FCC Test Report

Report No.:	RF191025E02
FCC ID:	UXX-S5A946A
Test Model:	S5A947A
Series Model:	S5A946A
Received Date:	Oct. 25, 2019
Test Date:	Nov. 06, 2019 ~ Nov. 21, 2019
Issued Date:	Dec. 04, 2019
Applicant:	Cradlepoint, Inc
Address:	1111 W. Jefferson Street Suite 400 Boise, ID 83702 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF191025E02	Original Release	Dec. 04, 2019

1 Certificate of Conformity

Product:	Advanced Edge Router
Brand:	cradlepoint
Test Model:	S5A947A
Series Model:	S5A946A
Sample Status:	Engineering Sample
Applicant:	Cradlepoint, Inc
Test Date:	Nov. 06, 2019 ~ Nov. 21, 2019
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Rona Chen , **Date:** Dec. 04, 2019

Rona Chen / Specialist

Approved by : , **Date:** Dec. 04, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -7.44 dB at 0.34124 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.3 dB at 2390.00 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex (MHF) not a standard connector.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	3.86 dB
	200 MHz ~ 1000 MHz	3.87 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Advanced Edge Router
Brand	cradlepoint
Test Model	S5A947A
Series Model	S5A946A
Status of EUT	Engineering Sample
Power Supply Rating	12.0 Vdc (Adapter)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM for OFDMA
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps 802.11ac: up to 400.0 Mbps 802.11ax: up to 573.5 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 7 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
Output Power	CDD Mode: 634.05 mW Beamforming Mode: 610.331 mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	Refer to Note as below
Data Cable Supplied	N/A

Note:

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

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX
802.11ax (HE20)	2TX
802.11ax (HE40)	2TX

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

* For 802.11n, 802.11ac and 802.11ax, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

2. All models are listed as below.

Brand	Product Marketing Name (PMN)	Model	Wi-Fi Function	Embedded Radio (WWAN Module)	Number of WWAN Antenna Port
cradlepoint	E300-C18B	S5A946A	Yes	Telit, LM960A18 Contains FCC ID: RI7LM960 Contains IC : 5131A-LM960	4
	E300-C4D	S5A947A	Yes	Quectel, EC25-AF Contains FCC ID: XMR201808EC25AF Contains IC : 10224A-2018EC25AF	2
* The differences compared with different models are embedded WWAN module and number of WWAN antenna port. Above samples had been pre-tested and the worst case was found on model: S5A947A. Therefore, only this S5A947A was as a representative for the final test and recorded in this report.					

3. The WLAN antenna information of EUT is listed as below.

Antenna No.	RF Chain No.	Brand	Model	Antenna Gain (dBi)		Antenna Type	Connecter Type
				2.4G	5G		
Radio 1	WiFi Chain0	Cradlepoint	02102140-06997-1	1.7	3	PCB	i-pex (MHF)
Radio 2	WiFi Chain1		02102140-06997-2	2.5	3.3		

4. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	APD	WA-36N12R	I/P: 100 – 240 Vac, 0.9 A, 50-60 Hz, O/P: 12 Vdc, 3 A 1.5 m non-shielded cable w/o ferrite core
Adapter 2	APD	WA-36A12R	I/P: 100 – 240 Vac, 0.9 A, 50-60 Hz, O/P: 12 Vdc, 3 A 1.5 m non-shielded cable w/o ferrite core
Adapter 3	Ktec	KSA-36W-120300D5	I/P: 100 – 240 Vac, 1 A, 50/60 Hz, O/P: 12 Vdc, 3 A 1.5 m non-shielded cable w/o ferrite core

5. 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), 802.11ac (VHT20), 802.11ax (HE20):

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + Adapter 1
B	-	√	√	-	EUT + Adapter 2
C	-	√	√	-	EUT + Adapter 3

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

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

Radiated Emission Test (Above 1 GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B, C	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	8.6
	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	17.2

Radiated Emission Test (Below 1 GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11ax (HE20)	1 to 11	1	OFDMA	BPSK	8.6

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B, C	802.11ax (HE20)	1 to 11	1	OFDMA	BPSK	8.6

Bandedge Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
	802.11ax (HE20)	1 to 11	1, 11	OFDM	BPSK	8.6
	802.11ax (HE40)	3 to 9	3, 9	OFDM	BPSK	17.2

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
	802.11ax (HE20)	1 to 11	1, 6, 11	OFDM	BPSK	8.6
	802.11ax (HE40)	3 to 9	3, 6, 9	OFDM	BPSK	17.2

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Adair Peng
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Titan Hsu
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Adair Peng
APCM	25 deg. C, 65 % RH	120 Vac, 60 Hz	Ivan Tseng

3.3 Duty Cycle of Test Signal

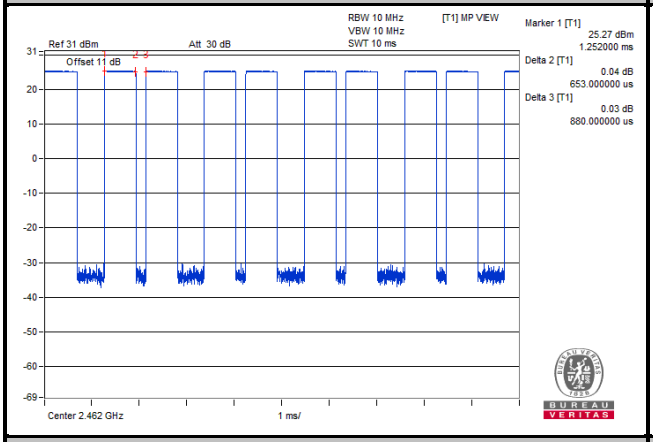
802.11b: Duty cycle = 0.653/0.880 = 0.742, Duty factor = 10 * log(1/0.742) = 1.30

802.11g: Duty cycle = 1.960/2.105 = 0.931, Duty factor = 10 * log(1/0.931) = 0.31

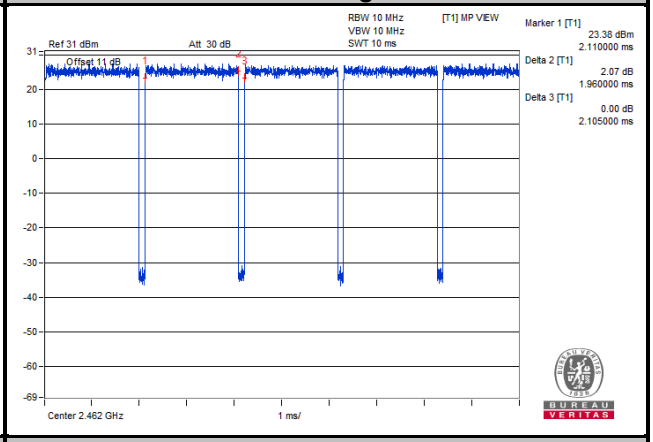
802.11ax (HE20): Duty cycle = 5.420/5.735 = 0.945, Duty factor = 10 * log(1/0.945) = 0.25

802.11ax (HE40): Duty cycle = 5.420/5.785 = 0.937, Duty factor = 10 * log(1/0.937) = 0.28

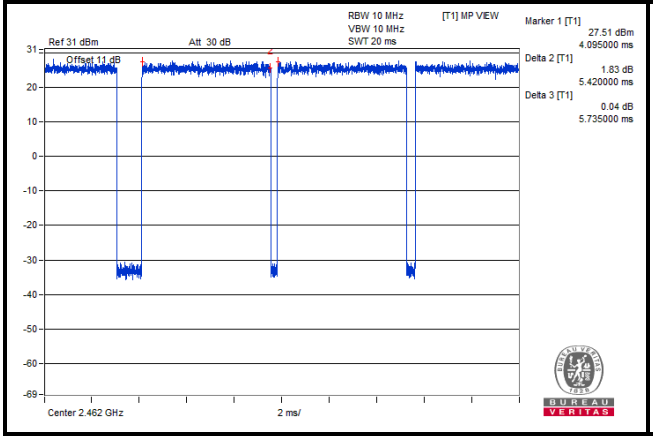
802.11b



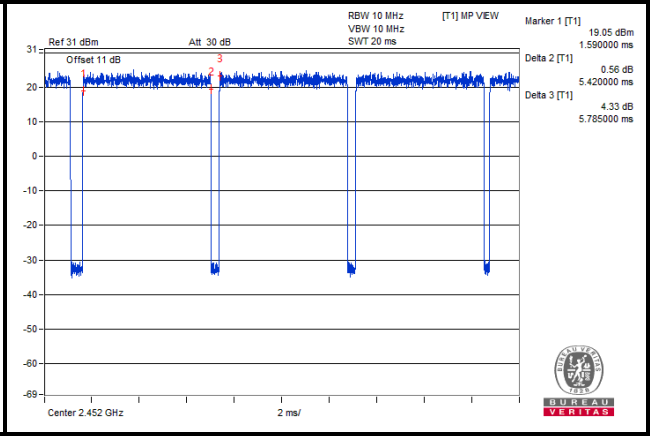
802.11g



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.

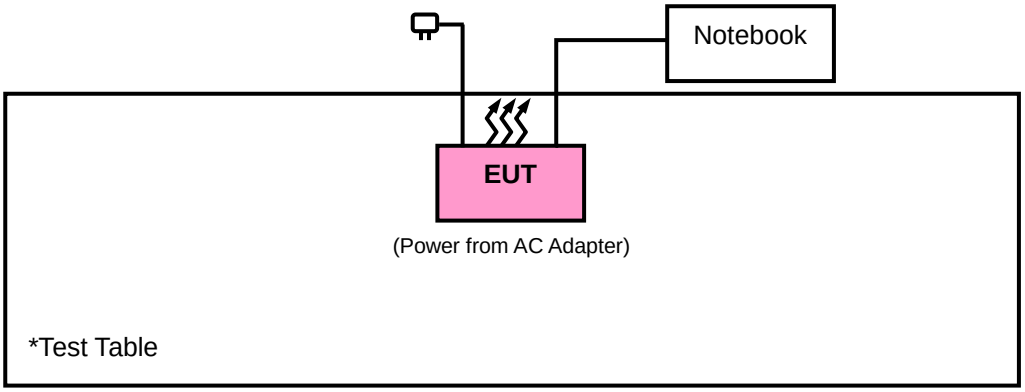
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	DELL	E5410	1HC2XM1	N/A
2.	Adapter 1	APD	WA-36N12R	N/A	N/A
3.	Adapter 2	APD	WA-36A12R	N/A	N/A
4.	Adapter 3	Ktec	KSA-36W-120300D5	N/A	N/A

No.	Signal Cable Description of The Above Support Units
1.	6 m LAN cable
2.	1.5 m non-shielded cable w/o ferrite core
3.	1.5 m non-shielded cable w/o ferrite core
4.	1 m non-shielded cable w/o ferrite core

Note:

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

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 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 20 dB below the highest level of the desired power:

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

NOTE:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 30, 2019	May 29, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
			Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 20, 2019	Aug. 19, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 27, 2019	Mar. 26, 2020
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 20, 2019	Aug. 19, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 05, 2019	Sep. 04, 2020
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55 190004/MY551900 07/MY55210005	Jul. 15, 2019	Jul. 14, 2020

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

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

Note:

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

For Radiated Emission above 30 MHz

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

Note:

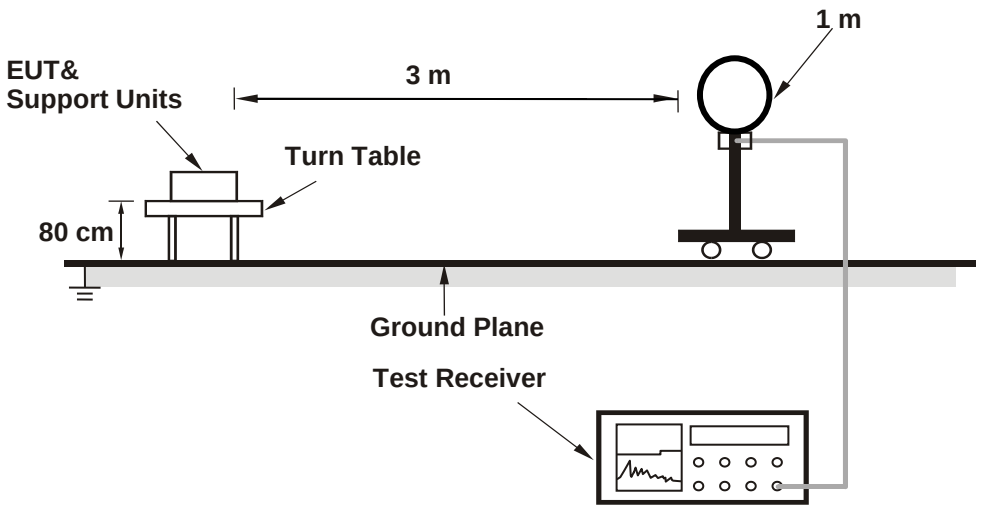
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

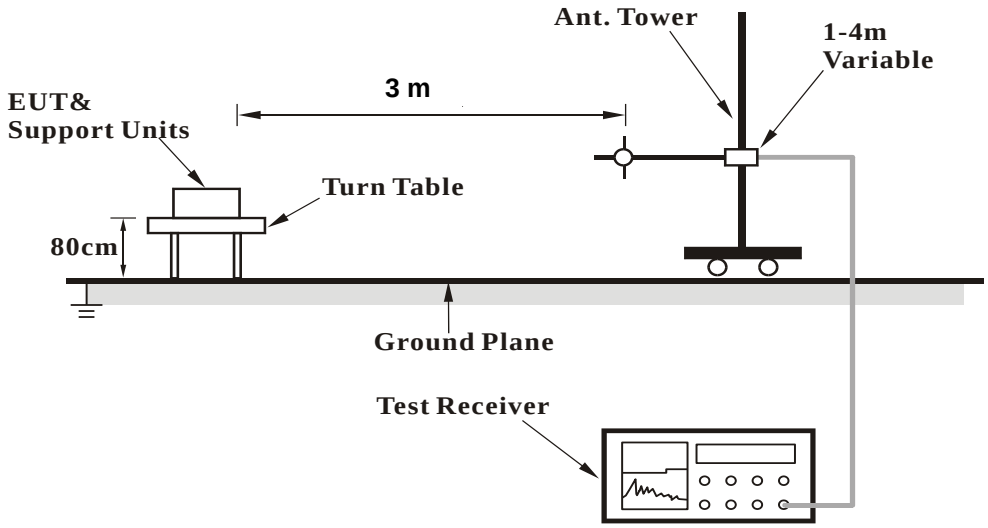
No deviation.

4.1.5 Test Set Up

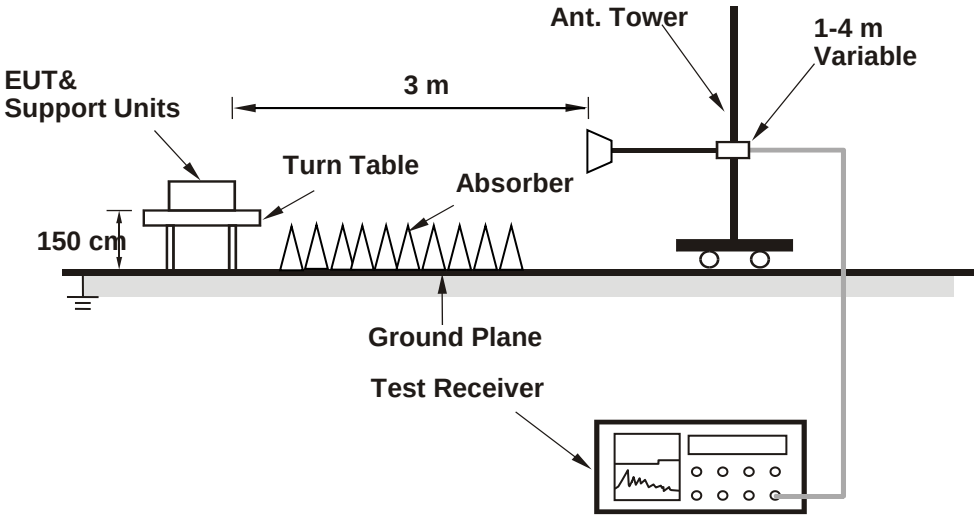
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data：

Mode A

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	58.4 PK	74.0	-15.6	3.37 H	33	25.9	32.5
2	2390.00	47.3 AV	54.0	-6.7	3.37 H	33	14.8	32.5
3	*2412.00	113.5 PK			3.54 H	28	81.0	32.5
4	*2412.00	110.1 AV			3.54 H	28	77.6	32.5
5	4824.00	53.7 PK	74.0	-20.3	2.70 H	66	50.3	3.4
6	4824.00	50.1 AV	54.0	-3.9	2.70 H	66	46.7	3.4
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	59.5 PK	74.0	-14.5	3.10 V	13	27.0	32.5
2	2390.00	51.0 AV	54.0	-3.0	3.10 V	13	18.5	32.5
3	*2412.00	120.5 PK			2.45 V	110	88.0	32.5
4	*2412.00	117.3 AV			2.45 V	110	84.8	32.5
5	4824.00	56.0 PK	74.0	-18.0	1.97 V	304	52.6	3.4
6	4824.00	53.4 AV	54.0	-0.6	1.97 V	304	50.0	3.4

REMARKS:

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

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	*2437.00	112.2 PK			3.48 H	38	79.8	32.4
2	*2437.00	108.7 AV			3.48 H	38	76.3	32.4
3	4874.00	53.6 PK	74.0	-20.4	2.85 H	59	49.9	3.7
4	4874.00	50.1 AV	54.0	-3.9	2.85 H	59	46.4	3.7
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	*2437.00	119.2 PK			2.71 V	13	86.8	32.4
2	*2437.00	115.8 AV			2.71 V	13	83.4	32.4
3	4874.00	55.7 PK	74.0	-18.3	1.58 V	84	52.0	3.7
4	4874.00	53.0 AV	54.0	-1.0	1.58 V	84	49.3	3.7

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.3 PK			3.53 H	39	77.8	32.5
2	*2462.00	106.9 AV			3.53 H	39	74.4	32.5
3	2483.50	57.2 PK	74.0	-16.8	2.60 H	32	24.6	32.6
4	2483.50	45.7 AV	54.0	-8.3	2.60 H	32	13.1	32.6
5	4924.00	54.0 PK	74.0	-20.0	2.65 H	70	50.2	3.8
6	4924.00	50.3 AV	54.0	-3.7	2.65 H	70	46.5	3.8
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	117.5 PK			2.43 V	16	85.0	32.5
2	*2462.00	114.0 AV			2.43 V	16	81.5	32.5
3	2483.50	58.4 PK	74.0	-15.6	2.53 V	10	25.8	32.6
4	2483.50	47.0 AV	54.0	-7.0	2.53 V	10	14.4	32.6
5	4924.00	56.3 PK	74.0	-17.7	2.02 V	305	52.5	3.8
6	4924.00	53.6 AV	54.0	-0.4	2.02 V	305	49.8	3.8

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.0 PK	74.0	-15.0	3.43 H	44	26.5	32.5
2	2390.00	47.0 AV	54.0	-7.0	3.43 H	44	14.5	32.5
3	*2412.00	110.2 PK			3.35 H	38	77.7	32.5
4	*2412.00	100.8 AV			3.35 H	38	68.3	32.5
5	4824.00	47.6 PK	74.0	-26.4	2.99 H	69	44.2	3.4
6	4824.00	33.6 AV	54.0	-20.4	2.99 H	69	30.2	3.4
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	67.6 PK	74.0	-6.4	2.15 V	27	35.1	32.5
2	2390.00	53.2 AV	54.0	-0.8	2.15 V	27	20.7	32.5
3	*2412.00	117.6 PK			1.76 V	25	85.1	32.5
4	*2412.00	107.9 AV			1.76 V	25	75.4	32.5
5	4824.00	49.4 PK	74.0	-24.6	2.11 V	305	46.0	3.4
6	4824.00	36.0 AV	54.0	-18.0	2.11 V	305	32.6	3.4

REMARKS:

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

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	*2437.00	112.6 PK			3.50 H	46	80.2	32.4
2	*2437.00	102.7 AV			3.50 H	46	70.3	32.4
3	4874.00	50.5 PK	74.0	-23.5	2.85 H	73	46.8	3.7
4	4874.00	36.2 AV	54.0	-17.8	2.85 H	73	32.5	3.7
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	*2437.00	119.8 PK			2.27 V	24	87.4	32.4
2	*2437.00	110.0 AV			2.27 V	24	77.6	32.4
3	4874.00	52.7 PK	74.0	-21.3	2.16 V	300	49.0	3.7
4	4874.00	38.4 AV	54.0	-15.6	2.16 V	300	34.7	3.7

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.4 PK			3.49 H	46	77.9	32.5
2	*2462.00	100.8 AV			3.49 H	46	68.3	32.5
3	2483.50	58.1 PK	74.0	-15.9	3.60 H	23	25.5	32.6
4	2483.50	46.9 AV	54.0	-7.1	3.60 H	23	14.3	32.6
5	4924.00	50.1 PK	74.0	-23.9	3.05 H	63	46.3	3.8
6	4924.00	35.3 AV	54.0	-18.7	3.05 H	63	31.5	3.8
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	117.7 PK			2.50 V	16	85.2	32.5
2	*2462.00	108.0 AV			2.50 V	16	75.5	32.5
3	2483.50	66.5 PK	74.0	-7.5	2.58 V	8	33.9	32.6
4	2483.50	53.1 AV	54.0	-0.9	2.58 V	8	20.5	32.6
5	4924.00	51.9 PK	74.0	-22.1	2.09 V	301	48.1	3.8
6	4924.00	37.3 AV	54.0	-16.7	2.09 V	301	33.5	3.8

REMARKS:

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

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	2390.00	57.7 PK	74.0	-16.3	3.50 H	45	25.2	32.5
2	2390.00	47.2 AV	54.0	-6.8	3.50 H	45	14.7	32.5
3	*2412.00	111.9 PK			3.57 H	40	79.4	32.5
4	*2412.00	99.6 AV			3.57 H	40	67.1	32.5
5	4824.00	46.6 PK	74.0	-27.4	2.86 H	65	43.2	3.4
6	4824.00	33.1 AV	54.0	-20.9	2.86 H	65	29.7	3.4
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	67.1 PK	74.0	-6.9	2.12 V	20	34.6	32.5
2	**2390.00**	**53.7 AV**	**54.0**	**-0.3**	**2.12 V**	**20**	**21.2**	**32.5**
3	*2412.00	119.4 PK			2.41 V	17	86.9	32.5
4	*2412.00	106.9 AV			2.41 V	17	74.4	32.5
5	4824.00	48.3 PK	74.0	-25.7	2.42 V	314	44.9	3.4
6	4824.00	34.8 AV	54.0	-19.2	2.42 V	314	31.4	3.4

REMARKS:

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

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	*2437.00	115.4 PK			3.59 H	49	83.0	32.4
2	*2437.00	102.6 AV			3.59 H	49	70.2	32.4
3	4874.00	50.2 PK	74.0	-23.8	2.94 H	74	46.5	3.7
4	4874.00	34.9 AV	54.0	-19.1	2.94 H	74	31.2	3.7
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	*2437.00	122.6 PK			2.27 V	23	90.2	32.4
2	*2437.00	109.7 AV			2.27 V	23	77.3	32.4
3	4874.00	52.4 PK	74.0	-21.6	2.40 V	309	48.7	3.7
4	4874.00	37.6 AV	54.0	-16.4	2.40 V	309	33.9	3.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
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	112.3 PK			3.60 H	48	79.8	32.5
2	*2462.00	99.8 AV			3.60 H	48	67.3	32.5
3	2483.50	58.7 PK	74.0	-15.3	3.47 H	50	26.1	32.6
4	2483.50	47.1 AV	54.0	-6.9	3.47 H	50	14.5	32.6
5	4924.00	49.4 PK	74.0	-24.6	2.82 H	63	45.6	3.8
6	4924.00	34.9 AV	54.0	-19.1	2.82 H	63	31.1	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	119.5 PK			2.32 V	8	87.0	32.5
2	*2462.00	106.8 AV			2.32 V	8	74.3	32.5
3	2483.50	68.8 PK	74.0	-5.2	2.32 V	10	36.2	32.6
4	2483.50	53.2 AV	54.0	-0.8	2.32 V	10	20.6	32.6
5	4924.00	51.0 PK	74.0	-23.0	2.15 V	297	47.2	3.8
6	4924.00	36.8 AV	54.0	-17.2	2.15 V	297	33.0	3.8

REMARKS:

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

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	2390.00	59.7 PK	74.0	-14.3	3.48 H	45	27.2	32.5
2	2390.00	47.1 AV	54.0	-6.9	3.48 H	45	14.6	32.5
3	*2422.00	107.6 PK			3.59 H	40	75.2	32.4
4	*2422.00	94.2 AV			3.59 H	40	61.8	32.4
5	4844.00	45.6 PK	74.0	-28.4	2.86 H	62	42.0	3.6
6	4844.00	31.9 AV	54.0	-22.1	2.86 H	62	28.3	3.6
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	69.7 PK	74.0	-4.3	2.09 V	19	37.2	32.5
2	2390.00	53.4 AV	54.0	-0.6	2.09 V	19	20.9	32.5
3	*2422.00	114.8 PK			1.92 V	23	82.4	32.4
4	*2422.00	101.4 AV			1.92 V	23	69.0	32.4
5	4844.00	47.5 PK	74.0	-26.5	2.13 V	309	43.9	3.6
6	4844.00	34.4 AV	54.0	-19.6	2.13 V	309	30.8	3.6

REMARKS:

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

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	59.9 PK	74.0	-14.1	3.33 H	41	27.4	32.5
2	2390.00	46.7 AV	54.0	-7.3	3.33 H	41	14.2	32.5
3	*2437.00	109.8 PK			3.57 H	39	77.4	32.4
4	*2437.00	95.8 AV			3.57 H	39	63.4	32.4
5	4874.00	47.5 PK	74.0	-26.5	2.94 H	74	43.8	3.7
6	4874.00	33.0 AV	54.0	-21.0	2.94 H	74	29.3	3.7
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	69.2 PK	74.0	-4.8	2.22 V	4	36.7	32.5
2	2390.00	53.1 AV	54.0	-0.9	2.22 V	4	20.6	32.5
3	*2437.00	116.9 PK			2.45 V	23	84.5	32.4
4	*2437.00	103.7 AV			2.45 V	23	71.3	32.4
5	4874.00	48.8 PK	74.0	-25.2	2.11 V	299	45.1	3.7
6	4874.00	35.2 AV	54.0	-18.8	2.11 V	299	31.5	3.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
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	108.8 PK			3.60 H	37	76.3	32.5
2	*2452.00	95.9 AV			3.60 H	37	63.4	32.5
3	2483.50	59.3 PK	74.0	-14.7	3.40 H	43	26.7	32.6
4	2483.50	47.0 AV	54.0	-7.0	3.40 H	43	14.4	32.6
5	4904.00	46.1 PK	74.0	-27.9	2.97 H	66	42.3	3.8
6	4904.00	33.0 AV	54.0	-21.0	2.97 H	66	29.2	3.8
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	116.0 PK			2.06 V	6	83.5	32.5
2	*2452.00	103.3 AV			2.06 V	6	70.8	32.5
3	2483.50	67.9 PK	74.0	-6.1	1.92 V	12	35.3	32.6
4	2483.50	53.2 AV	54.0	-0.8	1.92 V	12	20.6	32.6
5	4904.00	48.7 PK	74.0	-25.3	2.03 V	291	44.9	3.8
6	4904.00	35.4 AV	54.0	-18.6	2.03 V	291	31.6	3.8

REMARKS:

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

Below 1 GHz Worst-Case Data:

Mode A

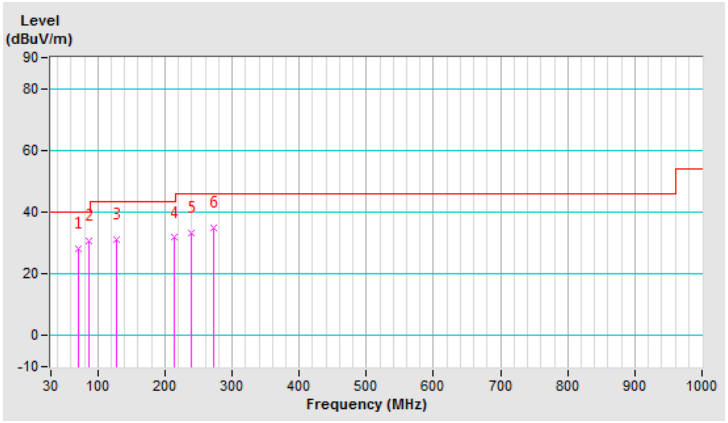
802.11ax (HE20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	70.77	28.3 QP	40.0	-11.7	2.00 H	258	39.5	-11.2
2	86.23	30.5 QP	40.0	-9.5	2.00 H	4	44.4	-13.9
3	128.41	31.1 QP	43.5	-12.4	1.50 H	97	41.3	-10.2
4	214.16	31.7 QP	43.5	-11.8	1.01 H	69	42.4	-10.7
5	239.46	33.2 QP	46.0	-12.8	1.01 H	226	42.8	-9.6
6	271.80	35.1 QP	46.0	-10.9	1.01 H	162	43.3	-8.2

REMARKS:

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

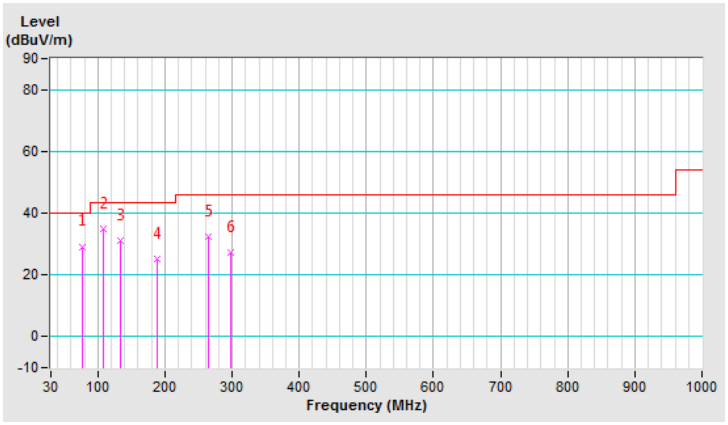


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	76.39	29.2 QP	40.0	-10.8	1.99 V	318	41.7	-12.5
2	107.32	35.0 QP	43.5	-8.5	1.49 V	2	47.1	-12.1
3	134.03	30.9 QP	43.5	-12.6	1.49 V	41	40.5	-9.6
4	188.86	25.1 QP	43.5	-18.4	1.99 V	279	35.7	-10.6
5	264.77	32.4 QP	46.0	-13.6	1.49 V	133	41.1	-8.7
6	297.10	27.3 QP	46.0	-18.7	1.00 V	177	34.8	-7.5

REMARKS:

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



Mode B

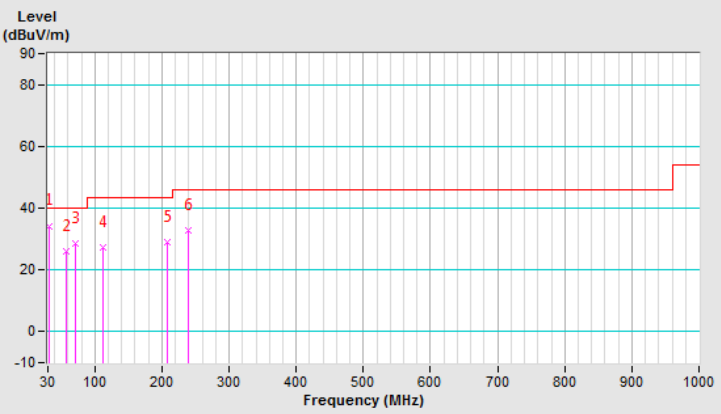
802.11ax (HE20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	31.41	34.3 QP	40.0	-5.7	1.51 H	87	45.2	-10.9
2	56.71	26.1 QP	40.0	-13.9	2.00 H	11	35.4	-9.3
3	70.77	28.4 QP	40.0	-11.6	2.00 H	258	39.6	-11.2
4	111.54	27.5 QP	43.5	-16.0	2.00 H	335	39.3	-11.8
5	207.13	28.8 QP	43.5	-14.7	1.51 H	121	39.7	-10.9
6	239.46	32.8 QP	46.0	-13.2	1.01 H	16	42.4	-9.6

REMARKS:

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

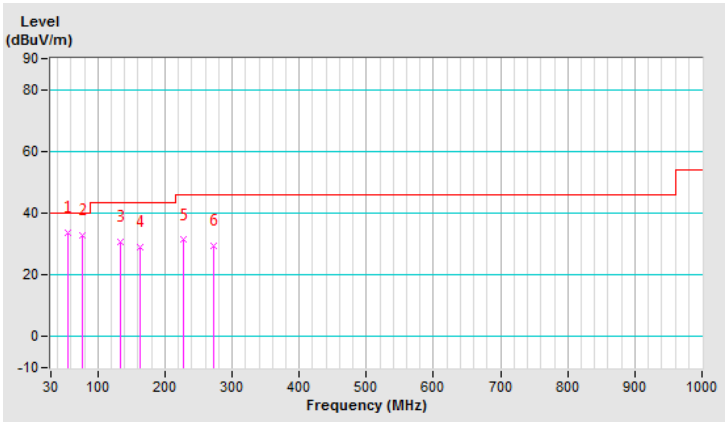


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	55.30	33.8 QP	40.0	-6.2	1.00 V	20	42.8	-9.0
2	76.39	32.8 QP	40.0	-7.2	1.49 V	329	45.3	-12.5
3	134.03	30.8 QP	43.5	-12.7	1.49 V	338	40.4	-9.6
4	162.14	28.9 QP	43.5	-14.6	1.49 V	104	37.6	-8.7
5	226.81	31.3 QP	46.0	-14.7	1.00 V	160	41.7	-10.4
6	271.80	29.6 QP	46.0	-16.4	1.49 V	15	37.8	-8.2

REMARKS:

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



Mode C

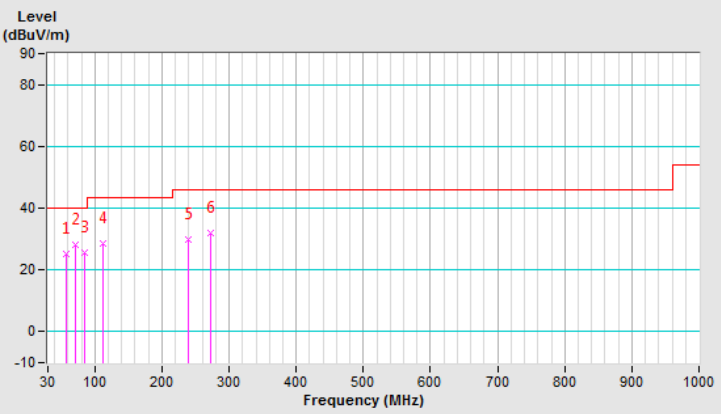
802.11ax (HE20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	56.71	25.1 QP	40.0	-14.9	2.00 H	40	34.4	-9.3
2	70.77	28.2 QP	40.0	-11.8	2.00 H	211	39.4	-11.2
3	84.83	25.7 QP	40.0	-14.3	2.00 H	54	39.5	-13.8
4	111.54	28.6 QP	43.5	-14.9	2.00 H	200	40.4	-11.8
5	239.46	30.0 QP	46.0	-16.0	1.51 H	216	39.6	-9.6
6	271.80	31.8 QP	46.0	-14.2	1.00 H	301	40.0	-8.2

REMARKS:

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

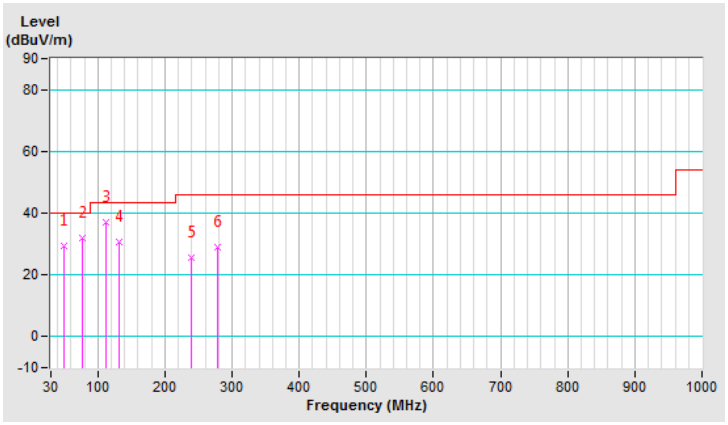


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	49.68	29.4 QP	40.0	-10.6	2.00 V	149	38.4	-9.0
2	76.39	31.8 QP	40.0	-8.2	1.51 V	21	44.3	-12.5
3	111.54	36.9 QP	43.5	-6.6	1.00 V	16	48.7	-11.8
4	131.22	30.6 QP	43.5	-12.9	1.51 V	10	40.6	-10.0
5	239.46	25.7 QP	46.0	-20.3	2.00 V	335	35.3	-9.6
6	277.42	28.9 QP	46.0	-17.1	1.51 V	107	36.9	-8.0

REMARKS:

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



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

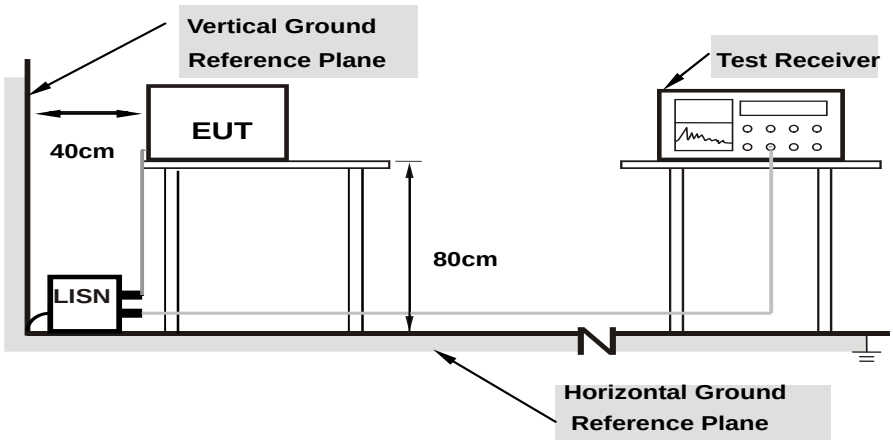
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

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

4.2.7 Test Results

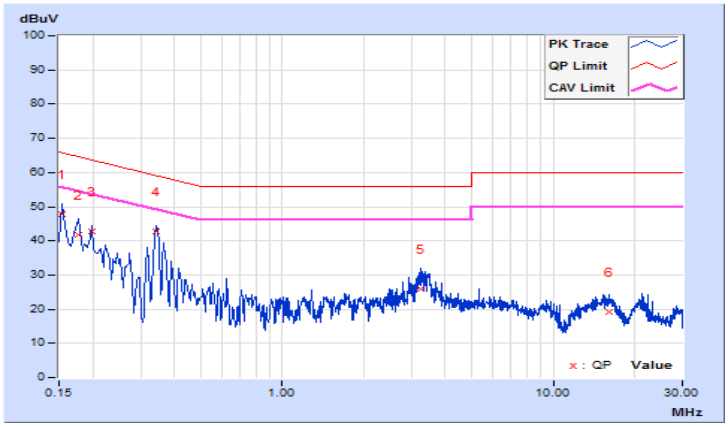
Mode A

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.67	38.03	26.29	47.70	35.96	65.78	55.78	-18.08	-19.82
2	0.17800	9.66	32.21	19.33	41.87	28.99	64.58	54.58	-22.71	-25.59
3	0.19800	9.66	33.21	19.82	42.87	29.48	63.69	53.69	-20.82	-24.21
4	**0.34124**	**9.68**	**33.18**	**32.05**	**42.86**	**41.73**	**59.17**	**49.17**	**-16.31**	**-7.44**
5	3.23800	9.82	16.19	5.61	26.01	15.43	56.00	46.00	-29.99	-30.57
6	16.17400	9.97	9.06	4.33	19.03	14.30	60.00	50.00	-40.97	-35.70

Remarks:

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

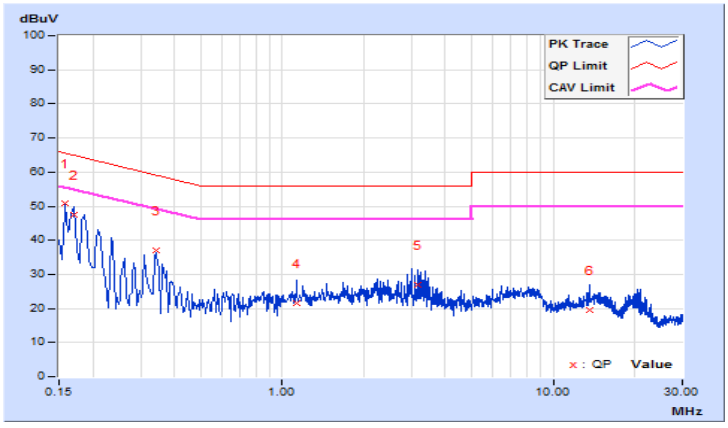


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	9.64	41.14	29.76	50.78	39.40	65.57	55.57	-14.79	-16.17
2	0.16932	9.64	37.85	23.81	47.49	33.45	64.99	54.99	-17.50	-21.54
3	0.34200	9.65	27.38	24.70	37.03	34.35	59.15	49.15	-22.12	-14.80
4	1.13000	9.71	11.71	3.66	21.42	13.37	56.00	46.00	-34.58	-32.63
5	3.16600	9.78	17.29	7.57	27.07	17.35	56.00	46.00	-28.93	-28.65
6	13.58600	9.97	9.53	3.90	19.50	13.87	60.00	50.00	-40.50	-36.13

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



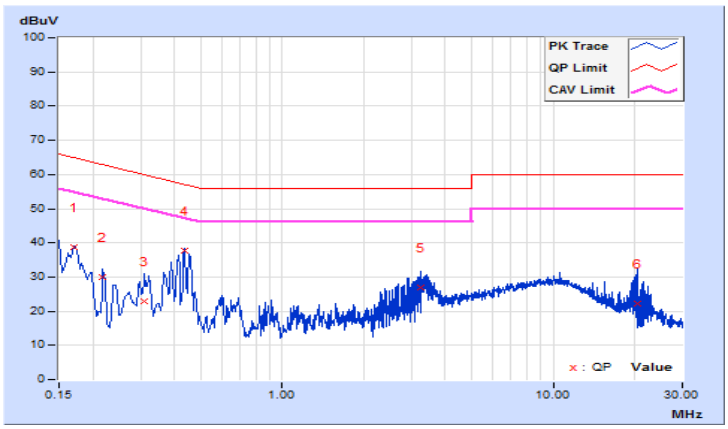
Mode B

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17000	9.67	29.03	19.74	38.70	29.41	64.96	54.96	-26.26	-25.55
2	0.21800	9.66	20.17	7.77	29.83	17.43	62.89	52.89	-33.06	-35.46
3	0.31000	9.68	13.36	8.26	23.04	17.94	59.97	49.97	-36.93	-32.03
4	0.43370	9.69	27.91	27.27	37.60	36.96	57.18	47.18	-19.58	-10.22
5	3.25400	9.82	17.25	8.09	27.07	17.91	56.00	46.00	-28.93	-28.09
6	20.61400	9.98	12.12	2.35	22.10	12.33	60.00	50.00	-37.90	-37.67

Remarks:

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

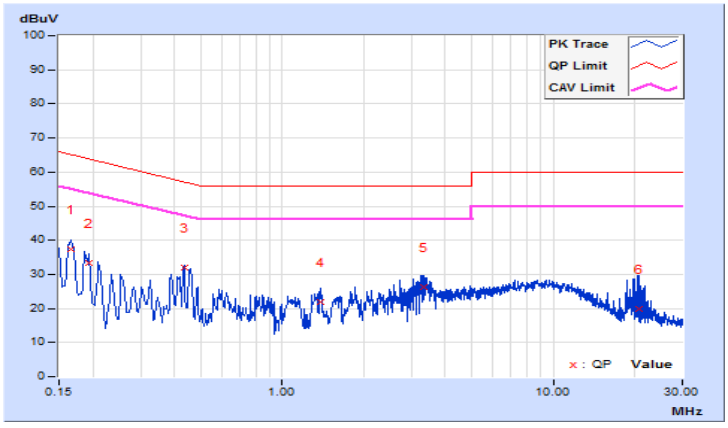


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16600	9.64	27.60	15.56	37.24	25.20	65.16	55.16	-27.92	-29.96
2	0.19400	9.64	23.72	10.62	33.36	20.26	63.86	53.86	-30.50	-33.60
3	0.43370	9.66	22.33	21.03	31.99	30.69	57.18	47.18	-25.19	-16.49
4	1.37800	9.72	12.19	6.03	21.91	15.75	56.00	46.00	-34.09	-30.25
5	3.33400	9.79	16.33	9.03	26.12	18.82	56.00	46.00	-29.88	-27.18
6	20.71400	10.06	9.97	2.31	20.03	12.37	60.00	50.00	-39.97	-37.63

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



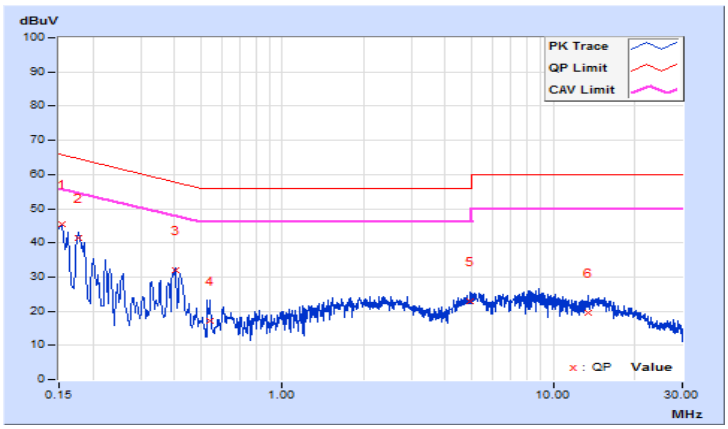
Mode C

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.67	35.79	21.04	45.46	30.71	65.78	55.78	-20.32	-25.07
2	0.17800	9.66	31.91	17.11	41.57	26.77	64.58	54.58	-23.01	-27.81
3	0.40179	9.69	22.30	16.67	31.99	26.36	57.82	47.82	-25.83	-21.46
4	0.54200	9.70	7.42	1.36	17.12	11.06	56.00	46.00	-38.88	-34.94
5	4.93400	9.85	13.14	5.79	22.99	15.64	56.00	46.00	-33.01	-30.36
6	13.46600	9.95	9.43	2.82	19.38	12.77	60.00	50.00	-40.62	-37.23

Remarks:

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

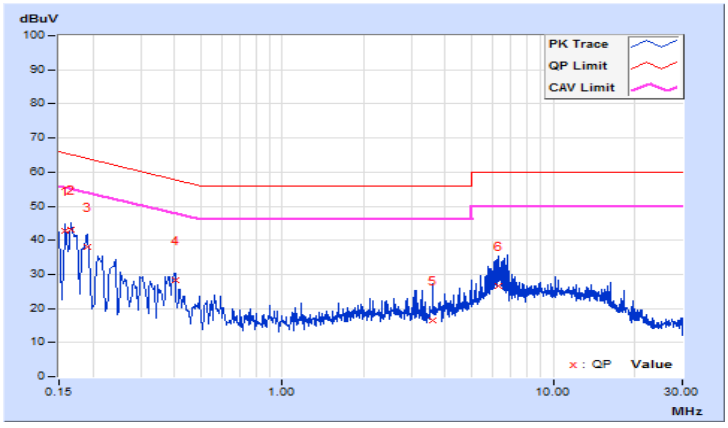


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23℃, 67%RH
Tested by	Adair Peng	Test Date	2019/11/16

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	9.64	33.26	17.91	42.90	27.55	65.57	55.57	-22.67	-28.02
2	0.16600	9.64	33.34	17.01	42.98	26.65	65.16	55.16	-22.18	-28.51
3	0.19000	9.64	28.25	12.40	37.89	22.04	64.04	54.04	-26.15	-32.00
4	0.40179	9.66	18.64	12.98	28.30	22.64	57.82	47.82	-29.52	-25.18
5	3.60200	9.80	6.86	1.22	16.66	11.02	56.00	46.00	-39.34	-34.98
6	6.32200	9.85	16.79	8.94	26.64	18.79	60.00	50.00	-33.36	-31.21

Remarks:

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

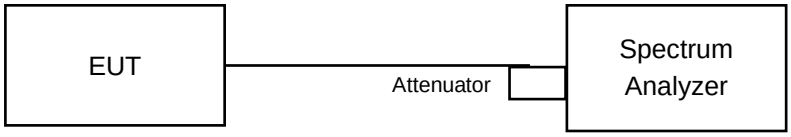


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.07	8.08	0.5	Pass
6	2437	7.59	7.62	0.5	Pass
11	2462	8.10	7.57	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.36	16.38	0.5	Pass
6	2437	15.98	16.32	0.5	Pass
11	2462	15.98	15.79	0.5	Pass

802.11ax (HE20)

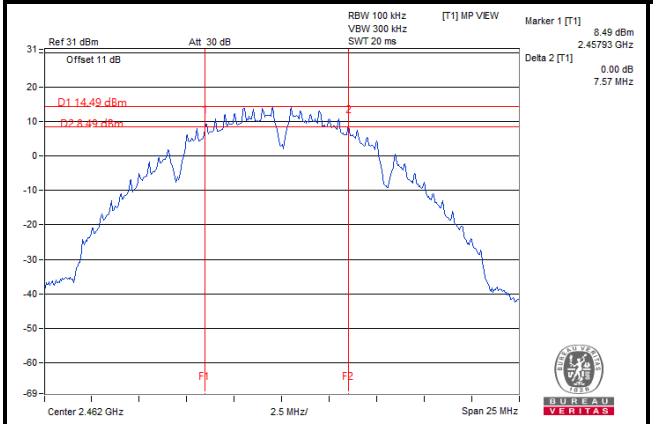
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.70	18.95	0.5	Pass
6	2437	18.71	18.95	0.5	Pass
11	2462	18.65	18.44	0.5	Pass

802.11ax (HE40)

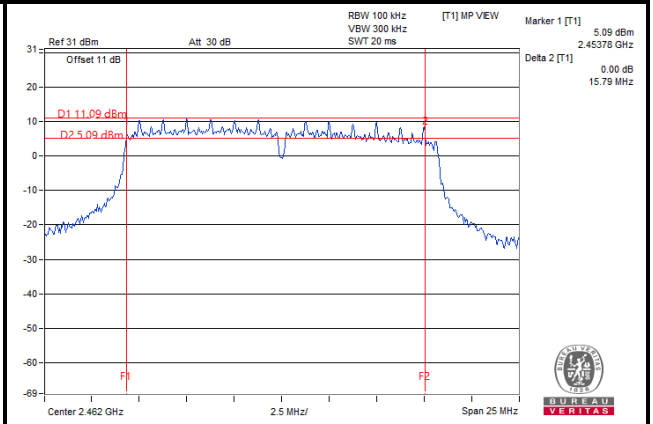
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	38.21	38.04	0.5	Pass
6	2437	37.87	37.82	0.5	Pass
9	2452	37.45	36.32	0.5	Pass

Spectrum Plot of Worst Value

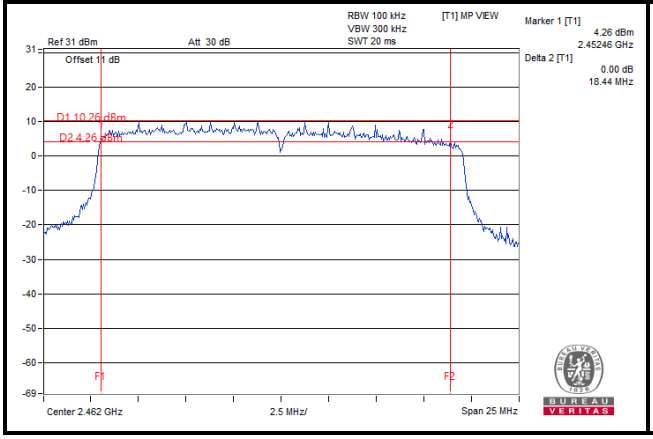
802.11b



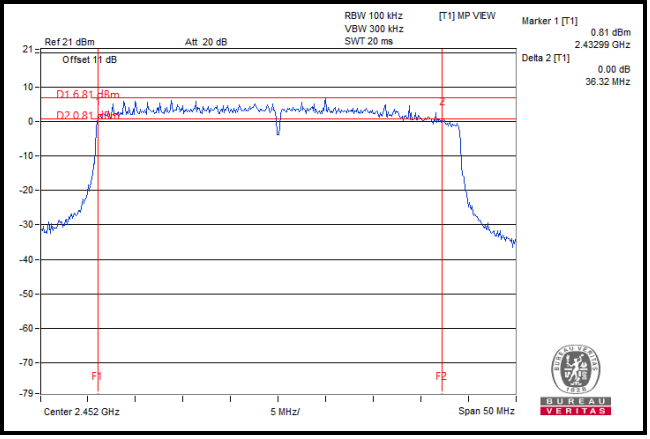
802.11g



802.11ax (HE20)

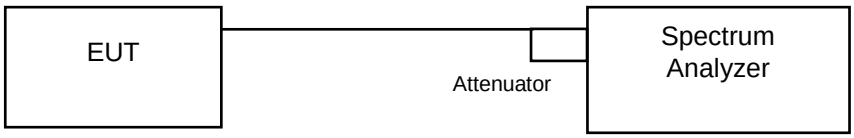


802.11ax (HE40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

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

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	13.13	13.04	Pass
6	2437	13.32	13.20	Pass
11	2462	12.96	12.84	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.44	16.44	Pass
6	2437	16.80	16.56	Pass
11	2462	16.56	16.44	Pass

802.11ax (HE20)

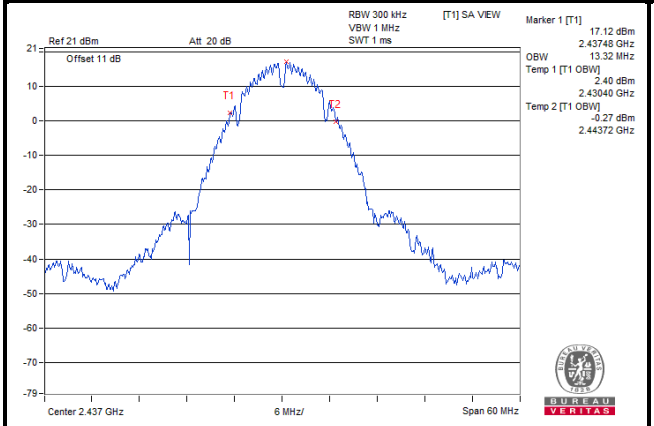
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	18.84	18.96	Pass
6	2437	19.20	19.08	Pass
11	2462	18.96	18.96	Pass

802.11ax (HE40)

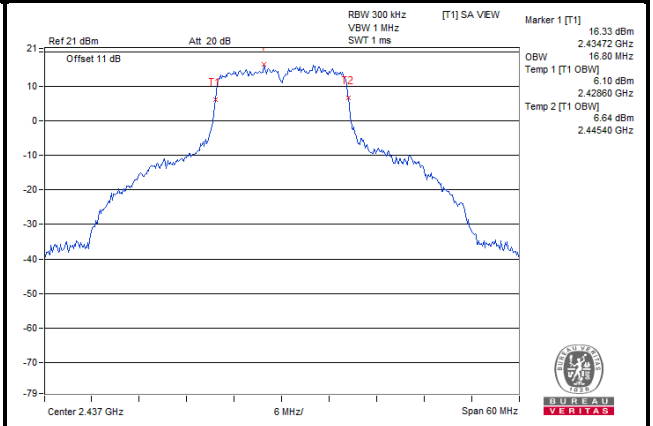
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	38.04	38.04	Pass
6	2437	37.92	38.16	Pass
9	2452	37.80	37.92	Pass

Spectrum Plot of Worst Value

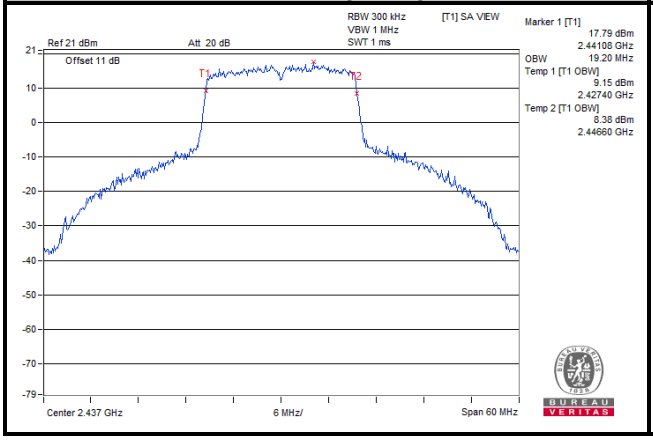
802.11b



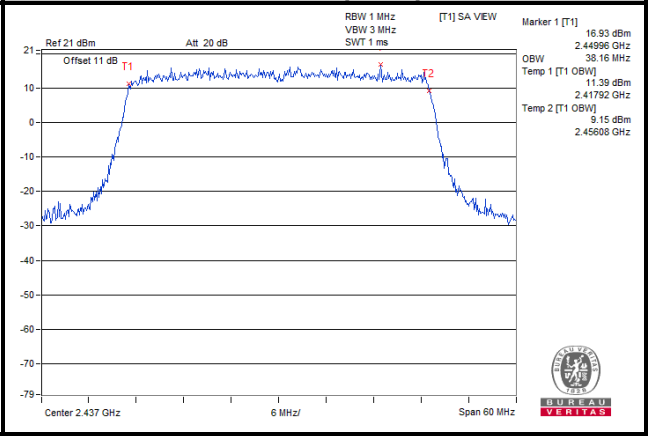
802.11g



802.11ax (HE20)



802.11ax (HE40)



4.5 Conducted Output Power Measurement

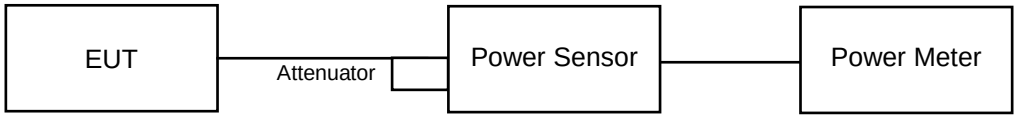
4.5.1 Limits of Conducted Output Power Measurement

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

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;
Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20 MHz channel widths with NANT ≥ 5.

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

CDD Mode:

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.65	24.55	576.845	27.61	30	Pass
6	2437	25.10	24.92	634.05	28.02	30	Pass
11	2462	23.06	22.88	396.391	25.98	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.41	20.52	222.621	23.48	30	Pass
6	2437	24.99	24.71	611.301	27.86	30	Pass
11	2462	22.21	22.10	328.522	25.17	30	Pass

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.80	20.01	195.73	22.92	30	Pass
6	2437	24.90	24.79	610.331	27.86	30	Pass
11	2462	21.90	21.84	307.639	24.88	30	Pass

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.22	17.46	108.442	20.35	30	Pass
6	2437	20.93	20.58	238.168	23.77	30	Pass
9	2452	21.36	21.45	276.41	24.42	30	Pass

Beamforming Mode:

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.80	20.01	195.73	22.92	30	Pass
6	2437	24.90	24.79	610.331	27.86	30	Pass
11	2462	21.90	21.84	307.639	24.88	30	Pass

Note:

Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi <6 dBi, so the limit no need to be reduced.

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.22	17.46	108.442	20.35	30	Pass
6	2437	20.93	20.58	238.168	23.77	30	Pass
9	2452	21.36	21.45	276.41	24.42	30	Pass

Note:

Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi <6 dBi, so the limit no need to 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 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.6.2 Test Setup

4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

802.11b

TX Chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/10 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-9.92	3.01	1.30	-5.61	8	Pass
	6	2437	-9.88	3.01	1.30	-5.57	8	Pass
	11	2462	-9.09	3.01	1.30	-4.78	8	Pass
1	1	2412	-9.18	3.01	1.30	-4.87	8	Pass
	6	2437	-16.81	3.01	1.30	-12.50	8	Pass
	11	2462	-12.16	3.01	1.30	-7.85	8	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi < 6 dBi, so the limit no need to be reduced.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/10 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-10.19	3.01	0.31	-6.87	8	Pass
	6	2437	-6.14	3.01	0.31	-2.82	8	Pass
	11	2462	-8.27	3.01	0.31	-4.95	8	Pass
1	1	2412	-9.93	3.01	0.31	-6.61	8	Pass
	6	2437	-6.49	3.01	0.31	-3.17	8	Pass
	11	2462	-7.63	3.01	0.31	-4.31	8	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi < 6 dBi, so the limit no need to be reduced.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX Chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/10 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-12.97	3.01	0.25	-9.71	8	Pass
	6	2437	-7.78	3.01	0.25	-4.52	8	Pass
	11	2462	-10.13	3.01	0.25	-6.87	8	Pass
1	1	2412	-12.69	3.01	0.25	-9.43	8	Pass
	6	2437	-8.60	3.01	0.25	-5.34	8	Pass
	11	2462	-11.06	3.01	0.25	-7.80	8	Pass

NOTE:

1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi < 6 dBi, so the limit no need to be reduced.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

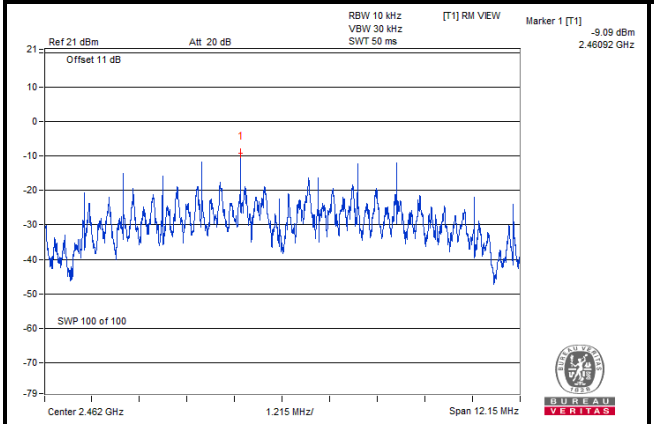
TX Chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/10 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-18.78	3.01	0.28	-15.49	8	Pass
	6	2437	-14.39	3.01	0.28	-11.10	8	Pass
	9	2452	-14.41	3.01	0.28	-11.12	8	Pass
1	3	2422	-18.20	3.01	0.28	-14.91	8	Pass
	6	2437	-14.87	3.01	0.28	-11.58	8	Pass
	9	2452	-13.82	3.01	0.28	-10.53	8	Pass

NOTE:

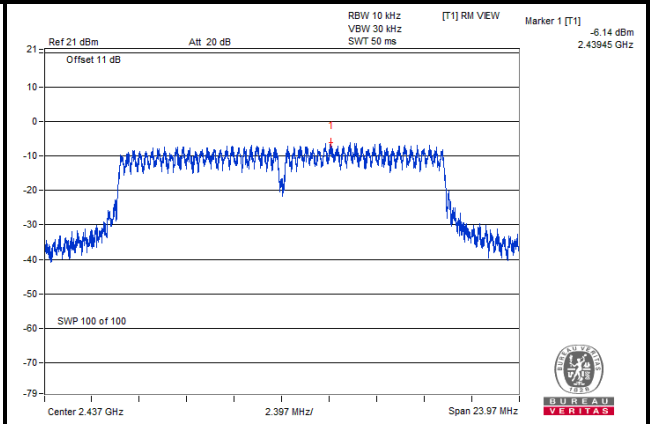
1. Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi < 6 dBi, so the limit no need to be reduced.
2. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

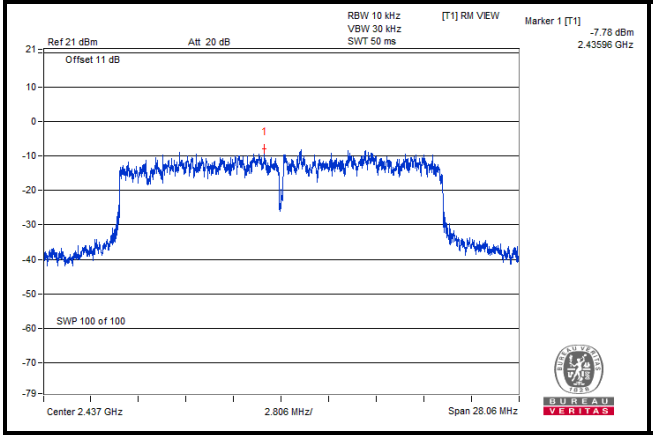
802.11b



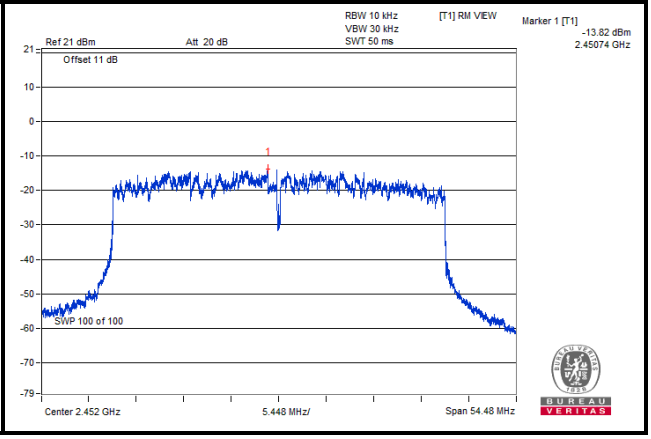
802.11g



802.11ax (HE20)



802.11ax (HE40)

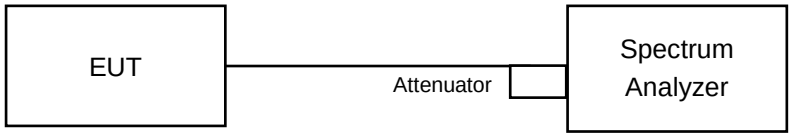


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

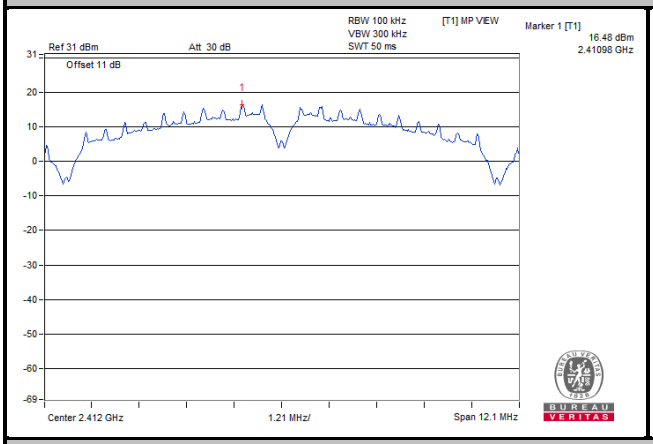
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

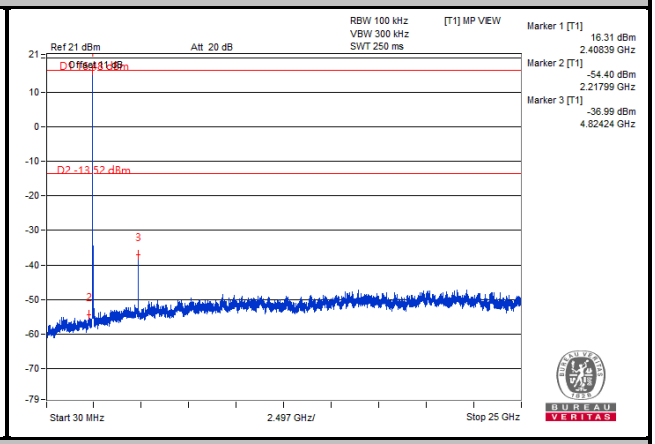
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

802.11b

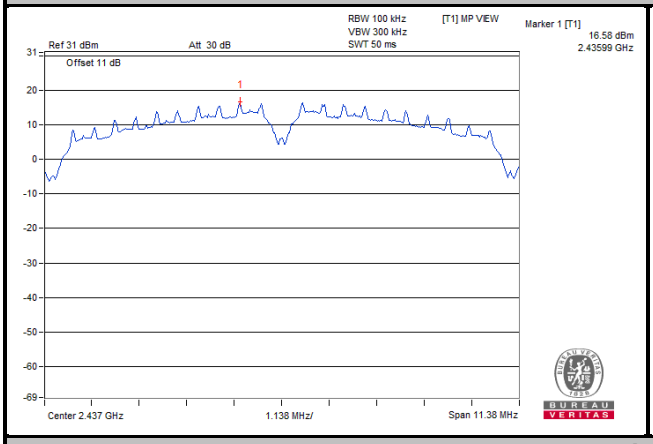
CHAIN 0

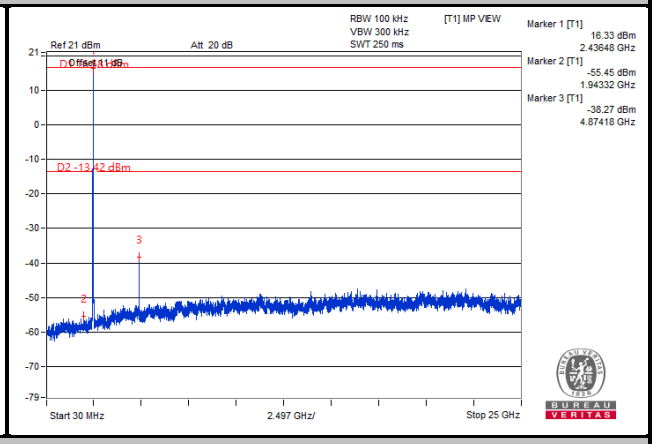
Ch 1



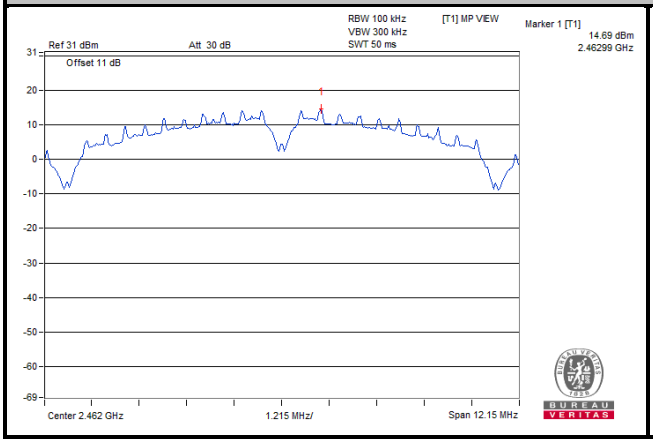


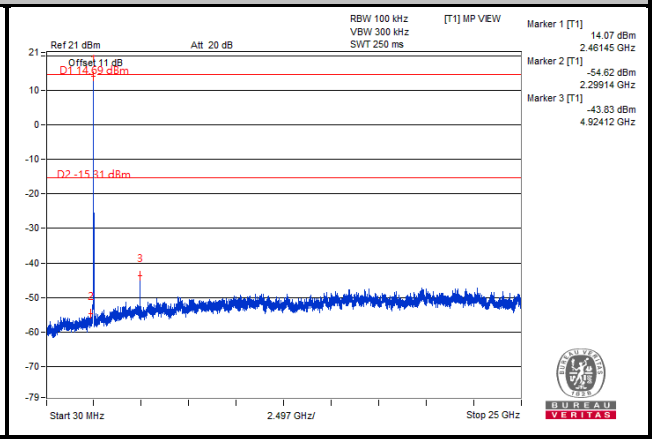
Ch 6

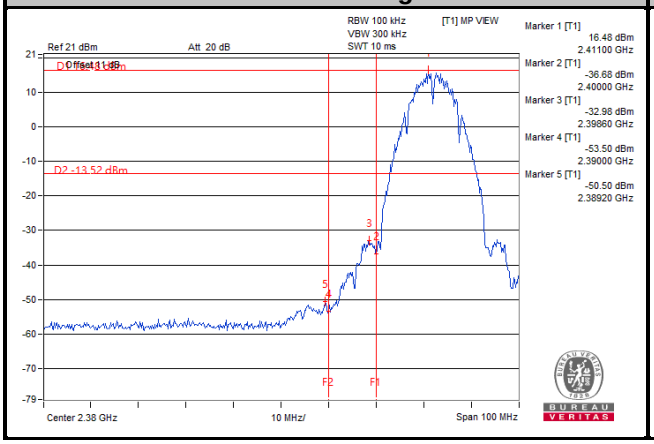
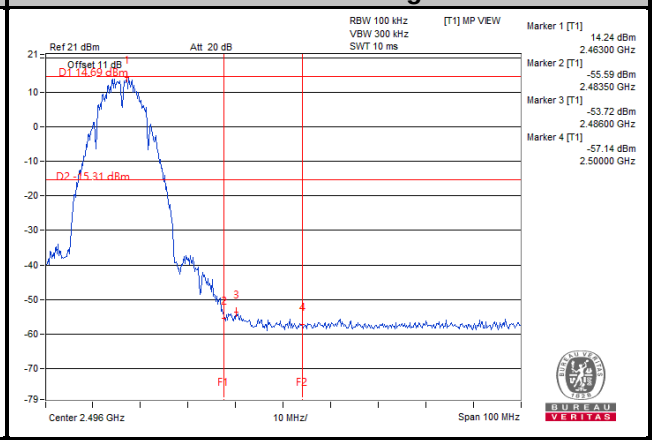




Ch 11

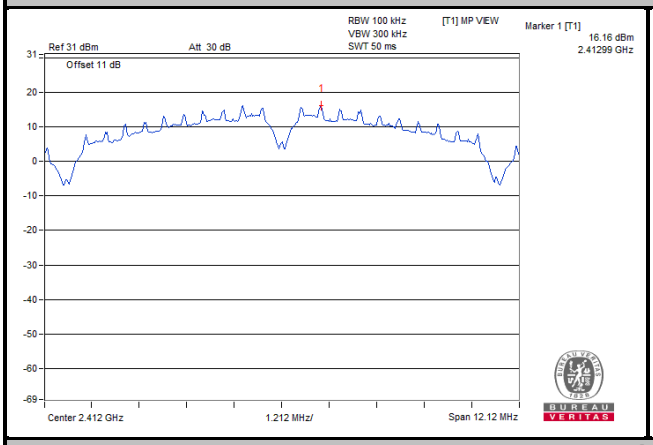


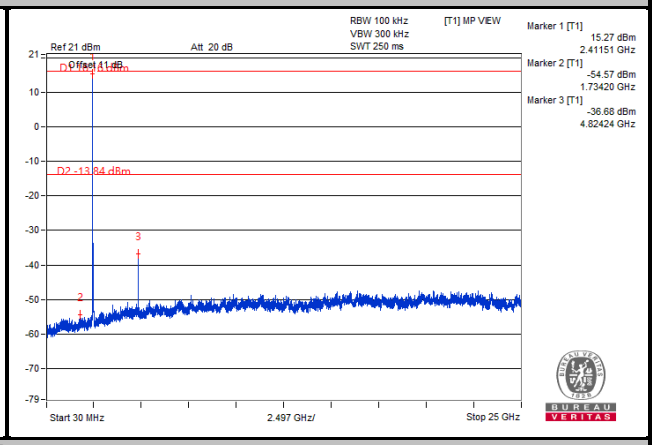


Ch 1 Band Edge	Ch 11 Band Edge
	

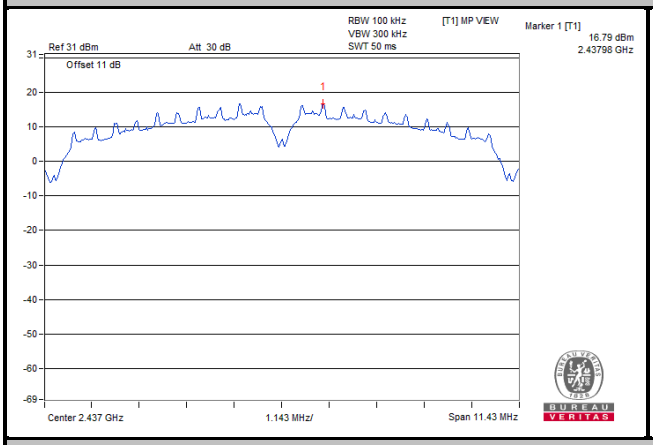
CHAIN 1

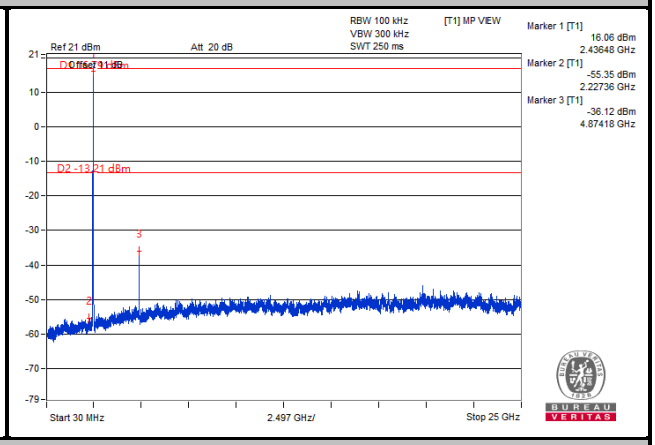
Ch 1



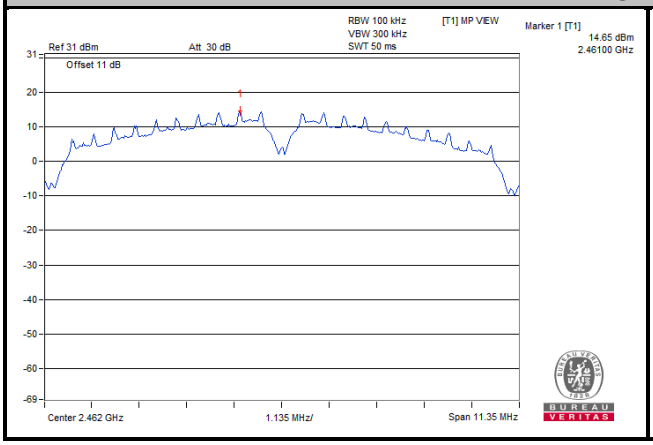


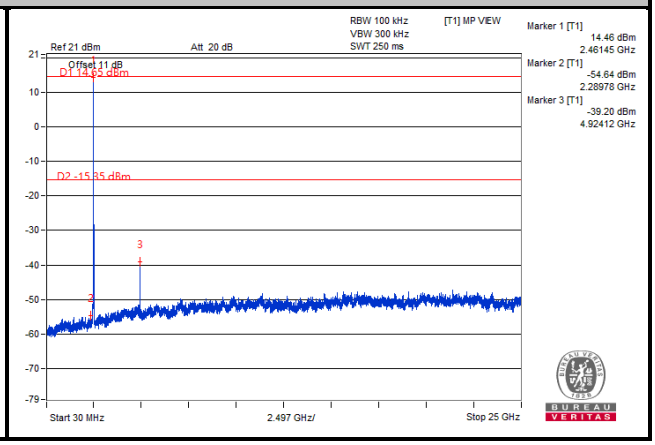
Ch 6

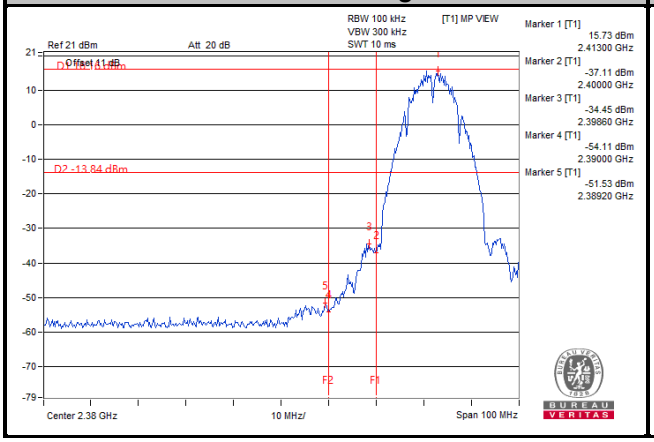
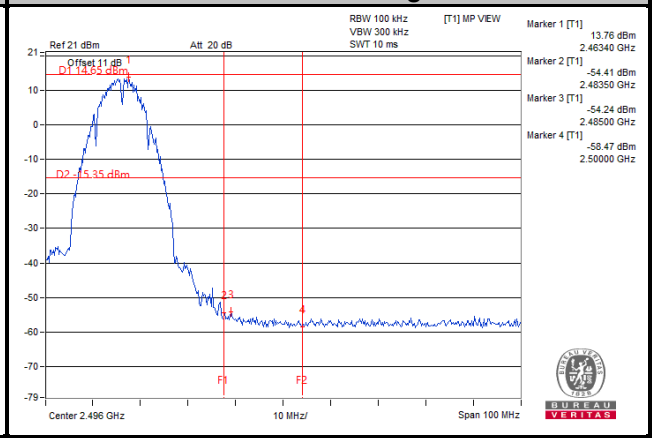




Ch 11





Ch 1 Band Edge	Ch 11 Band Edge
	

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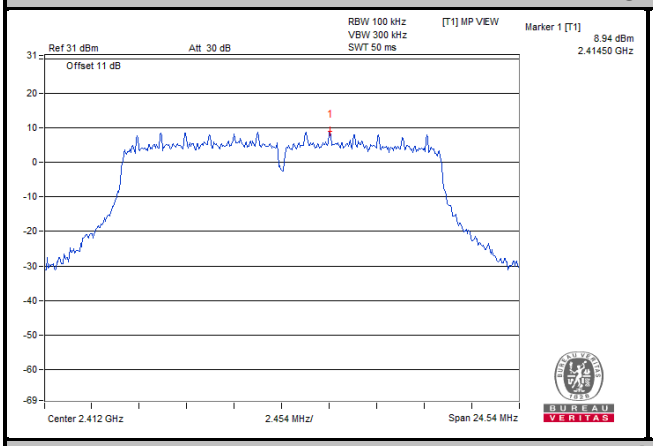
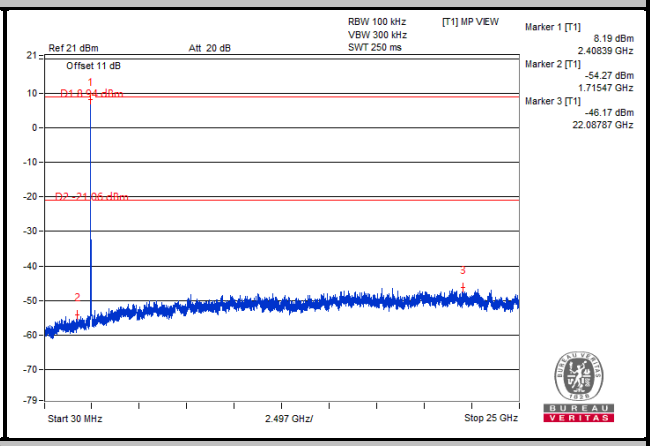
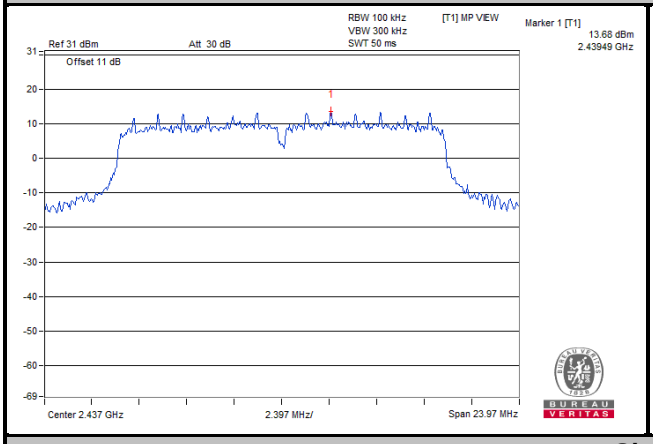
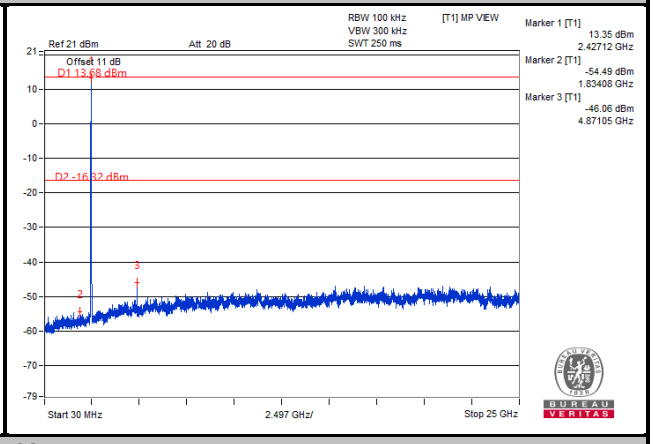
Ch 1



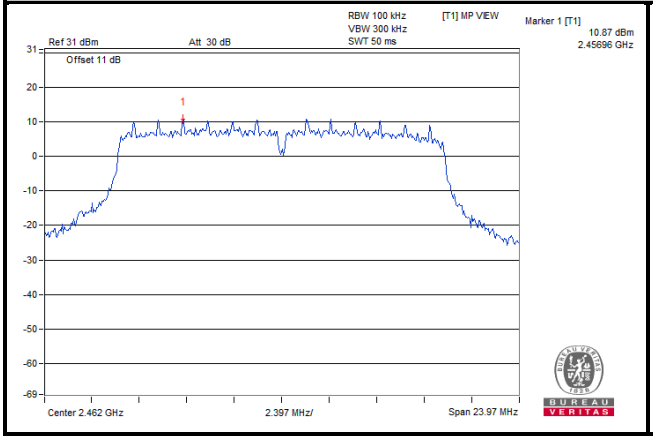


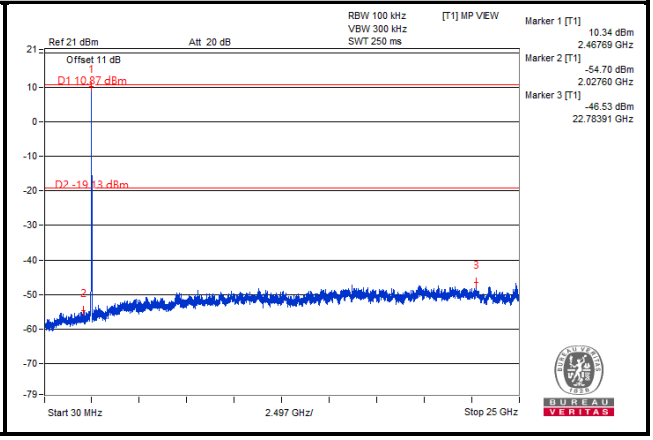
Ch 6

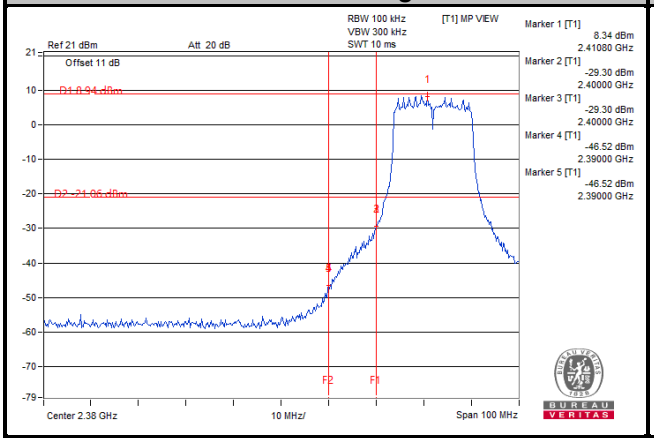
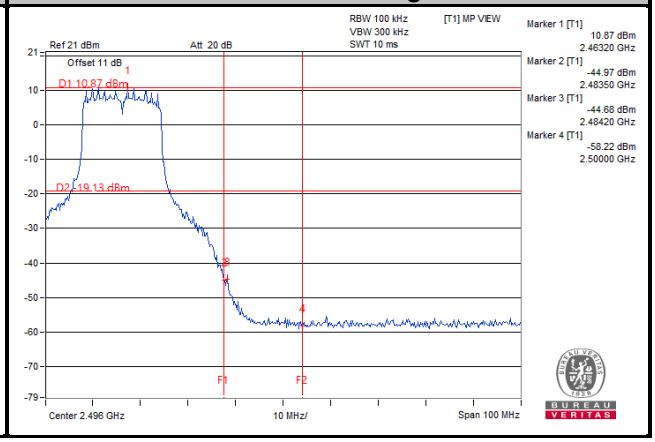




Ch 11

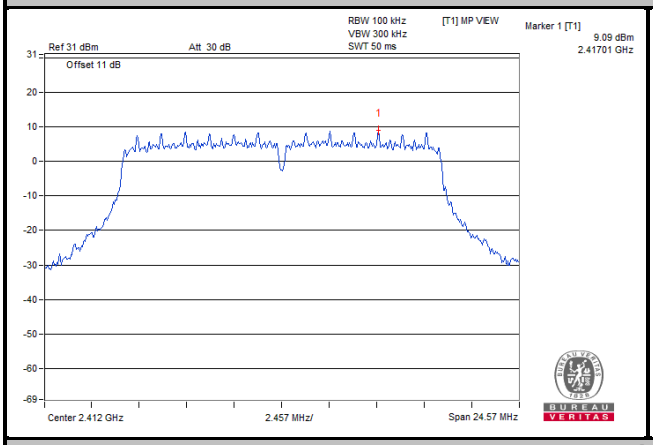


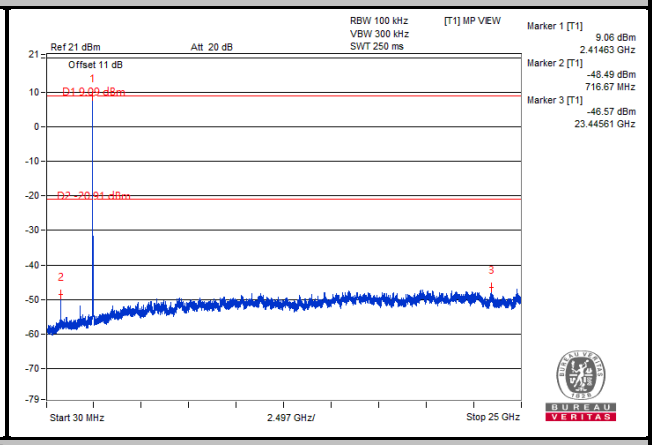


Ch 1 Band Edge	Ch 11 Band Edge
	

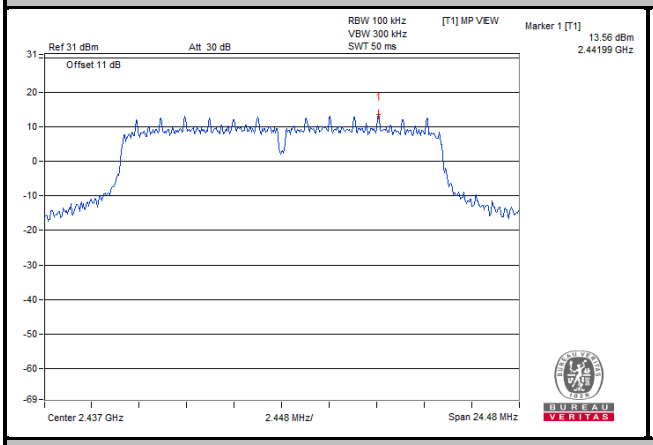
CHAIN 1

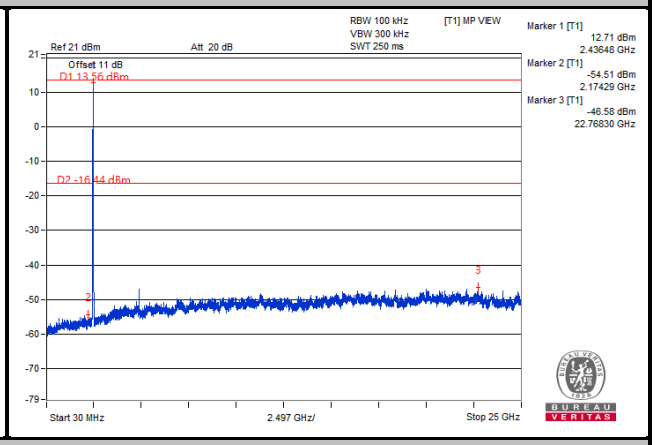
Ch 1



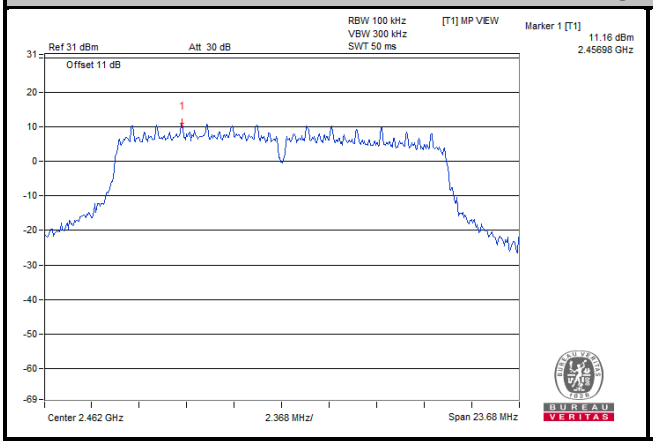


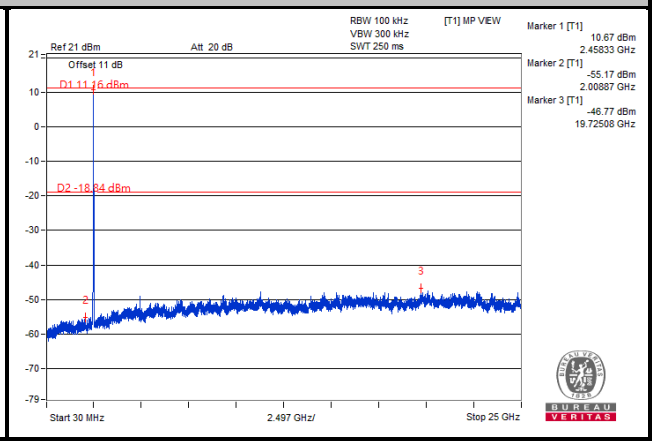
Ch 6

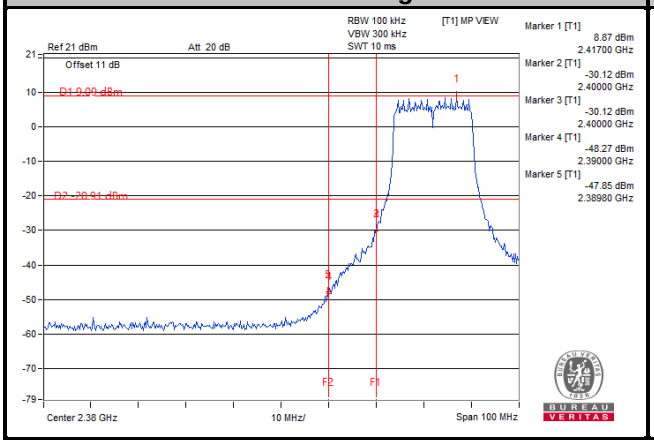
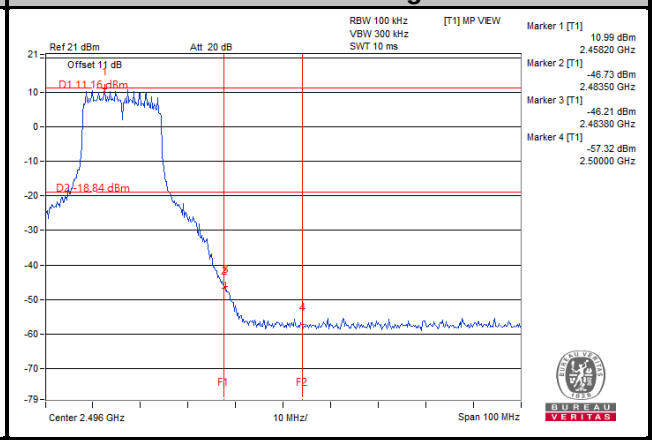




Ch 11





Ch 1 Band Edge	Ch 11 Band Edge
	

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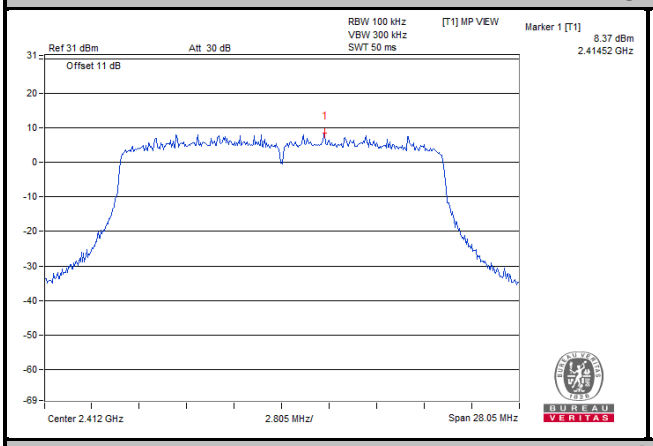
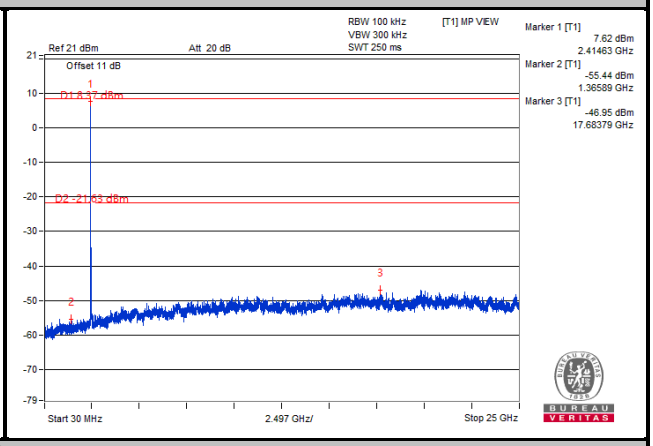
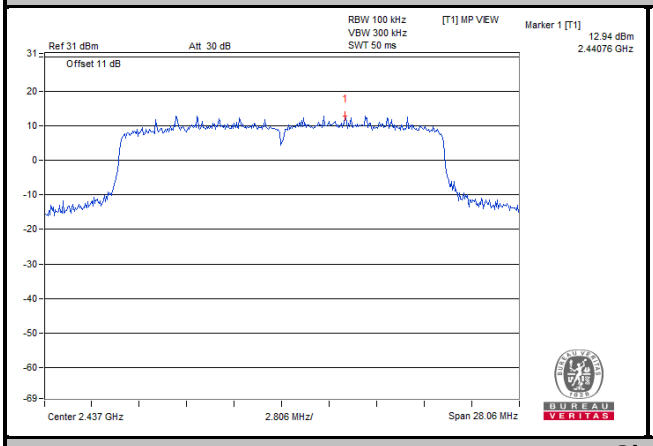
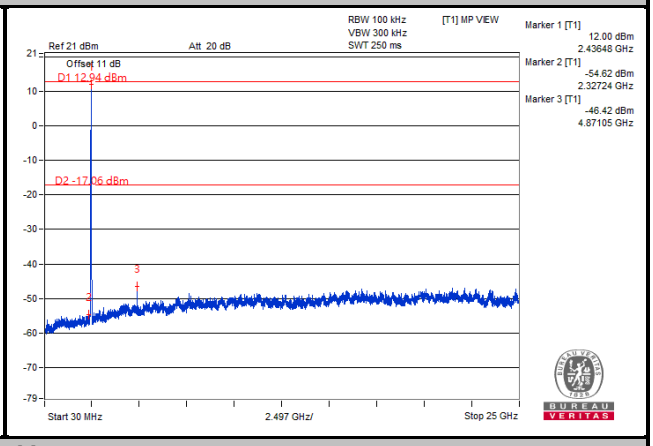
Ch 1



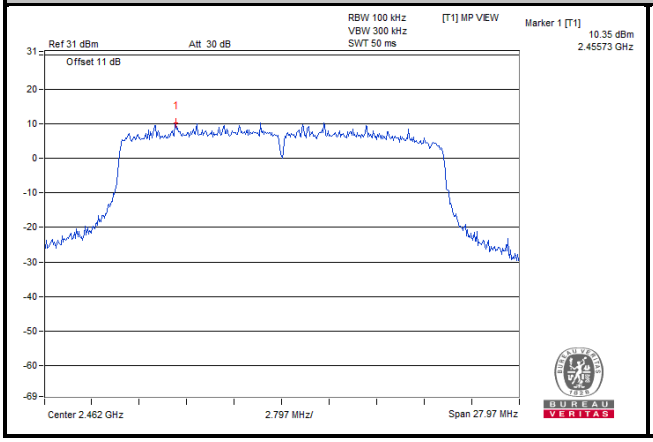


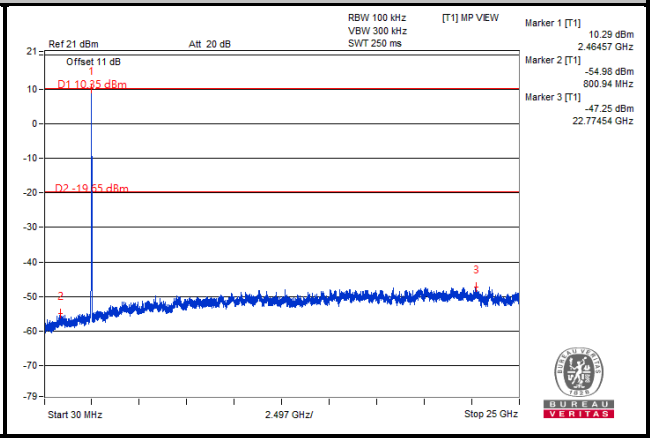
Ch 6

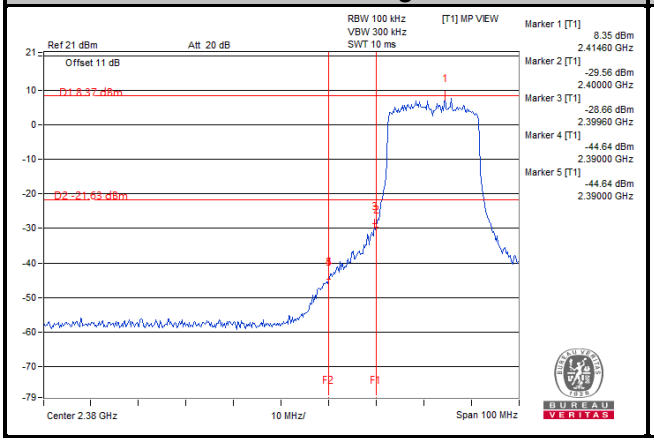
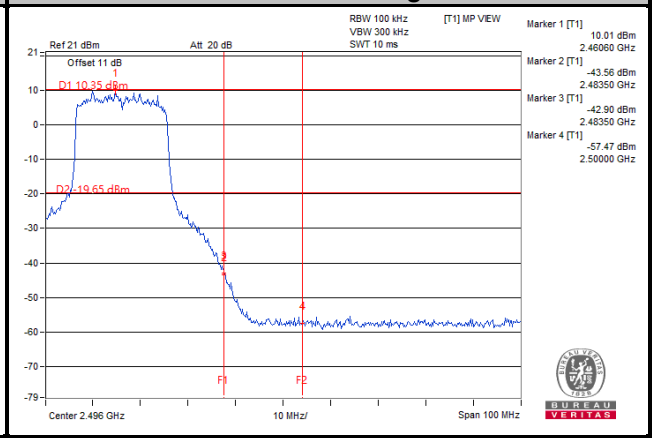




Ch 11

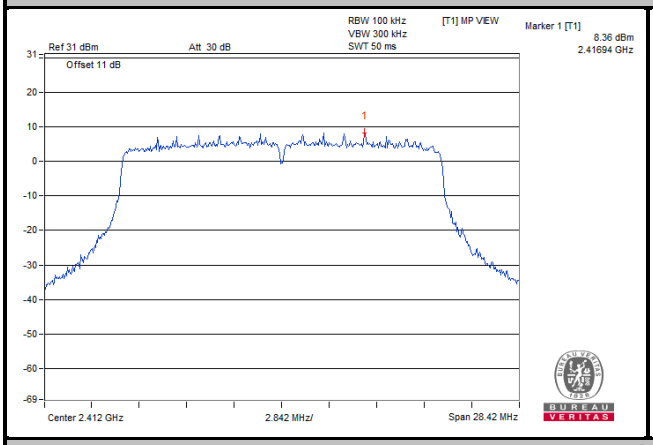


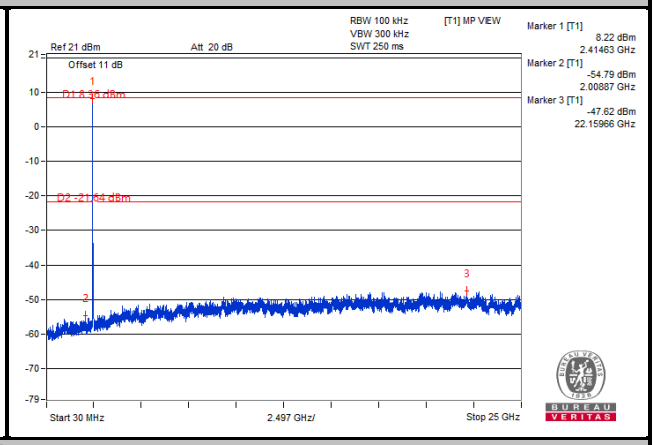


Ch 1 Band Edge	Ch 11 Band Edge
	

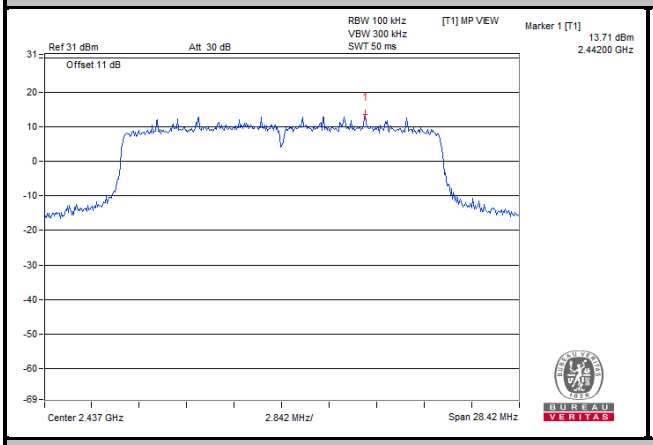
CHAIN 1

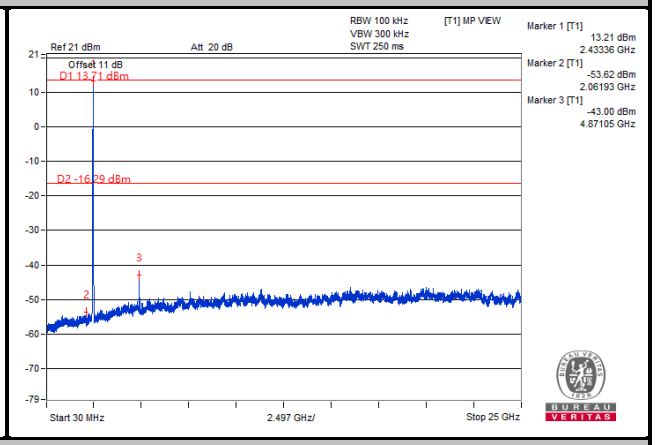
Ch 1



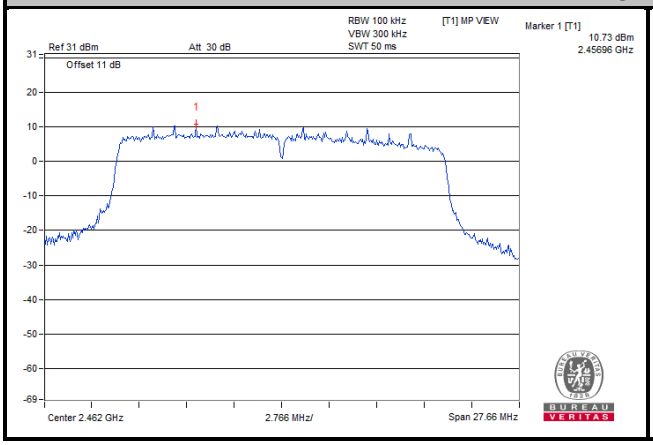


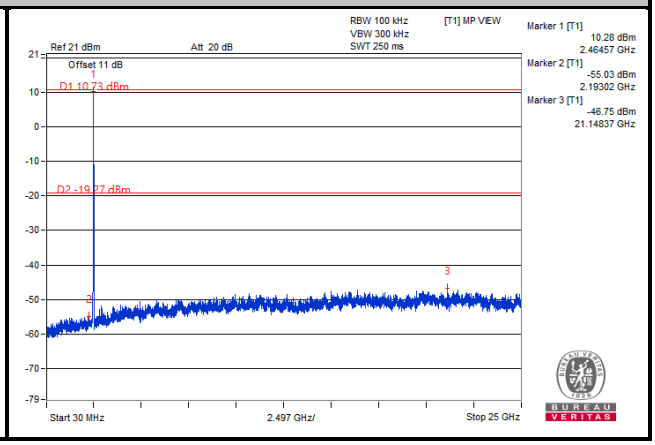
Ch 6

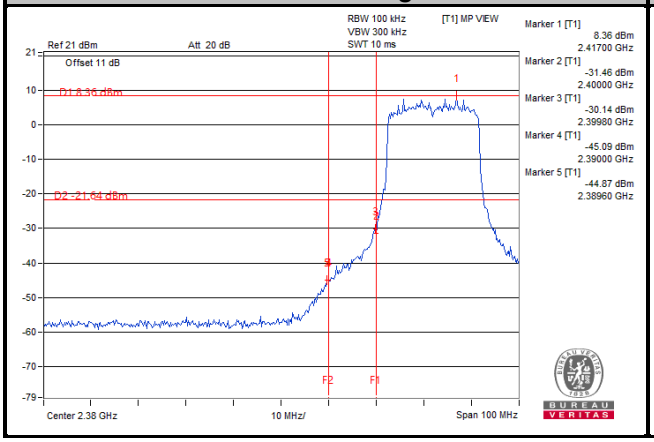
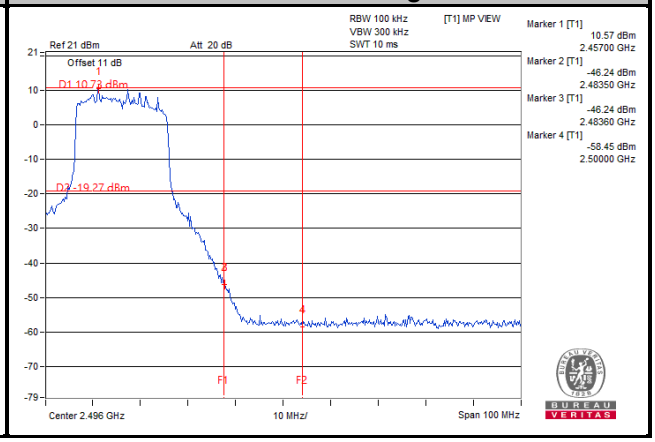




Ch 11





Ch 1 Band Edge	Ch 11 Band Edge
	

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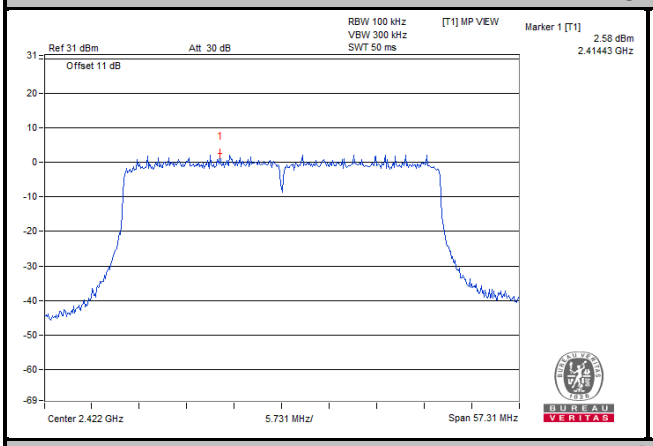
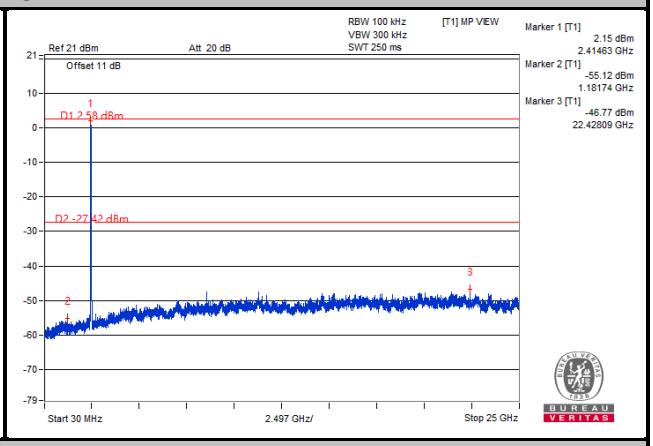
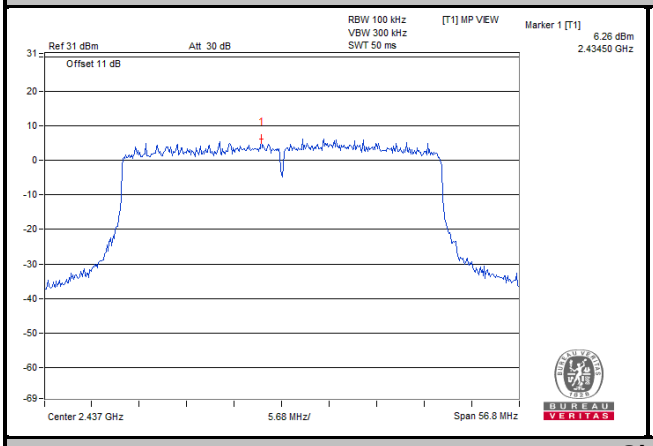
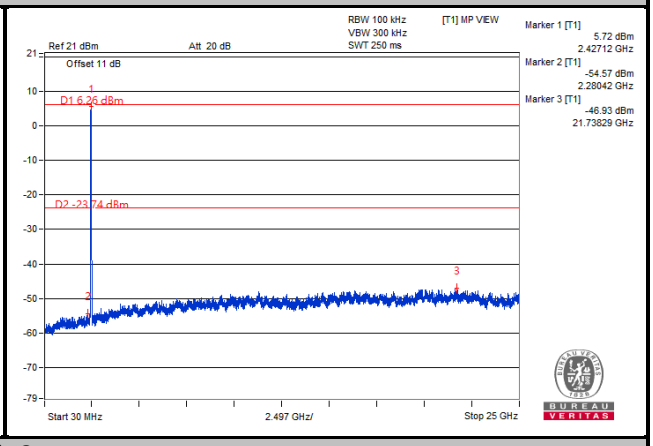
Ch 3



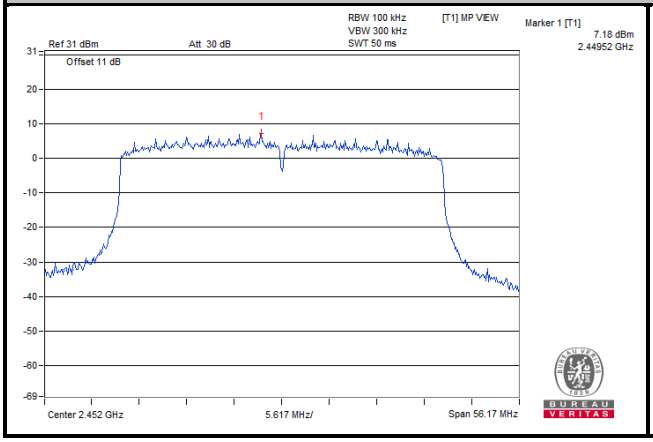


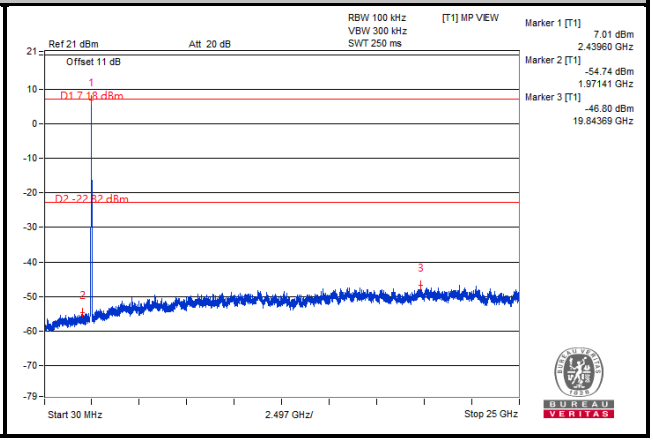
Ch 6

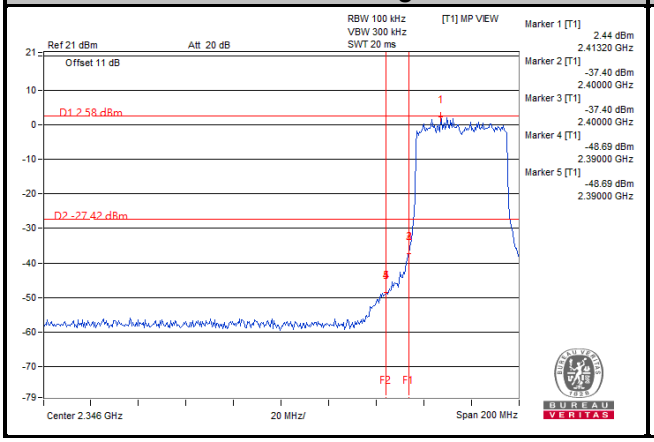
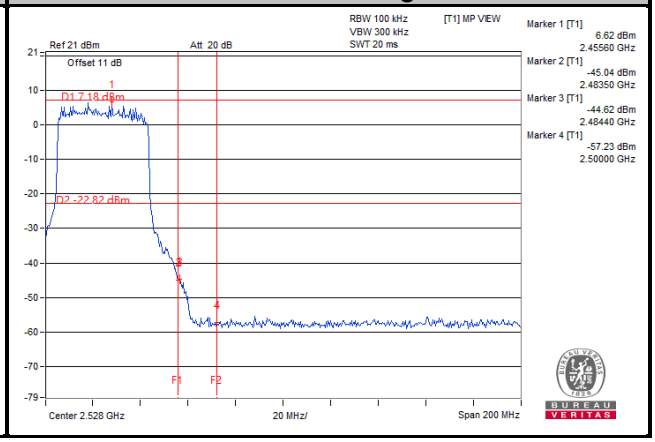




Ch 9

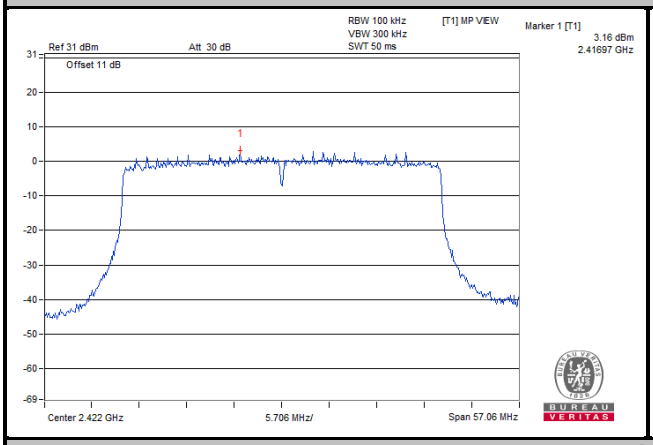


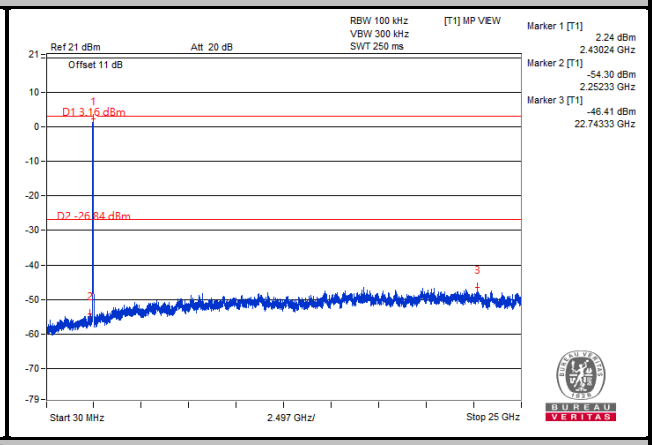


Ch 3 Band Edge	Ch 9 Band Edge
	

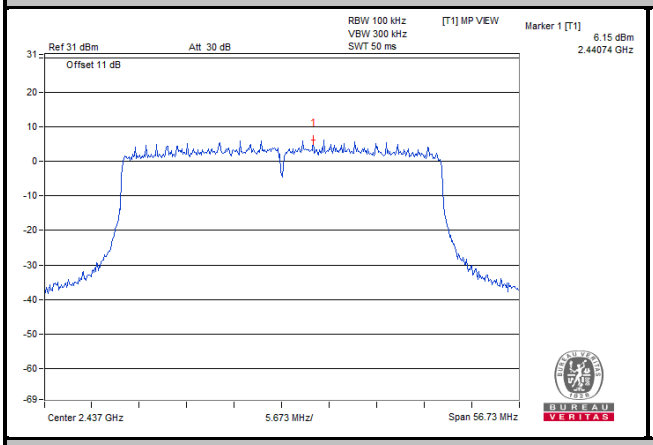
CHAIN 1

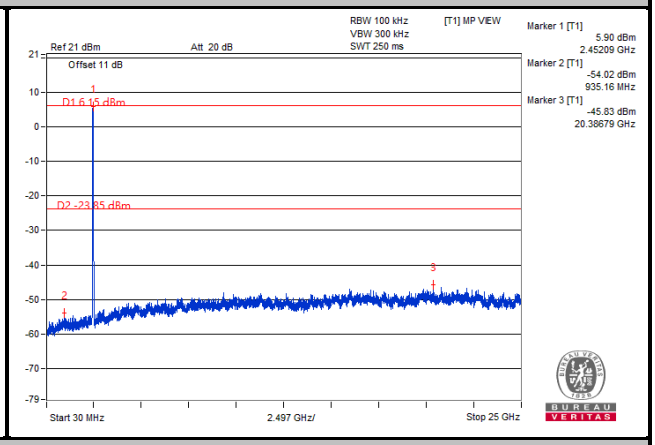
Ch 3



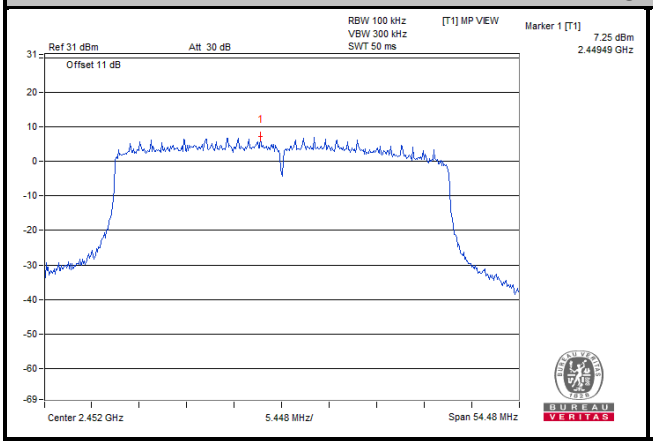


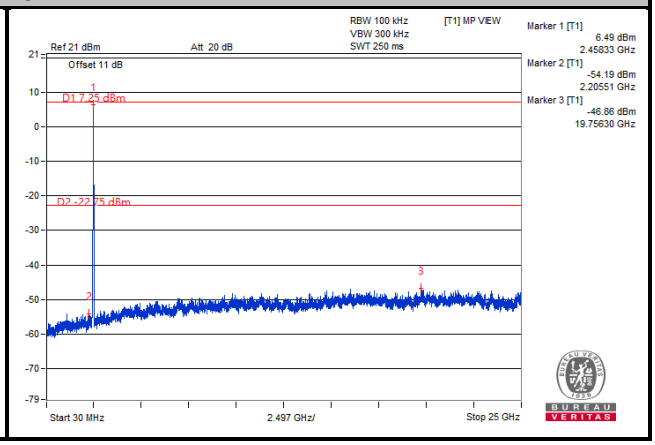
Ch 6

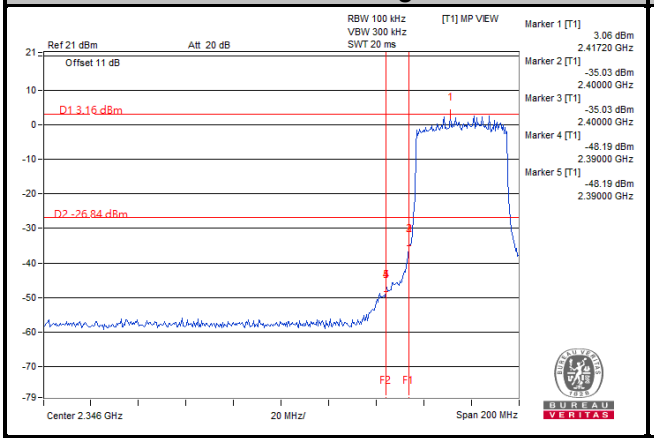
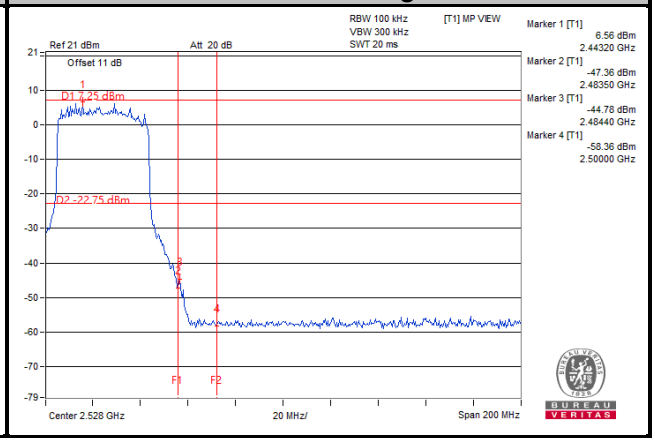




Ch 9





Ch 3 Band Edge	Ch 9 Band Edge
	

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

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

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

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