

FCC Test Report

Report No.: RF141227C27

FCC ID: 2ADAIFFWD

Test Model: FFWD, FFWD Lite (Refer to item 3.1 for more details)

Received Date: Dec. 27, 2014

Test Date: Jan. 21 ~ Feb. 11, 2015

Issued Date: Feb. 13, 2015

Applicant: Raylios Technology Inc.

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Release Control Record

Issue No.	Description	Date Issued
RF141227C27	Original release	Feb. 13, 2015

1 Certificate of Conformity

Product: FFWD Cloud-based Time -lapse Network Camera

Brand: FFWD

Test Model: FFWD, FFWD Lite (Refer to item 3.1 for more details)

Sample Status: Engineering sample

Applicant: Raylios Technology Inc.

Test Date: Jan. 21 ~ Feb. 11, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2009

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 : Maggie Wu **Date:** Feb. 13, 2015
Maggie Wu / Specialist

Approved by : Ken Liu , **Date:** Feb. 13, 2015
Ken Liu / Senior Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -18.04dB at 0.58792MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.0dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is IPEX not a standard connector.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expended Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 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	FFWD Cloud-based Time -lapse Network Camera
Brand	FFWD
Test Model	FFWD, FFWD Lite
Model Difference	Refer to note
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from adapter
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 150.0Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	299.916mW
Antenna Type	PIFA antenna with 2.72dBi gain
Antenna Connector	IPEX
Accessory Device	Adapter
Data Cable Supplied	3.1m shielded USB cable with 2 cores

Note:

1. All models are listed as below.

Brand	Model	Difference
FFWD	FFWD	With infrared board
	FFWD Lite	Without infrared board

2. The EUT provides 1 completed transmitter and 1 receiver.

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

3. The EUT consumes power from the following adapter.

Brand	Ktec
Model	KSAPK0110500200FU
Input Power	100-240Vac, 50/60Hz, 0.5A
Output Power	5.0Vdc, 2.0A

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	
A	√	√	√	√	Model: FFWD
B	-	√	√	-	Model: FFWD Lite

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 EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
2. "-" 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
A	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)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

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

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

Antenna Port Conducted Measurement:

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

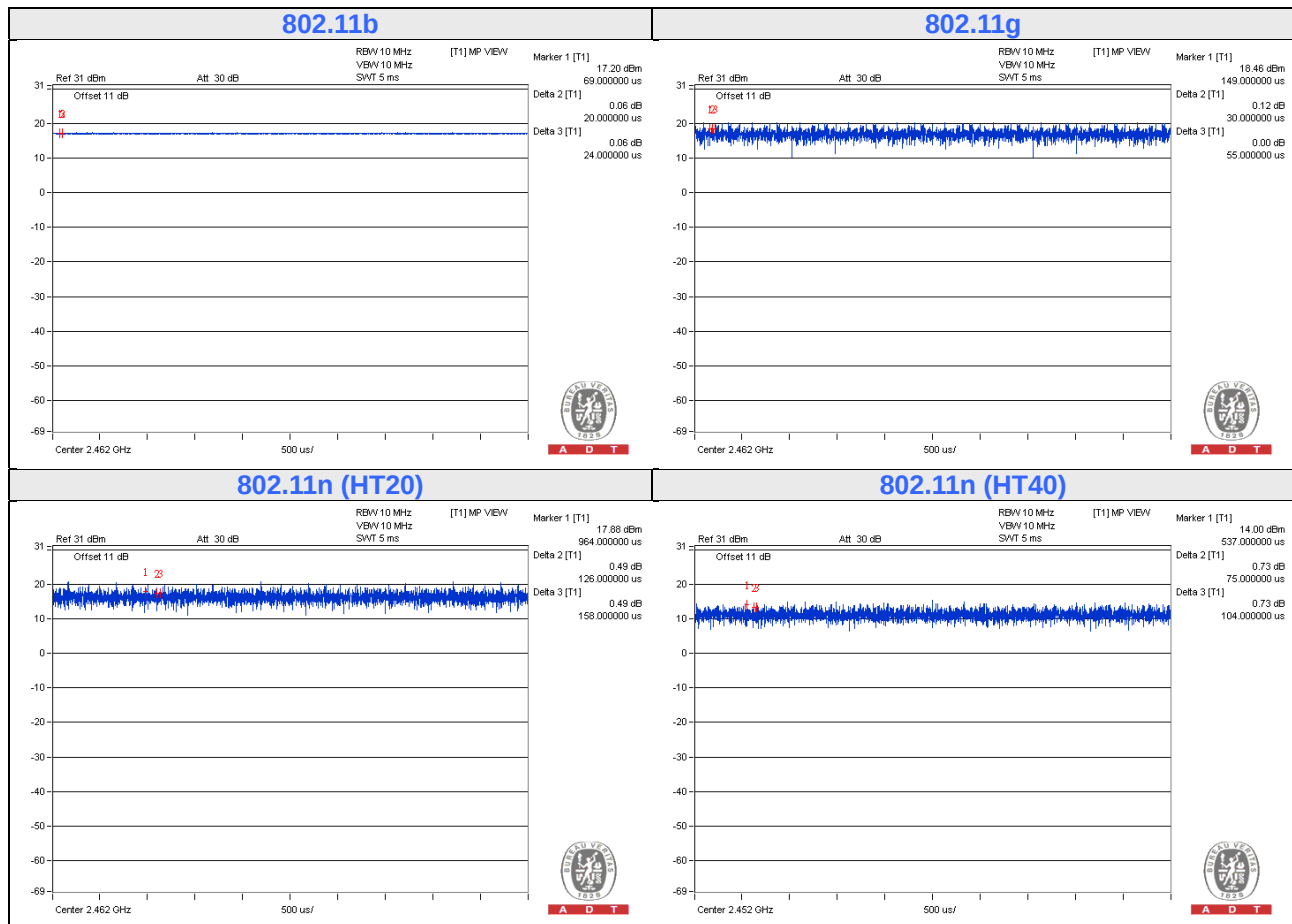
EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	20deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
RE<1G (Mode A)	20deg. C, 70%RH	120Vac, 60Hz	Ted Chang
RE<1G (Mode B)	25deg. C, 60%RH	120Vac, 60Hz	Match Tsui
PLC (Mode A)	25deg. C, 65%RH	120Vac, 60Hz	Ted Chang
PLC (Mode B)	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
APCM	25deg. C, 60%RH	120Vac, 60Hz	Ted Chang

3.3 Duty Cycle of Test Signal

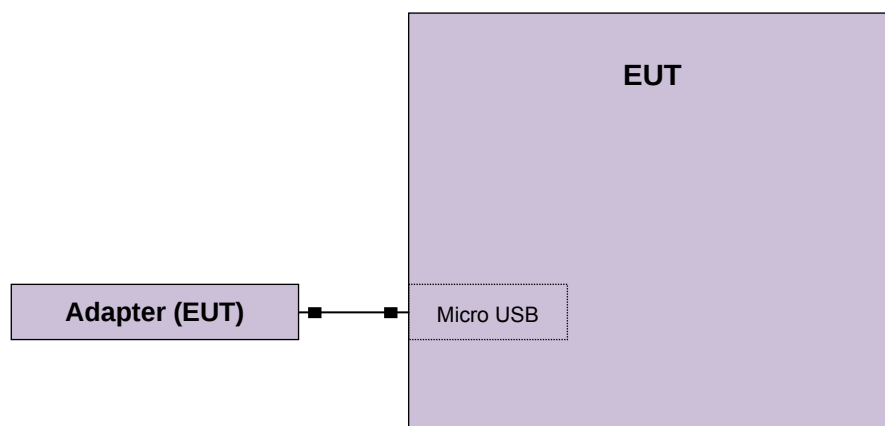
Duty cycle of test signal is 100 %, duty factor is not required.



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 specification of the EUT declared by the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v03r02

ANSI C63.10-2009

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

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 01, 2014	Nov. 30, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Aug. 29, 2014	Aug. 28, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Feb. 25, 2014	Feb. 24, 2015
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-209	Aug. 25, 2014	Aug. 24, 2015
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 17, 2014	Feb. 16, 2015
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2014	Aug. 08, 2015
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	248780/4 309222/4 274092/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable Worken	8D-FB	Cable-CH9-01	Aug. 11, 2014	Aug. 10, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	NA	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015

- 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 9.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 215374.
 5. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters 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:

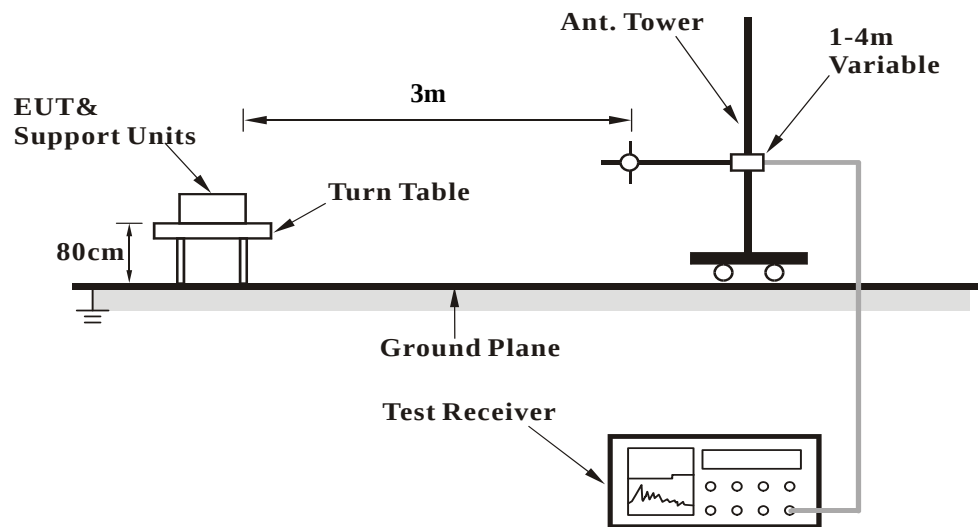
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

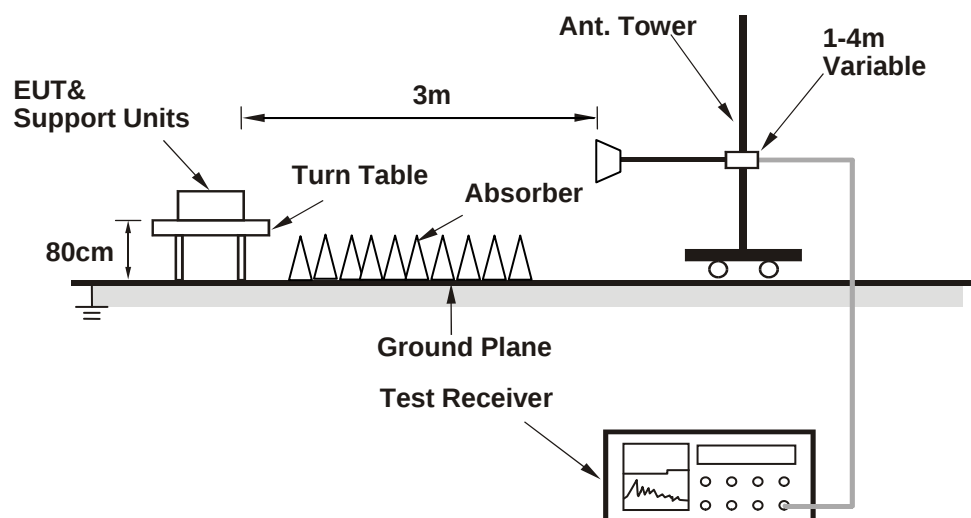
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

Set the 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 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	57.5 PK	74.0	-16.5	1.07 H	85	24.50	33.00
2	2390.00	45.4 AV	54.0	-8.6	1.07 H	85	12.40	33.00
3	*2412.00	103.1 PK			1.28 H	63	70.00	33.10
4	*2412.00	99.2 AV			1.28 H	63	66.10	33.10
5	4824.00	49.8 PK	74.0	-24.2	1.49 H	231	48.00	1.80
6	4824.00	42.9 AV	54.0	-11.1	1.49 H	231	41.10	1.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.5 PK	74.0	-17.5	1.06 V	108	23.50	33.00
2	2390.00	45.1 AV	54.0	-8.9	1.06 V	108	12.10	33.00
3	*2412.00	95.8 PK			1.00 V	253	62.70	33.10
4	*2412.00	92.6 AV			1.00 V	253	59.50	33.10
5	4824.00	54.5 PK	74.0	-19.5	1.08 V	204	52.70	1.80
6	4824.00	50.9 AV	54.0	-3.1	1.08 V	204	49.10	1.80

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
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	104.6 PK			1.03 H	21	71.30	33.30
2	*2437.00	100.8 AV			1.03 H	21	67.50	33.30
3	4874.00	50.3 PK	74.0	-23.7	1.21 H	229	48.40	1.90
4	4874.00	42.4 AV	54.0	-11.6	1.21 H	229	40.50	1.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	96.4 PK			1.00 V	254	63.10	33.30
2	*2437.00	93.3 AV			1.00 V	254	60.00	33.30
3	4874.00	54.3 PK	74.0	-19.7	1.06 V	204	52.40	1.90
4	4874.00	51.0 AV	54.0	-3.0	1.06 V	204	49.10	1.90

Remarks:

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

CHANNEL	TX Channel 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	104.9 PK			1.02 H	35	71.50	33.40
2	*2462.00	101.2 AV			1.02 H	35	67.80	33.40
3	2483.50	57.3 PK	74.0	-16.7	1.21 H	318	23.90	33.40
4	2483.50	45.8 AV	54.0	-8.2	1.21 H	318	12.40	33.40
5	4924.00	49.2 PK	74.0	-24.8	1.27 H	230	47.20	2.00
6	4924.00	41.4 AV	54.0	-12.6	1.27 H	230	39.40	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	*2462.00	95.4 PK			1.00 V	252	62.00	33.40
2	*2462.00	91.9 AV			1.00 V	252	58.50	33.40
3	2483.50	57.3 PK	74.0	-16.7	1.00 V	43	23.90	33.40
4	2483.50	45.7 AV	54.0	-8.3	1.00 V	43	12.30	33.40
5	4924.00	54.5 PK	74.0	-19.5	1.07 V	204	52.50	2.00
6	4924.00	50.7 AV	54.0	-3.3	1.07 V	204	48.70	2.00

Remarks:

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

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
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	68.5 PK	74.0	-5.5	1.06 H	35	35.50	33.00
2	2390.00	52.4 AV	54.0	-1.6	1.06 H	35	19.40	33.00
3	*2412.00	108.1 PK			1.05 H	34	75.00	33.10
4	*2412.00	99.0 AV			1.05 H	34	65.90	33.10
5	4824.00	47.6 PK	74.0	-26.4	1.41 H	215	45.80	1.80
6	4824.00	35.9 AV	54.0	-18.1	1.41 H	215	34.10	1.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.6 PK	74.0	-14.4	1.00 V	254	26.60	33.00
2	2390.00	47.2 AV	54.0	-6.8	1.00 V	254	14.20	33.00
3	*2412.00	98.6 PK			1.00 V	255	65.50	33.10
4	*2412.00	90.6 AV			1.00 V	255	57.50	33.10
5	4824.00	52.1 PK	74.0	-21.9	1.22 V	212	50.30	1.80
6	4824.00	39.3 AV	54.0	-14.7	1.22 V	212	37.50	1.80

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
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	105.8 PK			1.06 H	14	72.50	33.30
2	*2437.00	96.3 AV			1.06 H	14	63.00	33.30
3	4874.00	61.4 PK	74.0	-12.6	1.30 H	206	59.50	1.90
4	4874.00	48.4 AV	54.0	-5.6	1.30 H	206	46.50	1.90
5	7311.00	58.1 PK	74.0	-15.9	1.00 H	187	49.60	8.50
6	7311.00	43.8 AV	54.0	-10.2	1.00 H	187	35.30	8.50
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	106.3 PK			1.45 V	16	73.00	33.30
2	*2437.00	96.9 AV			1.45 V	16	63.60	33.30
3	4874.00	56.4 PK	74.0	-17.6	1.02 V	205	54.50	1.90
4	4874.00	43.1 AV	54.0	-10.9	1.02 V	205	41.20	1.90
5	7311.00	55.1 PK	74.0	-18.9	1.00 V	51	46.60	8.50
6	7311.00	42.0 AV	54.0	-12.0	1.00 V	51	33.50	8.50

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
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	107.5 PK			1.04 H	25	74.10	33.40
2	*2462.00	98.2 AV			1.04 H	25	64.80	33.40
3	2483.50	69.2 PK	74.0	-4.8	1.03 H	11	35.80	33.40
4	2483.50	52.9 AV	54.0	-1.1	1.03 H	11	19.50	33.40
5	4924.00	48.0 PK	74.0	-26.0	1.40 H	230	46.00	2.00
6	4924.00	34.7 AV	54.0	-19.3	1.40 H	230	32.70	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	*2462.00	97.2 PK			1.00 V	250	63.80	33.40
2	*2462.00	88.2 AV			1.00 V	250	54.80	33.40
3	2483.50	62.9 PK	74.0	-11.1	1.00 V	250	29.50	33.40
4	2483.50	47.5 AV	54.0	-6.5	1.00 V	250	14.10	33.40
5	4924.00	51.0 PK	74.0	-23.0	1.06 V	203	49.00	2.00
6	4924.00	38.2 AV	54.0	-15.8	1.06 V	203	36.20	2.00

Remarks:

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

802.11n (20MHz)

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	71.5 PK	74.0	-2.5	1.05 H	37	38.50	33.00
2	2390.00	52.4 AV	54.0	-1.6	1.05 H	37	19.40	33.00
3	*2412.00	106.7 PK			1.05 H	37	73.60	33.10
4	*2412.00	97.4 AV			1.05 H	37	64.30	33.10
5	4824.00	47.0 PK	74.0	-27.0	1.39 H	227	45.20	1.80
6	4824.00	34.8 AV	54.0	-19.2	1.39 H	227	33.00	1.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.2 PK	74.0	-9.8	1.00 V	272	31.20	33.00
2	2390.00	48.2 AV	54.0	-5.8	1.00 V	272	15.20	33.00
3	*2412.00	98.8 PK			1.00 V	256	65.70	33.10
4	*2412.00	89.7 AV			1.00 V	256	56.60	33.10
5	4824.00	53.3 PK	74.0	-20.7	1.08 V	196	51.50	1.80
6	4824.00	38.6 AV	54.0	-15.4	1.08 V	196	36.80	1.80

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
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	103.9 PK			1.05 H	12	70.60	33.30
2	*2437.00	94.5 AV			1.05 H	12	61.20	33.30
3	4874.00	61.5 PK	74.0	-12.5	1.29 H	205	59.60	1.90
4	4874.00	47.4 AV	54.0	-6.6	1.29 H	205	45.50	1.90
5	7311.00	57.0 PK	74.0	-17.0	1.00 H	187	48.50	8.50
6	7311.00	42.7 AV	54.0	-11.3	1.00 H	187	34.20	8.50
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	104.8 PK			1.00 V	15	71.50	33.30
2	*2437.00	95.4 AV			1.00 V	15	62.10	33.30
3	4874.00	55.6 PK	74.0	-18.4	1.03 V	205	53.70	1.90
4	4874.00	41.5 AV	54.0	-12.5	1.03 V	205	39.60	1.90
5	7311.00	54.8 PK	74.0	-19.2	1.05 V	64	46.30	8.50
6	7311.00	42.1 AV	54.0	-11.9	1.05 V	64	33.60	8.50

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
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	106.2 PK			1.06 H	14	72.80	33.40
2	*2462.00	96.6 AV			1.06 H	14	63.20	33.40
3	2483.50	69.9 PK	74.0	-4.1	1.00 H	22	36.50	33.40
4	2483.50	52.7 AV	54.0	-1.3	1.00 H	22	19.30	33.40
5	4924.00	47.0 PK	74.0	-27.0	1.27 H	204	45.00	2.00
6	4924.00	34.6 AV	54.0	-19.4	1.27 H	204	32.60	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	*2462.00	96.1 PK			1.00 V	251	62.70	33.40
2	*2462.00	87.5 AV			1.00 V	251	54.10	33.40
3	2483.50	62.0 PK	74.0	-12.0	1.00 V	247	28.60	33.40
4	2483.50	47.7 AV	54.0	-6.3	1.00 V	247	14.30	33.40
5	4924.00	49.9 PK	74.0	-24.1	1.22 V	185	47.90	2.00
6	4924.00	37.3 AV	54.0	-16.7	1.22 V	185	35.30	2.00

Remarks:

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

802.11n (40MHz)

CHANNEL	TX Channel 3	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	66.5 PK	74.0	-7.5	1.05 H	33	33.50	33.00
2	2390.00	52.9 AV	54.0	-1.1	1.05 H	33	19.90	33.00
3	*2422.00	102.6 PK			1.04 H	36	69.40	33.20
4	*2422.00	93.3 AV			1.04 H	36	60.10	33.20
5	4844.00	46.8 PK	74.0	-27.2	1.10 H	210	45.00	1.80
6	4844.00	34.1 AV	54.0	-19.9	1.10 H	210	32.30	1.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.5 PK	74.0	-15.5	1.00 V	252	25.50	33.00
2	2390.00	47.2 AV	54.0	-6.8	1.00 V	252	14.20	33.00
3	*2422.00	93.7 PK			1.00 V	254	60.50	33.20
4	*2422.00	84.3 AV			1.00 V	254	51.10	33.20
5	4844.00	48.4 PK	74.0	-25.6	1.21 V	167	46.60	1.80
6	4844.00	35.1 AV	54.0	-18.9	1.21 V	167	33.30	1.80

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
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	63.3 PK	74.0	-10.7	1.05 H	15	30.30	33.00
2	2390.00	48.4 AV	54.0	-5.6	1.05 H	15	15.40	33.00
3	*2437.00	101.2 PK			1.05 H	15	67.90	33.30
4	*2437.00	91.8 AV			1.05 H	15	58.50	33.30
5	2483.50	66.6 PK	74.0	-7.4	1.05 H	15	33.20	33.40
6	2483.50	51.5 AV	54.0	-2.5	1.05 H	15	18.10	33.40
7	4874.00	56.8 PK	74.0	-17.2	1.00 H	205	54.90	1.90
8	4874.00	44.3 AV	54.0	-9.7	1.00 H	205	42.40	1.90
9	7311.00	54.4 PK	74.0	-19.6	1.00 H	251	45.90	8.50
10	7311.00	42.1 AV	54.0	-11.9	1.00 H	251	33.60	8.50

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	63.6 PK	74.0	-10.4	1.00 V	15	30.60	33.00
2	2390.00	50.1 AV	54.0	-3.9	1.00 V	15	17.10	33.00
3	*2437.00	102.3 PK			1.00 V	15	69.00	33.30
4	*2437.00	93.2 AV			1.00 V	15	59.90	33.30
5	2483.50	65.9 PK	74.0	-8.1	1.00 V	15	32.50	33.40
6	2483.50	50.3 AV	54.0	-3.7	1.00 V	15	16.90	33.40
7	4874.00	52.2 PK	74.0	-21.8	1.03 V	205	50.30	1.90
8	4874.00	40.9 AV	54.0	-13.1	1.03 V	205	39.00	1.90
9	7311.00	54.1 PK	74.0	-19.9	1.02 V	51	45.60	8.50
10	7311.00	42.0 AV	54.0	-12.0	1.02 V	51	33.50	8.50

Remarks:

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

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
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	*2452.00	102.1 PK			1.04 H	17	68.80	33.30
2	*2452.00	92.6 AV			1.04 H	17	59.30	33.30
3	2483.50	67.5 PK	74.0	-6.5	1.03 H	13	34.10	33.40
4	2483.50	53.0 AV	54.0	-1.0	1.03 H	13	19.60	33.40
5	4904.00	47.0 PK	74.0	-27.0	1.31 H	186	45.00	2.00
6	4904.00	34.4 AV	54.0	-19.6	1.31 H	186	32.40	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	*2452.00	92.4 PK			1.00 V	255	59.10	33.30
2	*2452.00	83.5 AV			1.00 V	255	50.20	33.30
3	2483.50	59.8 PK	74.0	-14.2	1.00 V	250	26.40	33.40
4	2483.50	47.5 AV	54.0	-6.5	1.00 V	250	14.10	33.40
5	4904.00	47.7 PK	74.0	-26.3	1.41 V	218	45.70	2.00
6	4904.00	35.6 AV	54.0	-18.4	1.41 V	218	33.60	2.00

Remarks:

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

BELOW 1GHz WORST-CASE DATA: 802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	30.00	22.5 QP	40.0	-17.5	1.26 H	233	38.50	-16.00
2	192.96	26.5 QP	43.5	-17.0	1.51 H	296	42.90	-16.40
3	359.80	30.0 QP	46.0	-16.0	1.01 H	37	41.40	-11.40
4	677.96	33.3 QP	46.0	-12.7	1.26 H	208	38.40	-5.10
5	804.06	32.2 QP	46.0	-13.8	1.01 H	5	34.80	-2.60
6	924.34	34.5 QP	46.0	-11.5	1.51 H	202	35.00	-0.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	37.8 QP	40.0	-2.2	1.00 V	118	53.80	-16.00
2	359.80	28.1 QP	46.0	-17.9	1.49 V	142	39.50	-11.40
3	439.34	33.8 QP	46.0	-12.2	1.24 V	205	43.30	-9.50
4	580.96	30.7 QP	46.0	-15.3	1.00 V	216	37.60	-6.90
5	676.02	30.4 QP	46.0	-15.6	1.49 V	215	35.60	-5.20
6	837.04	40.1 QP	46.0	-5.9	1.00 V	262	42.40	-2.30

Remarks:

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

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	580.96	34.4 QP	46.0	-11.6	1.24 H	150	41.30	-6.90
2	780.78	35.3 QP	46.0	-10.7	1.00 H	199	38.20	-2.90
3	802.12	36.2 QP	46.0	-9.8	1.24 H	14	38.90	-2.70
4	901.06	35.7 QP	46.0	-10.3	1.24 H	138	37.00	-1.30
5	924.34	36.0 QP	46.0	-10.0	1.24 H	275	36.50	-0.50
6	949.56	36.8 QP	46.0	-9.2	1.24 H	144	37.10	-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	780.78	35.8 QP	46.0	-10.2	1.24 V	10	38.80	-3.00
2	802.12	37.8 QP	46.0	-8.2	1.00 V	205	40.60	-2.80
3	829.28	34.3 QP	46.0	-11.7	1.24 V	21	36.70	-2.40
4	852.56	34.0 QP	46.0	-12.0	1.49 V	17	36.10	-2.10
5	924.34	35.1 QP	46.0	-10.9	1.00 V	40	35.80	-0.70
6	949.56	37.6 QP	46.0	-8.4	1.00 V	31	37.90	-0.30

Remarks:

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Notes: 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	100612	Sep. 30, 2014	Sep. 29, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 13, 2014	Feb. 12, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Notes: 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

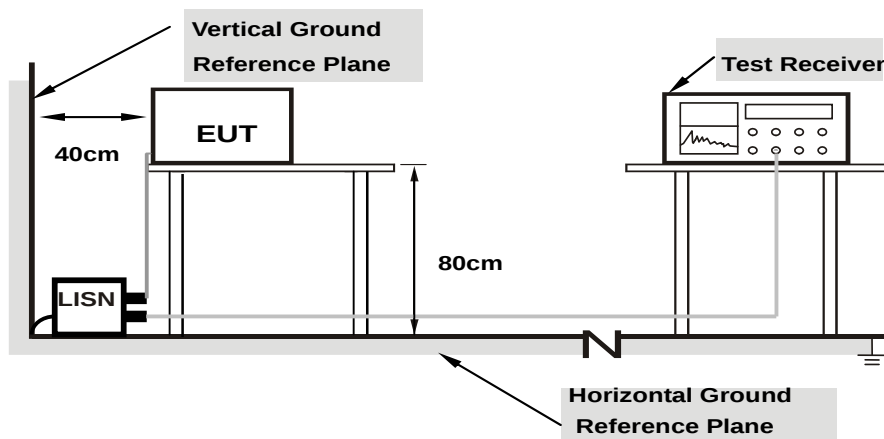
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

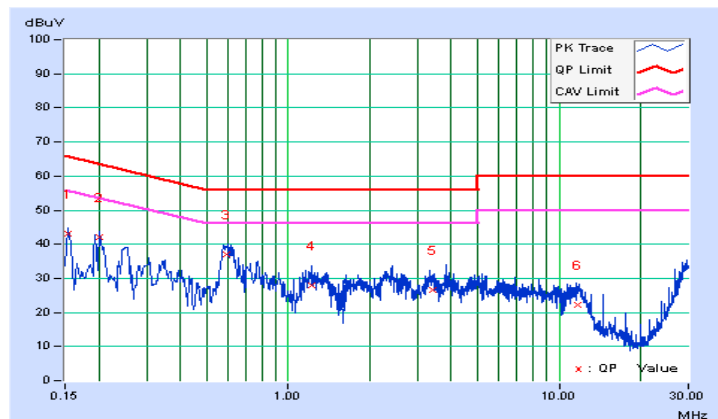
4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.11	42.95	32.12	43.06	32.23	65.79	55.79	-22.73	-23.56
2	0.19978	0.09	42.06	31.49	42.15	31.58	63.62	53.62	-21.47	-22.04
3	0.58792	0.14	36.93	27.82	37.07	27.96	56.00	46.00	-18.93	-18.04
4	1.21454	0.22	27.74	17.05	27.96	17.27	56.00	46.00	-28.04	-28.73
5	3.40284	0.26	26.22	16.81	26.48	17.07	56.00	46.00	-29.52	-28.93
6	11.65322	0.64	21.42	10.68	22.06	11.32	60.00	50.00	-37.94	-38.68

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

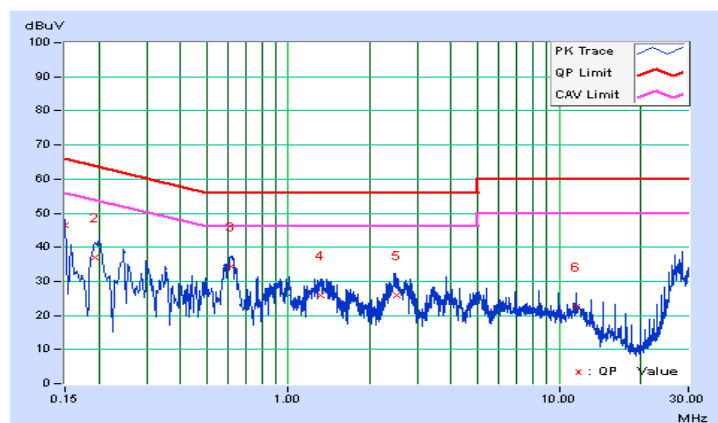


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	46.44	34.23	46.49	34.28	66.00	56.00	-19.51	-21.72
2	0.19255	0.08	37.10	23.36	37.18	23.44	63.93	53.93	-26.74	-30.48
3	0.61381	0.19	34.02	22.52	34.21	22.71	56.00	46.00	-21.79	-23.29
4	1.31099	0.22	25.68	14.27	25.90	14.49	56.00	46.00	-30.10	-31.51
5	2.51330	0.23	25.63	14.10	25.86	14.33	56.00	46.00	-30.14	-31.67
6	11.51637	0.61	21.94	15.83	22.55	16.44	60.00	50.00	-37.45	-33.56

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

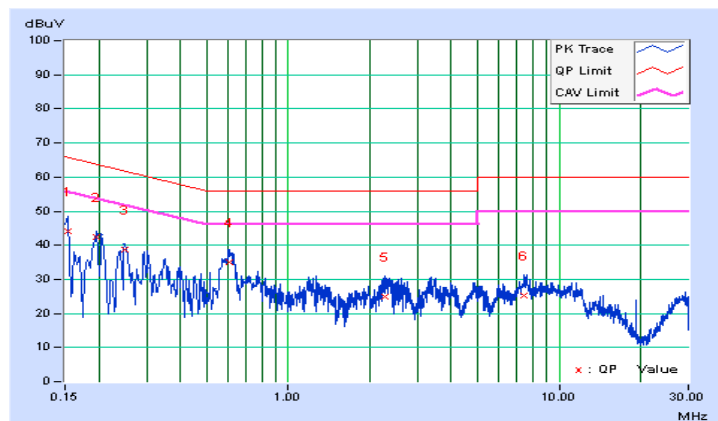


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.11	43.91	31.58	44.02	31.69	65.79	55.79	-21.77	-24.10
2	0.19692	0.09	42.34	30.45	42.43	30.54	63.74	53.74	-21.31	-23.20
3	0.24796	0.09	38.61	26.91	38.70	27.00	61.83	51.83	-23.12	-24.82
4	0.60356	0.14	35.01	25.31	35.15	25.45	56.00	46.00	-20.85	-20.55
5	2.26140	0.25	24.72	14.96	24.97	15.21	56.00	46.00	-31.03	-30.79
6	7.41478	0.43	24.93	18.15	25.36	18.58	60.00	50.00	-34.64	-31.42

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

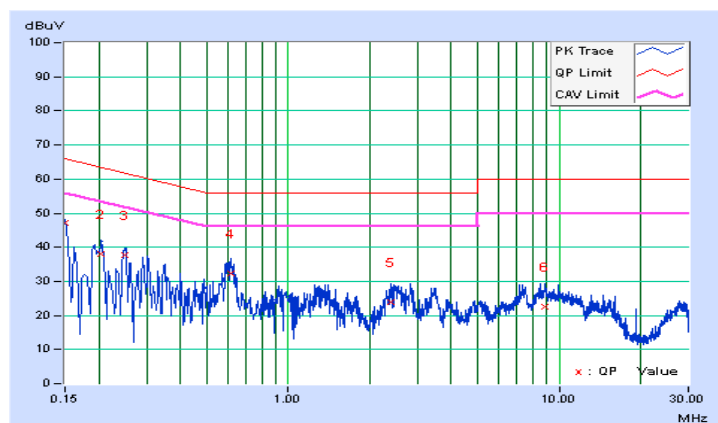


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	47.24	34.73	47.29	34.78	66.00	56.00	-18.71	-21.22
2	0.20474	0.09	38.09	24.59	38.18	24.68	63.42	53.42	-25.23	-28.73
3	0.25059	0.11	37.44	25.01	37.55	25.12	61.74	51.74	-24.19	-26.62
4	0.61138	0.19	32.16	21.82	32.35	22.01	56.00	46.00	-23.65	-23.99
5	2.39825	0.23	23.58	12.06	23.81	12.29	56.00	46.00	-32.19	-33.71
6	8.83020	0.49	22.17	14.91	22.66	15.40	60.00	50.00	-37.34	-34.60

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

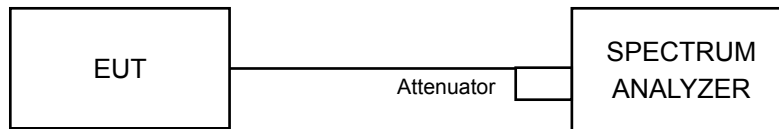


4.3 6dB Bandwidth Measurement

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	10.13	0.5	Pass
6	2437	10.12	0.5	Pass
11	2462	10.11	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.64	0.5	Pass
6	2437	16.64	0.5	Pass
11	2462	16.62	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.78	0.5	Pass
6	2437	17.78	0.5	Pass
11	2462	17.72	0.5	Pass

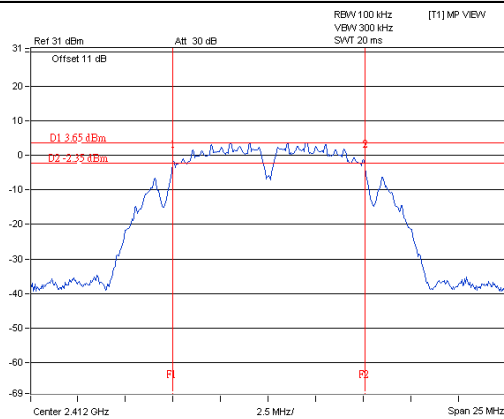
802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	36.63	0.5	Pass
6	2437	36.60	0.5	Pass
9	2452	36.61	0.5	Pass

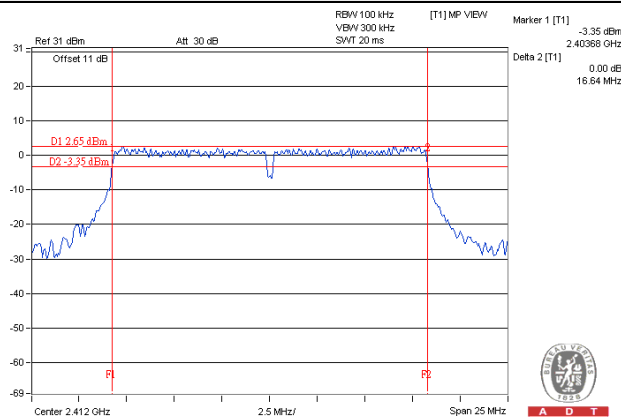
Spectrum Plot of Worst Value

802.11b

802.11g



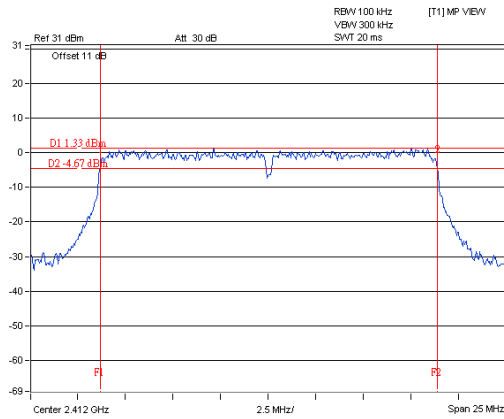
A D T



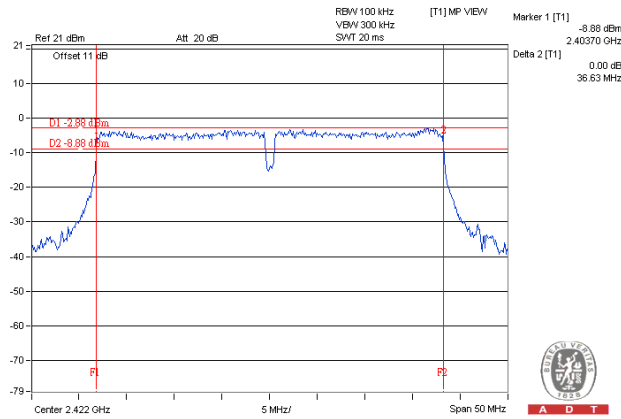
A D T

802.11n (HT20)

802.11n (HT40)



A D T



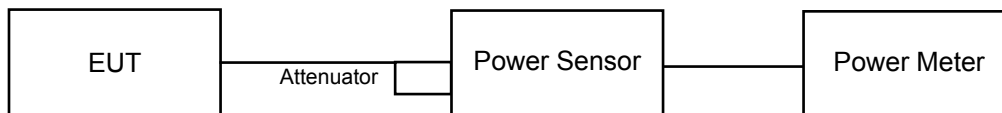
A D T

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)

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	63.680	18.04	30	Pass
6	2437	72.277	18.59	30	Pass
11	2462	73.621	18.67	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	238.232	23.77	30	Pass
6	2437	299.916	24.77	30	Pass
11	2462	200.909	23.03	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	190.108	22.79	30	Pass
6	2437	260.615	24.16	30	Pass
11	2462	187.499	22.73	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
3	2422	121.339	20.84	30	Pass
6	2437	231.739	23.65	30	Pass
9	2452	129.420	21.12	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	29.107	14.64
6	2437	33.420	15.24
11	2462	33.806	15.29

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	52.845	17.23
6	2437	63.680	18.04
11	2462	41.783	16.21

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	39.174	15.93
6	2437	56.364	17.51
11	2462	36.475	15.62

802.11n (HT40)

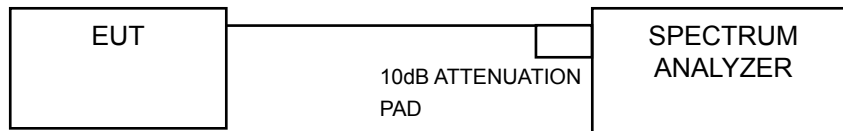
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	29.992	14.77
6	2437	52.119	17.17
9	2452	24.155	13.83

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	-14.60	8	Pass
6	2437	-14.13	8	Pass
11	2462	-13.99	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-11.58	8	Pass
6	2437	-10.27	8	Pass
11	2462	-12.73	8	Pass

802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-12.00	8	Pass
6	2437	-11.38	8	Pass
11	2462	-12.99	8	Pass

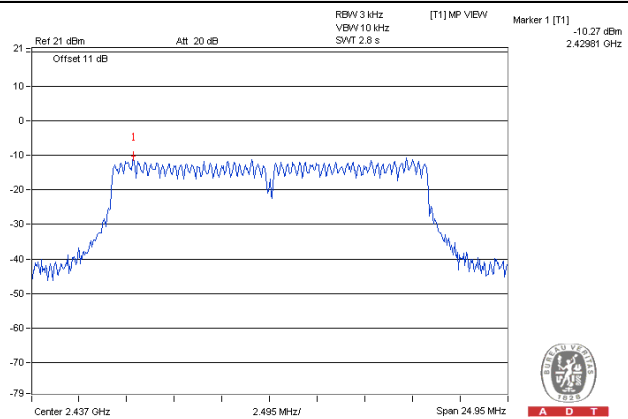
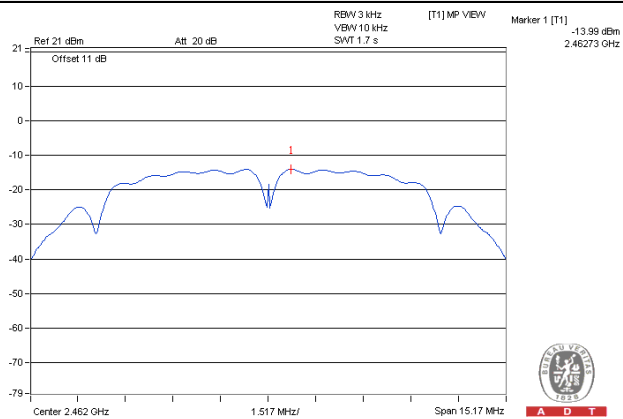
802.11n (HT40)

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
3	2422	-15.43	8	Pass
6	2437	-14.07	8	Pass
9	2452	-16.09	8	Pass

Spectrum Plot of Worst Value

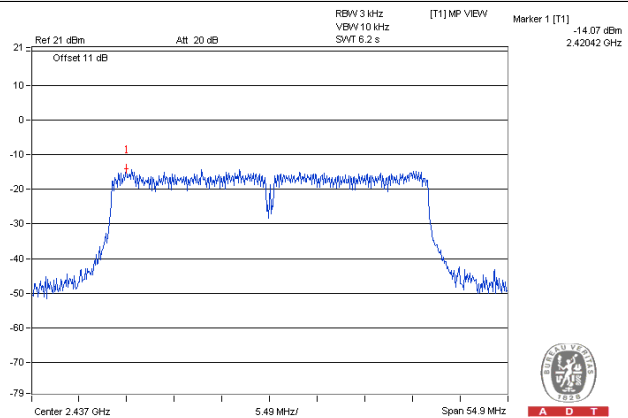
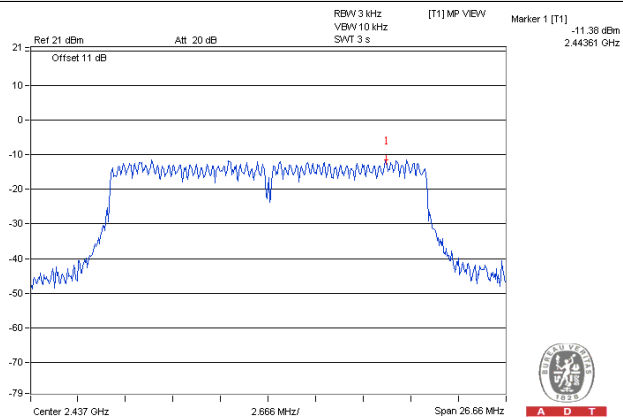
802.11b

802.11g



802.11n (HT20)

802.11n (HT40)

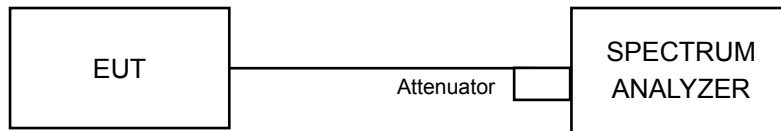


4.6 Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

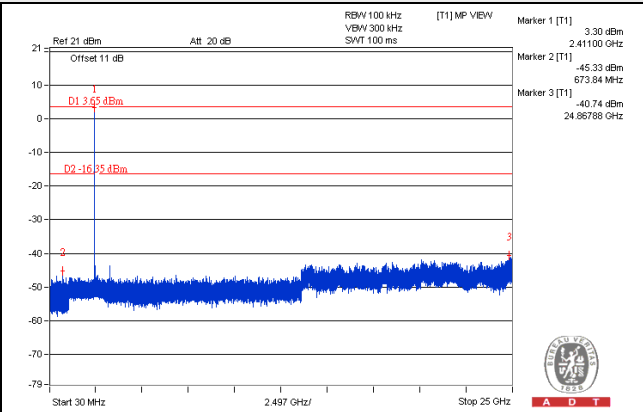
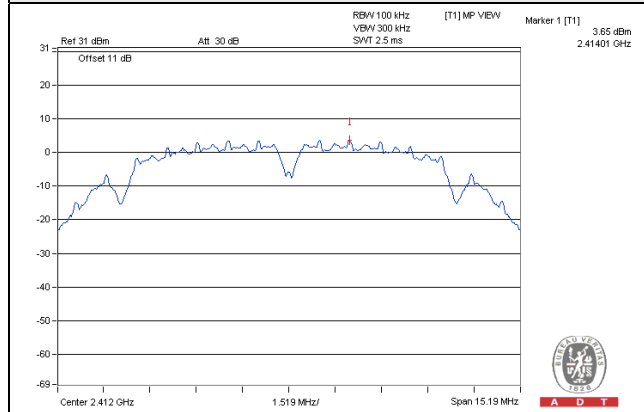
4.6.6 EUT Operating Condition

Same as Item 4.3.6

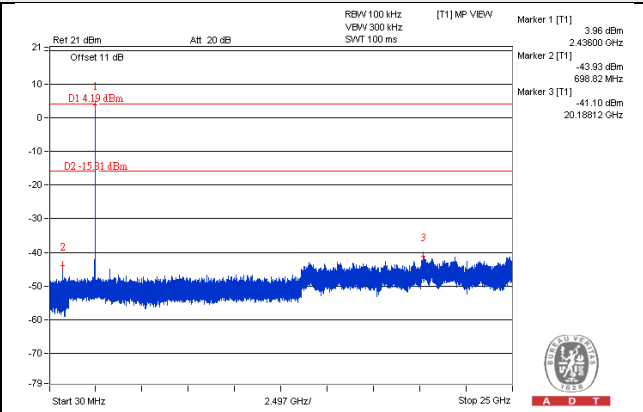
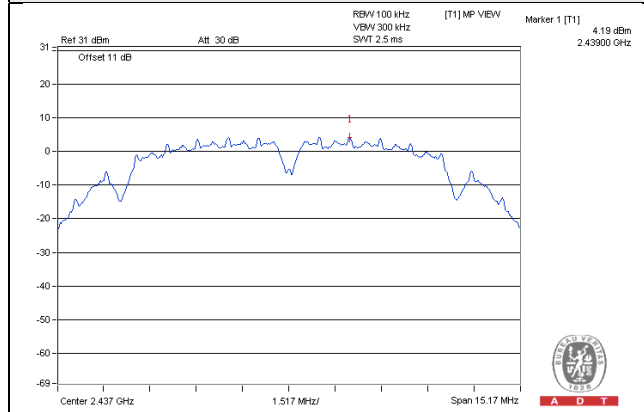
4.6.7 Test Results

802.11b

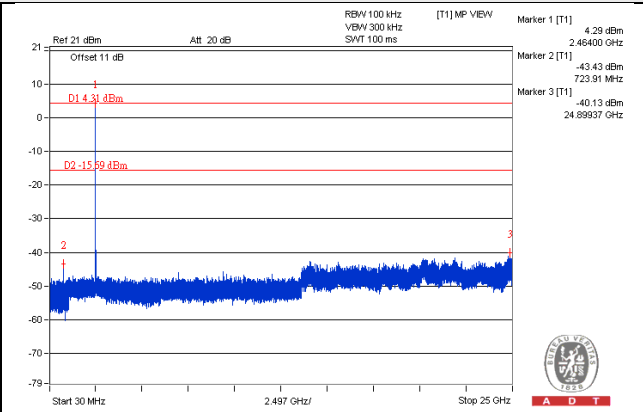
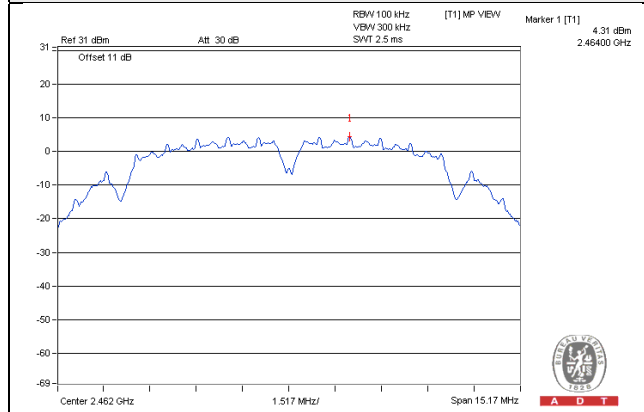
CH 1



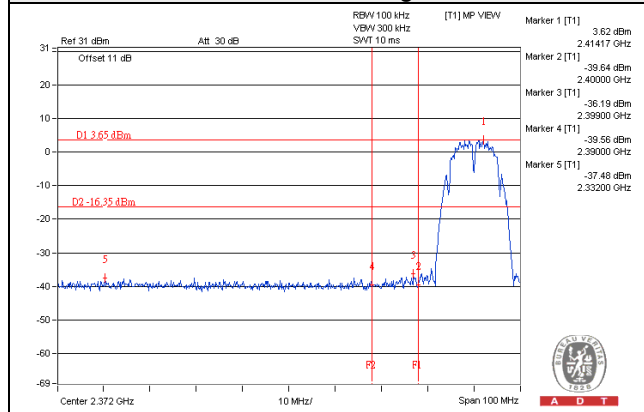
CH 6



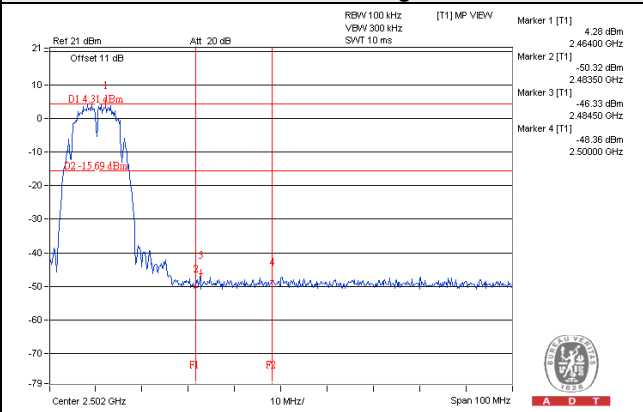
CH 11



CH 1 Band edge

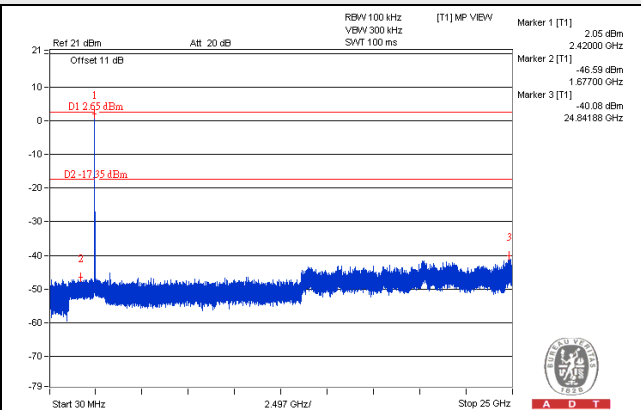
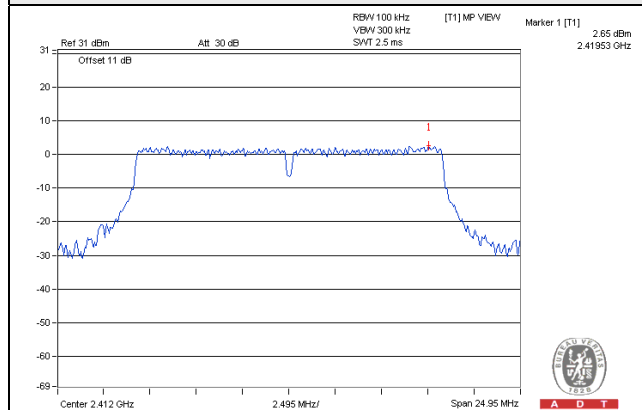


CH 11 Band edge

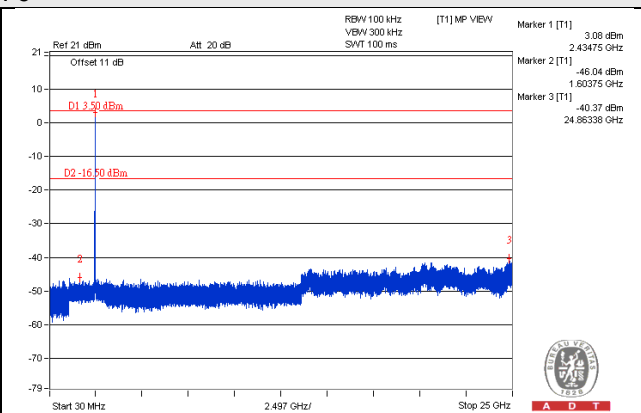
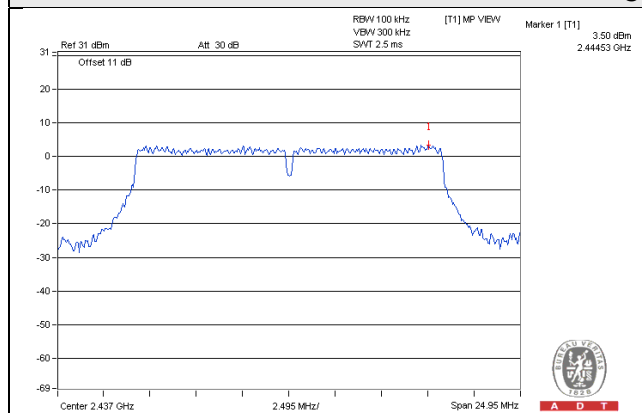


802.11g

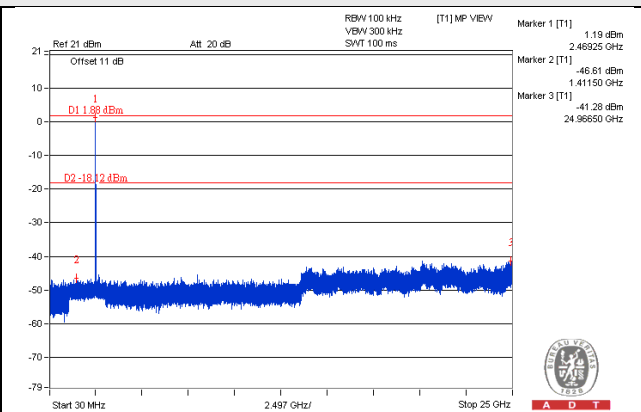
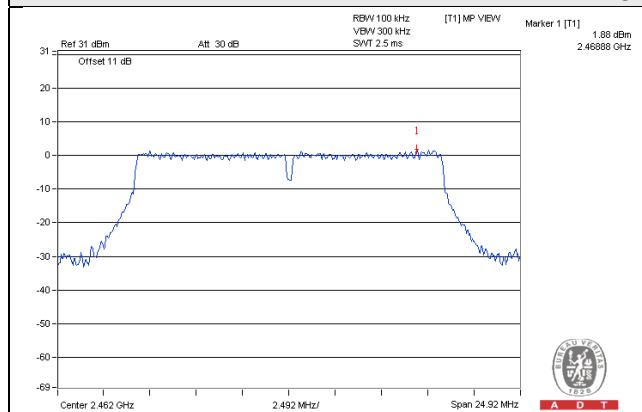
CH 1



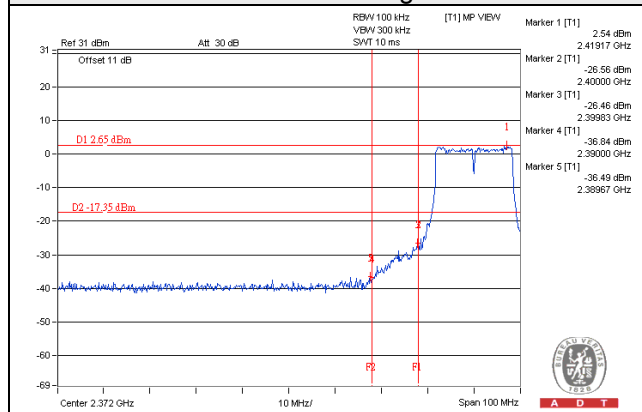
CH 6



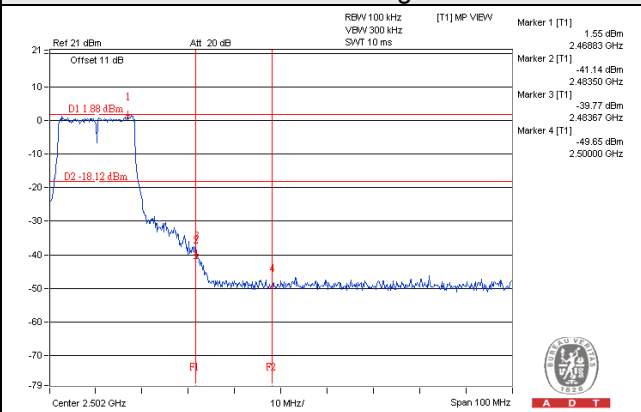
CH 11



CH 1 Band edge

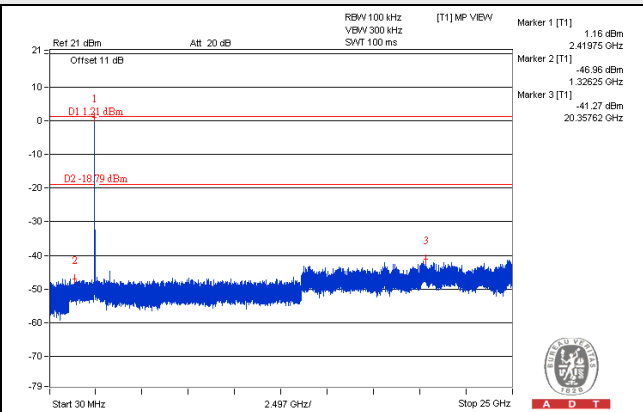
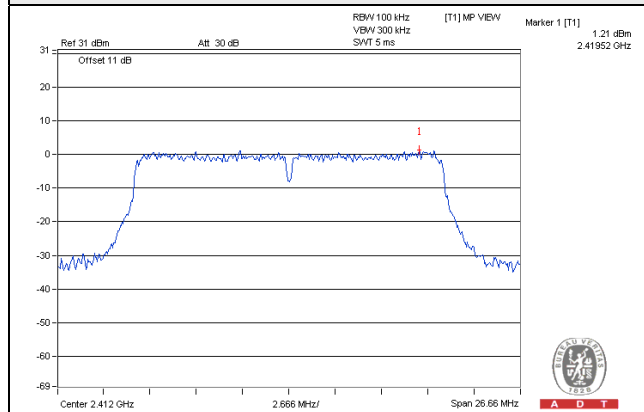


CH 11 Band edge

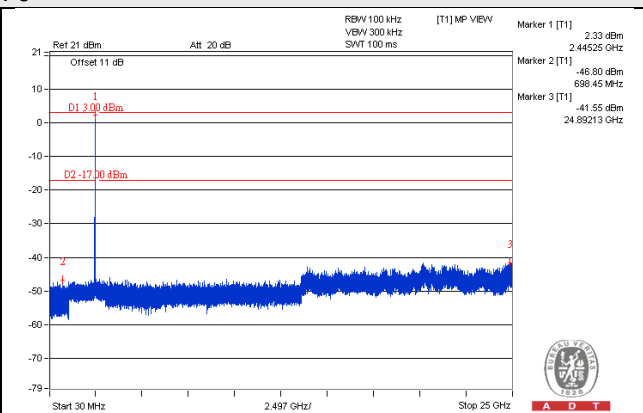
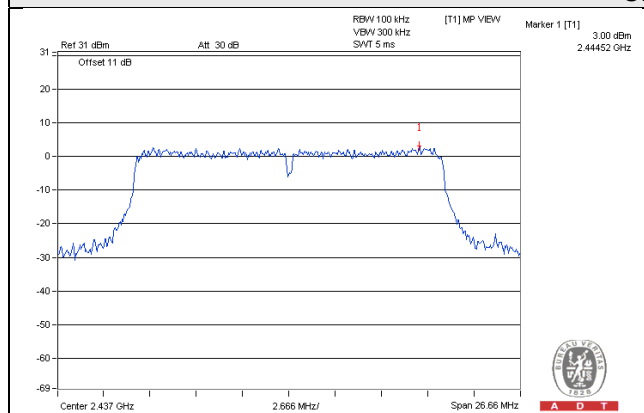


802.11n (HT20)

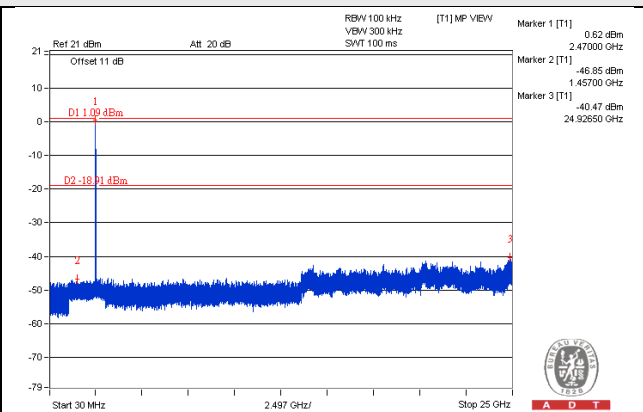
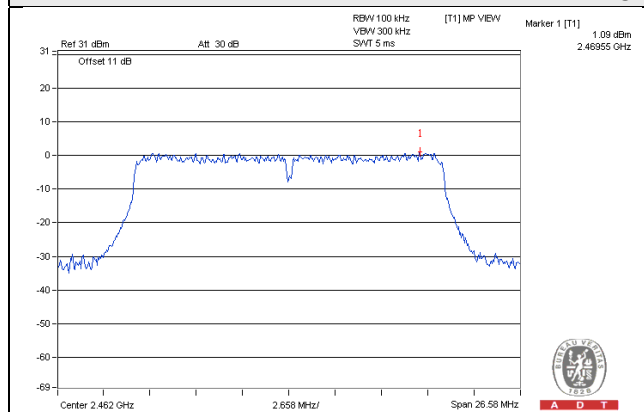
CH 1



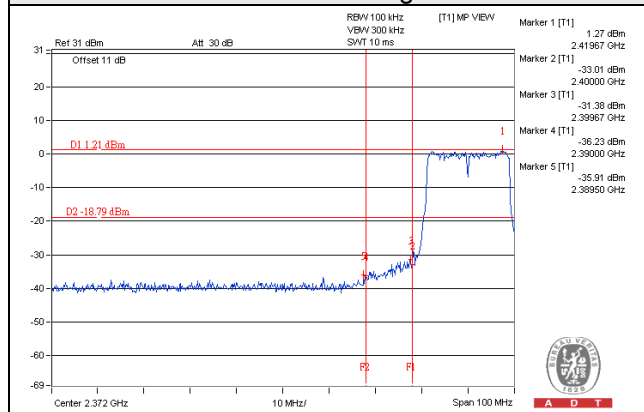
CH 6



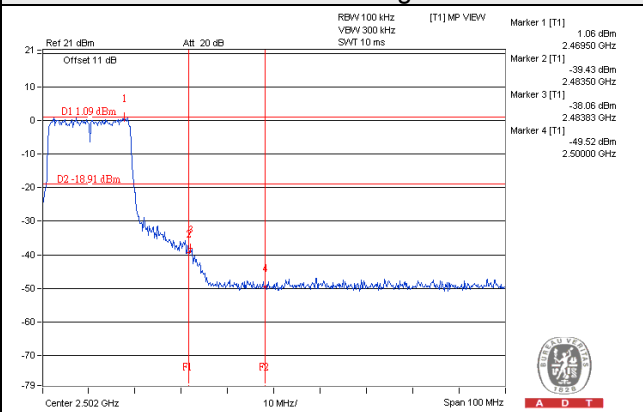
CH 11



CH 1 Band edge

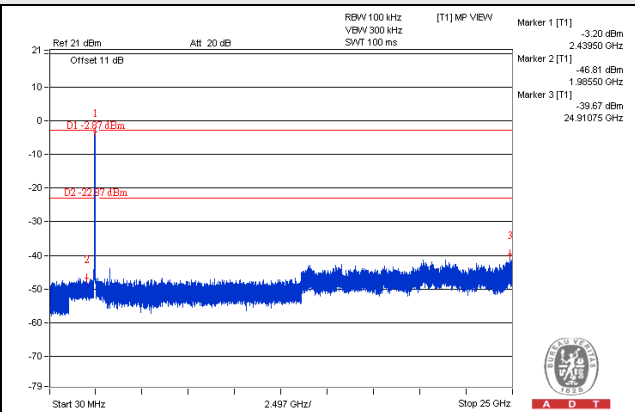
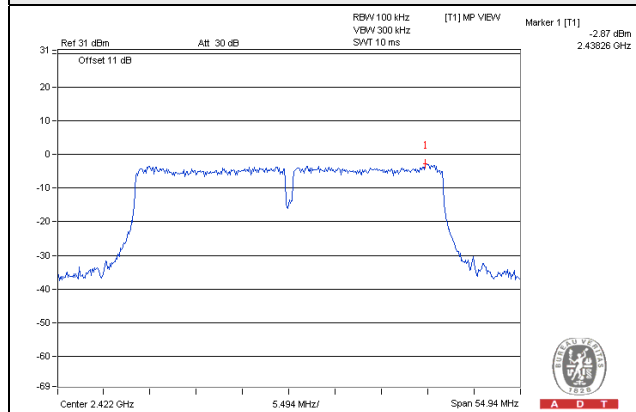


CH 11 Band edge

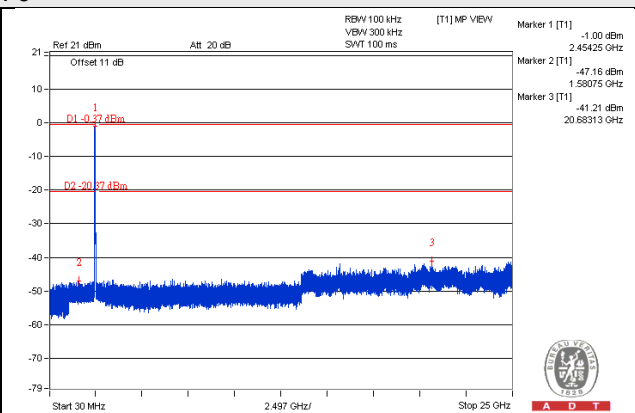
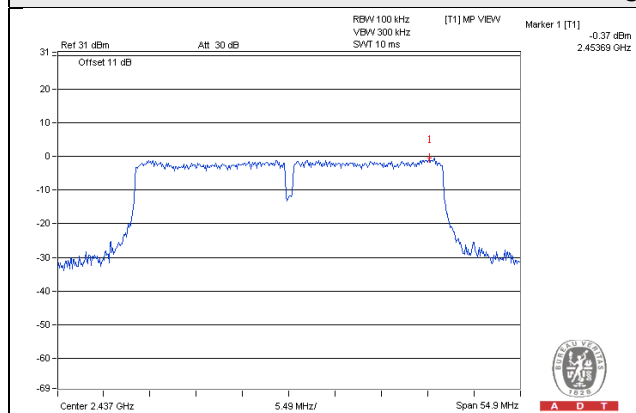


802.11n (HT40)

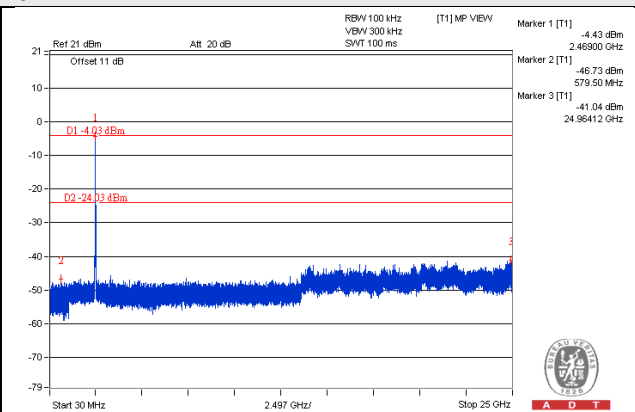
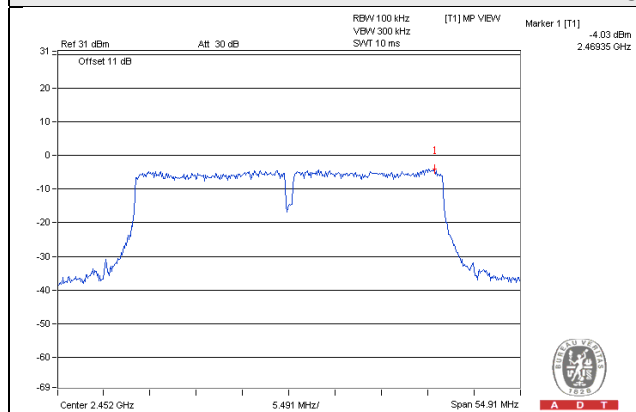
CH 3



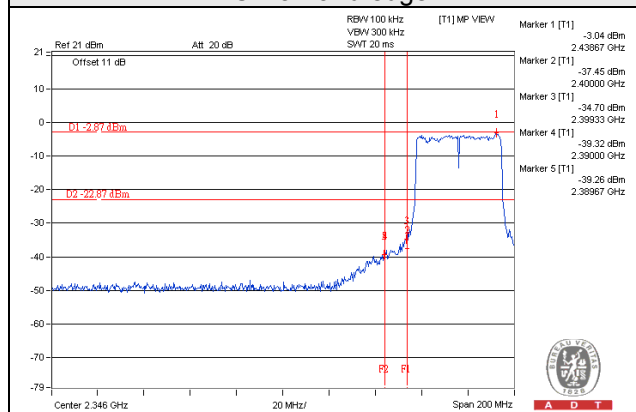
CH 6



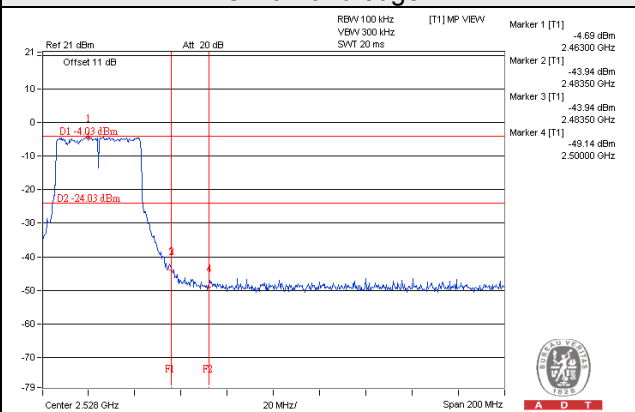
CH 9



CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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

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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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