FCC Test Report

Report No.: RF160719C17B

FCC ID: A8J-EWS550AP

Model: EWS550AP

Received Date: Jul. 19, 2016

Test Date: Jul. 20 ~ Aug. 17, 2016

Issued Date: Dec. 20, 2016

Applicant: EnGenius Technologies

Address: 1580 Scenic Avenue, Costa Mesa, CA92626

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

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Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RF160719C17B	Original release	Dec. 20, 2016

1 Certificate of Conformity

Product: Wireless AC1300 Managed Wall Plate Access Point

Brand: EnGenius

Model: EWS550AP

Sample Status: Engineering sample

Applicant: EnGenius Technologies

Test Date: Jul. 20 ~ Aug. 17, 2016

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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Dec. 20, 2016
Pettie Chen / Senior Specialist

Approved by : _____ , **Date:** Dec. 20, 2016
Ken Liu / Senior Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -9.62dB at 0.40391MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.2dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is IPEX not a standard connector.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless AC1300 Managed Wall Plate Access Point
Brand	EnGenius
Model	EWS550AP
Sample Status	Engineering sample
Power Supply Rating	48Vdc or 54Vdc or 55Vdc (POE)
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 300Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	CDD Mode: 220.653mW Beamforming Mode: 140.652mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	NA
Data Cable Supplied	NA

Note:

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

Modulation Mode	TX Function	Beamforming
802.11b	2TX	Not Support
802.11g	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support

* For 2.4GHz band, CDD mode is the worst case for final radiated emission below 1GHz and power line conducted emission tests after pretesting CDD mode and beamforming mode.

2. The EUT with follow antennas gain is listed as table below.

Ant. No.	1	2	3	4	BT / Zigbee
Ant. Type	PIFA				
Frequency (MHz)	2400-2500		5150-5850		2400-2500
Gain (dBi)	3.67	4.31	5.72	5.99	3.51
Connector	IPEX				

3. The EUT consumes power from the following POE. (Support unit only)

POE	
Brand	SENAO
Model	EPA5006GP
Input Power	100-240Vac, 0.8A, 50-60Hz
Output Power	54Vdc, 0.6A
Power Line	0.5m non-shielded power cable without core

4. 2.4GHz, 5GHz, BT LE or Zigbee technology can transmit at same time.
5. Power Setting as below.

CDD Mode					
	802.11b	802.11g	802.11n (HT20)		802.11n (HT40)
CH 1	21	17	16.5	CH 3	14
CH 6	21	21	21	CH 6	17
CH 11	21	17.5	17	CH 9	16

Beamforming Mode			
	802.11n (HT20)		802.11n (HT40)
CH 1	15	CH 3	13
CH 6	19	CH 6	14
CH 11	15	CH 9	13

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		

7 channels are provided for 802.11n (HT40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

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

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-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 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (POE)	TESTED BY
RE≥1G	19deg. C, 70%RH	54Vdc	Jones Chang
RE<1G	19deg. C, 70%RH	54Vdc	Jones Chang
PLC	20deg. C, 70%RH	54Vdc	Jones Chang
APCM	25deg. C, 60%RH	54Vdc	Antony Lee

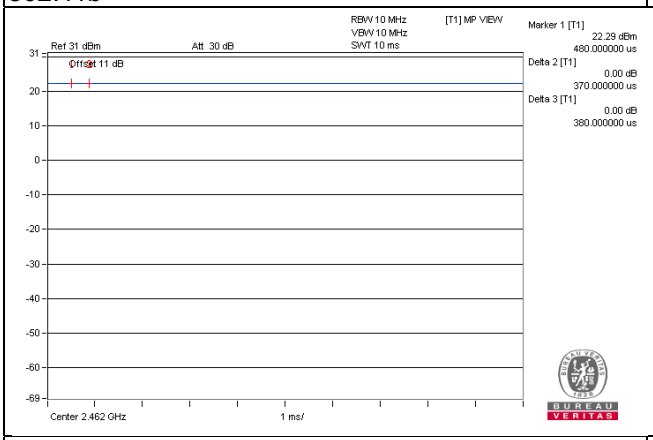
3.3 Duty Cycle of Test Signal

CDD Mode

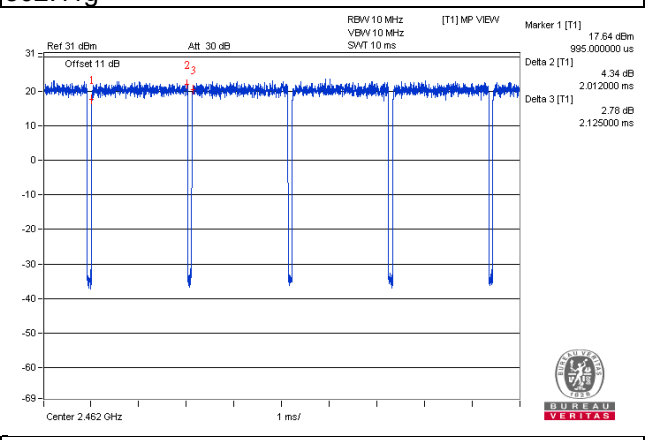
Duty cycle of test signal is 100 %, duty factor is not required.
Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle of test signal is 100 %, duty factor is not required.
802.11g: Duty cycle = 2.012/2.125 = 0.947, Duty factor = 10 * log(1/ 0.947) = 0.24
802.11n (HT20): Duty cycle = 4.954/5.062 = 0.979, Duty factor = 10 * log(1/ 0.947) = 0.09
802.11n (HT40): Duty cycle = 2.405/2.505 = 0.960, Duty factor = 10 * log(1/ 0.960) = 0.18

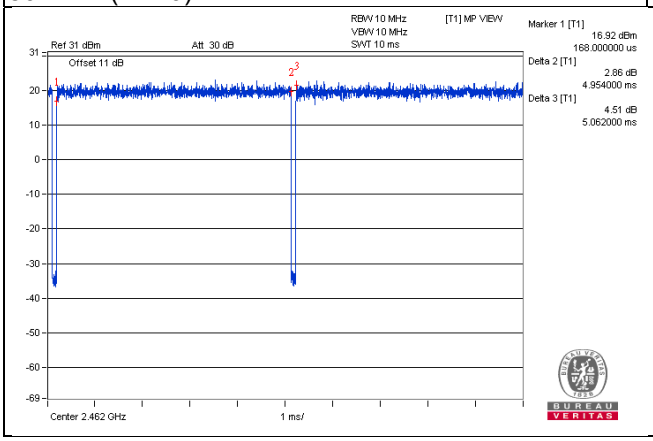
802.11b



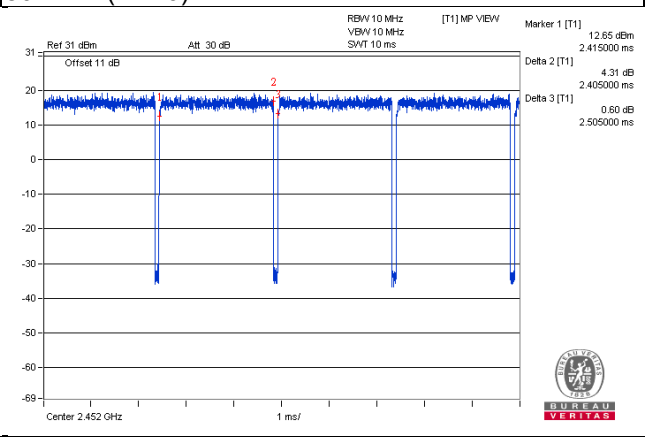
802.11g



802.11n (HT20)



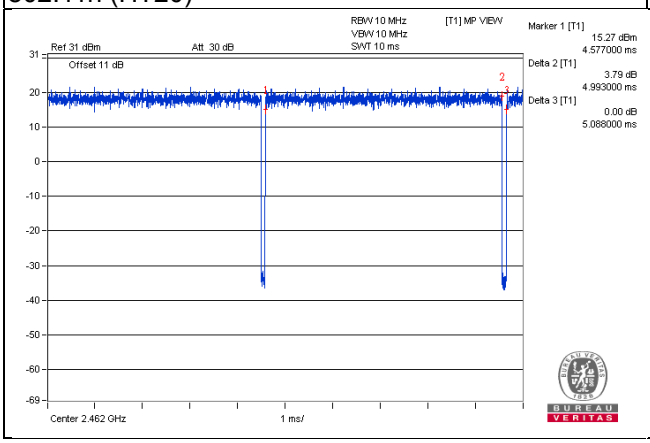
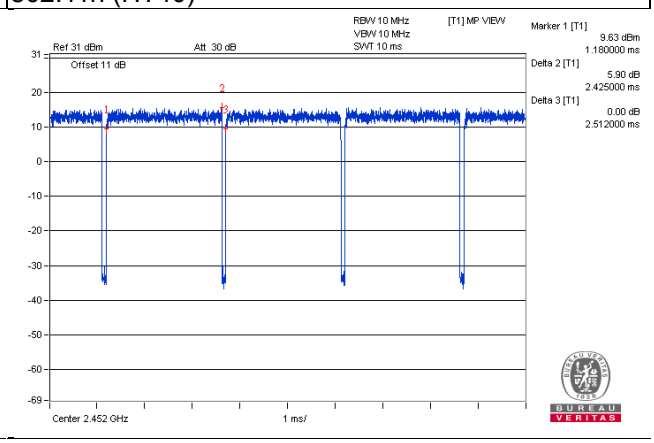
802.11n (HT40)



Beamforming Mode

802.11n (HT20): Duty cycle of test signal is > 98%, duty factor is not required.
802.11n (HT40): Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11n (HT20): Duty cycle = 4.993/5.088 = 0.981
802.11n (HT40): Duty cycle = 2.425/2.512 = 0.965, Duty factor = 10 * log(1/0.965) = 0.15

802.11n (HT20)	802.11n (HT40)
	

3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

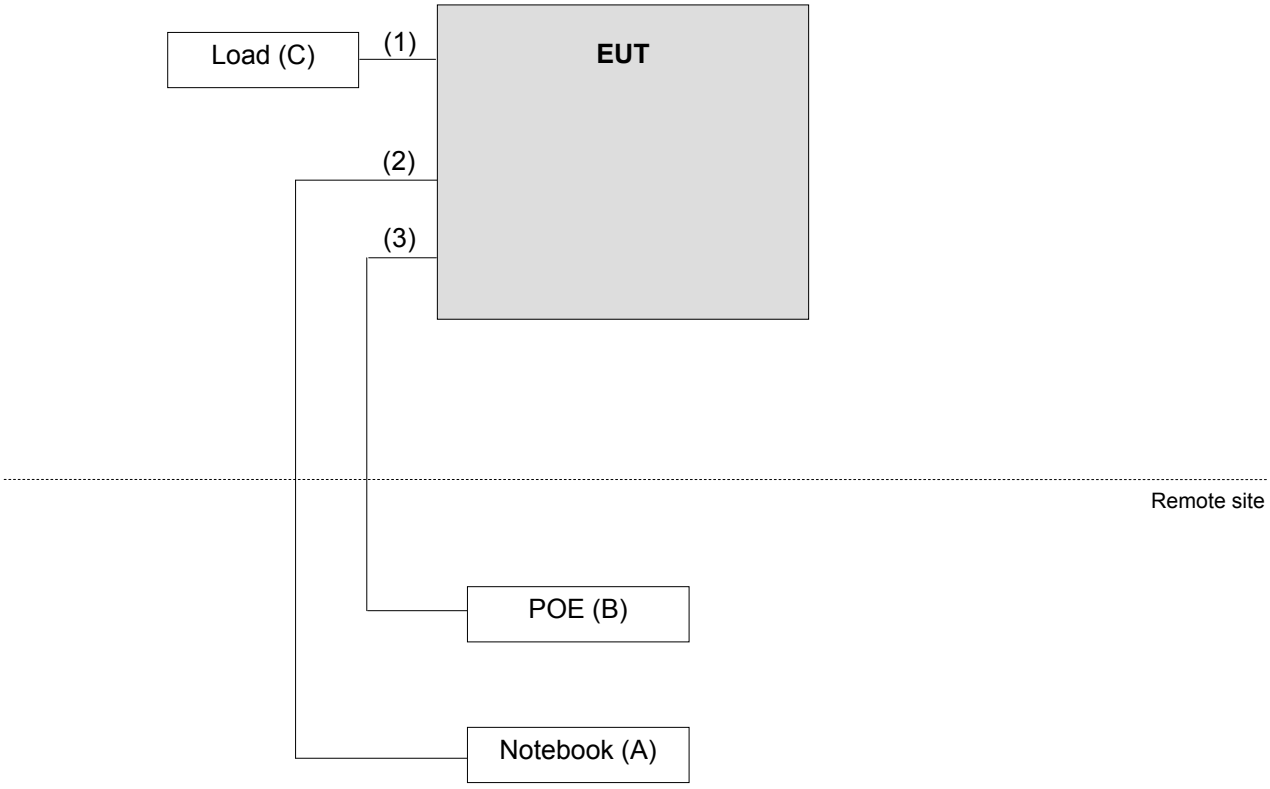
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	POE	SENAO	EPA5006GP	N/A	N/A	Provided by manufacturer
C.	Load	N/A	N/A	N/A	N/A	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 Cable	4	1.8	N	0	Cat5e
2.	RJ45 Cable	1	3	N	0	Cat5e
3.	RJ45 Cable	1	3	N	0	Cat5e

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 DTS Meas Guidance v03r05

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

Note: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Apr. 18, 2016	Apr. 17, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	May 03, 2016	May 02, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	9120D	209	Jan. 20, 2016	Jan. 19, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8447D	2944A10738	Oct.18, 2015	Oct. 17, 2016
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2015	Aug. 21, 2016
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2016	Jul. 08, 2017
Power Sensor	MA2411B	0738171	Jul. 09, 2016	Jul. 08, 2017

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC 7450F-3.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

c. Both X and Y axes 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:

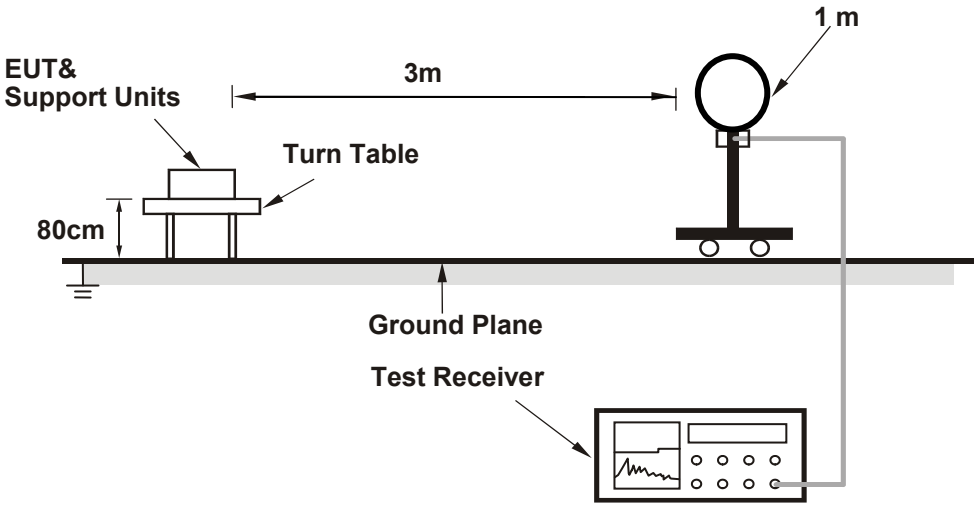
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

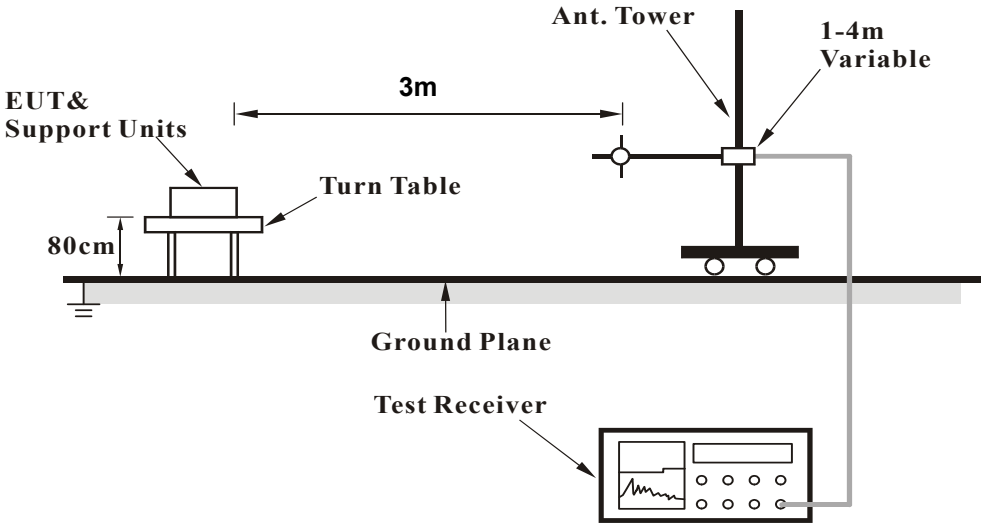
No deviation.

4.1.5 Test Set Up

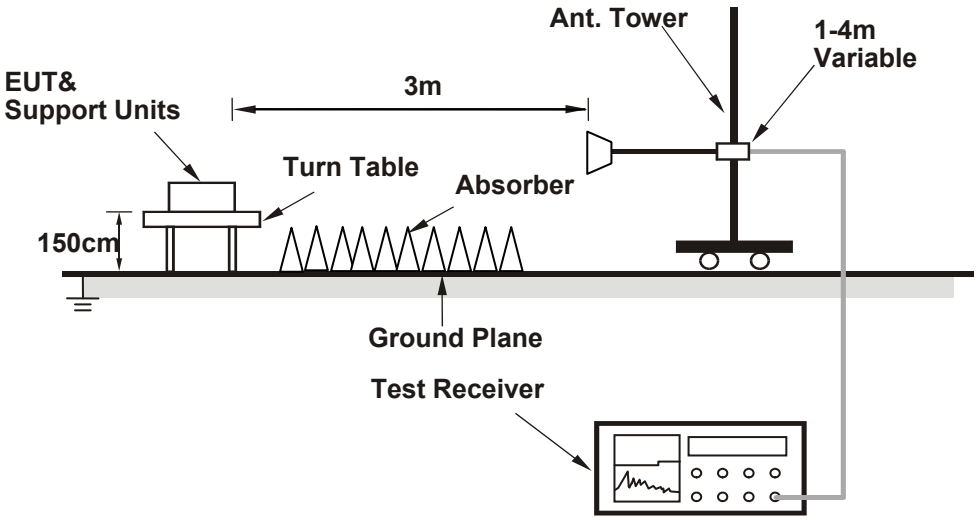
For Radiated emission below 30MHz



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

4.1.7 Test Results

Above 1GHz worst-Case data:

CDD Mode

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	60.2 PK	74.0	-13.8	1.51 H	127	27.40	32.80
2	2390.00	49.6 AV	54.0	-4.4	1.51 H	127	16.80	32.80
3	*2412.00	112.2 PK			1.85 H	28	79.30	32.90
4	*2412.00	108.5 AV			1.85 H	28	75.60	32.90
5	4824.00	49.0 PK	74.0	-25.0	1.20 H	100	43.10	5.90
6	4824.00	39.0 AV	54.0	-15.0	1.20 H	100	33.10	5.90
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	61.8 PK	74.0	-12.2	1.97 V	12	29.00	32.80
2	2390.00	51.8 AV	54.0	-2.2	1.97 V	12	19.00	32.80
3	*2412.00	115.3 PK			1.93 V	327	82.40	32.90
4	*2412.00	111.5 AV			1.93 V	327	78.60	32.90
5	4824.00	40.5 PK	74.0	-33.5	1.97 V	296	34.60	5.90
6	4824.00	30.1 AV	54.0	-23.9	1.97 V	296	24.20	5.90

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	112.2 PK			1.69 H	292	79.30	32.90
2	*2437.00	108.2 AV			1.69 H	292	75.30	32.90
3	4874.00	49.8 PK	74.0	-24.2	1.69 H	300	43.80	6.00
4	4874.00	39.9 AV	54.0	-14.1	1.69 H	300	33.90	6.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	114.5 PK			2.45 V	27	81.60	32.90
2	*2437.00	110.8 AV			2.45 V	27	77.90	32.90
3	4874.00	50.5 PK	74.0	-23.5	1.82 V	145	44.50	6.00
4	4874.00	38.3 AV	54.0	-15.7	1.82 V	145	32.30	6.00

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	111.1 PK			2.47 H	297	78.20	32.90
2	*2462.00	107.3 AV			2.47 H	297	74.40	32.90
3	2483.50	60.3 PK	74.0	-13.7	2.17 H	347	27.30	33.00
4	2483.50	48.1 AV	54.0	-5.9	2.17 H	347	15.10	33.00
5	4924.00	47.9 PK	74.0	-26.1	1.60 H	303	41.90	6.00
6	4924.00	38.7 AV	54.0	-15.3	1.60 H	303	32.70	6.00
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	113.5 PK			1.80 V	0	80.60	32.90
2	*2462.00	111.4 AV			1.80 V	0	78.50	32.90
3	2483.50	59.8 PK	74.0	-14.2	2.00 V	329	26.80	33.00
4	2483.50	51.2 AV	54.0	-2.8	2.00 V	329	18.20	33.00
5	4924.00	49.1 PK	74.0	-24.9	1.75 V	299	43.10	6.00
6	4924.00	38.6 AV	54.0	-15.4	1.75 V	299	32.60	6.00

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.

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.6 PK	74.0	-7.4	2.06 H	284	33.8	32.8
2	2390.00	50.8 AV	54.0	-3.2	2.06 H	284	18.0	32.8
3	*2412.00	109.4 PK			2.47 H	303	76.5	32.9
4	*2412.00	99.4 AV			2.47 H	303	66.5	32.9
5	4824.00	46.4 PK	74.0	-27.6	1.50 H	111	40.5	5.9
6	4824.00	35.1 AV	54.0	-18.9	1.50 H	111	29.2	5.9
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	68.1 PK	74.0	-5.9	1.53 V	346	35.30	32.80
2	2390.00	52.6 AV	54.0	-1.4	1.53 V	346	19.80	32.80
3	*2412.00	111.1 PK			1.83 V	10	78.20	32.90
4	*2412.00	100.1 AV			1.83 V	10	67.20	32.90
5	4824.00	47.8 PK	74.0	-26.2	1.77 V	300	41.90	5.90
6	4824.00	36.6 AV	54.0	-17.4	1.77 V	300	30.70	5.90

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	112.6 PK			1.45 H	46	79.70	32.90
2	*2437.00	102.5 AV			1.45 H	46	69.60	32.90
3	4874.00	48.5 PK	74.0	-25.5	1.60 H	123	42.50	6.00
4	4874.00	36.3 AV	54.0	-17.7	1.60 H	123	30.30	6.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	114.6 PK			2.57 V	9	81.70	32.90
2	*2437.00	105.2 AV			2.57 V	9	72.30	32.90
3	4874.00	47.5 PK	74.0	-26.5	1.99 V	273	41.50	6.00
4	4874.00	35.4 AV	54.0	-18.6	1.99 V	273	29.40	6.00

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	108.4 PK			2.28 H	305	75.50	32.90
2	*2462.00	98.4 AV			2.28 H	305	65.50	32.90
3	2483.50	65.7 PK	74.0	-8.3	1.43 H	307	32.70	33.00
4	2483.50	52.2 AV	54.0	-1.8	1.43 H	307	19.20	33.00
5	4924.00	46.7 PK	74.0	-27.3	1.98 H	279	40.80	5.90
6	4924.00	36.0 AV	54.0	-18.0	1.98 H	279	30.10	5.90
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	112.3 PK			2.20 V	336	79.40	32.90
2	*2462.00	101.9 AV			2.20 V	336	69.00	32.90
3	2483.50	68.0 PK	74.0	-6.0	1.84 V	340	35.00	33.00
4	**2483.50**	**52.8 AV**	**54.0**	**-1.2**	**1.84 V**	**340**	**19.80**	**33.00**
5	4924.00	49.5 PK	74.0	-24.5	1.90 V	292	43.50	6.00
6	4924.00	37.4 AV	54.0	-16.6	1.90 V	292	31.40	6.00

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	61.8 PK	74.0	-12.2	1.92 H	308	29.00	32.80
2	2390.00	47.5 AV	54.0	-6.5	1.92 H	308	14.70	32.80
3	*2412.00	109.2 PK			2.74 H	287	76.30	32.90
4	*2412.00	98.7 AV			2.74 H	287	65.80	32.90
5	4824.00	46.0 PK	74.0	-28.0	1.40 H	250	40.10	5.90
6	4824.00	35.1 AV	54.0	-18.9	1.40 H	250	29.20	5.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.3 PK	74.0	-4.7	2.45 V	18	36.50	32.80
2	2390.00	52.4 AV	54.0	-1.6	2.45 V	18	19.60	32.80
3	*2412.00	111.9 PK			1.84 V	11	79.00	32.90
4	*2412.00	101.8 AV			1.84 V	11	68.90	32.90
5	4824.00	47.6 PK	74.0	-26.4	1.53 V	212	41.70	5.90
6	4824.00	35.5 AV	54.0	-18.5	1.53 V	212	29.60	5.90

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	112.5 PK			2.36 H	292	79.60	32.90
2	*2437.00	101.9 AV			2.36 H	292	69.00	32.90
3	4874.00	49.3 PK	74.0	-24.7	2.22 H	322	43.30	6.00
4	4874.00	37.5 AV	54.0	-16.5	2.22 H	322	31.50	6.00
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	115.2 PK			2.44 V	340	82.30	32.90
2	*2437.00	105.2 AV			2.44 V	340	72.30	32.90
3	4874.00	48.9 PK	74.0	-25.1	2.50 V	300	42.90	6.00
4	4874.00	36.5 AV	54.0	-17.5	2.50 V	300	30.50	6.00

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	108.4 PK			2.37 H	318	75.50	32.90
2	*2462.00	98.0 AV			2.37 H	318	65.10	32.90
3	2483.50	61.9 PK	74.0	-12.1	2.15 H	299	28.90	33.00
4	2483.50	48.1 AV	54.0	-5.9	2.15 H	299	15.10	33.00
5	4924.00	46.6 PK	74.0	-27.4	1.78 H	23	40.60	6.00
6	4924.00	34.8 AV	54.0	-19.2	1.78 H	23	28.80	6.00
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	112.9 PK			2.75 V	332	80.00	32.90
2	*2462.00	102.0 AV			2.75 V	332	69.10	32.90
3	2483.50	69.0 PK	74.0	-5.0	1.83 V	22	36.00	33.00
4	2483.50	52.3 AV	54.0	-1.7	1.83 V	22	19.30	33.00
5	4924.00	48.4 PK	74.0	-25.6	1.69 V	23	42.40	6.00
6	4924.00	36.1 AV	54.0	-17.9	1.69 V	23	30.10	6.00

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 (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.5 PK	74.0	-15.5	2.17 H	288	25.70	32.80
2	2390.00	47.4 AV	54.0	-6.6	2.17 H	288	14.60	32.80
3	*2422.00	101.8 PK			2.17 H	301	68.90	32.90
4	*2422.00	92.5 AV			2.17 H	301	59.60	32.90
5	4844.00	46.2 PK	74.0	-27.8	1.63 H	84	40.40	5.80
6	4844.00	34.4 AV	54.0	-19.6	1.63 H	84	28.60	5.80
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	65.6 PK	74.0	-8.4	1.95 V	13	32.80	32.80
2	2390.00	52.5 AV	54.0	-1.5	1.95 V	13	19.70	32.80
3	*2422.00	104.0 PK			2.10 V	334	71.10	32.90
4	*2422.00	94.6 AV			2.10 V	334	61.70	32.90
5	4844.00	47.9 PK	74.0	-26.1	2.02 V	292	42.10	5.80
6	4844.00	36.5 AV	54.0	-17.5	2.02 V	292	30.70	5.80

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	2390.00	62.6 PK	74.0	-11.4	2.22 H	290	29.80	32.80
2	2390.00	49.3 AV	54.0	-4.7	2.22 H	290	16.50	32.80
3	*2437.00	104.2 PK			2.42 H	278	71.30	32.90
4	*2437.00	95.4 AV			2.42 H	278	62.50	32.90
5	2483.50	61.5 PK	74.0	-12.5	1.39 H	347	28.50	33.00
6	2483.50	47.9 AV	54.0	-6.1	1.39 H	347	14.90	33.00
7	4874.00	47.8 PK	74.0	-26.2	1.50 H	247	41.80	6.00
8	4874.00	35.9 AV	54.0	-18.1	1.50 H	247	29.90	6.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.1 PK	74.0	-6.9	2.60 V	359	34.30	32.80
2	2390.00	52.3 AV	54.0	-1.7	2.60 V	359	19.50	32.80
3	*2437.00	109.6 PK			2.44 V	347	76.70	32.90
4	*2437.00	100.2 AV			2.44 V	347	67.30	32.90
5	2483.50	63.2 PK	74.0	-10.8	1.56 V	34	30.20	33.00
6	2483.50	49.6 AV	54.0	-4.4	1.56 V	34	16.60	33.00
7	4874.00	48.2 PK	74.0	-25.8	2.22 V	340	42.20	6.00
8	4874.00	35.1 AV	54.0	-18.9	2.22 V	340	29.10	6.00

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	104.1 PK			1.88 H	292	71.10	33.00
2	*2452.00	94.8 AV			1.88 H	292	61.80	33.00
3	2483.50	61.6 PK	74.0	-12.4	2.12 H	297	28.60	33.00
4	2483.50	47.7 AV	54.0	-6.3	2.12 H	297	14.70	33.00
5	4904.00	46.9 PK	74.0	-27.1	1.55 H	19	41.00	5.90
6	4904.00	34.4 AV	54.0	-19.6	1.55 H	19	28.50	5.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	105.2 PK			1.91 V	37	72.20	33.00
2	*2452.00	96.0 AV			1.91 V	37	63.00	33.00
3	2483.50	69.8 PK	74.0	-4.2	1.22 V	329	36.80	33.00
4	2483.50	52.5 AV	54.0	-1.5	1.22 V	329	19.50	33.00
5	4904.00	48.2 PK	74.0	-25.8	1.12 V	324	42.30	5.90
6	4904.00	37.3 AV	54.0	-16.7	1.12 V	324	31.40	5.90

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.

Beamforming Mode

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	63.0 PK	74.0	-11.0	2.08 H	272	30.20	32.80
2	2390.00	47.7 AV	54.0	-6.3	2.08 H	272	14.90	32.80
3	*2412.00	108.8 PK			1.89 H	279	75.90	32.90
4	*2412.00	95.7 AV			1.89 H	279	62.80	32.90
5	4824.00	45.9 PK	74.0	-28.1	1.91 H	242	40.00	5.90
6	4824.00	33.9 AV	54.0	-20.1	1.91 H	242	28.00	5.90
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	71.9 PK	74.0	-2.1	2.55 V	322	39.10	32.80
2	2390.00	50.5 AV	54.0	-3.5	2.55 V	322	17.70	32.80
3	*2412.00	113.9 PK			1.97 V	18	81.00	32.90
4	*2412.00	101.1 AV			1.97 V	18	68.20	32.90
5	4824.00	46.9 PK	74.0	-27.1	2.09 V	289	41.00	5.90
6	4824.00	34.3 AV	54.0	-19.7	2.09 V	289	28.40	5.90

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	112.1 PK			1.90 H	297	79.20	32.90
2	*2437.00	99.4 AV			1.90 H	297	66.50	32.90
3	4874.00	47.0 PK	74.0	-27.0	1.57 H	202	41.00	6.00
4	4874.00	34.5 AV	54.0	-19.5	1.57 H	202	28.50	6.00
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	115.1 PK			2.36 V	290	82.20	32.90
2	*2437.00	103.9 AV			2.36 V	290	71.00	32.90
3	4874.00	46.7 PK	74.0	-27.3	1.59 V	252	40.70	6.00
4	4874.00	34.4 AV	54.0	-19.6	1.59 V	252	28.40	6.00

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	107.7 PK			1.49 H	35	74.80	32.90
2	*2462.00	94.9 AV			1.49 H	35	62.00	32.90
3	2483.50	63.1 PK	74.0	-10.9	1.82 H	48	30.10	33.00
4	2483.50	47.8 AV	54.0	-6.2	1.82 H	48	14.80	33.00
5	4924.00	46.5 PK	74.0	-27.5	1.57 H	78	40.50	6.00
6	4924.00	34.8 AV	54.0	-19.2	1.57 H	78	28.80	6.00
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	113.8 PK			2.06 V	8	80.90	32.90
2	*2462.00	101.3 AV			2.06 V	8	68.40	32.90
3	2483.50	71.9 PK	74.0	-2.1	2.16 V	329	38.90	33.00
4	2483.50	50.1 AV	54.0	-3.9	2.16 V	329	17.10	33.00
5	4924.00	46.2 PK	74.0	-27.8	1.57 V	86	40.20	6.00
6	4924.00	34.4 AV	54.0	-19.6	1.57 V	86	28.40	6.00

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 (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.6 PK	74.0	-9.4	2.07 H	297	31.80	32.80
2	2390.00	47.2 AV	54.0	-6.8	2.07 H	297	14.40	32.80
3	*2422.00	104.2 PK			1.90 H	297	71.30	32.90
4	*2422.00	94.2 AV			1.90 H	297	61.30	32.90
5	4844.00	48.1 PK	74.0	-25.9	1.91 H	279	42.30	5.80
6	4844.00	36.7 AV	54.0	-17.3	1.91 H	279	30.90	5.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.7 PK	74.0	-1.3	1.51 V	289	39.90	32.80
2	2390.00	50.1 AV	54.0	-3.9	1.51 V	289	17.30	32.80
3	*2422.00	109.7 PK			2.30 V	7	76.80	32.90
4	*2422.00	102.6 AV			2.30 V	7	69.70	32.90
5	4844.00	50.4 PK	74.0	-23.6	2.00 V	256	44.60	5.80
6	4844.00	37.2 AV	54.0	-16.8	2.00 V	256	31.40	5.80

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	2390.00	66.3 PK	74.0	-7.7	1.71 H	278	33.50	32.80
2	2390.00	46.8 AV	54.0	-7.2	1.71 H	278	14.00	32.80
3	*2437.00	104.4 PK			1.86 H	276	71.50	32.90
4	*2437.00	96.8 AV			1.86 H	276	63.90	32.90
5	4874.00	49.8 PK	74.0	-24.2	2.39 H	187	43.80	6.00
6	4874.00	38.4 AV	54.0	-15.6	2.39 H	187	32.40	6.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.4 PK	74.0	-1.6	2.24 V	0	39.60	32.80
2	2390.00	50.1 AV	54.0	-3.9	2.24 V	0	17.30	32.80
3	*2437.00	110.3 PK			2.25 V	6	77.40	32.90
4	*2437.00	105.0 AV			2.25 V	6	72.10	32.90
5	4874.00	50.0 PK	74.0	-24.0	1.82 V	278	44.00	6.00
6	4874.00	37.2 AV	54.0	-16.8	1.82 V	278	31.20	6.00

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	102.5 PK			1.84 H	282	69.50	33.00
2	*2452.00	96.1 AV			1.84 H	282	63.10	33.00
3	2483.50	57.7 PK	74.0	-16.3	2.25 H	290	24.70	33.00
4	2483.50	46.9 AV	54.0	-7.1	2.25 H	290	13.90	33.00
5	4904.00	49.5 PK	74.0	-24.5	1.91 H	331	43.60	5.90
6	4904.00	36.3 AV	54.0	-17.7	1.91 H	331	30.40	5.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	106.5 PK			2.22 V	318	73.50	33.00
2	*2452.00	102.5 AV			2.22 V	318	69.50	33.00
3	2483.50	72.3 PK	74.0	-1.7	2.07 V	346	39.30	33.00
4	2483.50	49.5 AV	54.0	-4.5	2.07 V	346	16.50	33.00
5	4904.00	49.1 PK	74.0	-24.9	1.93 V	258	43.20	5.90
6	4904.00	36.5 AV	54.0	-17.5	1.93 V	258	30.60	5.90

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:

CDD Mode

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	30.3 QP	40.0	-9.7	2.00 H	240	44.90	-14.60
2	140.72	27.3 QP	43.5	-16.2	2.00 H	86	41.80	-14.50
3	167.94	29.1 QP	43.5	-14.4	1.50 H	291	43.20	-14.10
4	235.99	24.7 QP	46.0	-21.3	1.50 H	121	39.90	-15.20
5	292.38	24.5 QP	46.0	-21.5	1.00 H	251	36.90	-12.40
6	399.31	25.5 QP	46.0	-20.5	1.00 H	131	35.70	-10.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	47.40	36.7 QP	40.0	-3.3	1.49 V	10	51.20	-14.50
2	78.51	30.1 QP	40.0	-9.9	1.00 V	224	48.50	-18.40
3	173.78	29.0 QP	43.5	-14.5	1.00 V	161	43.40	-14.40
4	235.99	26.1 QP	46.0	-19.9	1.00 V	194	41.30	-15.20
5	502.36	29.6 QP	46.0	-16.4	1.00 V	260	37.80	-8.20
6	525.69	29.5 QP	46.0	-16.5	1.00 V	252	37.30	-7.80

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

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	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 11, 2016	Jan. 10, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 26, 2016	Jul. 25, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	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 2.
3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

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

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

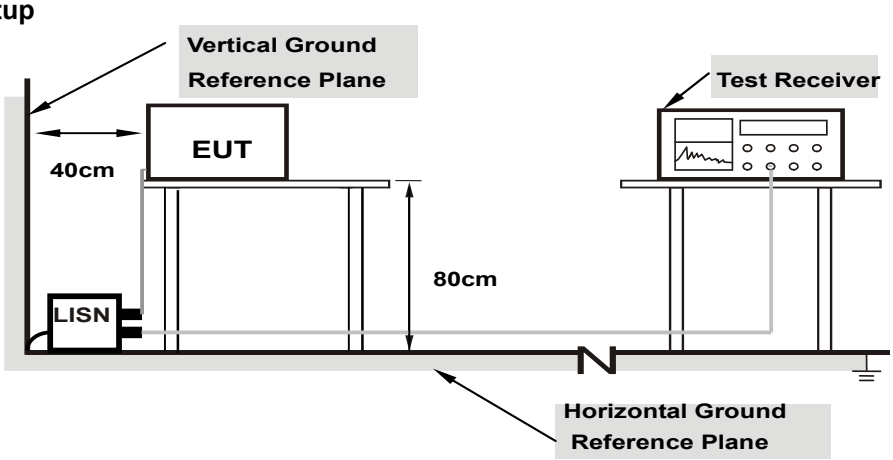
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

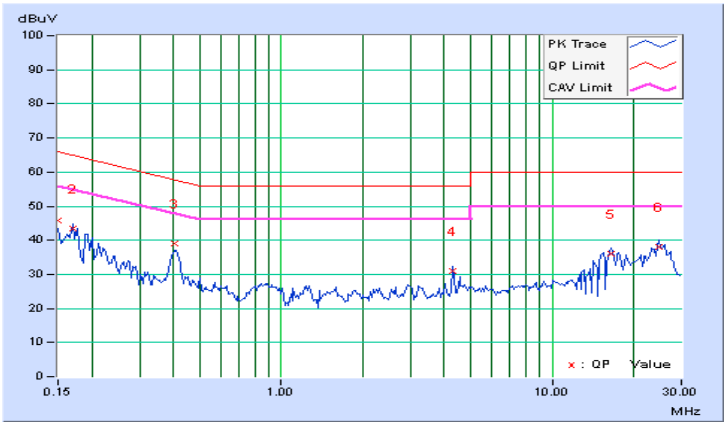
CDD Mode

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.12	35.76	23.30	45.88	33.42	66.00	56.00	-20.12	-22.58
2	0.16953	10.14	33.13	24.08	43.27	34.22	64.98	54.98	-21.71	-20.76
3	**0.40391**	**10.19**	**28.90**	**27.96**	**39.09**	**38.15**	**57.77**	**47.77**	**-18.68**	**-9.62**
4	4.29297	10.36	20.73	20.04	31.09	30.40	56.00	46.00	-24.91	-15.60
5	16.41407	10.56	25.63	25.58	36.19	36.14	60.00	50.00	-23.81	-13.86
6	24.75000	10.52	27.45	26.48	37.97	37.00	60.00	50.00	-22.03	-13.00

Remarks:

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

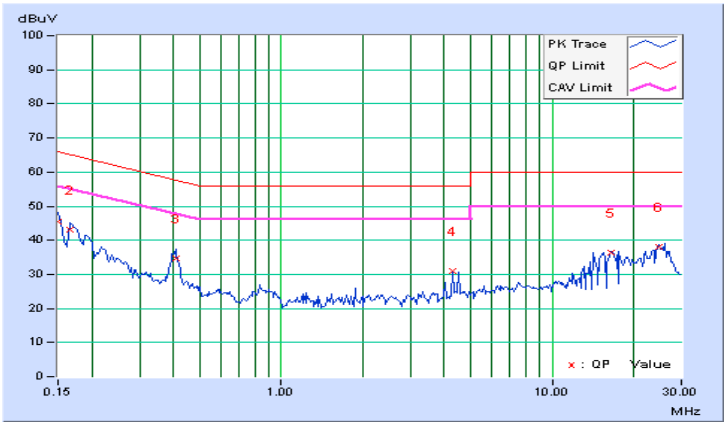


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.13	35.41	22.74	45.54	32.87	66.00	56.00	-20.46	-23.13
2	0.16562	10.14	33.07	21.66	43.21	31.80	65.18	55.18	-21.97	-23.38
3	0.40781	10.19	24.59	24.52	34.78	34.71	57.69	47.69	-22.91	-12.98
4	4.29297	10.40	20.43	19.96	30.83	30.36	56.00	46.00	-25.17	-15.64
5	16.41406	10.69	25.63	25.24	36.32	35.93	60.00	50.00	-23.68	-14.07
6	24.74676	10.67	27.45	26.18	38.12	36.85	60.00	50.00	-21.88	-13.15

Remarks:

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

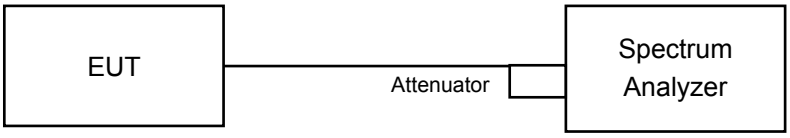


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz

b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = average.

c. Trace mode = max hold.

d. Sweep = auto couple.

e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

CDD Mode

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.09	8.08	0.5	Pass
6	2437	8.08	9.04	0.5	Pass
11	2462	8.06	8.57	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.38	16.40	0.5	Pass
6	2437	16.36	16.37	0.5	Pass
11	2462	16.38	16.38	0.5	Pass

802.11n (HT20)

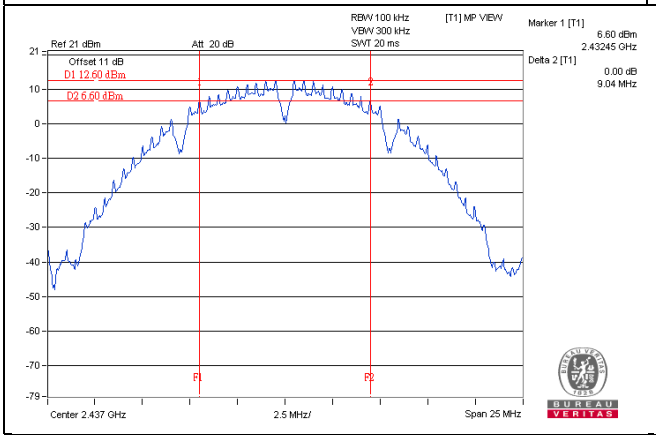
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.61	17.60	0.5	Pass
6	2437	17.61	17.59	0.5	Pass
11	2462	17.61	17.63	0.5	Pass

802.11n (HT40)

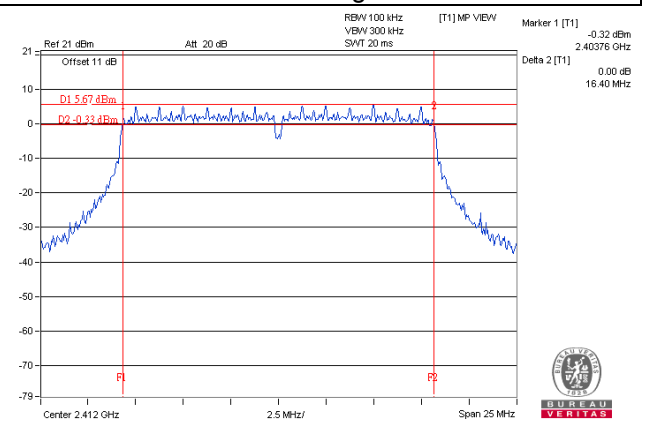
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.24	35.60	0.5	Pass
6	2437	35.19	35.25	0.5	Pass
9	2452	35.43	35.21	0.5	Pass

Spectrum Plot of Worst Value

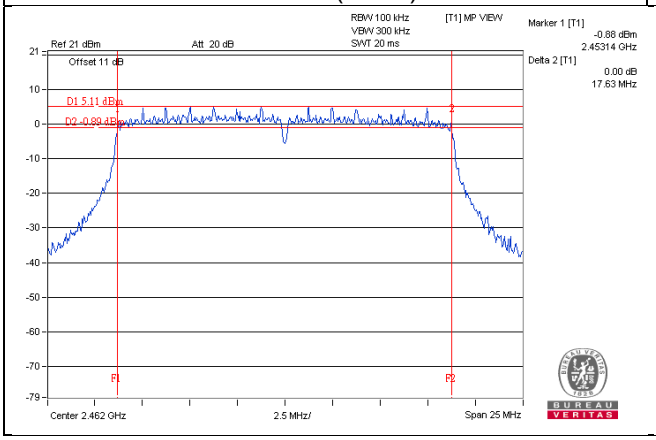
802.11b



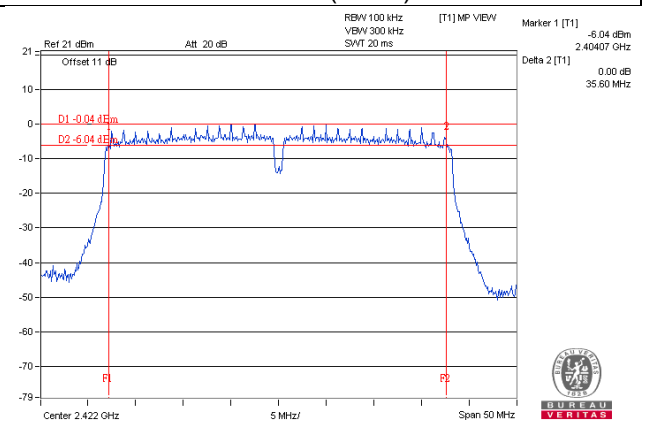
802.11g



802.11n (HT20)



802.11n (HT40)



Beamforming Mode

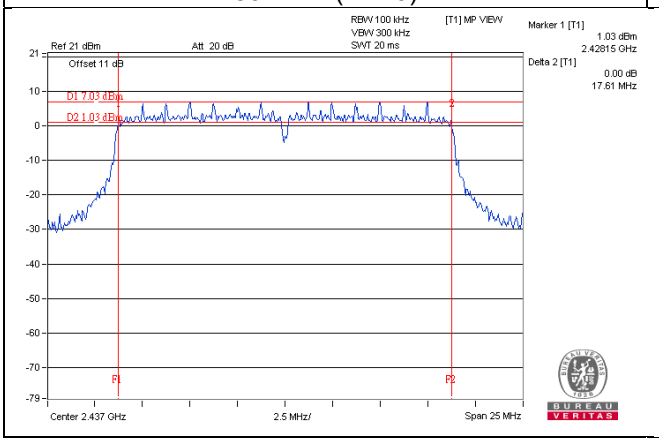
802.11n (HT20)

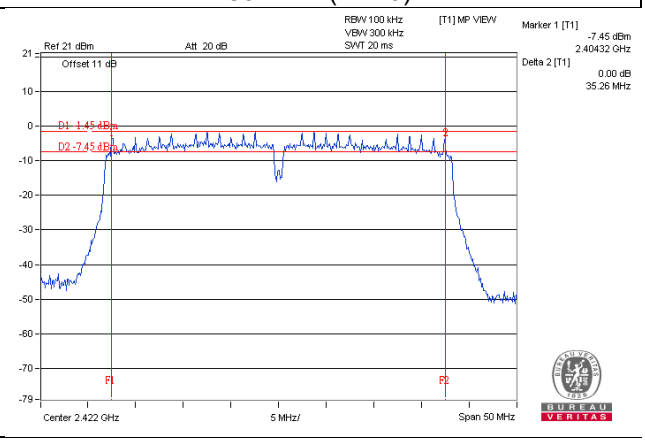
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.60	17.61	0.5	Pass
6	2437	17.61	17.60	0.5	Pass
11	2462	17.60	17.60	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.25	35.26	0.5	Pass
6	2437	35.18	35.24	0.5	Pass
9	2452	35.20	35.24	0.5	Pass

Spectrum Plot of Worst Value	
802.11n (HT20)	802.11n (HT40)





4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

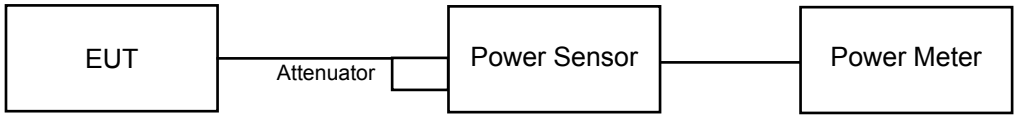
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

CDD Mode

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.30	20.55	**220.653**	23.44	30	Pass
6	2437	20.16	20.47	215.182	23.33	30	Pass
11	2462	19.90	20.26	203.894	23.09	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	16.32	16.61	88.669	19.48	30	Pass
6	2437	19.70	20.05	194.483	22.89	30	Pass
11	2462	16.42	16.75	91.168	19.60	30	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	15.90	16.15	80.115	19.04	30	Pass
6	2437	19.71	20.01	193.772	22.87	30	Pass
11	2462	15.90	16.40	82.557	19.17	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	13.46	13.61	45.143	16.55	30	Pass
6	2437	16.41	16.66	90.097	19.55	30	Pass
9	2452	15.20	15.56	69.088	18.39	30	Pass

Beamforming Mode

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.78	14.72	59.709	17.76	28.99	Pass
6	2437	18.37	18.57	**140.652**	21.48	28.99	Pass
11	2462	14.21	14.41	53.969	17.32	28.99	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power limit shall be reduced to 30-(7.01-6) = 28.99dBm.

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	12.81	12.58	37.212	15.71	28.99	Pass
6	2437	13.54	13.64	45.715	16.60	28.99	Pass
9	2452	12.42	12.67	35.951	15.56	28.99	Pass

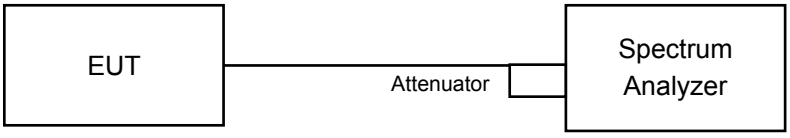
Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power limit shall be reduced to 30-(7.01-6) = 28.99dBm.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For 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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

CDD Mode

802.11b

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-7.81	3.01	-4.80	6.99	Pass
	6	2437	-7.93	3.01	-4.92	6.99	Pass
	11	2462	-7.71	3.01	-4.70	6.99	Pass
1	1	2412	-7.06	3.01	-4.05	6.99	Pass
	6	2437	-6.99	3.01	-3.98	6.99	Pass
	11	2462	-7.13	3.01	-4.12	6.99	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm

802.11g

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-14.25	3.01	0.24	-11.00	6.99	Pass
	6	2437	-11.25	3.01	0.24	-8.00	6.99	Pass
	11	2462	-13.86	3.01	0.24	-10.61	6.99	Pass
1	1	2412	-14.21	3.01	0.24	-10.96	6.99	Pass
	6	2437	-10.27	3.01	0.24	-7.02	6.99	Pass
	11	2462	-12.94	3.01	0.24	-9.69	6.99	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-15.27	3.01	0.09	-12.17	6.99	Pass
	6	2437	-11.17	3.01	0.09	-8.07	6.99	Pass
	11	2462	-15.14	3.01	0.09	-12.04	6.99	Pass
1	1	2412	-15.07	3.01	0.09	-11.97	6.99	Pass
	6	2437	-10.88	3.01	0.09	-7.78	6.99	Pass
	11	2462	-14.46	3.01	0.09	-11.36	6.99	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

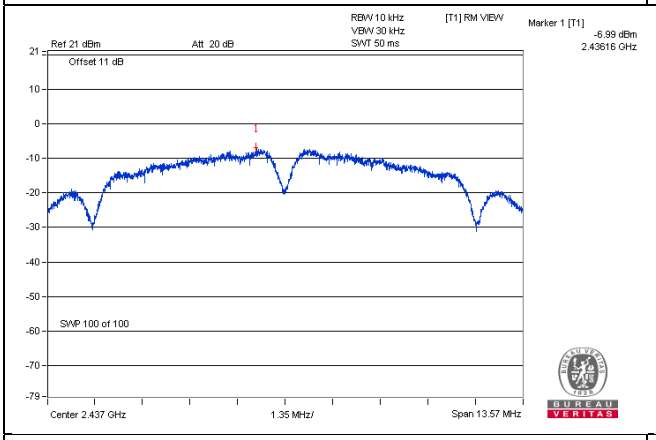
802.11n (HT40)

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	3	2422	-20.28	3.01	0.18	-17.09	6.99	Pass
	6	2437	-17.34	3.01	0.18	-14.15	6.99	Pass
	9	2452	-18.25	3.01	0.18	-15.06	6.99	Pass
1	3	2422	-20.11	3.01	0.18	-16.92	6.99	Pass
	6	2437	-16.58	3.01	0.18	-13.39	6.99	Pass
	9	2452	-17.94	3.01	0.18	-14.75	6.99	Pass

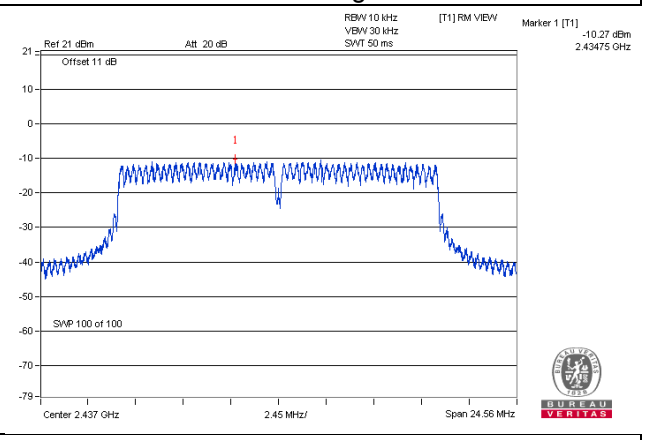
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

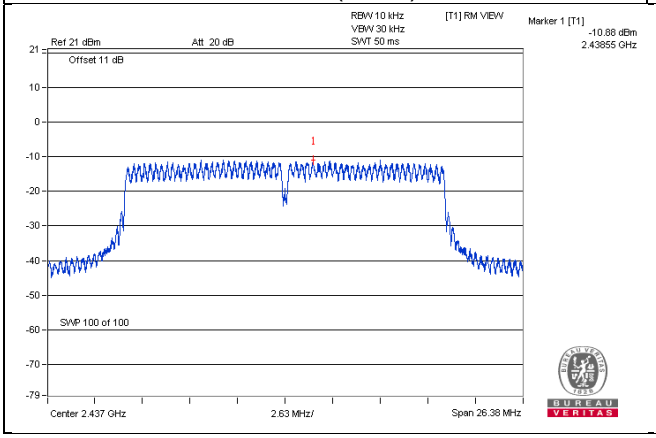
802.11b



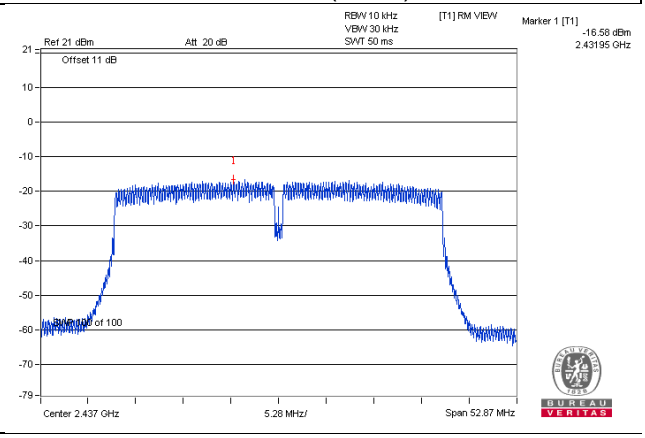
802.11g



802.11n (HT20)



802.11n (HT40)



Beamforming Mode

802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-22.16	3.01	-19.15	6.99	Pass
	6	2437	-18.05	3.01	-15.04	6.99	Pass
	11	2462	-21.84	3.01	-18.83	6.99	Pass
1	1	2412	-21.44	3.01	-18.43	6.99	Pass
	6	2437	-17.50	3.01	-14.49	6.99	Pass
	11	2462	-21.58	3.01	-18.57	6.99	Pass

Note:

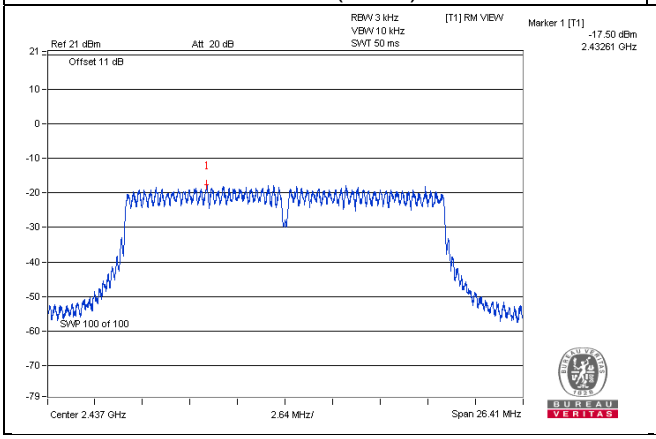
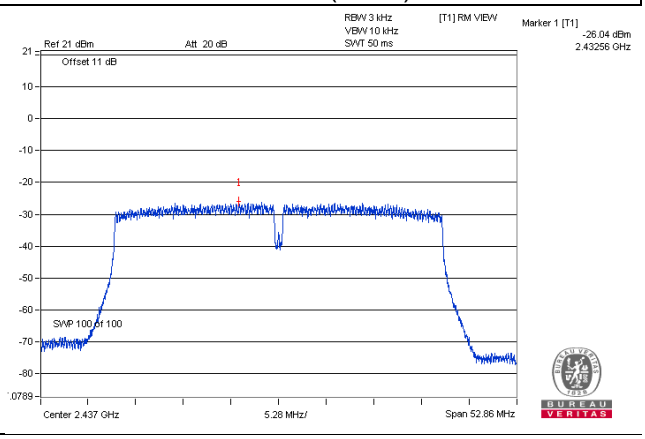
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm

802.11n (HT40)

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=2) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	3	2422	-27.38	3.01	0.15	-24.22	6.99	Pass
	6	2437	-26.54	3.01	0.15	-23.38	6.99	Pass
	9	2452	-27.45	3.01	0.15	-24.29	6.99	Pass
1	3	2422	-26.88	3.01	0.15	-23.72	6.99	Pass
	6	2437	-26.04	3.01	0.15	-22.88	6.99	Pass
	9	2452	-27.01	3.01	0.15	-23.85	6.99	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2$]= 7.01dBi > 6dBi, so the power density limit shall be reduced to 8-(7.01-6) = 6.99dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

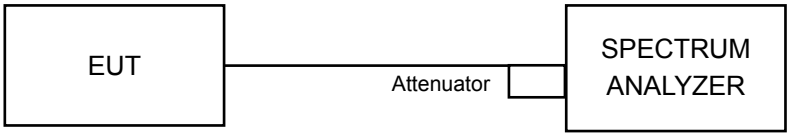
Spectrum Plot of Worst Value	
802.11n (HT20)	802.11n (HT40)
	

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

a. Set the RBW = 100 kHz.

b. Set the VBW ≥ 300 kHz.

c. Detector = average.

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 = average.

f. Trace Mode = max hold.

g. Sweep = auto couple.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6

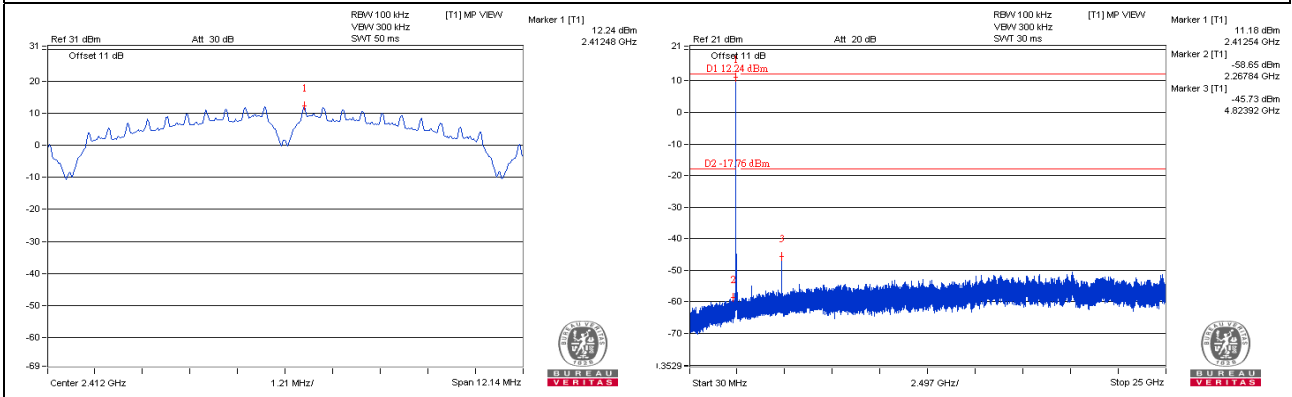
4.6.7 Test Results

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

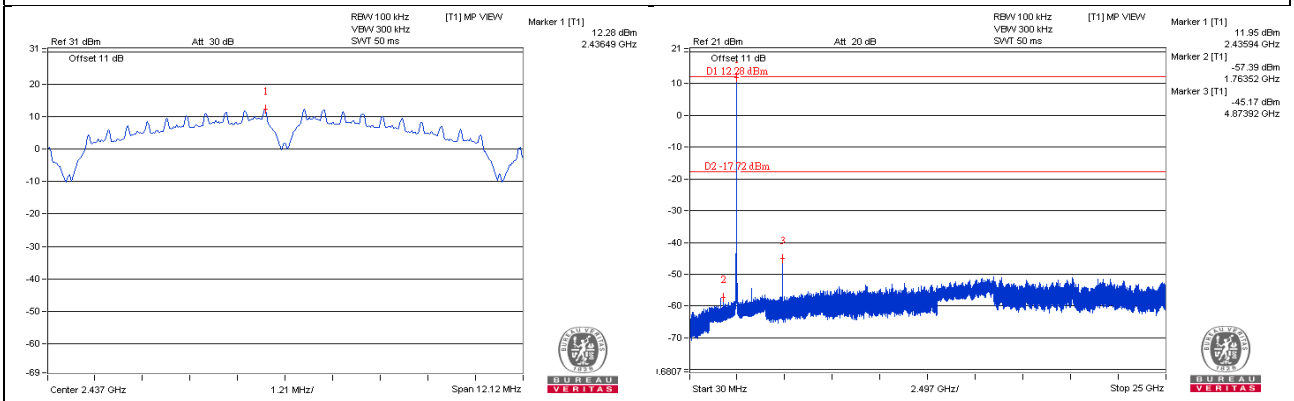
CDD Mode

802.11b_Chain 0

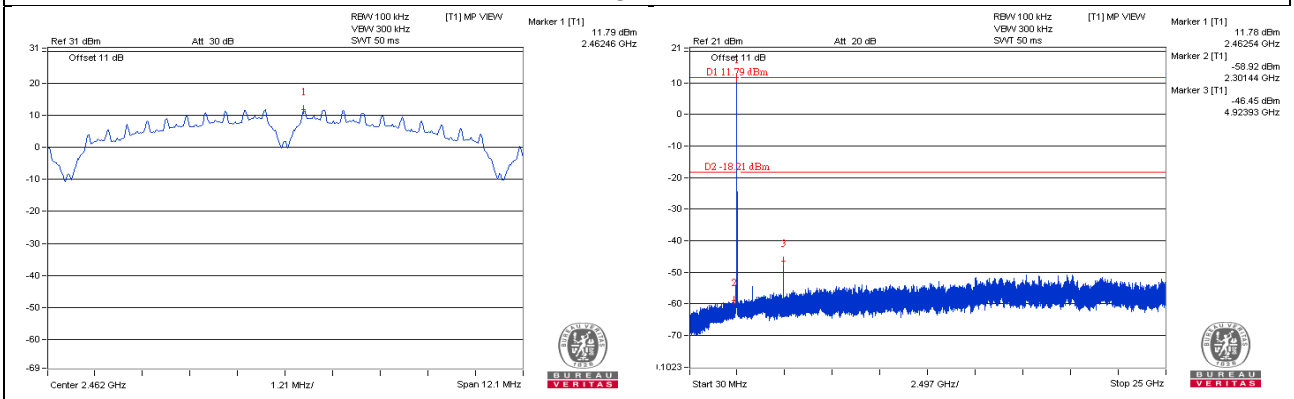
CH 1



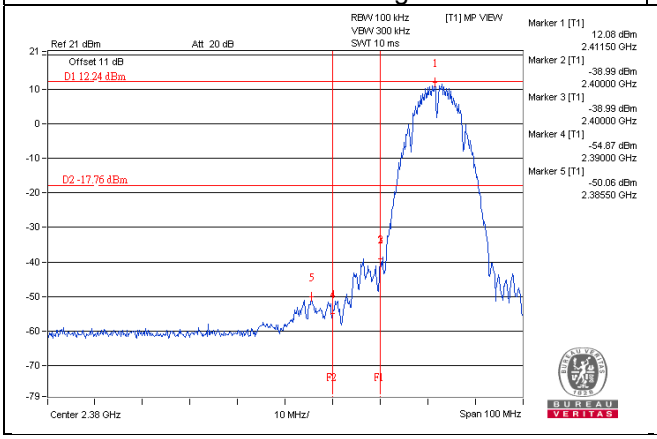
CH 6



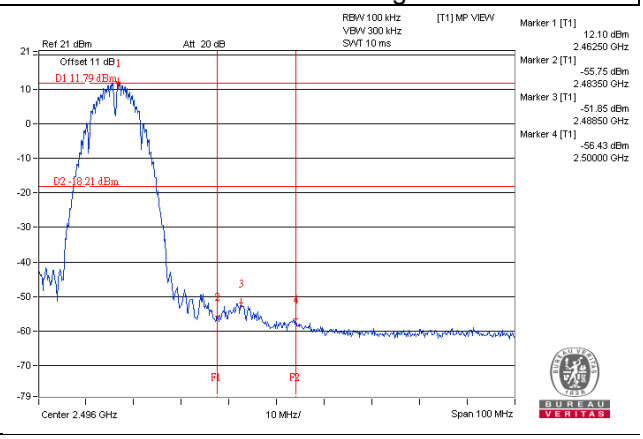
CH 11



CH 1 Band edge

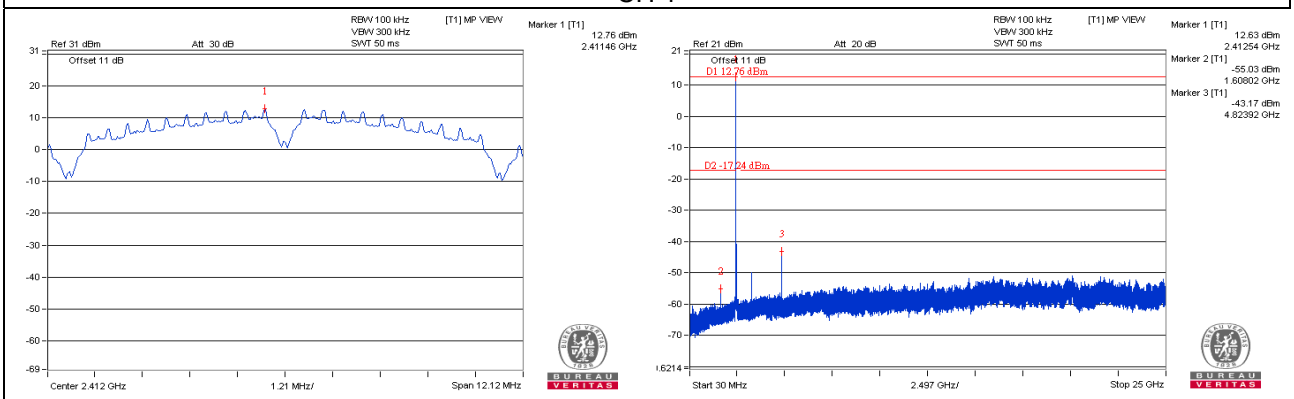


CH 11 Band edge

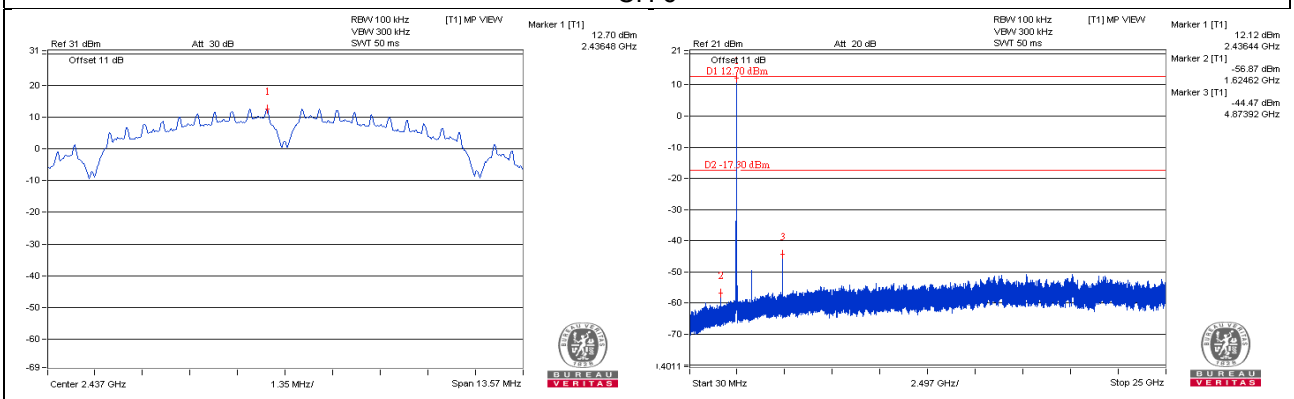


802.11b_Chain 1

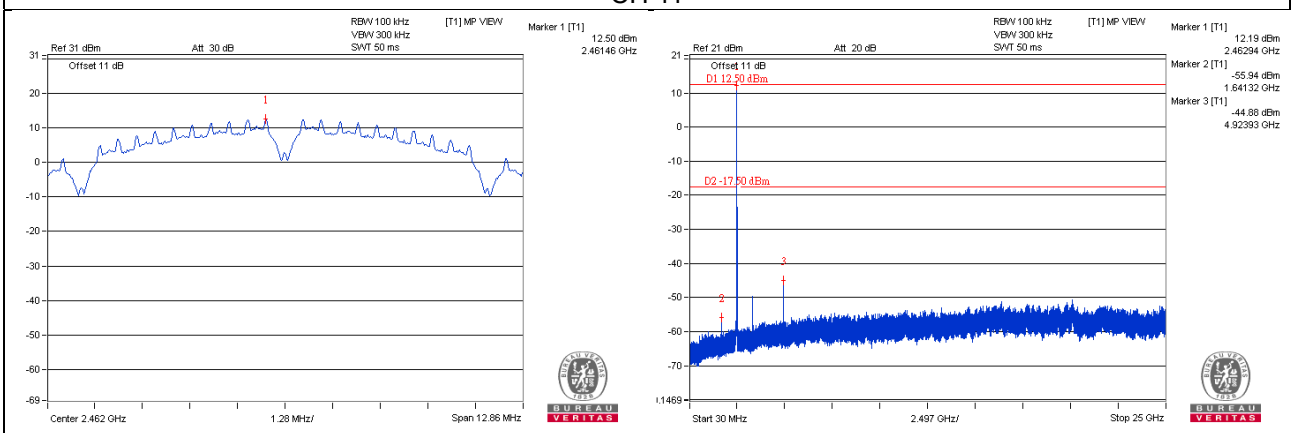
CH 1



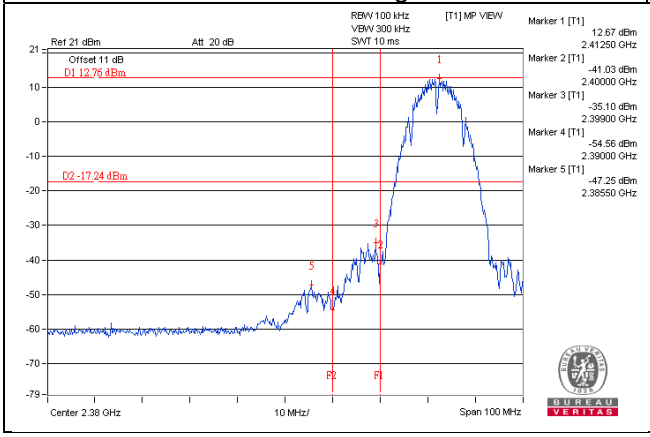
CH 6



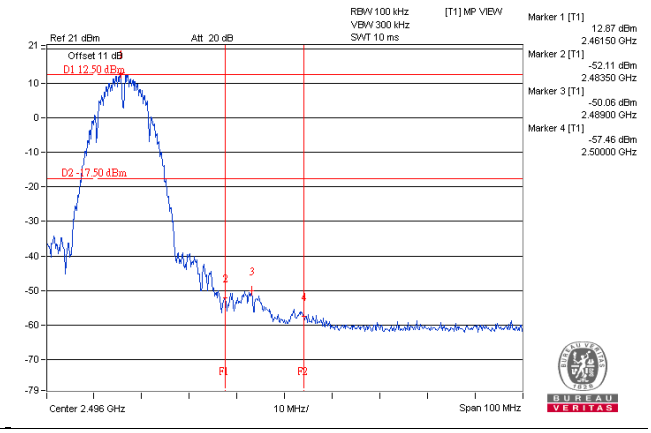
CH 11



CH 1 Band edge

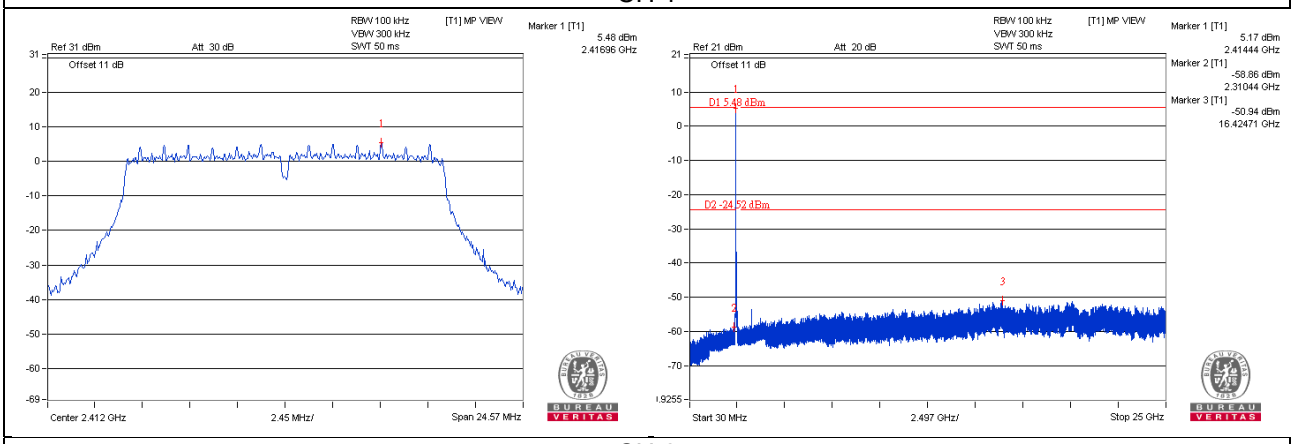


CH 11 Band edge

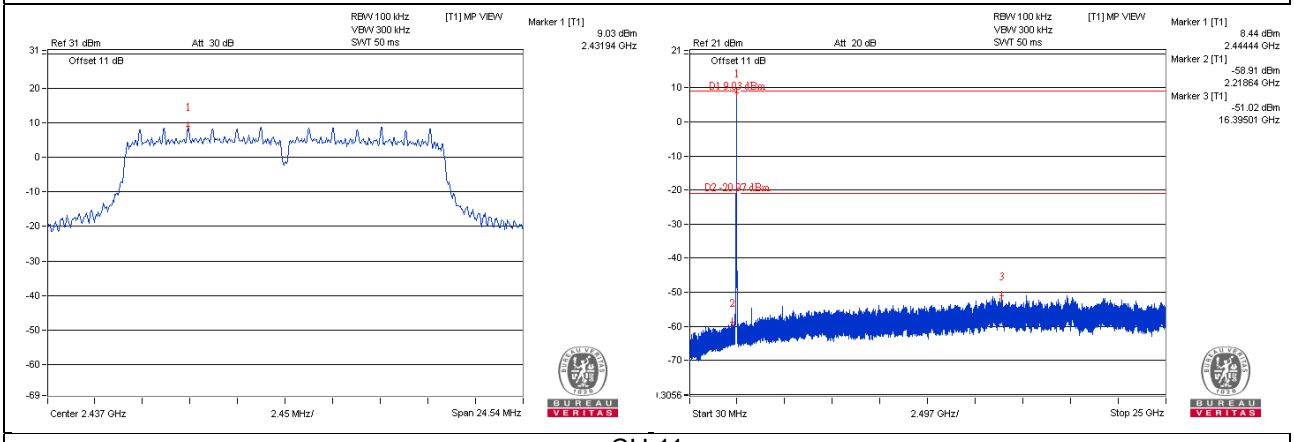


802.11g_Chain 0

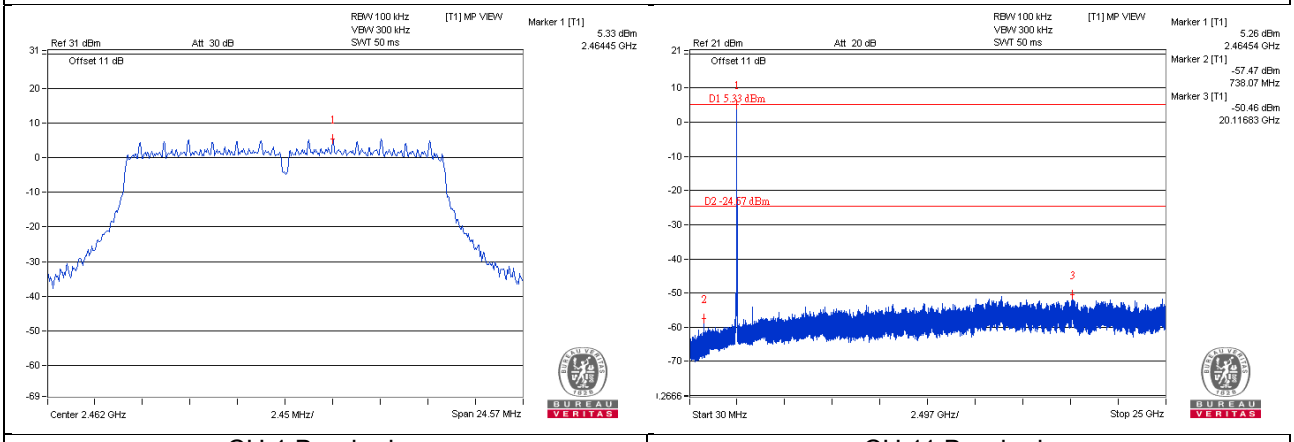
CH 1



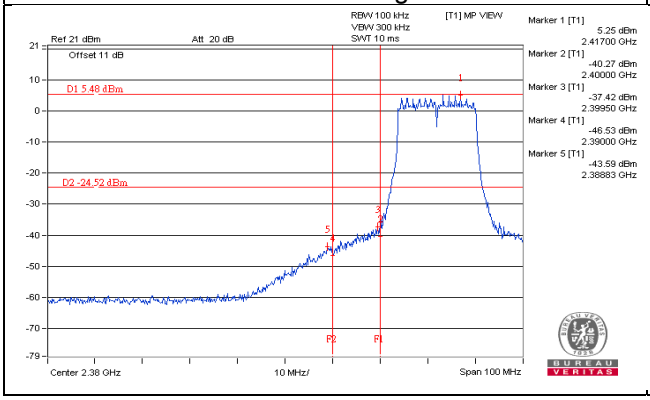
CH 6



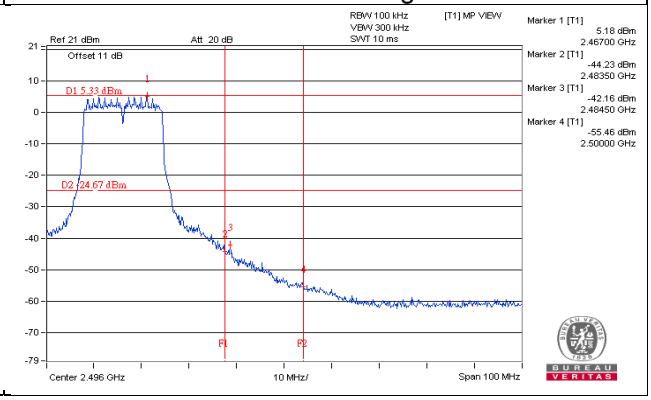
CH 11



CH 1 Band edge

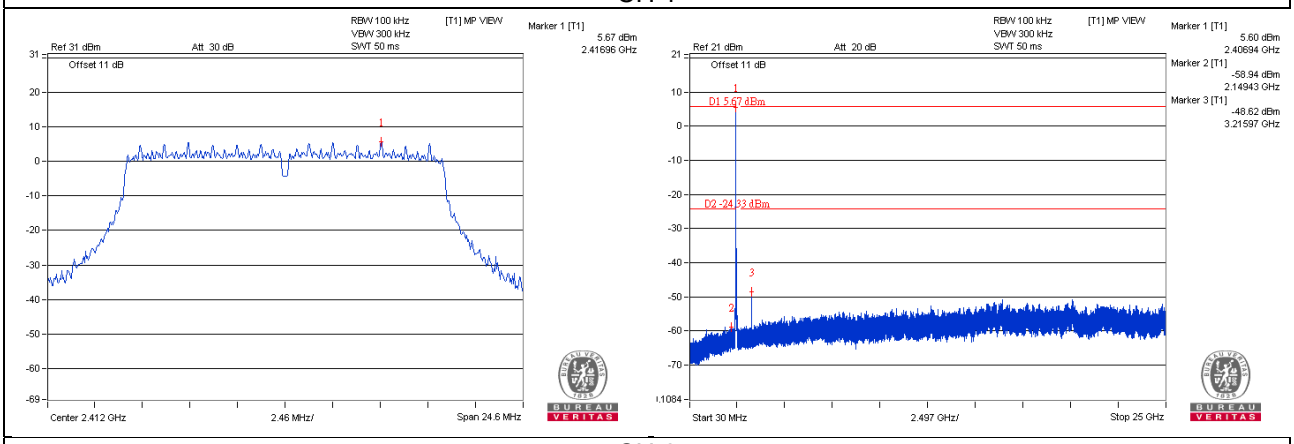


CH 11 Band edge

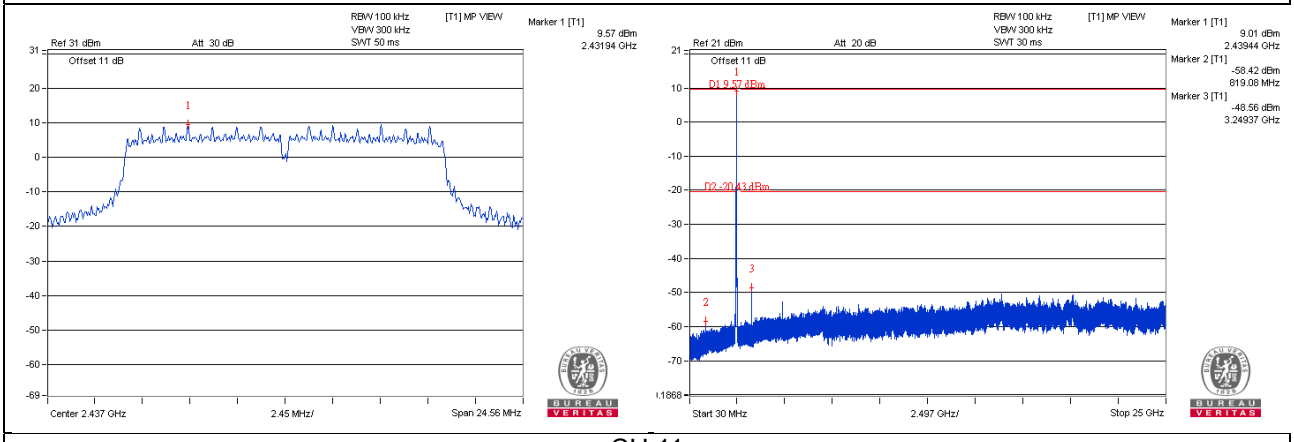


802.11g_Chain 1

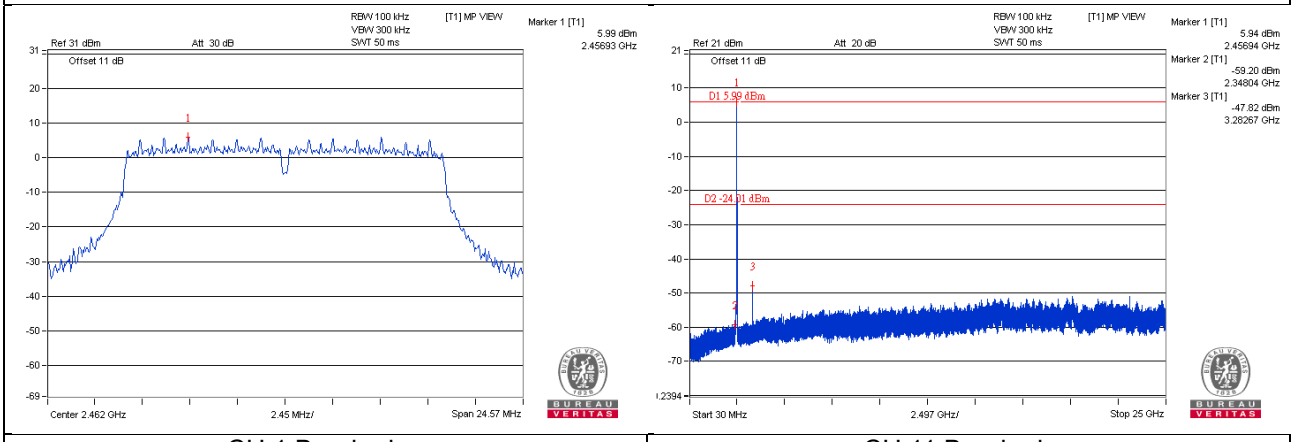
CH 1



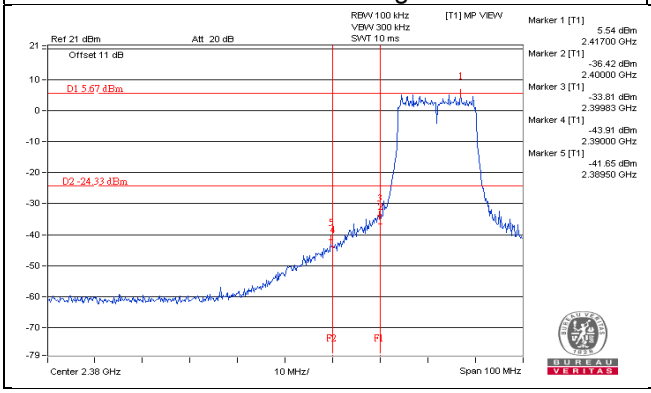
CH 6



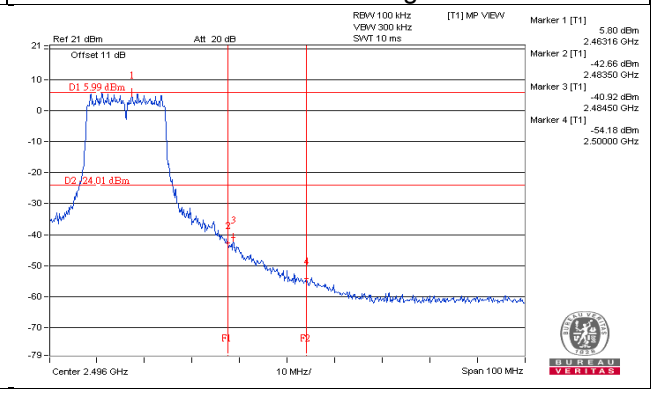
CH 11



CH 1 Band edge

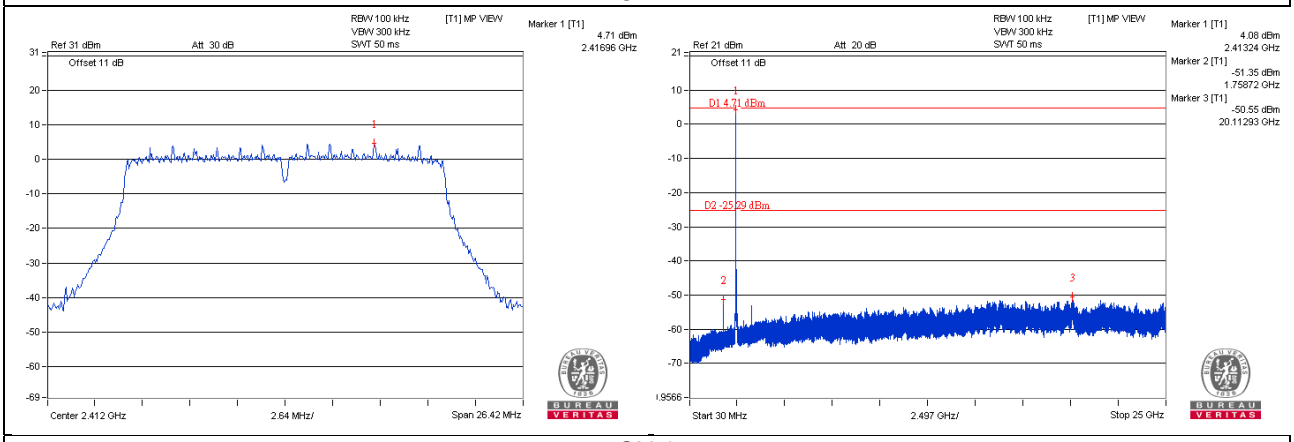


CH 11 Band edge

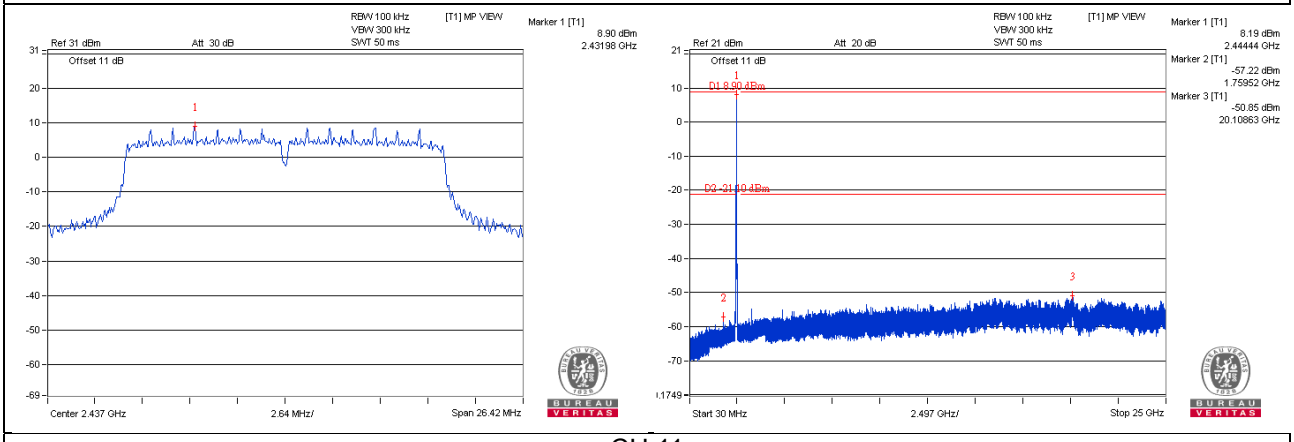


802.11n (HT20)_Chain 0

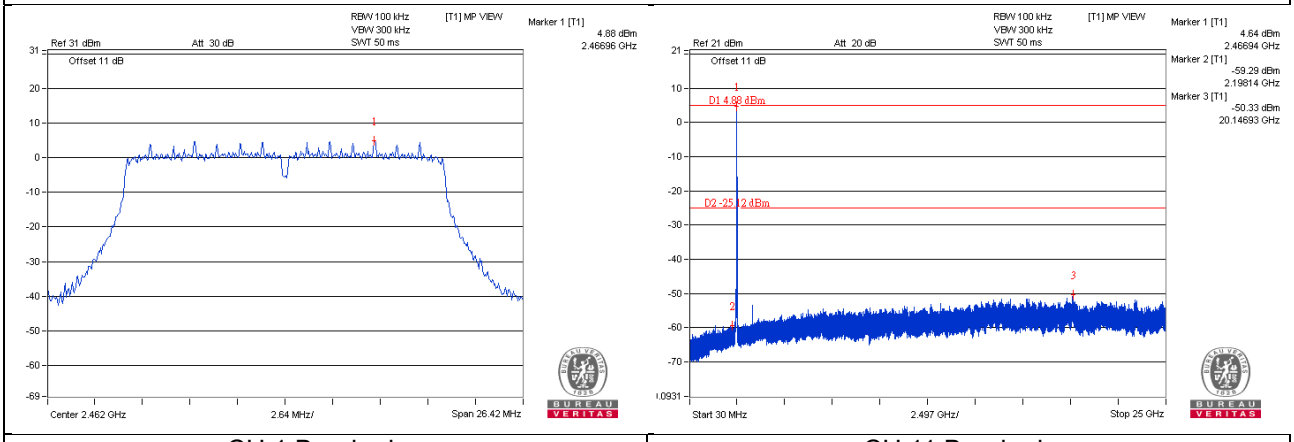
CH 1



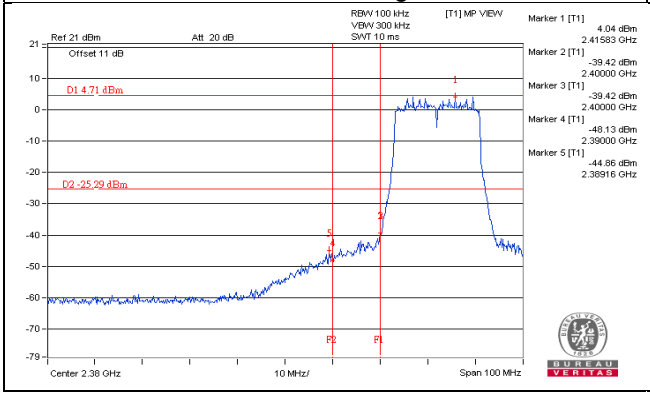
CH 6



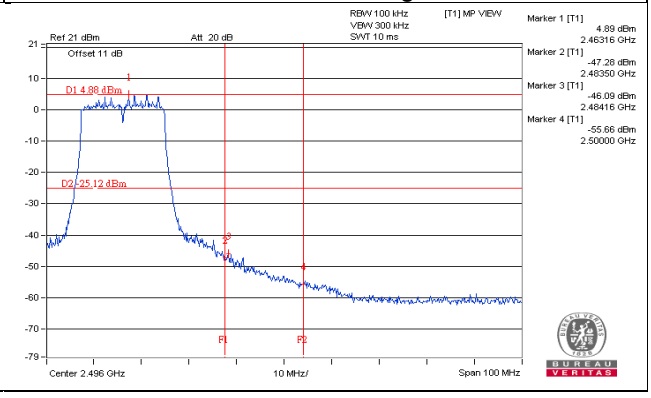
CH 11



CH 1 Band edge

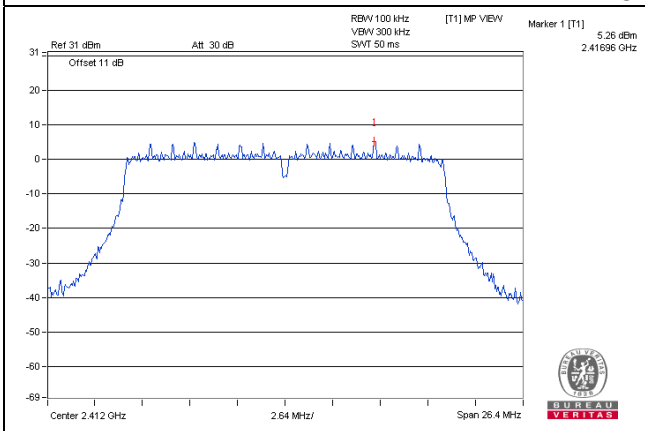


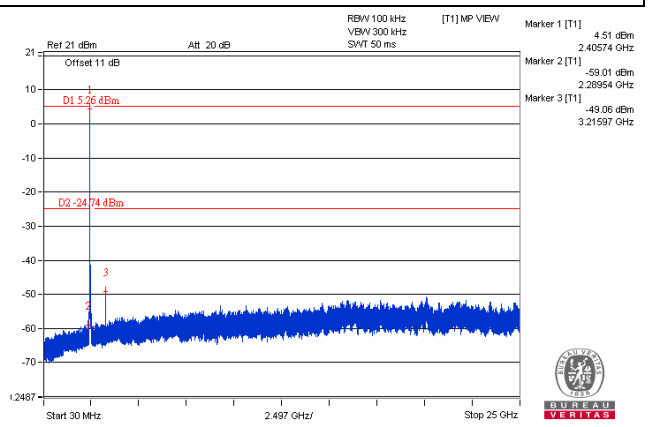
CH 11 Band edge



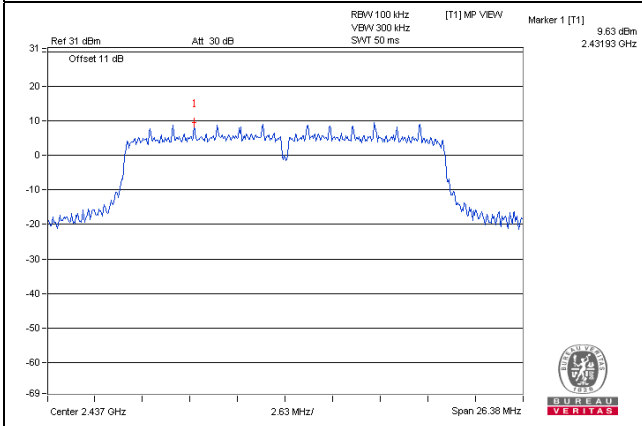
802.11n (HT20)_Chain 1

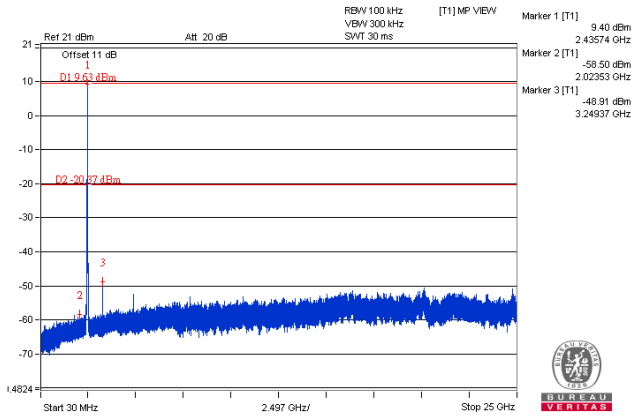
CH 1



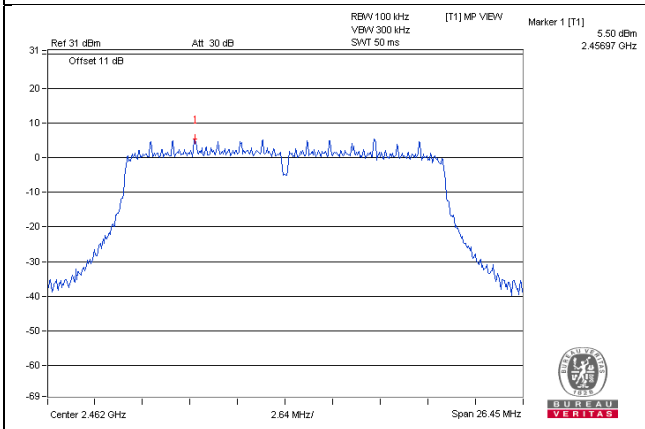


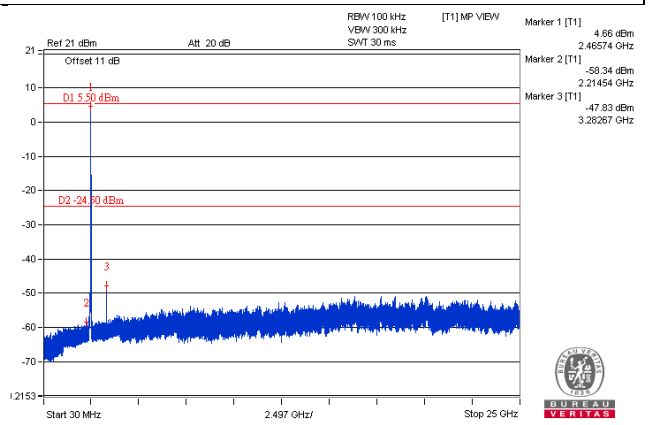
CH 6



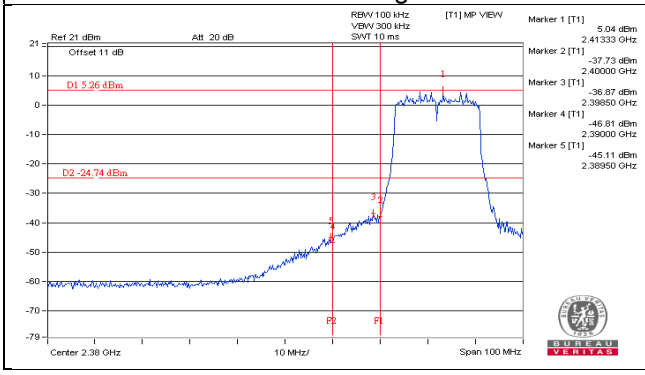


CH 11

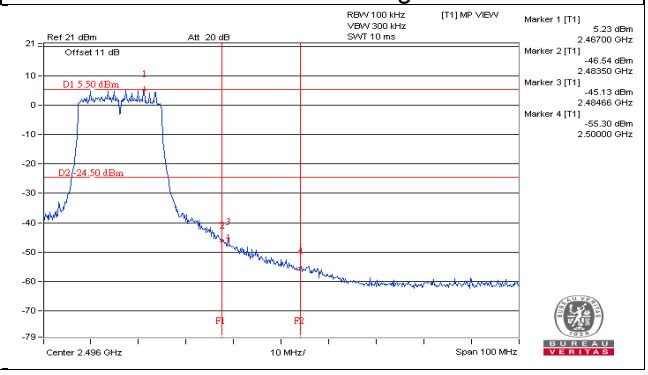




CH 1 Band edge

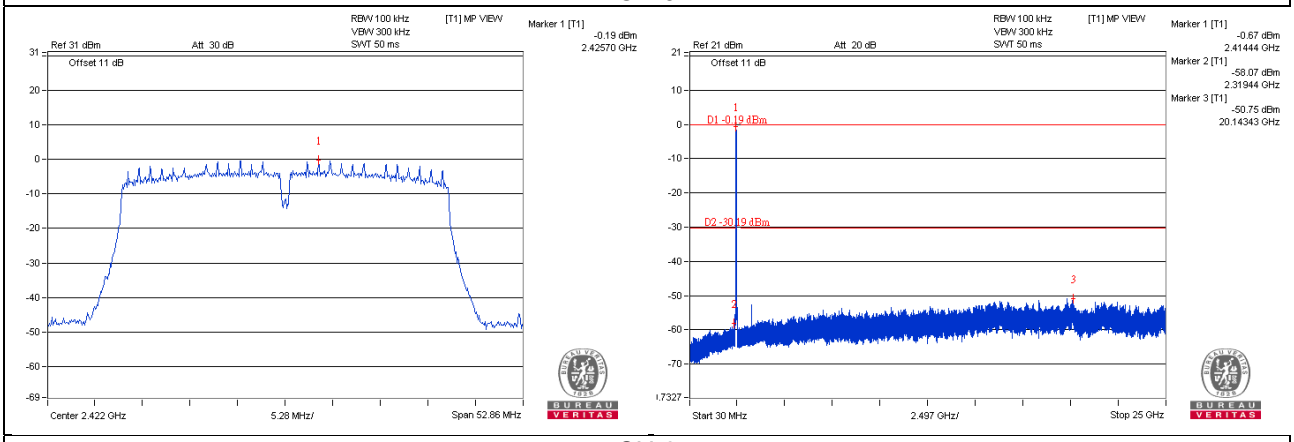


CH 11 Band edge

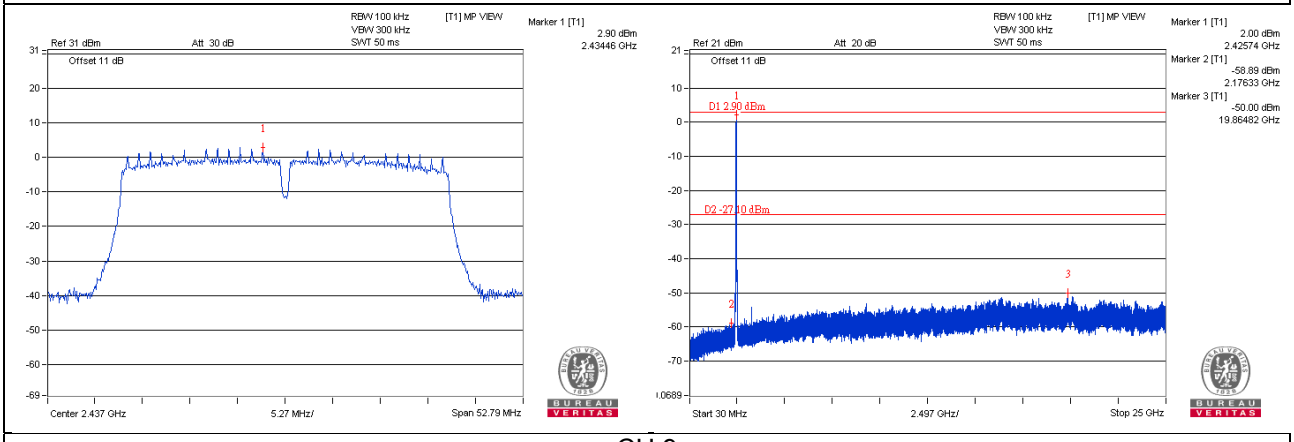


802.11n (HT40)_Chain 0

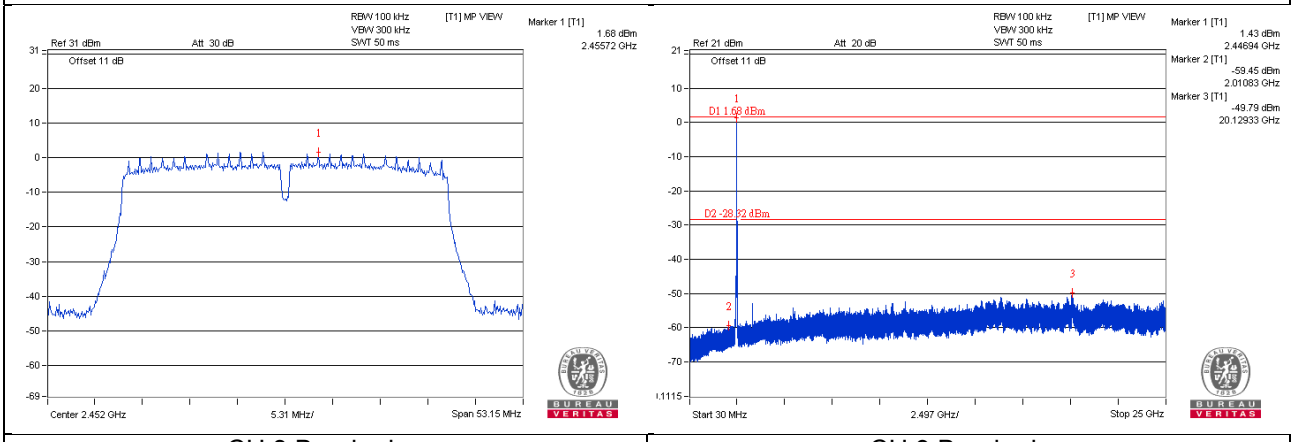
CH 3



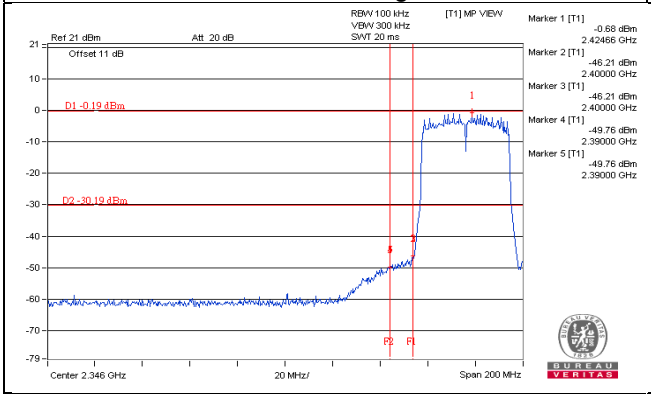
CH 6



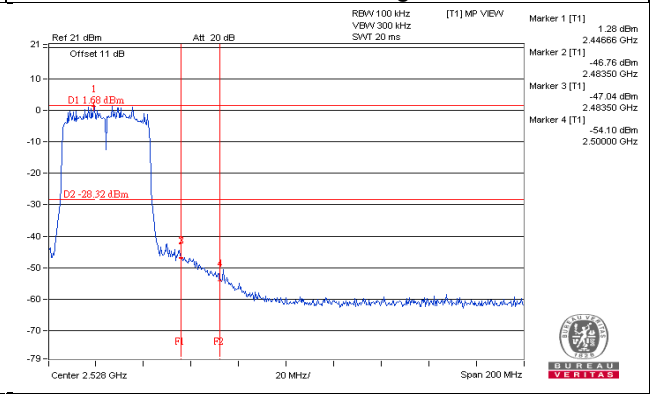
CH 9



CH 3 Band edge

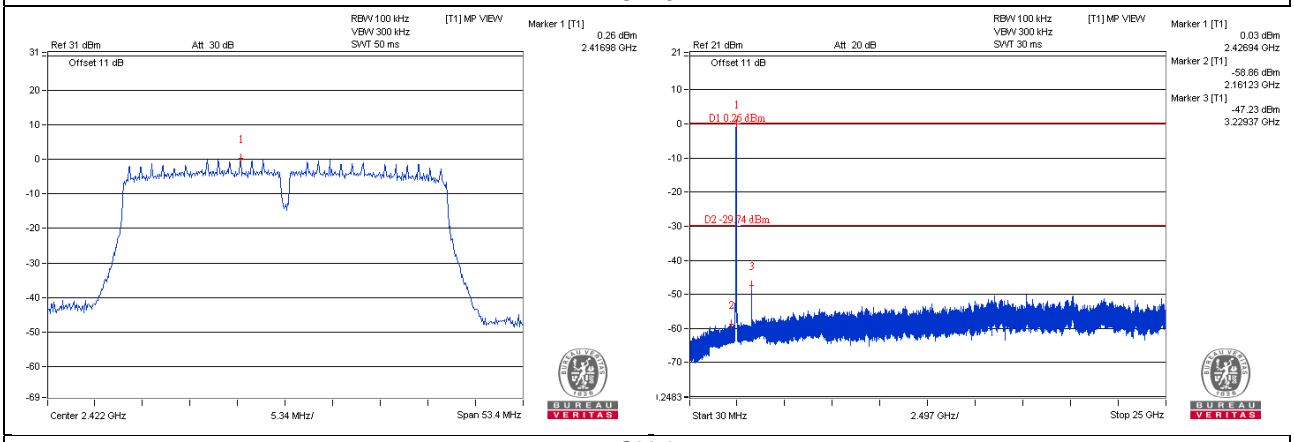


CH 9 Band edge

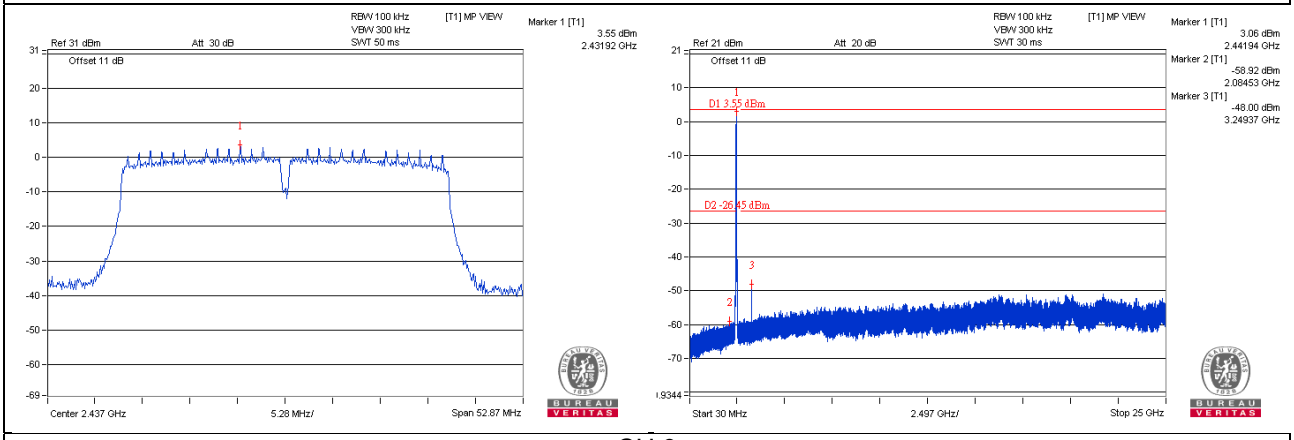


802.11n (HT40)_Chain 1

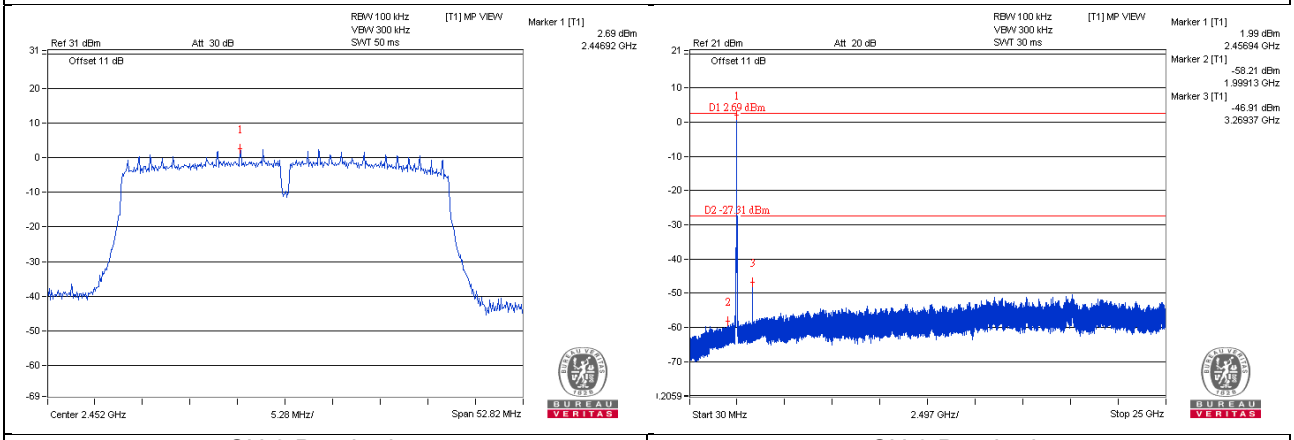
CH 3



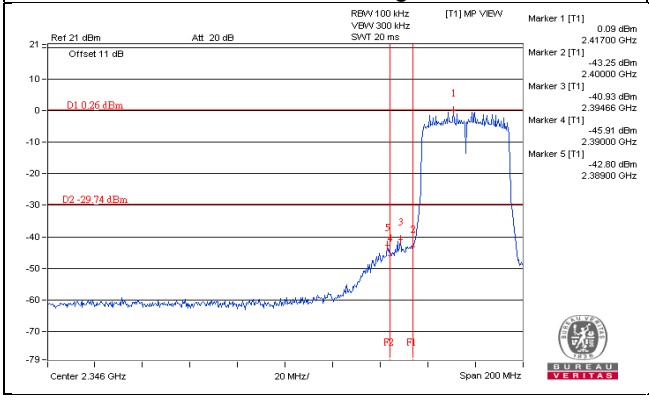
CH 6



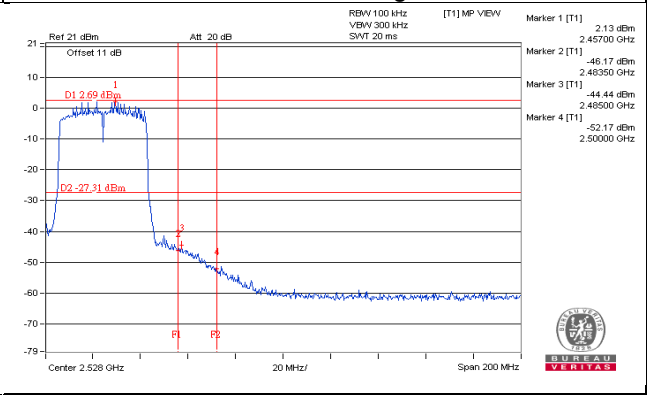
CH 9



CH 3 Band edge



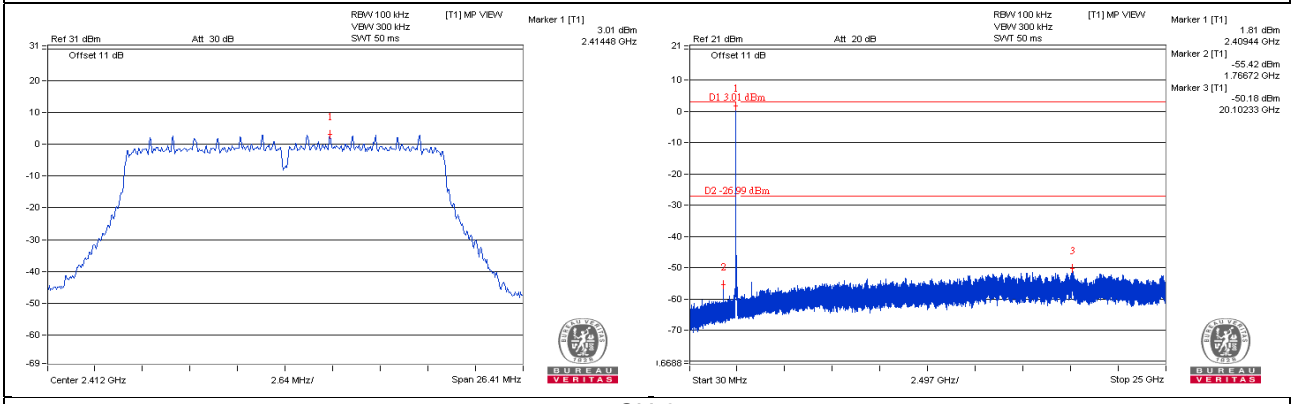
CH 9 Band edge



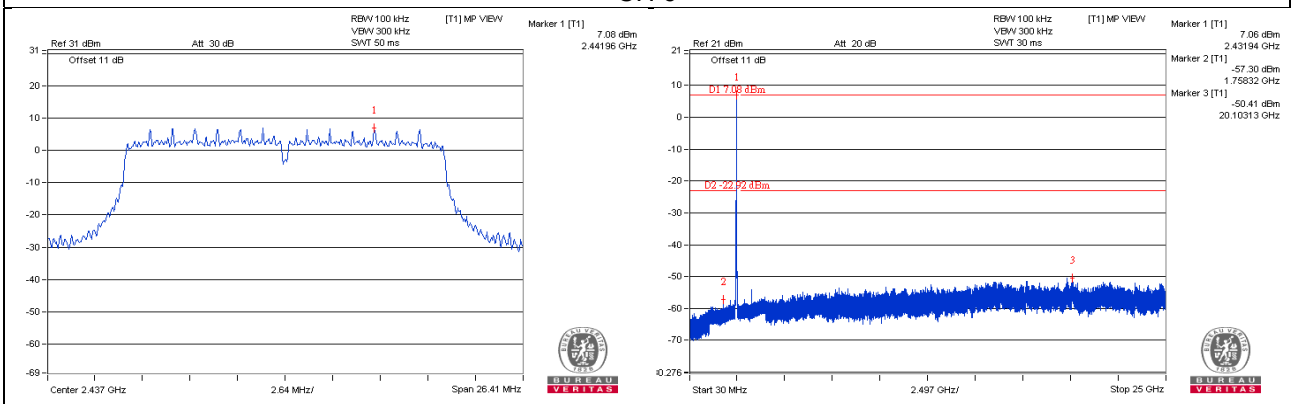
Beamforming Mode

802.11n (HT20)_Chain 0

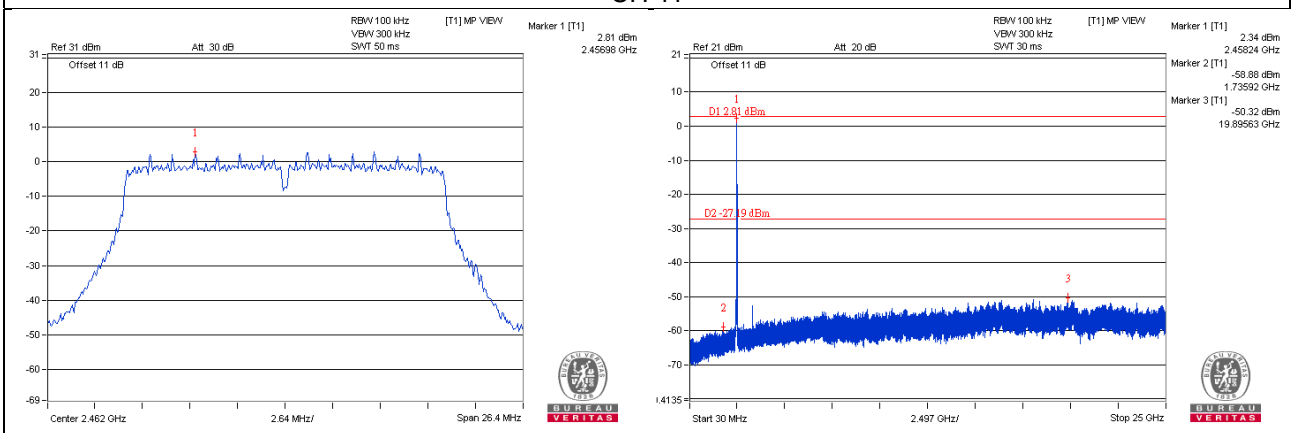
CH 1



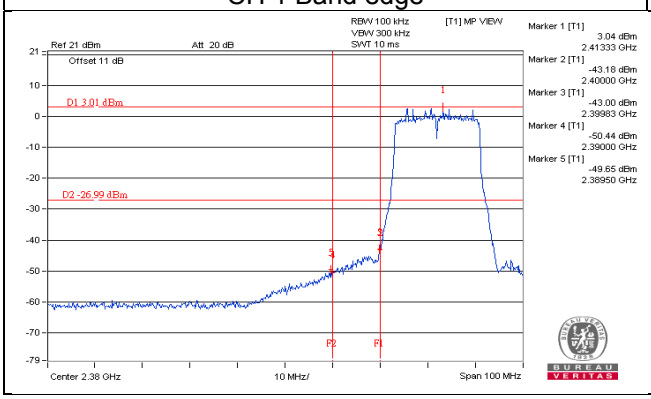
CH 6



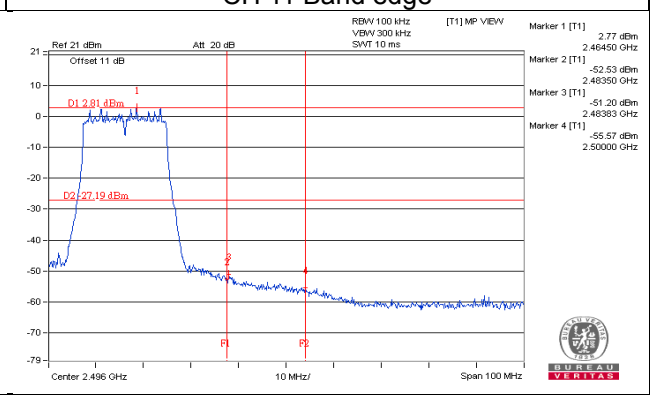
CH 11



CH 1 Band edge

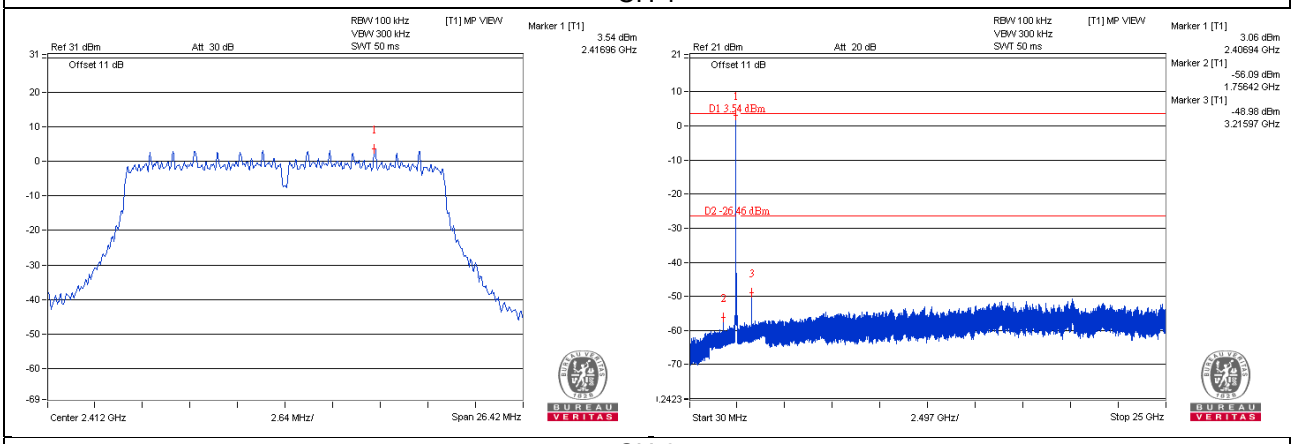


CH 11 Band edge

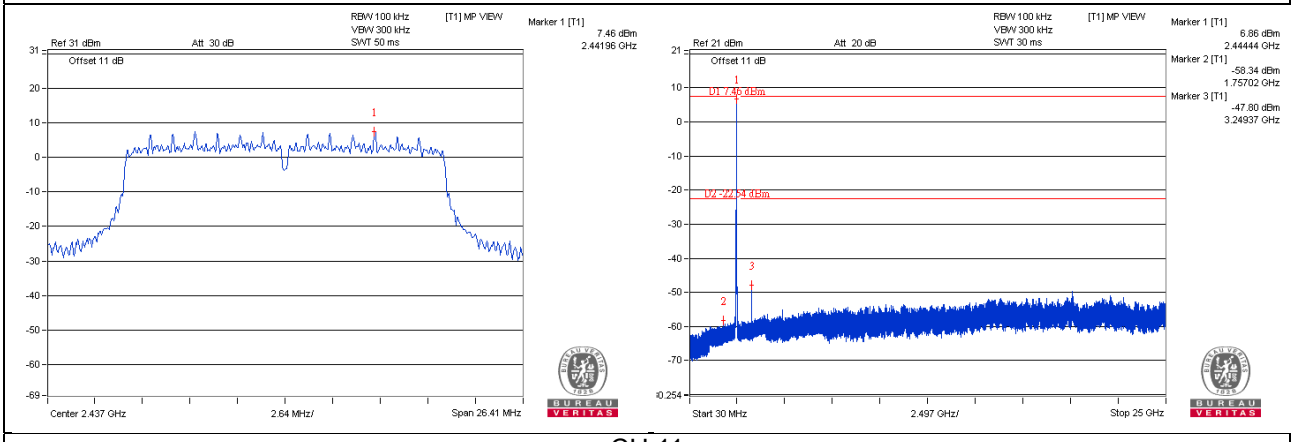


802.11n (HT20)_Chain 1

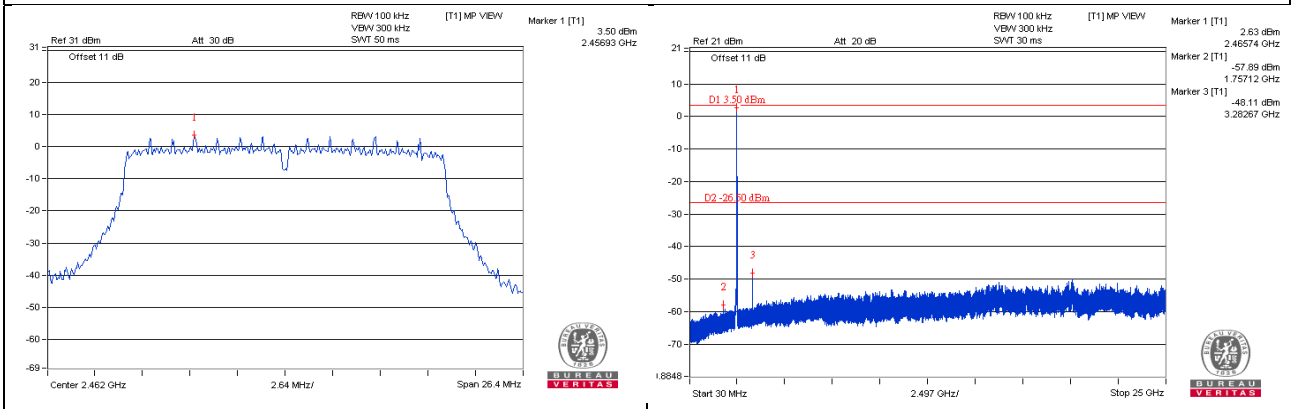
CH 1



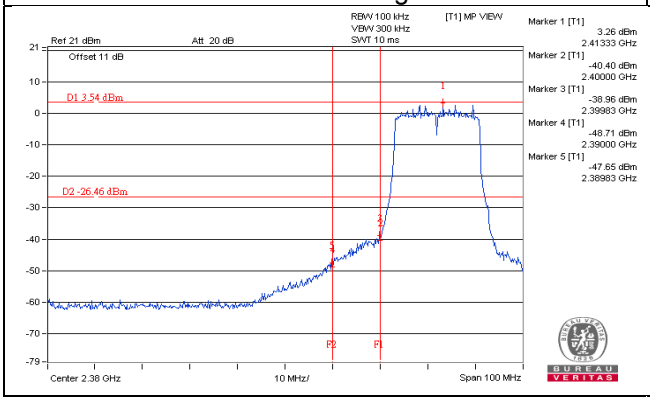
CH 6



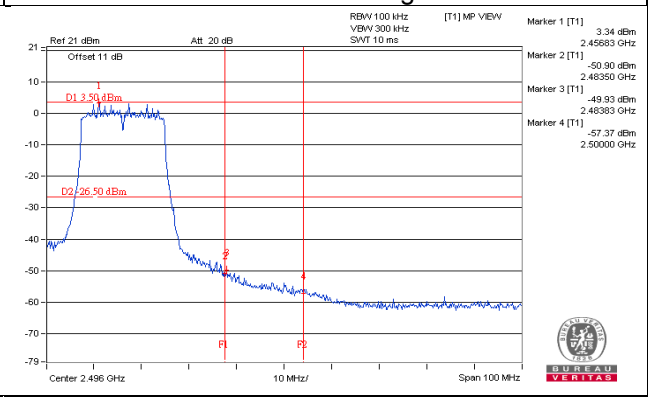
CH 11



CH 1 Band edge

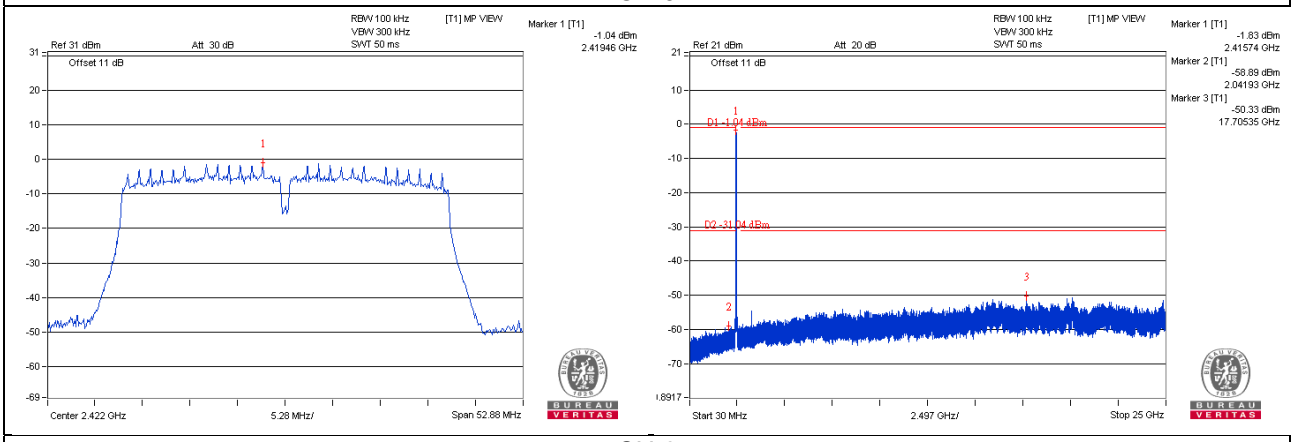


CH 11 Band edge

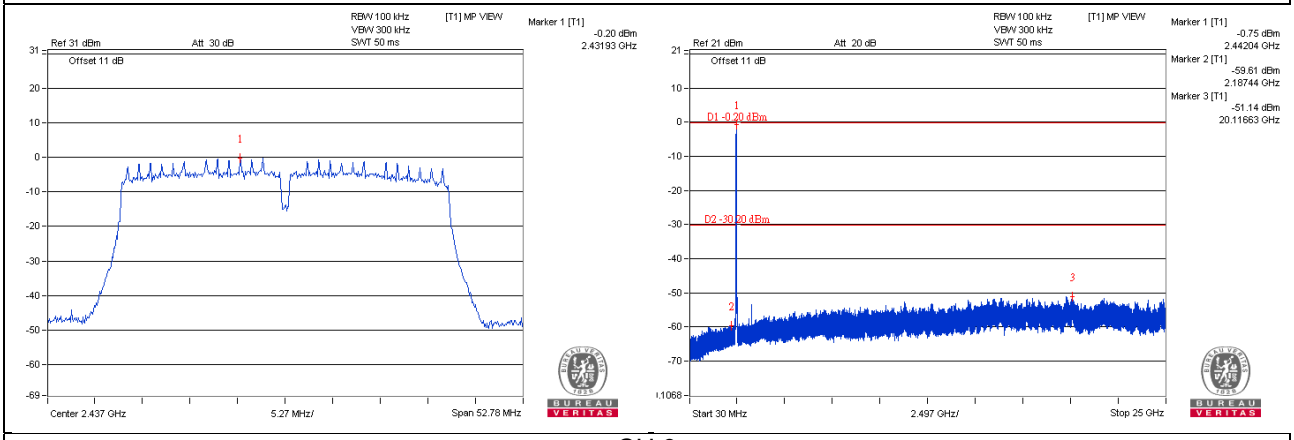


802.11n (HT40)_Chain 0

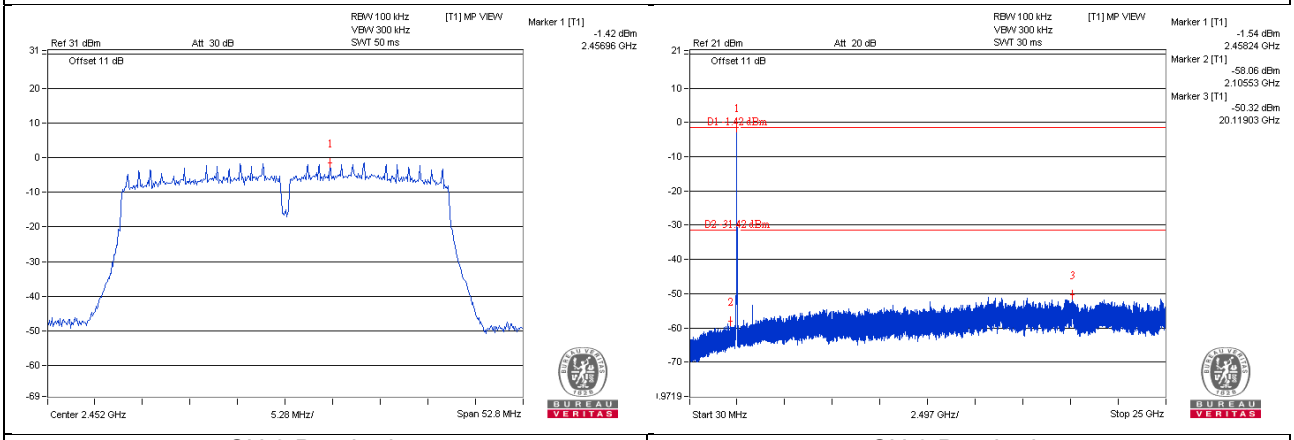
CH 3



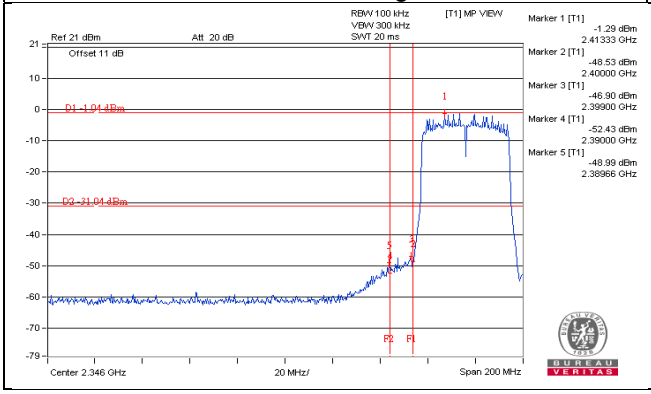
CH 6



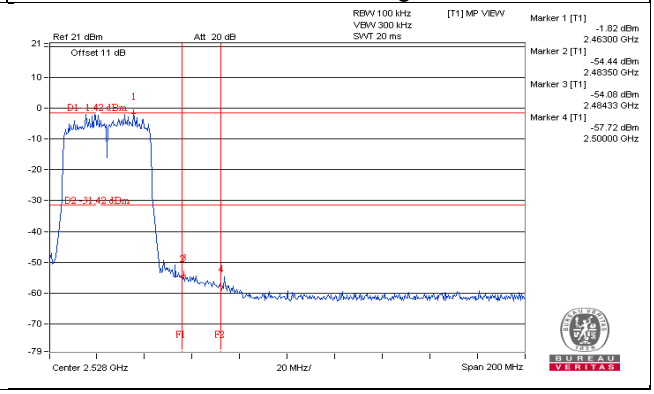
CH 9



CH 3 Band edge

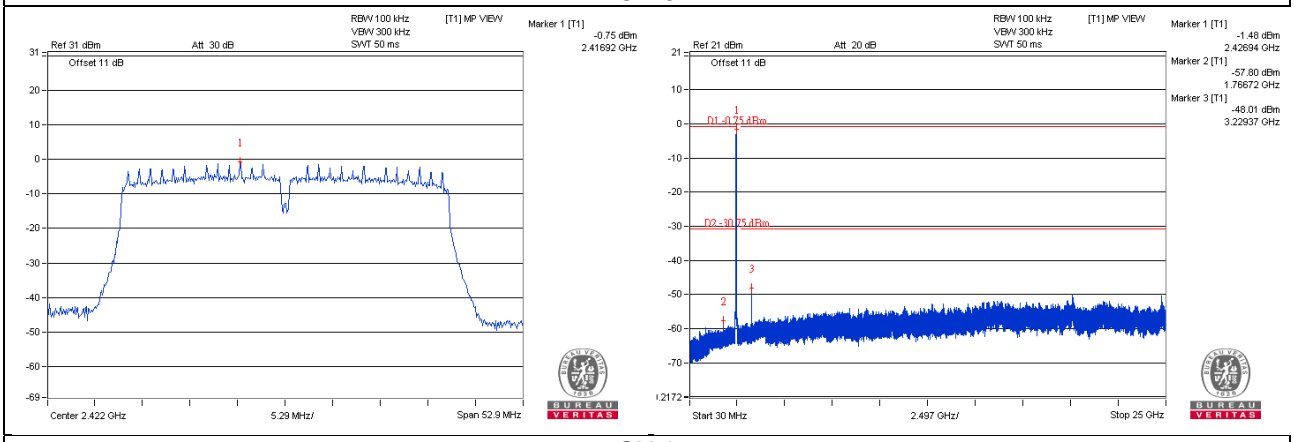


CH 9 Band edge

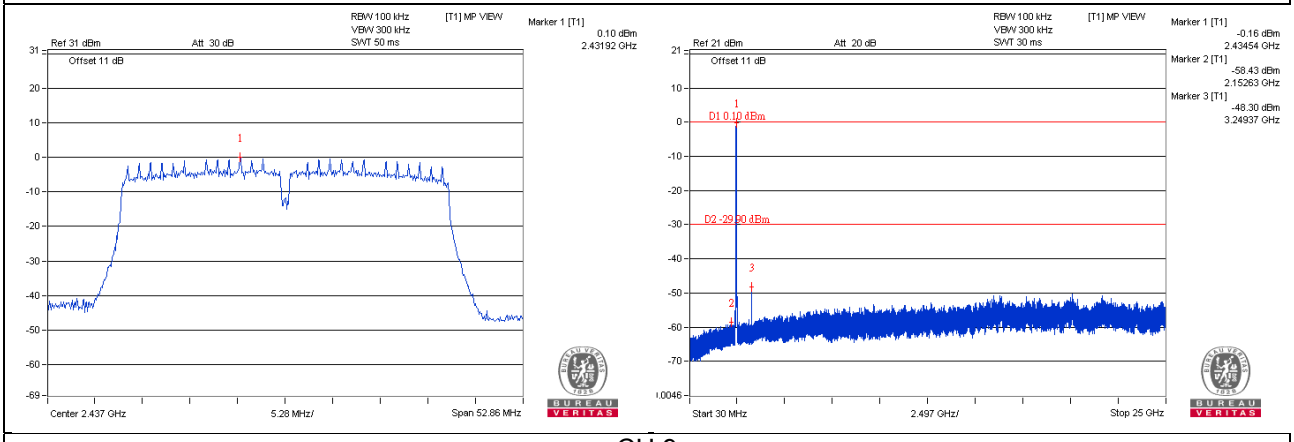


802.11n (HT40)_Chain 1

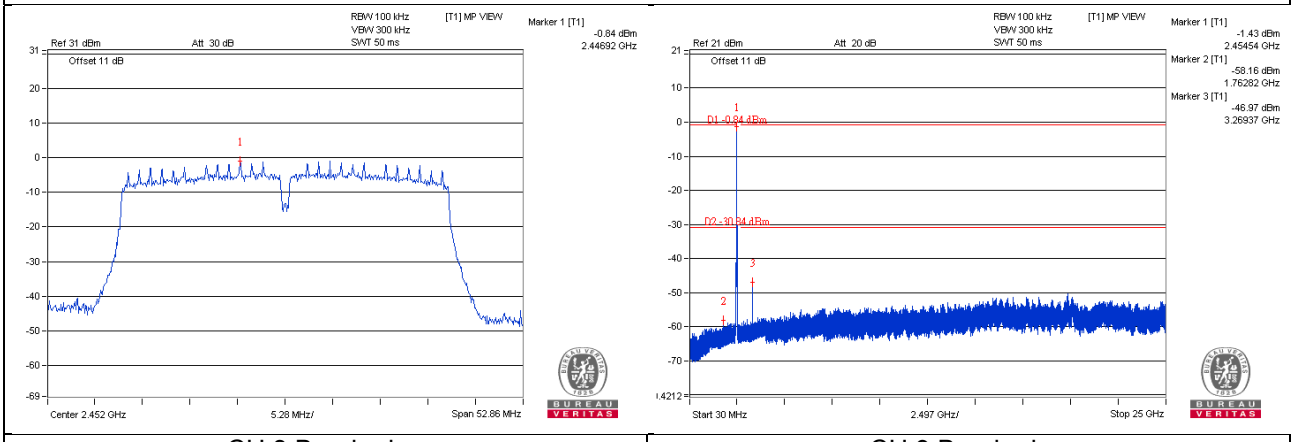
CH 3



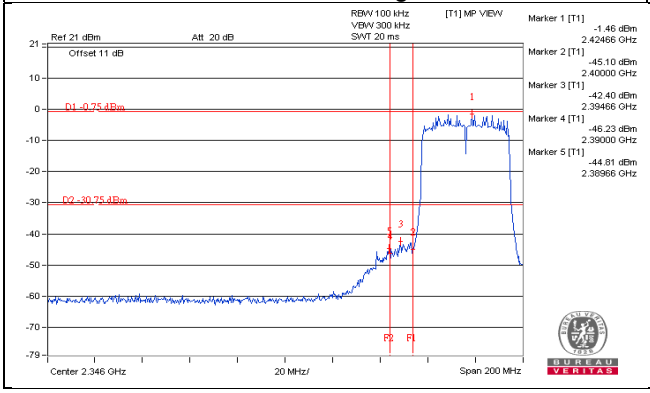
CH 6



CH 9



CH 3 Band edge



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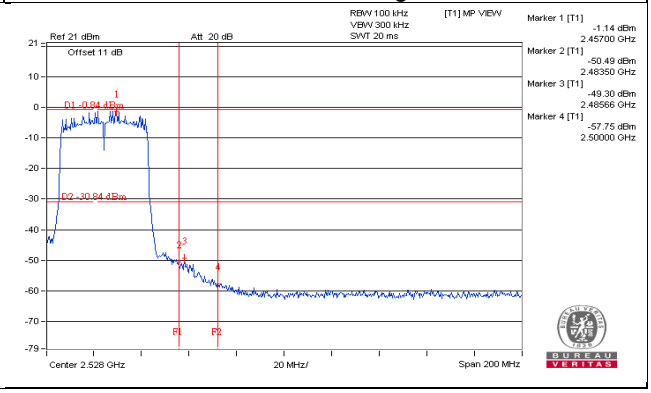

5 Pictures of Test Arrangements

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

Appendix – Information on 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 accredited and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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