



VARIANT FCC TEST REPORT (Bluetooth)

REPORT NO.: RF111021C03A
MODEL NO.: VX600 Bluetooth
FCC ID: B32VX600BTCTLS
RECEIVED: Feb. 10, 2012
TESTED: Feb. 17 ~ Feb. 22, 2012
ISSUED: Feb. 23, 2012

APPLICANT: VeriFone, Inc.

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CA 95765 USA

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
Original release	NA	Feb. 23, 2012



1. CERTIFICATION

PRODUCT: Point of Sale Terminal

MODEL: VX600 Bluetooth

BRAND: VeriFone

APPLICANT: VeriFone, Inc.

TEST SAMPLE: ENGINEERING SAMPLE

TESTED: Feb. 17 ~ Feb. 22, 2012

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

ANSI C63.10-2009

This report is issued as a supplementary report of RF111021C03 R1. This report shall be used combined together with its original report.

PREPARED BY : Ivy Lin , DATE: Feb. 23, 2012
Ivy Lin / Specialist

APPROVED BY : Gary Chang , DATE: Feb. 23, 2012
Gary Chang / Technical Manager

NOTE: The conducted emission & radiated emission tests were performed for the addendum. Refer to original report for the other test data.



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 -6.13dB at 0.150MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	NA	Refer to Note
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	NA	Refer to Note
15.247(a)(1)	1. Hopping Channel Separation Spec. : Min. 25 kHz or $\frac{2}{3} * 20$ dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	Refer to Note
15.247(b)	Maximum Output Power Spec.: max. 21dBm	NA	Refer to Note
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -5.9dB at 265.16MHz.
15.247(d)	Band Edge Measurement	NA	Refer to Note
15.203	Antenna Requirement	NA	Refer to Note

NOTE: The conducted emission & radiated emission tests were performed for the addendum. Refer to original report for the other test data.

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	2.44 dB
	200MHz ~1000MHz	3.19 dB
	1GHz ~ 18GHz	3.21 dB
	18GHz ~ 40GHz	2.26 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	Point of Sale Terminal
MODEL NO.	VX600 Bluetooth
FCC ID	B32VX600BTCTLS
POWER SUPPLY	5Vdc (host equipment) 3.7Vdc (battery)
MODULATION TYPE	GFSK, $\pi/4$ -DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
TRANSFER RATE	1/2/3Mbps
FREQUENCY RANGE	2402 ~ 2480MHz
NUMBER OF CHANNEL	79
CHANNEL SPACING	1MHz
OUTPUT POWER	1.091mW
ANTENNA TYPE	Fix internal antenna with 1.02dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	Refer to note as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Battery

NOTE:

- This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV ADT report no.: RF111021C03 R1. The difference compared with original report is without bar code function. Therefore, test items of conducted emission and radiated emission are re-tested and presented in the test report.
- The Bluetooth module (brand: ISSC, model: IS1657NM) is collocated in this EUT.
- The EUT uses the following USB cable.

Brand Name	Model No.	Cable length
HUIZHOU SHENGHUA INDUSTRY CO.,	CBL000-021-01-A	1m non-shielded mini USB cable without core

- The EUT uses following battery.

Battery	
Brand	VeriFone
Model	BPK087-201
Power Rating	3.7Vdc, 1380mAh

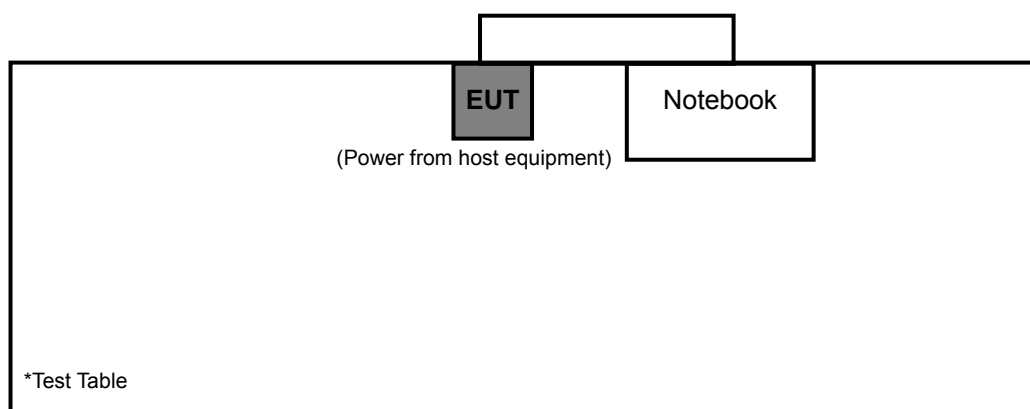
- The above EUT information is declared by manufacturer and for more detailed feature description, please refer to the manufacturer's specifications or user's manual.

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 CONFIGURATION OF SYSTEM UNDER TEST



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE \geq 1G	RE<1G	PLC	
-	√	√	√	EUT USB link + notebook + RFID off + BT on + smart card off + battery charging

Where **RE \geq 1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

NOTE:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**
2. The EUT was tested the above mode which was defined by client..

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	8DPSK	DH5

POWER LINE CONDUCTED EMISSION TEST:

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

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

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE \geq 1G	25deg. C, 65%RH	120Vac, 60Hz	Mark Liao
RE $<$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Mark Liao
PLC	25deg. C, 65%RH	120Vac, 60Hz	Mark Liao

3.3 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

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.

3.4 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	NOTEBOOK	DELL	E5410	1HC2XM1	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

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

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). 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. As shown in 15.35(b), 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	ESI7	838496/016	Jan. 03, 2012	Jan. 02, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 30, 2012	Jan. 29, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 12, 2011	Apr. 11, 2012
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 05, 2012	Jan. 04, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 20, 2011	Jul. 19, 2012
Preamplifier Agilent	8449B	3008A01961	Oct. 29, 2011	Oct. 28, 2012
Preamplifier Agilent	8447D	2944A10738	Oct. 29, 2011	Oct. 28, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Nov. 03, 2011	Nov. 02, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Nov. 03, 2011	Nov. 02, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Nov. 03, 2011	Nov. 02, 2012
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.
 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 460141.
 5. The IC Site Registration No. is IC7450F-4.

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.

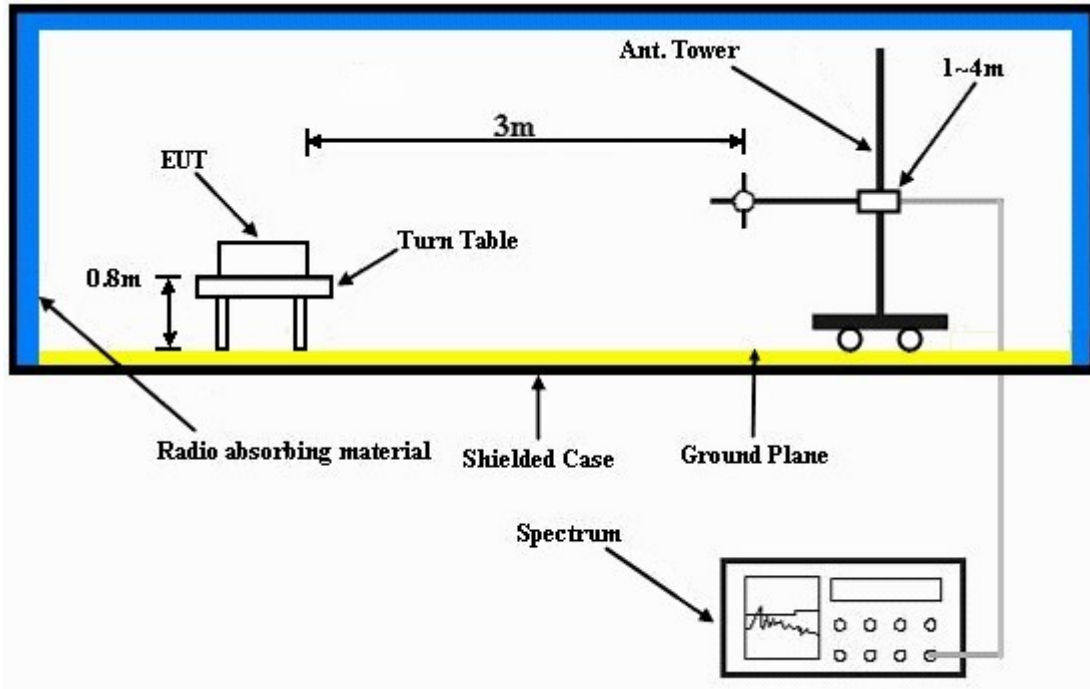
NOTE:

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



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

4.1.7 TEST RESULTS

GFSK MODULATION

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

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	2390.00	43.9 PK	74.0	-30.1	1.07 H	168	11.80	32.10
2	2390.00	37.8 AV	54.0	-16.2	1.07 H	168	5.70	32.10
3	#2398.00	43.1 PK	77.3	-34.2	1.07 H	168	10.90	32.20
4	#2398.00	31.4 AV	47.2	-15.8	1.07 H	168	-0.80	32.20
5	#2400.00	48.8 PK	77.3	-28.5	1.07 H	168	16.60	32.20
6	#2400.00	18.7 AV	47.2	-28.5	1.07 H	168	-13.50	32.20
7	*2402.00	97.3 PK			1.07 H	168	65.10	32.20
8	*2402.00	67.2 AV			1.07 H	168	35.00	32.20
9	4804.00	47.4 PK	74.0	-26.6	1.27 H	14	8.90	38.50
10	4804.00	17.3 AV	54.0	-36.7	1.27 H	14	-21.20	38.50

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 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 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Mark Liao

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	2390.00	42.5 PK	74.0	-31.5	1.04 V	187	10.40	32.10
2	2390.00	31.0 AV	54.0	-23.0	1.04 V	187	-1.10	32.10
3	#2398.00	42.1 PK	69.6	-27.5	1.04 V	187	9.90	32.20
4	#2398.00	29.5 AV	39.5	-10.0	1.04 V	187	-2.70	32.20
5	#2400.00	41.1 PK	69.6	-28.5	1.04 V	187	8.90	32.20
6	#2400.00	11.0 AV	39.5	-28.5	1.04 V	187	-21.20	32.20
7	*2402.00	89.6 PK			1.04 V	187	57.40	32.20
8	*2402.00	59.5 AV			1.04 V	187	27.30	32.20
9	4804.00	47.9 PK	74.0	-26.1	1.38 V	351	9.40	38.50
10	4804.00	17.8 AV	54.0	-36.2	1.38 V	351	-20.70	38.50

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 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 (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Mark Liao

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	*2441.00	96.4 PK			1.07 H	155	64.10	32.30
2	*2441.00	66.3 AV			1.07 H	155	34.00	32.30
3	4882.00	47.5 PK	74.0	-26.5	1.03 H	21	8.80	38.70
4	4882.00	17.4 AV	54.0	-36.6	1.03 H	21	-21.30	38.70
5	7323.00	53.7 PK	74.0	-20.3	1.02 H	155	8.80	44.90
6	7323.00	23.6 AV	54.0	-30.4	1.02 H	155	-21.30	44.90
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	*2441.00	90.5 PK			1.07 V	223	58.20	32.30
2	*2441.00	60.4 AV			1.07 V	223	28.10	32.30
3	4882.00	46.3 PK	74.0	-27.7	1.10 V	152	7.60	38.70
4	4882.00	16.2 AV	54.0	-37.8	1.10 V	152	-22.50	38.70
5	7323.00	52.7 PK	74.0	-21.3	1.01 V	301	7.80	44.90
6	7323.00	22.6 AV	54.0	-31.4	1.01 V	301	-22.30	44.90

- 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).
 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 (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Mark Liao

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	*2480.00	95.1 PK			1.06 H	158	62.60	32.50
2	*2480.00	65.0 AV			1.06 H	158	32.50	32.50
3	2483.50	38.9 PK	74.0	-35.1	1.06 H	158	6.40	32.50
4	2483.50	8.8 AV	54.0	-45.2	1.06 H	158	-23.70	32.50
5	2485.50	52.4 PK	74.0	-21.6	1.06 H	158	19.90	32.50
6	2485.50	29.8 AV	54.0	-24.2	1.06 H	158	-2.70	32.50
7	2496.00	45.2 PK	74.0	-28.8	1.04 H	157	12.70	32.50
8	2496.00	34.2 AV	54.0	-19.8	1.04 H	157	1.70	32.50
9	4960.00	46.4 PK	74.0	-27.6	1.25 H	357	7.50	38.90
10	4960.00	16.3 AV	54.0	-37.7	1.25 H	357	-22.60	38.90

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	*2480.00	89.2 PK			1.05 V	217	56.70	32.50
2	*2480.00	59.1 AV			1.05 V	217	26.60	32.50
3	2483.50	33.0 PK	74.0	-41.0	1.05 V	217	0.50	32.50
4	2483.50	2.9 AV	54.0	-51.1	1.05 V	217	-29.60	32.50
5	2485.50	41.4 PK	74.0	-32.6	1.05 V	217	8.90	32.50
6	2485.50	29.1 AV	54.0	-24.9	1.05 V	217	-3.40	32.50
7	2496.00	42.2 PK	74.0	-31.8	1.05 V	217	9.70	32.50
8	2496.00	30.0 AV	54.0	-24.0	1.05 V	217	-2.50	32.50
9	4960.00	46.7 PK	74.0	-27.3	1.05 V	21	7.80	38.90
10	4960.00	16.6 AV	54.0	-37.4	1.05 V	21	-22.30	38.90

- REMARKS:**
- Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 - Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable 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 + $20\log(\text{duty cycle})$.



A D T

8DPSK MODULATION

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

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	2390.00	46.0 PK	74.0	-28.0	1.41 H	175	13.90	32.10
2	2390.00	35.7 AV	54.0	-18.3	1.41 H	175	3.60	32.10
3	#2398.00	54.6 PK	77.7	-23.1	1.41 H	175	22.40	32.20
4	#2398.00	30.7 AV	47.6	-16.9	1.41 H	175	-1.50	32.20
5	#2400.00	45.2 PK	77.7	-32.5	1.41 H	175	13.00	32.20
6	#2400.00	15.1 AV	47.6	-32.5	1.41 H	175	-17.10	32.20
7	*2402.00	97.7 PK			1.41 H	175	65.50	32.20
8	*2402.00	67.6 AV			1.41 H	175	35.40	32.20
9	4804.00	47.2 PK	74.0	-26.8	1.04 H	19	8.70	38.50
10	4804.00	17.1 AV	54.0	-36.9	1.04 H	19	-21.40	38.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	42.9 PK	74.0	-31.1	1.77 V	214	10.80	32.10
2	2390.00	31.4 AV	54.0	-22.6	1.77 V	214	-0.70	32.10
3	#2398.00	45.0 PK	70.0	-25.0	1.77 V	214	12.80	32.20
4	#2398.00	29.2 AV	39.9	-10.7	1.77 V	214	-3.00	32.20
5	#2400.00	37.5 PK	70.0	-32.5	1.77 V	214	5.30	32.20
6	#2400.00	7.4 AV	39.9	-32.5	1.77 V	214	-24.80	32.20
7	*2402.00	90.0 PK			1.77 V	214	57.80	32.20
8	*2402.00	59.9 AV			1.77 V	214	27.70	32.20
9	4804.00	46.1 PK	74.0	-27.9	1.08 V	63	7.60	38.50
10	4804.00	16.0 AV	54.0	-38.0	1.08 V	63	-22.50	38.50

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



A D T

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

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	*2441.00	96.0 PK			1.08 H	155	63.70	32.30
2	*2441.00	65.9 AV			1.08 H	155	33.60	32.30
3	4882.00	48.1 PK	74.0	-25.9	1.06 H	35	9.40	38.70
4	4882.00	18.0 AV	54.0	-36.0	1.06 H	35	-20.70	38.70
5	7323.00	53.9 PK	74.0	-20.1	1.05 H	202	9.00	44.90
6	7323.00	23.8 AV	54.0	-30.2	1.05 H	202	-21.10	44.90
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	*2441.00	89.1 PK			1.70 V	200	56.80	32.30
2	*2441.00	59.0 AV			1.70 V	200	26.70	32.30
3	4882.00	46.8 PK	74.0	-27.2	1.07 V	199	8.10	38.70
4	4882.00	16.7 AV	54.0	-37.3	1.07 V	199	-22.00	38.70
5	7323.00	52.1 PK	74.0	-21.9	1.03 V	291	7.20	44.90
6	7323.00	22.0 AV	54.0	-32.0	1.03 V	291	-22.90	44.90

- 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).
 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 + $20\log(\text{duty cycle})$.



A D T

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

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	*2480.00	94.4 PK			1.06 H	176	61.90	32.50
2	*2480.00	64.3 AV			1.06 H	176	31.80	32.50
3	2483.50	38.3 PK	74.0	-35.7	1.06 H	176	5.80	32.50
4	2483.50	8.2 AV	54.0	-45.8	1.06 H	176	-24.30	32.50
5	2485.50	51.7 PK	74.0	-22.3	1.06 H	176	19.20	32.50
6	2485.50	28.3 AV	54.0	-25.7	1.06 H	176	-4.20	32.50
7	2496.00	44.2 PK	74.0	-29.8	1.06 H	176	11.70	32.50
8	2496.00	31.1 AV	54.0	-22.9	1.06 H	176	-1.40	32.50
9	4960.00	46.9 PK	74.0	-27.1	1.01 H	300	8.00	38.90
10	4960.00	16.8 AV	54.0	-37.2	1.01 H	300	-22.10	38.90

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	*2480.00	88.7 PK			1.70 V	215	56.20	32.50
2	*2480.00	58.6 AV			1.70 V	215	26.10	32.50
3	2483.50	32.6 PK	74.0	-41.4	1.70 V	215	0.10	32.50
4	2483.50	2.5 AV	54.0	-51.5	1.70 V	215	-30.00	32.50
5	2485.50	41.0 PK	74.0	-33.0	1.70 V	215	8.50	32.50
6	2485.50	28.0 AV	54.0	-26.0	1.70 V	215	-4.50	32.50
7	2496.00	41.5 PK	74.0	-32.5	1.70 V	215	9.00	32.50
8	2496.00	28.8 AV	54.0	-25.2	1.70 V	215	-3.70	32.50
9	4960.00	45.5 PK	74.0	-28.5	1.06 V	155	6.60	38.90
10	4960.00	15.4 AV	54.0	-38.6	1.06 V	155	-23.50	38.90

- 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).
 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 + $20\log(\text{duty cycle})$.

BELOW 1GHz WORST-CASE DATA : 8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Mark Liao

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	142.67	32.7 QP	43.5	-10.8	1.25 H	169	18.60	14.10
2	199.05	37.2 QP	43.5	-6.3	2.00 H	163	25.60	11.60
3	239.88	39.0 QP	46.0	-7.0	1.25 H	187	25.80	13.20
4	265.16	40.1 QP	46.0	-5.9	1.00 H	172	25.80	14.30
5	374.04	33.0 QP	46.0	-13.0	1.00 H	106	15.20	17.80
6	799.84	32.3 QP	46.0	-13.7	1.75 H	136	5.20	27.10
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	62.95	31.0 QP	40.0	-9.0	1.25 V	136	17.70	13.30
2	265.16	29.2 QP	46.0	-16.8	1.00 V	121	14.90	14.30
3	391.54	32.2 QP	46.0	-13.8	1.00 V	127	14.00	18.20
4	533.47	31.2 QP	46.0	-14.8	1.25 V	247	9.20	22.00
5	799.84	30.1 QP	46.0	-15.9	1.25 V	112	3.00	27.10
6	893.16	29.8 QP	46.0	-16.2	1.25 V	253	1.30	28.50

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

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ 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 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 19, 2011	Nov. 18, 2012
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 22, 2011	Dec. 21, 2012
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 30, 2011	Dec. 29, 2012
LISN ROHDE & SCHWARZ	ESH3-Z5	100312	Jul. 07, 2011	Jul. 06, 2012
Software ADT	ADT_Cond_ V7.3.7	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

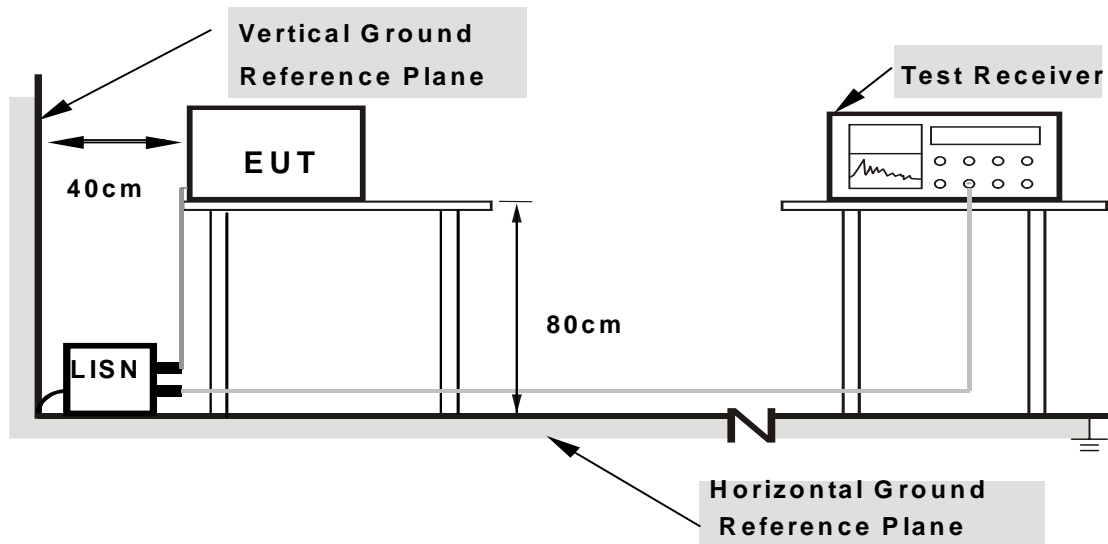
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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 4.1.6.

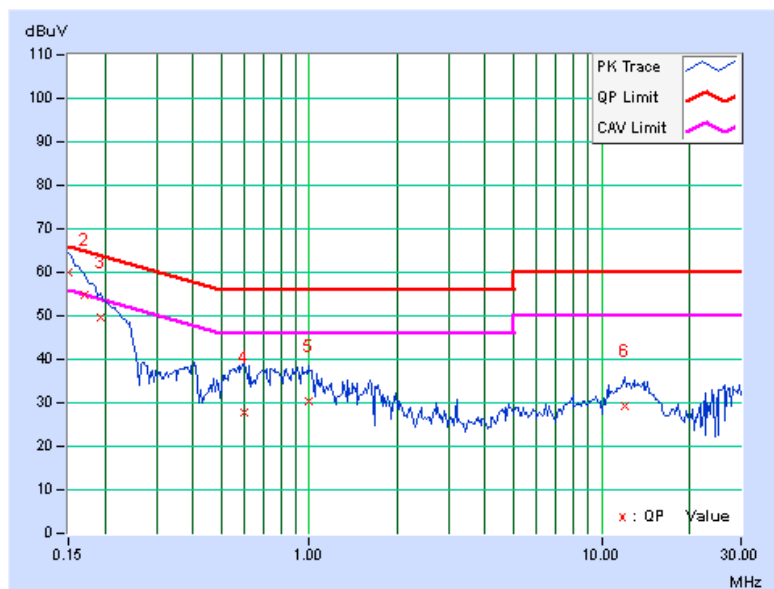
4.2.7 TEST RESULTS

CONDUCTED WORST CASE DATA: 8DPSK

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	Q.P. [dB (uV)]	AV. [dB (uV)]	Q.P. [dB (uV)]	AV. [dB (uV)]	Q.P. [dB (uV)]	AV. [dB (uV)]	Q.P. (dB)	AV. (dB)
1	0.150	0.15	59.70	37.06	59.85	37.21	66.00	56.00	-6.15	-18.79
2	0.170	0.15	54.53	33.53	54.68	33.68	64.98	54.98	-10.30	-21.30
3	0.193	0.15	49.38	30.42	49.53	30.57	63.91	53.91	-14.38	-23.34
4	0.599	0.18	27.56	12.21	27.74	12.39	56.00	46.00	-28.26	-33.61
5	0.990	0.19	30.26	15.37	30.45	15.56	56.00	46.00	-25.55	-30.44
6	12.008	0.47	28.64	23.49	29.11	23.96	60.00	50.00	-30.89	-26.04

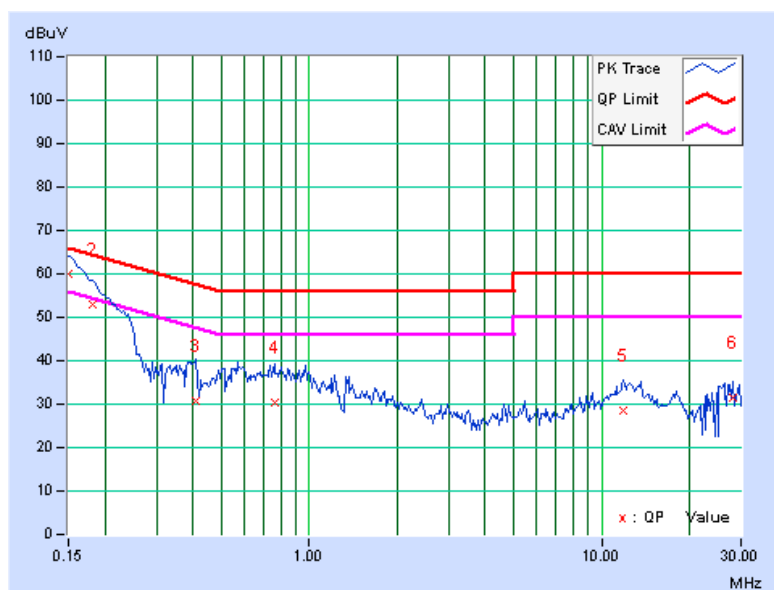
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.13	59.74	36.90	59.87	37.03	66.00	56.00	-6.13	-18.97
2	0.181	0.14	52.84	32.52	52.98	32.66	64.43	54.43	-11.45	-21.77
3	0.412	0.16	30.71	14.01	30.87	14.17	57.61	47.61	-26.74	-33.44
4	0.759	0.18	30.11	17.85	30.29	18.03	56.00	46.00	-25.71	-27.97
5	11.891	0.53	28.08	22.87	28.61	23.40	60.00	50.00	-31.39	-26.60
6	28.285	0.57	31.05	23.16	31.62	23.73	60.00	50.00	-28.38	-26.27

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



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.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. 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

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

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

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

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

--- END ---