FCC Test Report

Report No.:	RF200420E01
FCC ID:	I88EX3510-B0
Test Model:	EX3510-B0
Received Date:	Apr. 20, 2020
Test Date:	Apr. 27 to May 27, 2020
Issued Date:	June 11, 2020
Applicant:	Zyxel Communications Corporation
Address:	No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan
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

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Release Control Record

Issue No.	Description	Date Issued
RF200420E01	Original release.	June 11, 2020

1 Certificate of Conformity

Product:	AX5700 WiFi6 Gigabit Ethernet Gateway
Brand:	ZYXEL
Test Model:	EX3510-B0
Sample Status:	ENGINEERING SAMPLE
Applicant:	Zyxel Communications Corporation
Test Date:	Apr. 27 to May 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:** June 11, 2020

Vivian Hunag / Specialist

Approved by : , **Date:** June 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 -13.70dB at 0.36344MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.5dB at 2388.49MHz, 2388.25MHz, 2383.50MHz, 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	No antenna connector is used.
-	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	5.1 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	AX5700 WiFi6 Gigabit Ethernet Gateway
Brand	ZYXEL
Test Model	EX3510-B0
CPU Model No.	BCM4906
RF Chip Model No.	BCM6710
FW	V5.17(ABUP.0)b4
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter
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 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 3466.7 Mbps 802.11ax: up to 4803.9 Mbps
Operating Frequency	**2.4GHz:** 2.412GHz ~ 2.462GHz **5GHz:** 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
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:** 686.935 mW **5.18 ~ 5.24 GHz:** 777.956 mW **5.745 ~ 5.825 GHz:** 887.947 mW **Beamforming Mode:** **2.412 ~ 2.462 GHz:** 641.958 mW **5.18 ~ 5.24 GHz:** 549.242 mW **5.745 ~ 5.825 GHz:** 553.281 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	-Adapter x1 (Brand: MNC, Model: MAUS-1202503000) -Ethernet Cable x1 (Unshielded, 1m)

Note:

1. The EUT has two radios as following table:

Radio 1	Radio 2
WLAN 2.4GHz	WLAN 5GHz

2. 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.		

3. The EUT must be supplied with a power adapter as following table:

Brand	Model No.	Spec.
MNC	MAUS-1202503000	AC Input: 100-240V 50/60Hz, 1.2A DC Output: 12V / 2.5A DC Cable: 1.5m, Unshielded

4. The directional antenna gain, please refer to the following table:

Frequency Range (GHz)	Directional Antenna Gain (dBi)	Antenna Type	Antenna Connector
2.4~2.4835	5.27	Dipole	None
5.15 ~ 5.25	8.09		i-pex(MHF)
5.25 ~ 5.35	7.66		
5.47 ~ 5.725	7.86		
5.725 ~ 5.85	7.98		
Note: More detailed information, please refer to antenna specification.			

5. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	3TX	3RX
802.11g	3TX	3RX
802.11n (HT20)	3TX	3RX
802.11n (HT40)	3TX	3RX
VHT20	3TX	3RX
VHT40	3TX	3RX
802.11ax (HE20)	3TX	3RX
802.11ax (HE40)	3TX	3RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	4TX	4TX
802.11n (HT20)	4TX	4TX
802.11n (HT40)	4TX	4TX
802.11ac (VHT20)	4TX	4TX
802.11ac (VHT40)	4TX	4TX
802.11ac (VHT80)	4TX	4TX
802.11ax (HE20)	4TX	4TX
802.11ax (HE40)	4TX	4TX
802.11ax (HE80)	4TX	4TX

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)

6. The power setting are list as below:

CDD Mode											
802.11b		802.11g		VHT20		VHT40		802.11ax (HE20)		802.11ax (HE40)	
Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting
2412	93	2412	74	2412	74	2422	66	2412	74	2422	66
2437	93	2437	92	2437	92	2437	74	2437	92	2437	74
2462	93	2462	76	2462	75	2452	71	2462	75	2452	71

Beamforming Mode							
VHT20		VHT40		802.11ax (HE20)		802.11ax (HE40)	
Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting
2412	74	2422	66	2412	74	2422	66
2437	92	2437	74	2437	92	2437	74
2462	75	2452	71	2462	75	2452	71

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.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), VHT20 and 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 and 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	1Mb/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	1Mb/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	1Mb/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:

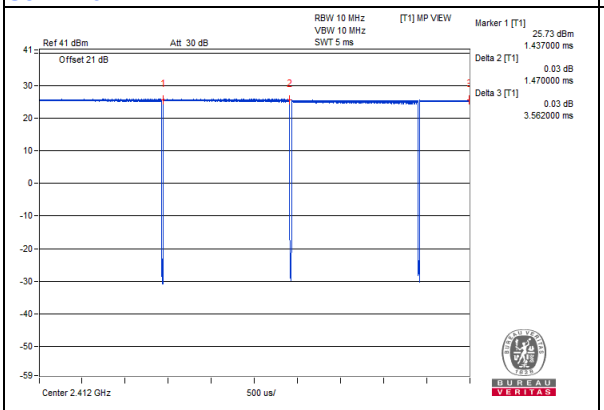
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 75%RH	120Vac, 60Hz	Ryan Du
RE<1G	19deg. C, 69%RH	120Vac, 60Hz	Sampson Chen
PLC	25deg. C, 75%RH	120Vac, 60Hz	Eagle Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

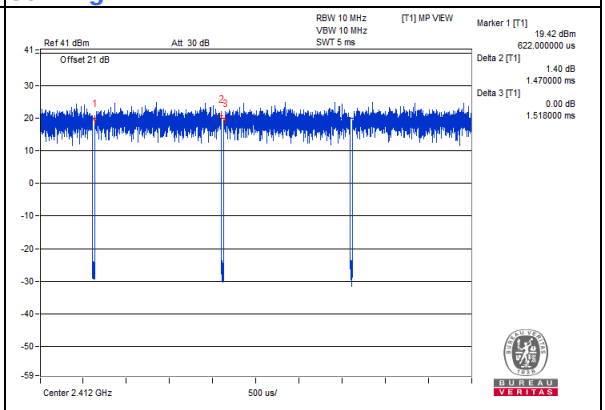
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 1.47 ms /3.562 ms=0.413, Duty factor = 10 * log (1/Duty cycle) = 3.84 dB
802.11g: Duty cycle = 1.47 ms /1.518 ms=0.968, Duty factor = 10 * log (1/Duty cycle) = 0.14 dB
802.11ax (HE20): Duty cycle = 1.147 ms /1.178 ms=0.974, Duty factor = 10 * log (1/Duty cycle) = 0.12 dB
802.11ax (HE40): Duty cycle = 1.187 ms /1.22 ms=0.973, Duty factor = 10 * log (1/Duty cycle) = 0.12 dB

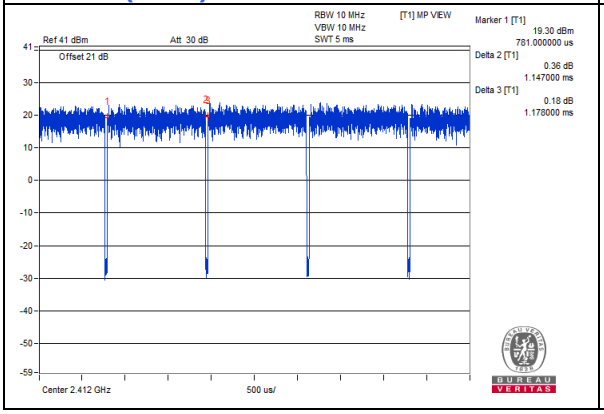
802.11b



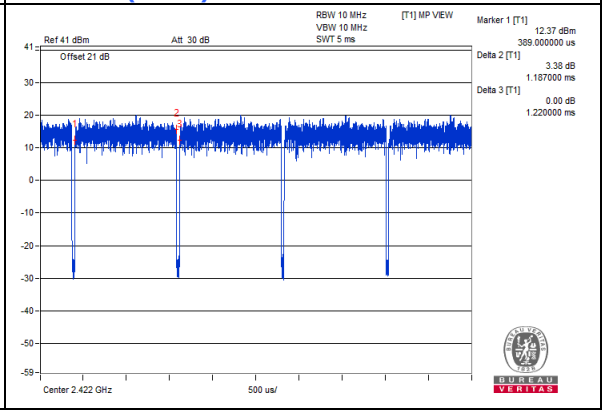
802.11g



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.

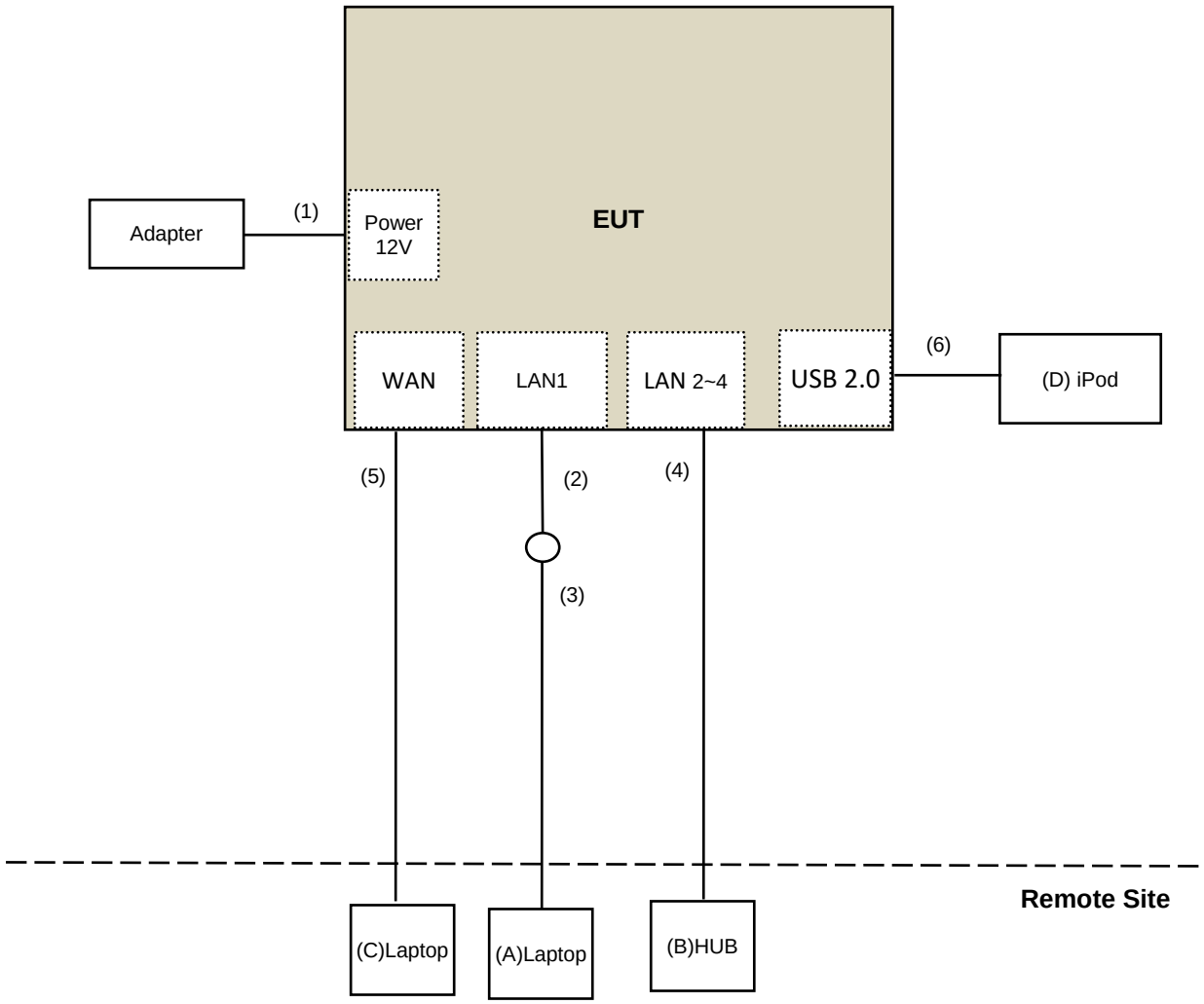
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B.	HUB	ZyXEL	GS1100-16	S150H44000046	FCC DoC	Provided by Lab
C.	Laptop	DELL	PP27L	8SNZ12S	FCC DoC Approved	Provided by Lab
D.	iPod	Apple	MD778TA/A	CC4JMH7LF4T1	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.5	No	0	Supplied by client
2.	RJ-45 Cable	1	1	No	0	Supplied by client
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	RJ-45 Cable	3	10	No	0	Provided by Lab
5.	RJ-45 Cable	1	10	No	0	Provided by Lab
6.	USB Cable	1	0.1	Yes	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

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

Test Standard:

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

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

References Test Guidance:

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

For Radiated emission test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESR7	102026	Apr. 22, 2020	Apr. 21, 2021
Spectrum Analyzer Keysight	N9030B	MY57141948	May 25, 2019	May 24, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
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 EMCI	EMC330N	980538	Apr. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB9168	9168-0842	Nov. 08, 2019	Nov. 07, 2020
RF Cable	8D	966-5-1	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-2	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-3	Apr. 29, 2020	Apr. 28, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	Jan. 14, 2020	Jan. 13, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980509	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-1500	180503	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-2000	180501	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-6000	180506	Apr. 29, 2020	Apr. 28, 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
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. 5.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: May 13 to 22, 2020

For Bandedge test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESR7	102026	Apr. 22, 2020	Apr. 21, 2021
Spectrum Analyzer Keysight	N9030B	MY57141948	May 25, 2019	May 24, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980509	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-1500	180503	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-2000	180501	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-6000	180506	May 03, 2019	May 02, 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
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. 5.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Apr. 27, 2020

For other test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
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: May 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:

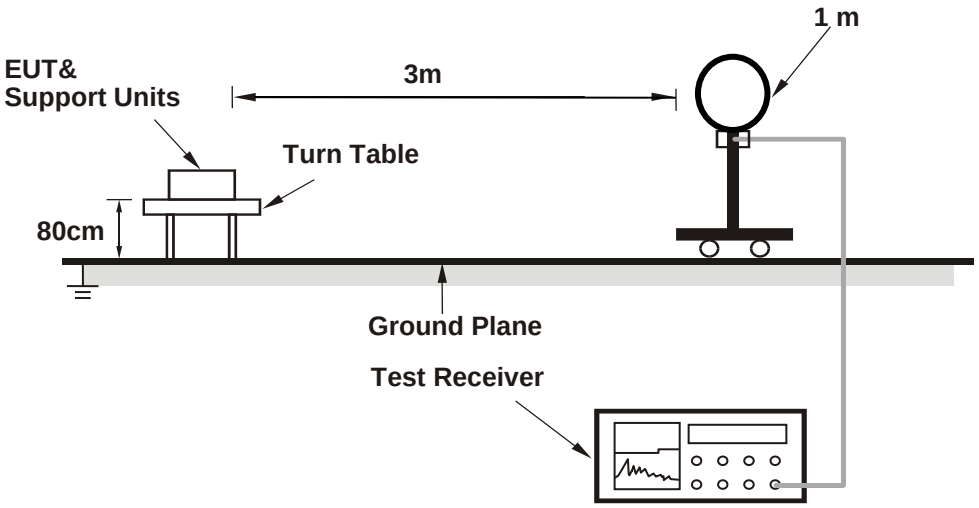
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

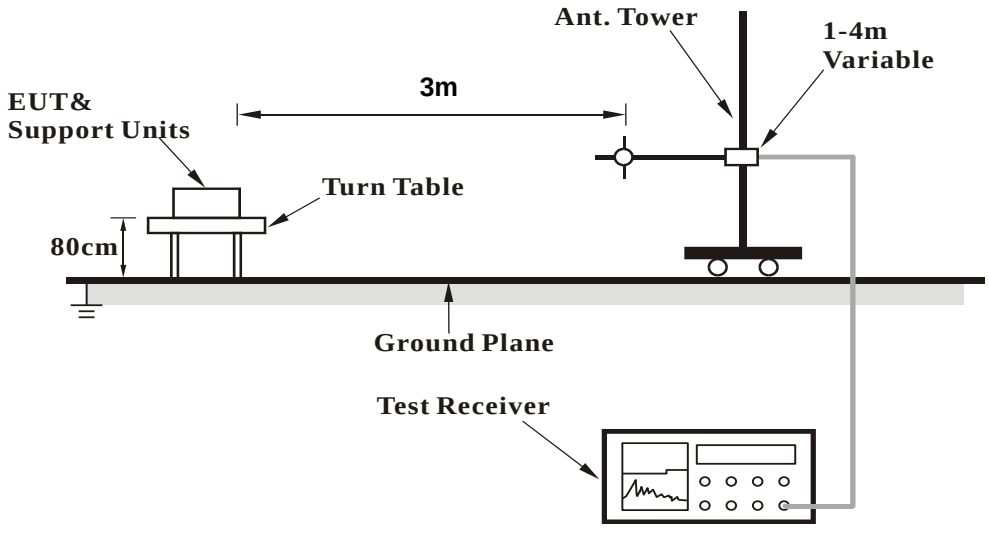
No deviation.

4.1.5 Test Setup

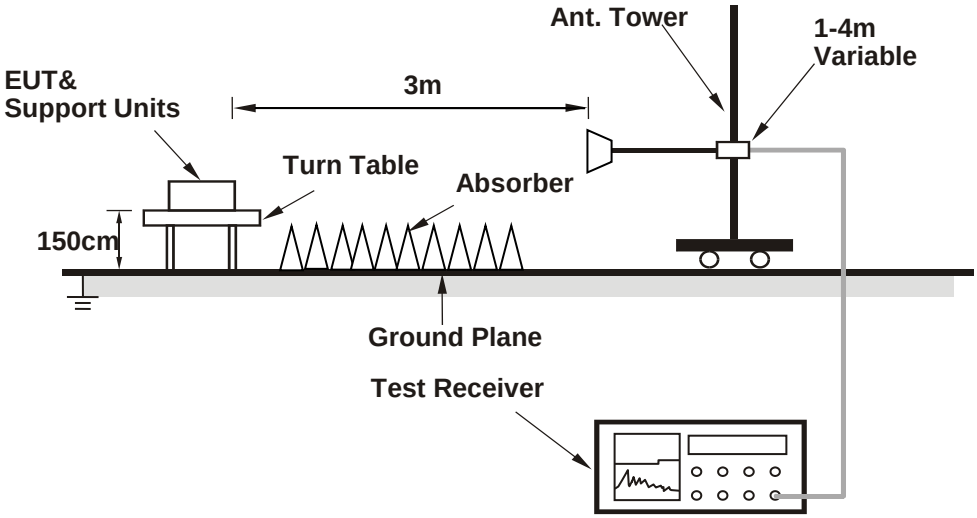
For Radiated emission below 30MHz



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 (accessMTool_REL_3_1_0_3) has been activated to set the EUT under transmission condition continuously at specific channel frenquency.

4.1.7 Test Results

Above 1GHz Data：

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.3 PK	74.0	-13.7	1.38 H	279	63.4	-3.1
2	2390.00	48.8 AV	54.0	-5.2	1.38 H	279	51.9	-3.1
3	*2412.00	116.4 PK			1.38 H	279	119.4	-3.0
4	*2412.00	114.0 AV			1.38 H	279	117.0	-3.0
5	4824.00	49.5 PK	74.0	-24.5	2.29 H	16	48.5	1.0
6	4824.00	48.8 AV	54.0	-5.2	2.29 H	16	47.8	1.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.3 PK	74.0	-15.7	2.21 V	116	61.4	-3.1
2	2390.00	47.0 AV	54.0	-7.0	2.21 V	116	50.1	-3.1
3	*2412.00	118.9 PK			2.21 V	116	121.9	-3.0
4	*2412.00	115.8 AV			2.21 V	116	118.8	-3.0
5	4824.00	44.0 PK	74.0	-30.0	2.12 V	73	43.0	1.0
6	4824.00	40.0 AV	54.0	-14.0	2.12 V	73	39.0	1.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.5 PK	74.0	-15.5	1.42 H	237	61.6	-3.1
2	2390.00	46.3 AV	54.0	-7.7	1.42 H	237	49.4	-3.1
3	*2437.00	116.6 PK			1.42 H	237	119.6	-3.0
4	*2437.00	113.7 AV			1.42 H	237	116.7	-3.0
5	2483.50	58.7 PK	74.0	-15.3	1.24 H	237	61.8	-3.1
6	2483.50	46.3 AV	54.0	-7.7	1.24 H	237	49.4	-3.1
7	4874.00	49.7 PK	74.0	-24.3	2.26 H	26	48.8	0.9
8	4874.00	48.5 AV	54.0	-5.5	2.26 H	26	47.6	0.9
9	7311.00	46.7 PK	74.0	-27.3	2.15 H	133	39.7	7.0
10	7311.00	40.9 AV	54.0	-13.1	2.15 H	133	33.9	7.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.8 PK	74.0	-15.2	1.95 V	298	61.9	-3.1
2	2390.00	47.1 AV	54.0	-6.9	1.95 V	298	50.2	-3.1
3	*2437.00	119.5 PK			1.95 V	298	122.5	-3.0
4	*2437.00	116.4 AV			1.95 V	298	119.4	-3.0
5	2483.50	62.2 PK	74.0	-11.8	1.95 V	298	65.3	-3.1
6	2483.50	50.1 AV	54.0	-3.9	1.95 V	298	53.2	-3.1
7	4874.00	43.7 PK	74.0	-30.3	2.15 V	59	42.8	0.9
8	4874.00	40.5 AV	54.0	-13.5	2.15 V	59	39.6	0.9
9	7311.00	42.7 PK	74.0	-31.3	3.77 V	221	35.7	7.0
10	7311.00	35.1 AV	54.0	-18.9	3.77 V	221	28.1	7.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.4 PK			1.62 H	277	118.5	-3.1
2	*2462.00	113.0 AV			1.62 H	277	116.1	-3.1
3	2483.50	59.8 PK	74.0	-14.2	1.62 H	277	62.9	-3.1
4	2483.50	49.0 AV	54.0	-5.0	1.62 H	277	52.1	-3.1
5	4924.00	50.2 PK	74.0	-23.8	2.29 H	37	49.2	1.0
6	4924.00	48.1 AV	54.0	-5.9	2.29 H	37	47.1	1.0
7	7386.00	47.1 PK	74.0	-26.9	2.13 H	141	40.0	7.1
8	7386.00	40.6 AV	54.0	-13.4	2.13 H	141	33.5	7.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.9 PK			2.09 V	140	121.0	-3.1
2	*2462.00	115.6 AV			2.09 V	140	118.7	-3.1
3	2483.50	62.6 PK	74.0	-11.4	2.09 V	140	65.7	-3.1
4	2483.50	51.3 AV	54.0	-2.7	2.09 V	140	54.4	-3.1
5	4924.00	43.1 PK	74.0	-30.9	2.16 V	70	42.1	1.0
6	4924.00	40.0 AV	54.0	-14.0	2.16 V	70	39.0	1.0
7	7386.00	42.5 PK	74.0	-31.5	3.74 V	206	35.4	7.1
8	7386.00	35.6 AV	54.0	-18.4	3.74 V	206	28.5	7.1

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	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	2389.62	72.5 PK	74.0	-1.5	1.53 H	232	75.6	-3.1
2	2389.62	51.1 AV	54.0	-2.9	1.53 H	232	54.2	-3.1
3	*2412.00	118.5 PK			1.53 H	232	121.5	-3.0
4	*2412.00	107.6 AV			1.53 H	232	110.6	-3.0
5	4824.00	46.2 PK	74.0	-27.8	2.34 H	20	45.2	1.0
6	4824.00	43.2 AV	54.0	-10.8	2.34 H	20	42.2	1.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2389.05	72.7 PK	74.0	-1.3	1.85 V	296	75.8	-3.1
2	2389.05	49.4 AV	54.0	-4.6	1.85 V	296	52.5	-3.1
3	*2412.00	118.5 PK			1.85 V	296	121.5	-3.0
4	*2412.00	107.0 AV			1.85 V	296	110.0	-3.0
5	4824.00	42.3 PK	74.0	-31.7	2.17 V	66	41.3	1.0
6	4824.00	35.4 AV	54.0	-18.6	2.17 V	66	34.4	1.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.1 PK	74.0	-6.9	1.73 H	232	70.2	-3.1
2	2390.00	49.5 AV	54.0	-4.5	1.73 H	232	52.6	-3.1
3	*2437.00	117.1 PK			1.73 H	232	120.1	-3.0
4	*2437.00	106.9 AV			1.73 H	232	109.9	-3.0
5	2483.50	65.9 PK	74.0	-8.1	1.73 H	232	69.0	-3.1
6	2483.50	49.8 AV	54.0	-4.2	1.73 H	232	52.9	-3.1
7	4874.00	45.9 PK	74.0	-28.1	2.32 H	9	45.0	0.9
8	4874.00	42.9 AV	54.0	-11.1	2.32 H	9	42.0	0.9
9	7311.00	43.4 PK	74.0	-30.6	2.09 H	156	36.4	7.0
10	7311.00	36.4 AV	54.0	-17.6	2.09 H	156	29.4	7.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.9 PK	74.0	-10.1	1.54 V	296	67.0	-3.1
2	2390.00	48.2 AV	54.0	-5.8	1.54 V	296	51.3	-3.1
3	*2437.00	118.9 PK			1.54 V	296	121.9	-3.0
4	*2437.00	108.9 AV			1.54 V	296	111.9	-3.0
5	2483.50	67.3 PK	74.0	-6.7	1.54 V	296	70.4	-3.1
6	2483.50	51.1 AV	54.0	-2.9	1.54 V	296	54.2	-3.1
7	4874.00	42.4 PK	74.0	-31.6	2.16 V	72	41.5	0.9
8	4874.00	35.6 AV	54.0	-18.4	2.16 V	72	34.7	0.9
9	7311.00	41.9 PK	74.0	-32.1	3.74 V	206	34.9	7.0
10	7311.00	34.6 AV	54.0	-19.4	3.74 V	206	27.6	7.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.5 PK			1.58 H	234	118.6	-3.1
2	*2462.00	104.4 AV			1.58 H	234	107.5	-3.1
3	2483.50	73.3 PK	74.0	-0.7	1.58 H	234	76.4	-3.1
4	2483.50	48.3 AV	54.0	-5.7	1.58 H	234	51.4	-3.1
5	4924.00	45.7 PK	74.0	-28.3	2.38 H	18	44.7	1.0
6	4924.00	42.9 AV	54.0	-11.1	2.38 H	18	41.9	1.0
7	7386.00	43.6 PK	74.0	-30.4	2.04 H	162	36.5	7.1
8	7386.00	36.2 AV	54.0	-17.8	2.04 H	162	29.1	7.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	116.8 PK			1.72 V	292	119.9	-3.1
2	*2462.00	106.1 AV			1.72 V	292	109.2	-3.1
3	**2483.50**	**73.5 PK**	**74.0**	**-0.5**	**1.72 V**	**292**	**76.6**	**-3.1**
4	2483.50	50.3 AV	54.0	-3.7	1.72 V	292	53.4	-3.1
5	4924.00	52.7 PK	74.0	-21.3	2.16 V	74	51.7	1.0
6	4924.00	35.4 AV	54.0	-18.6	2.16 V	74	34.4	1.0
7	7386.00	41.8 PK	74.0	-32.2	3.72 V	218	34.7	7.1
8	7386.00	34.8 AV	54.0	-19.2	3.72 V	218	27.7	7.1

REMARKS:

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

802.11ax (HE20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	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	**2388.49**	**73.5 PK**	**74.0**	**-0.5**	**1.58 H**	**232**	**76.6**	**-3.1**
2	**2388.49**	**53.5 AV**	**54.0**	**-0.5**	**1.58 H**	**232**	**56.6**	**-3.1**
3	*2412.00	116.6 PK			1.58 H	232	119.6	-3.0
4	*2412.00	103.2 AV			1.58 H	232	106.2	-3.0
5	4824.00	45.5 PK	74.0	-28.5	2.29 H	13	44.5	1.0
6	4824.00	43.1 AV	54.0	-10.9	2.29 H	13	42.1	1.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2388.25	72.9 PK	74.0	-1.1	1.78 V	300	76.0	-3.1
2	**2388.25**	**53.5 AV**	**54.0**	**-0.5**	**1.78 V**	**300**	**56.6**	**-3.1**
3	*2412.00	119.0 PK			1.78 V	300	122.0	-3.0
4	*2412.00	105.5 AV			1.78 V	300	108.5	-3.0
5	4824.00	42.8 PK	74.0	-31.2	2.13 V	53	41.8	1.0
6	4824.00	35.1 AV	54.0	-18.9	2.13 V	53	34.1	1.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.1 PK	74.0	-6.9	1.48 H	232	70.2	-3.1
2	2390.00	50.1 AV	54.0	-3.9	1.48 H	232	53.2	-3.1
3	*2437.00	118.9 PK			1.48 H	232	121.9	-3.0
4	*2437.00	105.8 AV			1.48 H	232	108.8	-3.0
5	2483.50	68.7 PK	74.0	-5.3	1.48 H	232	71.8	-3.1
6	2483.50	51.1 AV	54.0	-2.9	1.48 H	232	54.2	-3.1
7	4874.00	45.6 PK	74.0	-28.4	2.34 H	12	44.7	0.9
8	4874.00	43.3 AV	54.0	-10.7	2.34 H	12	42.4	0.9
9	7311.00	44.0 PK	74.0	-30.0	2.07 H	156	37.0	7.0
10	7311.00	36.3 AV	54.0	-17.7	2.07 H	156	29.3	7.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.7 PK	74.0	-6.3	1.96 V	297	70.8	-3.1
2	2390.00	51.7 AV	54.0	-2.3	1.96 V	297	54.8	-3.1
3	*2437.00	122.5 PK			1.96 V	297	125.5	-3.0
4	*2437.00	109.9 AV			1.96 V	297	112.9	-3.0
5	2483.50	70.4 PK	74.0	-3.6	1.96 V	297	73.5	-3.1
6	**2483.50**	**53.5 AV**	**54.0**	**-0.5**	**1.96 V**	**297**	**56.6**	**-3.1**
7	4874.00	42.4 PK	74.0	-31.6	2.13 V	84	41.5	0.9
8	4874.00	35.1 AV	54.0	-18.9	2.13 V	84	34.2	0.9
9	7311.00	42.1 PK	74.0	-31.9	3.76 V	209	35.1	7.0
10	7311.00	34.7 AV	54.0	-19.3	3.76 V	209	27.7	7.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	114.5 PK			1.61 H	233	117.6	-3.1
2	*2462.00	102.4 AV			1.61 H	233	105.5	-3.1
3	2483.50	70.6 PK	74.0	-3.4	1.61 H	233	73.7	-3.1
4	2483.50	48.3 AV	54.0	-5.7	1.61 H	233	51.4	-3.1
5	4924.00	45.5 PK	74.0	-28.5	2.31 H	21	44.5	1.0
6	4924.00	42.9 AV	54.0	-11.1	2.31 H	21	41.9	1.0
7	7386.00	43.9 PK	74.0	-30.1	2.09 H	131	36.8	7.1
8	7386.00	36.8 AV	54.0	-17.2	2.09 H	131	29.7	7.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.3 PK			1.50 V	276	120.4	-3.1
2	*2462.00	104.2 AV			1.50 V	276	107.3	-3.1
3	2483.50	72.7 PK	74.0	-1.3	1.50 V	276	75.8	-3.1
4	2483.50	49.4 AV	54.0	-4.6	1.50 V	276	52.5	-3.1
5	4924.00	42.2 PK	74.0	-31.8	2.07 V	81	41.2	1.0
6	4924.00	35.5 AV	54.0	-18.5	2.07 V	81	34.5	1.0
7	7386.00	41.8 PK	74.0	-32.2	3.76 V	221	34.7	7.1
8	7386.00	34.3 AV	54.0	-19.7	3.76 V	221	27.2	7.1

REMARKS:

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

802.11ax (HE40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	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	2388.61	71.3 PK	74.0	-2.7	1.58 H	234	74.4	-3.1
2	2388.61	53.1 AV	54.0	-0.9	1.58 H	234	56.2	-3.1
3	*2422.00	112.2 PK			1.58 H	234	115.2	-3.0
4	*2422.00	98.6 AV			1.58 H	234	101.6	-3.0
5	4844.00	45.6 PK	74.0	-28.4	2.44 H	22	44.6	1.0
6	4844.00	43.4 AV	54.0	-10.6	2.44 H	22	42.4	1.0
7	7266.00	44.2 PK	74.0	-29.8	2.01 H	162	37.2	7.0
8	7266.00	35.6 AV	54.0	-18.4	2.01 H	162	28.6	7.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2389.29	71.8 PK	74.0	-2.2	1.50 V	278	74.9	-3.1
2	2389.29	53.3 AV	54.0	-0.7	1.50 V	278	56.4	-3.1
3	*2422.00	114.3 PK			1.50 V	278	117.3	-3.0
4	*2422.00	99.6 AV			1.50 V	278	102.6	-3.0
5	4844.00	41.8 PK	74.0	-32.2	2.03 V	85	40.8	1.0
6	4844.00	35.7 AV	54.0	-18.3	2.03 V	85	34.7	1.0
7	7266.00	42.2 PK	74.0	-31.8	3.73 V	226	35.2	7.0
8	7266.00	34.6 AV	54.0	-19.4	3.73 V	226	27.6	7.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.1 PK	74.0	-2.9	1.18 H	249	74.2	-3.1
2	**2390.00**	**53.5 AV**	**54.0**	**-0.5**	**1.18 H**	**249**	**56.6**	**-3.1**
3	*2437.00	113.1 PK			1.18 H	249	116.1	-3.0
4	*2437.00	100.3 AV			1.18 H	249	103.3	-3.0
5	2483.50	70.0 PK	74.0	-4.0	1.18 H	249	73.1	-3.1
6	2483.50	47.8 AV	54.0	-6.2	1.18 H	249	50.9	-3.1
7	4874.00	45.5 PK	74.0	-28.5	2.40 H	11	44.6	0.9
8	4874.00	43.6 AV	54.0	-10.4	2.40 H	11	42.7	0.9
9	7311.00	44.4 PK	74.0	-29.6	2.03 H	165	37.4	7.0
10	7311.00	36.0 AV	54.0	-18.0	2.03 H	165	29.0	7.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.4 PK	74.0	-5.6	1.91 V	300	71.5	-3.1
2	2390.00	52.4 AV	54.0	-1.6	1.91 V	300	55.5	-3.1
3	*2437.00	115.2 PK			1.91 V	300	118.2	-3.0
4	*2437.00	103.1 AV			1.91 V	300	106.1	-3.0
5	**2483.50**	**73.5 PK**	**74.0**	**-0.5**	**1.91 V**	**300**	**76.6**	**-3.1**
6	2483.50	50.7 AV	54.0	-3.3	1.91 V	300	53.8	-3.1
7	4874.00	41.7 PK	74.0	-32.3	1.98 V	79	40.8	0.9
8	4874.00	35.6 AV	54.0	-18.4	1.98 V	79	34.7	0.9
9	7311.00	41.7 PK	74.0	-32.3	3.78 V	235	34.7	7.0
10	7311.00	34.5 AV	54.0	-19.5	3.78 V	235	27.5	7.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	113.4 PK			1.87 H	228	116.5	-3.1
2	*2452.00	99.2 AV			1.87 H	228	102.3	-3.1
3	2485.37	70.5 PK	74.0	-3.5	1.87 H	228	73.6	-3.1
4	2485.37	47.7 AV	54.0	-6.3	1.87 H	228	50.8	-3.1
5	4904.00	45.7 PK	74.0	-28.3	2.43 H	7	44.7	1.0
6	4904.00	43.8 AV	54.0	-10.2	2.43 H	7	42.8	1.0
7	7356.00	43.9 PK	74.0	-30.1	2.06 H	171	36.8	7.1
8	7356.00	35.8 AV	54.0	-18.2	2.06 H	171	28.7	7.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	113.0 PK			2.98 V	120	116.1	-3.1
2	*2452.00	100.9 AV			2.98 V	120	104.0	-3.1
3	2486.10	72.8 PK	74.0	-1.2	2.98 V	120	75.9	-3.1
4	2486.10	48.6 AV	54.0	-5.4	2.98 V	120	51.7	-3.1
5	4904.00	41.5 PK	74.0	-32.5	2.03 V	64	40.5	1.0
6	4904.00	35.3 AV	54.0	-18.7	2.03 V	64	34.3	1.0
7	7356.00	41.6 PK	74.0	-32.4	3.73 V	251	34.5	7.1
8	7356.00	34.7 AV	54.0	-19.3	3.73 V	251	27.6	7.1

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.

Below 1GHz Data:

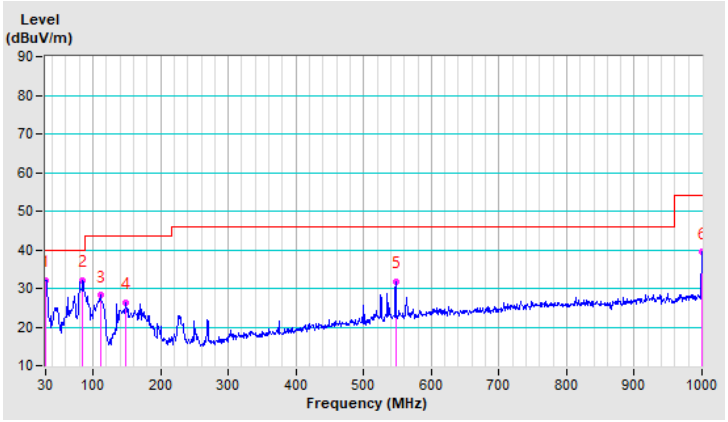
802.11b

CHANNEL	TX Channel 11	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	30.19	32.1 QP	40.0	-7.9	1.50 H	235	46.1	-14.0
2	85.24	32.1 QP	40.0	-7.9	2.00 H	292	50.4	-18.3
3	111.87	28.1 QP	43.5	-15.4	3.00 H	255	43.7	-15.6
4	148.25	26.3 QP	43.5	-17.2	3.00 H	274	39.0	-12.7
5	547.08	31.8 QP	46.0	-14.2	1.50 H	101	38.5	-6.7
6	999.78	39.4 QP	54.0	-14.6	1.50 H	70	39.4	0.0

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 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.

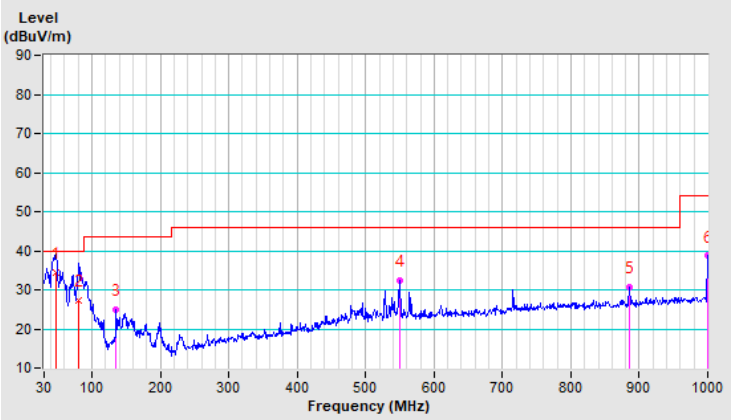


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	47.27	34.5 QP	40.0	-5.5	1.00 V	360	47.2	-12.7
2	80.88	27.4 QP	40.0	-12.6	1.00 V	159	45.2	-17.8
3	135.44	24.9 QP	43.5	-18.6	1.50 V	150	38.3	-13.4
4	550.04	32.3 QP	46.0	-13.7	2.00 V	169	39.0	-6.7
5	885.58	30.7 QP	46.0	-15.3	1.00 V	75	32.1	-1.4
6	999.78	38.7 QP	54.0	-15.3	3.00 V	118	38.7	0.0

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 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	005	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: May 11, 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.

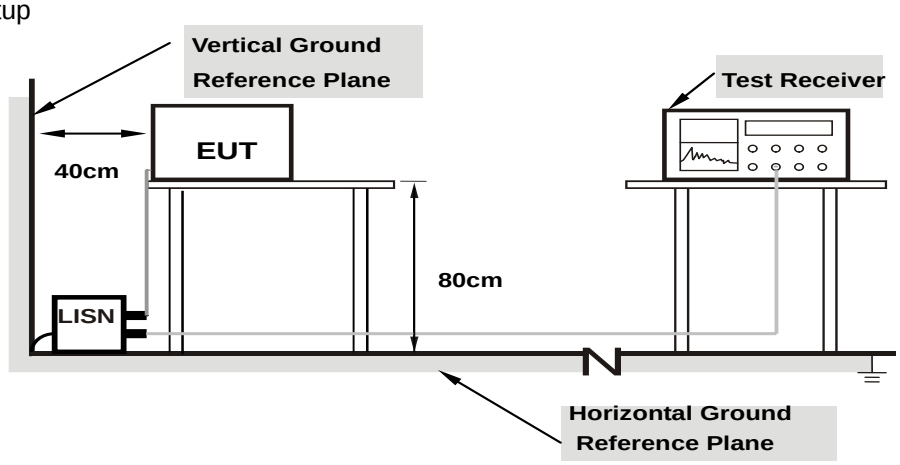
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

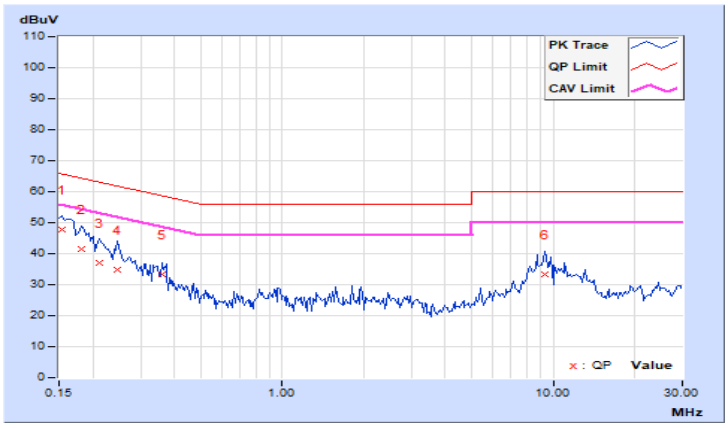
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.96	37.79	23.29	47.75	33.25	65.79	55.79	-18.04	-22.54
2	0.18125	9.97	31.66	17.47	41.63	27.44	64.43	54.43	-22.80	-26.99
3	0.21250	9.98	26.99	12.99	36.97	22.97	63.11	53.11	-26.14	-30.14
4	0.24766	9.98	25.02	13.43	35.00	23.41	61.84	51.84	-26.84	-28.43
5	0.36094	10.00	23.15	16.81	33.15	26.81	58.71	48.71	-25.56	-21.90
6	9.35156	10.33	22.91	15.51	33.24	25.84	60.00	50.00	-26.76	-24.16

Remarks:

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

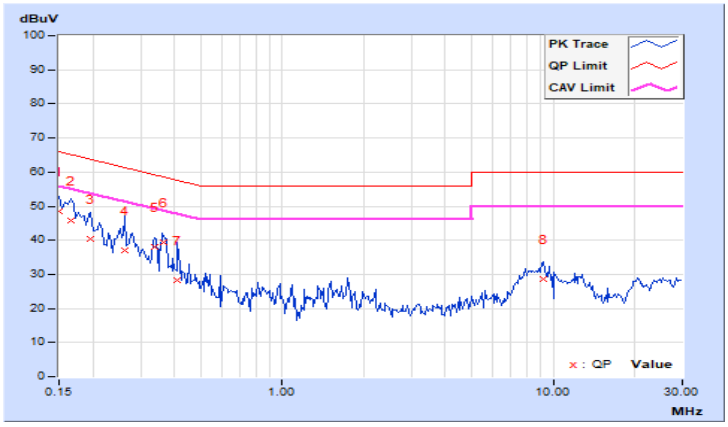


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15033	9.98	38.45	25.57	48.43	35.55	65.98	55.98	-17.55	-20.43
2	0.16562	9.99	35.80	21.88	45.79	31.87	65.18	55.18	-19.39	-23.31
3	0.19687	10.00	30.30	16.89	40.30	26.89	63.74	53.74	-23.44	-26.85
4	0.26328	10.00	27.19	11.83	37.19	21.83	61.33	51.33	-24.14	-29.50
5	0.33750	10.01	27.96	25.52	37.97	35.53	59.26	49.26	-21.29	-13.73
6	**0.36344**	**10.01**	**29.46**	**24.94**	**39.47**	**34.95**	**58.65**	**48.65**	**-19.18**	**-13.70**
7	0.41172	10.01	18.21	3.05	28.22	13.06	57.61	47.61	-29.39	-34.55
8	9.25391	10.32	18.28	11.34	28.60	21.66	60.00	50.00	-31.40	-28.34

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

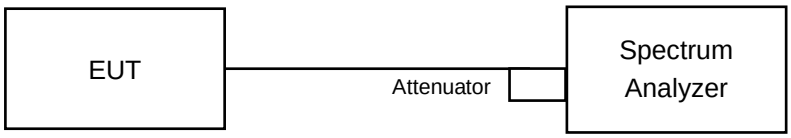


4.3 6dB Bandwidth Measurement

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

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	7.1	7.08	7.08	0.5	PASS
6	2437	7.08	7.1	7.09	0.5	PASS
11	2462	7.1	7.09	7.58	0.5	PASS

802.11g

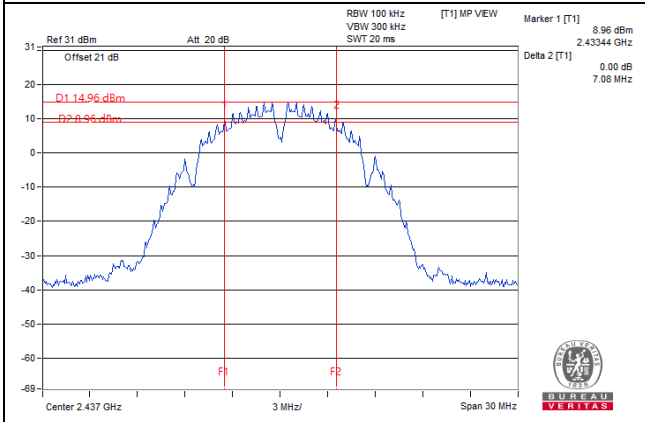
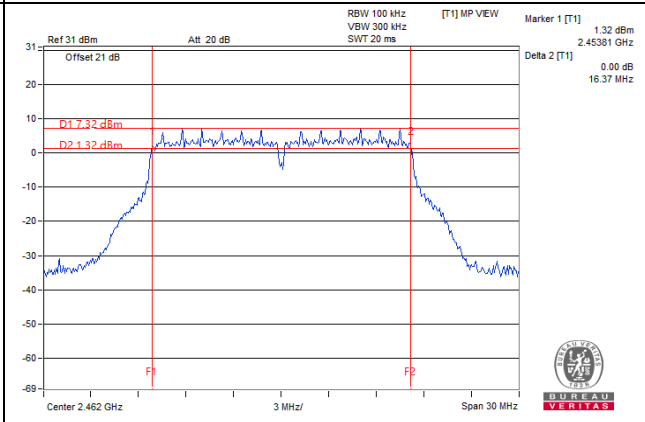
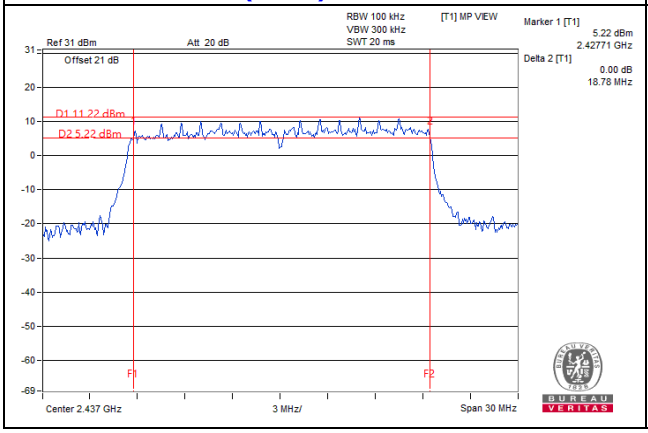
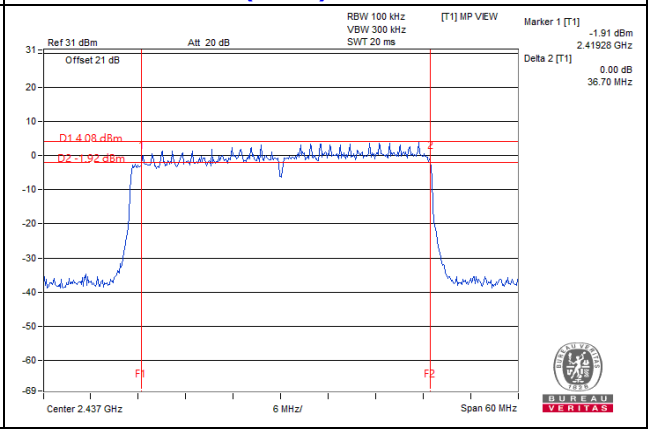
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.42	16.43	16.42	0.5	PASS
6	2437	16.41	16.41	16.38	0.5	PASS
11	2462	16.37	16.42	16.39	0.5	PASS

802.11ax (HE20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	19	19.02	18.97	0.5	PASS
6	2437	19.01	19	18.78	0.5	PASS
11	2462	19.05	19.02	18.79	0.5	PASS

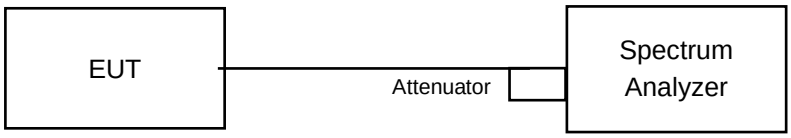
802.11ax (HE40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	37.84	37.06	37.49	0.5	PASS
6	2437	37.82	37.41	36.7	0.5	PASS
9	2452	37.88	37.46	36.69	0.5	PASS

Spectrum Plot of Worst Value	
802.11b / Chain 0 : CH6	**802.11g / Chain 0 : CH11**
	
802.11ax (HE20) / Chain 2 : CH6	**802.11ax (HE40) / Chain 2 : CH6**
	

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

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

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

Same as Item 4.3.6.

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
1	2412	10.56	10.56	10.68
6	2437	10.56	10.56	10.8
11	2462	10.56	10.68	10.8

802.11g

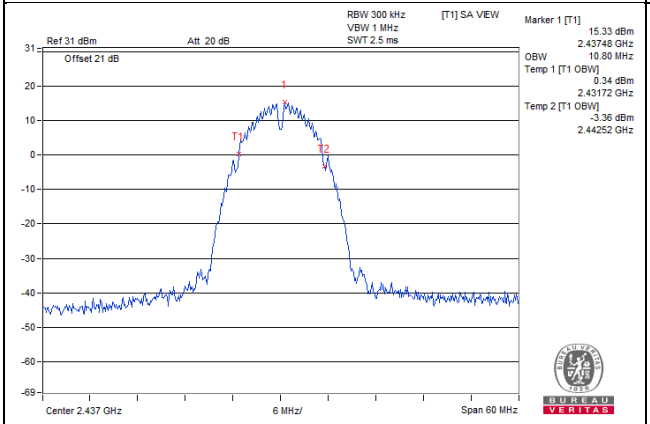
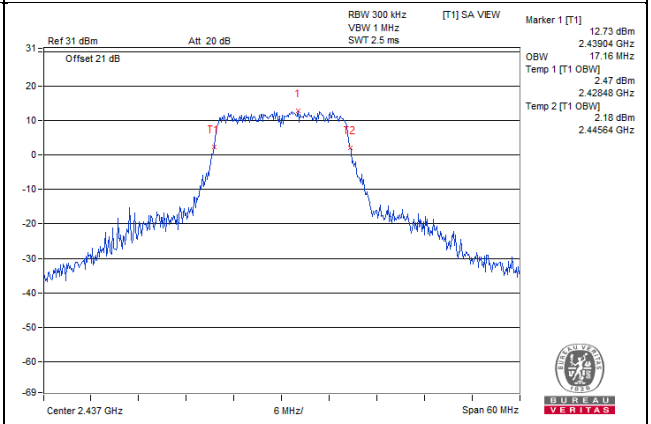
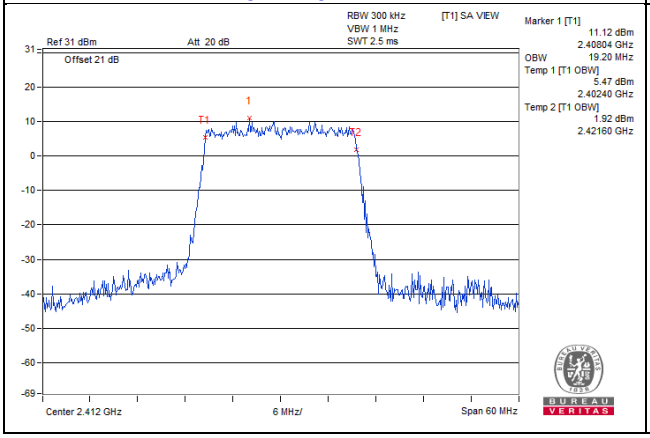
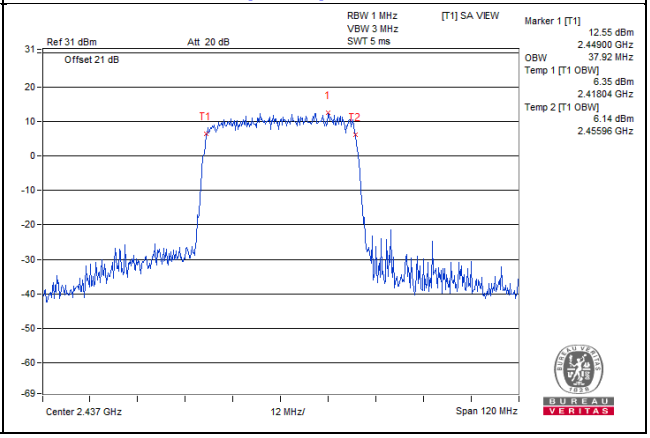
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
1	2412	16.92	16.92	16.92
6	2437	17.16	17.16	17.16
11	2462	16.92	16.92	16.8

802.11ax (HE20)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
1	2412	19.2	19.08	19.08
6	2437	19.2	19.08	19.2
11	2462	19.2	19.08	19.2

802.11ax (HE40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
3	2422	37.68	37.92	37.68
6	2437	37.92	37.92	37.68
9	2452	37.92	37.92	37.92

Spectrum Plot of Worst Value	
802.11b_Chain 2 / CH6	**802.11g _Chain 0 / CH6**
	
802.11ax (HE20) _Chain 0 / CH1	**802.11ax (HE40) _Chain 0 / CH6**
	

4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

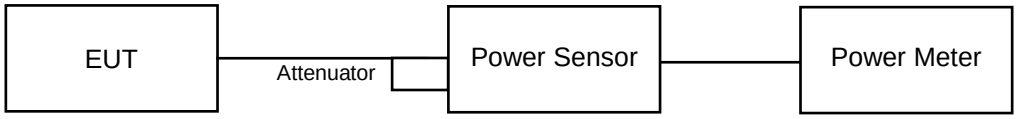
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as Item 4.3.6.

4.5.7 Test Results

CDD Mode

802.11b

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	23.46	23.74	23.27	670.736	28.27	30	Pass
6	2437	23.48	23.71	23.31	672.096	28.27	30	Pass
11	2462	23.54	23.86	23.38	686.935	28.37	30	Pass

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	18.79	18.70	18.41	219.157	23.41	30	Pass
6	2437	22.93	23.29	22.88	603.729	27.81	30	Pass
11	2462	19.39	19.34	19.08	253.707	24.04	30	Pass

VHT20

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	18.62	18.91	18.71	224.884	23.52	30	Pass
6	2437	23.01	23.38	23.06	620.059	27.92	30	Pass
11	2462	19.18	19.22	18.96	245.059	23.89	30	Pass

VHT40

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	16.96	16.95	16.73	146.302	21.65	30	Pass
6	2437	19.19	19.28	19.01	247.324	23.93	30	Pass
9	2452	18.27	18.69	18.26	208.092	23.18	30	Pass

802.11ax (HE20)

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	18.71	19.02	18.82	230.309	23.62	30	Pass
6	2437	23.12	23.55	23.23	641.958	28.08	30	Pass
11	2462	19.32	19.41	19.11	254.274	24.05	30	Pass

802.11ax (HE40)

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	17.08	17.10	16.84	150.643	21.78	30	Pass
6	2437	19.36	19.41	19.14	255.63	24.08	30	Pass
9	2452	18.51	18.84	18.32	215.438	23.33	30	Pass

Beamforming Mode

VHT20

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	18.62	18.91	18.71	224.884	23.52	30	Pass
6	2437	23.01	23.38	23.06	620.059	27.92	30	Pass
11	2462	19.18	19.22	18.96	245.059	23.89	30	Pass

Note: 1. Directional gain=5.27dBi < 6dBi, so the power limit shall not be reduced.

VHT40

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	16.96	16.95	16.73	146.302	21.65	30	Pass
6	2437	19.19	19.28	19.01	247.324	23.93	30	Pass
9	2452	18.27	18.69	18.26	208.092	23.18	30	Pass

Note: 1. Directional gain=5.27dBi < 6dBi, so the power limit shall not be reduced.

802.11ax (HE20)

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	18.71	19.02	18.82	230.309	23.62	30	Pass
6	2437	23.12	23.55	23.23	641.958	28.08	30	Pass
11	2462	19.32	19.41	19.11	254.274	24.05	30	Pass

Note: 1. Directional gain=5.27dBi < 6dBi, so the power limit shall not be reduced.

802.11ax (HE40)

Chan.	Frequency (MHz)	Avg. Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	17.08	17.10	16.84	150.643	21.78	30	Pass
6	2437	19.36	19.41	19.14	255.63	24.08	30	Pass
9	2452	18.51	18.84	18.32	215.438	23.33	30	Pass

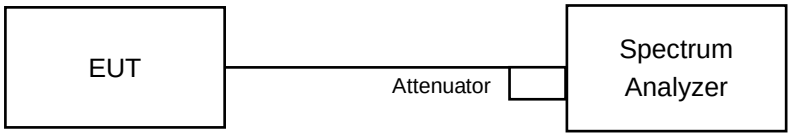
Note: 1. Directional gain=5.27dBi < 6dBi, so the power limit shall not be reduced.

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

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

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

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6

4.6.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2					
1	2412	-6.34	-6.74	-6.69	3.84	1.5922	2.02	8.00	PASS
6	2437	-6.75	-6.90	-7.12	3.84	1.4757	1.69	8.00	PASS
11	2462	-6.71	-6.87	-6.10	3.84	1.6069	2.06	8.00	PASS

Note: 1. Directional gain = 5.27dBi < 6dBi, so the power density limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2					
1	2412	-13.05	-13.48	-14.37	0.14	0.13521	-8.69	8.00	PASS
6	2437	-8.55	-8.00	-9.69	0.14	0.4188	-3.78	8.00	PASS
11	2462	-13.72	-12.66	-13.20	0.14	0.14928	-8.26	8.00	PASS

Note: 1. Directional gain = 5.27dBi < 6dBi, so the power density limit shall not be reduced.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2					
1	2412	-12.98	-13.92	-14.16	0.12	0.13305	-8.76	8.00	PASS
6	2437	-10.12	-9.68	-9.98	0.12	0.31405	-5.03	8.00	PASS
11	2462	-14.40	-13.79	-13.45	0.12	0.12677	-8.97	8.00	PASS

Note: 1. Directional gain = 5.27dBi < 6dBi, so the power density limit shall not be reduced.

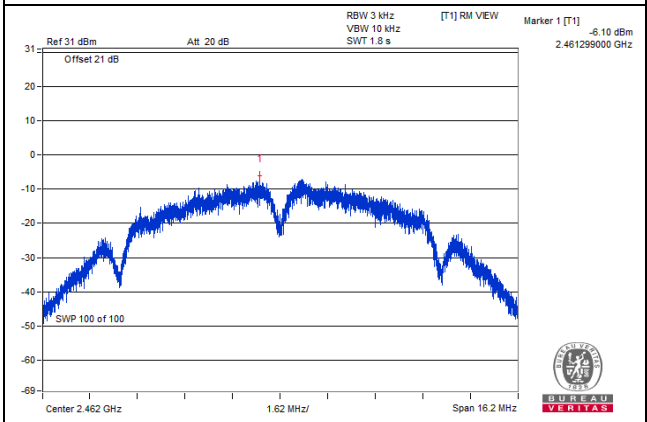
802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)			Duty Factor (dB)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2					
3	2422	-18.59	-18.24	-19.31	0.12	0.04169	-13.80	8.00	PASS
6	2437	-16.81	-16.56	-17.13	0.12	0.06397	-11.94	8.00	PASS
9	2452	-17.70	-17.71	-16.59	0.12	0.05741	-12.41	8.00	PASS

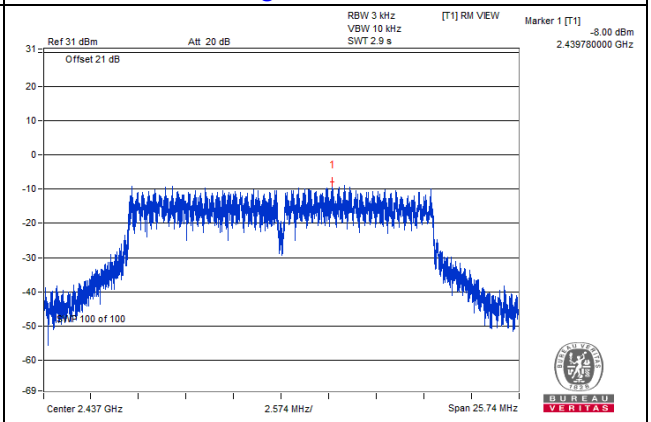
Note: 1. Directional gain = 5.27dBi < 6dBi, so the power density limit shall not be reduced.

Spectrum Plot of Worst Value

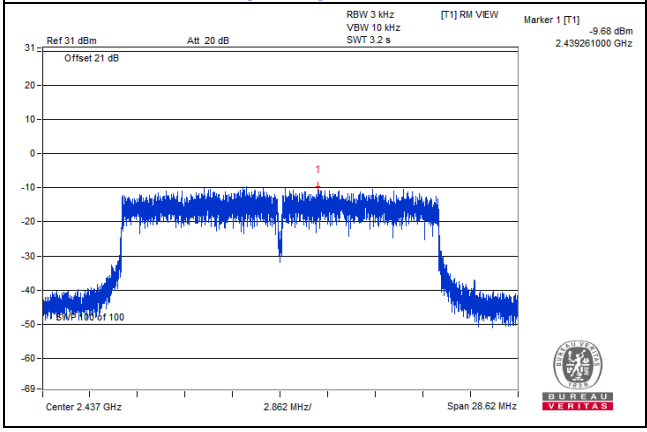
802.11b / Chain 2 : CH11



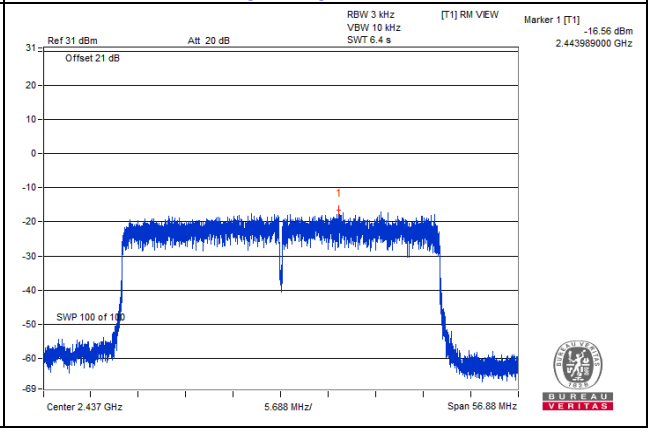
802.11g / Chain 1 : CH6



802.11ax (HE20) / Chain 1 : CH6



802.11ax (HE40) / Chain 1 : CH6

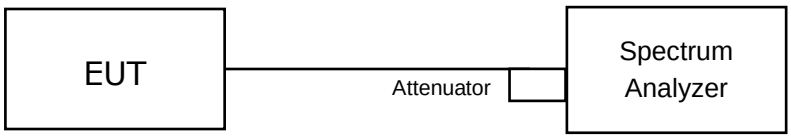


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

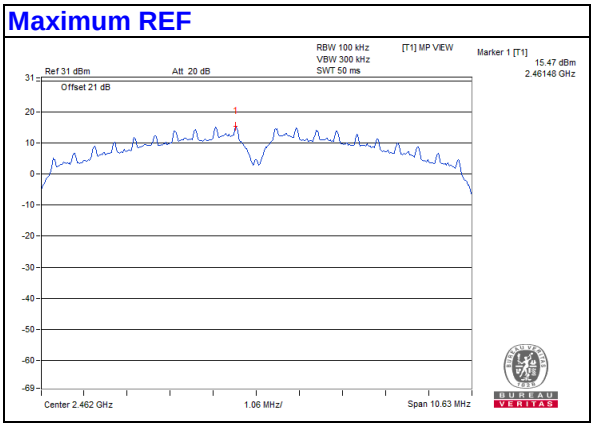
Same as Item 4.3.6

4.7.7 Test Results

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

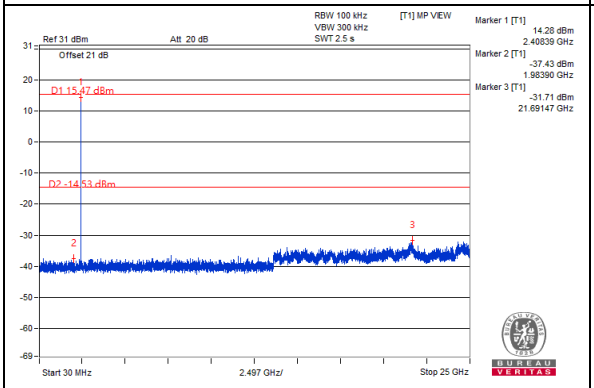
802.11b

Maximum REF

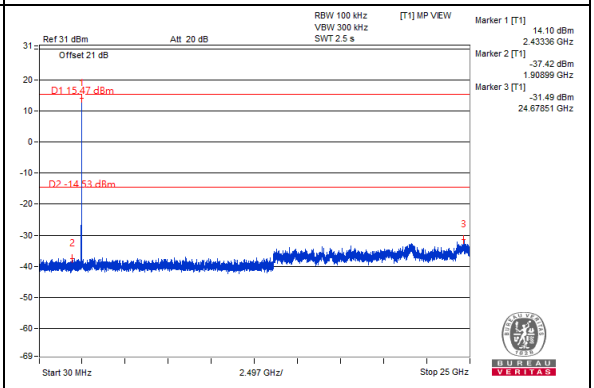


Chain 0

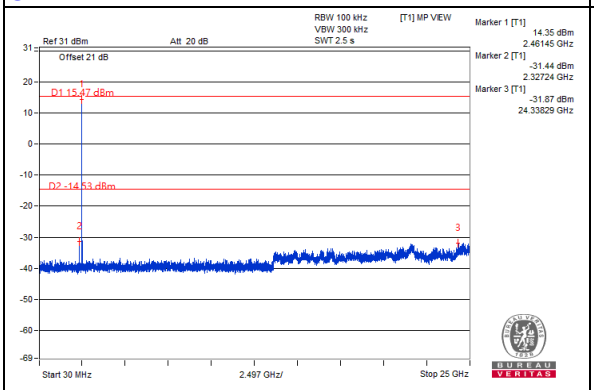
CH 1



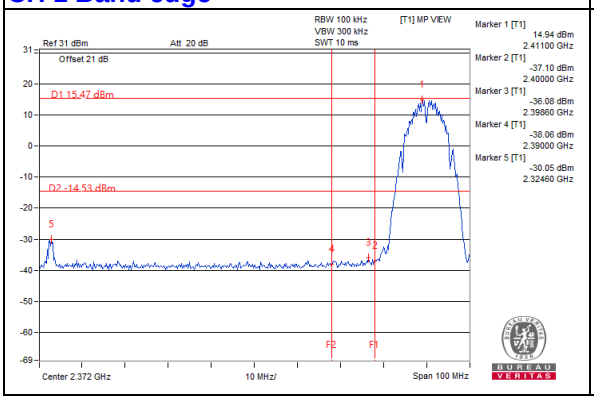
CH 6



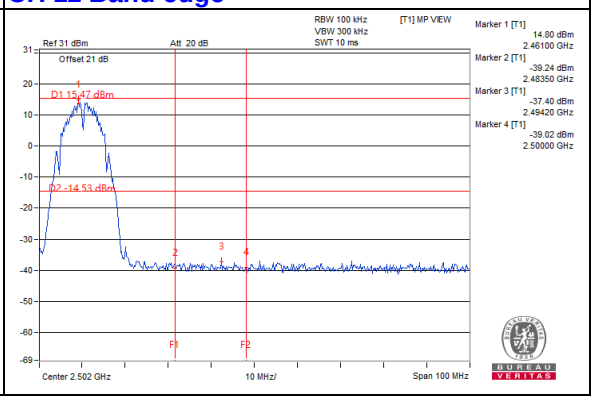
CH 11



CH 1 Band edge

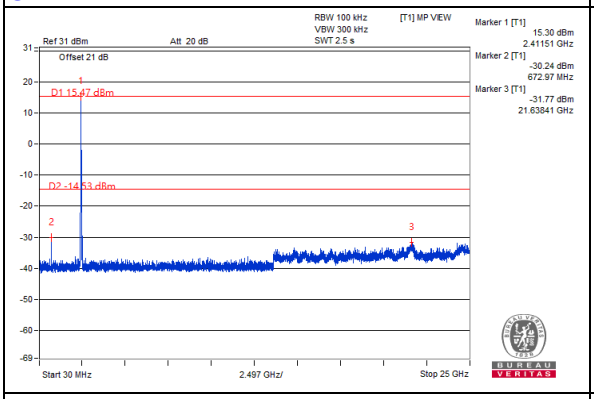


CH 11 Band edge

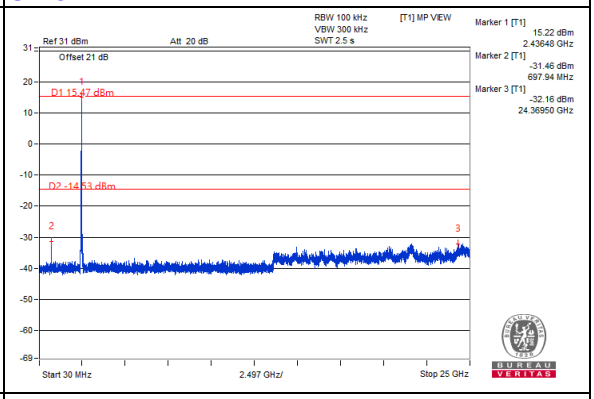


Chain 1

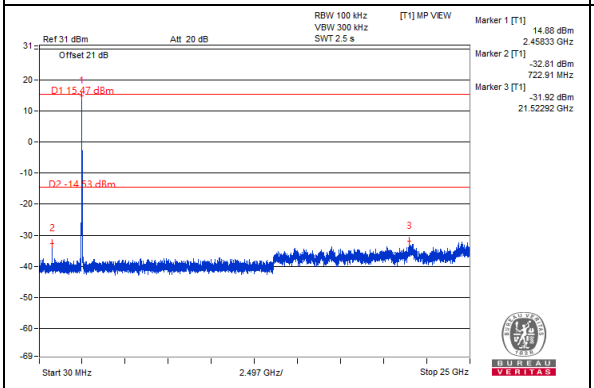
CH 1



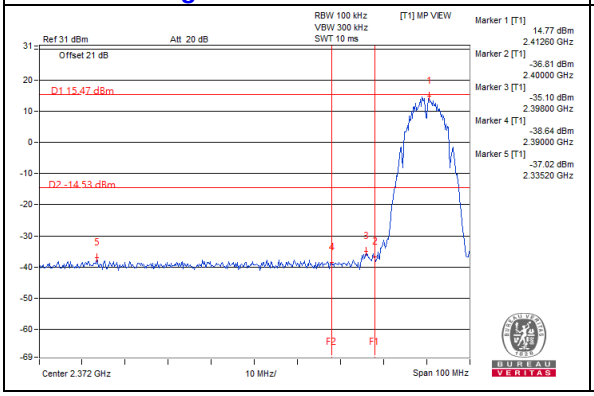
CH 6



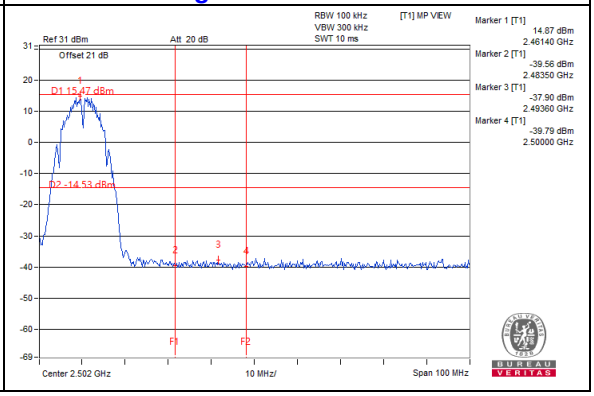
CH 11



CH 1 Band edge

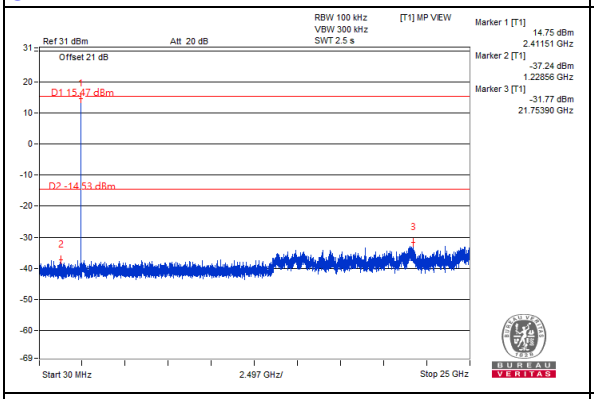


CH 11 Band edge

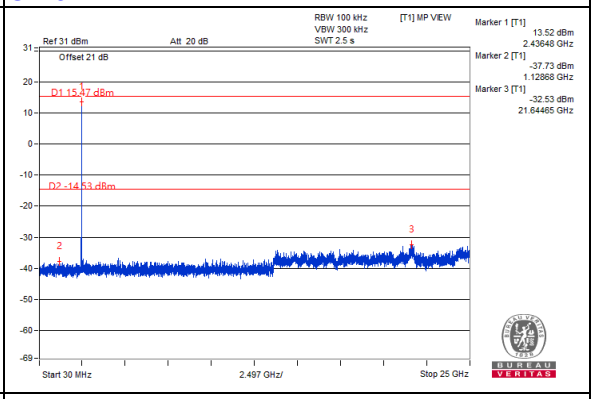


Chain 2

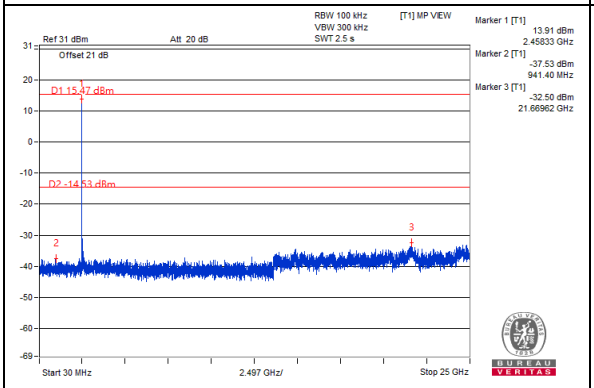
CH 1



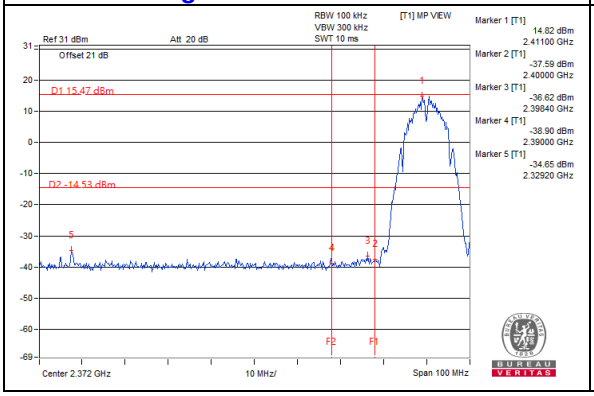
CH 6



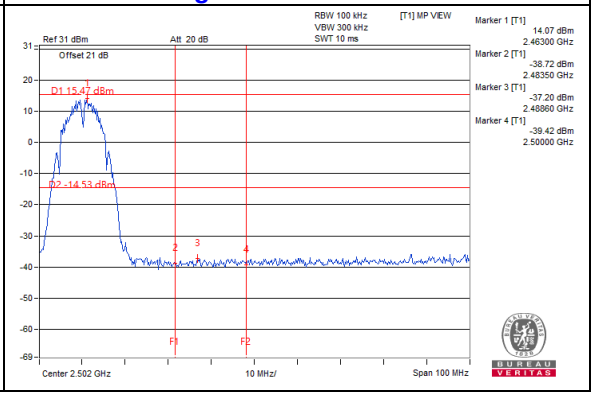
CH 11



CH 1 Band edge

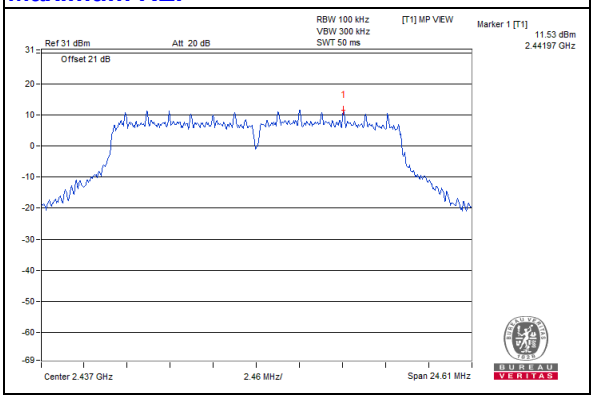


CH 11 Band edge



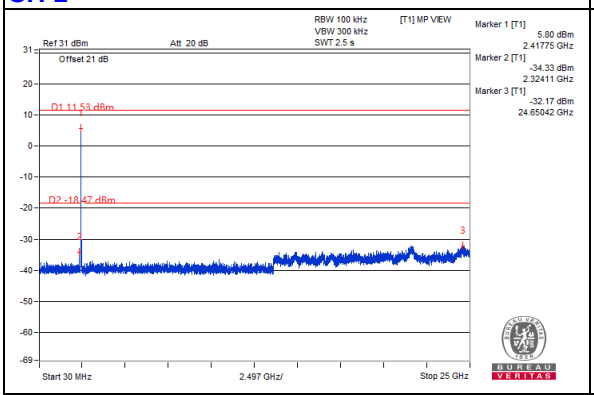
802.11g

Maximum REF

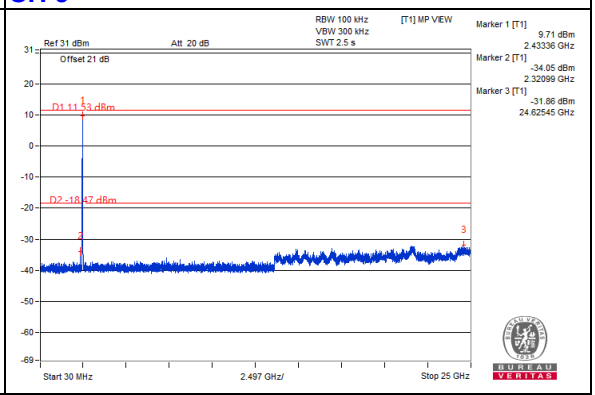


Chain 0

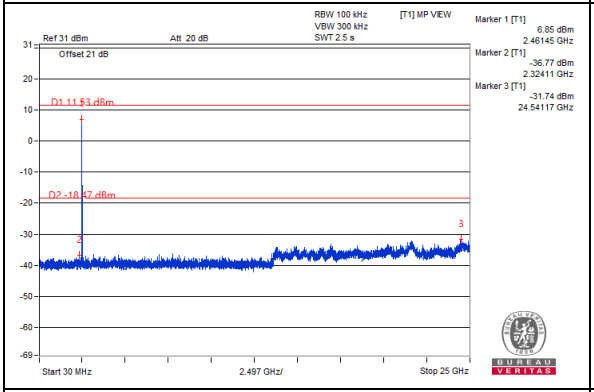
CH 1



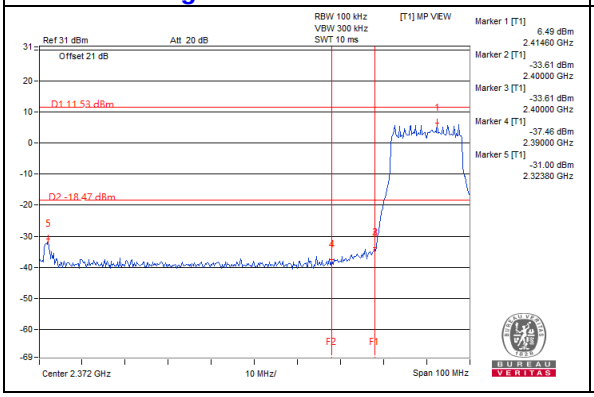
CH 6



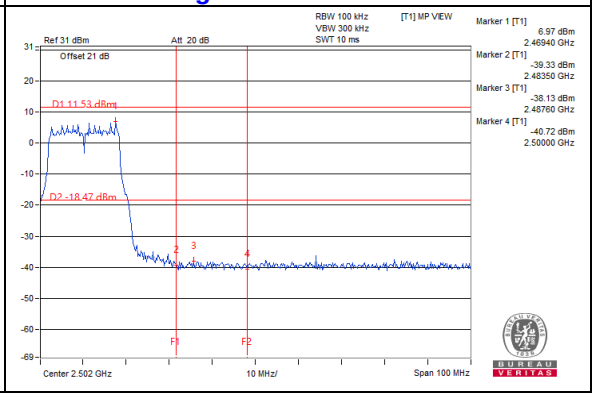
CH 11



CH 1 Band edge

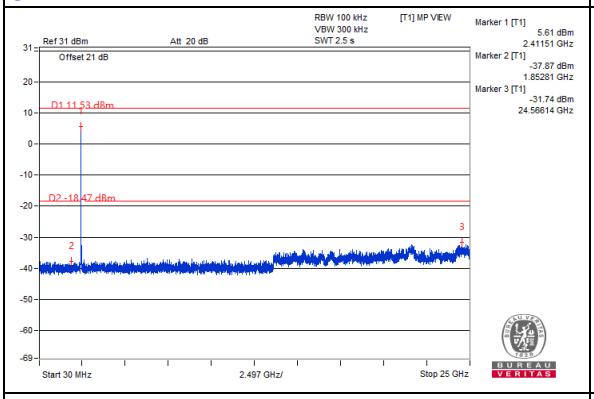


CH 11 Band edge

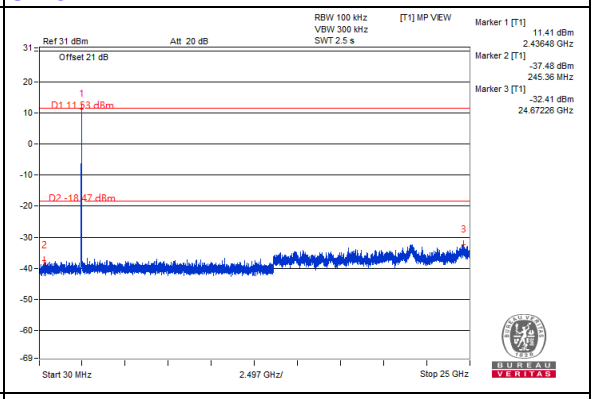


Chain 1

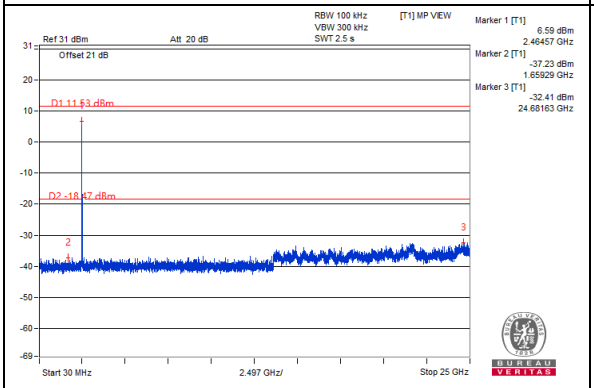
CH 1



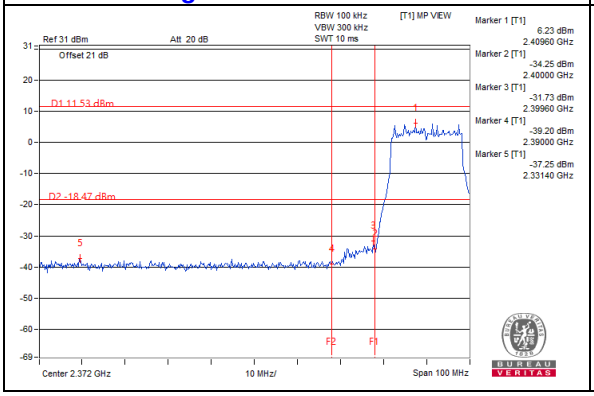
CH 6



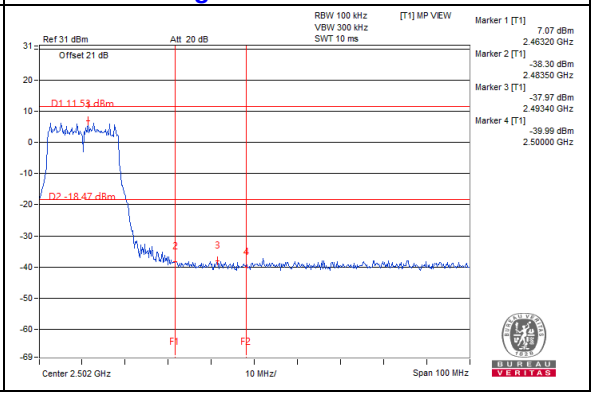
CH 11



CH 1 Band edge

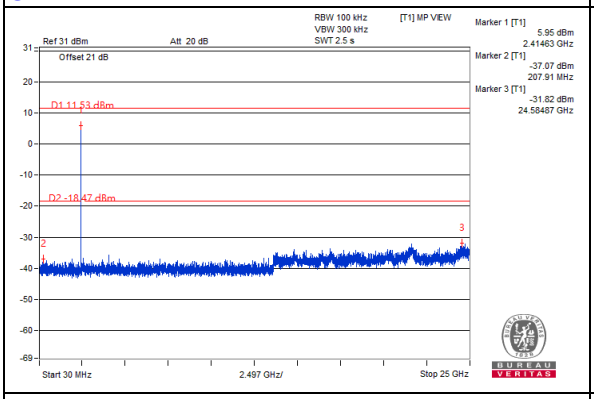


CH 11 Band edge

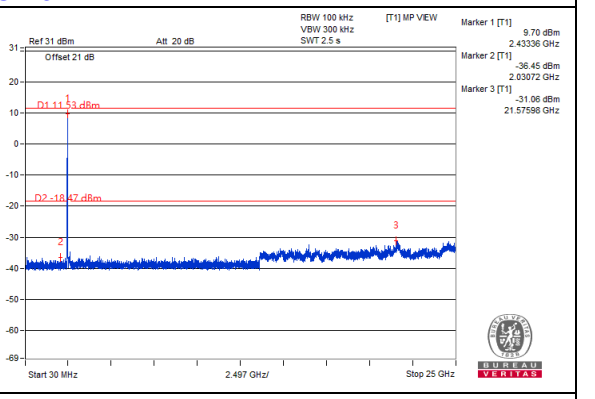


Chain 2

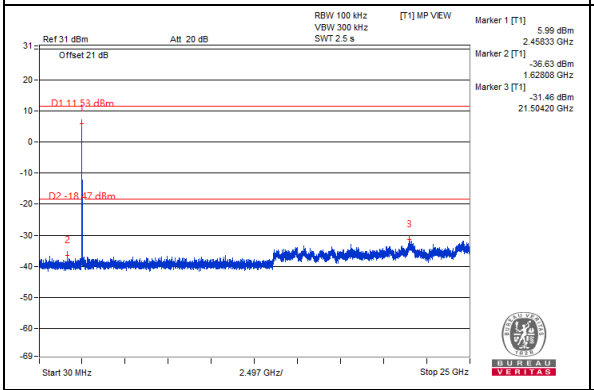
CH 1



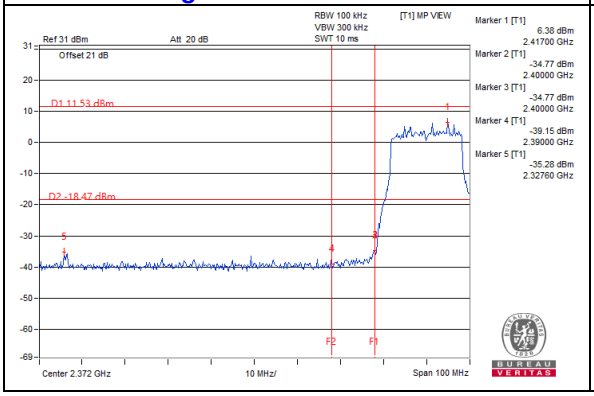
CH 6



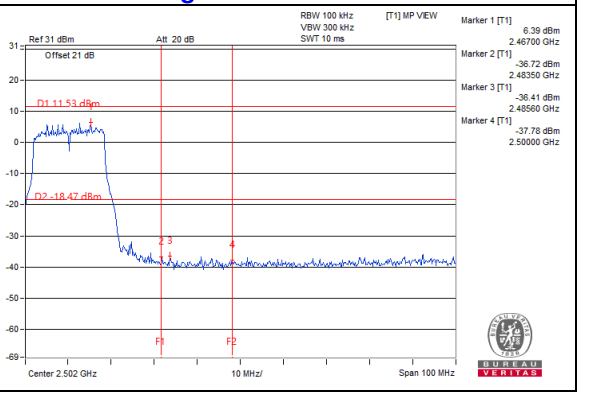
CH 11



CH 1 Band edge

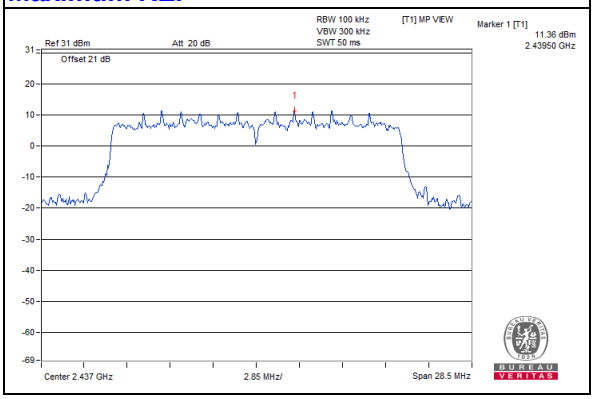


CH 11 Band edge



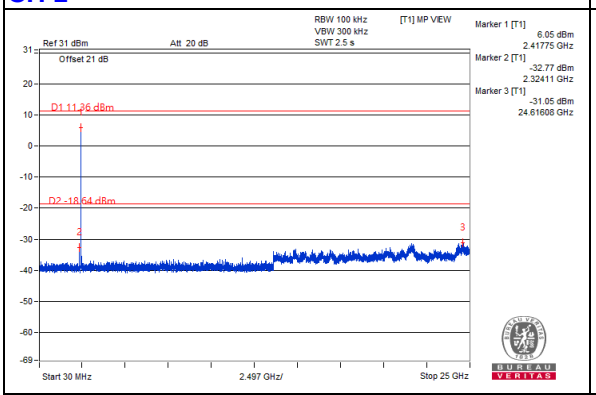
802.11ax (HE20)

Maximum REF

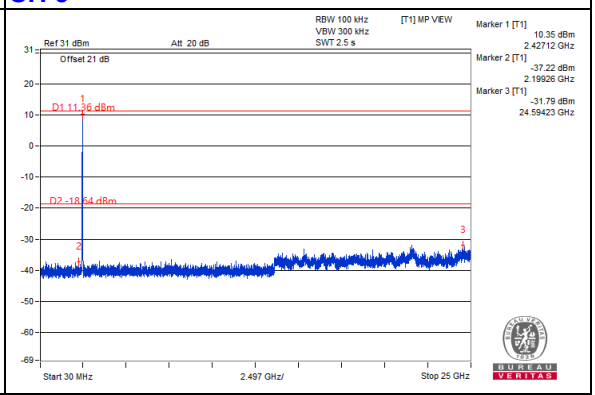


Chain 0

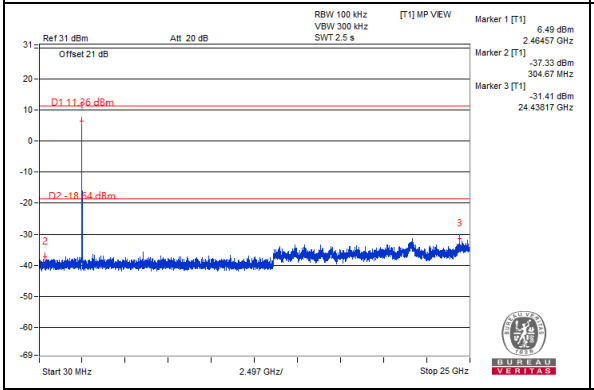
CH 1



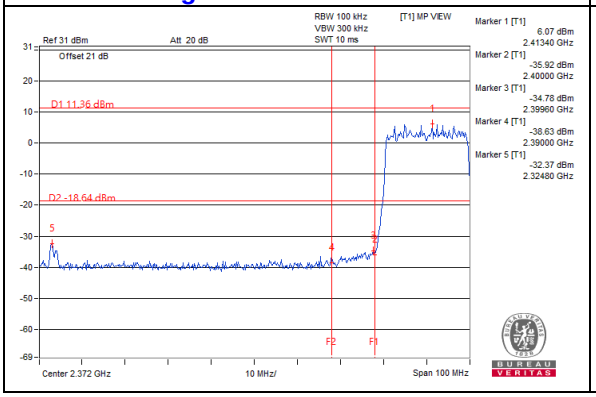
CH 6



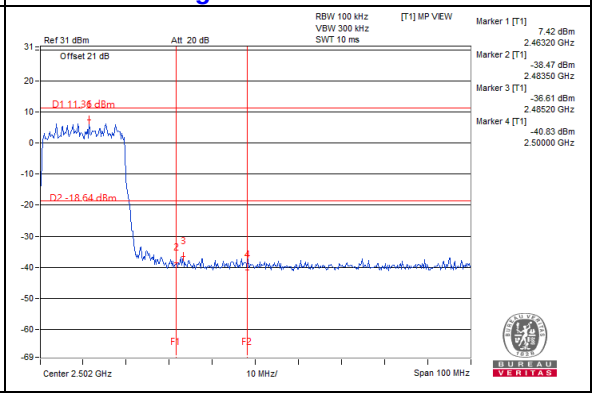
CH 11



CH 1 Band edge

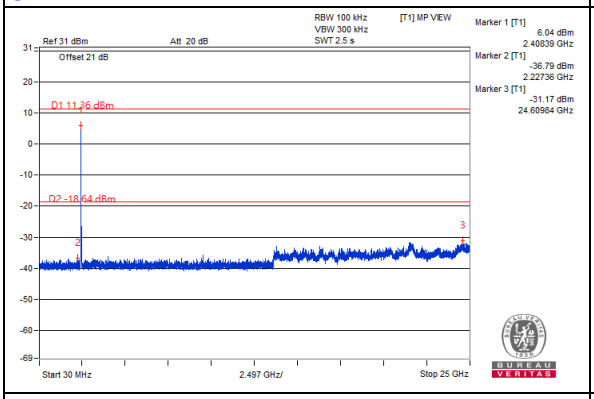


CH 11 Band edge

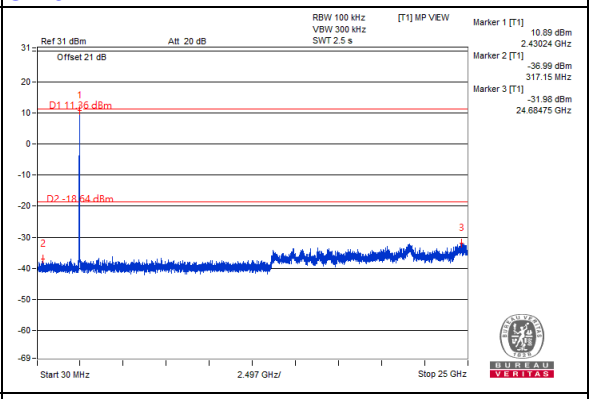


Chain 1

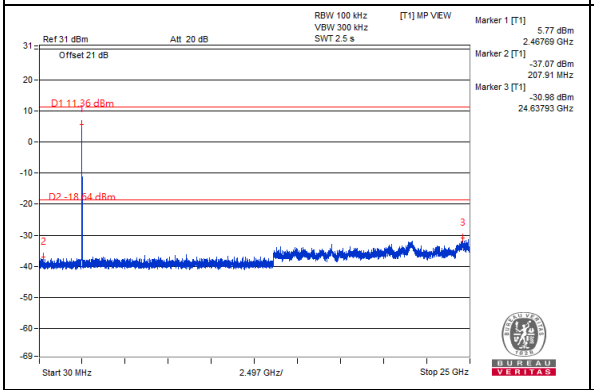
CH 1



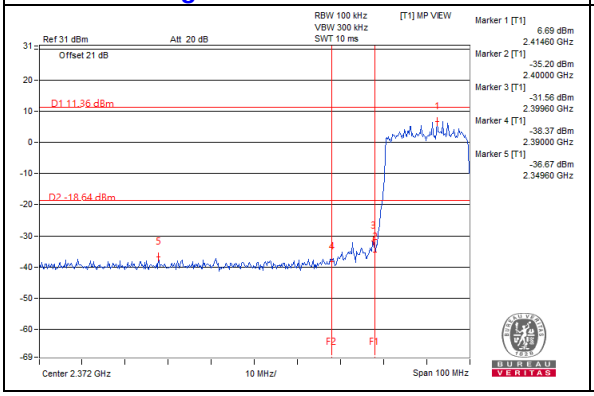
CH 6



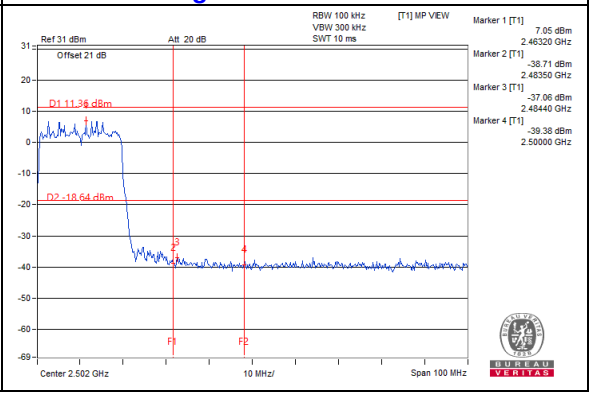
CH 11



CH 1 Band edge

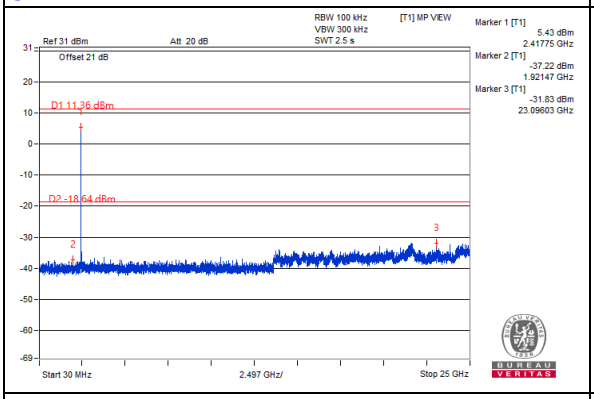


CH 11 Band edge

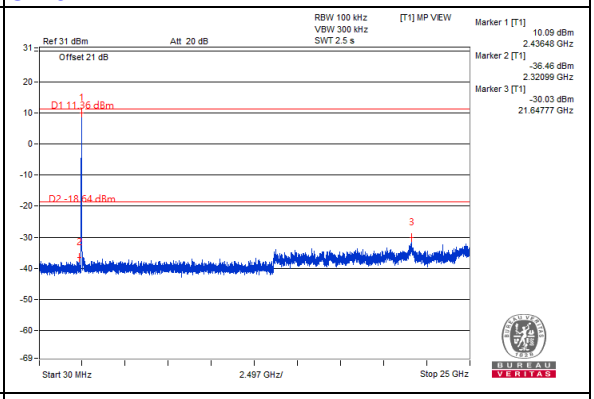


Chain 2

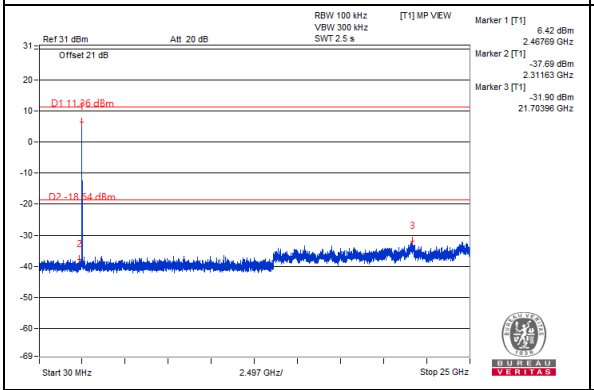
CH 1



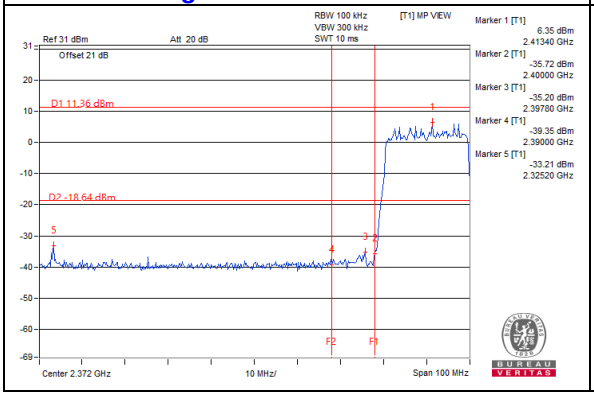
CH 6



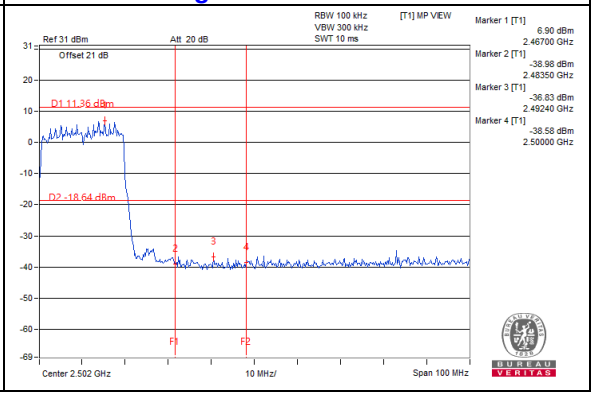
CH 11



CH 1 Band edge

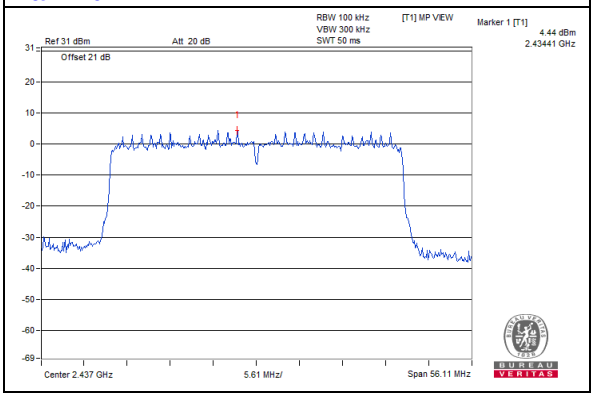


CH 11 Band edge



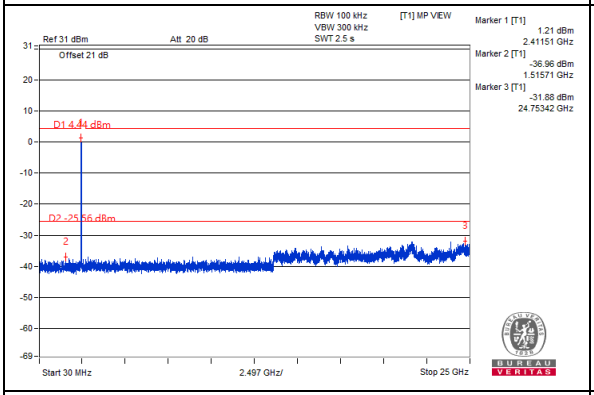
802.11ax (HE40)

Maximum REF

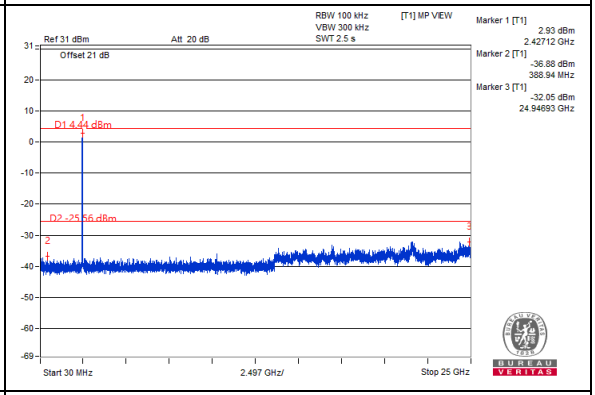


Chain 0

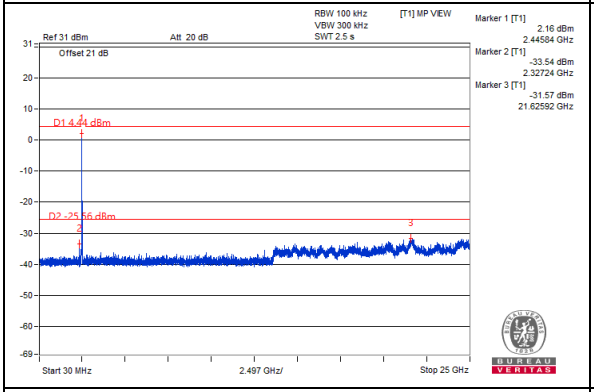
CH 3



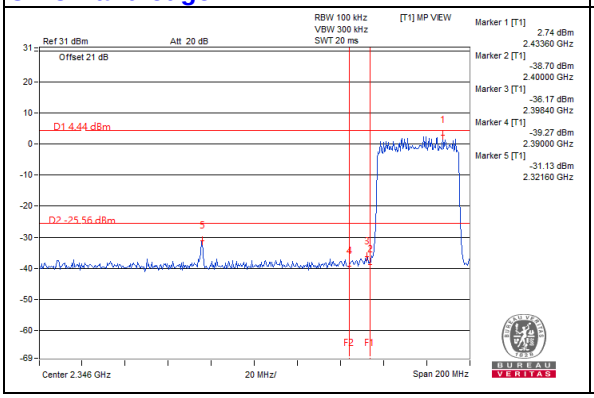
CH 6



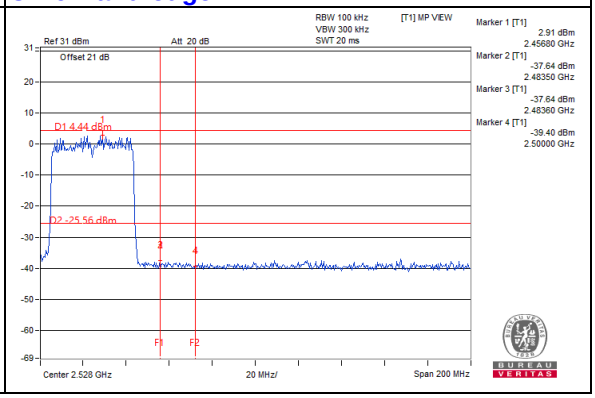
CH 9



CH 3 Band edge

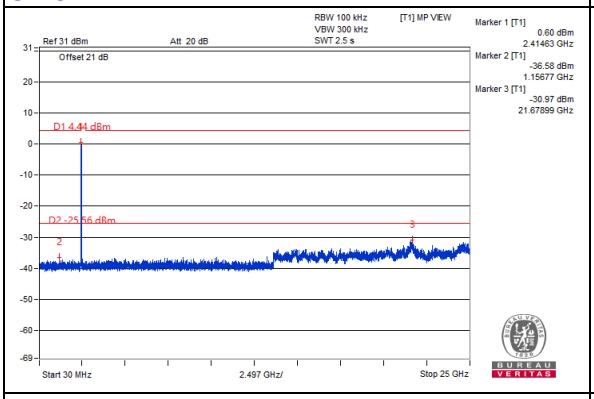


CH 9 Band edge

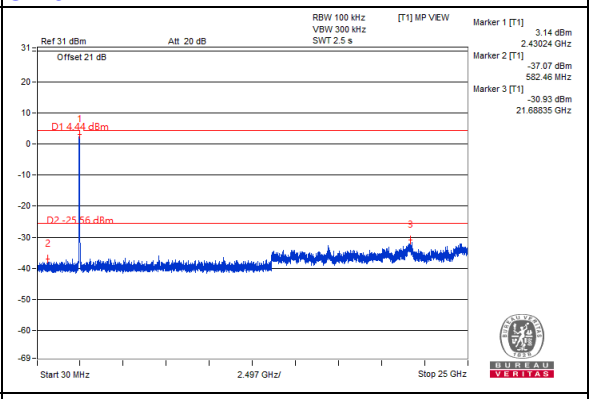


Chain 1

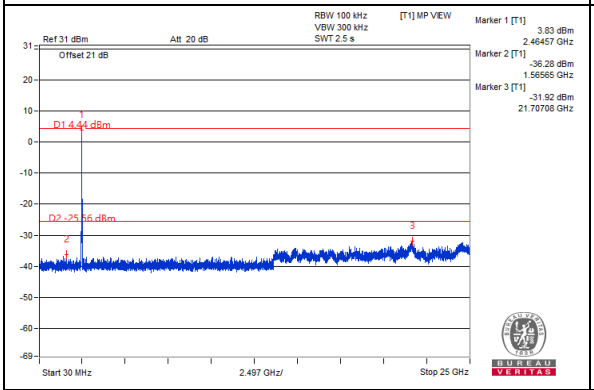
CH 3



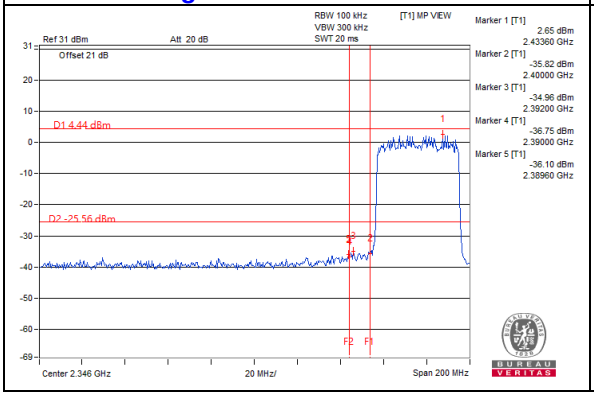
CH 6



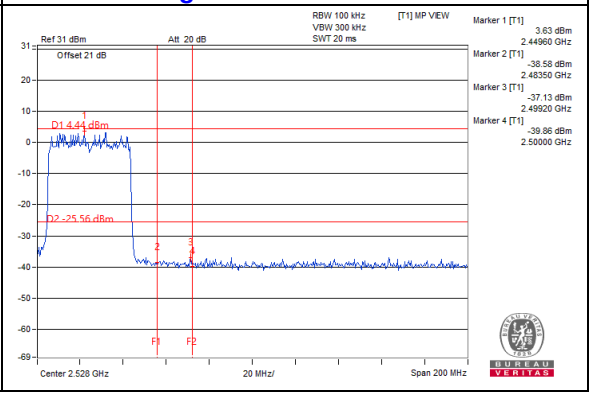
CH 9



CH 3 Band edge

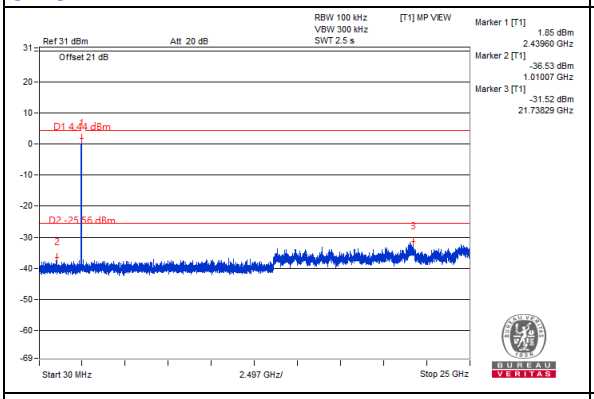


CH 9 Band edge

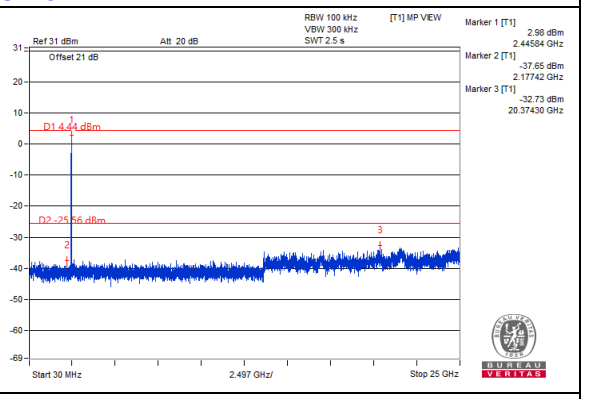


Chain 2

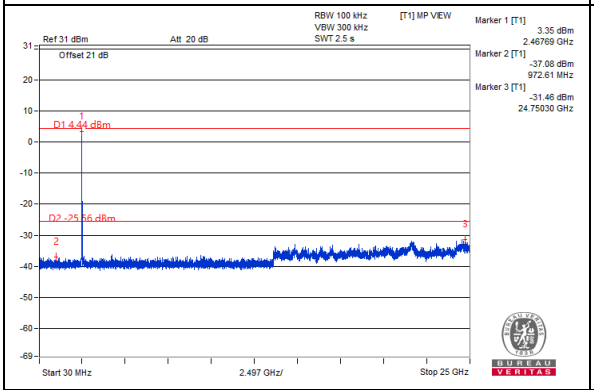
CH 3



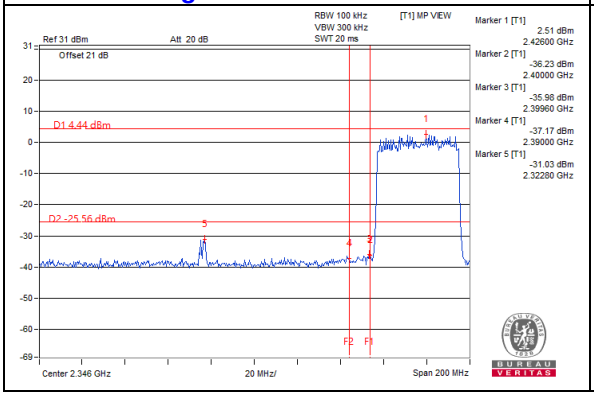
CH 6



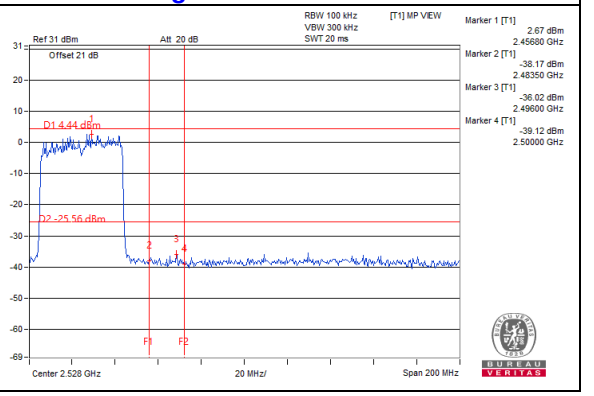
CH 9



CH 3 Band edge



CH 9 Band edge

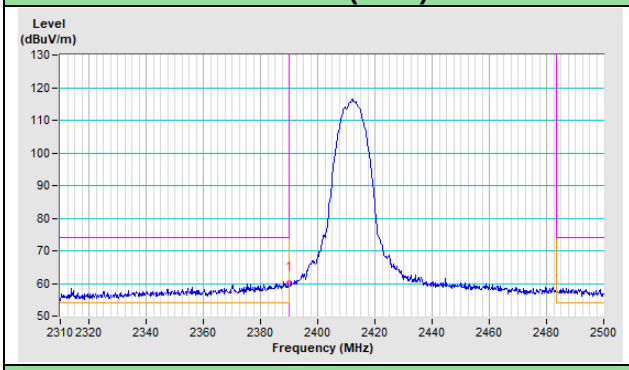
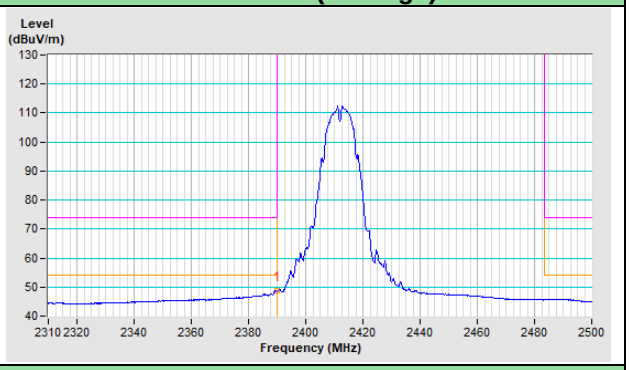
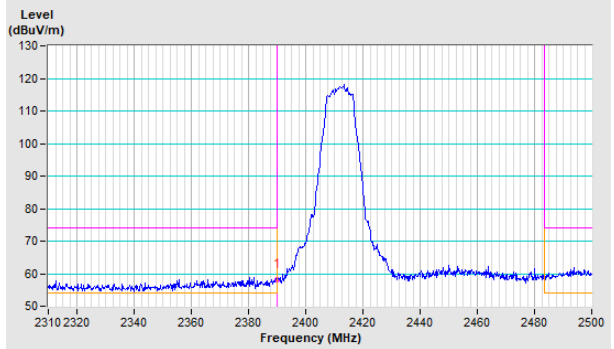
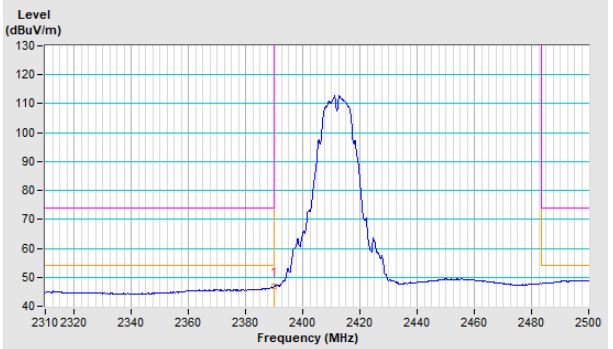
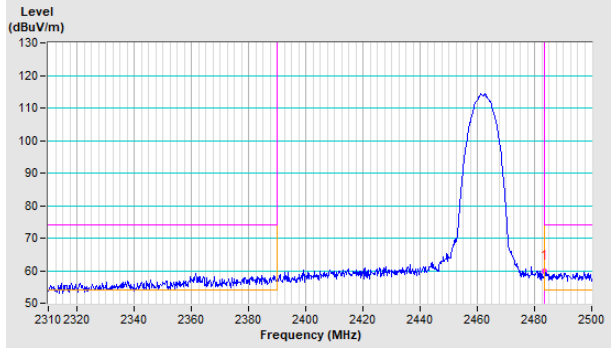
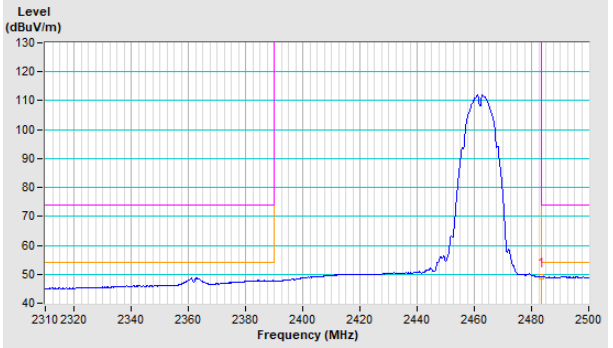
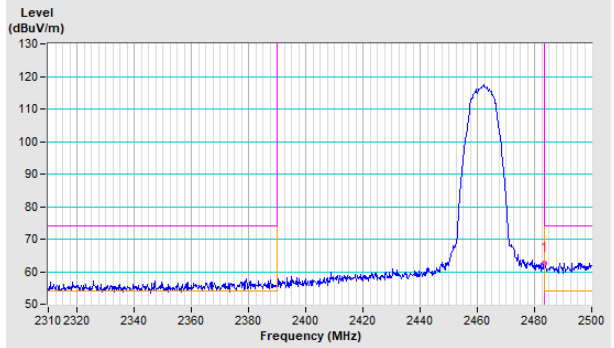
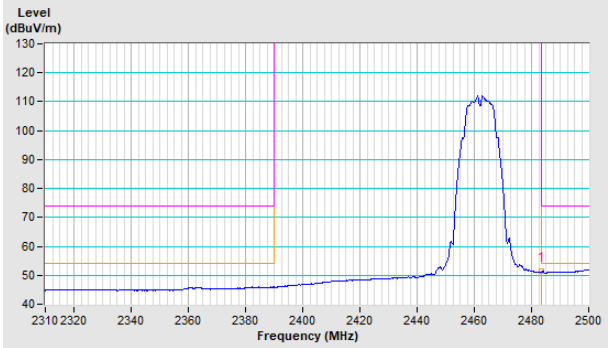


5 Pictures of Test Arrangements

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

Annex A - Band-Edge Measurement

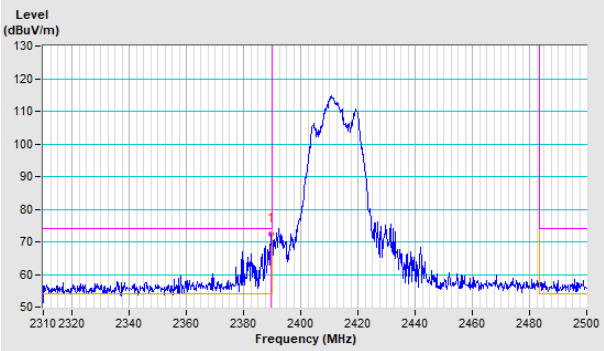
802.11b

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

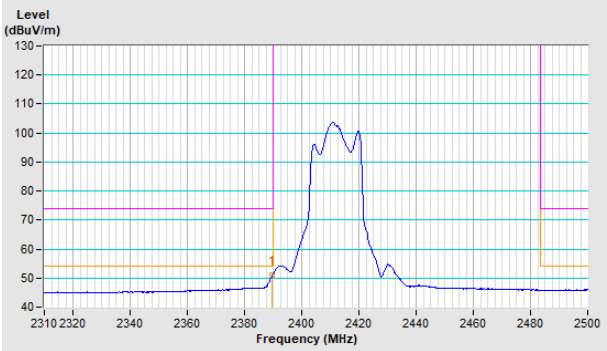
802.11g

Channel 1

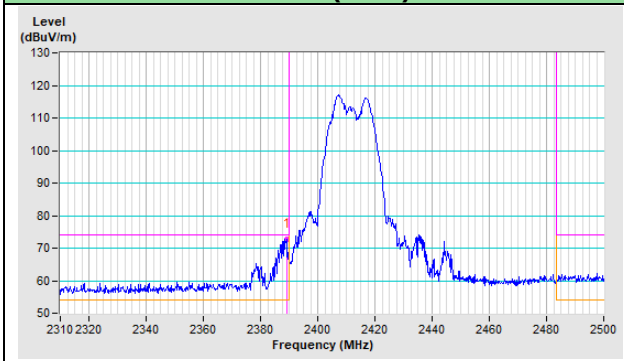
Horizontal (Peak)



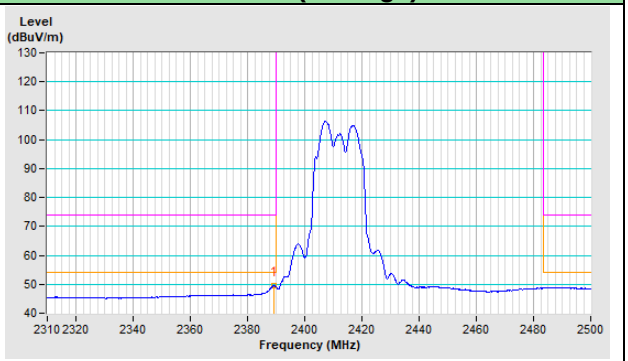
Horizontal (Average)



Vertical (Peak)

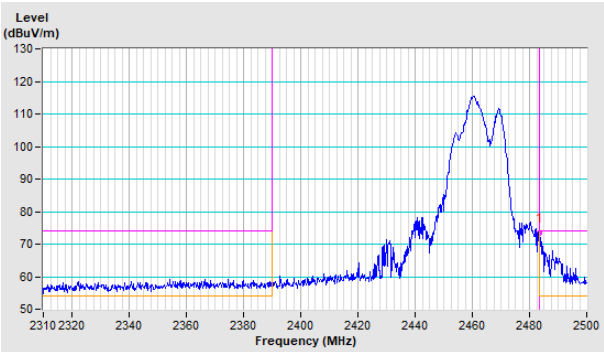


Vertical (Average)

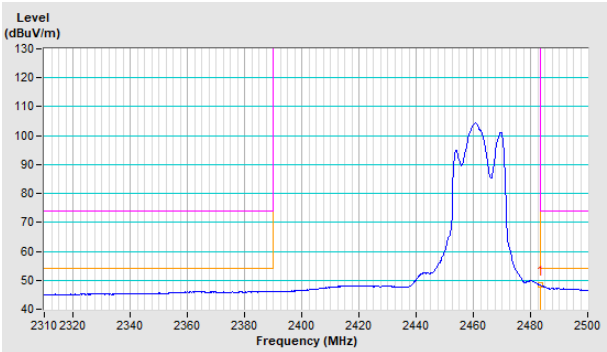


Channel 11

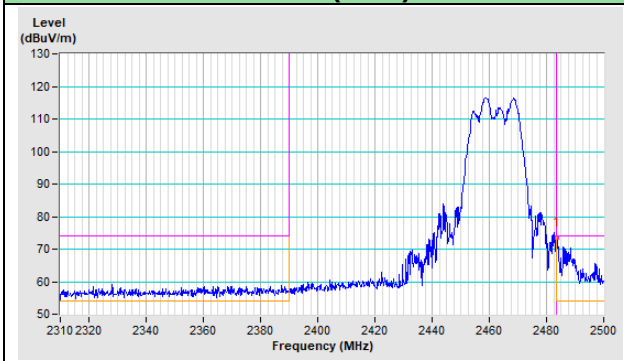
Horizontal (Peak)



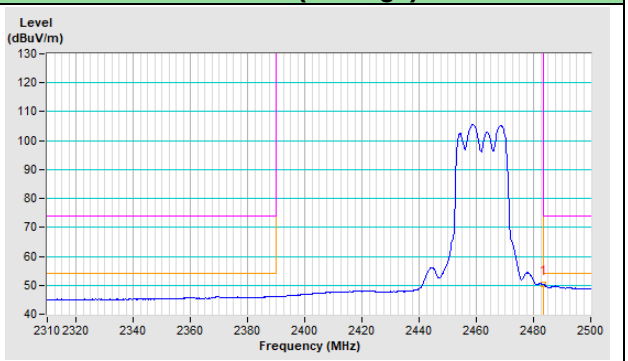
Horizontal (Average)



Vertical (Peak)



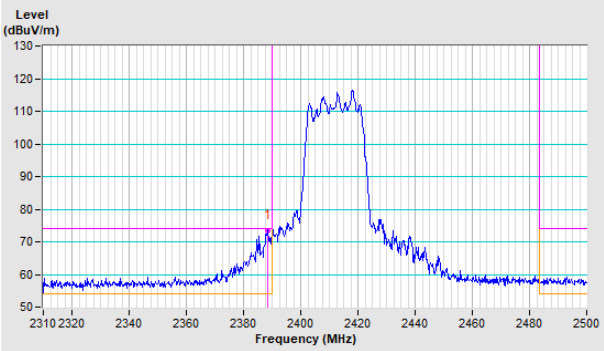
Vertical (Average)



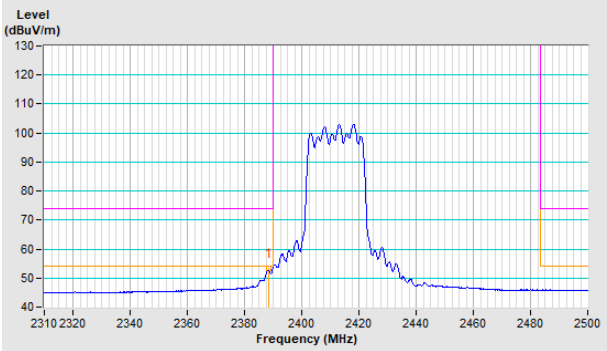
802.11ax (HE20)

Channel 1

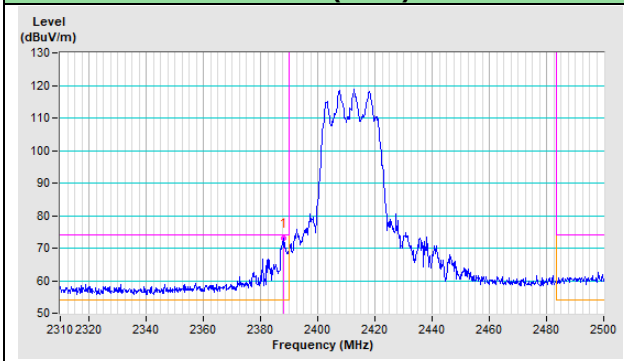
Horizontal (Peak)



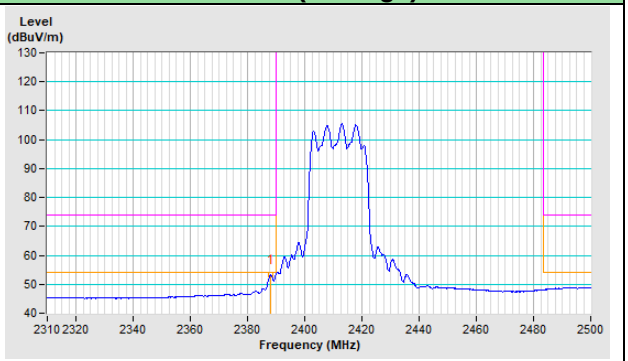
Horizontal (Average)



Vertical (Peak)

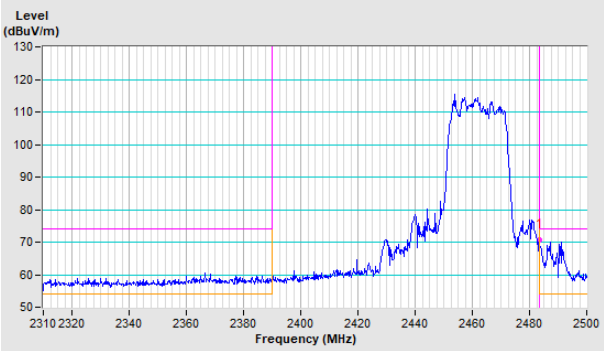


Vertical (Average)

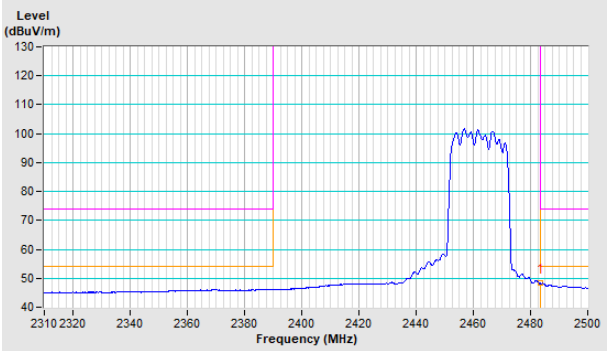


Channel 11

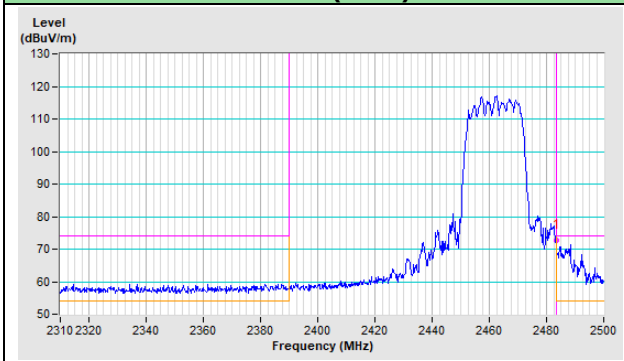
Horizontal (Peak)



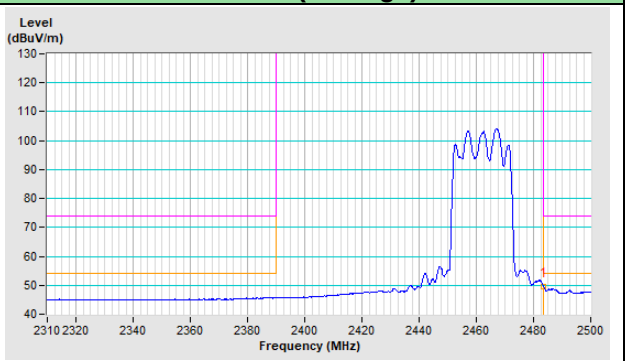
Horizontal (Average)



Vertical (Peak)



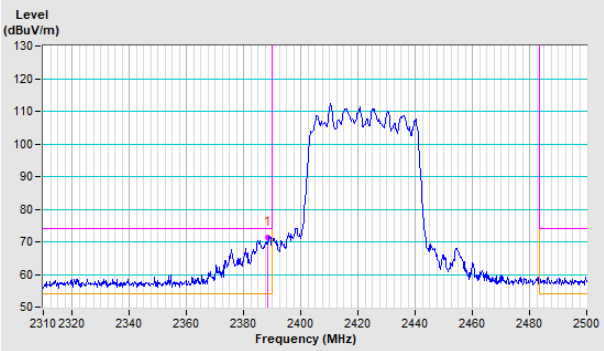
Vertical (Average)



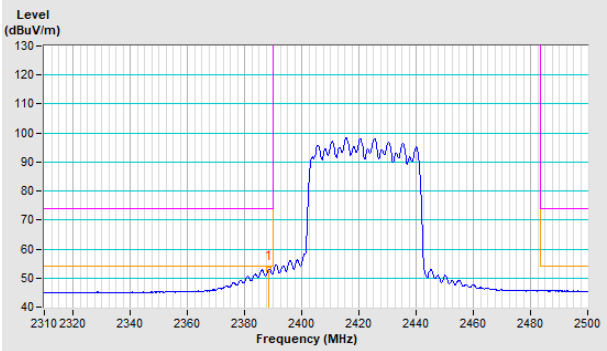
802.11ax (HE40)

Channel 3

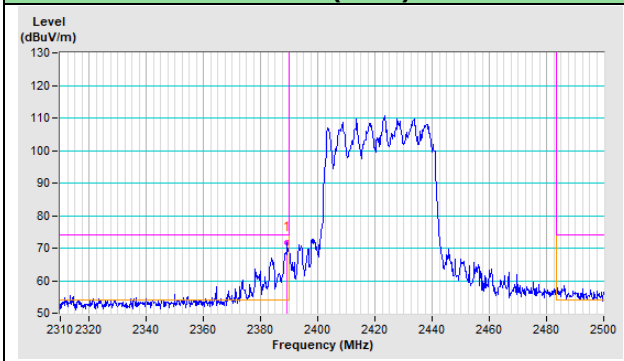
Horizontal (Peak)



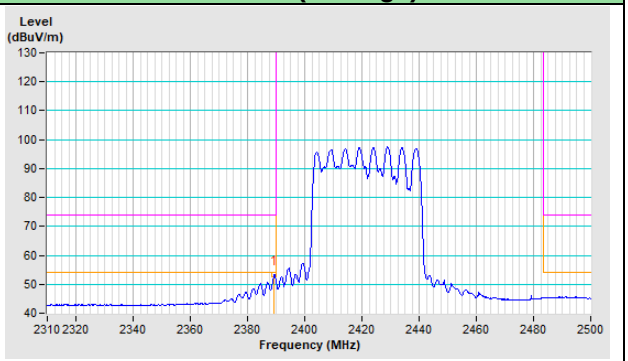
Horizontal (Average)



Vertical (Peak)

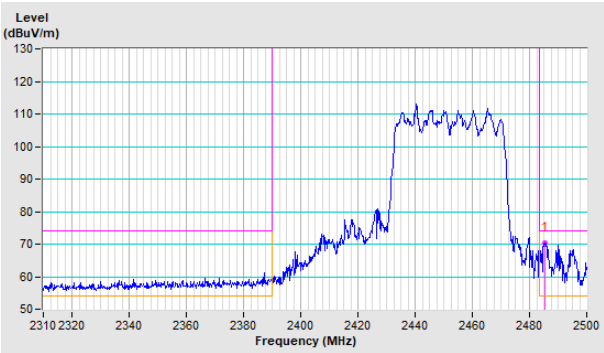


Vertical (Average)

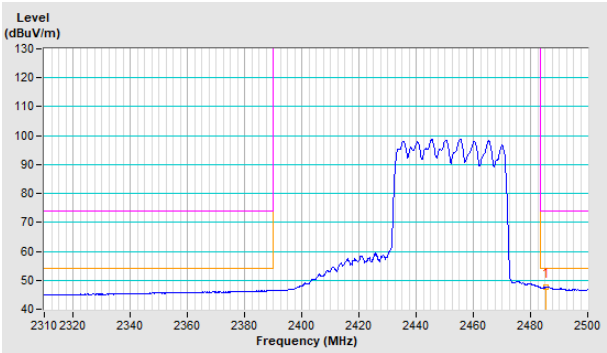


Channel 9

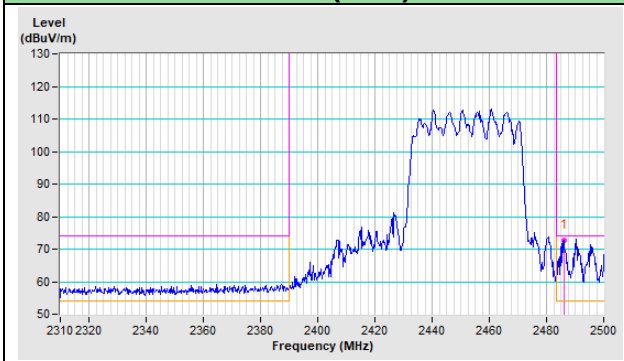
Horizontal (Peak)



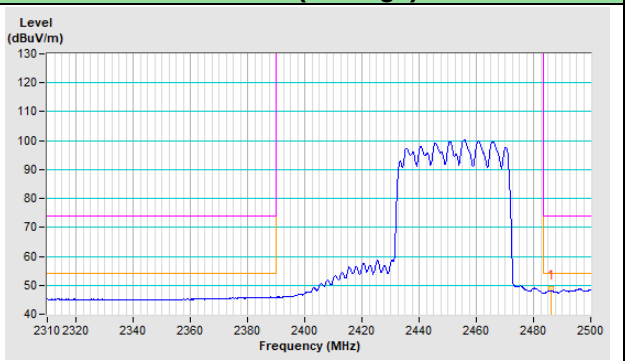
Horizontal (Average)



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 accredited and approved 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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