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PARTIAL FCC TEST REPORT

(15.247_BLUETOOTH)

REPORT NO.: RF140707C54-4

MODEL NO.: UTX-3115XXXXXXXXXXXXXXXXXXXX,
UTX3115XXXXXXXXXXXXXXXXXXXX
("X" can be 0-9 or A-Z or blank or any
alphanumeric character)

FCC ID: M82-UTX-3115

RECEIVED: Jun. 18, 2014

TESTED: Jul. 16 ~ Jul. 25, 2014

ISSUED: Jul. 29, 2014

APPLICANT: ADVANTECH CO., LTD

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District, Taipei, Taiwan 114

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

LAB ADDRESS: No. 47, 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 Tsuen, Kwei
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140707C54-4	Original release.	Jul. 29, 2014

1. CERTIFICATION

PRODUCT: COMPUTER

MODEL NO.: UTX-3115XXXXXXXXXXXXXXXXXX,
UTX3115XXXXXXXXXXXXXXXXXX ("X" can be 0-9 or A-Z or blank or
any alphanumeric character)

BRAND: Advantech

APPLICANT: ADVANTECH CO., LTD

TESTED: Jul. 16 ~ Jul. 25, 2014

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10-2009

The above equipment (model: UTX-3115) 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 : Celine Chou , **DATE :** Jul. 29, 2014
Celine Chou / Specialist

APPROVED BY : Ken Liu , **DATE :** Jul. 29, 2014
Ken Liu / Senior Manager

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -15.97dB at 26.99997MHz.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	NA	Refer to NOTE below.
15.247(a)(1) (iii)	Dwell Time on Each Channel	NA	Refer to NOTE below.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	Refer to NOTE below.
15.247(b)	Maximum Peak Output Power	NA	Refer to NOTE below.
15.205 & 209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -3.5dB at 2322.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -16.6dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Refer to NOTE below.
15.203	Antenna Requirement	PASS	Antenna connector is SMA (M) not a standard connector.

NOTE: Test items for conducted and radiated emission test were performed for this report. Other testing data please refer to module (Brand: Intel, Model: 7260HMW, FCC ID: PD97260H) Report.

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 emission	150kHz ~ 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.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	COMPUTER
MODEL NO.	UTX-3115XXXXXXXXXXXXXXXXXX, UTX3115XXXXXXXXXXXXXXXXXX ("X" can be 0-9 or A-Z or blank or any alphanumeric character)
POWER SUPPLY	12Vdc from Adapter
MODULATION TYPE	GFSK, $\pi/4$ -DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
TRANSFER RATE	1/2/3Mbps
OPERATING FREQUENCY	2402 ~ 2480MHz
NUMBER OF CHANNEL	79
ANTENNA TYPE	Dipole antenna with 2.98dBi gain
ANTENNA CONNECTOR	SMA (M)
I/O PORTS	Refer to users' manual
DATA CABLE	N/A
ACCESSORY DEVICES	Refer to note

NOTE:

1. All models are listed as below.

Brand	Model	Difference
ADVANTECH	UTX-3115XXXXXXXXXXXXXXXXXX	"X" can be 0-9 or A-Z or blank or any alphanumeric character
	UTX3115XXXXXXXXXXXXXXXXXX	

* Model UTX-3115 was chosen for final test.

2. The EUT uses the following components.

Part	Specification	Vendor	Model
Main board	-	Advantech	AIMB-115
Memory	DDR3L 4GB	Apacer	PC3-1066 CL9
SSD	32GB	Plextor	PX-32G5Le-72
CPU	1.4GHz	Intel	ATOM E3826
3G Module	-	Telit	HE910
Wi-Fi Module	-	Intel	7260HMW
Adapter	I/P: 100-240Vac, 50-60Hz, 1.5A O/P: 12Vdc, 3A DC: 1.5m cable with one core attached on adapter AC: 1.8m shielded cable without core	FSP	FSP036-RAB

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 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 **X-plane**.

RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ 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
-	0 to 78	0, 39, 78	FHSS	8DPSK	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, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ 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	FHSS	GFSK	DH5

POWER LINE CONDUCTED EMISSION:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ 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	FHSS	GFSK	DH5



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BANDEDGE MEASUREMENT:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ 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, 78	FHSS	GFSK	DH5
-	0 to 78	0, 78	FHSS	8DPSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	24deg. C, 68%RH	120Vac, 60Hz	Jones Chang
RE $<$ 1G	24deg. C, 68%RH	120Vac, 60Hz	Jones Chang
PLC	25deg. C, 70%RH	120Vac, 60Hz	Jones Chang

3.3 DESCRIPTION OF SUPPORT UNITS

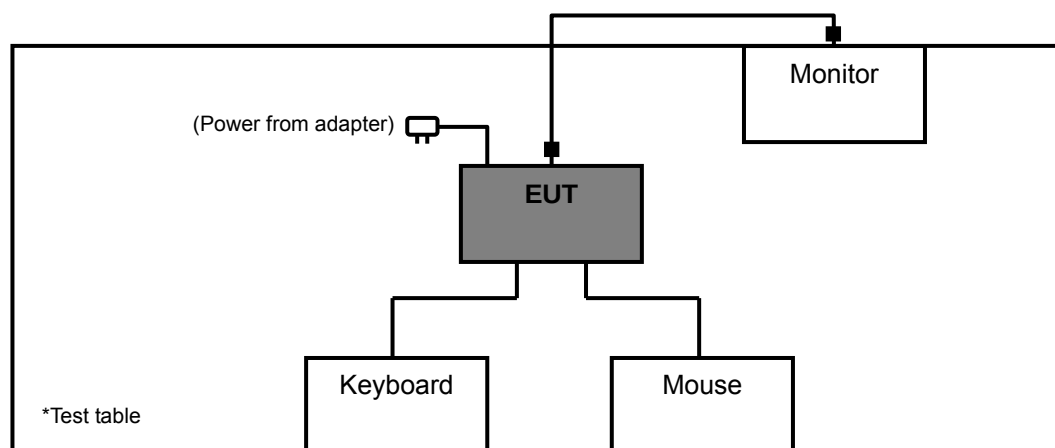
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	LCD Monitor	Samsung	173v	N/A	FCC DoC Approved
2	USB Mouse	DELL	MS-111T	CN-0KW2YH-71616-28H-0L30	N/A
3	USB Keyboard	WINTEK	WM700	20110700000	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8m D-sub Cable with two cores
2	1.8m USB Cable
3	1.8m USB Cable

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

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 C63.10-2009

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

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 29, 2013	Nov. 28, 2014
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Feb. 11, 2014	Feb. 10, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Feb. 25, 2014	Feb. 24, 2015
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-209	Sep. 12, 2013	Sep. 11, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 17, 2014	Feb. 16, 2015
Preamplifier Agilent	8449B	3008A01911	Aug. 22, 2013	Aug. 21, 2014
Preamplifier Agilent	8447D	2944A10638	Oct. 18, 2013	Oct. 17, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	248780/4 309222/4 274092/4	Aug. 26, 2013	Aug. 25, 2014
RF signal cable Worken	5D-FB	Cable-HYCH9-01	Aug. 11, 2013	Aug. 10, 2014
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	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 9.
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 215374.
5. The IC Site Registration No. is IC 7450F-9.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter 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:

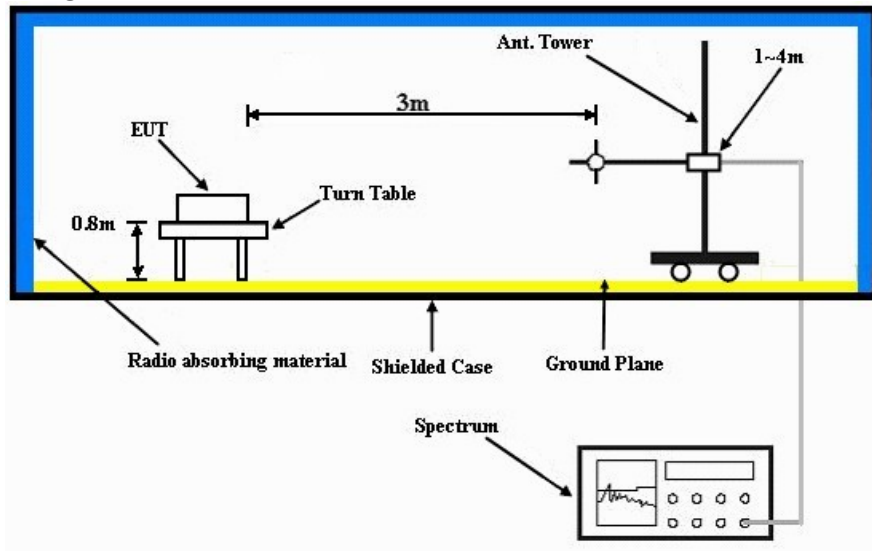
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

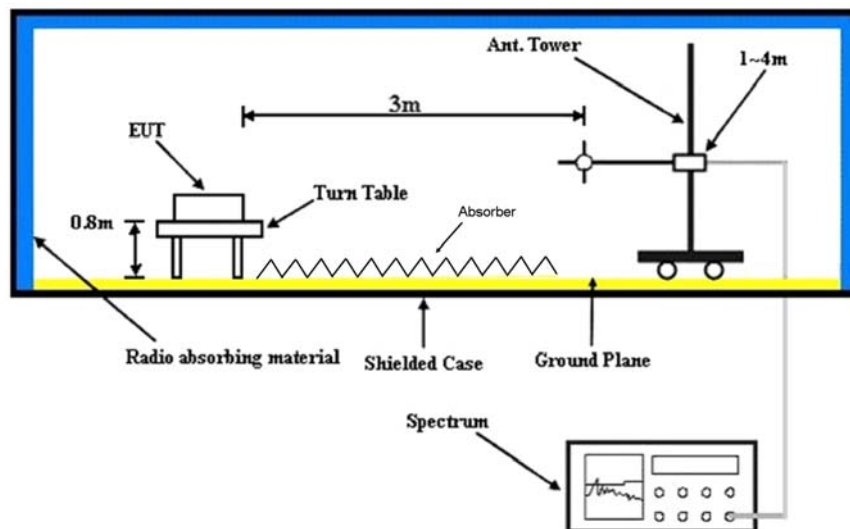
No deviation.

4.1.5 TEST SETUP

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

- Placed the EUT on the testing table.
- The EUT ran a test program (provided by manufacturer) to enable itself under transmission condition continuously at specific channel frequency.



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4.1.7 TEST RESULTS

ABOVE 1GHz DATA :

GFSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2322.00	46.3 PK	74.0	-27.7	1.14 H	142	49.00	-2.70
2	2322.00	43.7 AV	54.0	-10.3	1.14 H	142	46.40	-2.70
3	#2400.00	47.4 PK	76.5	-29.1	1.06 H	131	49.80	-2.40
4	#2400.00	17.3 AV	46.4	-29.1	1.06 H	131	19.70	-2.40
5	*2402.00	96.5 PK			1.06 H	131	65.50	31.00
6	*2402.00	66.4 AV			1.06 H	131	35.40	31.00
7	4804.00	47.4 PK	74.0	-26.6	1.10 H	222	42.50	4.90
8	4804.00	17.3 AV	54.0	-36.7	1.10 H	222	12.40	4.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2322.00	52.0 PK	74.0	-22.0	1.33 V	296	54.70	-2.70
2	2322.00	50.5 AV	54.0	-3.5	1.33 V	296	53.20	-2.70
3	#2400.00	55.0 PK	84.1	-29.1	1.35 V	283	57.40	-2.40
4	#2400.00	24.9 AV	54.0	-29.1	1.35 V	283	27.30	-2.40
5	*2402.00	104.1 PK			1.35 V	283	73.10	31.00
6	*2402.00	74.0 AV			1.35 V	283	43.00	31.00
7	4804.00	48.2 PK	74.0	-25.8	1.16 V	102	43.30	4.90
8	4804.00	18.1 AV	54.0	-35.9	1.16 V	102	13.20	4.90

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB
7. Average value = peak reading + $20\log(\text{duty cycle})$
8. "#": The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.00	47.2 PK	74.0	-26.8	1.11 H	134	49.70	-2.50
2	2360.00	44.4 AV	54.0	-9.6	1.11 H	134	46.90	-2.50
3	*2441.00	96.5 PK			1.04 H	133	65.30	31.20
4	*2441.00	66.4 AV			1.04 H	133	35.20	31.20
5	4882.00	48.4 PK	74.0	-25.6	1.11 H	234	43.30	5.10
6	4882.00	18.3 AV	54.0	-35.7	1.11 H	234	13.20	5.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.00	52.4 PK	74.0	-21.6	1.39 V	292	54.90	-2.50
2	2360.00	50.4 AV	54.0	-3.6	1.39 V	292	52.90	-2.50
3	*2441.00	106.5 PK			1.35 V	282	75.30	31.20
4	*2441.00	76.4 AV			1.35 V	282	45.20	31.20
5	4882.00	48.6 PK	74.0	-25.4	1.19 V	304	43.50	5.10
6	4882.00	18.5 AV	54.0	-35.5	1.00 V	304	13.40	5.10

REMARKS:

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



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2380.00	39.8 PK	74.0	-34.2	1.09 H	138	42.20	-2.40
2	2380.00	37.4 AV	54.0	-16.6	1.09 H	138	39.80	-2.40
3	*2480.00	96.3 PK			1.05 H	207	65.00	31.30
4	*2480.00	66.2 AV			1.05 H	207	34.90	31.30
5	2483.50	46.2 PK	74.0	-27.8	1.05 H	257	48.20	-2.00
6	2483.50	16.1 AV	54.0	-37.9	1.05 H	257	18.10	-2.00
7	4960.00	48.1 PK	74.0	-25.9	1.18 H	180	42.70	5.40
8	4960.00	18.0 AV	54.0	-36.0	1.18 H	180	12.60	5.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2380.00	41.1 PK	74.0	-32.9	1.20 V	40	43.50	-2.40
2	2380.00	34.5 AV	54.0	-19.5	1.20 V	40	36.90	-2.40
3	*2480.00	105.9 PK			1.16 V	179	74.60	31.30
4	*2480.00	74.8 AV			1.16 V	179	43.50	31.30
5	2483.50	55.8 PK	74.0	-18.2	1.16 V	179	57.80	-2.00
6	2483.50	25.7 AV	54.0	-28.3	1.16 V	179	27.70	-2.00
7	4960.00	48.6 PK	74.0	-25.4	1.25 V	150	43.20	5.40
8	4960.00	18.5 AV	54.0	-35.5	1.25 V	150	13.10	5.40

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$



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8DPSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2322.00	45.3 PK	74.0	-28.7	1.41 H	133	48.00	-2.70
2	2322.00	37.8 AV	54.0	-16.2	1.41 H	133	40.50	-2.70
3	#2400.00	39.7 PK	69.2	-29.5	1.09 H	132	42.10	-2.40
4	#2400.00	9.6 AV	39.1	-29.5	1.09 H	132	12.00	-2.40
5	*2402.00	89.2 PK			1.09 H	132	58.20	31.00
6	*2402.00	59.1 AV			1.09 H	132	28.10	31.00
7	4804.00	47.6 PK	74.0	-26.4	1.31 H	289	42.70	4.90
8	4804.00	17.5 AV	54.0	-36.5	1.31 H	289	12.60	4.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2322.00	48.5 PK	74.0	-25.5	1.20 V	142	51.20	-2.70
2	2322.00	43.5 AV	54.0	-10.5	1.20 V	142	46.20	-2.70
3	#2400.00	47.0 PK	76.5	-29.5	1.20 V	141	49.40	-2.40
4	#2400.00	16.9 AV	46.4	-29.5	1.20 V	141	19.30	-2.40
5	*2402.00	96.5 PK			1.19 V	141	65.50	31.00
6	*2402.00	66.4 AV			1.19 V	141	35.40	31.00
7	4804.00	48.0 PK	74.0	-26.0	1.25 V	219	43.10	4.90
8	4804.00	17.9 AV	54.0	-36.1	1.25 V	219	13.00	4.90

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- "*": Fundamental frequency.
- The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB
- Average value = peak reading + $20\log(\text{duty cycle})$
- "#": The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.00	45.6 PK	74.0	-28.4	1.08 H	139	48.10	-2.50
2	2360.00	38.4 AV	54.0	-15.6	1.08 H	139	40.90	-2.50
3	*2441.00	91.0 PK			1.28 H	317	59.80	31.20
4	*2441.00	60.9 AV			1.28 H	317	29.70	31.20
5	4882.00	47.9 PK	74.0	-26.1	1.30 H	256	42.80	5.10
6	4882.00	17.8 AV	54.0	-36.2	1.30 H	256	12.70	5.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.00	49.1 PK	74.0	-24.9	1.37 V	293	51.60	-2.50
2	2360.00	44.5 AV	54.0	-9.5	1.37 V	293	47.00	-2.50
3	*2441.00	99.9 PK			1.37 V	283	68.70	31.20
4	*2441.00	69.8 AV			1.37 V	283	38.60	31.20
5	4882.00	48.3 PK	74.0	-25.7	1.19 V	185	43.20	5.10
6	4882.00	18.2 AV	54.0	-35.8	1.19 V	185	13.10	5.10

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * ”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on $0.625 * 5$ per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB
7. Average value = peak reading + $20\log(\text{duty cycle})$



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2380.00	41.0 PK	74.0	-33.0	1.16 H	136	43.40	-2.40
2	2380.00	33.0 AV	54.0	-21.0	1.16 H	136	35.40	-2.40
3	*2480.00	90.5 PK			1.28 H	317	59.20	31.30
4	*2480.00	60.4 AV			1.28 H	317	29.10	31.30
5	2483.50	57.4 PK	74.0	-16.6	1.28 H	317	59.40	-2.00
6	2483.50	27.3 AV	54.0	-26.7	1.28 H	317	29.30	-2.00
7	4960.00	48.2 PK	74.0	-25.8	1.13 H	304	42.80	5.40
8	4960.00	17.1 AV	54.0	-36.9	1.21 H	224	11.70	5.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2380.00	46.3 PK	74.0	-27.7	1.37 V	295	48.70	-2.40
2	2380.00	40.8 AV	54.0	-13.2	1.37 V	295	43.20	-2.40
3	*2480.00	99.1 PK			1.36 V	294	67.80	31.30
4	*2480.00	69.0 AV			1.36 V	294	37.70	31.30
5	2483.50	56.0 PK	74.0	-18.0	1.36 V	294	58.00	-2.00
6	2483.50	25.9 AV	54.0	-28.1	1.36 V	294	27.90	-2.00
7	4960.00	48.4 PK	74.0	-25.6	1.21 V	224	43.00	5.40
8	4960.00	18.3 AV	54.0	-35.7	1.21 V	224	12.90	5.40

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- “ * ”: Fundamental frequency.
- The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on $0.625 * 5$ per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB
- Average value = peak reading + $20\log(\text{duty cycle})$



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BELOW 1GHz WORST-CASE DATA : GFSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH	TESTED BY	Jones Chang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	32.2 QP	40.0	-7.8	2.00 H	102	46.80	-14.60
2	86.28	23.9 QP	40.0	-16.1	2.00 H	207	43.40	-19.50
3	136.84	23.4 QP	43.5	-20.1	2.00 H	62	38.10	-14.70
4	199.05	26.9 QP	43.5	-16.6	1.00 H	209	43.50	-16.60
5	607.35	26.9 QP	46.0	-19.1	1.54 H	191	32.80	-5.90
6	825.11	33.9 QP	46.0	-12.1	1.00 H	236	35.70	-1.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	37.68	25.5 QP	40.0	-14.5	1.55 V	277	40.80	-15.30
2	57.12	29.0 QP	40.0	-11.0	1.01 V	359	43.60	-14.60
3	84.34	27.4 QP	40.0	-12.6	1.01 V	111	46.80	-19.40
4	199.05	23.1 QP	43.5	-20.4	1.01 V	14	39.70	-16.60
5	523.75	25.6 QP	46.0	-20.4	1.01 V	64	33.50	-7.90
6	932.05	32.6 QP	46.0	-13.4	1.01 V	125	32.40	0.20

REMARKS:

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

4.2 CONDUCTED 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.
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	100289	Nov. 29, 2013	Nov. 28, 2014
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 27, 2013	Dec. 26, 2014
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 13, 2014	Feb. 12, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2013	Jul. 20, 2014
			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

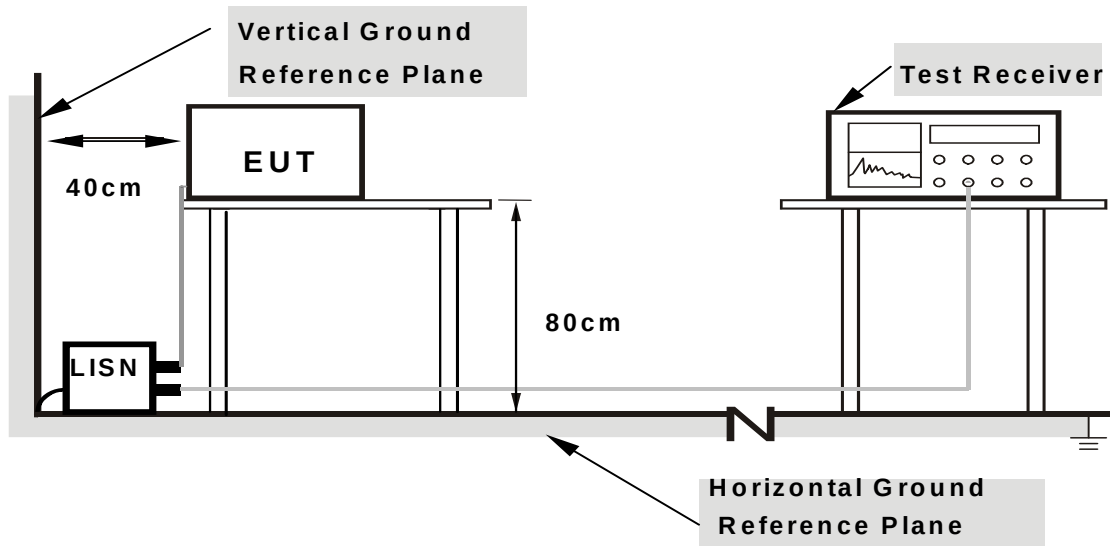
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

Same as 4.1.6.

4.2.7 TEST RESULTS

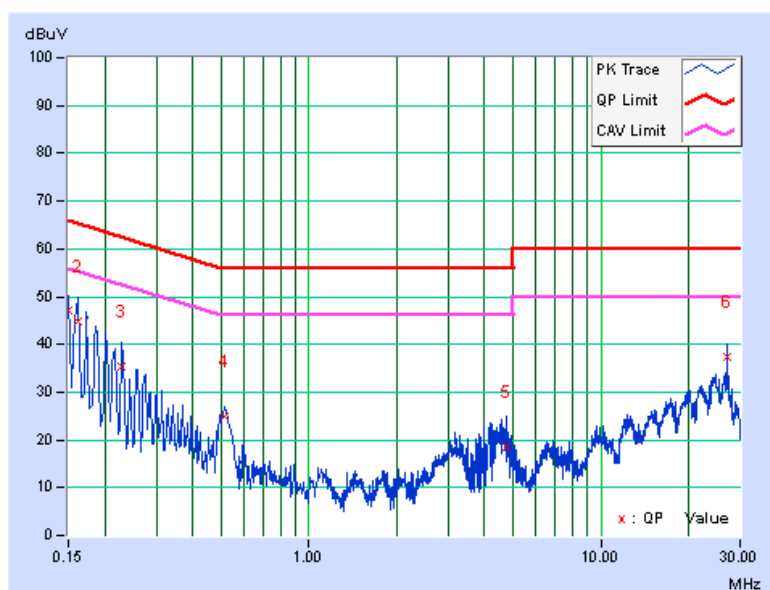
CONDUCTED WORST-CASE DATA : GFSK

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.08	47.11	33.39	47.19	33.47	66.00	56.00	-18.81	-22.53
2	0.16173	0.08	44.79	30.70	44.87	30.78	65.37	55.37	-20.51	-24.60
3	0.22820	0.07	35.38	24.31	35.45	24.38	62.51	52.51	-27.06	-28.13
4	0.51312	0.09	24.67	20.02	24.76	20.11	56.00	46.00	-31.24	-25.89
5	4.74425	0.26	18.28	8.93	18.54	9.19	56.00	46.00	-37.46	-36.81
6	26.99997	1.25	36.21	32.78	37.46	34.03	60.00	50.00	-22.54	-15.97

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

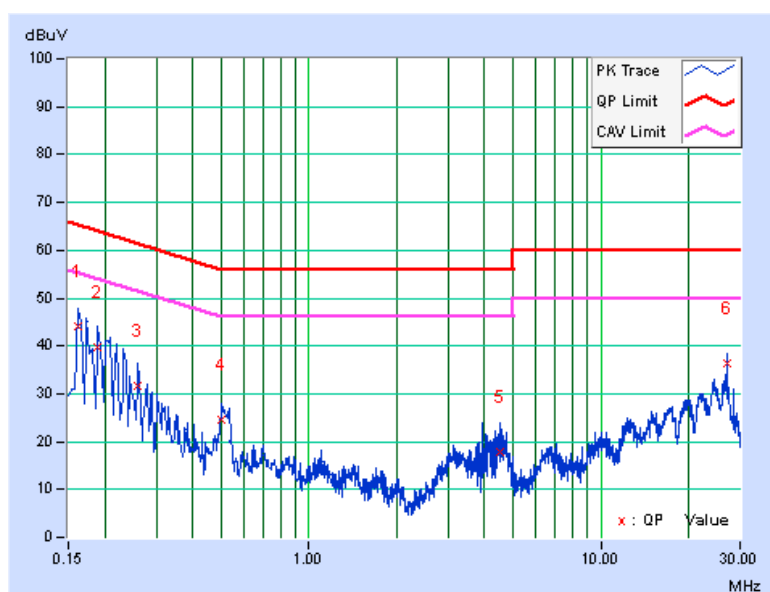


PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16181	0.05	43.99	29.63	44.04	29.68	65.37	55.37	-21.33	-25.69
2	0.18910	0.05	39.63	26.21	39.68	26.26	64.08	54.08	-24.40	-27.82
3	0.25948	0.06	31.48	19.54	31.54	19.60	61.45	51.45	-29.91	-31.85
4	0.50190	0.07	24.35	19.48	24.42	19.55	56.00	46.00	-31.58	-26.45
5	4.51356	0.23	17.69	8.36	17.92	8.59	56.00	46.00	-38.08	-37.41
6	26.99997	1.06	35.45	31.91	36.51	32.97	60.00	50.00	-23.49	-17.03

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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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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:

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Web Site: 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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7. 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.

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