

## Partial FCC Test Report

**Report No.:** RF151109C30-1

**FCC ID:** VPYLB1EN

**Test Model:** LBEE5ZZ1EN

**Received Date:** Nov. 09, 2015

**Test Date:** Nov. 18, 2015 ~ Nov. 21, 2015

**Issued Date:** Dec. 07, 2015

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

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

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**Test Location (1):** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.



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### Release Control Record

Issue No.	Description	Date Issued
RF151109C30-1	Original Release	Dec. 07, 2015

## 1 Certificate of Conformity

**Product:** Communication Module

**Brand:** Murata

**Test Model:** LBEE5ZZ1EN

**Sample Status:** Identical Prototype

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

**Test Date:** Nov. 18, 2015 ~ Nov. 21, 2015

**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 :**

*Vera Huang*

**Date:**

Dec. 07, 2015

Vera Huang / Specialist

**Approved by :**

*Stanley Wu*

**Date:**

Dec. 07, 2015

Stanley Wu / Assistant 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 -18.58 dB at 0.15760 MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note ad below.
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note ad below.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note ad below.
15.247(b)	Maximum Peak Output Power	N/A	Refer to Note ad below.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.52 dB at 2484 MHz.
15.247(d)	Band Edge Measurement	N/A	Refer to Note ad below.
15.247(d)	Antenna Port Emission	N/A	Refer to Note ad below.
15.203	Antenna Requirement	N/A	Refer to Note ad below.

**Note:** Only test items for AC Power Conducted Emission and Radiated Emissions were performed for this report. Refer to module (Model: LBEE5ZZ1EN, FCC ID: VPYLB1EN) Report No.: 10689818H-B for other testing data.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Communication Module	
<b>Brand</b>	Murata	
<b>Test Model</b>	LBEE5ZZ1EN	
<b>Power Supply Rating</b>	19.5 Vdc (adapter)	
<b>Modulation Type</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK	
<b>Transfer Rate</b>	1/2/3 Mbps	
<b>Operating Frequency</b>	2402 ~ 2480 MHz	
<b>Number of Channel</b>	79	
<b>Antenna Type</b>	Antenna 1 (Monopole Antenna)	2.52 dBi gain
	Antenna 2 (Dipole Antenna)	3.5 dBi gain
<b>Antenna Connector</b>	N/A	
<b>Accessory Device</b>	Refer to Note as below	
<b>Data Cable Supplied</b>	Refer to Note as below	

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	DELL	HK65NM130	I/P: 100-240Vac, 50-60Hz, 1.7A O/P: 19.5Vdc, 3.34A
Platform	DELL	N01G	--
Antenna 1 (Monopole Antenna)	taoglas	MA761.B.B1CG.014	Pantheon Antenna 4in1 MA761
Antenna 2 (Dipole Antenna)	Laird	PVD24515-DE1	PCB Dipole Antenna

2. Since the module report was also verified with dipole antenna and the antenna gain was the same as antenna 2 (Brand: Laird). Therefore, only the test data for monopole antenna was presented in the report.
3. 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

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE<1G	PLC	
-	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz **RE<1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission

#### NOTE:

1. For Radiated emission test, pre-tested GFSK,  $\pi/4$ -DQPSK, 8DPSK modulation type and found GFSK was the worse, therefore chosen for the final test and presented in the test report.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
3. "-" means no effect.

#### Radiated Emission Test (Above 1 GHz):

- ☒ 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5

#### Radiated Emission Test (Below 1 GHz):

- ☒ 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	78	FHSS	GFSK	DH5

#### 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	78	FHSS	GFSK	DH5

#### Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Toby Tian



### 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.

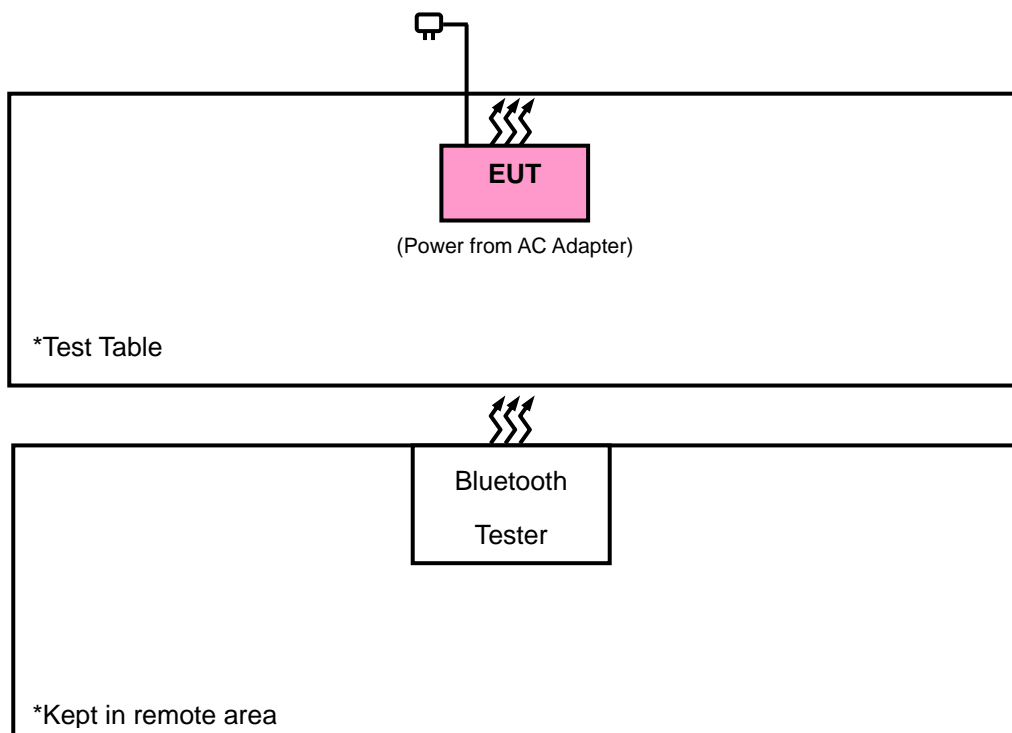
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Bluetooth Tester	R&S	CBT	100946	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A

Note:

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

#### 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)**

**FCC Public Notice DA 00-705**

ANSI C63.10-2013

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

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).  
The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB 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 1000 MHz, 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 20 dB 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 Agilent	N9038A	MY51210203	Jan. 21, 2015	Jan. 21, 2016
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep. 03, 2015	Sep. 02, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 04, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 09, 2015	Feb. 09, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Feb. 04, 2015	Feb. 04, 2016
Loop Antenna	EM-6879	269	Jul. 31, 2015	Jul. 30, 2016
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 09, 2015	Jan. 08, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2014	Dec. 26, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 12, 2015	Oct. 11, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 12, 2015	Oct. 11, 2016
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2015	Oct. 11, 2016
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC7450F-10.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:**

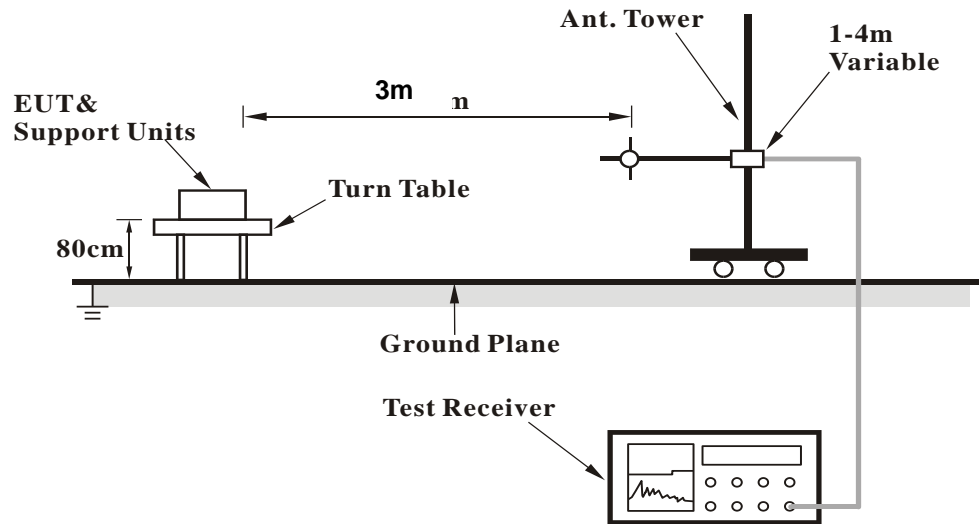
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.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

#### 4.1.4 Deviation from Test Standard

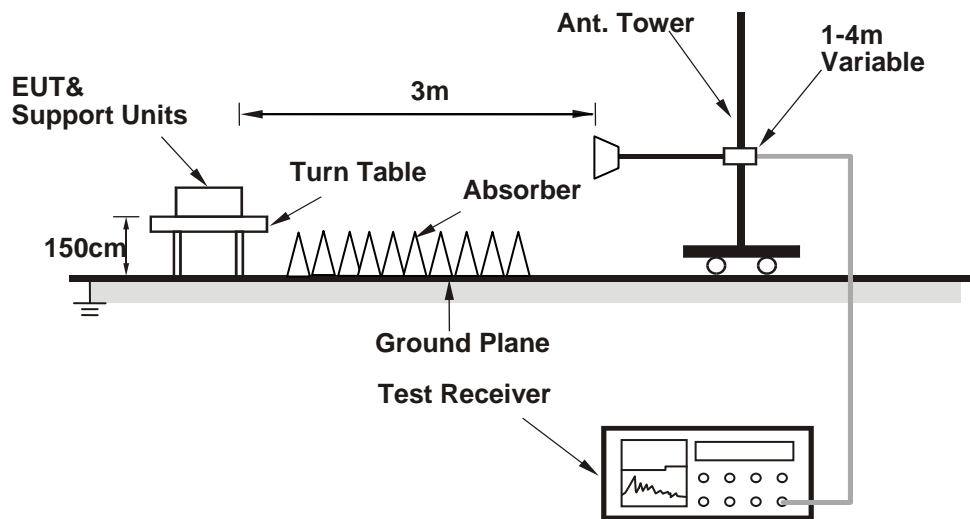
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range below 1 GHz>



##### <Frequency Range above 1 GHz>



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.



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#### 4.1.7 Test Results

#### ABOVE 1 GHz DATA :

#### GFSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 GHz ~ 25 GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65 % RH	TESTED BY	Gavin Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	33.91	40.44	54	-20.09	26.91	4.08	37.52	228	65	Average
2390	58.26	64.79	74	-15.74	26.91	4.08	37.52	228	65	Peak
2402	84.86	91.38			26.91	4.09	37.52	228	65	Average
2402	95.1	101.62			26.91	4.09	37.52	228	65	Peak
2498	33.9	39.79	54	-20.1	27.2	4.16	37.25	228	65	Average
2498	57.13	63.02	74	-16.87	27.2	4.16	37.25	228	65	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2324	34.04	40.76	54	-19.96	26.72	4.03	37.47	169	216	Average
2324	57.42	64.14	74	-16.58	26.72	4.03	37.47	169	216	Peak
2402	85.89	92.41			26.91	4.09	37.52	169	216	Average
2402	97.4	103.92			26.91	4.09	37.52	169	216	Peak
2500	33.95	39.84	54	-20.05	27.2	4.16	37.25	169	216	Average
2500	56.75	62.64	74	-17.25	27.2	4.16	37.25	169	216	Peak

#### REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2402 MHz: Fundamental frequency.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 GHz ~ 25 GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65 % RH	TESTED BY	Gavin Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2382	34.15	40.71	54	-19.85	26.86	4.08	37.5	228	65	Average
2382	56.56	63.12	74	-17.44	26.86	4.08	37.5	228	65	Peak
2441	84.21	90.42			27.06	4.12	37.39	228	65	Average
2441	95.41	101.62			27.06	4.12	37.39	228	65	Peak
2500	34.5	40.39	54	-19.5	27.2	4.16	37.25	228	65	Average
2500	57.58	63.47	74	-16.42	27.2	4.16	37.25	228	65	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2382	34.44	41	54	-19.56	26.86	4.08	37.5	181	219	Average
2382	56.69	63.25	74	-17.31	26.86	4.08	37.5	181	219	Peak
2441	86.21	92.42			27.06	4.12	37.39	181	219	Average
2441	97.72	103.93			27.06	4.12	37.39	181	219	Peak
2494	34.8	40.69	54	-19.2	27.2	4.16	37.25	181	219	Average
2494	57.04	62.93	74	-16.96	27.2	4.16	37.25	181	219	Peak

**REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2441 MHz: Fundamental frequency.





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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 GHz ~ 25 GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65 % RH	TESTED BY	Gavin Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2336	33.15	39.81	54	-20.85	26.77	4.04	37.47	205	80	Average
2336	57.12	63.78	74	-16.88	26.77	4.04	37.47	205	80	Peak
2480	84.82	90.84			27.15	4.15	37.32	205	80	Average
2480	95.91	101.93			27.15	4.15	37.32	205	80	Peak
2488	35.22	41.18	54	-18.78	27.2	4.16	37.32	205	80	Average
2488	57.27	63.23	74	-16.73	27.2	4.16	37.32	205	80	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2364	33	39.61	54	-21	26.81	4.07	37.49	217	214	Average
2364	56.3	62.91	74	-17.7	26.81	4.07	37.49	217	214	Peak
2480	86.44	92.46			27.15	4.15	37.32	217	214	Average
2480	98.08	104.1			27.15	4.15	37.32	217	214	Peak
2484	35.69	41.71	54	-18.31	27.15	4.15	37.32	217	214	Average
2484	70.48	76.5	74	-3.52	27.15	4.15	37.32	217	214	Peak

**REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.



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**9 kHz ~ 30 MHz DATA:**

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz WORST-CASE DATA:**

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	30 MHz ~ 1 GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Quasi-peak (QP)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65 % RH	TESTED BY	Gavin Wu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
128.94	26	45.13	43.5	-17.5	11.61	1.14	31.88	121	151	Peak
177.44	27.47	47.08	43.5	-16.03	11.01	1.19	31.81	114	184	Peak
192.96	26.41	47	43.5	-17.09	9.84	1.27	31.7	118	262	Peak
215.27	26.5	46.78	43.5	-17	10.01	1.36	31.65	136	112	Peak
333.61	21.69	38.03	46	-24.31	13.75	1.72	31.81	131	124	Peak
662.44	22.99	32.16	46	-23.01	20.36	2.38	31.91	124	180	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
66.86	26.38	46.09	40	-13.62	11.12	0.85	31.68	104	299	Peak
187.14	22.56	42.77	43.5	-20.94	10.26	1.25	31.72	100	217	Peak
197.81	23.46	44.43	43.5	-20.04	9.5	1.28	31.75	130	30	Peak
529.55	20.41	31.97	46	-25.59	17.99	2.14	31.69	104	338	Peak
593.57	21.67	32.15	46	-24.33	19.46	2.24	32.18	136	235	Peak
676.02	23.94	32.83	46	-22.06	20.53	2.41	31.83	106	12	Peak

**REMARKS:** Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

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

- Note: 1. The lower limit shall apply at the transition frequencies.  
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.  
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The test was performed in HwaYa Shielded Room 1.  
3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 Test Procedures

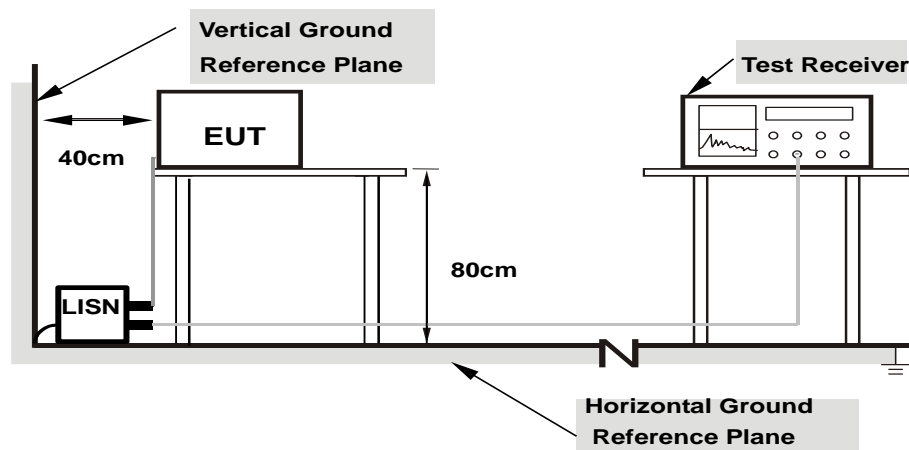
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling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

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



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

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

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

#### 4.2.6 EUT Operating Condition

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

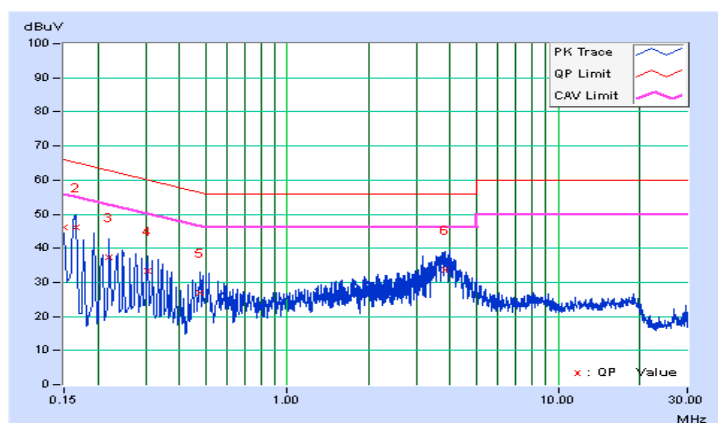
#### 4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2015/11/21

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.82	36.37	23.39	46.19	33.21	66.00	56.00	-19.81	-22.79
2	0.16564	9.83	36.13	21.20	45.96	31.03	65.18	55.18	-19.22	-24.15
3	0.22038	9.84	27.65	13.05	37.49	22.89	62.80	52.80	-25.31	-29.91
4	0.30615	9.86	23.38	9.78	33.24	19.64	60.07	50.07	-26.83	-30.43
5	0.47453	9.89	16.92	6.42	26.81	16.31	56.43	46.43	-29.63	-30.13
6	3.84495	10.12	23.58	13.27	33.70	23.39	56.00	46.00	-22.30	-22.61

#### 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

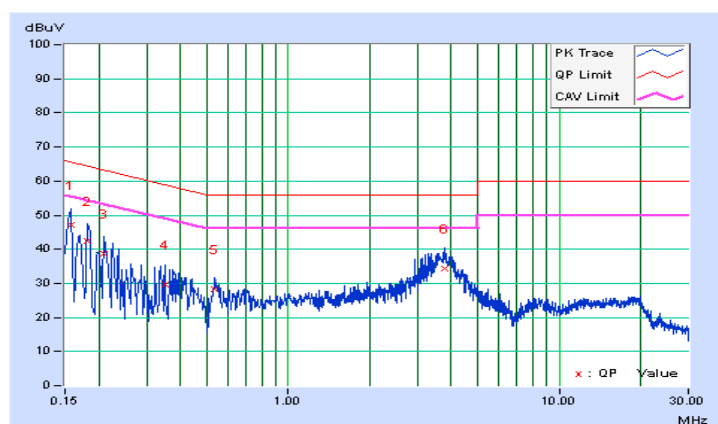


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2015/11/21

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15760	9.82	37.19	23.00	47.01	32.82	65.59	55.59	-18.58	-22.77
2	0.18128	9.83	32.49	17.51	42.32	27.34	64.43	54.43	-22.11	-27.09
3	0.20865	9.83	28.78	14.12	38.61	23.95	63.26	53.26	-24.65	-29.31
4	0.34941	9.87	19.79	6.80	29.66	16.67	58.98	48.98	-29.32	-32.31
5	0.53709	9.89	18.49	12.05	28.38	21.94	56.00	46.00	-27.62	-24.06
6	3.77848	10.11	24.24	14.52	34.35	24.63	56.00	46.00	-21.65	-21.37

#### 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



## 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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Fax: 886-2-26051924

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**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.

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