FCC Test Report

Report No.: RF121031C18K

FCC ID: UL9200N

Test Model: WAP-200N

Series Model: WBS-200N (refer to item 3.1 for more details)

Received Date: Nov. 01, 2012

Test Date: Jan. 04 ~ Jan. 11, 2013 (All tests except radiated emission)
Jul. 26 ~ Aug. 07, 2017 (Radiated emission test)

Issued Date: Aug. 15, 2017

Applicant: PLANET Technology Corporation

Address: 10F., No.96, Minquan Rd., Xindian Dist., New Taipei City, Taiwan, 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.)

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

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This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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Release Control Record

Issue No.	Description	Date Issued
RF121031C18K	Original release.	Aug. 15, 2017

1 Certificate of Conformity

Product:	300Mbps 802.11n Outdoor Wireless AP, 300Mbps 802.11n Outdoor Wireless CPE (refer to item 3.1 for more details)
Brand:	PLANET
Test Model:	WAP-200N
Series Model:	WBS-200N (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	PLANET Technology Corporation
Test Date:	Jan. 04 ~ Jan. 11, 2013 (All tests except radiated emission) Jul. 26 ~ Aug. 07, 2017 (Radiated emission test)
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Aug. 15, 2017

Suntee Liu / Specialist

Approved by : _____ , **Date:** Aug. 15, 2017

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 -17.73dB at 23.12907MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.2dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is RSMA not a standard connector.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	300Mbps 802.11n Outdoor Wireless AP, 300Mbps 802.11n Outdoor Wireless CPE (refer to Note for more details)
Brand	PLANET
Test Model	WAP-200N
Series Model	WBS-200N
Model Difference	Refer to Note
Sample Status	Engineering sample
Power Supply Rating	24Vdc (POE)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps
Operating Frequency	2412~2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	827.942mW
Antenna Type	Dipole antenna with 5dBi gain
Antenna Connector	RSMA
Accessory Device	POE
Cable Supplied	NA

Note:

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

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

2. All models and product names are listed as below. Model WAP-200N is the representative for final test.

Brand	Model	Product Name	Difference
PLANET	WBS-200N	300Mbps 802.11n Outdoor Wireless CPE	Marketing requirement
	WAP-200N	300Mbps 802.11n Outdoor Wireless AP	

3. The EUT uses following POE.

POE	
Brand	PLANET
Model	EPE-1212
Input Power	24Vdc, 0.6A

Adapter for POE	
Brand	Powertron Electronics Corp.
Model	PA1024-3HU
Input Power	100-240Vac, 50-60Hz, 0.6A
Output Power	24Vdc, 1.0A, 24W Max
Power Line	1.5m DC cable without 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:
1. The antenna had been pre-tested on the positioned of each 3 axis. The worst cases were 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)	Remark
-	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)	Remark
-	802.11g	1 to 11	6	OFDM	BPSK	6.0	-

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11g	1 to 11	6	OFDM	BPSK	6.0	-

Antenna Port Conducted Measurement:

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

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	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:

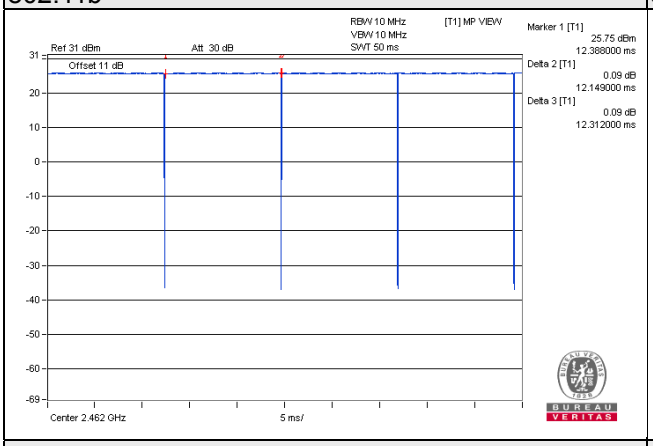
Applicable to	Environmental Conditions	Input Power (system)	Tested by
RE≥1G	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
RE<1G	25 deg. C, 65% RH	120Vac, 60Hz	Matthew Yang
PLC	24 deg. C, 69% RH	120Vac, 60Hz	Alan Wu
APCM	24 deg. C, 64% RH	120Vac, 60Hz	Match Tsui

3.3 Duty Cycle of Test Signal

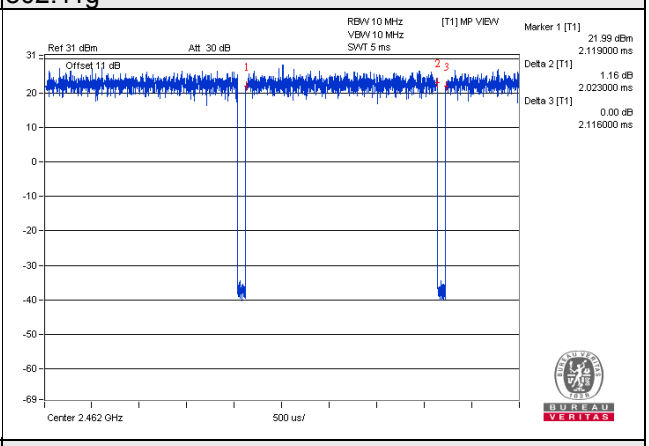
Duty cycle of test signal is ≥ 98%, duty factor is not required.
Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle = 12.149/12.312 = 0.987
802.11g: Duty cycle = 2.023/2.116 = 0.956, Duty factor = 10 * log(1/0.956) = 0.20
802.11n (HT20): Duty cycle = 4.95/5.06 = 0.978, Duty factor = 10 * log(1/0.978) = 0.10
802.11n (HT40): Duty cycle = 2.397/2.502 = 0.958, Duty factor = 10 * log(1/0.958) = 0.19

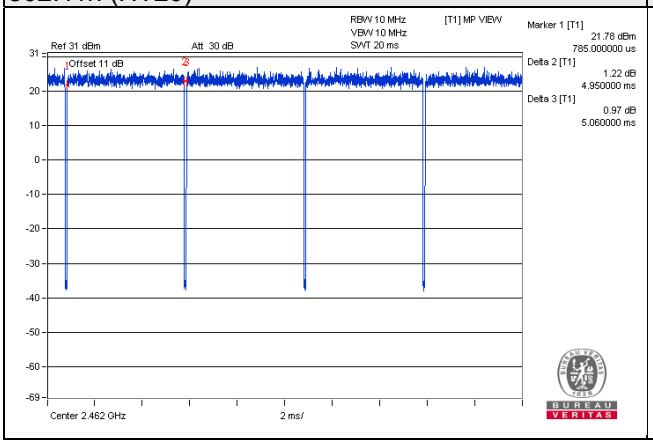
802.11b



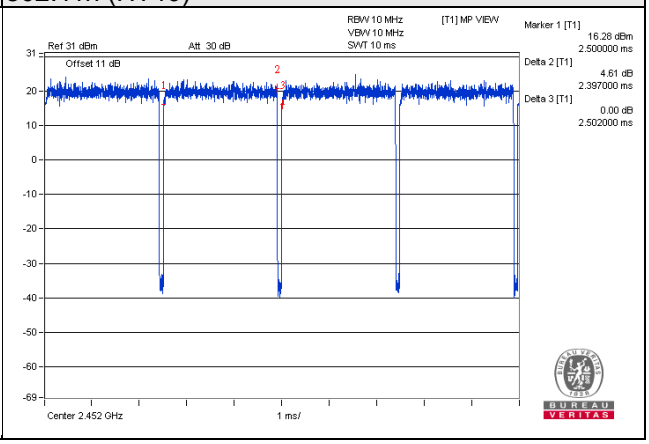
802.11g



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.

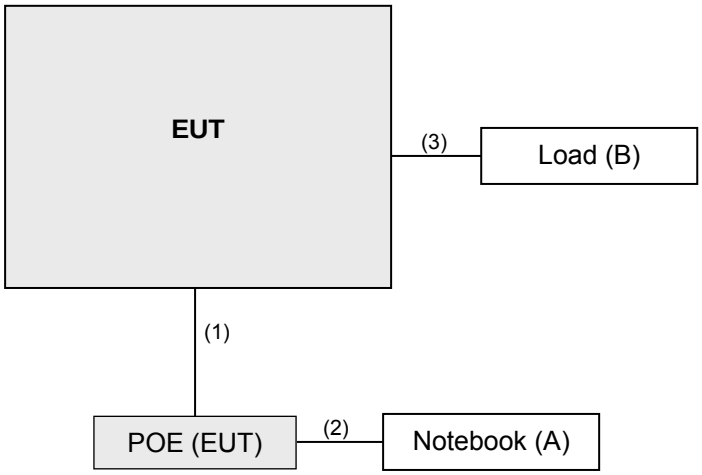
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	10	N	0	-
2.	RJ45, Cat5e	1	1.8	N	0	-
3.	RJ45, Cat5e	1	1.8	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)
KDB 558074 D01 DTS Meas Guidance v04
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 20dB below the highest level of the desired power:

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

Note:

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

4.1.2 Test Instruments

Test date: Jan. 04 ~ Jan. 11, 2013

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Aug. 21, 2012	Aug. 20, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP 40	100039	Feb. 03, 2012	Feb. 02, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 06, 2012	Apr. 05, 2013
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-404	Dec. 22, 2012	Dec. 21, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8449B	3008A01961	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8447D	2944A10738	Oct. 26, 2012	Oct. 25, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Aug. 28, 2012	Aug. 27, 2013
Software ADT	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT	TT100.	TT93021704	NA	NA
Turn Table Controller ADT	SC100.	SC93021704	NA	NA
High Speed Peak Power Meter	ML2495A	0842014	Apr. 28, 2012	Apr. 27, 2013
Power Sensor	MA2411B	0738404	Apr. 28, 2012	Apr. 27, 2013

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC7450F-4.

Test date: Jul. 26 ~ Aug. 07, 2017

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 24, 2016	Oct. 23, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Aug. 16, 2016	Aug. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Dec. 15, 2016	Dec. 14, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 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	3008A01922	Sep. 18, 2016	Sep. 17, 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	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
High Speed Peak Power Meter	ML2495A	0824012	Aug. 11, 2016	Aug. 10, 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 4.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC7450F-4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

c. Both X and Y axes of the antenna are set to make the measurement.

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

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

Note:

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

For Radiated emission above 30MHz

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

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

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

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

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

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

Note:

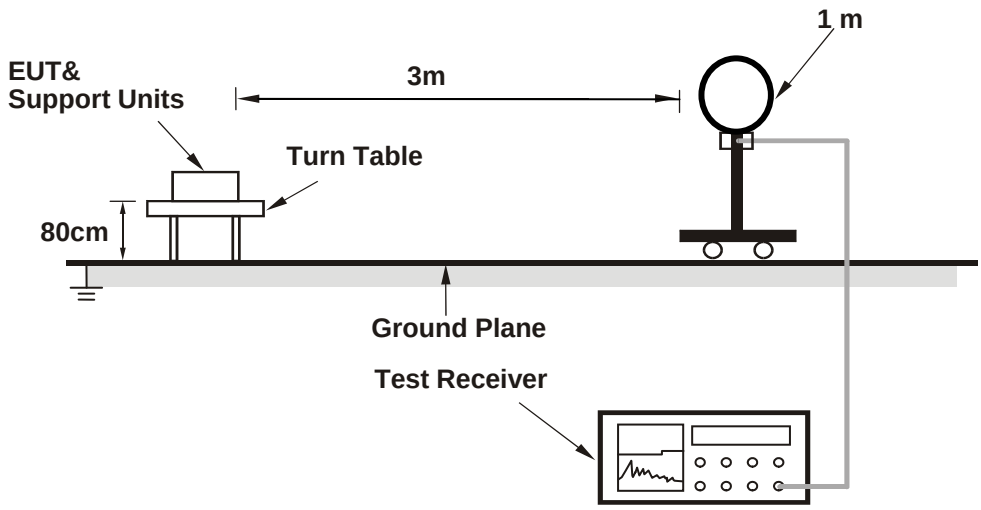
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

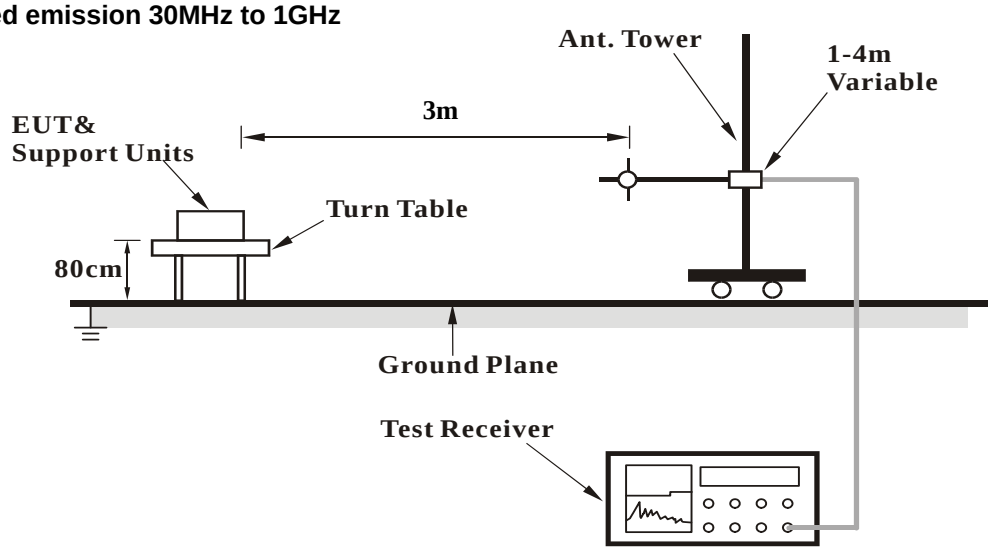
No deviation.

4.1.5 Test Setup

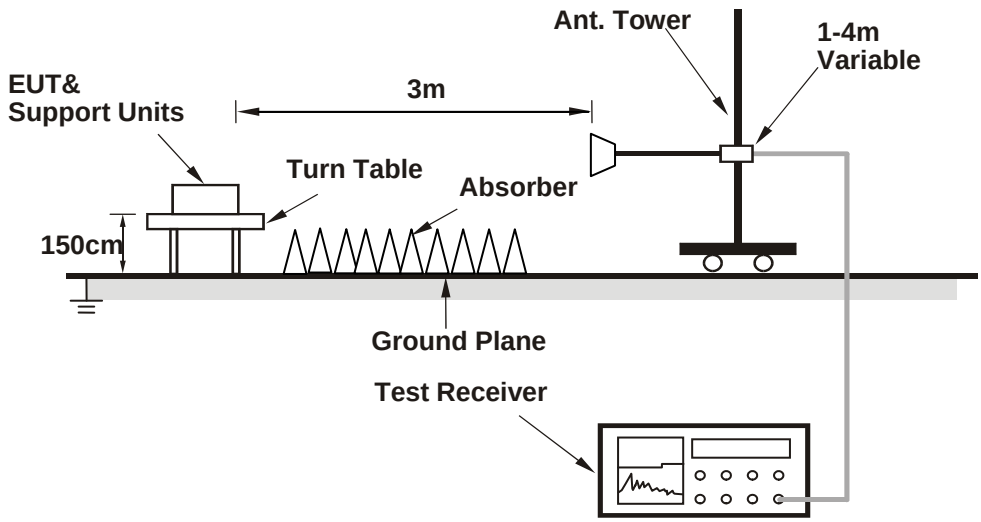
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".
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	2390.00	56.7 PK	74.0	-17.3	1.30 H	149	23.8	32.9
2	2390.00	46.1 AV	54.0	-7.9	1.30 H	149	13.2	32.9
3	*2412.00	101.8 PK			1.22 H	154	68.9	32.9
4	*2412.00	98.1 AV			1.22 H	154	65.2	32.9
5	4824.00	48.2 PK	74.0	-25.8	2.64 H	177	41.5	6.7
6	4824.00	35.8 AV	54.0	-18.2	2.64 H	177	29.1	6.7
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	2.69 V	0	30.0	32.9
2	2390.00	51.3 AV	54.0	-2.7	2.69 V	0	18.4	32.9
3	*2412.00	114.1 PK			2.51 V	3	81.2	32.9
4	*2412.00	110.2 AV			2.51 V	3	77.3	32.9
5	4824.00	49.3 PK	74.0	-24.7	1.59 V	83	42.6	6.7
6	4824.00	38.1 AV	54.0	-15.9	1.59 V	83	31.4	6.7

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
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	103.2 PK			1.00 H	151	70.1	33.1
2	*2437.00	99.4 AV			1.00 H	151	66.3	33.1
3	4874.00	49.6 PK	74.0	-24.4	1.39 H	200	42.8	6.8
4	4874.00	38.6 AV	54.0	-15.4	1.39 H	200	31.8	6.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	117.7 PK			1.81 V	0	84.6	33.1
2	*2437.00	114.0 AV			1.81 V	0	80.9	33.1
3	4874.00	51.8 PK	74.0	-22.2	1.00 V	328	45.0	6.8
4	4874.00	44.8 AV	54.0	-9.2	1.00 V	328	38.0	6.8

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) 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	97.3 PK			1.00 H	153	64.1	33.2
2	*2462.00	94.0 AV			1.00 H	153	60.8	33.2
3	2483.50	58.8 PK	74.0	-15.2	1.10 H	163	25.5	33.3
4	2483.50	45.7 AV	54.0	-8.3	1.10 H	163	12.4	33.3
5	4924.00	48.0 PK	74.0	-26.0	1.66 H	148	41.1	6.9
6	4924.00	36.2 AV	54.0	-17.8	1.66 H	148	29.3	6.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	112.5 PK			1.97 V	0	79.3	33.2
2	*2462.00	109.0 AV			1.97 V	0	75.8	33.2
3	2483.50	62.4 PK	74.0	-11.6	2.33 V	14	29.1	33.3
4	2483.50	50.6 AV	54.0	-3.4	2.33 V	14	17.3	33.3
5	4924.00	49.4 PK	74.0	-24.6	2.16 V	168	42.5	6.9
6	4924.00	38.7 AV	54.0	-15.3	2.16 V	168	31.8	6.9

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) 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	58.0 PK	74.0	-16.0	1.12 H	163	25.1	32.9
2	2390.00	46.3 AV	54.0	-7.7	1.12 H	163	13.4	32.9
3	*2412.00	100.1 PK			1.00 H	152	67.2	32.9
4	*2412.00	89.9 AV			1.00 H	152	57.0	32.9
5	4824.00	48.5 PK	74.0	-25.5	1.19 H	243	41.8	6.7
6	4824.00	35.6 AV	54.0	-18.4	1.19 H	243	28.9	6.7
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	68.8 PK	74.0	-5.2	2.72 V	0	35.9	32.9
2	2390.00	52.9 AV	54.0	-1.1	2.72 V	0	20.0	32.9
3	*2412.00	113.1 PK			2.48 V	0	80.2	32.9
4	*2412.00	102.4 AV			2.48 V	0	69.5	32.9
5	4824.00	49.1 PK	74.0	-24.9	1.97 V	157	42.4	6.7
6	4824.00	36.1 AV	54.0	-17.9	1.97 V	157	29.4	6.7

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
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	102.2 PK			1.00 H	151	69.1	33.1
2	*2437.00	91.8 AV			1.00 H	151	58.7	33.1
3	4874.00	49.0 PK	74.0	-25.0	1.93 H	247	42.2	6.8
4	4874.00	36.0 AV	54.0	-18.0	1.93 H	247	29.2	6.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	116.1 PK			1.95 V	0	83.0	33.1
2	*2437.00	105.5 AV			1.95 V	0	72.4	33.1
3	4874.00	49.6 PK	74.0	-24.4	2.29 V	311	42.8	6.8
4	4874.00	36.5 AV	54.0	-17.5	2.29 V	311	29.7	6.8

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) 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	98.9 PK			1.25 H	156	65.7	33.2
2	*2462.00	88.5 AV			1.25 H	156	55.3	33.2
3	2483.50	58.1 PK	74.0	-15.9	1.28 H	167	24.8	33.3
4	2483.50	46.6 AV	54.0	-7.4	1.28 H	167	13.3	33.3
5	4924.00	48.2 PK	74.0	-25.8	1.98 H	360	41.3	6.9
6	4924.00	35.7 AV	54.0	-18.3	1.98 H	360	28.8	6.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	114.2 PK			1.85 V	0	81.0	33.2
2	*2462.00	103.3 AV			1.85 V	0	70.1	33.2
3	2483.50	71.3 PK	74.0	-2.7	2.25 V	7	38.0	33.3
4	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**2.25 V**	**7**	**20.5**	**33.3**
5	4924.00	48.8 PK	74.0	-25.2	2.64 V	197	41.9	6.9
6	4924.00	36.3 AV	54.0	-17.7	2.64 V	197	29.4	6.9

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) 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	56.9 PK	74.0	-17.1	1.68 H	177	24.1	32.8
2	2360.00	45.9 AV	54.0	-8.1	1.68 H	177	13.1	32.8
3	2390.00	58.8 PK	74.0	-15.2	1.59 H	201	25.9	32.9
4	2390.00	47.1 AV	54.0	-6.9	1.59 H	201	14.2	32.9
5	*2412.00	93.0 PK			1.41 H	195	60.1	32.9
6	*2412.00	82.6 AV			1.41 H	195	49.7	32.9
7	4824.00	47.9 PK	74.0	-26.1	2.29 H	351	41.2	6.7
8	4824.00	35.3 AV	54.0	-18.7	2.29 H	351	28.6	6.7
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	57.7 PK	74.0	-16.3	1.74 V	119	24.9	32.8
2	2360.00	47.2 AV	54.0	-6.8	1.74 V	119	14.4	32.8
3	2390.00	64.4 PK	74.0	-9.6	1.84 V	86	31.5	32.9
4	2390.00	52.7 AV	54.0	-1.3	1.84 V	86	19.8	32.9
5	*2412.00	108.1 PK			1.87 V	15	75.2	32.9
6	*2412.00	98.2 AV			1.87 V	15	65.3	32.9
7	4824.00	48.7 PK	74.0	-25.3	1.69 V	325	42.0	6.7
8	4824.00	35.9 AV	54.0	-18.1	1.69 V	325	29.2	6.7

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
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	97.2 PK			1.13 H	193	64.1	33.1
2	*2437.00	86.9 AV			1.13 H	193	53.8	33.1
3	4874.00	48.0 PK	74.0	-26.0	2.27 H	300	41.2	6.8
4	4874.00	35.6 AV	54.0	-18.4	2.27 H	300	28.8	6.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	111.3 PK			1.91 V	24	78.2	33.1
2	*2437.00	101.2 AV			1.91 V	24	68.1	33.1
3	4874.00	49.5 PK	74.0	-24.5	1.97 V	153	42.7	6.8
4	4874.00	36.1 AV	54.0	-17.9	1.97 V	153	29.3	6.8

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) 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	95.5 PK			1.00 H	191	62.3	33.2
2	*2462.00	85.4 AV			1.00 H	191	52.2	33.2
3	2483.50	57.4 PK	74.0	-16.6	1.38 H	202	24.1	33.3
4	2483.50	45.7 AV	54.0	-8.3	1.38 H	202	12.4	33.3
5	4924.00	48.7 PK	74.0	-25.3	1.93 H	106	41.8	6.9
6	4924.00	35.5 AV	54.0	-18.5	1.93 H	106	28.6	6.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.0 PK			2.12 V	17	76.8	33.2
2	*2462.00	99.9 AV			2.12 V	17	66.7	33.2
3	2483.50	61.9 PK	74.0	-12.1	2.45 V	9	28.6	33.3
4	2483.50	48.9 AV	54.0	-5.1	2.45 V	9	15.6	33.3
5	4924.00	49.4 PK	74.0	-24.6	2.87 V	143	42.5	6.9
6	4924.00	36.1 AV	54.0	-17.9	2.87 V	143	29.2	6.9

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 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	2320.00	56.9 PK	74.0	-17.1	1.28 H	175	24.3	32.6
2	2320.00	45.2 AV	54.0	-8.8	1.28 H	175	12.6	32.6
3	2390.00	59.5 PK	74.0	-14.5	1.15 H	180	26.6	32.9
4	2390.00	48.7 AV	54.0	-5.3	1.15 H	180	15.8	32.9
5	*2422.00	86.1 PK			1.00 H	193	53.0	33.1
6	*2422.00	75.8 AV			1.00 H	193	42.7	33.1
7	4844.00	48.4 PK	74.0	-25.6	3.25 H	142	41.7	6.7
8	4844.00	35.3 AV	54.0	-18.7	3.25 H	142	28.6	6.7
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	2320.00	57.0 PK	74.0	-17.0	1.50 V	67	24.4	32.6
2	2320.00	48.9 AV	54.0	-5.1	1.50 V	67	16.3	32.6
3	2390.00	65.0 PK	74.0	-9.0	2.05 V	59	32.1	32.9
4	2390.00	52.8 AV	54.0	-1.2	2.05 V	59	19.9	32.9
5	*2422.00	101.2 PK			2.16 V	26	68.1	33.1
6	*2422.00	91.2 AV			2.16 V	26	58.1	33.1
7	4844.00	49.0 PK	74.0	-25.0	2.56 V	342	42.3	6.7
8	4844.00	36.0 AV	54.0	-18.0	2.56 V	342	29.3	6.7

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
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	94.3 PK			1.00 H	192	61.2	33.1
2	*2437.00	84.3 AV			1.00 H	192	51.2	33.1
3	4874.00	48.7 PK	74.0	-25.3	1.00 H	155	41.9	6.8
4	4874.00	35.5 AV	54.0	-18.5	1.00 H	155	28.7	6.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	109.6 PK			1.78 V	21	76.5	33.1
2	*2437.00	99.6 AV			1.78 V	21	66.5	33.1
3	4874.00	49.4 PK	74.0	-24.6	2.58 V	341	42.6	6.8
4	4874.00	36.3 AV	54.0	-17.7	2.58 V	341	29.5	6.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – 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 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	88.6 PK			1.00 H	193	55.4	33.2
2	*2452.00	78.5 AV			1.00 H	193	45.3	33.2
3	2483.50	57.2 PK	74.0	-16.8	1.34 H	227	23.9	33.3
4	2483.50	45.5 AV	54.0	-8.5	1.34 H	227	12.2	33.3
5	4904.00	48.5 PK	74.0	-25.5	2.64 H	198	41.6	6.9
6	4904.00	35.5 AV	54.0	-18.5	2.64 H	198	28.6	6.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	102.4 PK			2.04 V	22	69.2	33.2
2	*2452.00	93.3 AV			2.04 V	22	60.1	33.2
3	2483.50	68.5 PK	74.0	-5.5	1.59 V	10	35.2	33.3
4	2483.50	49.5 AV	54.0	-4.5	1.59 V	10	16.2	33.3
5	4904.00	49.4 PK	74.0	-24.6	2.29 V	147	42.5	6.9
6	4904.00	36.2 AV	54.0	-17.8	2.29 V	147	29.3	6.9

Remarks:

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

Below 1GHz worst-case data: 802.11g

CHANNEL	TX Channel 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	94.02	28.8 QP	43.5	-14.7	1.99 H	98	48.0	-19.2
2	142.52	30.0 QP	43.5	-13.5	1.24 H	108	44.0	-14.0
3	222.06	24.9 QP	46.0	-21.1	1.50 H	252	41.1	-16.2
4	375.32	30.0 QP	46.0	-16.0	1.00 H	137	40.8	-10.8
5	600.36	28.6 QP	46.0	-17.4	1.50 H	7	34.8	-6.2
6	747.80	30.7 QP	46.0	-15.3	1.00 H	65	33.7	-3.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	45.42	22.2 QP	40.0	-17.8	1.00 V	40	36.8	-14.6
2	80.35	32.1 QP	40.0	-7.9	1.25 V	163	50.4	-18.3
3	140.50	32.5 QP	43.5	-11.0	1.00 V	175	46.7	-14.2
4	222.00	27.7 QP	46.0	-18.3	1.50 V	189	43.9	-16.2
5	400.52	34.8 QP	46.0	-11.2	1.00 V	69	45.2	-10.4
6	936.07	39.1 QP	46.0	-6.9	1.00 V	268	39.4	-0.3

Remarks:

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

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	Nov. 16, 2012	Nov. 15, 2013
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 28, 2012	Dec. 27, 2013
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 02, 2012	Jul. 01, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 07, 2012	Feb. 06, 2013
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 1.
3. The VCCI Site Registration No. is C-2040.

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.

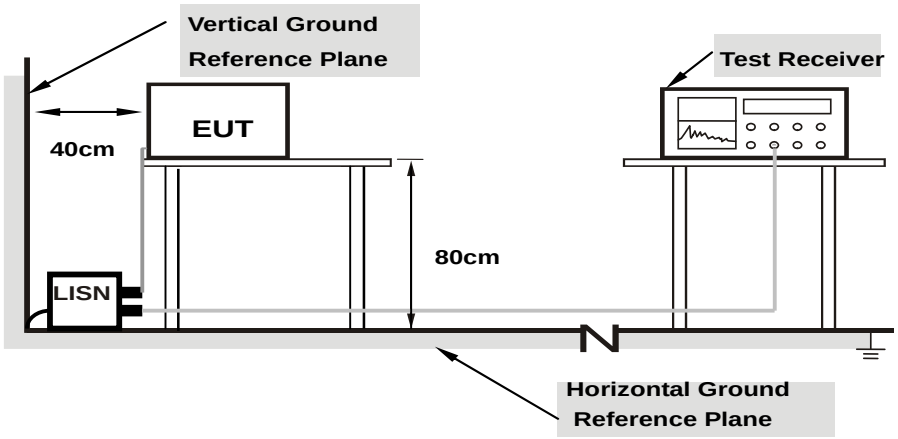
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

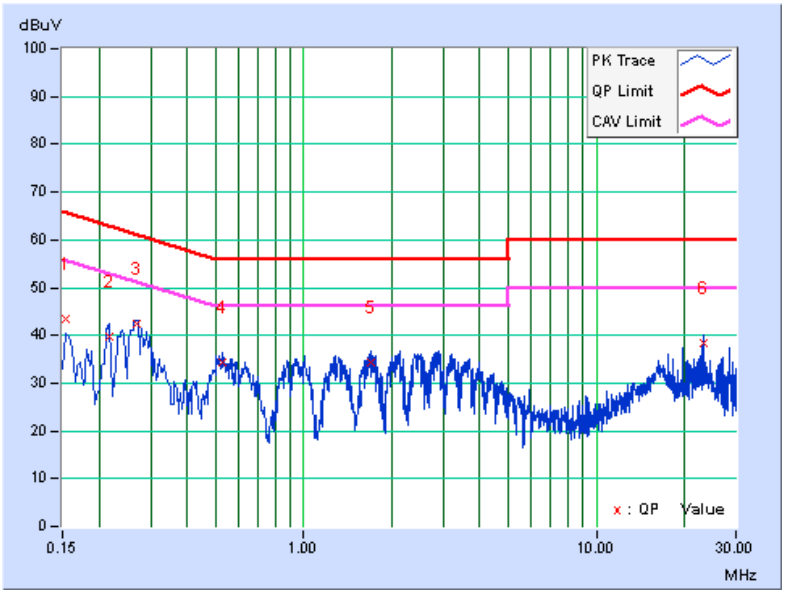
Worst-case data: 802.11g

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	0.15391	0.12	43.25	29.81	43.37	29.93	65.79	55.79	-22.42	-25.86
2	0.21621	0.13	39.55	26.85	39.68	26.98	62.96	52.96	-23.28	-25.98
3	0.26765	0.13	42.15	32.98	42.28	33.11	61.19	51.19	-18.91	-18.08
4	0.52960	0.14	34.36	23.89	34.50	24.03	56.00	46.00	-21.50	-21.97
5	1.70620	0.21	34.05	24.05	34.26	24.26	56.00	46.00	-21.74	-21.74
6	**23.12907**	**1.32**	**37.09**	**30.95**	**38.41**	**32.27**	**60.00**	**50.00**	**-21.59**	**-17.73**

Remarks:

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

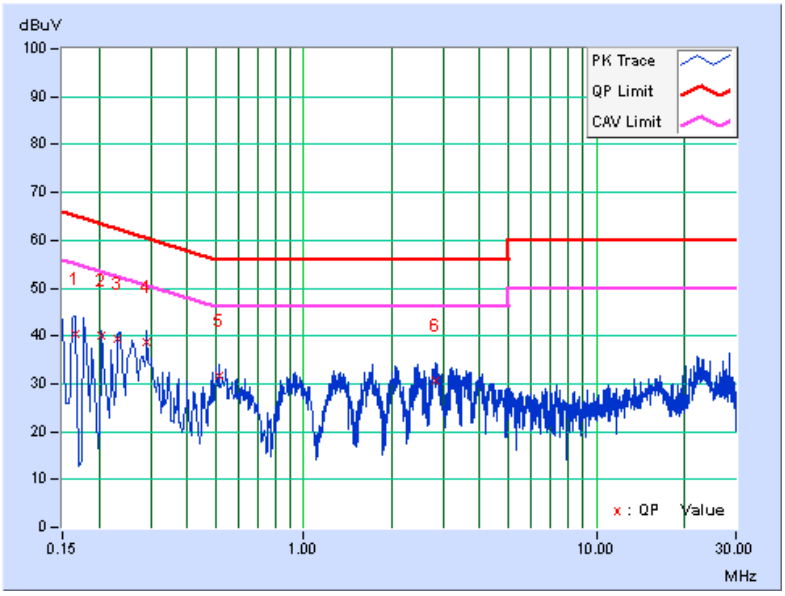


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16526	0.13	40.13	20.30	40.26	20.43	65.20	55.20	-24.94	-34.77
2	0.20474	0.14	39.95	24.85	40.09	24.99	63.42	53.42	-23.33	-28.43
3	0.23216	0.14	39.23	27.61	39.37	27.75	62.37	52.37	-23.00	-24.62
4	0.29076	0.14	38.65	26.55	38.79	26.69	60.50	50.50	-21.71	-23.81
5	0.51363	0.16	31.53	21.68	31.69	21.84	56.00	46.00	-24.31	-24.16
6	2.83617	0.28	30.43	19.83	30.71	20.11	56.00	46.00	-25.29	-25.89

Remarks:

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

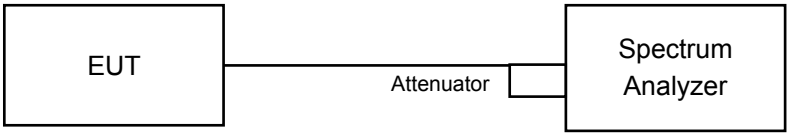


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.08	0.5	Pass
6	2437	10.14	0.5	Pass
11	2462	10.12	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.44	0.5	Pass
6	2437	16.44	0.5	Pass
11	2462	16.44	0.5	Pass

802.11n (HT20)

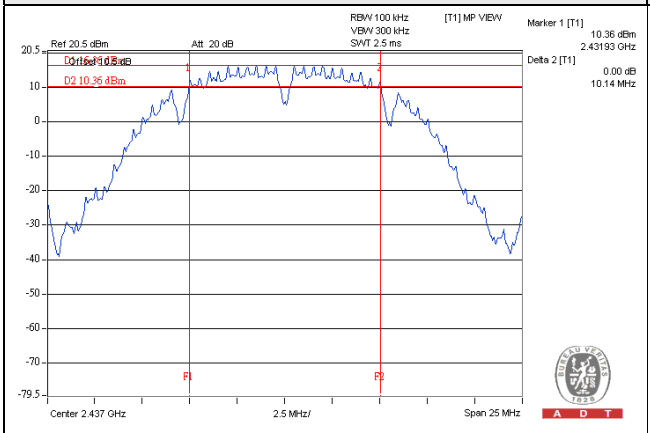
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.66	17.64	0.5	Pass
6	2437	17.64	16.37	0.5	Pass
11	2462	17.67	17.65	0.5	Pass

802.11n (HT40)

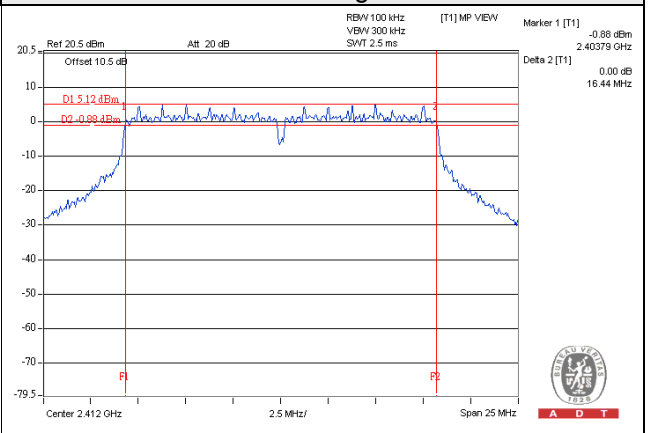
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	36.48	36.53	0.5	Pass
6	2437	36.48	36.49	0.5	Pass
9	2452	36.51	36.49	0.5	Pass

Spectrum Plot of Worst Value

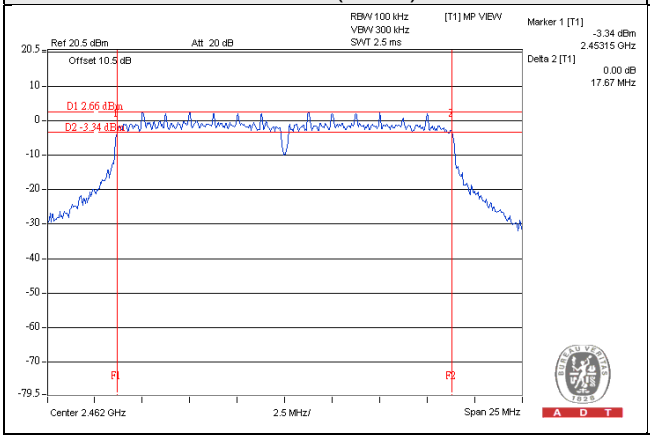
802.11b



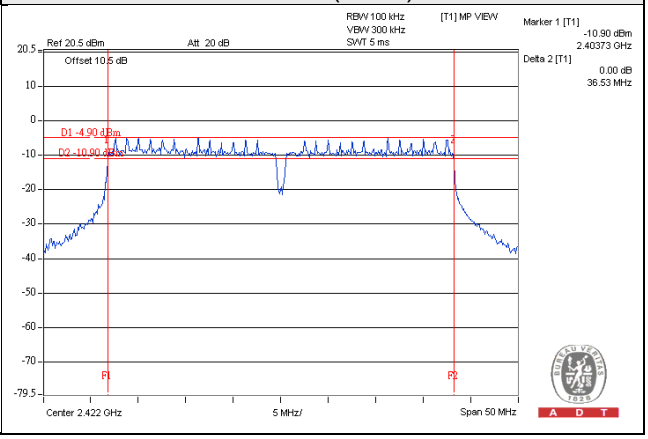
802.11g



802.11n (HT20)



802.11n (HT40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

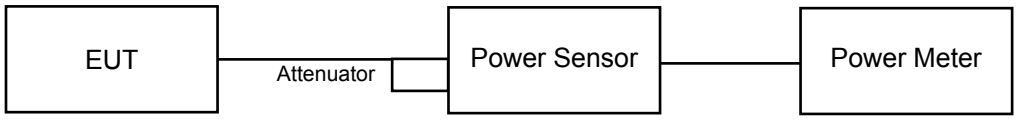
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak 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

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	273.527	24.37	30	Pass
6	2437	505.825	27.04	30	Pass
11	2462	228.560	23.59	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	474.242	26.76	30	Pass
6	2437	**827.942**	29.18	30	Pass
11	2462	615.177	27.89	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.32	22.52	393.432	25.95	30	Pass
6	2437	26.74	25.13	797.900	29.02	30	Pass
11	2462	23.98	23.32	464.818	26.67	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.34	19.47	174.413	22.42	30	Pass
6	2437	25.06	25.01	637.584	28.05	30	Pass
9	2452	19.45	19.27	172.633	22.37	30	Pass

Average Power

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	160.694	22.06	30	Pass
6	2437	291.743	24.65	30	Pass
11	2462	131.220	21.18	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	47.643	16.78	30	Pass
6	2437	114.815	20.60	30	Pass
11	2462	62.087	17.93	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	12.79	12.14	35.400	15.49	30	Pass
6	2437	16.28	14.55	70.958	18.51	30	Pass
11	2462	13.20	12.51	38.726	15.88	30	Pass

802.11n (HT40)

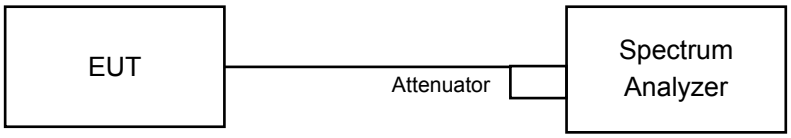
Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	6.46	6.98	9.419	9.74	30	Pass
6	2437	12.56	13.70	41.495	16.18	30	Pass
9	2452	6.62	7.84	10.666	10.28	30	Pass

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 Peak power
a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

802.11b

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	1.14	8	Pass
6	2437	2.15	8	Pass
11	2462	-1.15	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-7.32	8	Pass
6	2437	-4.34	8	Pass
11	2462	-6.43	8	Pass

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.98	3.01	-8.97	5.99	Pass
	6	2437	-3.02	3.01	-0.01	5.99	Pass
	11	2462	-12.07	3.01	-9.06	5.99	Pass
1	1	2412	-13.38	3.01	-10.37	5.99	Pass
	6	2437	-8.71	3.01	-5.70	5.99	Pass
	11	2462	-11.82	3.01	-8.81	5.99	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Max. directional gain = 5dBi + 10log(2) = 8.01dBi > 6dBi, so the limit shall be reduced to 8-(8.01-6) = 5.99dBm.

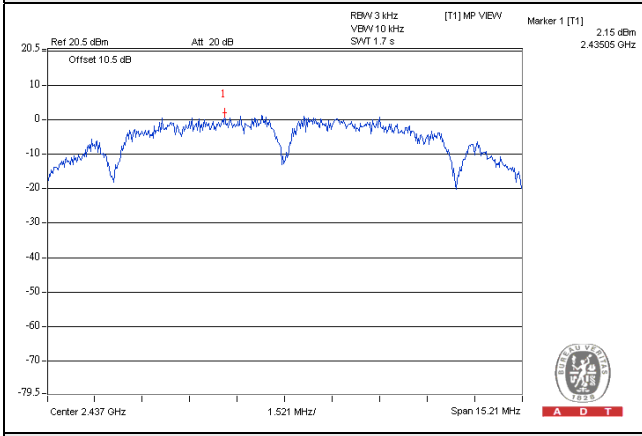
802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-19.53	3.01	-16.52	5.99	Pass
	6	2437	-13.30	3.01	-10.29	5.99	Pass
	9	2452	-19.58	3.01	-16.57	5.99	Pass
1	3	2422	-19.09	3.01	-16.08	5.99	Pass
	6	2437	-13.85	3.01	-10.84	5.99	Pass
	9	2452	-18.49	3.01	-15.48	5.99	Pass

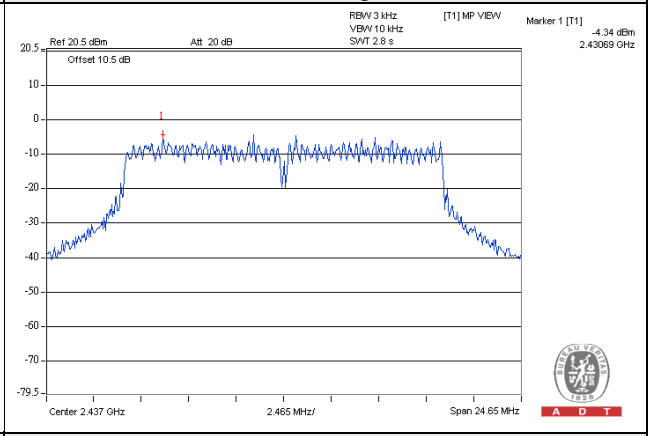
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Max. directional gain = 5dBi + 10log(2) = 8.01dBi > 6dBi, so the limit shall be reduced to 8-(8.01-6) = 5.99dBm.

Spectrum Plot of Worst Value

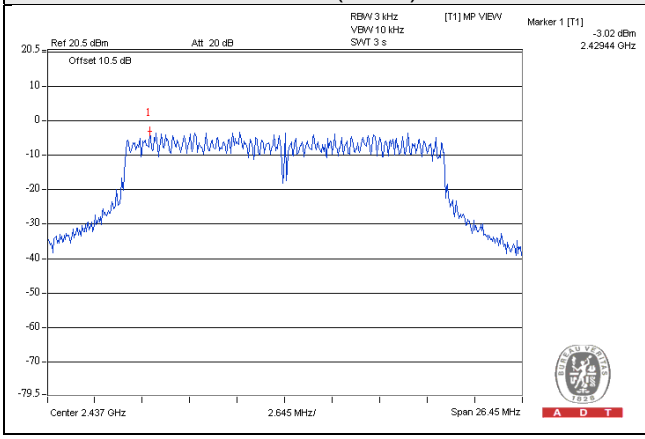
802.11b



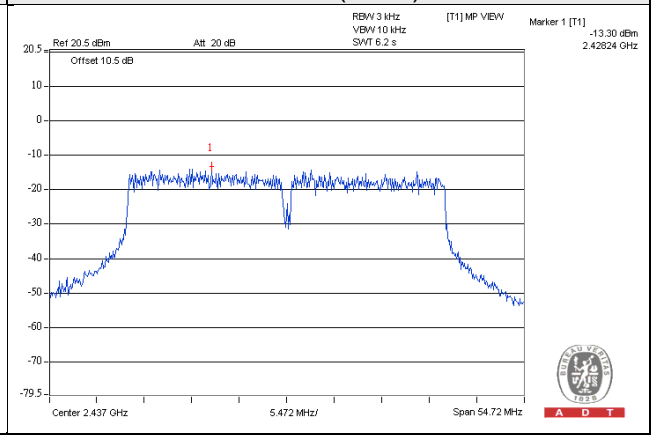
802.11g



802.11n (HT20)



802.11n (HT40)

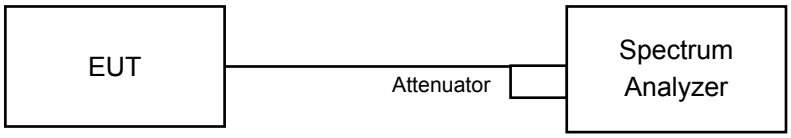


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB 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

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

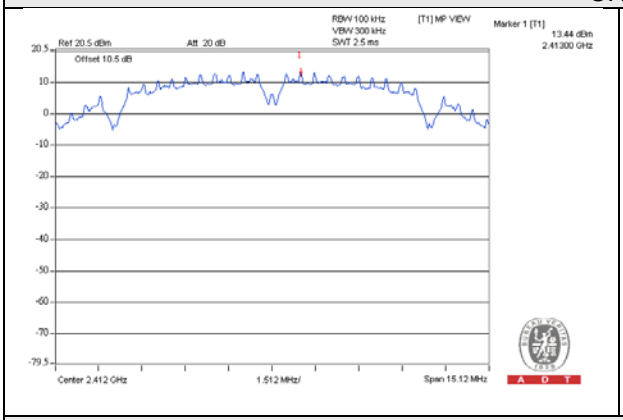
Same as item 4.3.6

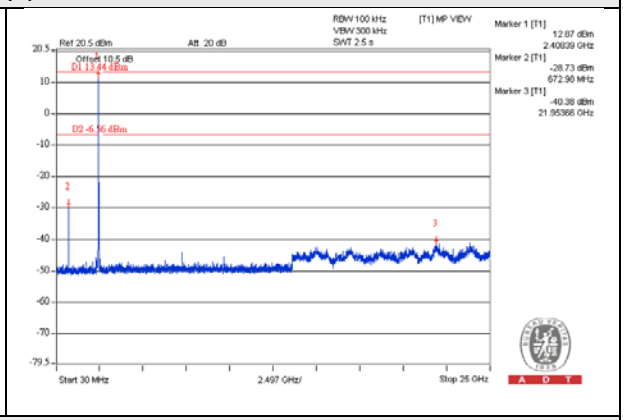
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

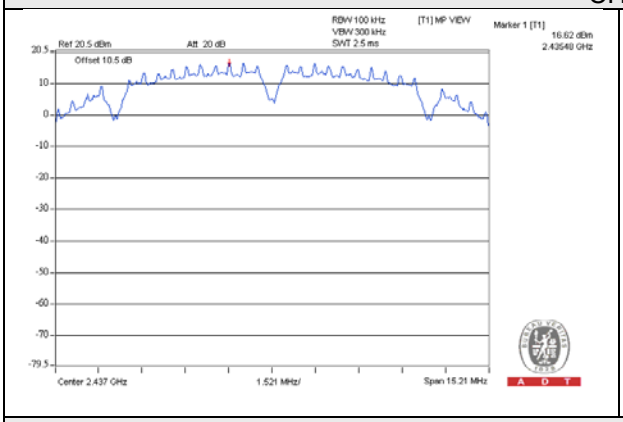
802.11b

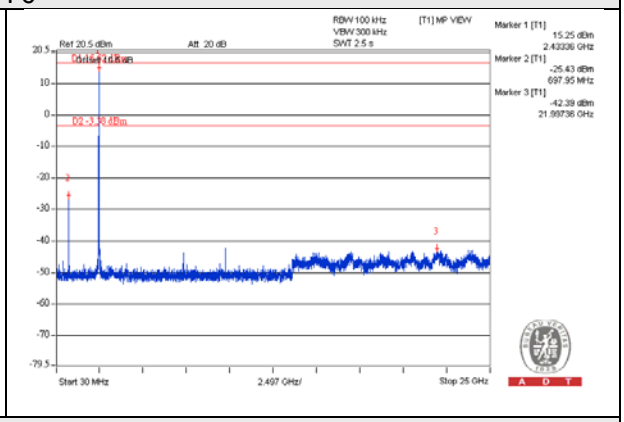
CH 1



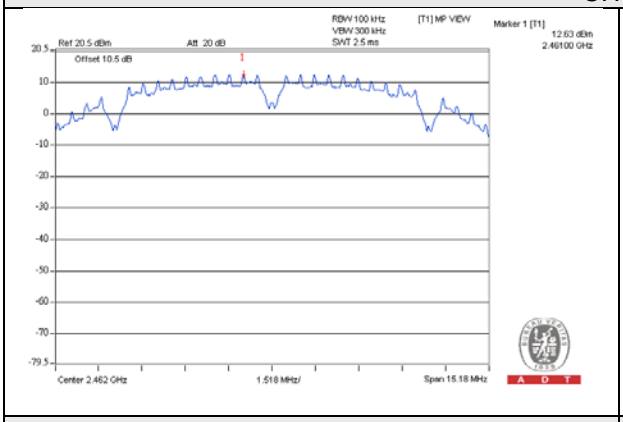


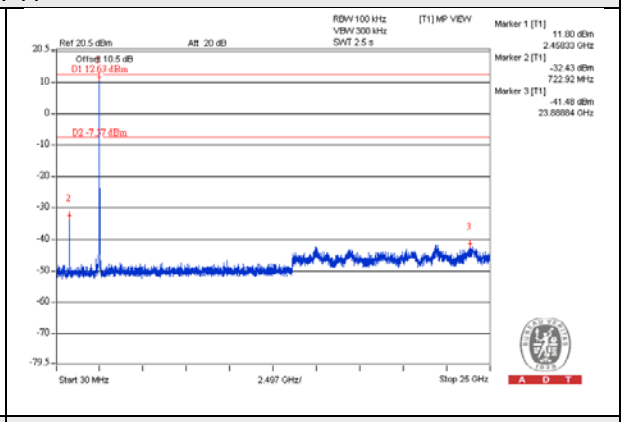
CH 6



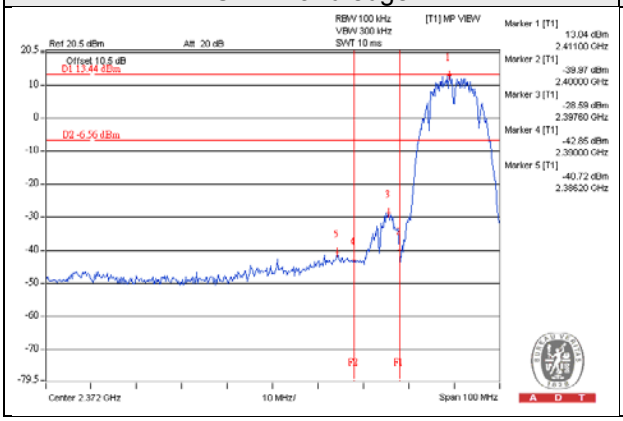


CH 11

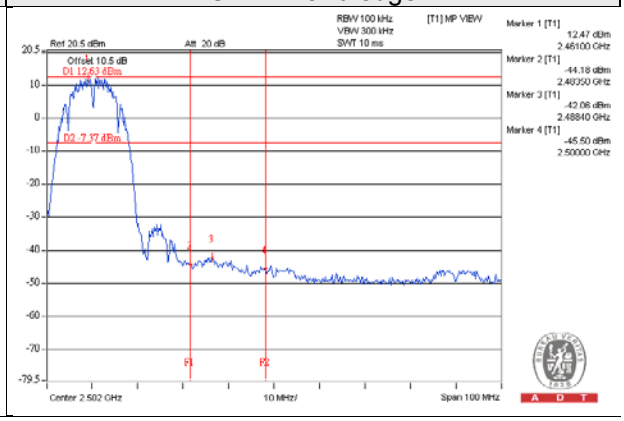




CH 1 Band edge

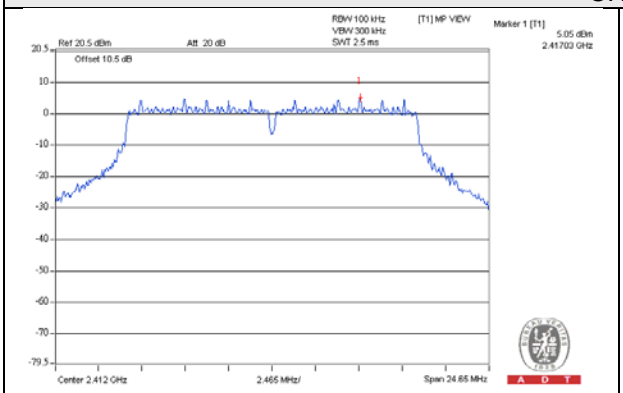


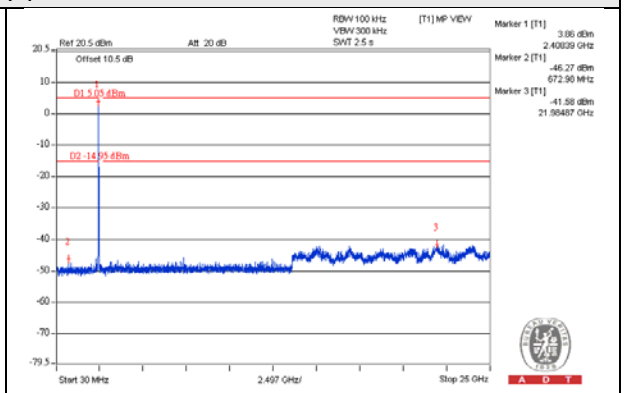
CH 11 Band edge



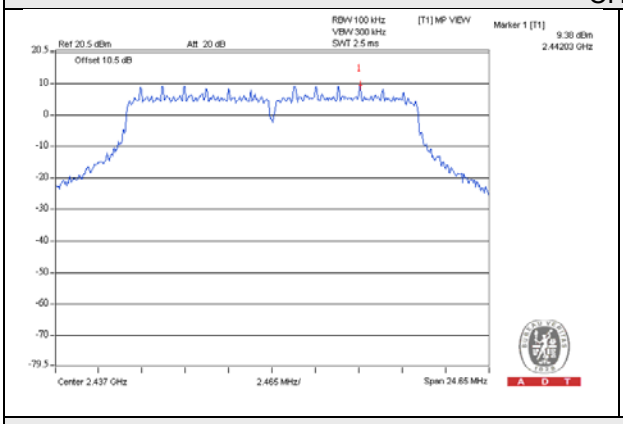
802.11g

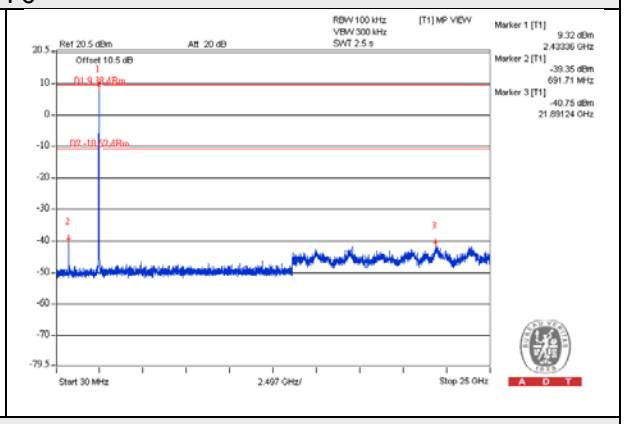
CH 1



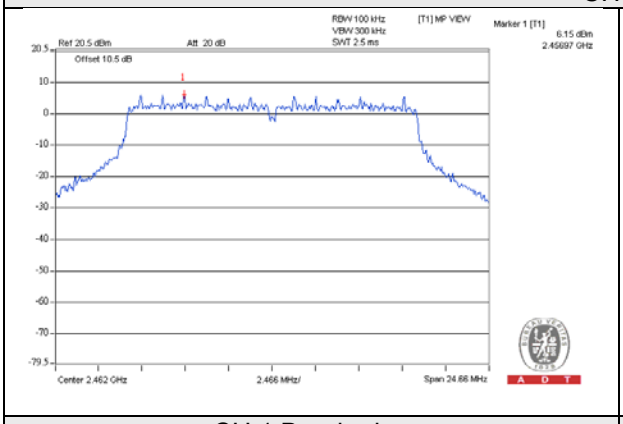


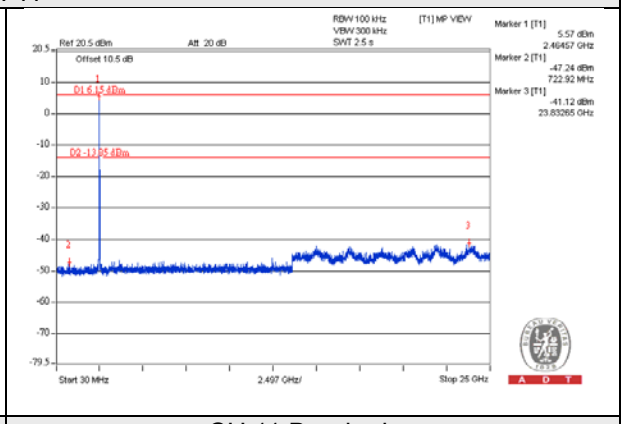
CH 6



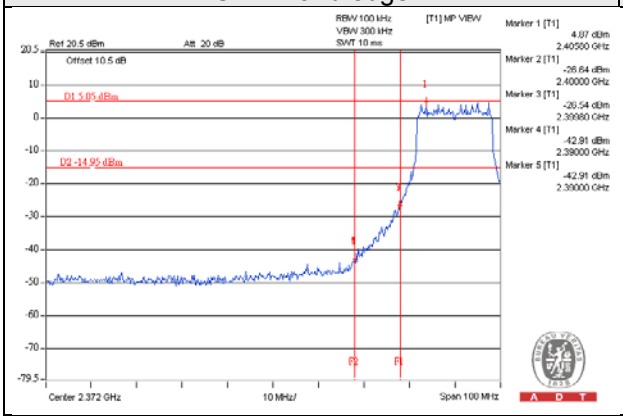


CH 11

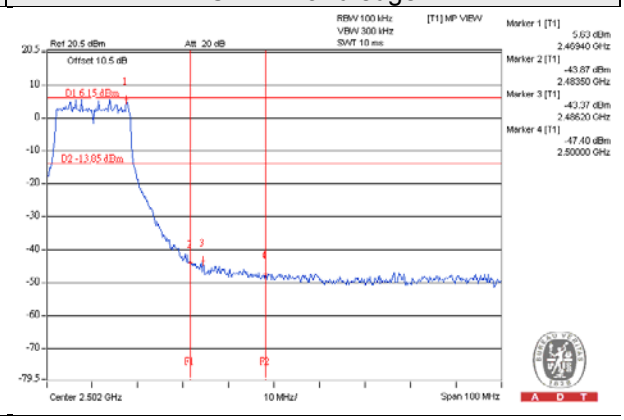




CH 1 Band edge

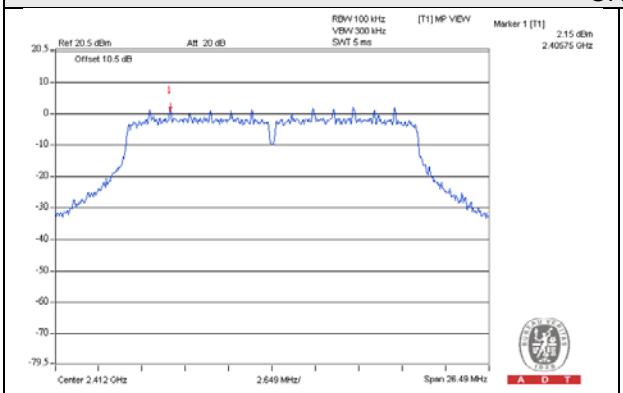


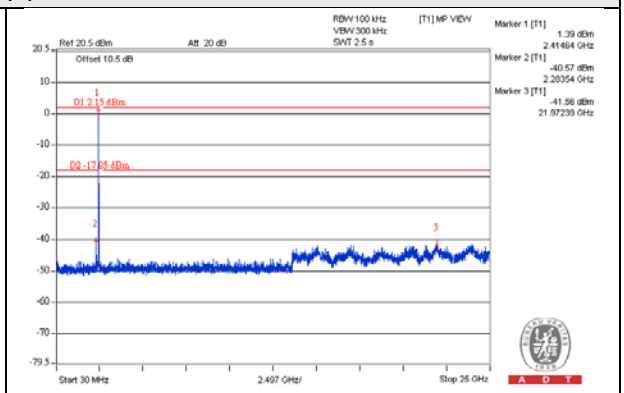
CH 11 Band edge



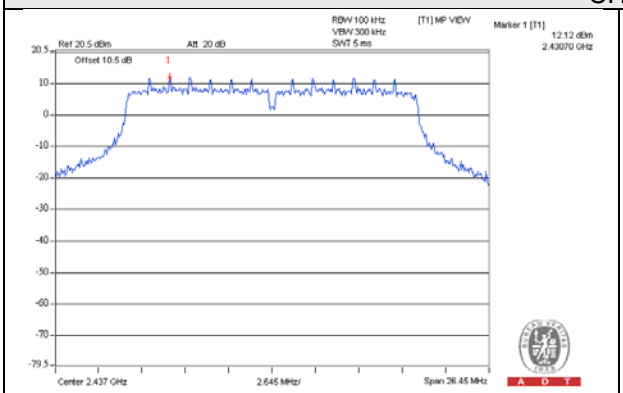
802.11n (HT20)_Chain 0

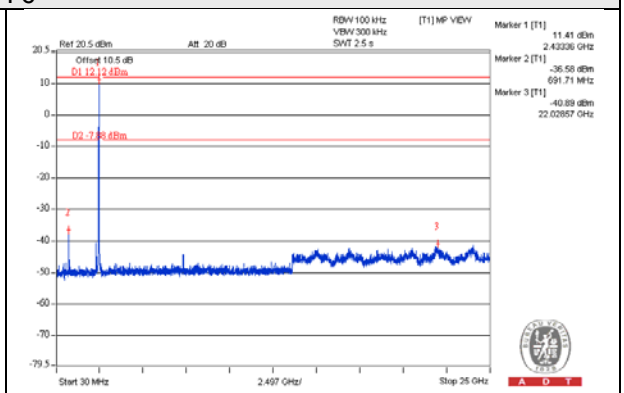
CH 1



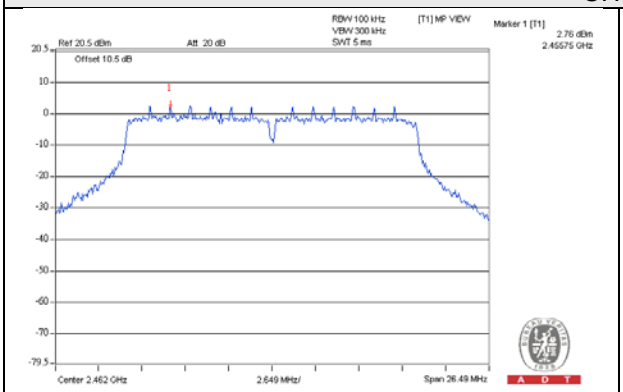


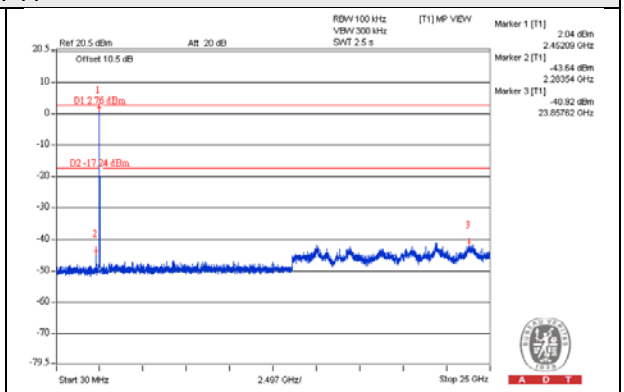
CH 6



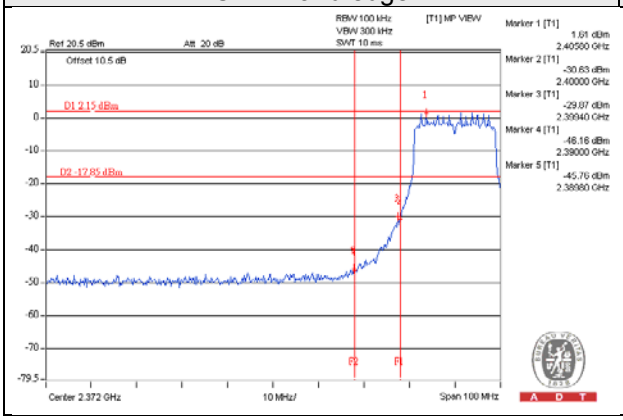


CH 11





CH 1 Band edge



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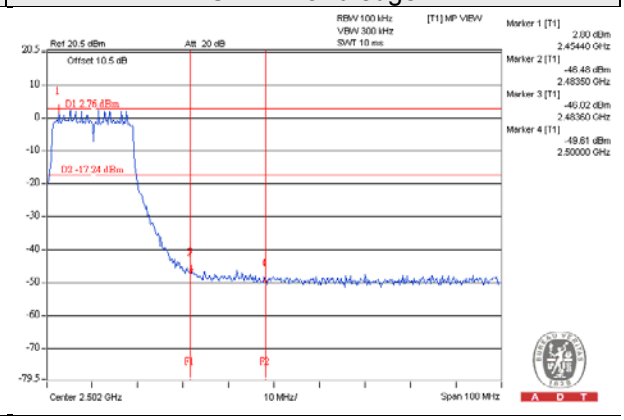
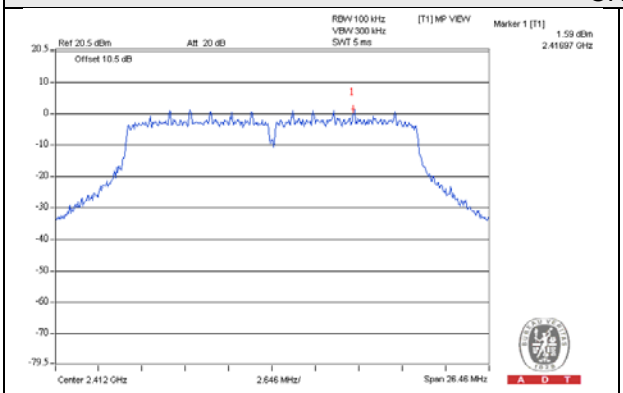
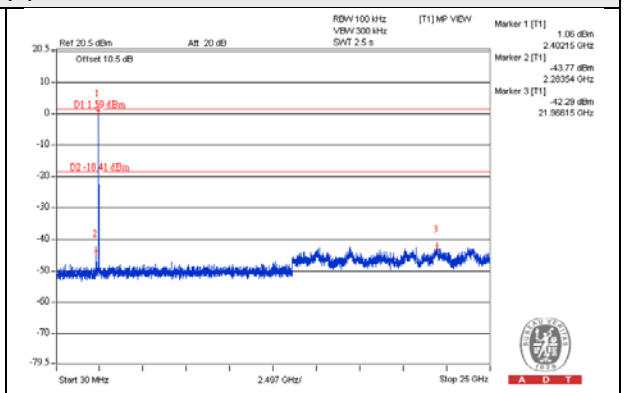


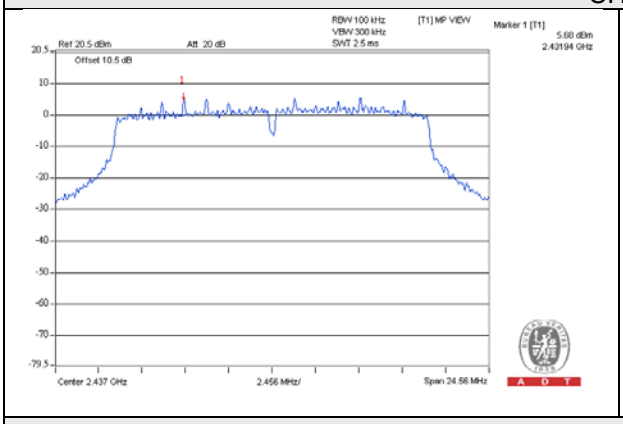
802.11n (HT20)_Chain 1

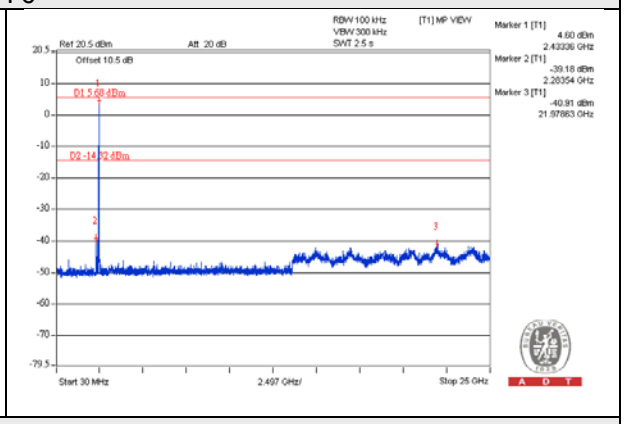
CH 1



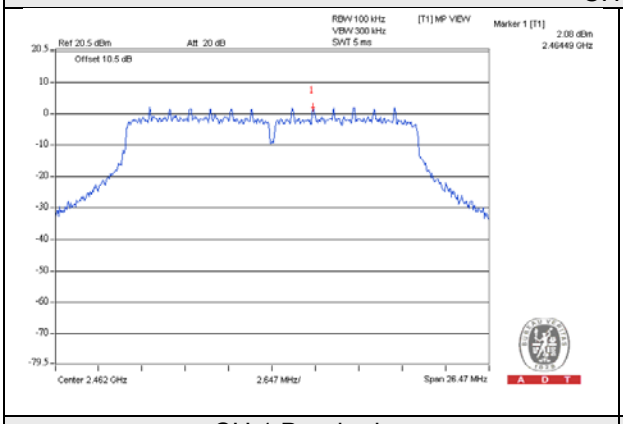


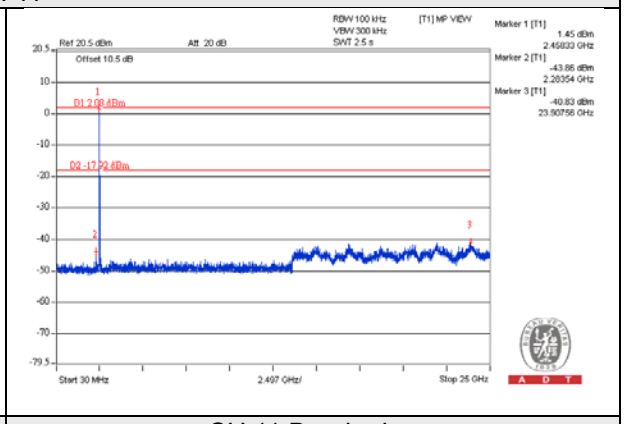
CH 6



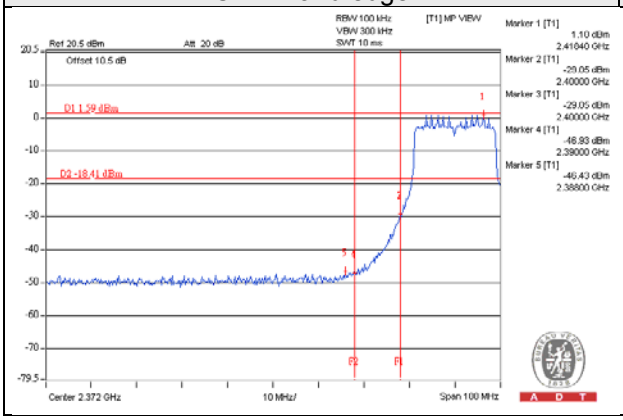


CH 11

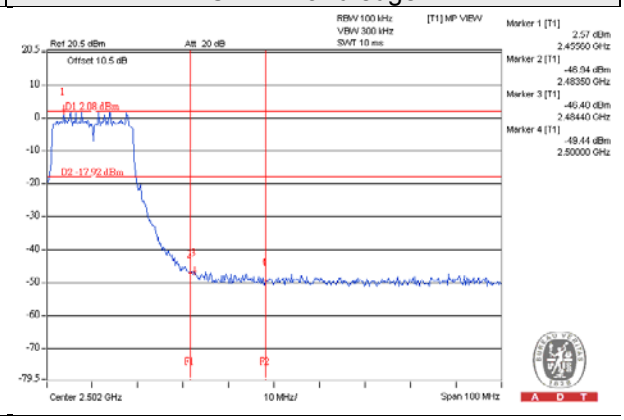




CH 1 Band edge

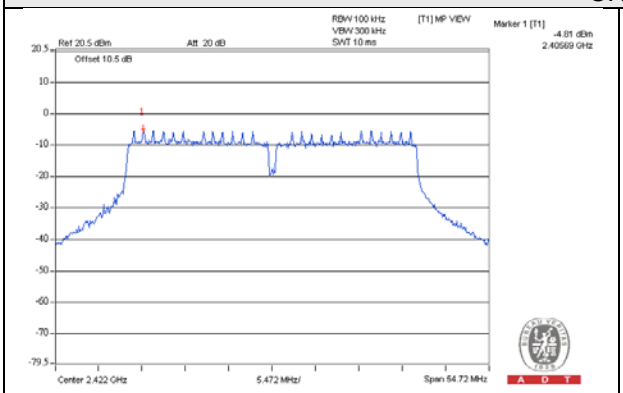


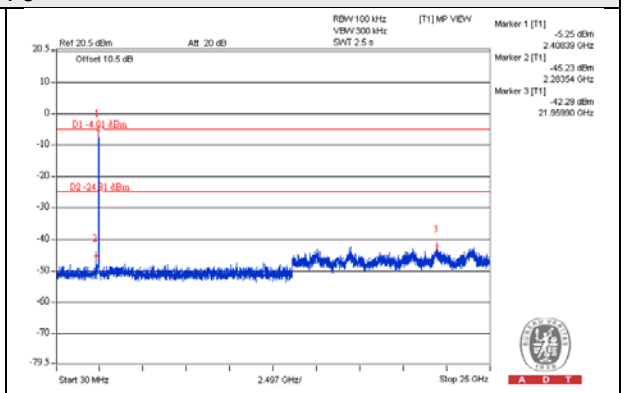
CH 11 Band edge



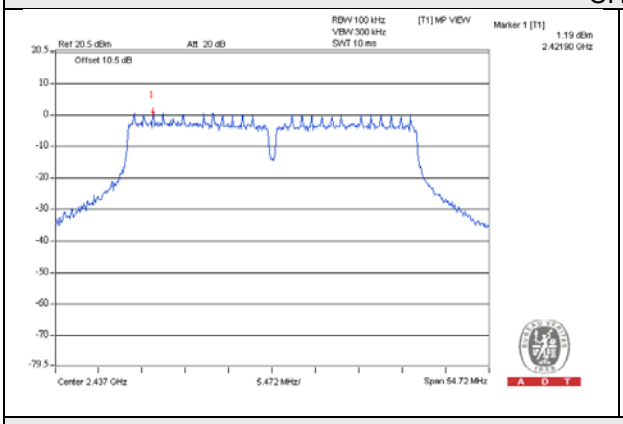
802.11n (HT40)_Chain 0

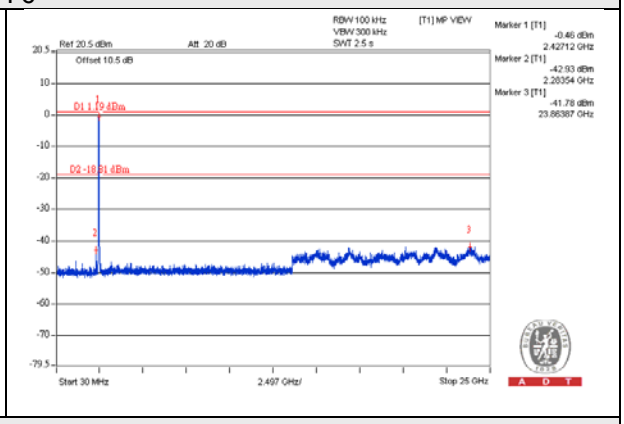
CH 3



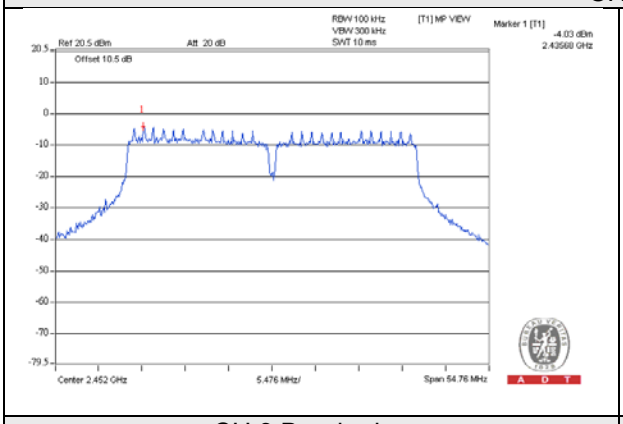


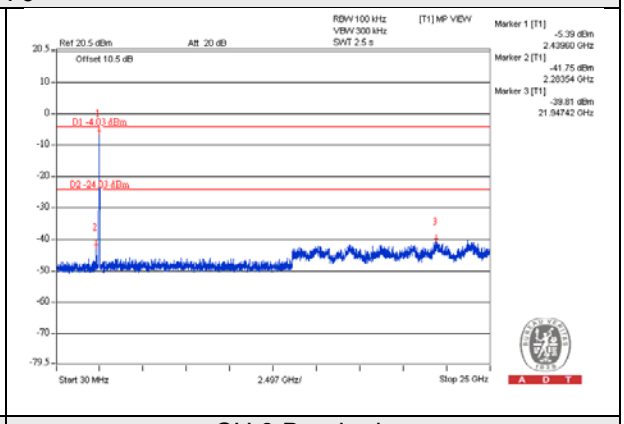
CH 6



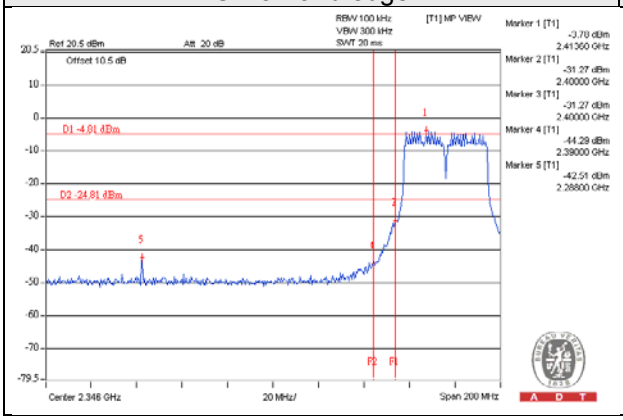


CH 9

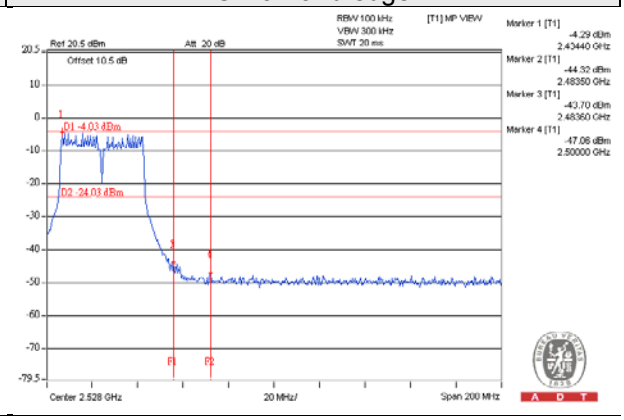




CH 3 Band edge

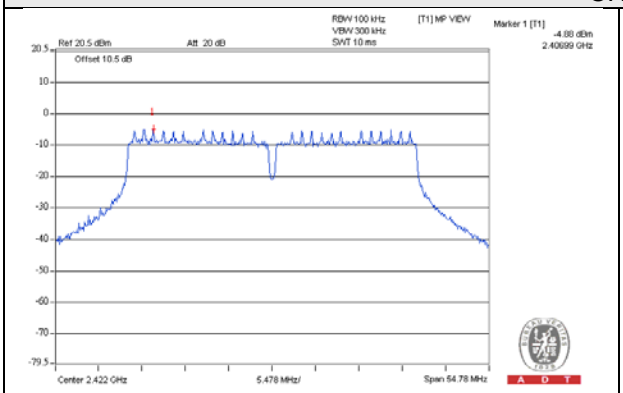


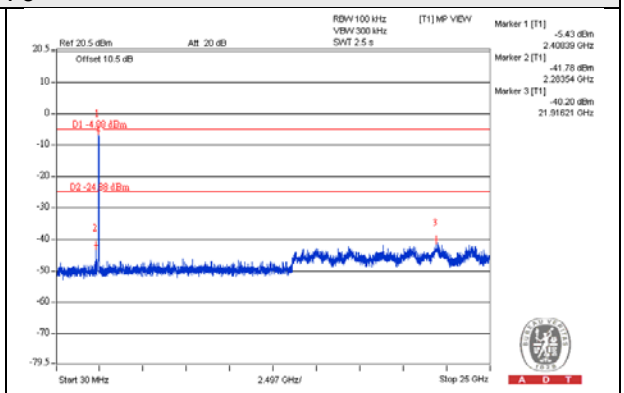
CH 9 Band edge



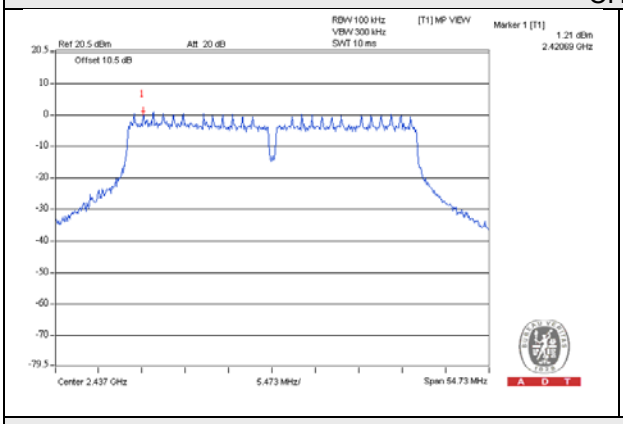
802.11n (HT40)_Chain 1

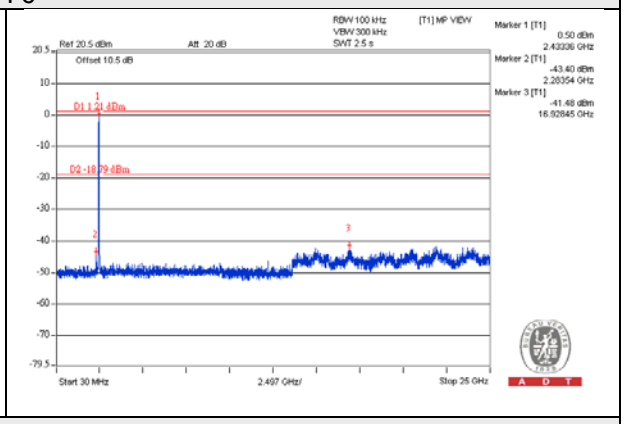
CH 3



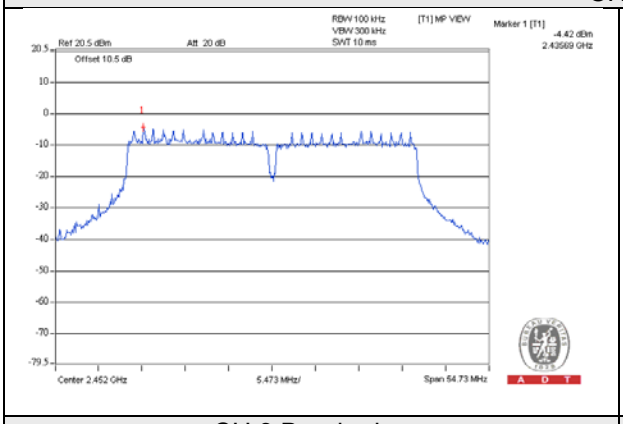


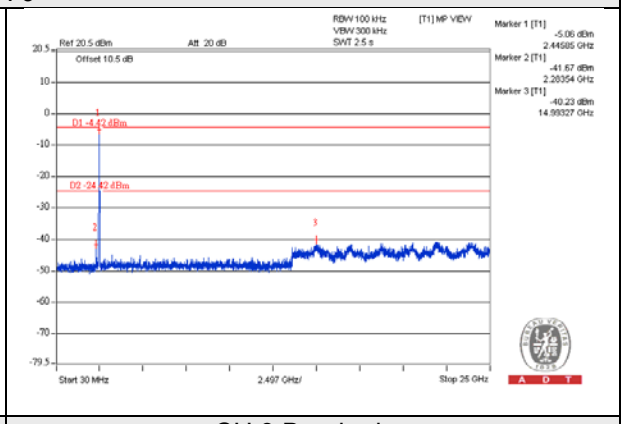
CH 6



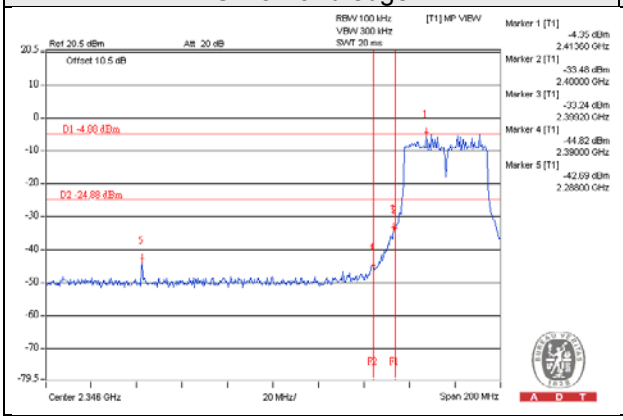


CH 9

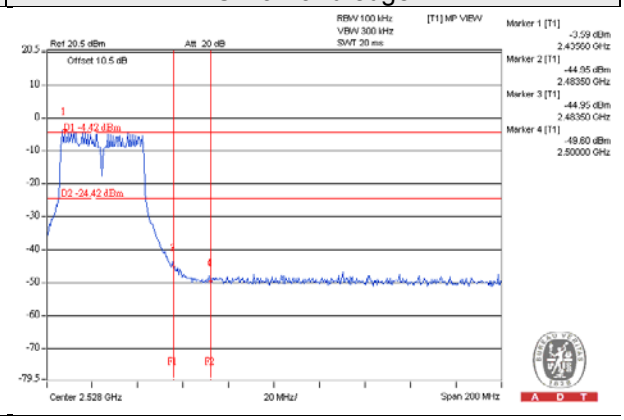




CH 3 Band edge



CH 9 Band edge



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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

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

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