

FCC Test Report (WLAN)

Report No.: RF160819E01C

FCC ID: COF-WMBNBM26A

Test Model: WM-BN-BM-26_A

Series Model: WM-BN-BM-26_A_FF2

Received Date: Oct. 26, 2017

Test Date: Nov. 06 to 08, 2017

Issued Date: Nov. 14, 2017

Applicant: UNIVERSAL GLOBAL SCIENTIFIC INDUSTRIAL CO., LTD.

Address: 141, Lane 351, Sec. 1, Taiping Road., Tsautuen, Nantou 54261, Taiwan

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

**FCC Registration /
Designation Number:** 723255 / TW2022



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	3
1 Certificate of Conformity.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information.....	6
3.1 General Description of EUT (WLAN)	6
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.3 Duty Cycle of Test Signal	11
3.4 Description of Support Units	12
3.4.1 Configuration of System under Test	13
3.5 General Description of Applied Standards	14
4 Test Types and Results	15
4.1 Radiated Emission and Bandedge Measurement.....	15
4.1.1 Limits of Radiated Emission and Bandedge Measurement	15
4.1.2 Test Instruments	16
4.1.3 Test Procedures.....	17
4.1.4 Deviation from Test Standard	17
4.1.5 Test Setup.....	18
4.1.6 EUT Operating Conditions.....	19
4.1.7 Test Results	20
4.2 Conducted Output Power Measurement.....	30
4.2.1 Limits of Conducted Output Power Measurement	30
4.2.2 Test Setup.....	30
4.2.3 Test Instruments	30
4.2.4 Test Procedures.....	30
4.2.5 Deviation from Test Standard	30
4.2.6 EUT Operating Conditions.....	30
4.2.7 Test Results	31
4.3 Pictures of Test Arrangements	33
Appendix – Information on the Testing Laboratories	34

Release Control Record

Issue No.	Description	Date Issued
RF160819E01C	Original release.	Nov. 14, 2017

1 Certificate of Conformity

Product: 802.11b/g/n + BT Wireless LAN Module

Brand: USI

Test Model: WM-BN-BM-26_A

Series Model: WM-BN-BM-26_A_FF2

Sample Status: ENGINEERING SAMPLE

Applicant: UNIVERSAL GLOBAL SCIENTIFIC INDUSTRIAL CO., LTD.

Test Date: Nov. 06 to 08, 2017

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: Nov. 14, 2017

Mary Ko / Specialist

Approved by :



Date: Nov. 14, 2017

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2385.00MHz.
15.247(b)	Conducted Power	PASS	Meet the requirement of limit.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.32 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.14 dB
	6GHz ~ 18GHz	5.04 dB
	18GHz ~ 40GHz	5.25 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	802.11b/g/n + BT Wireless LAN Module
Brand	USI
Test Model	WM-BN-BM-26_A
Series Model	WM-BN-BM-26_A_FF2
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	3.6Vdc from host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 72Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	271.644mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC Class II change. The difference compared with the Report No.: RF160819E01A design is as the following:

- ◆ Added the one new model name to changed the component for improve radio throughput as following table:

Original		
Brand	Model	Difference
USI	WM-BN-BM-26_A	-
Newly		
Brand	Model	Difference
USI	WM-BN-BM-26_A_FF2	1. R30 capacitor 1.8pF change to 2.2pF belongs to part of antenna matching circuit. 2. C46 inductor remove

2. According to above conditions only Output Power and Radiated Emissions test items need to be performed. And all data was verified to meet the requirements.

3. There are WLAN, BT technology used for the EUT.

4. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Net Gain(dBi)	Frequency range (GHz to GHz)	Antenna Type	Connector Type
YAGEO	ANT3216LL11R2400A	3.68	2.4~2.4835	Chip	NA

5. WLAN and BT technology cannot transmit at same time.

6. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
802.11n (HT20)	MCS 0~7	1TX	1RX

7. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

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	APCM	
-	√	√	√	-

Where **RE≥1G**: Radiated Emission above 1GHz & Bandedge Measurement **RE<1G**: Radiated Emission below 1GHz

APCM: Antenna Port Conducted Measurement

NOTE:

1. In the original report, the EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.

Radiated Emission Test (Above 1GHz):

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	6,	OFDM	BPSK	6.5

Antenna Port Conducted Measurement:

- ☒ 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.

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

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	22deg. C, 64%RH	120Vac, 60Hz	Jyunchun Lin
RE<1G	25deg. C, 67%RH	120Vac, 60Hz	Weiwei Lo
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

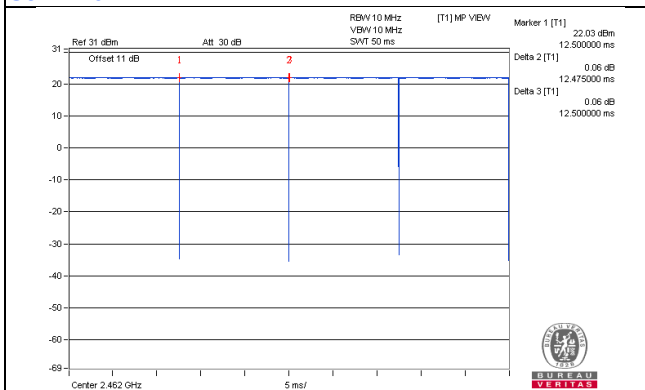
If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

802.11b: Duty cycle = $12.475/12.5 = 0.998$

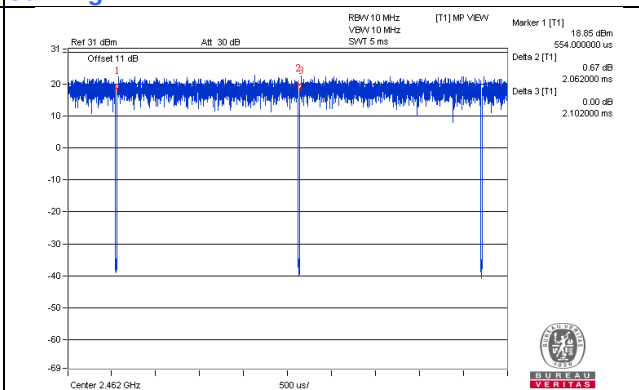
802.11g: Duty cycle = $2.062/2.102 = 0.981$

802.11n (HT20): Duty cycle = $2.063/2.103 = 0.981$

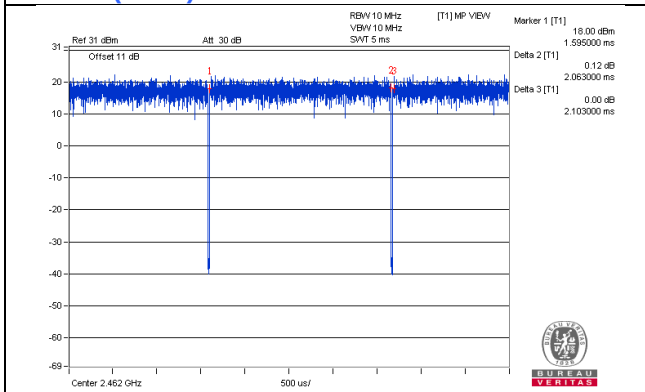
802.11b



802.11g



802.11n (HT20)



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

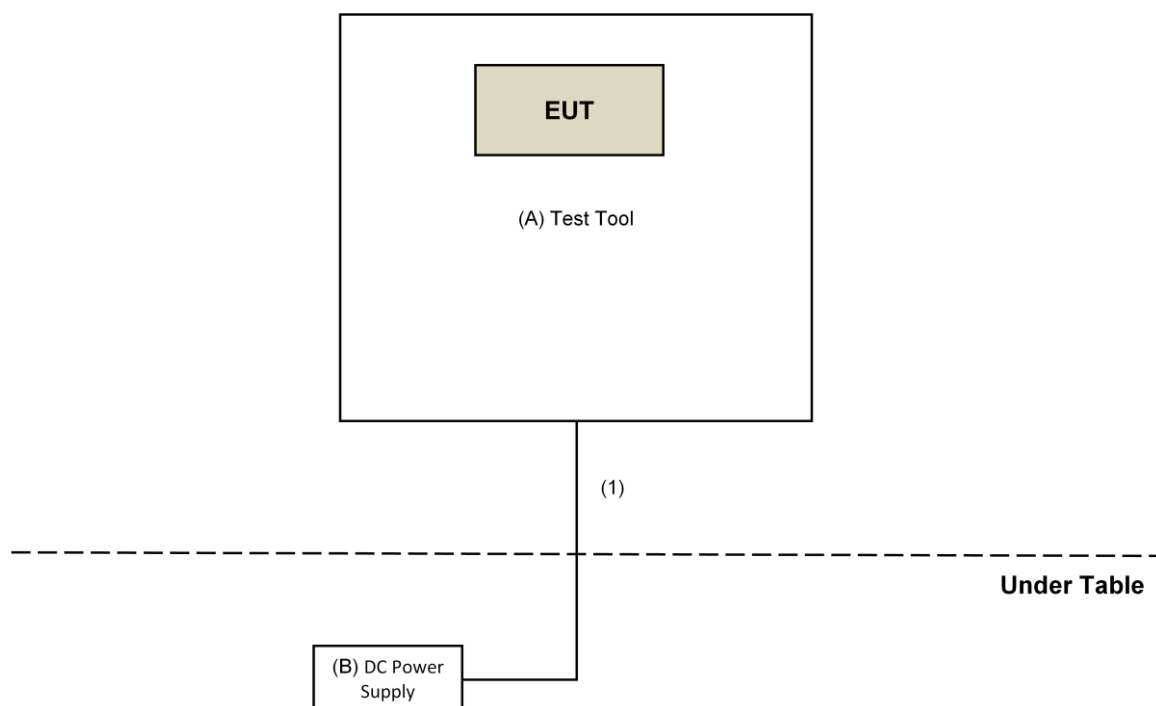
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Test Tool	WM-BN-BM-26_A_EVB TDK V1.1	NA	NA	NA	Supplied by client
B.	DC Power Supply	GOOD WILL INSTRUMENT CO., LTD.	GPC-3030D	7700087	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	3	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 DTS Meas Guidance v04
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2017	July 11, 2018
Pre-Amplifier ^(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 06, 2017	May 05, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Dec. 29, 2016	Dec. 28, 2017
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Dec. 28, 2016	Dec. 27, 2017
Pre-Amplifier EMCI	EMC12630SE	980384	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160922 150317 150322	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Spectrum Analyzer Keysight	N9030A	MY54490679	July 25, 2017	July 24, 2018
Pre-Amplifier EMCI	EMC184045SE	980386	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer R&S	FSV40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1.
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Nov. 06 to 08, 2017.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

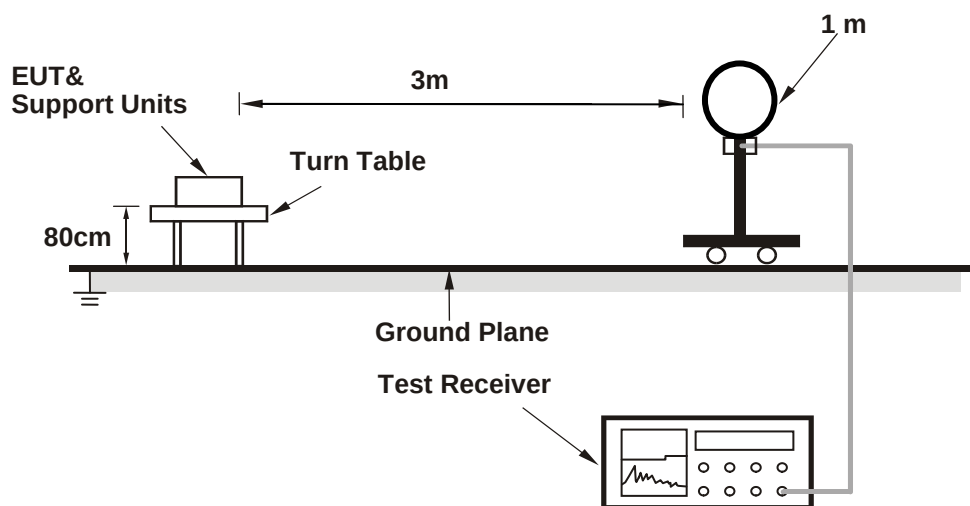
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

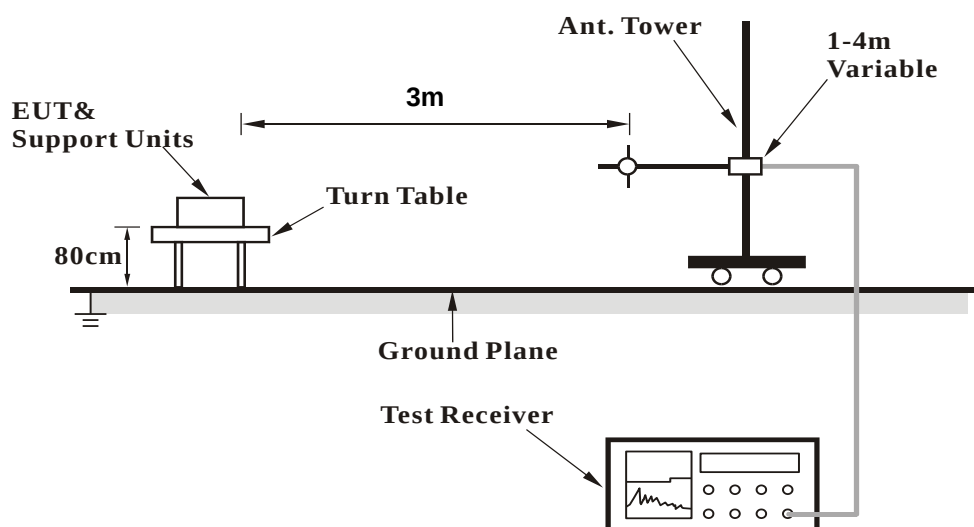
No deviation.

4.1.5 Test Setup

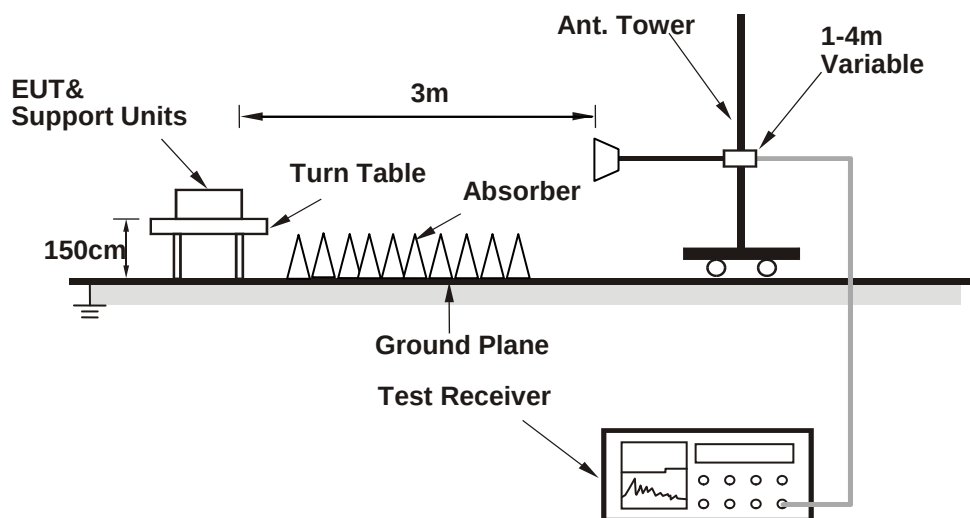
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Contorlling software (USI Broadcom Wireless Labtool 2.0) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz 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	2385.00	62.8 PK	74.0	-11.2	1.46 H	180	64.4	-1.6
2	2385.00	53.9 AV	54.0	-0.1	1.46 H	180	55.5	-1.6
3	*2412.00	109.0 PK			1.46 H	180	110.5	-1.5
4	*2412.00	106.7 AV			1.46 H	180	108.2	-1.5
5	4824.00	37.4 PK	74.0	-36.6	1.00 H	188	34.4	3.0
6	4824.00	25.4 AV	54.0	-28.6	1.00 H	188	22.4	3.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2385.00	56.2 PK	74.0	-17.8	4.00 V	285	57.8	-1.6
2	2385.00	47.9 AV	54.0	-6.1	4.00 V	285	49.5	-1.6
3	*2412.00	100.0 PK			4.00 V	285	101.5	-1.5
4	*2412.00	97.4 AV			4.00 V	285	98.9	-1.5
5	4824.00	37.1 PK	74.0	-36.9	1.06 V	234	34.1	3.0
6	4824.00	25.7 AV	54.0	-28.3	1.06 V	234	22.7	3.0

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	110.5 PK			1.19 H	186	112.0	-1.5
2	*2437.00	108.0 AV			1.19 H	186	109.5	-1.5
3	4874.00	36.9 PK	74.0	-37.1	1.00 H	200	33.7	3.2
4	4874.00	25.0 AV	54.0	-29.0	1.00 H	200	21.8	3.2
5	7311.00	44.9 PK	74.0	-29.1	1.00 H	147	36.0	8.9
6	7311.00	33.7 AV	54.0	-20.3	1.00 H	147	24.8	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	101.0 PK			4.00 V	294	102.5	-1.5
2	*2437.00	98.5 AV			4.00 V	294	100.0	-1.5
3	4874.00	37.3 PK	74.0	-36.7	1.00 V	249	34.1	3.2
4	4874.00	25.6 AV	54.0	-28.4	1.00 V	249	22.4	3.2
5	7311.00	45.6 PK	74.0	-28.4	1.00 V	335	36.7	8.9
6	7311.00	34.4 AV	54.0	-19.6	1.00 V	335	25.5	8.9

REMARKS:

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

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	107.1 PK			1.18 H	190	108.5	-1.4
2	*2462.00	104.7 AV			1.18 H	190	106.1	-1.4
3	2484.00	60.3 PK	74.0	-13.7	1.18 H	190	61.7	-1.4
4	2484.00	52.5 AV	54.0	-1.5	1.18 H	190	53.9	-1.4
5	4924.00	37.2 PK	74.0	-36.8	1.00 H	192	33.9	3.3
6	4924.00	25.7 AV	54.0	-28.3	1.00 H	192	22.4	3.3
7	7386.00	45.1 PK	74.0	-28.9	1.00 H	144	36.0	9.1
8	7386.00	33.9 AV	54.0	-20.1	1.00 H	144	24.8	9.1
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	98.1 PK			3.98 V	291	99.5	-1.4
2	*2462.00	95.4 AV			3.98 V	291	96.8	-1.4
3	2484.00	54.2 PK	74.0	-19.8	3.98 V	291	55.6	-1.4
4	2484.00	46.6 AV	54.0	-7.4	3.98 V	291	48.0	-1.4
5	4924.00	37.6 PK	74.0	-36.4	1.00 V	248	34.3	3.3
6	4924.00	25.9 AV	54.0	-28.1	1.00 V	248	22.6	3.3
7	7386.00	45.3 PK	74.0	-28.7	1.04 V	337	36.2	9.1
8	7386.00	34.3 AV	54.0	-19.7	1.04 V	337	25.2	9.1

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	69.3 PK	74.0	-4.7	1.18 H	181	70.9	-1.6
2	2390.00	53.6 AV	54.0	-0.4	1.18 H	181	55.2	-1.6
3	*2412.00	109.6 PK			1.18 H	181	111.1	-1.5
4	*2412.00	99.4 AV			1.18 H	181	100.9	-1.5
5	4824.00	36.4 PK	74.0	-37.6	1.00 H	186	33.4	3.0
6	4824.00	24.5 AV	54.0	-29.5	1.00 H	186	21.5	3.0

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.5 PK	74.0	-11.5	3.99 V	270	64.1	-1.6
2	2390.00	47.4 AV	54.0	-6.6	3.99 V	270	49.0	-1.6
3	*2412.00	102.1 PK			3.99 V	270	103.6	-1.5
4	*2412.00	92.2 AV			3.99 V	270	93.7	-1.5
5	4824.00	37.7 PK	74.0	-36.3	1.00 V	233	34.7	3.0
6	4824.00	26.2 AV	54.0	-27.8	1.00 V	233	23.2	3.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	61.9 PK	74.0	-12.1	1.18 H	184	63.5	-1.6
2	2390.00	45.1 AV	54.0	-8.9	1.18 H	184	46.7	-1.6
3	*2437.00	112.0 PK			1.18 H	184	113.5	-1.5
4	*2437.00	102.0 AV			1.18 H	184	103.5	-1.5
5	2483.50	66.5 PK	74.0	-7.5	1.18 H	184	67.9	-1.4
6	2483.50	45.9 AV	54.0	-8.1	1.18 H	184	47.3	-1.4
7	4874.00	36.6 PK	74.0	-37.4	1.00 H	177	33.4	3.2
8	4874.00	24.8 AV	54.0	-29.2	1.00 H	177	21.6	3.2
9	7311.00	45.0 PK	74.0	-29.0	1.02 H	152	36.1	8.9
10	7311.00	33.5 AV	54.0	-20.5	1.02 H	152	24.6	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.8 PK	74.0	-17.2	3.95 V	277	58.4	-1.6
2	2390.00	43.8 AV	54.0	-10.2	3.95 V	277	45.4	-1.6
3	*2437.00	104.6 PK			3.95 V	277	106.1	-1.5
4	*2437.00	94.8 AV			3.95 V	277	96.3	-1.5
5	2483.50	57.5 PK	74.0	-16.5	3.95 V	277	58.9	-1.4
6	2483.50	44.1 AV	54.0	-9.9	3.95 V	277	45.5	-1.4
7	4874.00	37.6 PK	74.0	-36.4	1.00 V	234	34.4	3.2
8	4874.00	25.9 AV	54.0	-28.1	1.00 V	234	22.7	3.2
9	7311.00	44.7 PK	74.0	-29.3	1.00 V	344	35.8	8.9
10	7311.00	33.9 AV	54.0	-20.1	1.00 V	344	25.0	8.9

REMARKS:

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

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	108.3 PK			1.18 H	186	109.7	-1.4
2	*2462.00	98.3 AV			1.18 H	186	99.7	-1.4
3	2483.50	72.1 PK	74.0	-1.9	1.18 H	186	73.5	-1.4
4	2483.50	53.6 AV	54.0	-0.4	1.18 H	186	55.0	-1.4
5	4924.00	37.1 PK	74.0	-36.9	1.00 H	186	33.8	3.3
6	4924.00	25.2 AV	54.0	-28.8	1.00 H	186	21.9	3.3
7	7386.00	45.5 PK	74.0	-28.5	1.03 H	152	36.4	9.1
8	7386.00	34.3 AV	54.0	-19.7	1.03 H	152	25.2	9.1

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	101.0 PK			4.00 V	284	102.4	-1.4
2	*2462.00	91.1 AV			4.00 V	284	92.5	-1.4
3	2483.50	63.8 PK	74.0	-10.2	4.00 V	284	65.2	-1.4
4	2483.50	47.6 AV	54.0	-6.4	4.00 V	284	49.0	-1.4
5	4924.00	37.7 PK	74.0	-36.3	1.04 V	248	34.4	3.3
6	4924.00	26.0 AV	54.0	-28.0	1.04 V	248	22.7	3.3
7	7386.00	45.6 PK	74.0	-28.4	1.02 V	348	36.5	9.1
8	7386.00	34.6 AV	54.0	-19.4	1.02 V	348	25.5	9.1

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	68.9 PK	74.0	-5.1	1.18 H	179	70.5	-1.6
2	2390.00	53.2 AV	54.0	-0.8	1.18 H	179	54.8	-1.6
3	*2412.00	109.0 PK			1.18 H	179	110.5	-1.5
4	*2412.00	98.4 AV			1.18 H	179	99.9	-1.5
5	4824.00	37.1 PK	74.0	-36.9	1.01 H	182	34.1	3.0
6	4824.00	25.1 AV	54.0	-28.9	1.01 H	182	22.1	3.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.8 PK	74.0	-11.2	4.00 V	271	64.4	-1.6
2	2390.00	47.5 AV	54.0	-6.5	4.00 V	271	49.1	-1.6
3	*2412.00	101.6 PK			4.00 V	271	103.1	-1.5
4	*2412.00	91.2 AV			4.00 V	271	92.7	-1.5
5	4824.00	37.9 PK	74.0	-36.1	1.00 V	261	34.9	3.0
6	4824.00	26.3 AV	54.0	-27.7	1.00 V	261	23.3	3.0

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.4 PK	74.0	-11.6	1.18 H	173	64.0	-1.6
2	2390.00	45.4 AV	54.0	-8.6	1.18 H	173	47.0	-1.6
3	*2437.00	112.4 PK			1.18 H	173	113.9	-1.5
4	*2437.00	102.1 AV			1.18 H	173	103.6	-1.5
5	2483.50	66.4 PK	74.0	-7.6	1.18 H	173	67.8	-1.4
6	2483.50	45.6 AV	54.0	-8.4	1.18 H	173	47.0	-1.4
7	4874.00	36.9 PK	74.0	-37.1	1.00 H	182	33.7	3.2
8	4874.00	25.0 AV	54.0	-29.0	1.00 H	182	21.8	3.2
9	7311.00	44.9 PK	74.0	-29.1	1.00 H	135	36.0	8.9
10	7311.00	33.4 AV	54.0	-20.6	1.00 H	135	24.5	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.5 PK	74.0	-17.5	3.90 V	289	58.1	-1.6
2	2390.00	43.3 AV	54.0	-10.7	3.90 V	289	44.9	-1.6
3	*2437.00	104.4 PK			3.90 V	289	105.9	-1.5
4	*2437.00	94.5 AV			3.90 V	289	96.0	-1.5
5	2483.50	57.8 PK	74.0	-16.2	3.90 V	289	59.2	-1.4
6	2483.50	44.5 AV	54.0	-9.5	3.90 V	289	45.9	-1.4
7	4874.00	37.1 PK	74.0	-36.9	1.03 V	262	33.9	3.2
8	4874.00	25.4 AV	54.0	-28.6	1.03 V	262	22.2	3.2
9	7311.00	45.2 PK	74.0	-28.8	1.10 V	327	36.3	8.9
10	7311.00	34.0 AV	54.0	-20.0	1.10 V	327	25.1	8.9

REMARKS:

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

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			1.18 H	188	108.9	-1.4
2	*2462.00	97.2 AV			1.18 H	188	98.6	-1.4
3	2483.50	68.1 PK	74.0	-5.9	1.18 H	188	69.5	-1.4
4	2483.50	52.5 AV	54.0	-1.5	1.18 H	188	53.9	-1.4
5	4924.00	37.7 PK	74.0	-36.3	1.00 H	203	34.4	3.3
6	4924.00	25.8 AV	54.0	-28.2	1.00 H	203	22.5	3.3
7	7386.00	44.7 PK	74.0	-29.3	1.00 H	141	35.6	9.1
8	7386.00	33.8 AV	54.0	-20.2	1.00 H	141	24.7	9.1
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	100.0 PK			3.99 V	277	101.4	-1.4
2	*2462.00	90.1 AV			3.99 V	277	91.5	-1.4
3	2483.50	63.4 PK	74.0	-10.6	3.96 V	269	64.8	-1.4
4	2483.50	47.4 AV	54.0	-6.6	3.96 V	269	48.8	-1.4
5	4924.00	38.2 PK	74.0	-35.8	1.00 V	260	34.9	3.3
6	4924.00	26.3 AV	54.0	-27.7	1.00 V	260	23.0	3.3
7	7386.00	45.3 PK	74.0	-28.7	1.03 V	342	36.2	9.1
8	7386.00	34.0 AV	54.0	-20.0	1.03 V	342	24.9	9.1

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 Data:

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	89.96	35.5 QP	43.5	-8.0	1.20 H	181	49.4	-13.9
2	308.76	38.3 QP	46.0	-7.7	2.96 H	181	45.5	-7.2
3	442.32	39.9 QP	46.0	-6.1	1.93 H	21	43.7	-3.8
4	527.38	38.4 QP	46.0	-7.6	1.00 H	115	40.8	-2.4
5	595.88	35.5 QP	46.0	-10.5	1.20 H	93	36.5	-1.0
6	723.62	34.1 QP	46.0	-11.9	1.80 H	60	33.5	0.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	85.96	35.3 QP	40.0	-4.7	1.00 V	151	49.2	-13.9
2	288.76	38.1 QP	46.0	-7.9	1.76 V	69	46.0	-7.9
3	412.32	39.9 QP	46.0	-6.1	1.63 V	0	44.9	-5.0
4	497.38	38.2 QP	46.0	-7.8	2.80 V	185	41.3	-3.1
5	625.88	35.5 QP	46.0	-10.5	1.40 V	133	36.1	-0.6
6	813.62	34.1 QP	46.0	-11.9	2.10 V	90	32.0	2.1

REMARKS:

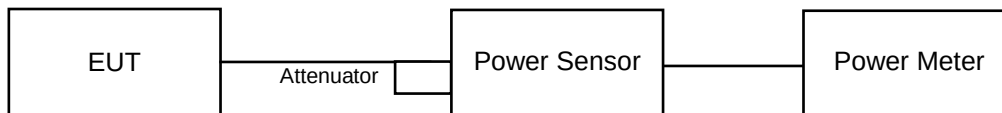
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Output Power Measurement

4.2.1 Limits of Conducted Output Power Measurement

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

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 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.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

Same as Item 4.1.6.

4.2.7 Test Results

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	109.901	20.41	30.00	Pass
6	2437	154.17	21.88	30.00	Pass
11	2462	120.781	20.82	30.00	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	179.061	22.53	30.00	Pass
6	2437	264.85	24.23	30.00	Pass
11	2462	167.88	22.25	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	158.489	22.00	30.00	Pass
6	2437	271.644	24.34	30.00	Pass
11	2462	156.315	21.94	30.00	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	67.764	18.31
6	2437	95.499	19.80
11	2462	72.946	18.63

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	44.157	16.45
6	2437	79.799	19.02
11	2462	37.068	15.69

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	33.343	15.23
6	2437	79.433	19.00
11	2462	29.785	14.74

4.3 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited 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.

--- END ---