

FCC Test Report

Report No.: RF161017C10

FCC ID: 2ADYF-OAP30

Test Model: OAP30

Received Date: Oct. 17, 2016

Test Date: Oct. 22 ~ Nov. 11, 2016

Issued Date: Nov. 17, 2016

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Release Control Record

Issue No.	Description	Date Issued
RF161017C10	Original release	Nov. 17, 2016

1 Certificate of Conformity

Product: 802.11 abgn/ac Access Point

Brand: KodaCloud

Test Model: OAP30

Sample Status: Engineering sample

Applicant: KodaCloud, Inc.

Test Date: Oct. 22 ~ Nov. 11, 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 : Celine Chou , **Date:** Nov. 17, 2016
Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Nov. 17, 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 -5.21dB at 0.52109MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1dB at 2390.00MHz and 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is N-Type. (The device is professionally installed)

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 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	802.11 abgn/ac Access Point
Brand	KodaCloud
Test Model	OAP30
Sample Status	Engineering sample
Power Supply Rating	54Vdc (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 450Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	792.027mW
Antenna Type	Dipole antenna with 4.5dBi gain
Antenna Connector	N-Type (The device is professionally installed)
Accessory Device	1.8m non-shielded ground cable without core
Data Cable Supplied	NA

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 3 completed transmitters and 3 receivers.

Modulation Mode	TX Function
802.11b	3TX
802.11g	3TX
802.11n (HT20)	3TX
802.11n (HT40)	3TX

2. The EUT consumes power from the following POE. (support unit only)

Brand	SENAO
Model	EPA5006GAT
Input Power	100-240Vac, 0.8A, 50-60Hz
Output Power	54Vdc, 0.6A
Power Line	0.5m power cable without core

3. 2.4GHz and 5GHz technology can transmit at same time.
4. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g 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

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	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

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	6	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	6	DSSS	DBPSK	1.0

Antenna Port Conducted Measurement:

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	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	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE \geq 1G	21deg. C, 66%RH	120Vac, 60Hz	Jones Chang
RE<1G	21deg. C, 66%RH	120Vac, 60Hz	Jones Chang
PLC	25deg. C, 68%RH	120Vac, 60Hz	Jones Chang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Nick Hsu

3.3 Duty Cycle of Test Signal

802.11b: Duty cycle of test signal is 100 %, duty factor is not required.

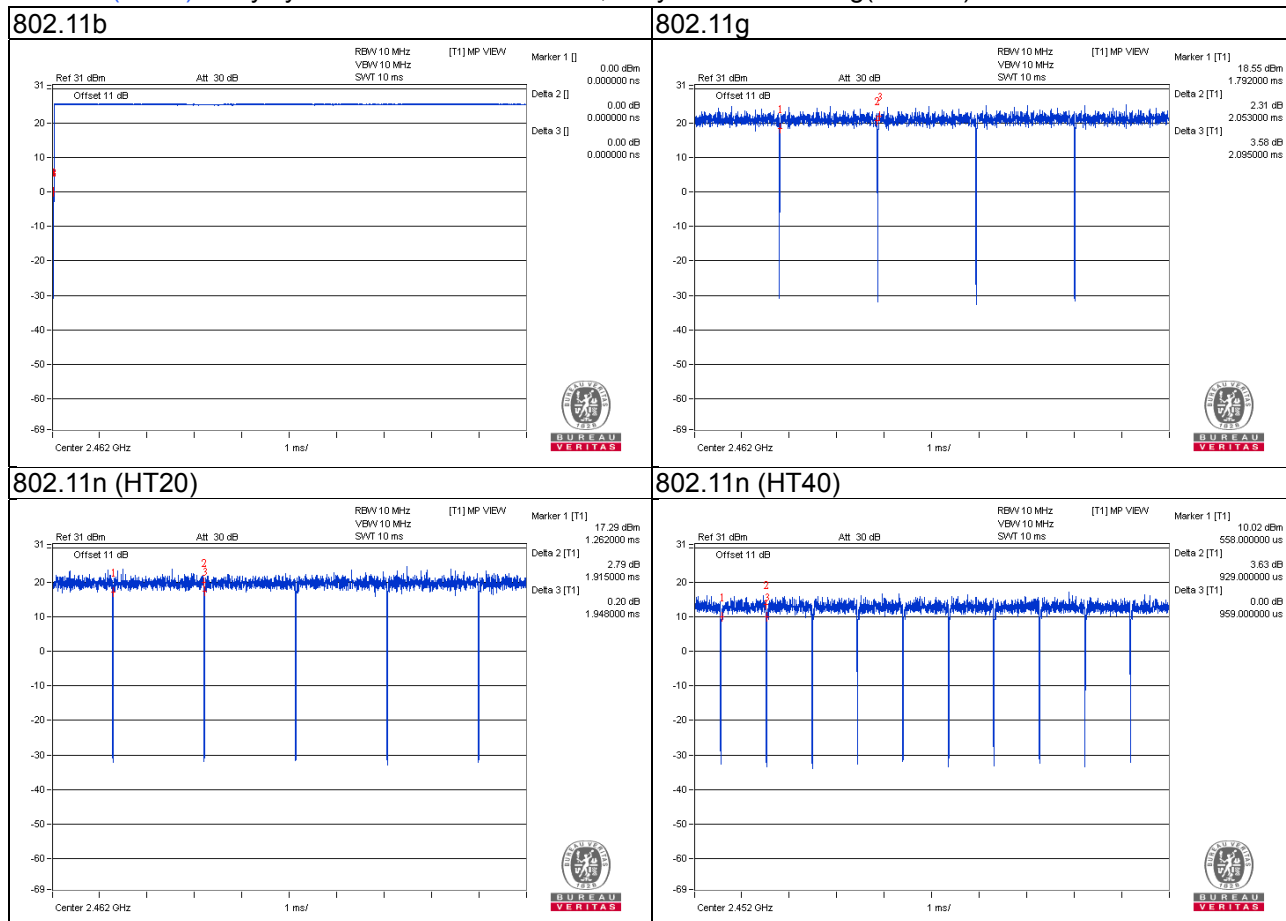
802.11g, 802.11n (HT20): Duty cycle of test signal is > 98 %, duty factor is not required.

802.11n (HT40): Duty cycle of test signal is < 98 %, duty factor is required.

802.11g: Duty cycle = $2.053/2.095 = 0.980$

802.11n (HT20): Duty cycle = $1.915/1.948 = 0.983$

802.11n (HT40): Duty cycle = $0.929/0.959 = 0.969$, Duty factor = $10 * \log(1/0.969) = 0.14$



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.

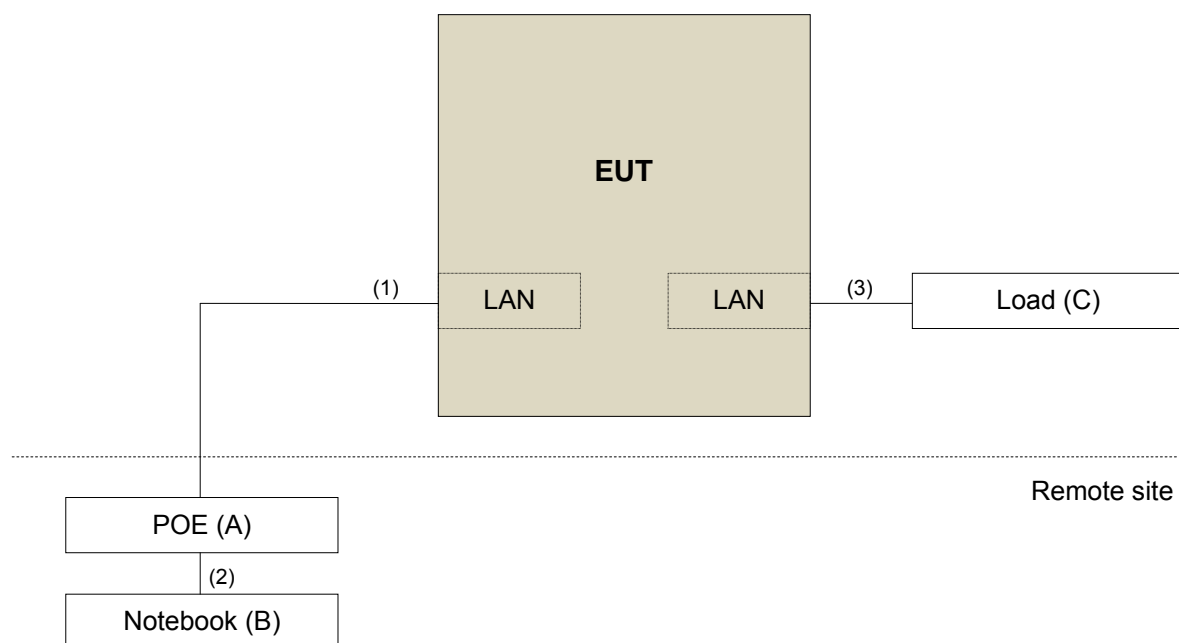
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	POE	SENAO	EPA5006GAT	NA	NA	Provided by manufacturer
B.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
C.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	1	10	N	0	Cat5e
2.	LAN cable	1	1.8	N	0	Cat5e
3.	LAN cable	1	1.8	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 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	100041	Sep. 02, 2016	Sep. 01, 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
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Preamplifier Agilent	8447D	2944A10738	Aug. 22, 2016	Aug. 21, 2017
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2016	Aug. 21, 2017
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	Aug. 11, 2016	Aug. 10, 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:

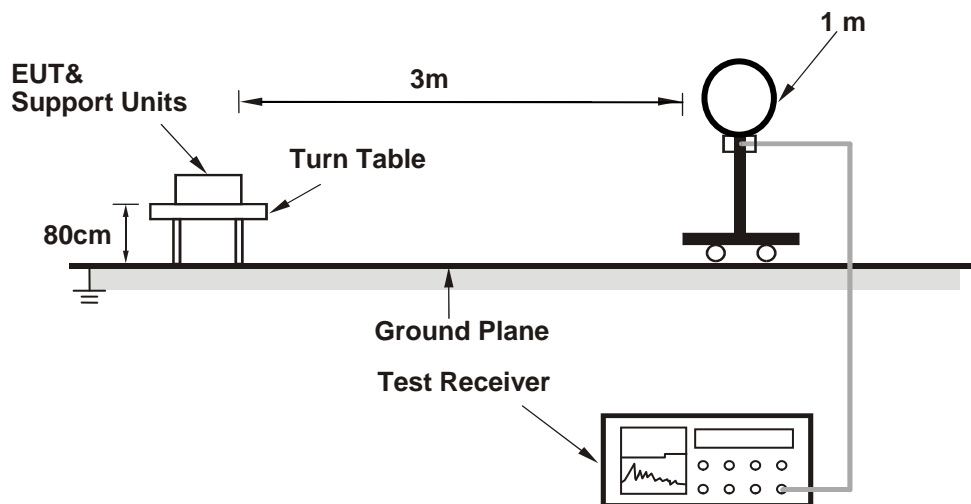
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

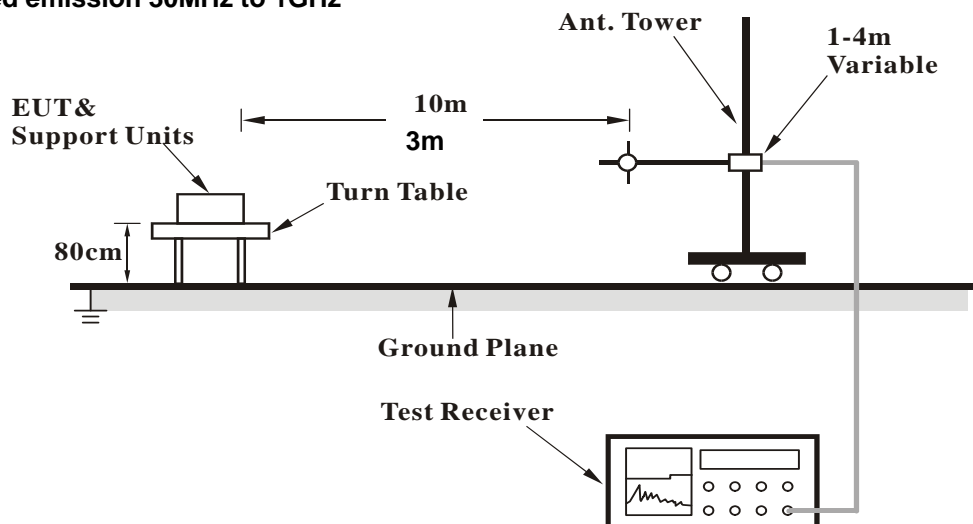
No deviation.

4.1.5 Test Set Up

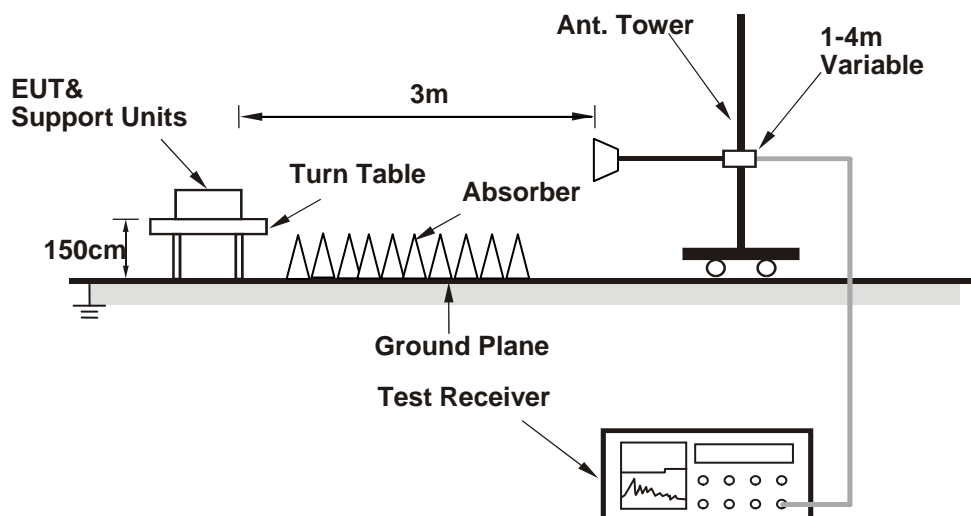
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- 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.
- The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz worst-Case data:

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2387.00	55.8 PK	74.0	-18.2	2.89 H	214	24.9	30.9
2	2387.00	43.1 AV	54.0	-10.9	2.89 H	214	12.2	30.9
3	*2412.00	99.8 PK			3.06 H	195	68.7	31.1
4	*2412.00	95.8 AV			3.06 H	195	64.7	31.1
5	4824.00	46.6 PK	74.0	-27.4	2.76 H	188	42.1	4.5
6	4824.00	33.4 AV	54.0	-20.6	2.76 H	188	28.9	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2387.00	61.2 PK	74.0	-12.8	1.94 V	46	30.3	30.9
2	2387.00	52.5 AV	54.0	-1.5	1.94 V	46	21.6	30.9
3	*2412.00	117.6 PK			1.91 V	53	86.5	31.1
4	*2412.00	113.8 AV			1.91 V	53	82.7	31.1
5	4824.00	48.2 PK	74.0	-25.8	1.59 V	66	43.7	4.5
6	4824.00	36.2 AV	54.0	-17.8	1.59 V	66	31.7	4.5

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.7 PK	74.0	-19.3	1.64 H	135	23.8	30.9
2	2390.00	43.0 AV	54.0	-11.0	1.64 H	135	12.1	30.9
3	*2437.00	99.4 PK			1.44 H	112	68.3	31.1
4	*2437.00	95.4 AV			1.44 H	112	64.3	31.1
5	2483.50	55.6 PK	74.0	-18.4	1.48 H	110	24.3	31.3
6	2483.50	43.5 AV	54.0	-10.5	1.48 H	110	12.2	31.3
7	4874.00	46.8 PK	74.0	-27.2	2.51 H	222	42.2	4.6
8	4874.00	33.9 AV	54.0	-20.1	2.51 H	222	29.3	4.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.3 PK	74.0	-16.7	1.67 V	344	26.4	30.9
2	2390.00	44.9 AV	54.0	-9.1	1.67 V	344	14.0	30.9
3	*2437.00	121.4 PK			1.59 V	343	90.3	31.1
4	*2437.00	117.6 AV			1.59 V	343	86.5	31.1
5	2483.50	60.2 PK	74.0	-13.8	1.83 V	349	28.9	31.3
6	2483.50	47.4 AV	54.0	-6.6	1.83 V	349	16.1	31.3
7	4874.00	46.9 PK	74.0	-27.1	1.86 V	53	42.3	4.6
8	4874.00	33.9 AV	54.0	-20.1	1.86 V	53	29.3	4.6

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	96.8 PK			3.07 H	4	65.6	31.2
2	*2462.00	93.0 AV			3.07 H	4	61.8	31.2
3	2483.50	55.3 PK	74.0	-18.7	3.01 H	12	24.0	31.3
4	2483.50	43.5 AV	54.0	-10.5	3.01 H	12	12.2	31.3
5	4924.00	46.8 PK	74.0	-27.2	2.76 H	148	42.3	4.5
6	4924.00	33.7 AV	54.0	-20.3	2.76 H	148	29.2	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	114.6 PK			2.00 V	58	83.4	31.2
2	*2462.00	111.7 AV			2.00 V	58	80.5	31.2
3	2483.50	63.4 PK	74.0	-10.6	1.62 V	350	32.1	31.3
4	2483.50	52.3 AV	54.0	-1.7	1.62 V	350	21.0	31.3
5	4924.00	49.0 PK	74.0	-25.0	2.19 V	229	44.5	4.5
6	4924.00	36.2 AV	54.0	-17.8	2.19 V	229	31.7	4.5

Remarks:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.2 PK	74.0	-17.8	1.62 H	133	25.3	30.9
2	2390.00	44.0 AV	54.0	-10.0	1.62 H	133	13.1	30.9
3	*2412.00	99.9 PK			1.62 H	132	68.8	31.1
4	*2412.00	90.6 AV			1.62 H	132	59.5	31.1
5	4824.00	46.1 PK	74.0	-27.9	1.97 H	179	41.6	4.5
6	4824.00	33.9 AV	54.0	-20.1	1.97 H	179	29.4	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.3 PK	74.0	-5.7	1.71 V	143	37.4	30.9
2	2390.00	52.9 AV	54.0	-1.1	1.71 V	143	22.0	30.9
3	*2412.00	113.8 PK			1.66 V	194	82.7	31.1
4	*2412.00	104.4 AV			1.66 V	194	73.3	31.1
5	4824.00	46.3 PK	74.0	-27.7	1.89 V	212	41.8	4.5
6	4824.00	34.1 AV	54.0	-19.9	1.89 V	212	29.6	4.5

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.3 PK	74.0	-18.7	1.60 H	19	24.4	30.9
2	2390.00	43.8 AV	54.0	-10.2	1.60 H	19	12.9	30.9
3	*2437.00	101.9 PK			3.18 H	24	70.8	31.1
4	*2437.00	92.7 AV			3.18 H	24	61.6	31.1
5	2483.50	54.6 PK	74.0	-19.4	3.00 H	356	23.3	31.3
6	2483.50	44.8 AV	54.0	-9.2	3.00 H	356	13.5	31.3
7	4874.00	47.6 PK	74.0	-26.4	1.99 H	279	43.0	4.6
8	4874.00	35.1 AV	54.0	-18.9	1.99 H	279	30.5	4.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.8 PK	74.0	-15.2	1.70 V	2	27.9	30.9
2	2390.00	48.4 AV	54.0	-5.6	1.70 V	2	17.5	30.9
3	*2437.00	121.3 PK			1.63 V	148	90.2	31.1
4	*2437.00	112.1 AV			1.63 V	148	81.0	31.1
5	2483.50	65.1 PK	74.0	-8.9	1.88 V	339	33.8	31.3
6	2483.50	51.8 AV	54.0	-2.2	1.88 V	339	20.5	31.3
7	4874.00	47.3 PK	74.0	-26.7	2.00 V	238	42.7	4.6
8	4874.00	35.2 AV	54.0	-18.8	2.00 V	238	30.6	4.6

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	95.0 PK			2.71 H	18	63.8	31.2
2	*2462.00	86.0 AV			2.71 H	18	54.8	31.2
3	2483.50	54.9 PK	74.0	-19.1	2.66 H	22	23.6	31.3
4	2483.50	43.4 AV	54.0	-10.6	2.66 H	22	12.1	31.3
5	4924.00	46.2 PK	74.0	-27.8	1.95 H	100	41.7	4.5
6	4924.00	34.3 AV	54.0	-19.7	1.95 H	100	29.8	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.3 PK			1.67 V	328	84.1	31.2
2	*2462.00	106.1 AV			1.67 V	328	74.9	31.2
3	2483.50	69.8 PK	74.0	-4.2	1.62 V	182	38.5	31.3
4	2483.50	52.8 AV	54.0	-1.2	1.62 V	182	21.5	31.3
5	4924.00	45.2 PK	74.0	-28.8	1.00 V	228	40.7	4.5
6	4924.00	33.2 AV	54.0	-20.8	1.00 V	228	28.7	4.5

Remarks:

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

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.6 PK	74.0	-18.4	1.45 H	198	24.7	30.9
2	2390.00	44.5 AV	54.0	-9.5	1.45 H	198	13.6	30.9
3	*2412.00	94.2 PK			1.45 H	198	63.1	31.1
4	*2412.00	83.9 AV			1.45 H	198	52.8	31.1
5	4824.00	45.9 PK	74.0	-28.1	2.01 H	300	41.4	4.5
6	4824.00	33.8 AV	54.0	-20.2	2.01 H	300	29.3	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.7 PK	74.0	-2.3	1.95 V	0	40.8	30.9
2	2390.00	52.9 AV	54.0	-1.1	1.95 V	0	22.0	30.9
3	*2412.00	113.1 PK			1.85 V	0	82.0	31.1
4	*2412.00	103.1 AV			1.85 V	0	72.0	31.1
5	4824.00	44.6 PK	74.0	-29.4	1.66 V	222	40.1	4.5
6	4824.00	32.6 AV	54.0	-21.4	1.66 V	222	28.1	4.5

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	52.8 PK	74.0	-21.2	2.60 H	100	21.9	30.9
2	2390.00	43.9 AV	54.0	-10.1	2.60 H	100	13.0	30.9
3	*2437.00	101.4 PK			2.76 H	122	70.3	31.1
4	*2437.00	91.5 AV			2.76 H	122	60.4	31.1
5	2483.50	54.4 PK	74.0	-19.6	1.54 H	200	23.1	31.3
6	2483.50	43.8 AV	54.0	-10.2	1.54 H	200	12.5	31.3
7	4874.00	47.4 PK	74.0	-26.6	2.22 H	19	42.8	4.6
8	4874.00	35.1 AV	54.0	-18.9	2.22 H	19	30.5	4.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.9 PK	74.0	-11.1	1.69 V	155	32.0	30.9
2	2390.00	48.0 AV	54.0	-6.0	1.69 V	155	17.1	30.9
3	*2437.00	119.9 PK			1.78 V	147	88.8	31.1
4	*2437.00	110.7 AV			1.78 V	147	79.6	31.1
5	2483.50	63.0 PK	74.0	-11.0	1.78 V	147	31.7	31.3
6	2483.50	51.2 AV	54.0	-2.8	1.78 V	147	19.9	31.3
7	4874.00	46.8 PK	74.0	-27.2	1.86 V	326	42.2	4.6
8	4874.00	34.8 AV	54.0	-19.2	1.86 V	326	30.2	4.6

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	93.5 PK			1.46 H	199	62.3	31.2
2	*2462.00	83.0 AV			1.46 H	199	51.8	31.2
3	2483.50	55.3 PK	74.0	-18.7	1.50 H	200	24.0	31.3
4	2483.50	44.5 AV	54.0	-9.5	1.50 H	200	13.2	31.3
5	4924.00	45.4 PK	74.0	-28.6	1.89 H	179	40.9	4.5
6	4924.00	32.2 AV	54.0	-21.8	1.89 H	179	27.7	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	112.2 PK			2.00 V	145	81.0	31.2
2	*2462.00	102.0 AV			2.00 V	145	70.8	31.2
3	2483.50	72.4 PK	74.0	-1.6	1.91 V	333	41.1	31.3
4	2483.50	52.5 AV	54.0	-1.5	1.91 V	333	21.2	31.3
5	4924.00	46.5 PK	74.0	-27.5	2.10 V	44	42.0	4.5
6	4924.00	32.8 AV	54.0	-21.2	2.10 V	44	28.3	4.5

Remarks:

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

802.11n (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.9 PK	74.0	-19.1	1.50 H	202	24.0	30.9
2	2390.00	43.5 AV	54.0	-10.5	1.50 H	202	12.6	30.9
3	*2422.00	91.1 PK			1.45 H	197	60.0	31.1
4	*2422.00	80.2 AV			1.45 H	197	49.1	31.1
5	4844.00	46.7 PK	74.0	-27.3	1.86 H	233	42.3	4.4
6	4844.00	33.7 AV	54.0	-20.3	1.86 H	233	29.3	4.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.1 PK	74.0	-8.9	1.88 V	144	34.2	30.9
2	2390.00	52.7 AV	54.0	-1.3	1.88 V	144	21.8	30.9
3	*2422.00	107.4 PK			1.91 V	141	76.3	31.1
4	*2422.00	98.2 AV			1.91 V	141	67.1	31.1
5	4844.00	44.6 PK	74.0	-29.4	2.10 V	229	40.2	4.4
6	4844.00	32.4 AV	54.0	-21.6	2.10 V	229	28.0	4.4

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	93.4 PK			1.17 H	136	62.3	31.1
2	*2437.00	84.0 AV			1.17 H	136	52.9	31.1
3	2483.50	55.6 PK	74.0	-18.4	1.23 H	150	24.3	31.3
4	2483.50	45.1 AV	54.0	-8.9	1.23 H	150	13.8	31.3
5	4874.00	46.5 PK	74.0	-27.5	2.50 H	311	41.9	4.6
6	4874.00	32.7 AV	54.0	-21.3	2.50 H	311	28.1	4.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	110.4 PK			1.83 V	143	79.3	31.1
2	*2437.00	101.3 AV			1.83 V	143	70.2	31.1
3	2483.50	71.3 PK	74.0	-2.7	1.87 V	147	40.0	31.3
4	2483.50	52.7 AV	54.0	-1.3	1.87 V	147	21.4	31.3
5	4874.00	48.0 PK	74.0	-26.0	1.90 V	0	43.4	4.6
6	4874.00	35.4 AV	54.0	-18.6	1.90 V	0	30.8	4.6

Remarks:

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	89.8 PK			1.45 H	132	58.6	31.2
2	*2452.00	80.2 AV			1.45 H	132	49.0	31.2
3	2483.50	55.4 PK	74.0	-18.6	1.45 H	132	24.1	31.3
4	2483.50	44.4 AV	54.0	-9.6	1.45 H	132	13.1	31.3
5	4904.00	45.1 PK	74.0	-28.9	1.77 H	259	40.6	4.5
6	4904.00	31.9 AV	54.0	-22.1	1.77 H	259	27.4	4.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	107.1 PK			1.83 V	333	75.9	31.2
2	*2452.00	97.1 AV			1.83 V	333	65.9	31.2
3	2483.50	71.1 PK	74.0	-2.9	1.96 V	327	39.8	31.3
4	2483.50	52.9 AV	54.0	-1.1	1.96 V	327	21.6	31.3
5	4904.00	46.0 PK	74.0	-28.0	2.33 V	354	41.5	4.5
6	4904.00	33.8 AV	54.0	-20.2	2.33 V	354	29.3	4.5

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. " * " : Fundamental frequency.

Below 1GHz worst-case data:

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	29.3 QP	40.0	-10.7	2.00 H	264	43.9	-14.6
2	96.01	23.8 QP	43.5	-19.7	2.00 H	245	43.2	-19.4
3	167.94	24.0 QP	43.5	-19.5	1.49 H	261	38.0	-14.0
4	241.83	23.4 QP	46.0	-22.6	1.00 H	117	37.8	-14.4
5	288.49	22.6 QP	46.0	-23.4	1.00 H	239	35.0	-12.4
6	799.84	33.9 QP	46.0	-12.1	1.00 H	131	35.4	-1.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	35.56	32.8 QP	40.0	-7.2	1.00 V	66	48.4	-15.6
2	61.40	34.1 QP	40.0	-5.9	1.00 V	6	49.2	-15.1
3	96.01	37.8 QP	43.5	-5.7	1.00 V	273	57.2	-19.4
4	234.05	32.3 QP	46.0	-13.7	1.00 V	214	47.6	-15.3
5	356.54	27.9 QP	46.0	-18.1	1.00 V	60	38.9	-11.0
6	729.84	29.8 QP	46.0	-16.2	1.00 V	27	32.5	-2.7

Remarks:

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

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_Conc_ 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

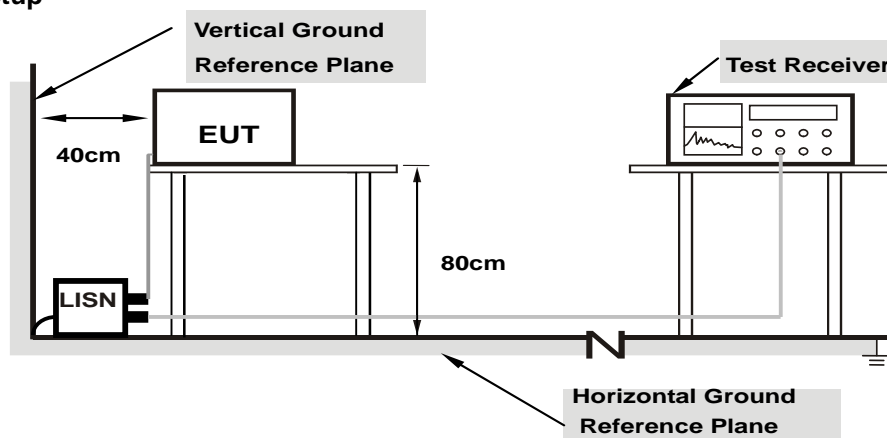
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

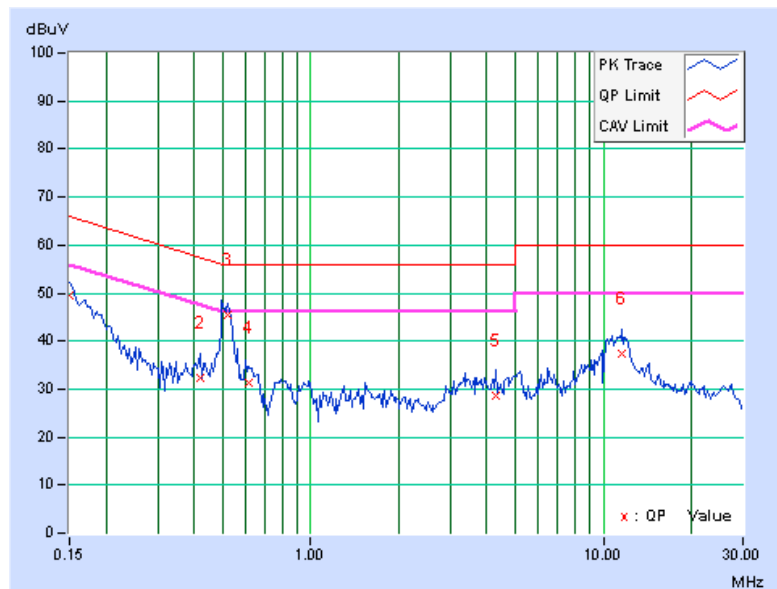
4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.18	39.19	25.57	49.37	35.75	66.00	56.00	-16.63	-20.25
2	0.41953	10.24	21.93	16.01	32.17	26.25	57.46	47.46	-25.29	-21.21
3	0.52109	10.25	35.09	30.54	45.34	40.79	56.00	46.00	-10.66	-5.21
4	0.61094	10.26	21.19	15.95	31.45	26.21	56.00	46.00	-24.55	-19.79
5	4.28906	10.42	18.16	11.05	28.58	21.47	56.00	46.00	-27.42	-24.53
6	11.62109	10.55	26.97	22.06	37.52	32.61	60.00	50.00	-22.48	-17.39

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.

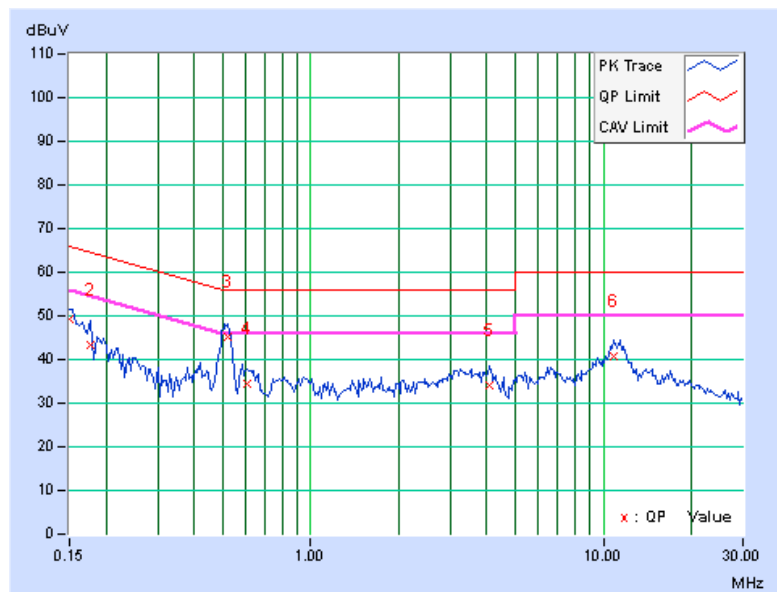


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.19	38.99	25.65	49.18	35.84	66.00	56.00	-16.82	-20.16
2	0.17734	10.20	33.31	18.82	43.51	29.02	64.61	54.61	-21.10	-25.59
3	0.52109	10.30	34.74	29.93	45.04	40.23	56.00	46.00	-10.96	-5.77
4	0.60313	10.30	24.12	18.81	34.42	29.11	56.00	46.00	-21.58	-16.89
5	4.07422	10.55	23.64	18.59	34.19	29.14	56.00	46.00	-21.81	-16.86
6	10.85938	10.63	29.93	25.13	40.56	35.76	60.00	50.00	-19.44	-14.24

Remarks:

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

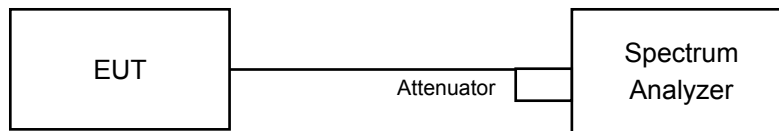


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = average.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	8.59	9.07	9.07	0.5	Pass
6	2437	8.59	9.08	9.10	0.5	Pass
11	2462	9.05	8.58	9.03	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.42	16.42	16.42	0.5	Pass
6	2437	16.36	16.37	16.37	0.5	Pass
11	2462	16.38	16.38	16.41	0.5	Pass

802.11n (HT20)

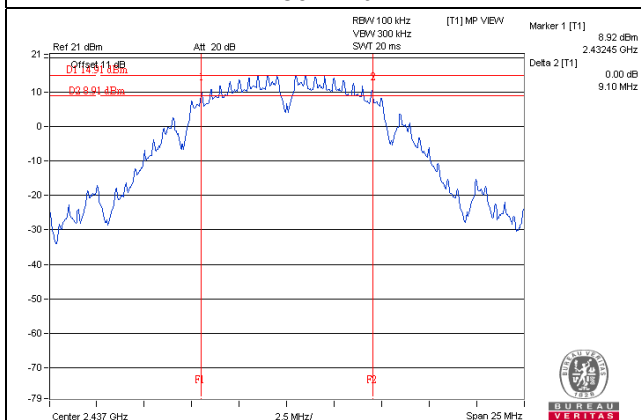
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	17.63	17.67	15.75	0.5	Pass
6	2437	17.35	17.63	17.62	0.5	Pass
11	2462	17.62	17.66	17.63	0.5	Pass

802.11n (HT40)

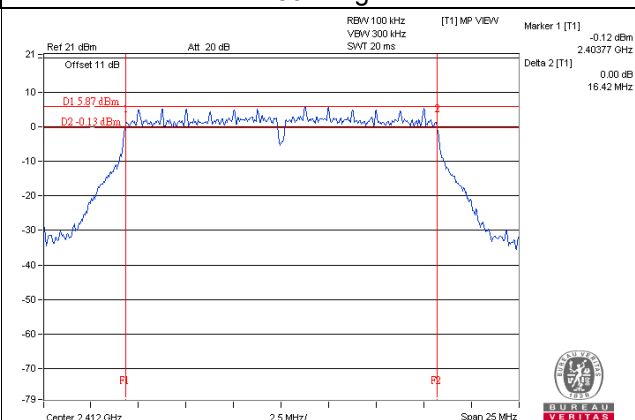
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	36.26	36.45	36.45	0.5	Pass
6	2437	36.13	36.42	36.39	0.5	Pass
9	2452	36.15	36.09	36.11	0.5	Pass

Spectrum Plot of Worst Value

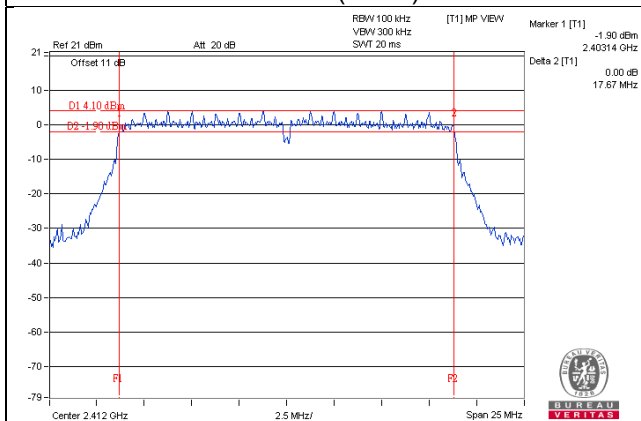
802.11b



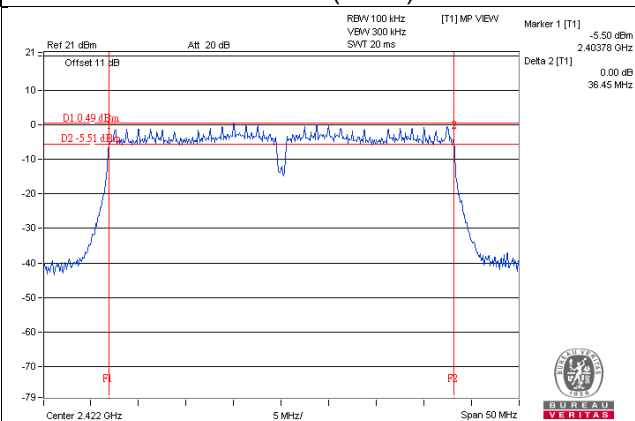
802.11g



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,

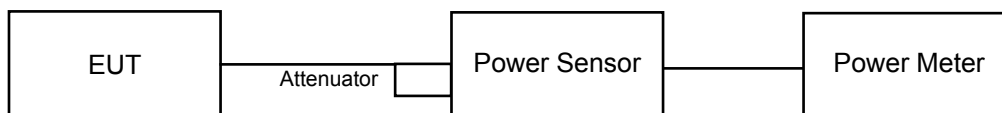
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

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 $NANT \geq 5$.

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

802.11b

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	23.64	23.72	23.16	673.725	28.28	30.00	Pass
6	2437	24.39	24.49	23.73	792.027	28.99	30.00	Pass
11	2462	21.94	21.78	20.71	424.737	26.28	30.00	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	17.09	17.16	16.18	144.663	21.60	30.00	Pass
6	2437	23.93	24.03	23.14	706.165	28.49	30.00	Pass
11	2462	16.22	16.25	15.23	117.392	20.70	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	15.86	15.68	14.77	105.523	20.23	30.00	Pass
6	2437	23.88	23.94	22.96	689.782	28.39	30.00	Pass
11	2462	15.06	15.17	13.78	88.826	19.49	30.00	Pass

802.11n (HT40)

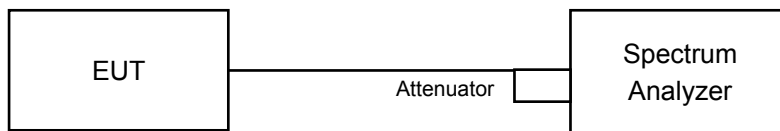
Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	13.93	14.29	12.90	71.068	18.52	30.00	Pass
6	2437	16.86	16.88	15.71	134.521	21.29	30.00	Pass
9	2452	12.22	12.78	11.55	49.928	16.98	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

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

Duty cycle $\geq 98\%$

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

Duty cycle $< 98\%$

- Measure the duty cycle (x).
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Do not use sweep triggering. Allow sweep to “free run”.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- Add $10 \log (1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Frequency (MHz)	PSD (dBm/10kHz)	10 log (N=3) dB	Total PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-4.29	4.77	0.48	4.73	Pass
	6	2437	-3.30	4.77	1.47	4.73	Pass
	11	2462	-5.53	4.77	-0.76	4.73	Pass
1	1	2412	-4.59	4.77	0.18	4.73	Pass
	6	2437	-3.76	4.77	1.01	4.73	Pass
	11	2462	-6.33	4.77	-1.56	4.73	Pass
2	1	2412	-5.34	4.77	-0.57	4.73	Pass
	6	2437	-4.68	4.77	0.09	4.73	Pass
	11	2462	-6.82	4.77	-2.05	4.73	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $4.5\text{dBi} + 10\log(3) = 9.27\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.27 - 6) = 4.73\text{dBm}$

802.11g

TX chain	Channel	Frequency (MHz)	PSD (dBm/10kHz)	10 log (N=3) dB	Total PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-12.61	4.77	-7.84	4.73	Pass
	6	2437	-5.47	4.77	-0.70	4.73	Pass
	11	2462	-13.25	4.77	-8.48	4.73	Pass
1	1	2412	-12.93	4.77	-8.16	4.73	Pass
	6	2437	-5.69	4.77	-0.92	4.73	Pass
	11	2462	-12.57	4.77	-7.80	4.73	Pass
2	1	2412	-13.73	4.77	-8.96	4.73	Pass
	6	2437	-6.21	4.77	-1.44	4.73	Pass
	11	2462	-13.81	4.77	-9.04	4.73	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $4.5\text{dBi} + 10\log(3) = 9.27\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.27 - 6) = 4.73\text{dBm}$

802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD (dBm/10kHz)	10 log (N=3) dB	Total PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-14.90	4.77	-10.13	4.73	Pass
	6	2437	-6.86	4.77	-2.09	4.73	Pass
	11	2462	-15.41	4.77	-10.64	4.73	Pass
1	1	2412	-15.61	4.77	-10.84	4.73	Pass
	6	2437	-7.14	4.77	-2.37	4.73	Pass
	11	2462	-15.50	4.77	-10.73	4.73	Pass
2	1	2412	-15.40	4.77	-10.63	4.73	Pass
	6	2437	-7.89	4.77	-3.12	4.73	Pass
	11	2462	-16.61	4.77	-11.84	4.73	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $4.5\text{dBi} + 10\log(3) = 9.27\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.27 - 6) = 4.73\text{dBm}$

802.11n (HT40)

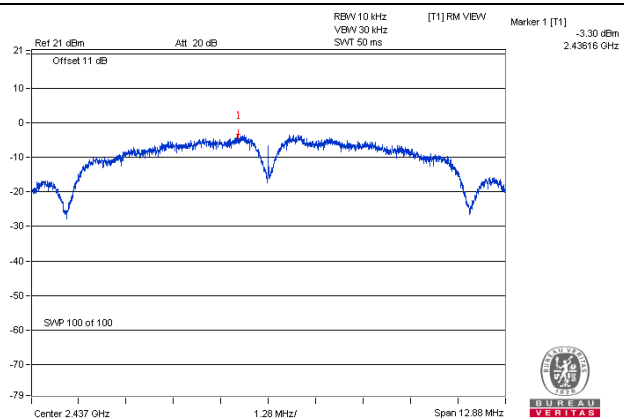
TX chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=3) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-19.32	4.77	0.14	-14.41	4.73	Pass
	6	2437	-16.26	4.77	0.14	-11.35	4.73	Pass
	9	2452	-20.48	4.77	0.14	-15.57	4.73	Pass
1	3	2422	-18.31	4.77	0.14	-13.40	4.73	Pass
	6	2437	-16.22	4.77	0.14	-11.31	4.73	Pass
	9	2452	-19.78	4.77	0.14	-14.87	4.73	Pass
2	3	2422	-20.46	4.77	0.14	-15.55	4.73	Pass
	6	2437	-17.56	4.77	0.14	-12.65	4.73	Pass
	9	2452	-21.57	4.77	0.14	-16.66	4.73	Pass

Note:

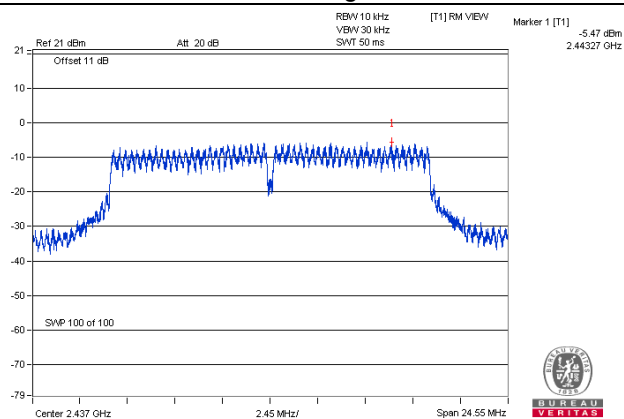
- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $4.5\text{dBi} + 10\log(3) = 9.27\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.27 - 6) = 4.73\text{dBm}$
- Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

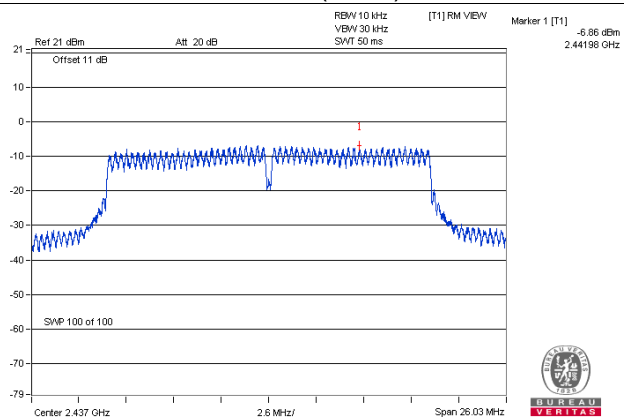
802.11b



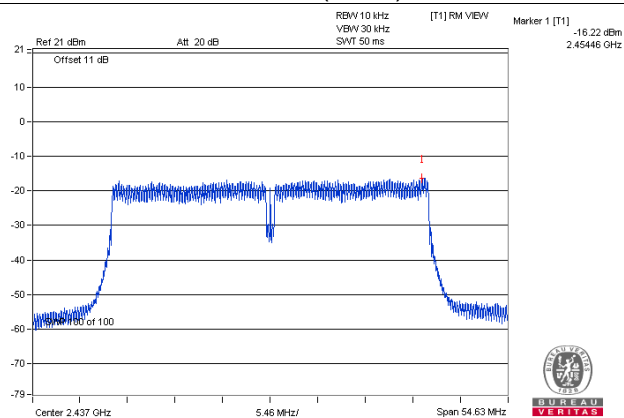
802.11g



802.11n (HT20)



802.11n (HT40)

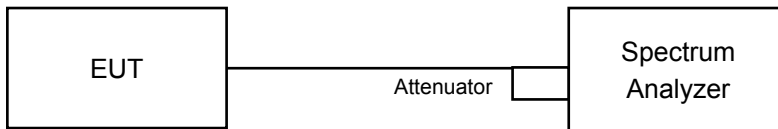


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW \geq 300 kHz.
- Ensure that the number of measurement points \geq span/RBW
- According to measurement points to set differ measurement span.
- Detector = average.
- Trace Mode = max hold.
- Sweep = auto couple.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

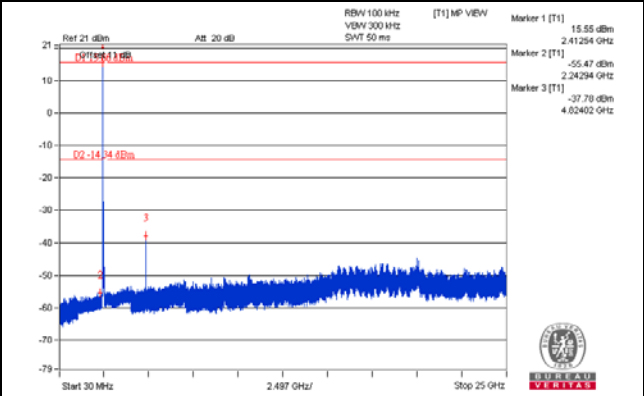
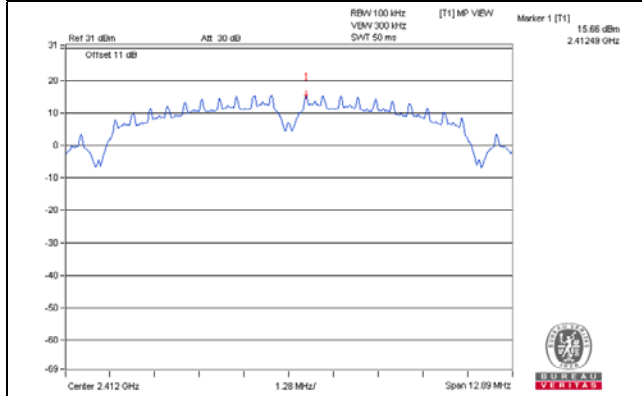
Same as Item 4.3.6

4.6.7 Test Results

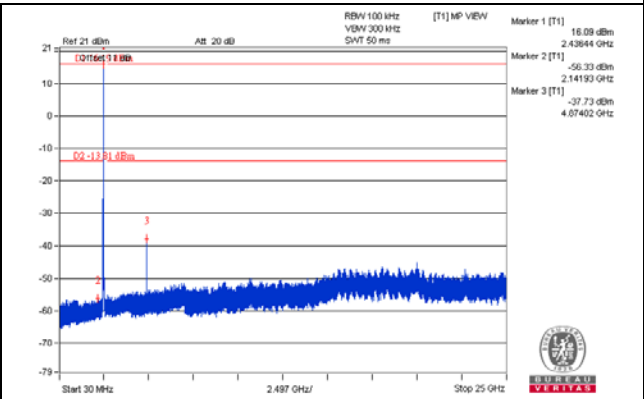
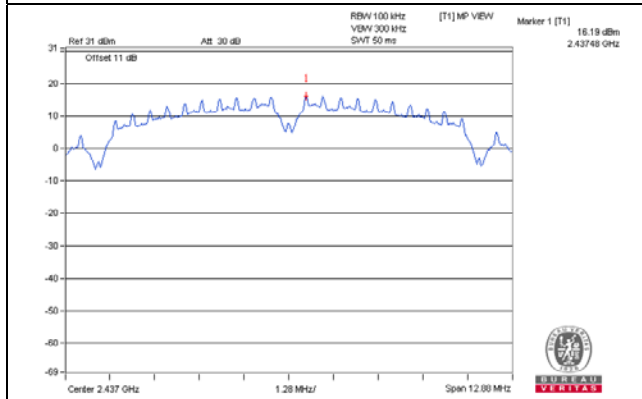
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

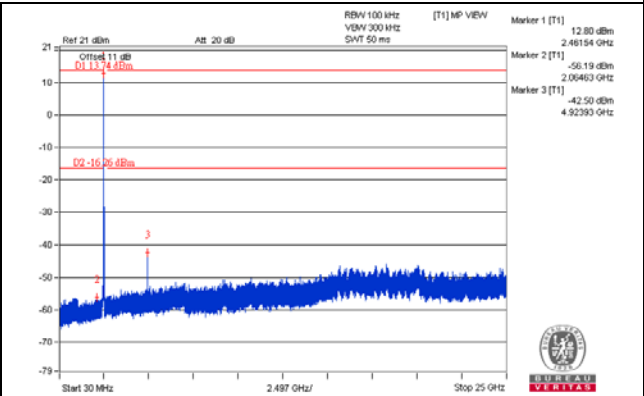
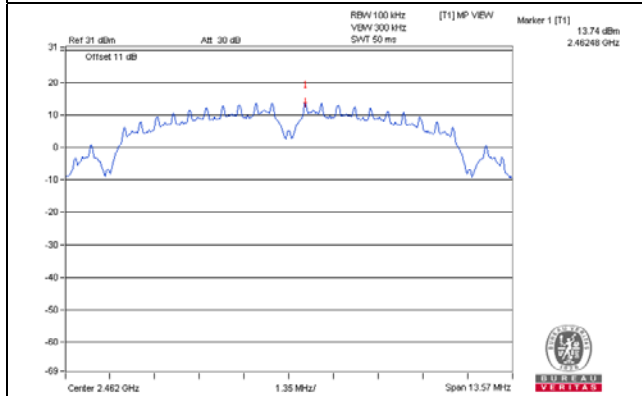
CH 1



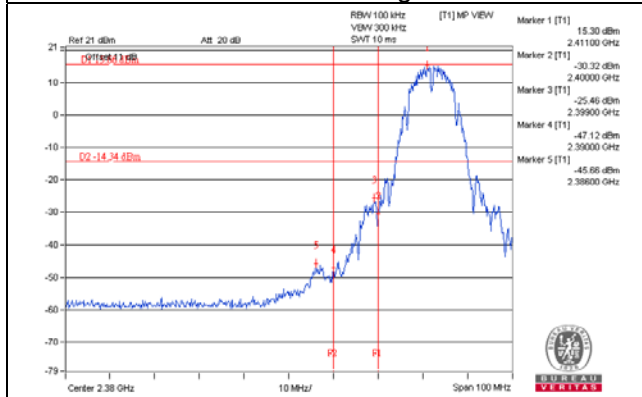
CH 6



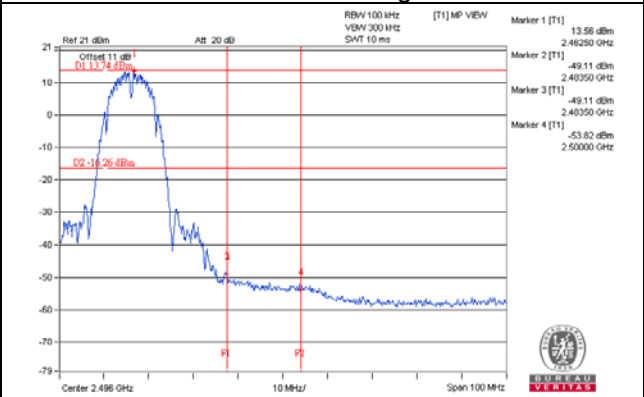
CH 11



CH 1 Band edge

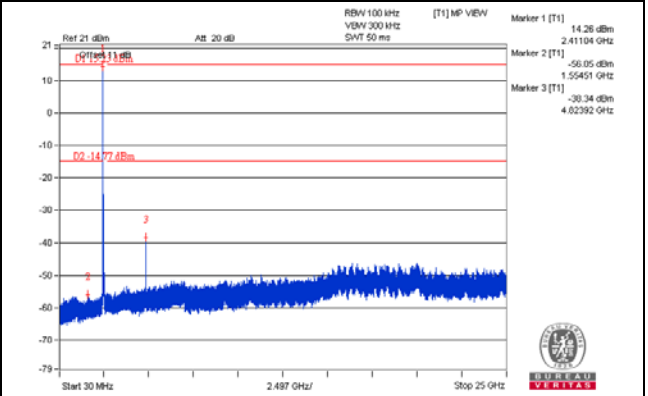
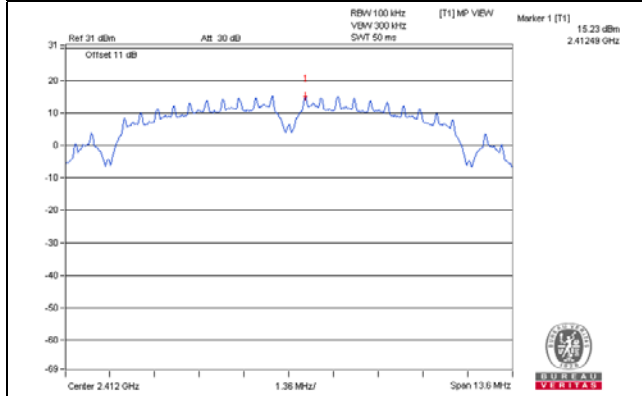


CH 11 Band edge

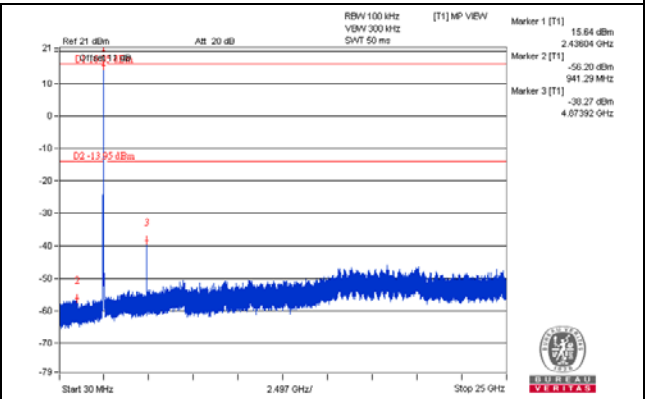
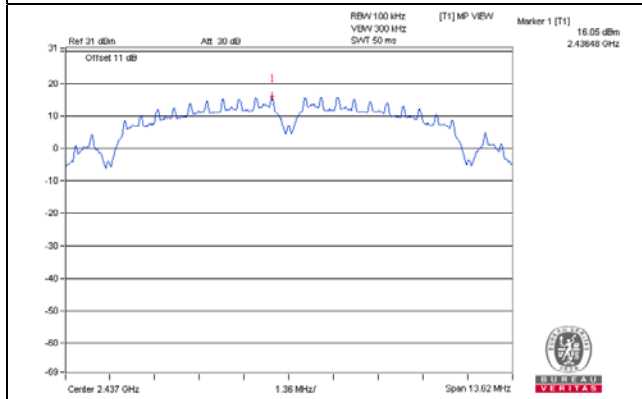


802.11b_Chain 1

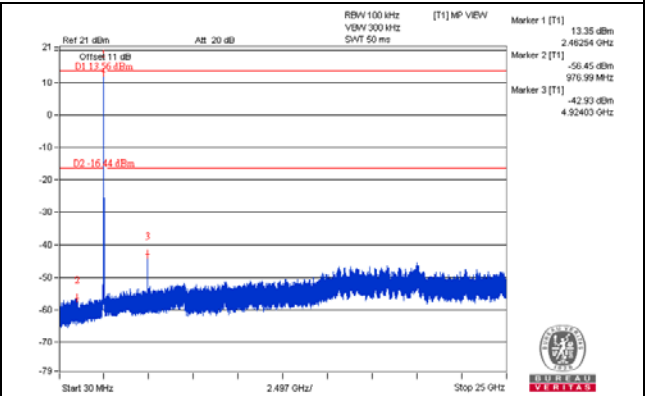
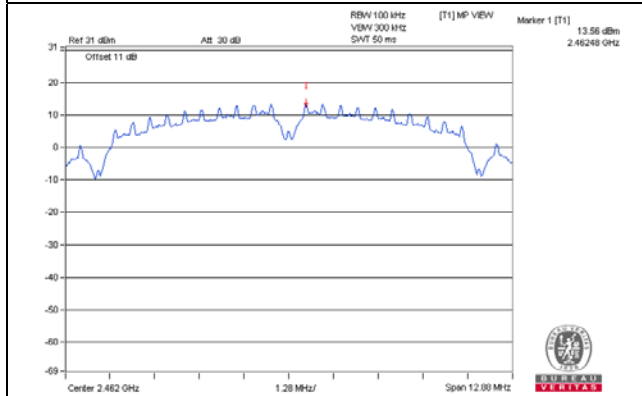
CH 1



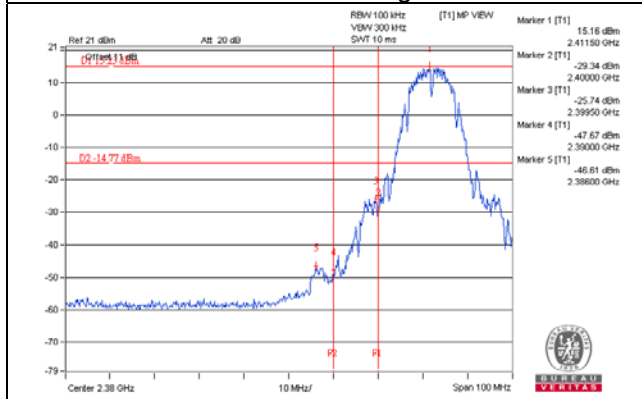
CH 6



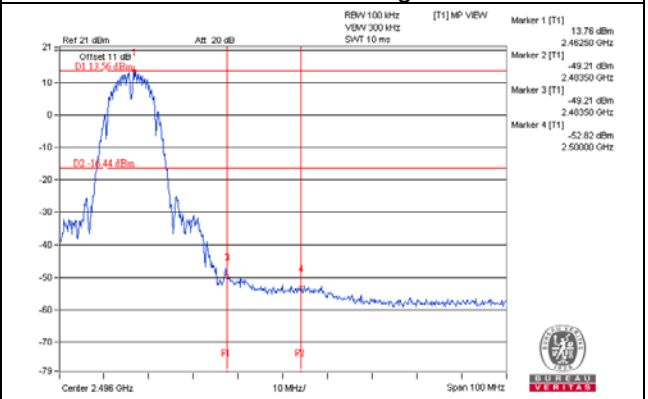
CH 11



CH 1 Band edge

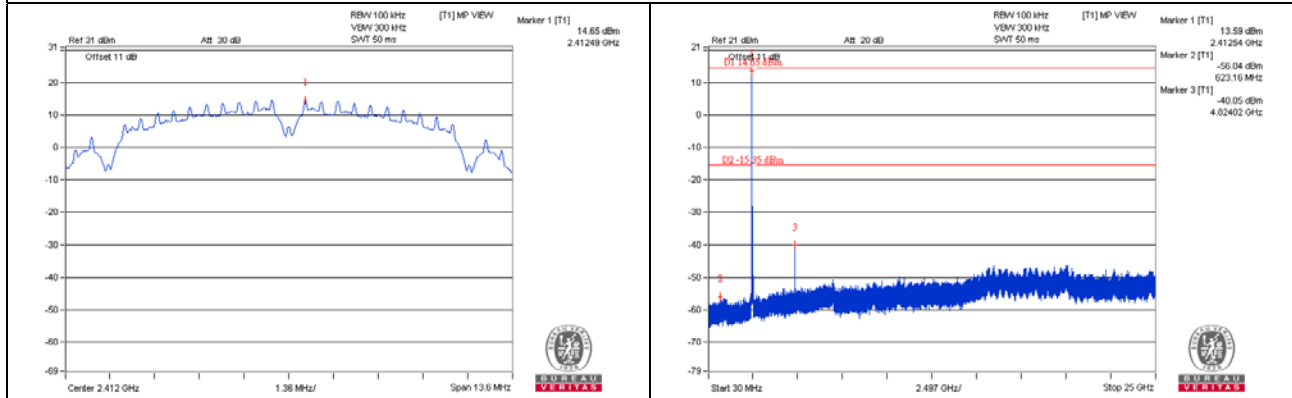


CH 11 Band edge

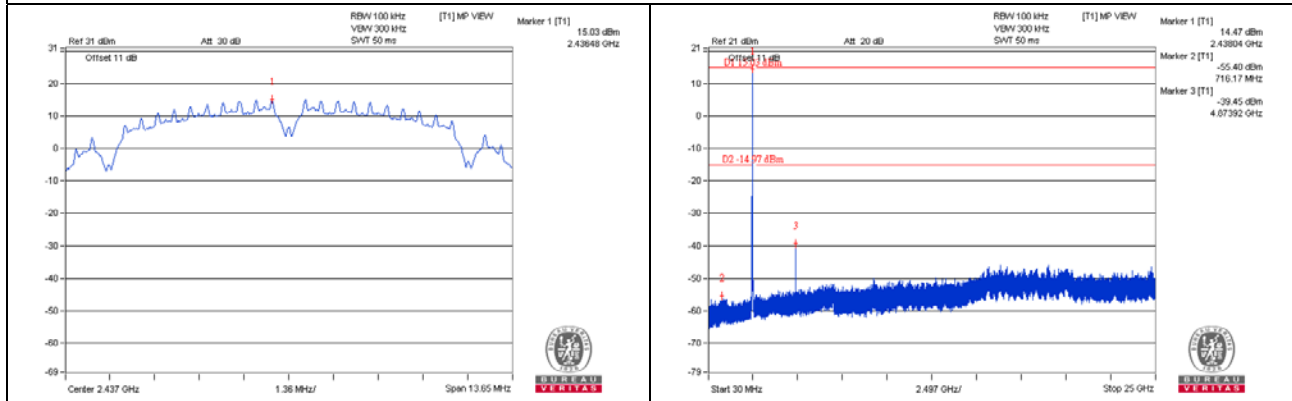


802.11b_Chain 2

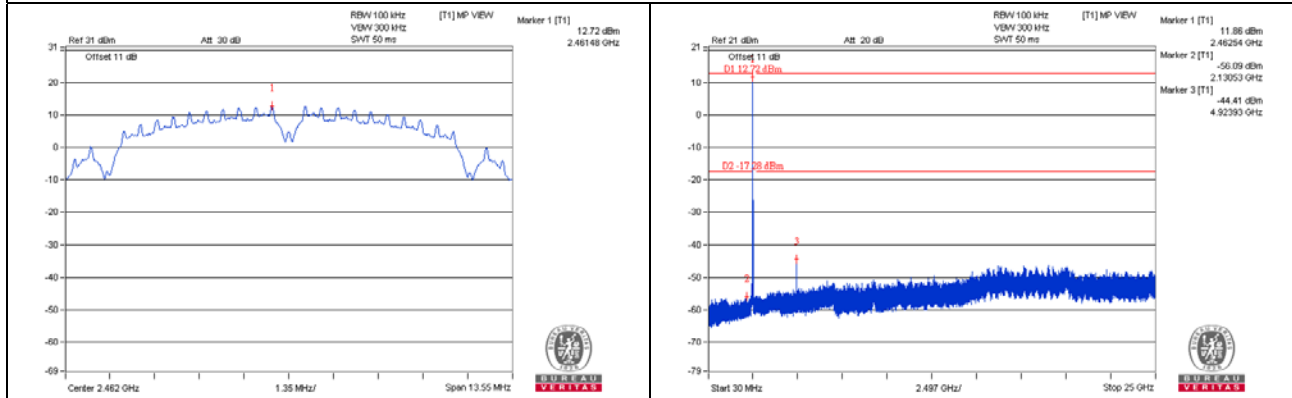
CH 1



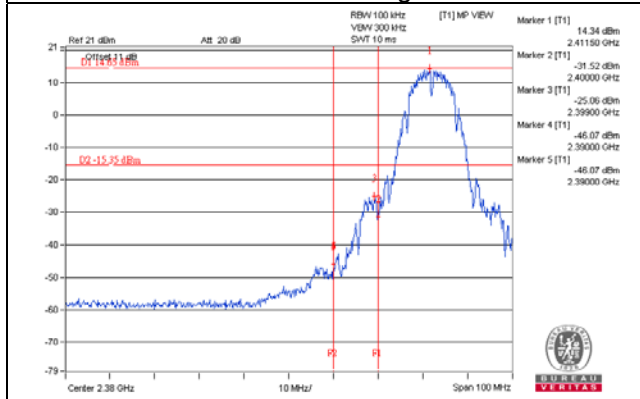
CH 6



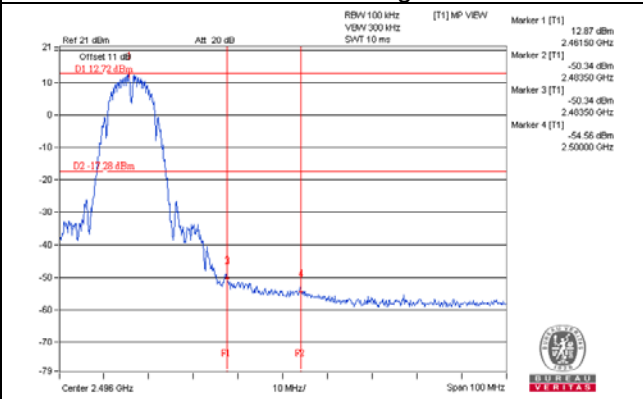
CH 11



CH 1 Band edge

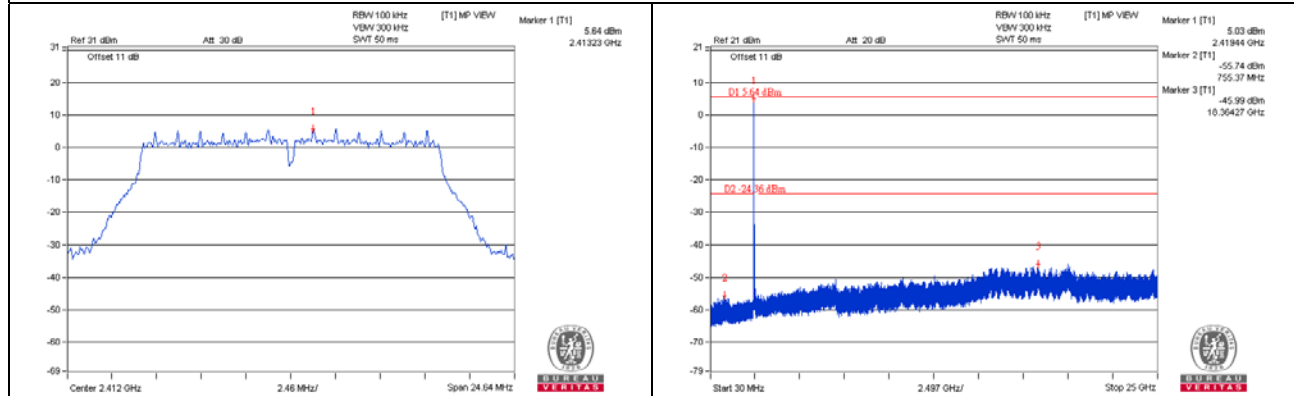


CH 11 Band edge

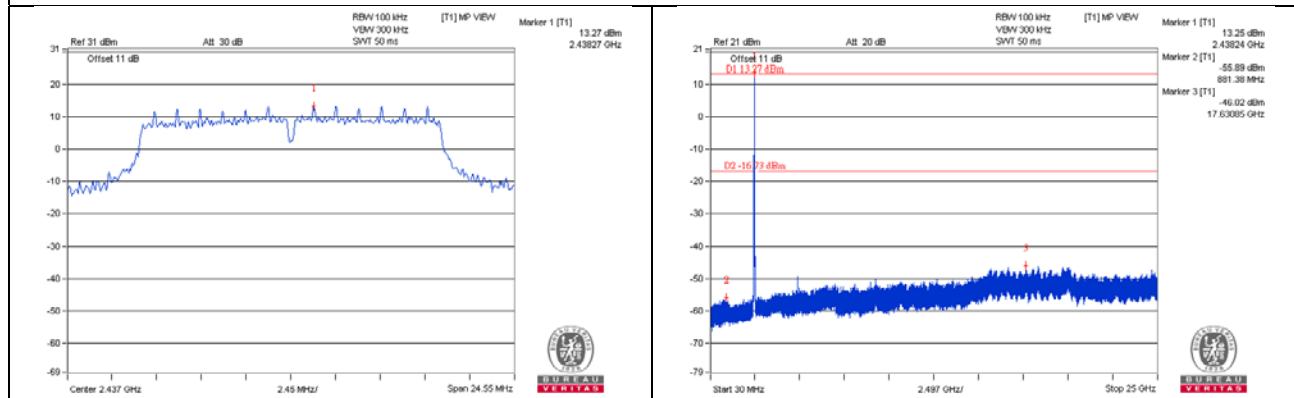


802.11g_Chain 0

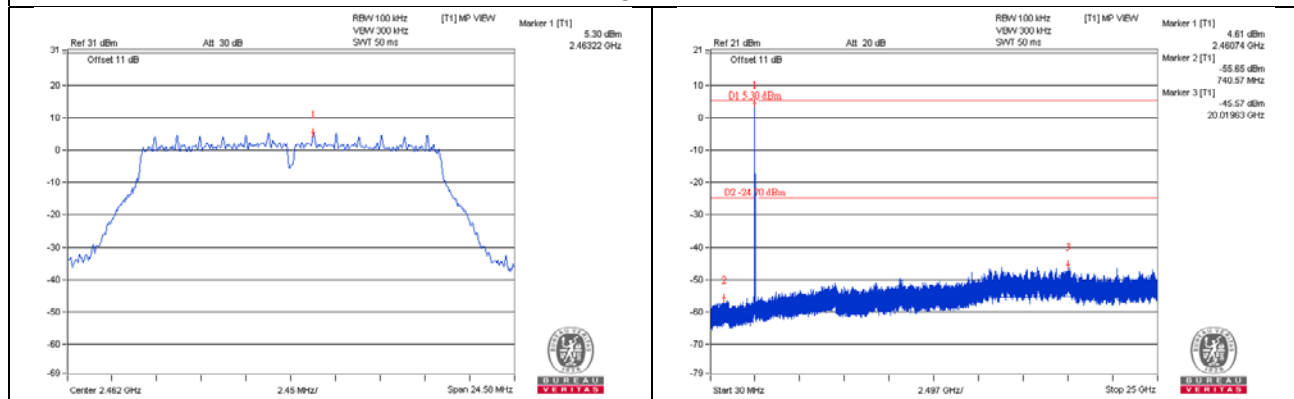
CH 1



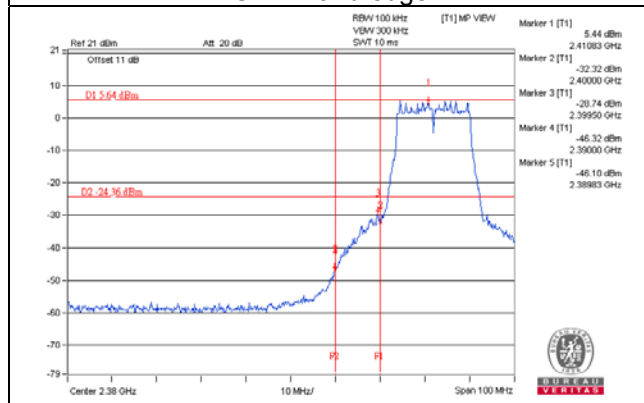
CH 6



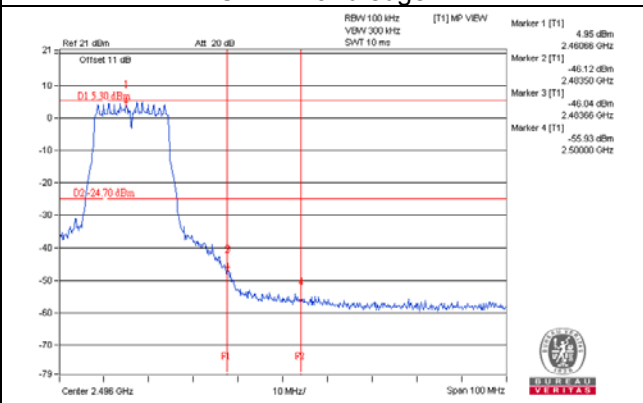
CH 11



CH 1 Band edge

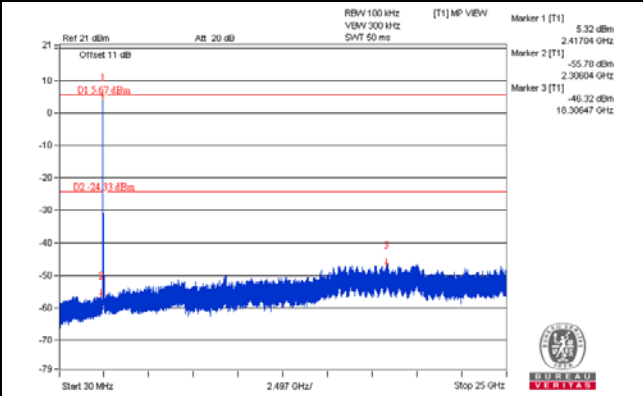
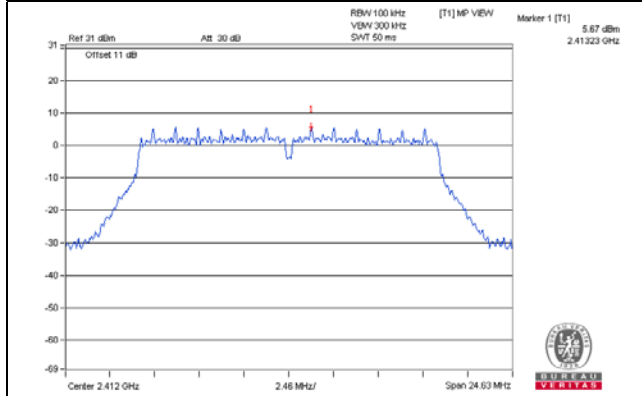


CH 11 Band edge

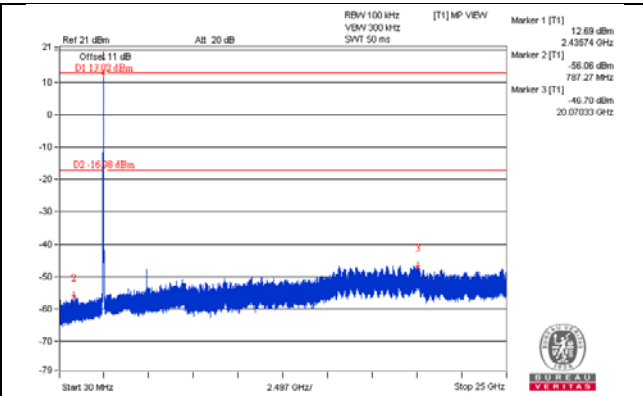
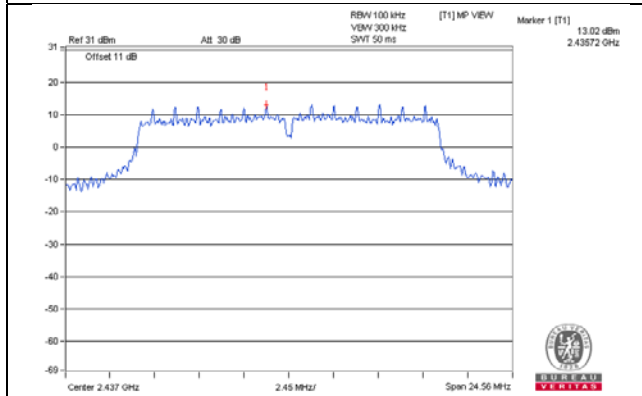


802.11g_Chain 1

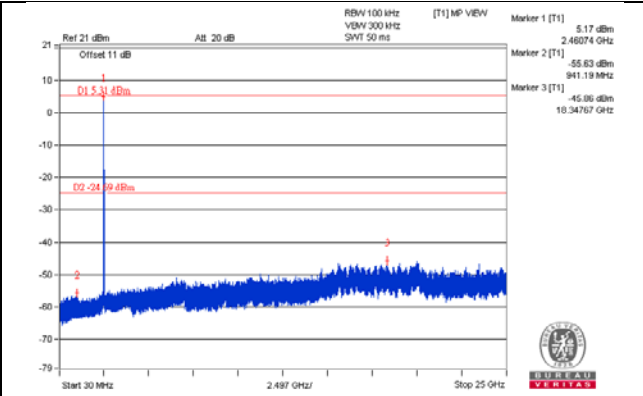
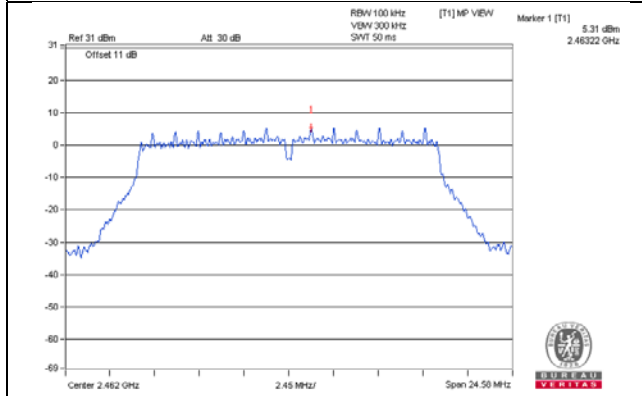
CH 1



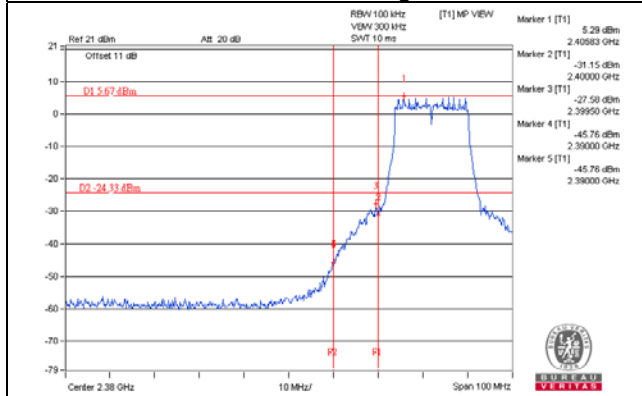
CH 6



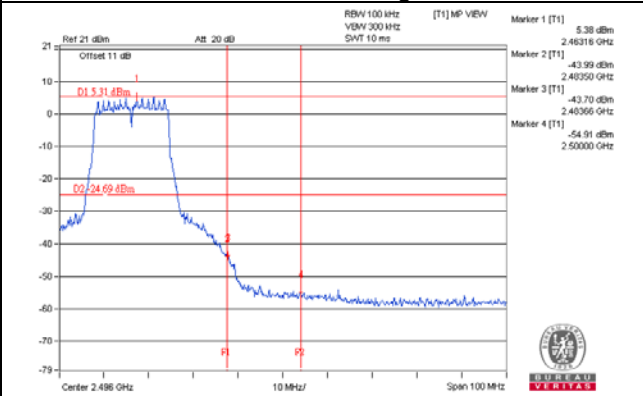
CH 11



CH 1 Band edge

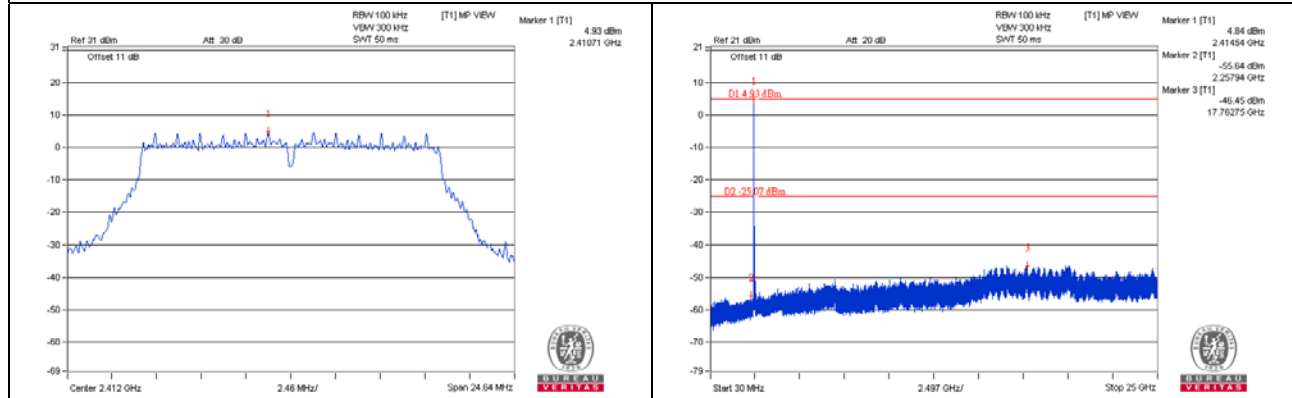


CH 11 Band edge

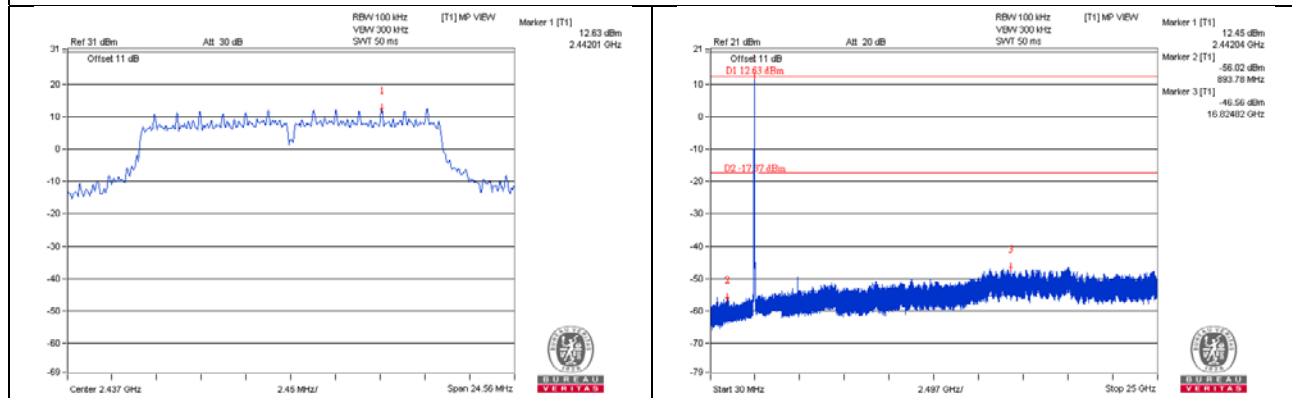


802.11g_Chain 2

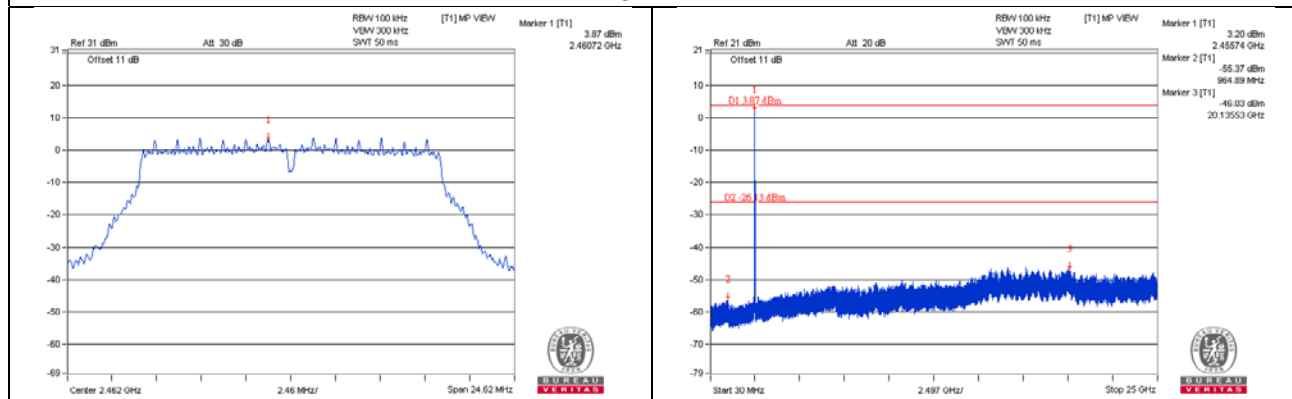
CH 1



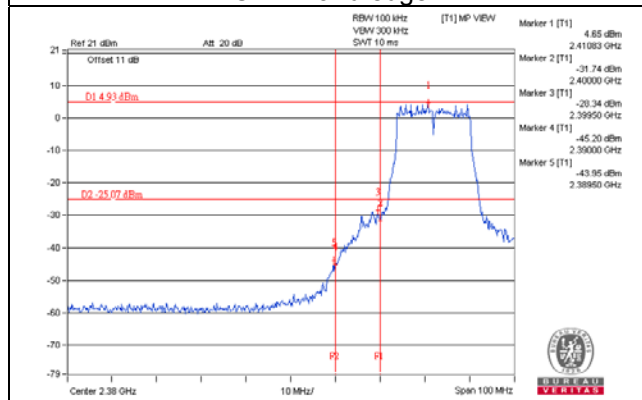
CH 6



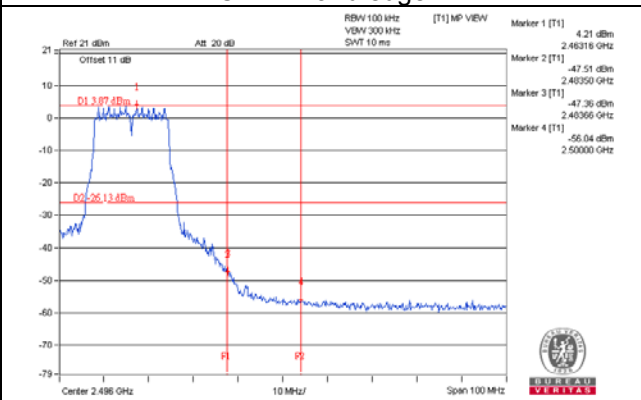
CH 11



CH 1 Band edge

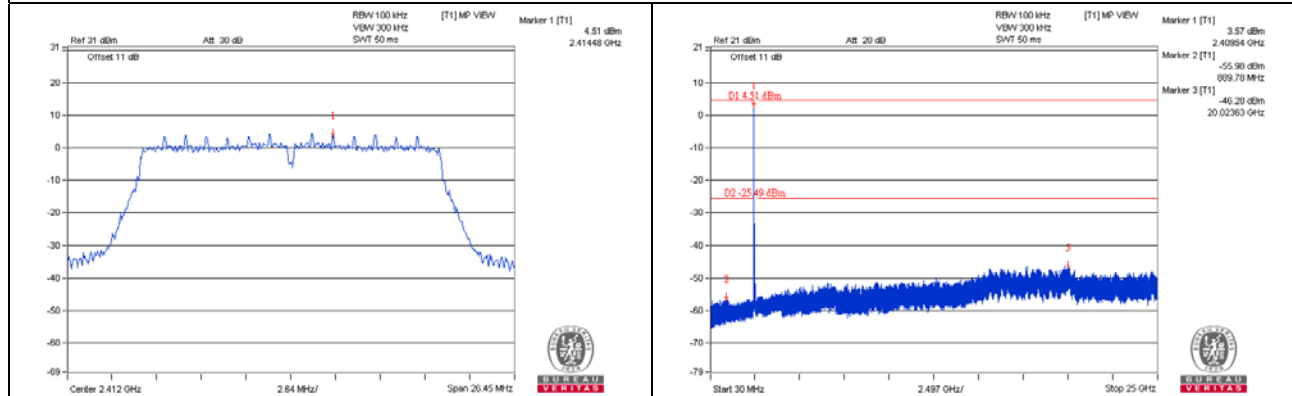


CH 11 Band edge

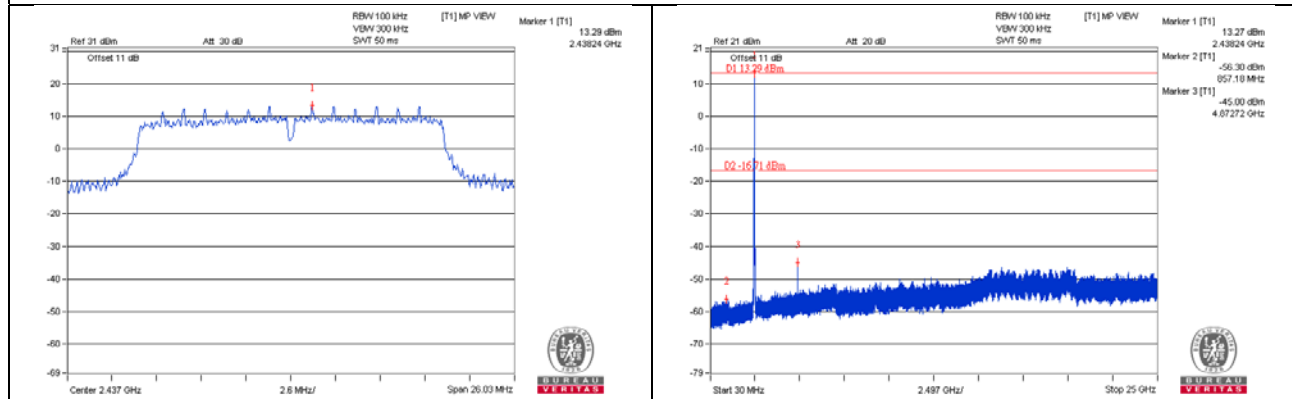


802.11n (HT20)_Chain 0

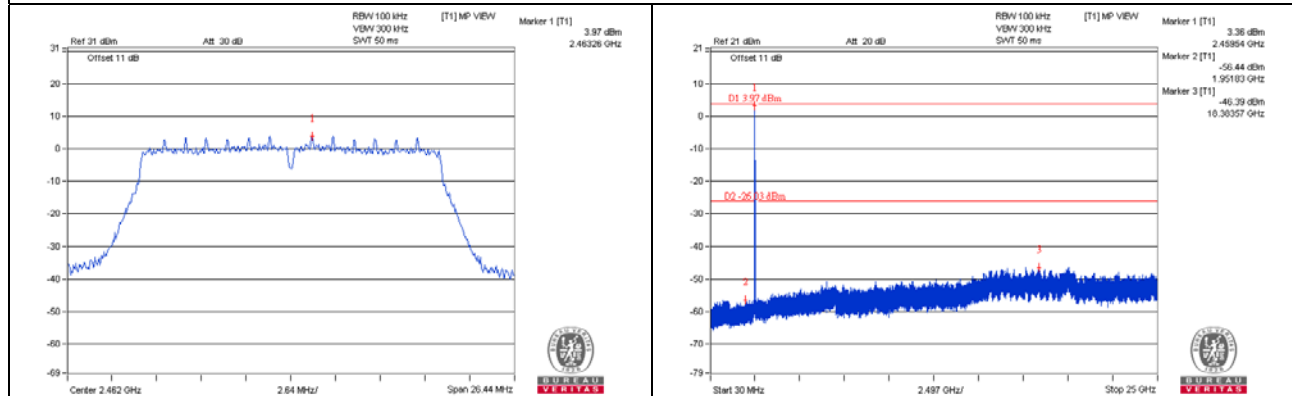
CH 1



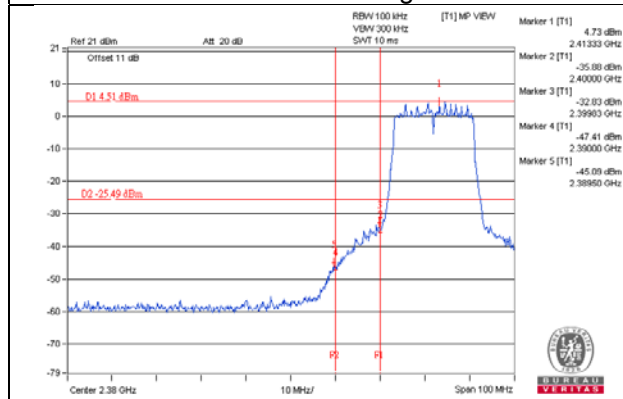
CH 6



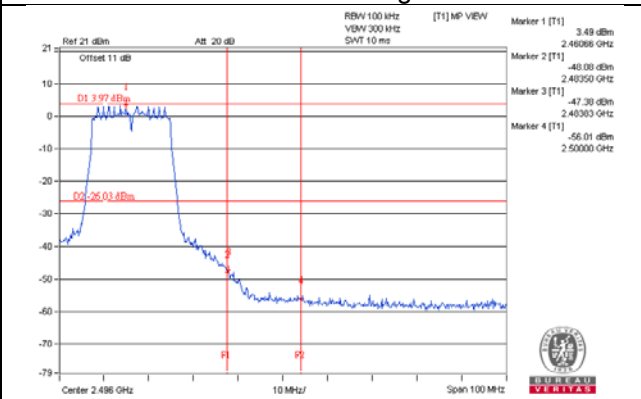
CH 11



CH 1 Band edge

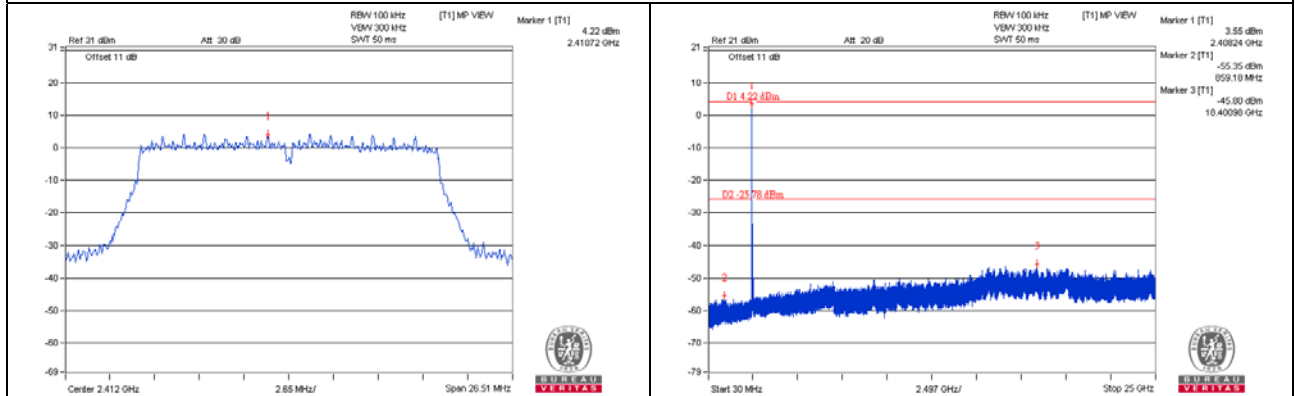


CH 11 Band edge

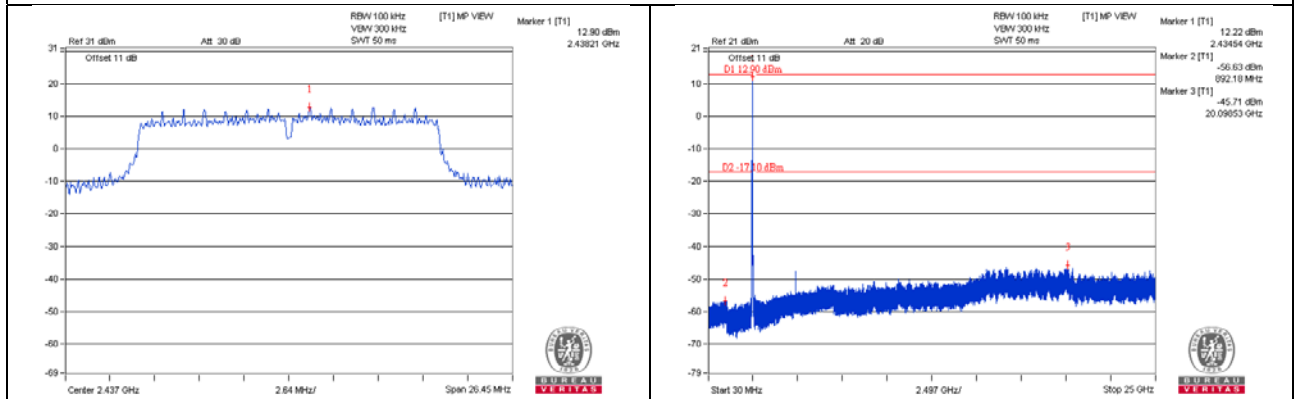


802.11n (HT20)_Chain 1

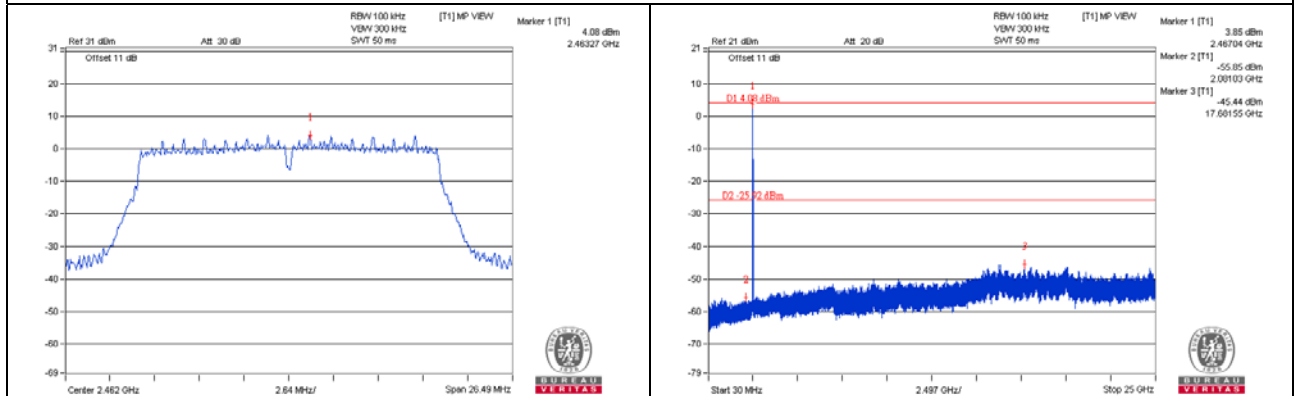
CH 1



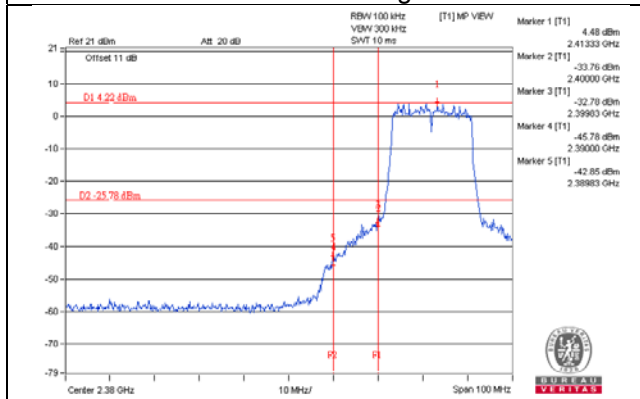
CH 6



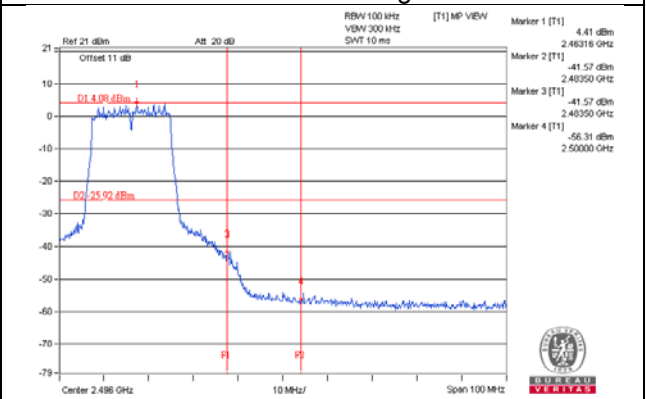
CH 11



CH 1 Band edge

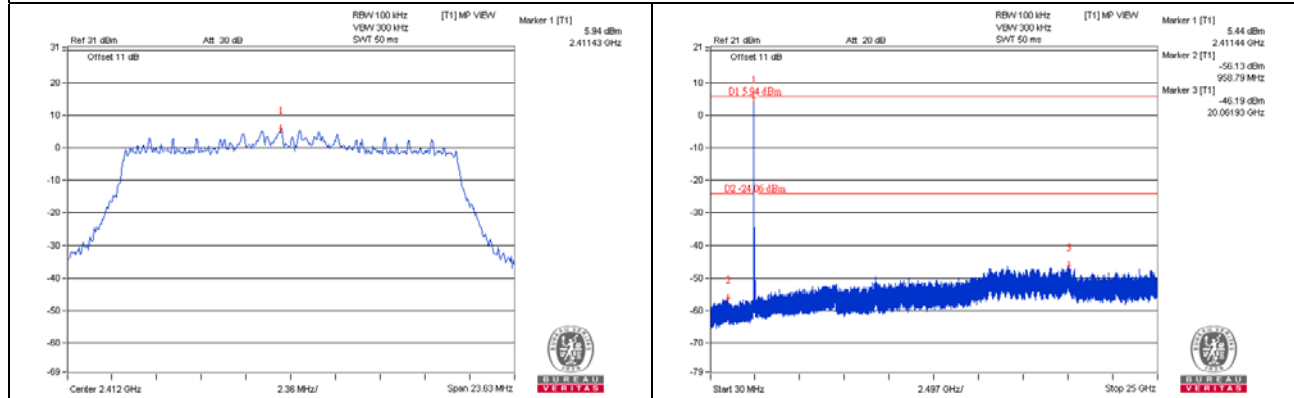


CH 11 Band edge

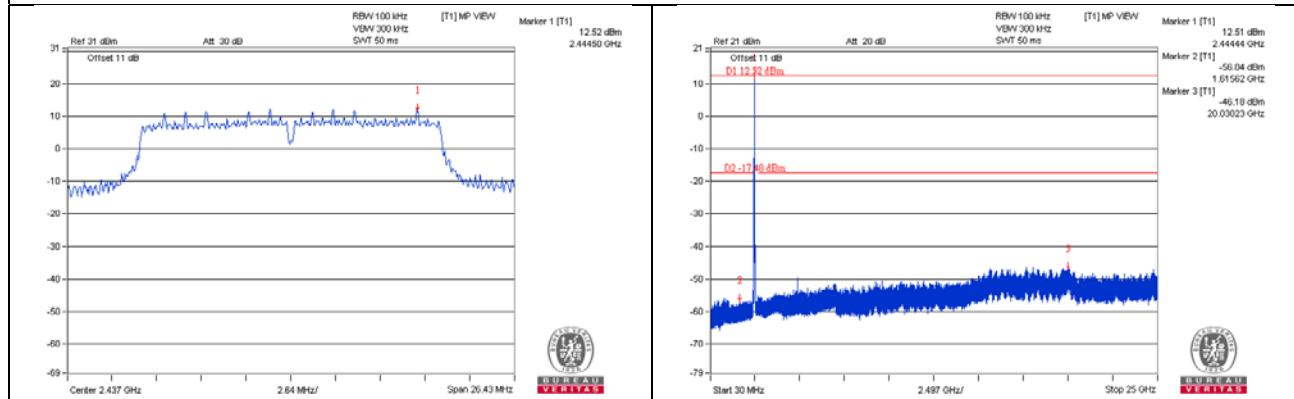


802.11n (HT20)_Chain 2

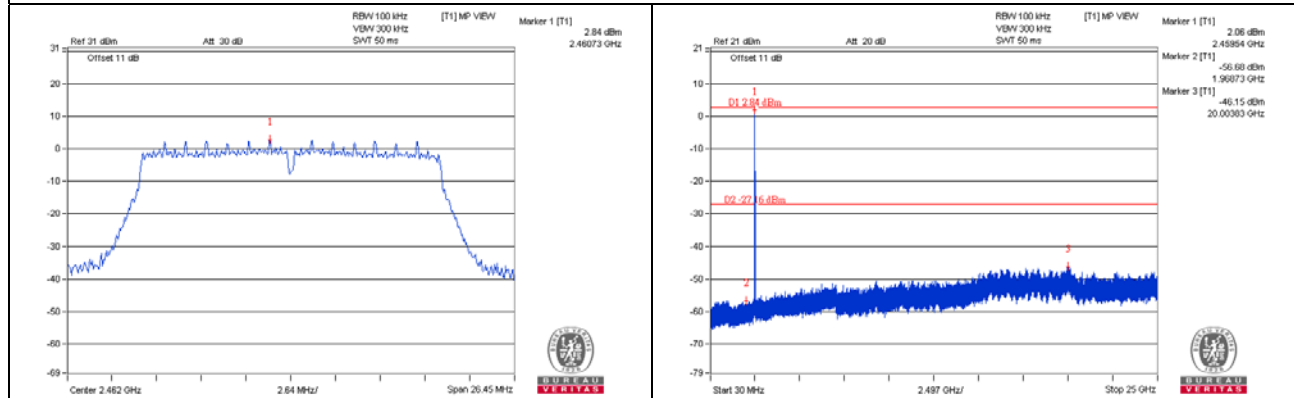
CH 1



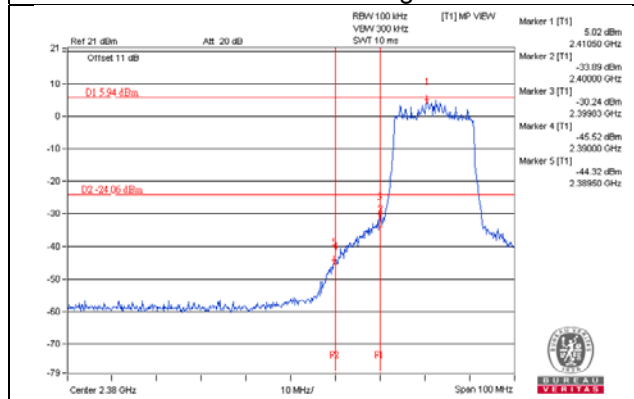
CH 6



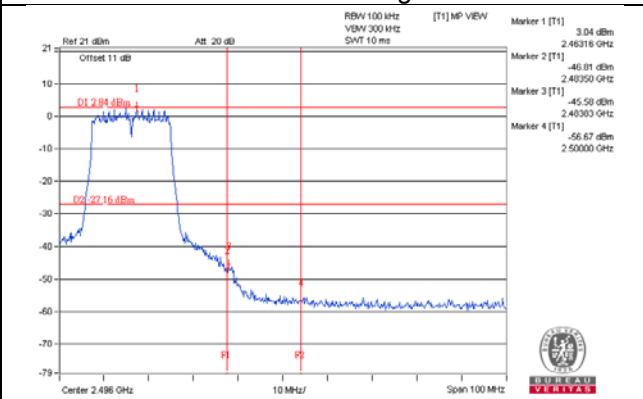
CH 11



CH 1 Band edge

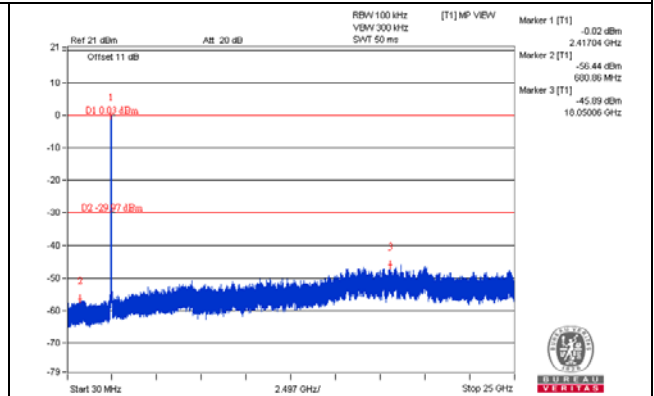
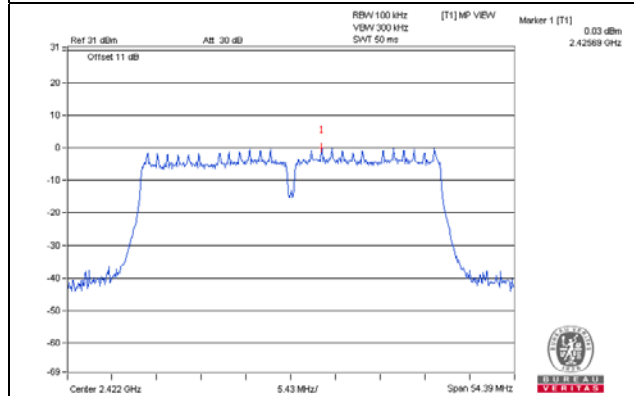


CH 11 Band edge

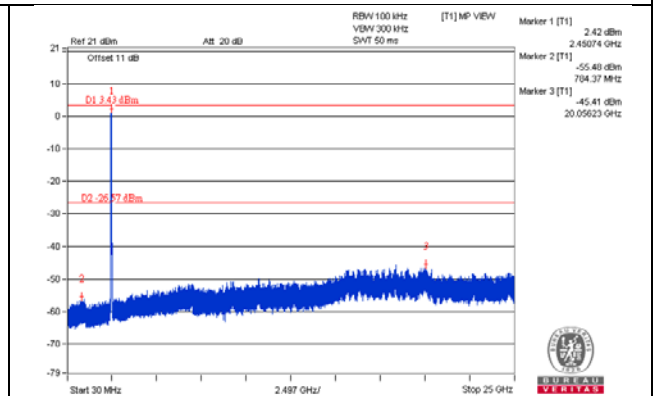
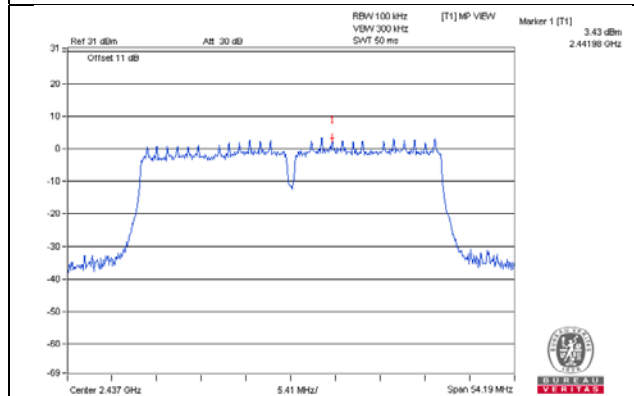


802.11n (HT40)_Chain 0

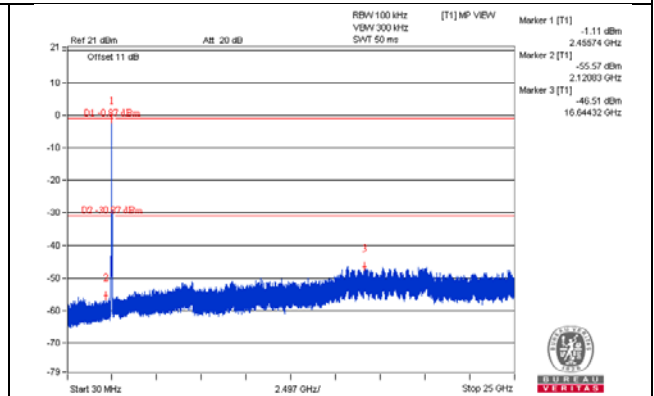
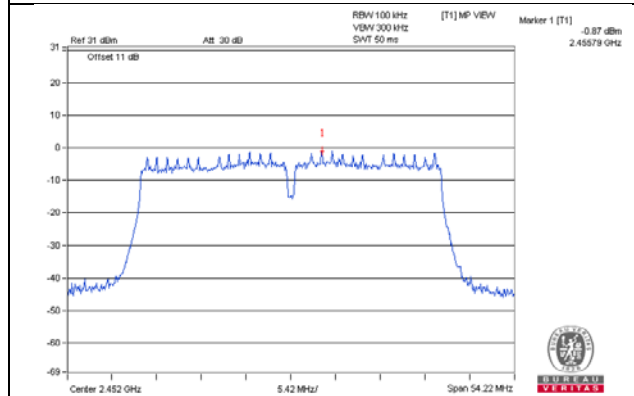
CH 3



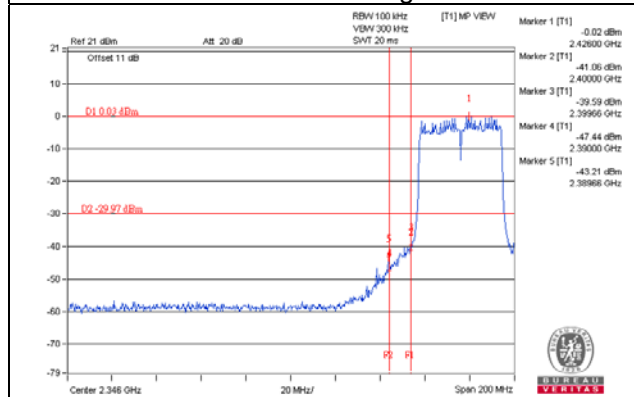
CH 6



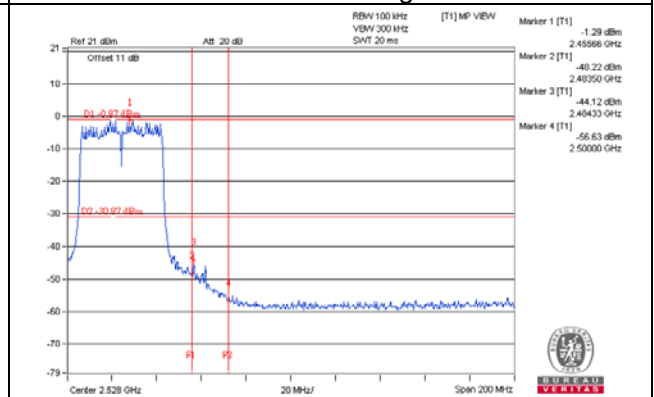
CH 9



CH 3 Band edge

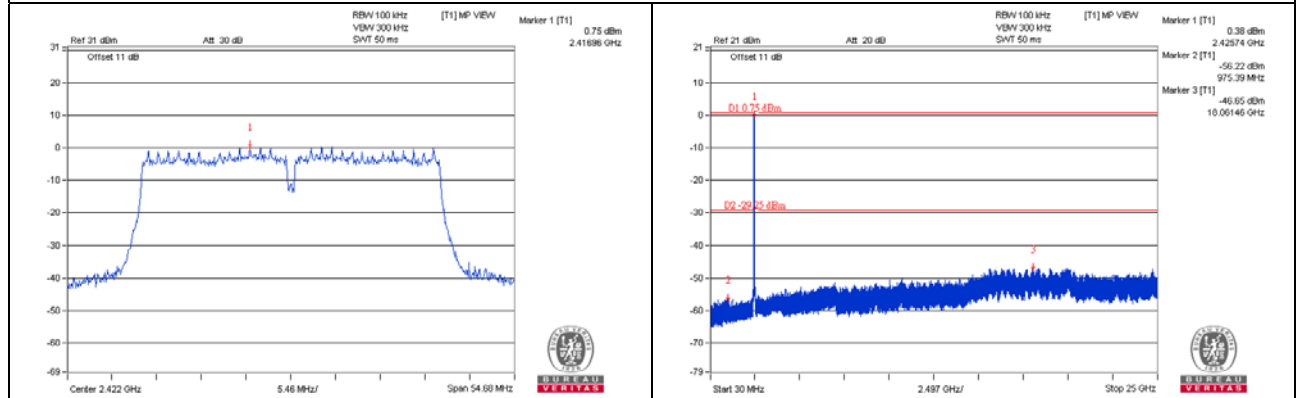


CH 9 Band edge

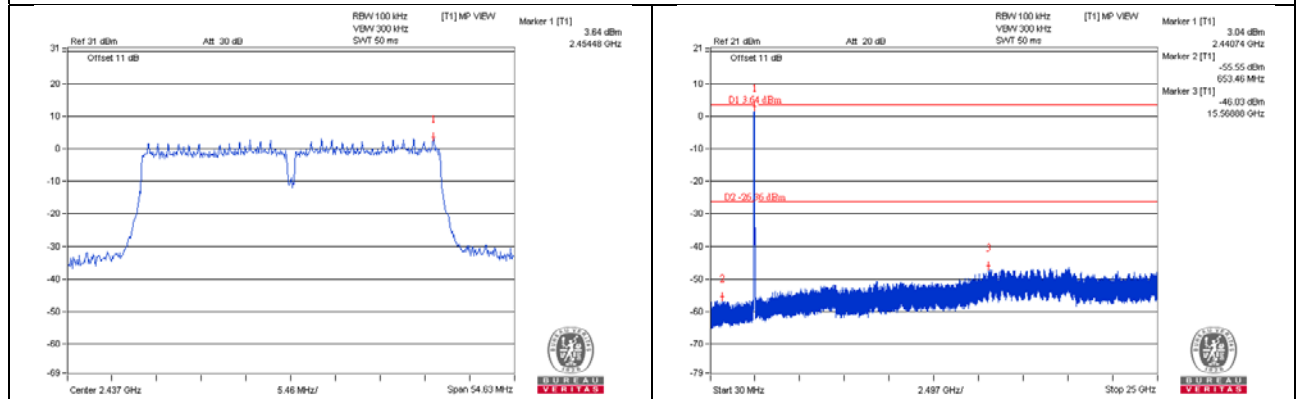


802.11n (HT40)_Chain 1

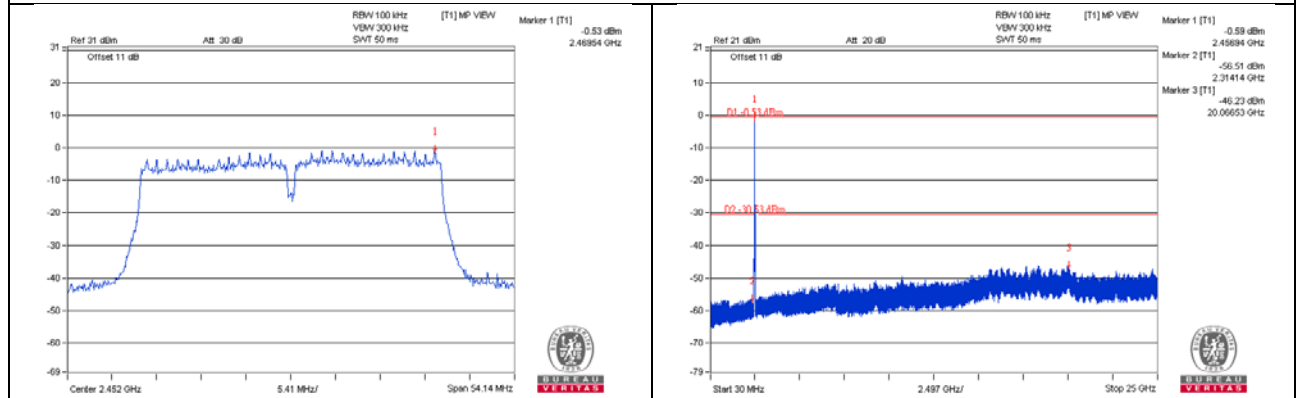
CH 3



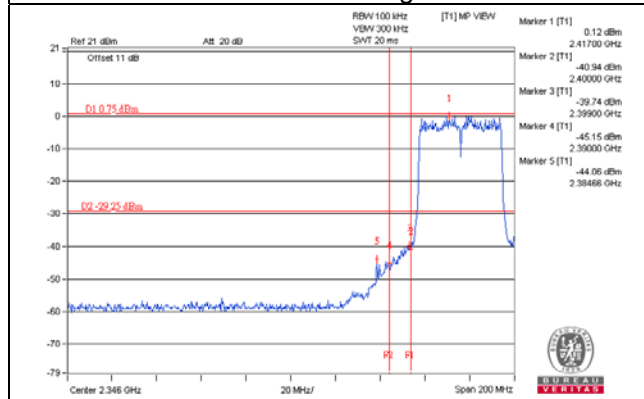
CH 6



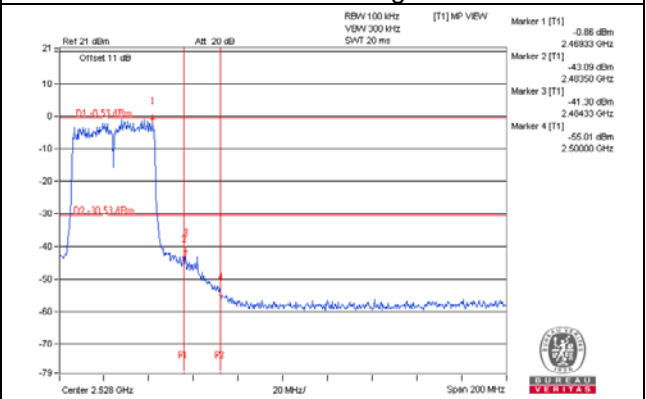
CH 9



CH 3 Band edge

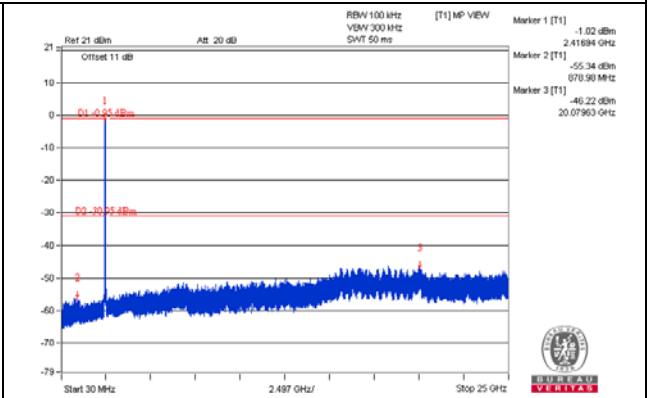
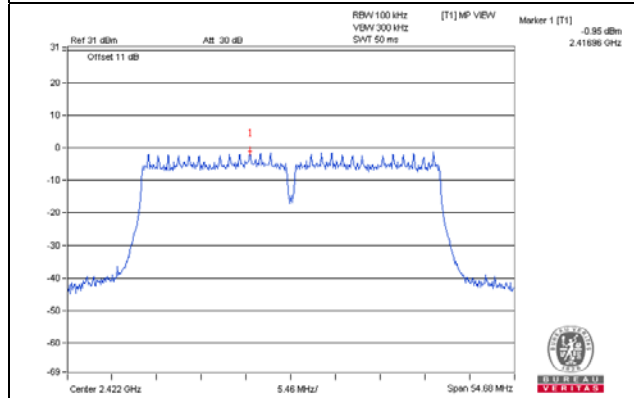


CH 9 Band edge

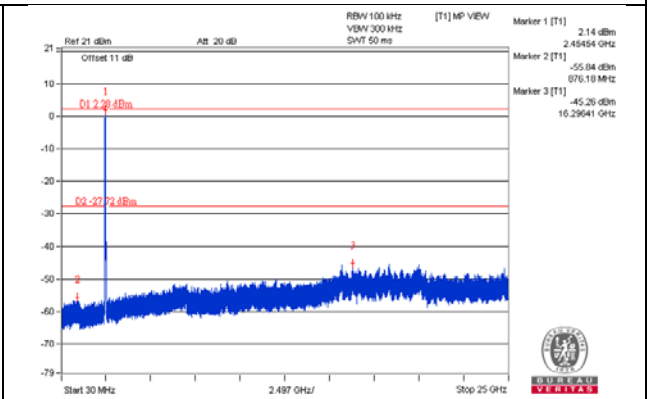
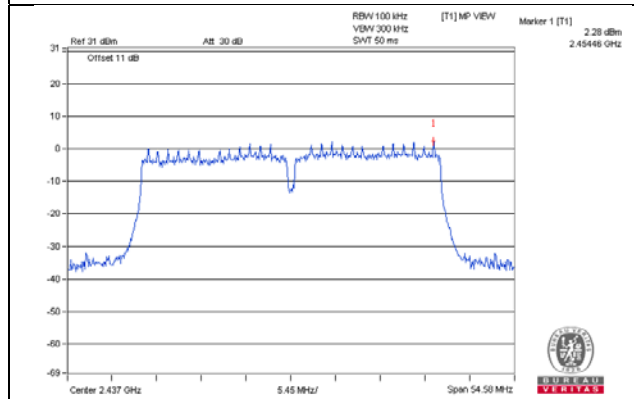


802.11n (HT40)_Chain 2

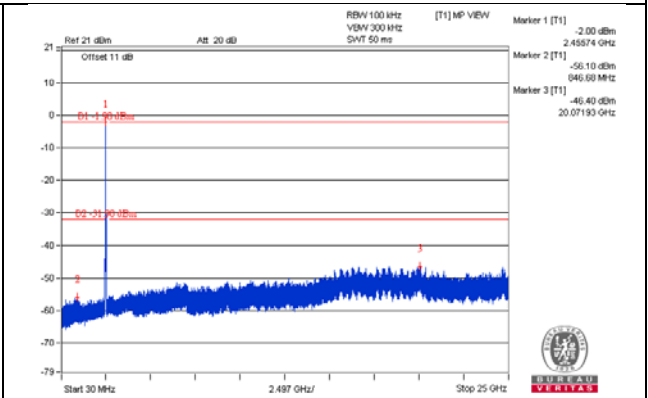
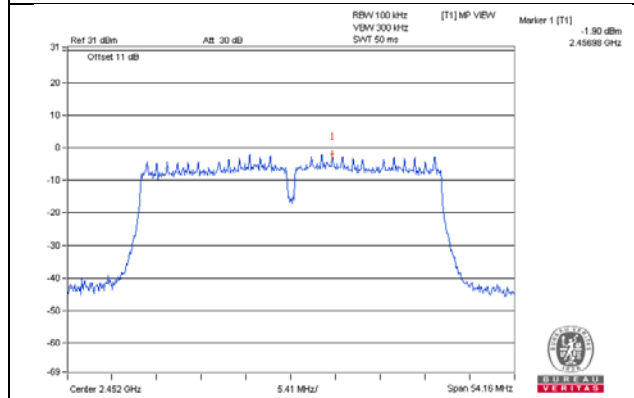
CH 3



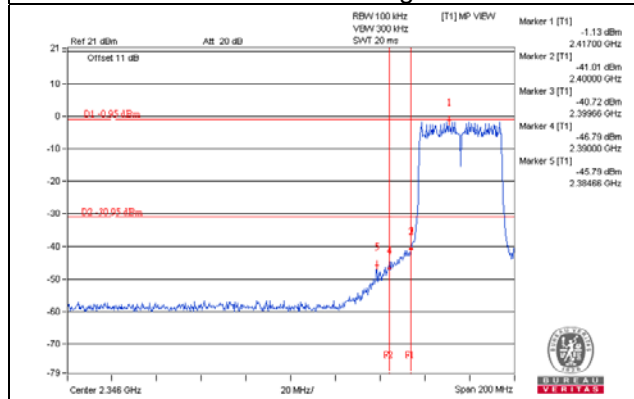
CH 6



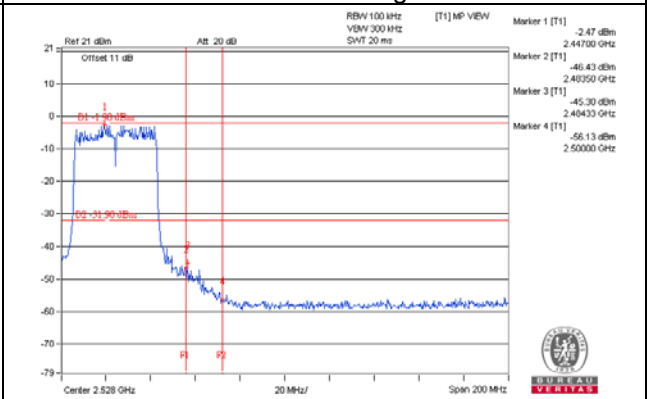
CH 9



CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information 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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