

## FCC Test Report (Radiated Test)

**Report No.:** RF151228C18B-3

**FCC ID:** VPYLB1DX

**Test Model:** 1DX

**Series Model:** 1FX

**Received Date:** Dec. 28, 2015

**Test Date:** Jun. 04 ~ Jun. 06, 2016

**Issued Date:** Jun. 13, 2016

**Applicant:** Murata Manufacturing Co., Ltd.

**Address:** 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan

**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.)



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 specifically mentioned, 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

<b>Release Control Record</b> .....	<b>3</b>
<b>1 Certificate of Conformity</b> .....	<b>4</b>
<b>2 Summary of Test Results</b> .....	<b>5</b>
2.1 Measurement Uncertainty.....	5
2.2 Modification Record.....	5
<b>3 General Information</b> .....	<b>6</b>
3.1 General Description of EUT.....	6
3.2 Description of Test Modes.....	7
3.2.1 Test Mode Applicability and Tested Channel Detail.....	8
3.3 Description of Support Units.....	9
3.3.1 Configuration of System under Test.....	9
3.4 General Description of Applied Standards.....	9
<b>4 Test Types and Results</b> .....	<b>10</b>
4.1 Radiated Emission and Bandedge Measurement.....	10
4.1.1 Limits of Radiated Emission and Bandedge Measurement.....	10
4.1.2 Test Instruments.....	11
4.1.3 Test Procedures.....	12
4.1.4 Deviation from Test Standard.....	12
4.1.5 Test Set Up.....	13
4.1.6 EUT Operating Conditions.....	13
4.1.7 Test Results.....	14
<b>5 Pictures of Test Arrangements</b> .....	<b>24</b>
<b>Appendix – Information on the Testing Laboratories</b> .....	<b>25</b>

### Release Control Record


Issue No.	Description	Date Issued
RF151228C18B-3	Original release.	Jun. 13, 2016

## 1 Certificate of Conformity

**Product:** Communication Module  
**Brand:** MURATA  
**Test Model:** 1DX  
**Series Model:** 1FX  
**Sample Status:** Engineering sample  
**Applicant:** Murata Manufacturing Co., Ltd.  
**Test Date:** Jun. 04 ~ Jun. 06, 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:** Jun. 13, 2016  
Polly Chien / Specialist

**Approved by :**  , **Date:** Jun. 13, 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	Refer to Note
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.2dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Refer to Note
15.247(a)(2)	6dB bandwidth	Pass	Refer to Note
15.247(b)	Conducted power	Pass	Refer to Note
15.247(e)	Power Spectral Density	Pass	Refer to Note
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: For other test items were recorded in Report No.: RF151228C18B.

### 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 ~ 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	Communication Module
Brand	MURATA
Test Model	1DX
Series Model	1FX
Model Difference	Refer to Note
Status of EUT	Engineering sample
Power Supply Rating	3.6Vdc VBAT and 3.3Vdc VDDIO
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 65Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	173.780mW
Antenna Type	Monopole antenna with 1.4dBi gain
Antenna Connector	NA
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is issued as a supplementary report of BV ADT report no. RF151228C18-3.
2. This report is prepared for FCC class II permissive change. The differences compared with original report is declaring the antenna gain from average value 0.6dBi to peak value 1.4dBi and the antenna design is identical. And adding one series model name which removing BT function. Therefore, radiated emission was re-tested.
3. The following models are provided to this EUT. (New model is marked in boldface)

Brand	Model	Description
Murata	1DX	Main test model
	<b>1FX</b>	<b>1FX is identical to 1DX except without BT function</b>

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

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

5. 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 $\geq$ 1G	RE $<$ 1G	
-	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement      **RE $<$ 1G**: Radiated Emission below 1GHz

**NOTE:** 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.

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

#### **Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	24deg. C, 67%RH	120Vac, 60Hz	Tank Wu
RE $<$ 1G	20deg. C, 69%RH	120Vac, 60Hz	Bayu Chen



### 3.3 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.

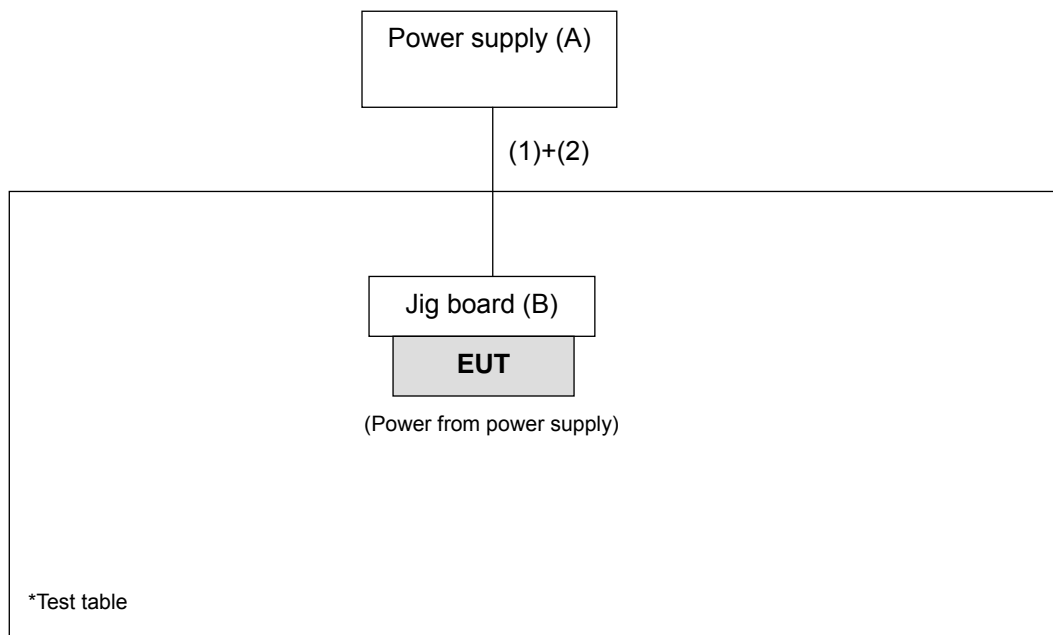
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Power Supply	Topward	6603D	700637	NA	-
B.	Jig board	MURATA	P2ML4452-1	1~	NA	Provided by manufacturer

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A was placed under the test table.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	4	1	-	0	Provided by manufacturer
2.	DC power cable	4	1.8	-	0	-

#### 3.3.1 Configuration of System under Test



### 3.4 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 v03r05**  
 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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Apr. 19, 2016	Apr. 18, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Jan. 18, 2016	Jan. 17, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Jan. 08, 2016	Jan. 07, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02(30 9222 +248780)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03(27 4092)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 11, 2015	Aug. 10, 2016
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 BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	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 Chamber 9.
  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 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 (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:**

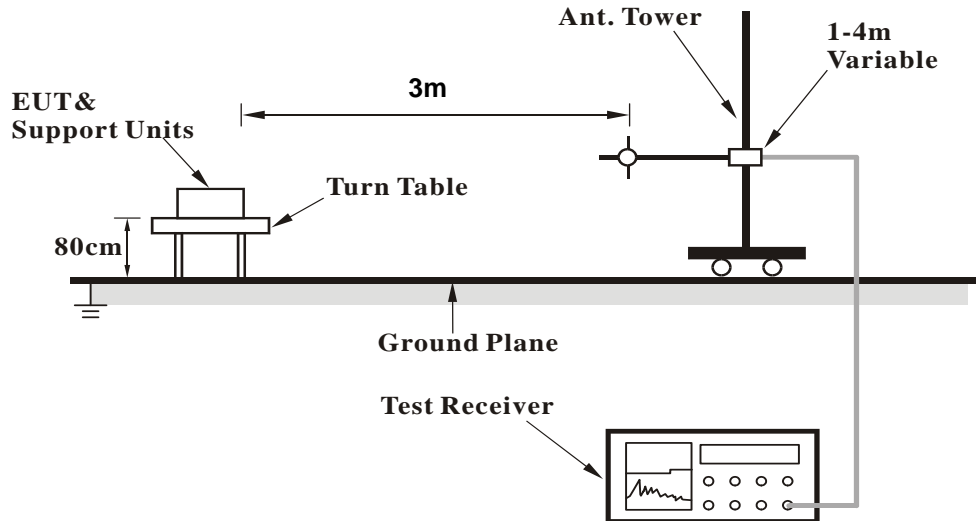
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

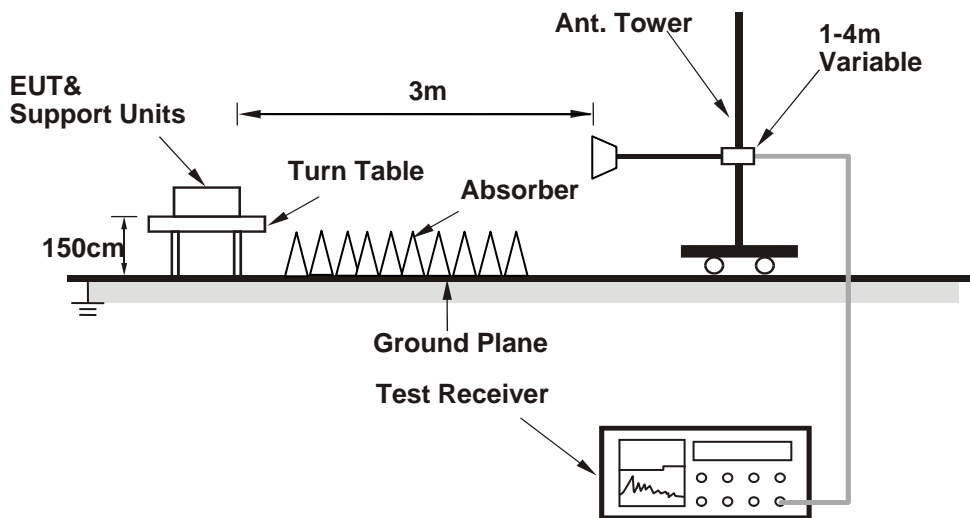
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range 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	1064.00	54.0 PK	74.0	-20.0	1.88 H	224	62.60	-8.60
2	1064.00	47.1 AV	54.0	-6.9	1.88 H	224	55.70	-8.60
3	2390.00	61.6 PK	74.0	-12.4	1.44 H	258	26.80	34.80
4	2390.00	50.5 AV	54.0	-3.5	1.44 H	258	15.70	34.80
5	*2412.00	109.0 PK			1.44 H	258	74.10	34.90
6	*2412.00	105.6 AV			1.44 H	258	70.70	34.90
7	4824.00	50.3 PK	74.0	-23.7	1.90 H	151	45.90	4.40
8	4824.00	37.1 AV	54.0	-16.9	1.90 H	151	32.70	4.40

#### 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	1064.00	51.6 PK	74.0	-22.4	1.29 V	20	60.20	-8.60
2	1064.00	44.5 AV	54.0	-9.5	1.29 V	20	53.10	-8.60
3	2390.00	60.7 PK	74.0	-13.3	2.39 V	11	25.90	34.80
4	2390.00	48.9 AV	54.0	-5.1	2.39 V	11	14.10	34.80
5	*2412.00	107.0 PK			2.39 V	11	72.10	34.90
6	*2412.00	103.4 AV			2.39 V	11	68.50	34.90
7	4824.00	49.9 PK	74.0	-24.1	2.33 V	10	45.50	4.40
8	4824.00	37.0 AV	54.0	-17.0	2.33 V	10	32.60	4.40

#### 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	1064.00	53.5 PK	74.0	-20.5	1.99 H	232	62.10	-8.60
2	1064.00	45.6 AV	54.0	-8.4	1.99 H	232	54.20	-8.60
3	*2437.00	111.1 PK			1.00 H	249	76.10	35.00
4	*2437.00	107.7 AV			1.00 H	249	72.70	35.00
5	4874.00	50.4 PK	74.0	-23.6	1.13 H	151	45.90	4.50
6	4874.00	37.3 AV	54.0	-16.7	1.13 H	151	32.80	4.50

**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	1064.00	50.8 PK	74.0	-23.2	1.08 V	16	59.40	-8.60
2	1064.00	44.1 AV	54.0	-9.9	1.08 V	16	52.70	-8.60
3	*2437.00	106.9 PK			2.44 V	9	71.90	35.00
4	*2437.00	104.2 AV			2.44 V	9	69.20	35.00
5	4874.00	50.3 PK	74.0	-23.7	1.39 V	222	45.80	4.50
6	4874.00	37.4 AV	54.0	-16.6	1.39 V	222	32.90	4.50

**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 &amp; 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	1064.00	53.5 PK	74.0	-20.5	1.99 H	231	62.10	-8.60
2	1064.00	46.1 AV	54.0	-7.9	1.99 H	231	54.70	-8.60
3	*2462.00	111.1 PK			1.00 H	232	75.90	35.20
4	*2462.00	107.0 AV			1.00 H	232	71.80	35.20
5	2483.50	63.6 PK	74.0	-10.4	1.00 H	232	28.40	35.20
<b>6</b>	<b>2483.50</b>	<b>52.8 AV</b>	<b>54.0</b>	<b>-1.2</b>	<b>1.00 H</b>	<b>232</b>	<b>17.60</b>	<b>35.20</b>
7	4924.00	50.3 PK	74.0	-23.7	1.00 H	33	45.60	4.70
8	4924.00	37.5 AV	54.0	-16.5	1.00 H	33	32.80	4.70

## ANTENNA POLARITY &amp; 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	1064.00	51.6 PK	74.0	-22.4	1.12 V	19	60.20	-8.60
2	1064.00	44.5 AV	54.0	-9.5	1.12 V	19	53.10	-8.60
3	*2462.00	107.1 PK			2.27 V	349	71.90	35.20
4	*2462.00	103.6 AV			2.27 V	349	68.40	35.20
5	2483.50	62.3 PK	74.0	-11.7	2.27 V	349	27.10	35.20
6	2483.50	52.1 AV	54.0	-1.9	2.27 V	349	16.90	35.20
7	4924.00	50.6 PK	74.0	-23.4	1.29 V	177	45.90	4.70
8	4924.00	37.6 AV	54.0	-16.4	1.29 V	177	32.90	4.70

## 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	1064.00	54.2 PK	74.0	-19.8	2.10 H	233	62.80	-8.60
2	1064.00	46.1 AV	54.0	-7.9	2.10 H	233	54.70	-8.60
3	2390.00	62.4 PK	74.0	-11.6	1.02 H	266	27.60	34.80
4	2390.00	50.9 AV	54.0	-3.1	1.02 H	266	16.10	34.80
5	*2412.00	109.8 PK			1.02 H	266	74.90	34.90
6	*2412.00	99.1 AV			1.02 H	266	64.20	34.90
7	4824.00	50.1 PK	74.0	-23.9	1.88 H	291	45.70	4.40
8	4824.00	37.0 AV	54.0	-17.0	1.88 H	291	32.60	4.40

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	1064.00	50.9 PK	74.0	-23.1	1.19 V	16	59.50	-8.60
2	1064.00	44.2 AV	54.0	-9.8	1.19 V	16	52.80	-8.60
3	2390.00	60.7 PK	74.0	-13.3	1.00 V	33	25.90	34.80
4	2390.00	48.9 AV	54.0	-5.1	1.00 V	33	14.10	34.80
5	*2412.00	104.7 PK			1.00 V	33	69.80	34.90
6	*2412.00	93.5 AV			1.00 V	33	58.60	34.90
7	4824.00	50.4 PK	74.0	-23.6	1.36 V	207	46.00	4.40
8	4824.00	37.2 AV	54.0	-16.8	1.36 V	207	32.80	4.40

## 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	1064.00	56.3 PK	74.0	-17.7	2.01 H	244	64.90	-8.60
2	1064.00	46.1 AV	54.0	-7.9	2.01 H	244	54.70	-8.60
3	*2437.00	108.1 PK			1.00 H	278	73.10	35.00
4	*2437.00	97.8 AV			1.00 H	278	62.80	35.00
5	4874.00	50.4 PK	74.0	-23.6	1.71 H	166	45.90	4.50
6	4874.00	36.9 AV	54.0	-17.1	1.71 H	166	32.40	4.50

**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	1064.00	51.0 PK	74.0	-23.0	1.22 V	344	59.60	-8.60
2	1064.00	43.8 AV	54.0	-10.2	1.22 V	344	52.40	-8.60
3	*2437.00	103.1 PK			1.07 V	29	68.10	35.00
4	*2437.00	92.3 AV			1.07 V	29	57.30	35.00
5	4874.00	50.6 PK	74.0	-23.4	1.36 V	223	46.10	4.50
6	4874.00	37.3 AV	54.0	-16.7	1.36 V	223	32.80	4.50

**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	1064.00	53.6 PK	74.0	-20.4	1.99 H	227	62.20	-8.60
2	1064.00	46.8 AV	54.0	-7.2	1.99 H	227	55.40	-8.60
3	*2462.00	108.6 PK			1.00 H	247	73.40	35.20
4	*2462.00	99.0 AV			1.00 H	247	63.80	35.20
5	2483.50	65.6 PK	74.0	-8.4	1.00 H	247	30.40	35.20
6	2483.50	51.3 AV	54.0	-2.7	1.00 H	247	16.10	35.20
7	4924.00	50.8 PK	74.0	-23.2	1.19 H	153	46.10	4.70
8	4924.00	37.1 AV	54.0	-16.9	1.19 H	153	32.40	4.70

**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	1064.00	50.6 PK	74.0	-23.4	1.20 V	11	59.20	-8.60
2	1064.00	44.2 AV	54.0	-9.8	1.20 V	11	52.80	-8.60
3	*2462.00	103.7 PK			1.06 V	62	68.50	35.20
4	*2462.00	94.2 AV			1.06 V	62	59.00	35.20
5	2483.50	63.3 PK	74.0	-10.7	1.06 V	62	28.10	35.20
6	2483.50	49.4 AV	54.0	-4.6	1.06 V	62	14.20	35.20
7	4924.00	51.0 PK	74.0	-23.0	1.29 V	277	46.30	4.70
8	4924.00	37.4 AV	54.0	-16.6	1.29 V	277	32.70	4.70

**REMARKS:**

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

802.11n (HT20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
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	1064.00	54.2 PK	74.0	-19.8	1.99 H	241	62.80	-8.60
2	1064.00	46.5 AV	54.0	-7.5	1.99 H	241	55.10	-8.60
3	2390.00	63.0 PK	74.0	-11.0	1.00 H	259	28.20	34.80
4	2390.00	50.2 AV	54.0	-3.8	1.00 H	259	15.40	34.80
5	*2412.00	107.9 PK			1.00 H	259	73.00	34.90
6	*2412.00	97.7 AV			1.00 H	259	62.80	34.90
7	4824.00	50.6 PK	74.0	-23.4	1.29 H	133	46.20	4.40
8	4824.00	36.8 AV	54.0	-17.2	1.29 H	133	32.40	4.40

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	1064.00	52.0 PK	74.0	-22.0	1.31 V	18	60.60	-8.60
2	1064.00	44.9 AV	54.0	-9.1	1.31 V	18	53.50	-8.60
3	2390.00	60.8 PK	74.0	-13.2	1.00 V	44	26.00	34.80
4	2390.00	48.9 AV	54.0	-5.1	1.00 V	44	14.10	34.80
5	*2412.00	101.8 PK			1.00 V	44	66.90	34.90
6	*2412.00	92.0 AV			1.00 V	44	57.10	34.90
7	4824.00	50.7 PK	74.0	-23.3	1.00 V	311	46.30	4.40
8	4824.00	37.2 AV	54.0	-16.8	1.00 V	311	32.80	4.40

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	1064.00	53.7 PK	74.0	-20.3	1.99 H	247	62.30	-8.60
2	1064.00	46.5 AV	54.0	-7.5	1.99 H	247	55.10	-8.60
3	*2437.00	107.8 PK			1.00 H	259	72.80	35.00
4	*2437.00	98.3 AV			1.00 H	259	63.30	35.00
5	4874.00	50.4 PK	74.0	-23.6	1.22 H	144	45.90	4.50
6	4874.00	37.2 AV	54.0	-16.8	1.22 H	144	32.70	4.50

**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	1064.00	50.8 PK	74.0	-23.2	1.31 V	15	59.40	-8.60
2	1064.00	44.4 AV	54.0	-9.6	1.31 V	15	53.00	-8.60
3	*2437.00	102.5 PK			1.03 V	29	67.50	35.00
4	*2437.00	94.1 AV			1.03 V	29	59.10	35.00
5	4874.00	50.4 PK	74.0	-23.6	1.31 V	50	45.90	4.50
6	4874.00	37.1 AV	54.0	-16.9	1.31 V	50	32.60	4.50

**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	1064.00	54.6 PK	74.0	-19.4	1.79 H	233	63.20	-8.60
2	1064.00	46.8 AV	54.0	-7.2	1.79 H	233	55.40	-8.60
3	*2462.00	107.8 PK			1.00 H	271	72.60	35.20
4	*2462.00	98.1 AV			1.00 H	271	62.90	35.20
5	2483.50	64.9 PK	74.0	-9.1	1.00 H	271	29.70	35.20
6	2483.50	51.2 AV	54.0	-2.8	1.00 H	271	16.00	35.20
7	4924.00	50.3 PK	74.0	-23.7	1.20 H	147	45.60	4.70
8	4924.00	37.1 AV	54.0	-16.9	1.20 H	147	32.40	4.70

**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	1064.00	52.1 PK	74.0	-21.9	1.20 V	32	60.70	-8.60
2	1064.00	44.5 AV	54.0	-9.5	1.20 V	32	53.10	-8.60
3	*2462.00	104.5 PK			1.03 V	35	69.30	35.20
4	*2462.00	94.1 AV			1.03 V	35	58.90	35.20
5	2483.50	62.5 PK	74.0	-11.5	1.03 V	35	27.30	35.20
6	2483.50	49.4 AV	54.0	-4.6	1.03 V	35	14.20	35.20
7	4924.00	50.4 PK	74.0	-23.6	1.44 V	132	45.70	4.70
8	4924.00	37.3 AV	54.0	-16.7	1.44 V	132	32.60	4.70

**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: 802.11g

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

## ANTENNA POLARITY &amp; 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	30.9 QP	40.0	-9.1	1.24 H	245	46.50	-15.60
2	62.98	17.4 QP	40.0	-22.6	1.00 H	146	32.60	-15.20
3	167.74	17.9 QP	43.5	-25.6	1.99 H	190	32.00	-14.10
4	342.34	20.7 QP	46.0	-25.3	1.24 H	232	32.30	-11.60
5	714.82	37.5 QP	46.0	-8.5	1.00 H	5	42.10	-4.60
6	901.06	35.4 QP	46.0	-10.6	1.99 H	100	36.30	-0.90

## ANTENNA POLARITY &amp; 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	33.27	30.4 QP	40.0	-9.6	1.00 V	1	46.00	-15.60
2	82.38	17.8 QP	40.0	-22.2	1.24 V	198	36.50	-18.70
3	159.98	18.0 QP	43.5	-25.5	1.50 V	20	31.90	-13.90
4	270.56	23.9 QP	46.0	-22.1	1.00 V	277	37.30	-13.40
5	482.02	24.6 QP	46.0	-21.4	1.99 V	155	33.40	-8.80
6	817.64	30.1 QP	46.0	-15.9	1.99 V	16	32.20	-2.10

## REMARKS:

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

## 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](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

--- END ---