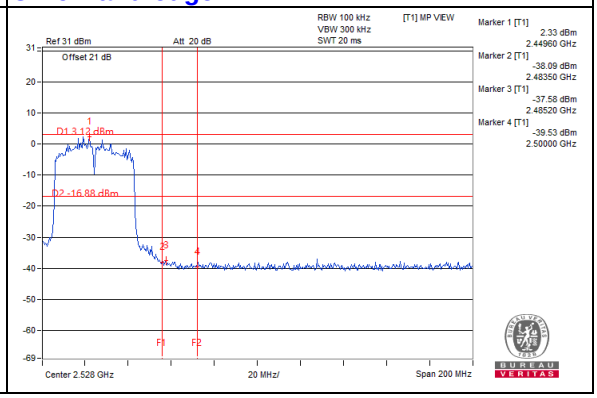




CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

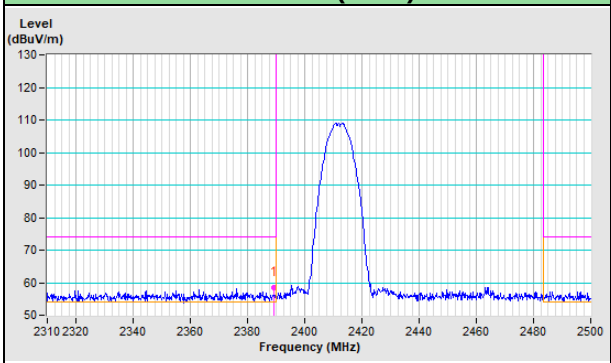
Please refer to the attached file (Test Setup Photo).

Annex A - Radiated Band-edge Measurement for Restricted Frequencies

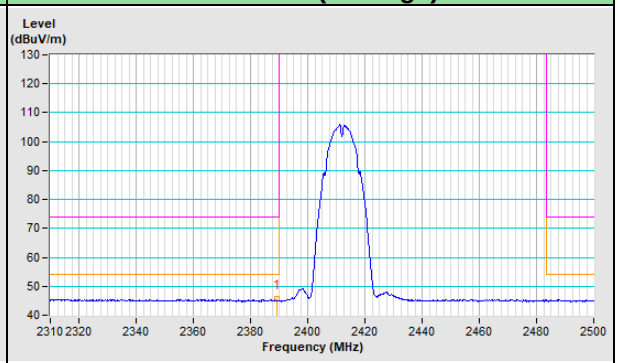
802.11b

Channel 1

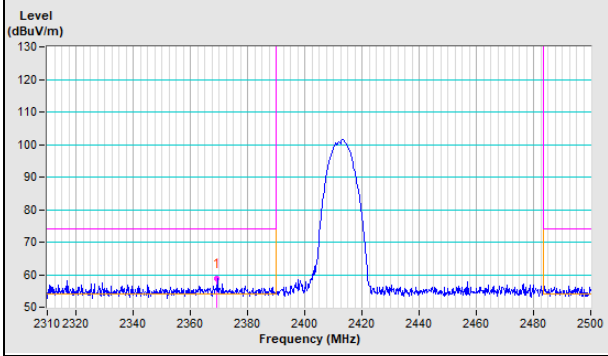
Horizontal (Peak)



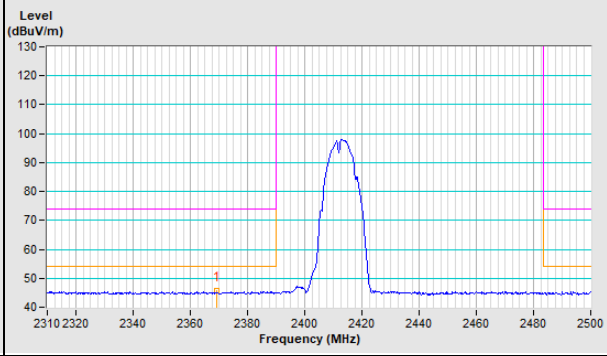
Horizontal (Average)



Vertical (Peak)

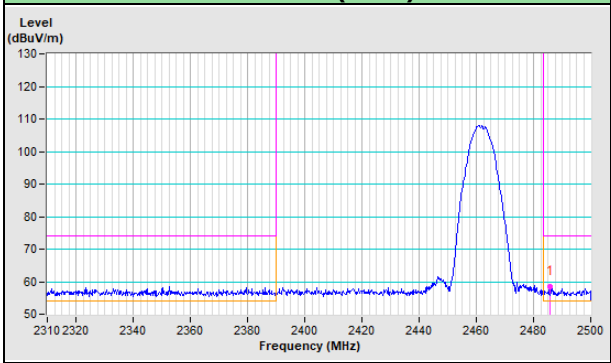


Vertical (Average)

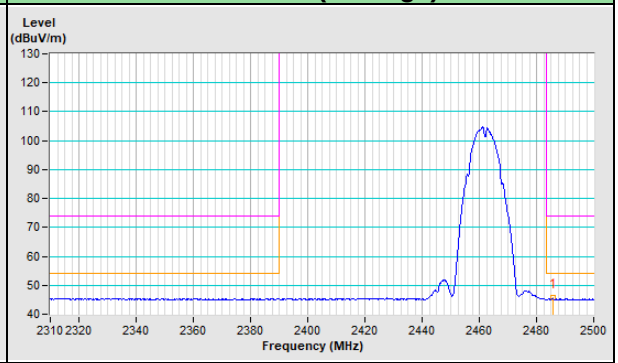


Channel 11

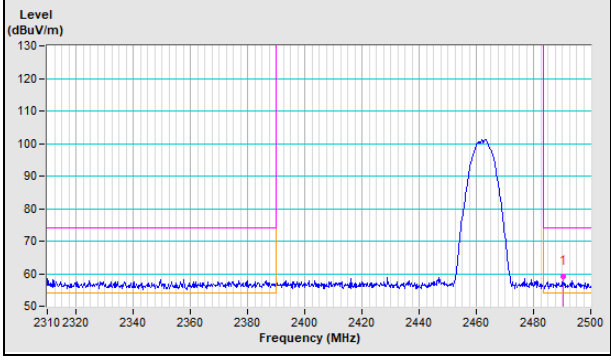
Horizontal (Peak)



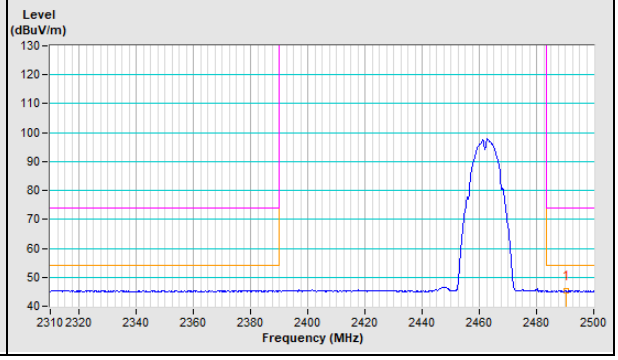
Horizontal (Average)



Vertical (Peak)



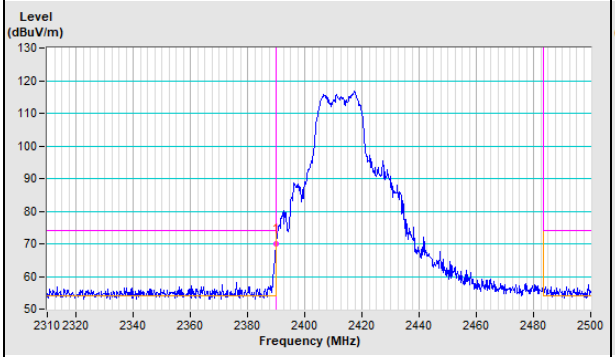
Vertical (Average)



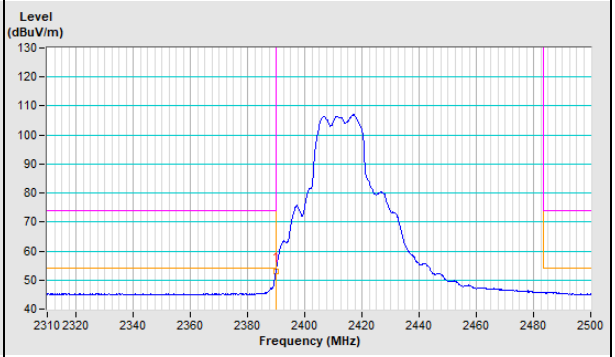
802.11g

Channel 1

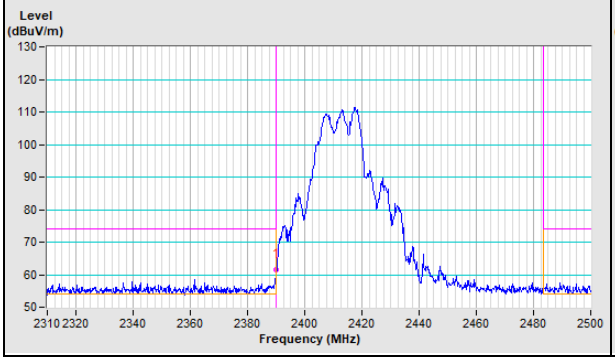
Horizontal (Peak)



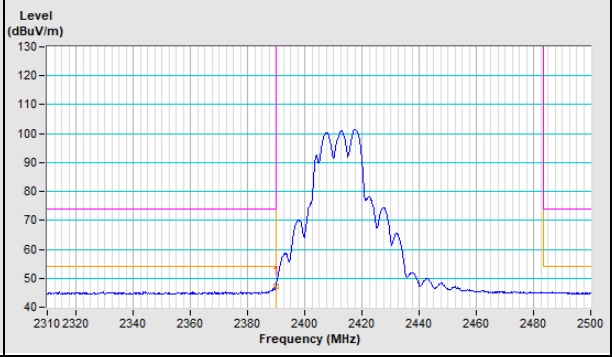
Horizontal (Average)



Vertical (Peak)

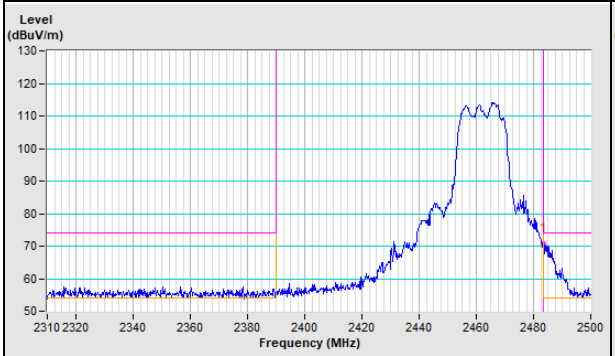


Vertical (Average)

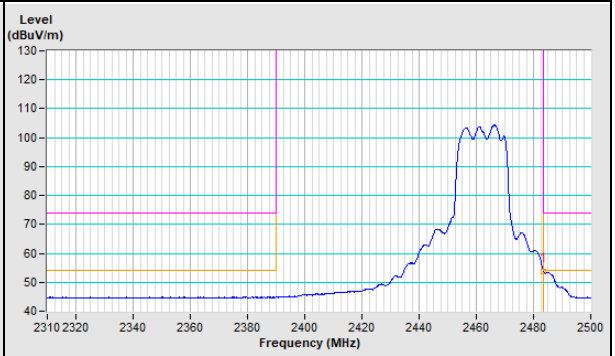


Channel 11

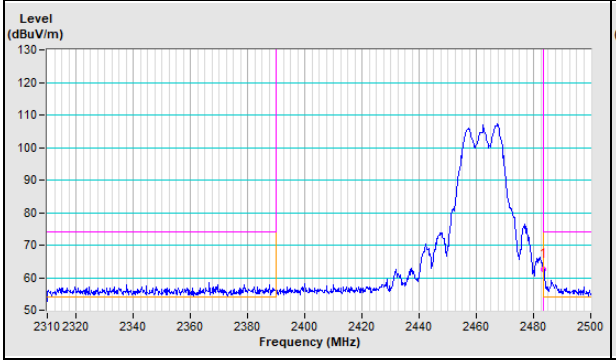
Horizontal (Peak)



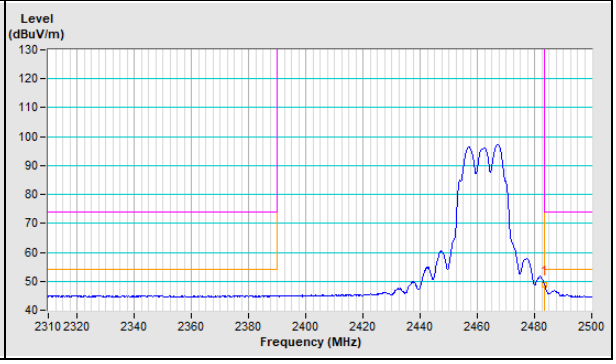
Horizontal (Average)



Vertical (Peak)



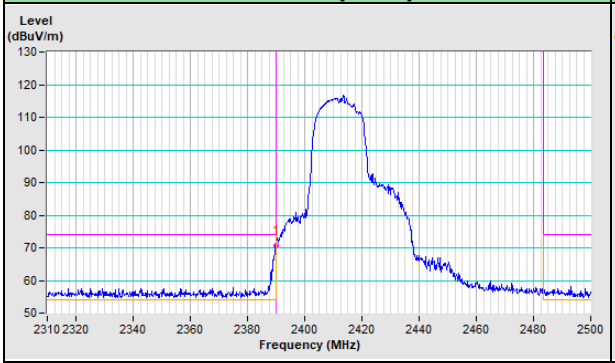
Vertical (Average)



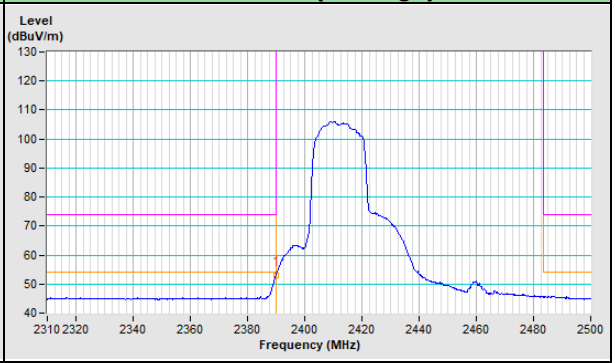
VHT20

Channel 1

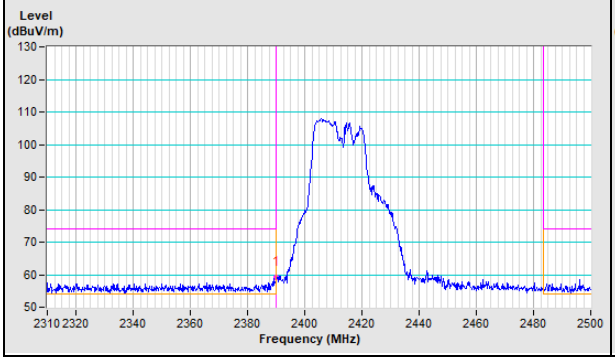
Horizontal (Peak)



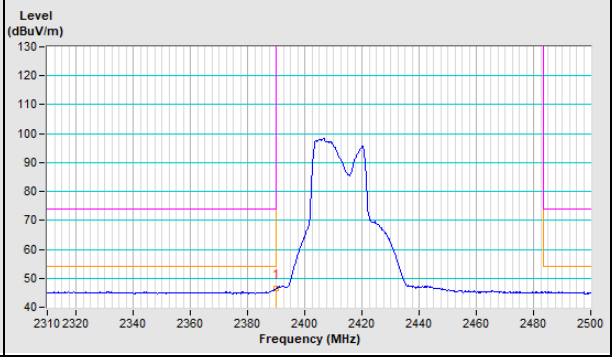
Horizontal (Average)



Vertical (Peak)

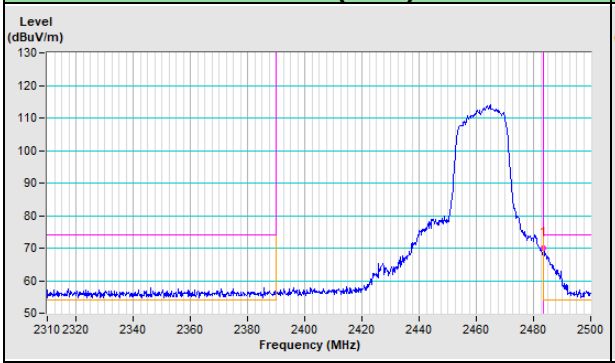


Vertical (Average)

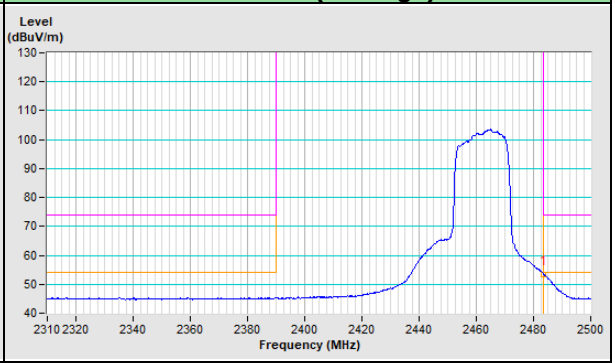


Channel 11

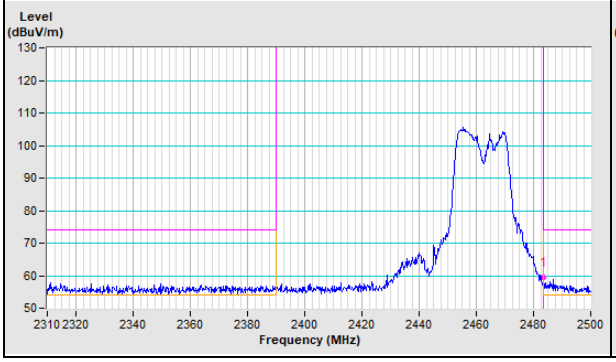
Horizontal (Peak)



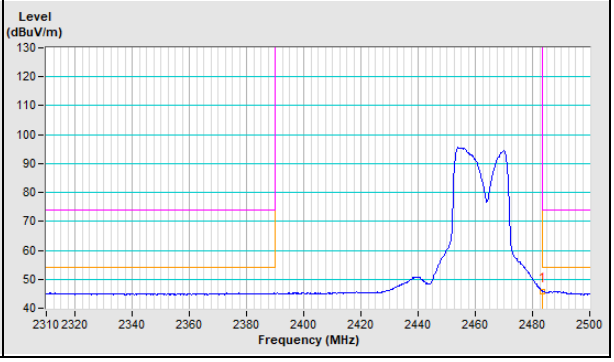
Horizontal (Average)



Vertical (Peak)



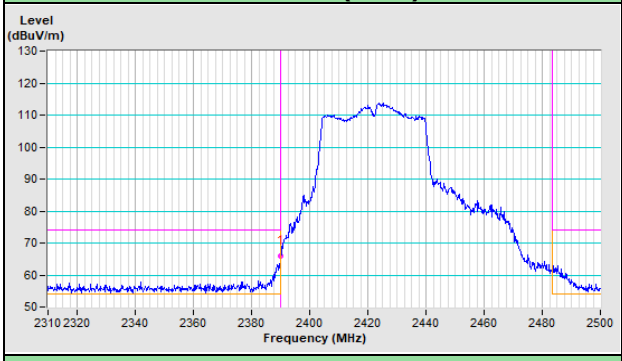
Vertical (Average)



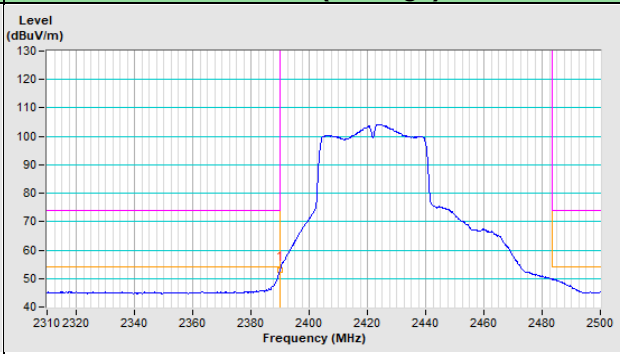
VHT40

Channel 3

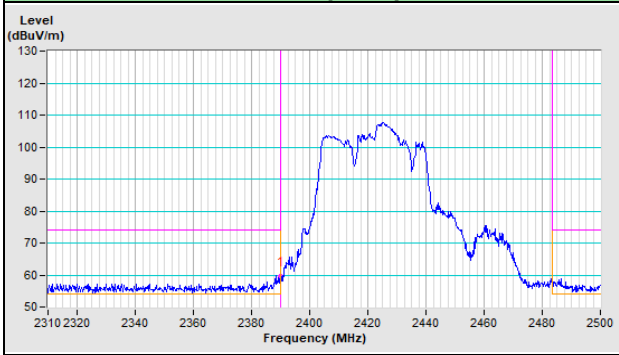
Horizontal (Peak)



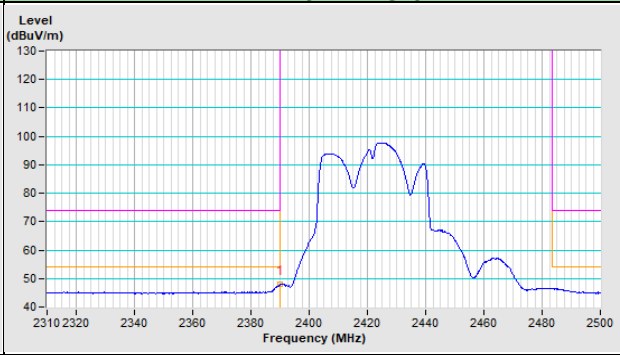
Horizontal (Average)



Vertical (Peak)

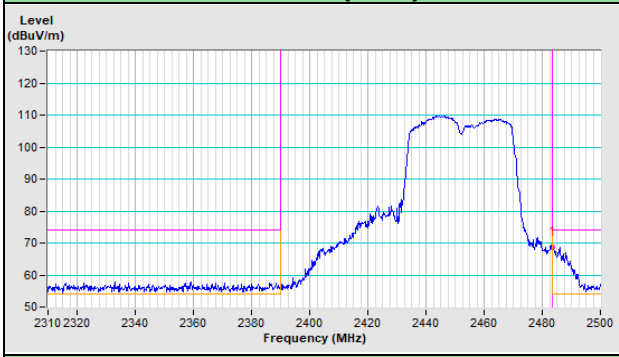


Vertical (Average)

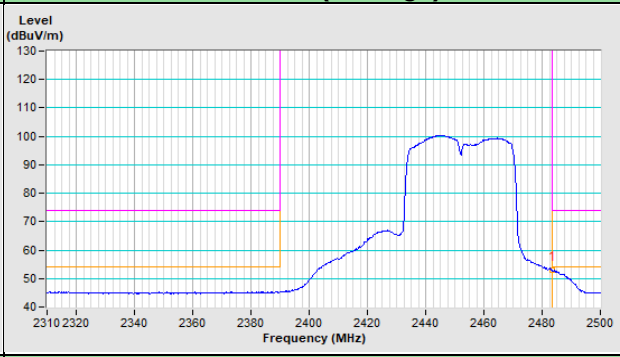


Channel 9

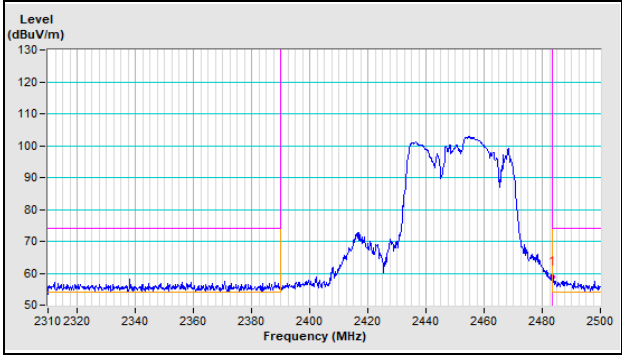
Horizontal (Peak)



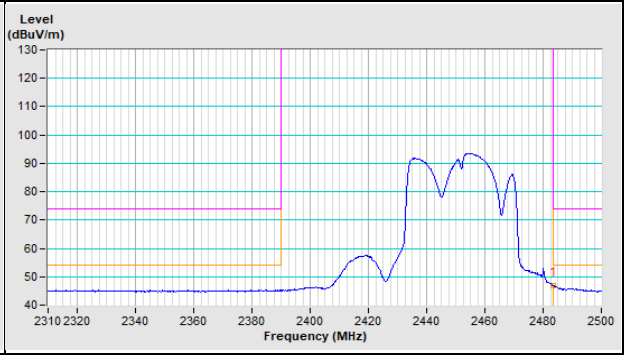
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



Appendix – Information of the Testing Laboratories

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

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

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