

FCC TEST REPORT

REPORT NO.: RF961102L06C
MODEL NO.: AW-BT250
RECEIVED: May 14, 2008
TESTED: May 15 ~ Jun. 20, 2008
ISSUED: Jun. 23, 2008

APPLICANT: AzureWave Technologies, Inc.

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ISSUED BY: Advance Data Technology Corporation

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Table of Contents

1.	CERTIFICATION.....	3
2.	SUMMARY OF TEST RESULTS	4
2.1	MEASUREMENT UNCERTAINTY	4
3.	GENERAL INFORMATION.....	5
3.1	GENERAL DESCRIPTION OF EUT	5
3.2	DESCRIPTION OF TEST MODES.....	7
3.2.1	CONFIGURATION OF SYSTEM UNDER TEST	7
3.2.2	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL	8
3.3	GENERAL DESCRIPTION OF APPLIED STANDARDS	9
3.4	DESCRIPTION OF SUPPORT UNITS	9
4.	TEST TYPES AND RESULTS	10
4.1	RADIATED EMISSION MEASUREMENT	10
4.1.1	LIMITS OF RADIATED EMISSION MEASUREMENT	10
4.1.2	TEST INSTRUMENTS	11
4.1.3	TEST PROCEDURES	12
4.1.4	DEVIATION FROM TEST STANDARD	12
4.1.5	TEST SETUP	13
4.1.6	EUT OPERATING CONDITIONS	13
4.1.7	TEST RESULTS	14
4.2	CONDUCTED EMISSION MEASUREMENT	21
4.2.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT	21
4.2.2	TEST INSTRUMENTS	21
4.2.3	TEST PROCEDURES	22
4.2.4	DEVIATION FROM TEST STANDARD	22
4.2.5	TEST SETUP	23
4.2.6	EUT OPERATING CONDITIONS	23
4.2.7	TEST RESULTS	24
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	26
6.	INFORMATION ON THE TESTING LABORATORIES	27
7.	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	28

1. CERTIFICATION

PRODUCT: Bluetooth Module

MODEL: AW-BT250

BRAND: Azurewave

APPLICANT: AzureWave Technologies, Inc.

TESTED: May 15 ~ Jun. 20, 2008

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart C (Section 15.247),
ANSI C63.4-2003

The above equipment (Model: AW-BT250) has been tested by **Advance Data Technology Corporation**, 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 : Ivy Lin , **DATE:** Jun. 23, 2008
Ivy Lin / Specialist

TECHNICAL ACCEPTANCE : Long Chen , **DATE:** Jun. 23, 2008
Responsible for RF Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE:** Jun. 23, 2008
Gary Chang / Assistant 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 -11.44dB at 0.173MHz
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	NA	NA
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	NA	NA
15.247(a)(1)	1. Hopping Channel Separation Spec.: Min. 25 kHz or 20 dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	NA
15.247(b)	Maximum Peak Output Power Spec.: max. 21dBm	NA	NA
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -2.38dB at 214.61MHz
15.247(d)	Band Edge Measurement	NA	NA

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

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.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Bluetooth Module
MODEL NO.	AW-BT250
FCC ID	TLZ-BT253
POWER SUPPLY	3.3Vdc from host equipment
MODULATION TYPE	GFSK, $\pi/4$ -DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
TRANSFER RATE	1/2/3Mbps
FREQUENCY RANGE	2400 ~ 2483.5MHz
NUMBER OF CHANNEL	79
CHANNEL SPACING	1MHz
OUTPUT POWER	1.476mW
ANTENNA TYPE	Refer to note 2
DATA CABLE	NA
I/O PORTS	NA
ACCESSORY DEVICES	NA

NOTE:

1. This report is issued as a supplementary report of ADT report no.: RF961102L06A. This report is prepared for FCC class II permissive change. The difference is adding the antenna. Therefore we re-tested the conduction emission test and radiation emission test and presented in the test report.
2. The following film antennas were provided to the EUT.

<Original>

ITEM	BRAND	MODEL NAME	ANTENNA TYPE	ANTENNA CONNECTOR	LEFT ANTENNA GAIN (dBi)	RIGHT ANTENNA GAIN (dBi)
1	ACON	ASAA 002	Film	UFL	1.67	0.50
2	Tyco	ASAT 002	Film	UFL	2.32	2.16
3	Tyco	ASAT 003	Film	UFL	1.10	0.92
4	Yageo	ASAY 002	Film	UFL	1.87	2.53
5	Yageo	ASAY 003	Film	UFL	0.75	2.51

**Left antenna is with white antenna cable; right antenna is with black antenna cable.

***Only the highest antenna gain was chosen for the final test and presented in the test report.

<New>

ITEM	BRAND	MODEL NAME	ANTENNA TYPE	ANTENNA CONNECTOR	ANTENNA GAIN (dBi)
1	Yageo	CAN 4313 711 012401B	PIFA	UFL	-4.14

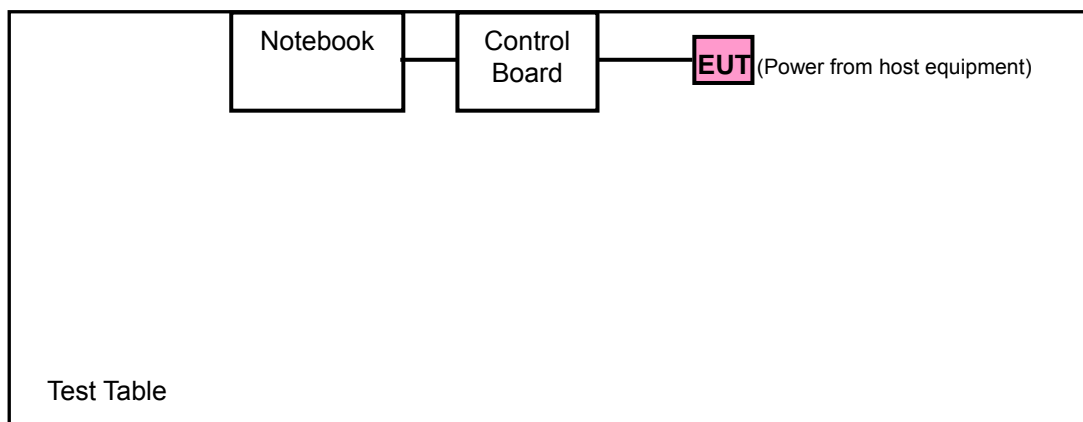
3. RF output power is the same as the original test report.
4. Bluetooth technology is used in this EUT.
5. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

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	
-	√	√	√	-

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

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
0 to 78	0, 39, 78	FHSS	GFSK	DH5	Z
0 to 78	0, 39, 78	FHSS	8DPSK	DH5	Z

RADIATED EMISSION TEST (BELOW 1 GHz):

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
0 to 78	39	FHSS	8DPSK	DH5	Z

POWER LINE CONDUCTED EMISSION TEST:

- ☒ 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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	39	FHSS	8DPSK	DH5

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 C63.4-2003

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 COMPUTER	DELL	D531	CN-0XM006-48643 -81U-2786	QDS-BRCM1020
2	CONTROL BOARD	NA	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.0m shielded USB cable

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

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	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.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESIB7	100212	May. 27, 2009
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Aug. 05, 2008
BILOG Antenna SCHWARZBECK	VULB9168	9168-153	Jan. 03, 2009
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Jul. 30, 2008
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 06, 2009
Preamplifier Agilent	8449B	3008A01910	Sep. 19, 2008
Preamplifier Agilent	8447D	2944A10638	Dec. 19, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274039/223650	Nov. 07, 2008
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 09, 2008
Software	ADT_Radiated_V7.6	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA
Turn Table EMCO	2087-2.03	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	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 IC3789B-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.

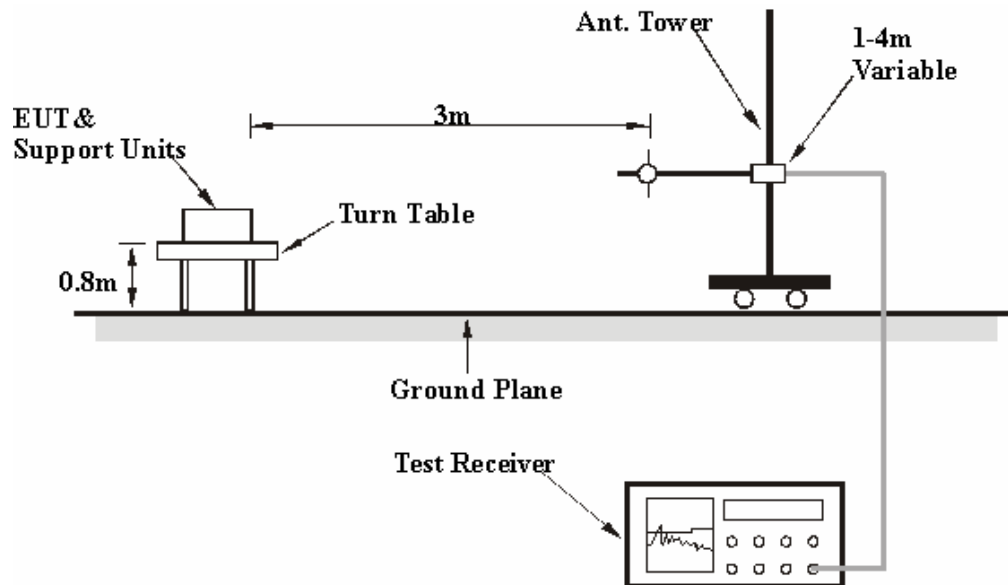
NOTE:

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



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

4.1.6 EUT OPERATING CONDITIONS

- Connected EUT with notebook system via control board and placed on a testing table.
- The notebook system ran a test program (provided by manufacturer) to enable EUT under transmitting condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 TEST RESULTS

Radiated Above 1GHz DATA: GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	32.83 PK	74.00	-41.17	1.02 H	28	0.51	32.32
2	2390.00	23.33 AV	54.00	-30.67	1.02 H	28	-8.99	32.32
3	*2402.00	88.15 PK			1.02 H	28	55.84	32.31
4	*2402.00	58.05 AV			1.02 H	28	25.74	32.31
5	4804.00	56.87 PK	74.00	-17.13	1.11 H	346	18.92	37.95
6	4804.00	26.77 AV	54.00	-27.23	1.11 H	346	-11.18	37.95
7	7206.00	56.43 PK	74.00	-17.57	1.21 H	23	11.59	44.85
8	7206.00	26.33 AV	54.00	-27.67	1.21 H	23	-18.51	44.85
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	26.63 PK	74.00	-47.37	1.28 V	175	-5.69	32.32
2	2390.00	17.13 AV	54.00	-36.87	1.28 V	175	-15.19	32.32
3	*2402.00	81.95 PK			1.28 V	175	49.64	32.31
4	*2402.00	51.85 AV			1.28 V	175	19.54	32.31
5	4804.00	56.82 PK	74.00	-17.18	1.20 V	144	18.87	37.95
6	4804.00	26.72 AV	54.00	-27.28	1.20 V	144	-11.23	37.95
7	7206.00	56.69 PK	74.00	-17.31	1.76 V	137	11.85	44.85
8	7206.00	26.59 AV	54.00	-27.41	1.76 V	137	-18.25	44.85

- 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: $20\log(3.125 / 100) = -30.1 \text{ dB}$.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	88.80 PK			1.03 H	200	56.45	32.35
2	*2441.00	58.70 AV			1.03 H	200	26.35	32.35
3	4882.00	55.16 PK	74.00	-18.84	1.42 H	16	17.02	38.14
4	4882.00	25.06 AV	54.00	-28.94	1.42 H	16	-13.08	38.14
5	7323.00	56.37 PK	74.00	-17.63	1.08 H	100	11.39	44.98
6	7323.00	26.27 AV	54.00	-27.73	1.08 H	100	-18.71	44.98
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	82.10 PK			1.16 V	249	49.75	32.35
2	*2441.00	52.00 AV			1.16 V	249	19.65	32.35
3	4882.00	55.05 PK	74.00	-18.95	1.00 V	2	16.91	38.14
4	4882.00	24.95 AV	54.00	-29.05	1.00 V	2	-13.19	38.14
5	7323.00	56.44 PK	74.00	-17.56	1.18 V	107	11.46	44.98
6	7323.00	26.34 AV	54.00	-27.66	1.18 V	107	-18.64	44.98

- 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: $20\log(3.125 / 100) = -30.1 \text{ dB}$.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	89.12 PK			1.01 H	233	56.74	32.38
2	*2480.00	59.02 AV			1.01 H	233	26.64	32.38
3	2483.50	35.88 PK	74.00	-38.12	1.01 H	233	3.49	32.39
4	2483.50	26.38 AV	54.00	-27.62	1.01 H	233	-6.01	32.39
5	4960.00	53.46 PK	74.00	-20.54	1.99 H	172	15.16	38.30
6	4960.00	23.36 AV	54.00	-30.64	1.99 H	172	-14.94	38.30
7	7440.00	56.18 PK	74.00	-17.82	1.35 H	168	11.16	45.02
8	7440.00	26.08 AV	54.00	-27.92	1.35 H	168	-18.94	45.02
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	82.74 PK			1.30 V	115	50.36	32.38
2	*2480.00	52.64 AV			1.30 V	115	20.26	32.38
3	2483.50	29.50 PK	74.00	-44.50	1.30 V	115	-2.89	32.39
4	2483.50	20.00 AV	54.00	-34.00	1.30 V	115	-12.39	32.39
5	4960.00	53.18 PK	74.00	-20.82	1.01 V	316	14.88	38.30
6	4960.00	23.08 AV	54.00	-30.92	1.01 V	316	-15.22	38.30
7	7440.00	56.34 PK	74.00	-17.66	1.10 V	146	11.32	45.02
8	7440.00	26.23 AV	54.00	-27.77	1.10 V	146	-18.79	45.02

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

8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	35.33 PK	74.00	-38.67	1.06 H	211	3.01	32.32
2	2390.00	25.83 AV	54.00	-28.17	1.06 H	211	-6.49	32.32
3	*2402.00	89.89 PK			1.06 H	211	57.58	32.31
4	*2402.00	59.79 AV			1.06 H	211	27.48	32.31
5	4804.00	58.20 PK	74.00	-15.80	1.01 H	325	20.25	37.95
6	4804.00	28.10 AV	54.00	-25.90	1.01 H	325	-9.85	37.95
7	7206.00	57.77 PK	74.00	-16.23	1.32 H	249	12.92	44.85
8	7206.00	27.67 AV	54.00	-26.33	1.32 H	249	-17.18	44.85
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	28.85 PK	74.00	-45.15	1.10 V	175	-3.47	32.32
2	2390.00	19.35 AV	54.00	-34.65	1.10 V	175	-12.97	32.32
3	*2402.00	83.41 PK			1.10 V	175	51.10	32.31
4	*2402.00	53.31 AV			1.10 V	175	21.00	32.31
5	4804.00	57.89 PK	74.00	-16.11	1.00 V	41	19.94	37.95
6	4804.00	27.79 AV	54.00	-26.21	1.00 V	41	-10.16	37.95
7	7206.00	57.92 PK	74.00	-16.08	1.08 V	255	13.07	44.85
8	7206.00	27.82 AV	54.00	-26.18	1.08 V	255	-17.03	44.85

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	90.56 PK			1.42 H	5	58.21	32.35
2	*2441.00	60.46 AV			1.42 H	5	28.11	32.35
3	4882.00	56.62 PK	74.00	-17.38	1.00 H	188	18.48	38.14
4	4882.00	26.52 AV	54.00	-27.48	1.00 H	188	-11.62	38.14
5	7323.00	58.08 PK	74.00	-15.92	1.00 H	311	13.10	44.98
6	7323.00	27.98 AV	54.00	-26.02	1.00 H	311	-17.00	44.98
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	83.83 PK			1.00 V	101	51.48	32.35
2	*2441.00	53.73 AV			1.00 V	101	21.38	32.35
3	4882.00	55.77 PK	74.00	-18.23	1.02 V	254	17.63	38.14
4	4882.00	25.67 AV	54.00	-28.33	1.02 V	254	-12.47	38.14
5	7323.00	58.24 PK	74.00	-15.76	1.25 V	216	13.26	44.98
6	7323.00	28.14 AV	54.00	-25.86	1.25 V	216	-16.84	44.98

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa
TESTED BY	Lori Chiu		

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	91.71 PK			1.22 H	347	59.33	32.38
2	*2480.00	61.61 AV			1.22 H	347	29.23	32.38
3	2483.50	39.62 PK	74.00	-34.38	1.22 H	347	7.23	32.39
4	2483.50	30.12 AV	54.00	-23.88	1.22 H	347	-2.27	32.39
5	4960.00	54.45 PK	74.00	-19.55	1.11 H	252	16.15	38.30
6	4960.00	24.35 AV	54.00	-29.65	1.11 H	252	-13.95	38.30
7	7440.00	57.82 PK	74.00	-16.18	1.00 H	156	12.80	45.02
8	7440.00	27.72 AV	54.00	-26.28	1.00 H	156	-17.30	45.02
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	84.32 PK			1.00 V	331	51.94	32.38
2	*2480.00	54.22 AV			1.00 V	331	21.84	32.38
3	2483.50	32.23 PK	74.00	-41.77	1.00 V	331	-0.16	32.39
4	2483.50	22.73 AV	54.00	-31.27	1.00 V	331	-9.66	32.39
5	4960.00	54.13 PK	74.00	-19.87	1.36 V	282	15.83	38.30
6	4960.00	24.03 AV	54.00	-29.97	1.36 V	282	-14.27	38.30
7	7440.00	57.93 PK	74.00	-16.07	1.04 V	56	12.91	45.02
8	7440.00	27.83 AV	54.00	-26.17	1.04 V	56	-17.19	45.02

- 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: $20\log(3.125 / 100) = -30.1 \text{ dB}$.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.

RADIATED BELOW 1GHz WORST-CASE DATA:

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	Below 1000MHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH, 998hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Lori Chiu		

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	92.12	31.77 QP	43.50	-11.73	2.00 H	247	22.56	9.21
2	144.61	33.44 QP	43.50	-10.06	2.00 H	103	20.32	13.12
3	191.28	37.36 QP	43.50	-6.14	1.50 H	43	26.06	11.29
4	214.61	41.12 QP	43.50	-2.38	1.25 H	214	29.93	11.20
5	228.22	39.85 QP	46.00	-6.15	2.00 H	16	28.05	11.81
6	288.49	34.15 QP	46.00	-11.85	1.00 H	346	20.75	13.41
7	300.16	34.38 QP	46.00	-11.62	1.00 H	10	20.78	13.60
8	751.23	36.34 QP	46.00	-9.66	1.00 H	49	12.59	23.75
9	797.89	37.73 QP	46.00	-8.27	1.00 H	34	12.86	24.88
10	879.55	35.01 QP	46.00	-10.99	1.00 H	40	9.36	25.66
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	31.84	31.00 QP	40.00	-9.00	1.00 V	7	18.87	12.14
2	78.51	34.36 QP	40.00	-5.64	1.25 V	262	25.80	8.55
3	144.61	33.07 QP	43.50	-10.43	1.25 V	166	19.95	13.12
4	760.95	33.15 QP	46.00	-12.85	1.25 V	331	9.16	23.99
5	797.89	37.27 QP	46.00	-8.73	1.25 V	340	12.39	24.88
6	877.61	35.39 QP	46.00	-10.61	1.50 V	52	9.75	25.64
7	955.38	33.65 QP	46.00	-12.35	2.00 V	10	7.30	26.36

- 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.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 21, 2008
RF signal cable Woken	5D-FB	Cable-HYCO3-01	Jan. 06, 2009
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Jan. 09, 2009
LISN SCHWARZBECK	ESH3-Z5	100311	Jan. 21, 2009
Software ADT	ADT_Cond_V3	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

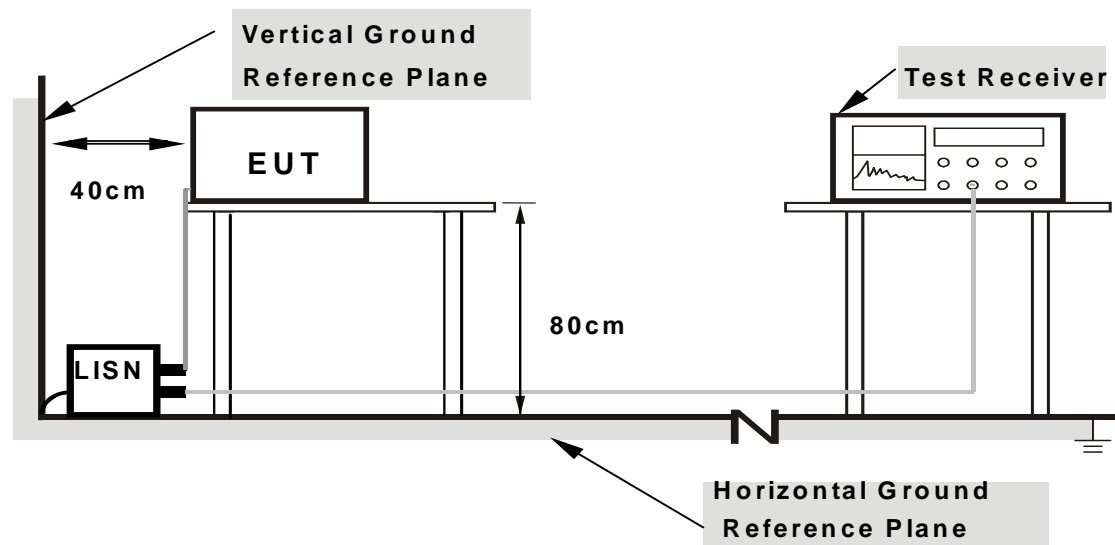
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

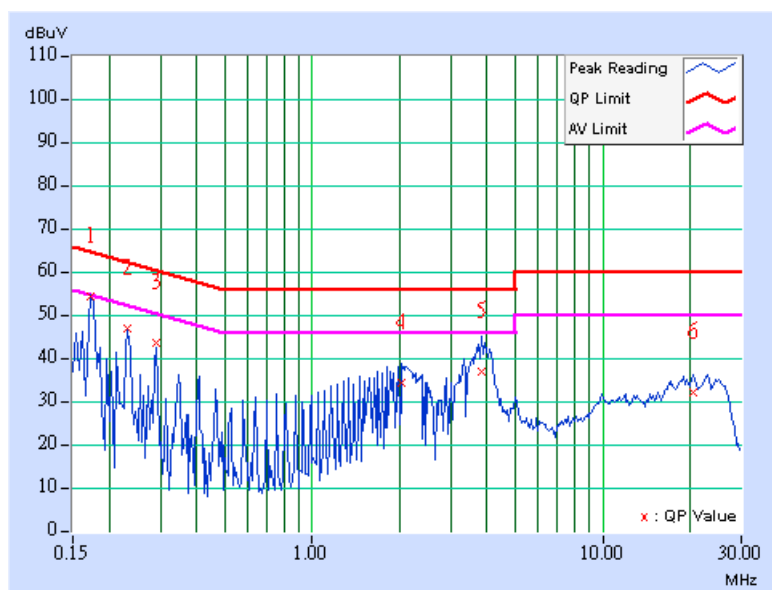
4.2.7 TEST RESULTS

CONDUCTED WORST CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	PHASE	Line 1
MODULATION TYPE	8DPSK	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.13	53.23	-	53.36	-	64.79	54.79	-11.44	-
2	0.232	0.13	45.86	-	45.99	-	62.38	52.38	-16.39	-
3	0.291	0.13	42.29	-	42.42	-	60.51	50.51	-18.08	-
4	2.035	0.26	33.21	-	33.47	-	56.00	46.00	-22.53	-
5	3.836	0.43	35.55	-	35.98	-	56.00	46.00	-20.02	-
6	20.570	1.34	30.80	-	32.14	-	60.00	50.00	-27.86	-

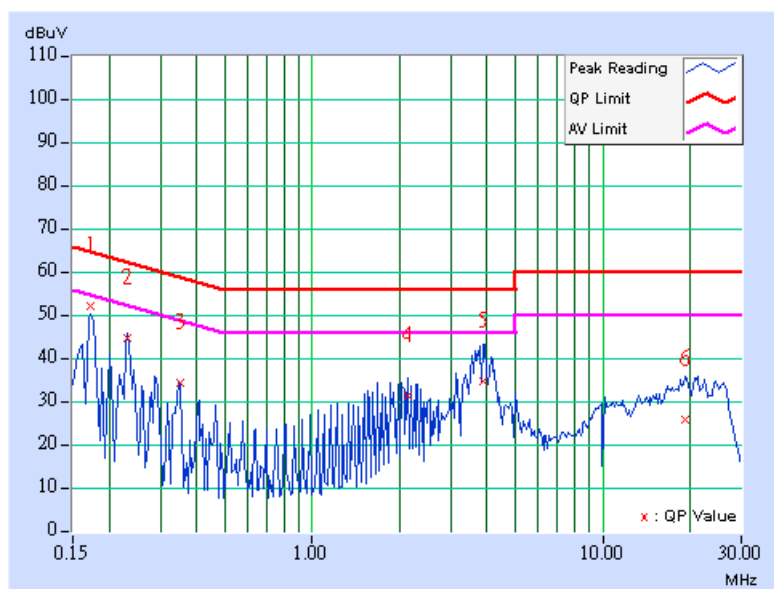
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	PHASE	Line 2
MODULATION TYPE	8DPSK	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.14	51.26	-	51.40	-	64.79	54.79	-13.39	-
2	0.232	0.14	43.97	-	44.11	-	62.38	52.38	-18.27	-
3	0.349	0.15	33.43	-	33.58	-	58.98	48.98	-25.40	-
4	2.145	0.27	30.61	-	30.88	-	56.00	46.00	-25.12	-
5	3.883	0.42	33.93	-	34.35	-	56.00	46.00	-21.65	-
6	19.340	0.93	25.06	-	25.99	-	60.00	50.00	-34.01	-

- 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, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation 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

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 any modifications are made to the EUT by the lab during the test.

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