

FCC Test Report

Report No.: RF151104C25

FCC ID: HD5-PM43ABGN

Test Model: PM43

Series Model: PM43c, PM23c

Received Date: Nov. 05, 2015

Test Date: Nov. 21, 2015 ~ Apr. 01, 2016

Issued Date: Apr. 06, 2016

Applicant: Honeywell International Inc

Address: 9680 Old Bailes Rd Fort Mill South Carolina 29707 United States

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

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



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Release Control Record

Issue No.	Description	Date Issued
RF151104C25	Original release.	Apr. 06, 2016

1 Certificate of Conformity

Product: Thermal Printer

Brand: Intermec, Honeywell

Test Model: PM43

Series Model: PM43c, PM23c

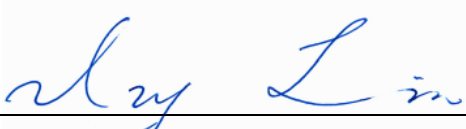
Sample Status: Engineering sample

Applicant: Honeywell International Inc

Test Date: Nov. 21, 2015 ~ Apr. 01, 2016

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

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

Prepared by :  , **Date:** Apr. 06, 2016
Ivy Lin / Specialist

Approved by :  , **Date:** Apr. 06, 2016
Ken Liu / Senior Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -7.09dB at 25.94600MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.5dB at 449.87MHz.
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 R-TNC 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	Expended Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Thermal Printer
Brand	Intermec, Honeywell
Test Model	PM43
Series Model	PM43c, PM23c
Model Difference	Refer to Note
Status of EUT	Engineering sample
Power Supply Rating	100-240Vac, 4A, 50/60Hz
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 72.2Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	166.341mW
Antenna Type	Dipole antenna with 2.44dBi gain
Antenna Connector	R-TNC
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- The EUT provides one completed transmitter and one receiver.

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

- All models are listed as below. Model: PM43 is the representative for final test.

Brand	Model	Difference
Intermec, Honeywell	PM43	With / Without LCD panel 1. Big appearance size, 4" thermal printer head 2. With/ Without full roll rewinder 3. Antenna type: RFID antenna is strip type, Antenna Gain: -19.96dBi
	PM43c	With LCD panel 1. Small appearance size, 4" thermal printer head 2. Antenna type: RFID antenna is strip type, Antenna Gain: -19.96dBi
	PM23c	With LCD panel Same as PM43c except: 1. 2" thermal printer head 2. RFID antenna is circular type, Antenna Gain: -7.81dBi

- 2.4GHz and 5GHz technology can not transmit at same time.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Model: PM43
B	-	√	√	-	Model: PM43c
C	-	√	√	-	Model: PM23c

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: “-” means no effect.

Radiated Emission Test (Above 1GHz):

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

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

Radiated Emission Test (Below 1GHz):

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B, C	802.11g	1 to 11	11	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)
A, B, C	802.11g	1 to 11	11	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.

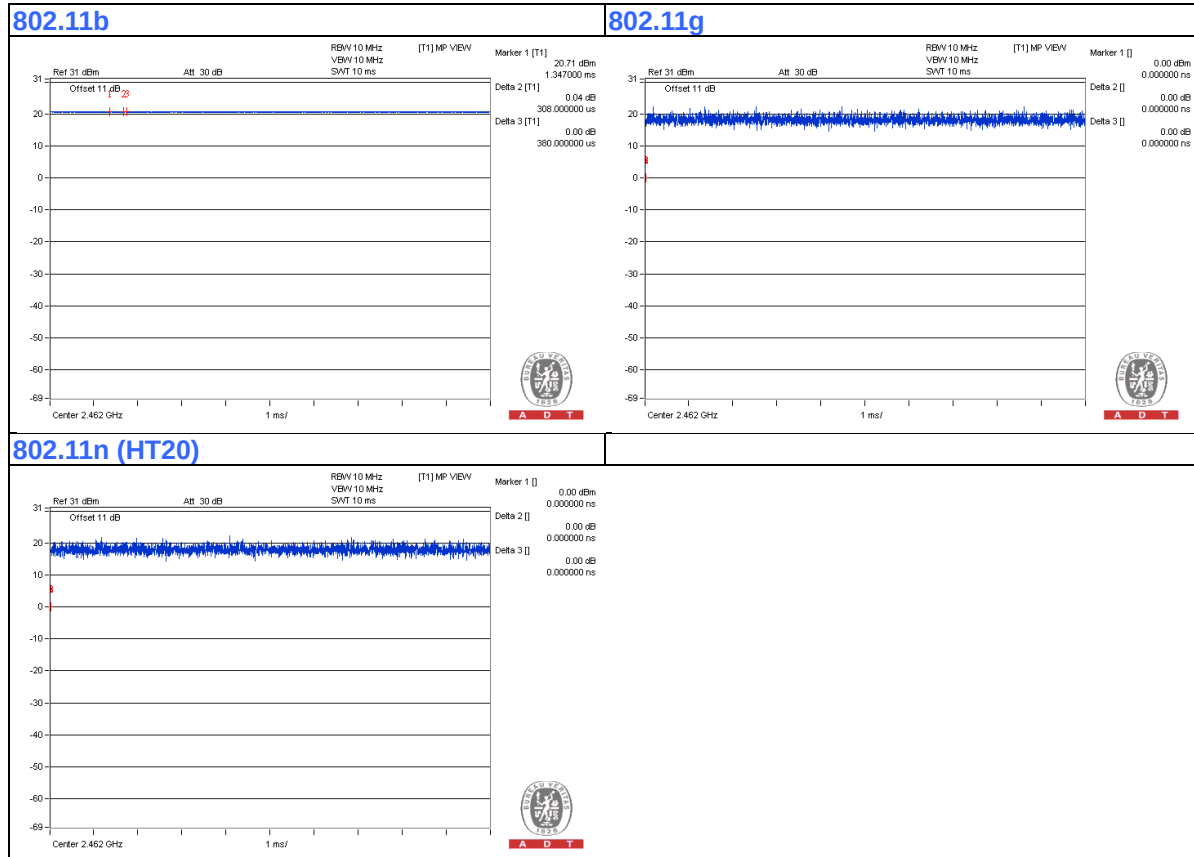
EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	21deg. C, 66%RH	120Vac, 60Hz	Jones Chang
RE<1G	18deg. C, 70%RH, 24deg. C, 64%RH	120Vac, 60Hz	Jones Chang, Match Tsui
PLC	20deg. C, 70%RH, 16deg. C, 70%RH	120Vac, 60Hz	Jones Chang, Nick Hsu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

3.3 Duty Cycle of Test Signal

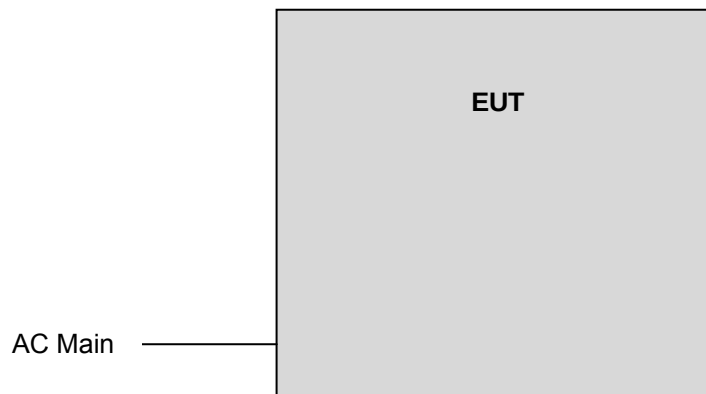
Duty cycle of test signal is 100 %, duty factor is not required.



3.4 Description of Support Units

The EUT has been tested as an independent unit.

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 v03r05
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 A (Verification). 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

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	9168-171	Feb. 02, 2015 Jan. 07, 2016	Feb. 01, 2016 Jan. 06, 2017
HORN Antenna SCHWARZBECK	9120D	209	Feb. 09, 2015 Jan. 20, 2016	Feb. 08, 2016 Jan. 19, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015 Jan. 18, 2016	Feb. 08, 2016 Jan. 17, 2017
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2015	Oct. 17, 2016
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2015	Aug. 21, 2016
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 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:

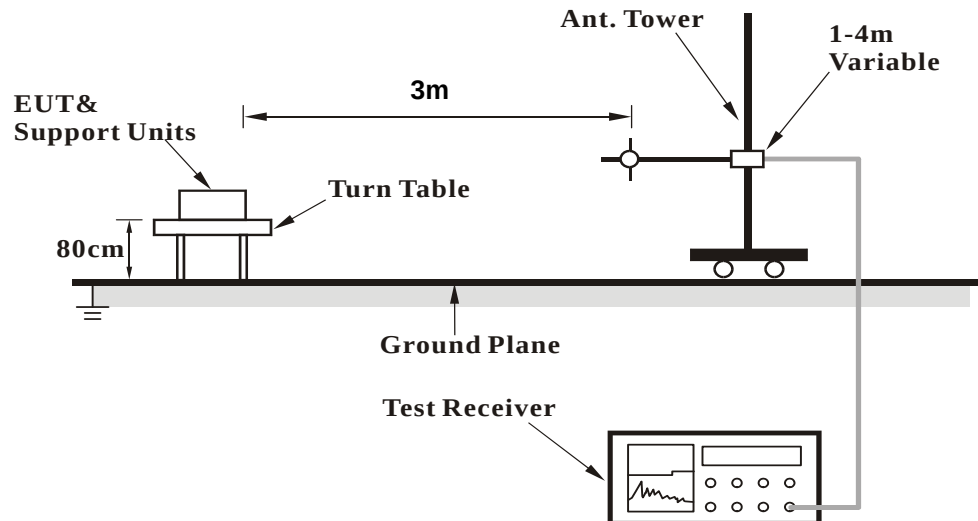
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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 ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) 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

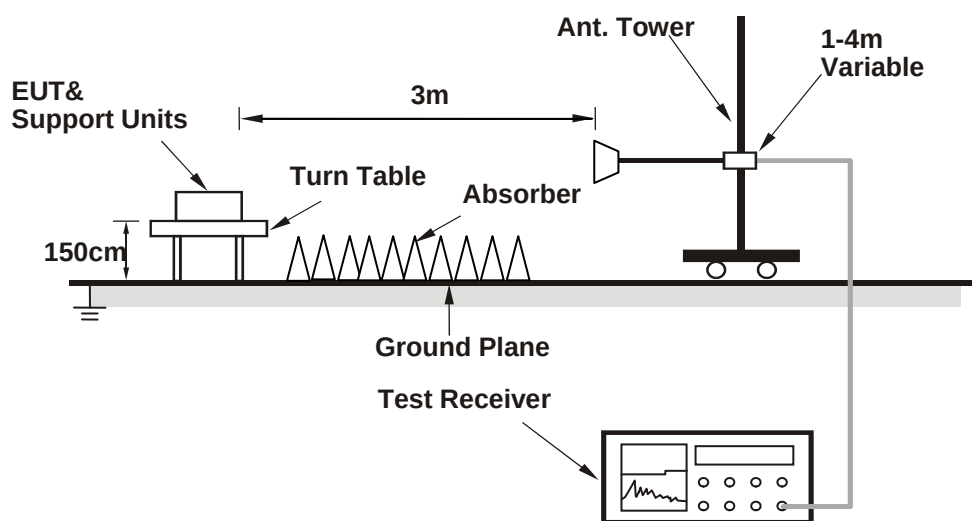
No deviation.

4.1.5 Test Set Up

<Frequency Range 30MHz ~ 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

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

4.1.7 Test Results

Above 1GHz worst-case data :

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.7 PK	74.0	-16.3	1.78 H	102	25.20	32.50
2	2390.00	46.0 AV	54.0	-8.0	1.78 H	102	13.50	32.50
3	*2412.00	106.0 PK			1.78 H	102	73.40	32.60
4	*2412.00	102.3 AV			1.78 H	102	69.70	32.60
5	4824.00	48.6 PK	74.0	-25.4	1.80 H	106	42.50	6.10
6	4824.00	35.7 AV	54.0	-18.3	1.80 H	106	29.60	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	59.0 PK	74.0	-15.0	1.84 V	239	26.50	32.50
2	2390.00	48.5 AV	54.0	-5.5	1.84 V	239	16.00	32.50
3	*2412.00	110.8 PK			2.05 V	242	78.20	32.60
4	*2412.00	107.2 AV			2.05 V	242	74.60	32.60
5	4824.00	49.1 PK	74.0	-24.9	1.60 V	159	43.00	6.10
6	4824.00	36.2 AV	54.0	-17.8	1.60 V	159	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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	105.9 PK			1.80 H	109	73.20	32.70
2	*2437.00	102.2 AV			1.80 H	109	69.50	32.70
3	4874.00	48.8 PK	74.0	-25.2	1.63 H	111	42.60	6.20
4	4874.00	35.7 AV	54.0	-18.3	1.63 H	111	29.50	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	*2437.00	109.0 PK			2.06 V	236	76.30	32.70
2	*2437.00	105.3 AV			2.06 V	236	72.60	32.70
3	4874.00	49.6 PK	74.0	-24.4	1.50 V	189	43.40	6.20
4	4874.00	36.5 AV	54.0	-17.5	1.50 V	189	30.30	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)– 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)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	105.3 PK			1.74 H	101	72.70	32.60
2	*2462.00	101.5 AV			1.74 H	101	68.90	32.60
3	2483.50	57.4 PK	74.0	-16.6	1.74 H	101	24.70	32.70
4	2483.50	45.4 AV	54.0	-8.6	1.74 H	101	12.70	32.70
5	4924.00	48.5 PK	74.0	-25.5	1.49 H	153	42.20	6.30
6	4924.00	35.6 AV	54.0	-18.4	1.49 H	153	29.30	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	110.1 PK			1.84 V	243	77.50	32.60
2	*2462.00	106.4 AV			1.84 V	243	73.80	32.60
3	2483.50	58.1 PK	74.0	-15.9	2.04 V	241	25.40	32.70
4	2483.50	46.3 AV	54.0	-7.7	2.04 V	241	13.60	32.70
5	4924.00	49.1 PK	74.0	-24.9	1.64 V	180	42.80	6.30
6	4924.00	36.1 AV	54.0	-17.9	1.64 V	180	29.80	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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.8 PK	74.0	-11.2	2.10 H	100	30.30	32.50
2	2390.00	46.6 AV	54.0	-7.4	2.10 H	100	14.10	32.50
3	*2412.00	104.1 PK			2.15 H	102	71.50	32.60
4	*2412.00	94.1 AV			2.15 H	102	61.50	32.60
5	4824.00	48.7 PK	74.0	-25.3	1.70 H	222	42.60	6.10
6	4824.00	35.5 AV	54.0	-18.5	1.70 H	222	29.40	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	69.2 PK	74.0	-4.8	2.02 V	239	36.70	32.50
2	2390.00	49.5 AV	54.0	-4.5	2.02 V	239	17.00	32.50
3	*2412.00	108.4 PK			2.02 V	239	75.80	32.60
4	*2412.00	99.1 AV			2.02 V	239	66.50	32.60
5	4824.00	48.6 PK	74.0	-25.4	1.51 V	19	42.50	6.10
6	4824.00	35.6 AV	54.0	-18.4	1.51 V	19	29.50	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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	103.8 PK			2.06 H	98	71.10	32.70
2	*2437.00	94.2 AV			2.06 H	98	61.50	32.70
3	4874.00	48.8 PK	74.0	-25.2	1.36 H	159	42.60	6.20
4	4874.00	35.9 AV	54.0	-18.1	1.36 H	159	29.70	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	*2437.00	106.8 PK			1.89 V	240	74.10	32.70
2	*2437.00	98.8 AV			1.89 V	240	66.10	32.70
3	4874.00	49.2 PK	74.0	-24.8	1.48 V	211	43.00	6.20
4	4874.00	36.4 AV	54.0	-17.6	1.48 V	211	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)– 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)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	102.5 PK			1.81 H	99	69.90	32.60
2	*2462.00	93.1 AV			1.81 H	99	60.50	32.60
3	2483.50	62.2 PK	74.0	-11.8	1.81 H	101	29.50	32.70
4	2483.50	46.9 AV	54.0	-7.1	1.81 H	101	14.20	32.70
5	4924.00	48.8 PK	74.0	-25.2	1.23 H	45	42.50	6.30
6	4924.00	36.1 AV	54.0	-17.9	1.23 H	45	29.80	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	*2462.00	108.5 PK			1.83 V	244	75.90	32.60
2	*2462.00	99.8 AV			1.83 V	244	67.20	32.60
3	2483.50	64.1 PK	74.0	-9.9	1.83 V	249	31.40	32.70
4	2483.50	49.8 AV	54.0	-4.2	1.83 V	249	17.10	32.70
5	4924.00	49.2 PK	74.0	-24.8	1.72 V	144	42.90	6.30
6	4924.00	36.4 AV	54.0	-17.6	1.72 V	144	30.10	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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.9 PK	74.0	-8.1	1.78 H	9	33.40	32.50
2	2390.00	48.4 AV	54.0	-5.6	1.78 H	9	15.90	32.50
3	*2412.00	103.7 PK			1.78 H	99	71.10	32.60
4	*2412.00	95.0 AV			1.78 H	99	62.40	32.60
5	4824.00	48.5 PK	74.0	-25.5	1.28 H	169	42.40	6.10
6	4824.00	35.2 AV	54.0	-18.8	1.28 H	169	29.10	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	2390.00	72.4 PK	74.0	-1.6	1.89 V	199	39.90	32.50
2	2390.00	50.6 AV	54.0	-3.4	1.89 V	199	18.10	32.50
3	*2412.00	108.1 PK			2.04 V	239	75.50	32.60
4	*2412.00	98.9 AV			2.04 V	239	66.30	32.60
5	4824.00	49.6 PK	74.0	-24.4	1.84 V	261	43.50	6.10
6	4824.00	36.7 AV	54.0	-17.3	1.84 V	261	30.60	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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	103.1 PK			1.82 H	107	70.40	32.70
2	*2437.00	93.5 AV			1.82 H	107	60.80	32.70
3	4874.00	48.4 PK	74.0	-25.6	1.32 H	119	42.20	6.20
4	4874.00	35.2 AV	54.0	-18.8	1.32 H	119	29.00	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	*2437.00	108.9 PK			2.18 V	237	76.20	32.70
2	*2437.00	99.4 AV			2.18 V	237	66.70	32.70
3	4874.00	49.9 PK	74.0	-24.1	1.80 V	184	43.70	6.20
4	4874.00	37.2 AV	54.0	-16.8	1.80 V	184	31.00	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)– 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)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	103.1 PK			1.75 H	101	70.50	32.60
2	*2462.00	93.7 AV			1.75 H	101	61.10	32.60
3	2483.50	61.8 PK	74.0	-12.2	1.75 H	100	29.10	32.70
4	2483.50	48.3 AV	54.0	-5.7	1.75 H	100	15.60	32.70
5	4924.00	48.6 PK	74.0	-25.4	1.55 H	178	42.30	6.30
6	4924.00	35.7 AV	54.0	-18.3	1.55 H	178	29.40	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	109.0 PK			1.62 V	230	76.40	32.60
2	*2462.00	99.1 AV			1.62 V	230	66.50	32.60
3	2483.50	65.7 PK	74.0	-8.3	1.48 V	99	33.00	32.70
4	2483.50	51.2 AV	54.0	-2.8	1.48 V	99	18.50	32.70
5	4924.00	49.4 PK	74.0	-24.6	2.01 V	195	43.10	6.30
6	4924.00	36.6 AV	54.0	-17.4	2.01 V	195	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)– 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 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	154.33	37.8 QP	43.5	-5.7	2.00 H	238	51.50	-13.70
2	220.44	40.1 QP	46.0	-5.9	1.00 H	14	56.30	-16.20
3	348.76	45.1 QP	46.0	-0.9	1.00 H	93	56.40	-11.30
4	449.87	40.2 QP	46.0	-5.8	1.50 H	119	49.10	-8.90
5	500.00	44.7 QP	46.0	-1.3	1.49 H	129	52.70	-8.00
6	550.97	44.9 QP	46.0	-1.1	1.50 H	136	52.10	-7.20
7	599.58	41.8 QP	46.0	-4.2	1.00 H	107	47.60	-5.80
8	650.13	44.0 QP	46.0	-2.0	2.00 H	132	48.80	-4.80
9	700.68	44.8 QP	46.0	-1.2	1.00 H	125	48.80	-4.00
10	799.84	43.3 QP	46.0	-2.7	1.00 H	135	45.30	-2.00
11	850.39	42.3 QP	46.0	-3.7	1.00 H	139	43.40	-1.10
12	900.94	44.5 QP	46.0	-1.5	1.00 H	205	44.80	-0.30
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	348.76	42.8 QP	46.0	-3.2	1.49 V	103	54.10	-11.30
2	449.87	43.9 QP	46.0	-2.1	1.00 V	115	52.80	-8.90
3	500.42	44.0 QP	46.0	-2.0	1.00 V	105	52.10	-8.10
4	549.99	44.8 QP	46.0	-1.2	1.00 V	180	52.00	-7.20
5	599.58	41.9 QP	46.0	-4.1	1.00 V	179	47.70	-5.80
6	650.13	44.2 QP	46.0	-1.8	1.00 V	210	49.00	-4.80
7	700.68	42.0 QP	46.0	-4.0	1.00 V	226	46.00	-4.00
8	850.39	41.6 QP	46.0	-4.4	1.00 V	183	42.70	-1.10
9	900.94	42.3 QP	46.0	-3.7	1.00 V	188	42.60	-0.30
10	1000.10	43.8 QP	54.0	-10.2	1.49 V	215	42.80	1.00

REMARKS:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	148.50	39.5 QP	43.5	-4.0	2.00 H	86	53.30	-13.80
2	212.66	41.0 QP	43.5	-2.5	1.50 H	50	57.20	-16.20
3	249.60	45.0 QP	46.0	-1.0	1.00 H	300	59.20	-14.20
4	348.76	44.6 QP	46.0	-1.4	1.00 H	147	55.90	-11.30
5	399.31	43.9 QP	46.0	-2.1	2.00 H	152	54.10	-10.20
6	500.42	44.8 QP	46.0	-1.2	1.50 H	142	52.90	-8.10
7	550.97	44.6 QP	46.0	-1.4	1.50 H	125	51.80	-7.20
8	700.68	45.0 QP	46.0	-1.0	1.00 H	149	49.00	-4.00
9	799.84	44.4 QP	46.0	-1.6	1.00 H	204	46.40	-2.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	199.05	40.7 QP	43.5	-2.8	1.00 V	223	57.10	-16.40
2	348.76	45.0 QP	46.0	-1.0	1.49 V	262	56.30	-11.30
3	500.42	43.7 QP	46.0	-2.3	1.00 V	293	51.80	-8.10
4	550.97	44.9 QP	46.0	-1.1	1.00 V	183	52.10	-7.20
5	599.58	43.4 QP	46.0	-2.6	1.00 V	183	49.20	-5.80
6	650.13	45.0 QP	46.0	-1.0	1.00 V	251	49.80	-4.80
7	700.68	45.0 QP	46.0	-1.0	1.00 V	245	49.00	-4.00
8	799.84	43.6 QP	46.0	-2.4	1.49 V	210	45.60	-2.00
9	850.39	44.6 QP	46.0	-1.4	1.49 V	215	45.70	-1.10

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)– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	C		

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	249.60	42.0 QP	46.0	-4.0	1.00 H	88	56.20	-14.20
2	449.87	42.7 QP	46.0	-3.3	1.00 H	108	51.80	-9.10
3	650.13	42.1 QP	46.0	-3.9	1.00 H	220	47.00	-4.90
4	751.23	41.8 QP	46.0	-4.2	1.00 H	159	44.60	-2.80
5	799.84	42.9 QP	46.0	-3.1	1.00 H	206	45.00	-2.10
6	850.39	42.4 QP	46.0	-3.6	1.00 H	198	43.60	-1.20
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	449.87	45.5 QP	46.0	-0.5	1.00 V	168	54.60	-9.10
2	500.42	41.4 QP	46.0	-4.6	1.00 V	193	49.60	-8.20
3	650.13	42.0 QP	46.0	-4.0	1.50 V	299	46.90	-4.90
4	751.23	40.2 QP	46.0	-5.8	1.00 V	148	43.00	-2.80
5	850.39	43.5 QP	46.0	-2.5	1.00 V	174	44.70	-1.20
6	900.94	44.7 QP	46.0	-1.3	1.00 V	163	44.60	0.10

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)– 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	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
			Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
			Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 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 1.

3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

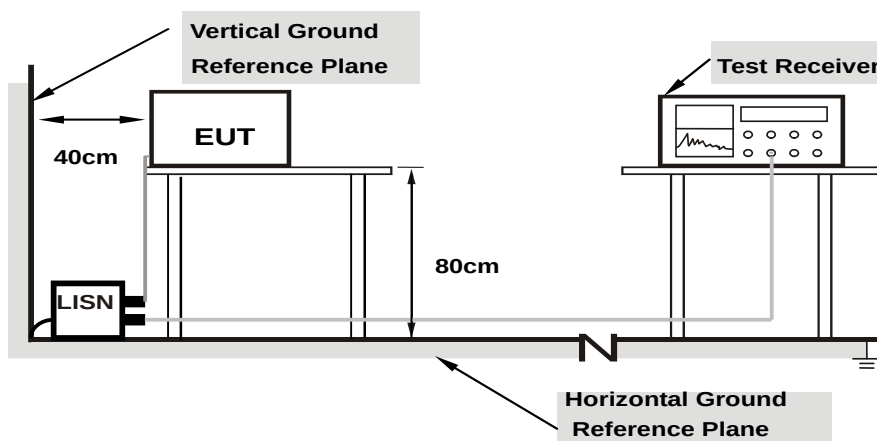
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

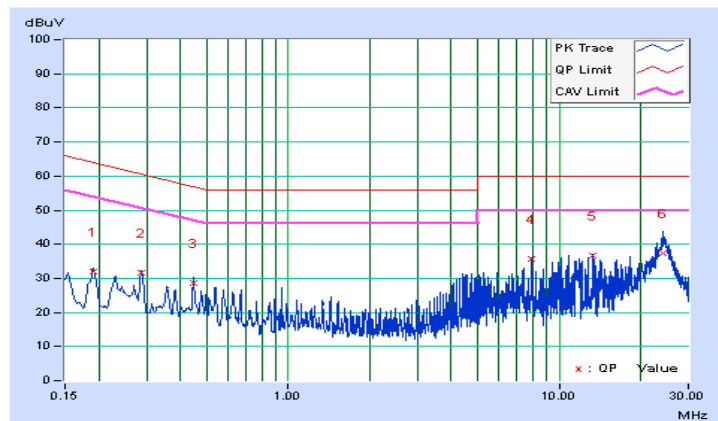
4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19013	9.84	22.05	21.81	31.89	31.65	64.03	54.03	-32.14	-22.38
2	0.28602	9.86	21.77	21.35	31.63	31.21	60.64	50.64	-29.01	-19.43
3	0.44645	9.88	18.78	12.68	28.66	22.56	56.94	46.94	-28.28	-24.38
4	7.92200	10.38	25.36	24.45	35.74	34.83	60.00	50.00	-24.26	-15.17
5	13.35800	10.71	25.99	24.84	36.70	35.55	60.00	50.00	-23.30	-14.45
6	24.11000	11.25	26.07	17.67	37.32	28.92	60.00	50.00	-22.68	-21.08

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.

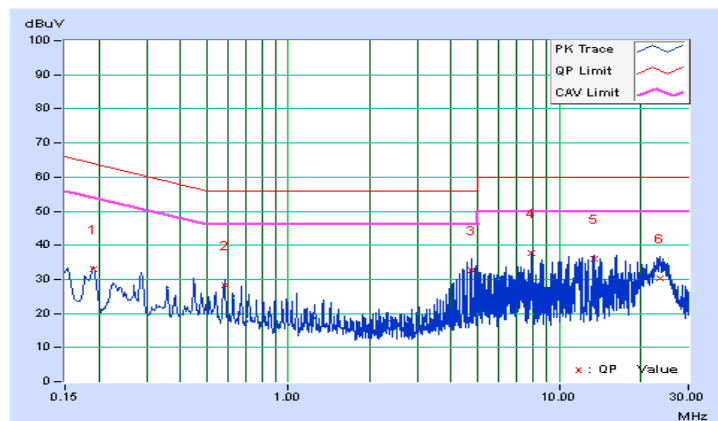


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
TEST MODE	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19013	9.83	23.19	23.12	33.02	32.95	64.03	54.03	-31.01	-21.08
2	0.58200	9.90	18.24	10.12	28.14	20.02	56.00	46.00	-27.86	-25.98
3	4.77400	10.18	22.32	21.73	32.50	31.91	56.00	46.00	-23.50	-14.09
4	7.92200	10.36	27.29	24.56	37.65	34.92	60.00	50.00	-22.35	-15.08
5	13.41800	10.63	25.43	24.45	36.06	35.08	60.00	50.00	-23.94	-14.92
6	23.45400	11.00	19.42	10.51	30.42	21.51	60.00	50.00	-29.58	-28.49

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.

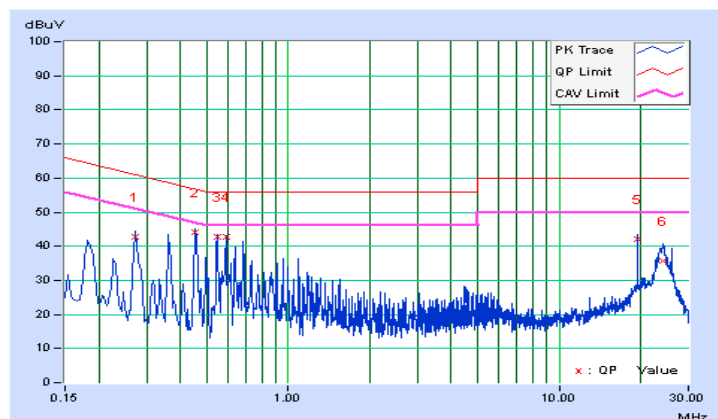


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.27400	10.04	32.72	28.47	42.76	38.51	61.00	51.00	-18.23	-12.48
2	0.45400	10.11	34.12	28.69	44.23	38.80	56.80	46.80	-12.57	-8.00
3	0.54600	10.12	32.57	28.27	42.69	38.39	56.00	46.00	-13.31	-7.61
4	0.59000	10.13	32.65	24.41	42.78	34.54	56.00	46.00	-13.22	-11.46
5	19.46200	11.09	31.03	30.73	42.12	41.82	60.00	50.00	-17.88	-8.18
6	24.18200	11.17	24.54	17.00	35.71	28.17	60.00	50.00	-24.29	-21.83

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.

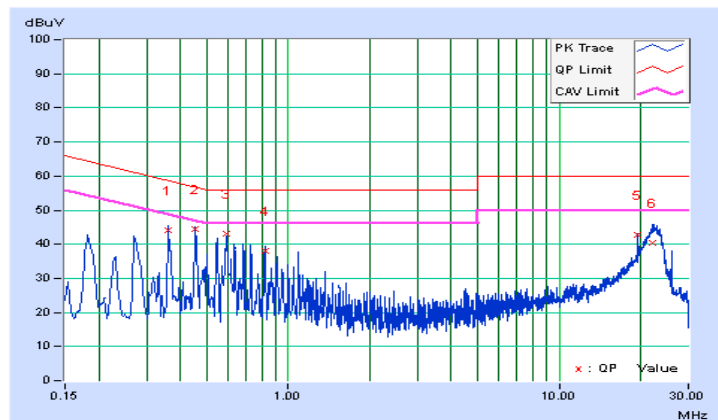


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.36200	10.05	33.89	28.77	43.94	38.82	58.68	48.68	-14.74	-9.86
2	0.45400	10.08	34.40	28.95	44.48	39.03	56.80	46.80	-12.33	-7.78
3	0.59028	10.09	32.96	24.75	43.05	34.84	56.00	46.00	-12.95	-11.16
4	0.81800	10.12	27.89	19.14	38.01	29.26	56.00	46.00	-17.99	-16.74
5	19.46200	10.87	31.80	30.65	42.67	41.52	60.00	50.00	-17.33	-8.48
6	22.22200	10.91	29.37	20.68	40.28	31.59	60.00	50.00	-19.72	-18.41

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.

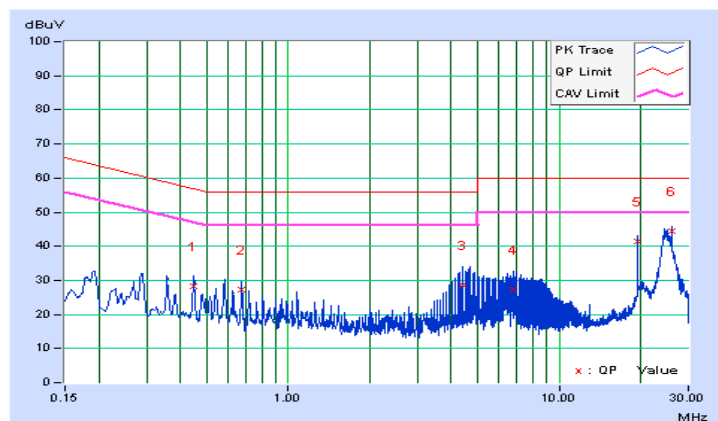


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
TEST MODE	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.44999	10.11	18.01	12.52	28.12	22.63	56.88	46.88	-28.76	-24.25
2	0.67400	10.14	17.01	10.03	27.15	20.17	56.00	46.00	-28.85	-25.83
3	4.41400	10.41	18.09	15.53	28.50	25.94	56.00	46.00	-27.50	-20.06
4	6.81000	10.52	16.77	15.46	27.29	25.98	60.00	50.00	-32.71	-24.02
5	19.46200	11.09	30.44	30.24	41.53	41.33	60.00	50.00	-18.47	-8.67
6	25.94600	11.20	33.13	31.71	44.33	42.91	60.00	50.00	-15.67	-7.09

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.

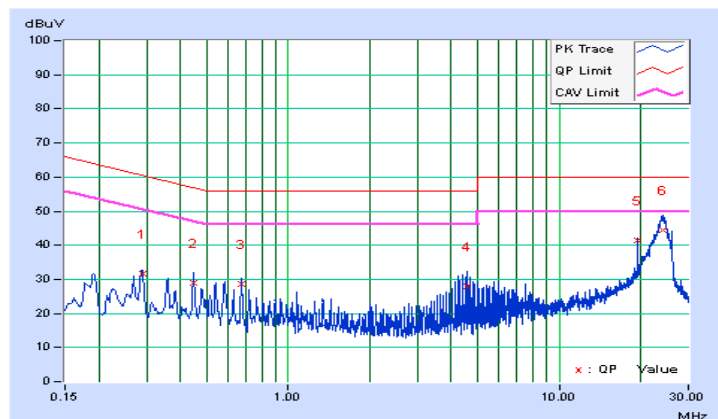


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
TEST MODE	C		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.28906	10.02	21.61	21.09	31.63	31.11	60.55	50.55	-28.92	-19.44
2	0.44999	10.08	18.91	13.45	28.99	23.53	56.88	46.88	-27.89	-23.35
3	0.67339	10.10	18.63	11.78	28.73	21.88	56.00	46.00	-27.27	-24.12
4	4.60200	10.35	17.56	14.79	27.91	25.14	56.00	46.00	-28.09	-20.86
5	19.46200	10.87	30.52	29.94	41.39	40.81	60.00	50.00	-18.61	-9.19
6	24.21800	10.93	33.56	24.85	44.49	35.78	60.00	50.00	-15.51	-14.22

REMARKS:

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

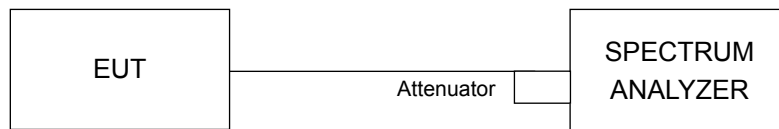


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	9.57	0.5	PASS
6	2437	9.10	0.5	PASS
11	2462	9.10	0.5	PASS

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.83	0.5	PASS
6	2437	15.90	0.5	PASS
11	2462	15.81	0.5	PASS

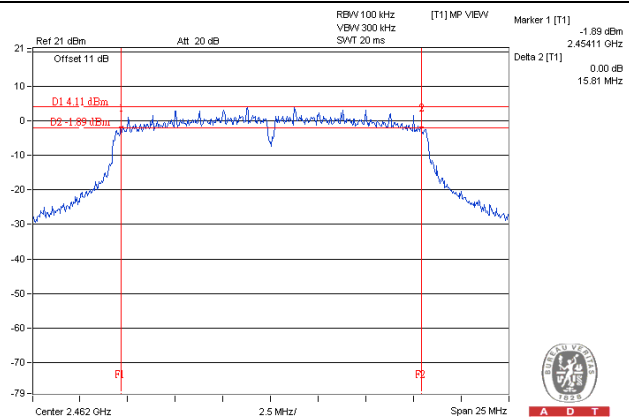
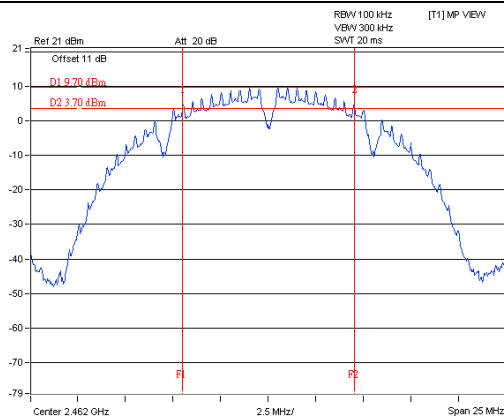
802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.47	0.5	PASS
6	2437	15.68	0.5	PASS
11	2462	15.93	0.5	PASS

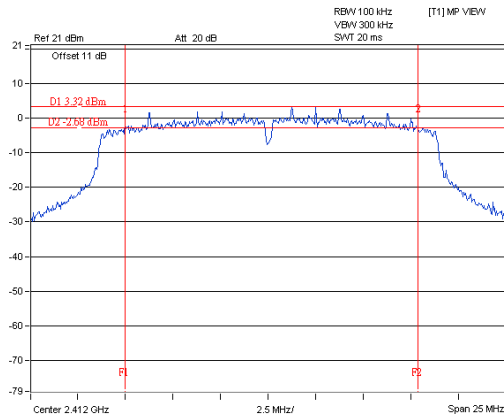
Spectrum Plot of Worst Value

802.11b

802.11g



802.11n (HT20)



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,

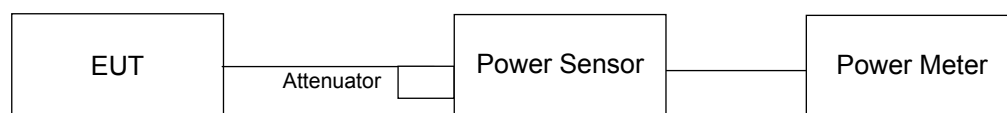
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	83.368	19.21	30	Pass
6	2437	88.512	19.47	30	Pass
11	2462	97.949	19.91	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	147.231	21.68	30	Pass
6	2437	154.17	21.88	30	Pass
11	2462	166.341	22.21	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	157.036	21.96	30	Pass
6	2437	159.956	22.04	30	Pass
11	2462	162.555	22.11	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	51.404	17.11
6	2437	55.081	17.41
11	2462	60.117	17.79

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	25.645	14.09
6	2437	25.942	14.14
11	2462	27.925	14.46

802.11n (HT20)

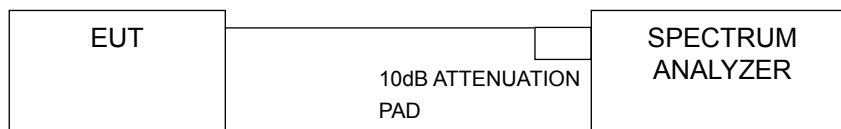
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	24.044	13.81
6	2437	25.823	14.12
11	2462	28.379	14.53

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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)	Limit (dBm)	Pass /Fail
1	2412	-6.62	8	Pass
6	2437	-5.01	8	Pass
11	2462	-5.67	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-10.80	8	Pass
6	2437	-9.95	8	Pass
11	2462	-10.88	8	Pass

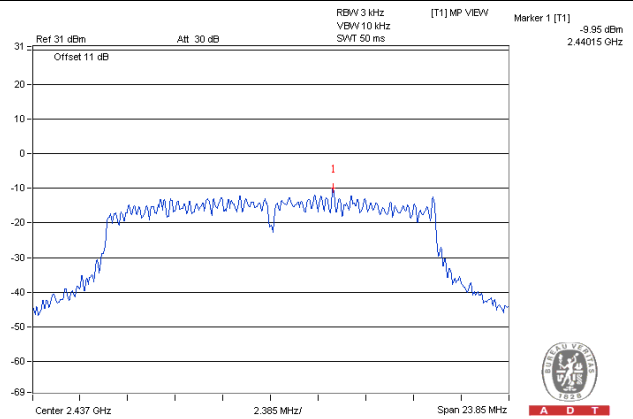
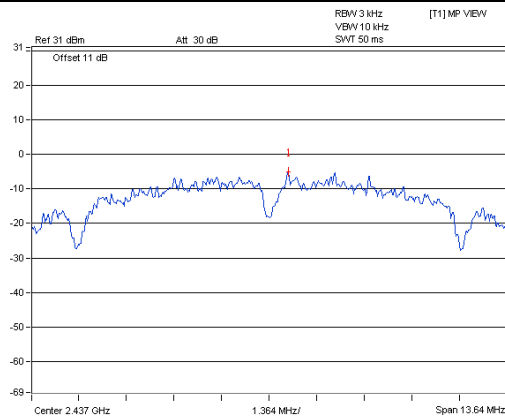
802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-13.08	8	Pass
6	2437	-10.79	8	Pass
11	2462	-11.85	8	Pass

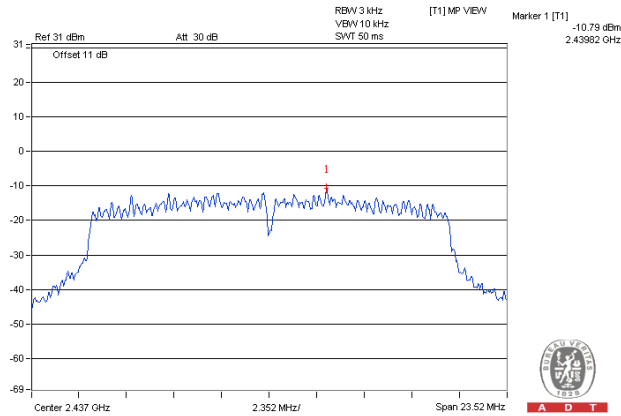
Spectrum Plot of Worst Value

802.11b

802.11g



802.11n (HT20)

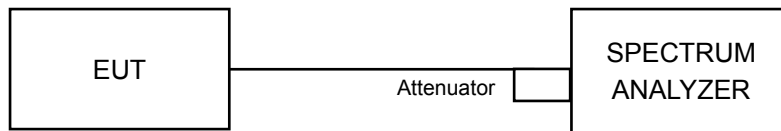


4.6 Conducted Out of Band Emission Measurement

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 $\geq$ 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 OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 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

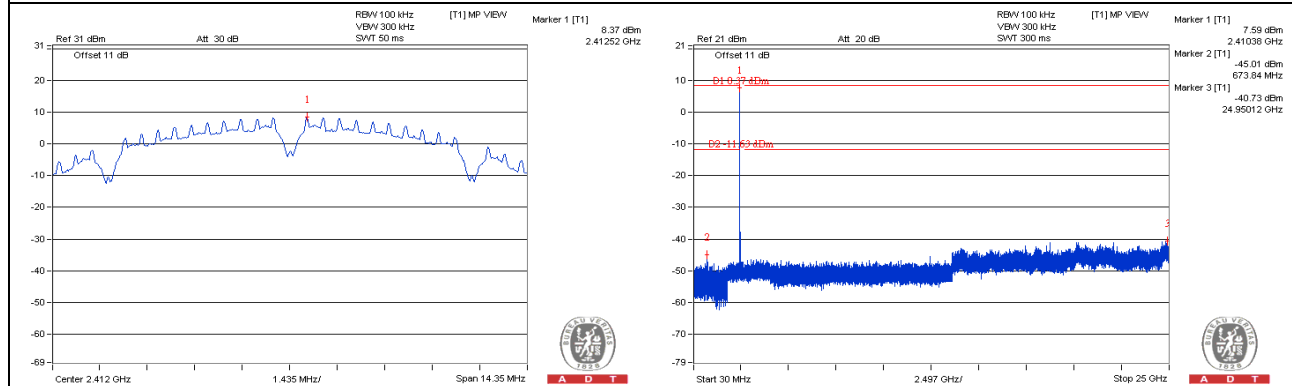
Same as Item 4.3.6

4.6.7 Test Results

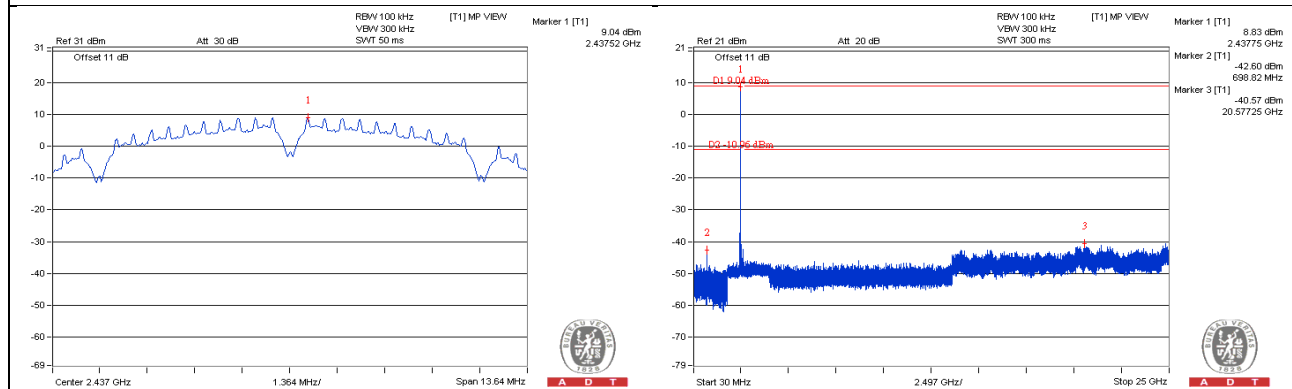
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

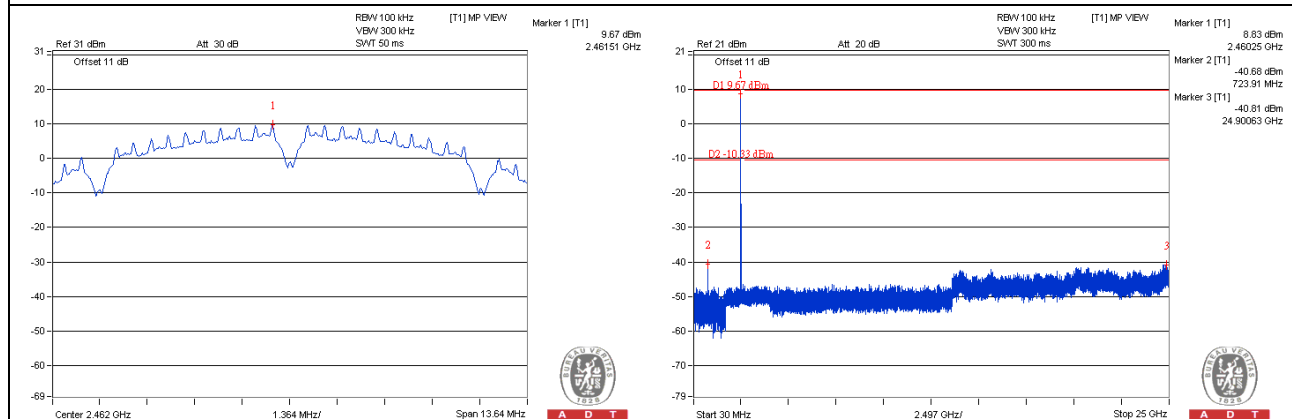
CH 1



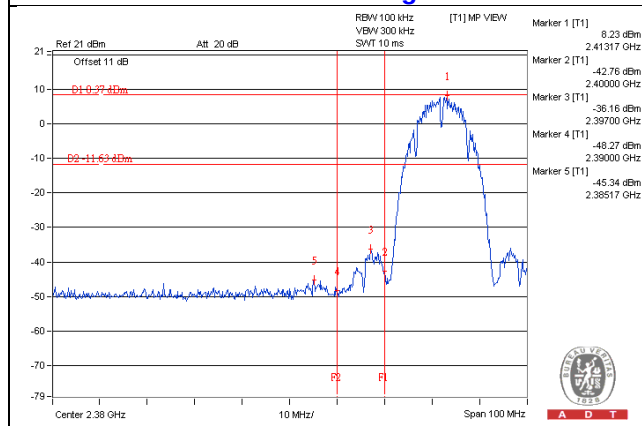
CH 6



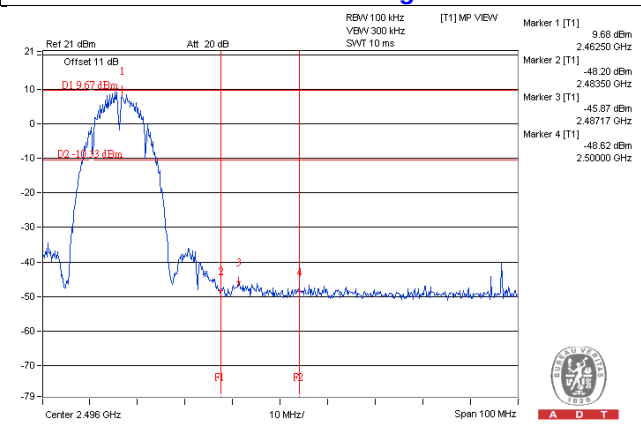
CH 11



CH 1 Band edge

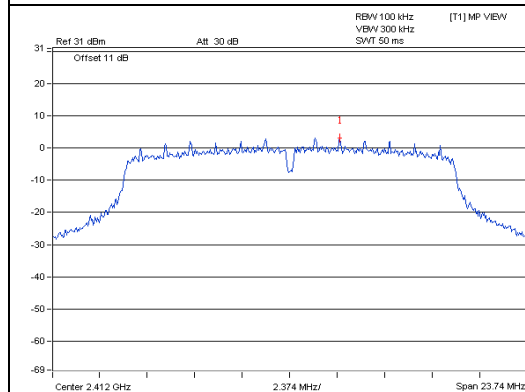


CH 11 Band edge

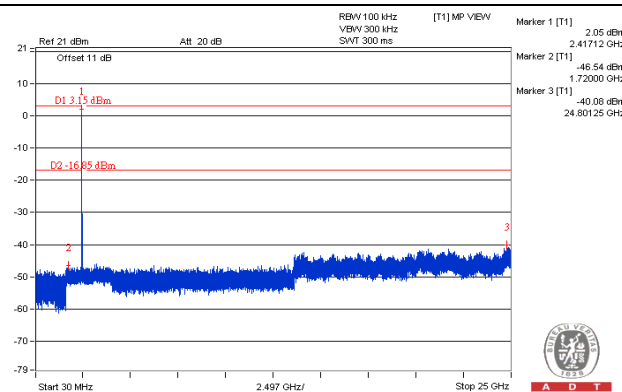


802.11g

CH 1

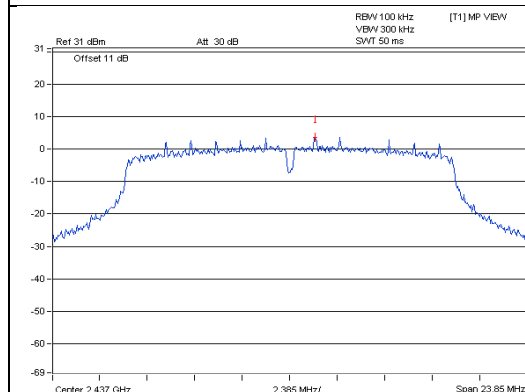


A D T

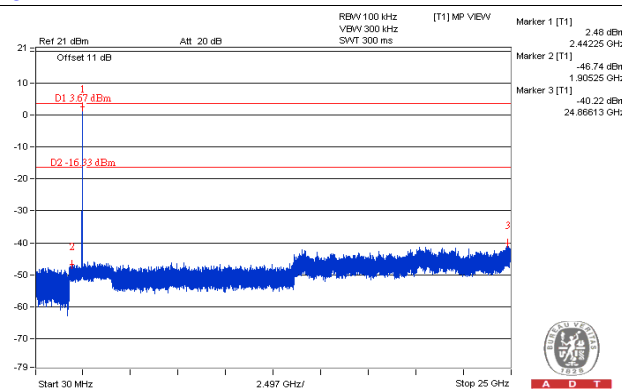


A D T

CH 6

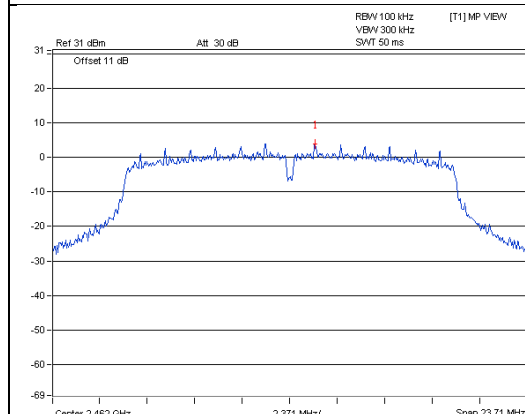


A D T

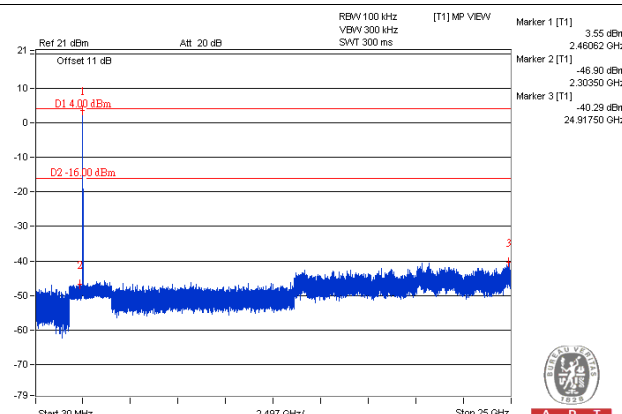


A D T

CH 11

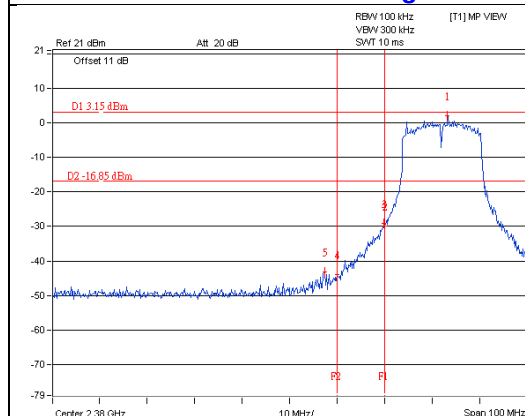


A D T



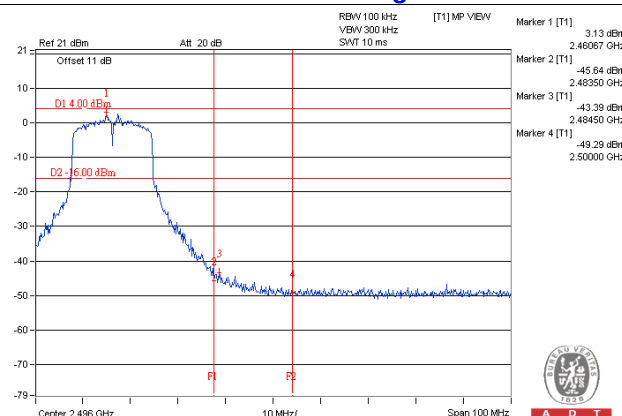
A D T

CH 1 Band edge



A D T

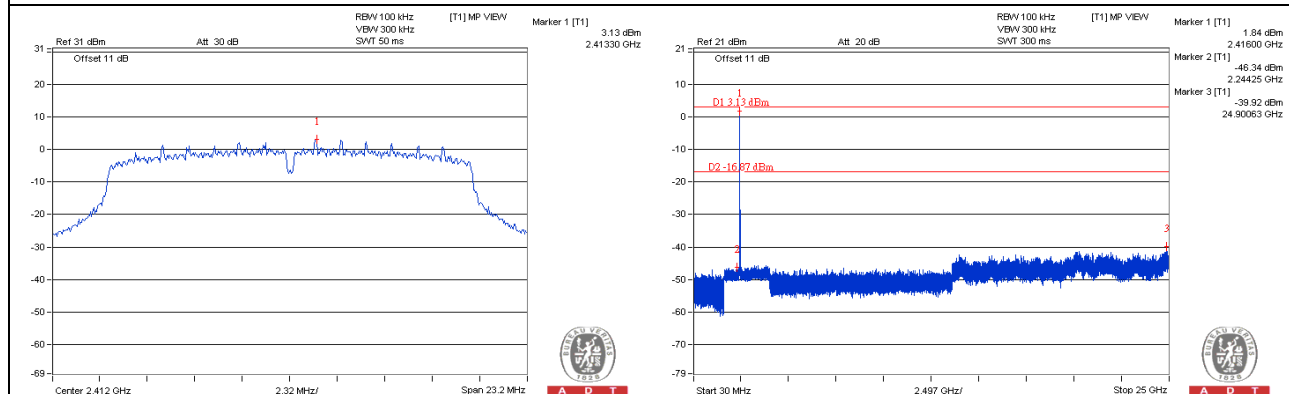
CH 11 Band edge



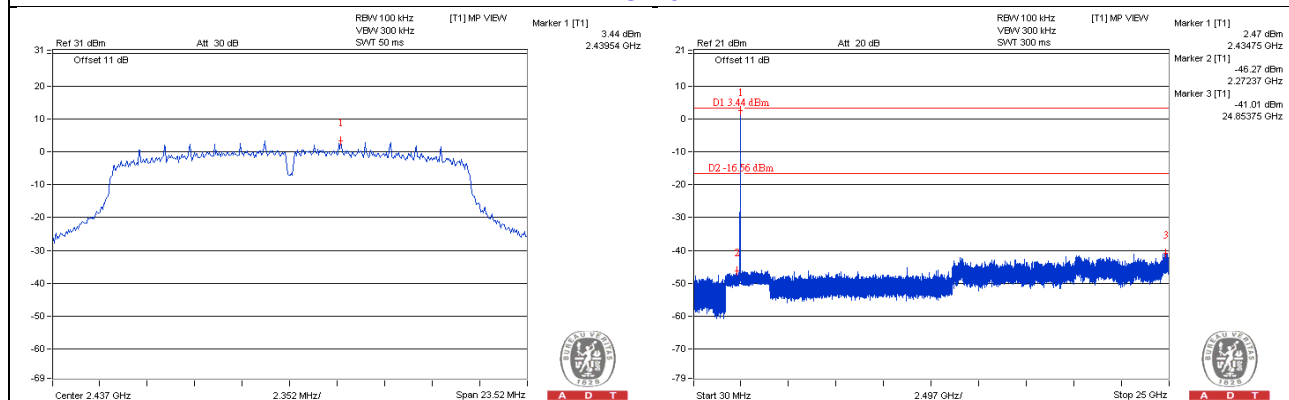
A D T

802.11n (HT20)

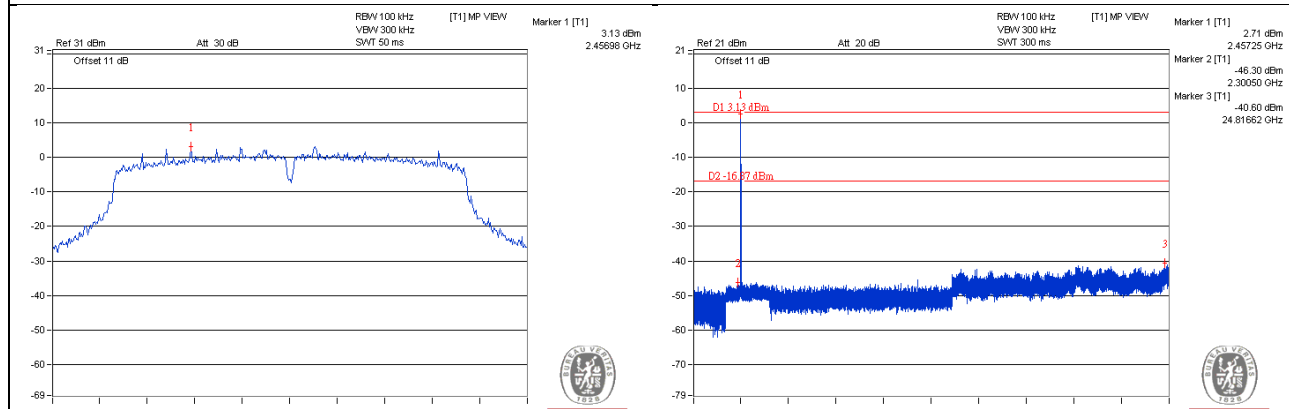
CH 1



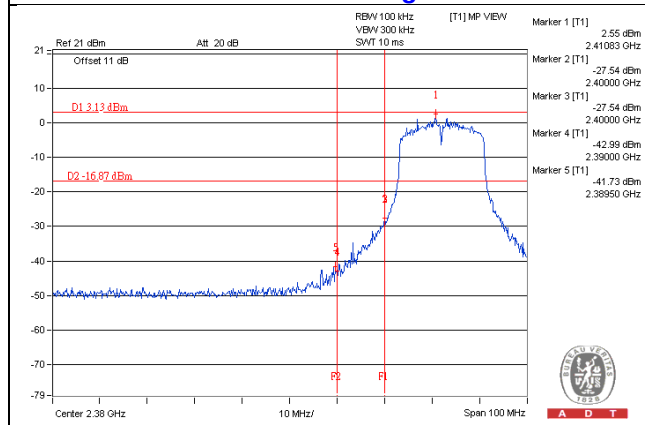
CH 6



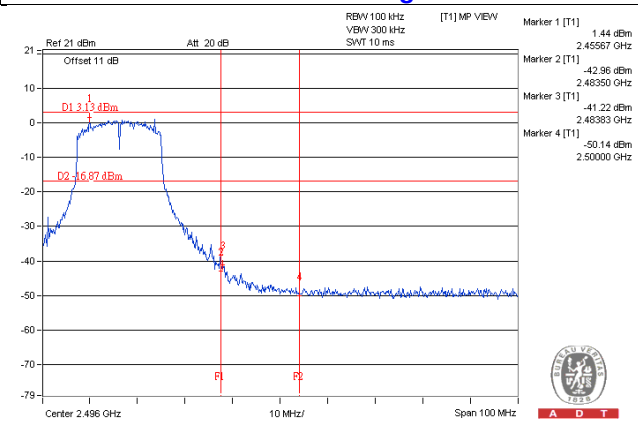
CH 11



CH 1 Band edge



CH 11 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:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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