



# VARIANT FCC TEST REPORT (BLUETOOTH)

**REPORT NO.:** RF140331C10B  
**MODEL NO.:** K01A  
**FCC ID:** MSQK01A  
**RECEIVED:** Jul. 02, 2014  
**TESTED:** Jul. 12, 2014 ~ Jul. 15, 2014  
**ISSUED:** Jul. 18, 2014

**APPLICANT:** ASUSTek COMPUTER INC.

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

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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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# TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
RELEASE CONTROL RECORD.....	3
1. CERTIFICATION.....	4
2. SUMMARY OF TEST RESULTS.....	5
2.1 MEASUREMENT UNCERTAINTY.....	6
3. GENERAL INFORMATION.....	7
3.1 GENERAL DESCRIPTION OF EUT.....	7
3.2 DESCRIPTION OF TEST MODES.....	9
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	10
3.3 DESCRIPTION OF SUPPORT UNITS.....	12
3.3.1 CONFIGURATION OF SYSTEM UNDER TEST.....	12
3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS.....	12
4. TEST TYPES AND RESULTS (FOR BLUETOOTH EDR).....	13
4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	13
4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	13
4.1.2 TEST INSTRUMENTS.....	14
4.1.3 TEST PROCEDURES.....	15
4.1.4 DEVIATION FROM TEST STANDARD.....	15
4.1.5 TEST SETUP.....	16
4.1.6 EUT OPERATING CONDITIONS.....	16
4.1.7 TEST RESULTS.....	17
4.2 CONDUCTED EMISSION MEASUREMENT.....	20
4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	20
4.2.2 TEST INSTRUMENTS.....	20
4.2.3 TEST PROCEDURES.....	21
4.2.4 DEVIATION FROM TEST STANDARD.....	21
4.2.5 TEST SETUP.....	22
4.2.6 EUT OPERATING CONDITIONS.....	22
4.2.7 TEST RESULTS.....	23
5. TEST TYPES AND RESULTS (FOR BLUETOOTH LE 4.0).....	25
5.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	25
5.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	25
5.1.2 TEST INSTRUMENTS.....	25
5.1.3 TEST PROCEDURES.....	26
5.1.4 DEVIATION FROM TEST STANDARD.....	26
5.1.5 TEST SETUP.....	27
5.1.6 EUT OPERATING CONDITIONS.....	27
5.1.7 TEST RESULTS.....	28
5.2 CONDUCTED EMISSION MEASUREMENT.....	30
5.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	30
5.2.2 TEST INSTRUMENTS.....	30
5.2.3 TEST PROCEDURES.....	30
5.2.4 DEVIATION FROM TEST STANDARD.....	30
5.2.5 TEST SETUP.....	30
5.2.6 EUT OPERATING CONDITIONS.....	30
5.2.7 TEST RESULTS.....	31
6. PHOTOGRAPHS OF THE TEST CONFIGURATION.....	33
7. INFORMATION ON THE TESTING LABORATORIES.....	34
THE ADDRESS AND ROAD MAP OF ALL OUR LABS CAN BE FOUND IN OUR WEB SITE ALSO.	34
8. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	35



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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140331C10B	Original release	Jul. 18, 2014

## 1. CERTIFICATION

**PRODUCT:** ASUS Tablet  
**MODEL NO.:** K01A  
**BRAND:** ASUS  
**APPLICANT:** ASUSTek COMPUTER INC.  
**TESTED:** Jul. 12, 2014 ~ Jul. 15, 2014  
**TEST SAMPLE:** Production Unit  
**STANDARDS:** **FCC Part 15, Subpart C (Section 15.247)**  
ANSI C63.10-2009

This report is issued as a supplementary report to BV ADT report no.: RF140331C10B. This report shall be used by combining with its original report.

**PREPARED BY :** Evonne Liu , **DATE :** Jul. 18, 2014  
Evonne Liu / Specialist

**APPROVED BY :** Sam Chen , **DATE :** Jul. 18, 2014  
Sam Chen / Senior Project Engineer

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Bluetooth EDR)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.49dB at 0.45078MHz.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	NA	Refer to Note
15.247(a)(1) (iii)	Dwell Time on Each Channel	NA	Refer to Note
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	Refer to Note
15.247(b)	Maximum Peak Output Power	NA	Refer to Note
15.247(d)	Transmitter Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -9.05dB at 31.89MHz.
15.247(d)	Band Edge Measurement	NA	Refer to Note
15.203	Antenna Requirement	NA	Refer to Note

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 -8.30dB at 0.42734MHz.
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.65dB at 4960MHz.
15.247(d)	Band Edge Measurement	NA	Refer to Note
15.247(a)(2)	6dB bandwidth	NA	Refer to Note
15.247(b)	Conducted power	NA	Refer to Note
15.247(e)	Power Spectral Density	NA	Refer to Note
15.203	Antenna Requirement	NA	Refer to Note

**Note:** Only radiated emissions and conducted emission tests were performed for this addendum. Refer to original report for other test data.



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## 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
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	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  $k = 2$ .



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	ASUS Tablet	
<b>MODEL NO.</b>	K01A	
<b>POWER SUPPLY</b>	3.8Vdc (Battery) 5Vdc / 5.2Vdc (Adapter or host equipment)	
<b>MODULATION TYPE</b>	<b>Bluetooth EDR</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
	<b>Bluetooth LE 4.0</b>	GFSK
<b>TRANSFER RATE</b>	<b>Bluetooth EDR</b>	1/2/3Mbps
	<b>Bluetooth LE 4.0</b>	1Mbps
<b>OPERATING FREQUENCY</b>	2402 ~ 2480MHz	
<b>NUMBER OF CHANNEL</b>	<b>Bluetooth EDR</b>	79
	<b>Bluetooth LE 4.0</b>	40
<b>CHANNEL SPACING</b>	<b>Bluetooth EDR</b>	1MHz
	<b>Bluetooth LE 4.0</b>	2MHz
<b>ANTENNA TYPE</b>	PIFA antenna with 1.63dBi gain	
<b>ANTENNA CONNECTOR</b>	NA	
<b>DATA CABLE</b>	Refer to Note as below	
<b>I/O PORTS</b>	Refer to user's manual	
<b>ACCESSORY DEVICES</b>	Refer to Note as below	

**NOTE:**

1. This report is issued as a supplementary report to BV ADT report no.: RF140331C10. The difference compared with original report are adding 2nd LCD panel, Front Camera and Rear Camera. Therefore, only radiated emissions and conducted emission tests were performed in this report.



2. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Adapter 1	ASUS	PA-1070-07	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Adapter 2	ASUS	PSM06A-050Q	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Adapter 3	ASUS	AD2005320	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Adapter 4	ASUS	PSAC05A-050	I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 5Vdc, 1A
Battery	ASUS	B11P1405	3.8Vdc, 12.2Wh
USB Cable 1	ASUS	AA781000	0.9m cable
USB Cable 2	ASUS	L65U2009-CS-B	0.9m cable
Earphone 1	ASUS	CHM-801STS07001	1.15m cable
Earphone 2	ASUS	CHM-125STS02001	1.15m cable
eMMC 1	Hynix	H26M31003GMR	4G
eMMC 2	Sandisk	SDIN7DU2-8G	8G
LCD Panel 1	AUO	B070ATN02.0	--
LCD Panel 2	KDI	KD070D27-32NB-A16	--
Front Camera 1	Chicony	CIFD01820003870LH	--
Front Camera 2	Sunwin	SW6957270CXB-VA	--
Rear Camera 1	Ability	SS2BF218	--
Rear Camera 2	Sunwin	SW3157270CXA-VA	--
WLAN Module	BROADCOM	BCM43362	--
BT & GPS Module	BROADCOM	BCM2076	--

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.





### 3.2 DESCRIPTION OF TEST MODES

#### Bluetooth EDR:

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		

#### 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

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

#### BLUETOOTH EDR

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	
-	√	√		-

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

- NOTE:** 1. For Radiated emission test, pre-tested GFSK,  $\pi/4$ -DQPSK, 8DPSK modulation type and found 8DPSK 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 **Y-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	PACKET TYPE
-	0 to 78	0, 39, 78	8DPSK	DH5

#### 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	PACKET TYPE
-	0 to 78	78	8DPSK	DH5

#### POWER LINE CONDUCTED EMISSION TEST:

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
-	0 to 78	78	8DPSK	DH5

#### Test CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Will Chen
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Will Chen
PLC	25deg. C, 65%RH	120Vac, 60Hz	Anson Lin



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**BLUETOOTH LE 4.0:**

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE≥1G	RE<1G	PLC	
-	√	√	√	-

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

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-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)
-	0 to 39	0, 19, 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)
-	0 to 39	39	GFSK	1.0

**POWER LINE CONDUCTED EMISSION TEST:**

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

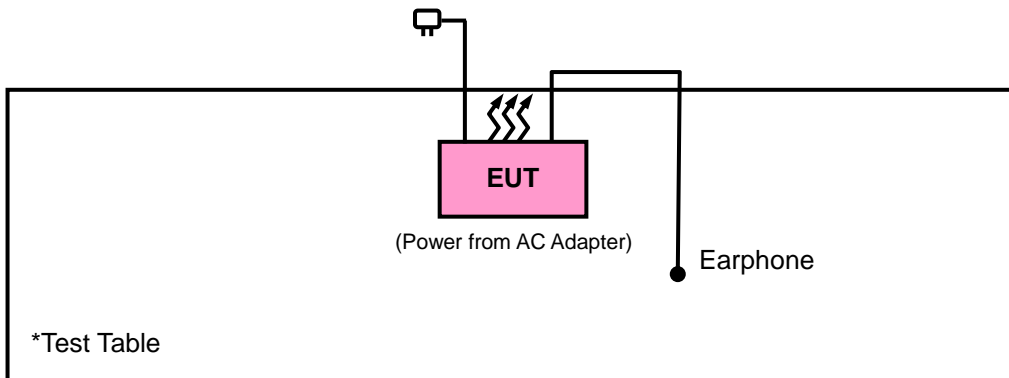
**Test CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Will Chen
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Will Chen
PLC	25deg. C, 65%RH	120Vac, 60Hz	Anson Lin

### 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



### 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 C63.10-2009**

**558074 D01 DTS Meas Guidance v03r01**

**FCC Public Notice DA 00-705**

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

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It 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 EDR)

### 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 ROHDE & SCHWARZ	ESCI	100744	Apr. 15, 2014	Apr. 14, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 21, 2013	Dec. 20, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 27, 2014	Feb. 26, 2015
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D- 209	Sep. 12, 2013	Sep. 11, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 18, 2013	Dec. 17, 2014
Preamplifier EMCI	EMC 012645	980115	Dec. 26, 2013	Dec. 25, 2014
Preamplifier EMCI	EMC 184045	980116	Jan. 13, 2014	Jan. 12, 2015
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2013	Dec. 26, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4	Oct. 18, 2013	Oct. 17, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2013	Oct. 17, 2014
RF signal cable Worken	RG-213	NA	Nov. 07, 2013	Nov. 06, 2014
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
Bluetooth Tester	CBT	100980	Jan. 02, 2014	Jan. 01, 2015
Power Meter	ML2495A	1232002	Aug. 23, 2013	Aug. 22, 2014
Power Sensor	MA2411B	1207325	Aug. 23, 2013	Aug. 22, 2014

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. The test was performed in HwaYa Chamber 10.
  4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  5. The FCC Site Registration No. is 690701.
  6. 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 above the ground at a 3 meters semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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:

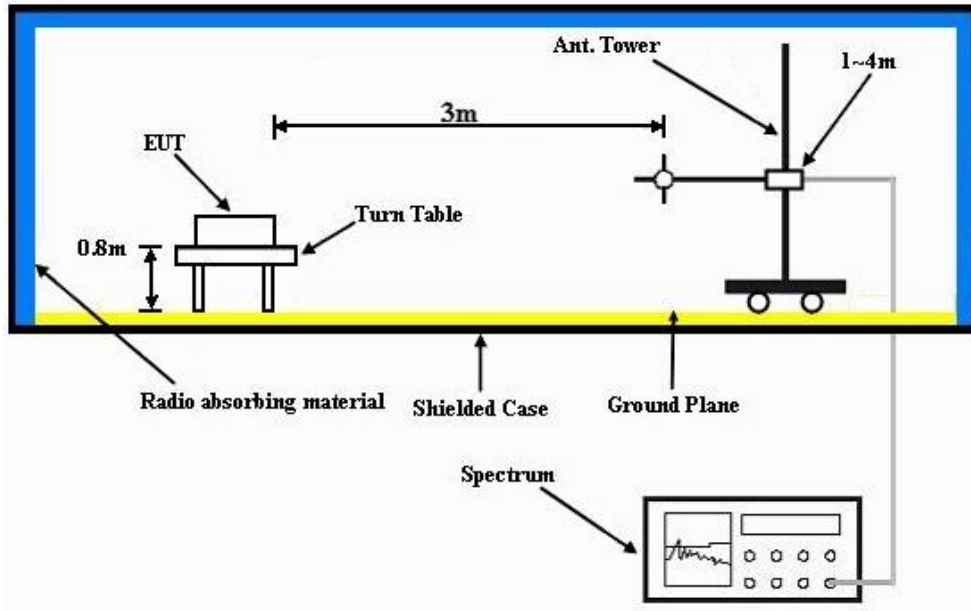
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection; resolution bandwidth is 1 MHz and video bandwidth is 10 Hz for Average detection (except fundamental, bandedge and harmonic frequency) at frequency above 1GHz.

#### 4.1.4 DEVIATION FROM TEST STANDARD

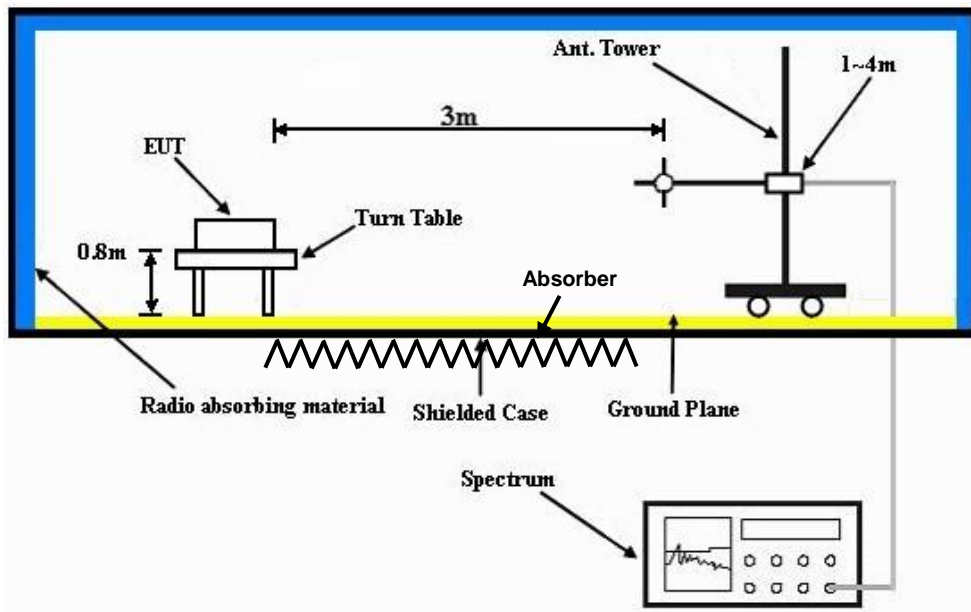
No deviation.

### 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.





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**4.1.7 TEST RESULTS**

**ABOVE 1GHz WORST-CASE DATA**

**8DPSK**

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

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
2480	86.18	84.22			31.88	5.5	35.42	145	352	Average
2480	110.88	108.92			31.88	5.5	35.42	145	352	Peak
2483.5	29.7	27.74	54	-24.3	31.88	5.5	35.42	145	352	Average
2483.5	54.4	52.44	74	-19.6	31.88	5.5	35.42	145	352	Peak
4960	38.69	30.42	54	-15.31	33.99	8.29	34.01	114	285	Average
4960	63.39	55.12	74	-10.61	33.99	8.29	34.01	114	285	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
2480	82.1	80.14			31.88	5.5	35.42	100	261	Average
2480	106.8	104.84			31.88	5.5	35.42	100	261	Peak
2483.5	29.57	27.61	54	-24.43	31.88	5.5	35.42	100	261	Average
2483.5	54.27	52.31	74	-19.73	31.88	5.5	35.42	100	261	Peak
4960	33.95	25.68	54	-20.05	33.99	8.29	34.01	177	278	Average
4960	58.65	50.38	74	-15.35	33.99	8.29	34.01	177	278	Peak

**REMARKS:**

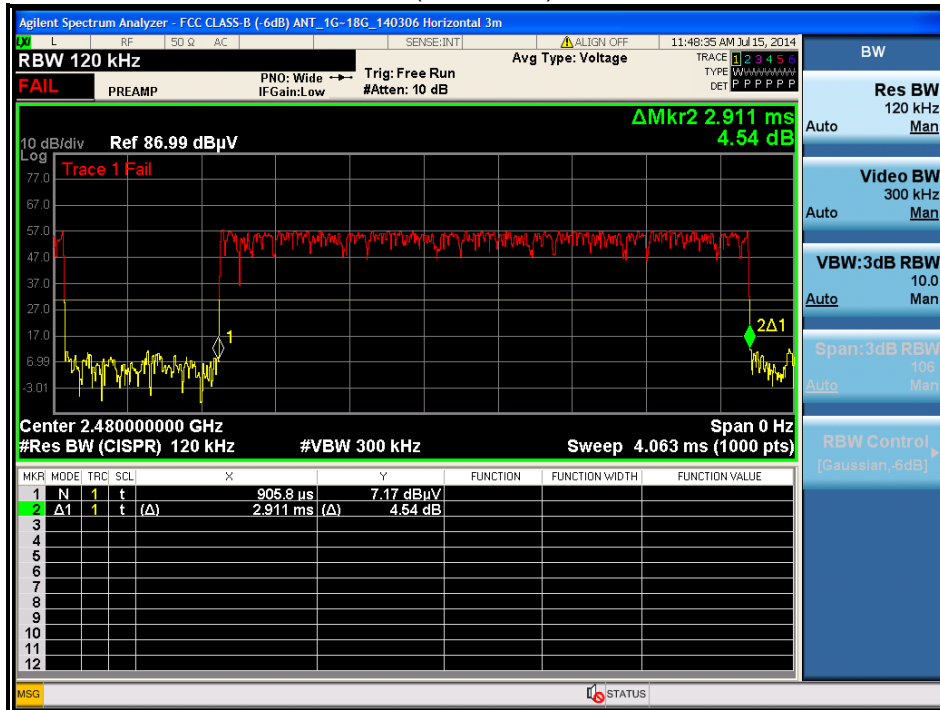
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2480MHz: Fundamental frequency.
- The average value of fundamental frequency is : Average = Peak value + 20log(duty cycle)  
Where the duty factor is calculated from following formula:  
 $20\log(\text{duty cycle}) = 20\log(0.058) = -24.73$ .  
Please see as below for plotted duty.



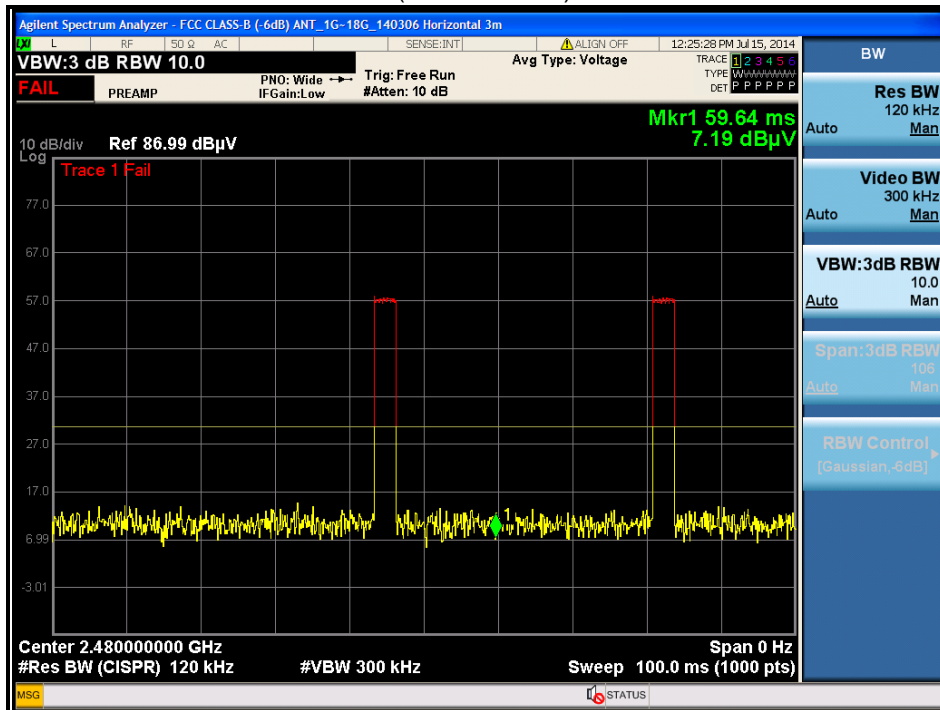
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### <Duty cycle correction factor>

DH5 on time/100ms (One Pulse) Plot on Channel 78



DH5 on time/100ms (Count Pulses) Plot on Channel 78



**Note:** Duty cycle = on time/100 milliseconds = 2 \* 2.911 / 100 = 5.8%

Duty cycle correction factor = 20 log (Duty cycle) = -24.70dB



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

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

**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
92.37	28.54	50.15	43.5	-14.96	9.1	1.11	31.82	159	37	Peak
152.85	29.31	49.73	43.5	-14.19	10.33	1.52	32.27	134	187	Peak
225.75	25.37	43.81	46	-20.63	11.9	1.85	32.19	108	112	Peak
526.1	24.38	33.17	46	-21.62	20.66	2.7	32.15	103	34	Peak
677.3	30.21	35.92	46	-15.79	23.36	3.05	32.12	197	226	Peak
752.2	29.34	35.06	46	-16.66	23.2	3.22	32.14	150	239	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
31.89	30.95	46.14	40	-9.05	16.33	0.74	32.26	188	201	Peak
62.13	30.15	54.4	40	-9.85	7.08	0.9	32.23	117	156	Peak
89.13	25.15	46.95	43.5	-18.35	8.85	1.11	31.76	107	55	Peak
451.2	22.22	33.87	46	-23.78	18	2.49	32.14	142	173	Peak
601	27.78	36	46	-18.22	21.1	2.87	32.19	158	93	Peak
918.1	29.73	31.58	46	-16.27	25.96	3.53	31.34	100	335	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 (dB $\mu$ V)	
	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.
  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	ESCS30	100288	Nov. 17, 2013	Nov. 16, 2014
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 27, 2013	Dec. 26, 2014
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 23, 2013	Dec. 22, 2014
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 08, 2013	Jul. 07, 2014
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 2.
  3. The VCCI Site Registration No. is C-2047.

#### 4.2.3 TEST PROCEDURES

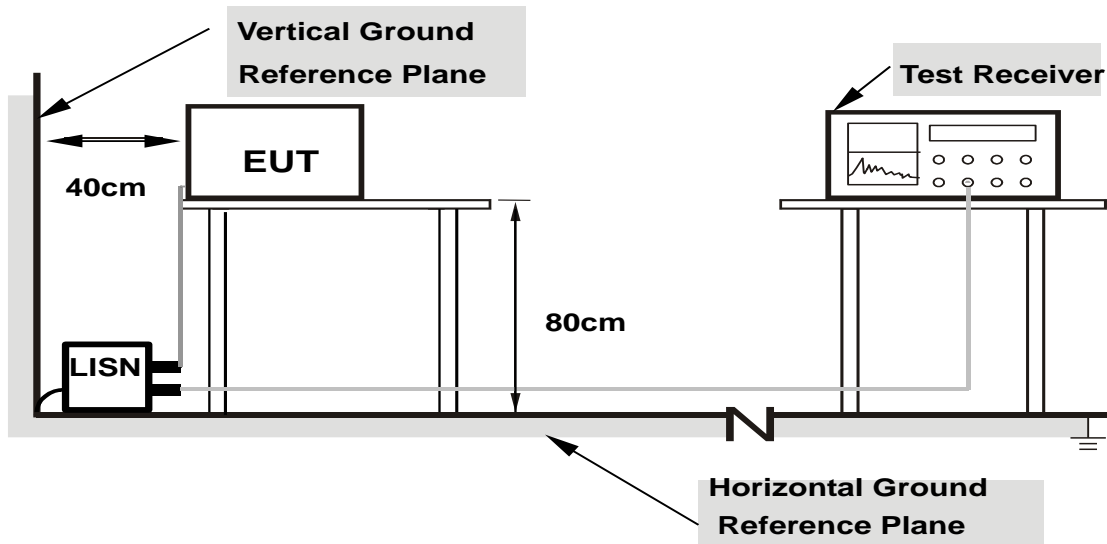
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

Same as section 4.1.6.

**4.2.7 TEST RESULTS**

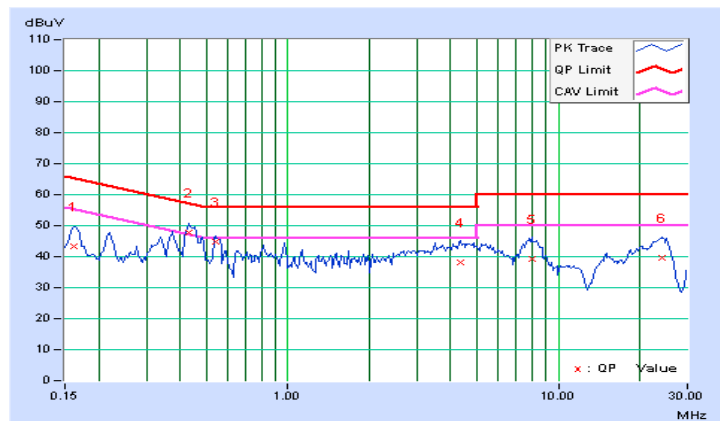
**CONDUCTED WORST-CASE DATA :**

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 9kHz Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH

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	0.16172	0.27	42.98	32.36	43.25	32.63	65.38	55.38	-22.13	-22.75
2	0.43125	0.30	47.62	36.91	47.92	37.21	57.23	47.23	-9.31	-10.02
3	0.54063	0.31	44.63	33.98	44.94	34.29	56.00	46.00	-11.06	-11.71
4	4.36328	0.43	37.59	31.32	38.02	31.75	56.00	46.00	-17.98	-14.25
5	8.00000	0.48	38.70	31.28	39.18	31.76	60.00	50.00	-20.82	-18.24
6	24.32031	0.54	38.98	30.94	39.52	31.48	60.00	50.00	-20.48	-18.52

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





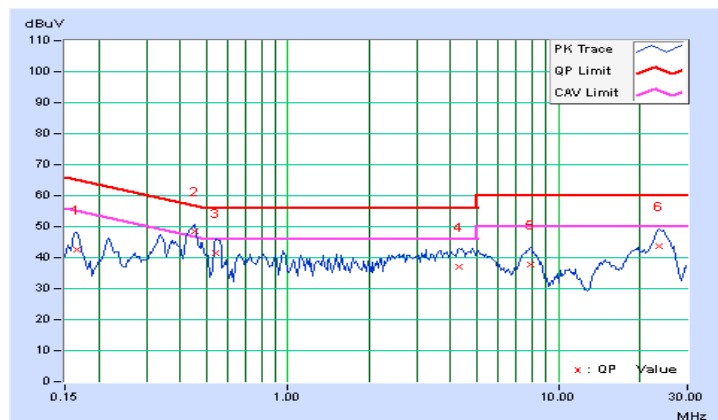
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Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 9kHz Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH

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	0.16562	0.27	42.16	32.80	42.43	33.07	65.18	55.18	-22.75	-22.11
<b>2</b>	<b>0.45078</b>	<b>0.30</b>	<b>48.28</b>	<b>40.07</b>	<b>48.58</b>	<b>40.37</b>	<b>56.86</b>	<b>46.86</b>	<b>-8.28</b>	<b>-6.49</b>
3	0.54453	0.31	41.00	30.01	41.31	30.32	56.00	46.00	-14.69	-15.68
4	4.28516	0.44	36.55	29.07	36.99	29.51	56.00	46.00	-19.01	-16.49
5	7.85547	0.49	37.13	29.43	37.62	29.92	60.00	50.00	-22.38	-20.08
6	23.57031	0.59	43.03	32.90	43.62	33.49	60.00	50.00	-16.38	-16.51

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. TEST TYPES AND RESULTS (FOR BLUETOOTH LE 4.0)

### 5.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

#### 5.1.1 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.

#### 5.1.2 TEST INSTRUMENTS

Same as section 4.1.2.

### 5.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. 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.

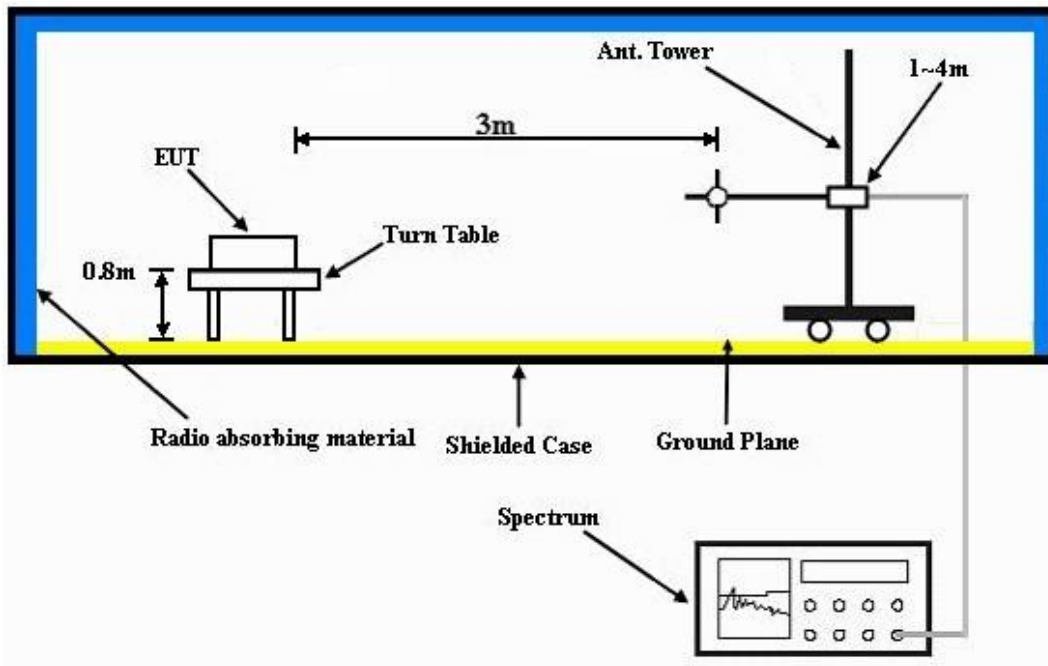
#### NOTE:

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.

### 5.1.4 DEVIATION FROM TEST STANDARD

No deviation.

### 5.1.5 TEST SETUP



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

### 5.1.6 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.



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**5.1.7 TEST RESULTS**

**ABOVE 1GHz WORST-CASE DATA**

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	Will Chen

**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
2350	41.13	39.56	54	-12.87	31.74	5.33	35.5	175	298	Average
2350	55.73	54.16	74	-18.27	31.74	5.33	35.5	175	298	Peak
2480	103.68	101.72			31.88	5.5	35.42	175	298	Average
2480	104.83	102.87			31.88	5.5	35.42	175	298	Peak
2484	42.46	40.5	54	-11.54	31.88	5.5	35.42	175	298	Average
2484	56.79	54.83	74	-17.21	31.88	5.5	35.42	175	298	Peak
4960	52.35	44.08	54	-1.65	33.99	8.29	34.01	100	286	Average
4960	57.15	48.88	74	-16.85	33.99	8.29	34.01	100	286	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
2390	41.37	39.64	54	-12.63	31.8	5.4	35.47	147	264	Average
2390	55.98	54.25	74	-18.02	31.8	5.4	35.47	147	264	Peak
2480	100.38	98.42			31.88	5.5	35.42	147	264	Average
2480	101.45	99.49			31.88	5.5	35.42	147	264	Peak
2496	41.72	39.7	54	-12.28	31.9	5.53	35.41	147	264	Average
2496	56.45	54.43	74	-17.55	31.9	5.53	35.41	147	264	Peak
4960	48.51	40.24	54	-5.49	33.99	8.29	34.01	112	278	Average
4960	51.73	43.46	74	-22.27	33.99	8.29	34.01	112	278	Peak

**REMARKS:**

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



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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

**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
91.29	28.33	49.97	43.5	-15.17	9.02	1.11	31.77	111	130	Peak
153.93	29.01	49.37	43.5	-14.49	10.39	1.52	32.27	105	173	Peak
225.75	24.76	43.2	46	-21.24	11.9	1.85	32.19	197	116	Peak
451.2	22.98	34.63	46	-23.02	18	2.49	32.14	105	102	Peak
601	28.86	37.08	46	-17.14	21.1	2.87	32.19	166	287	Peak
677.3	31.7	37.41	46	-14.3	23.36	3.05	32.12	132	227	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
30.81	29.34	43.67	40	-10.66	17.19	0.74	32.26	189	311	Peak
62.67	30.1	54.26	40	-9.9	7.17	0.9	32.23	107	85	Peak
90.48	25.49	47.15	43.5	-18.01	8.94	1.11	31.71	114	167	Peak
451.2	22.87	34.52	46	-23.13	18	2.49	32.14	100	337	Peak
601	27.16	35.38	46	-18.84	21.1	2.87	32.19	107	46	Peak
976.2	29.4	30.61	54	-24.6	25.8	3.67	30.68	154	178	Peak

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

Margin value = Emission level – Limit value



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## **5.2 CONDUCTED EMISSION MEASUREMENT**

### **5.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT**

Same as section 4.2.1.

### **5.2.2 TEST INSTRUMENTS**

Same as section 4.2.2.

### **5.2.3 TEST PROCEDURES**

Same as section 4.2.3.

### **5.2.4 DEVIATION FROM TEST STANDARD**

No deviation.

### **5.2.5 TEST SETUP**

Same as section 4.2.5.

### **5.2.6 EUT OPERATING CONDITIONS**

Same as section 4.1.6.

### 5.2.7 TEST RESULTS

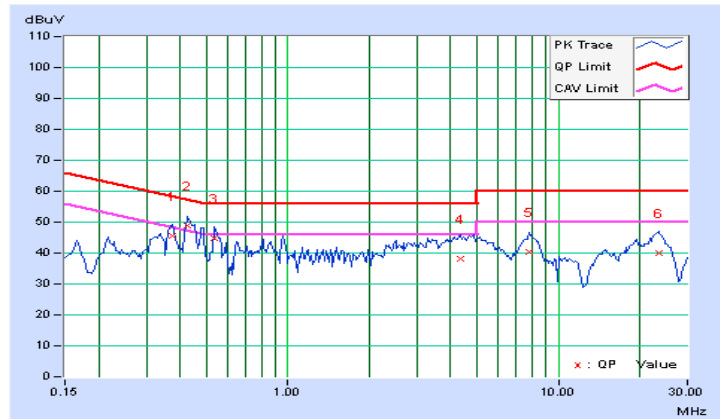
#### CONDUCTED WORST-CASE DATA :

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 9kHz Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH

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	0.37266	0.30	45.12	32.74	45.42	33.04	58.44	48.44	-13.02	-15.40
<b>2</b>	<b>0.42734</b>	<b>0.30</b>	<b>48.70</b>	<b>36.67</b>	<b>49.00</b>	<b>36.97</b>	<b>57.30</b>	<b>47.30</b>	<b>-8.30</b>	<b>-10.33</b>
3	0.53281	0.31	44.42	30.95	44.73	31.26	56.00	46.00	-11.27	-14.74
4	4.32813	0.43	37.85	31.14	38.28	31.57	56.00	46.00	-17.72	-14.43
5	7.75781	0.47	39.94	32.05	40.41	32.52	60.00	50.00	-19.59	-17.48
6	23.51563	0.55	39.39	31.20	39.94	31.75	60.00	50.00	-20.06	-18.25

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





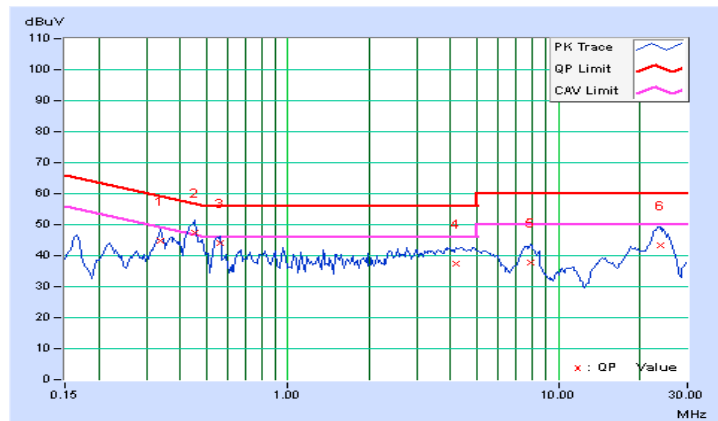
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Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 9kHz Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH

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	0.33750	0.29	44.35	35.44	44.64	35.73	59.26	49.26	-14.62	-13.53
2	0.45469	0.30	47.20	35.96	47.50	36.26	56.79	46.79	-9.29	-10.53
3	0.56016	0.31	43.66	35.73	43.97	36.04	56.00	46.00	-12.03	-9.96
4	4.17969	0.44	36.88	29.17	37.32	29.61	56.00	46.00	-18.68	-16.39
5	7.90234	0.49	37.16	29.54	37.65	30.03	60.00	50.00	-22.35	-19.97
6	23.74219	0.58	42.70	32.81	43.28	33.39	60.00	50.00	-16.72	-16.61

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







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## 6. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 7. 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 Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**

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

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

---END---