FCC Test Report

Report No.:	RFBFBE-WTW-P21010850
FCC ID:	2ABLK-GS4227
Test Model:	u6x GS4227
Received Date:	Jan. 28, 2021
Test Date:	Feb. 09 to Mar. 29, 2021
Issued Date:	Apr. 29, 2021
Applicant:	Calix Inc.
Address:	1035 N. McDowell Blvd Petaluma, CA94954 U.S.A
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
RFBFBE-WTW-P21010850	Original release.	Apr. 29, 2021

1 Certificate of Conformity

Product:	GigaSpire BLAST
Brand:	Calix
Test Model:	u6x GS4227
Sample Status:	Engineering Sample
Applicant:	Calix Inc.
Test Date:	Feb. 09 to Mar. 29, 2021
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:** Apr. 29, 2021

Vivian Huang / Specialist

Approved by : , **Date:** Apr. 29, 2021

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-12.27 dB at 0.34922 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2 dB at 2390.00MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is i-pex(MHF) not a standard connector.
-	Occupied Bandwidth Measurement	-	Reference only

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	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	GigaSpire BLAST
Brand	Calix
Test Model	u6x GS4227
Status of EUT	Engineering Sample
Power Supply Rating	12 Vdc from power adapter,
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 600 Mbps 802.11ac: up to 1733.3 Mbps 802.11ax: up to 2401.9 Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462 GHz **5GHz:** 5.18~ 5.24 GHz, 5.745 ~ 5.825 GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 9 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 4 802.11ac (VHT80), 802.11ax (HE80): 2
Output Power	**CDD Mode:** **2.412 ~ 2.462 GHz:** 757.798 mW **5.18 ~ 5.24 GHz:** 978.11 mW **5.745 ~ 5.825 GHz:** 922.209 mW **Beamforming Mode:** **2.412 ~ 2.462 GHz:** 678.599 mW **5.18 ~ 5.24 GHz:** 978.11 mW **5.745 ~ 5.825 GHz:** 922.209 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x1
Data Cable Supplied	NA

Note:

1. Simultaneously transmission condition.

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

2. The EUT could be supplied with power adapter as the following table:

Brand	Model No.	Spec.
AMIGO	AMS157-1203000FU	Input: 100-240V, 50/60Hz, 1A Output: 12Vdc, 3.0A DC output cable: Unshielded, 1.5m

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

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
DB1	2.4G: Chain 1	HONGBO	290-11015	3.64	2.4~2.4835GHz	Dipole	i-pex(MHF)	110
	5G: Chain 3			4.55	5.15~5.85GHz			
DB2	2.4G: Chain 0	HONGBO	290-11016	3.91	2.4~2.4835GHz	Dipole	i-pex(MHF)	110
	5G: Chain 2			5.94	5.15~5.85GHz			
5G1	Chain 0	HONGBO	290-11013	4.57	5.15~5.85GHz	Dipole	i-pex(MHF)	90
5G2	Chain 1	HONGBO	290-11014	4.68	5.15~5.85GHz	Dipole	i-pex(MHF)	90

Note:

1. Antenna Gain refer to “P21010850 Multi-Antenna Systems Directional Gain measurement” files.
2. Maximum Correlated Directional Gain following KDB662911 D03 MIMO Antenna Gain Measurement.

4. The EUT was radiated emission pre-tested under the following modes:

Test Mode	Description
Mode A	Adapter - AMS157-1203000FU
Mode B	UPS
Mode C	**Adapter - AMS157-1203000FU + UPS**
Mode D	UPS Battery mode
Note: From the above modes, radiated emission the worst case was found in **Mode C**. Therefore only the test data of the mode was recorded in this report.	

5. The EUT was Conducted Emission pre-tested under the following modes:

Test Mode	Description
Mode A	Adapter - AMS157-1203000FU
Mode B	UPS
Mode C	**Adapter - AMS157-1203000FU + UPS**
Note: From the above modes, Conducted Emission the worst case was found in **Mode C**. Therefore only the test data of the mode was recorded in this report.	

6. 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
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
802.11ac (VHT20)	4TX	4RX
802.11ac (VHT40)	4TX	4RX
802.11ac (VHT80)	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
802.11ax (HE80)	4TX	4RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and CDD 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), VHT mode for 20MHz (40MHz) and 802.11ax mode for 20MHz (40MHz), therefore the manufacturer will control the power for 802.11n/ VHT mode is the same as the 802.11ax 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)

7. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
8. 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, 802.11ax (HE20):

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥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 Parameter
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1 Mb/s
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6Mb/s
802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Radiated Emission Test (Below 1GHz):

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

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

CDD Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11b	1 to 11	11	DSSS	DBPSK	1 Mb/s

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 Parameter
802.11b	1 to 11	11	DSSS	DBPSK	1 Mb/s

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 Parameter**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1Mb/s
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6Mb/s
VHT20 (Output power only)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
VHT40 (Output power only)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0
Beamforming Mode (output power only)					
MODE	**AVAILABLE CHANNEL**	**TESTED CHANNEL**	**MODULATION TECHNOLOGY**	**MODULATION TYPE**	**Data Rate Parameter**
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
VHT40	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

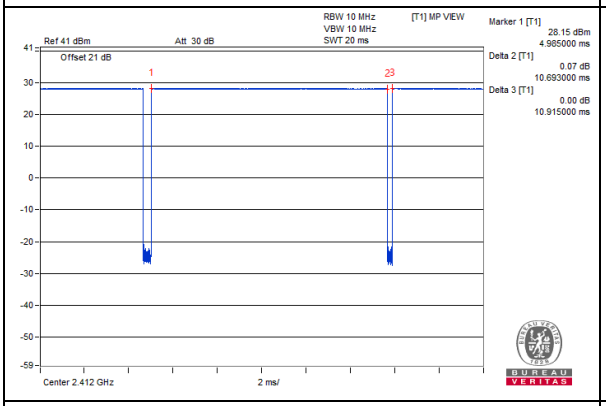
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Gary Cheng
RE<1G	24deg. C, 66%RH	120Vac, 60Hz	Tom Yang
PLC	24deg. C, 66%RH	120Vac, 60Hz	Tom Yang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

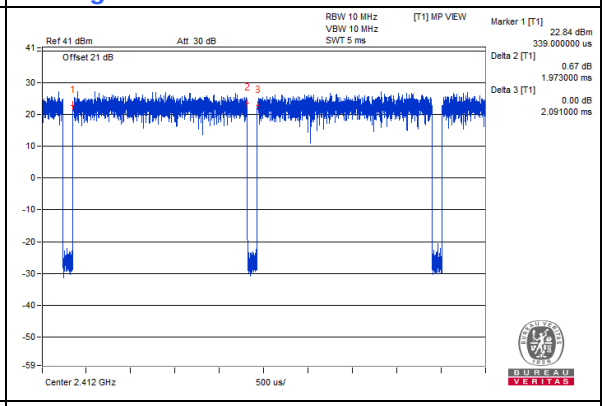
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 10.693 ms/10.915 ms= 0.98
802.11g: Duty cycle = 1.973 ms/2.091 ms= 0.944, Duty factor = 10 * log(1/Duty cycle) = 0.25 dB
802.11ax (HE20): Duty cycle = 5.443 ms/5.748 ms= 0.947, Duty factor = 10 * log(1/Duty cycle) = 0.24 dB
802.11ax (HE40): Duty cycle = 5.435 ms/ 5.752 ms= 0.945, Duty factor = 10 * log(1/Duty cycle) = 0.25 dB

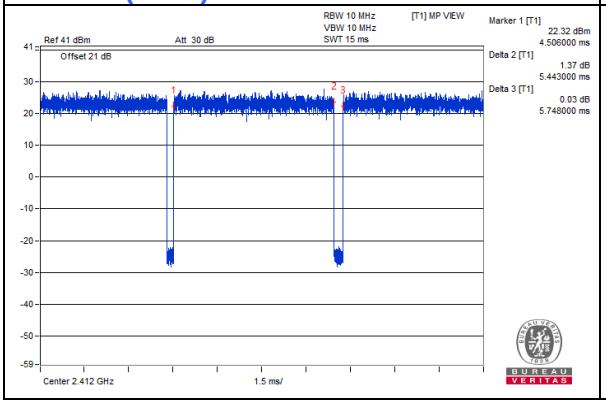
802.11b



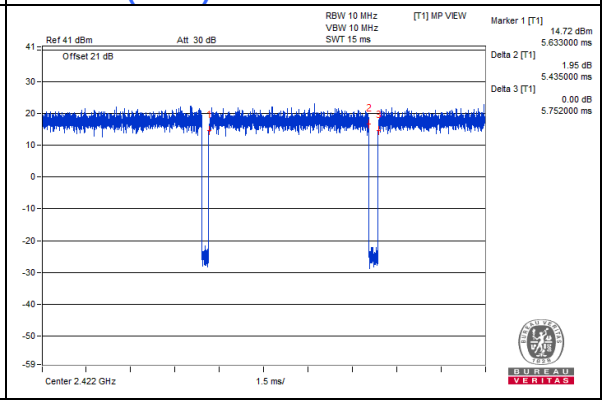
802.11g



802.11ax (HE20)



802.11ax (HE40)



3.4 Description of Support Units

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

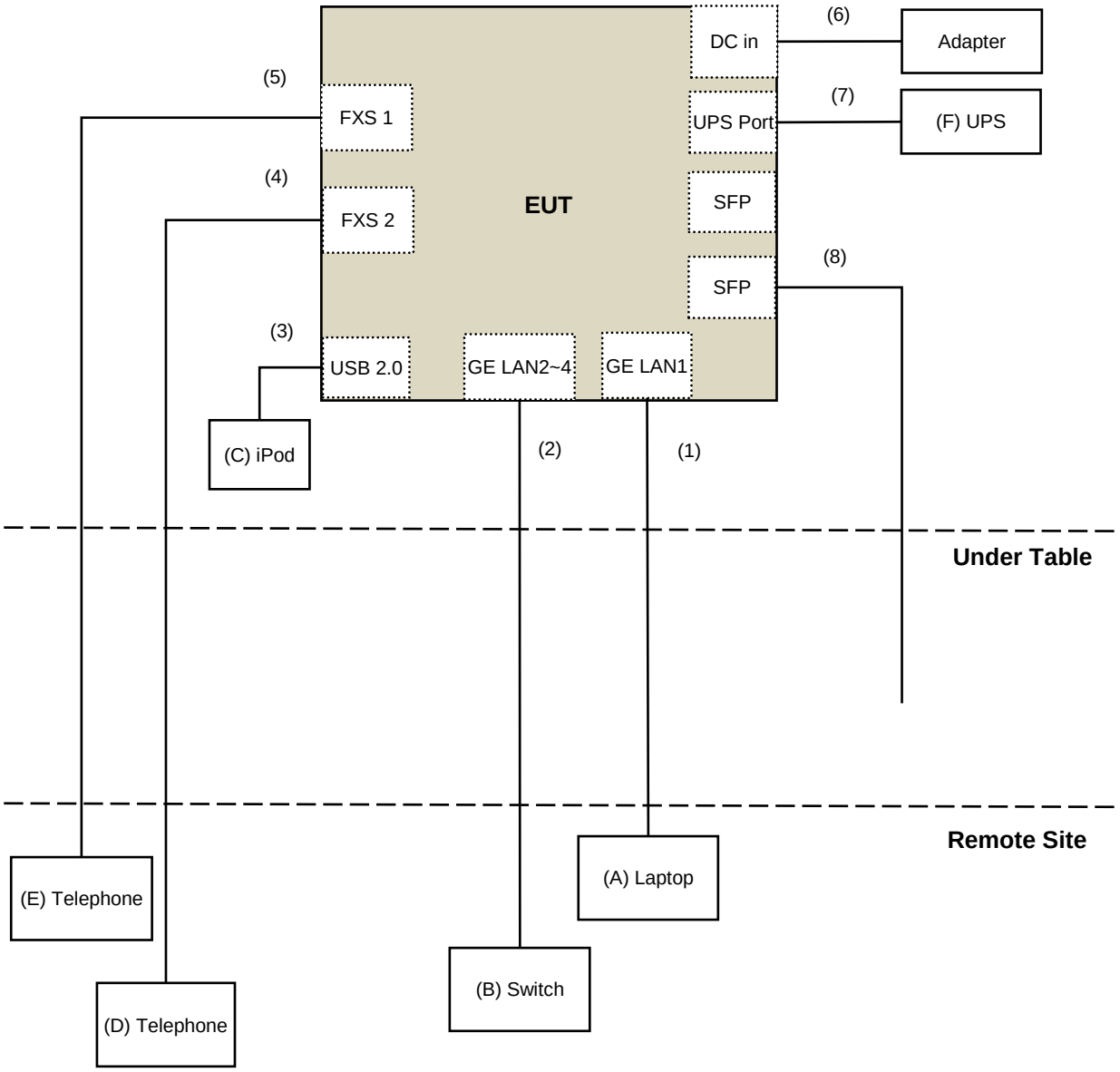
ID	Product	Brand	Model No.	Serial No	FCC ID	Remarks
A.	Laptop	DELL	E5430	HYV4VY1	DoC	Provided by Lab
B.	Switch	D-Link	DGS-1005D	DR8WC92000523	NA	Provided by Lab
C.	iPod	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
D.	Telephone	DAISHO	DS-03	N/A	NA	Provided by Lab
E.	Telephone	Romeo	TE-812	97280903	NA	Provided by Lab
F.	UPS	CyberPower	DTC36U12V3-G	NA	NA	Supplied by client

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	RJ-45 Cable	1	10	No	0	Provided by Lab
2	RJ-45 Cable	3	10	No	0	Provided by Lab
3	USB Cable	1	0.1	Yes	0	Provided by Lab
4	RJ-11 Cable	1	10	No	0	Provided by Lab
5	RJ-11 Cable	1	10	No	0	Provided by Lab
6	DC Cable	1	1.5	No	0	Supplied by client
7	UPS Cable	1	1	No	0	Supplied by client
8	Fiber Cable	1	3	No	0	Supplied by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and references

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

Test standard:

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

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

References Test Guidance :

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

For Radiated Emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Mar. 05, 2021	Mar. 04, 2022
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier EMCI	EMC330N	980701	Mar. 10, 2021	Mar. 09, 2022
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 06, 2020	Nov. 05, 2021
RF Cable	8D	966-4-1	Mar. 17, 2021	Mar. 16, 2022
RF Cable	8D	966-4-2	Mar. 17, 2021	Mar. 16, 2022
RF Cable	8D	966-4-3	Mar. 17, 2021	Mar. 16, 2022
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC 12630 SE	980638	Apr. 08, 2020	Apr. 07, 2021
RF Cable	EMC104-SM-SM-1200	160922	Dec. 25, 2020	Dec. 24, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 10, 2021	Mar. 09, 2022
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	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. 4.
3. Tested Date: Mar. 19, 2021

Bangedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Mar. 05, 2021	Mar. 04, 2022
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier EMCI	EMC330N	980701	Mar. 11, 2020	Mar. 10, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 06, 2020	Nov. 05, 2021
RF Cable	8D	966-6-1	Apr. 04, 2020	Apr. 03, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC 12630 SE	980638	Apr. 08, 2020	Apr. 07, 2021
RF Cable	EMC104-SM-SM-1200	160922	Dec. 25, 2020	Dec. 24, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	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. 4.
3. Tested Date: Feb. 09, 2021

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Spectrum Analyzer Keysight	N9030A	MY54490679	July 13, 2020	July 12, 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
Mech Switch Absorptive Mini-Circuits	MSP4TA-18+	0140	Feb. 05, 2021	Feb. 04, 2022
FXD ATTEN Mini-Circuits	BW-S3W2+	MN71981	Feb. 05, 2021	Feb. 04, 2022
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: Mar. 24 to 29, 2021

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:

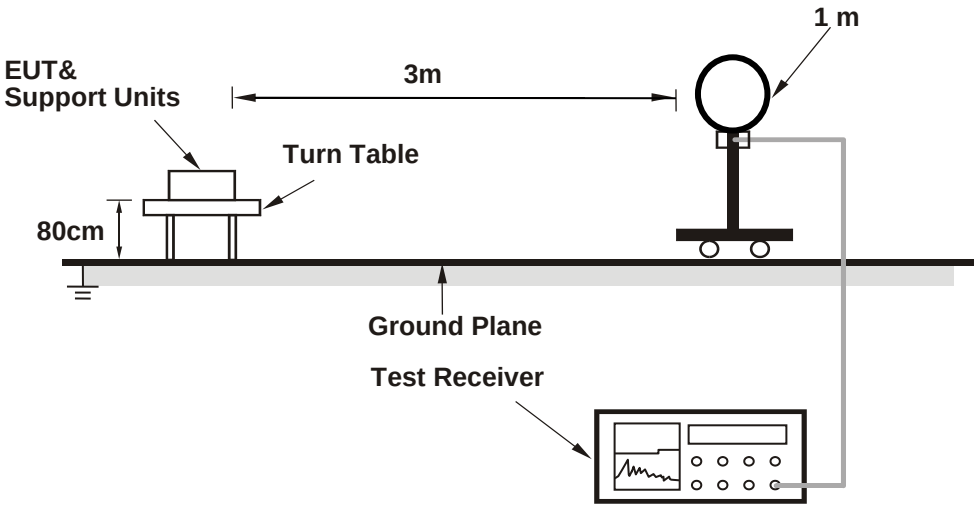
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

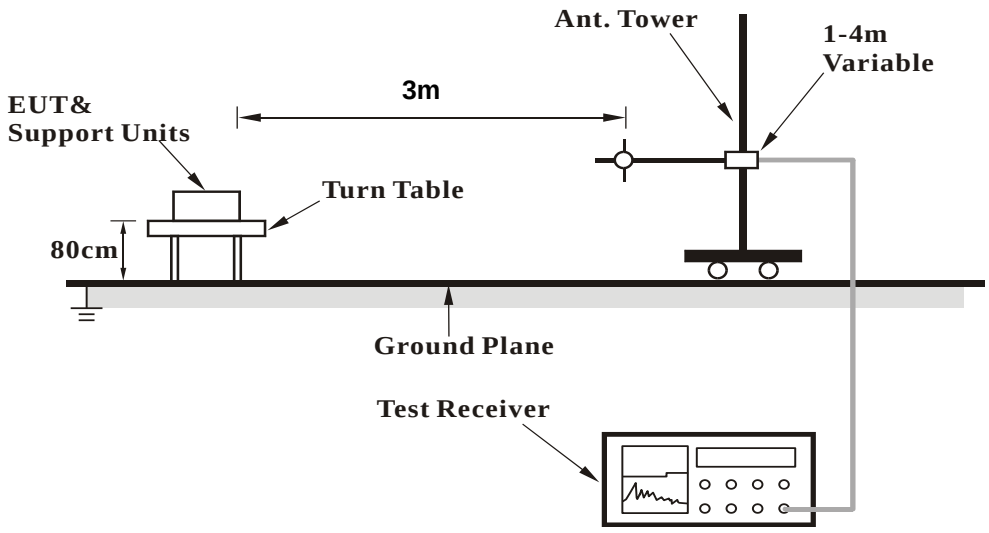
No deviation.

4.1.5 Test Setup

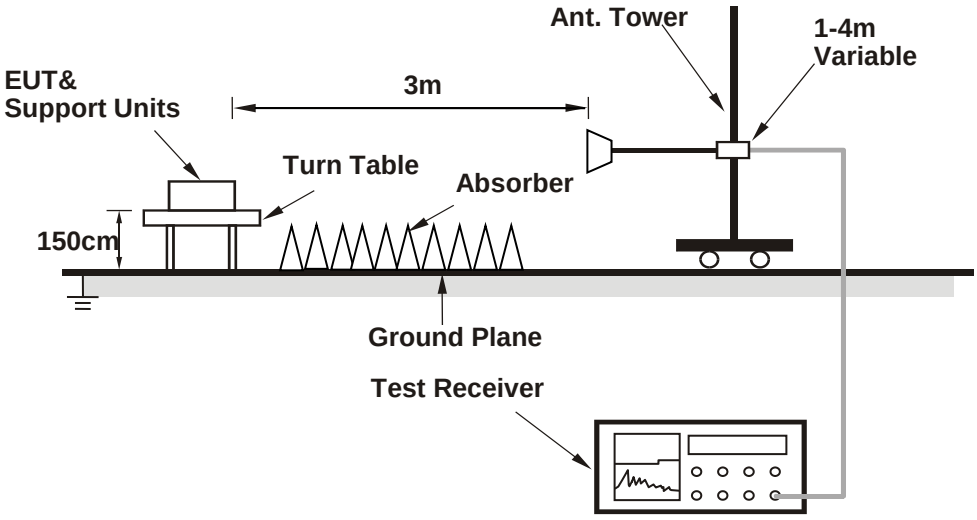
For Radiated emission below 30MHz



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_conn.win.1.0_installer_00076.1) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX 802.11b	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2385.22	57.7 PK	74.0	-16.3	1.78 H	134	62.1	-4.4
2	2385.22	47.8 AV	54.0	-6.2	1.78 H	134	52.2	-4.4
3	*2412.00	116.4 PK			1.78 H	134	120.8	-4.4
4	*2412.00	114.6 AV			1.78 H	134	119.0	-4.4
5	4824.00	46.3 PK	74.0	-27.7	1.18 H	329	46.2	0.1
6	4824.00	42.9 AV	54.0	-11.1	1.18 H	329	42.8	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2385.23	60.1 PK	74.0	-13.9	1.82 V	195	64.5	-4.4
2	2385.23	52.7 AV	54.0	-1.3	1.82 V	195	57.1	-4.4
3	*2412.00	117.5 PK			1.82 V	195	121.9	-4.4
4	*2412.00	116.5 AV			1.82 V	195	120.9	-4.4
5	4824.00	45.5 PK	74.0	-28.5	2.57 V	230	45.4	0.1
6	4824.00	42.8 AV	54.0	-11.2	2.57 V	230	42.7	0.1

Remarks:

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

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.4 PK	74.0	-16.6	1.83 H	94	61.9	-4.5
2	2390.00	44.3 AV	54.0	-9.7	1.83 H	94	48.8	-4.5
3	*2437.00	113.4 PK			1.83 H	94	117.8	-4.4
4	*2437.00	103.4 AV			1.83 H	94	107.8	-4.4
5	2483.50	57.1 PK	74.0	-16.9	1.83 H	94	61.6	-4.5
6	2483.50	43.5 AV	54.0	-10.5	1.83 H	94	48.0	-4.5
7	4874.00	46.1 PK	74.0	-27.9	1.16 H	327	46.0	0.1
8	4874.00	42.9 AV	54.0	-11.1	1.16 H	327	42.8	0.1
9	7311.00	47.1 PK	74.0	-26.9	1.72 H	286	40.8	6.3
10	7311.00	40.4 AV	54.0	-13.6	1.72 H	286	34.1	6.3
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	60.9 PK	74.0	-13.1	1.79 V	142	65.4	-4.5
2	2390.00	47.8 AV	54.0	-6.2	1.79 V	142	52.3	-4.5
3	*2437.00	118.4 PK			1.79 V	142	122.8	-4.4
4	*2437.00	109.6 AV			1.79 V	142	114.0	-4.4
5	2483.50	60.9 PK	74.0	-13.1	1.79 V	142	65.4	-4.5
6	2483.50	46.8 AV	54.0	-7.2	1.79 V	142	51.3	-4.5
7	4874.00	45.4 PK	74.0	-28.6	2.57 V	229	45.3	0.1
8	4874.00	42.5 AV	54.0	-11.5	2.57 V	229	42.4	0.1
9	7311.00	44.2 PK	74.0	-29.8	2.12 V	79	37.9	6.3
10	7311.00	34.7 AV	54.0	-19.3	2.12 V	79	28.4	6.3

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.

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	116.6 PK			1.70 H	136	121.0	-4.4
2	*2462.00	114.7 AV			1.70 H	136	119.1	-4.4
3	2490.26	57.8 PK	74.0	-16.2	1.70 H	136	62.3	-4.5
4	2490.26	49.0 AV	54.0	-5.0	1.70 H	136	53.5	-4.5
5	4924.00	46.7 PK	74.0	-27.3	1.21 H	317	46.4	0.3
6	4924.00	43.2 AV	54.0	-10.8	1.21 H	317	42.9	0.3
7	7386.00	46.7 PK	74.0	-27.3	1.71 H	300	40.1	6.6
8	7386.00	40.1 AV	54.0	-13.9	1.71 H	300	33.5	6.6
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	118.2 PK			1.84 V	156	122.6	-4.4
2	*2462.00	116.0 AV			1.84 V	156	120.4	-4.4
3	2489.84	59.1 PK	74.0	-14.9	1.84 V	156	63.6	-4.5
4	2489.84	51.7 AV	54.0	-2.3	1.84 V	156	56.2	-4.5
5	4924.00	45.7 PK	74.0	-28.3	2.62 V	229	45.4	0.3
6	4924.00	42.5 AV	54.0	-11.5	2.62 V	229	42.2	0.3
7	7386.00	44.7 PK	74.0	-29.3	2.17 V	84	38.1	6.6
8	7386.00	35.2 AV	54.0	-18.8	2.17 V	84	28.6	6.6

Remarks:

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

RF Mode	TX 802.11g	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.5 PK	74.0	-12.5	1.79 H	109	66.0	-4.5
2	2390.00	47.2 AV	54.0	-6.8	1.79 H	109	51.7	-4.5
3	*2412.00	114.0 PK			1.79 H	109	118.4	-4.4
4	*2412.00	103.9 AV			1.79 H	109	108.3	-4.4
5	4824.00	41.4 PK	74.0	-32.6	1.13 H	313	41.3	0.1
6	4824.00	38.6 AV	54.0	-15.4	1.13 H	313	38.5	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	66.0 PK	74.0	-8.0	1.62 V	318	70.5	-4.5
2	**2390.00**	**53.8 AV**	**54.0**	**-0.2**	**1.62 V**	**318**	**58.3**	**-4.5**
3	*2412.00	116.3 PK			1.62 V	318	120.7	-4.4
4	*2412.00	106.4 AV			1.62 V	318	110.8	-4.4
5	4824.00	41.0 PK	74.0	-33.0	2.59 V	231	40.9	0.1
6	4824.00	38.1 AV	54.0	-15.9	2.59 V	231	38.0	0.1

Remarks:

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

RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	1.74 H	104	64.0	-4.5
2	2390.00	45.4 AV	54.0	-8.6	1.74 H	104	49.9	-4.5
3	*2437.00	115.4 PK			1.74 H	104	119.8	-4.4
4	*2437.00	106.2 AV			1.74 H	104	110.6	-4.4
5	2483.50	59.3 PK	74.0	-14.7	1.74 H	104	63.8	-4.5
6	2483.50	45.3 AV	54.0	-8.7	1.74 H	104	49.8	-4.5
7	4874.00	44.3 PK	74.0	-29.7	1.24 H	327	44.2	0.1
8	4874.00	41.3 AV	54.0	-12.7	1.24 H	327	41.2	0.1
9	7311.00	45.8 PK	74.0	-28.2	1.71 H	296	39.5	6.3
10	7311.00	39.2 AV	54.0	-14.8	1.71 H	296	32.9	6.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	61.2 PK	74.0	-12.8	1.85 V	152	65.7	-4.5
2	2390.00	47.9 AV	54.0	-6.1	1.85 V	152	52.4	-4.5
3	*2437.00	118.4 PK			1.85 V	152	122.8	-4.4
4	*2437.00	109.6 AV			1.85 V	152	114.0	-4.4
5	2483.50	61.3 PK	74.0	-12.7	1.85 V	152	65.8	-4.5
6	2483.50	47.0 AV	54.0	-7.0	1.85 V	152	51.5	-4.5
7	4874.00	43.2 PK	74.0	-30.8	2.58 V	226	43.1	0.1
8	4874.00	40.6 AV	54.0	-13.4	2.58 V	226	40.5	0.1
9	7311.00	44.2 PK	74.0	-29.8	2.12 V	98	37.9	6.3
10	7311.00	34.9 AV	54.0	-19.1	2.12 V	98	28.6	6.3

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.

RF Mode	TX 802.11g	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	115.0 PK			1.53 H	102	119.4	-4.4
2	*2462.00	104.5 AV			1.53 H	102	108.9	-4.4
3	2484.14	60.9 PK	74.0	-13.1	1.53 H	102	65.4	-4.5
4	2484.14	47.9 AV	54.0	-6.1	1.53 H	102	52.4	-4.5
5	4924.00	41.0 PK	74.0	-33.0	1.10 H	307	40.7	0.3
6	4924.00	38.2 AV	54.0	-15.8	1.10 H	307	37.9	0.3
7	7386.00	45.3 PK	74.0	-28.7	1.69 H	308	38.7	6.6
8	7386.00	39.0 AV	54.0	-15.0	1.69 H	308	32.4	6.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	116.0 PK			1.43 V	152	120.4	-4.4
2	*2462.00	106.4 AV			1.43 V	152	110.8	-4.4
3	2483.50	66.6 PK	74.0	-7.4	1.43 V	152	71.1	-4.5
4	2483.50	52.9 AV	54.0	-1.1	1.43 V	152	57.4	-4.5
5	4924.00	44.6 PK	74.0	-29.4	2.10 V	82	44.3	0.3
6	4924.00	35.3 AV	54.0	-18.7	2.10 V	82	35.0	0.3
7	7386.00	43.9 PK	74.0	-30.1	2.13 V	97	37.3	6.6
8	7386.00	34.9 AV	54.0	-19.1	2.13 V	97	28.3	6.6

Remarks:

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

RF Mode	TX 802.11ax (HE20)	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.5 PK	74.0	-9.5	1.78 H	109	69.0	-4.5
2	2390.00	50.9 AV	54.0	-3.1	1.78 H	109	55.4	-4.5
3	*2412.00	116.3 PK			1.78 H	109	120.7	-4.4
4	*2412.00	103.7 AV			1.78 H	109	108.1	-4.4
5	4824.00	41.6 PK	74.0	-32.4	1.18 H	306	41.5	0.1
6	4824.00	39.0 AV	54.0	-15.0	1.18 H	306	38.9	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2387.85	65.8 PK	74.0	-8.2	1.63 V	317	70.2	-4.4
2	2387.85	52.9 AV	54.0	-1.1	1.63 V	317	57.3	-4.4
3	*2412.00	118.3 PK			1.63 V	317	122.7	-4.4
4	*2412.00	105.4 AV			1.63 V	317	109.8	-4.4
5	4824.00	41.4 PK	74.0	-32.6	2.55 V	243	41.3	0.1
6	4824.00	38.2 AV	54.0	-15.8	2.55 V	243	38.1	0.1

Remarks:

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

RF Mode	TX 802.11ax (HE20)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.0 PK	74.0	-15.0	1.74 H	93	63.5	-4.5
2	2390.00	45.1 AV	54.0	-8.9	1.74 H	93	49.6	-4.5
3	*2437.00	115.6 PK			1.74 H	93	120.0	-4.4
4	*2437.00	106.2 AV			1.74 H	93	110.6	-4.4
5	2483.50	59.2 PK	74.0	-14.8	1.74 H	93	63.7	-4.5
6	2483.50	45.5 AV	54.0	-8.5	1.74 H	93	50.0	-4.5
7	4874.00	44.4 PK	74.0	-29.6	1.21 H	332	44.3	0.1
8	4874.00	41.6 AV	54.0	-12.4	1.21 H	332	41.5	0.1
9	7311.00	46.2 PK	74.0	-27.8	1.69 H	289	39.9	6.3
10	7311.00	39.6 AV	54.0	-14.4	1.69 H	289	33.3	6.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.2 PK	74.0	-8.8	2.01 V	302	69.7	-4.5
2	2390.00	49.0 AV	54.0	-5.0	2.01 V	302	53.5	-4.5
3	*2437.00	121.6 PK			2.01 V	302	126.0	-4.4
4	*2437.00	109.1 AV			2.01 V	302	113.5	-4.4
5	2483.50	66.1 PK	74.0	-7.9	2.01 V	302	70.6	-4.5
6	2483.50	49.8 AV	54.0	-4.2	2.01 V	302	54.3	-4.5
7	4874.00	43.4 PK	74.0	-30.6	2.59 V	234	43.3	0.1
8	4874.00	40.5 AV	54.0	-13.5	2.59 V	234	40.4	0.1
9	7311.00	43.8 PK	74.0	-30.2	2.13 V	82	37.5	6.3
10	7311.00	34.7 AV	54.0	-19.3	2.13 V	82	28.4	6.3

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.

RF Mode	TX 802.11ax (HE20)	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	116.7 PK			1.95 H	104	121.1	-4.4
2	*2462.00	104.2 AV			1.95 H	104	108.6	-4.4
3	2483.50	63.2 PK	74.0	-10.8	1.95 H	104	67.7	-4.5
4	2483.50	49.9 AV	54.0	-4.1	1.95 H	104	54.4	-4.5
5	4924.00	40.9 PK	74.0	-33.1	1.08 H	294	40.6	0.3
6	4924.00	37.9 AV	54.0	-16.1	1.08 H	294	37.6	0.3
7	7386.00	45.0 PK	74.0	-29.0	1.68 H	320	38.4	6.6
8	7386.00	38.6 AV	54.0	-15.4	1.68 H	320	32.0	6.6
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	118.7 PK			1.83 V	152	123.1	-4.4
2	*2462.00	105.7 AV			1.83 V	152	110.1	-4.4
3	2483.50	64.9 PK	74.0	-9.1	1.83 V	152	69.4	-4.5
4	2483.50	53.1 AV	54.0	-0.9	1.83 V	152	57.6	-4.5
5	4924.00	44.8 PK	74.0	-29.2	2.06 V	72	44.5	0.3
6	4924.00	35.3 AV	54.0	-18.7	2.06 V	72	35.0	0.3
7	7386.00	43.5 PK	74.0	-30.5	2.08 V	101	36.9	6.6
8	7386.00	34.7 AV	54.0	-19.3	2.08 V	101	28.1	6.6

Remarks:

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

RF Mode	TX 802.11ax (HE40)	Channel	CH 3：2422 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	63.1 PK	74.0	-10.9	1.89 H	113	67.6	-4.5
2	2390.00	50.1 AV	54.0	-3.9	1.89 H	113	54.6	-4.5
3	*2422.00	109.8 PK			1.89 H	113	114.2	-4.4
4	*2422.00	97.5 AV			1.89 H	113	101.9	-4.4
5	4844.00	41.1 PK	74.0	-32.9	1.03 H	296	41.0	0.1
6	4844.00	38.3 AV	54.0	-15.7	1.03 H	296	38.2	0.1
7	7266.00	45.2 PK	74.0	-28.8	1.71 H	317	39.0	6.2
8	7266.00	38.7 AV	54.0	-15.3	1.71 H	317	32.5	6.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	2390.00	66.1 PK	74.0	-7.9	1.90 V	154	70.6	-4.5
2	**2390.00**	**53.8 AV**	**54.0**	**-0.2**	**1.90 V**	**154**	**58.3**	**-4.5**
3	*2422.00	112.5 PK			1.90 V	154	116.9	-4.4
4	*2422.00	100.5 AV			1.90 V	154	104.9	-4.4
5	4844.00	44.8 PK	74.0	-29.2	2.06 V	63	44.7	0.1
6	4844.00	35.0 AV	54.0	-19.0	2.06 V	63	34.9	0.1
7	7266.00	43.4 PK	74.0	-30.6	2.03 V	103	37.2	6.2
8	7266.00	34.7 AV	54.0	-19.3	2.03 V	103	28.5	6.2

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.

RF Mode	TX 802.11ax (HE40)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	66.5 PK	74.0	-7.5	1.89 H	102	71.0	-4.5
2	2390.00	51.6 AV	54.0	-2.4	1.89 H	102	56.1	-4.5
3	*2437.00	112.3 PK			1.89 H	102	116.7	-4.4
4	*2437.00	100.6 AV			1.89 H	102	105.0	-4.4
5	2483.50	64.5 PK	74.0	-9.5	1.89 H	102	69.0	-4.5
6	2483.50	49.9 AV	54.0	-4.1	1.89 H	102	54.4	-4.5
7	4874.00	40.9 PK	74.0	-33.1	1.11 H	296	40.8	0.1
8	4874.00	38.1 AV	54.0	-15.9	1.11 H	296	38.0	0.1
9	7311.00	45.5 PK	74.0	-28.5	1.62 H	322	39.2	6.3
10	7311.00	39.0 AV	54.0	-15.0	1.62 H	322	32.7	6.3
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	68.2 PK	74.0	-5.8	1.43 V	154	72.7	-4.5
2	2390.00	53.2 AV	54.0	-0.8	1.43 V	154	57.7	-4.5
3	*2437.00	115.6 PK			1.43 V	154	120.0	-4.4
4	*2437.00	103.5 AV			1.43 V	154	107.9	-4.4
5	2483.50	67.2 PK	74.0	-6.8	1.43 V	154	71.7	-4.5
6	2483.50	52.2 AV	54.0	-1.8	1.43 V	154	56.7	-4.5
7	4874.00	44.3 PK	74.0	-29.7	2.09 V	72	44.2	0.1
8	4874.00	35.1 AV	54.0	-18.9	2.09 V	72	35.0	0.1
9	7311.00	43.0 PK	74.0	-31.0	2.04 V	96	36.7	6.3
10	7311.00	34.5 AV	54.0	-19.5	2.04 V	96	28.2	6.3

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.

RF Mode	TX 802.11ax (HE40)	Channel	CH 9：2452 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2452.00	111.9 PK			1.97 H	104	116.3	-4.4
2	*2452.00	99.4 AV			1.97 H	104	103.8	-4.4
3	2486.67	67.4 PK	74.0	-6.6	1.97 H	104	71.9	-4.5
4	2486.67	50.6 AV	54.0	-3.4	1.97 H	104	55.1	-4.5
5	4904.00	40.7 PK	74.0	-33.3	1.03 H	288	40.5	0.2
6	4904.00	37.5 AV	54.0	-16.5	1.03 H	288	37.3	0.2
7	7356.00	44.6 PK	74.0	-29.4	1.68 H	319	38.2	6.4
8	7356.00	38.3 AV	54.0	-15.7	1.68 H	319	31.9	6.4
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	113.9 PK			1.48 V	318	118.3	-4.4
2	*2452.00	101.6 AV			1.48 V	318	106.0	-4.4
3	2484.13	72.4 PK	74.0	-1.6	1.48 V	318	76.9	-4.5
4	2484.13	52.3 AV	54.0	-1.7	1.48 V	318	56.8	-4.5
5	4904.00	44.7 PK	74.0	-29.3	2.04 V	66	44.5	0.2
6	4904.00	35.5 AV	54.0	-18.5	2.04 V	66	35.3	0.2
7	7356.00	44.3 PK	74.0	-29.7	2.11 V	116	37.9	6.4
8	7356.00	35.2 AV	54.0	-18.8	2.11 V	116	28.8	6.4

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.

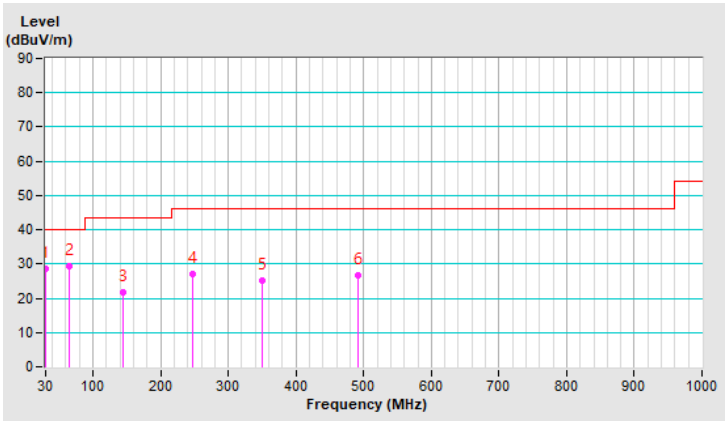
Below 1GHz Data:

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	30.63	28.5 QP	40.0	-11.5	2.00 H	337	42.1	-13.6
2	64.44	29.4 QP	40.0	-10.6	2.00 H	215	43.3	-13.9
3	143.76	21.6 QP	43.5	-21.9	2.00 H	84	33.7	-12.1
4	246.36	27.1 QP	46.0	-18.9	1.00 H	92	39.9	-12.8
5	350.05	25.0 QP	46.0	-21.0	1.50 H	0	34.3	-9.3
6	492.25	26.6 QP	46.0	-19.4	1.50 H	2	31.7	-5.1

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.

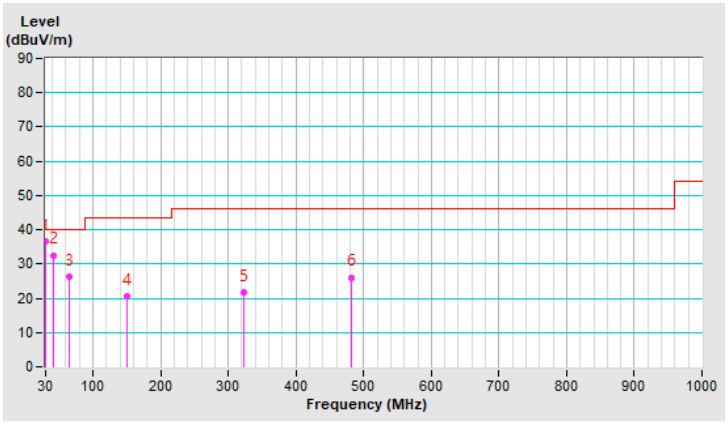


RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.27	36.6 QP	40.0	-3.4	1.00 V	221	50.1	-13.5
2	41.03	32.6 QP	40.0	-7.4	1.00 V	5	45.4	-12.8
3	65.48	26.4 QP	40.0	-13.6	1.50 V	360	40.4	-14.0
4	149.77	20.5 QP	43.5	-23.0	1.50 V	273	32.4	-11.9
5	323.86	21.8 QP	46.0	-24.2	1.50 V	360	31.8	-10.0
6	482.19	26.1 QP	46.0	-19.9	1.00 V	306	31.5	-5.4

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. 20, 2020	Oct. 19, 2021
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 27, 2020	Oct. 26, 2021
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 26, 2020	Oct. 25, 2021
RF Cable	5D-FB	COCCAB-001	Sep. 26, 2020	Sep. 25, 2021
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 29, 2020	Aug. 28, 2021
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. 17, 2021

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.

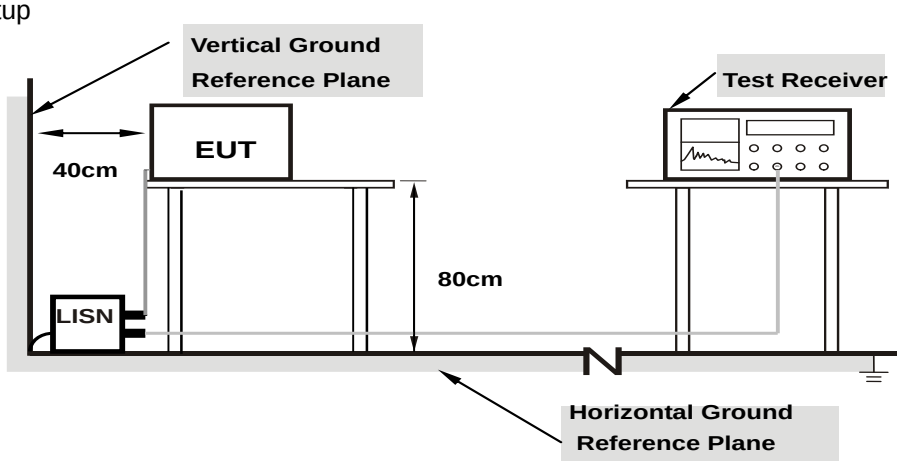
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

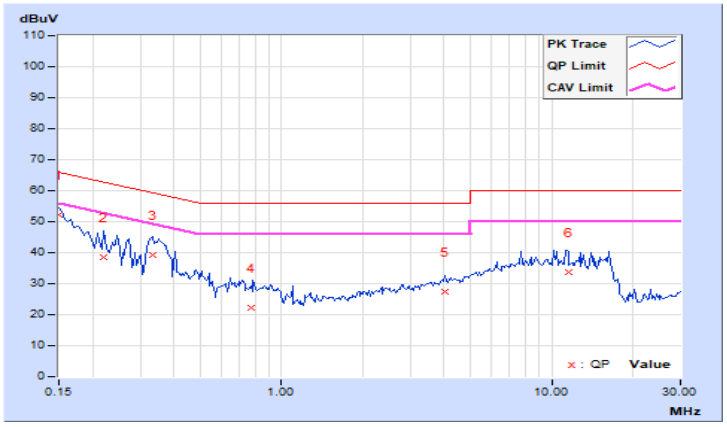
4.2.7 Test Results

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15000	9.96	42.08	25.42	52.04	35.38	66.00	56.00	-13.96	-20.62
2	0.22031	9.99	28.40	13.99	38.39	23.98	62.81	52.81	-24.42	-28.83
3	0.33359	10.01	29.24	17.05	39.25	27.06	59.36	49.36	-20.11	-22.30
4	0.77500	10.04	12.07	2.56	22.11	12.60	56.00	46.00	-33.89	-33.40
5	4.01563	10.28	17.08	8.48	27.36	18.76	56.00	46.00	-28.64	-27.24
6	11.54297	10.84	22.70	17.25	33.54	28.09	60.00	50.00	-26.46	-21.91

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

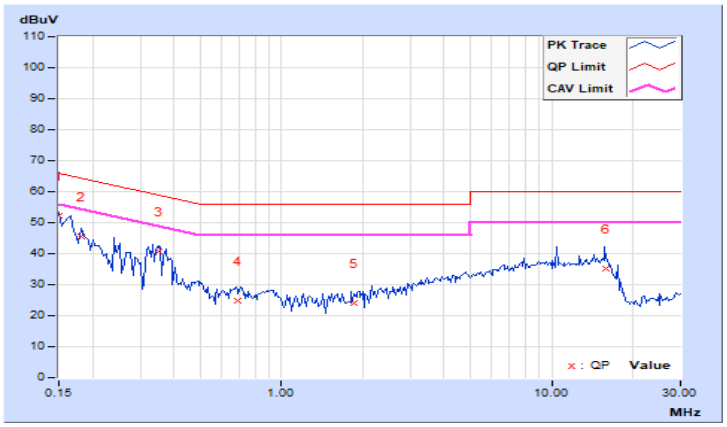


RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	9.94	42.35	25.68	52.29	35.62	66.00	56.00	-13.71	-20.38
2	0.18125	9.97	35.53	18.03	45.50	28.00	64.43	54.43	-18.93	-26.43
3	**0.34922**	**10.00**	**30.77**	**26.71**	**40.77**	**36.71**	**58.98**	**48.98**	**-18.21**	**-12.27**
4	0.68516	10.04	14.90	7.31	24.94	17.35	56.00	46.00	-31.06	-28.65
5	1.85938	10.13	13.80	6.30	23.93	16.43	56.00	46.00	-32.07	-29.57
6	15.95313	10.96	24.28	19.79	35.24	30.75	60.00	50.00	-24.76	-19.25

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

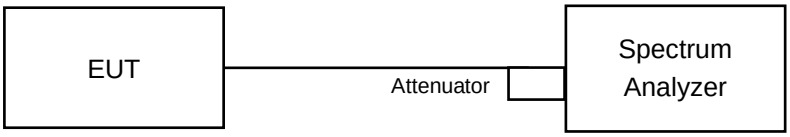


4.3 6dB Bandwidth Measurement

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	8.02	7.53	0.5	Pass
6	2437	8.07	8.07	0.5	Pass
11	2462	7.6	7.62	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.38	16.39	0.5	Pass
6	2437	16.37	16.36	0.5	Pass
11	2462	16.36	16.38	0.5	Pass

802.11ax (HE20)

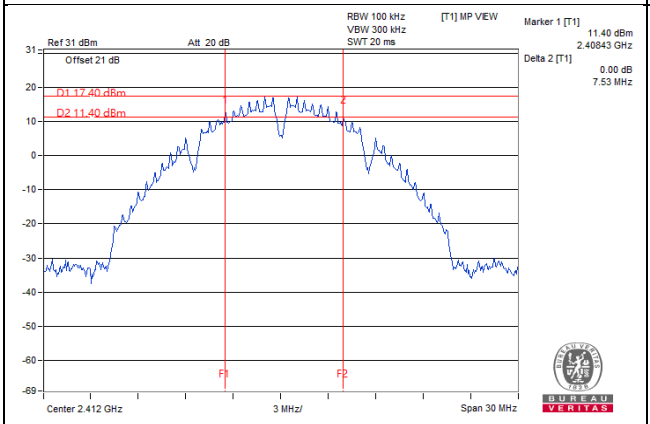
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.95	18.85	0.5	Pass
6	2437	18.88	18.84	0.5	Pass
11	2462	18.99	18.99	0.5	Pass

802.11ax (HE40)

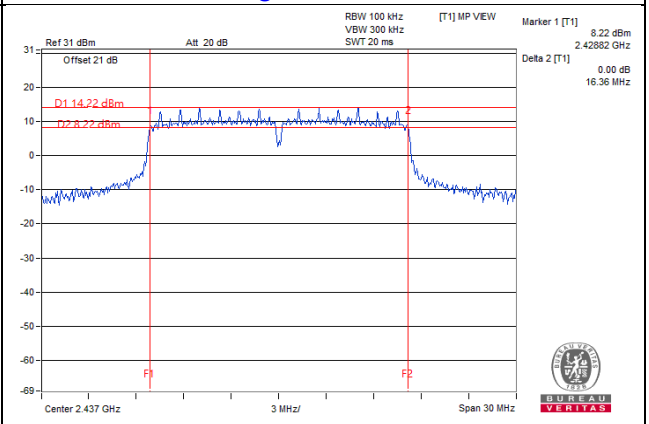
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	38.03	37.96	0.5	Pass
6	2437	38.19	37.59	0.5	Pass
9	2452	38.11	37.93	0.5	Pass

Spectrum Plot of Worst Value

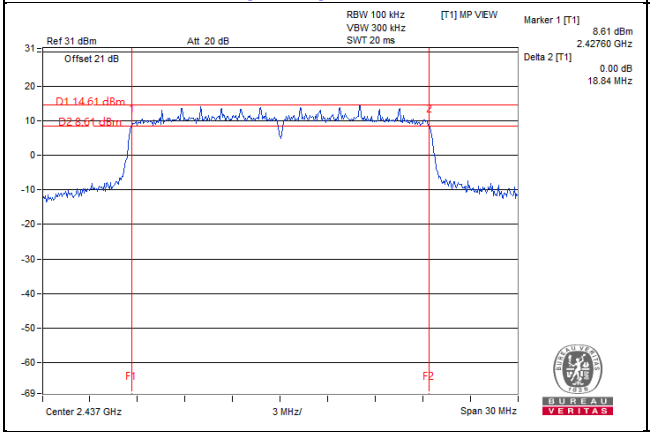
802.11b / Chain 1 : CH1



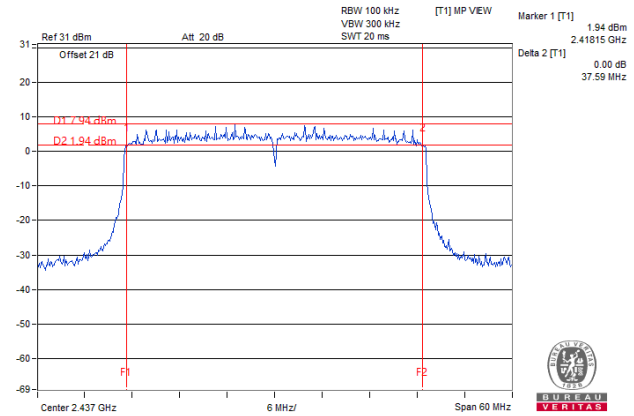
802.11g / Chain 1 : CH6



802.11ax (HE20) / Chain 1 : CH6



802.11ax (HE40) / Chain 1 : CH6



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

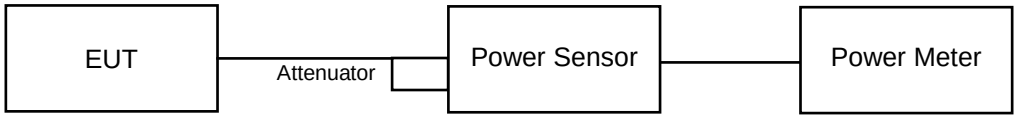
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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				
1	2412	25.21	25.74	706.867	28.49	30.00	Pass
6	2437	25.59	25.89	750.393	28.75	30.00	Pass
11	2462	25.74	25.83	757.798	28.80	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				
1	2412	21.27	21.53	276.201	24.41	30.00	Pass
6	2437	25.21	25.33	673.087	28.28	30.00	Pass
11	2462	22.33	22.12	333.931	25.24	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				
1	2412	20.70	20.75	236.34	23.74	30.00	Pass
6	2437	24.94	25.10	635.483	28.03	30.00	Pass
11	2462	21.56	21.45	282.856	24.52	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				
3	2422	18.33	18.67	141.698	21.51	30.00	Pass
6	2437	21.62	21.72	293.805	24.68	30.00	Pass
9	2452	20.09	20.19	206.566	23.15	30.00	Pass

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.91	21.03	250.076	23.98	30.00	Pass
6	2437	25.22	25.39	678.599	28.32	30.00	Pass
11	2462	21.83	21.69	299.976	24.77	30.00	Pass

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	18.55	18.88	148.882	21.73	30.00	Pass
6	2437	21.83	21.95	309.08	24.90	30.00	Pass
9	2452	20.37	20.47	220.322	23.43	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				
1	2412	20.70	20.75	236.34	23.74	30.00	Pass
6	2437	24.94	25.10	635.483	28.03	30.00	Pass
11	2462	21.56	21.45	282.856	24.52	30.00	Pass

Note: Directional gain = 0.09dBi < 6dBi, so the power limit shall not be reduced.

VHT40

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	18.33	18.67	141.698	21.51	30.00	Pass
6	2437	21.62	21.72	293.805	24.68	30.00	Pass
9	2452	20.09	20.19	206.566	23.15	30.00	Pass

Note: Directional gain = 0.09dBi < 6dBi, so the power limit shall not be reduced.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.91	21.03	250.076	23.98	30.00	Pass
6	2437	25.22	25.39	678.599	28.32	30.00	Pass
11	2462	21.83	21.69	299.976	24.77	30.00	Pass

Note: Directional gain = 0.09dBi < 6dBi, so the power limit shall not be reduced.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	18.55	18.88	148.882	21.73	30.00	Pass
6	2437	21.83	21.95	309.08	24.90	30.00	Pass
9	2452	20.37	20.47	220.322	23.43	30.00	Pass

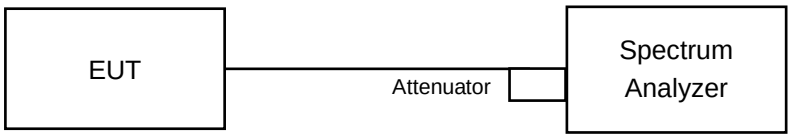
Note: Directional gain = 0.09dBi < 6dBi, so the power limit shall not be reduced.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

a) Measure the duty cycle (x).
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 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

CDD Mode

802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)		Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1				
1	2412	-7.59	-4.16	0.5579	-2.53	8.00	PASS
6	2437	-5.12	-6.11	0.5525	-2.58	8.00	PASS
11	2462	-4.94	-6.19	0.5611	-2.51	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. The directional gain = 0.09dBi < 6dBi, so the power density limit shall not be reduced.

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
		Chain 0	Chain 1					
1	2412	-12.18	-11.21	0.25	0.14436	-8.41	8.00	PASS
6	2437	-7.31	-8.00	0.25	0.3649	-4.38	8.00	PASS
11	2462	-11.08	-11.27	0.25	0.16176	-7.91	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. The directional gain = 0.09dBi < 6dBi, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

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
		Chain 0	Chain 1					
1	2412	-14.39	-12.64	0.24	0.09593	-10.18	8.00	PASS
6	2437	-10.43	-10.68	0.24	0.18595	-7.31	8.00	PASS
11	2462	-13.52	-11.89	0.24	0.1153	-9.38	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. The directional gain = 0.09dBi < 6dBi, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

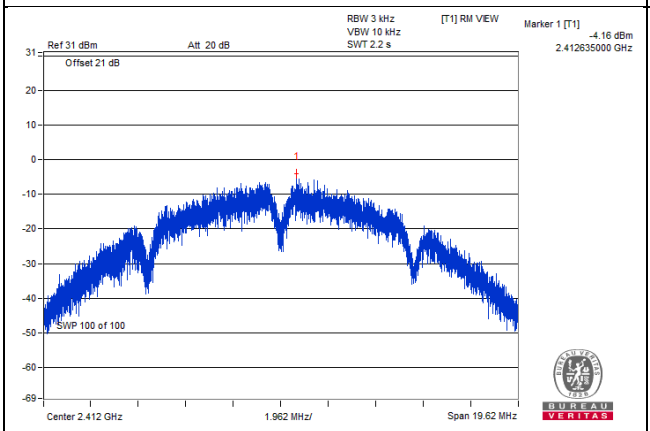
802.11ax (HE40)

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
		Chain 0	Chain 1					
3	2422	-18.89	-18.74	0.25	0.02781	-15.56	8.00	PASS
6	2437	-16.81	-15.47	0.25	0.0521	-12.83	8.00	PASS
9	2452	-17.13	-16.58	0.25	0.04375	-13.59	8.00	PASS

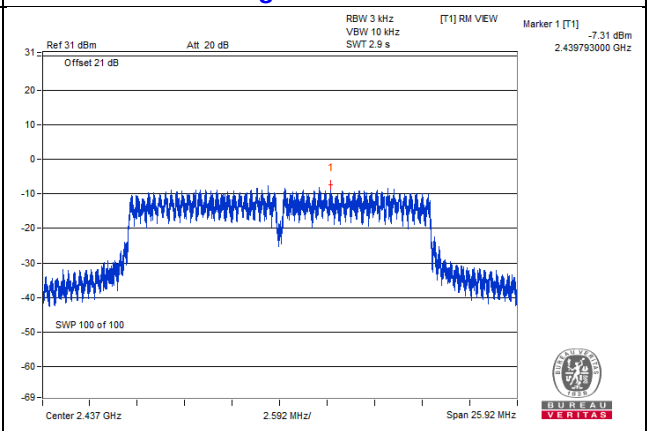
Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. The directional gain = 0.09dBi < 6dBi, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

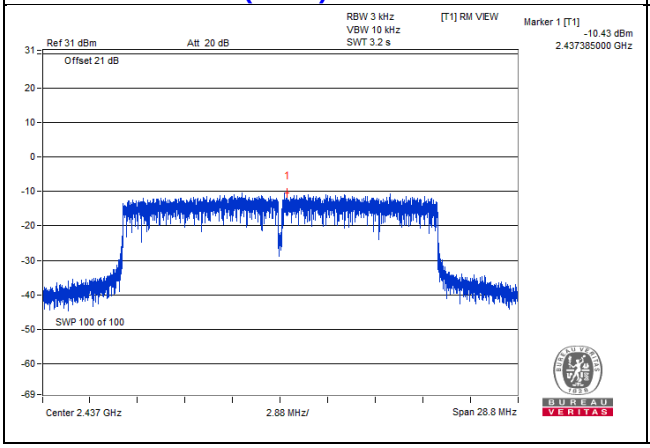
802.11b / Chain 1 : CH1



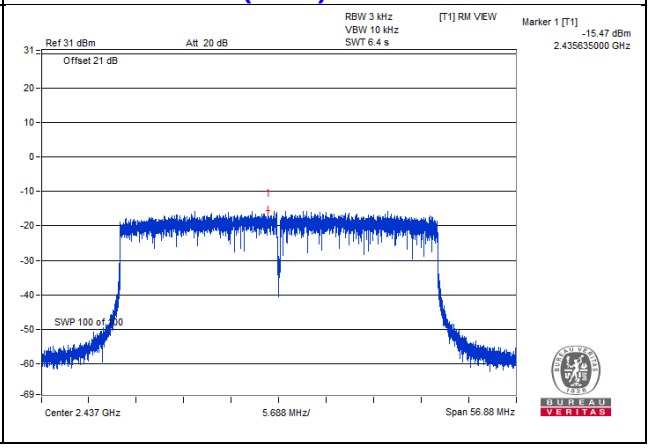
802.11g / Chain 0 : CH6



802.11ax (HE20) / Chain 0 : CH6



802.11ax (HE40) / Chain 1 : CH6

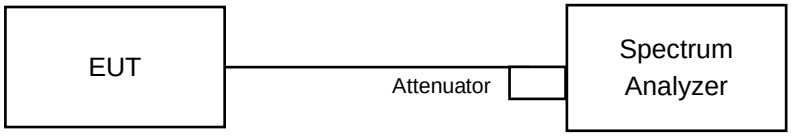


4.6 Conducted Out of Band Emission Measurement

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

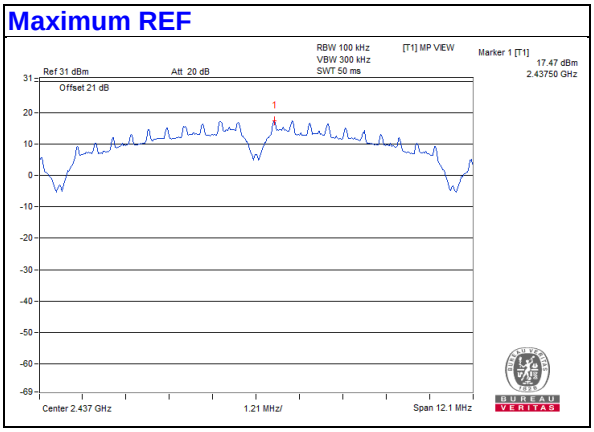
Same as Item 4.3.6

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.

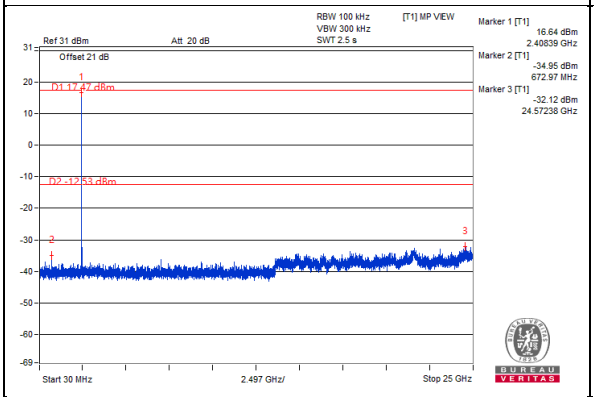
802.11b

Maximum REF

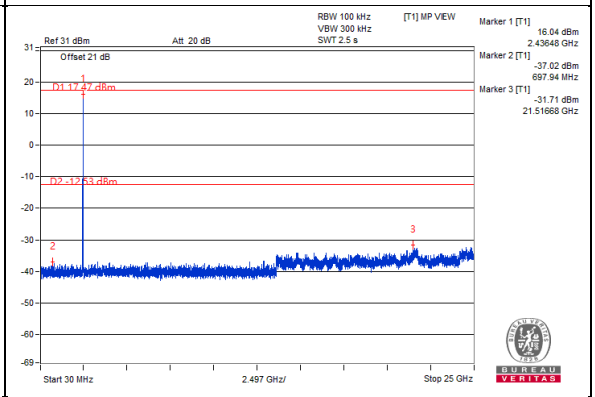


Chain 0

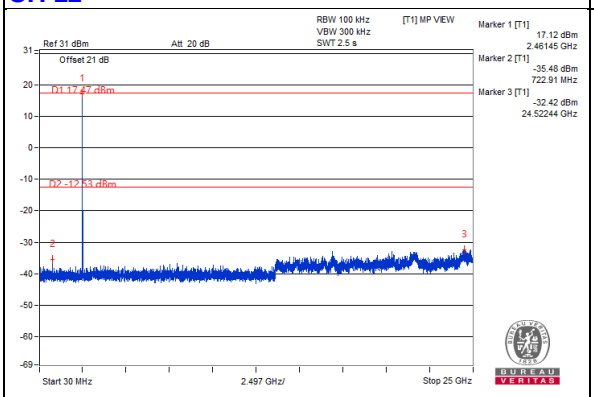
CH 1



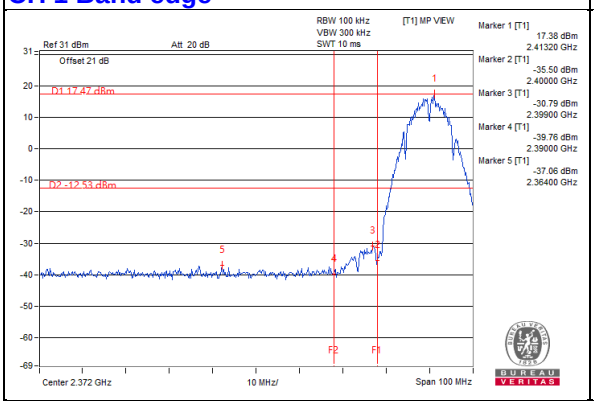
CH 6



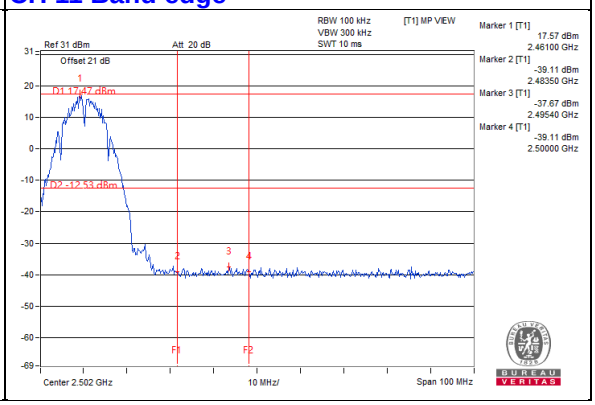
CH 11



CH 1 Band edge

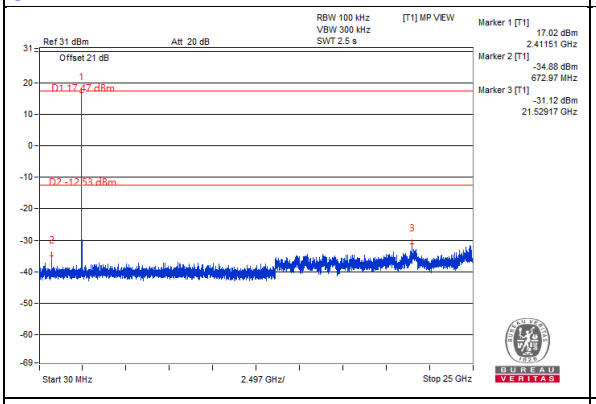


CH 11 Band edge

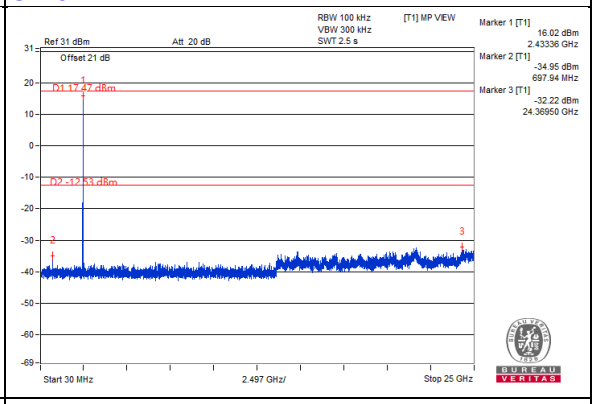


Chain 1

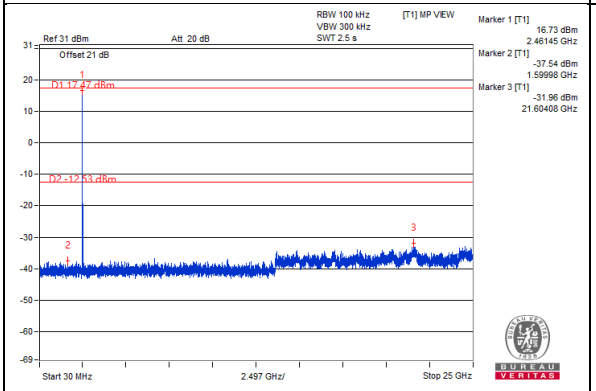
CH 1



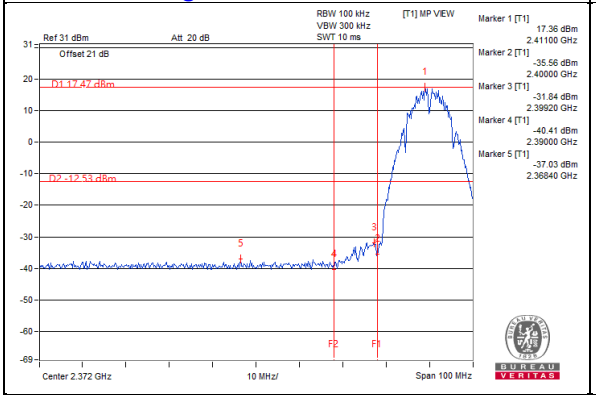
CH 6



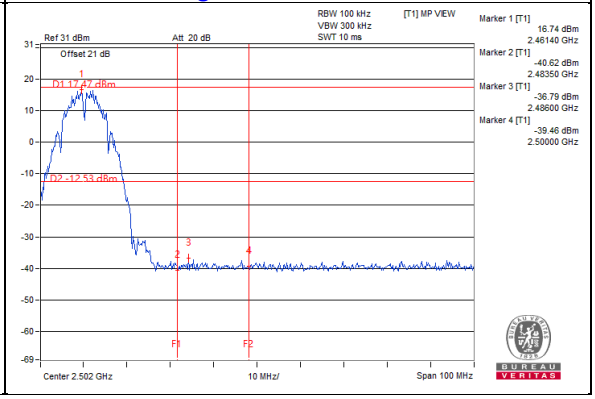
CH 11



CH 1 Band edge

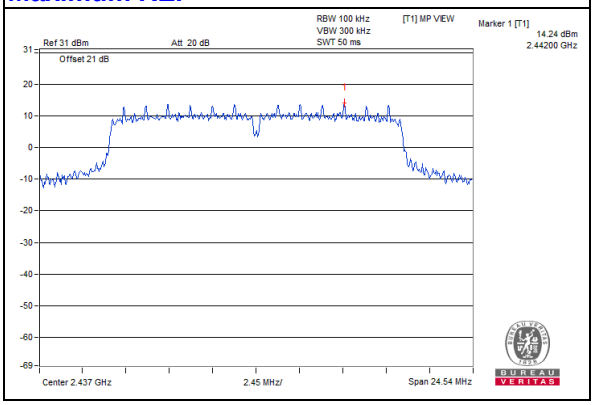


CH 11 Band edge



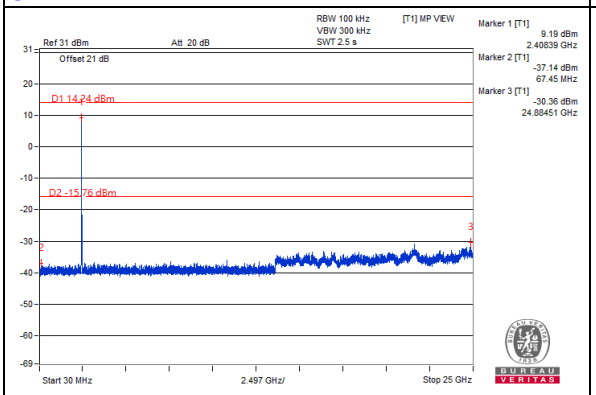
802.11g

Maximum REF

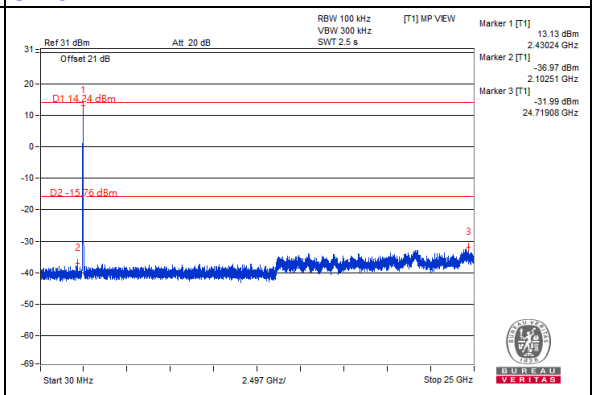


Chain 0

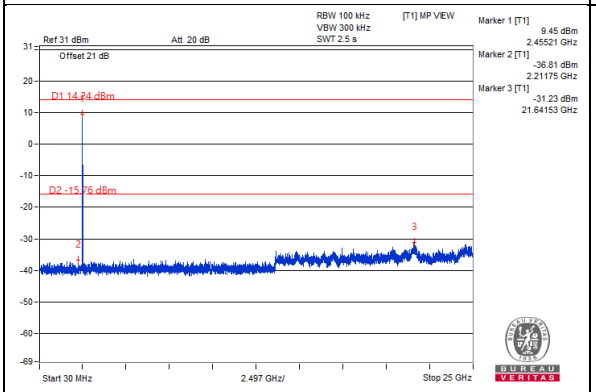
CH 1



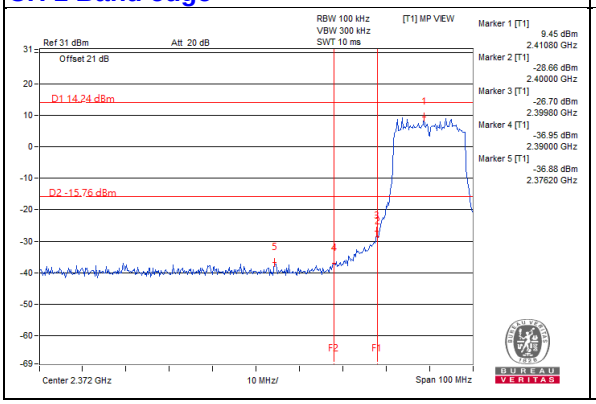
CH 6



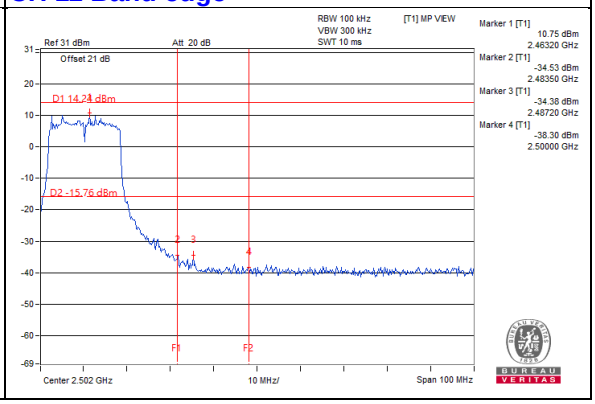
CH 11



CH 1 Band edge

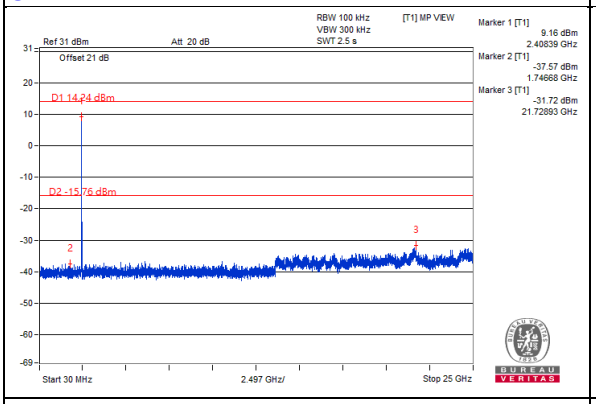


CH 11 Band edge

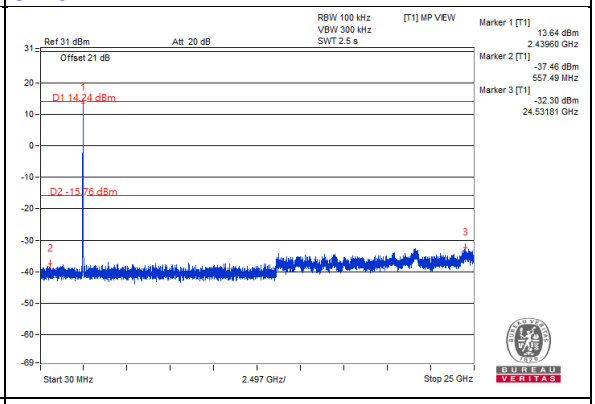


Chain 1

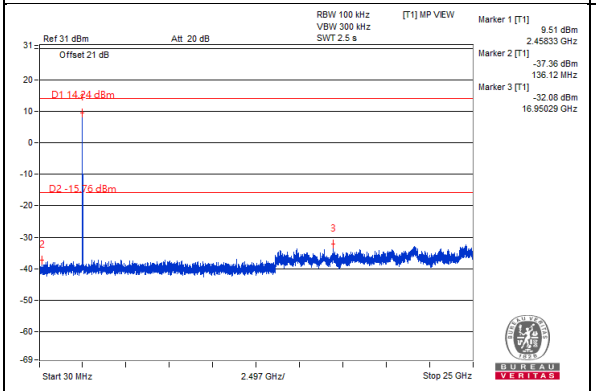
CH 1



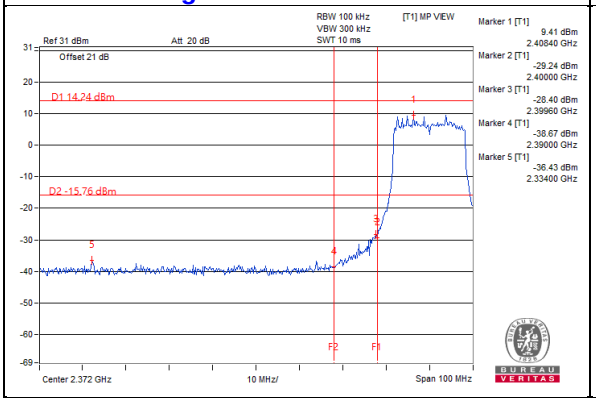
CH 6



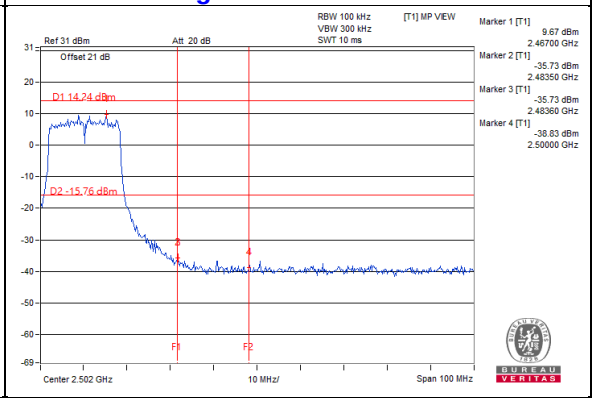
CH 11



CH 1 Band edge

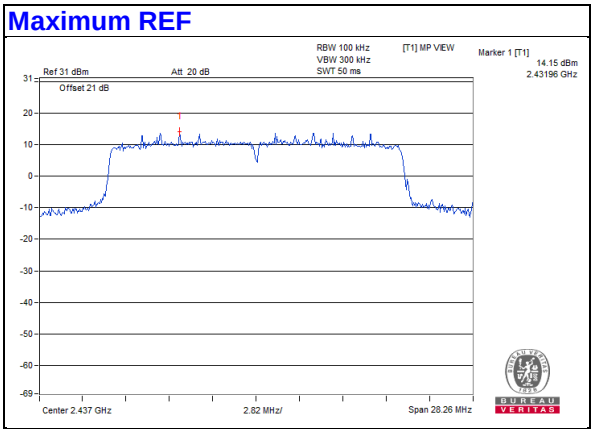


CH 11 Band edge



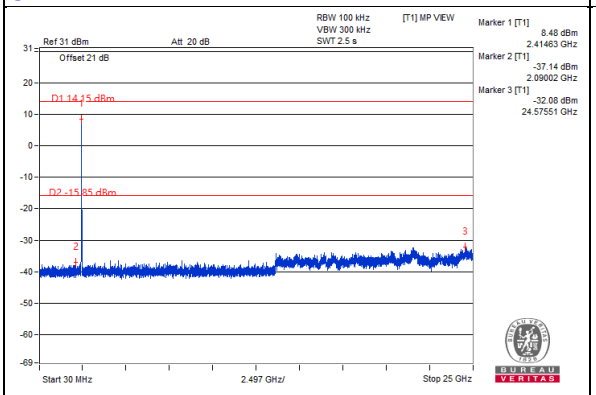
802.11ax (HE20)

Maximum REF

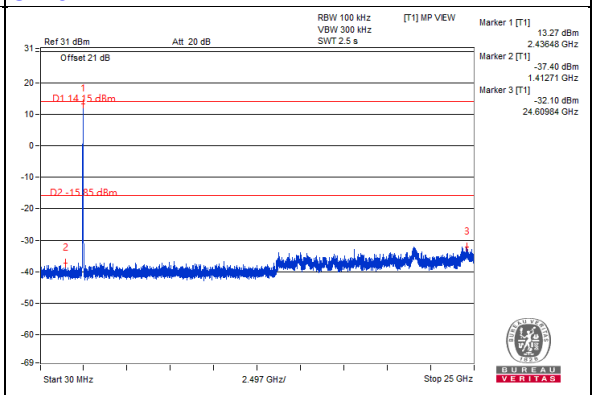


Chain 0

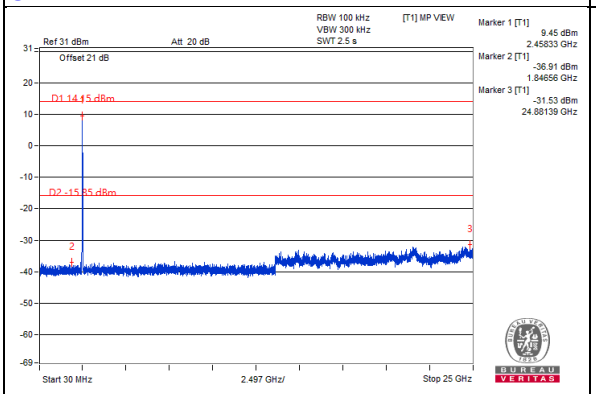
CH 1



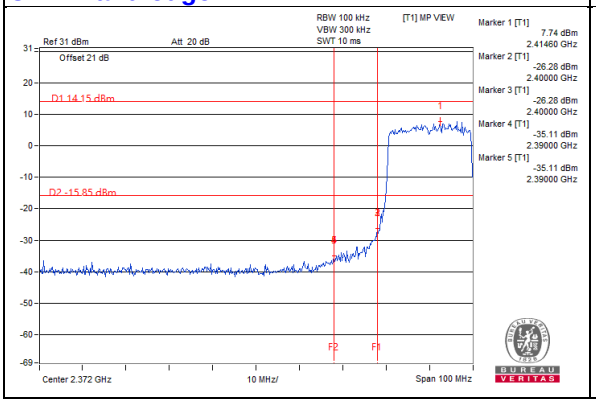
CH 6



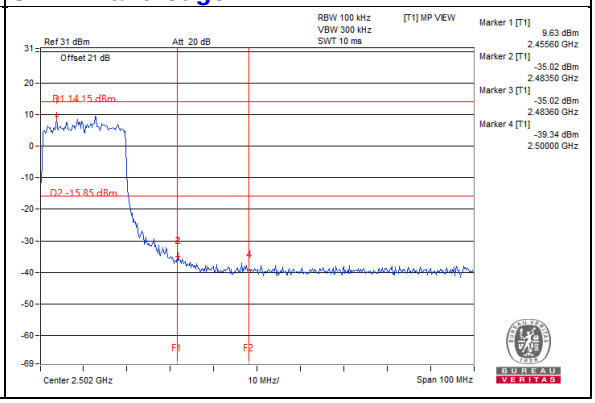
CH 11



CH 1 Band edge

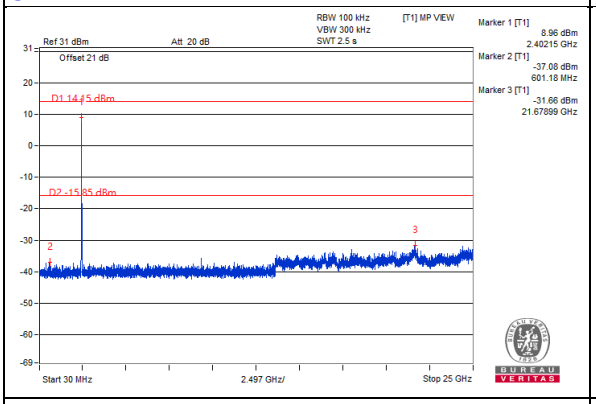


CH 11 Band edge

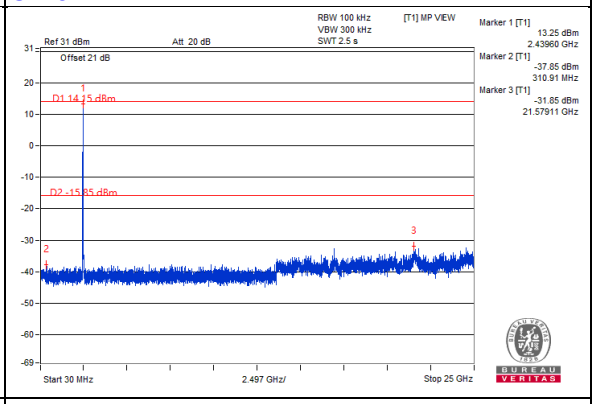


Chain 1

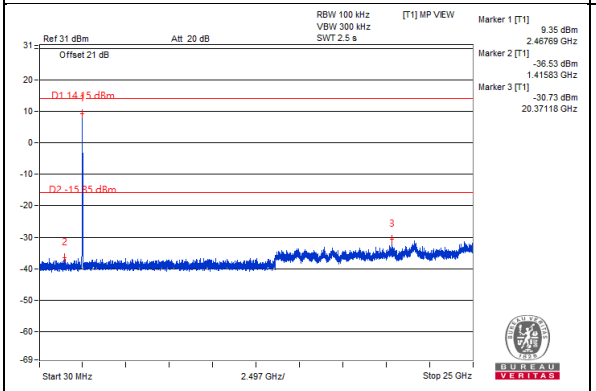
CH 1



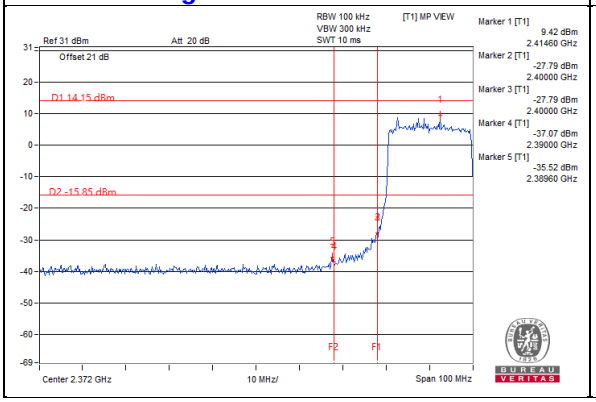
CH 6



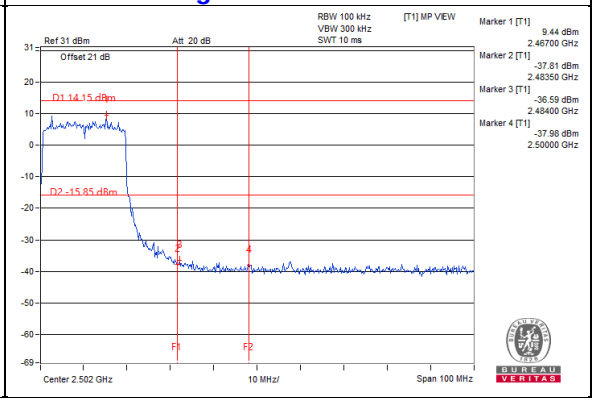
CH 11



CH 1 Band edge

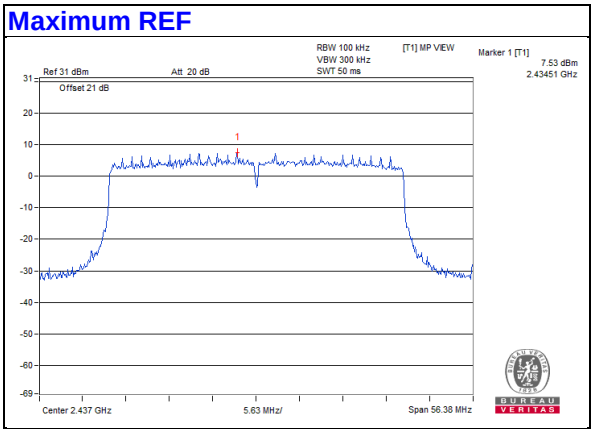


CH 11 Band edge



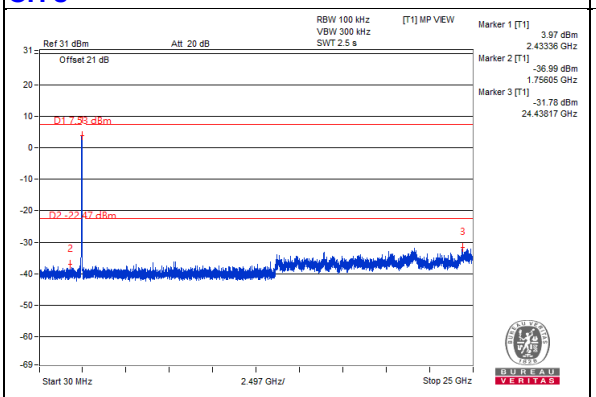
802.11ax (HE40)

Maximum REF

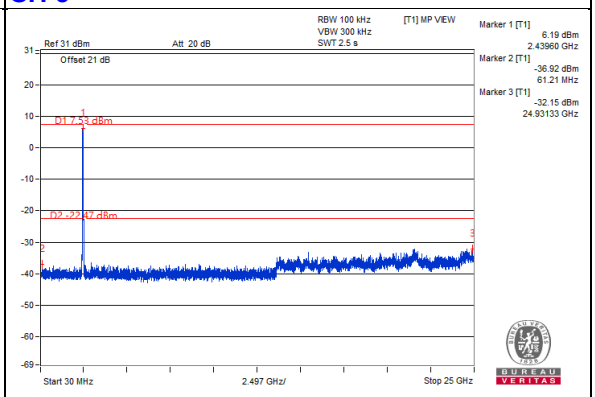


Chain 0

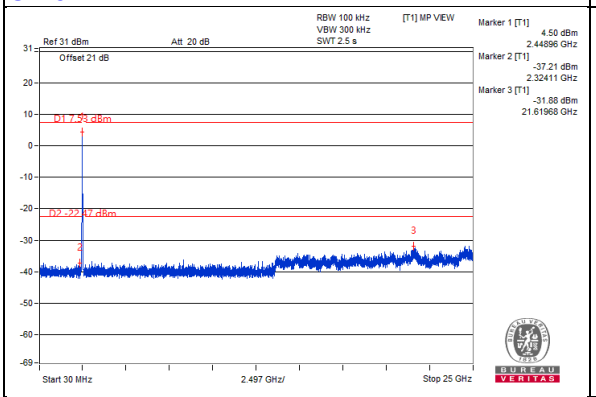
CH 3



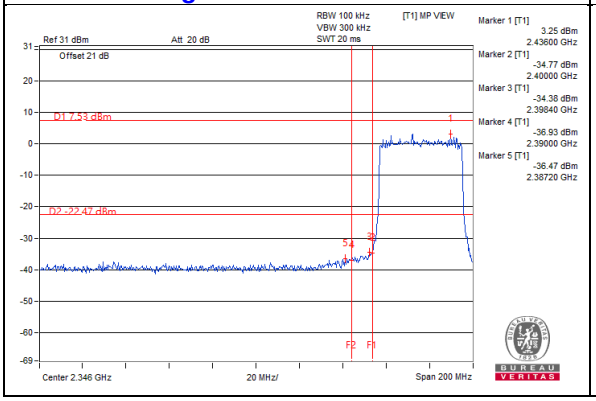
CH 6



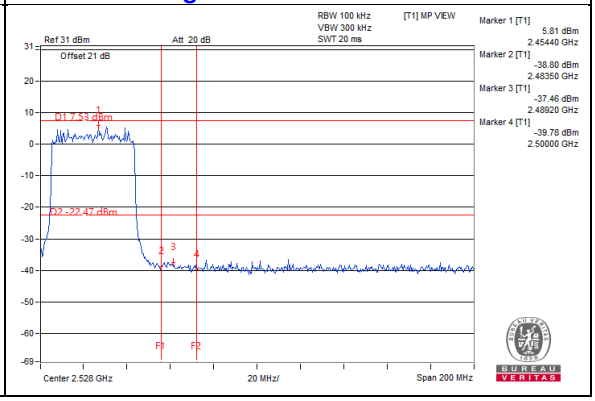
CH 9



CH 3 Band edge

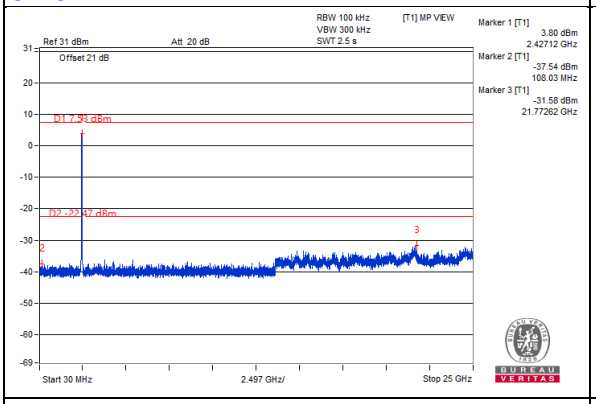


CH 9 Band edge

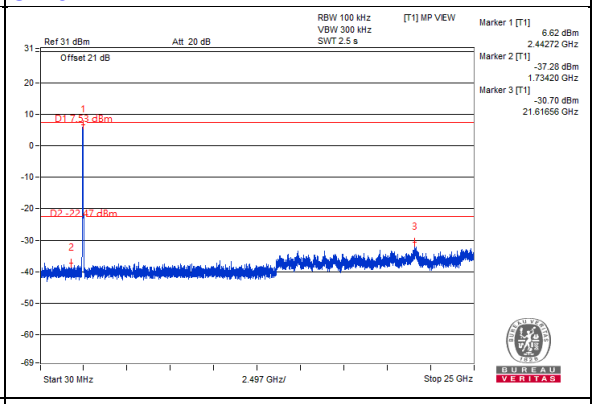


Chain 1

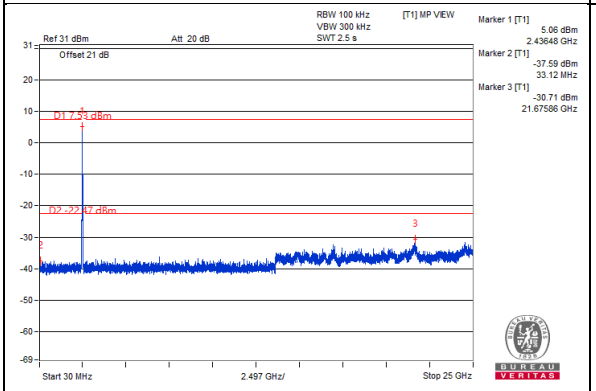
CH 3



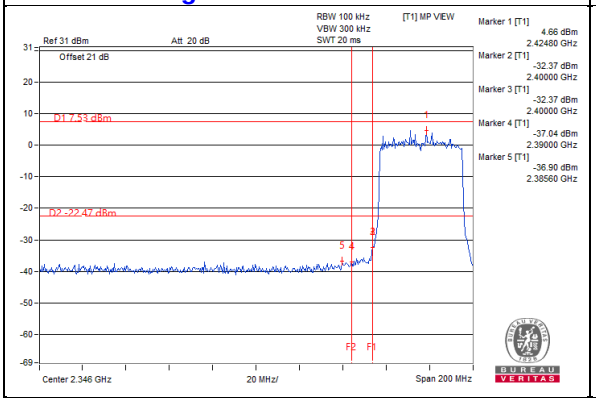
CH 6



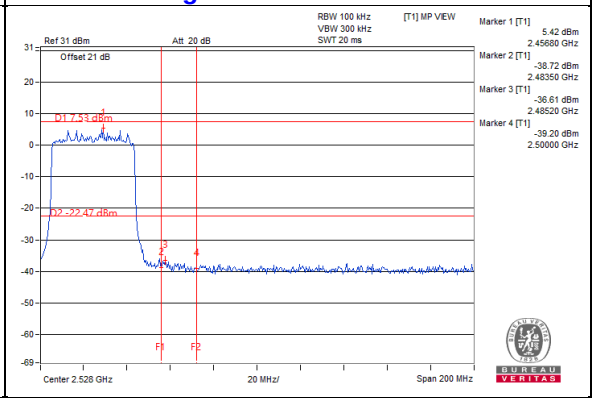
CH 9



CH 3 Band edge



CH 9 Band edge



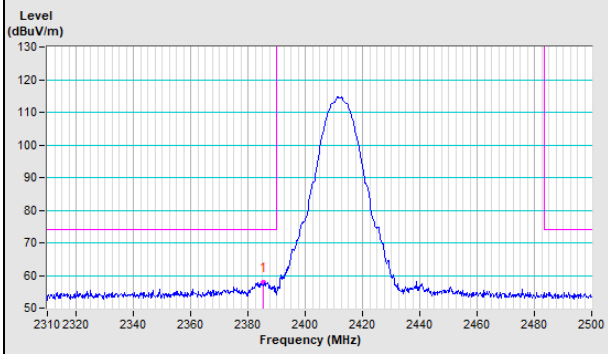
5 Pictures of Test Arrangements

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

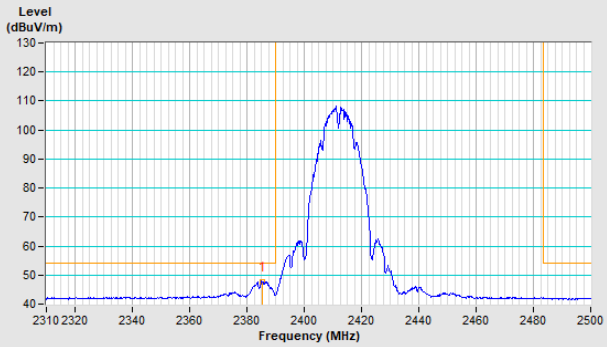
Annex A - Band-Edge Measurement

802.11b Channel 1

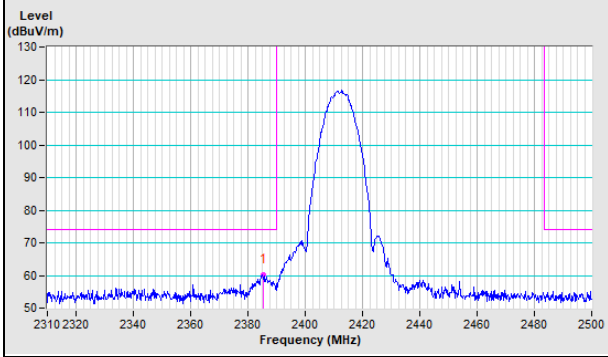
Horizontal (Peak)



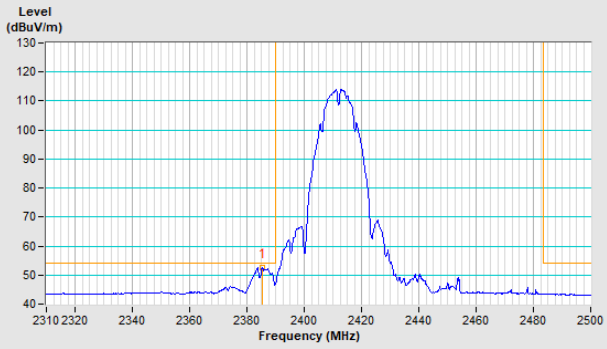
Horizontal (Average)



Vertical (Peak)

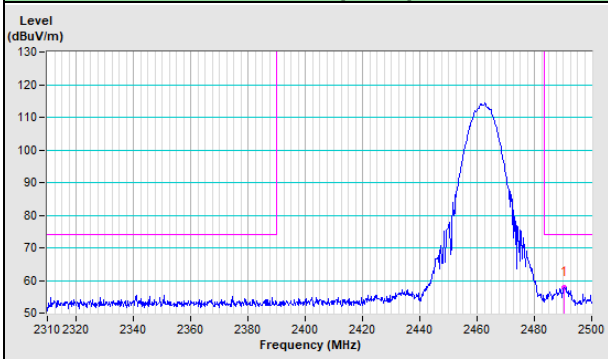


Vertical (Average)

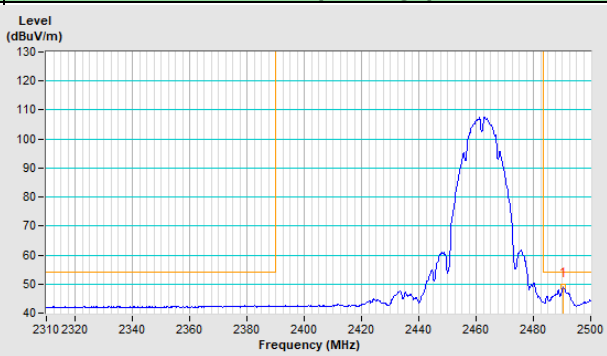


802.11b Channel 11

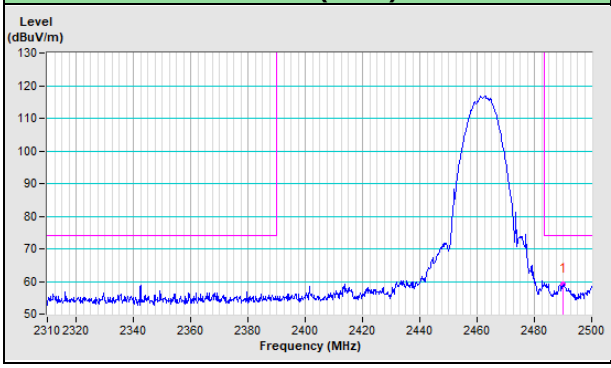
Horizontal (Peak)



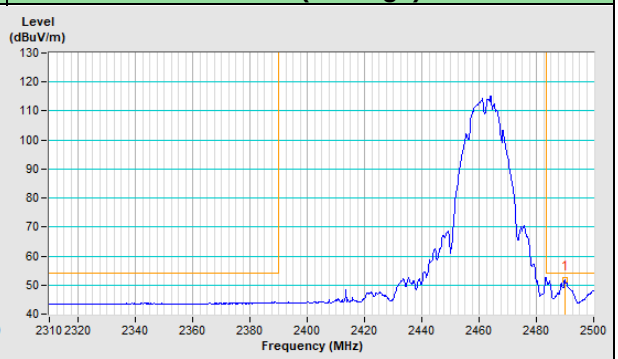
Horizontal (Average)



Vertical (Peak)

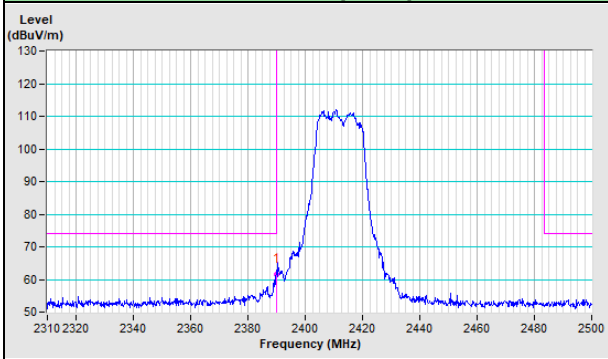


Vertical (Average)

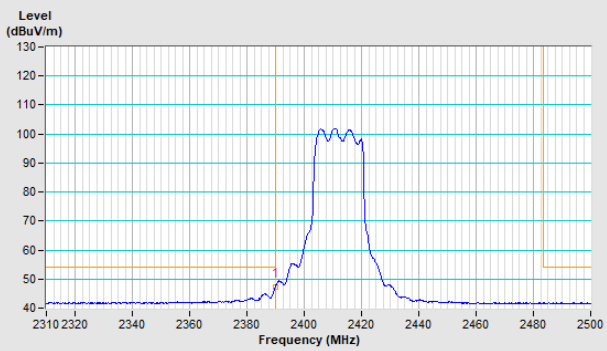


802.11g Channel 1

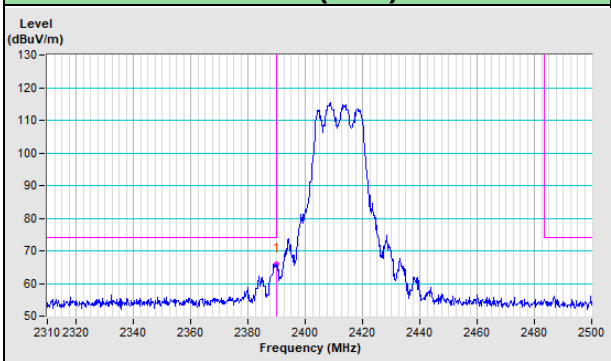
Horizontal (Peak)



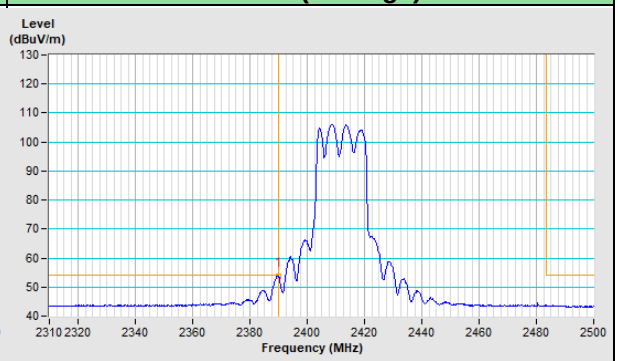
Horizontal (Average)



Vertical (Peak)

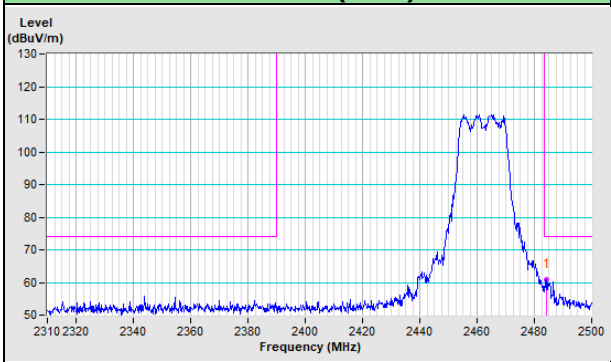


Vertical (Average)

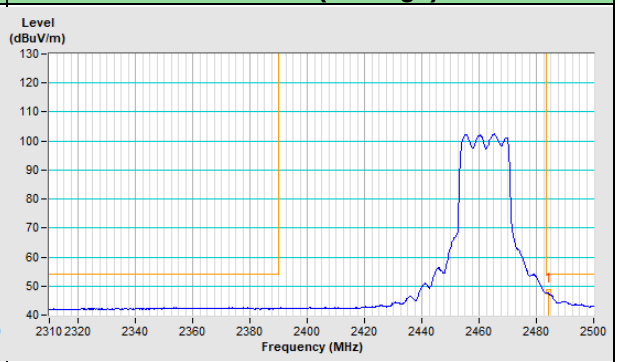


802.11g Channel 11

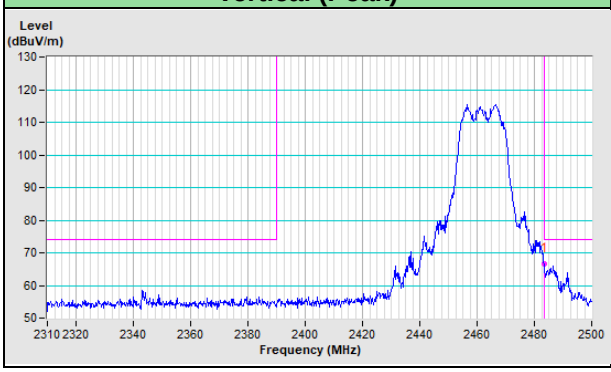
Horizontal (Peak)



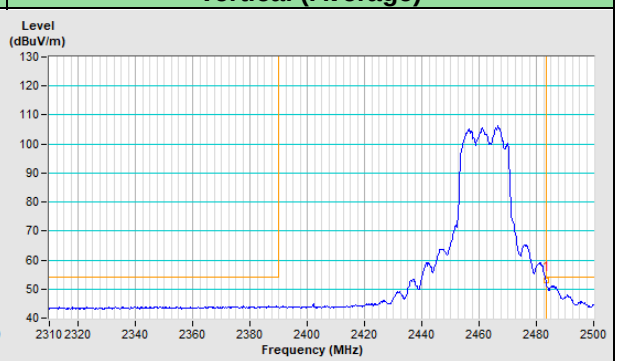
Horizontal (Average)



Vertical (Peak)

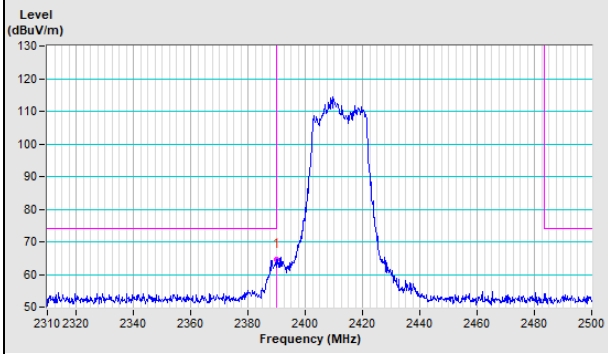


Vertical (Average)

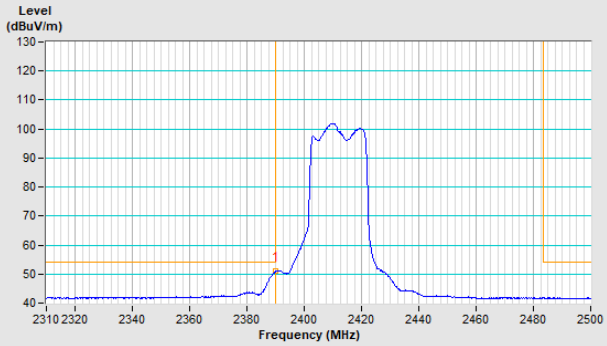


802.11ax (HE20) Channel 1

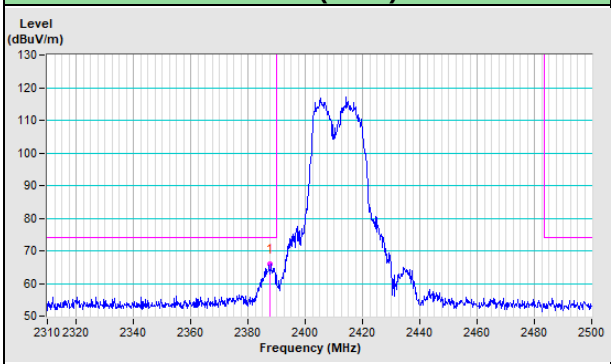
Horizontal (Peak)



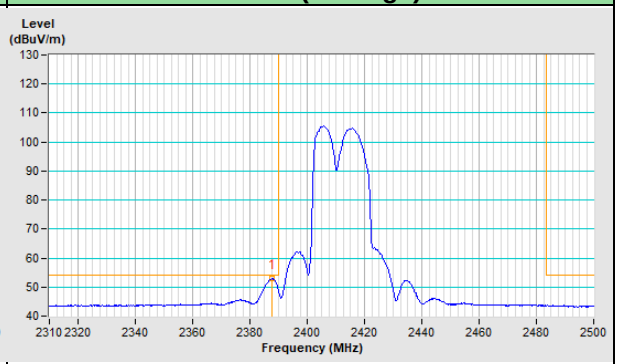
Horizontal (Average)



Vertical (Peak)

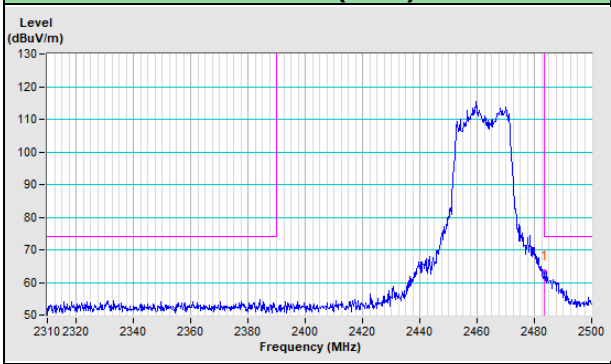


Vertical (Average)

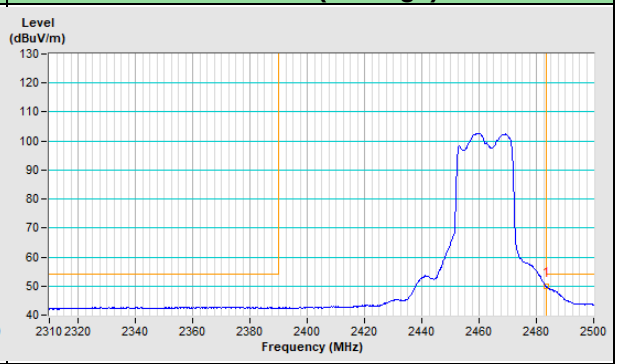


802.11ax (HE20) Channel 11

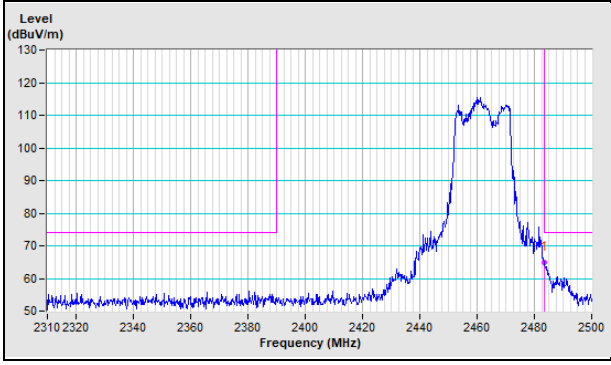
Horizontal (Peak)



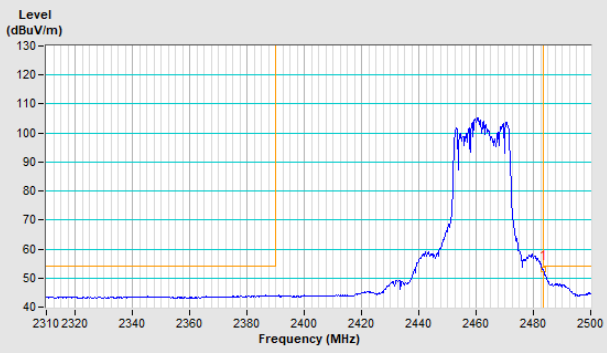
Horizontal (Average)



Vertical (Peak)

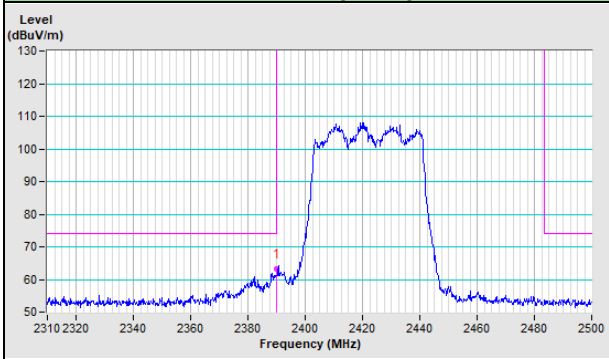


Vertical (Average)

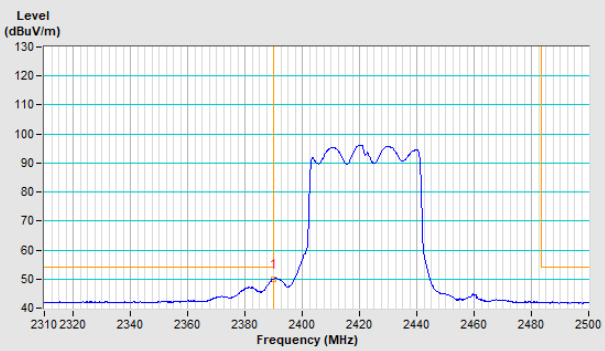


802.11ax (HE40) Channel 3

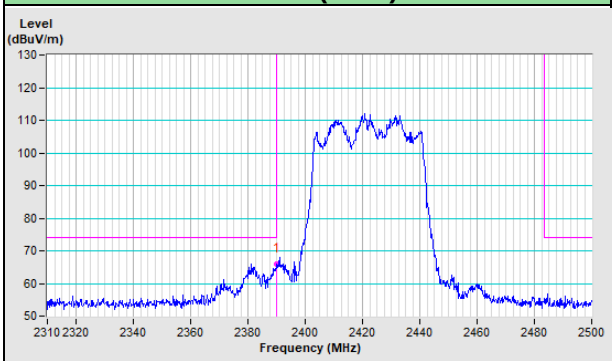
Horizontal (Peak)



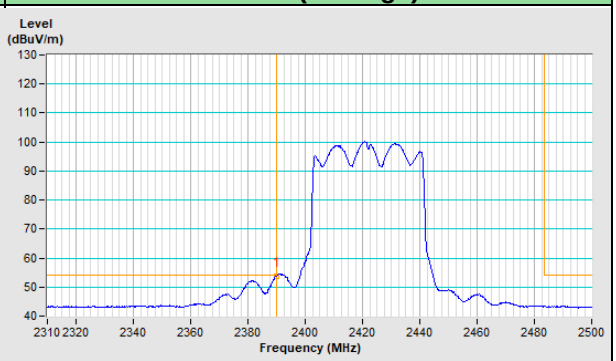
Horizontal (Average)



Vertical (Peak)

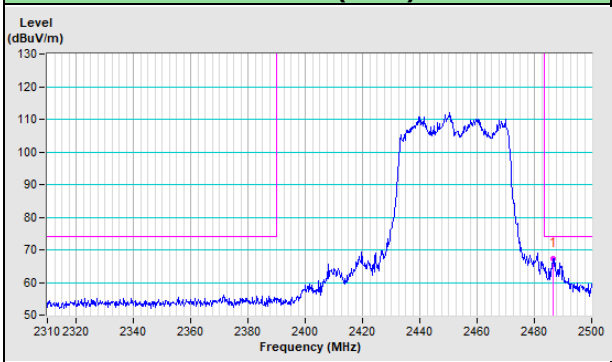


Vertical (Average)

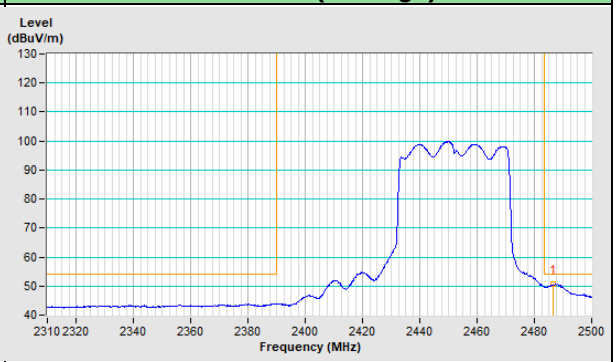


802.11ax (HE40) Channel 9

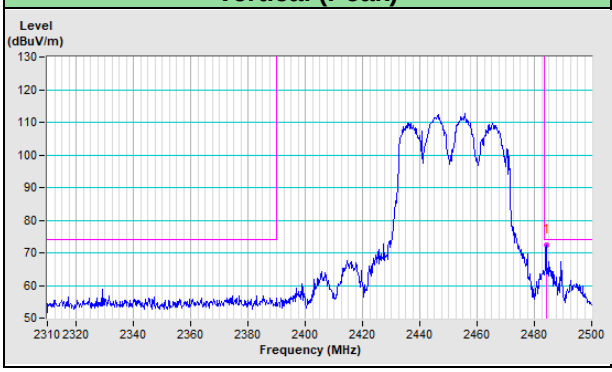
Horizontal (Peak)



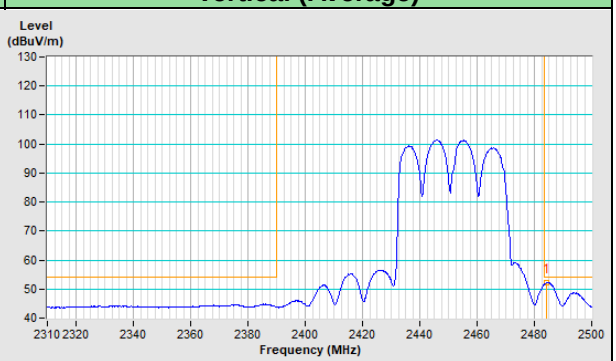
Horizontal (Average)



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.

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

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

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

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

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

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

--- END ---