FCC Test Report

Report No.:	RF150716C07D
FCC ID:	U2M-OAP7250AG
Test Model:	OAP7250AG
Received Date:	Aug. 27, 2015
Test Date:	Sep. 04 ~ Sep. 18, 2015
Issued Date:	Sep. 25, 2015
Applicant:	Senao Networks, Inc.
Address:	3F, No. 529, Chung Cheng Rd., Hsintien, New Taipei City, R.O.C
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.
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Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF150716C07D	Original release	Sep. 25, 2015

1 Certificate of Conformity

Product:	Wireless 802.11ac/b/g/n access point
Brand:	Senao Networks
Test Model:	OAP7250AG
Sample Status:	Engineering Sample
Applicant:	Senao Networks, Inc.
Test Date:	Sep. 04 ~ Sep. 18, 2015
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:** Sep. 25, 2015

Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Sep. 25, 2015

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 -10.77dB at 0.44944MHz
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 2483.50 and 2390.00MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is 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	Expended 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 802.11ac/b/g/n access point
Brand	Senao Networks
Test Model	OAP7250AG
Sample Status	Engineering Sample
Power Supply Rating	48Vdc (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	295.566mW
Antenna Type	Dipole antenna with 5.41dBi gain
Antenna Connector	N-Type (The device is professionally installed)
Accessory Device	PoE, Adapter of PoE
Data Cable Supplied	N/A

Note:

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

PoE	
Brand	EnGenius
Model	EPE-48GP
Rating	48Vdc, 0.8A, 38.4W Max

Adapter of PoE	
Brand	Powertron Electronics Corp.
Model	PA1040-480IB080
Input Power	100-240Vac~50-60Hz 1.5A
Output Power	48Vdc / 0.8A 38.4W Max
Power Line	1.55m power cable with 1 core attached on adapter

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	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	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.

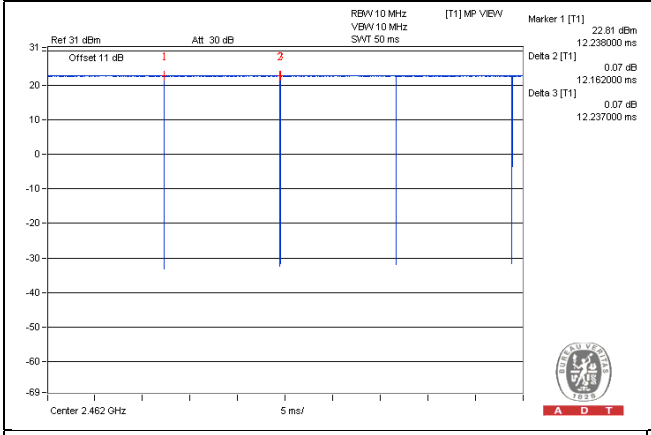
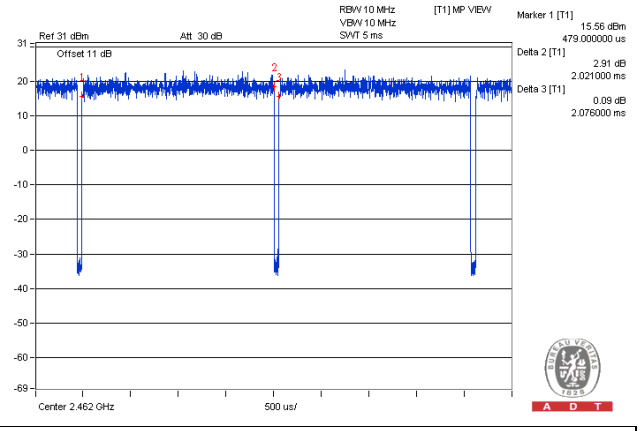
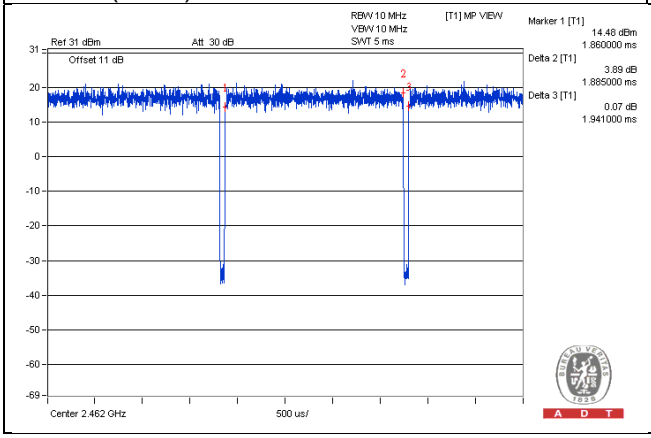
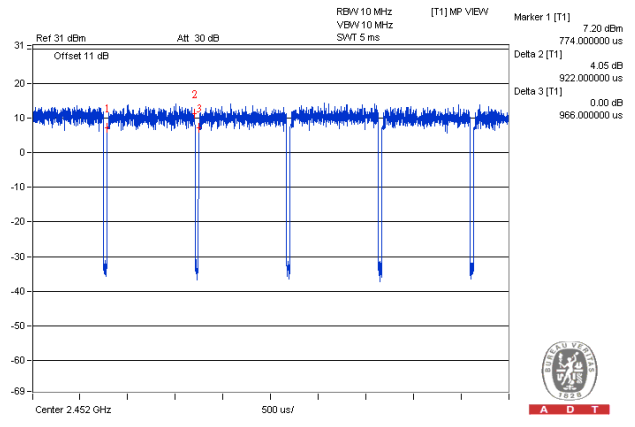
EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
RE<1G	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
PLC	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Nick Hsu

3.3 Duty Cycle of Test Signal

802.11b: Duty cycle of test signal is > 98%, duty factor is not required.
802.11g, 802.11n (HT20), 802.11n (HT40): Duty cycle of test signal is < 98%, duty factor shall be considered.
802.11g: Duty cycle = 2.021/2.076 =0.974, Duty factor = 10 * log(1/0.974) = 0.12
802.11n (HT20): Duty cycle = 1.885/1.941 = 0.971, Duty factor = 10 * log(1/0.971) = 0.13
802.11n (HT40): Duty cycle = 0.922/0.966 =0.954, Duty factor = 10 * log(1/0.954) = 0.20

802.11b	802.11g
	
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.

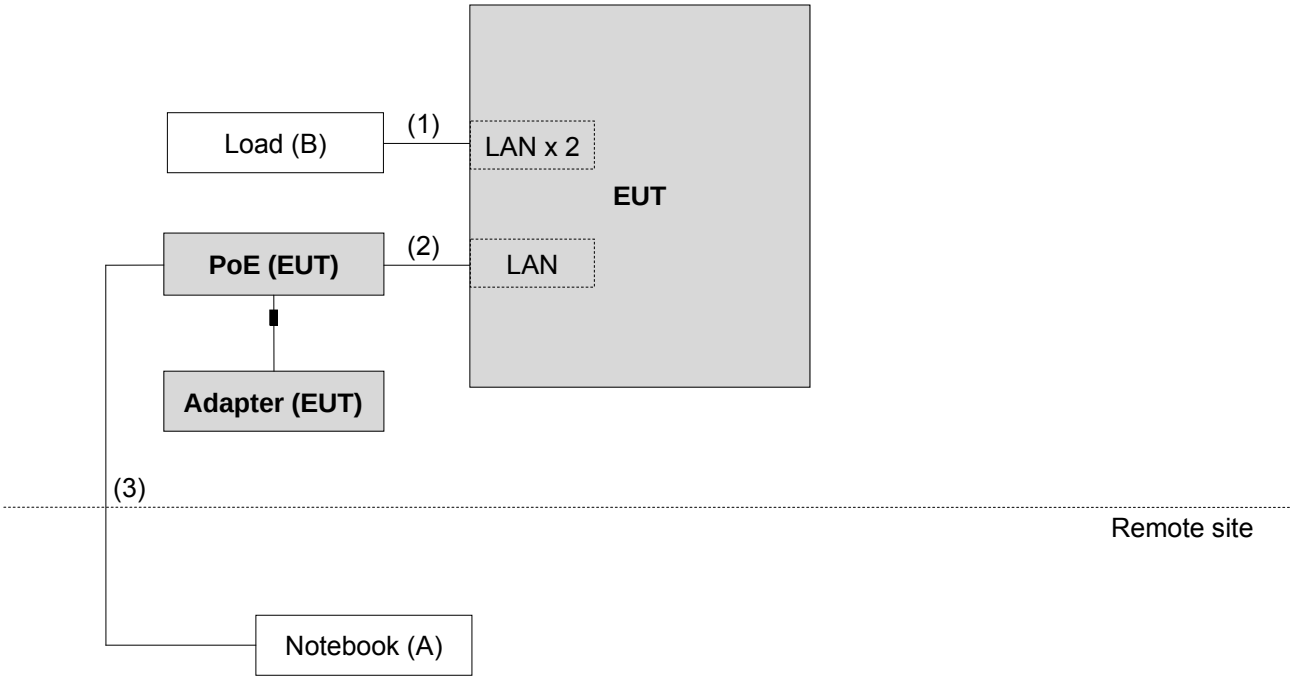
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Cat5e cable	1	1.8	N	0	-
2.	Cat5e cable	1	1.8	N	0	-
3.	Cat5e cable	1	10	N	0	-

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)

558074 D01 DTS Meas Guidance v03r03

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. 10, 2015	Apr. 09, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Sep. 02, 2015	Sep. 01, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	9120D	209	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8447D	2944A10738	Oct.18, 2014	Oct. 17, 2015
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, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2015	Jul. 08, 2016

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

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

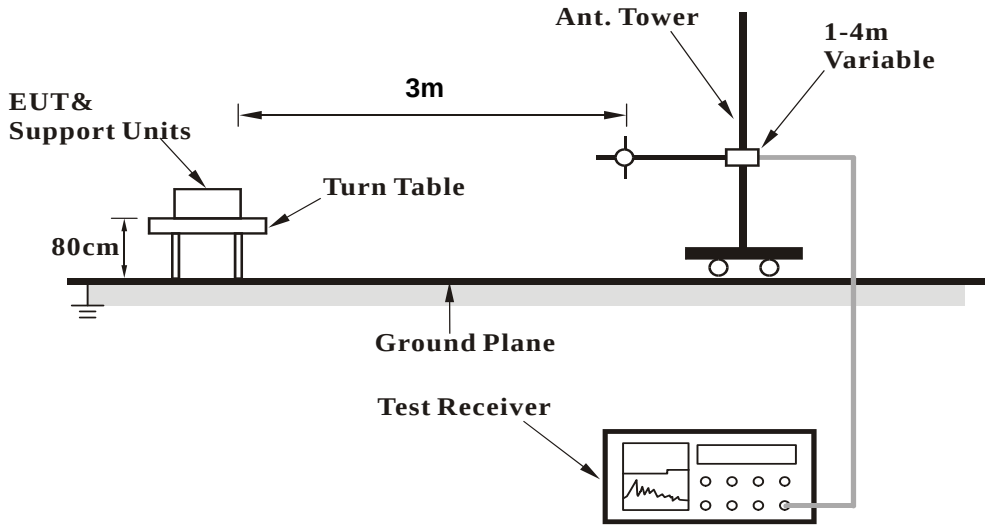
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

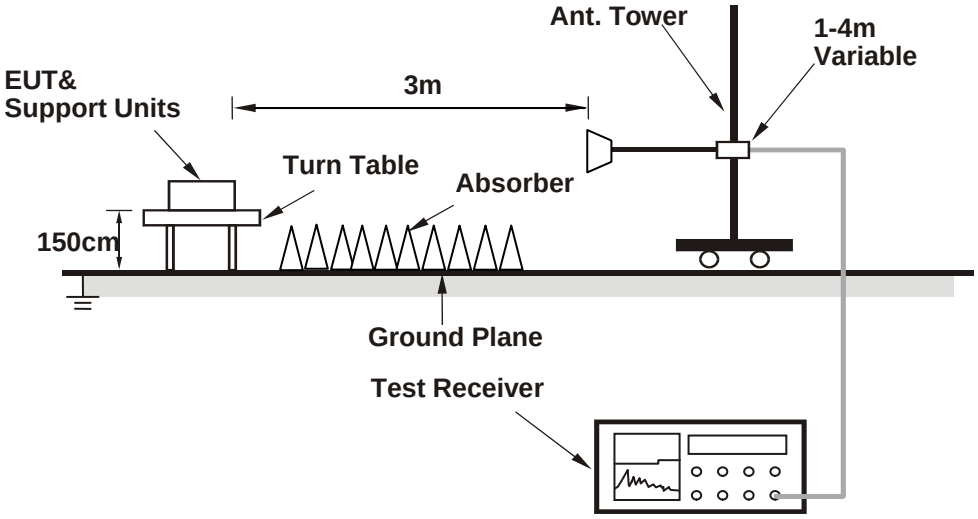
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range 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 notebook to act as 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".
e. The necessary accessories enable the system in full functions.

4.1.7 Test Results

Above 1GHz Worst-Case data:

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2370.00	60.0 PK	74.0	-14.0	1.48 H	102	27.50	32.50
2	2370.00	47.3 AV	54.0	-6.7	1.48 H	102	14.80	32.50
3	*2412.00	104.2 PK			1.00 H	206	71.60	32.60
4	*2412.00	101.0 AV			1.00 H	206	68.40	32.60
5	4824.00	47.3 PK	74.0	-26.7	1.29 H	83	41.20	6.10
6	4824.00	36.2 AV	54.0	-17.8	1.29 H	83	30.10	6.10
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	2370.00	69.6 PK	74.0	-4.4	1.71 V	345	37.10	32.50
2	2370.00	52.6 AV	54.0	-1.4	1.71 V	345	20.10	32.50
3	*2412.00	118.8 PK			1.85 V	319	86.20	32.60
4	*2412.00	115.4 AV			1.85 V	319	82.80	32.60
5	4824.00	47.6 PK	74.0	-26.4	1.45 V	202	41.50	6.10
6	4824.00	36.2 AV	54.0	-17.8	1.45 V	202	30.10	6.10

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	2360.00	59.2 PK	74.0	-14.8	1.13 H	144	26.80	32.40
2	2360.00	47.3 AV	54.0	-6.7	1.13 H	144	14.90	32.40
3	*2437.00	106.3 PK			1.00 H	128	73.60	32.70
4	*2437.00	103.7 AV			1.00 H	128	71.00	32.70
5	2483.50	58.8 PK	74.0	-15.2	1.61 H	312	26.10	32.70
6	2483.50	46.7 AV	54.0	-7.3	1.61 H	312	14.00	32.70
7	4874.00	48.3 PK	74.0	-25.7	1.26 H	92	42.10	6.20
8	4874.00	36.0 AV	54.0	-18.0	1.26 H	92	29.80	6.20
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	2360.00	71.8 PK	74.0	-2.2	1.73 V	352	39.40	32.40
2	2360.00	52.3 AV	54.0	-1.7	1.73 V	352	19.90	32.40
3	*2437.00	121.1 PK			1.67 V	333	88.40	32.70
4	*2437.00	118.1 AV			1.67 V	333	85.40	32.70
5	2483.50	64.2 PK	74.0	-9.8	1.76 V	354	31.50	32.70
6	2483.50	52.0 AV	54.0	-2.0	1.76 V	354	19.30	32.70
7	4874.00	47.6 PK	74.0	-26.4	1.42 V	263	41.40	6.20
8	4874.00	36.4 AV	54.0	-17.6	1.42 V	263	30.20	6.20

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	2390.00	59.7 PK	74.0	-14.3	1.27 H	194	27.20	32.50
2	2390.00	47.0 AV	54.0	-7.0	1.27 H	194	14.50	32.50
3	*2462.00	105.7 PK			1.00 H	208	73.10	32.60
4	*2462.00	102.9 AV			1.00 H	208	70.30	32.60
5	2483.50	58.8 PK	74.0	-15.2	1.50 H	210	26.10	32.70
6	2483.50	46.6 AV	54.0	-7.4	1.50 H	210	13.90	32.70
7	4924.00	49.2 PK	74.0	-24.8	1.12 H	162	42.90	6.30
8	4924.00	37.1 AV	54.0	-16.9	1.12 H	162	30.80	6.30
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	72.1 PK	74.0	-1.9	1.87 V	331	39.60	32.50
2	2390.00	52.7 AV	54.0	-1.3	1.87 V	331	20.20	32.50
3	*2462.00	120.3 PK			1.80 V	208	87.70	32.60
4	*2462.00	116.9 AV			1.80 V	208	84.30	32.60
5	2483.50	63.4 PK	74.0	-10.6	1.82 V	334	30.70	32.70
6	2483.50	51.8 AV	54.0	-2.2	1.82 V	334	19.10	32.70
7	4924.00	47.8 PK	74.0	-26.2	1.59 V	84	41.50	6.30
8	4924.00	36.6 AV	54.0	-17.4	1.59 V	84	30.30	6.30

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.6 PK	74.0	-15.4	1.51 H	194	26.10	32.50
2	2390.00	46.8 AV	54.0	-7.2	1.51 H	194	14.30	32.50
3	*2412.00	103.8 PK			1.24 H	140	71.20	32.60
4	*2412.00	94.5 AV			1.24 H	140	61.90	32.60
5	4824.00	47.7 PK	74.0	-26.3	1.40 H	111	41.60	6.10
6	4824.00	36.0 AV	54.0	-18.0	1.40 H	111	29.90	6.10
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	68.0 PK	74.0	-6.0	1.88 V	9	35.50	32.50
2	2390.00	52.2 AV	54.0	-1.8	1.88 V	9	19.70	32.50
3	*2412.00	117.6 PK			1.70 V	338	85.00	32.60
4	*2412.00	107.6 AV			1.70 V	338	75.00	32.60
5	4824.00	49.4 PK	74.0	-24.6	1.52 V	216	43.30	6.10
6	4824.00	36.0 AV	54.0	-18.0	1.52 V	216	29.90	6.10

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	58.4 PK	74.0	-15.6	1.39 H	114	25.90	32.50
2	2390.00	47.1 AV	54.0	-6.9	1.39 H	114	14.60	32.50
3	*2437.00	108.7 PK			1.00 H	210	76.00	32.70
4	*2437.00	99.4 AV			1.00 H	210	66.70	32.70
5	4874.00	48.5 PK	74.0	-25.5	1.11 H	224	42.30	6.20
6	4874.00	36.3 AV	54.0	-17.7	1.11 H	224	30.10	6.20
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	2390.00	71.7 PK	74.0	-2.3	1.72 V	344	39.20	32.50
2	2390.00	52.4 AV	54.0	-1.6	1.72 V	344	19.90	32.50
3	*2437.00	124.4 PK			1.85 V	330	91.70	32.70
4	*2437.00	113.5 AV			1.85 V	330	80.80	32.70
5	4874.00	47.8 PK	74.0	-26.2	1.16 V	224	41.60	6.20
6	4874.00	35.8 AV	54.0	-18.2	1.16 V	224	29.60	6.20

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	103.3 PK			1.00 H	145	70.70	32.60
2	*2462.00	94.4 AV			1.00 H	145	61.80	32.60
3	2483.50	58.6 PK	74.0	-15.4	1.28 H	198	25.90	32.70
4	2483.50	46.8 AV	54.0	-7.2	1.28 H	198	14.10	32.70
5	4924.00	48.0 PK	74.0	-26.0	1.10 H	52	41.70	6.30
6	4924.00	36.8 AV	54.0	-17.2	1.10 H	52	30.50	6.30
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	117.3 PK			1.82 V	4	84.70	32.60
2	*2462.00	108.0 AV			1.82 V	4	75.40	32.60
3	2483.50	67.0 PK	74.0	-7.0	1.98 V	7	34.30	32.70
4	**2483.50**	**52.9 AV**	**54.0**	**-1.1**	**1.98 V**	**7**	**20.20**	**32.70**
5	4924.00	47.7 PK	74.0	-26.3	1.62 V	282	41.40	6.30
6	4924.00	36.6 AV	54.0	-17.4	1.62 V	282	30.30	6.30

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	59.1 PK	74.0	-14.9	1.20 H	186	26.60	32.50
2	2390.00	47.1 AV	54.0	-6.9	1.20 H	186	14.60	32.50
3	*2412.00	101.9 PK			1.00 H	128	69.30	32.60
4	*2412.00	92.9 AV			1.00 H	128	60.30	32.60
5	4824.00	47.8 PK	74.0	-26.2	1.11 H	69	41.70	6.10
6	4824.00	35.8 AV	54.0	-18.2	1.11 H	69	29.70	6.10
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	68.7 PK	74.0	-5.3	1.84 V	346	36.20	32.50
2	**2390.00**	**52.9 AV**	**54.0**	**-1.1**	**1.84 V**	**346**	**20.40**	**32.50**
3	*2412.00	115.2 PK			1.83 V	339	82.60	32.60
4	*2412.00	106.0 AV			1.83 V	339	73.40	32.60
5	4824.00	47.1 PK	74.0	-26.9	1.63 V	276	41.00	6.10
6	4824.00	36.0 AV	54.0	-18.0	1.63 V	276	29.90	6.10

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	59.2 PK	74.0	-14.8	1.33 H	153	26.70	32.50
2	2390.00	47.3 AV	54.0	-6.7	1.33 H	153	14.80	32.50
3	*2437.00	109.5 PK			1.00 H	140	76.80	32.70
4	*2437.00	99.8 AV			1.00 H	140	67.10	32.70
5	4874.00	48.2 PK	74.0	-25.8	1.05 H	211	42.00	6.20
6	4874.00	36.2 AV	54.0	-17.8	1.05 H	211	30.00	6.20
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	2390.00	70.7 PK	74.0	-3.3	1.71 V	334	38.20	32.50
2	2390.00	52.6 AV	54.0	-1.4	1.71 V	334	20.10	32.50
3	*2437.00	123.9 PK			1.84 V	333	91.20	32.70
4	*2437.00	113.9 AV			1.84 V	333	81.20	32.70
5	4874.00	47.3 PK	74.0	-26.7	1.58 V	241	41.10	6.20
6	4874.00	36.2 AV	54.0	-17.8	1.58 V	241	30.00	6.20

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	103.4 PK			1.46 H	144	70.80	32.60
2	*2462.00	93.1 AV			1.46 H	144	60.50	32.60
3	2483.50	58.6 PK	74.0	-15.4	1.43 H	127	25.90	32.70
4	2483.50	46.9 AV	54.0	-7.1	1.43 H	127	14.20	32.70
5	4924.00	48.7 PK	74.0	-25.3	1.07 H	143	42.40	6.30
6	4924.00	36.9 AV	54.0	-17.1	1.07 H	143	30.60	6.30
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	116.2 PK			1.84 V	333	83.60	32.60
2	*2462.00	106.9 AV			1.84 V	333	74.30	32.60
3	2483.50	68.3 PK	74.0	-5.7	1.78 V	73	35.60	32.70
4	2483.50	52.3 AV	54.0	-1.7	1.78 V	73	19.60	32.70
5	4924.00	48.7 PK	74.0	-25.3	1.59 V	253	42.40	6.30
6	4924.00	36.6 AV	54.0	-17.4	1.59 V	253	30.30	6.30

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	59.5 PK	74.0	-14.5	1.06 H	76	27.00	32.50
2	2390.00	47.8 AV	54.0	-6.2	1.06 H	76	15.30	32.50
3	*2422.00	95.7 PK			1.00 H	127	63.10	32.60
4	*2422.00	87.3 AV			1.00 H	127	54.70	32.60
5	4844.00	47.8 PK	74.0	-26.2	1.06 H	70	41.70	6.10
6	4844.00	36.8 AV	54.0	-17.2	1.06 H	70	30.70	6.10
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	68.0 PK	74.0	-6.0	1.97 V	0	35.50	32.50
2	2390.00	52.3 AV	54.0	-1.7	1.97 V	0	19.80	32.50
3	*2422.00	108.9 PK			1.79 V	327	76.30	32.60
4	*2422.00	100.1 AV			1.79 V	327	67.50	32.60
5	4844.00	46.8 PK	74.0	-27.2	1.26 V	242	40.70	6.10
6	4844.00	36.5 AV	54.0	-17.5	1.26 V	242	30.40	6.10

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	58.3 PK	74.0	-15.7	1.17 H	144	25.80	32.50
2	2390.00	47.8 AV	54.0	-6.2	1.17 H	144	15.30	32.50
3	*2437.00	101.8 PK			1.00 H	141	69.10	32.70
4	*2437.00	92.6 AV			1.00 H	141	59.90	32.70
5	2483.50	57.9 PK	74.0	-16.1	1.02 H	224	25.20	32.70
6	2483.50	47.5 AV	54.0	-6.5	1.02 H	224	14.80	32.70
7	4874.00	48.1 PK	74.0	-25.9	1.14 H	82	41.90	6.20
8	4874.00	36.5 AV	54.0	-17.5	1.14 H	82	30.30	6.20
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	2390.00	65.1 PK	74.0	-8.9	1.87 V	0	32.60	32.50
2	**2390.00**	**52.9 AV**	**54.0**	**-1.1**	**1.87 V**	**0**	**20.40**	**32.50**
3	*2437.00	112.9 PK			1.82 V	179	80.20	32.70
4	*2437.00	103.1 AV			1.82 V	179	70.40	32.70
5	2483.50	63.8 PK	74.0	-10.2	1.92 V	22	31.10	32.70
6	2483.50	52.3 AV	54.0	-1.7	1.92 V	22	19.60	32.70
7	4874.00	48.0 PK	74.0	-26.0	1.32 V	120	41.80	6.20
8	4874.00	37.0 AV	54.0	-17.0	1.32 V	120	30.80	6.20

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	97.5 PK			1.23 H	136	64.80	32.70
2	*2452.00	88.5 AV			1.23 H	136	55.80	32.70
3	2483.50	59.1 PK	74.0	-14.9	1.02 H	86	26.40	32.70
4	2483.50	47.4 AV	54.0	-6.6	1.02 H	86	14.70	32.70
5	4904.00	47.3 PK	74.0	-26.7	1.03 H	86	41.20	6.10
6	4904.00	36.2 AV	54.0	-17.8	1.03 H	86	30.10	6.10
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	110.0 PK			1.64 V	13	77.30	32.70
2	*2452.00	100.5 AV			1.64 V	13	67.80	32.70
3	2483.50	70.7 PK	74.0	-3.3	1.76 V	9	38.00	32.70
4	2483.50	52.7 AV	54.0	-1.3	1.76 V	9	20.00	32.70
5	4904.00	47.0 PK	74.0	-27.0	1.27 V	321	40.90	6.10
6	4904.00	37.1 AV	54.0	-16.9	1.27 V	321	31.00	6.10

Remarks:

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

Below 1GHz worst-case data: 802.11b

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

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	33.5 QP	40.0	-6.5	1.99 H	49	48.30	-14.80
2	136.84	36.0 QP	43.5	-7.5	1.99 H	238	51.00	-15.00
3	166.00	36.3 QP	43.5	-7.2	1.49 H	198	50.50	-14.20
4	220.44	36.3 QP	46.0	-9.7	1.00 H	214	52.80	-16.50
5	374.04	37.2 QP	46.0	-8.8	1.00 H	112	48.20	-11.00
6	500.42	36.4 QP	46.0	-9.6	1.49 H	197	44.70	-8.30
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	30.00	37.5 QP	40.0	-2.5	1.00 V	9	53.60	-16.10
2	57.27	37.9 QP	40.0	-2.1	1.00 V	8	52.70	-14.80
3	68.79	37.3 QP	40.0	-2.7	1.00 V	55	53.30	-16.00
4	123.23	36.0 QP	43.5	-7.5	1.00 V	230	52.00	-16.00
5	374.04	36.6 QP	46.0	-9.4	1.00 V	167	47.60	-11.00
6	500.42	37.6 QP	46.0	-8.4	1.49 V	322	45.90	-8.30

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	ESCS 30	100288	Apr. 27, 2015	Apr. 26, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 30, 2014	Dec. 29, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 21, 2015	Jul. 20, 2016
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.

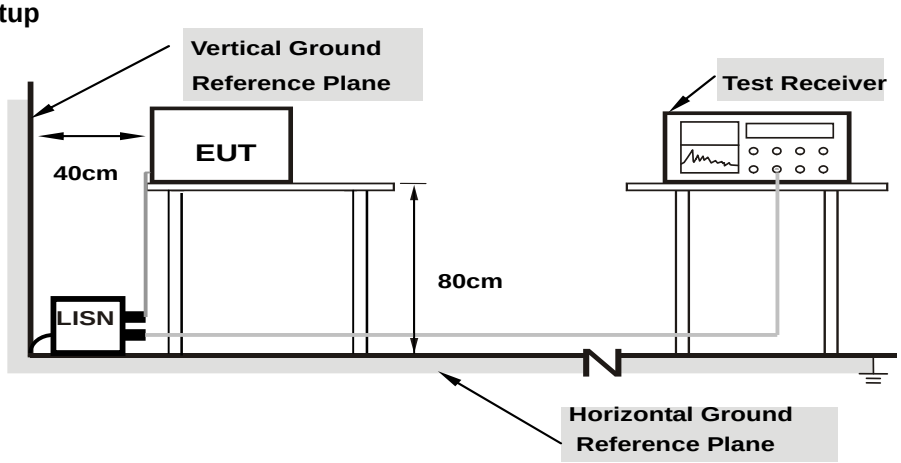
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

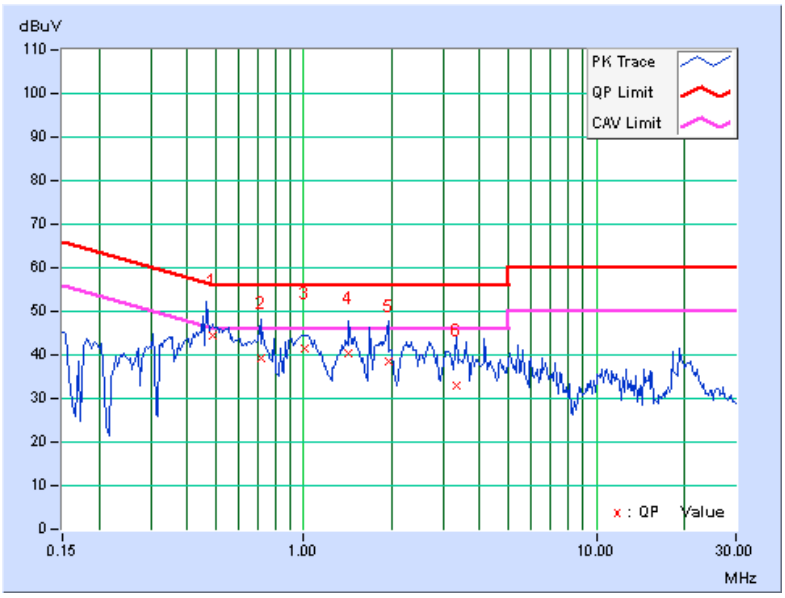
4.2.7 Test Results

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	0.48612	9.97	34.46	25.30	44.43	35.27	56.23	46.23	-11.81	-10.97
2	0.71250	10.01	29.30	17.25	39.31	27.26	56.00	46.00	-16.69	-18.74
3	1.00781	10.07	31.37	21.89	41.44	31.96	56.00	46.00	-14.56	-14.04
4	1.42578	10.10	30.35	21.50	40.45	31.60	56.00	46.00	-15.55	-14.40
5	1.95313	10.15	28.33	20.85	38.48	31.00	56.00	46.00	-17.52	-15.00
6	3.32422	10.23	22.75	12.62	32.98	22.85	56.00	46.00	-23.02	-23.15

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.

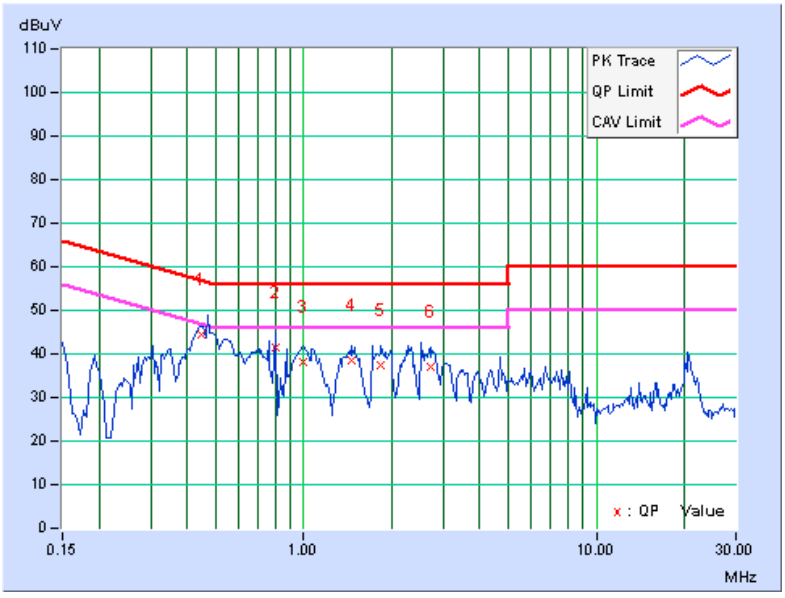


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.44944**	**10.01**	**34.37**	**26.11**	**44.38**	**36.12**	**56.89**	**46.89**	**-12.51**	**-10.77**
2	0.80234	10.05	31.54	16.69	41.59	26.74	56.00	46.00	-14.41	-19.26
3	0.99375	10.08	28.23	18.55	38.31	28.63	56.00	46.00	-17.69	-17.37
4	1.45703	10.13	28.29	19.22	38.42	29.35	56.00	46.00	-17.58	-16.65
5	1.84375	10.18	27.07	18.28	37.25	28.46	56.00	46.00	-18.75	-17.54
6	2.72656	10.23	26.70	18.43	36.93	28.66	56.00	46.00	-19.07	-17.34

Remarks:

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

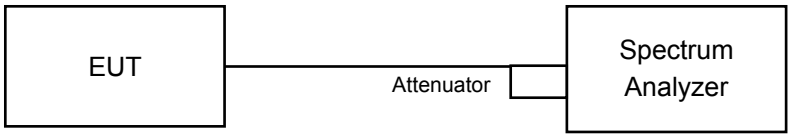


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz

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

c. Trace mode = max hold.

d. Sweep = auto couple.

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

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	7.09	7.09	7.10	0.5	Pass
6	2437	7.09	7.10	7.09	0.5	Pass
11	2462	7.11	7.11	7.11	0.5	Pass

802.11g

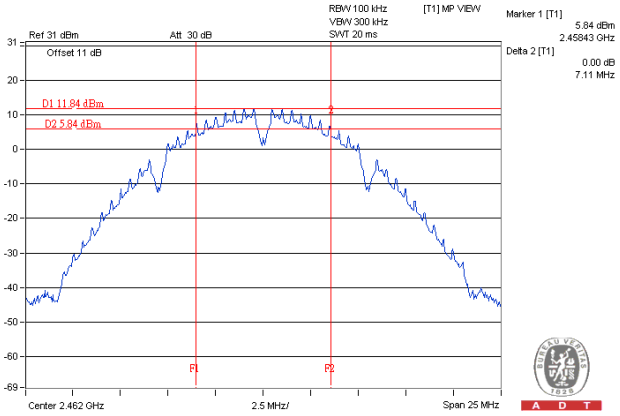
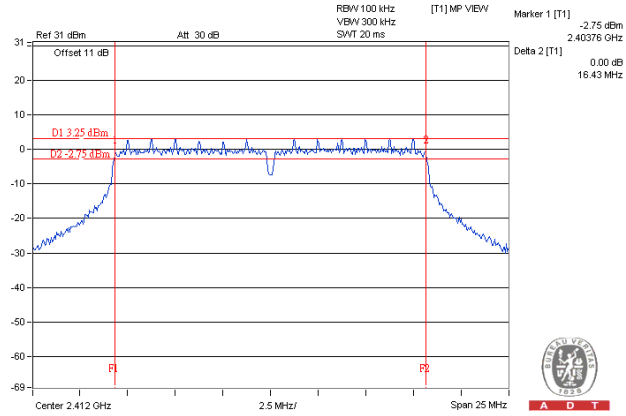
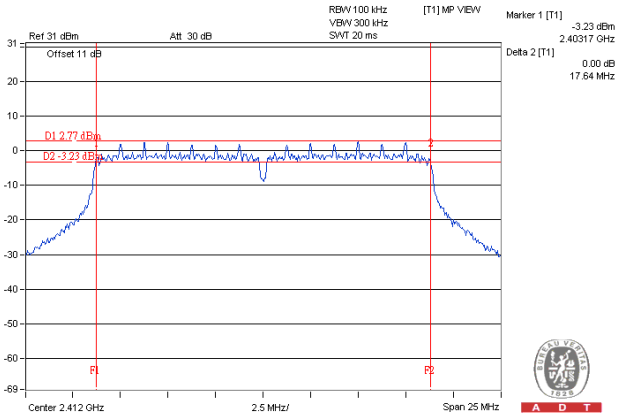
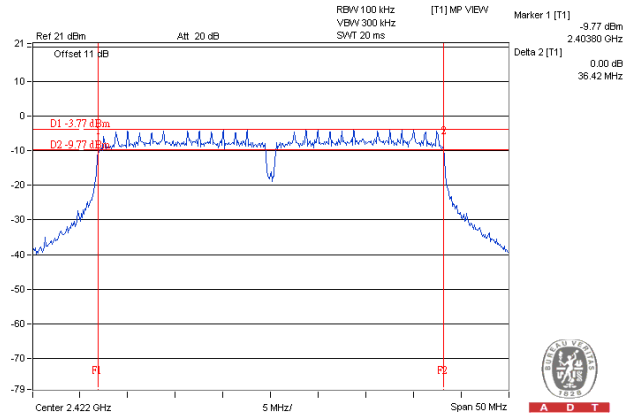
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.43	16.41	16.41	0.5	Pass
6	2437	16.39	16.40	16.40	0.5	Pass
11	2462	16.39	16.41	16.40	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	17.63	17.61	17.64	0.5	Pass
6	2437	17.61	17.62	17.59	0.5	Pass
11	2462	17.60	17.63	17.64	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	36.42	36.41	36.42	0.5	Pass
6	2437	36.37	36.40	36.41	0.5	Pass
9	2452	36.38	36.41	36.41	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

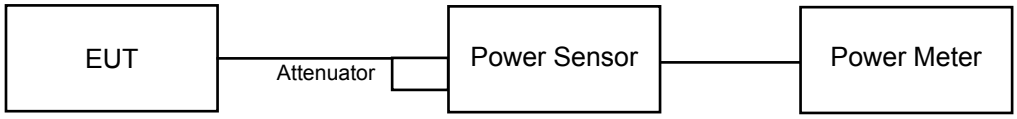
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 ≤ 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

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	19.01	18.41	18.70	223.090	23.48	30	Pass
6	2437	19.86	19.63	20.29	**295.566**	24.71	30	Pass
11	2462	20.02	19.23	19.80	279.714	24.47	30	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	15.01	14.18	15.09	90.163	19.55	30	Pass
6	2437	19.86	19.49	20.07	287.373	24.58	30	Pass
11	2462	15.43	14.55	15.22	96.690	19.85	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	Chain 2				
1	2412	14.02	13.21	14.01	71.353	18.53	30	Pass
6	2437	20.06	19.51	20.14	293.998	24.68	30	Pass
11	2462	14.65	13.30	14.11	76.317	18.83	30	Pass

802.11n (HT40)

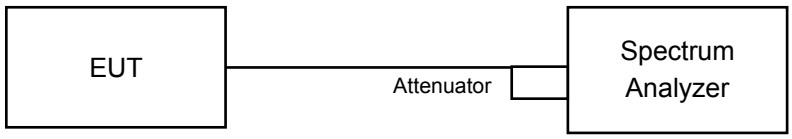
Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	11.23	10.27	10.99	36.475	15.62	30	Pass
6	2437	14.93	14.19	15.02	89.128	19.50	30	Pass
9	2452	11.16	9.81	10.77	34.574	15.39	30	Pass

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

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

802.11b

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=3) dB	Total PSD (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-8.32	4.77	-3.55	3.82	Pass
	6	2437	-7.58	4.77	-2.81	3.82	Pass
	11	2462	-7.35	4.77	-2.58	3.82	Pass
1	1	2412	-9.72	4.77	-4.95	3.82	Pass
	6	2437	-8.34	4.77	-3.57	3.82	Pass
	11	2462	-8.16	4.77	-3.39	3.82	Pass
2	1	2412	-8.00	4.77	-3.23	3.82	Pass
	6	2437	-7.63	4.77	-2.86	3.82	Pass
	11	2462	-7.99	4.77	-3.22	3.82	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 = 5.41dBi + 10log(3) = 10.18dBi > 6dBi , so the power density limit shall be reduced to 8-(10.18-6) = 3.82dBm.

802.11g

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=3) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-16.01	4.77	0.12	-11.12	3.82	Pass
	6	2437	-11.36	4.77	0.12	-6.47	3.82	Pass
	11	2462	-15.32	4.77	0.12	-10.43	3.82	Pass
1	1	2412	-16.82	4.77	0.12	-11.93	3.82	Pass
	6	2437	-12.07	4.77	0.12	-7.18	3.82	Pass
	11	2462	-16.91	4.77	0.12	-12.02	3.82	Pass
2	1	2412	-15.88	4.77	0.12	-10.99	3.82	Pass
	6	2437	-10.45	4.77	0.12	-5.56	3.82	Pass
	11	2462	-16.34	4.77	0.12	-11.45	3.82	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 = 5.41dBi + 10log(3) = 10.18dBi > 6dBi , so the power density limit shall be reduced to 8-(10.18-6) = 3.82dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

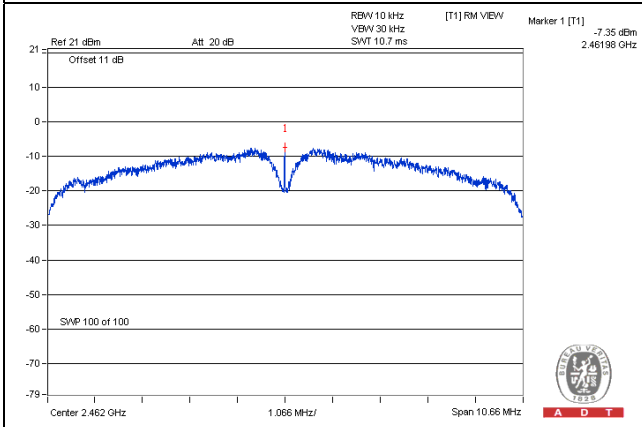
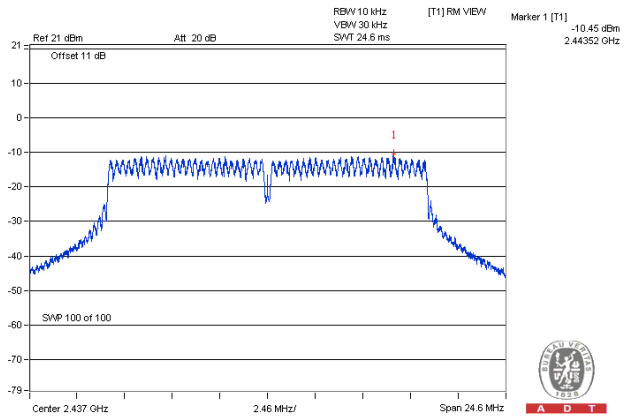
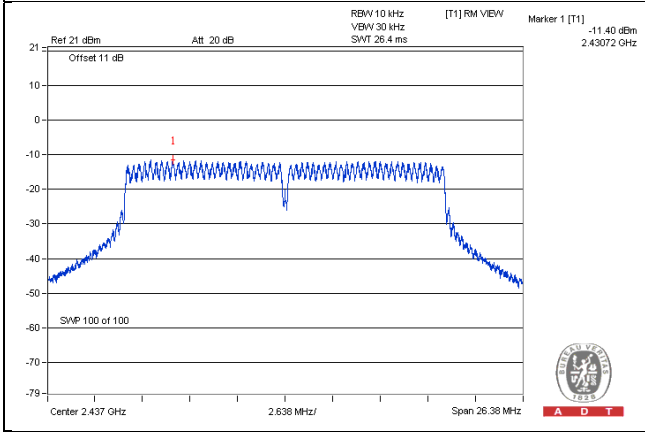
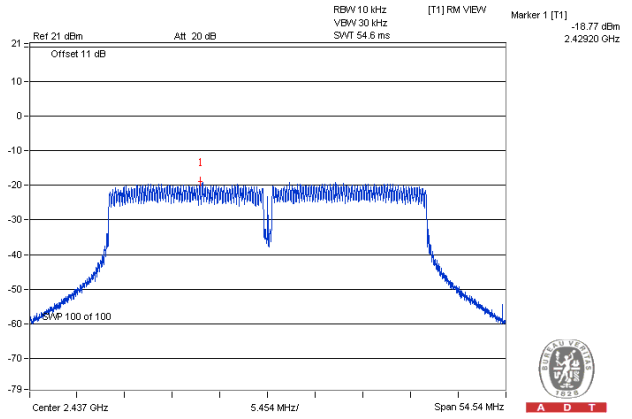
TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=3) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-17.64	4.77	0.13	-12.74	3.82	Pass
	6	2437	-11.95	4.77	0.13	-7.05	3.82	Pass
	11	2462	-17.12	4.77	0.13	-12.22	3.82	Pass
1	1	2412	-18.62	4.77	0.13	-13.72	3.82	Pass
	6	2437	-12.17	4.77	0.13	-7.27	3.82	Pass
	11	2462	-18.55	4.77	0.13	-13.65	3.82	Pass
2	1	2412	-17.60	4.77	0.13	-12.70	3.82	Pass
	6	2437	-11.40	4.77	0.13	-6.50	3.82	Pass
	11	2462	-17.26	4.77	0.13	-12.36	3.82	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 = 5.41dBi + 10log(3) = 10.18dBi > 6dBi , so the power density limit shall be reduced to 8-(10.18-6) = 3.82dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

TX chain	Channel	Frequency (MHz)	PSD (dBm)	10 log (N=3) dB	Duty Factor	Total PSD with Duty Factor (dBm)	Limit (dBm)	Pass / Fail
0	3	2422	-22.88	4.77	0.20	-17.91	3.82	Pass
	6	2437	-18.77	4.77	0.20	-13.80	3.82	Pass
	9	2452	-21.53	4.77	0.20	-16.56	3.82	Pass
1	3	2422	-23.74	4.77	0.20	-18.77	3.82	Pass
	6	2437	-19.44	4.77	0.20	-14.47	3.82	Pass
	9	2452	-23.30	4.77	0.20	-18.33	3.82	Pass
2	3	2422	-22.97	4.77	0.20	-18.00	3.82	Pass
	6	2437	-19.10	4.77	0.20	-14.13	3.82	Pass
	9	2452	-22.84	4.77	0.20	-17.87	3.82	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 = 5.41dBi + 10log(3) = 10.18dBi > 6dBi , so the power density limit shall be reduced to 8-(10.18-6) = 3.82dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

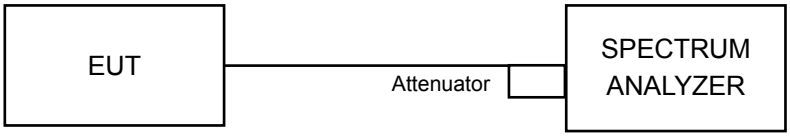
Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	802.11n (HT40)
	

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 = peak.
f. Trace Mode = max hold.
g. Sweep = auto couple.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

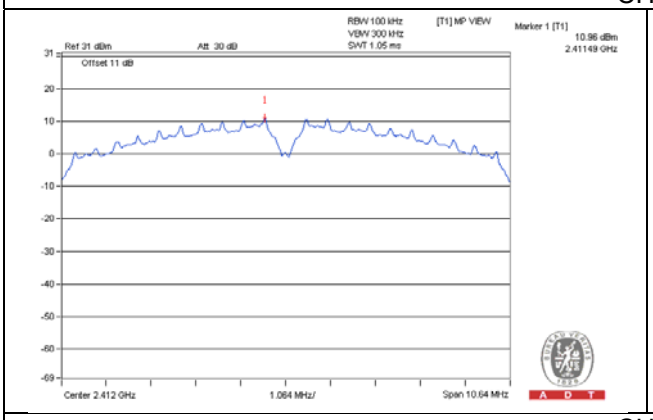
Same as Item 4.3.6

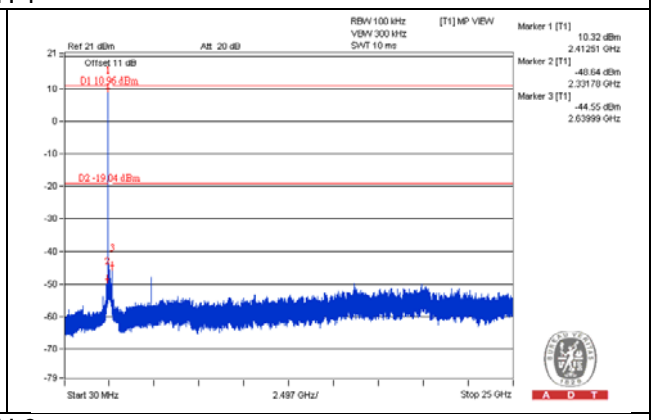
4.6.7 Test Results

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.

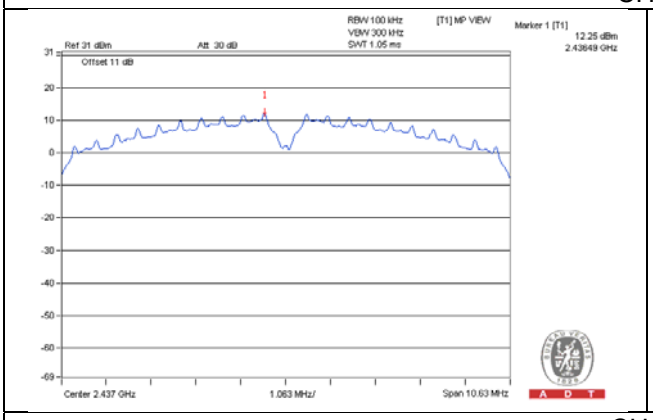
802.11b_Chain 0

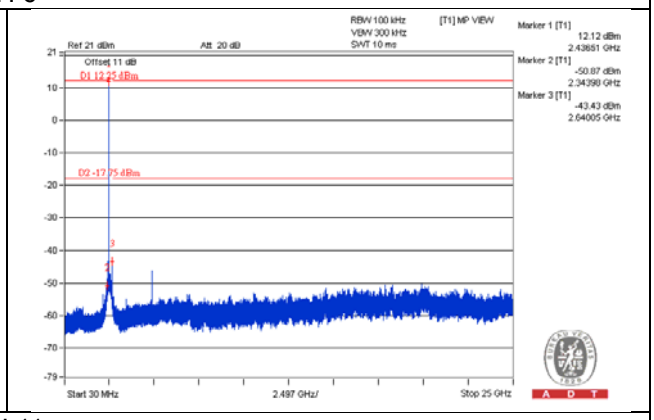
CH 1



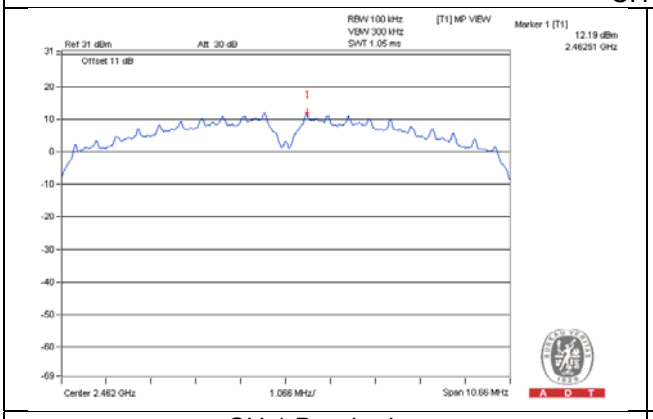


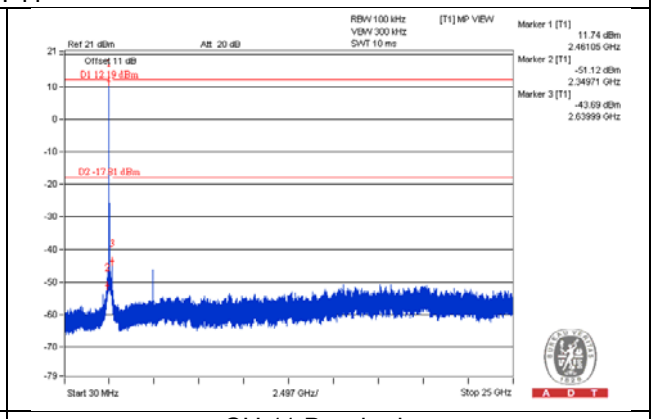
CH 6



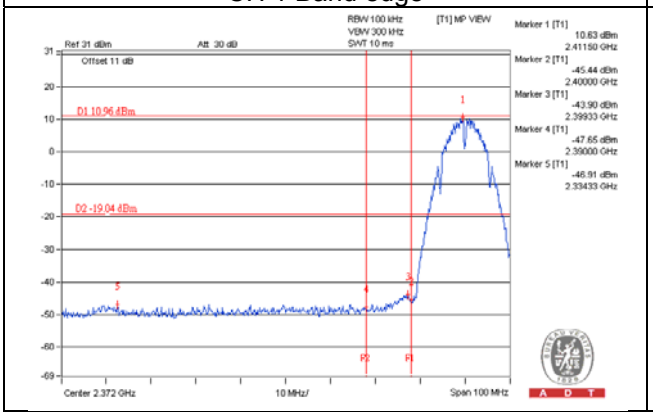


CH 11

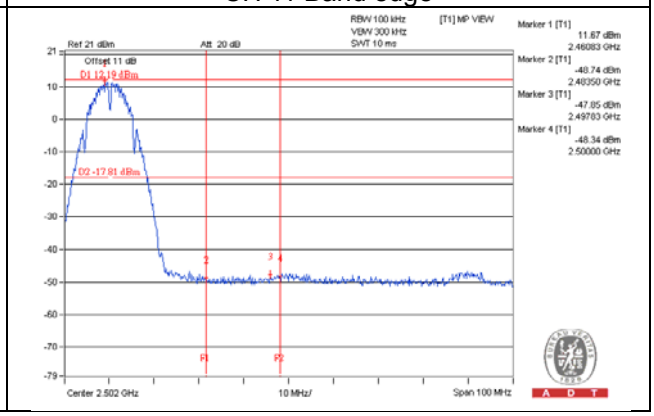




CH 1 Band edge

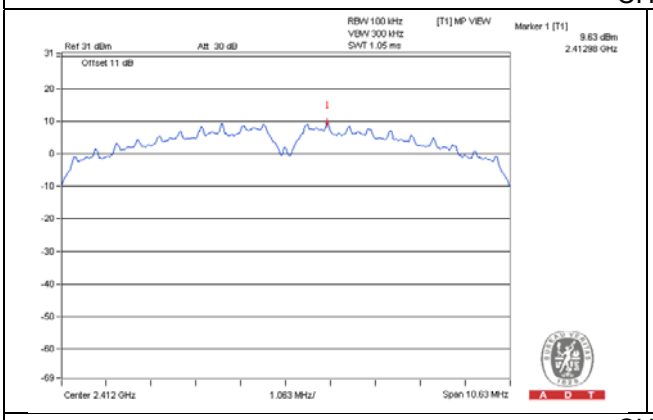


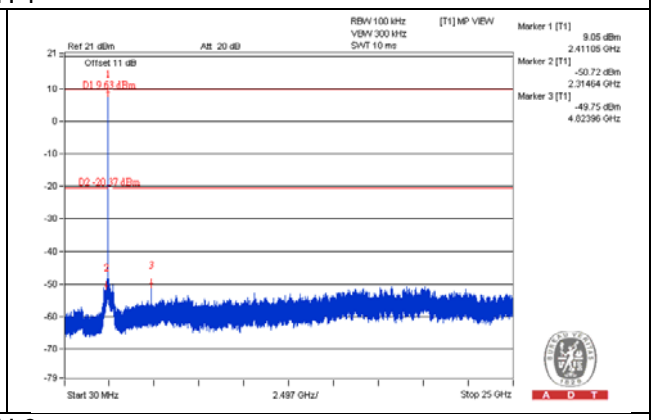
CH 11 Band edge



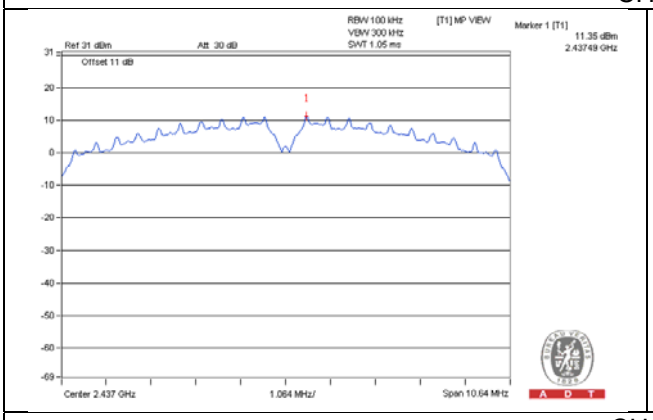
802.11b_Chain 1

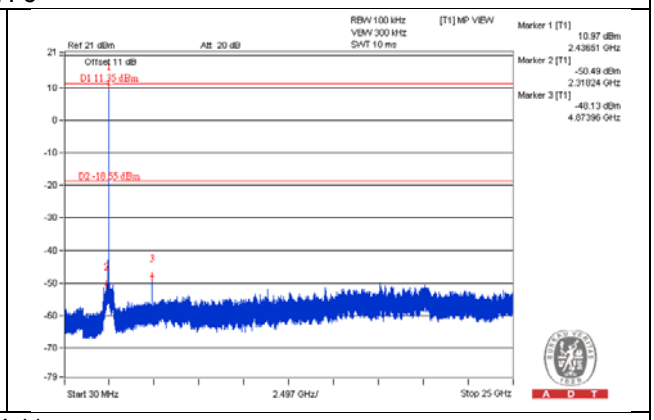
CH 1



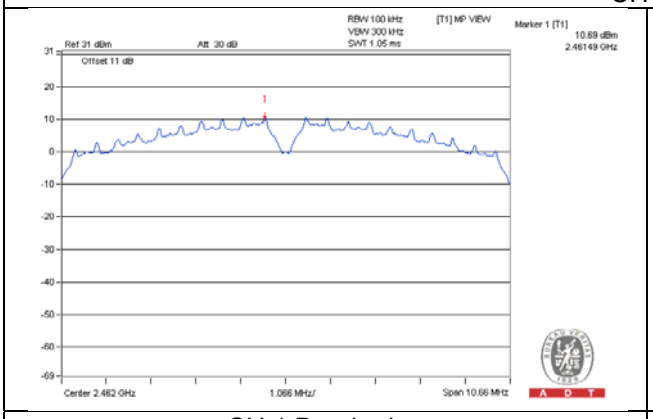


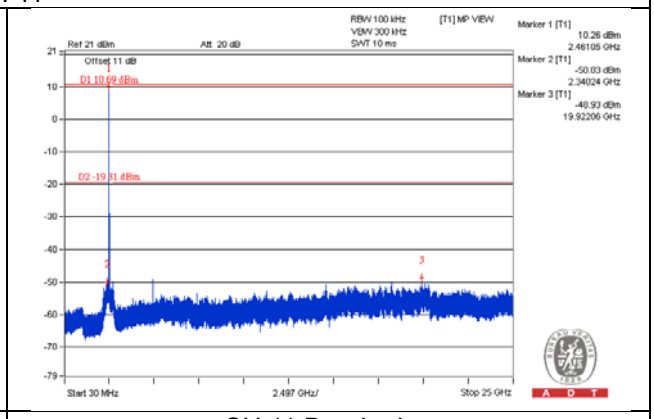
CH 6



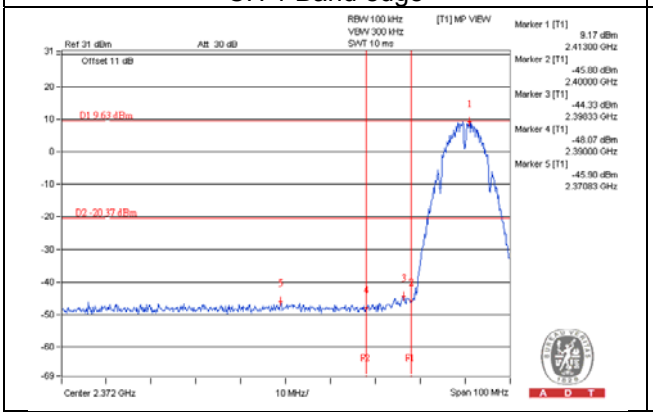


CH 11

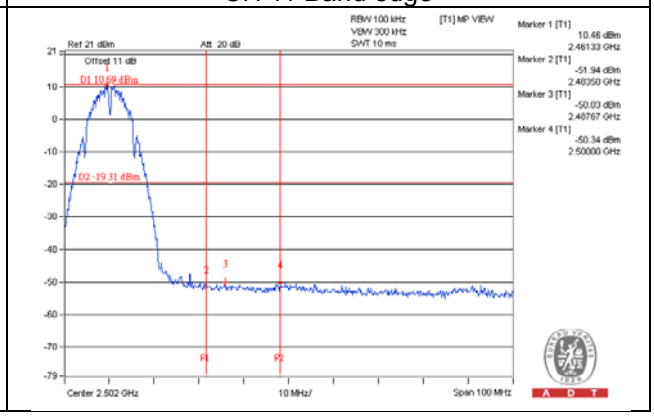




CH 1 Band edge

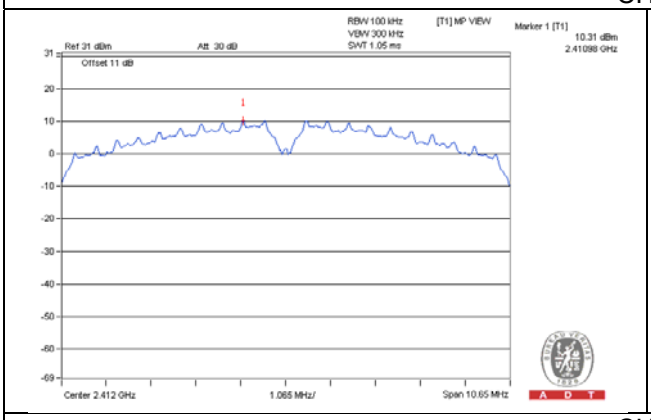


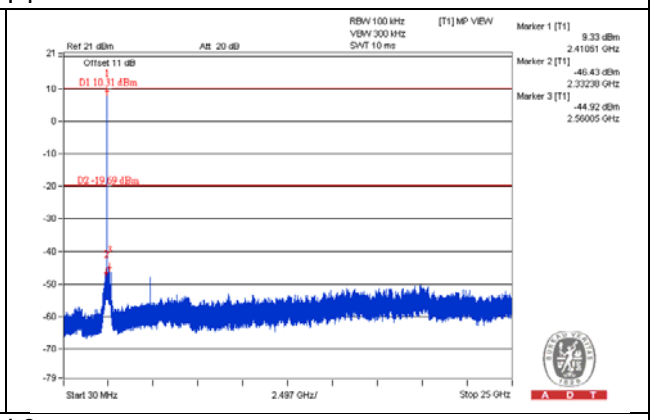
CH 11 Band edge



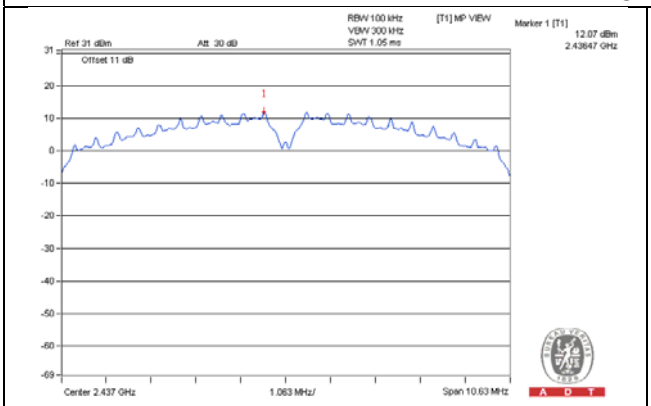
802.11b_Chain 2

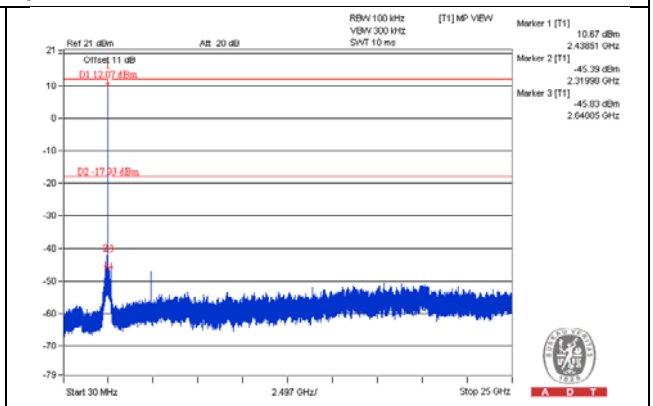
CH 1



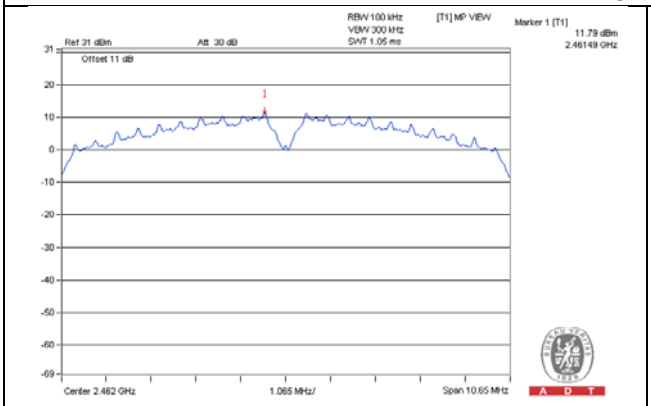


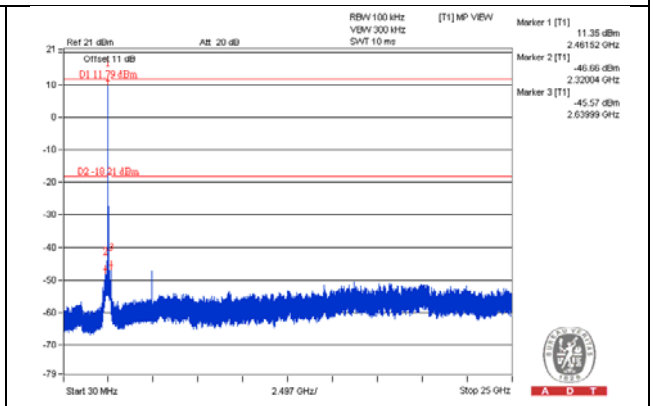
CH 6



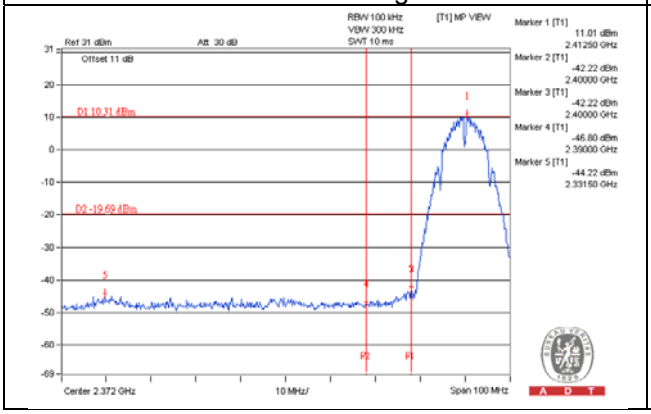


CH 11

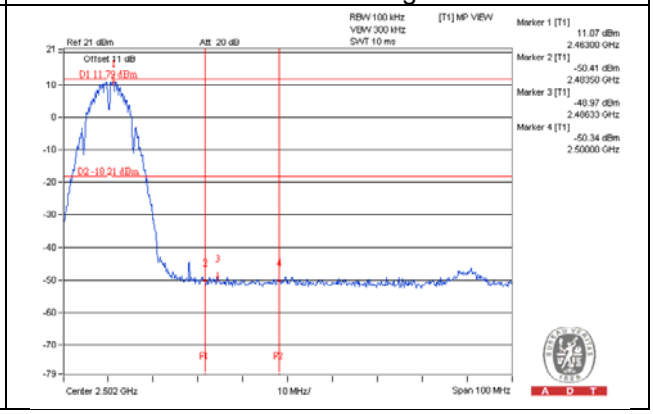




CH 1 Band edge

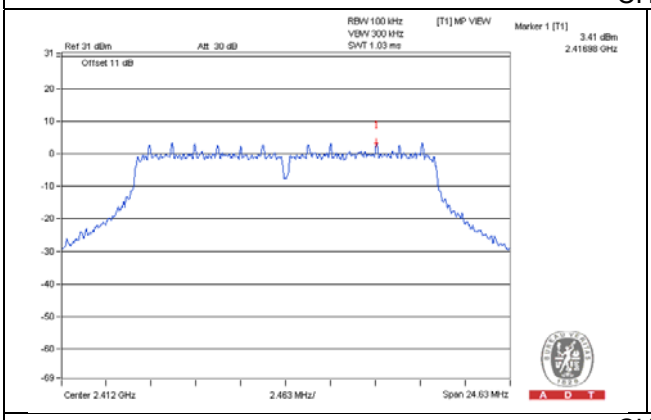


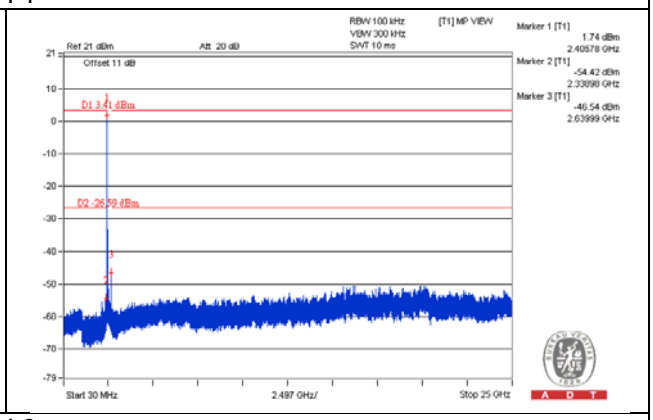
CH 11 Band edge



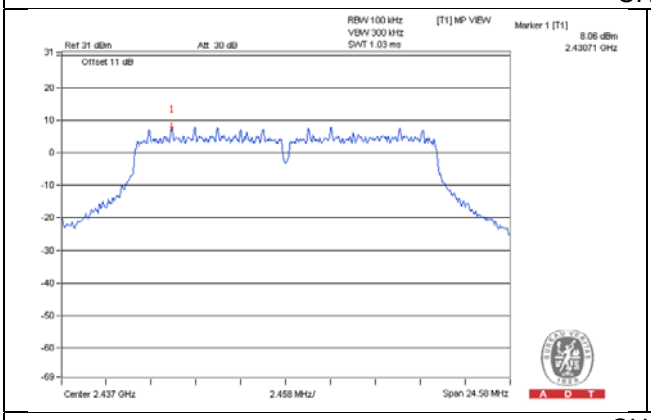
802.11g_Chain 0

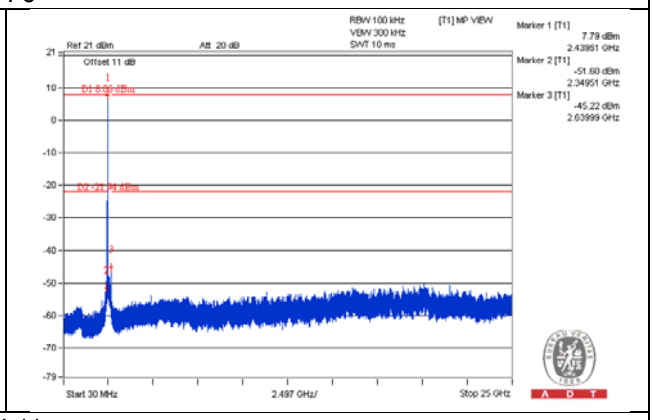
CH 1



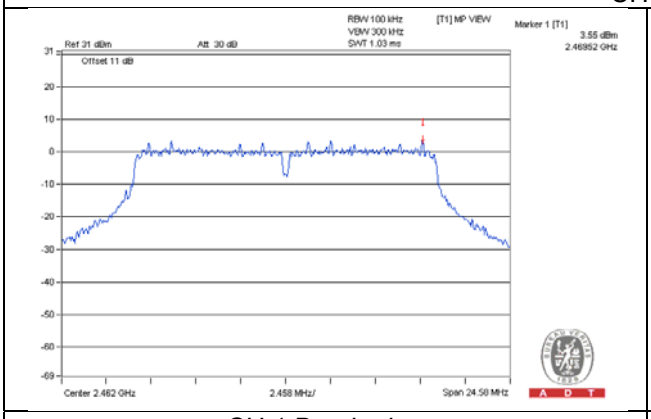


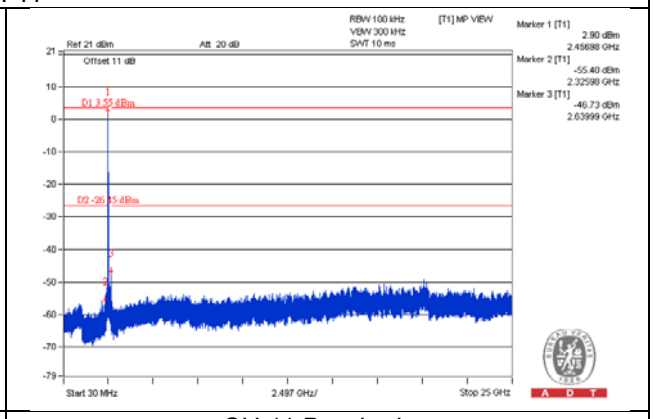
CH 6



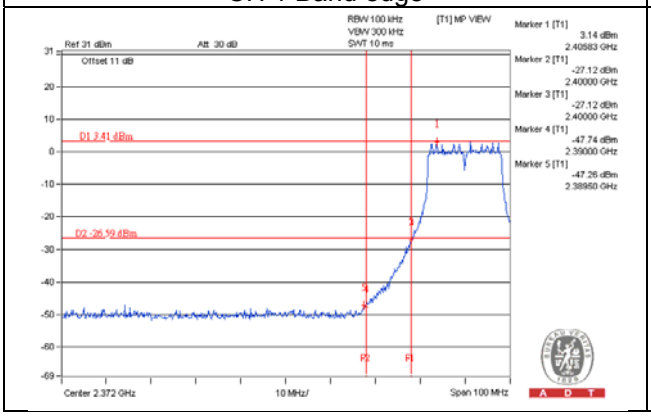


CH 11

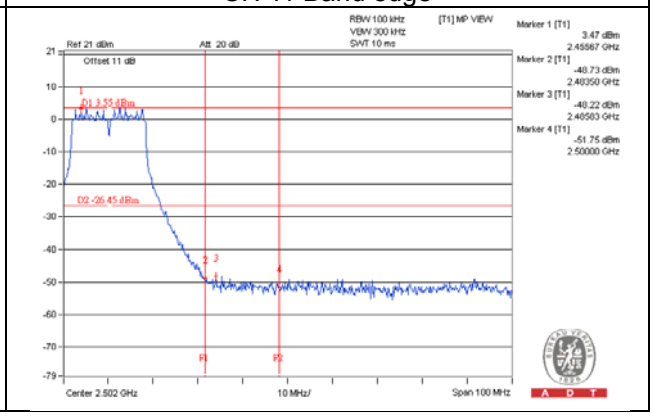




CH 1 Band edge

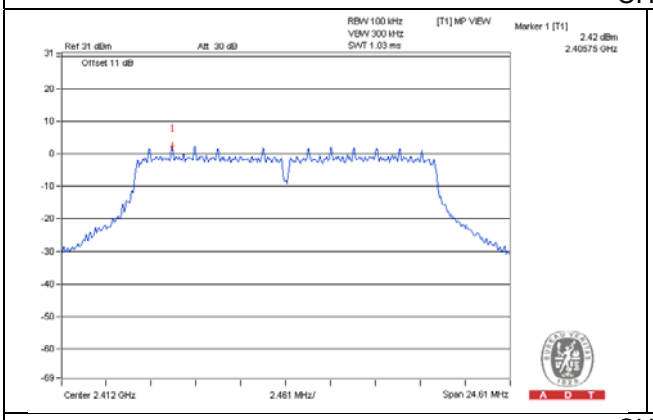


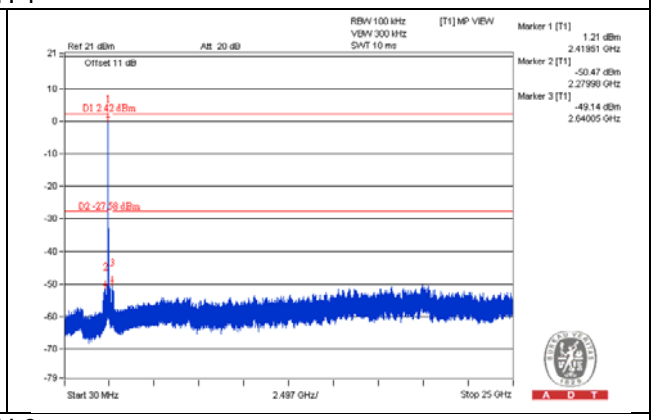
CH 11 Band edge



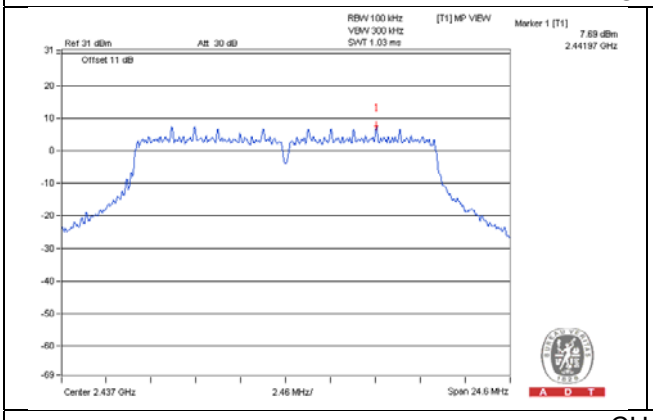
802.11g_Chain 1

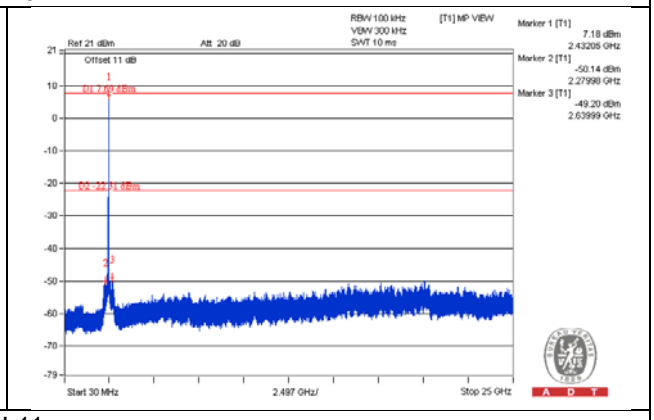
CH 1



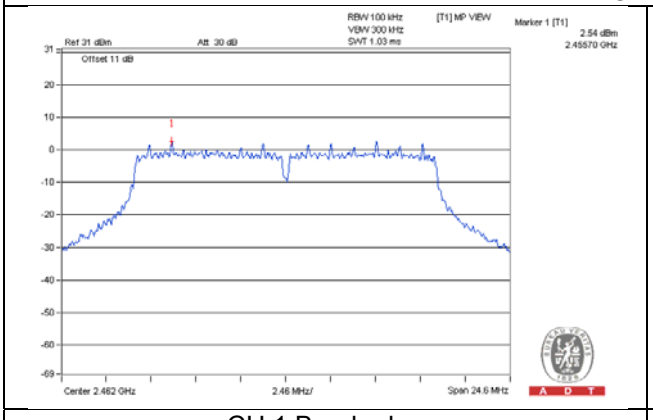


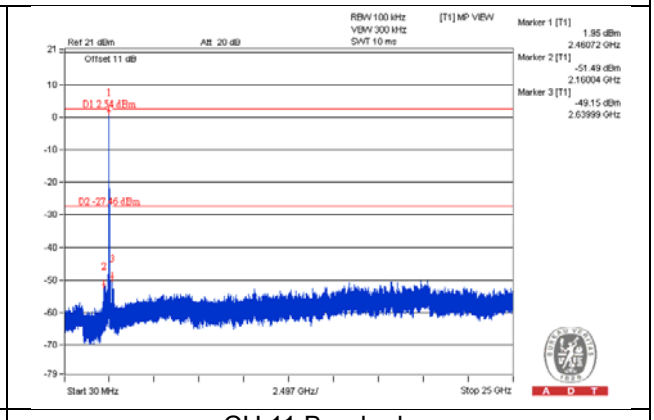
CH 6



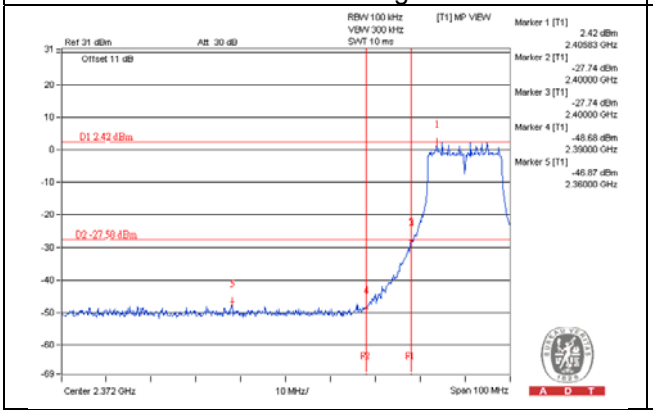


CH 11

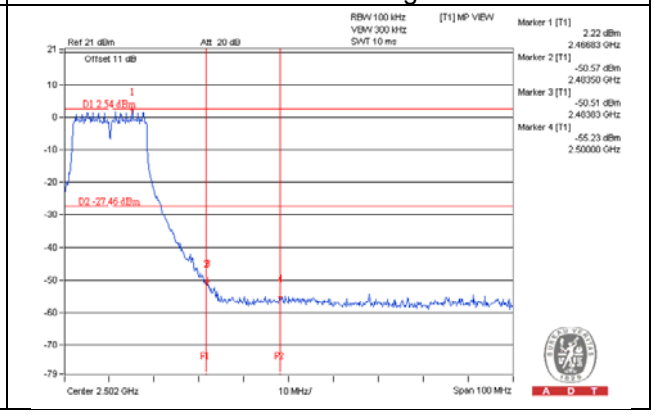




CH 1 Band edge

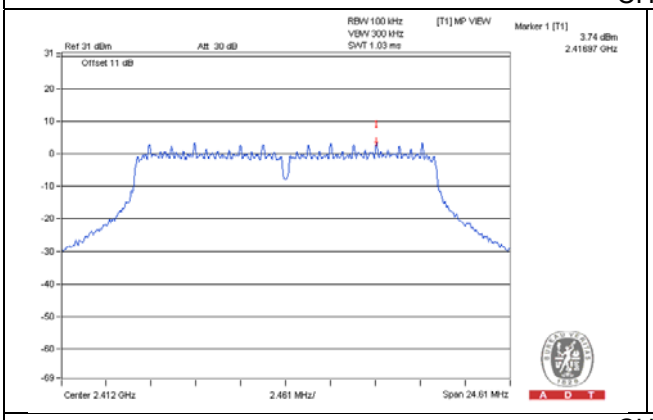


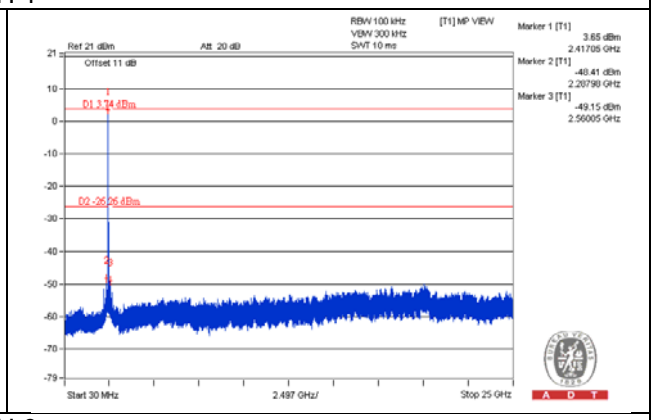
CH 11 Band edge



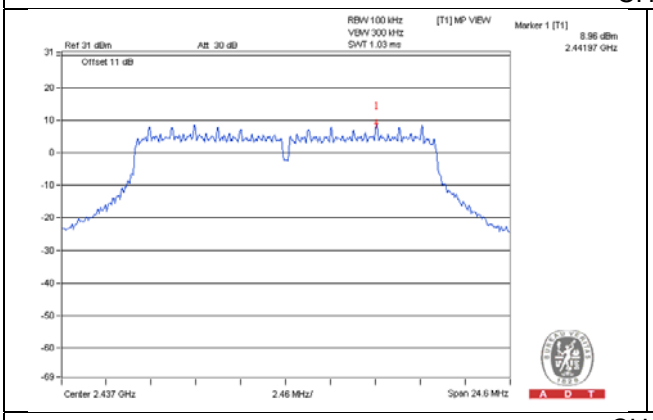
802.11g_Chain 2

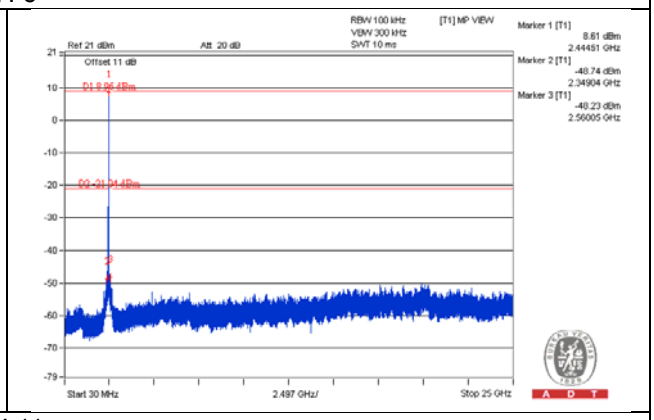
CH 1



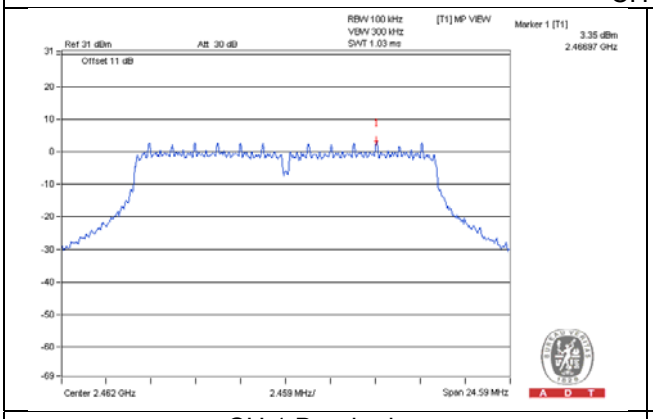


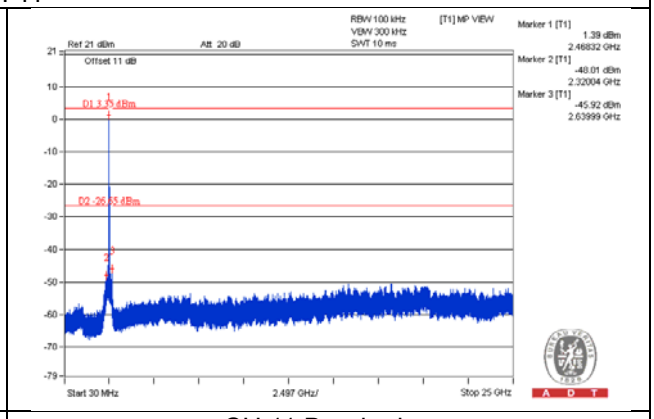
CH 6



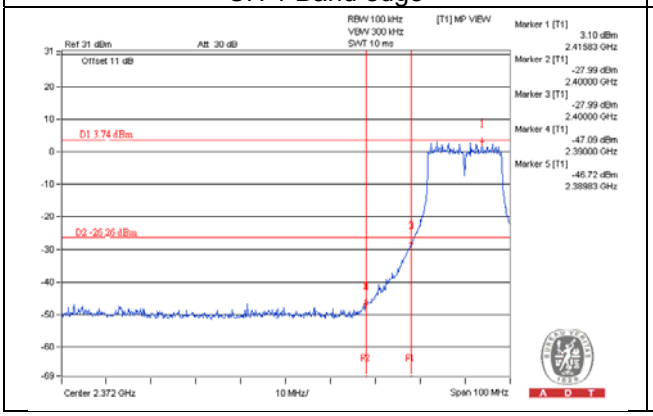


CH 11

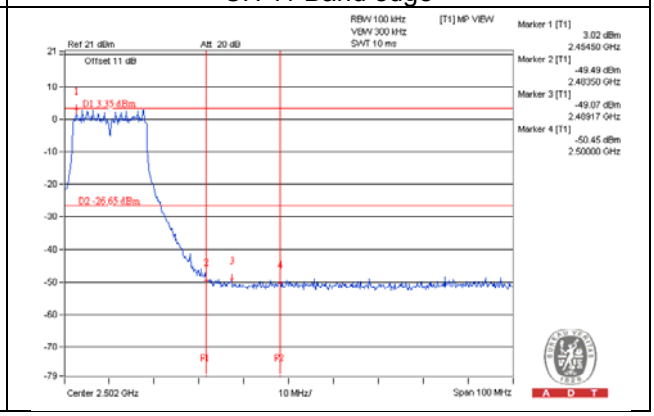




CH 1 Band edge

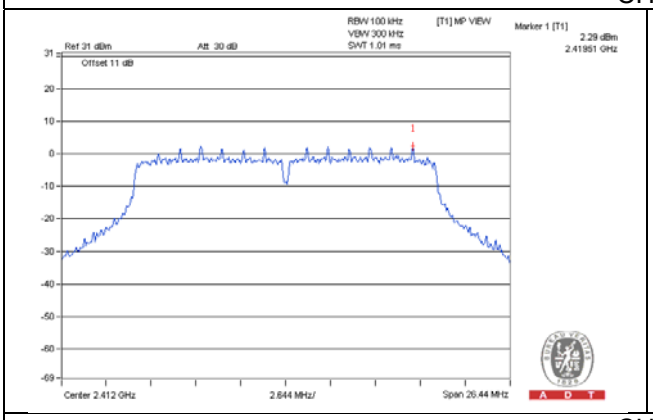


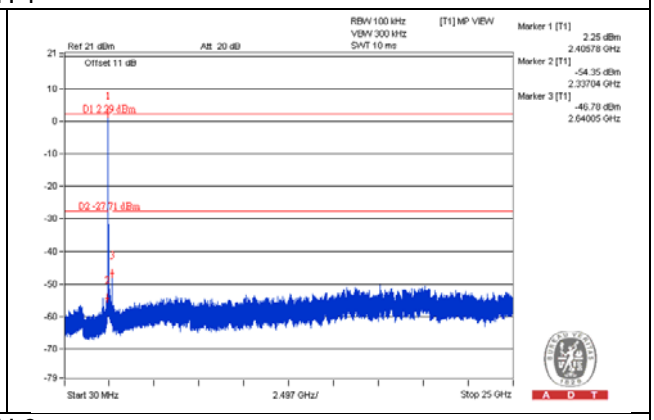
CH 11 Band edge



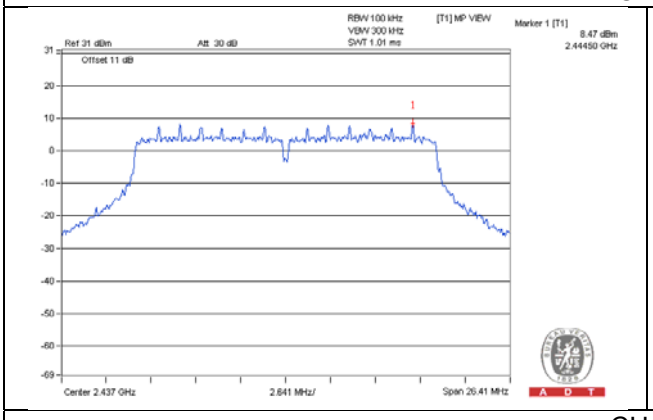
802.11n (HT20) _Chain 0

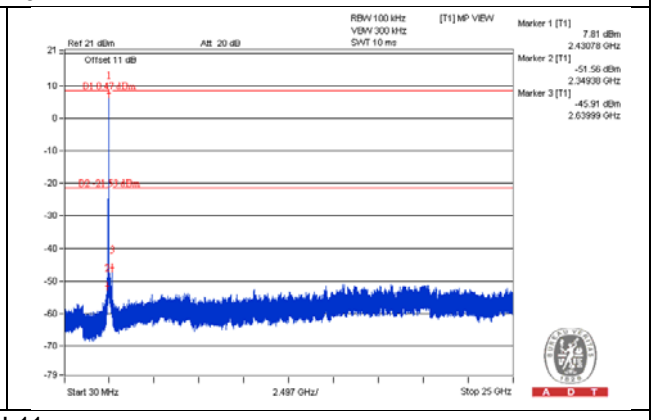
CH 1



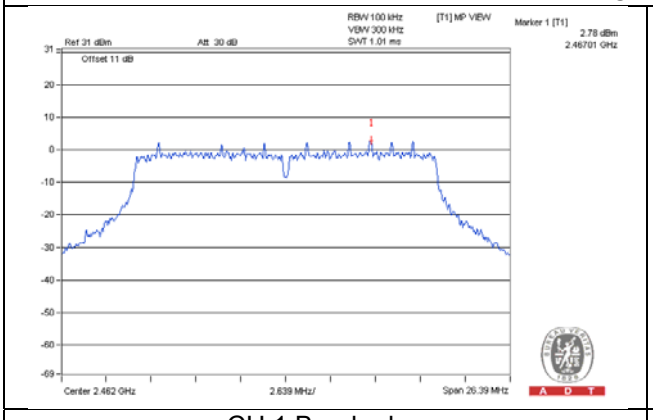


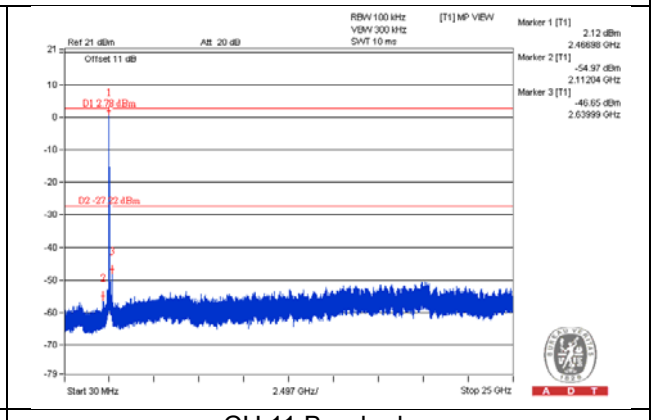
CH 6



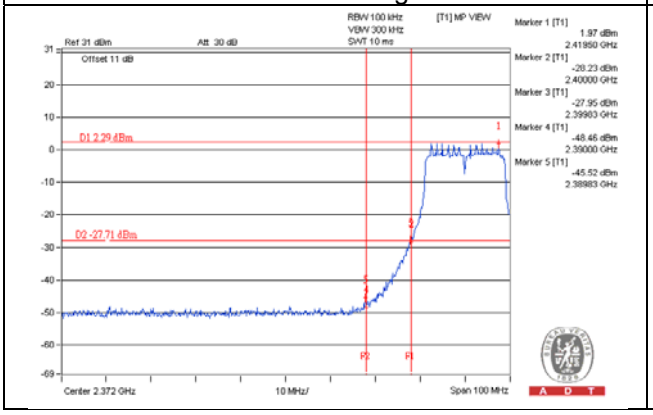


CH 11

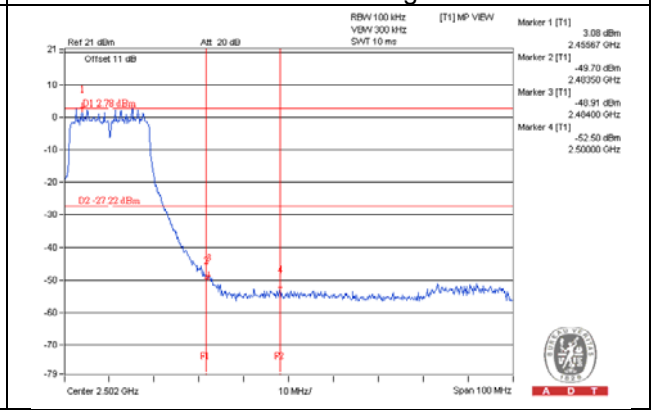




CH 1 Band edge

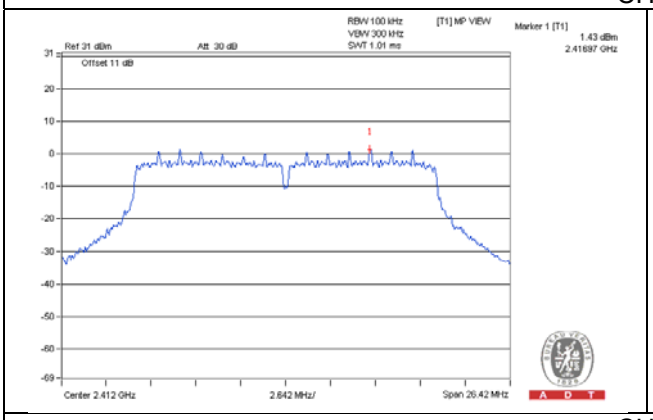


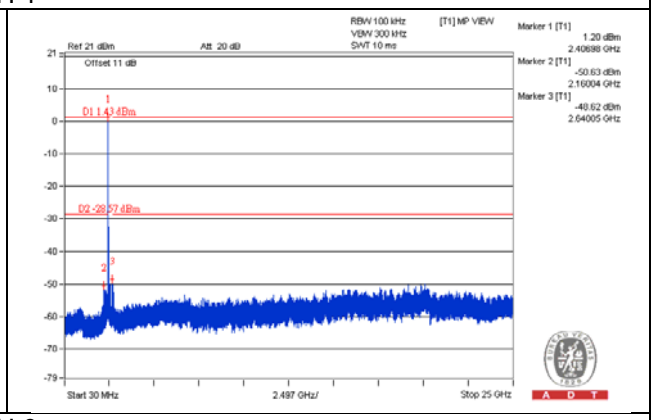
CH 11 Band edge



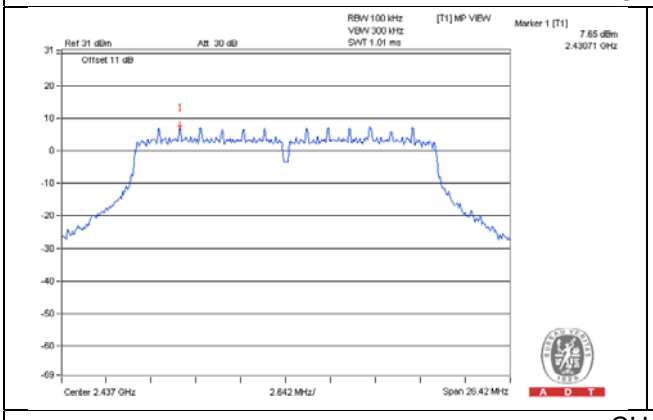
802.11n (HT20) _Chain 1

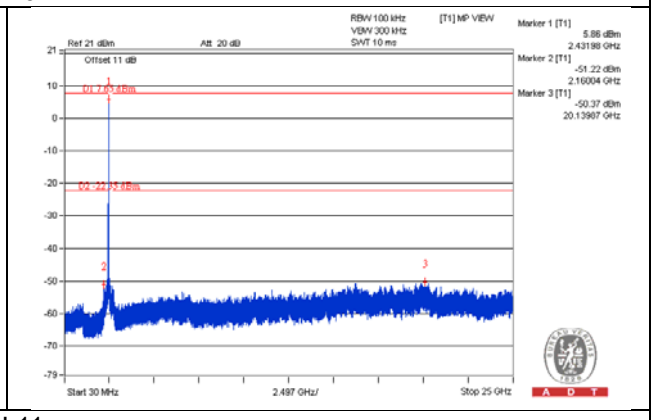
CH 1



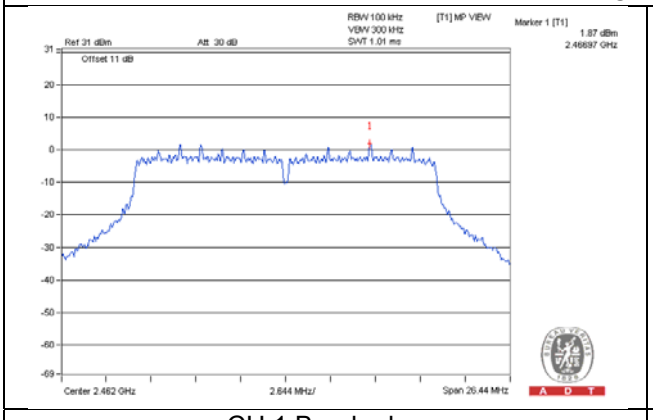


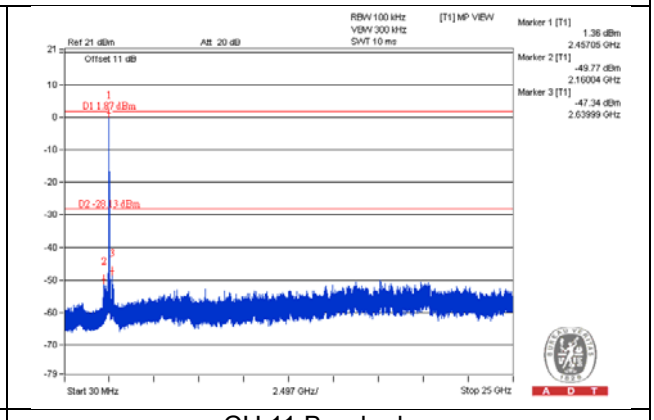
CH 6



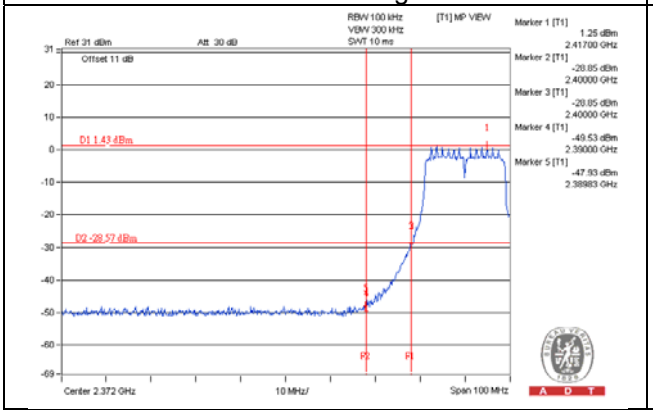


CH 11

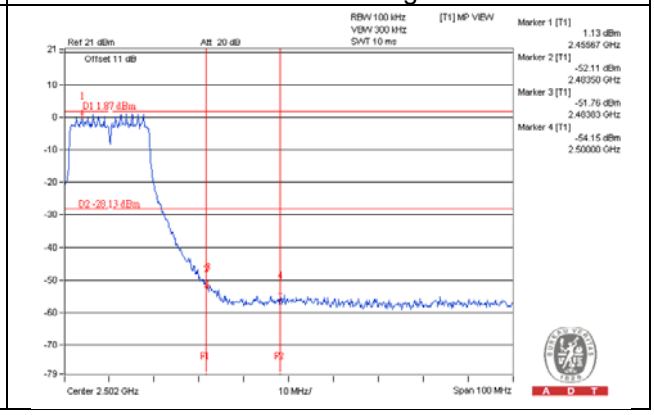




CH 1 Band edge

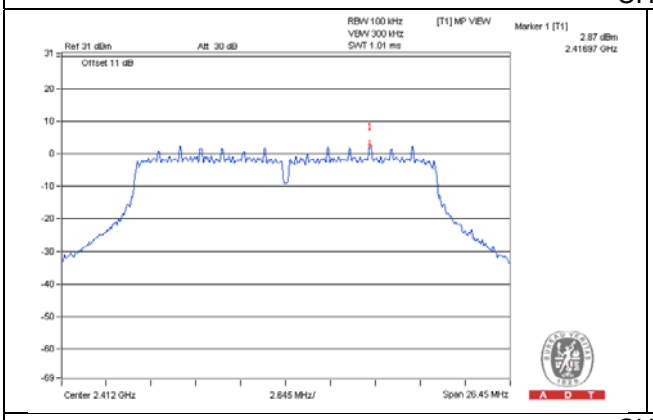


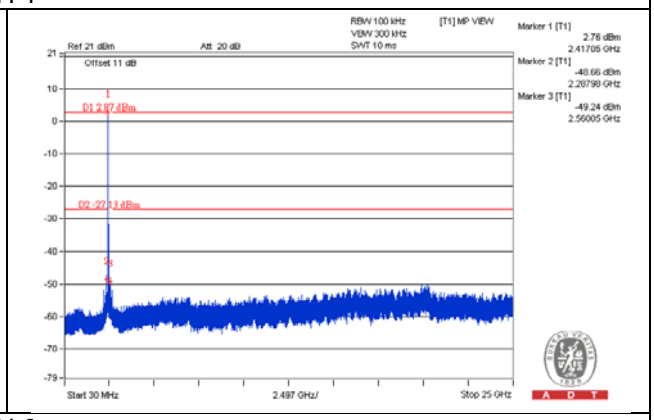
CH 11 Band edge



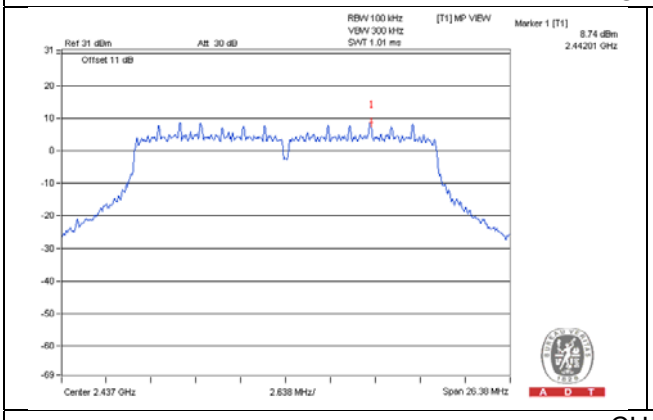
802.11n (HT20) _Chain 2

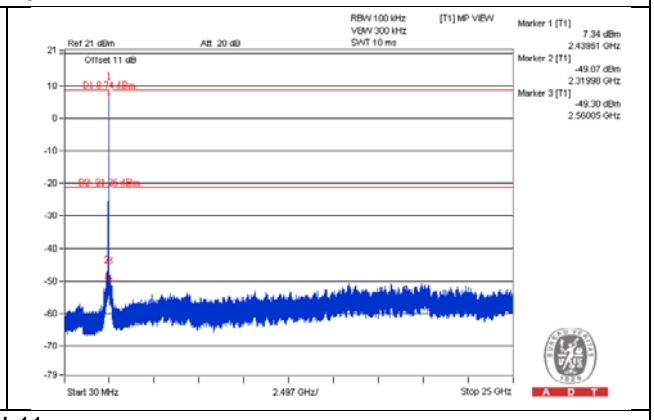
CH 1



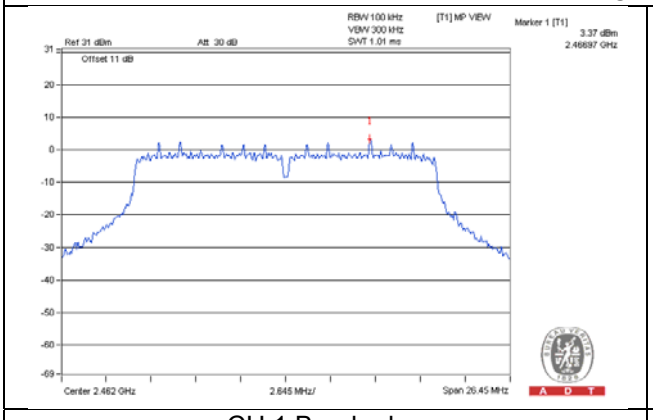


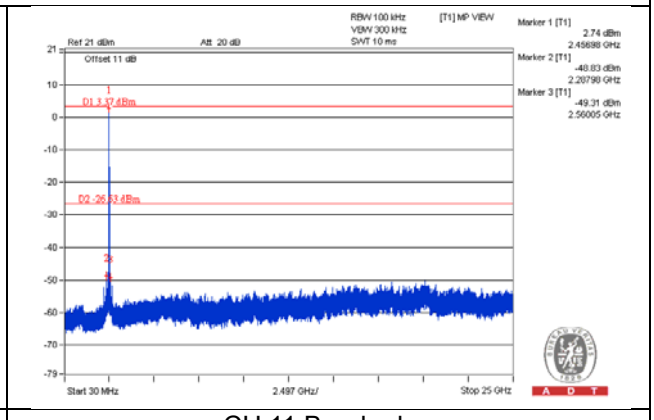
CH 6



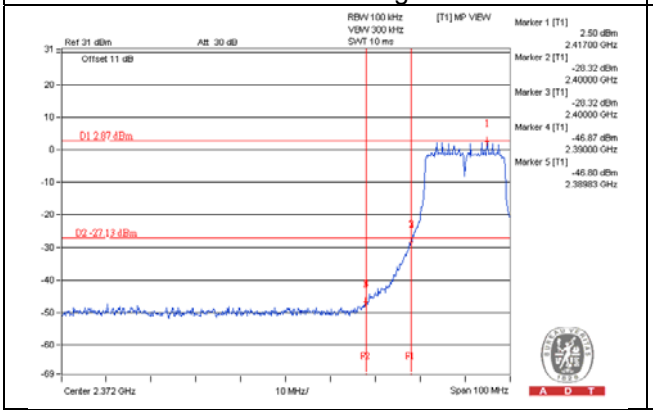


CH 11

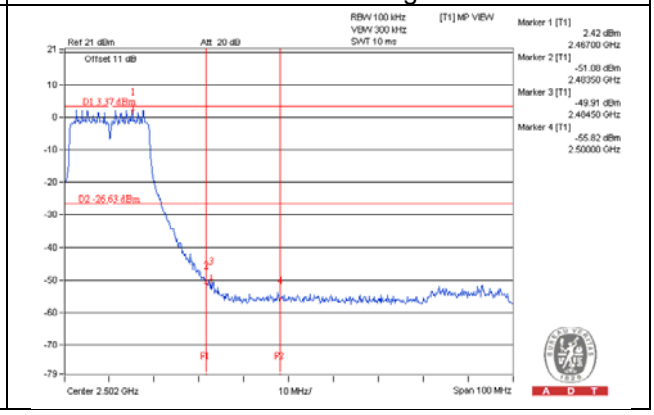




CH 1 Band edge

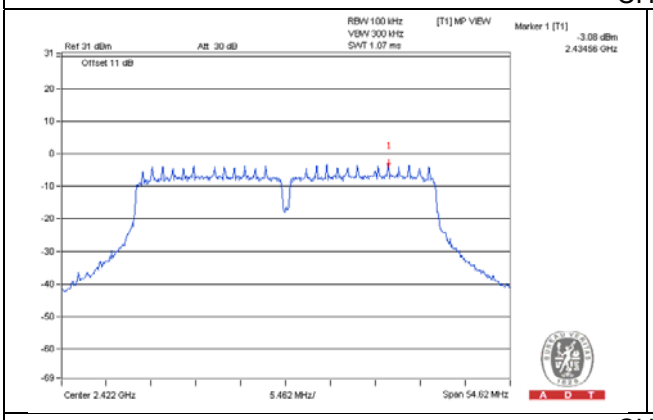


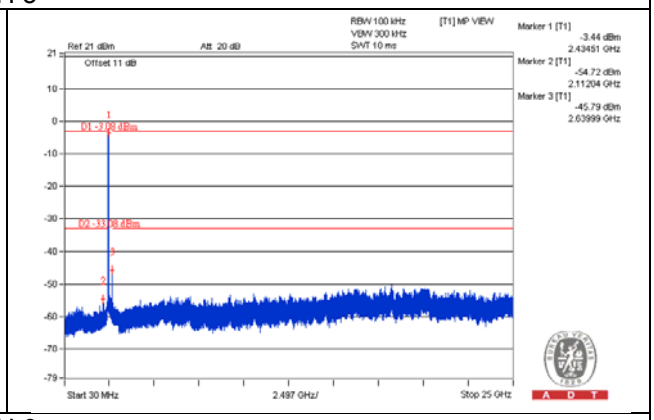
CH 11 Band edge



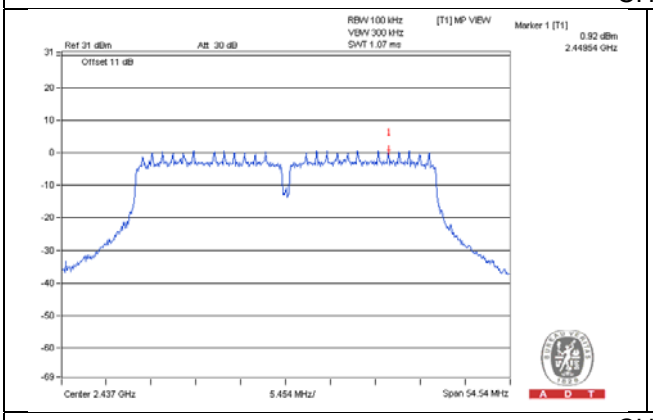
802.11n (HT40) _Chain 0

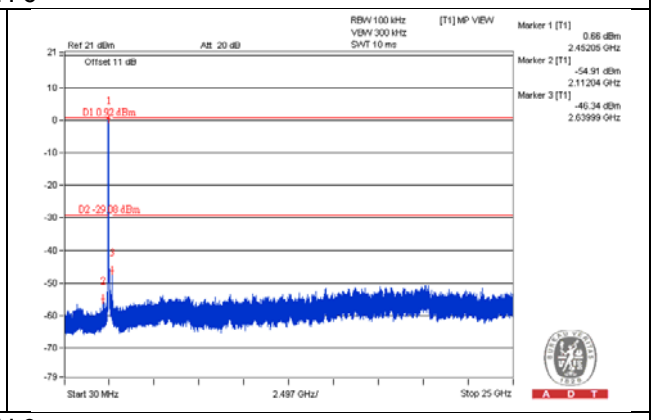
CH 3



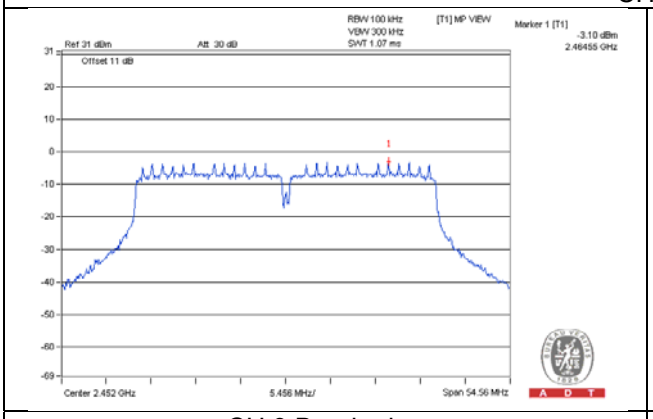


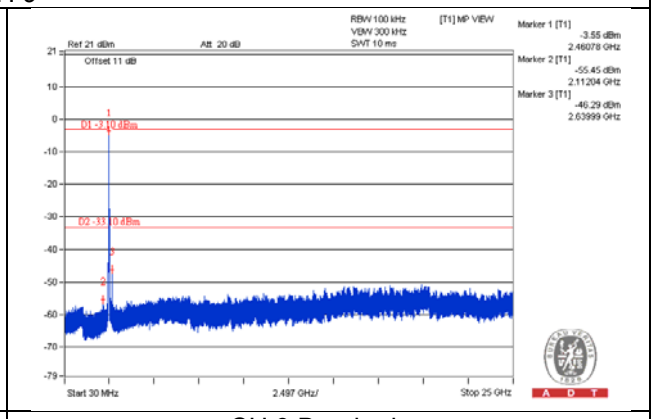
CH 6



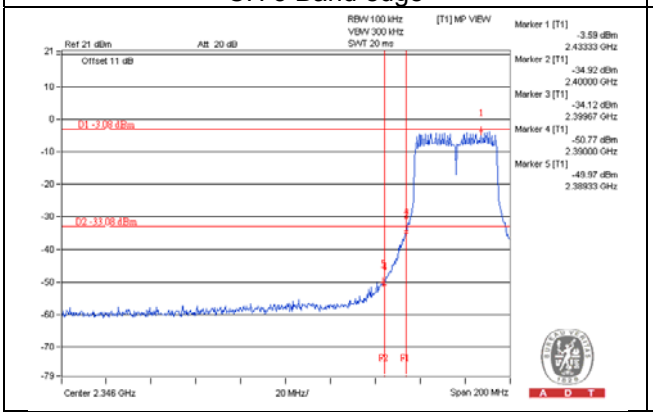


CH 9

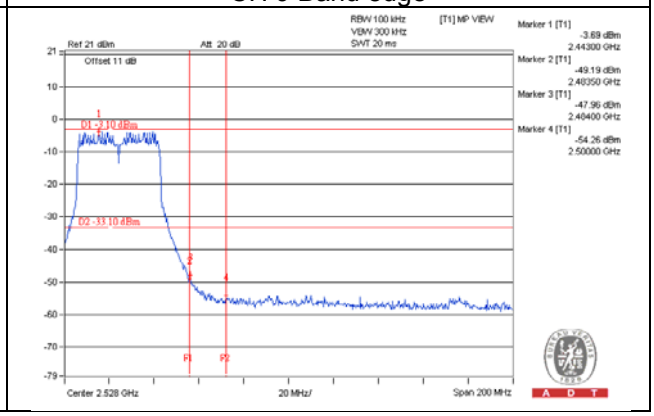




CH 3 Band edge

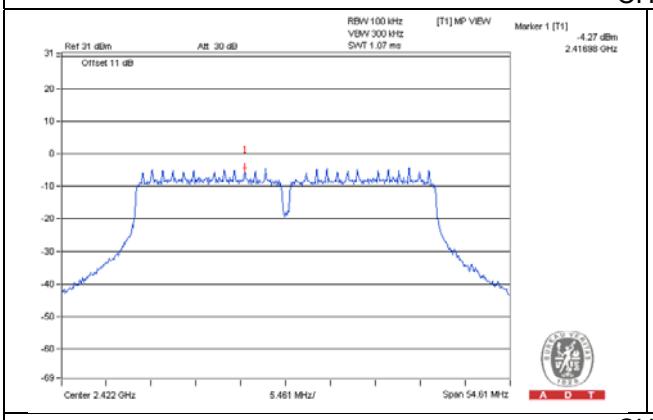


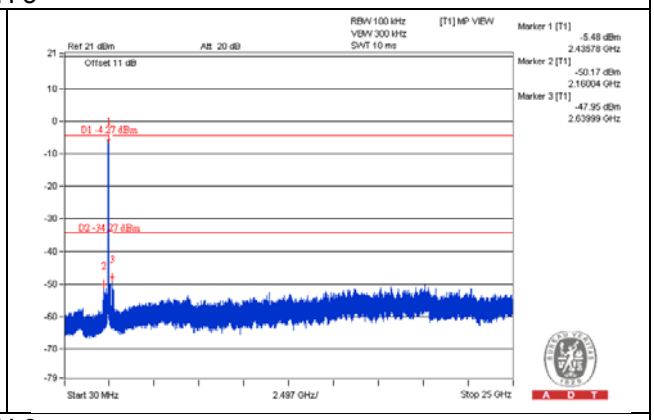
CH 9 Band edge



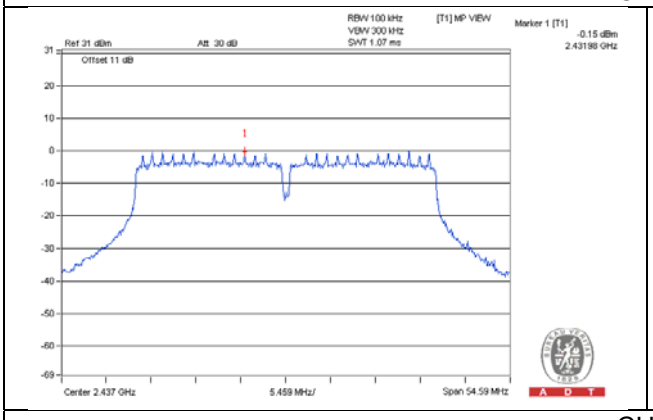
802.11n (HT40) _Chain 1

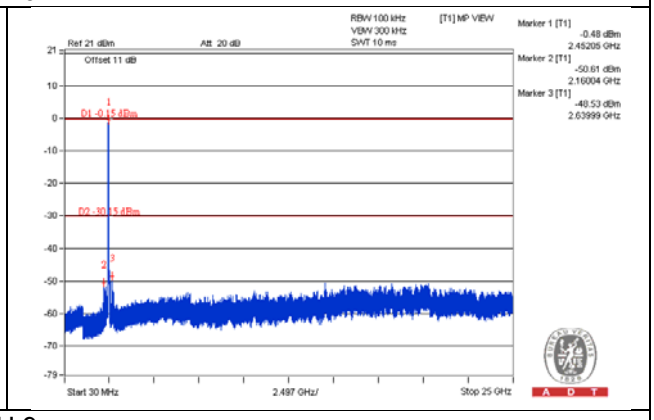
CH 3



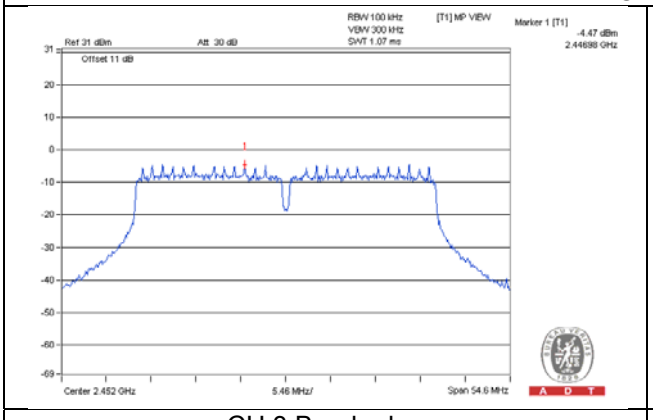


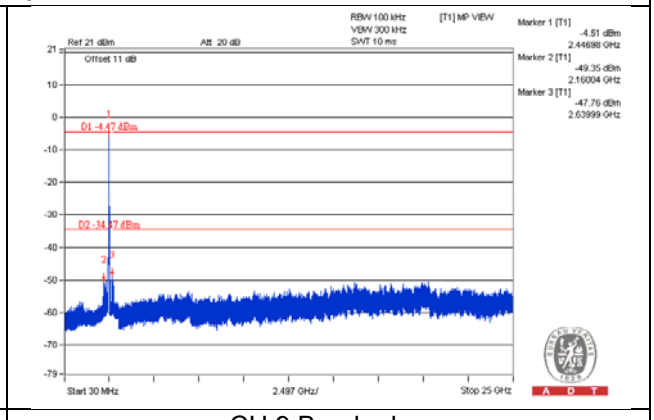
CH 6



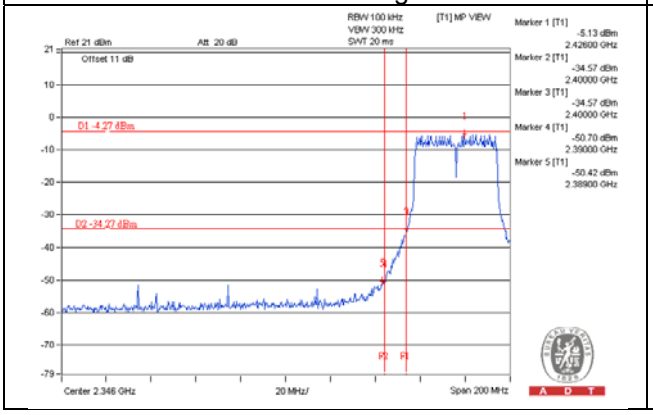


CH 9

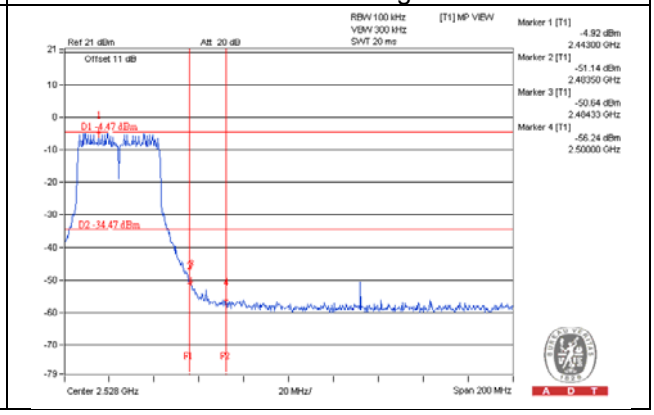




CH 3 Band edge

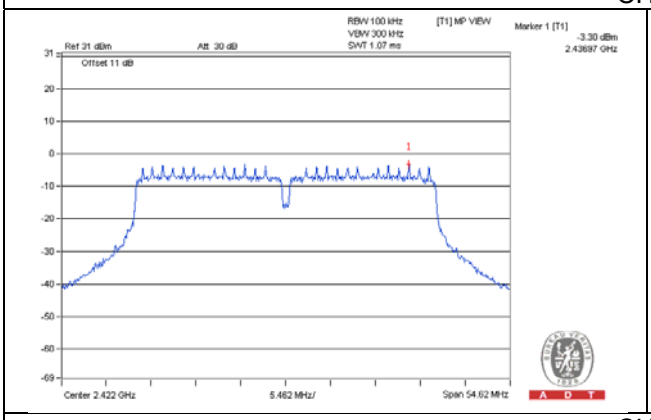


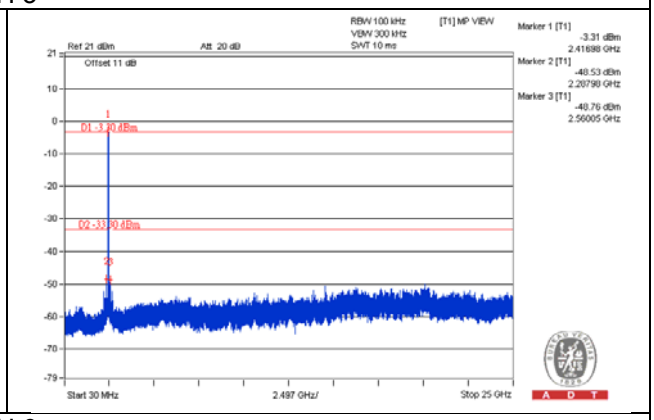
CH 9 Band edge



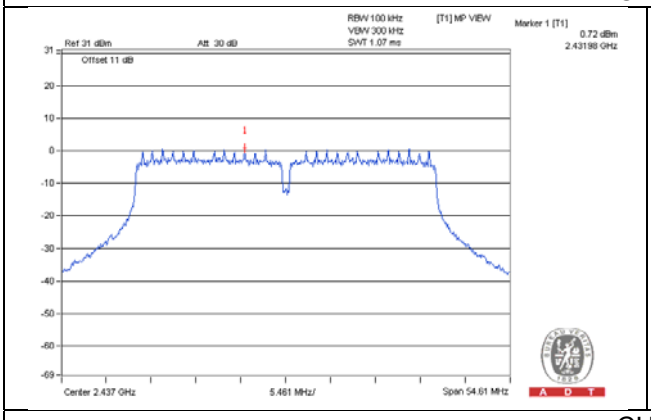
802.11n (HT40) _Chain 2

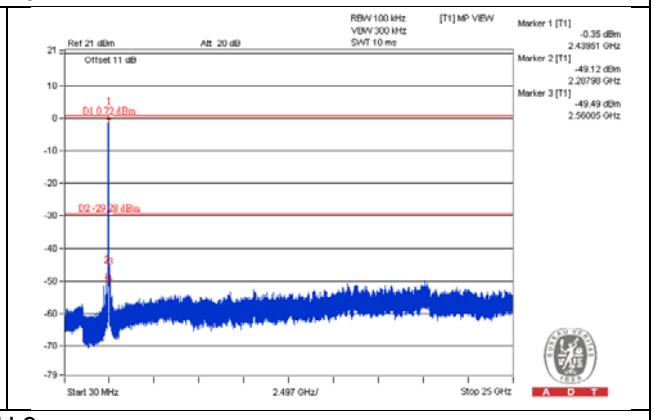
CH 3



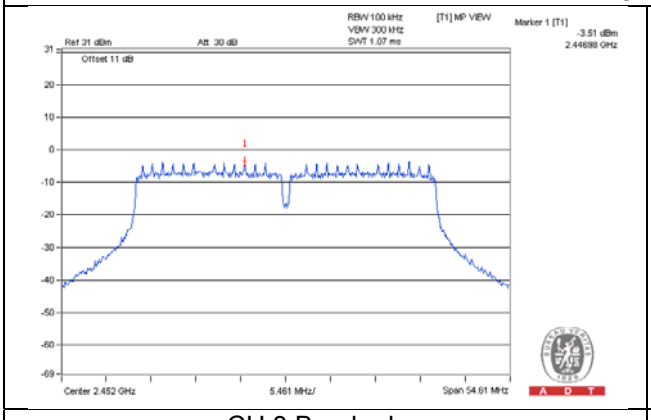


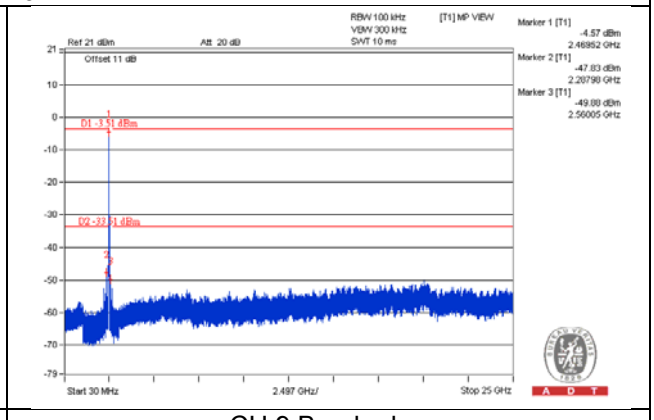
CH 6



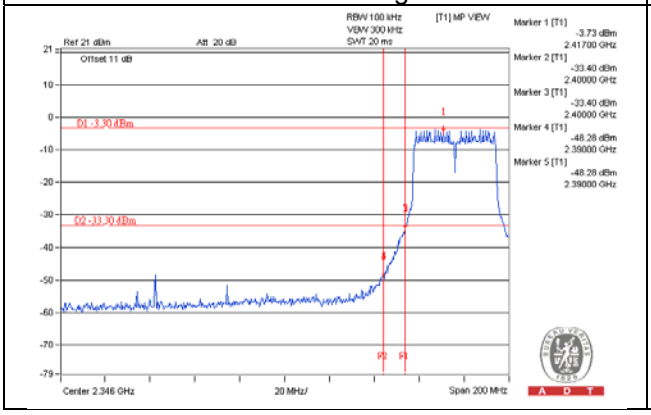


CH 9

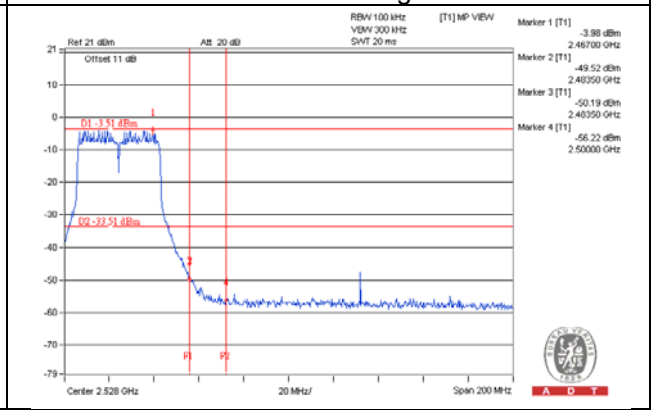




CH 3 Band edge



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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