

## **FCC TEST REPORT**

**REPORT NO.:** RF150519C09B-6

MODEL NO.: Lenovo A2010-l

FCC ID: YCNA2010-L

**RECEIVED:** May 29, 2015

**TESTED:** Jun. 09, 2015 ~ Jun. 16, 2015

**ISSUED:** Jun. 18, 2015

**APPLICANT:** Lenovo Mobile Communication Technology Ltd.

ADDRESS: No.999, Qishan North 2nd Road, Information &

Optoelectronics Park, Torch Hi-tech Industry Development Zone, Xiamen, P.R.China

**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 (R.O.C)

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan

Dist., Taoyuan City 333, Taiwan, R.O.C.

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# **RELEASE CONTROL RECORD**

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF150519C09B-6	Original release	Jun. 18, 2015

Report No.: RF150519C09B-6 4 of 38 Report Format Version 5.1.0 Reference No.: 150529C25



## 1. CERTIFICATION

**PRODUCT:** Lenovo Mobile Phone

MODEL NO.: Lenovo A2010-I

**BRAND:** lenovo

APPLICANT: Lenovo Mobile Communication Technology Ltd.

**TESTED:** Jun. 09, 2015 ~ Jun. 16, 2015

**TEST SAMPLE:** Production Unit

STANDARDS: FCC Part 15, Subpart C (Section 15.247)

ANSI C63.10-2013

The above equipment (model: Lenovo A2010-I) 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. 18, 2015

Ivonne Wu / Supervisor

APPROVED BY : \_\_\_\_\_\_\_ , DATE : \_\_\_\_\_\_ Jun. 18, 2015

Kaý Wu / Supervisor



## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) (Bluetooth LE 4.0)						
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK			
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -10.66dB at 0.16139MHz.			
15.205 & 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -12.67dB at 2484.00MHz.			
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.			
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.			
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.			
15.247(b)	Conducted power	PASS	Meet the requirement of limit.			
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.			
15.203	Antenna Requirement	PASS	No antenna connector is used.			

## 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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
	30MHz ~ 200MHz	2.93 dB
Radiated emissions	200MHz ~1000MHz	2.95 dB
Radiated emissions	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.



## 3. GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

EUT	Lenovo Mobile Phone
MODEL NO.	Lenovo A2010-I
POWER SUPPLY	5.0Vdc (adapter or host equipment) 3.8Vdc (Li-ion battery)
MODULATION TYPE	GFSK
TRANSFER RATE	1Mbps
OPERATING FREQUENCY	2402 ~ 2480MHz
NUMBER OF CHANNEL	40
CHANNEL SPACING	2MHz
OUTPUT POWER	0.740mW
ANTENNA TYPE	PIFA antenna with 4.2dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	Refer to Note as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

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#### NOTE:

1. There're 2 configurations for the EUT listed as below.

Main sample (A): LCD Panel 1 + Front Camera 1 + Rear Camera 1 + eMMC 1

2<sup>nd</sup> sample (B): LCD Panel 2 + Front Camera 2 + Rear Camera 2 + eMMC 2

♦ Only the worst data was presented in the report.



2. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Adapter 1	lenovo	C-P56	I/P: 100-240Vac, 0.13A O/P: 5.0Vdc, 1.0A Manufacturer: chenyang
Adapter 2	lenovo	C-P56	I/P: 100-240Vac, 0.13A O/P: 5.0Vdc, 1.0A Manufacturer: Acbel
Battery	lenovo	BL253	3.8Vdc, 2000mAh Manufacturer: SUNWODA
Earphone 1	LIANYUN	TS990B-28AMS05-M TS990B-28AMS06-M	1.3m non-shielded cable w/o core
Earphone 2	TIANZHI	TJ101247A TJ-101406	1.3m non-shielded cable w/o core
USB Cable 1	LIQI	L16B-05100070L L16w-05100070L	0.7m shielded cable w/o core
USB Cable 2	FUKANGYUAN	F16B-05100070L F16w-05100070L	0.7m shielded cable w/o core
LCD Panel 1	TONGXINGDA	TXDT450SKP-73V6	
LCD Panel 2	Arising	ART45PI6031A-1	
Front Camera 1	HUAQUAN	G6P2-AL712HQ	
Front Camera 2	QUNHUI	GV5893A1D-0P0J0	
Rear Camera 1	HUAQUAN	H7B5-AL711BHQ	
Rear Camera 2	QUNHUI	OX5892B1S-0P0J0	
eMMC 1	Samsung	KMQ72000SM-B316	MCP_8GB-eMMC_8Gb-LPDDR3
eMMC 2	hynix	H9TQ64A8GTMCUR- KUM	MCP_8GB-eMMC_8Gb-LPDDR3
CPU	MediaTek	MT6735V/WM	641pin

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

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## 3.2 DESCRIPTION OF TEST MODES

## Bluetooth LE 4.0:

40 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

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#### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

#### **BLUETOOTH LE 4.0:**

EUT CONFIGURE		APPLICA	ABLE TO		DESCRIPTION
MODE	RE≥1G	RE<1G	PLC	APCM	DESCRIPTION
А	$\checkmark$	$\checkmark$	$\checkmark$	√	Main sample
В	√	√	-	-	Main sample

Where RE≥1G: Radiated Emission above 1GHz RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
А	0 to 39	0, 19, 39	GFSK	1.0
В	0 to 39	39	GFSK	1.0

#### RADIATED EMISSION TEST (BELOW 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
A, B	0 to 39	39	GFSK	1.0

#### POWER LINE CONDUCTED EMISSION TEST:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
A, B	0 to 39	39	GFSK	1.0

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## **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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
А	0 to 39	0, 19, 39	GFSK	1.0

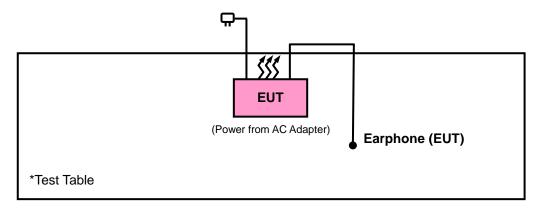
## **TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Charles Hsiao
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Charles Hsiao
PLC	25deg. C, 65%RH	120Vac, 60Hz	Toby Tian
АРСМ	25deg. C, 65%RH	120Vac, 60Hz	Howard Kao

## 3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units.

#### 3.3.1 CONFIGURATION OF SYSTEM UNDER TEST



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## 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)
ANSI C63.10-2013
558074 D01 DTS Meas Guidance v03r02
FCC Public Notice DA 00-705

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 (FOR BLUETOOTH LE 4.0)

#### 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.

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#### 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, 2014	Sep. 02, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
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	Aug. 13, 2014	Aug. 12, 2015
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
Power Meter Anritsu	ML2495A	1232002	Sep. 17, 2014	Sep. 16, 2015
Power Sensor Anritsu	MA2411B	1207325	Sep. 17, 2014	Sep. 16, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2014	Oct. 17, 2015
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Nov. 07, 2014	Nov. 06, 2015
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 HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 4. The FCC Site Registration No. is 690701.
- 5. The IC Site Registration No. is IC 7450F-10.



#### 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. Height of receiving 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### NOTE:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz 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

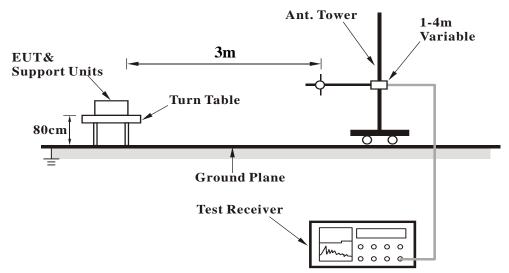
No deviation.

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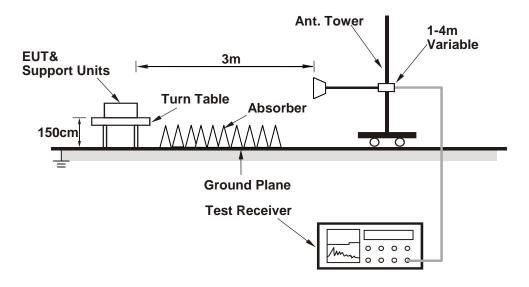


#### 4.1.5 TEST SETUP

## <Frequency Range 30MHz ~ 1GHz>



#### <Frequency Range above 1GHz>



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

## 4.1.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.



## 4.1.7 TEST RESULTS

## **ABOVE 1GHz WORST-CASE DATA**

## MODE A

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

	Α	NTENN	A POLAR	ITY & TE	ST DISTAI	NCE: HC	RIZONTA	AL 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
2338	40.64	39.09	54	-13.36	31.74	5.33	35.52	149	333	Average
2338	55.85	54.3	74	-18.15	31.74	5.33	35.52	149	333	Peak
2402	96.2	94.47			31.8	5.4	35.47	149	333	Average
2402	97.18	95.45			31.8	5.4	35.47	149	333	Peak
2486	41.27	39.28	54	-12.73	31.88	5.53	35.42	149	333	Average
2486	56.06	54.07	74	-17.94	31.88	5.53	35.42	149	333	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	/ERTICAL	. 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
2388	41	39.29	54	-13	31.8	5.4	35.49	100	278	Average
2388	55.42	53.71	74	-18.58	31.8	5.4	35.49	100	278	Peak
2402	91.98	90.25			31.8	5.4	35.47	100	278	Average
2402	92.92	91.19			31.8	5.4	35.47	100	278	Peak
2492	41.3	39.28	54	-12.7	31.9	5.53	35.41	100	278	Average
2492	55.96	53.94	74	-18.04	31.9	5.53	35.41	100	278	Peak

## **REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss Preamp Factor Margin value = Emission level – Limit value
- 2. 2402MHz: Fundamental frequency.



EUT TEST CONDITION		MEASUREMENT DETAIL			
CHANNEL	Channel 19	FREQUENCY RANGE	1GHz ~ 25GHz		
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)		
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao		

	A	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
2362	40.73	39.1	54	-13.27	31.76	5.37	35.5	101	333	Average
2362	55.25	53.62	74	-18.75	31.76	5.37	35.5	101	333	Peak
2440	97.51	95.66			31.85	5.46	35.46	101	333	Average
2440	98.47	96.62			31.85	5.46	35.46	101	333	Peak
2498	41.27	39.25	54	-12.73	31.9	5.53	35.41	101	333	Average
2498	55.24	53.22	74	-18.76	31.9	5.53	35.41	101	333	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	ERTICAL	. 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
2354										
2334	40.6	39.01	54	-13.4	31.76	5.33	35.5	100	248	Average
2354	40.6 56.37	39.01 54.78	54 74	-13.4 -17.63	31.76 31.76	5.33 5.33	35.5 35.5	100 100	248 248	Average Peak
										Ū
2354	56.37	54.78			31.76	5.33	35.5	100	248	Peak
2354 2440	56.37 92.71	54.78 90.86			31.76 31.85	5.33 5.46	35.5 35.46	100	248 248	Peak Average

## **REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss Preamp Factor Margin value = Emission level – Limit value
- 2. 2440MHz: Fundamental frequency.



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

	A	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
2374	40.65	38.99	54	-13.35	31.78	5.37	35.49	100	311	Average
2374	55.39	53.73	74	-18.61	31.78	5.37	35.49	100	311	Peak
2480	96.28	94.32			31.88	5.5	35.42	100	311	Average
2480	97.13	95.17			31.88	5.5	35.42	100	311	Peak
2484	41.33	39.37	54	-12.67	31.88	5.5	35.42	100	311	Average
2484	56.61	54.65	74	-17.39	31.88	5.5	35.42	100	311	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	/ERTICAL	. 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
2358	40.73	39.1	54	-13.27	31.76	5.37	35.5	225	330	Average
2358	56.52	54.89	74	-17.48	31.76	5.37	35.5	225	330	Peak
2480	91.48	89.52			31.88	5.5	35.42	225	330	Average
2480	92.39	90.43			31.88	5.5	35.42	225	330	Peak
2484	41.28	39.32	54	-12.72	31.88	5.5	35.42	225	330	Average

## **REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss Preamp Factor Margin value = Emission level – Limit value
- 2. 2480MHz: Fundamental frequency.



## MODE B

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

	Α	NTENN	A POLAR	ITY & TE	ST DISTAI	NCE: HC	RIZONTA	AL 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
2356	40.93	39.3	54	-13.07	31.76	5.37	35.5	100	328	Average
2356	56.31	54.68	74	-17.69	31.76	5.37	35.5	100	328	Peak
2480	96.35	94.39			31.88	5.5	35.42	100	328	Average
2480	97.33	95.37			31.88	5.5	35.42	100	328	Peak
2486	41.29	39.3	54	-12.71	31.88	5.53	35.42	100	328	Average
2486	55.87	53.88	74	-18.13	31.88	5.53	35.42	100	328	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	ERTICAL	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
2388	40.85	39.14	54	-13.15	31.8	5.4	35.49	182	102	Average
2388	55.18	53.47	74	-18.82	31.8	5.4	35.49	182	102	Peak
2480	91.88	89.92			31.88	5.5	35.42	182	102	Average
2480	92.8	90.84			31.88	5.5	35.42	182	102	Peak
2494	41.27	39.25	54	-12.73	31.9	5.53	35.41	182	102	Average
2494	55.82	53.8	74	-18.18	31.9	5.53	35.41	182	102	Peak

## **REMARKS:**

- Emission Level = Read Level + Antenna Factor + Cable Loss Preamp Factor Margin value = Emission level – Limit value
- 2. 2480MHz: Fundamental frequency.



## **BELOW 1GHz WORST-CASE DATA:**

## MODE A

<b>EUT TEST CONDITION</b>		MEASUREMENT DETAIL			
CHANNEL Channel 39		FREQUENCY RANGE	30MHz ~ 1GHz		
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Quasi-peak (QP)		
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao		

	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
103.17	14.23	32.85	43.5	-29.27	12.36	1.28	32.26	142	80	Peak
142.59	16.18	38.67	43.5	-27.32	8.4	1.38	32.27	159	142	Peak
254.37	18.13	35.9	46	-27.87	12.39	1.94	32.1	194	347	Peak
740.3	20.53	29.79	46	-25.47	19.71	3.16	32.13	174	103	Peak
860.7	23.03	30.16	46	-22.97	21.16	3.44	31.73	116	111	Peak
992.3	24.65	29.19	54	-29.35	22.15	3.72	30.41	199	230	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	ERTICAL	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
31.62	26.95	46.81	40	-13.05	11.66	0.74	32.26	162	131	Peak
102.36	15.94	34.56	43.5	-27.56	12.36	1.28	32.26	159	140	Peak
249.78	12.76	30.69	46	-33.24	12.32	1.85	32.1	123	183	Peak
697.6	20.66	30.44	46	-25.34	19.2	3.11	32.09	120	9	Peak
861.4	22.62	29.73	46	-23.38	21.17	3.44	31.72	133	340	Peak
963.6	25.13	30.5	54	-28.87	21.85	3.67	30.89	121	185	Peak

**REMARKS:** Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor Margin value = Emission level – Limit value

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## MODE B

<b>EUT TEST CONDITION</b>		MEASUREMENT DETAIL				
CHANNEL Channel 39		FREQUENCY RANGE	30MHz ~ 1GHz			
INPUT POWER (SYSTEM) 120Vac, 60 Hz			Peak (PK) Quasi-peak (QP)			
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao			

	Α	NTENN	A POLAR	ITY & TE	ST DISTAI	NCE: HC	RIZONTA	AL 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
102.9	14.17	32.79	43.5	-29.33	12.36	1.28	32.26	141	153	Peak
137.19	15.19	37.53	43.5	-28.31	8.54	1.38	32.26	137	351	Peak
246.27	18.5	36.53	46	-27.5	12.23	1.85	32.11	198	47	Peak
688.5	20.87	30.86	46	-25.13	19.06	3.05	32.1	120	135	Peak
752.9	21.36	30.44	46	-24.64	19.84	3.22	32.14	140	187	Peak
960.1	23.92	29.36	54	-30.08	21.83	3.67	30.94	192	239	Peak
		ANTEN	NA POLA	RITY & T	EST DIST	ANCE: V	ERTICAL	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
31.89	26.97	46.83	40	-13.03	11.66	0.74	32.26	131	289	Peak
102.63	14.21	32.83	43.5	-29.29	12.36	1.28	32.26	122	245	Peak
247.35	13.64	31.65	46	-32.36	12.25	1.85	32.11	147	158	Peak
662.6	19.83	30.32	46	-26.17	18.65	2.99	32.13	166	237	Peak
765.5	21.78	30.71	46	-24.22	19.97	3.22	32.12	199	275	Peak
959.4	24.39	29.85	46	-21.61	21.82	3.67	30.95	182	238	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 OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)			
	Quasi-peak	Average		
0.15 ~ 0.5	66 to 56	56 to 46		
0.5 ~ 5	56	46		
5 ~ 30	60	50		

**NOTE**: 1. The lower limit shall apply at the transition frequencies.

- 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
- 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 T EST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 02, 2015	Mar. 01, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

**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

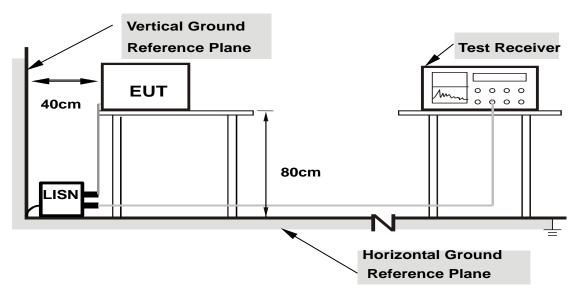
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit 20dB) 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 CONDITIONS

- a. Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

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## 4.2.7 TEST RESULTS

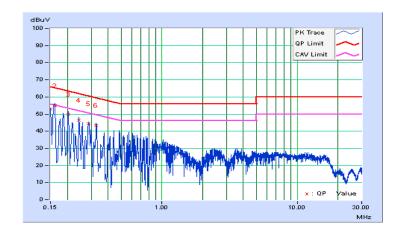
## **CONDUCTED WORST-CASE DATA:**

CONDUCTED WORKET CAGE DAWN							
Frequency Range	150kHz ~ 30MHz	IX. RECOILITION	Quasi-Peak (QP) / Average (AV), 9kHz				
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH				
Tested by	Toby Tian	Test Date	2015/6/9				

	Phase Of Power : Line (L)										
No	Frequency	Correction					rgin				
No	(MHz)	Factor (dB)	Q.P.	uV) AV.	Q.P.	uV) AV.	Q.P.	uV) AV.	Q.P.	B) AV.	
1	0.15000	0.05	52.89	36.46	52.94	36.51	66.00	56.00	-13.06	-19.49	
2	0.16139	0.05	54.68	41.44	54.73	41.49	65.39	55.39	-10.66	-13.90	
3	0.20458	0.06	49.69	35.90	49.75	35.96	63.42	53.42	-13.67	-17.46	
4	0.24384	0.06	46.36	32.60	46.42	32.66	61.96	51.96	-15.54	-19.30	
5	0.28685	0.06	44.29	31.68	44.35	31.74	60.62	50.62	-16.27	-18.88	
6	0.32614	0.06	43.52	33.11	43.58	33.17	59.55	49.55	-15.97	-16.38	

#### 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



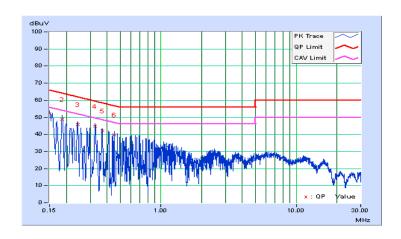


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Toby Tian	Test Date	2015/6/9

	Phase Of Power : Neutral (N)									
NI.	Frequency C			Reading Value		Emission Level		nit	Margin	
No		Factor	(aB	uV)	(aB	uV)	(aB	uV)	(a	B)
	(MHz)	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	52.24	36.60	52.29	36.65	66.00	56.00	-13.71	-19.35
2	0.18519	0.05	48.80	31.58	48.85	31.63	64.25	54.25	-15.40	-22.62
3	0.24343	0.05	45.72	30.67	45.77	30.72	61.98	51.98	-16.21	-21.26
4	0.32614	0.06	44.72	30.48	44.78	30.54	59.55	49.55	-14.77	-19.01
5	0.36816	0.06	41.92	29.58	41.98	29.64	58.54	48.54	-16.56	-18.90
6	0.45107	0.06	39.63	20.26	39.69	20.32	56.86	46.86	-17.16	-26.53

## Remarks:

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



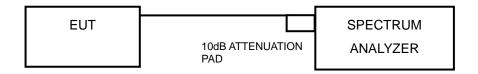


#### 4.3 6dB BANDWIDTH MEASUREMENT

#### 4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

#### 4.3.2 TEST SETUP



#### 4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 TEST PROCEDURE

- 1. Set resolution bandwidth (RBW) = approximately 1% of the emission bandwidth
- 2. Set the video bandwidth (VBW)  $\geq$  3 x RBW, Detector = Peak.
- 3. Trace mode = max hold.
- 4. Sweep = auto couple.
- 5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.6 EUT OPERATING CONDITIONS

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

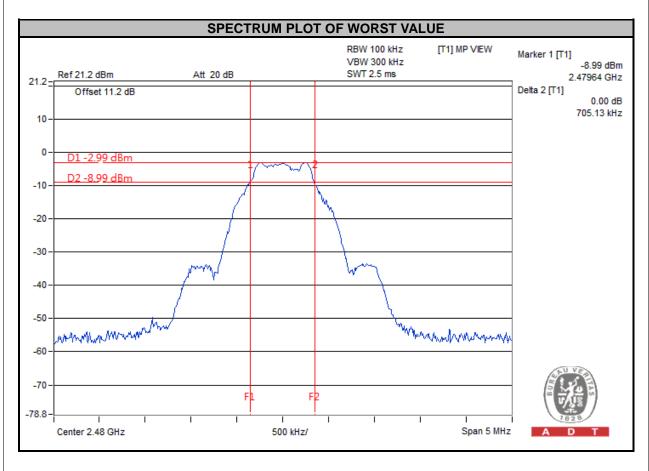
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## 4.3.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (KHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	695.83	0.5	PASS
19	2440	703.78	0.5	PASS
39	2480	705.13	0.5	PASS



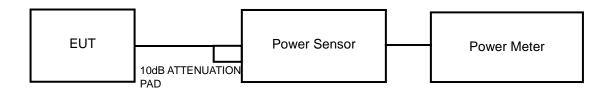


## 4.4 CONDUCTED OUTPUT POWER

## 4.4.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

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

#### 4.4.2 TEST SETUP



#### 4.4.3 INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

#### 4.4.4 TEST PROCEDURES

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

#### 4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.4.6 EUT OPERATING CONDITIONS

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

#### 4.4.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
0	2402	0.679	-1.68	30	PASS
19	2440	0.740	-1.31	30	PASS
39	2480	0.590	-2.29	30	PASS

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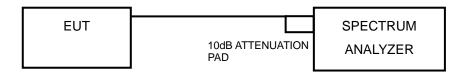


#### 4.5 POWER SPECTRAL DENSITY MEASUREMENT

#### 4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

#### 4.5.2 TEST SETUP



#### 4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

#### 4.5.4 TEST PROCEDURE.

- a. Set the RBW = 3 kHz, VBW =10 kHz, Detector = peak.
- b. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
- c. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### 4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.5.6 EUT OPERATING CONDITION

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

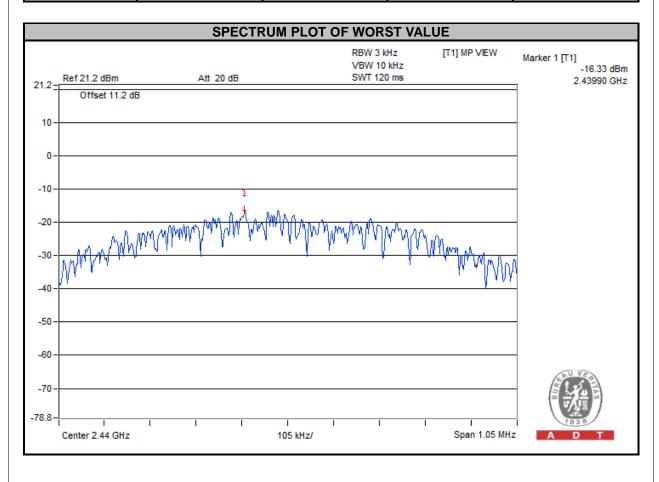
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#### 4.5.7 TEST RESULTS

Channel	FREQUENCY (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS / FAIL
0	2402	-16.71	8	PASS
19	2440	-16.33	8	PASS
39	2480	-17.32	8	PASS





#### 4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

#### 4.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

#### 4.6.2 TEST SETUP



#### 4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

#### 4.6.4 TEST PROCEDURE

#### MEASUREMENT PROCEDURE REF

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

## **MEASUREMENT PROCEDURE OOBE**

- 1. Set RBW = 100 kHz.
- 2. Set VBW ≥ 300 kHz.
- 3. Detector = peak.
- 4. Sweep = auto couple.
- 5. Trace Mode = max hold.
- 6. Allow trace to fully stabilize.
- 7. Use the peak marker function to determine the maximum amplitude level.

#### 4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

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## 4.6.6 EUT OPERATING CONDITION

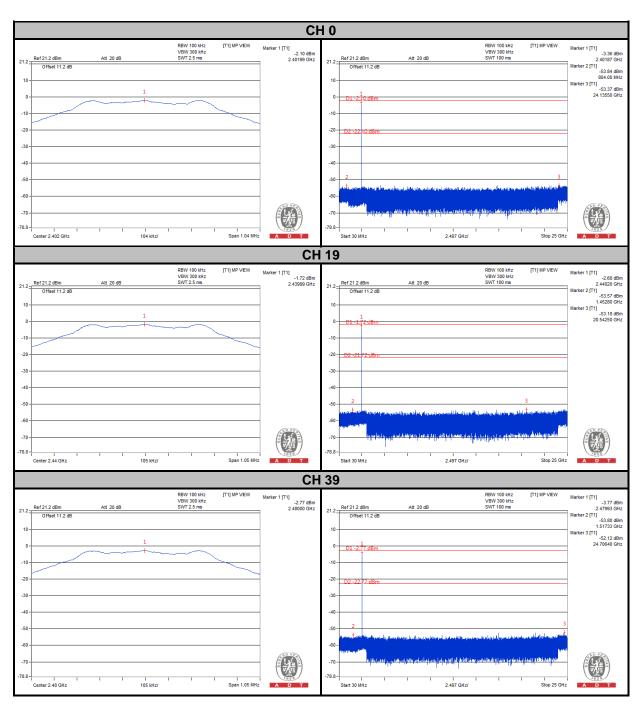
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

## 4.6.7 TEST RESULTS

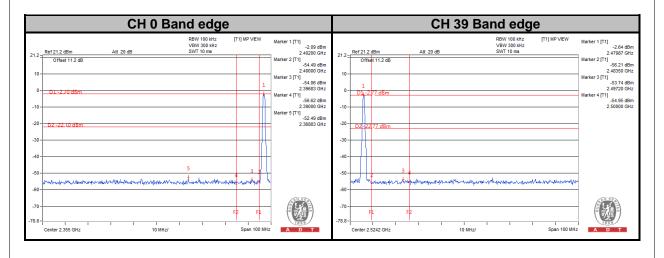
The spectrum	plots a	re attached	on the	following	images.	D1	line	indicates	the	highest	level,	and	D2
line indicates	the 20dE	3 offset belo	w D1. I	t shows co	omplianc	e wi	th th	e reauirer	nent				

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5. PHOTOGRAPHS OF THE TEST CONFIGURATION				
Please refer to the attached file (Test Setup Photo).				

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## 6. 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: Hsin Chu EMC/RF/Telecom Lab:

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

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# 7. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EU	IT by the lab during the test.
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