FCC Test Report

Report No.: RF190717D15A-1

FCC ID: 2AATB-WAP-7530

Test Model: WAP-7530

Received Date: Jan. 20, 2020

Test Date: Feb. 24 to Apr. 16, 2020

Issued Date: Apr. 27, 2020

Applicant: Tatung Technology Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories

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FCC Registration / Designation Number: 198487 / TW2021

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Release Control Record

Issue No.	Description	Date Issued
RF190717D15A-1	Original release.	Apr. 27, 2020

1 Certificate of Conformity

Product: Dual Band Wireless Router

Brand: TTI, WizeLink

Test Model: WAP-7530

Sample Status: Engineering sample

Applicant: Tatung Technology Inc.

Test Date: Feb. 24 to Apr. 16, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

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

Prepared by : Annie Chang, **Date:** Apr. 27, 2020

Annie Chang / Senior Specialist

Approved by : Rex. Lai, **Date:** Apr. 27, 2020

Rex Lai / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -12.25dB at 0.15000MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.03dB at 4924.00MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is I-PEX not a standard connector.

Note:
1. For 2.4GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.00 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.61 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.14 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Dual Band Wireless Router
Brand	TTI, WizeLink
Test Model	WAP-7530
Status of EUT	Engineering sample
Power Supply Rating	DC 12V from Adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS,OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 150Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
Output Power	614.522mW
Antenna Type	PCB antenna with 3.38dBi gain
Antenna Connector	I-PEX
Accessory Device	Adapter
Data Cable Supplied	Non-shielde LAN cable (3m)

Note:

1. The EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function
802.11b	2TX
802.11g	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

2. 2.4GHz & 5GHz technologies can transmit at same time.

3. The emission of the simultaneous operation has been evaluated and no non-compliance was found.

4. The EUT consumes power from the following adapters.

AC Adapter	1	2
Brand	Sunny	AtechOEM
Model	SYS1616-2412-W2	ADS0248T-W120200
Input Power	100-240Vac, 1.0A MAX, 50-60Hz	100-240Vac, 50-60Hz, 0.6A
Output Power	12Vdc / 2A	12Vdc / 2A
Power Line	AC 2 Pin, Non-shielded DC cable (1.5m)	AC 2 Pin, Non-shielded DC cable (1.5m)

After pre-tested above Adapters, the **Adapter 1** was the worst case, therefore, only its test data was recorded in this report.

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (20MHz):

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 (40MHz):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (20MHz)	1 to 11	1	OFDM	BPSK	6.5

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (20MHz)	1 to 11	1	OFDM	BPSK	6.5

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

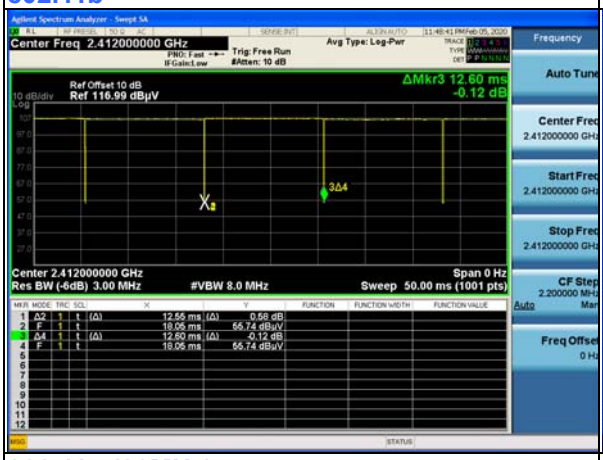
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	26deg. C, 65%RH	120Vac, 60Hz	Ian Chang
RE<1G	19deg. C, 79%RH	120Vac, 60Hz	Dalen Dai
PLC	21deg. C, 83%RH	120Vac, 60Hz	Dalen Dai
APCM	25deg. C, 76%RH	120Vac, 60Hz	Dalen Dai

3.3 Duty Cycle of Test Signal

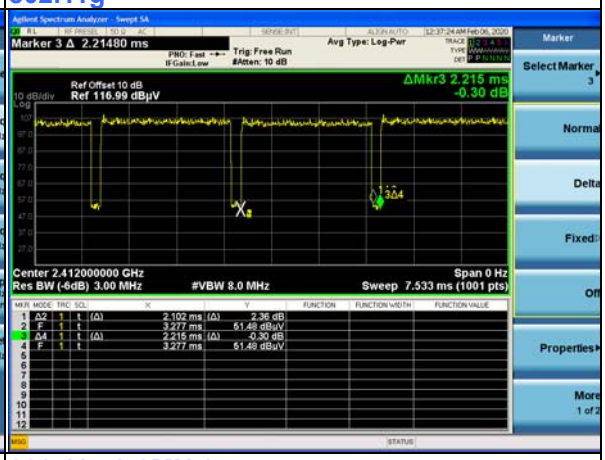
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.55/12.60 = 0.996
802.11g: Duty cycle = 2.102/2.215 = 0.949, Duty factor = 10 * log(1/0.949) = 0.23
802.11n (20MHz): Duty cycle = 1.936/2.049 = 0.945, Duty factor = 10 * log(1/0.945) = 0.25
802.11n (40MHz): Duty cycle = 0.960/1.095 = 0.877, Duty factor = 10 * log(1/0.877) = 0.57

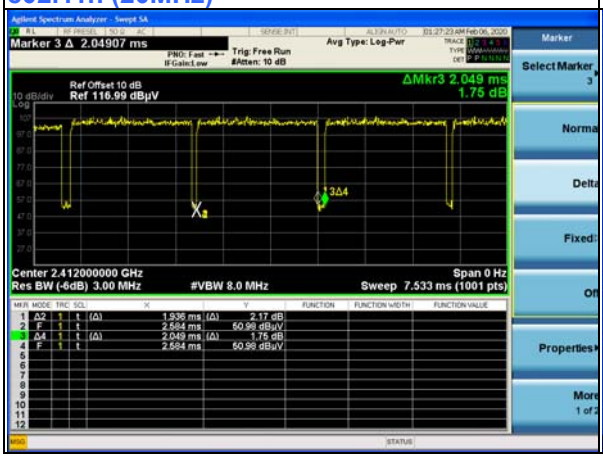
802.11b



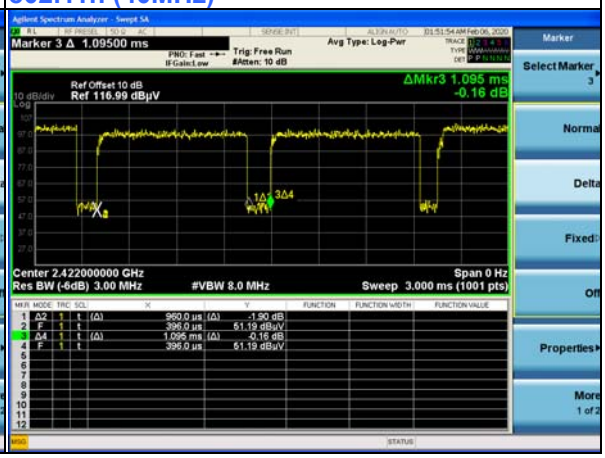
802.11g



802.11n (20MHz)



802.11n (40MHz)



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 PC	SONY	SVS151A12P	275548477000760	FCC DoC Approved	Provided by Lab
B.	Load	N/A	N/A	N/A	N/A	Provided by Lab

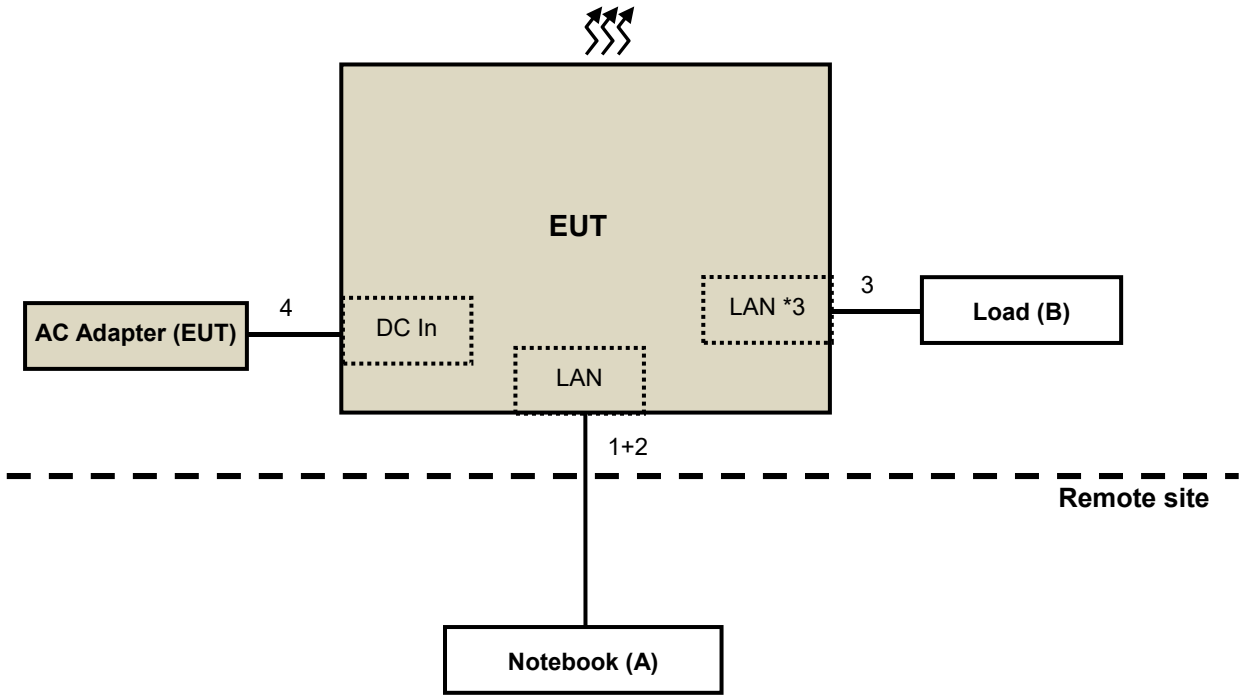
Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	1	10	N	0	Provided by Lab (RJ45, Cat.5e)
2.	LAN cable	1	3	N	0	Supplied by client (RJ45, Cat.5e)
3.	LAN cable	3	1.5	N	0	Provided by Lab (RJ45, Cat.5e)
4.	DC cable	1	1.5	N	0	Supplied by client

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and references

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

Test standard:

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

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

References Test Guidance:

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 19, 2020	Feb. 18, 2021
HP Preamplifier	8449B	3008A01201	Feb. 20, 2020	Feb. 19, 2021
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 19, 2020	Feb. 18, 2021
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 18, 2020	Mar. 17, 2021
Schwarzbeck Antenna	VULB 9168	139	Nov. 7, 2019	Nov. 6, 2020
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 24, 2019	Nov. 23, 2020
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 24, 2019	Nov. 23, 2020
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 10, 2019	Jul. 9, 2020
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 10, 2019	Jul. 9, 2020
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 11, 2019	Jun. 10, 2020
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 30, 2019	Jul. 29, 2020
Loop Antenna EMCI	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 24, 2019	Nov. 23, 2020
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2019	Sep. 22, 2020

NOTE:
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. Tested Date: Apr. 6 to 24, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

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

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

   The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz. (802.11b: RBW = 1MHz, VBW = 10Hz; 802.11g: RBW = 1MHz, VBW = 510Hz; 802.11n (20MHz): RBW = 1MHz, VBW = 560Hz; 802.11n (40MHz): RBW = 1MHz, VBW = 1.1kHz)

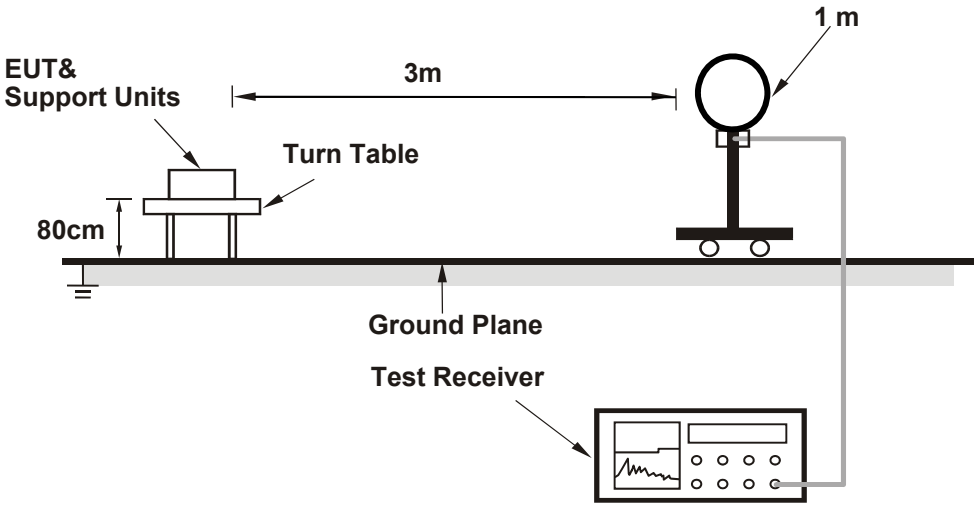
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

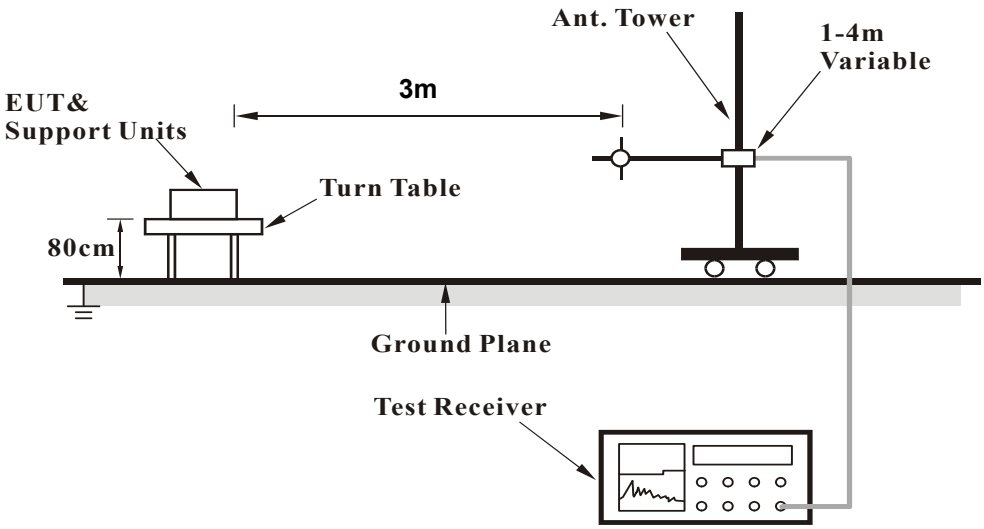
No deviation.

4.1.5 Test Setup

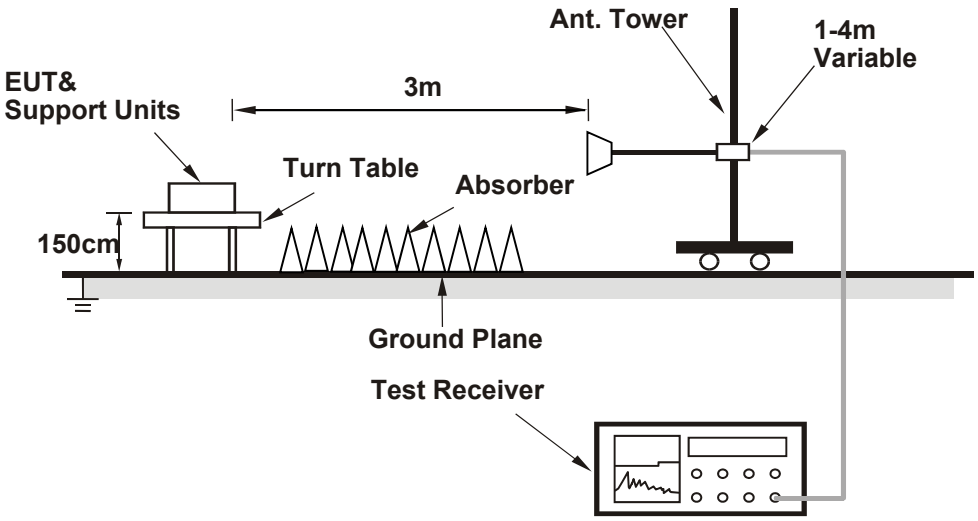
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Set the EUT under transmission condition continuously at specific channel frequency continuously.

4.1.7 Test Results

Above 1GHz Data：

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	59.97 PK	74.00	-14.03	1.53 H	294	58.66	1.31
2	2390.00	42.60 AV	54.00	-11.40	1.53 H	294	41.29	1.31
3	*2412.00	102.08 PK			1.53 H	294	100.72	1.36
4	*2412.00	98.02 AV			1.53 H	294	96.66	1.36
5	4824.00	53.93 PK	74.00	-20.07	1.93 H	280	45.08	8.85
6	4824.00	45.34 AV	54.00	-8.66	1.93 H	280	36.49	8.85
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	66.88 PK	74.00	-7.12	1.73 V	314	65.57	1.31
2	2390.00	42.95 AV	54.00	-11.05	1.73 V	314	41.64	1.31
3	*2412.00	103.59 PK			1.73 V	314	102.23	1.36
4	*2412.00	99.27 AV			1.73 V	314	97.91	1.36
5	4824.00	57.58 PK	74.00	-16.42	1.74 V	314	48.73	8.85
6	4824.00	52.67 AV	54.00	-1.33	1.74 V	314	43.82	8.85

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	101.27 PK			1.61 H	291	99.89	1.38
2	*2437.00	97.14 AV			1.61 H	291	95.76	1.38
3	4874.00	53.91 PK	74.00	-20.09	1.64 H	288	44.89	9.02
4	4874.00	45.08 AV	54.00	-8.92	1.64 H	288	36.06	9.02
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	103.07 PK			1.86 V	311	101.69	1.38
2	*2437.00	98.78 AV			1.86 V	311	97.40	1.38
3	4874.00	57.48 PK	74.00	-16.52	1.67 V	317	48.46	9.02
4	4874.00	52.60 AV	54.00	-1.40	1.67 V	317	43.58	9.02

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	101.70 PK			1.55 H	299	100.25	1.45
2	*2462.00	97.98 AV			1.55 H	299	96.53	1.45
3	2483.50	61.41 PK	74.00	-12.59	1.55 H	299	59.86	1.55
4	2483.50	42.40 AV	54.00	-11.60	1.55 H	299	40.85	1.55
5	4924.00	54.18 PK	74.00	-19.82	2.02 H	281	45.09	9.09
6	4924.00	45.60 AV	54.00	-8.40	2.02 H	281	36.51	9.09
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	103.69 PK			1.69 V	312	102.24	1.45
2	*2462.00	99.96 AV			1.69 V	312	98.51	1.45
3	2483.50	67.70 PK	74.00	-6.30	1.69 V	312	66.15	1.55
4	2483.50	43.35 AV	54.00	-10.65	1.69 V	312	41.80	1.55
5	4924.00	57.69 PK	74.00	-16.31	1.69 V	304	48.60	9.09
6	4924.00	52.85 AV	54.00	-1.15	1.69 V	304	43.76	9.09

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	62.02 PK	74.00	-11.98	2.04 H	302	60.71	1.31
2	2390.00	45.12 AV	54.00	-8.88	2.04 H	302	43.81	1.31
3	*2412.00	108.14 PK			2.04 H	302	106.78	1.36
4	*2412.00	98.47 AV			2.04 H	302	97.11	1.36
5	4824.00	59.82 PK	74.00	-14.18	1.93 H	280	50.97	8.85
6	4824.00	45.68 AV	54.00	-8.32	1.93 H	280	36.83	8.85
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	64.92 PK	74.00	-9.08	1.72 V	314	63.61	1.31
2	2390.00	47.11 AV	54.00	-6.89	1.72 V	314	45.80	1.31
3	*2412.00	110.07 PK			1.72 V	314	108.71	1.36
4	*2412.00	99.98 AV			1.72 V	314	98.62	1.36
5	4824.00	66.53 PK	74.00	-7.47	1.73 V	309	57.68	8.85
6	4824.00	52.54 AV	54.00	-1.46	1.73 V	309	43.69	8.85

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	107.97 PK			2.10 H	296	106.59	1.38
2	*2437.00	98.27 AV			2.10 H	296	96.89	1.38
3	4874.00	59.86 PK	74.00	-14.14	1.95 H	289	50.84	9.02
4	4874.00	45.84 AV	54.00	-8.16	1.95 H	289	36.82	9.02
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	109.77 PK			1.70 V	314	108.39	1.38
2	*2437.00	100.13 AV			1.70 V	314	98.75	1.38
3	4874.00	66.25 PK	74.00	-7.75	1.88 V	315	57.23	9.02
4	4874.00	52.77 AV	54.00	-1.23	1.88 V	315	43.75	9.02

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	109.30 PK			2.06 H	305	107.85	1.45
2	*2462.00	99.08 AV			2.06 H	305	97.63	1.45
3	2483.50	64.84 PK	74.00	-9.16	2.06 H	305	63.29	1.55
4	2483.50	45.83 AV	54.00	-8.17	2.06 H	305	44.28	1.55
5	4924.00	59.55 PK	74.00	-14.45	1.99 H	288	50.46	9.09
6	4924.00	46.05 AV	54.00	-7.95	1.99 H	288	36.96	9.09
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	110.93 PK			1.71 V	312	109.48	1.45
2	*2462.00	100.88 AV			1.71 V	312	99.43	1.45
3	2483.50	67.98 PK	74.00	-6.02	1.71 V	312	66.43	1.55
4	2483.50	48.88 AV	54.00	-5.12	1.71 V	312	47.33	1.55
5	4924.00	66.70 PK	74.00	-7.30	1.88 V	286	57.61	9.09
6	**4924.00**	**52.97 AV**	**54.00**	**-1.03**	**1.88 V**	**286**	**43.88**	**9.09**

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.

802.11n (20MHz)

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	67.44 PK	74.00	-6.56	1.63 H	297	66.13	1.31
2	2390.00	45.49 AV	54.00	-8.51	1.63 H	297	44.18	1.31
3	*2412.00	108.94 PK			1.63 H	297	107.58	1.36
4	*2412.00	98.05 AV			1.63 H	297	96.69	1.36
5	4824.00	64.28 PK	74.00	-9.72	2.02 H	289	55.43	8.85
6	4824.00	49.10 AV	54.00	-4.90	2.02 H	289	40.25	8.85
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	70.66 PK	74.00	-3.34	1.86 V	316	69.35	1.31
2	2390.00	48.72 AV	54.00	-5.28	1.86 V	316	47.41	1.31
3	*2412.00	110.82 PK			1.86 V	316	109.46	1.36
4	*2412.00	100.11 AV			1.86 V	316	98.75	1.36
5	4824.00	67.72 PK	74.00	-6.28	1.63 V	311	58.87	8.85
6	4824.00	52.90 AV	54.00	-1.10	1.63 V	311	44.05	8.85

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	107.84 PK			1.70 H	303	106.46	1.38
2	*2437.00	97.76 AV			1.70 H	303	96.38	1.38
3	4874.00	63.80 PK	74.00	-10.20	1.99 H	297	54.78	9.02
4	4874.00	48.70 AV	54.00	-5.30	1.99 H	297	39.68	9.02
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	110.12 PK			2.04 V	308	108.74	1.38
2	*2437.00	99.66 AV			2.04 V	308	98.28	1.38
3	4874.00	66.66 PK	74.00	-7.34	1.81 V	286	57.64	9.02
4	4874.00	52.45 AV	54.00	-1.55	1.81 V	286	43.43	9.02

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	107.99 PK			1.71 H	297	106.54	1.45
2	*2462.00	97.80 AV			1.71 H	297	96.35	1.45
3	2483.50	68.97 PK	74.00	-5.03	1.71 H	297	67.42	1.55
4	2483.50	45.84 AV	54.00	-8.16	1.71 H	297	44.29	1.55
5	4924.00	62.93 PK	74.00	-11.07	2.02 H	312	53.84	9.09
6	4924.00	47.76 AV	54.00	-6.24	2.02 H	312	38.67	9.09
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	109.90 PK			2.06 V	311	108.45	1.45
2	*2462.00	99.81 AV			2.06 V	311	98.36	1.45
3	2483.50	72.89 PK	74.00	-1.11	2.06 V	311	71.34	1.55
4	2483.50	49.27 AV	54.00	-4.73	2.06 V	311	47.72	1.55
5	4924.00	66.38 PK	74.00	-7.62	1.80 V	287	57.29	9.09
6	4924.00	51.44 AV	54.00	-2.56	1.80 V	287	42.35	9.09

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.

802.11n (40MHz)

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	69.90 PK	74.00	-4.10	1.74 H	312	68.59	1.31
2	2390.00	42.82 AV	54.00	-11.18	1.74 H	312	41.51	1.31
3	*2422.00	101.26 PK			1.74 H	312	99.89	1.37
4	*2422.00	91.16 AV			1.74 H	312	89.79	1.37
5	4844.00	53.43 PK	74.00	-20.57	2.02 H	309	44.52	8.91
6	4844.00	37.79 AV	54.00	-16.21	2.02 H	309	28.88	8.91
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	72.95 PK	74.00	-1.05	2.06 V	311	71.64	1.31
2	2390.00	44.97 AV	54.00	-9.03	2.06 V	311	43.66	1.31
3	*2422.00	103.27 PK			2.06 V	311	101.90	1.37
4	*2422.00	93.53 AV			2.06 V	311	92.16	1.37
5	4844.00	56.30 PK	74.00	-17.70	1.28 V	80	47.39	8.91
6	4844.00	42.24 AV	54.00	-11.76	1.28 V	80	33.33	8.91

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	69.77 PK	74.00	-4.23	1.74 H	311	68.46	1.31
2	2390.00	42.57 AV	54.00	-11.43	1.74 H	311	41.26	1.31
3	*2437.00	103.61 PK			1.74 H	311	102.23	1.38
4	*2437.00	94.01 AV			1.74 H	311	92.63	1.38
5	2483.50	69.51 PK	74.00	-4.49	1.74 H	311	67.96	1.55
6	2483.50	42.83 AV	54.00	-11.17	1.74 H	311	41.28	1.55
7	4874.00	57.65 PK	74.00	-16.35	2.02 H	310	48.63	9.02
8	4874.00	44.36 AV	54.00	-9.64	2.02 H	310	35.34	9.02
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	72.79 PK	74.00	-1.21	1.87 V	312	71.48	1.31
2	2390.00	45.34 AV	54.00	-8.66	1.87 V	312	44.03	1.31
3	*2437.00	105.88 PK			1.87 V	312	104.50	1.38
4	*2437.00	96.24 AV			1.87 V	312	94.86	1.38
5	2483.50	72.05 PK	74.00	-1.95	1.87 V	312	70.50	1.55
6	2483.50	46.10 AV	54.00	-7.90	1.87 V	312	44.55	1.55
7	4874.00	60.89 PK	74.00	-13.11	2.27 V	77	51.87	9.02
8	4874.00	47.24 AV	54.00	-6.76	2.27 V	77	38.22	9.02

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	101.82 PK			1.67 H	299	100.42	1.40
2	*2452.00	91.42 AV			1.67 H	299	90.02	1.40
3	2483.50	69.01 PK	74.00	-4.99	1.67 H	299	67.46	1.55
4	2483.50	41.85 AV	54.00	-12.15	1.67 H	299	40.30	1.55
5	4904.00	53.63 PK	74.00	-20.37	2.02 H	306	44.52	9.11
6	4904.00	39.80 AV	54.00	-14.20	2.02 H	306	30.69	9.11
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	103.57 PK			1.67 V	310	102.17	1.40
2	*2452.00	93.05 AV			1.67 V	310	91.65	1.40
3	2483.50	72.75 PK	74.00	-1.25	1.67 V	310	71.20	1.55
4	2483.50	45.97 AV	54.00	-8.03	1.67 V	310	44.42	1.55
5	4904.00	56.57 PK	74.00	-17.43	1.34 V	98	47.46	9.11
6	4904.00	42.63 AV	54.00	-11.37	1.34 V	98	33.52	9.11

REMARKS:

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

Below 1GHz Data:

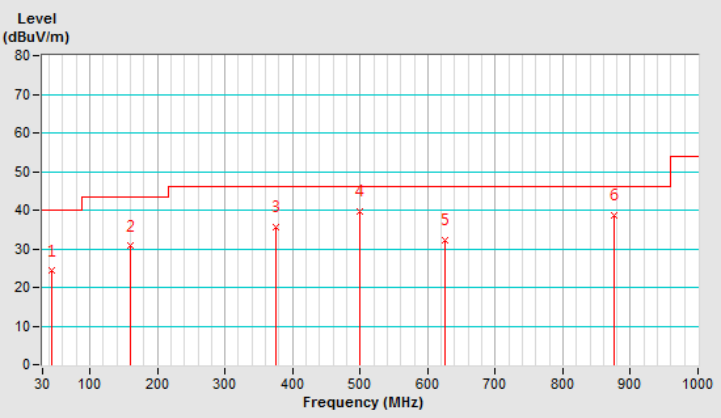
802.11n (20MHz)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	44.36	24.29 QP	40.00	-15.71	1.94 H	107	31.58	-7.29
2	159.98	30.70 QP	43.50	-12.80	1.43 H	114	37.10	-6.40
3	374.98	35.73 QP	46.00	-10.27	1.86 H	140	38.97	-3.24
4	500.01	39.61 QP	46.00	-6.39	2.01 H	222	40.07	-0.46
5	625.00	32.20 QP	46.00	-13.80	2.19 H	200	29.47	2.73
6	875.02	38.72 QP	46.00	-7.28	1.66 H	154	31.98	6.74

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.

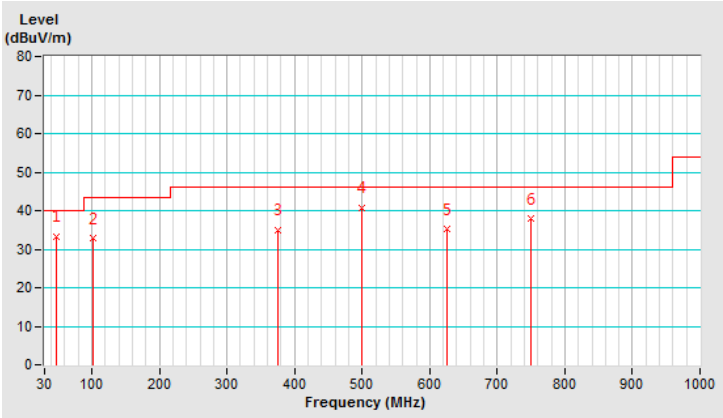


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	47.02	33.34 QP	40.00	-6.66	1.78 V	247	40.50	-7.16
2	101.15	32.77 QP	43.50	-10.73	1.22 V	275	43.91	-11.14
3	375.03	34.97 QP	46.00	-11.03	1.91 V	200	38.22	-3.25
4	500.01	40.76 QP	46.00	-5.24	1.20 V	140	41.22	-0.46
5	625.00	35.13 QP	46.00	-10.87	2.05 V	319	32.40	2.73
6	750.03	37.82 QP	46.00	-8.18	2.24 V	34	33.03	4.79

REMARKS:

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



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS30	100276	Apr. 8, 2019	Apr. 7, 2020
SCHWARZBECK Artificial Mains Network (for EUT)	NSLK 8128	8128-244	Nov. 11, 2019	Nov. 10, 2020
LISN With Adapter (for EUT)	AD10	C05Ada-001	Nov. 11, 2019	Nov. 10, 2020
ROHDE & SCHWARZ Artificial Mains Network (for peripheral)	ESH3-Z5	100220	Nov. 18, 2019	Nov. 17, 2020
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C05.01	Jan. 30, 2020	Jan. 29, 2021
LYNICS Terminator (For R&S LISN)	0900510	E1-01-305	Feb. 17, 2020	Feb. 16, 2021

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 Shielded Room No. 5.
3. Tested Date: Feb. 24, 2020

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

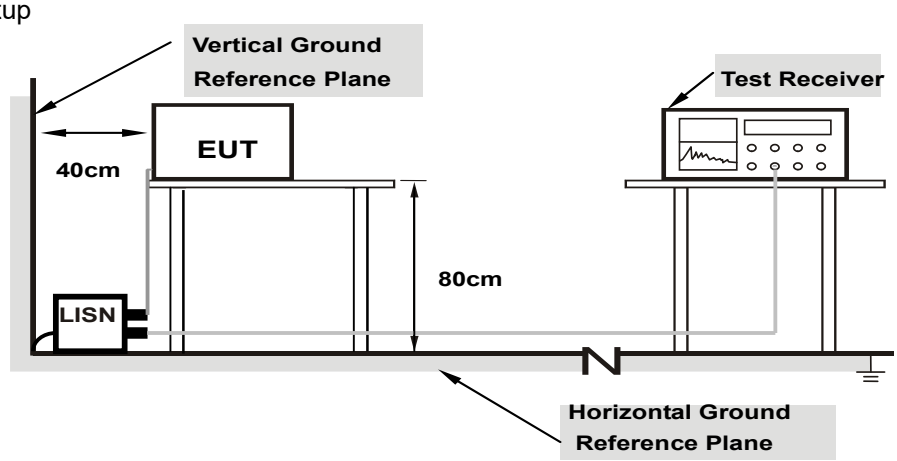
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

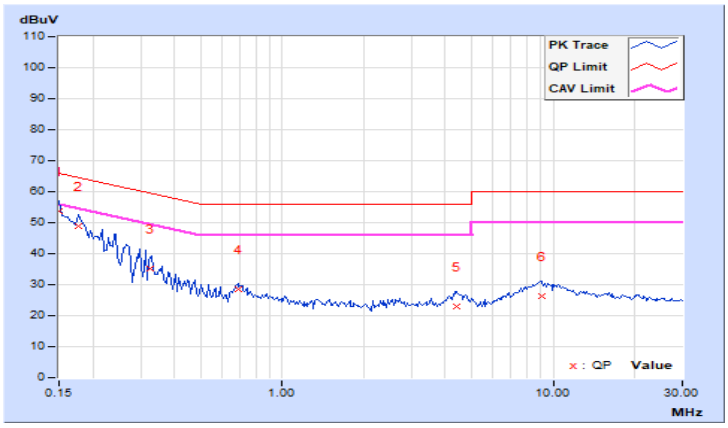
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15000**	**9.90**	**43.85**	**29.53**	**53.75**	**39.43**	**66.00**	**56.00**	**-12.25**	**-16.57**
2	0.17734	9.90	38.90	22.88	48.80	32.78	64.61	54.61	-15.81	-21.83
3	0.32422	9.91	25.39	18.78	35.30	28.69	59.60	49.60	-24.30	-20.91
4	0.68516	9.94	18.76	11.61	28.70	21.55	56.00	46.00	-27.30	-24.45
5	4.41406	10.18	12.74	6.24	22.92	16.42	56.00	46.00	-33.08	-29.58
6	9.03906	10.45	15.71	8.99	26.16	19.44	60.00	50.00	-33.84	-30.56

REMARKS:

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

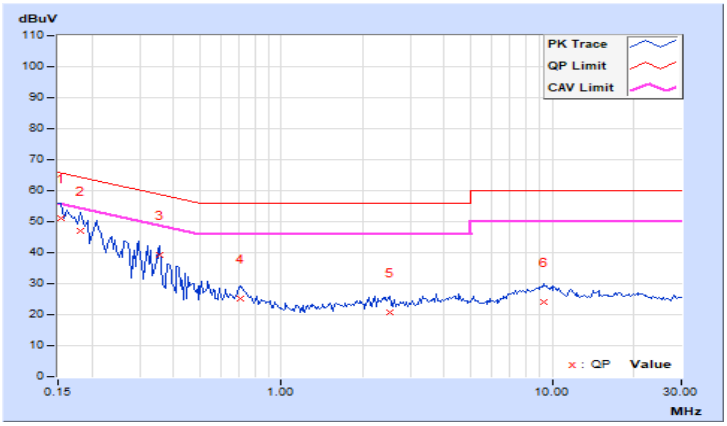


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.92	41.11	27.26	51.03	37.18	65.79	55.79	-14.76	-18.61
2	0.18125	9.92	37.26	23.94	47.18	33.86	64.43	54.43	-17.25	-20.57
3	0.35703	9.94	29.46	22.94	39.40	32.88	58.80	48.80	-19.40	-15.92
4	0.70469	9.97	15.07	9.26	25.04	19.23	56.00	46.00	-30.96	-26.77
5	2.51953	10.08	10.72	4.37	20.80	14.45	56.00	46.00	-35.20	-31.55
6	9.32422	10.48	13.66	6.63	24.14	17.11	60.00	50.00	-35.86	-32.89

REMARKS:

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

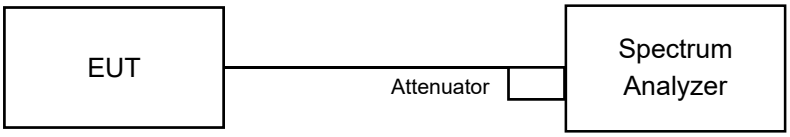


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation fromTest 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	10.09	10.06	0.5	PASS
6	2437	10.06	10.05	0.5	PASS
11	2462	10.05	10.06	0.5	PASS

802.11g

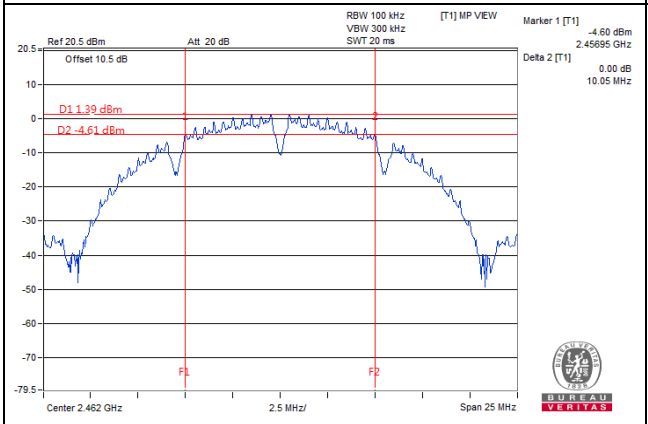
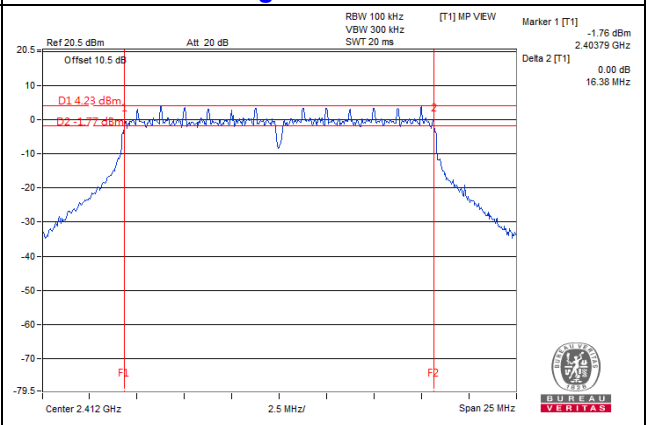
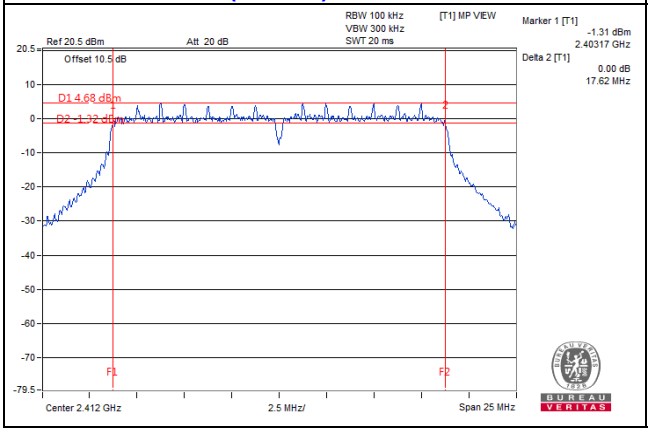
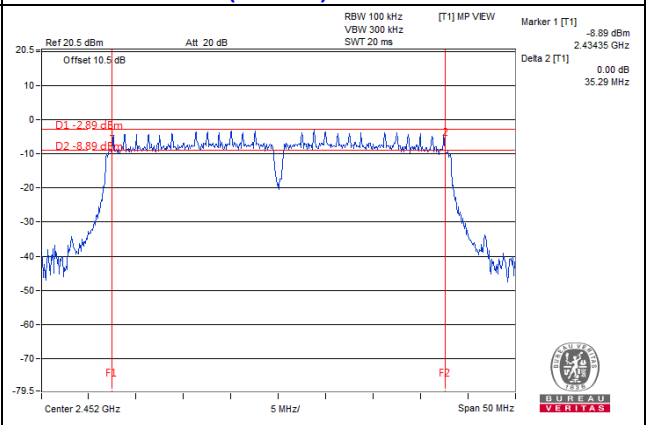
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.38	16.40	0.5	PASS
6	2437	16.40	16.40	0.5	PASS
11	2462	16.40	16.41	0.5	PASS

802.11n (20MHz)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.62	17.64	0.5	PASS
6	2437	17.64	17.63	0.5	PASS
11	2462	17.62	17.62	0.5	PASS

802.11n (40MHz)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.81	35.69	0.5	PASS
6	2437	35.85	35.81	0.5	PASS
9	2452	35.80	35.29	0.5	PASS

Spectrum Plot of Worst Value	
802.11b / Chain 0 : CH11	**802.11g / Chain 0 : CH1**
	
802.11n (20MHz) / Chain 0 : CH1	**802.11n (40MHz) / Chain 1 : CH9**
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

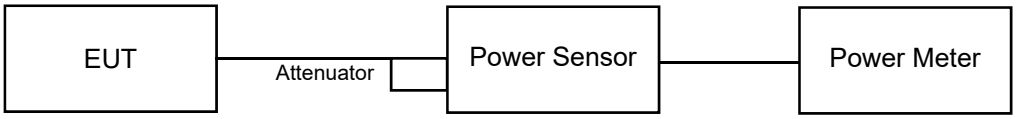
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

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

FOR PEAK POWER

802.11b

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.06	13.98	50.471	17.03	30	Pass
6	2437	14.05	14.00	50.529	17.04	30	Pass
11	2462	14.02	13.95	50.066	17.00	30	Pass

802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.19	24.11	520.054	27.16	30	Pass
6	2437	24.22	24.15	524.257	27.20	30	Pass
11	2462	24.15	24.12	518.242	27.15	30	Pass

802.11n (20MHz)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.90	24.85	**614.522**	27.89	30	Pass
6	2437	23.83	23.79	480.878	26.82	30	Pass
11	2462	23.86	23.83	484.766	26.86	30	Pass

802.11n (40MHz)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	21.99	21.82	310.180	24.92	30	Pass
6	2437	24.01	23.89	496.674	26.96	30	Pass
9	2452	21.23	21.17	263.657	24.21	30	Pass

FOR AVERAGE POWER

802.11b

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	11.88	11.83	30.658	14.87
6	2437	11.91	11.85	30.835	14.89
11	2462	11.89	11.81	30.624	14.86

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	15.73	15.58	73.552	18.67
6	2437	15.75	15.69	74.652	18.73
11	2462	15.72	15.70	74.479	18.72

802.11n (20MHz)

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	16.87	16.83	96.836	19.86
6	2437	15.86	15.81	76.655	18.85
11	2462	15.92	15.82	77.278	18.88

802.11n (40MHz)

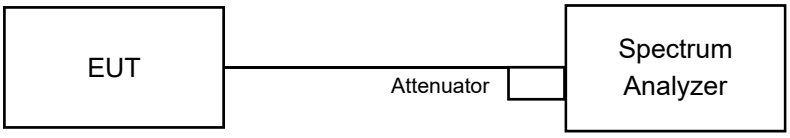
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	12.27	12.15	33.272	15.22
6	2437	15.38	15.28	68.243	18.34
9	2452	11.52	11.47	28.219	14.51

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-12.73	3.01	-9.72	7.61	Pass
	6	2437	-12.80	3.01	-9.79	7.61	Pass
	11	2462	-12.71	3.01	-9.70	7.61	Pass
1	1	2412	-12.86	3.01	-9.85	7.61	Pass
	6	2437	-12.42	3.01	-9.41	7.61	Pass
	11	2462	-12.52	3.01	-9.51	7.61	Pass

NOTE: Directional gain = 3.38dBi + 10log(2) = 6.39dBi > 6dBi , so the power density limit shall be reduced to 8-(8-6.39) = 7.61dBm.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.04	3.01	-8.03	7.61	Pass
	6	2437	-11.11	3.01	-8.10	7.61	Pass
	11	2462	-11.21	3.01	-8.20	7.61	Pass
1	1	2412	-11.34	3.01	-8.33	7.61	Pass
	6	2437	-11.19	3.01	-8.18	7.61	Pass
	11	2462	-11.03	3.01	-8.02	7.61	Pass

NOTE: Directional gain = 3.38dBi + 10log(2) = 6.39dBi > 6dBi , so the power density limit shall be reduced to 8-(8-6.39) = 7.61dBm.

802.11n (20MHz)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-10.30	3.01	-7.29	7.61	Pass
	6	2437	-10.70	3.01	-7.69	7.61	Pass
	11	2462	-10.68	3.01	-7.67	7.61	Pass
1	1	2412	-10.43	3.01	-7.42	7.61	Pass
	6	2437	-11.05	3.01	-8.04	7.61	Pass
	11	2462	-10.76	3.01	-7.75	7.61	Pass

NOTE: Directional gain = 3.38dBi + 10log(2) = 6.39dBi > 6dBi , so the power density limit shall be reduced to 8-(8-6.39) = 7.61dBm.

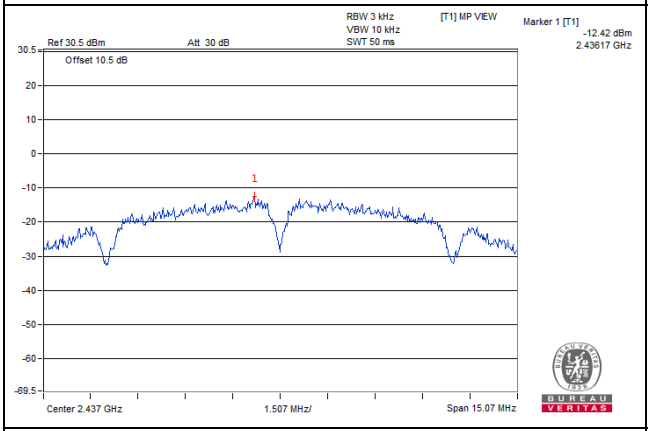
802.11n (40MHz)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-17.84	3.01	-14.83	7.61	Pass
	6	2437	-15.13	3.01	-12.12	7.61	Pass
	9	2452	-18.03	3.01	-15.02	7.61	Pass
1	3	2422	-17.70	3.01	-14.69	7.61	Pass
	6	2437	-14.92	3.01	-11.91	7.61	Pass
	9	2452	-18.40	3.01	-15.39	7.61	Pass

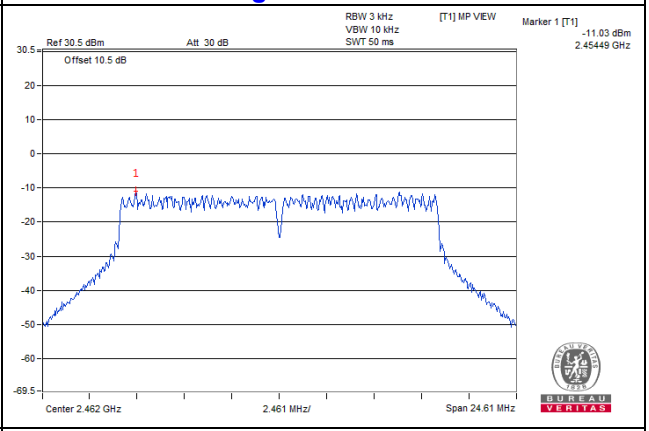
NOTE: Directional gain = 3.38dBi + 10log(2) = 6.39dBi > 6dBi , so the power density limit shall be reduced to 8-(8-6.39) = 7.61dBm.

Spectrum Plot of Worst Value

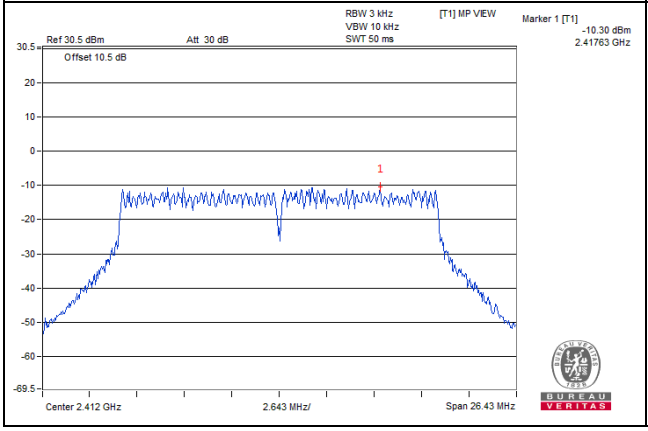
802.11b / Chain 1 : CH6



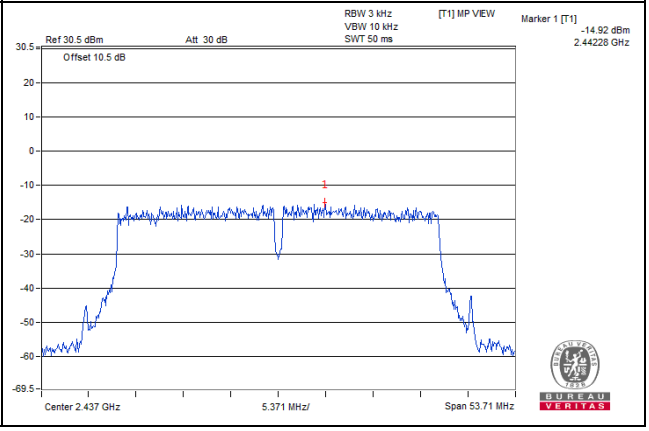
802.11g / Chain 1 : CH11



802.11n (20MHz) / Chain 0 : CH1



802.11n (40MHz) / Chain 1: CH6

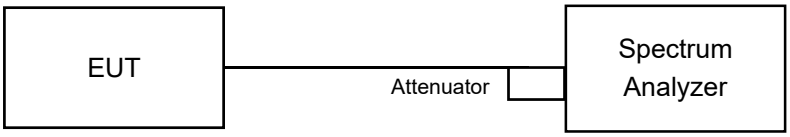


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

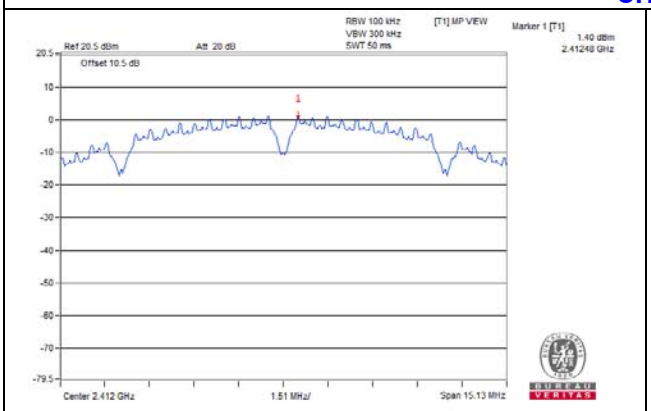
Same as Item 4.3.6

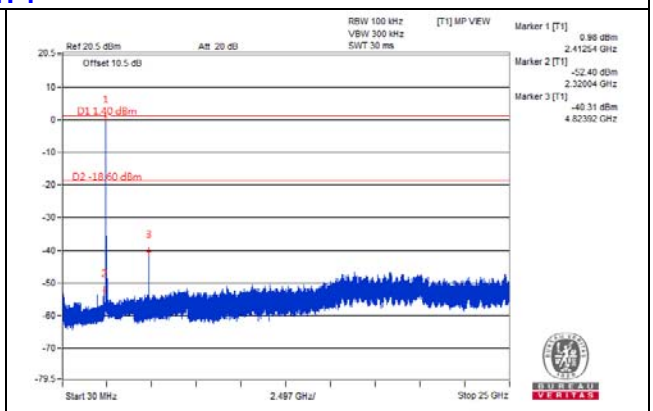
4.6.7 Test Results

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

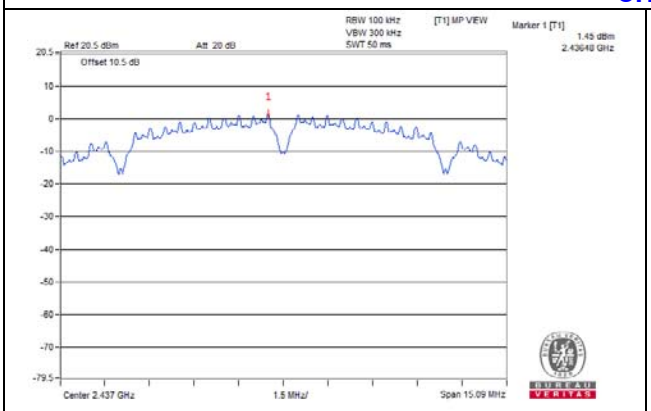
802.11b
CHAIN 0

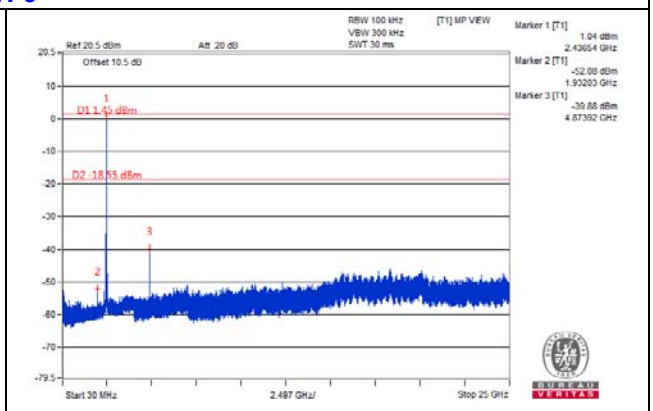
CH 1



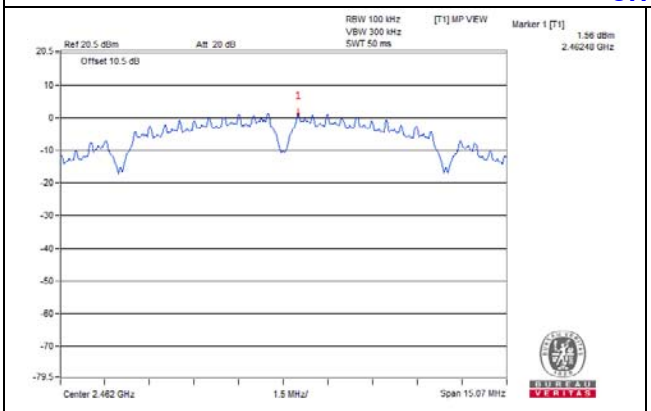


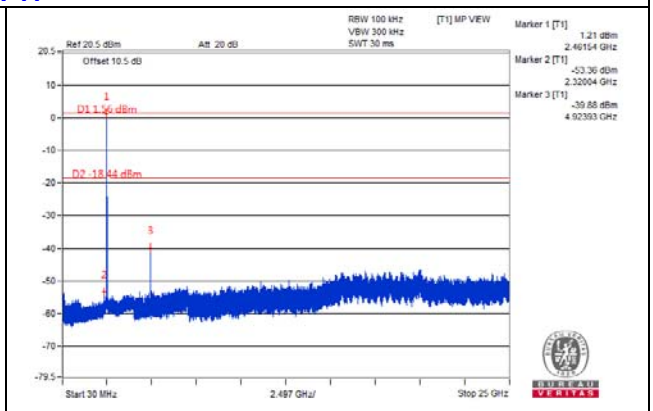
CH 6



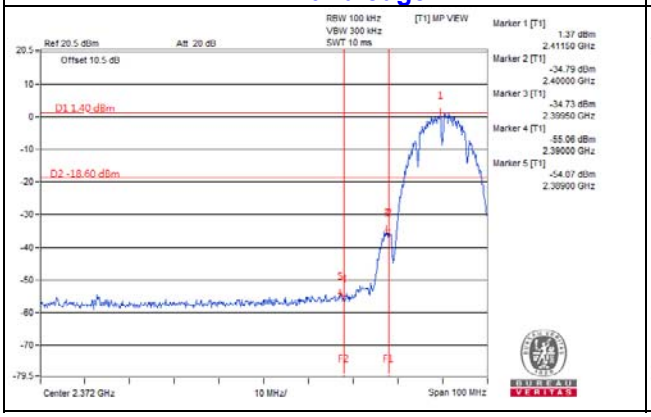


CH 11

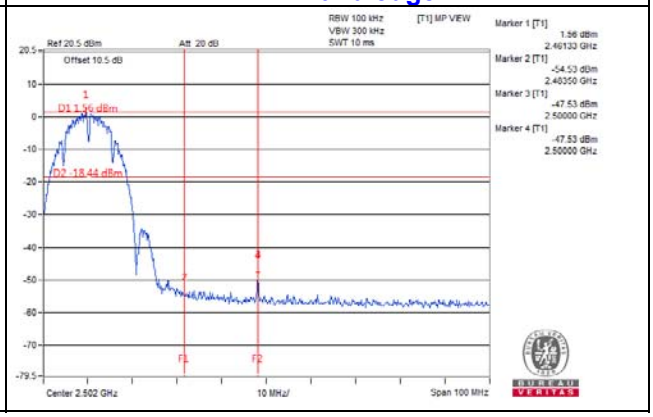




CH 1 Band edge

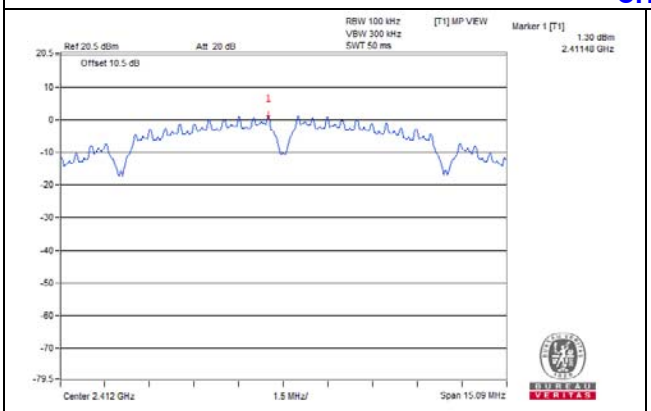


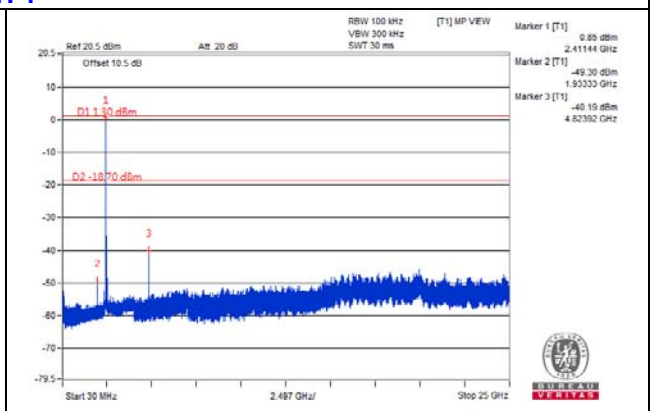
CH 11 Band edge



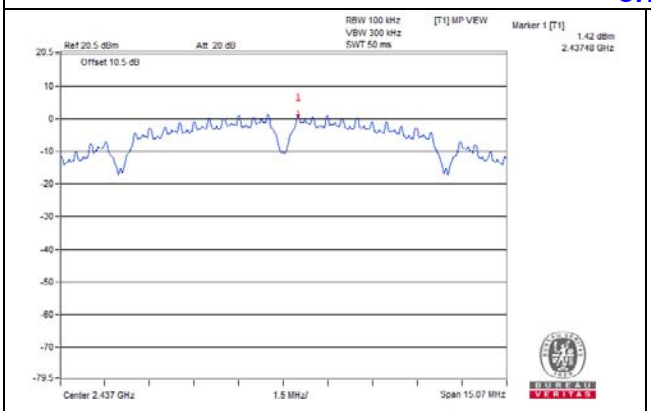
CHAIN 1

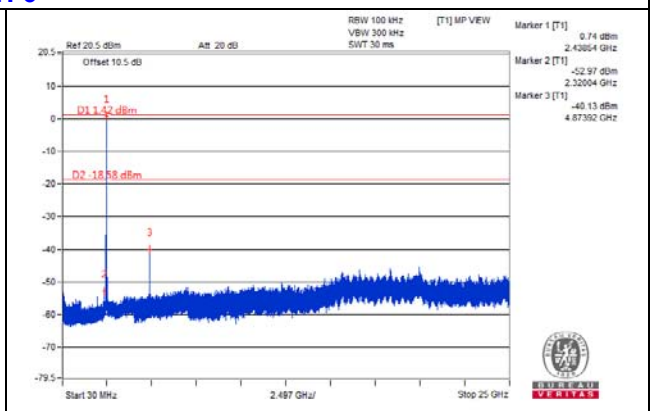
CH 1



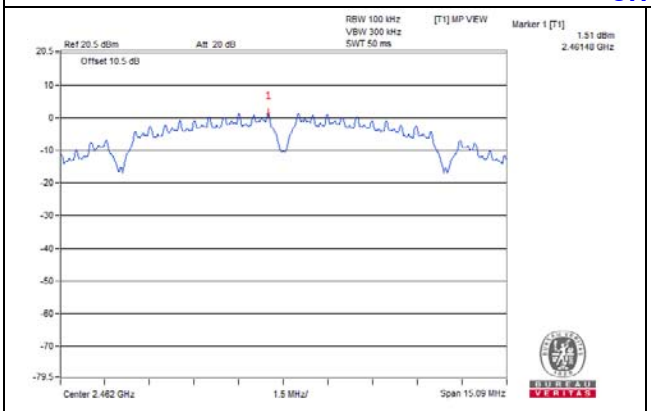


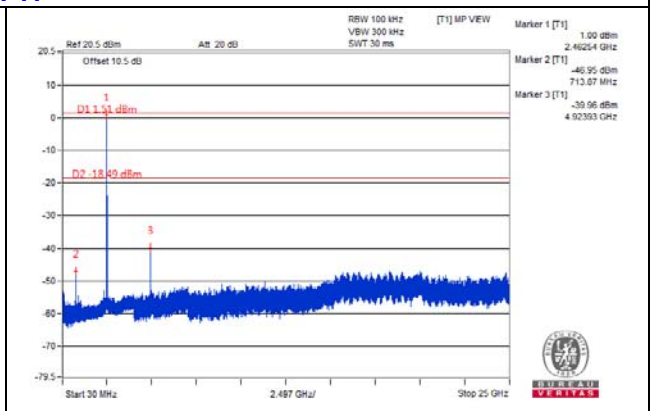
CH 6



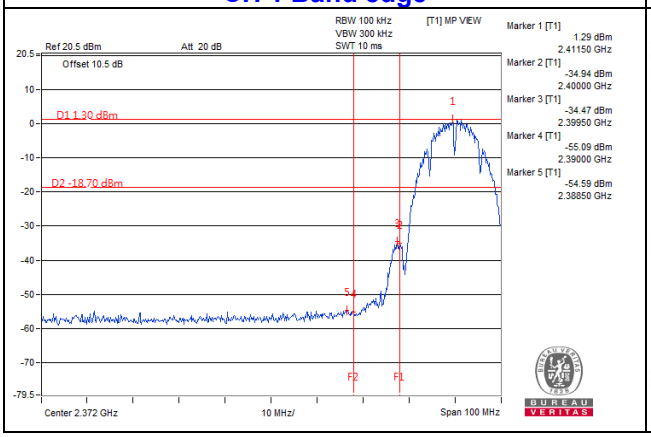


CH 11

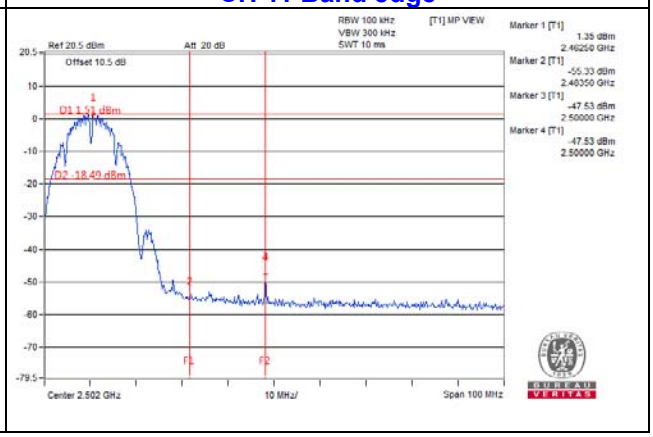




CH 1 Band edge

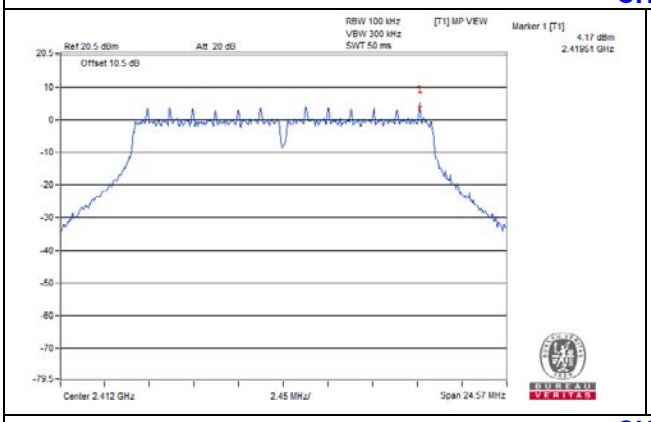


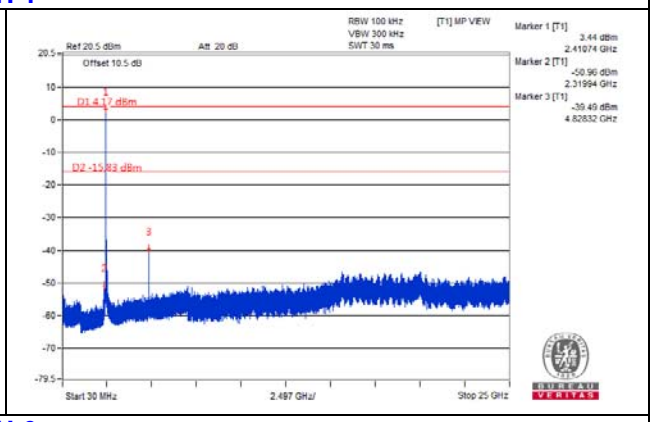
CH 11 Band edge



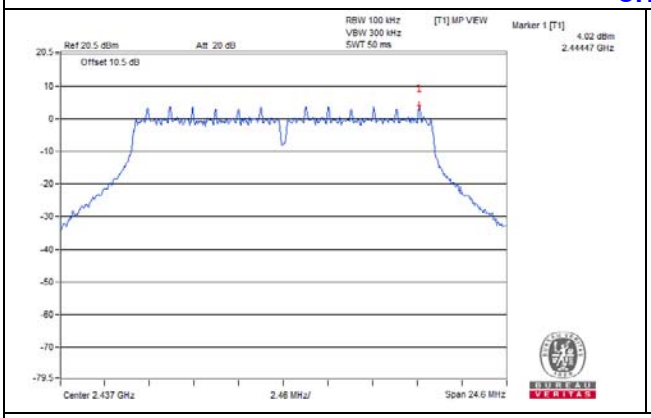
802.11g
CHAIN 0

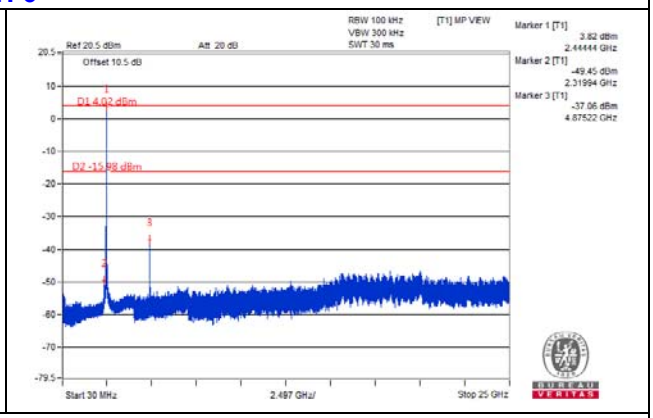
CH 1



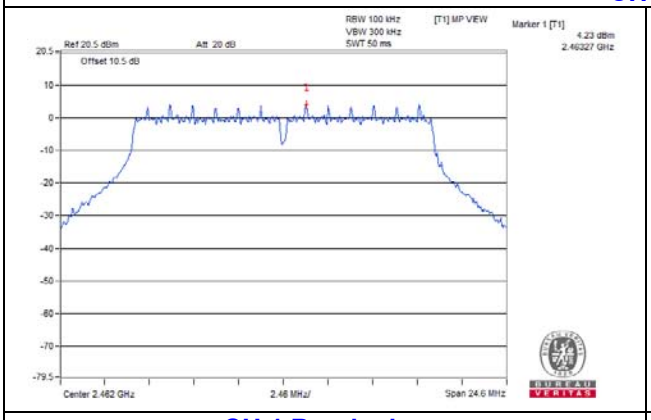


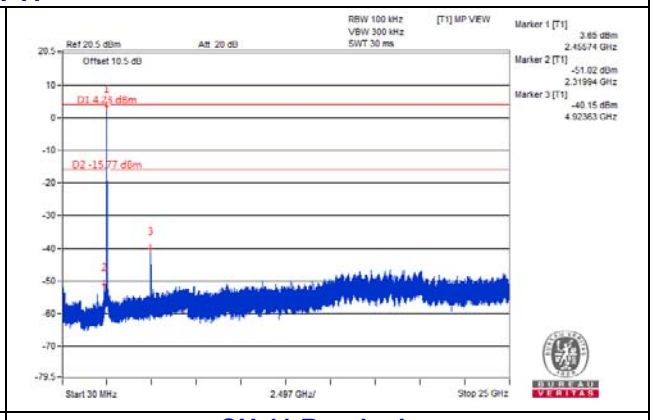
CH 6



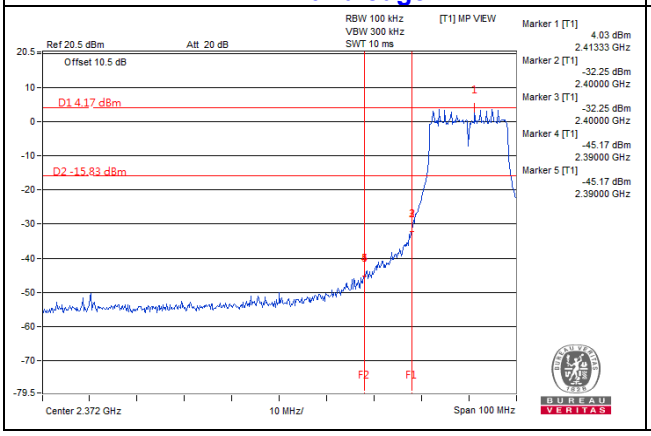


CH 11





CH 1 Band edge



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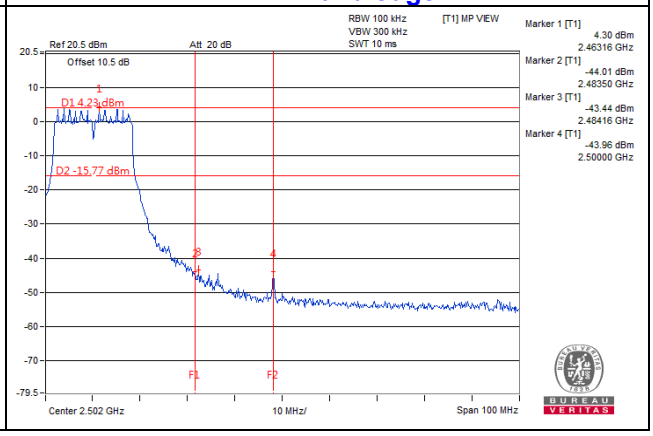
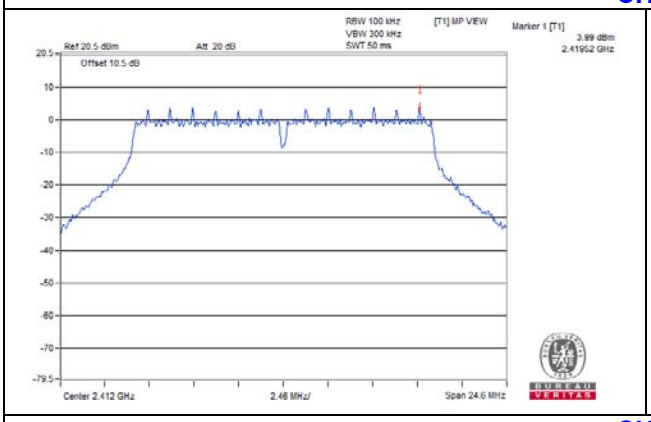
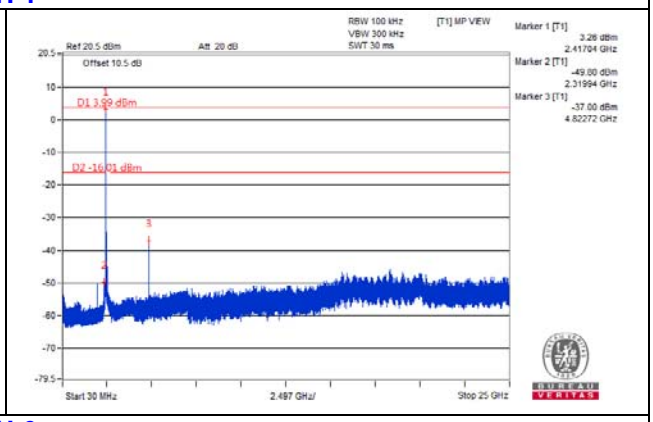


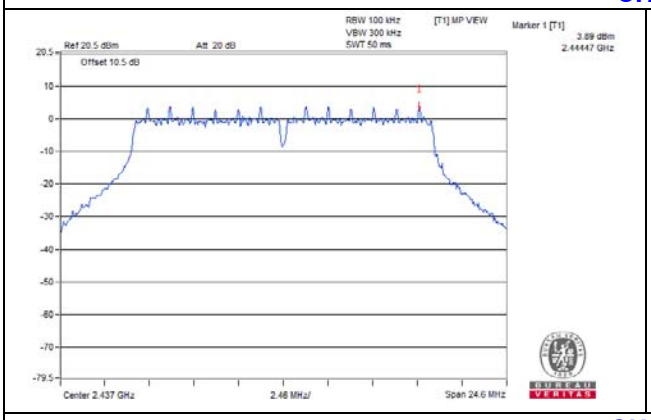
CHAIN 1

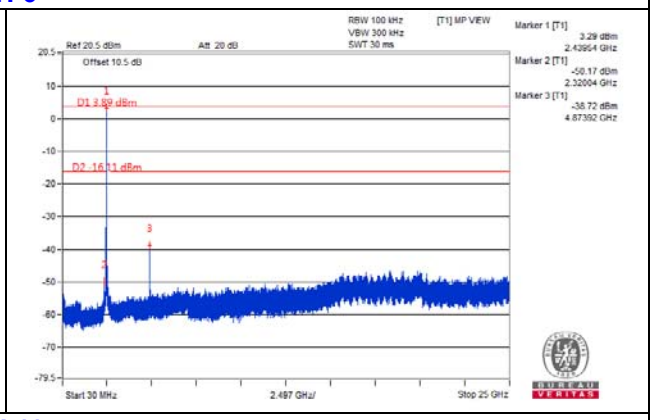
CH 1





CH 6





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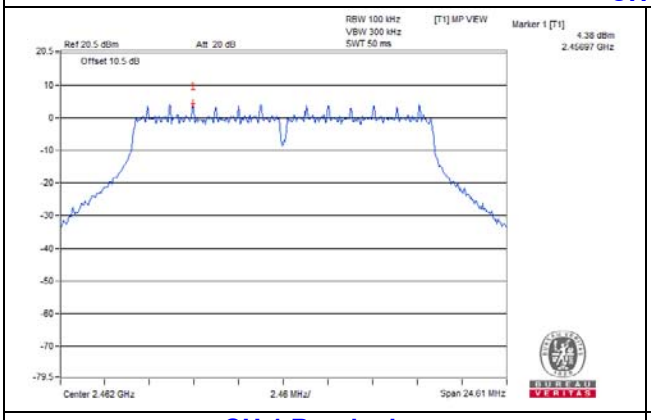
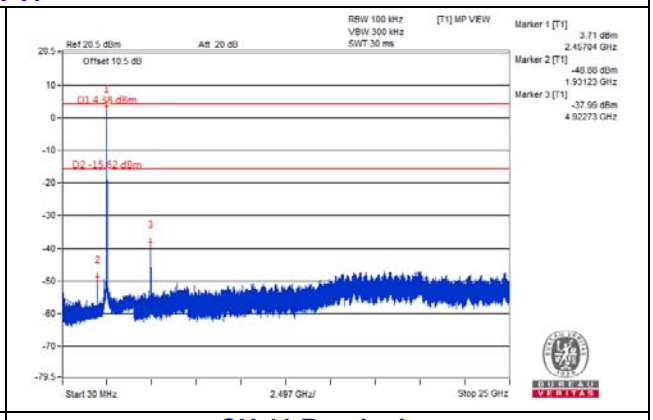
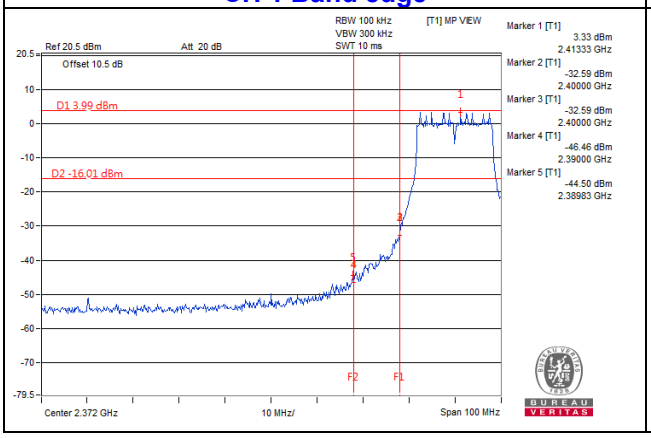
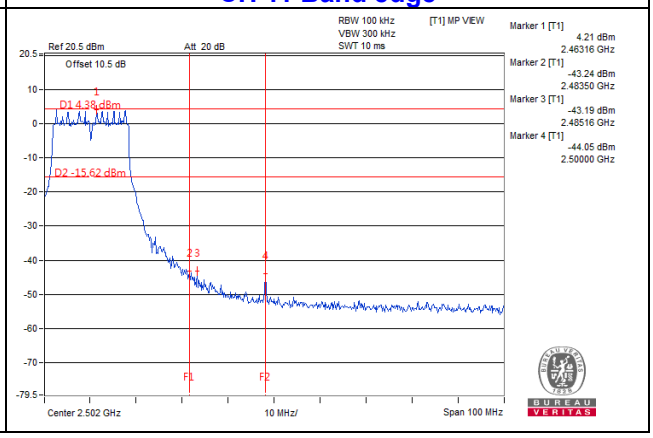




CH 1 Band edge

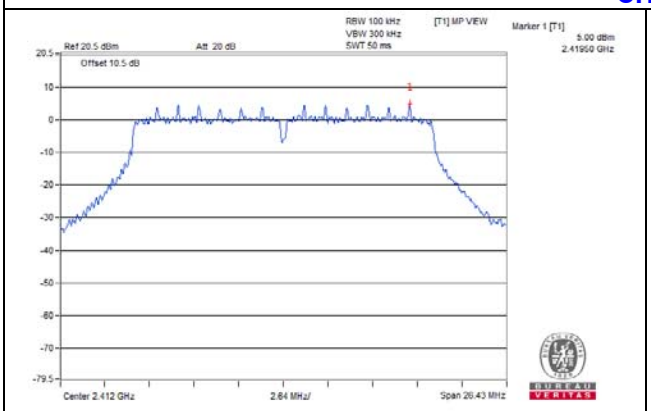


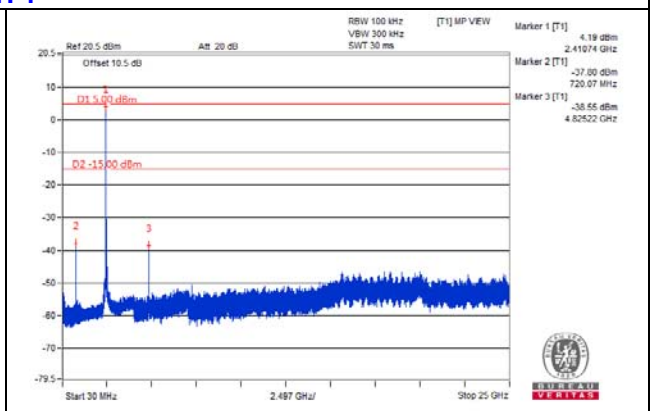
CH 11 Band edge



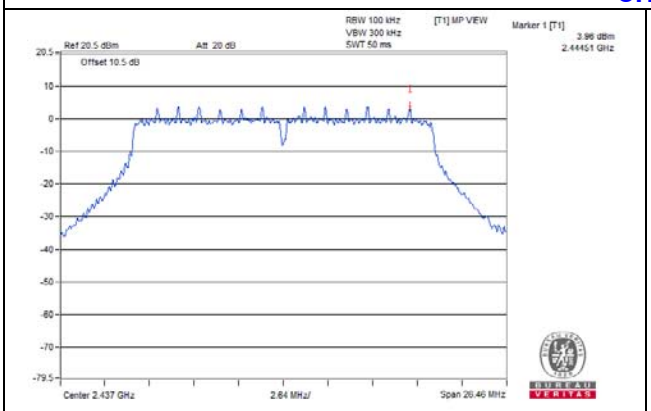
802.11n (20MHz)
CHAIN 0

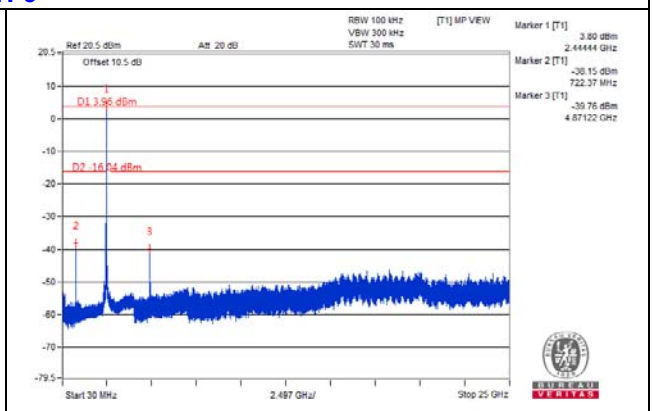
CH 1



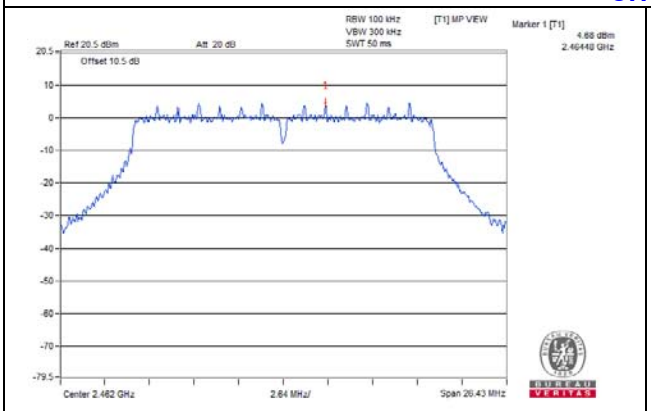


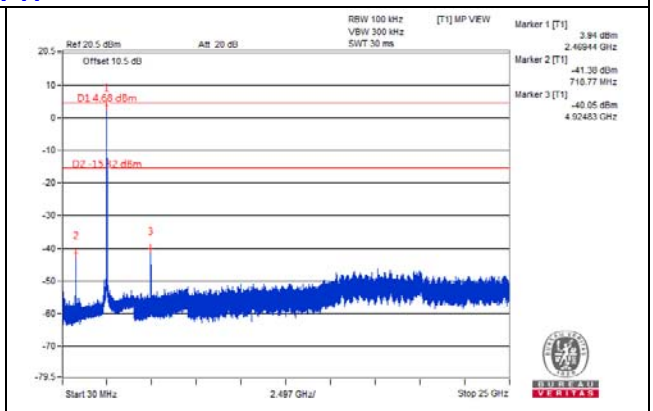
CH 6



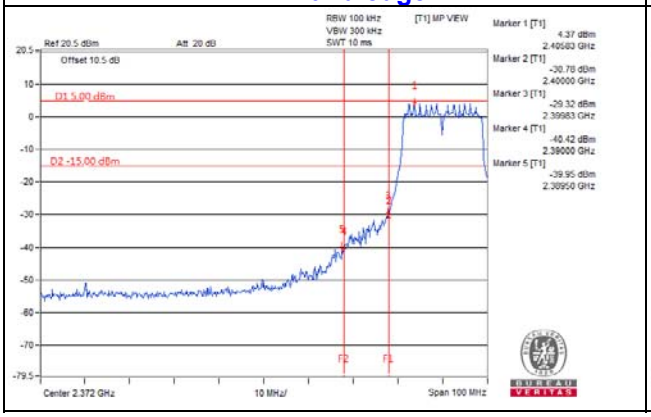


CH 11

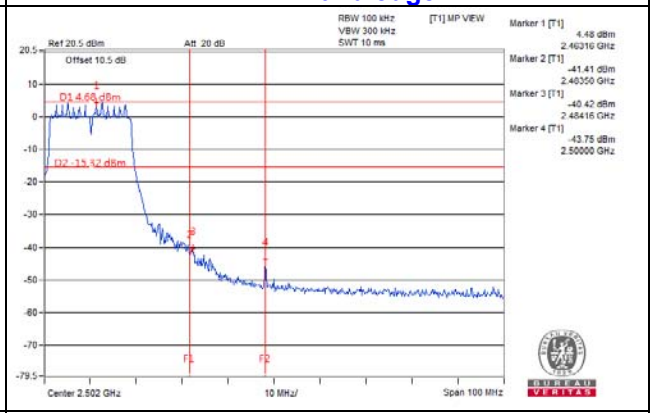




CH 1 Band edge

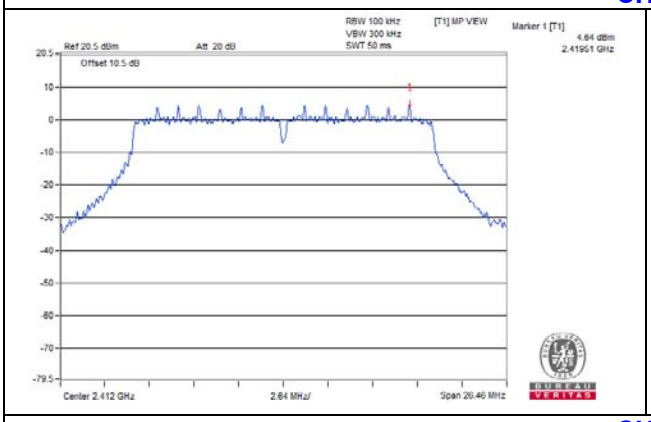


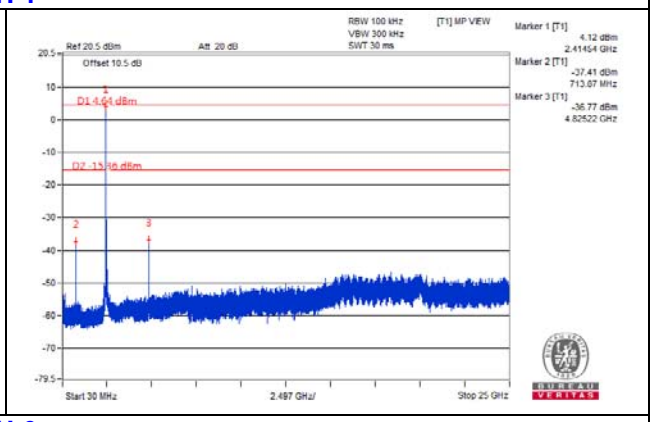
CH 11 Band edge



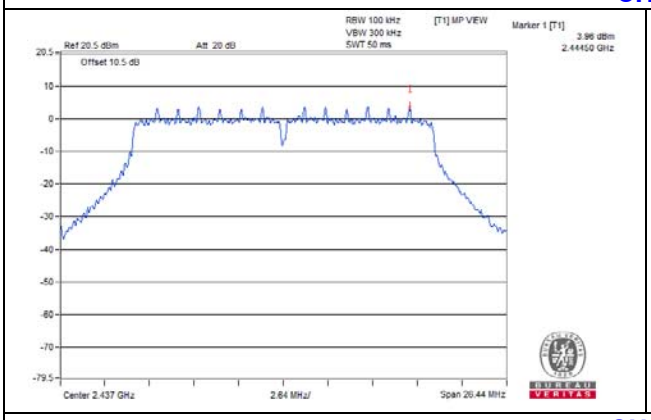
CHAIN 1

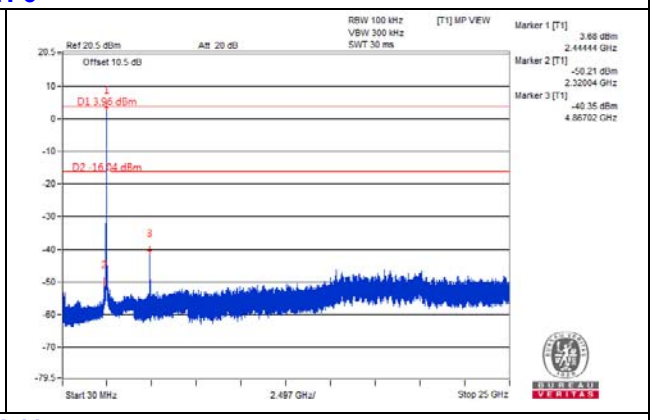
CH 1



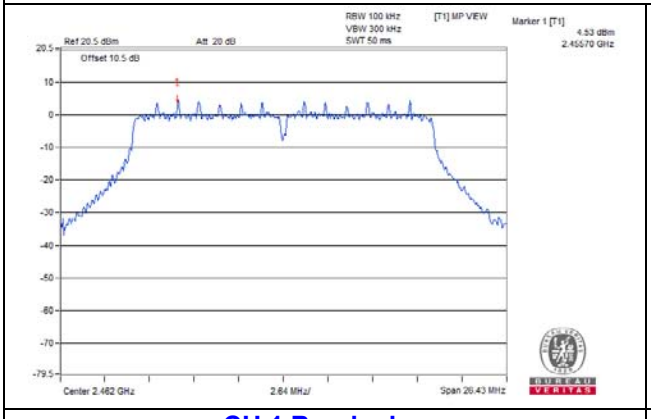


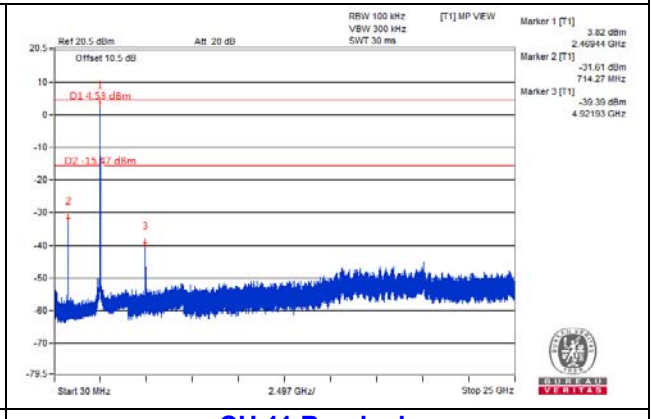
CH 6



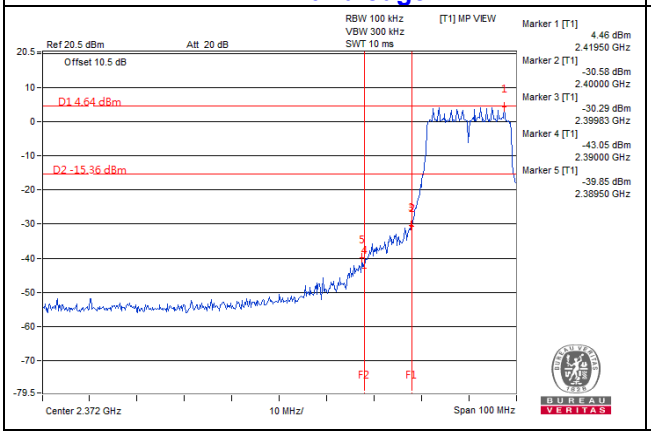


CH 11

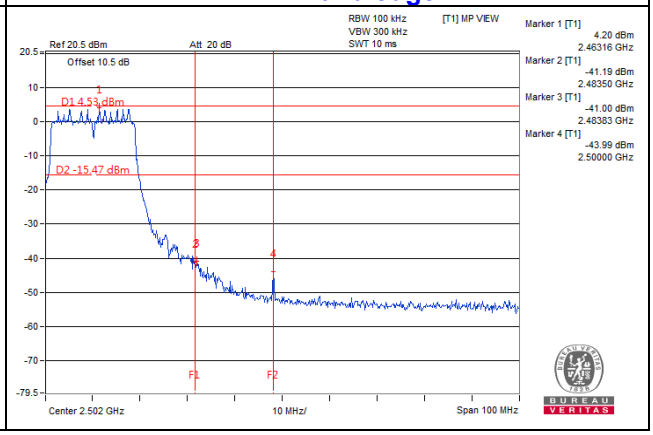




CH 1 Band edge

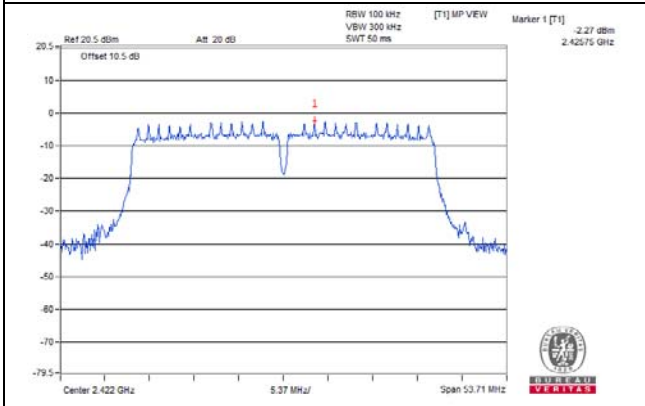


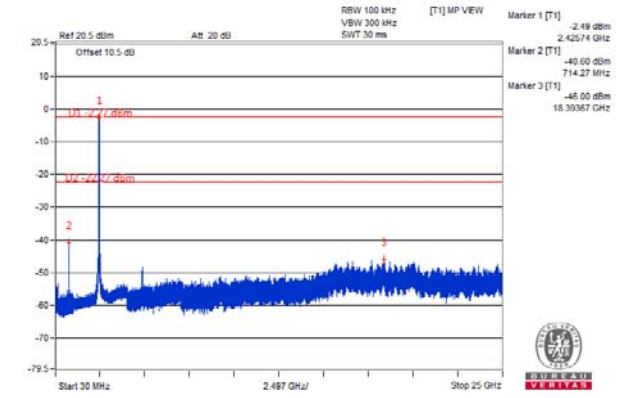
CH 11 Band edge



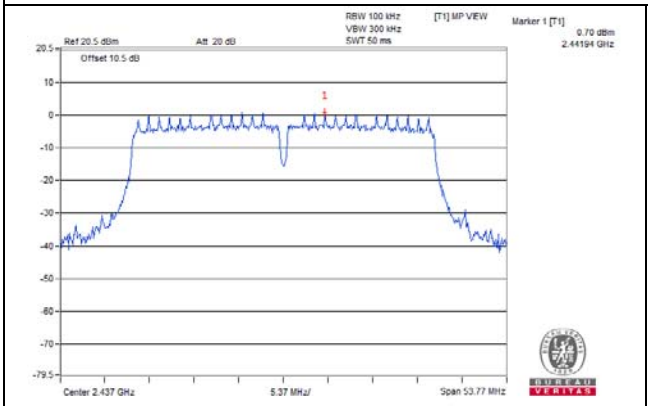
802.11n (40MHz)
Chain 0

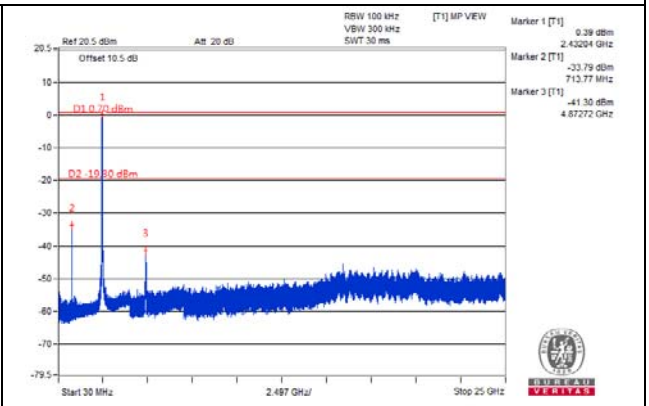
CH 3



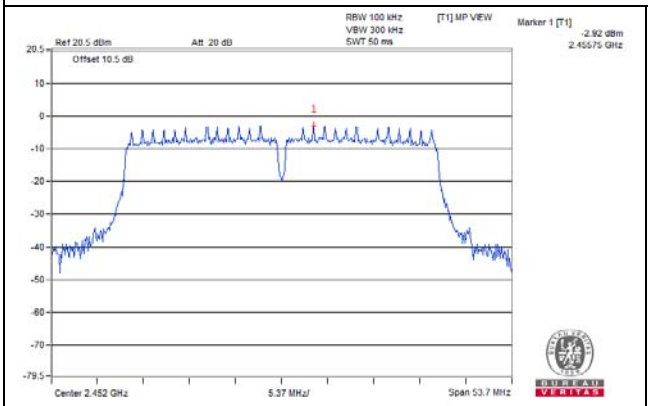


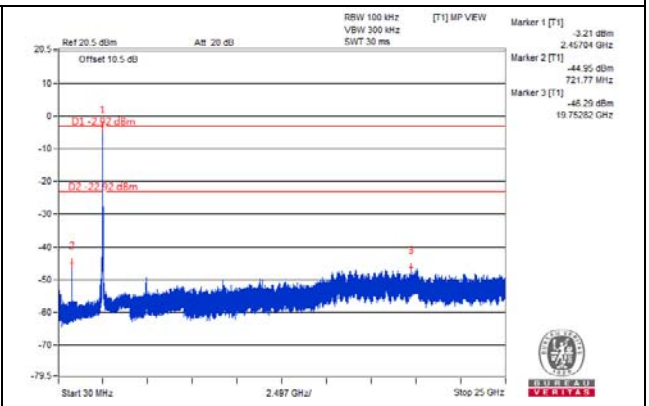
CH 6



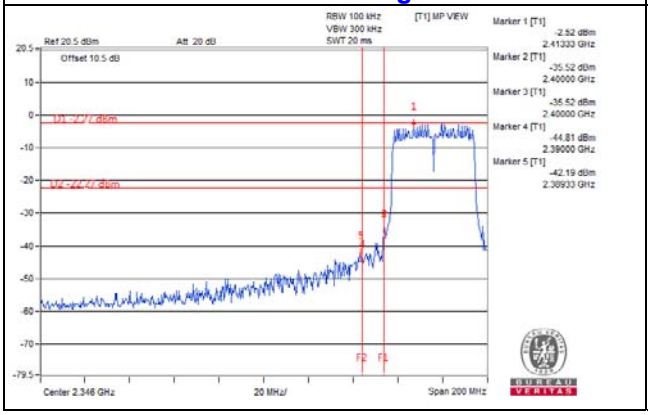


CH 9

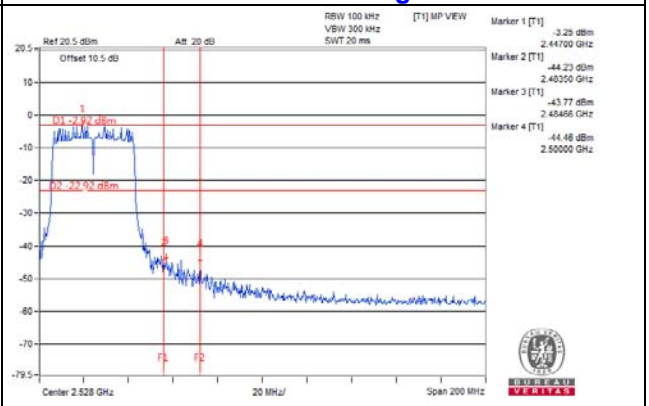




CH 3 Band edge

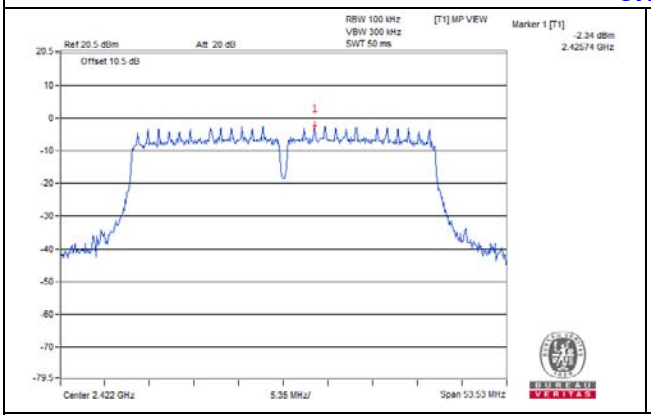


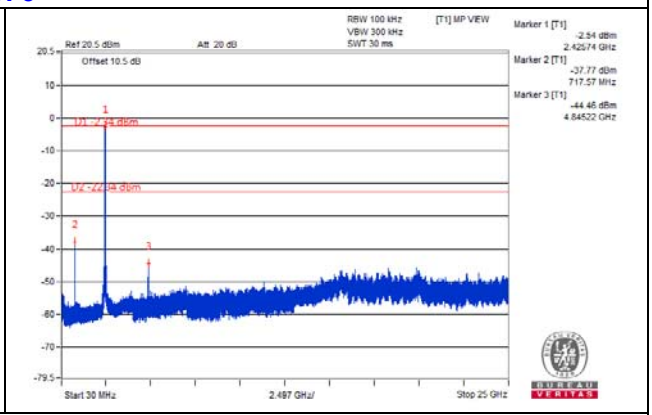
CH 9 Band edge



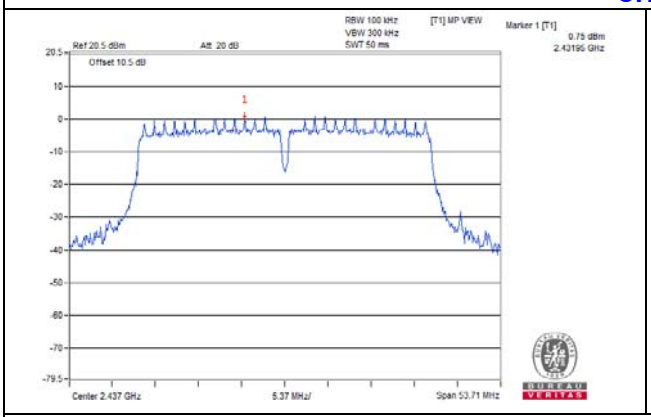
Chain 1

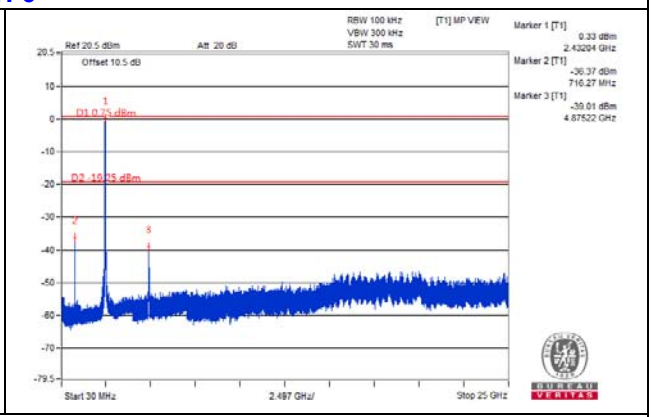
CH 3



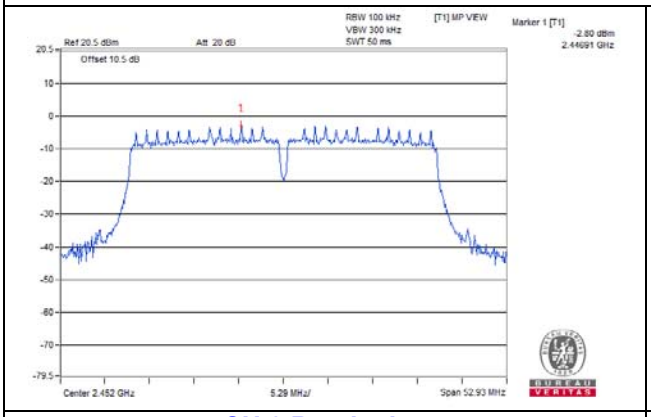


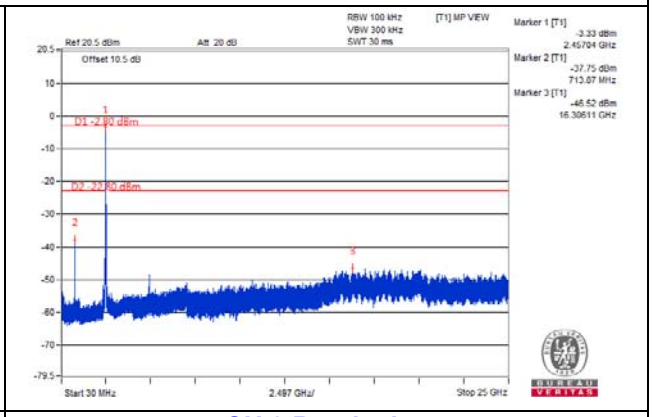
CH 6



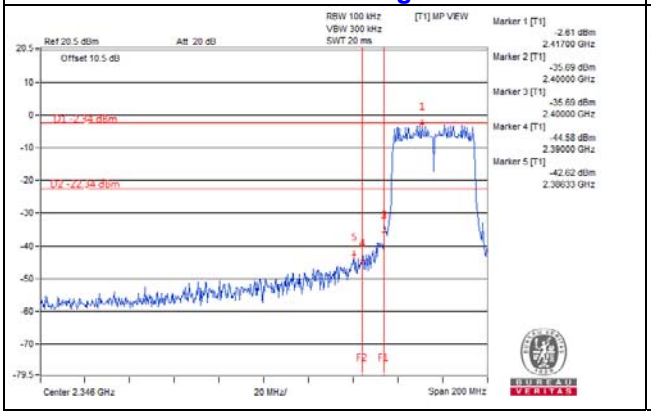


CH 9

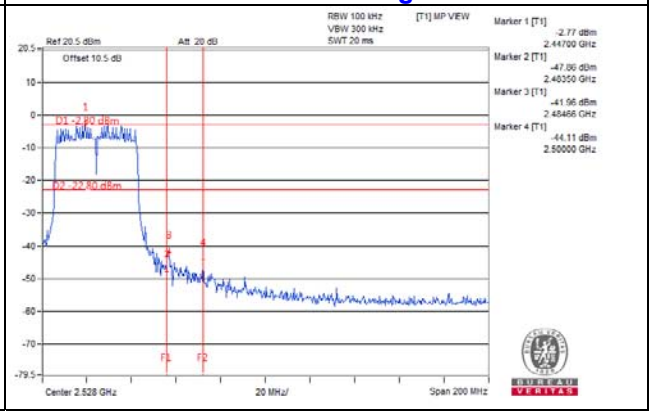




CH 3 Band edge



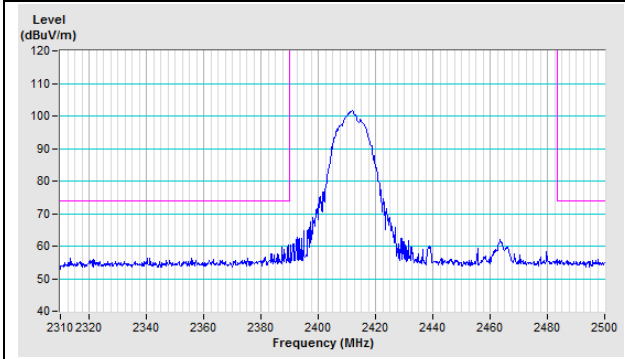
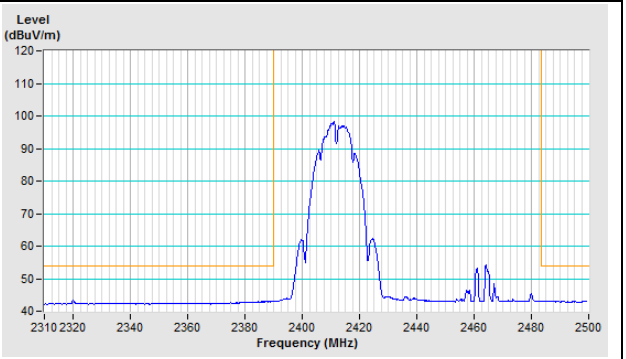
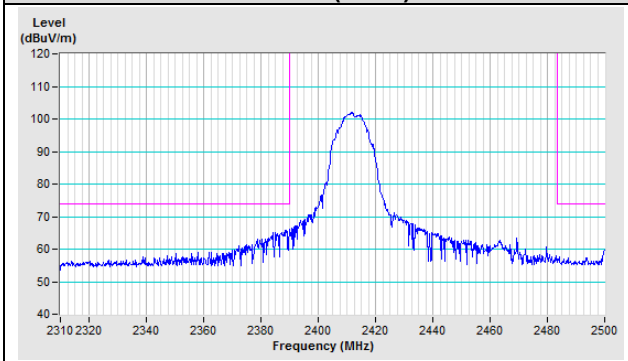
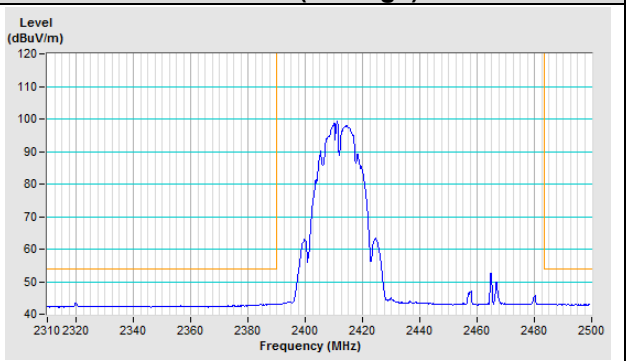
CH 9 Band edge

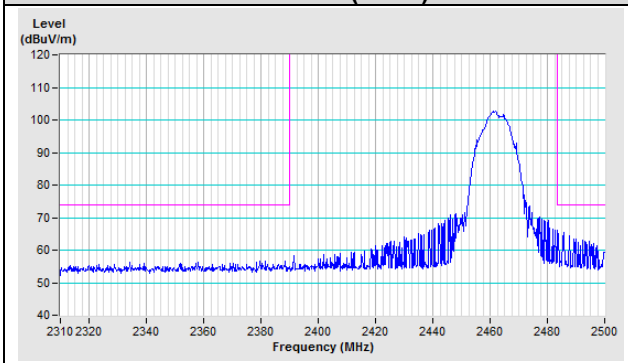
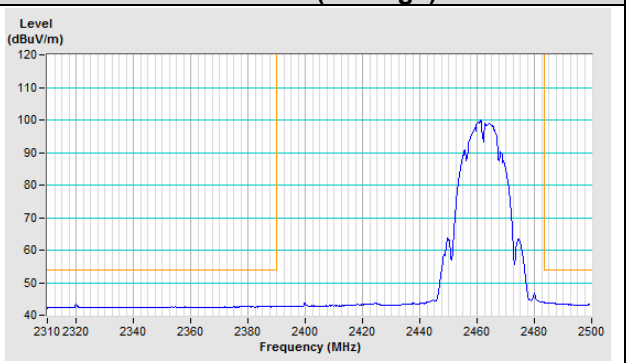
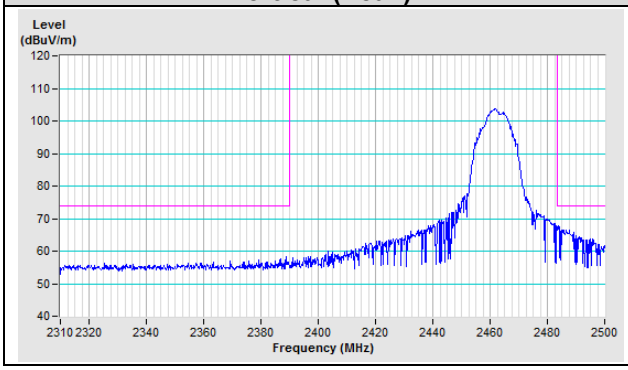
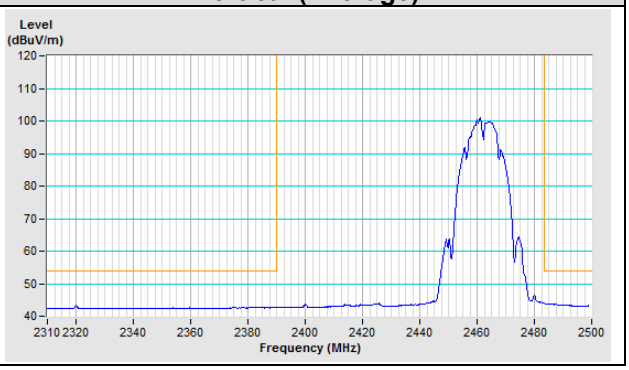


Annex A- Band Edge Measurement

Band Edge

802.11b

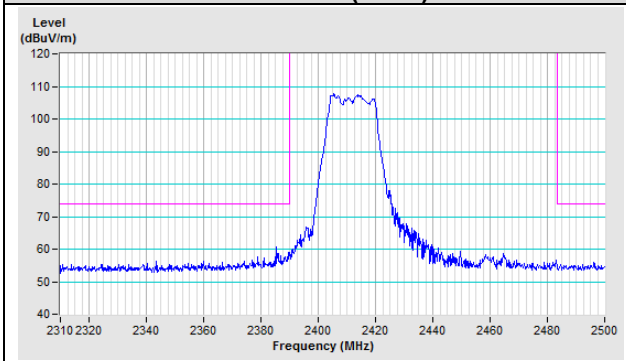
Channel 1	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

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

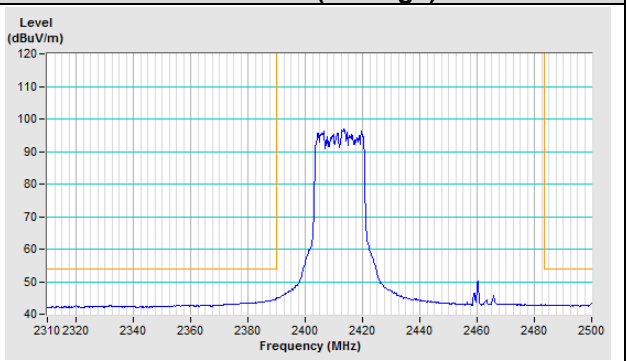
802.11g

Channel 1

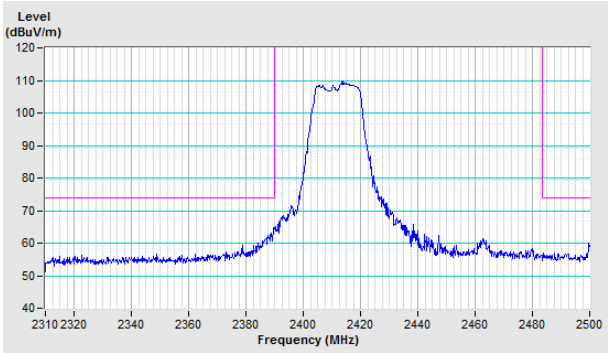
Horizontal (Peak)



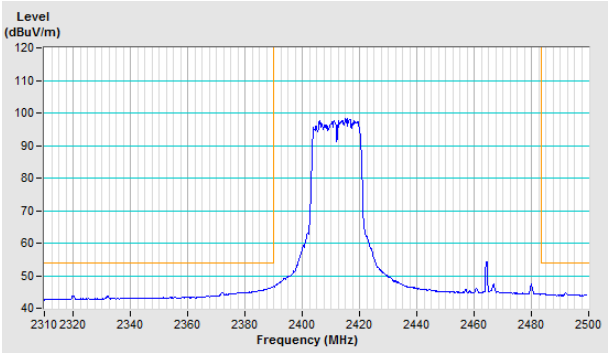
Horizontal (Average)



Vertical (Peak)

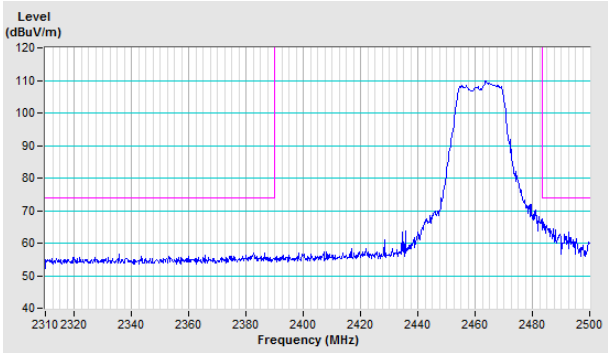


Vertical (Average)

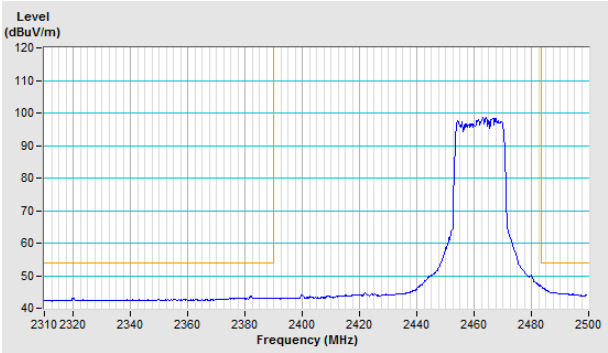


Channel 11

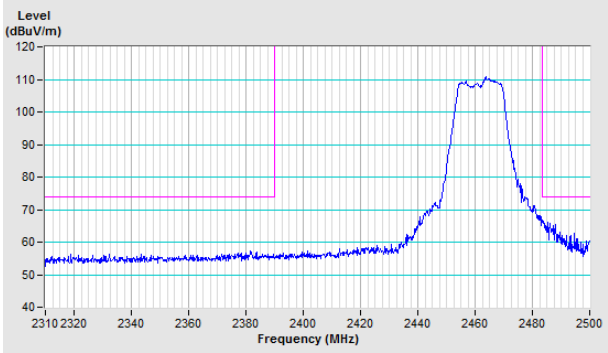
Horizontal (Peak)



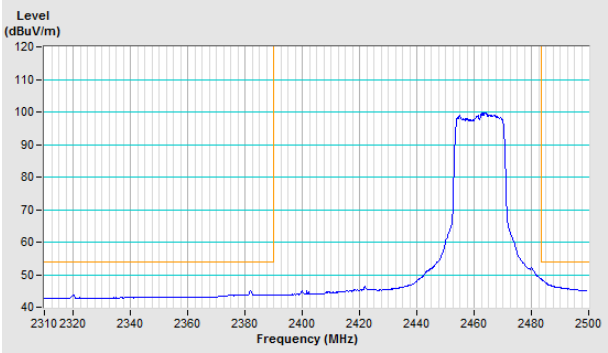
Horizontal (Average)



Vertical (Peak)



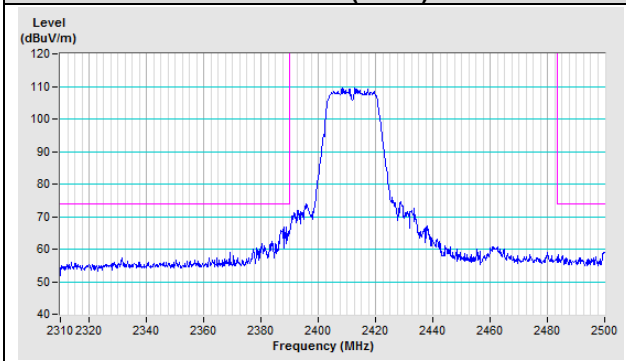
Vertical (Average)



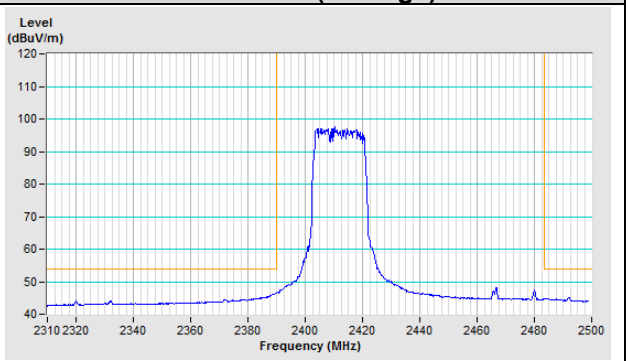
802.11n (20MHz)

Channel 1

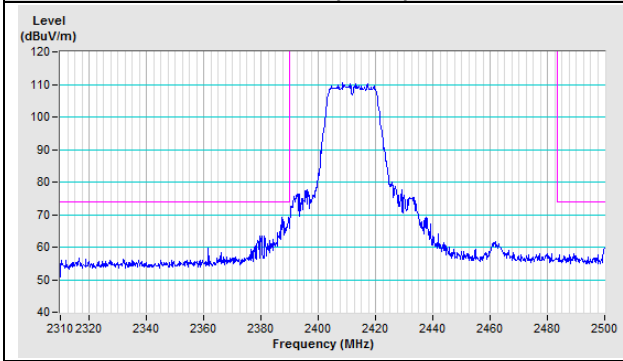
Horizontal (Peak)



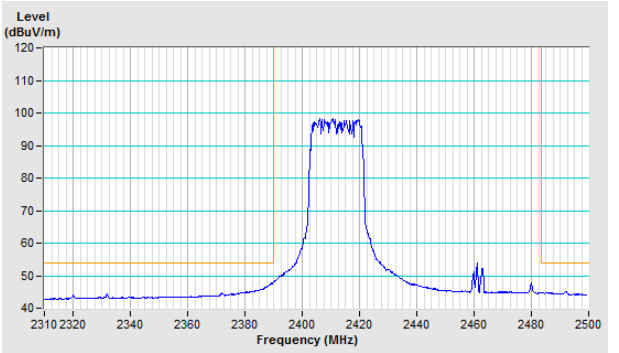
Horizontal (Average)



Vertical (Peak)

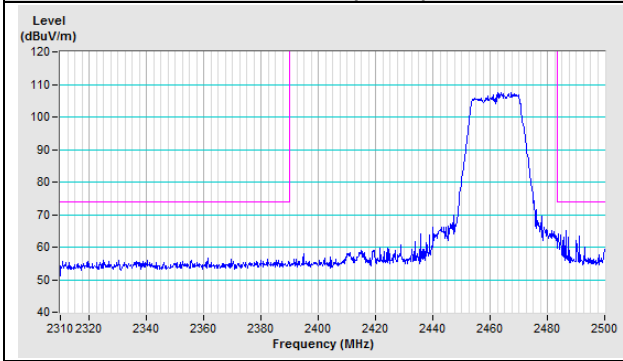


Vertical (Average)

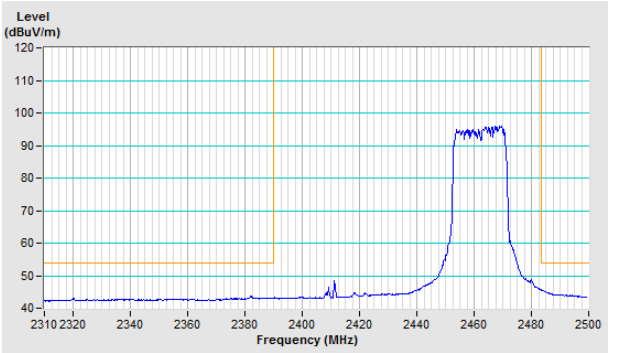


Channel 11

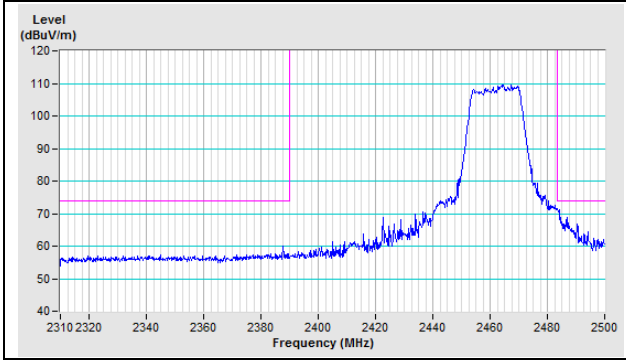
Horizontal (Peak)



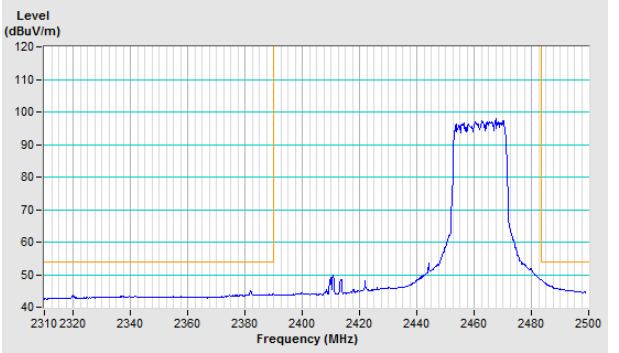
Horizontal (Average)



Vertical (Peak)



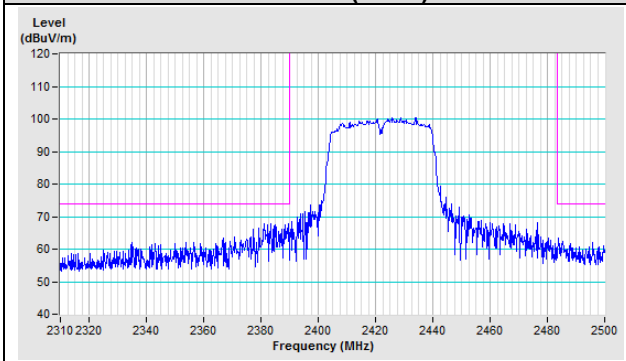
Vertical (Average)



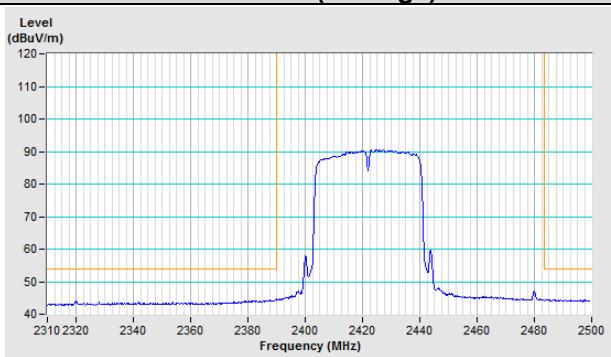
802.11n (40MHz)

Channel 3

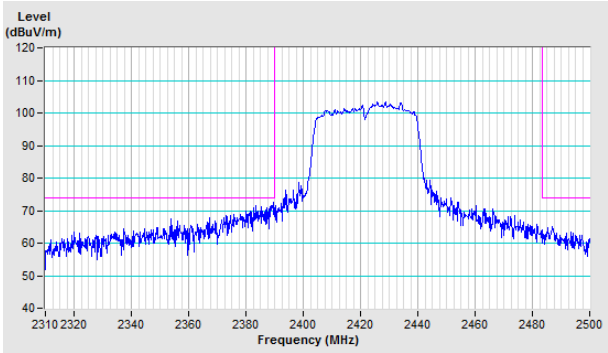
Horizontal (Peak)



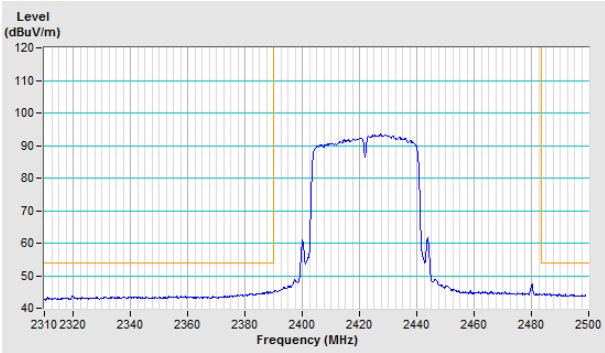
Horizontal (Average)



Vertical (Peak)

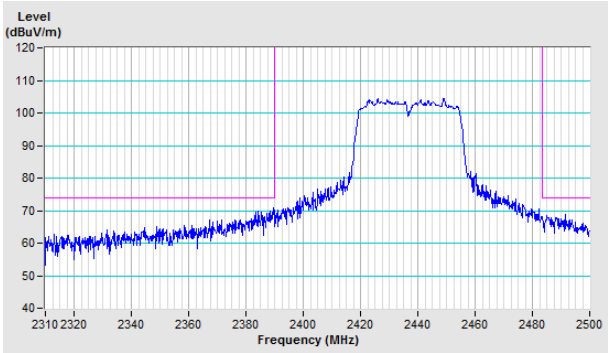


Vertical (Average)

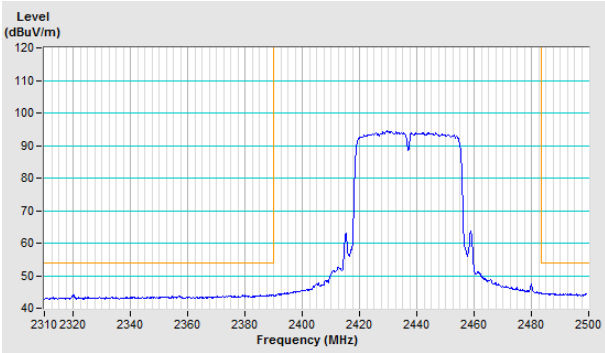


Channel 6

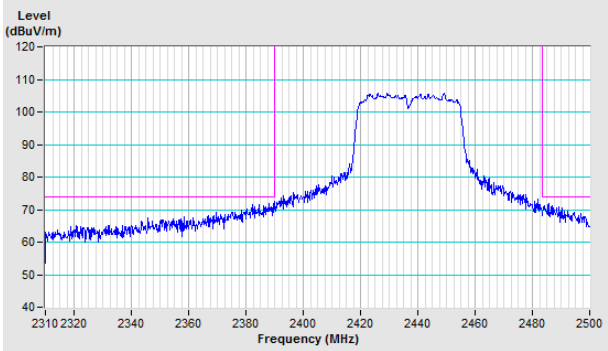
Horizontal (Peak)



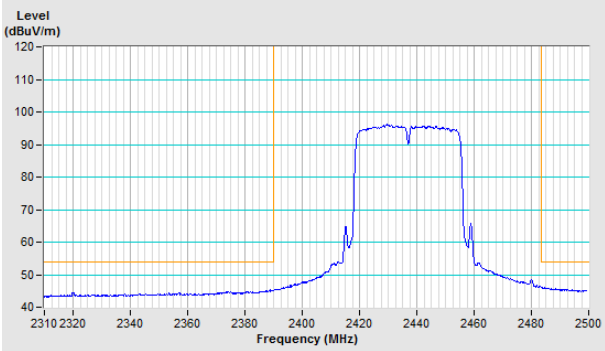
Horizontal (Average)

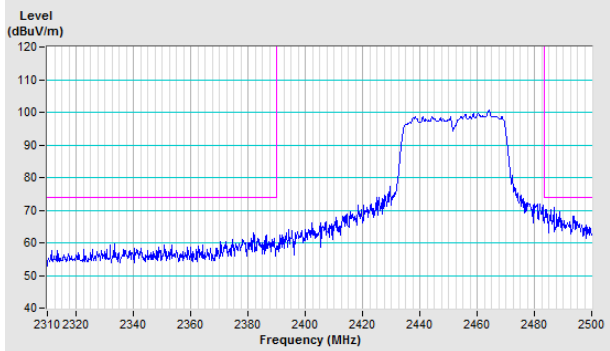
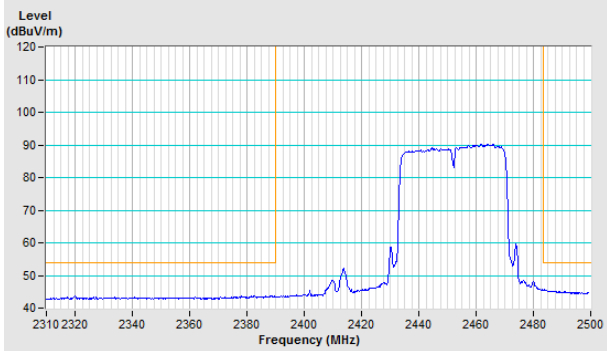
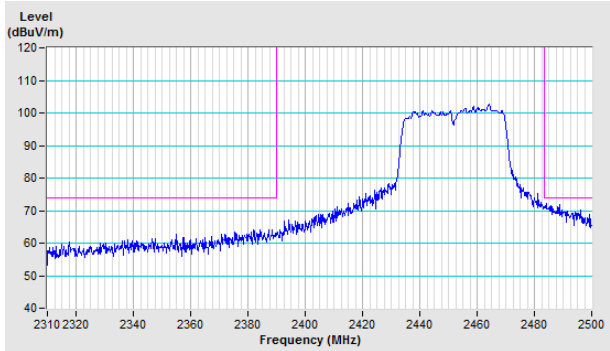
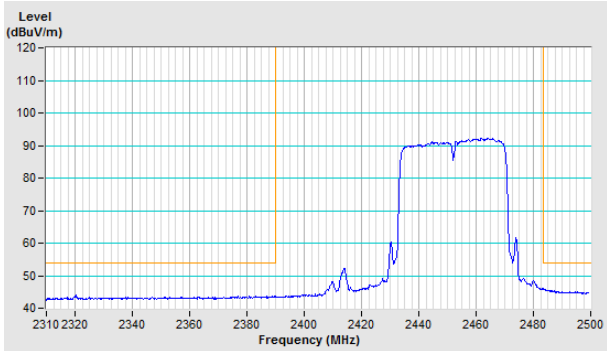


Vertical (Peak)



Vertical (Average)



Channel 9	
Horizontal (Peak)	**Horizontal (Average)**
	
Vertical (Peak)	**Vertical (Average)**
	

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

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

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

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