

FCC Test Report

Report No.: RF190515C36

FCC ID: H79WQL-400

Test Model: WQL-400

Received Date: May 16, 2019

Test Date: Jun. 06 ~ Aug. 13, 2019

Issued Date: Aug. 30, 2019

Applicant: Delta Electronics Incorporated

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



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Release Control Record

Issue No.	Description	Date Issued
RF190515C36	Original release	Aug. 30, 2019

1 Certificate of Conformity

Product: LauncherPlus

Brand: Vivitek, Delta

Test Model: WQL-400

Sample Status: Engineering Sample

Applicant: Delta Electronics Incorporated

Test Date: Jun. 06 ~ Aug. 13, 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 : Pettie Chen , **Date:** Aug. 30, 2019
Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Aug. 30, 2019
Bruce Chen / Senior 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 -13.43dB at 0.43800MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.0dB at 2390.00MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is Murata switch 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	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 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	LauncherPlus
Brand	Vivitek, Delta
Test Model	WQL-400
Sample Status	Engineering Sample
Power Supply Rating	5 Vdc (Host equipment)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 144.4Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11
Output Power	43.398mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	0.1m non-shielded USB cable without core attached on EUT

Note:

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

Modulation Mode	TX Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX

- The following antennas were provided to the EUT.

No.	Type	Gain(dBi)						Connector
		2400MHz	2450MHz	2500MHz	5150MHz	5550MHz	5850MHz	
1	Monopole	1.74	2.11	1.95	2.19	1.95	1.21	Murata switch
2	Monopole	0.77	-1.02	1.36	0.36	0.23	0.25	Murata switch

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE \geq 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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 13	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 13	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 13	1, 6, 11	OFDM	BPSK	6.5

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)
-	802.11g	1 to 13	11	OFDM	BPSK	6.0

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)
-	802.11g	1 to 13	11	OFDM	BPSK	6.0

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)
-	802.11b	1 to 13	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 13	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 13	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE \geq 1G	25 deg. C, 70% RH	120Vac, 60Hz	Noah Chang
RE $<$ 1G	25 deg. C, 70% RH	120Vac, 60Hz	Noah Chang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Luis Lee
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Frank Liu

3.3 Duty Cycle of Test Signal

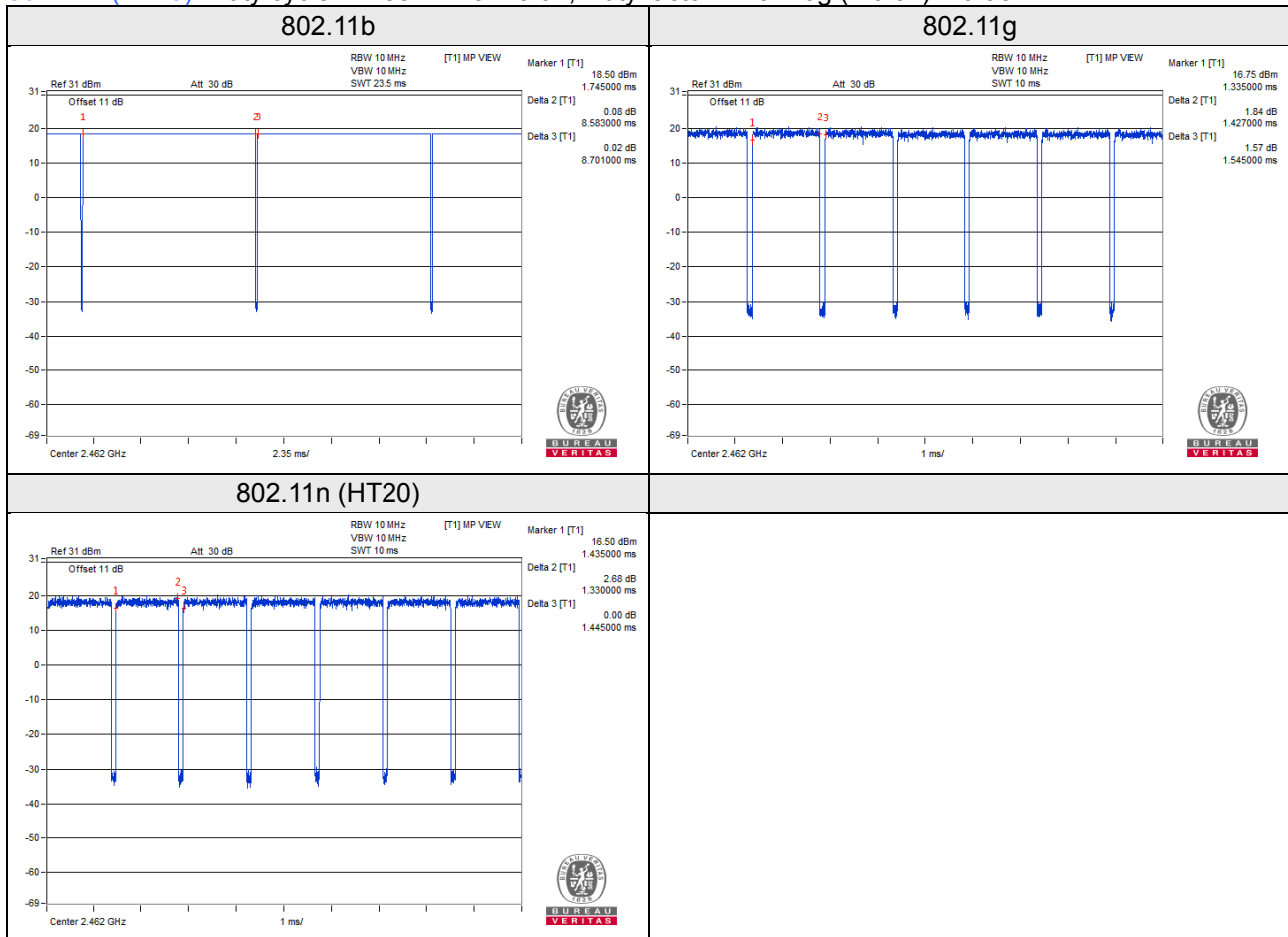
802.11b: Duty cycle of test signal is $\geq 98\%$.

802.11g, 802.11n (HT20): Duty cycle of test signal is $< 98\%$.

802.11b: Duty cycle = $8.583/8.701 = 0.986$

802.11g: Duty cycle = $1.427/1.545 = 0.924$, Duty factor = $10 * \log(1/0.924) = 0.35$

802.11n (HT20): Duty cycle = $1.33/1.445 = 0.92$, Duty factor = $10 * \log(1/0.92) = 0.36$



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.

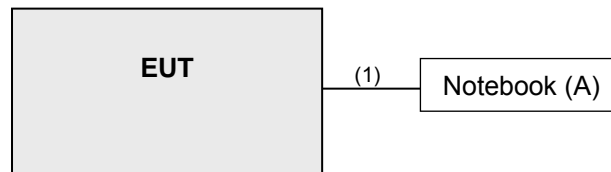
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	0.1	N	0	attached on EUT

3.4.1 Configuration of System under Test



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 v05r01

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	ESCI	100424	Jan. 03, 2019	Jan. 02, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 25, 2018	Sep. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 21, 2018	Nov. 20, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Aug. 08, 2018	Aug. 07, 2019
			Jul. 11, 2019	Jul. 10, 2020
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jul. 02, 2018	Jul. 01, 2019
			Jun. 11, 2019	Jun. 10, 2020
RF Coaxial Cable WORKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 21, 2018	Aug. 20, 2019
			Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 28, 2018	Aug. 27, 2019
			Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Mar. 25, 2019	Mar. 24, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2018	Aug. 07, 2019
			Jul. 11, 2019	Jul. 10, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2018	Aug. 07, 2019
			Jul. 11, 2019	Jul. 10, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190 004/MY55190007/MY55 210005	Jul. 17, 2018	Jul. 16, 2019
			Jul. 15, 2019	Jul. 14, 2020

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 4.

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:

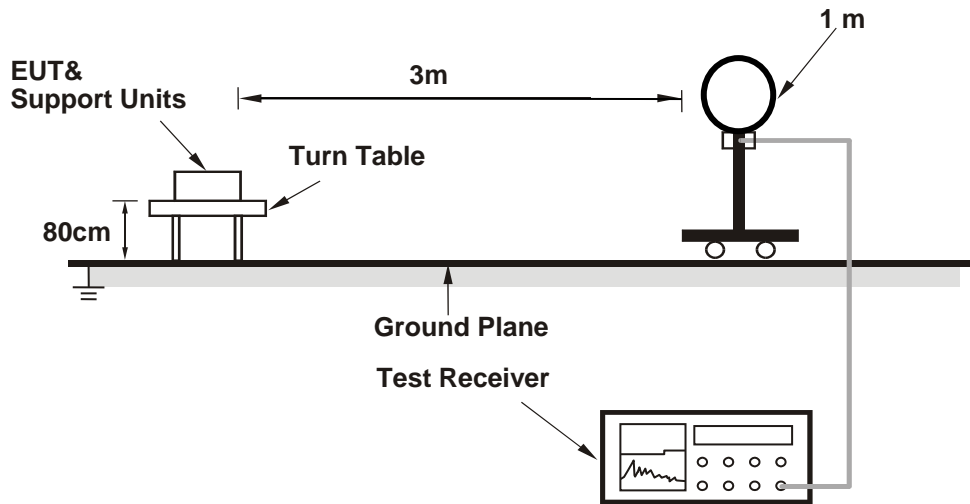
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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.
(802.11b: RBW = 1MHz, VBW = 10Hz; 802.11g: RBW = 1MHz, VBW = 1kHz; 802.11n (HT20): RBW = 1MHz, VBW = 1kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

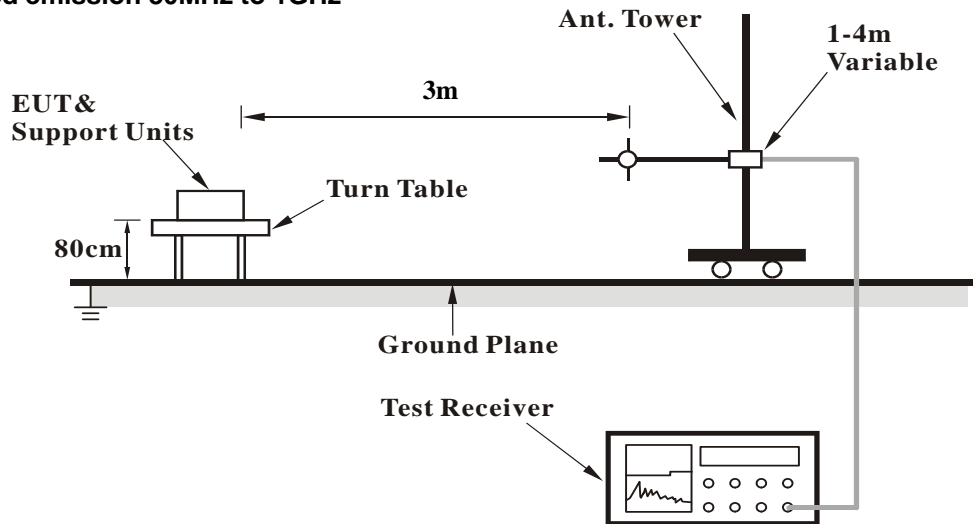
No deviation.

4.1.5 Test Setup

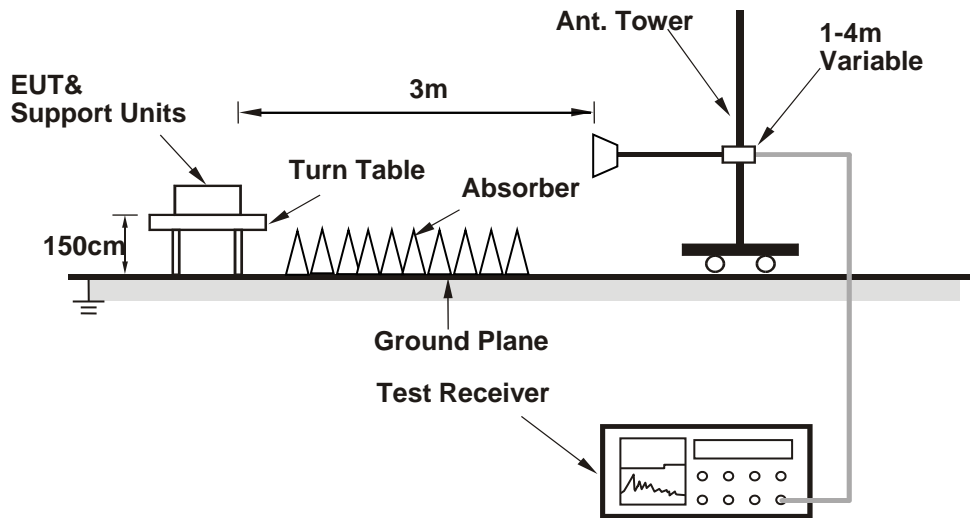
For Radiated emission below 30MHz



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. The EUT was connected to the notebook via USB cable.
- b. Set the EUT under transmission condition continuously at specific channel frequency.

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	57.5 PK	74.0	-16.5	1.18 H	112	23.7	33.8
2	2390.00	47.5 AV	54.0	-6.5	1.18 H	112	13.7	33.8
3	*2412.00	99.7 PK			1.10 H	110	65.9	33.8
4	*2412.00	95.7 AV			1.10 H	110	61.9	33.8
5	4824.00	51.7 PK	74.0	-22.3	1.39 H	145	38.5	13.2
6	4824.00	40.5 AV	54.0	-13.5	1.39 H	145	27.3	13.2
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	57.7 PK	74.0	-16.3	3.55 V	25	23.9	33.8
2	2390.00	47.3 AV	54.0	-6.7	3.55 V	25	13.5	33.8
3	*2412.00	99.5 PK			3.55 V	231	65.7	33.8
4	*2412.00	95.7 AV			3.55 V	231	61.9	33.8
5	4824.00	53.5 PK	74.0	-20.5	3.15 V	323	40.3	13.2
6	4824.00	45.5 AV	54.0	-8.5	3.15 V	323	32.3	13.2

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
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	99.2 PK			1.37 H	108	65.4	33.8
2	*2437.00	95.6 AV			1.37 H	108	61.8	33.8
3	4874.00	51.6 PK	74.0	-22.4	1.00 H	109	38.4	13.2
4	4874.00	40.6 AV	54.0	-13.4	1.00 H	109	27.4	13.2

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	98.8 PK			3.15 V	222	65.0	33.8
2	*2437.00	95.2 AV			3.15 V	222	61.4	33.8
3	4874.00	53.8 PK	74.0	-20.2	3.15 V	329	40.6	13.2
4	4874.00	45.2 AV	54.0	-8.8	3.15 V	329	32.0	13.2

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
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	100.7 PK			3.07 H	352	66.8	33.9
2	*2462.00	96.9 AV			3.07 H	352	63.0	33.9
3	2483.50	57.6 PK	74.0	-16.4	3.00 H	287	23.7	33.9
4	2483.50	48.0 AV	54.0	-6.0	3.00 H	287	14.1	33.9
5	4924.00	51.6 PK	74.0	-22.4	2.10 H	101	38.3	13.3
6	4924.00	40.9 AV	54.0	-13.1	2.10 H	101	27.6	13.3

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	*2462.00	99.8 PK			3.05 V	103	65.9	33.9
2	*2462.00	96.0 AV			3.05 V	103	62.1	33.9
3	2483.50	57.4 PK	74.0	-16.6	3.15 V	325	23.5	33.9
4	2483.50	47.8 AV	54.0	-6.2	3.15 V	325	13.9	33.9
5	4924.00	53.4 PK	74.0	-20.6	3.15 V	323	40.1	13.3
6	4924.00	45.9 AV	54.0	-8.1	3.15 V	323	32.6	13.3

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

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	62.8 PK	74.0	-11.2	2.52 H	168	29.0	33.8
2	2390.00	50.0 AV	54.0	-4.0	2.52 H	168	16.2	33.8
3	*2412.00	105.4 PK			2.81 H	181	71.6	33.8
4	*2412.00	95.7 AV			2.81 H	181	61.9	33.8
5	4824.00	52.1 PK	74.0	-21.9	1.59 H	222	38.9	13.2
6	4824.00	38.6 AV	54.0	-15.4	1.59 H	222	25.4	13.2
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	61.3 PK	74.0	-12.7	3.66 V	90	27.5	33.8
2	2390.00	48.0 AV	54.0	-6.0	3.66 V	90	14.2	33.8
3	*2412.00	103.4 PK			3.60 V	12	69.6	33.8
4	*2412.00	93.7 AV			3.60 V	12	59.9	33.8
5	4824.00	51.6 PK	74.0	-22.4	1.05 V	199	38.4	13.2
6	4824.00	38.4 AV	54.0	-15.6	1.05 V	199	25.2	13.2

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
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	104.5 PK			1.26 H	174	70.7	33.8
2	*2437.00	95.4 AV			1.26 H	174	61.6	33.8
3	4874.00	52.1 PK	74.0	-21.9	1.77 H	333	38.9	13.2
4	4874.00	38.7 AV	54.0	-15.3	1.77 H	333	25.5	13.2

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	102.5 PK			3.60 V	20	68.7	33.8
2	*2437.00	93.4 AV			3.60 V	20	59.6	33.8
3	4874.00	51.9 PK	74.0	-22.1	2.25 V	241	38.7	13.2
4	4874.00	38.4 AV	54.0	-15.6	2.25 V	241	25.2	13.2

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
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	104.0 PK			1.20 H	172	70.1	33.9
2	*2462.00	94.4 AV			1.20 H	172	60.5	33.9
3	2483.50	59.0 PK	74.0	-15.0	1.20 H	200	25.1	33.9
4	2483.50	47.8 AV	54.0	-6.2	1.20 H	200	13.9	33.9
5	4924.00	50.6 PK	74.0	-23.4	2.00 H	233	37.3	13.3
6	4924.00	38.4 AV	54.0	-15.6	2.00 H	233	25.1	13.3

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	*2462.00	102.0 PK			3.26 V	15	68.1	33.9
2	*2462.00	92.4 AV			3.26 V	15	58.5	33.9
3	2483.50	58.4 PK	74.0	-15.6	3.69 V	26	24.5	33.9
4	2483.50	46.7 AV	54.0	-7.3	3.69 V	26	12.8	33.9
5	4924.00	50.1 PK	74.0	-23.9	2.62 V	229	36.8	13.3
6	4924.00	38.3 AV	54.0	-15.7	2.62 V	229	25.0	13.3

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

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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	67.0 PK	74.0	-7.0	1.41 H	63	33.2	33.8
2	2390.00	53.0 AV	54.0	-1.0	1.41 H	63	19.2	33.8
3	*2412.00	102.4 PK			1.45 H	108	68.6	33.8
4	*2412.00	92.6 AV			1.45 H	108	58.8	33.8
5	4824.00	51.3 PK	74.0	-22.7	2.22 H	233	38.1	13.2
6	4824.00	38.4 AV	54.0	-15.6	2.22 H	233	25.2	13.2

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	61.2 PK	74.0	-12.8	2.99 V	355	27.4	33.8
2	2390.00	50.4 AV	54.0	-3.6	2.99 V	355	16.6	33.8
3	*2412.00	100.9 PK			3.01 V	359	67.1	33.8
4	*2412.00	92.0 AV			3.01 V	359	58.2	33.8
5	4824.00	51.0 PK	74.0	-23.0	2.67 V	142	37.8	13.2
6	4824.00	38.2 AV	54.0	-15.8	2.67 V	142	25.0	13.2

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
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	103.2 PK			2.31 H	175	69.4	33.8
2	*2437.00	93.4 AV			2.31 H	175	59.6	33.8
3	4874.00	51.8 PK	74.0	-22.2	3.02 H	333	38.6	13.2
4	4874.00	38.8 AV	54.0	-15.2	3.02 H	333	25.6	13.2

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	101.9 PK			3.01 V	1	68.1	33.8
2	*2437.00	92.1 AV			3.01 V	1	58.3	33.8
3	4874.00	51.6 PK	74.0	-22.4	2.11 V	205	38.4	13.2
4	4874.00	38.7 AV	54.0	-15.3	2.11 V	205	25.5	13.2

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
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	102.1 PK			2.31 H	175	68.2	33.9
2	*2462.00	92.3 AV			2.31 H	175	58.4	33.9
3	2483.50	61.5 PK	74.0	-12.5	2.11 H	165	27.6	33.9
4	2483.50	49.2 AV	54.0	-4.8	2.11 H	165	15.3	33.9
5	4924.00	51.6 PK	74.0	-22.4	2.68 H	274	38.3	13.3
6	4924.00	40.3 AV	54.0	-13.7	2.68 H	274	27.0	13.3

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	*2462.00	103.3 PK			2.89 V	7	69.4	33.9
2	*2462.00	93.5 AV			2.89 V	7	59.6	33.9
3	2483.50	63.3 PK	74.0	-10.7	2.89 V	35	29.4	33.9
4	2483.50	49.4 AV	54.0	-4.6	2.89 V	35	15.5	33.9
5	4924.00	51.3 PK	74.0	-22.7	2.55 V	241	38.0	13.3
6	4924.00	40.1 AV	54.0	-13.9	2.55 V	241	26.8	13.3

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

Below 1GHz worst-case data:

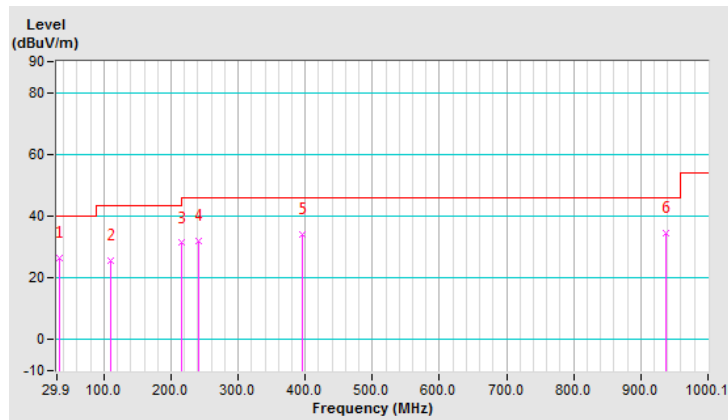
802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	33.78	26.4 QP	40.0	-13.6	1.01 H	79	37.0	-10.6
2	109.46	25.5 QP	43.5	-18.0	1.01 H	76	37.8	-12.3
3	216.18	31.3 QP	46.0	-14.7	1.01 H	179	42.7	-11.4
4	241.40	32.0 QP	46.0	-14.0	1.01 H	342	42.0	-10.0
5	396.64	33.9 QP	46.0	-12.1	1.01 H	201	40.0	-6.1
6	938.01	34.5 QP	46.0	-11.5	1.01 H	222	31.2	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 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

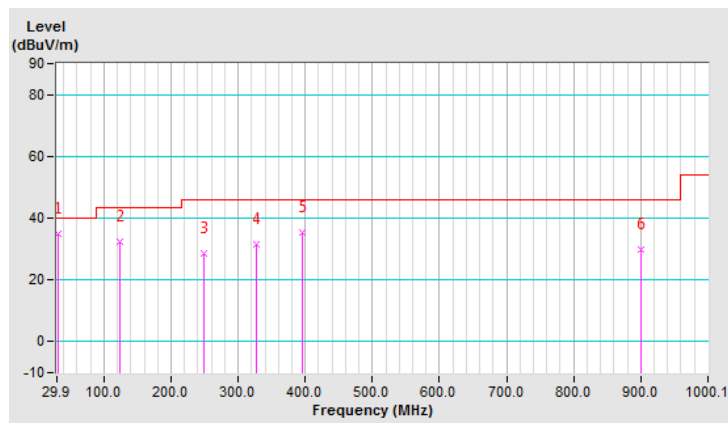


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.84	35.0 QP	40.0	-5.0	1.49 V	69	46.0	-11.0
2	123.04	32.2 QP	43.5	-11.3	1.49 V	69	43.5	-11.3
3	249.17	28.4 QP	46.0	-17.6	1.00 V	259	38.1	-9.7
4	326.78	31.5 QP	46.0	-14.5	2.00 V	14	38.9	-7.4
5	396.64	35.2 QP	46.0	-10.8	1.00 V	267	41.3	-6.1
6	901.14	30.0 QP	46.0	-16.0	1.00 V	252	27.4	2.6

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 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	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
			Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

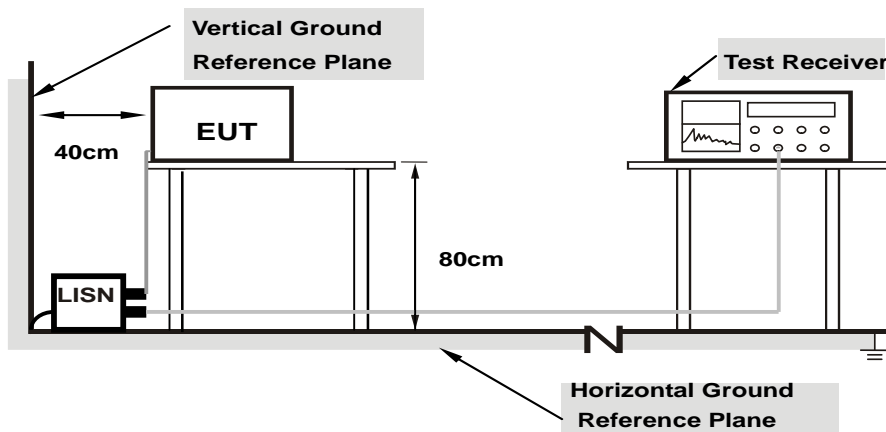
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

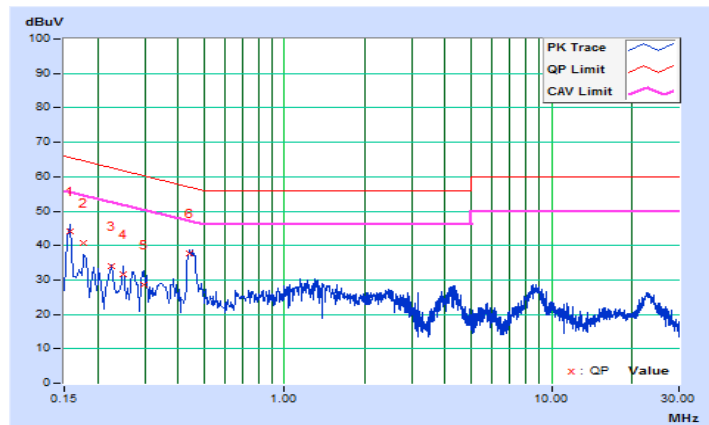
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Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15800	9.69	34.53	21.55	44.22	31.24	65.57
2	0.17801	9.68	31.19	17.50	40.87	27.18	64.58	54.58	-23.71	-27.40
3	0.22505	9.68	24.25	11.56	33.93	21.24	62.63	52.63	-28.70	-31.39
4	0.25000	9.68	22.11	11.15	31.79	20.83	61.76	51.76	-29.97	-30.93
5	0.29756	9.68	19.07	11.74	28.75	21.42	60.31	50.31	-31.56	-28.89
6	0.44177	9.68	28.04	21.09	37.72	30.77	57.03	47.03	-19.31	-16.26

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.

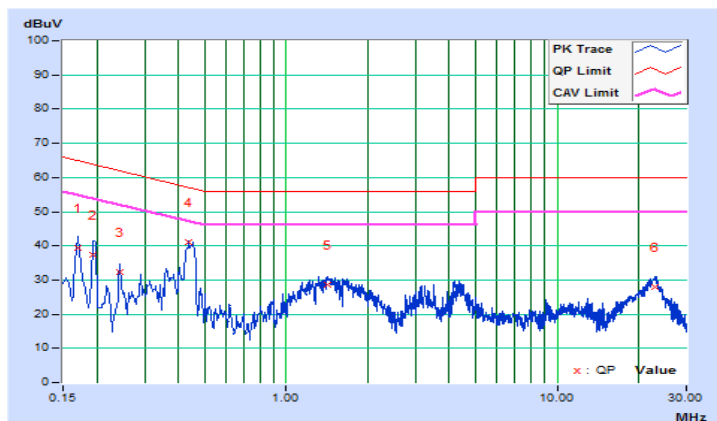


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.17000	9.66	29.75	16.10	39.41	25.76	64.96
2	0.19418	9.66	27.80	14.15	37.46	23.81	63.86	53.86	-26.40	-30.05
3	0.24200	9.66	22.52	9.75	32.18	19.41	62.03	52.03	-29.85	-32.62
4	0.43800	9.65	31.44	24.02	41.09	33.67	57.10	47.10	-16.01	-13.43
5	1.42600	9.65	18.86	11.63	28.51	21.28	56.00	46.00	-27.49	-24.72
6	22.89800	10.01	17.82	13.15	27.83	23.16	60.00	50.00	-32.17	-26.84

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.

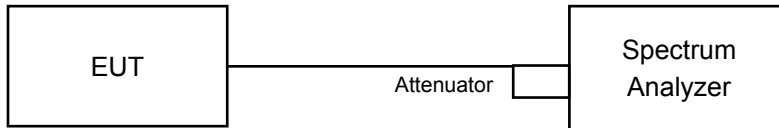


4.3 6dB Bandwidth Measurement

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	9.10	9.06	0.5	Pass
6	2437	9.09	8.61	0.5	Pass
11	2462	9.08	9.08	0.5	Pass

802.11g

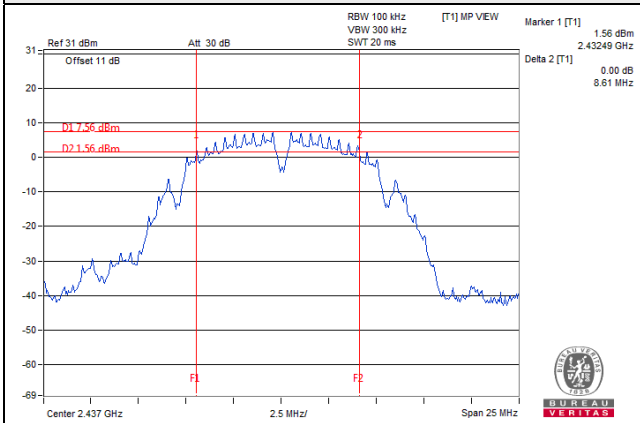
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.41	16.42	0.5	Pass
6	2437	16.41	16.42	0.5	Pass
11	2462	16.42	16.42	0.5	Pass

802.11n (HT20)

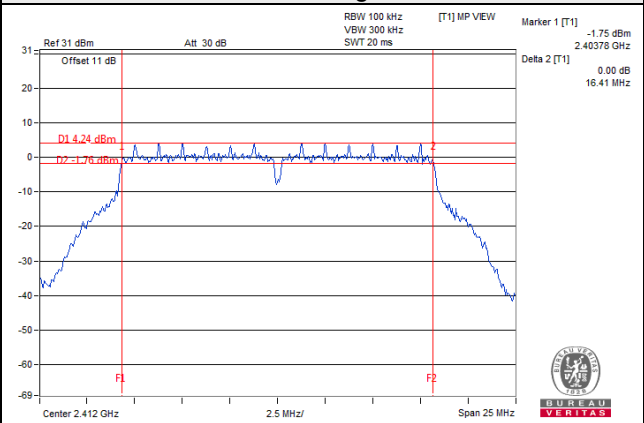
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.64	17.63	0.5	Pass
6	2437	17.64	17.64	0.5	Pass
11	2462	17.64	17.65	0.5	Pass

Spectrum Plot of Worst Value

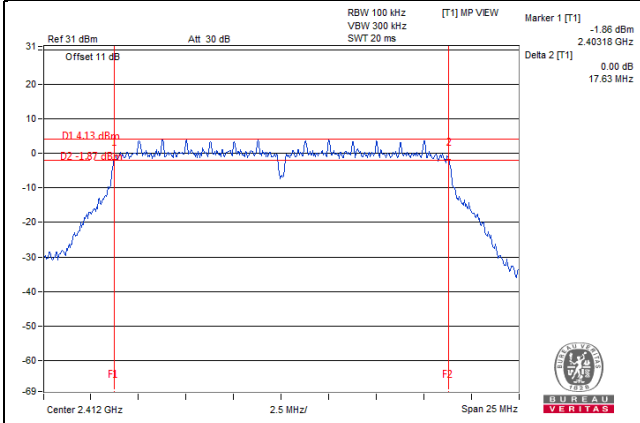
802.11b



802.11g



802.11n (HT20)



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,

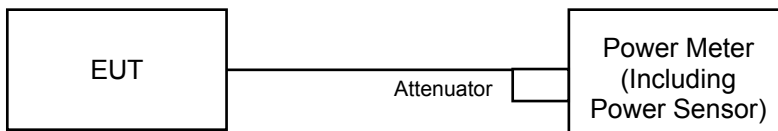
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

For Average Power

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

For Average Power

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	12.61	12.72	36.946	15.68	30.00	Pass
6	2437	12.68	12.96	38.305	15.83	30.00	Pass
11	2462	12.64	12.92	37.953	15.79	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	13.10	13.54	43.011	16.34	30.00	Pass
6	2437	13.11	13.43	42.493	16.28	30.00	Pass
11	2462	13.07	13.64	43.398	16.37	30.00	Pass

802.11n (HT20)

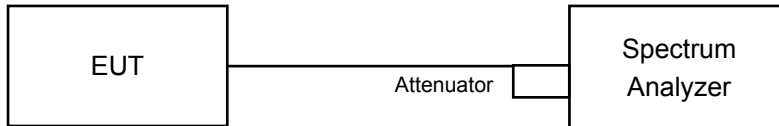
Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	11.69	12.08	30.901	14.90	30.00	Pass
6	2437	12.57	12.91	37.615	15.75	30.00	Pass
11	2462	12.63	13.01	38.322	15.83	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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	Frequency (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-12.46	3.01	-9.45	8.00	Pass
	6	2437	-12.35	3.01	-9.34	8.00	Pass
	11	2462	-11.93	3.01	-8.92	8.00	Pass
1	1	2412	-11.99	3.01	-8.98	8.00	Pass
	6	2437	-12.45	3.01	-9.44	8.00	Pass
	11	2462	-12.05	3.01	-9.04	8.00	Pass

Note:

1. Method E)2)c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $2.11\text{dBi} + 10\log(2) = 5.12\text{dBi} < 6\text{dBi}$, so the power density limit not need to reduce.

802.11g

TX chain	Channel	Frequency (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-13.92	3.01	-10.56	8.00	Pass
	6	2437	-13.44	3.01	-10.08	8.00	Pass
	11	2462	-14.19	3.01	-10.83	8.00	Pass
1	1	2412	-14.26	3.01	-10.90	8.00	Pass
	6	2437	-13.52	3.01	-10.16	8.00	Pass
	11	2462	-14.56	3.01	-11.20	8.00	Pass

Note:

1. Method E)2)c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $2.11\text{dBi} + 10\log(2) = 5.12\text{dBi} < 6\text{dBi}$, so the power density limit not need to reduce.

802.11n (HT20)

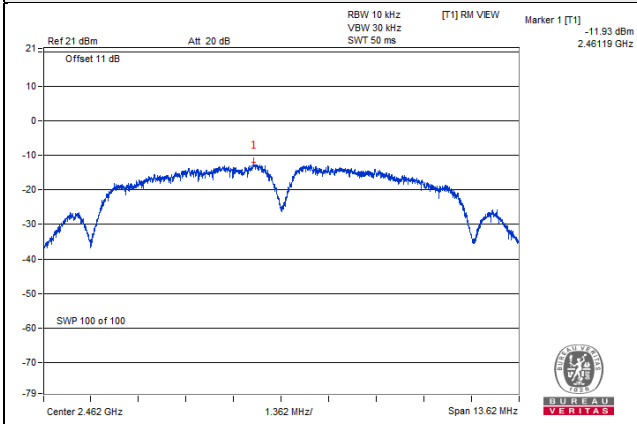
TX chain	Channel	Frequency (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-16.30	3.01	-12.93	8.00	Pass
	6	2437	-16.30	3.01	-12.93	8.00	Pass
	11	2462	-16.05	3.01	-12.68	8.00	Pass
1	1	2412	-16.08	3.01	-12.71	8.00	Pass
	6	2437	-16.38	3.01	-13.01	8.00	Pass
	11	2462	-16.52	3.01	-13.15	8.00	Pass

Note:

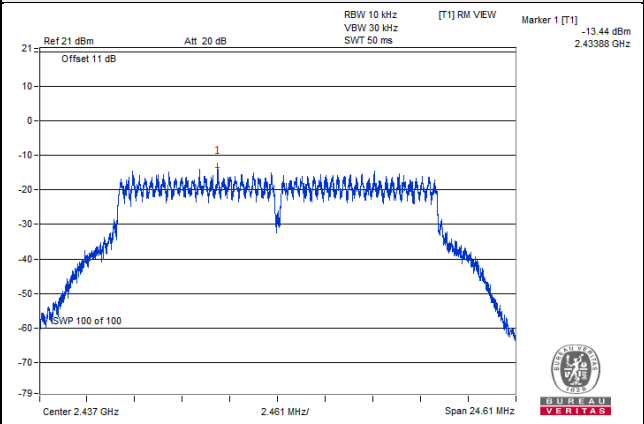
1. Method E)2)c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $2.11\text{dBi} + 10\log(2) = 5.12\text{dBi} < 6\text{dBi}$, so the power density limit not need to reduce.

Spectrum Plot of Worst Value

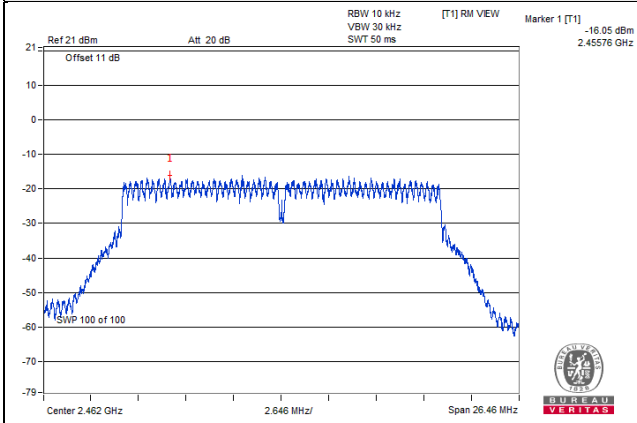
802.11b



802.11g



802.11n (HT20)

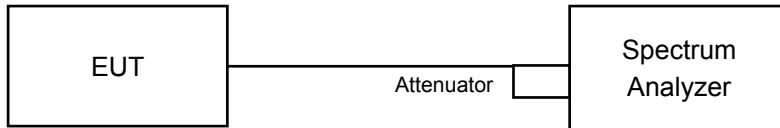


4.6 Conducted Out of Band Emission Measurement

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

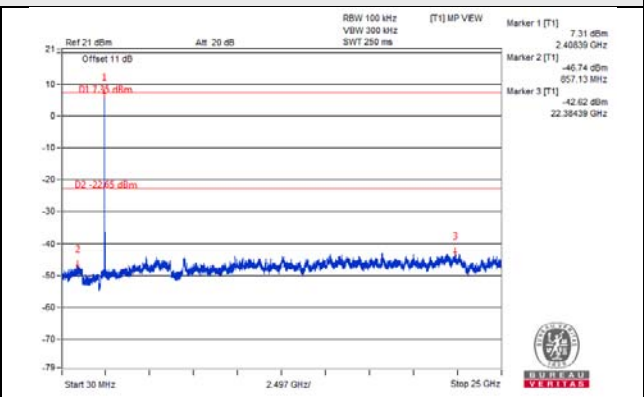
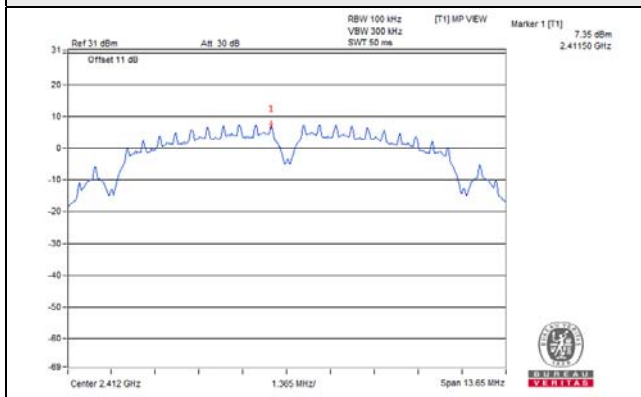
4.6.7 Test Results

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.

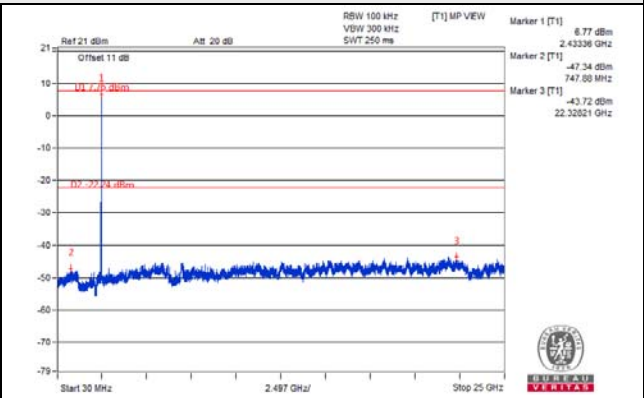
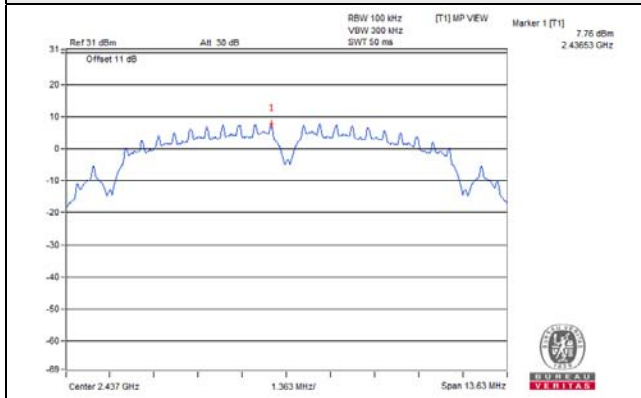
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

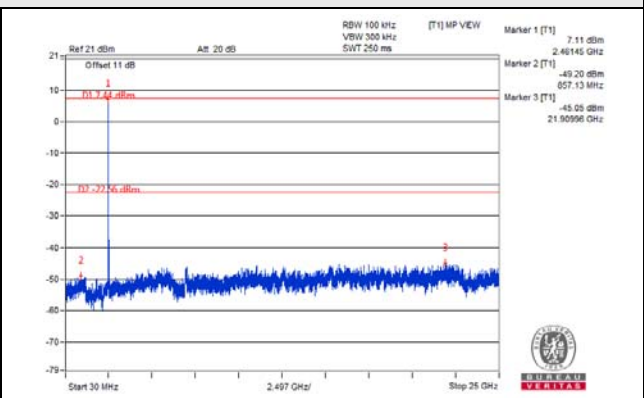
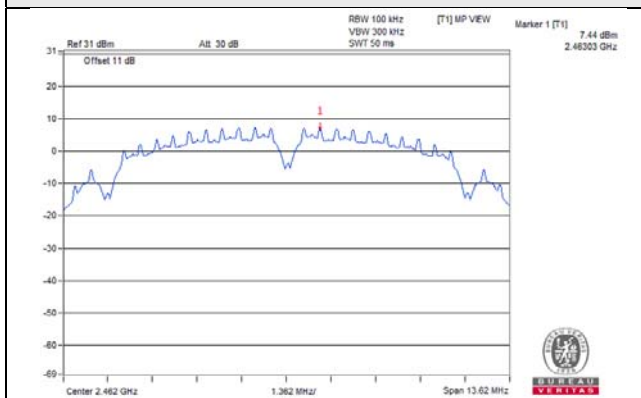
CH 1



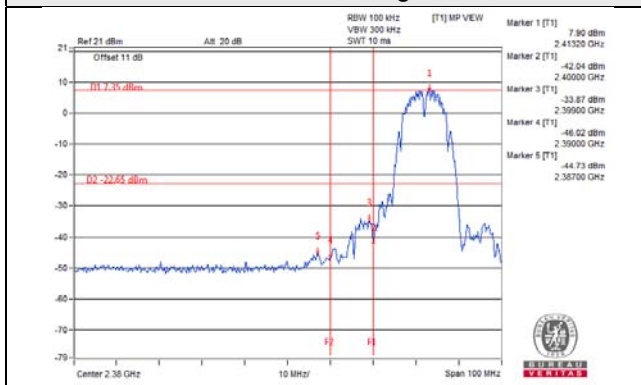
CH 6



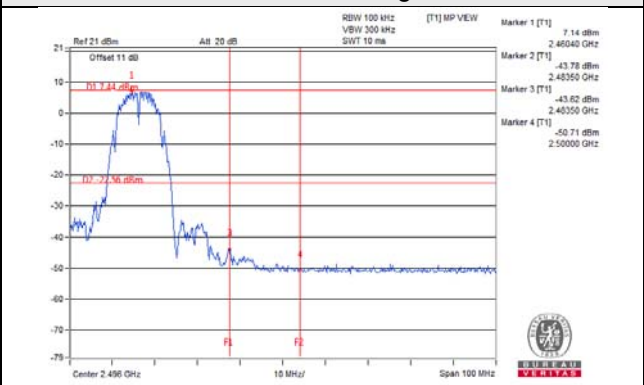
CH 11



CH 1 Band edge

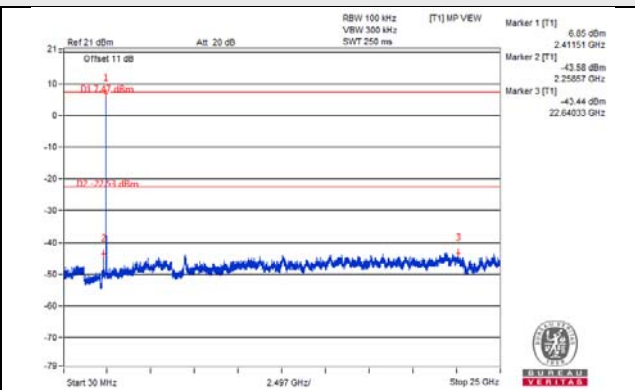
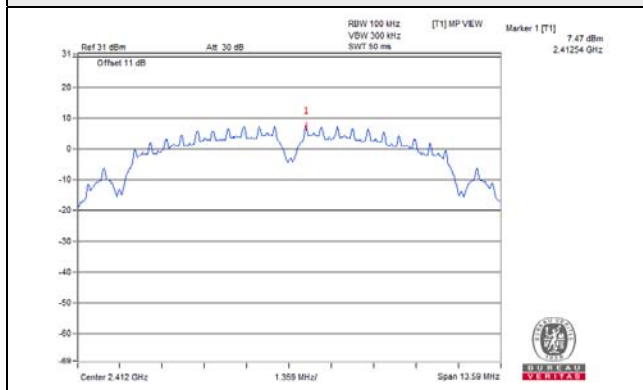


CH 11 Band edge

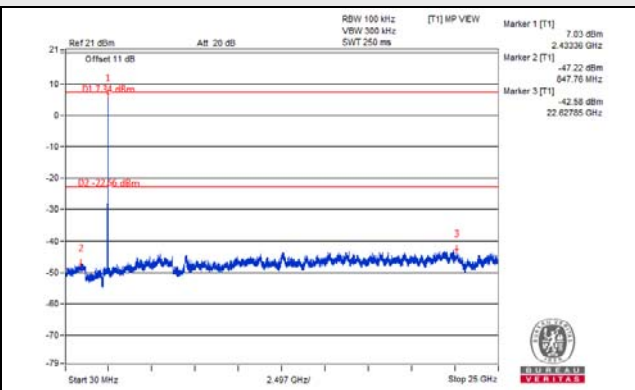
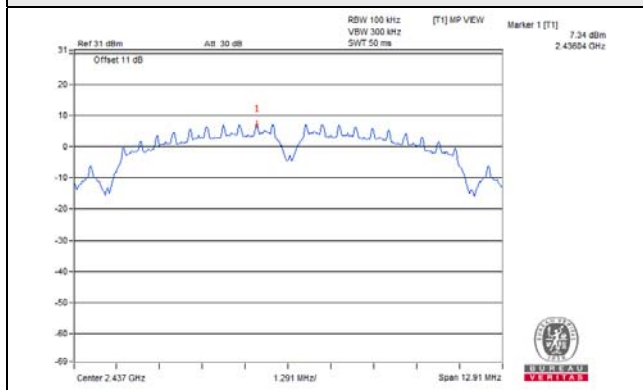


802.11b_Chain 1

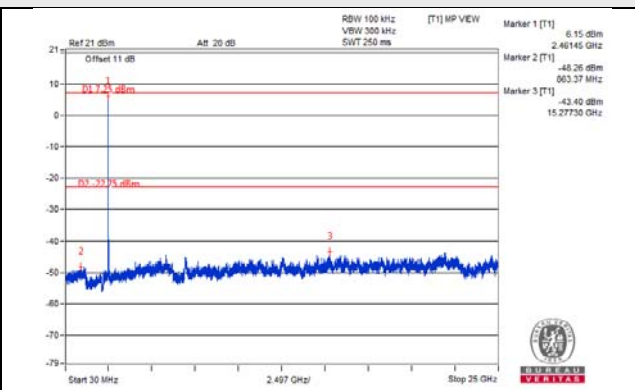
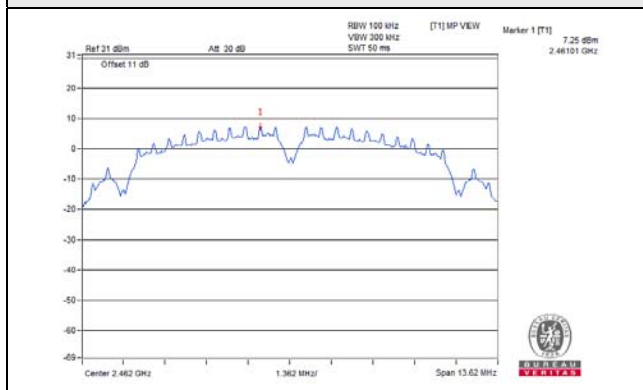
CH 1



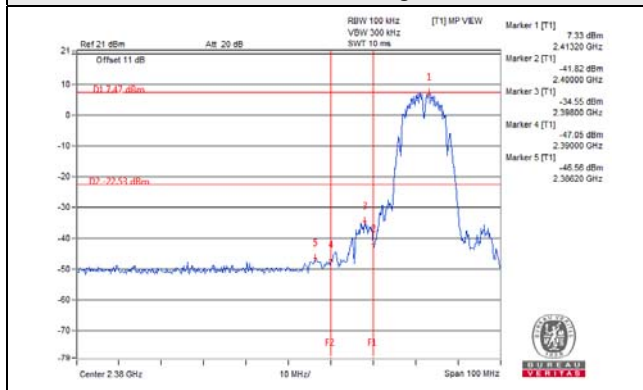
CH 6



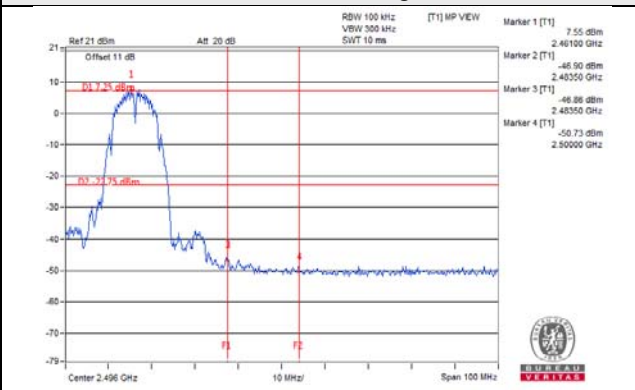
CH 11



CH 1 Band edge

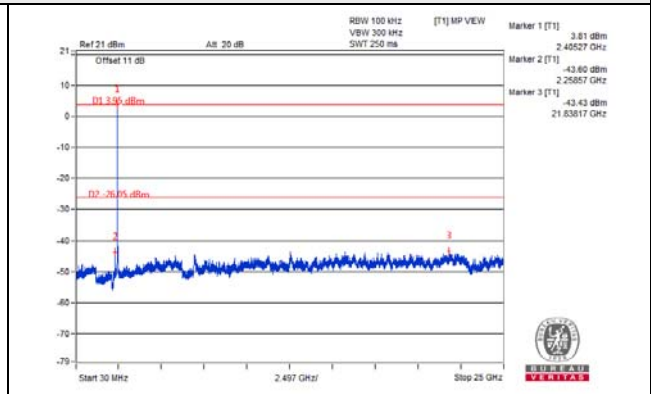
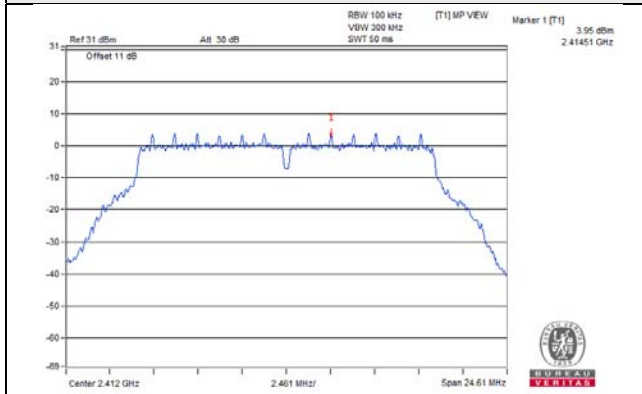


CH 11 Band edge

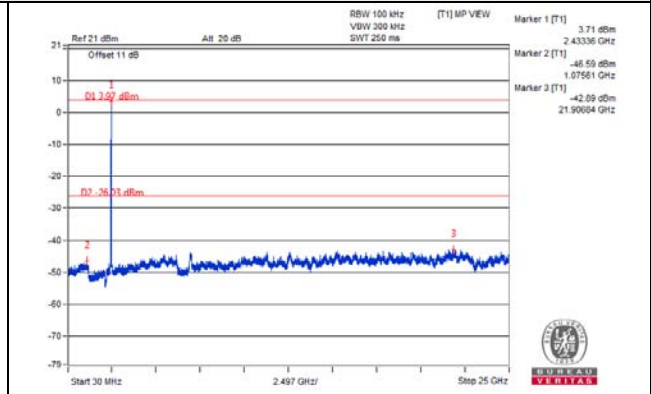
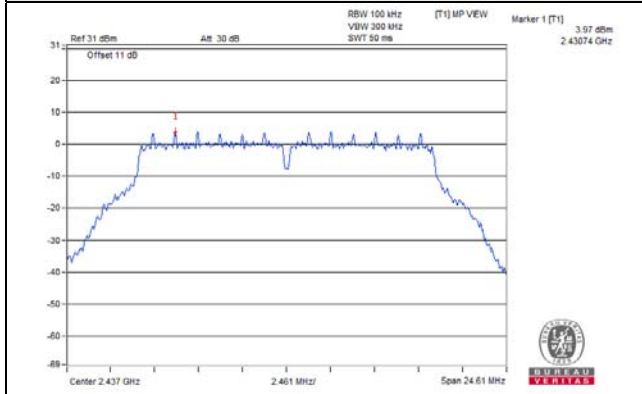


802.11g_Chain 0

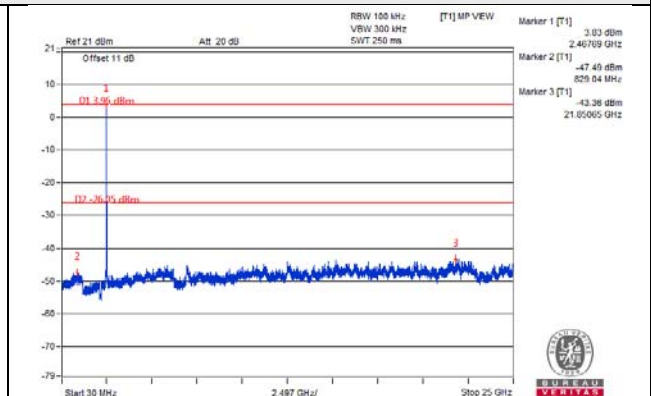
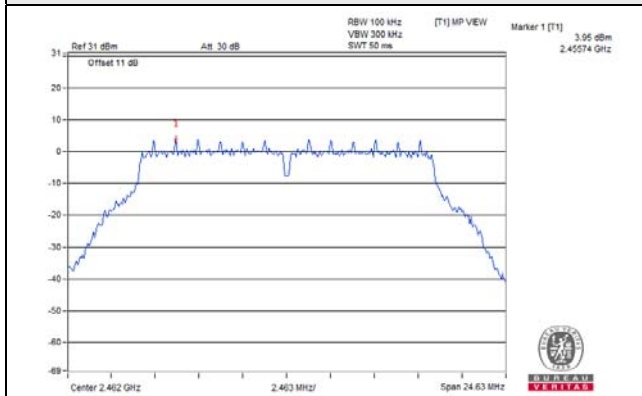
CH 1



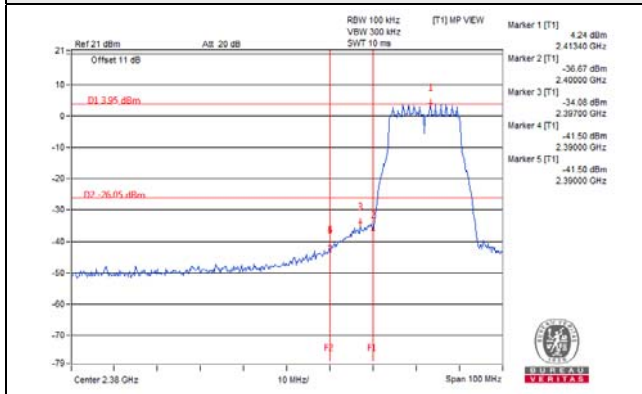
CH 6



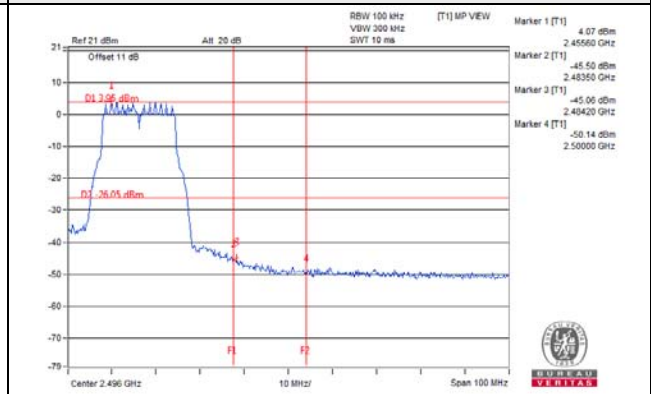
CH 11



CH 1 Band edge

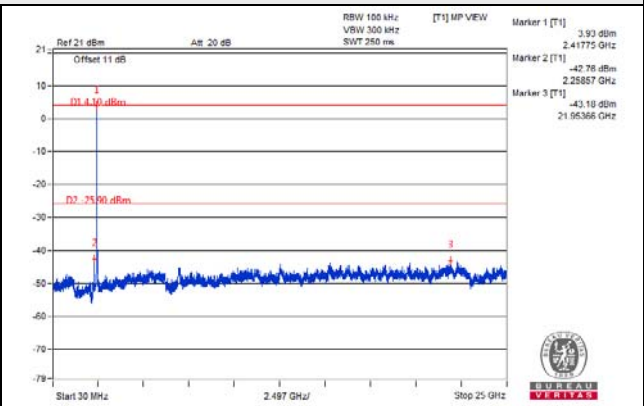
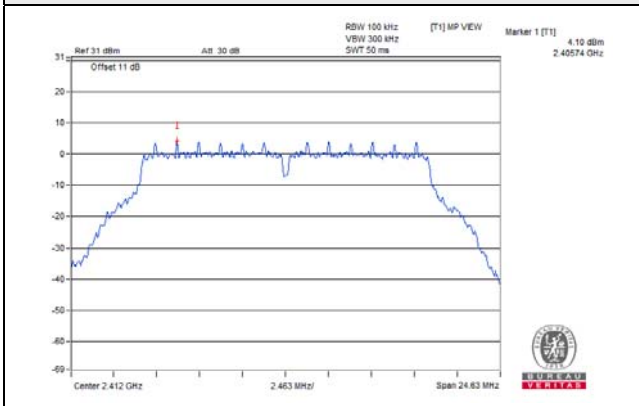


CH 11 Band edge

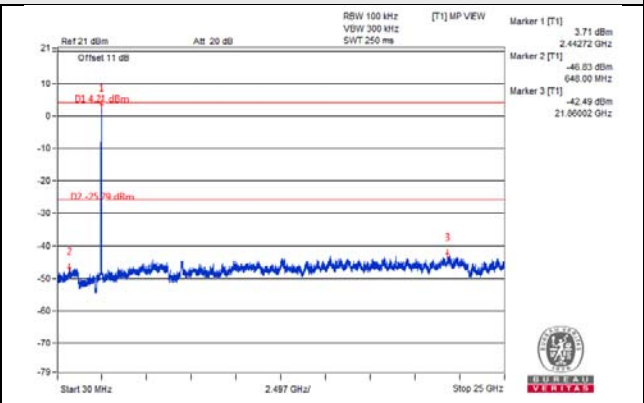
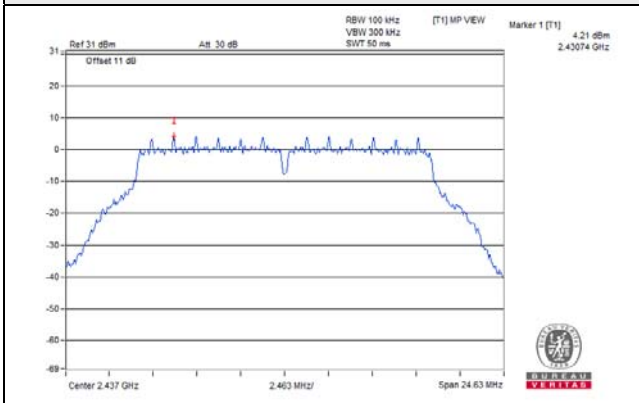


802.11g_Chain 1

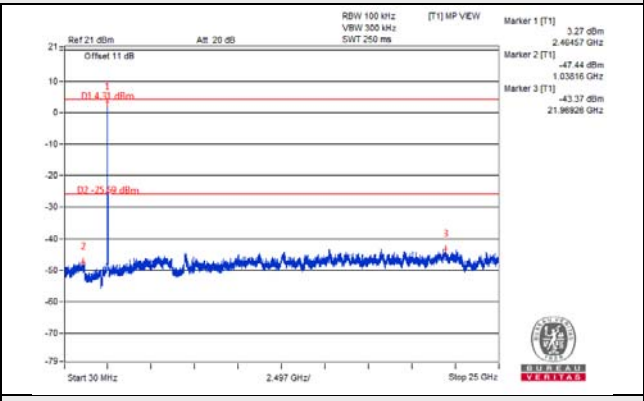
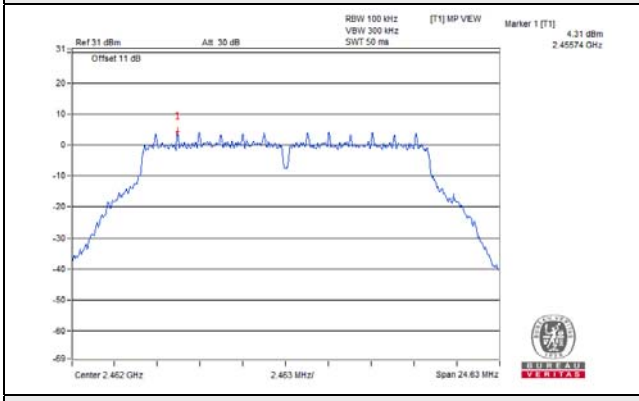
CH 1



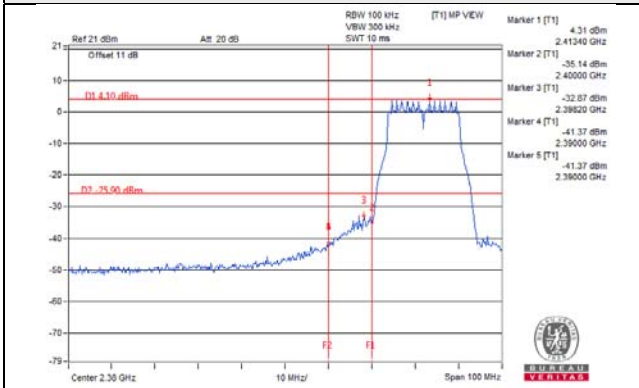
CH 6



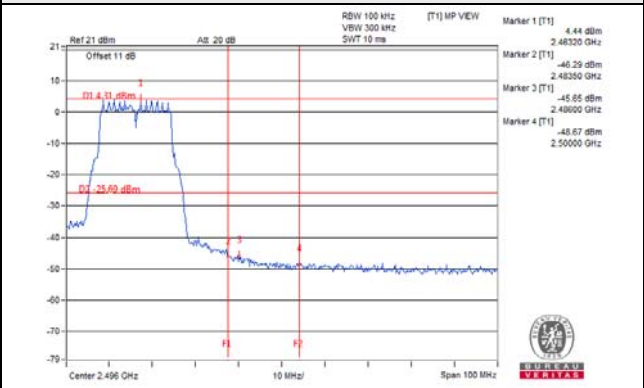
CH 11



CH 1 Band edge

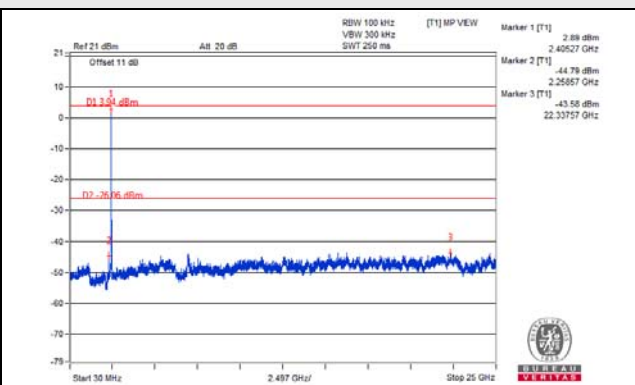
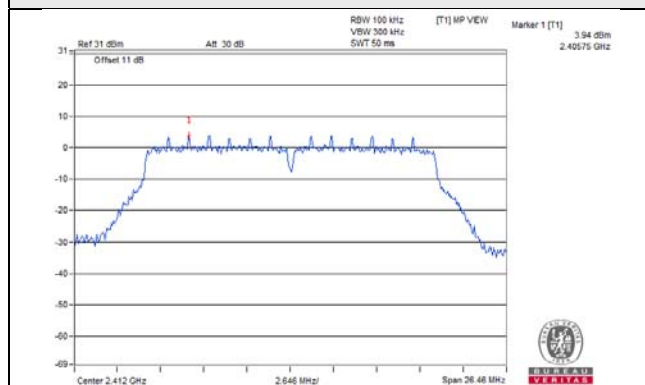


CH 11 Band edge

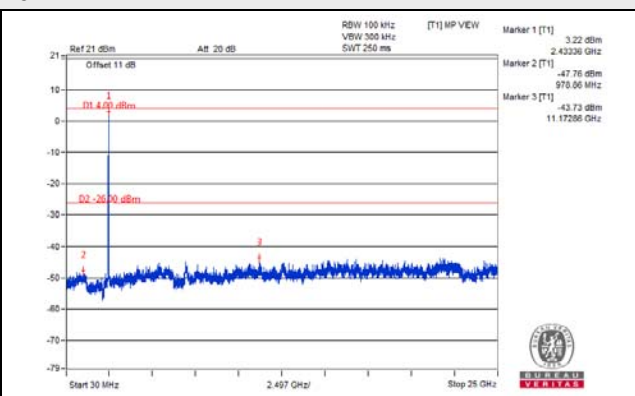
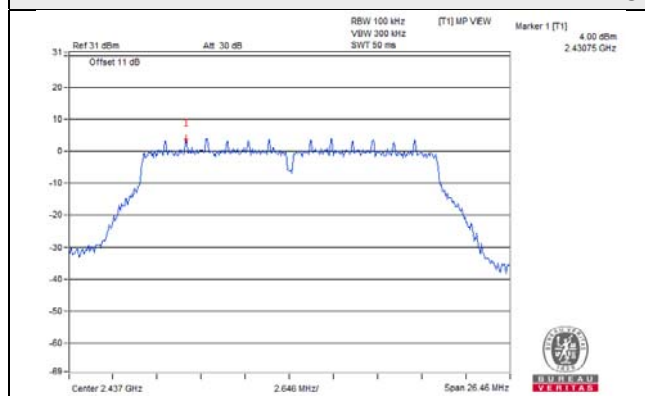


802.11n (HT20)_Chain 0

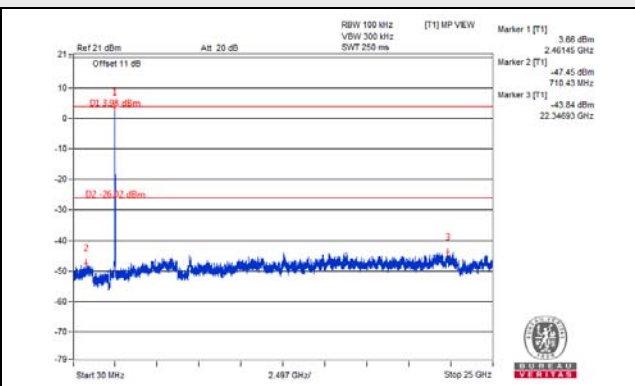
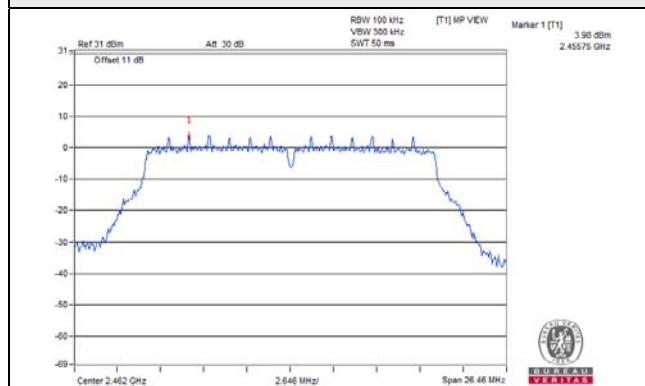
CH 1



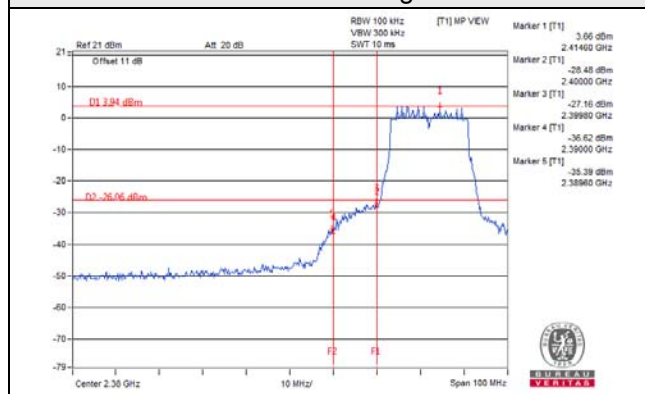
CH 6



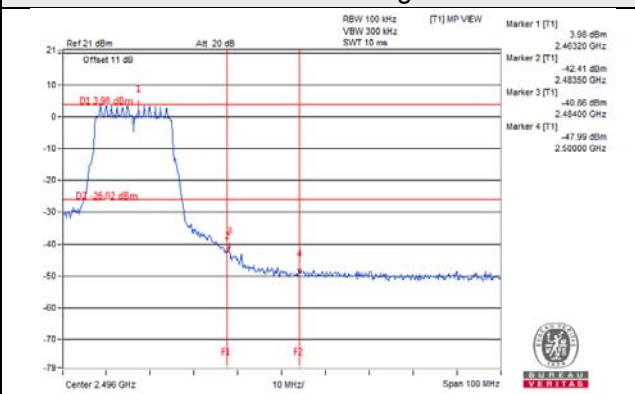
CH 11



CH 1 Band edge

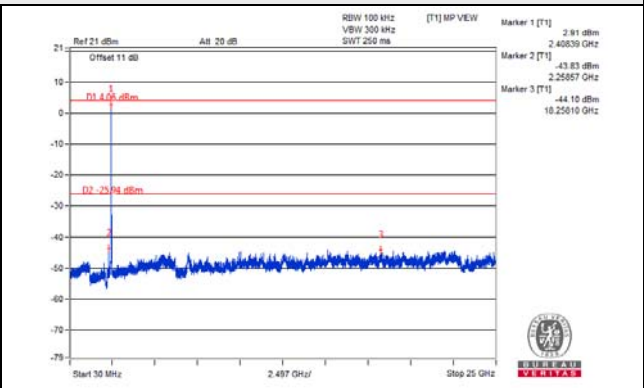
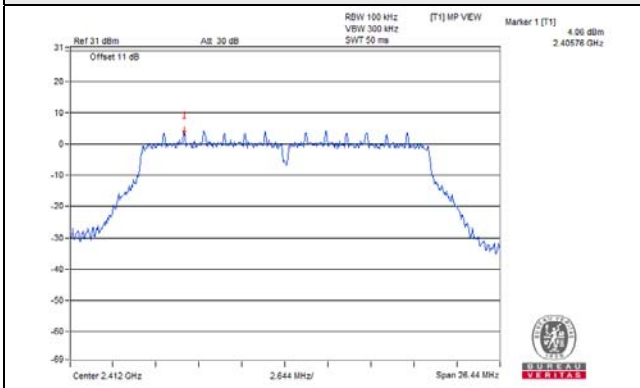


CH 11 Band edge

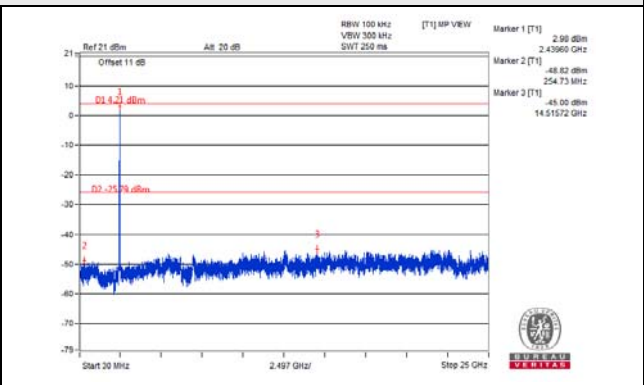
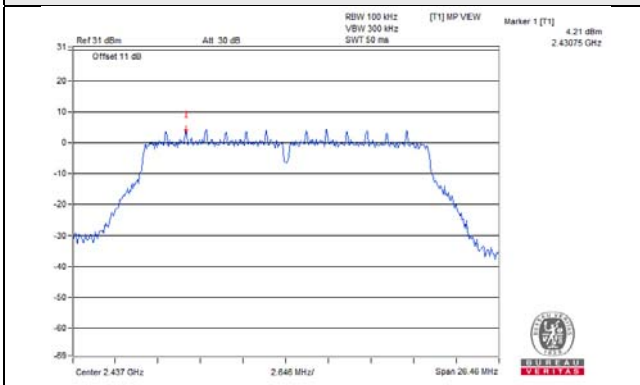


802.11n (HT20) Chain 1

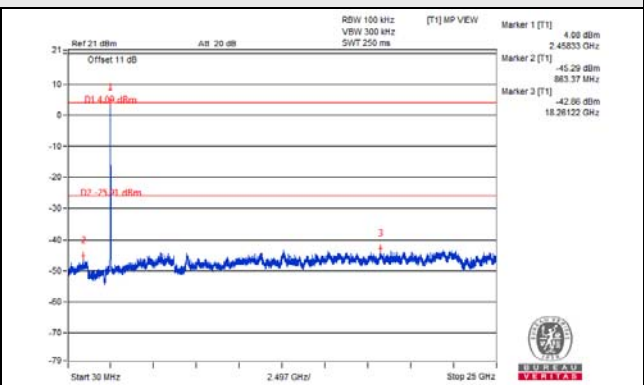
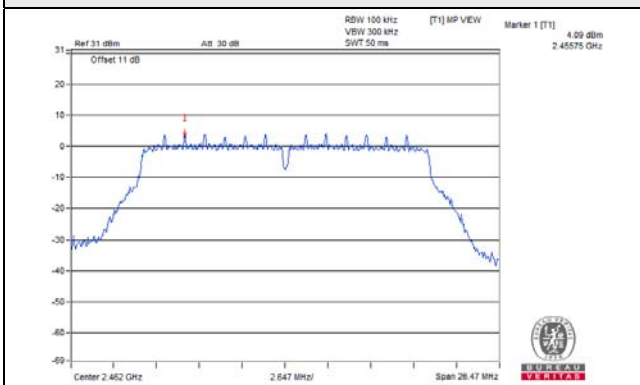
CH 1



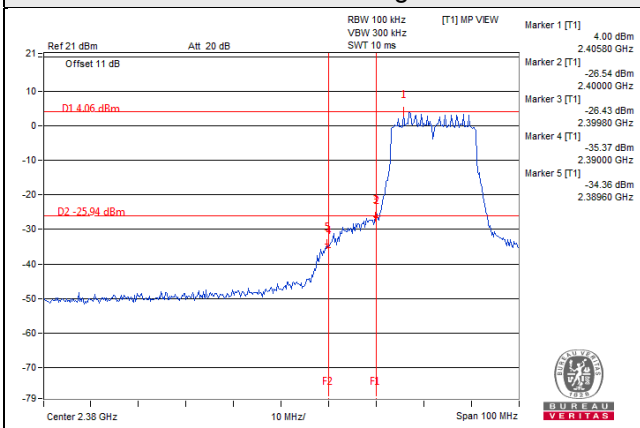
CH 6



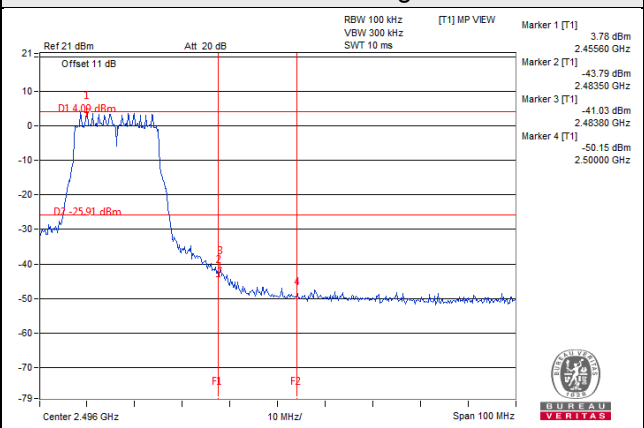
CH 11



CH 1 Band edge



CH 11 Band edge



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---