FCC Test Report

Report No.: RF200106C21 R3

FCC ID: UJH-R1LOW-SB

Model: R1LOW (refer to item 3.1 for more details)

Received Date: Jan. 06, 2020

Test Date: Jan. 08 ~ Mar. 17, 2020

Issued Date: Apr. 29, 2020

Applicant: Mitsubishi Electric Corporation Sanda Works

Address: 2-3-33 Miwa, Sanda-City, Hyogo 669-1513, Japan

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan

FCC Registration / Designation Number: 788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF200106C21	Original release	Mar. 18, 2020
RF200106C21 R1	Revised brand	Mar. 31, 2020
RF200106C21 R2	Revised Power Supply Rating	Apr. 09, 2020
RF200106C21 R3	Revised Cable Supplied	Apr. 29, 2020

1 Certificate of Conformity

Product: Display Audio

Brand: Mitsubishi Electric

Model: R1LOW (refer to item 3.1 for more details)

Sample Status: DV

Applicant: Mitsubishi Electric Corporation Sanda Works

Test Date: Jan. 08 ~ Mar. 17, 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 : Pettie Chen , **Date:** Apr. 29, 2020

Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 29, 2020

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	NA	EUT is powered from DC
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.6dB at 45.52MHz.
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 FAKRA 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) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 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	Display Audio
Brand	Mitsubishi Electric
Model	R1LOW (refer to note for more details)
Sample Status	DV
Power Supply Rating	12Vdc
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b:11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 144.44Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	26.444mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Antenna, 2.0m non-shielded DC power cable without core
Cable Supplied	0.5m shielded USB Cable with 2 cores

Note:

1. The following models are provided to this EUT.

Brand	Model	Description
Mitsubishi Electric	R1LOW	No. 28: SB, SXM
		No. 29: SB, DAB, FM2
		No. 39: SB, DAB, FM2, CAN-termination

2. 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

3. There two modules are collocated in the EUT.

Module No.	Function
1	WLAN 2.4GHz, 5GHz, BT EDR, BT LE (1M)
2	BT LE (1M, 2M)

4. The EUT uses following antennas.

Type		PCB								
Connecter		FAKRA								
Frequency (MHz)		2400	2450	2500	5150	5250	5350	5470	5725	5850
Ant. No.		0								
Gain (dBi)	Horizontal	1.19	1.85	0.49	-0.36	-0.51	0.02	-0.26	-1.40	-2.90
	Vertical	-8.98	-10.93	-13.69	-3.86	-3.10	-2.09	-2.07	0.15	-2.23
Max Gain (dBi)		1.85			0.15					
Ant. No.		1								
Gain (dBi)	Horizontal	1.50	1.64	0.12	0.87	1.61	0.51	0.89	0.84	0.14
	Vertical	-8.68	-13.32	-12.30	-0.86	-0.47	-0.70	-0.78	1.31	0.58
Max Gain (dBi)		1.64			1.61					

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≥1G	RE<1G	PLC	APCM	
A	√	√	Note 2	√	EUT: No. 28
B	-	√	Note 2	-	EUT: No. 39

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

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.
2. No need to concern of PLC due to the EUT is powered from DC.
3. For radiated emission (below 1GHz) test item, the worst maximum power was selected.
4. "-": Means no effect.

Radiated Emission Test (Above 1GHz):

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	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)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Antenna Port Conducted Measurement:

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

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

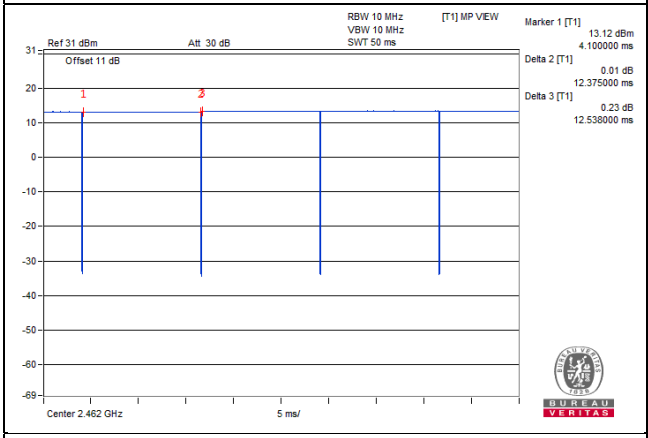
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	22 deg. C, 66% RH	12Vdc	Han Wu
RE<1G	22 deg. C, 66% RH	12Vdc	Han Wu
APCM	25 deg. C, 60% RH	12Vdc	Jisyong Wang

3.3 Duty Cycle of Test Signal

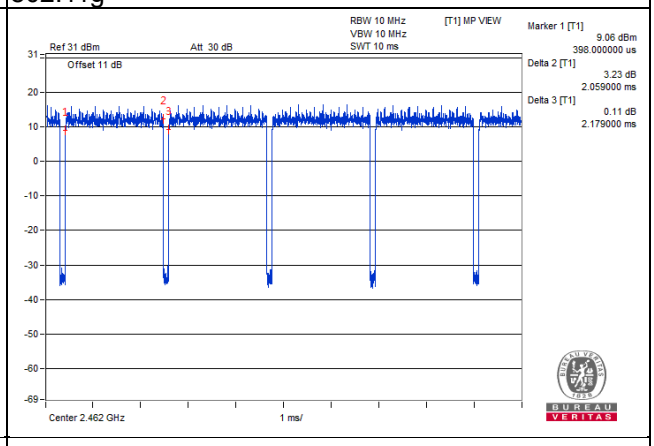
Duty cycle of test signal is > 98%, duty factor is not required.
Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.375/12.538 = 0.987
802.11g: Duty cycle = 2.059/2.179 = 0.945, Duty factor = 10 * log(1/0.945) = 0.25
802.11n (HT20): Duty cycle = 1.92/2.06 = 0.932, Duty factor = 10 * log(1/0.932) = 0.31

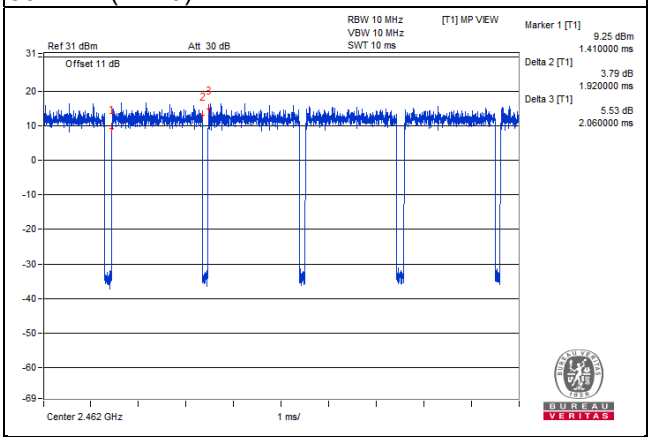
802.11b



802.11g



802.11n (HT20)



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.

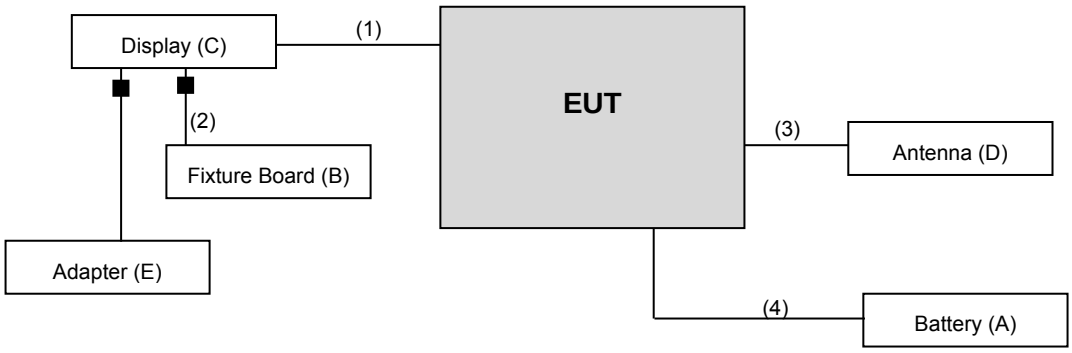
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Battery	YUASA	75D23R-CMF II	NA	NA	-
B.	Fixture Board	NA	NA	NA	NA	Provided by client
C.	Display	NA	NA	NA	NA	Provided by client
D.	Antenna	Molex	68306857AA	60021	NA	Accessory
E.	Adapter	NA	FJ-SW1203000D	NA	NA	Provided by client

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	2	N	0	Accessory
2.	USB cable	1	0.5	Y	2	Provided by client
3.	Harness cable	1	2	N	0	Provided by client

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 DTS Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 30dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2019	Jun. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100979	Apr. 18, 2019	Apr. 17, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019	Feb. 18, 2020
			Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 19, 2019	Jan. 18, 2020
			Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 15, 2019	Jul. 14, 2020

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

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

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

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

NOTE:

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

For Radiated emission above 30MHz

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

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

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

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

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

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

Note:

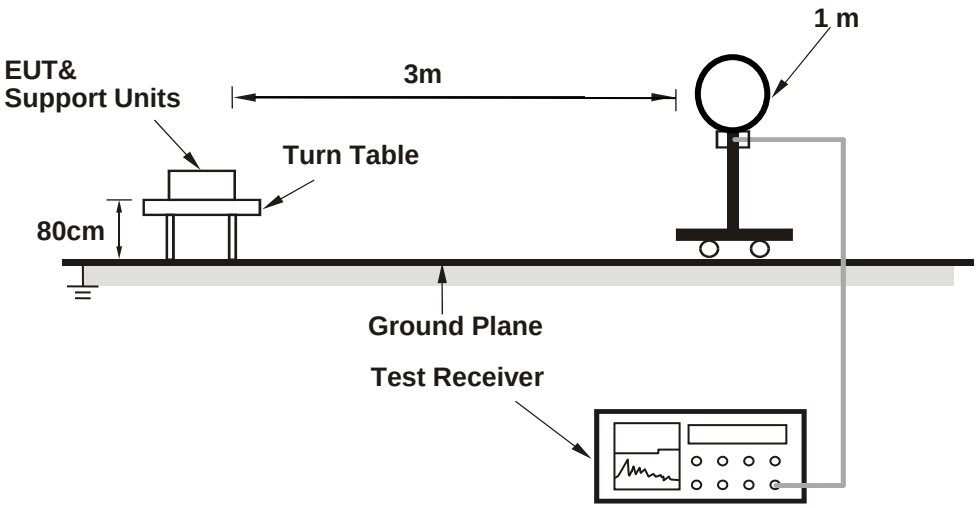
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz. (802.11b: RBW = 1 MHz, VBW =10 Hz; 802.11g: RBW = 1 MHz, VBW = 1 kHz; 802.11n (HT20): RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

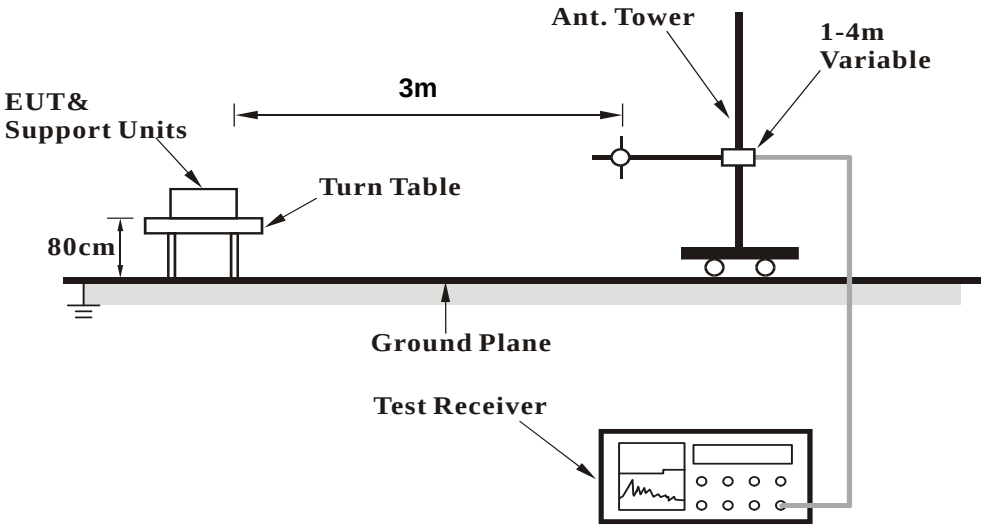
No deviation.

4.1.5 Test Set Up

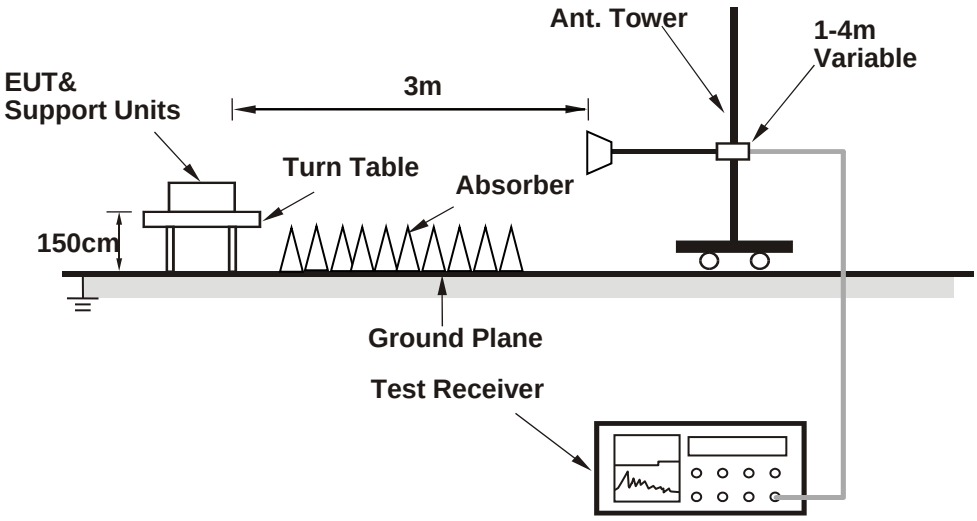
For Radiated emission below 30MHz



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. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz worst-Case 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	56.6 PK	74.0	-17.4	2.06 H	12	24.7	31.9
2	2390.00	44.7 AV	54.0	-9.3	2.06 H	12	12.8	31.9
3	*2412.00	104.5 PK			2.04 H	14	72.6	31.9
4	*2412.00	102.4 AV			2.04 H	14	70.5	31.9
5	4824.00	46.9 PK	74.0	-27.1	2.00 H	236	43.1	3.8
6	4824.00	40.2 AV	54.0	-13.8	2.00 H	236	36.4	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.9 PK	74.0	-16.1	1.00 V	326	26.0	31.9
2	2390.00	44.7 AV	54.0	-9.3	1.00 V	326	12.8	31.9
3	*2412.00	101.0 PK			1.00 V	322	69.1	31.9
4	*2412.00	99.2 AV			1.00 V	322	67.3	31.9
5	4824.00	48.8 PK	74.0	-25.2	1.00 V	120	45.0	3.8
6	4824.00	41.8 AV	54.0	-12.2	1.00 V	120	38.0	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	104.5 PK			1.95 H	10	72.6	31.9
2	*2437.00	100.7 AV			1.95 H	10	68.8	31.9
3	4874.00	46.9 PK	74.0	-27.1	1.94 H	245	43.1	3.8
4	4874.00	40.2 AV	54.0	-13.8	1.94 H	245	36.4	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	101.1 PK			1.01 V	324	69.2	31.9
2	*2437.00	97.4 AV			1.01 V	324	65.5	31.9
3	4874.00	48.6 PK	74.0	-25.4	1.03 V	121	44.8	3.8
4	4874.00	42.0 AV	54.0	-12.0	1.03 V	121	38.2	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	105.2 PK			1.83 H	8	73.3	31.9
2	*2462.00	101.3 AV			1.83 H	8	69.4	31.9
3	2483.50	57.8 PK	74.0	-16.2	1.87 H	4	25.8	32.0
4	2483.50	45.2 AV	54.0	-8.8	1.87 H	4	13.2	32.0
5	4924.00	47.2 PK	74.0	-26.8	1.98 H	242	43.4	3.8
6	4924.00	40.1 AV	54.0	-13.9	1.98 H	242	36.3	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	102.2 PK			1.02 V	328	70.3	31.9
2	*2462.00	98.2 AV			1.02 V	328	66.3	31.9
3	2483.50	58.4 PK	74.0	-15.6	1.05 V	326	26.4	32.0
4	2483.50	45.2 AV	54.0	-8.8	1.05 V	326	13.2	32.0
5	4924.00	48.6 PK	74.0	-25.4	1.03 V	126	44.8	3.8
6	4924.00	41.9 AV	54.0	-12.1	1.03 V	126	38.1	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.8 PK	74.0	-16.2	1.80 H	18	25.9	31.9
2	2390.00	45.0 AV	54.0	-9.0	1.80 H	18	13.1	31.9
3	*2412.00	102.7 PK			2.03 H	14	70.8	31.9
4	*2412.00	93.4 AV			2.03 H	14	61.5	31.9
5	4824.00	43.0 PK	74.0	-31.0	1.93 H	229	39.2	3.8
6	4824.00	30.5 AV	54.0	-23.5	1.93 H	229	26.7	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.8 PK	74.0	-16.2	1.01 V	323	25.9	31.9
2	2390.00	45.0 AV	54.0	-9.0	1.01 V	323	13.1	31.9
3	*2412.00	99.5 PK			1.03 V	326	67.6	31.9
4	*2412.00	90.2 AV			1.03 V	326	58.3	31.9
5	4824.00	43.2 PK	74.0	-30.8	1.05 V	116	39.4	3.8
6	4824.00	30.3 AV	54.0	-23.7	1.05 V	116	26.5	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	101.8 PK			1.99 H	6	69.9	31.9
2	*2437.00	92.6 AV			1.99 H	6	60.7	31.9
3	4874.00	43.3 PK	74.0	-30.7	2.10 H	245	39.5	3.8
4	4874.00	30.6 AV	54.0	-23.4	2.10 H	245	26.8	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	99.0 PK			1.02 V	327	67.1	31.9
2	*2437.00	89.6 AV			1.02 V	327	57.7	31.9
3	4874.00	43.3 PK	74.0	-30.7	1.05 V	117	39.5	3.8
4	4874.00	30.2 AV	54.0	-23.8	1.05 V	117	26.4	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	102.6 PK			1.85 H	9	70.7	31.9
2	*2462.00	93.1 AV			1.85 H	9	61.2	31.9
3	2483.50	57.6 PK	74.0	-16.4	1.80 H	8	25.6	32.0
4	2483.50	45.1 AV	54.0	-8.9	1.80 H	8	13.1	32.0
5	4924.00	42.9 PK	74.0	-31.1	2.03 H	232	39.1	3.8
6	4924.00	30.5 AV	54.0	-23.5	2.03 H	232	26.7	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	99.0 PK			1.03 V	324	67.1	31.9
2	*2462.00	89.7 AV			1.03 V	324	57.8	31.9
3	2483.50	57.6 PK	74.0	-16.4	1.03 V	330	25.6	32.0
4	2483.50	45.2 AV	54.0	-8.8	1.03 V	330	13.2	32.0
5	4924.00	42.9 PK	74.0	-31.1	1.04 V	124	39.1	3.8
6	4924.00	30.6 AV	54.0	-23.4	1.04 V	124	26.8	3.8

REMARKS:

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

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.8 PK	74.0	-16.2	1.64 H	12	25.9	31.9
2	2390.00	45.0 AV	54.0	-9.0	1.64 H	12	13.1	31.9
3	*2412.00	101.6 PK			1.65 H	11	69.7	31.9
4	*2412.00	90.4 AV			1.65 H	11	58.5	31.9
5	4824.00	42.9 PK	74.0	-31.1	2.10 H	240	39.1	3.8
6	4824.00	30.5 AV	54.0	-23.5	2.10 H	240	26.7	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.4 PK	74.0	-15.6	1.03 V	327	26.5	31.9
2	2390.00	45.2 AV	54.0	-8.8	1.03 V	327	13.3	31.9
3	*2412.00	98.0 PK			1.03 V	328	66.1	31.9
4	*2412.00	87.0 AV			1.03 V	328	55.1	31.9
5	4824.00	43.6 PK	74.0	-30.4	1.05 V	119	39.8	3.8
6	4824.00	30.3 AV	54.0	-23.7	1.05 V	119	26.5	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	101.8 PK			1.63 H	11	69.9	31.9
2	*2437.00	90.3 AV			1.63 H	11	58.4	31.9
3	4874.00	43.4 PK	74.0	-30.6	1.98 H	234	39.6	3.8
4	4874.00	30.3 AV	54.0	-23.7	1.98 H	234	26.5	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	98.6 PK			1.00 V	323	66.7	31.9
2	*2437.00	87.1 AV			1.00 V	323	55.2	31.9
3	4874.00	43.5 PK	74.0	-30.5	1.02 V	127	39.7	3.8
4	4874.00	30.2 AV	54.0	-23.8	1.02 V	127	26.4	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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) 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	102.8 PK			1.60 H	8	70.9	31.9
2	*2462.00	91.9 AV			1.60 H	8	60.0	31.9
3	2483.50	58.5 PK	74.0	-15.5	1.91 H	17	26.5	32.0
4	2483.50	44.9 AV	54.0	-9.1	1.91 H	17	12.9	32.0
5	4924.00	43.1 PK	74.0	-30.9	2.03 H	244	39.3	3.8
6	4924.00	30.2 AV	54.0	-23.8	2.03 H	244	26.4	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	99.4 PK			1.03 V	330	67.5	31.9
2	*2462.00	88.6 AV			1.03 V	330	56.7	31.9
3	2483.50	57.5 PK	74.0	-16.5	1.02 V	325	25.5	32.0
4	2483.50	45.2 AV	54.0	-8.8	1.02 V	325	13.2	32.0
5	4924.00	43.5 PK	74.0	-30.5	1.04 V	125	39.7	3.8
6	4924.00	30.6 AV	54.0	-23.4	1.04 V	125	26.8	3.8

REMARKS:

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

Below 1GHz worst-case data:

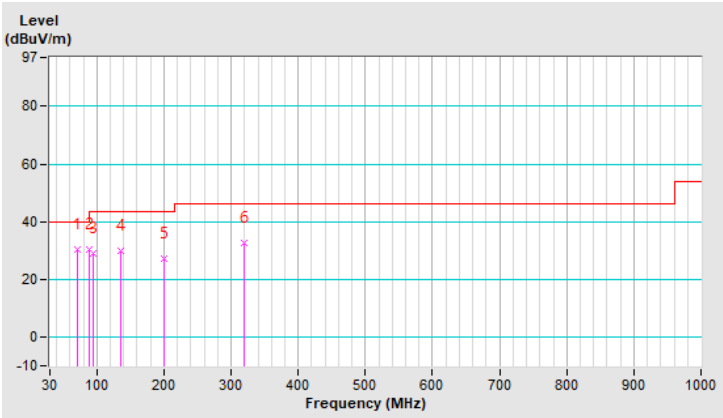
802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	70.74	30.5 QP	40.0	-9.5	1.00 H	110	42.1	-11.6
2	88.20	30.2 QP	43.5	-13.3	1.00 H	15	45.1	-14.9
3	94.99	29.0 QP	43.5	-14.5	1.00 H	15	43.6	-14.6
4	135.73	29.7 QP	43.5	-13.8	1.00 H	15	39.8	-10.1
5	200.72	27.3 QP	43.5	-16.2	1.00 H	259	39.4	-12.1
6	320.03	32.5 QP	46.0	-13.5	1.00 H	244	40.0	-7.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
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 20dB below the permissible value to be report.

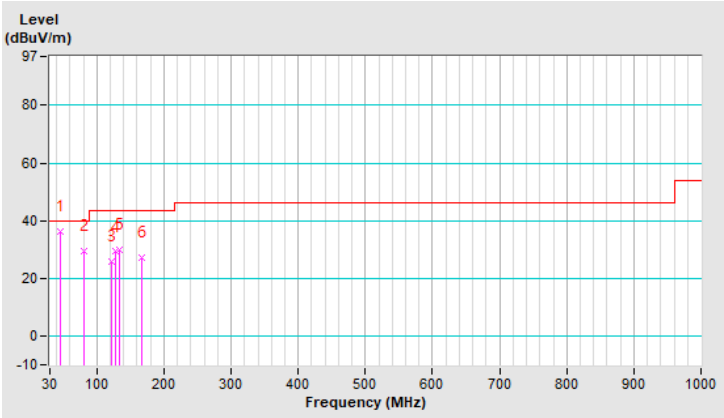


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	A

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**45.52**	**36.4 QP**	**40.0**	**-3.6**	**1.00 V**	**248**	**46.3**	**-9.9**
2	80.44	29.4 QP	40.0	-10.6	1.00 V	120	43.3	-13.9
3	121.18	25.9 QP	43.5	-17.6	1.00 V	225	37.4	-11.5
4	127.97	29.2 QP	43.5	-14.3	1.00 V	217	40.0	-10.8
5	132.82	30.0 QP	43.5	-13.5	1.00 V	197	40.4	-10.4
6	166.77	27.0 QP	43.5	-16.5	1.00 V	95	36.3	-9.3

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)
3. The other emission levels were very low against the limit.
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 20dB below the permissible value to be report.

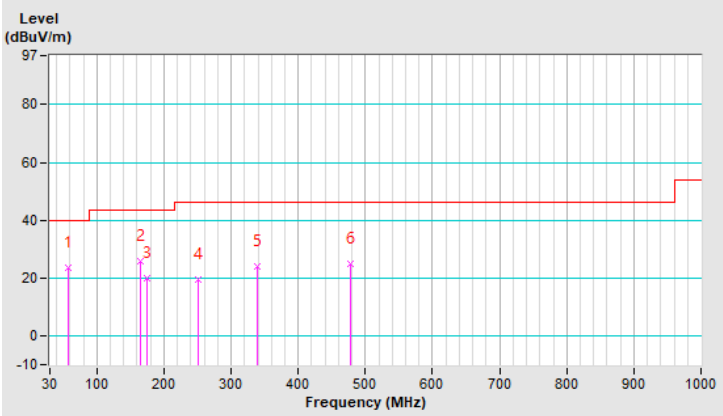


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.16	23.6 QP	40.0	-16.4	1.00 H	124	33.8	-10.2
2	165.80	25.9 QP	43.5	-17.6	1.00 H	280	35.1	-9.2
3	174.53	19.8 QP	43.5	-23.7	1.00 H	250	29.7	-9.9
4	250.19	19.4 QP	46.0	-26.6	1.00 H	304	29.4	-10.0
5	338.46	23.8 QP	46.0	-22.2	1.00 H	142	31.0	-7.2
6	477.17	24.9 QP	46.0	-21.1	1.00 H	289	29.1	-4.2

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)
3. The other emission levels were very low against the limit.
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 20dB below the permissible value to be report.

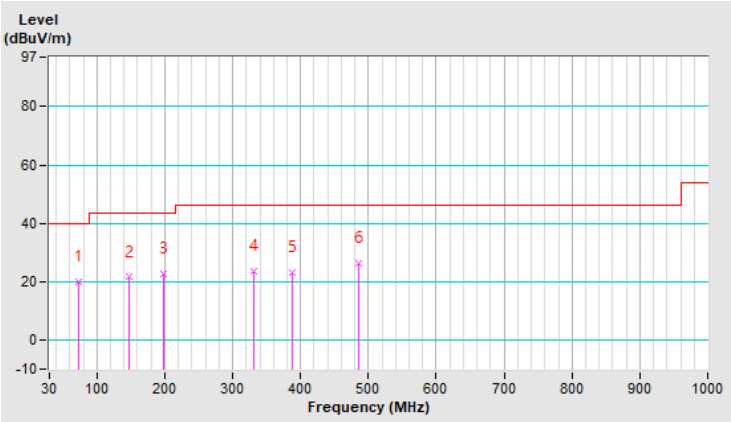


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	73.65	19.8 QP	40.0	-20.2	1.00 V	166	32.2	-12.4
2	146.40	21.5 QP	43.5	-22.0	1.00 V	11	30.9	-9.4
3	197.81	22.6 QP	43.5	-20.9	1.00 V	122	34.7	-12.1
4	330.70	23.6 QP	46.0	-22.4	1.00 V	241	30.8	-7.2
5	387.93	22.9 QP	46.0	-23.1	1.00 V	157	28.9	-6.0
6	485.90	26.1 QP	46.0	-19.9	1.00 V	146	30.1	-4.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
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 20dB below the permissible value to be report.

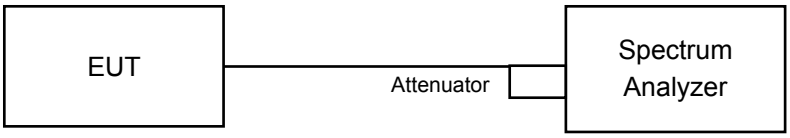


4.2 6dB Bandwidth Measurement

4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 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

4.2.5 Deviation fromTest Standard

No deviation.

4.2.6 EUT Operating Conditions

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

4.2.7 Test Result

802.11b

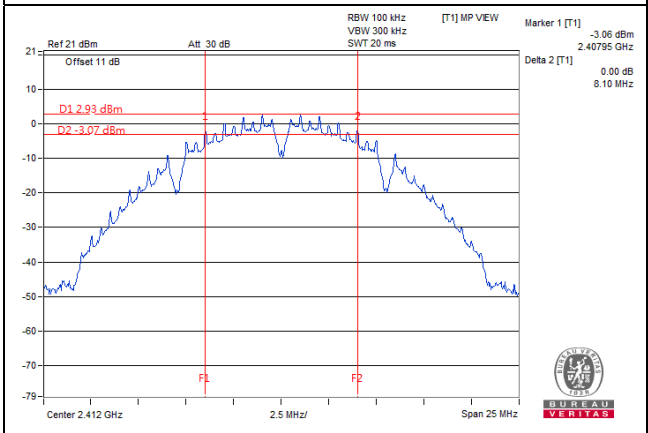
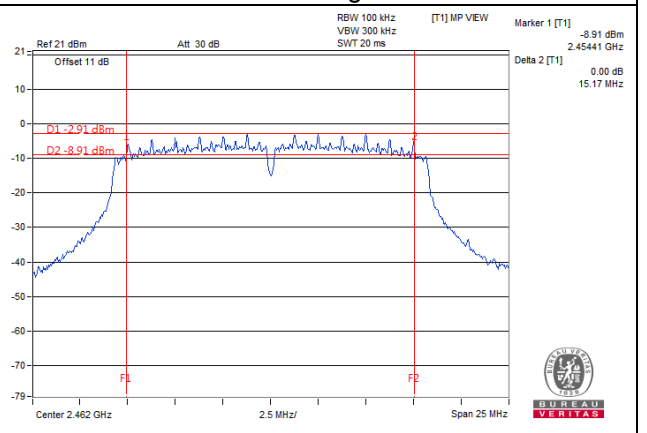
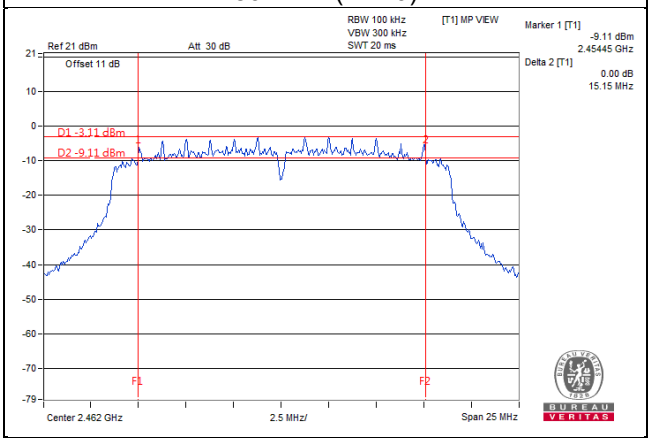
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.10	8.10	0.5	Pass
6	2437	8.12	8.12	0.5	Pass
11	2462	8.12	8.12	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.41	15.19	0.5	Pass
6	2437	15.56	15.18	0.5	Pass
11	2462	15.38	15.17	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.18	15.21	0.5	Pass
6	2437	15.21	15.18	0.5	Pass
11	2462	15.18	15.15	0.5	Pass

Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	
	

4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

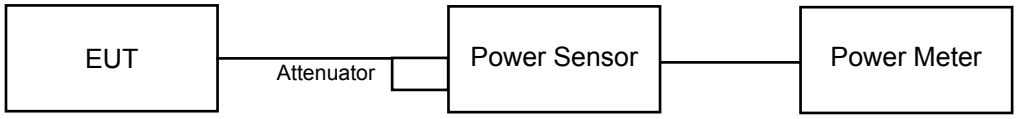
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

4.3.7 Test Results

802.11b

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	11.05	11.37	**26.444**	14.22	30	Pass
6	2437	11.07	11.18	25.916	14.14	30	Pass
11	2462	11.05	11.12	25.677	14.10	30	Pass

802.11g

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	8.33	8.43	13.774	11.39	30	Pass
6	2437	8.26	8.36	13.554	11.32	30	Pass
11	2462	8.08	8.22	13.064	11.16	30	Pass

802.11n (HT20)

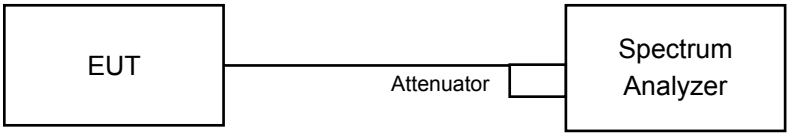
Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	8.20	8.21	13.229	11.22	30	Pass
6	2437	8.07	8.24	13.080	11.17	30	Pass
11	2462	8.11	8.08	12.898	11.11	30	Pass

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

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

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 Procedure

For duty cycle ≥ 98%

a. Set instrument center frequency to DTS channel center frequency.

b. Set span to at least 1.5 times the OBW.

c. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

d. Set VBW ≥3 x RBW.

e. Detector = power averaging (RMS) or sample detector (when RMS not available).

f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.

g. Sweep time = auto couple.

h. Employ trace averaging (RMS) mode over a minimum of 100 traces.

i. Use the peak marker function to determine the maximum amplitude level.

For duty cycle < 98%

a. Measure the duty cycle (x).

b. Set instrument center frequency to DTS channel center frequency.

c. Set span to at least 1.5 times the OBW.

d. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

e. Set VBW ≥3 x RBW.

f. Detector = power averaging (RMS) or sample detector (when RMS not available).

g. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.

h. Sweep time = auto couple.

i. Do not use sweep triggering. Allow sweep to “free run”.

j. Employ trace averaging (RMS) mode over a minimum of 100 traces.

k. Use the peak marker function to determine the maximum amplitude level.

l. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.2.6

4.4.7 Test Results

802.11b

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-22.24	3.01	-19.23	8.00	Pass
	6	2437	-22.10	3.01	-19.09	8.00	Pass
	11	2462	-21.50	3.01	-18.49	8.00	Pass
1	1	2412	-21.38	3.01	-18.37	8.00	Pass
	6	2437	-21.17	3.01	-18.16	8.00	Pass
	11	2462	-22.03	3.01	-19.02	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 = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$] = 4.76dBi < 6dBi, so the limit no need to reduced.

802.11g

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-27.73	3.01	0.25	-24.47	8.00	Pass
	6	2437	-28.10	3.01	0.25	-24.84	8.00	Pass
	11	2462	-27.62	3.01	0.25	-24.36	8.00	Pass
1	1	2412	-27.67	3.01	0.25	-24.41	8.00	Pass
	6	2437	-28.08	3.01	0.25	-24.82	8.00	Pass
	11	2462	-27.64	3.01	0.25	-24.38	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 = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$] = 4.76dBi < 6dBi, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

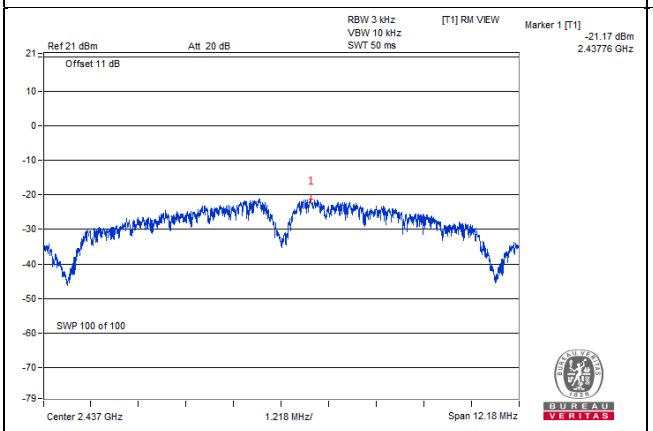
802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-28.23	3.01	0.31	-24.91	8.00	Pass
	6	2437	-28.09	3.01	0.31	-24.77	8.00	Pass
	11	2462	-28.48	3.01	0.31	-25.16	8.00	Pass
1	1	2412	-28.37	3.01	0.31	-25.05	8.00	Pass
	6	2437	-28.32	3.01	0.31	-25.00	8.00	Pass
	11	2462	-28.25	3.01	0.31	-24.93	8.00	Pass

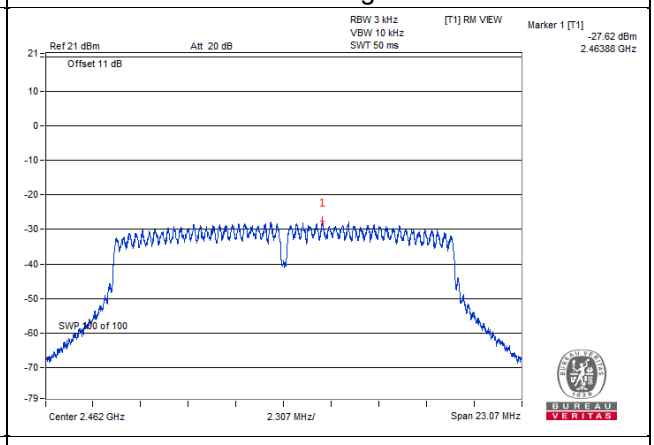
Note:
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$] = 4.76dBi < 6dBi, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

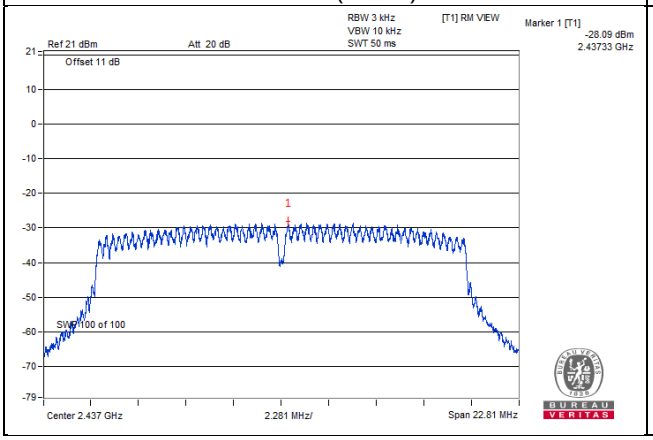
802.11b



802.11g



802.11n (HT20)

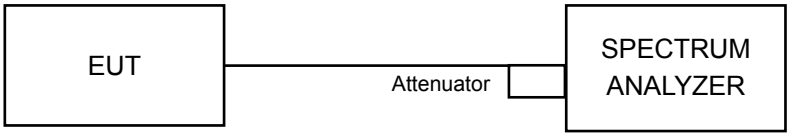


4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE REF

a. Set the RBW = 100 kHz.

b. Set the VBW ≥ 300 kHz.

c. Detector = peak.

d. Sweep time = auto couple.

e. Trace mode = max hold.

f. Allow trace to fully stabilize.

g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

a. Set RBW = 100 kHz.

b. Set VBW ≥ 300 kHz.

c. Ensure that the number of measurement points ≥ span/RBW

d. According to measurement points to set differ measurement span.

e. Detector = peak.

f. Trace Mode = max hold.

g. Sweep = auto couple.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

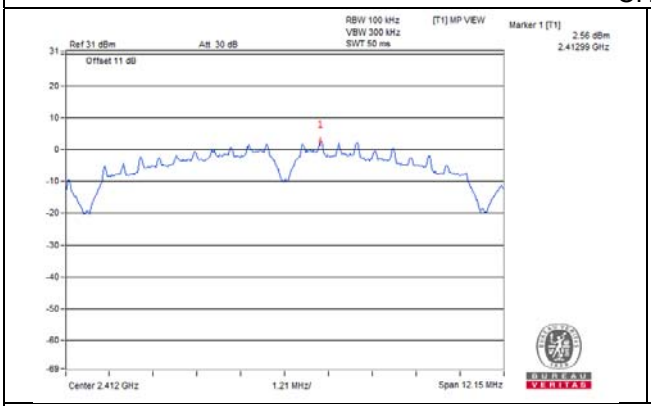
Same as Item 4.2.6

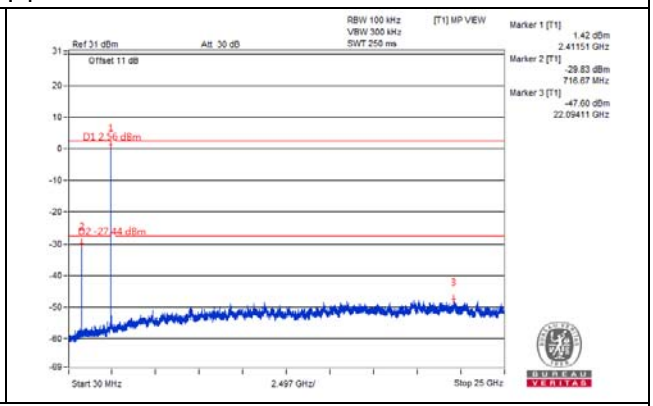
4.5.7 Test Results

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

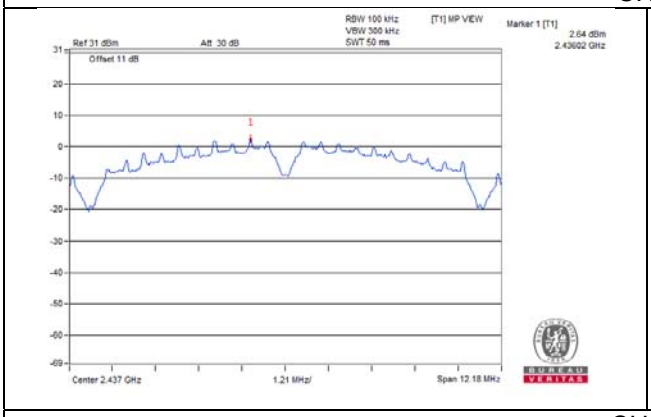
802.11b_Chain 0

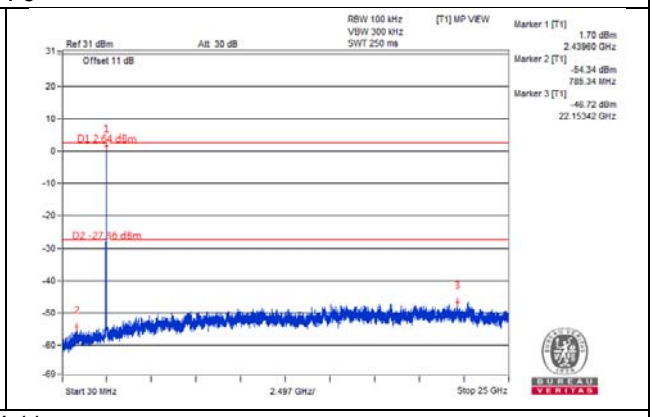
CH 1



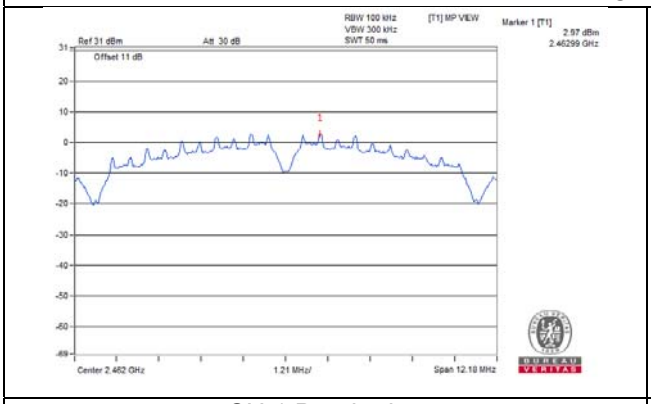


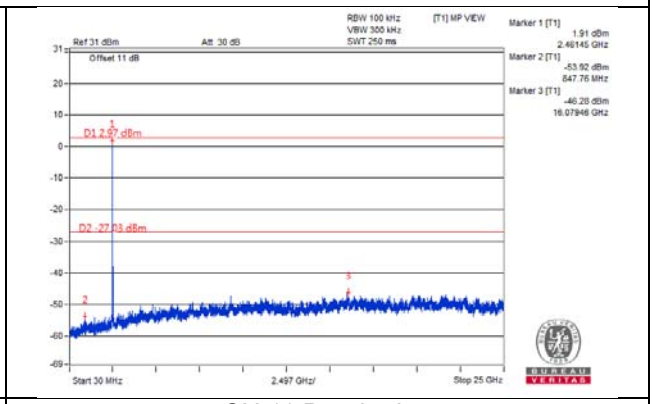
CH 6



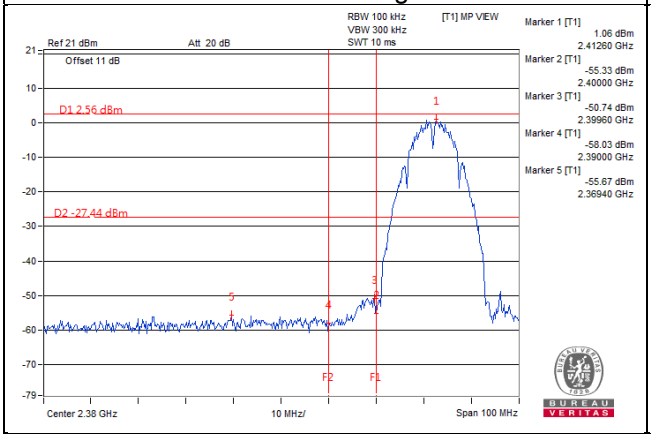


CH 11

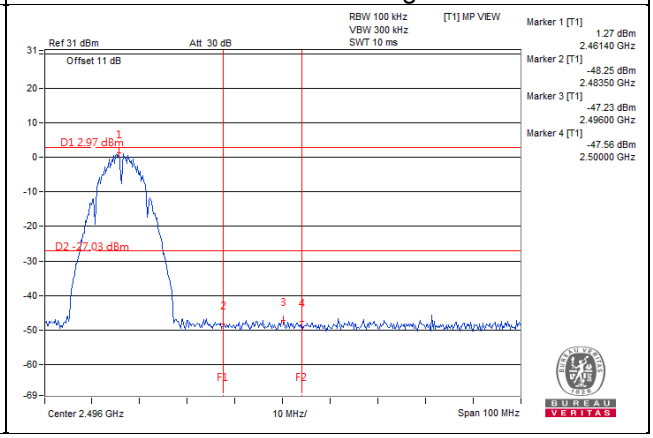




CH 1 Band edge

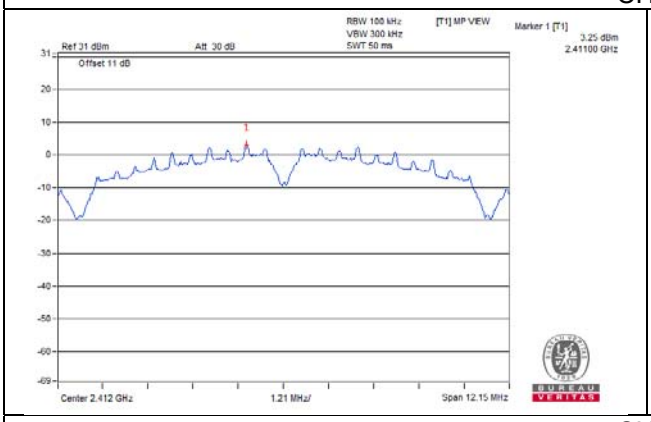


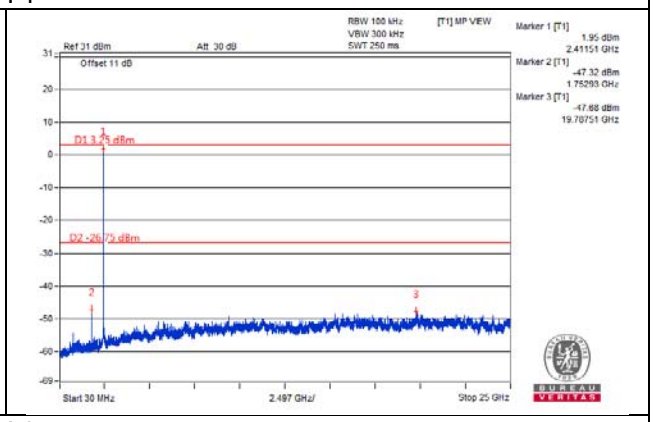
CH 11 Band edge



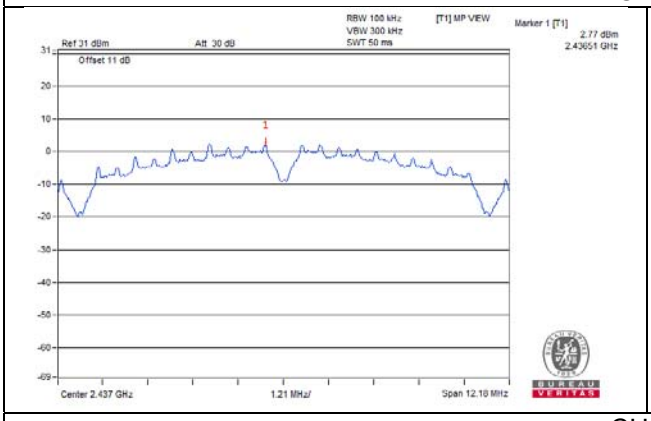
802.11b_Chain 1

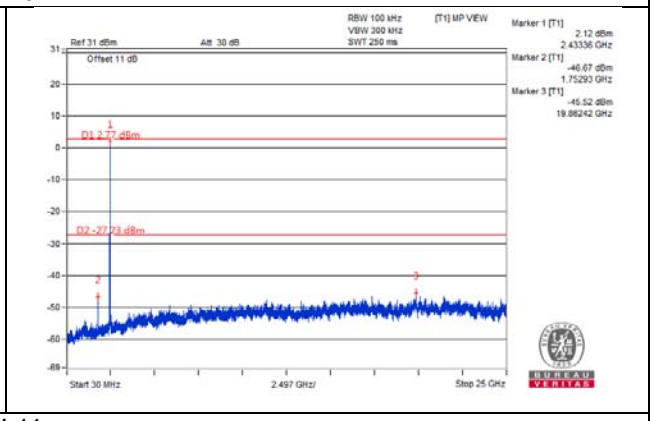
CH 1



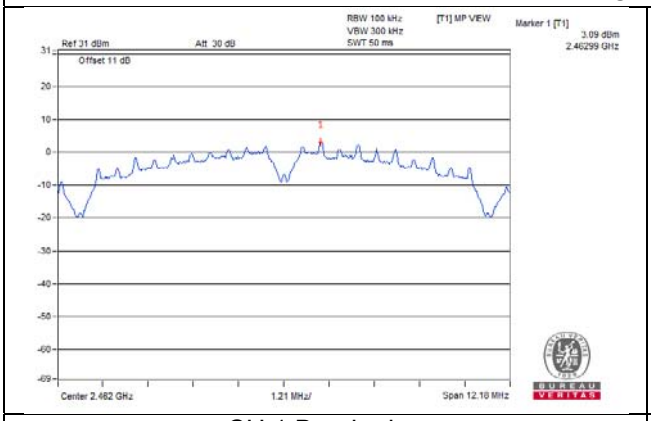


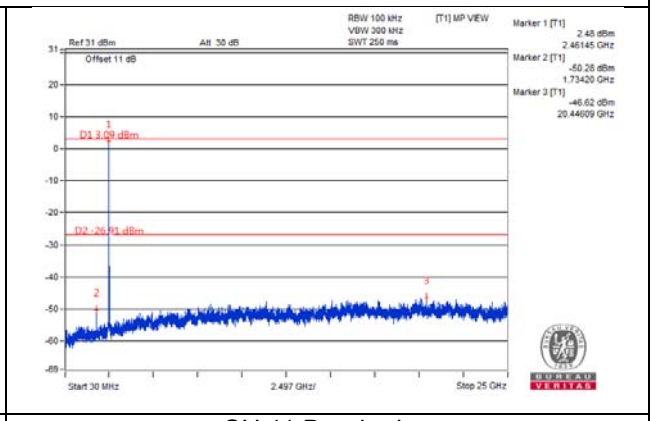
CH 6



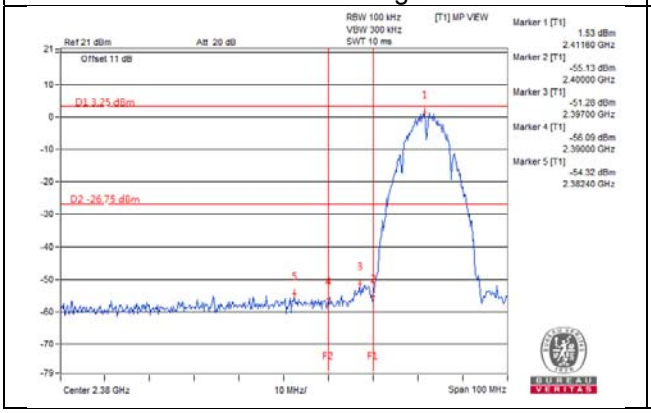


CH 11

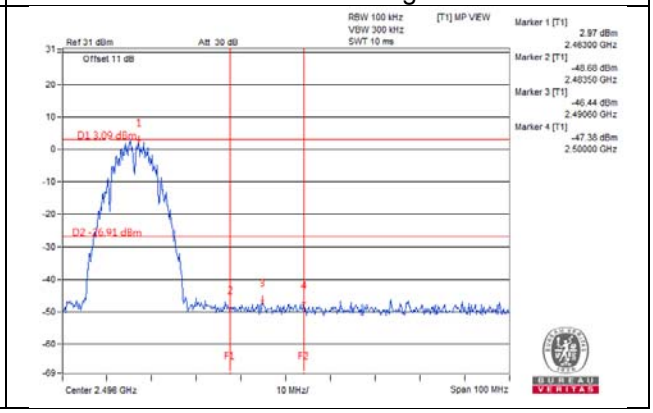




CH 1 Band edge

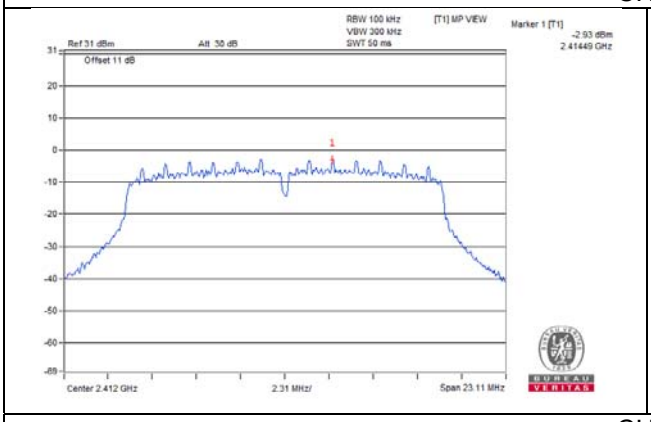


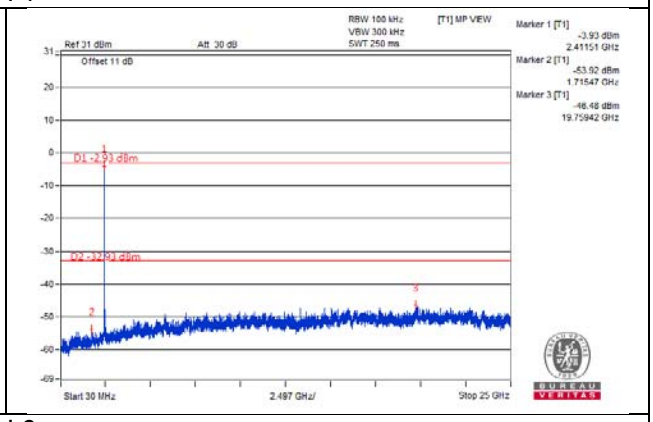
CH 11 Band edge



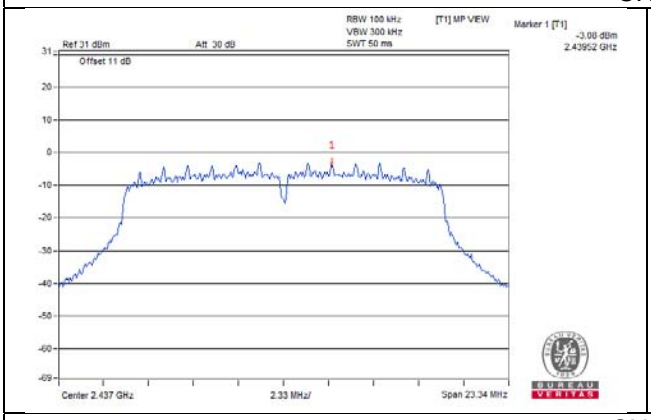
802.11g_Chain 0

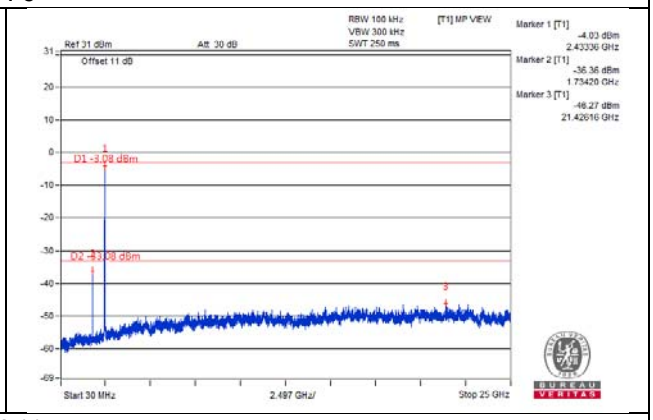
CH 1



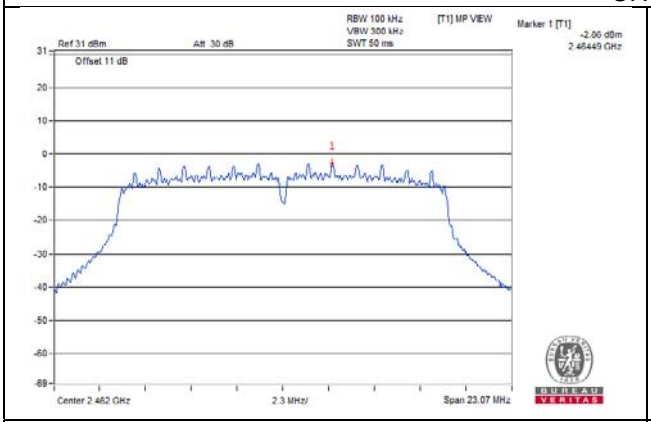


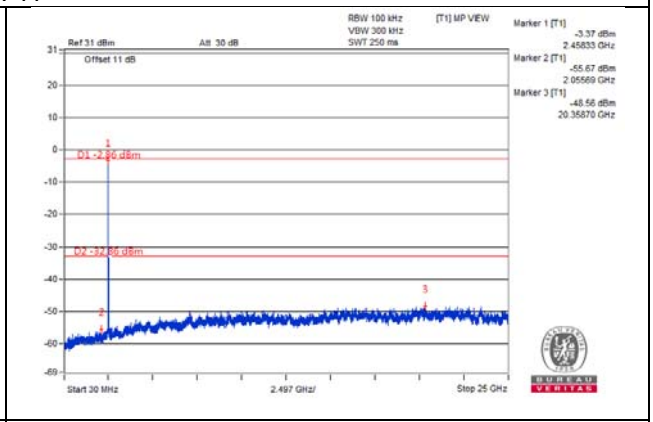
CH 6



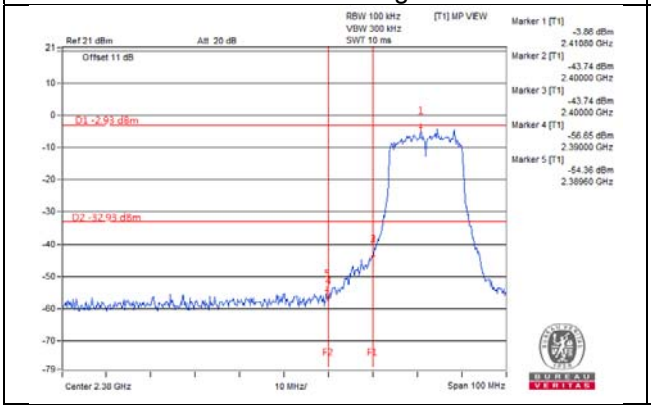


CH 11

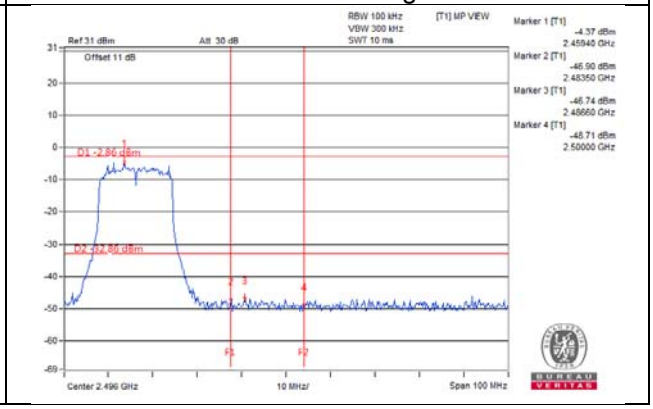




CH 1 Band edge

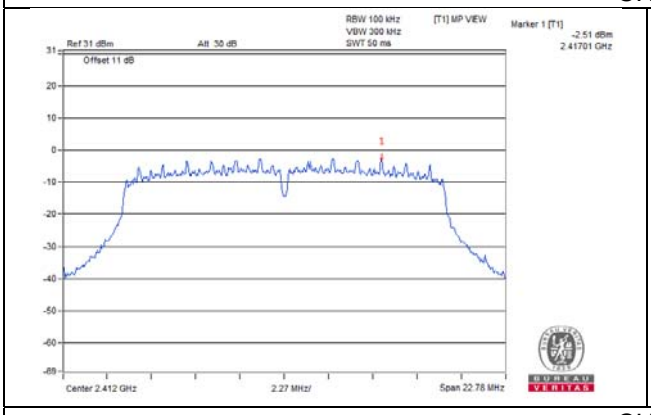


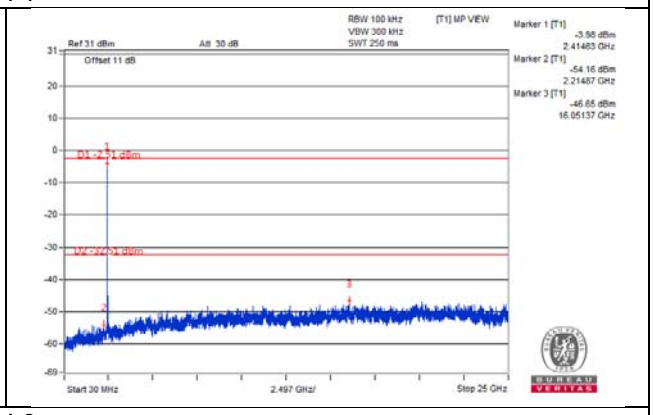
CH 11 Band edge



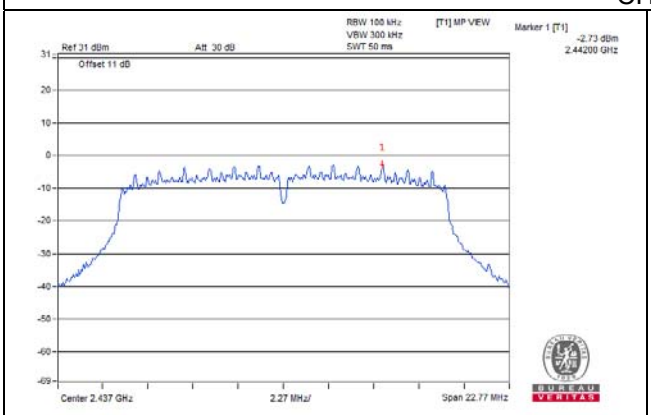
802.11g_Chain 1

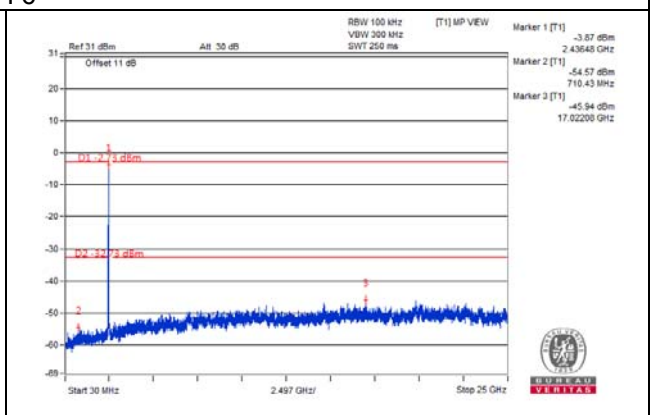
CH 1



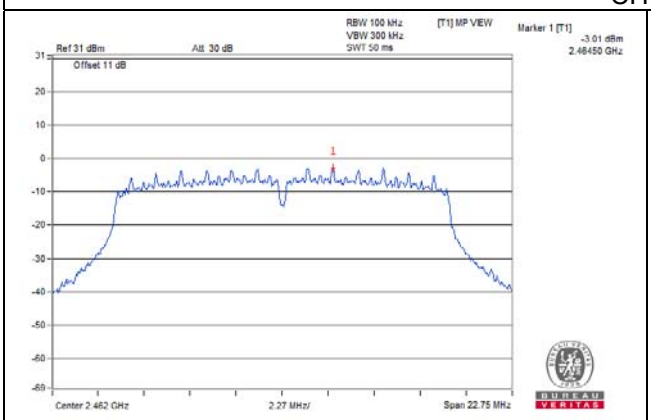


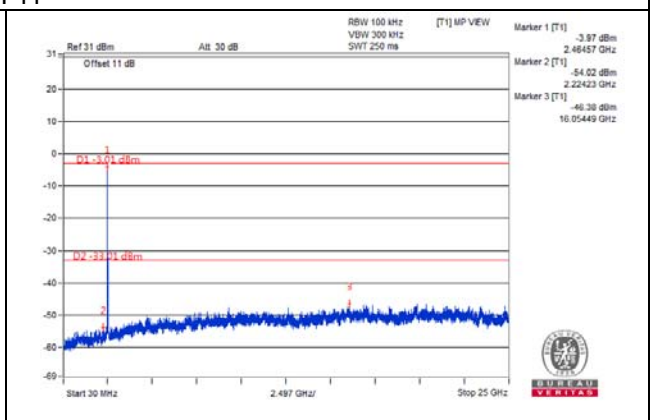
CH 6



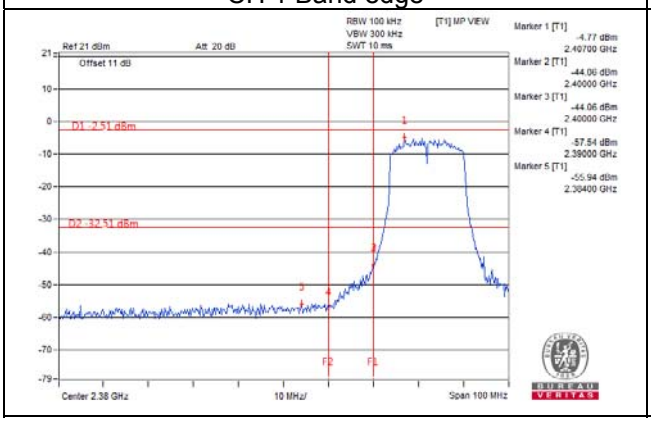


CH 11

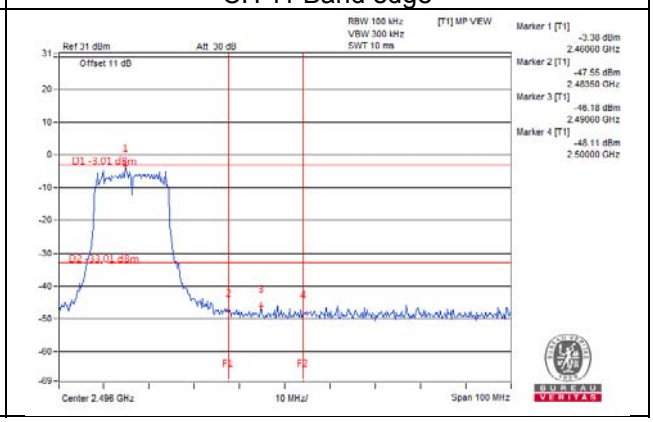




CH 1 Band edge

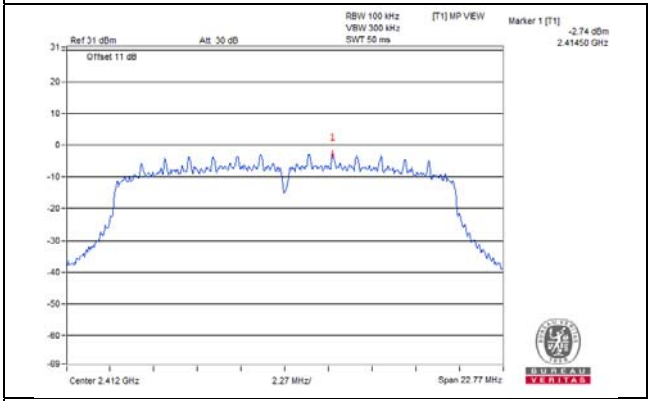


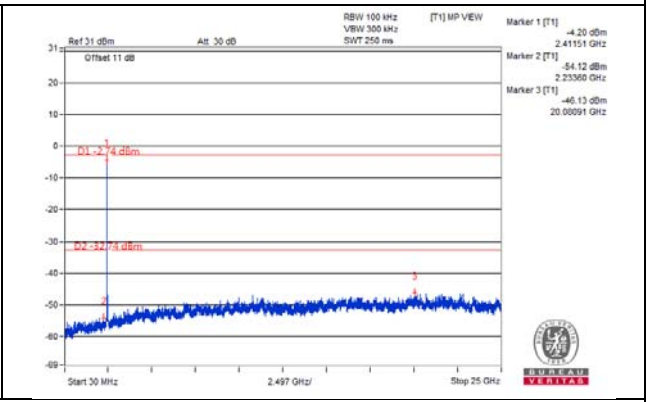
CH 11 Band edge



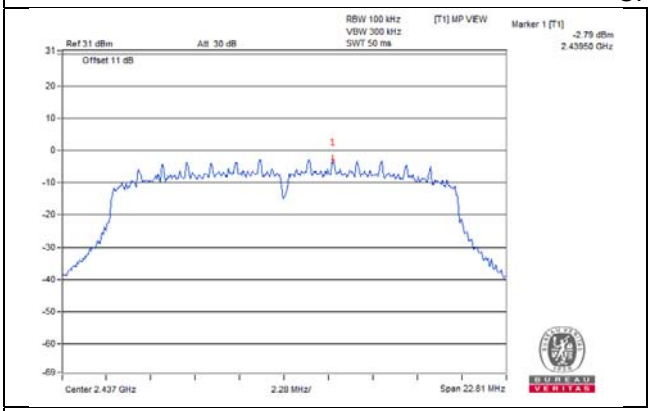
802.11n (HT20)_Chain 0

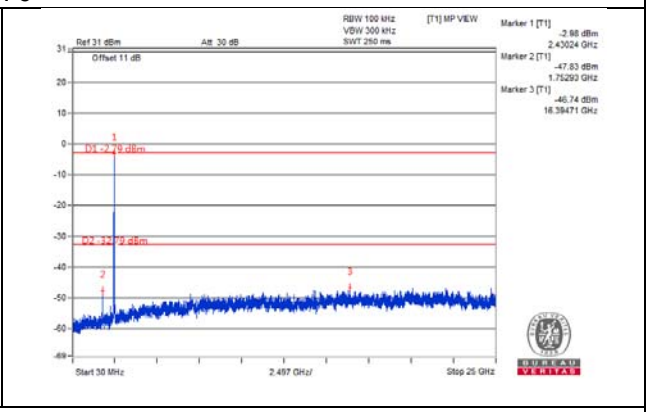
CH 1



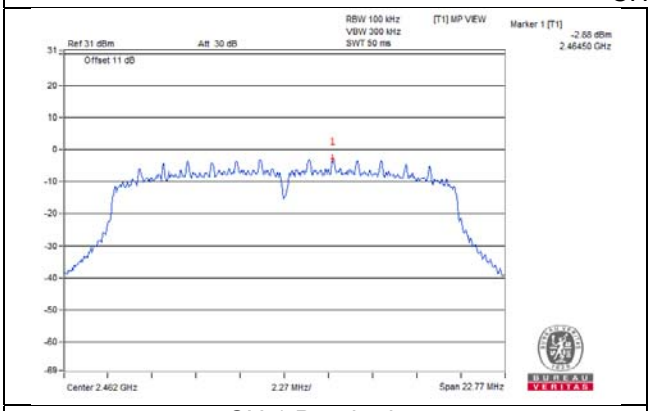


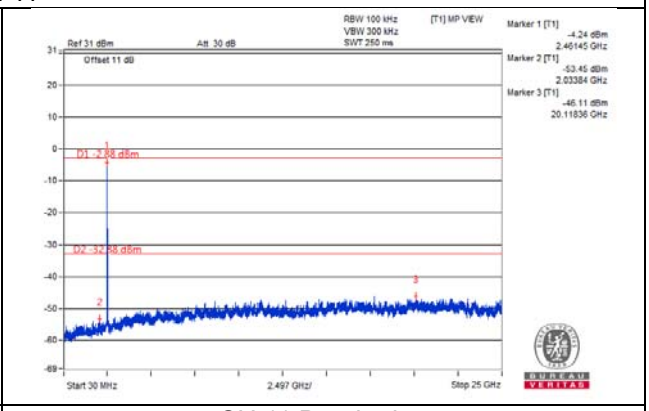
CH 6



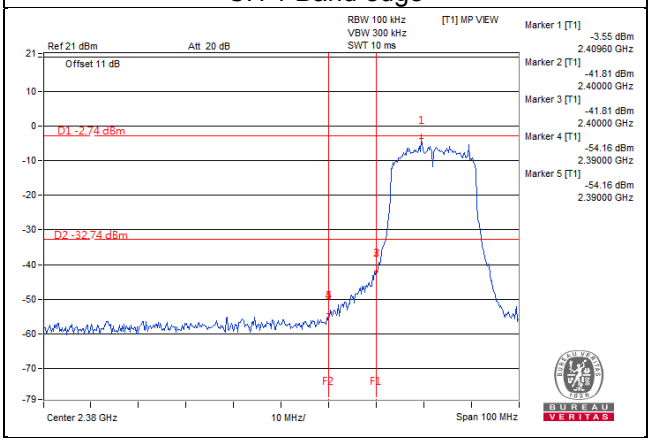


CH 11

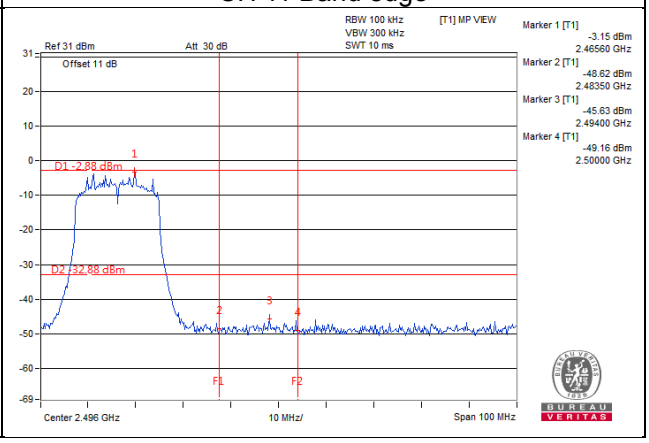




CH 1 Band edge

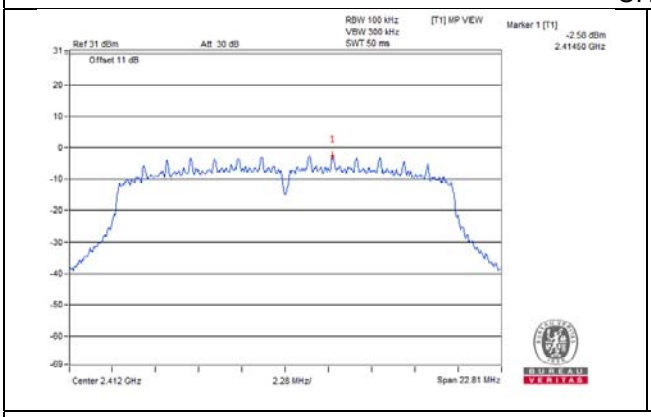


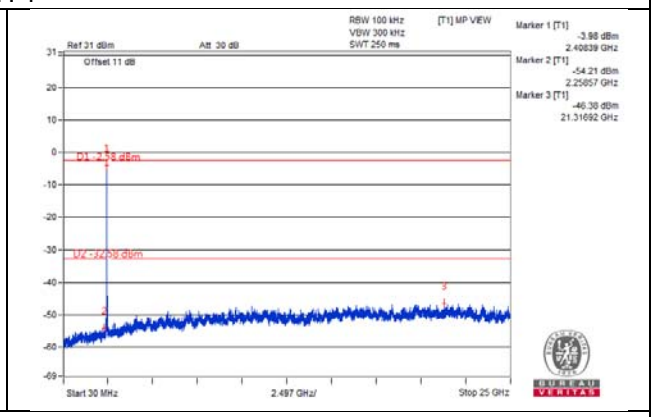
CH 11 Band edge



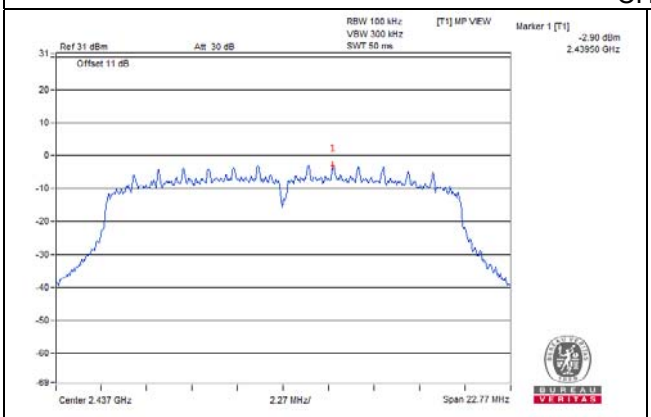
802.11n (HT20)_Chain 1

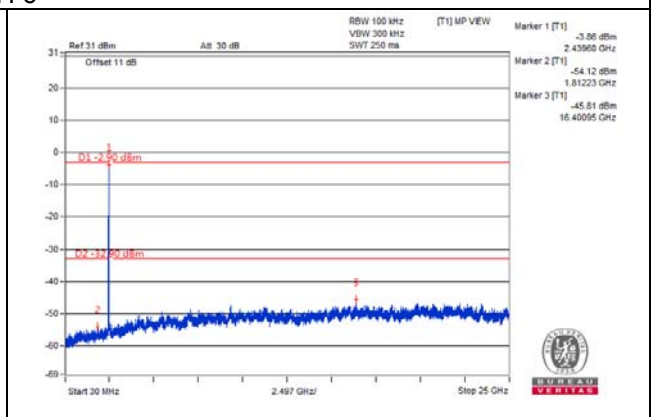
CH 1



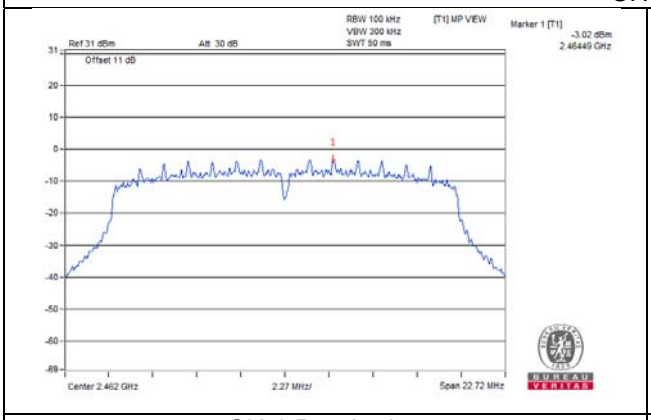


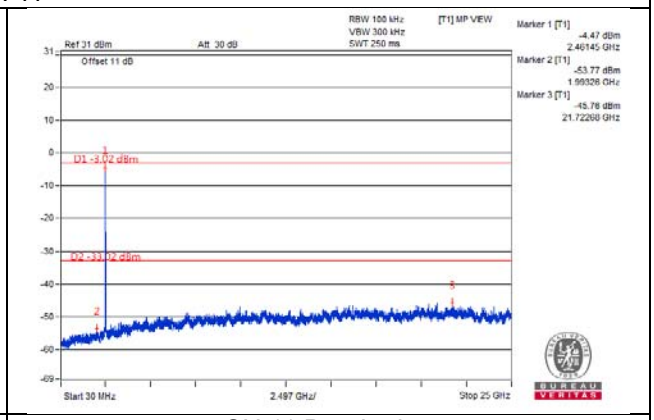
CH 6



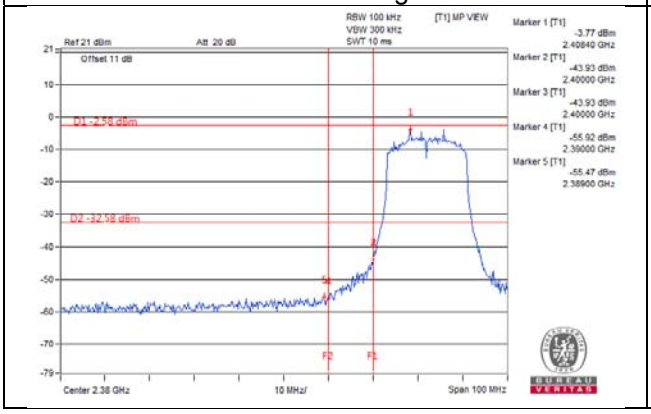


CH 11





CH 1 Band edge



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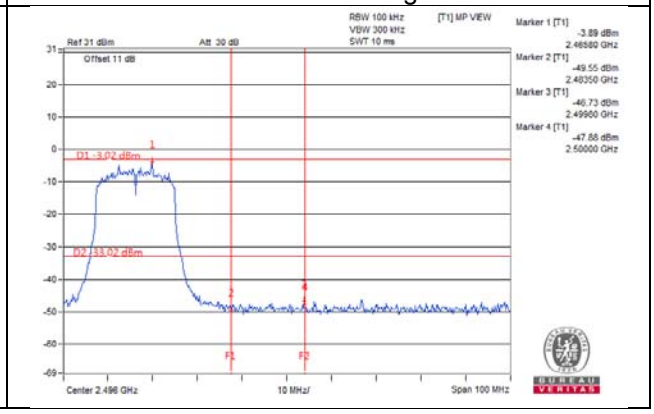

5 Pictures of Test Arrangements

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:

Linko 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.

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