

FCC Test Report

Report No.: RF181106C33

FCC ID: A8J-EWS357AP

Test Model: EWS357AP

Series Model: ECW220

Received Date: Nov. 06, 2018

Test Date: Nov. 30, 2018 ~ Jan. 23, 2019

Issued Date: Jan. 30, 2019

Applicant: EnGenius Technologies

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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF181106C33	Original release	Jan. 30, 2019

1 Certificate of Conformity

Product: 802.11AX Indoor Ceiling Mount Access Point

Brand: EnGenius

Test Model: EWS357AP

Series Model: ECW220

Sample Status: Engineering sample

Applicant: EnGenius Technologies

Test Date: Nov. 30, 2018 ~ Jan. 23, 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 : Celine Chou , **Date:** Jan. 30, 2019
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Jan. 30, 2019
Bruce Chen / 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 -6.02dB at 0.47031MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.6dB at 2390.00MHz and 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is IPEX 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) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	802.11AX Indoor Ceiling Mount Access Point
Brand	EnGenius
Test Model	EWS357AP
Series Model	ECW220
Model Difference	Refer to note for more details
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter 54Vdc from PoE
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: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 400Mbps 802.11ax: up to 574Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 11 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 7
Output Power	CDD Mode: 209.258mW Beamforming Mode: 68.948mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	NA
Cable Supplied	NA

Note:

1. All models are listed as below. Model EWS357AP is the representative for final test.

Brand	Model	Difference
EnGenius	EWS357AP	For marketing purpose.
	ECW220	

2. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	Beamforming Mode	TX Function
802.11b	Not Support	2TX
802.11g	Not Support	2TX
802.11n (HT20)	Support	2TX
802.11n (HT40)	Support	2TX
802.11ac (VHT20)	Support	2TX
802.11ac (VHT40)	Support	2TX
802.11ax (HE20)	Support	2TX
802.11ax (HE40)	Support	2TX

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

* For 802.11n, 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.

* 802.11ax mode only support full Resource Unit size.

3. The EUT consumes power from the following adapter and PoE.

Adapter (for support unit only)	
Brand	JG
Model	ZZU1588-150120-2A
Input	100-240Vac, ~1.5A Max, 50-60Hz
Output	12Vdc, 1.5A
Power Line	1.5m DC cable without core attached on adapter

PoE (for support unit only)	
Brand	EnGenius
Model	EPA5006GP
Input	100-240Vac, ~0.8A, 50-60Hz
Output	54Vdc, 0.6A PIN 4,5:54V PIN 7,8:RETURN
Power Line	0.55m non-shielding AC cable without core

4. The following antennas were provided to the EUT.

Ant. No.	1	2	3	4
Ant. Type	PIFA	PIFA	PIFA	PIFA
Ant. Connector	IPEX	IPEX	IPEX	IPEX
Frequency (MHz)	2400-2500		5150-5850	
Peak Gain (dBi)	3.5	3.5	4.6	4.5

5. 2.4GHz & 5GHz technology can transmit at same time.

6. Spurious emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.

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	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), 802.11ac (VHT40), 802.11ax (HE40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	Powered by adapter
B	-	√	√	-	Powered by POE

Where RE \geq 1G: Radiated Emission above 1GHz & Bandedge Measurement
 RE<1G: Radiated Emission below 1GHz
 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 **Y-plane**.
2. "-" means no effect.

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.

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
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
A	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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B	802.11b	1 to 11	6	DSSS	DBPSK	1.0

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	802.11b	1 to 11	6	DSSS	DBPSK	1.0

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
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
A	802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
A	802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	24 deg. C, 66% RH 24 deg. C, 67% RH 24 deg. C, 65% RH	120Vac, 60Hz	Willy Cheng
RE<1G	24 deg. C, 66% RH	120Vac, 60Hz 54Vdc	Adair Peng
PLC	25 deg. C, 75% RH	120Vac, 60Hz 54Vdc	Willy Cheng
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle = 2.608/2.818 = 0.925, Duty factor = $10 \cdot \log(1/0.925) = 0.34$

802.11g: Duty cycle = 2.084/2.212 = 0.942, Duty factor = $10 \cdot \log(1/0.942) = 0.26$

802.11n (HT20): Duty cycle = 5.412/5.691 = 0.951, Duty factor = $10 \cdot \log(1/0.951) = 0.22$

802.11n (HT40): Duty cycle = 5.434/5.687 = 0.956, Duty factor = $10 \cdot \log(1/0.956) = 0.20$

802.11ax (HT20): Duty cycle = 5.408/5.702 = 0.948, Duty factor = $11 \cdot \log(1/0.948) = 0.23$

802.11ax (HT40): Duty cycle = 5.404/5.656 = 0.955, Duty factor = $12 \cdot \log(1/0.955) = 0.20$



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.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Adapter	JG	ZZU1588-150120-2A	NA	NA	Provided by manufacturer
C.	POE	EnGenius	EPA5006GP	NA	NA	Provided by manufacturer

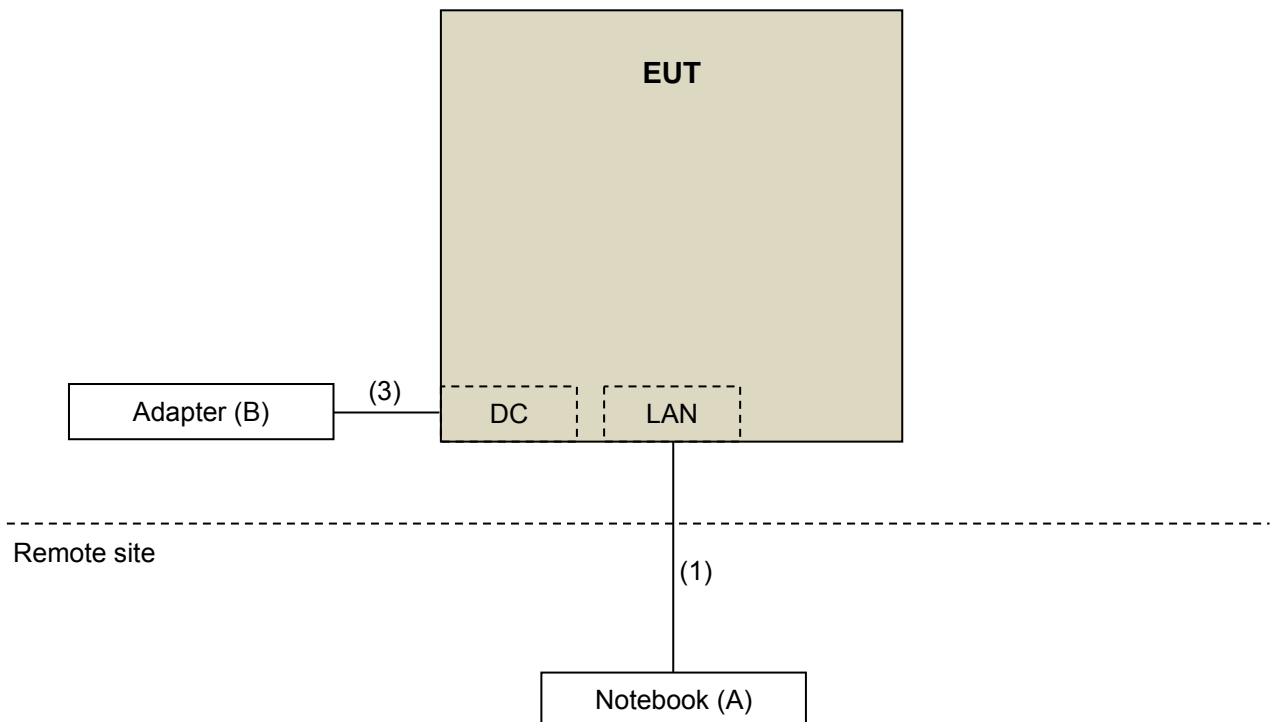
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

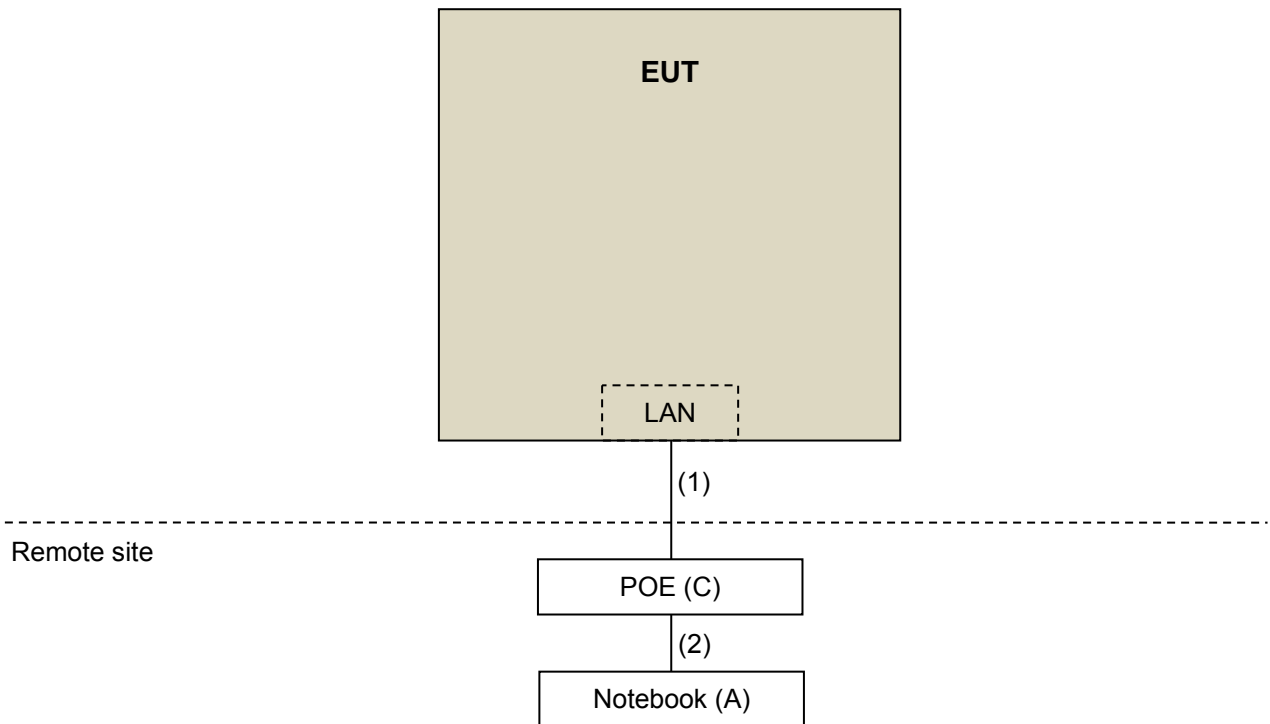
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	6	N	0	Cat5e
2.	RJ45 cable	1	1.5	N	0	Cat5e
3.	DC cable	1	1.5	-	0	Provided by manufacturer

3.4.1 Configuration of System under Test

Test Mode A



Test Mode B



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
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	Nov. 14, 2018	Nov. 13, 2019
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	Jul. 17, 2018	Jul. 16, 2019

- 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.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is 7450F-3.

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 detect 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:

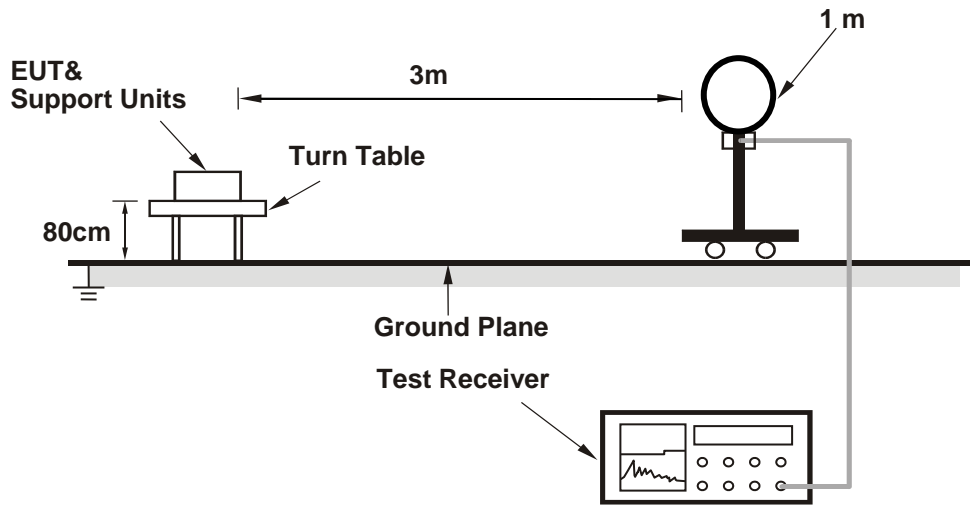
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) 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

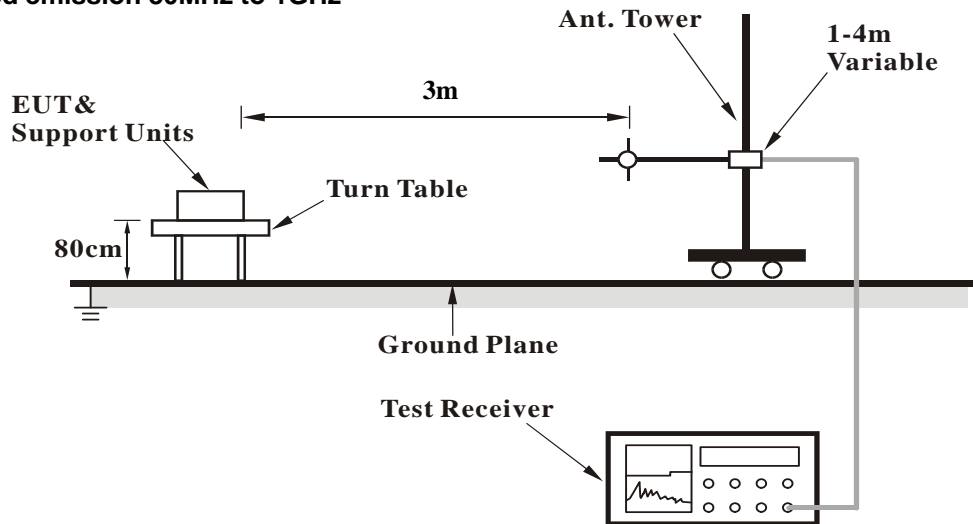
No deviation.

4.1.5 Test Setup

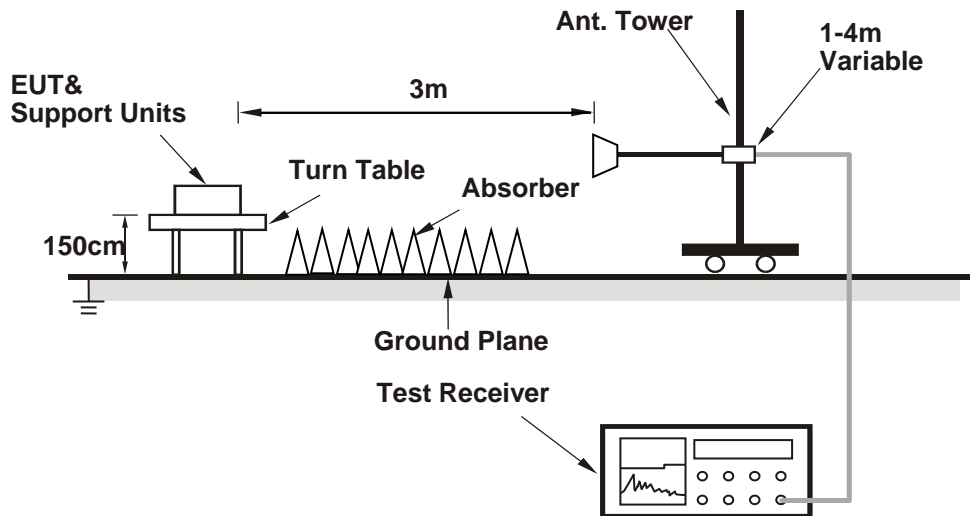
For Radiated emission below 30MHz



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. Placed the EUT on the testing table.
- b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz Data:

802.11b

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

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	61.4 PK	74.0	-12.6	2.41 H	43	28.4	33.0
2	2390.00	52.4 AV	54.0	-1.6	2.41 H	43	19.4	33.0
3	*2412.00	109.5 PK			3.08 H	294	76.6	32.9
4	*2412.00	107.5 AV			3.08 H	294	74.6	32.9
5	4824.00	49.8 PK	74.0	-24.2	1.21 H	329	46.2	3.6
6	4824.00	42.0 AV	54.0	-12.0	1.21 H	329	38.4	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	60.3 PK	74.0	-13.7	3.68 V	194	27.3	33.0
2	2390.00	49.1 AV	54.0	-4.9	3.68 V	194	16.1	33.0
3	*2412.00	107.9 PK			3.60 V	191	75.0	32.9
4	*2412.00	105.5 AV			3.60 V	191	72.6	32.9
5	4824.00	50.4 PK	74.0	-23.6	3.12 V	19	46.8	3.6
6	4824.00	44.6 AV	54.0	-9.4	3.12 V	19	41.0	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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	114.3 PK			2.04 H	33	81.4	32.9
2	*2437.00	112.4 AV			2.04 H	33	79.5	32.9
3	4874.00	57.9 PK	74.0	-16.1	1.02 H	56	54.6	3.3
4	4874.00	39.7 AV	54.0	-14.3	1.02 H	56	36.4	3.3
5	7311.00	55.7 PK	74.0	-18.3	1.03 H	355	46.0	9.7
6	7311.00	47.5 AV	54.0	-6.5	1.03 H	355	37.8	9.7

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	110.5 PK			2.99 V	66	77.6	32.9
2	*2437.00	108.6 AV			2.99 V	66	75.7	32.9
3	4874.00	48.6 PK	74.0	-25.4	1.51 V	50	45.3	3.3
4	4874.00	39.5 AV	54.0	-14.5	1.51 V	50	36.2	3.3
5	7311.00	57.6 PK	74.0	-16.4	2.65 V	356	47.9	9.7
6	7311.00	48.8 AV	54.0	-5.2	2.65 V	356	39.1	9.7

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	114.1 PK			2.29 H	31	81.3	32.8
2	*2462.00	112.1 AV			2.29 H	31	79.3	32.8
3	2483.50	59.9 PK	74.0	-14.1	2.02 H	38	27.2	32.7
4	2483.50	49.5 AV	54.0	-4.5	2.02 H	38	16.8	32.7
5	4924.00	50.5 PK	74.0	-23.5	2.40 H	350	47.4	3.1
6	4924.00	43.3 AV	54.0	-10.7	2.40 H	350	40.2	3.1

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	110.7 PK			3.76 V	47	77.9	32.8
2	*2462.00	108.7 AV			3.76 V	47	75.9	32.8
3	2483.50	60.1 PK	74.0	-13.9	3.67 V	50	27.4	32.7
4	2483.50	48.3 AV	54.0	-5.7	3.67 V	50	15.6	32.7
5	4924.00	52.5 PK	74.0	-21.5	3.24 V	24	49.4	3.1
6	4924.00	47.3 AV	54.0	-6.7	3.24 V	24	44.2	3.1

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

802.11g

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

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	72.4 PK	74.0	-1.6	1.24 H	14	39.5	32.9
2	2390.00	52.2 AV	54.0	-1.8	1.24 H	14	19.3	32.9
3	*2412.00	108.6 PK			2.38 H	40	75.7	32.9
4	*2412.00	98.7 AV			2.38 H	40	65.8	32.9
5	4824.00	46.6 PK	74.0	-27.4	1.42 H	293	42.8	3.8
6	4824.00	33.2 AV	54.0	-20.8	1.42 H	293	29.4	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	2390.00	67.1 PK	74.0	-6.9	1.06 V	3	34.2	32.9
2	2390.00	48.1 AV	54.0	-5.9	1.06 V	3	15.2	32.9
3	*2412.00	104.0 PK			1.52 V	42	71.1	32.9
4	*2412.00	94.2 AV			1.52 V	42	61.3	32.9
5	4824.00	46.0 PK	74.0	-28.0	1.52 V	253	42.2	3.8
6	4824.00	32.9 AV	54.0	-21.1	1.52 V	253	29.1	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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	111.6 PK			1.63 H	27	78.7	32.9
2	*2437.00	101.8 AV			1.63 H	27	68.9	32.9
3	2483.50	71.8 PK	74.0	-2.2	1.56 H	29	38.8	33.0
4	2483.50	52.3 AV	54.0	-1.7	1.56 H	29	19.3	33.0
5	4874.00	47.3 PK	74.0	-26.7	1.84 H	344	43.7	3.6
6	4874.00	33.6 AV	54.0	-20.4	1.84 H	344	30.0	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	*2437.00	106.1 PK			1.53 V	4	73.2	32.9
2	*2437.00	95.3 AV			1.53 V	4	62.4	32.9
3	2483.50	64.0 PK	74.0	-10.0	2.12 V	56	31.0	33.0
4	2483.50	48.8 AV	54.0	-5.2	2.12 V	56	15.8	33.0
5	4874.00	47.1 PK	74.0	-26.9	1.92 V	119	43.5	3.6
6	4874.00	33.4 AV	54.0	-20.6	1.92 V	119	29.8	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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	109.5 PK			1.59 H	28	76.6	32.9
2	*2462.00	99.5 AV			1.59 H	28	66.6	32.9
3	2483.50	72.2 PK	74.0	-1.8	1.53 H	42	39.2	33.0
4	2483.50	50.4 AV	54.0	-3.6	1.53 H	42	17.4	33.0
5	4924.00	47.5 PK	74.0	-26.5	1.36 H	355	44.0	3.5
6	4924.00	33.7 AV	54.0	-20.3	1.36 H	355	30.2	3.5

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	102.8 PK			1.52 V	6	69.9	32.9
2	*2462.00	92.5 AV			1.52 V	6	59.6	32.9
3	2483.50	59.7 PK	74.0	-14.3	2.46 V	26	26.7	33.0
4	2483.50	47.7 AV	54.0	-6.3	2.46 V	26	14.7	33.0
5	4924.00	47.7 PK	74.0	-26.3	2.61 V	27	44.2	3.5
6	4924.00	34.6 AV	54.0	-19.4	2.61 V	27	31.1	3.5

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

802.11ax (HE20)

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

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	69.2 PK	74.0	-4.8	2.44 H	43	36.2	33.0
2	2390.00	52.3 AV	54.0	-1.7	2.44 H	43	19.3	33.0
3	*2412.00	112.9 PK			2.31 H	41	80.0	32.9
4	*2412.00	99.4 AV			2.31 H	41	66.5	32.9
5	4824.00	46.9 PK	74.0	-27.1	2.78 H	296	43.3	3.6
6	4824.00	33.8 AV	54.0	-20.2	2.78 H	296	30.2	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	64.5 PK	74.0	-9.5	3.41 V	196	31.5	33.0
2	2390.00	49.6 AV	54.0	-4.4	3.41 V	196	16.6	33.0
3	*2412.00	109.2 PK			3.59 V	190	76.3	32.9
4	*2412.00	95.4 AV			3.59 V	190	62.5	32.9
5	4824.00	47.2 PK	74.0	-26.8	2.76 V	138	43.6	3.6
6	4824.00	33.5 AV	54.0	-20.5	2.76 V	138	29.9	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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	116.2 PK			2.13 H	23	83.3	32.9
2	*2437.00	102.5 AV			2.13 H	23	69.6	32.9
3	2483.50	65.3 PK	74.0	-8.7	2.19 H	31	32.6	32.7
4	2483.50	52.3 AV	54.0	-1.7	2.19 H	31	19.6	32.7
5	4874.00	47.5 PK	74.0	-26.5	2.43 H	268	44.2	3.3
6	4874.00	34.4 AV	54.0	-19.6	2.43 H	268	31.1	3.3

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	114.4 PK			3.88 V	210	81.5	32.9
2	*2437.00	101.0 AV			3.88 V	210	68.1	32.9
3	2483.50	61.9 PK	74.0	-12.1	3.55 V	183	29.2	32.7
4	2483.50	48.2 AV	54.0	-5.8	3.55 V	183	15.5	32.7
5	4874.00	47.4 PK	74.0	-26.6	2.51 V	116	44.1	3.3
6	4874.00	33.6 AV	54.0	-20.4	2.51 V	116	30.3	3.3

Remarks:

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

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

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	113.5 PK			2.29 H	38	80.7	32.8
2	*2462.00	100.2 AV			2.29 H	38	67.4	32.8
3	2483.50	67.5 PK	74.0	-6.5	1.98 H	38	34.8	32.7
4	2483.50	52.3 AV	54.0	-1.7	1.98 H	38	19.6	32.7
5	4924.00	47.7 PK	74.0	-26.3	2.23 H	183	44.6	3.1
6	4924.00	34.0 AV	54.0	-20.0	2.23 H	183	30.9	3.1

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	111.3 PK			3.78 V	208	78.5	32.8
2	*2462.00	97.3 AV			3.78 V	208	64.5	32.8
3	2483.50	66.6 PK	74.0	-7.4	3.73 V	205	33.9	32.7
4	2483.50	50.9 AV	54.0	-3.1	3.73 V	205	18.2	32.7
5	4924.00	47.6 PK	74.0	-26.4	1.89 V	195	44.5	3.1
6	4924.00	33.5 AV	54.0	-20.5	1.89 V	195	30.4	3.1

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

802.11ax (HE40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.2 PK	74.0	-7.8	2.43 H	53	33.2	33.0
2	2390.00	52.2 AV	54.0	-1.8	2.43 H	53	19.2	33.0
3	*2422.00	109.5 PK			2.29 H	32	76.6	32.9
4	*2422.00	96.3 AV			2.29 H	32	63.4	32.9
5	4844.00	46.8 PK	74.0	-27.2	2.32 H	216	43.4	3.4
6	4844.00	33.1 AV	54.0	-20.9	2.32 H	216	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	64.3 PK	74.0	-9.7	3.76 V	153	31.3	33.0
2	2390.00	48.8 AV	54.0	-5.2	3.76 V	153	15.8	33.0
3	*2422.00	107.4 PK			3.92 V	21	74.5	32.9
4	*2422.00	94.2 AV			3.92 V	21	61.3	32.9
5	4844.00	46.8 PK	74.0	-27.2	2.21 V	164	43.4	3.4
6	4844.00	32.8 AV	54.0	-21.2	2.21 V	164	29.4	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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

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

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	111.2 PK			2.04 H	36	78.3	32.9
2	*2437.00	97.7 AV			2.04 H	36	64.8	32.9
3	2483.50	67.2 PK	74.0	-6.8	2.00 H	40	34.5	32.7
4	2483.50	52.4 AV	54.0	-1.6	2.00 H	40	19.7	32.7
5	4874.00	47.0 PK	74.0	-27.0	1.79 H	254	43.7	3.3
6	4874.00	33.2 AV	54.0	-20.8	1.79 H	254	29.9	3.3

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	108.6 PK			3.88 V	210	75.7	32.9
2	*2437.00	95.6 AV			3.88 V	210	62.7	32.9
3	2483.50	61.9 PK	74.0	-12.1	3.08 V	196	29.2	32.7
4	2483.50	48.2 AV	54.0	-5.8	3.08 V	196	15.5	32.7
5	4874.00	47.5 PK	74.0	-26.5	1.64 V	313	44.2	3.3
6	4874.00	33.8 AV	54.0	-20.2	1.64 V	313	30.5	3.3

Remarks:

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

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

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	110.3 PK			2.25 H	29	77.4	32.9
2	*2452.00	96.9 AV			2.25 H	29	64.0	32.9
3	2483.50	70.1 PK	74.0	-3.9	2.20 H	30	37.4	32.7
4	2483.50	52.2 AV	54.0	-1.8	2.20 H	30	19.5	32.7
5	4904.00	46.5 PK	74.0	-27.5	2.23 H	218	43.4	3.1
6	4904.00	33.4 AV	54.0	-20.6	2.23 H	218	30.3	3.1

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	106.7 PK			3.43 V	77	73.8	32.9
2	*2452.00	93.9 AV			3.43 V	77	61.0	32.9
3	2483.50	65.1 PK	74.0	-8.9	3.35 V	82	32.4	32.7
4	2483.50	48.3 AV	54.0	-5.7	3.35 V	82	15.6	32.7
5	4904.00	47.0 PK	74.0	-27.0	2.14 V	169	43.9	3.1
6	4904.00	33.5 AV	54.0	-20.5	2.14 V	169	30.4	3.1

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency

Below 1GHz worst-case data:

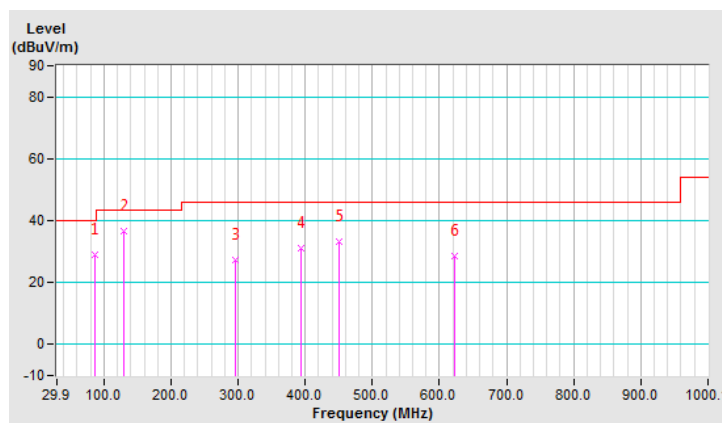
802.11b

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

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	86.28	28.8 QP	40.0	-11.2	1.99 H	255	43.4	-14.6
2	129.06	36.8 QP	43.5	-6.7	1.99 H	231	47.5	-10.7
3	296.27	27.4 QP	46.0	-18.6	1.00 H	228	35.0	-7.6
4	393.48	31.1 QP	46.0	-14.9	1.99 H	209	36.9	-5.8
5	449.87	33.2 QP	46.0	-12.8	1.99 H	209	37.5	-4.3
6	622.91	28.6 QP	46.0	-17.4	1.00 H	181	29.3	-0.7

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

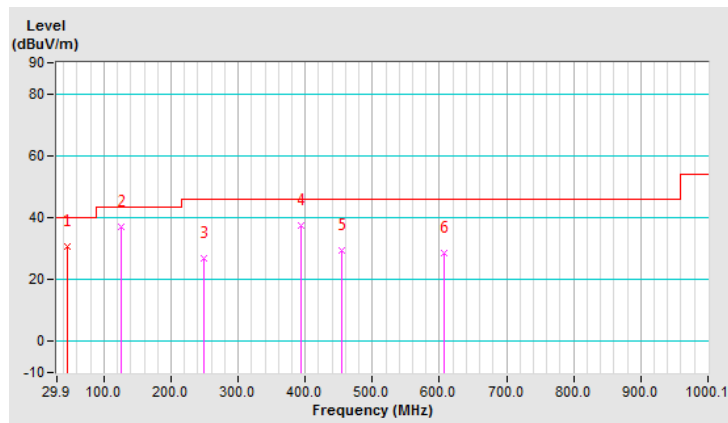


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

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	45.92	30.8 QP	40.0	-9.2	1.50 V	216	40.5	-9.7
2	125.17	36.9 QP	43.5	-6.6	1.50 V	2	47.9	-11.0
3	249.60	26.8 QP	46.0	-19.2	1.00 V	275	35.9	-9.1
4	393.48	37.3 QP	46.0	-8.7	1.50 V	161	43.1	-5.8
5	453.75	29.4 QP	46.0	-16.6	1.00 V	120	33.7	-4.3
6	607.35	28.5 QP	46.0	-17.5	1.00 V	358	29.5	-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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

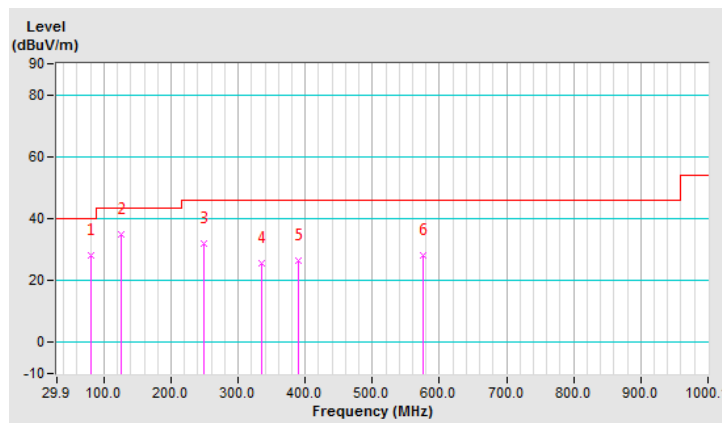


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

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	80.45	28.3 QP	40.0	-11.7	1.01 H	14	42.3	-14.0
2	125.17	35.0 QP	43.5	-8.5	1.51 H	94	46.0	-11.0
3	249.60	32.1 QP	46.0	-13.9	1.01 H	97	41.2	-9.1
4	335.15	25.6 QP	46.0	-20.4	1.01 H	114	32.3	-6.7
5	389.59	26.6 QP	46.0	-19.4	1.99 H	336	32.3	-5.7
6	576.25	28.2 QP	46.0	-17.8	1.99 H	222	30.2	-2.0

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

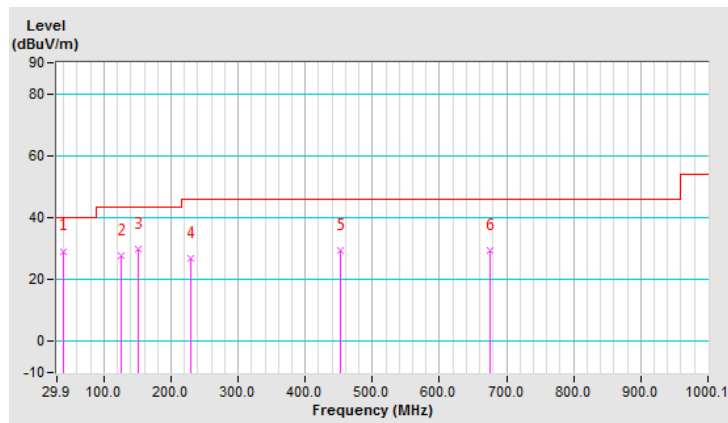


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

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	39.62	29.2 QP	40.0	-10.8	1.00 V	184	39.6	-10.4
2	125.17	27.9 QP	43.5	-15.6	1.99 V	204	38.9	-11.0
3	150.45	29.7 QP	43.5	-13.8	1.00 V	261	38.8	-9.1
4	230.16	26.7 QP	46.0	-19.3	1.00 V	200	37.1	-10.4
5	451.81	29.4 QP	46.0	-16.6	1.00 V	155	33.7	-4.3
6	675.40	29.4 QP	46.0	-16.6	1.99 V	5	29.6	-0.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 08, 2018	Feb. 07, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
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-2040.

4.2.3 Test Procedures

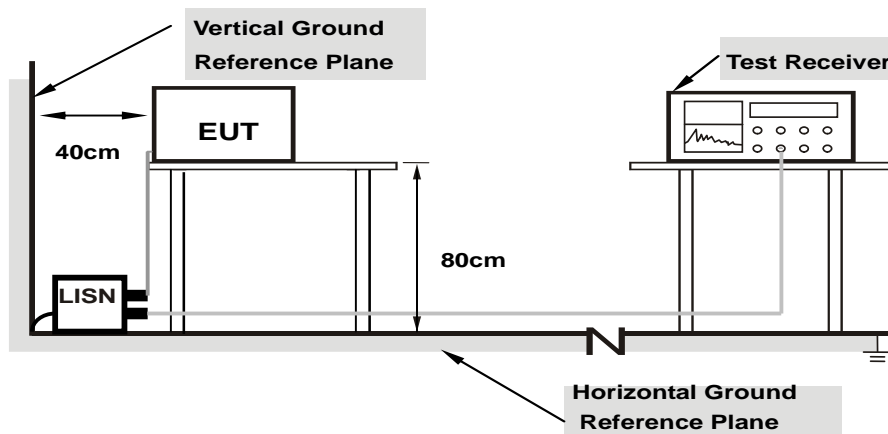
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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

Worst-case data:

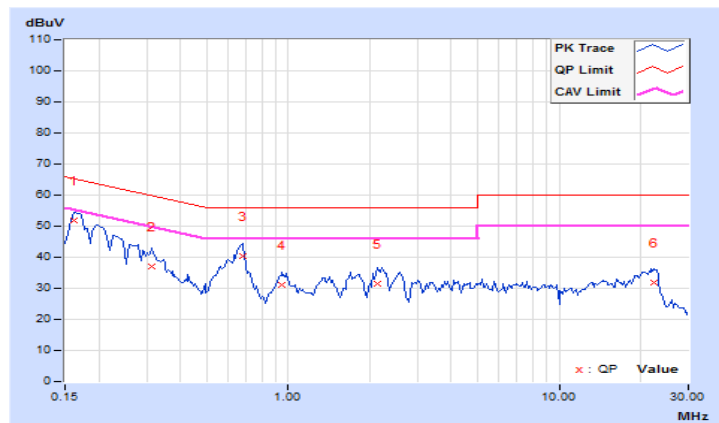
802.11b

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.16172	9.73	42.05	26.93	51.78	36.66	65.38
2	0.31406	9.74	27.40	22.72	37.14	32.46	59.86	49.86	-22.72	-17.40
3	0.67734	9.72	30.75	24.06	40.47	33.78	56.00	46.00	-15.53	-12.22
4	0.95078	9.69	21.31	15.40	31.00	25.09	56.00	46.00	-25.00	-20.91
5	2.12500	9.74	21.79	14.75	31.53	24.49	56.00	46.00	-24.47	-21.51
6	22.30469	9.95	21.95	16.26	31.90	26.21	60.00	50.00	-28.10	-23.79

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.

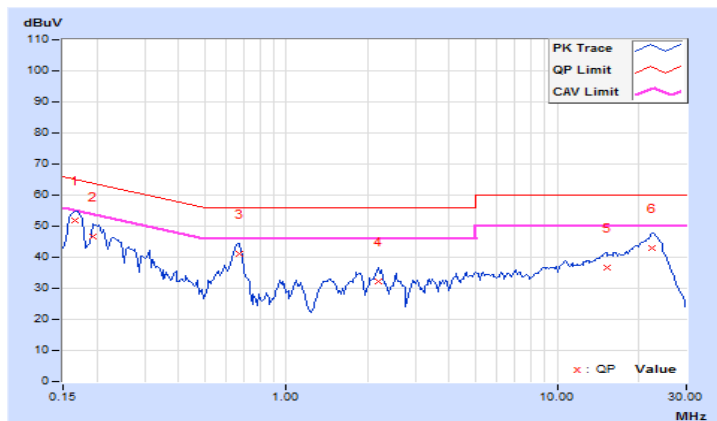


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.16562	9.72	42.14	28.97	51.86	38.69	65.18
2	0.19297	9.73	36.91	19.06	46.64	28.79	63.91	53.91	-17.27	-25.12
3	0.66953	9.74	31.50	24.67	41.24	34.41	56.00	46.00	-14.76	-11.59
4	2.19531	9.74	22.34	16.09	32.08	25.83	56.00	46.00	-23.92	-20.17
5	15.20703	10.01	26.62	21.37	36.63	31.38	60.00	50.00	-23.37	-18.62
6	22.46875	10.09	33.05	28.00	43.14	38.09	60.00	50.00	-16.86	-11.91

Remarks:

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

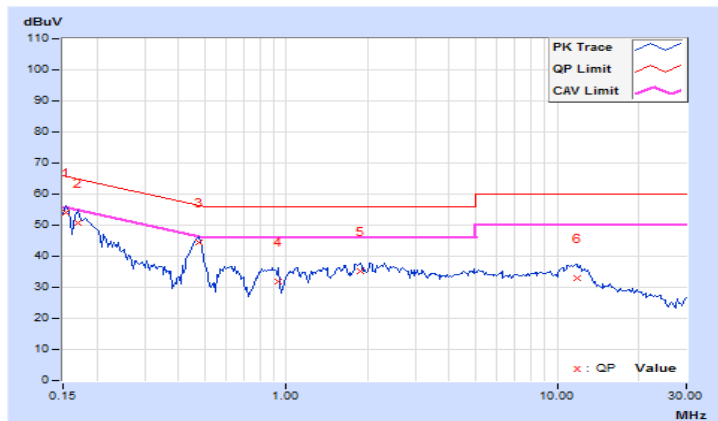


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15391	9.67	44.49	30.00	54.16	39.67	65.79
2	0.16953	9.67	41.18	26.28	50.85	35.95	64.98	54.98	-14.13	-19.03
3	0.47422	9.66	34.65	30.74	44.31	40.40	56.44	46.44	-12.13	-6.04
4	0.93516	9.65	22.35	16.83	32.00	26.48	56.00	46.00	-24.00	-19.52
5	1.87109	9.68	25.33	21.44	35.01	31.12	56.00	46.00	-20.99	-14.88
6	11.80078	9.86	23.23	18.39	33.09	28.25	60.00	50.00	-26.91	-21.75

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.

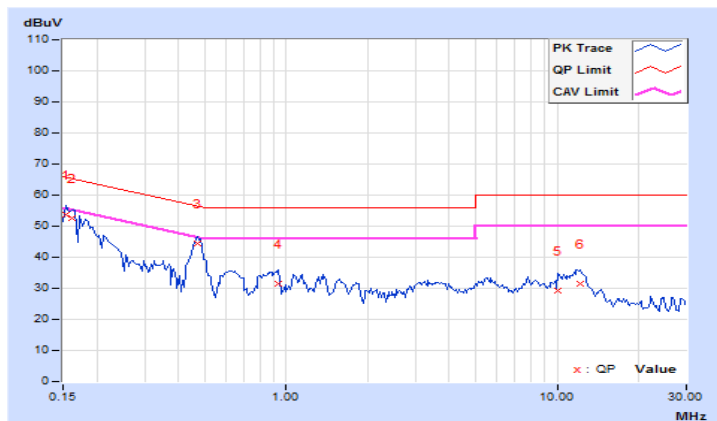


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15391	9.68	44.01	29.55	53.69	39.23	65.79
2	0.16172	9.68	42.75	28.06	52.43	37.74	65.38	55.38	-12.95	-17.64
3	0.47031	9.67	34.73	30.82	44.40	40.49	56.51	46.51	-12.11	-6.02
4	0.93516	9.65	21.92	16.87	31.57	26.52	56.00	46.00	-24.43	-19.48
5	10.08203	9.86	19.36	14.12	29.22	23.98	60.00	50.00	-30.78	-26.02
6	12.15625	9.89	21.62	16.60	31.51	26.49	60.00	50.00	-28.49	-23.51

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.

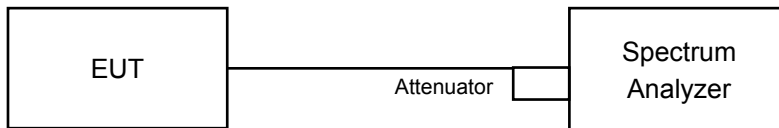


4.3 6dB Bandwidth Measurement

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

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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		
1	2412	7.59	8.07	0.5	Pass
6	2437	7.09	7.57	0.5	Pass
11	2462	8.10	7.62	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.40	16.43	0.5	Pass
6	2437	16.42	16.40	0.5	Pass
11	2462	16.42	16.37	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.75	18.81	0.5	Pass
6	2437	18.72	18.69	0.5	Pass
11	2462	18.48	18.86	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	37.75	38.13	0.5	Pass
6	2437	37.54	37.92	0.5	Pass
9	2452	37.42	37.78	0.5	Pass

802.11ax (HE20)

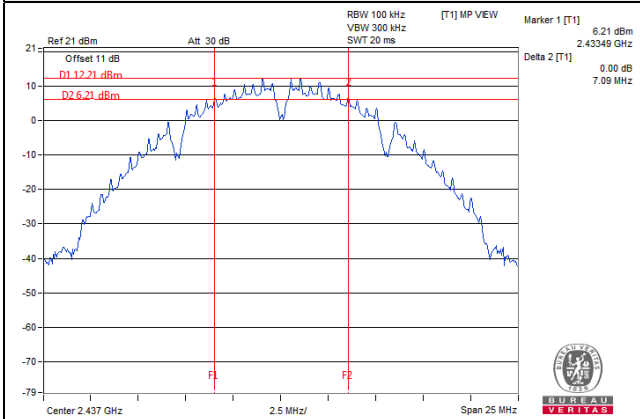
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.86	17.57	0.5	Pass
6	2437	16.86	17.59	0.5	Pass
11	2462	16.84	17.10	0.5	Pass

802.11ax (HE40)

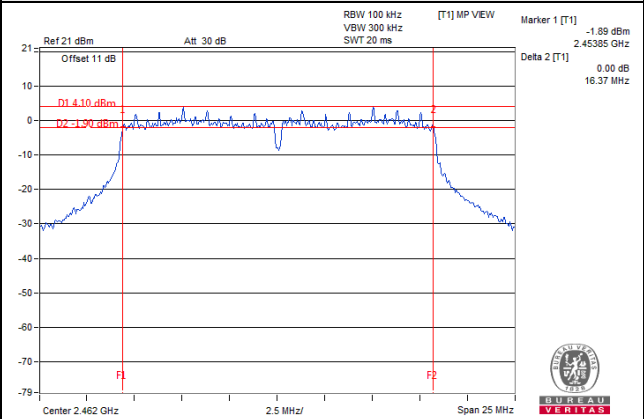
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.43	35.96	0.5	Pass
6	2437	35.51	35.92	0.5	Pass
9	2452	35.53	35.68	0.5	Pass

Spectrum Plot of Worst Value

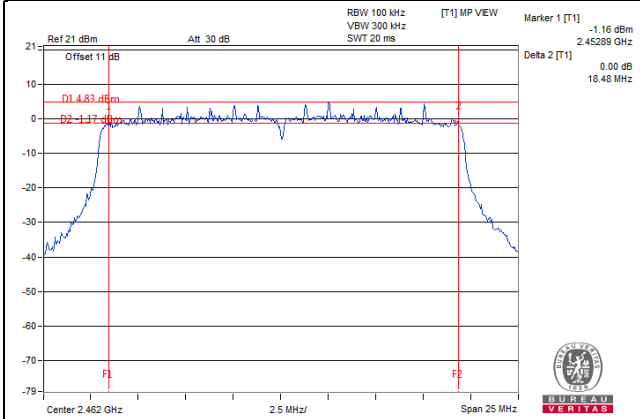
802.11b



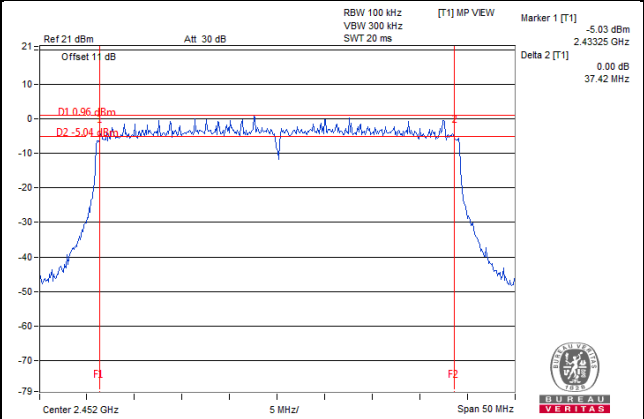
802.11g



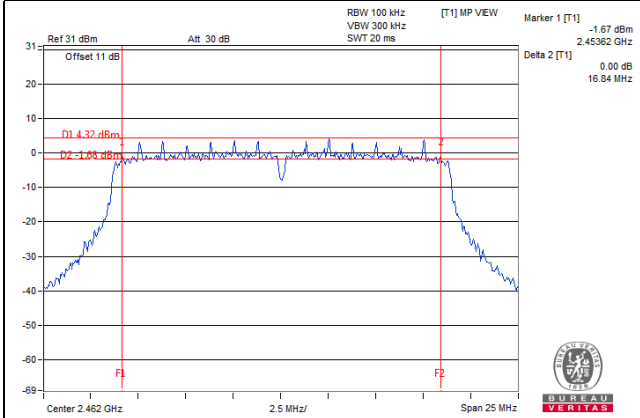
802.11n (HT20)



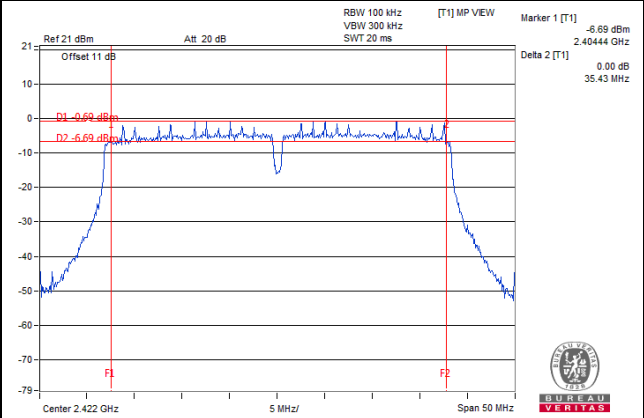
802.11n (HT40)



802.11ax (HE20)



802.11ax (HE40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

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

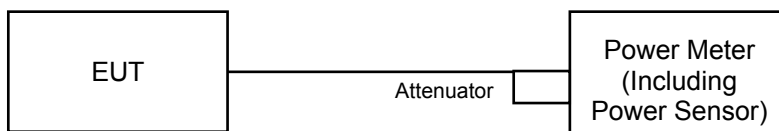
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

CDD Mode

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.79	18.89	153.129	21.85	30.00	Pass
6	2437	20.31	20.08	209.258	23.21	30.00	Pass
11	2462	19.96	19.91	197.032	22.95	30.00	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	14.72	14.66	58.890	17.70	30.00	Pass
6	2437	17.96	17.97	125.178	20.98	30.00	Pass
11	2462	15.34	15.36	68.554	18.36	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.39	14.76	57.402	17.59	30.00	Pass
6	2437	18.08	18.63	137.215	21.37	30.00	Pass
11	2462	15.36	15.94	73.620	18.67	30.00	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	13.92	14.36	51.950	17.16	30.00	Pass
6	2437	15.29	15.63	70.365	18.47	30.00	Pass
9	2452	14.59	15.23	62.117	17.93	30.00	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	14.48	14.72	57.702	17.61	30.00	Pass
6	2437	18.01	18.73	137.886	21.40	30.00	Pass
11	2462	15.42	15.95	74.189	18.70	30.00	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	13.92	14.42	52.329	17.19	30.00	Pass
6	2437	15.33	15.72	71.444	18.54	30.00	Pass
9	2452	14.58	15.25	62.205	17.94	30.00	Pass

Beamforming Mode

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	11.38	11.75	28.702	14.58	29.49	Pass
6	2437	15.07	15.62	68.612	18.36	29.49	Pass
11	2462	12.35	12.93	36.813	15.66	29.49	Pass

Note: Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.51 - 6) = 29.49\text{dBm}$.

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	10.91	11.35	25.977	14.15	29.49	Pass
6	2437	12.28	12.62	35.185	15.46	29.49	Pass
9	2452	11.58	12.22	31.060	14.92	29.49	Pass

Note: Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.51 - 6) = 29.49\text{dBm}$.

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	11.47	11.71	28.853	14.60	29.49	Pass
6	2437	15.00	15.72	68.948	18.39	29.49	Pass
11	2462	12.41	12.94	37.097	15.69	29.49	Pass

Note: Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.51 - 6) = 29.49\text{dBm}$.

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	10.91	11.41	26.167	14.18	29.49	Pass
6	2437	12.32	12.71	35.725	15.53	29.49	Pass
9	2452	11.57	12.24	31.104	14.93	29.49	Pass

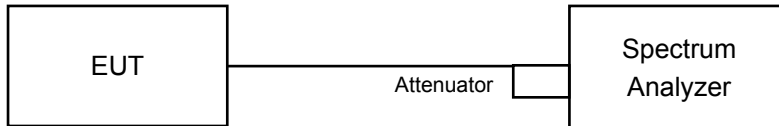
Note: Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.51 - 6) = 29.49\text{dBm}$.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For Average Power (Duty cycle < 98%)

- 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e. Set VBW $\geq 3 \times \text{RBW}$.
- f. Detector = power averaging (RMS) or sample detector (when RMS not available).
- g. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- h. Sweep time = auto couple.
- i. Do not use sweep triggering. Allow sweep to “free run”.
- j. Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k. Use the peak marker function to determine the maximum amplitude level.
- l. Add $10 \log (1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-9.03	3.01	0.34	-5.68	7.49	Pass
	6	2437	-7.79	3.01	0.34	-4.44	7.49	Pass
	11	2462	-8.68	3.01	0.34	-5.33	7.49	Pass
1	1	2412	-10.35	3.01	0.34	-7.00	7.49	Pass
	6	2437	-7.42	3.01	0.34	-4.07	7.49	Pass
	11	2462	-8.11	3.01	0.34	-4.76	7.49	Pass

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (6.51 - 6) = 7.49\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-16.43	3.01	0.26	-13.16	7.49	Pass
	6	2437	-12.88	3.01	0.26	-9.61	7.49	Pass
	11	2462	-15.57	3.01	0.26	-12.30	7.49	Pass
1	1	2412	-15.96	3.01	0.26	-12.69	7.49	Pass
	6	2437	-12.54	3.01	0.26	-9.27	7.49	Pass
	11	2462	-15.56	3.01	0.26	-12.29	7.49	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (6.51 - 6) = 7.49\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-18.37	3.01	0.22	-15.14	7.49	Pass
	6	2437	-14.85	3.01	0.22	-11.62	7.49	Pass
	11	2462	-17.54	3.01	0.22	-14.31	7.49	Pass
1	1	2412	-17.66	3.01	0.22	-14.43	7.49	Pass
	6	2437	-13.78	3.01	0.22	-10.55	7.49	Pass
	11	2462	-15.45	3.01	0.22	-12.22	7.49	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = 3.50dBi + 10log(2) = 6.51dBi > 6dBi, so the power density limit shall be reduced to 8-(6.51-6) = 7.49dBm.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-21.31	3.01	0.20	-18.10	7.49	Pass
	6	2437	-20.29	3.01	0.20	-17.08	7.49	Pass
	9	2452	-20.94	3.01	0.20	-17.73	7.49	Pass
1	3	2422	-20.96	3.01	0.20	-17.75	7.49	Pass
	6	2437	-19.06	3.01	0.20	-15.85	7.49	Pass
	9	2452	-19.60	3.01	0.20	-16.39	7.49	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = 3.50dBi + 10log(2) = 6.51dBi > 6dBi, so the power density limit shall be reduced to 8-(6.51-6) = 7.49dBm.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-16.72	3.01	0.23	-13.48	7.49	Pass
	6	2437	-12.79	3.01	0.23	-9.55	7.49	Pass
	11	2462	-16.05	3.01	0.23	-12.81	7.49	Pass
1	1	2412	-16.26	3.01	0.23	-13.02	7.49	Pass
	6	2437	-12.87	3.01	0.23	-9.63	7.49	Pass
	11	2462	-12.99	3.01	0.23	-9.75	7.49	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.51-6) = 7.49\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

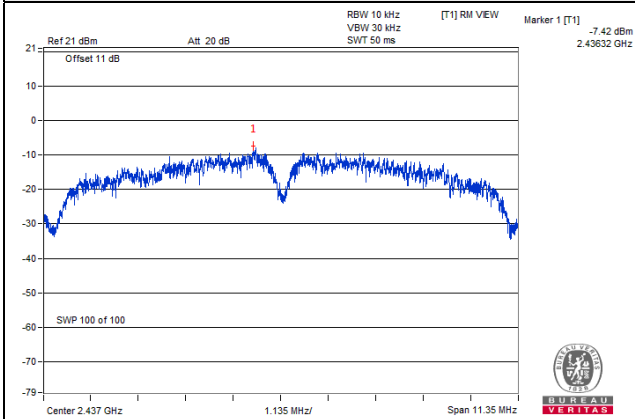
TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-20.50	3.01	0.20	-17.29	7.49	Pass
	6	2437	-19.26	3.01	0.20	-16.05	7.49	Pass
	9	2452	-19.84	3.01	0.20	-16.63	7.49	Pass
1	3	2422	-19.87	3.01	0.20	-16.66	7.49	Pass
	6	2437	-18.44	3.01	0.20	-15.23	7.49	Pass
	9	2452	-19.23	3.01	0.20	-16.02	7.49	Pass

Note:

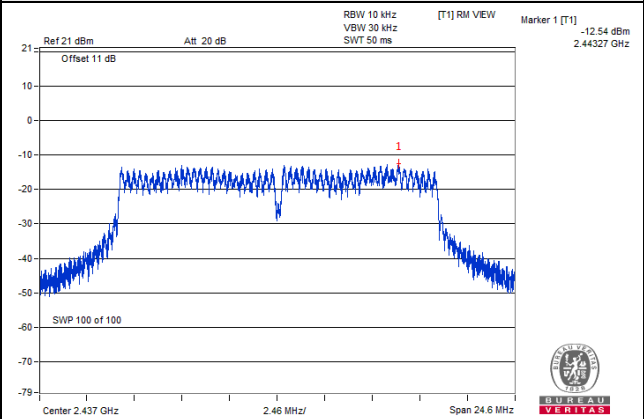
- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $3.50\text{dBi} + 10\log(2) = 6.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.51-6) = 7.49\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

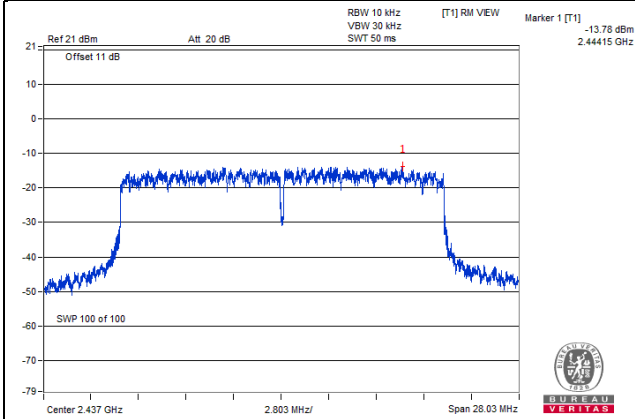
802.11b



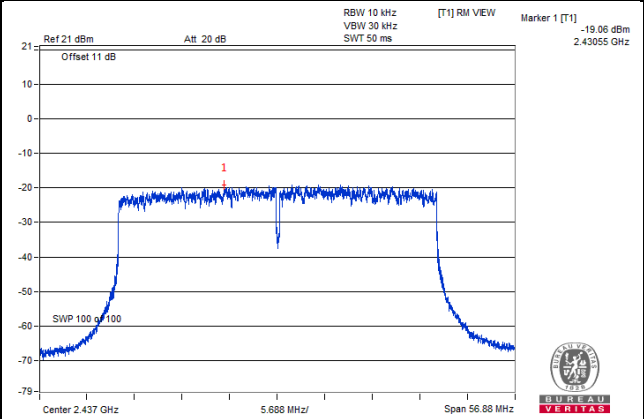
802.11g



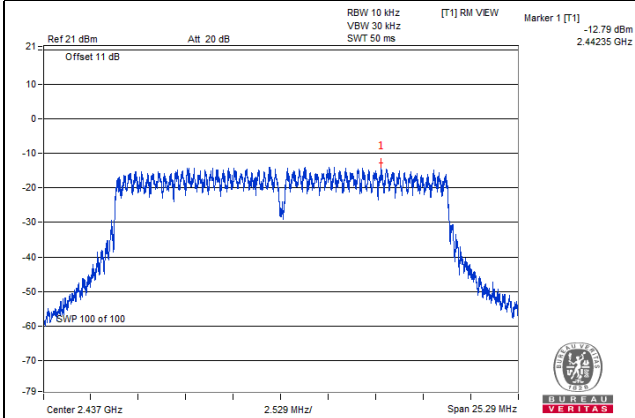
802.11n (HT20)



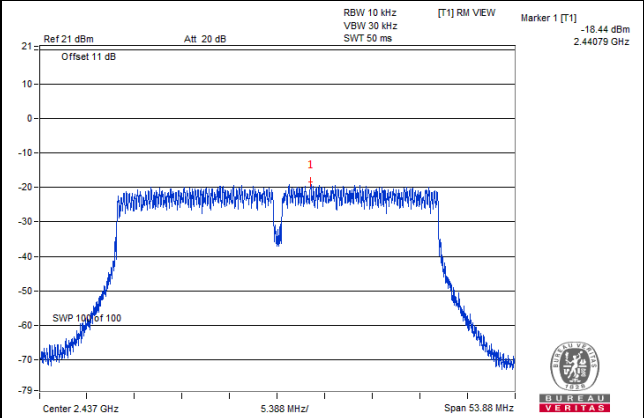
802.11n (HT40)



802.11ax (HE20)



802.11ax (HE40)

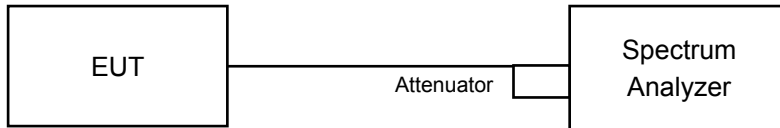


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW \geq 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW \geq 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as item 4.3.6

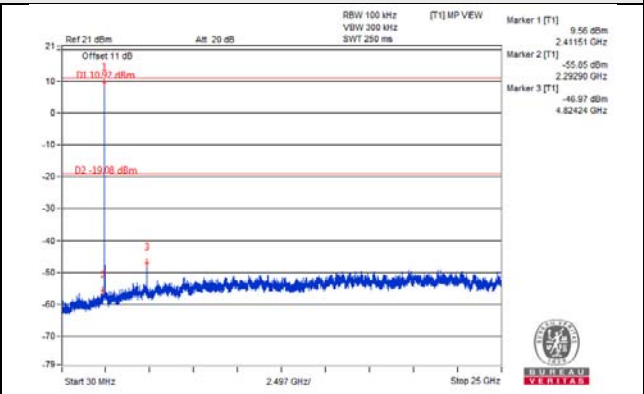
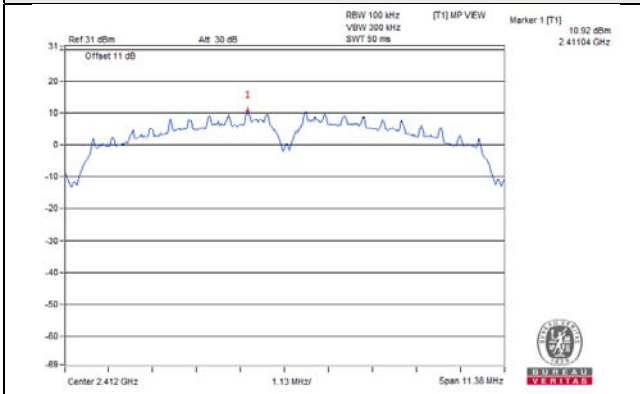
4.6.7 Test Results

The 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.

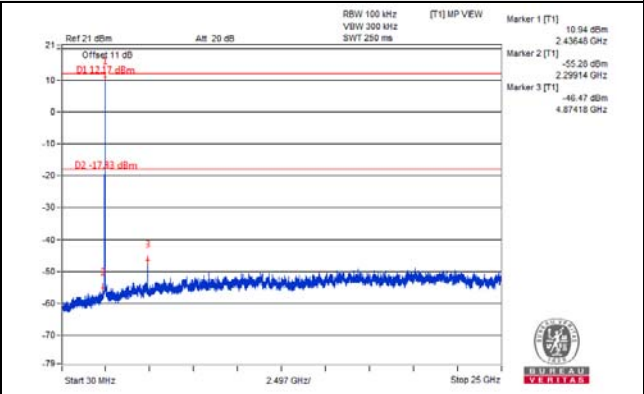
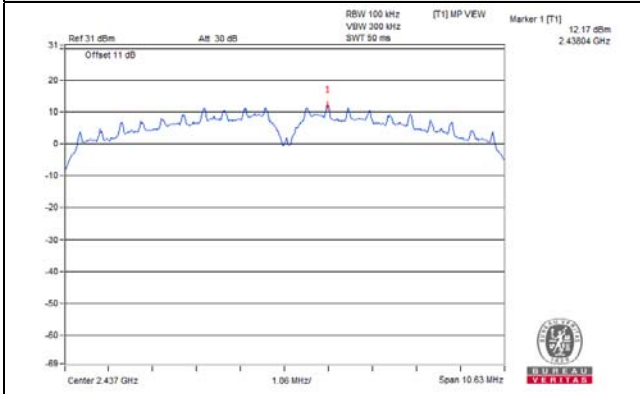
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

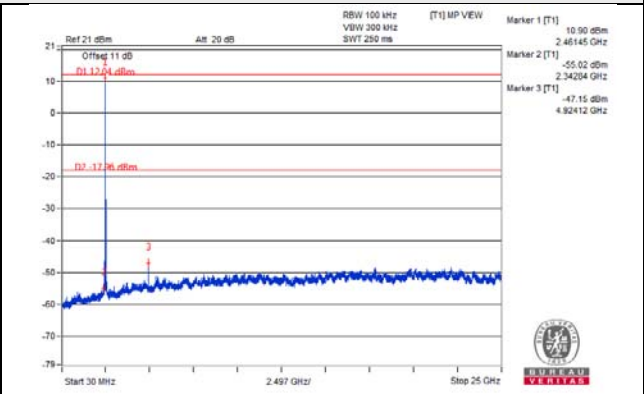
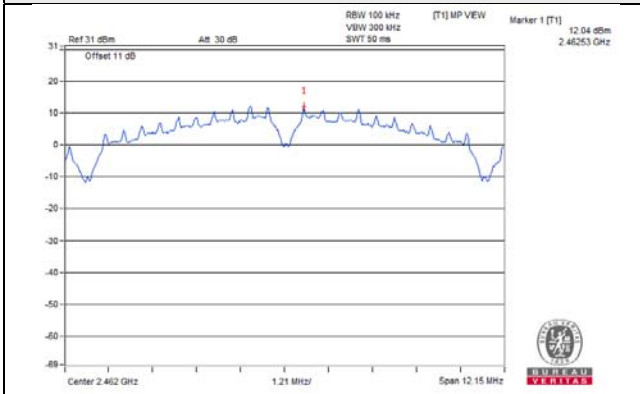
CH 1



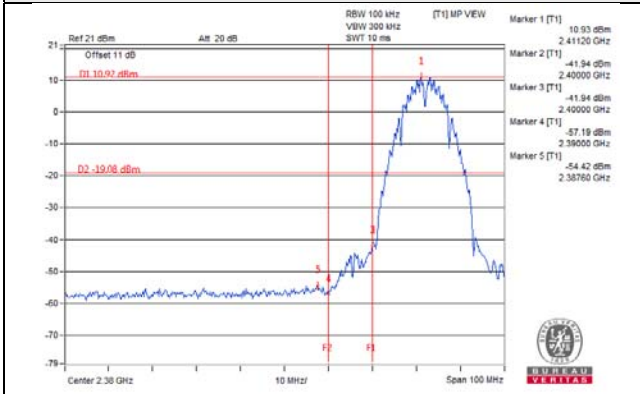
CH 6



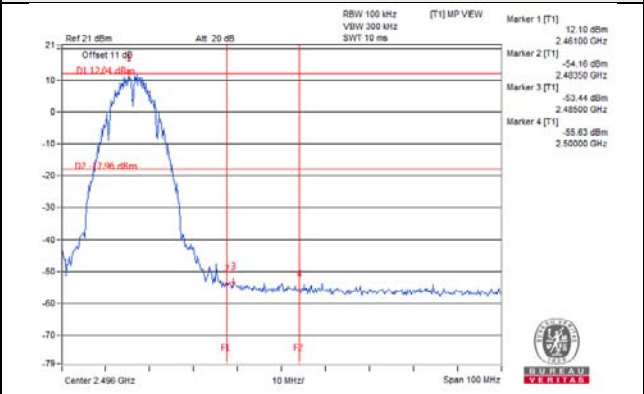
CH 11



CH 1 Band edge

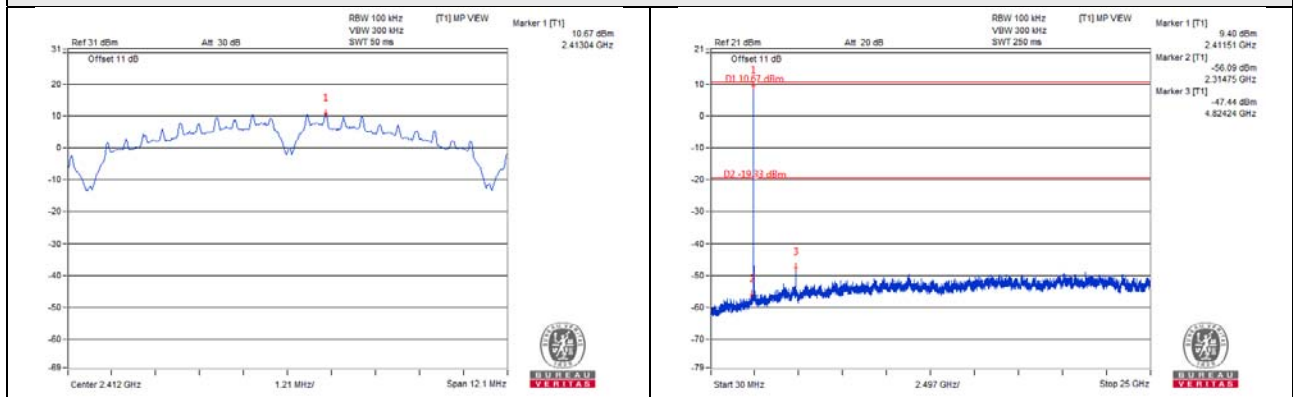


CH 11 Band edge

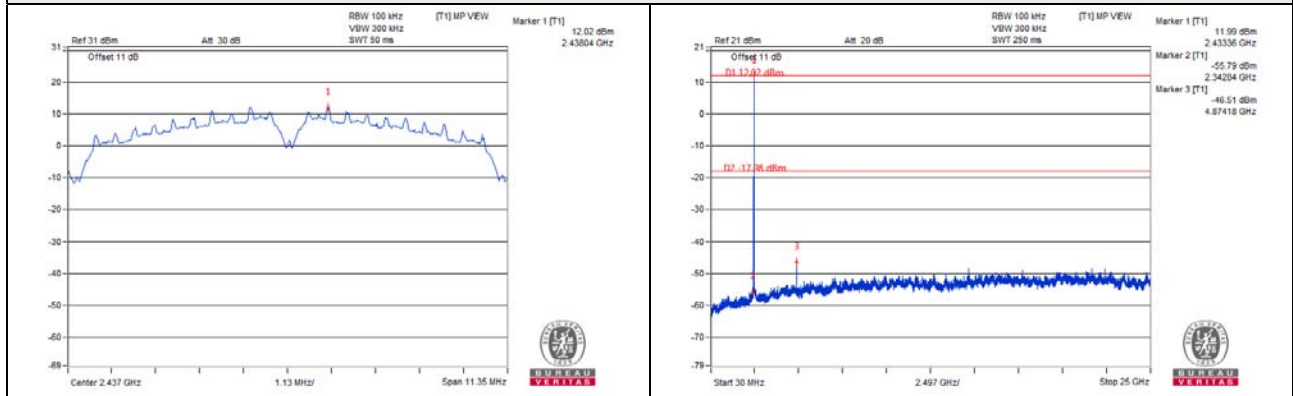


802.11b_Chain 1

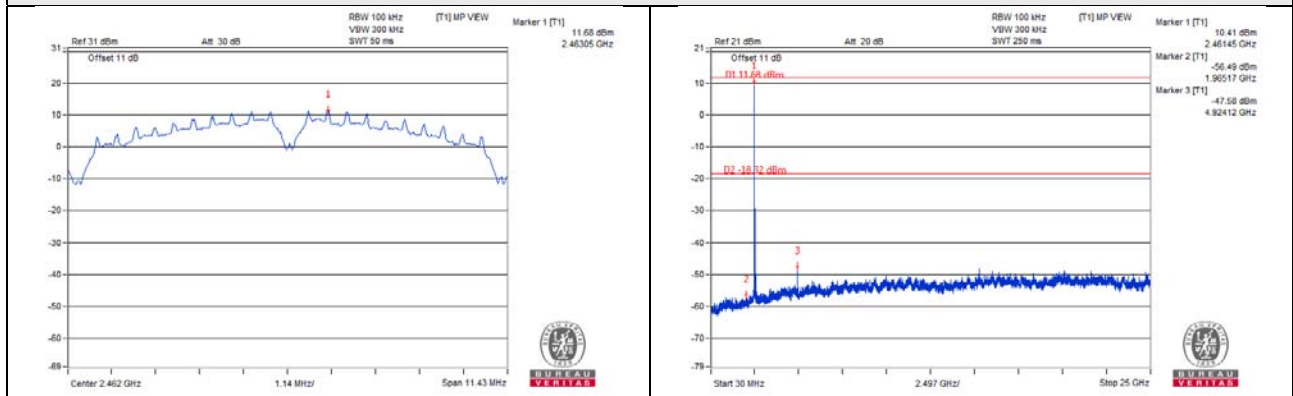
CH 1



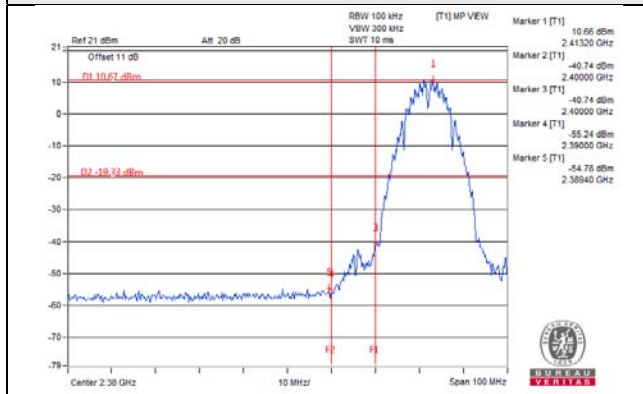
CH 6



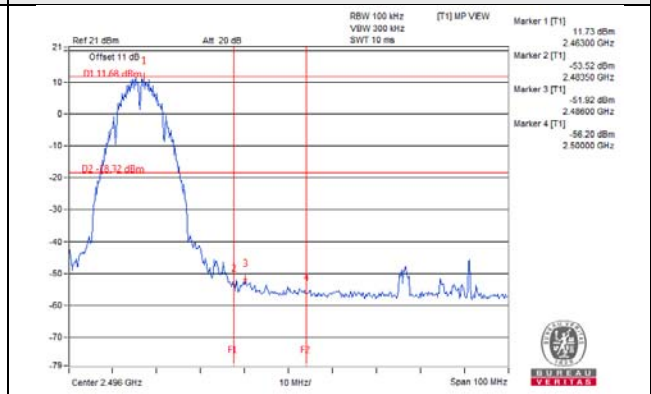
CH 11



CH 1 Band edge

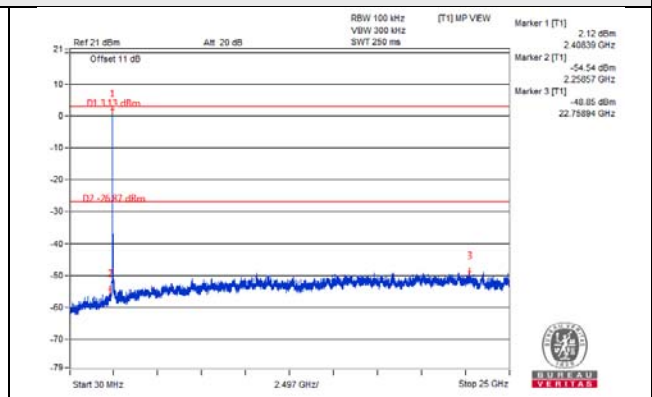
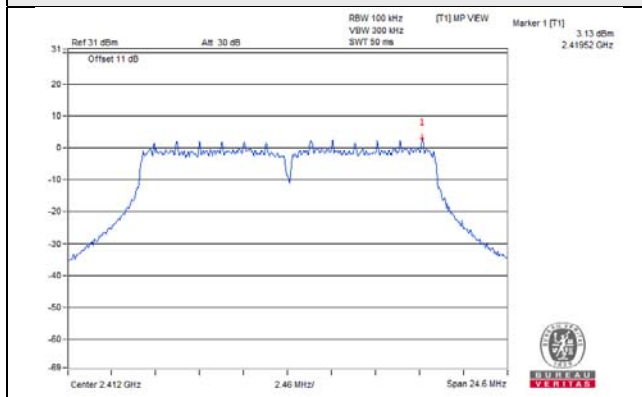


CH 11 Band edge

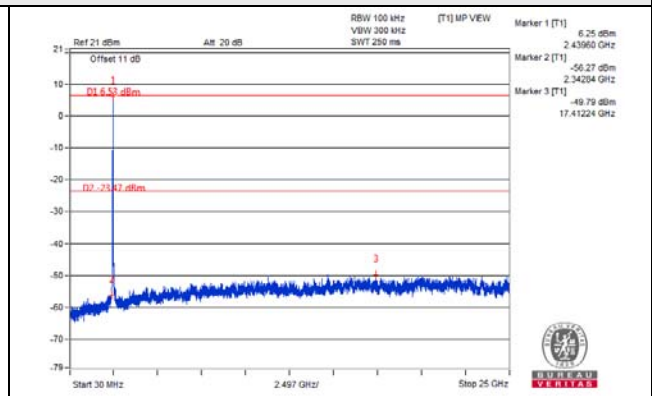
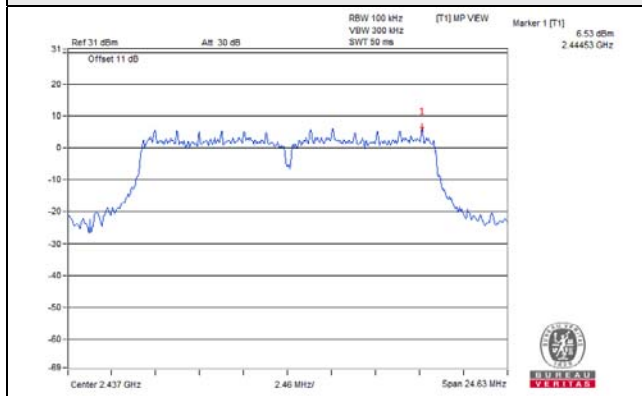


802.11g_Chain 0

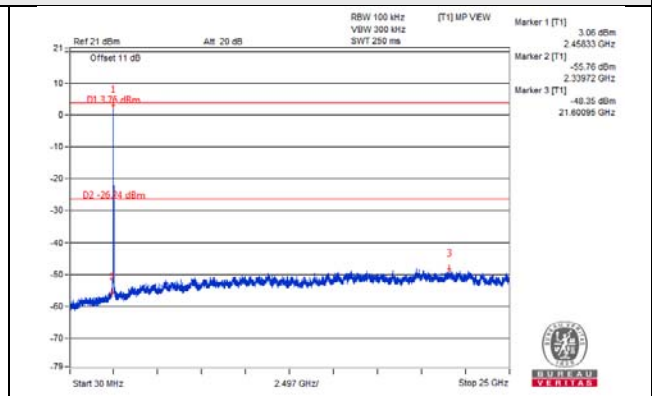
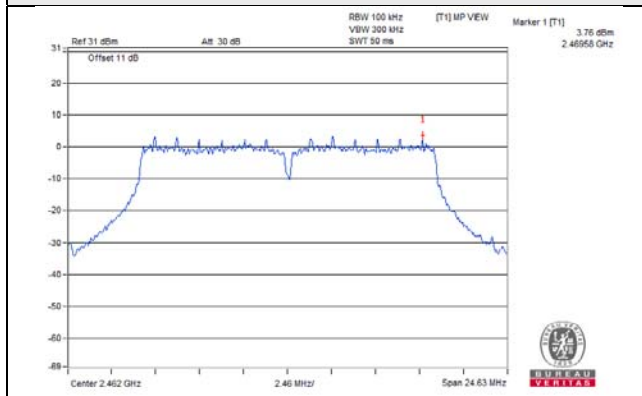
CH 1



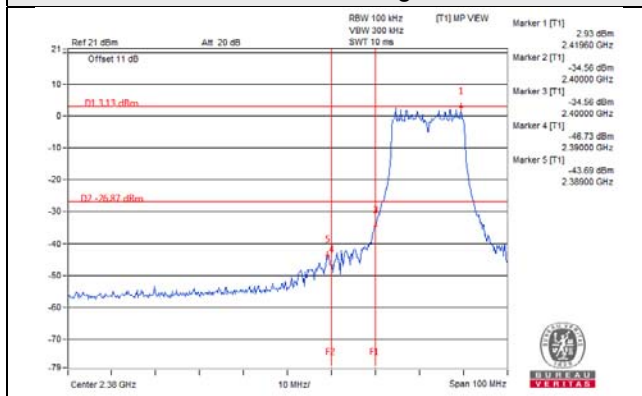
CH 6



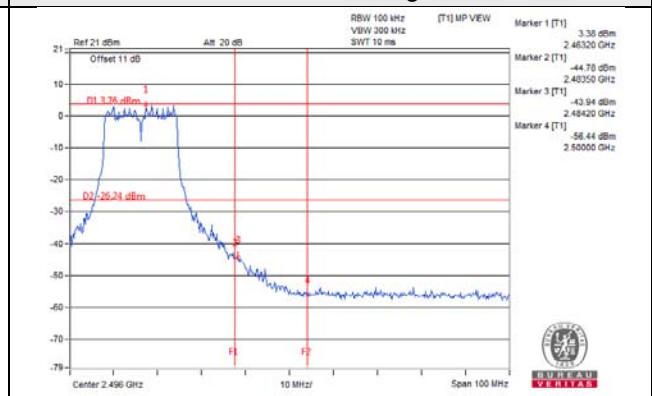
CH 11



CH 1 Band edge

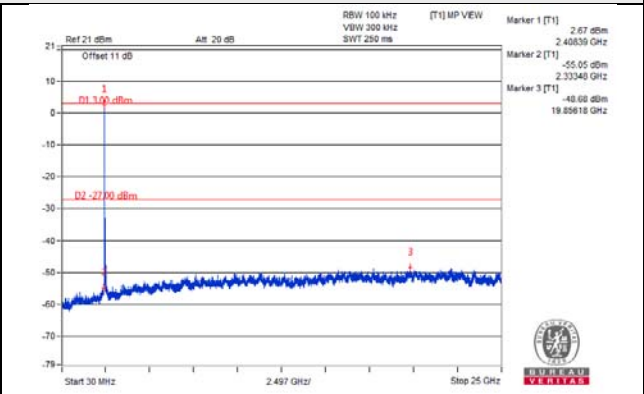
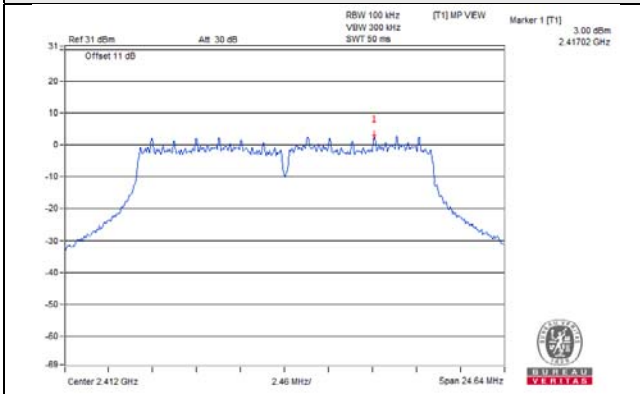


CH 11 Band edge

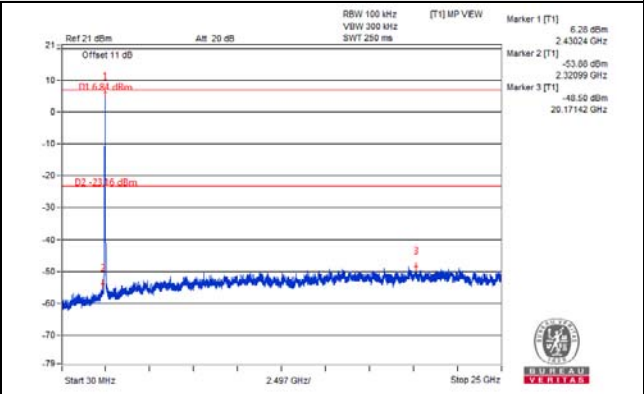
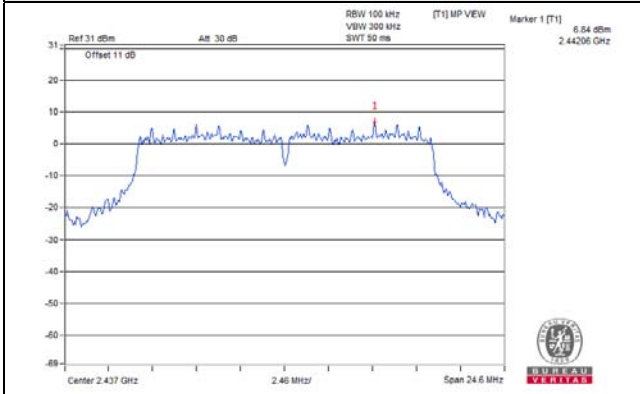


802.11g_Chain 1

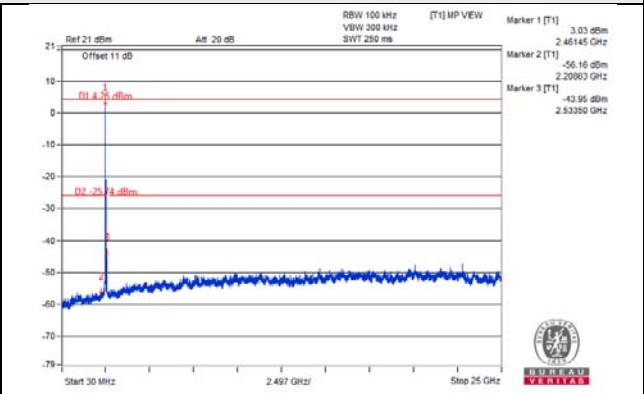
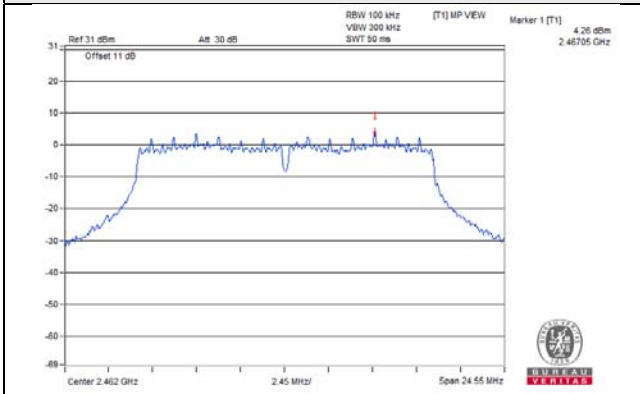
CH 1



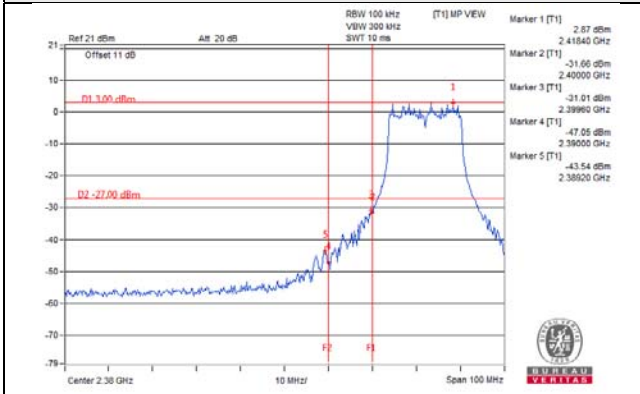
CH 6



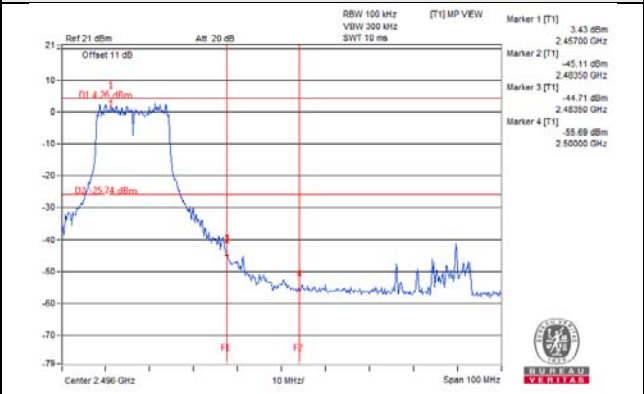
CH 11



CH 1 Band edge

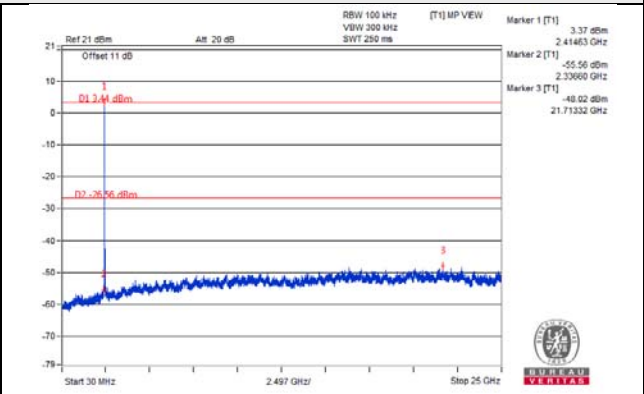
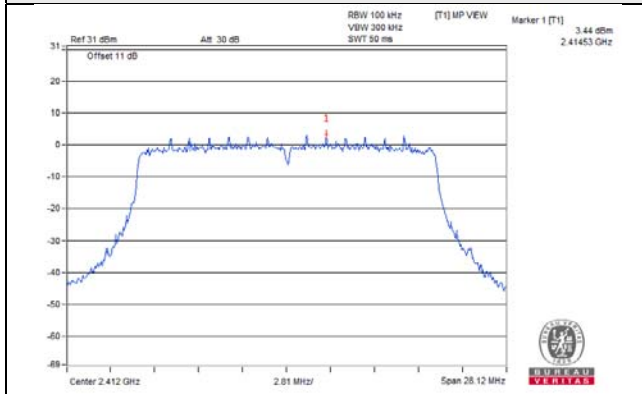


CH 11 Band edge

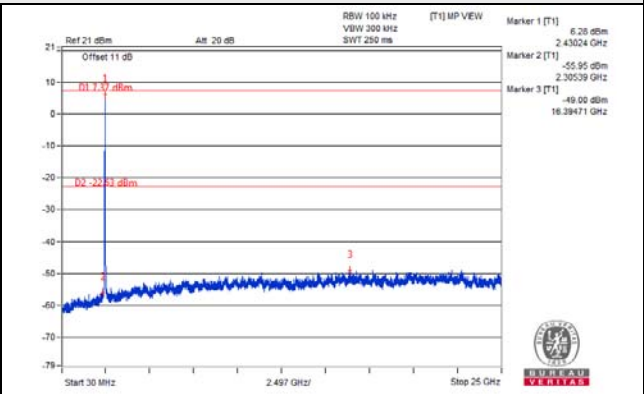
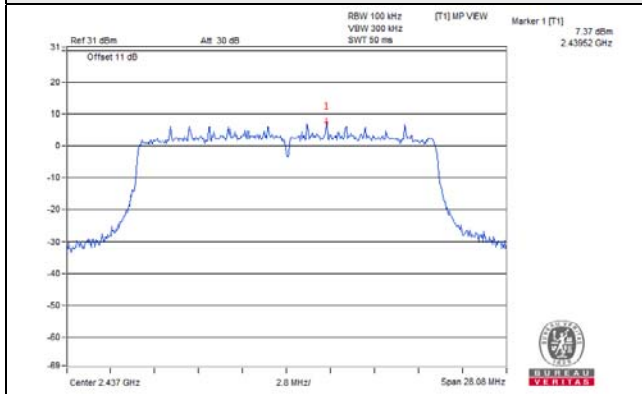


802.11n (HT20)_Chain 0

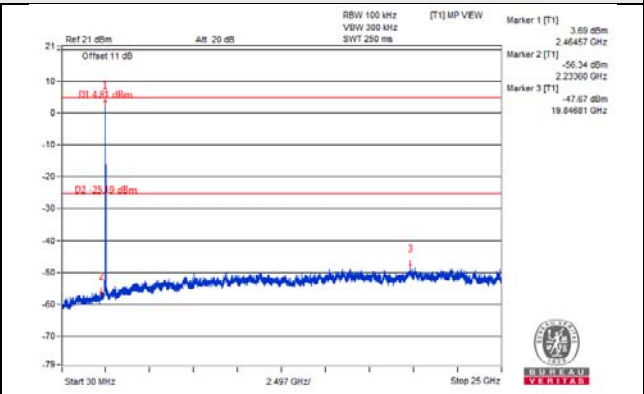
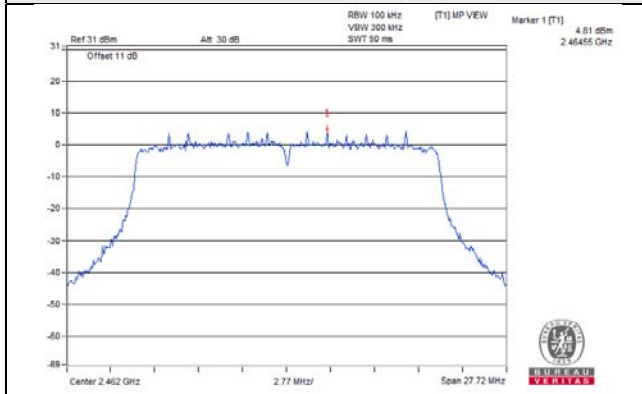
CH 1



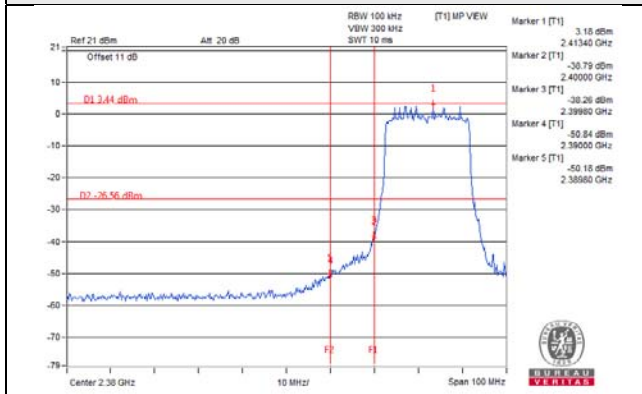
CH 6



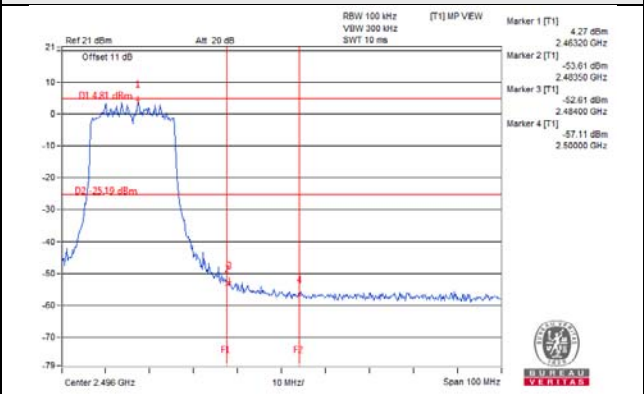
CH 11



CH 1 Band edge

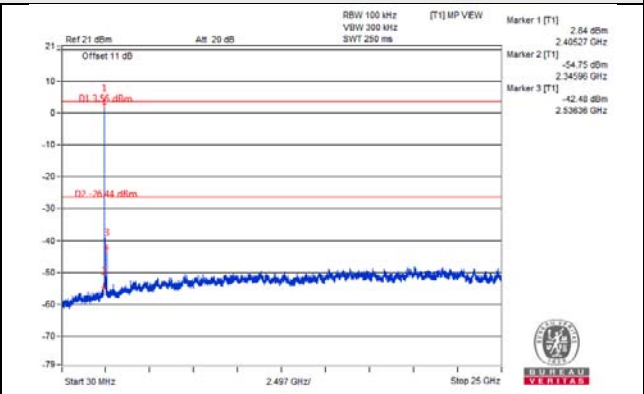
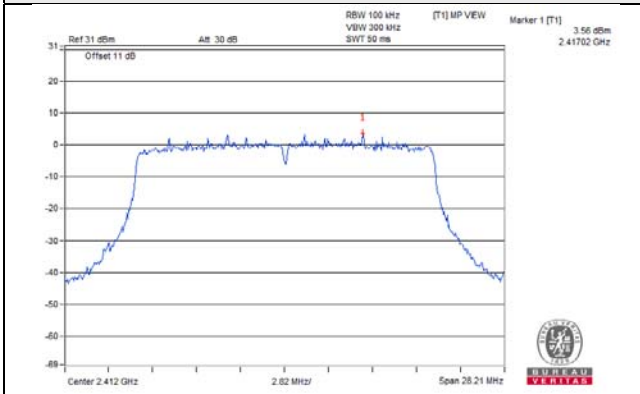


CH 11 Band edge

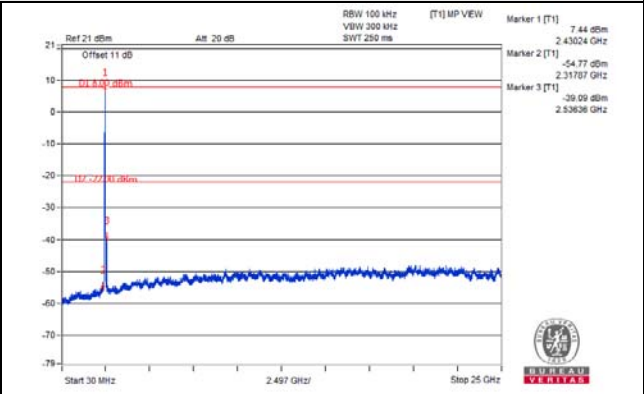
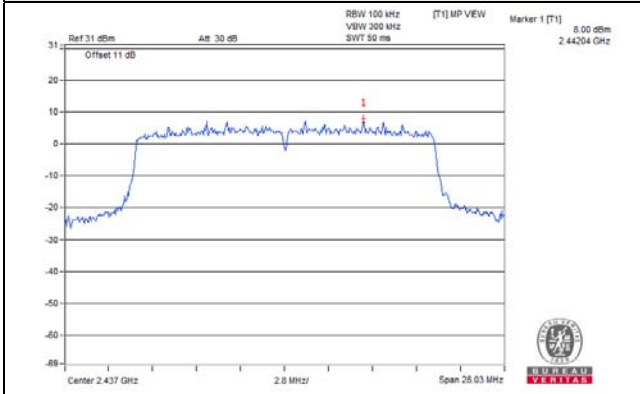


802.11n (HT20)_Chain 1

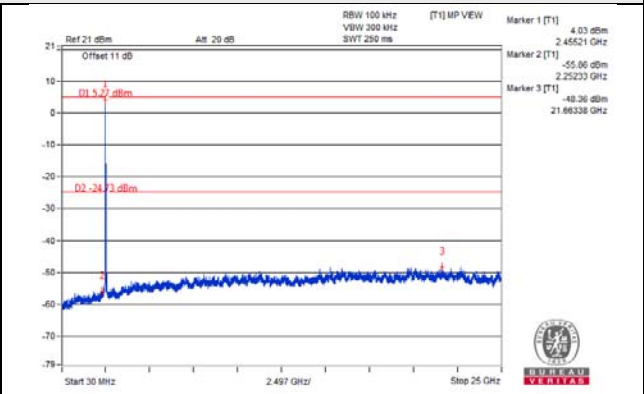
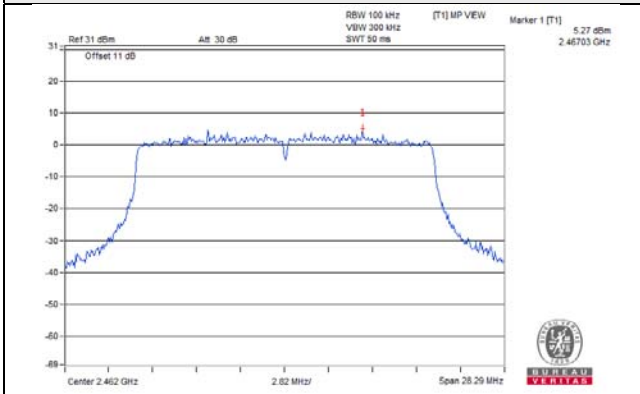
CH 1



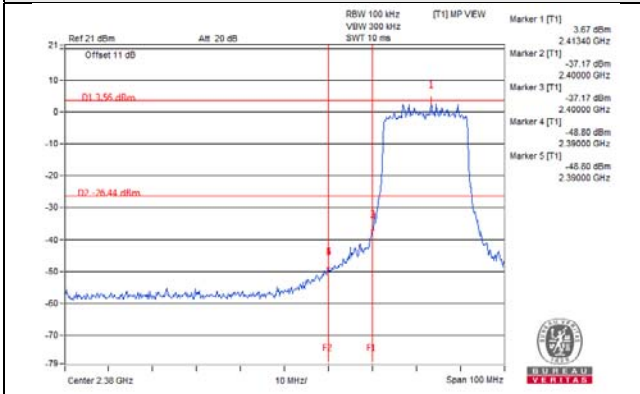
CH 6



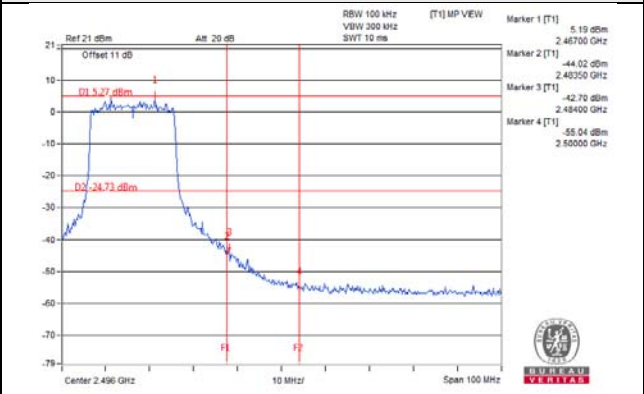
CH 11



CH 1 Band edge

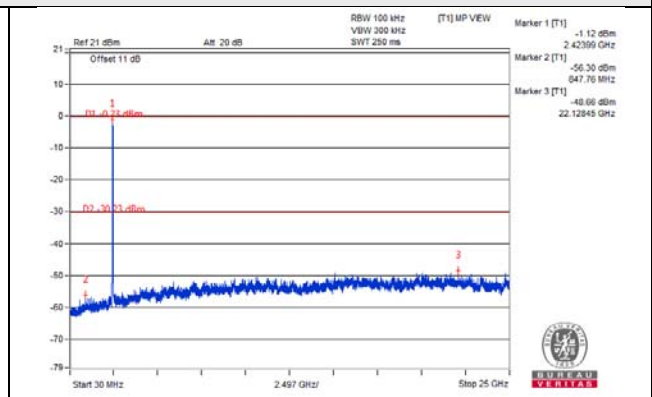
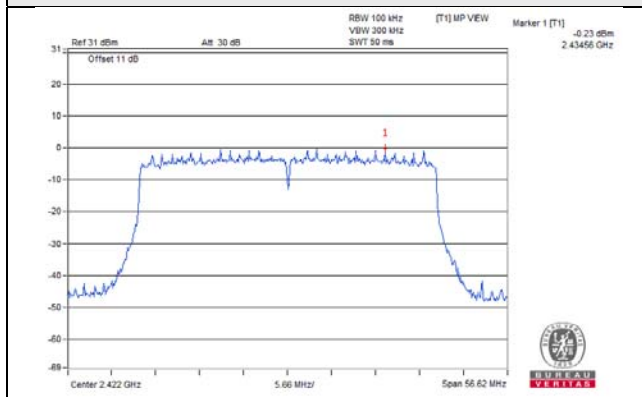


CH 11 Band edge

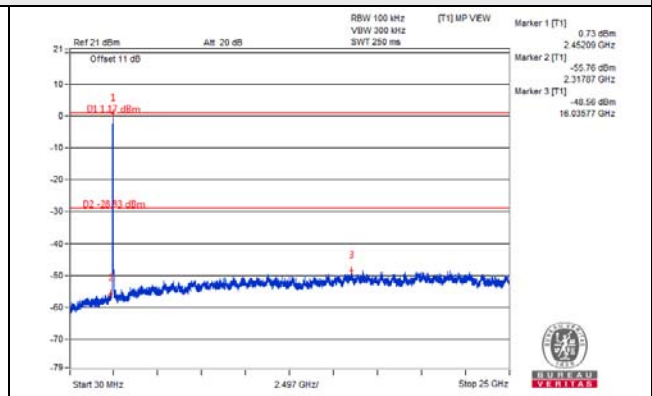
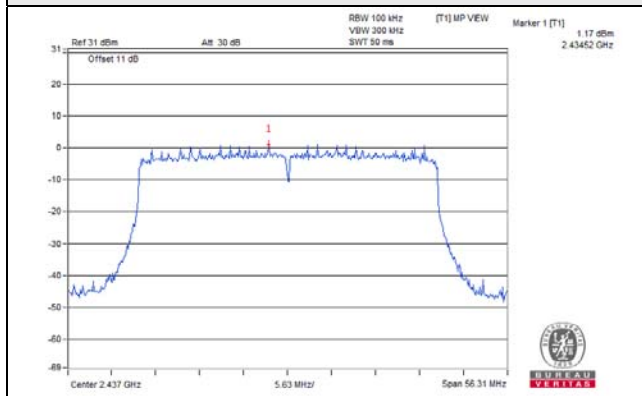


802.11n (HT40)_Chain 0

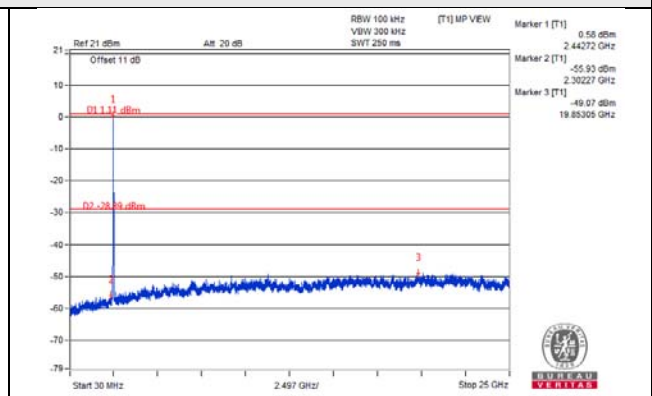
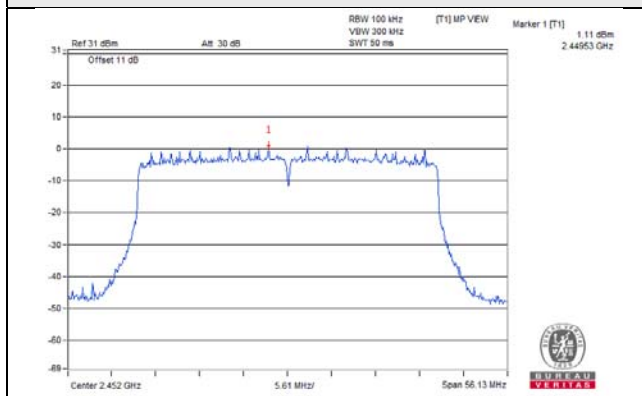
CH 3



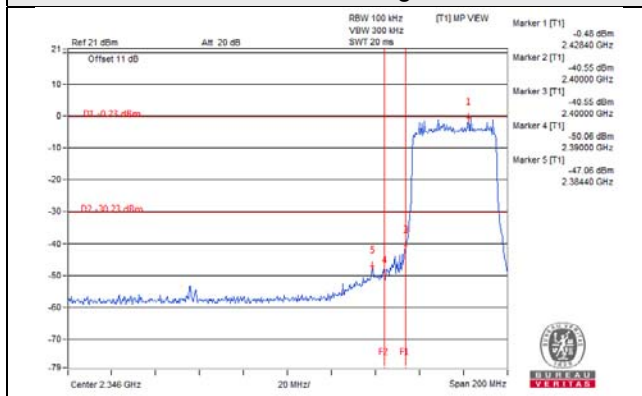
CH 6



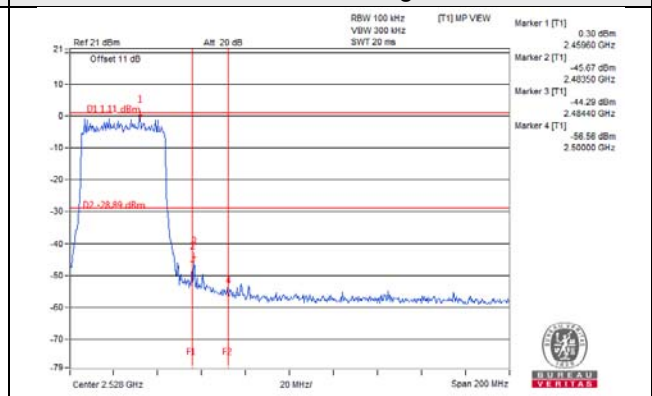
CH 9



CH 3 Band edge

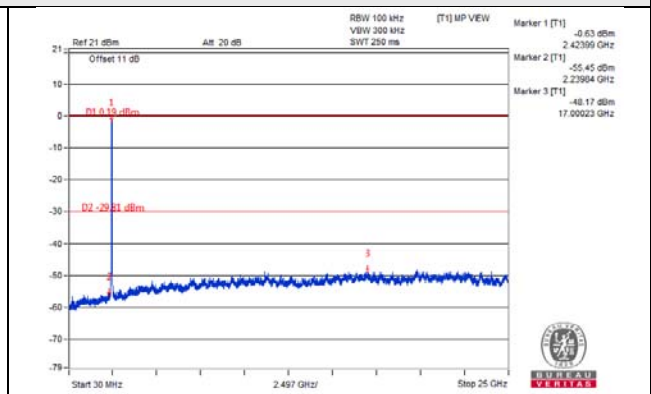
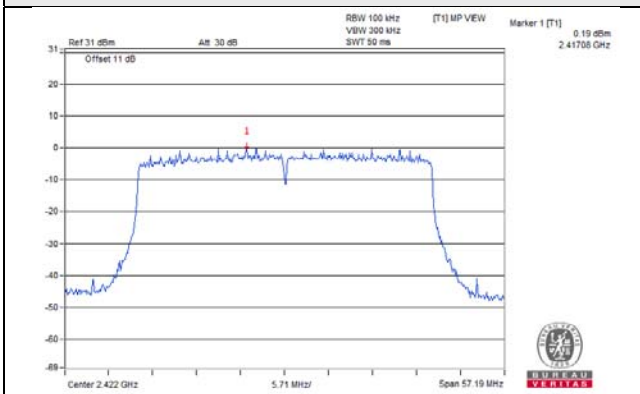


CH 9 Band edge

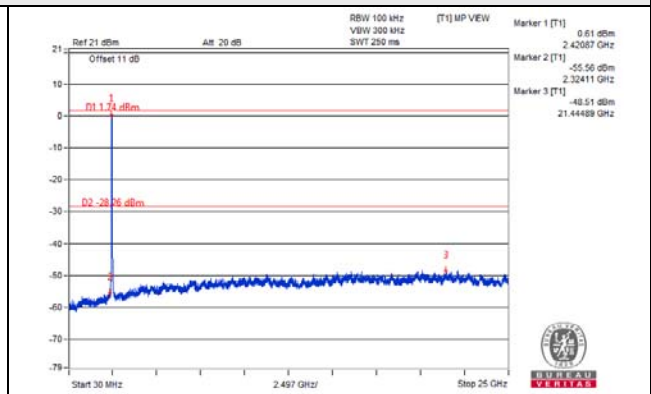
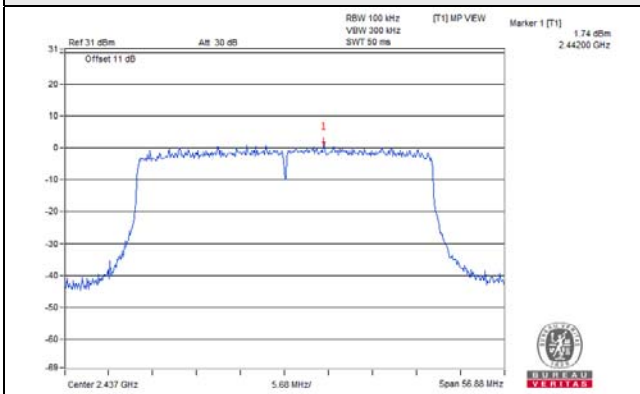


802.11n (HT40)_Chain 1

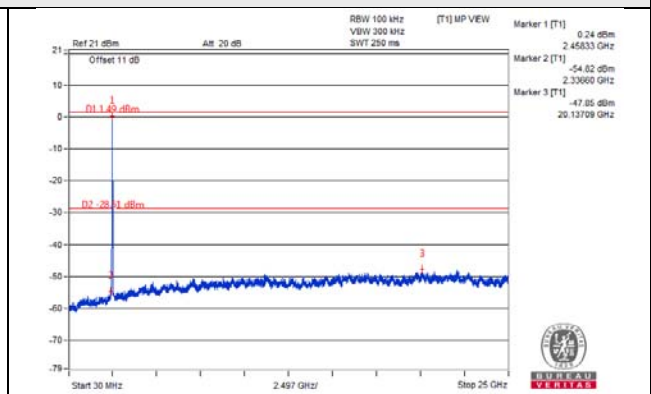
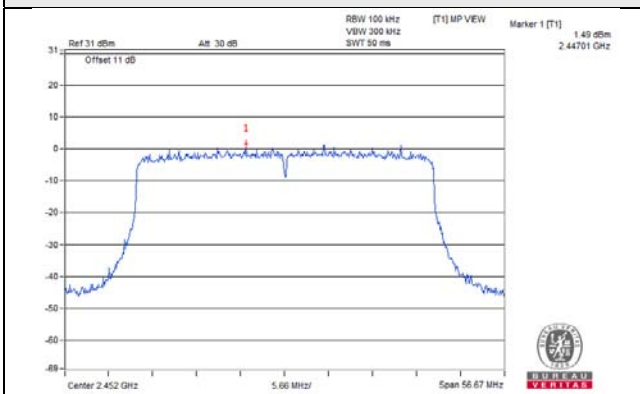
CH 3



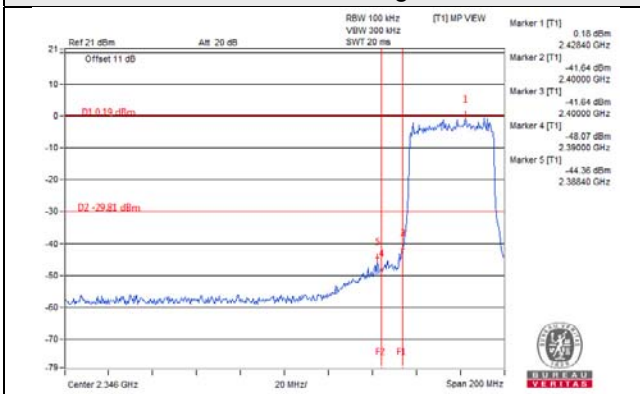
CH 6



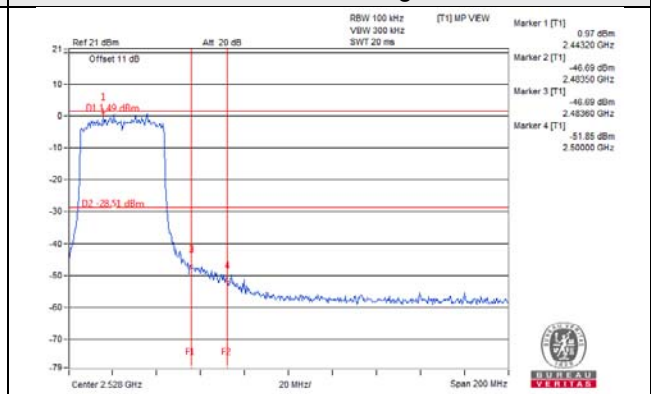
CH 9



CH 3 Band edge

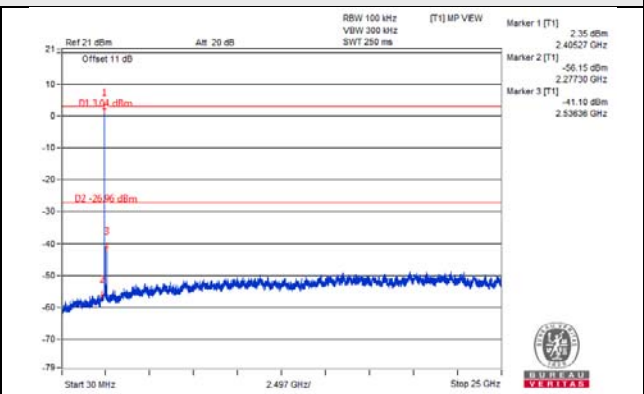
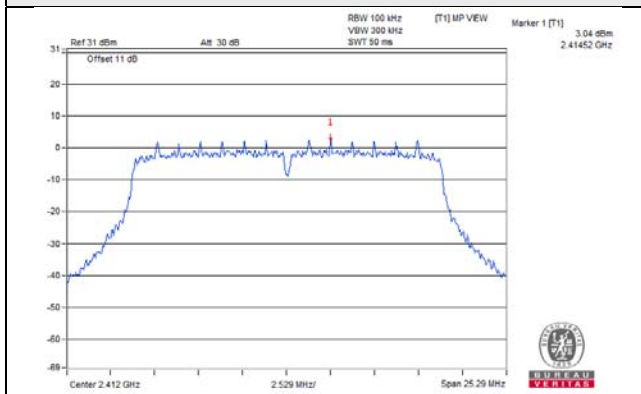


CH 9 Band edge

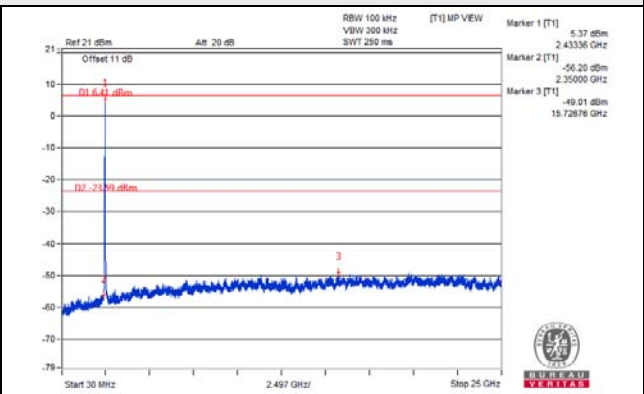
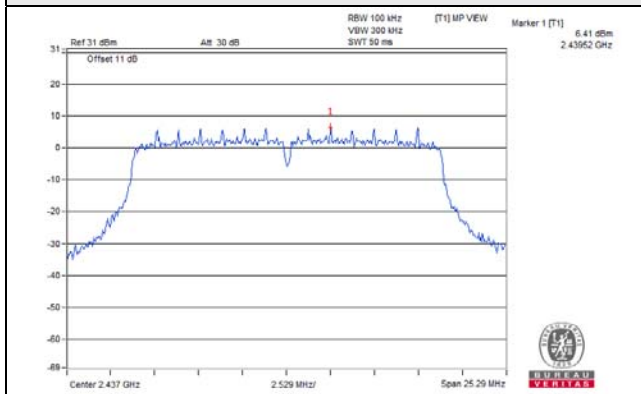


802.11ax (HE20)_Chain 0

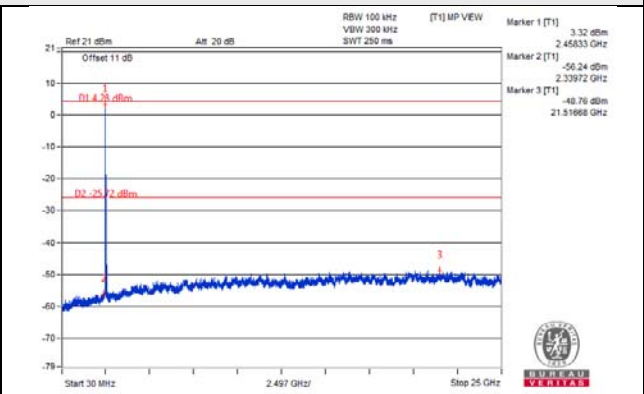
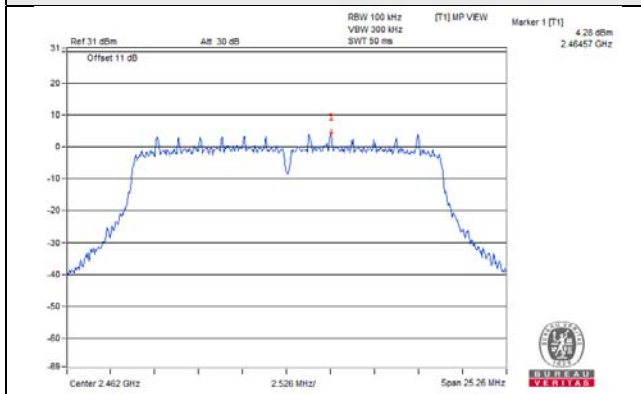
CH 1



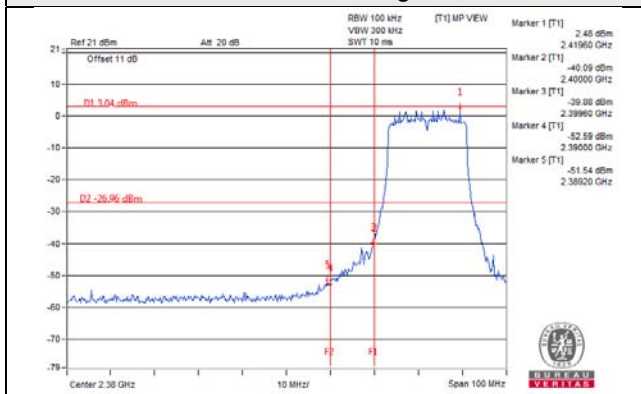
CH 6



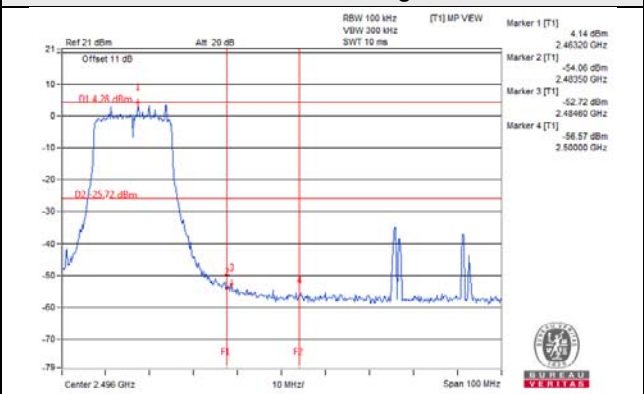
CH 11



CH 1 Band edge

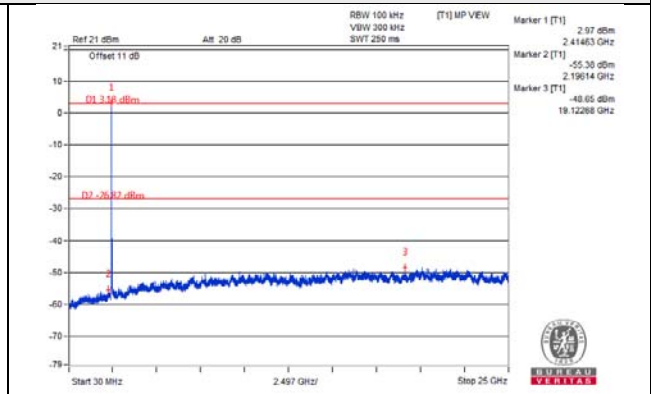
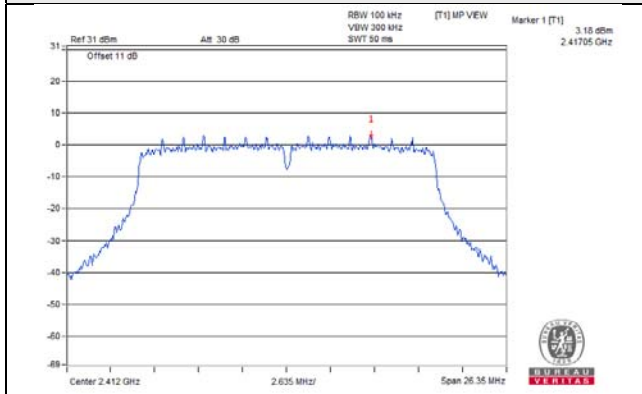


CH 11 Band edge

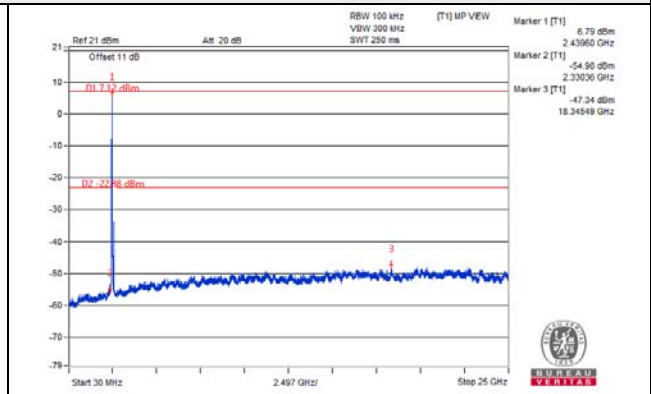
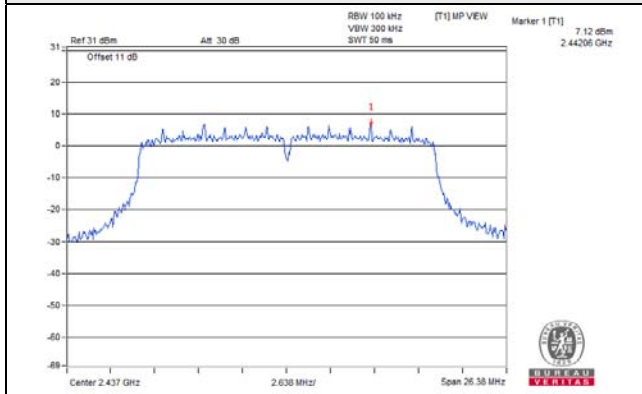


802.11ax (HE20)_Chain 1

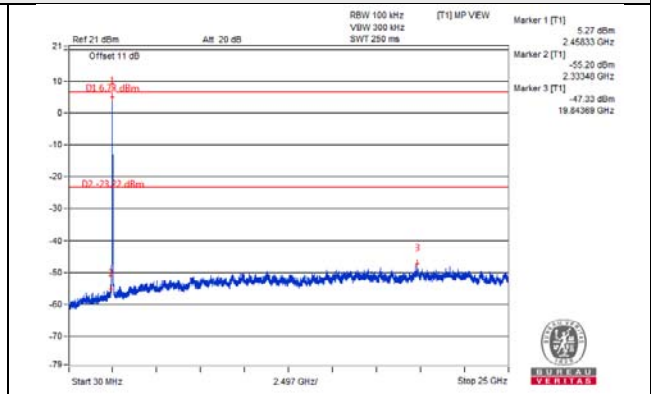
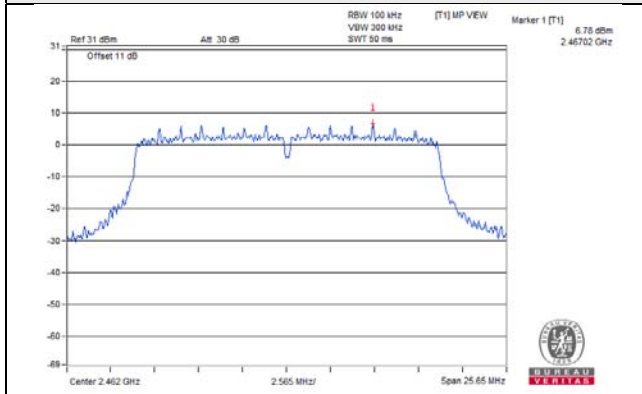
CH 1



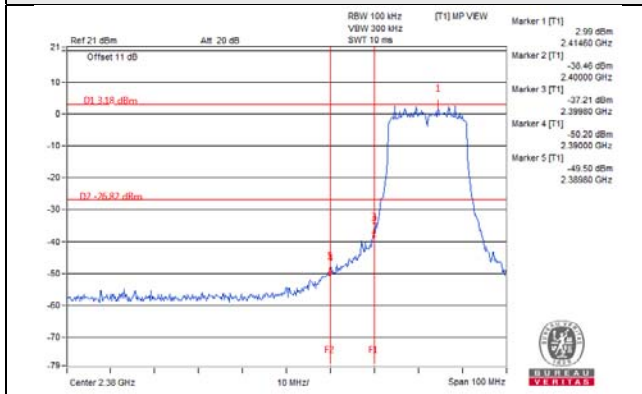
CH 6



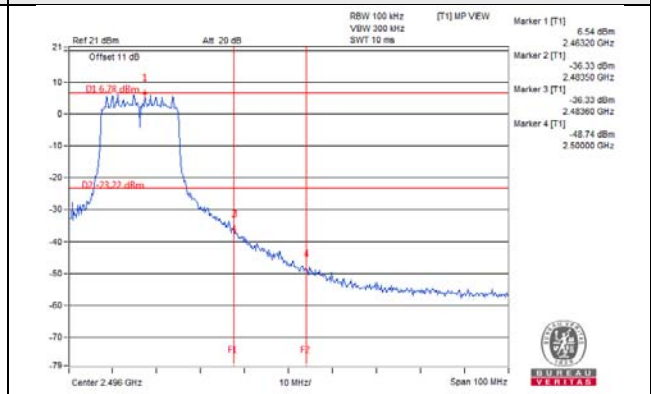
CH 11



CH 1 Band edge

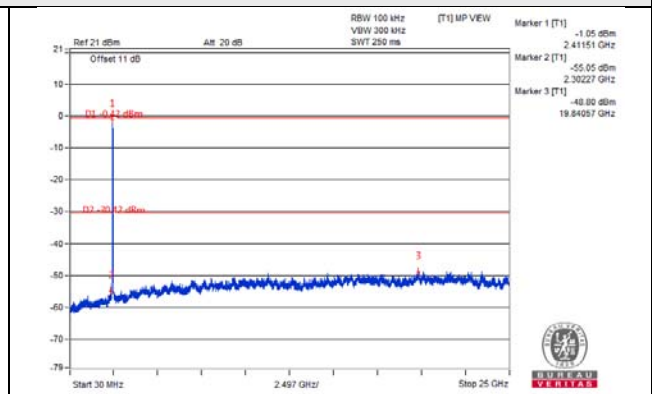
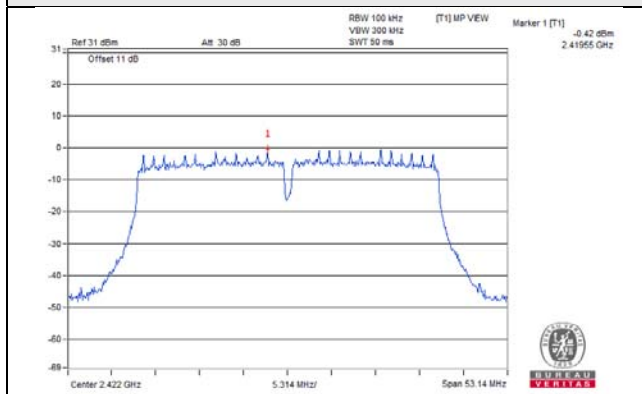


CH 11 Band edge

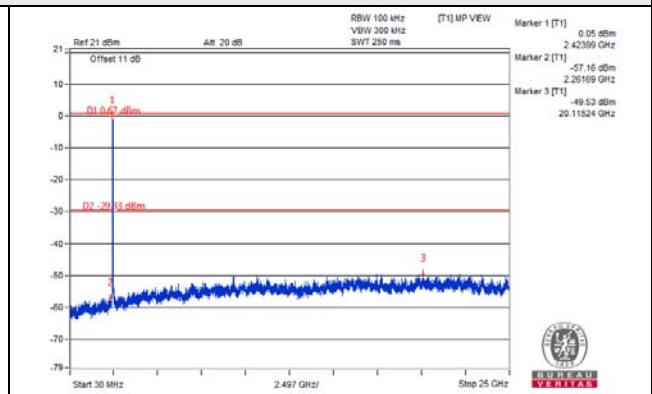
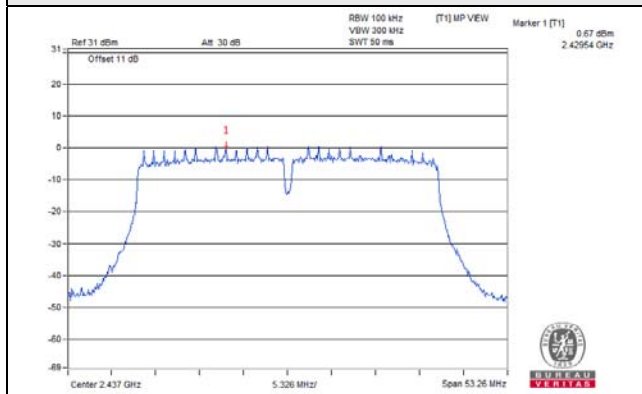


802.11ax (HE40)_Chain 0

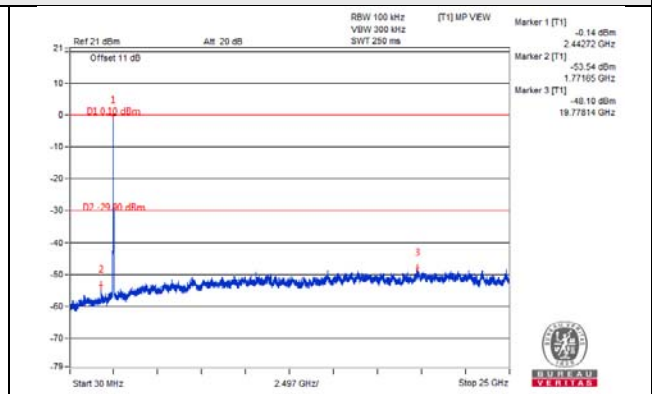
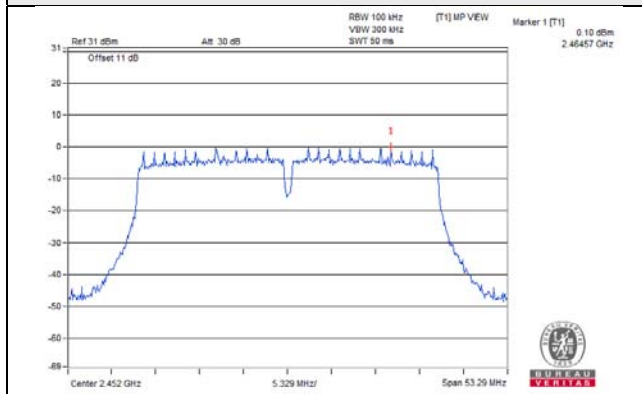
CH 3



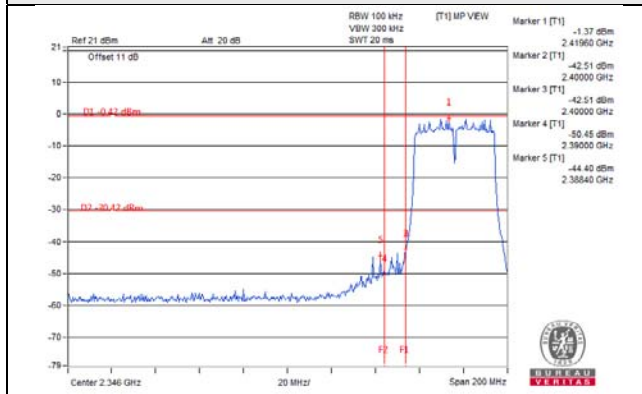
CH 6



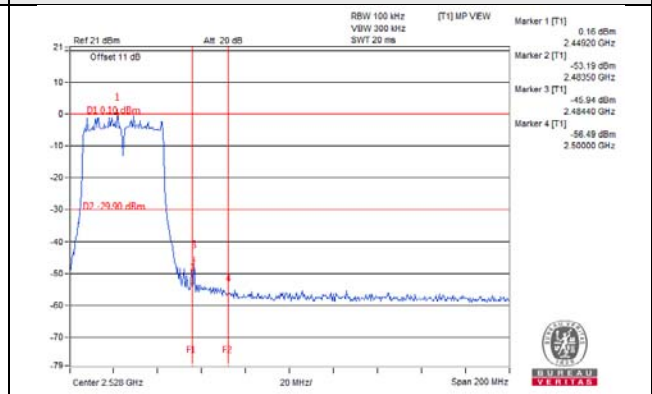
CH 9



CH 3 Band edge

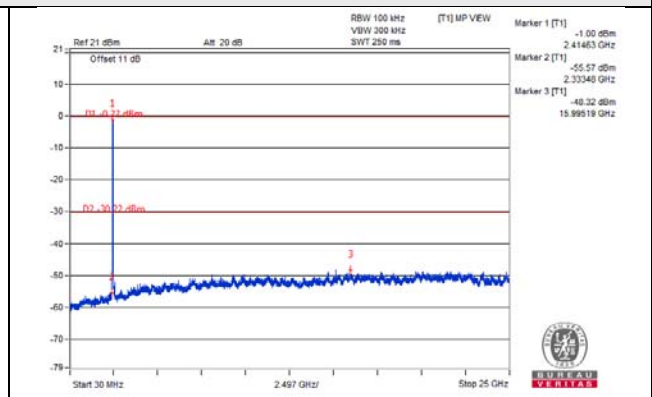
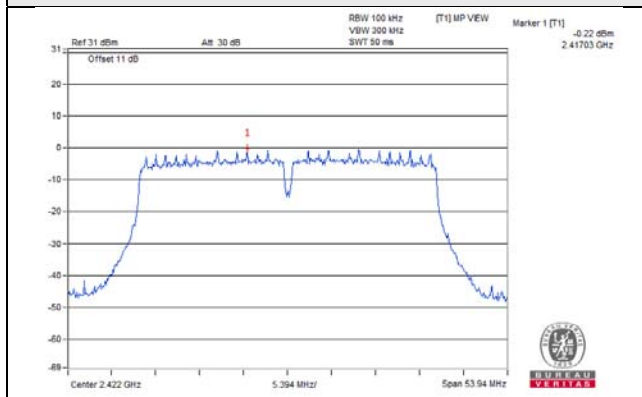


CH 9 Band edge

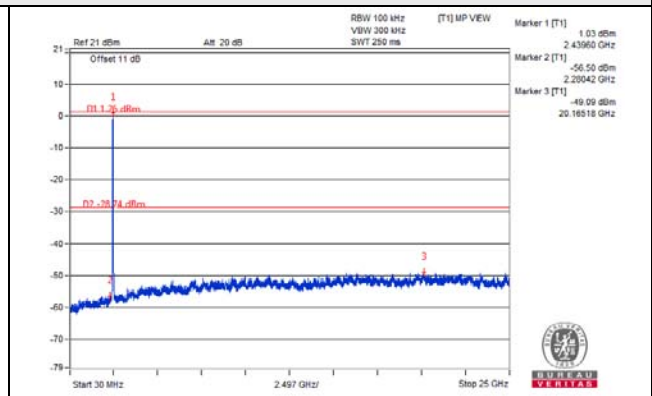
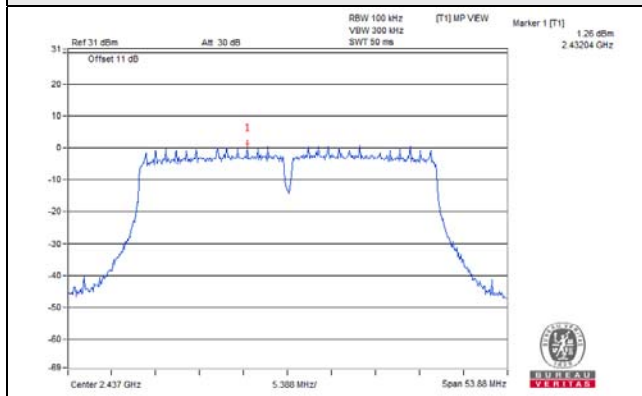


802.11ax (HE40)_Chain 1

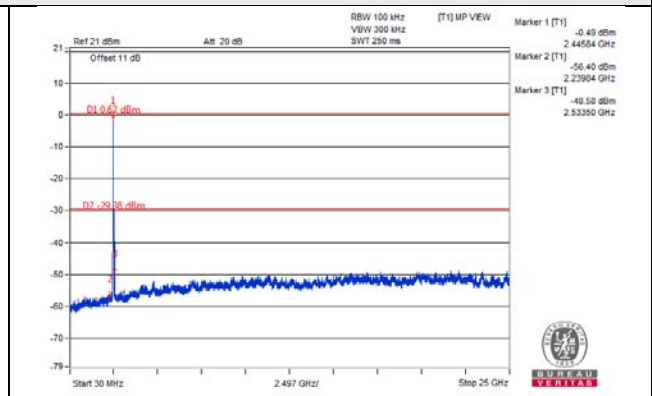
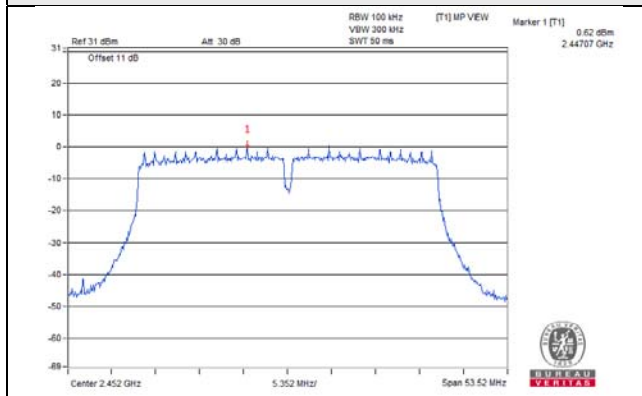
CH 3



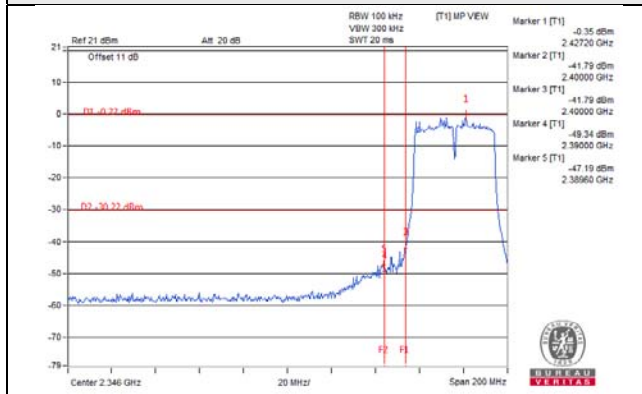
CH 6



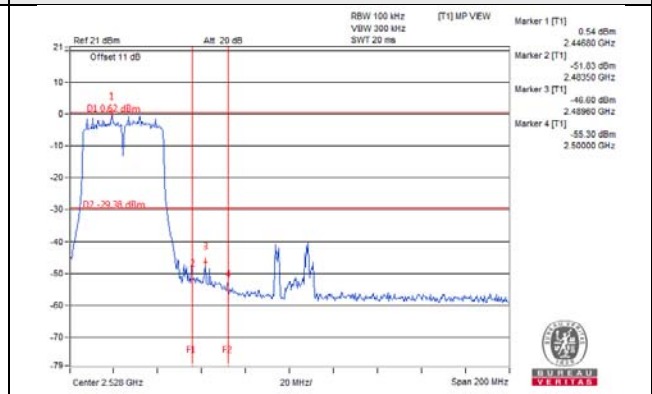
CH 9



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 and approved according to ISO/IEC 17025.

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

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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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