



FCC TEST REPORT

REPORT NO.: RF960205H09

MODEL NO.: SY 832

RECEIVED: Feb. 05, 2007

TESTED: Feb. 08 to March 20, 2007

ISSUED: March 28, 2007

APPLICANT: UNIVERSAL MICROELECTRONICS CO., LTD.

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TAICHUNG, TAIWAN, R.O.C.

ISSUED BY: Advance Data Technology Corporation

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TABLE OF CONTENTS

1	CERTIFICATION	4
2	SUMMARY OF TEST RESULTS.....	5
2.1	MEASUREMENT UNCERTAINTY	6
3	GENERAL INFORMATION	7
3.1	GENERAL DESCRIPTION OF EUT	7
3.2	DESCRIPTION OF TEST MODES	9
3.3	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL	10
3.4	GENERAL DESCRIPTION OF APPLIED STANDARDS	12
3.5	DESCRIPTION OF SUPPORT UNITS.....	13
3.6	CONFIGURATION OF SYSTEM UNDER TEST	13
4	TEST PROCEDURES AND RESULTS	14
4.1	CONDUCTED EMISSION MEASUREMENT	14
4.1.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT	14
4.1.2	TEST INSTRUMENTS.....	14
4.1.3	TEST PROCEDURES	15
4.1.4	TEST SETUP	15
4.1.5	EUT OPERATING CONDITIONS.....	16
4.1.6	TEST RESULTS	17
4.2	NUMBER OF HOPPING FREQUENCY USED	19
4.2.1	LIMIT OF HOPPING FREQUENCY USED	19
4.2.2	TEST INSTRUMENTS.....	19
4.2.3	TEST PROCEDURES	20
4.2.4	DEVIATION FROM TEST STANDARD	20
4.2.5	TEST SETUP	21
4.2.6	TEST RESULTS	21
4.3	DWELL TIME ON EACH CHANNEL.....	23
4.3.1	LIMIT OF DWELL TIME USED	23
4.3.2	TEST INSTRUMENTS.....	23
4.3.3	TEST PROCEDURES	24
4.3.4	DEVIATION FROM TEST STANDARD	24
4.3.5	TEST SETUP	24
4.3.6	TEST RESULTS	25
4.4	CHANNEL BANDWIDTH	29
4.4.1	TEST INSTRUMENTS.....	29
4.4.2	TEST PROCEDURE.....	30
4.4.3	DEVIATION FROM TEST STANDARD	30
4.4.4	TEST SETUP	30
4.4.5	EUT OPERATING CONDITION	30
4.4.6	TEST RESULTS	31
4.5	HOPPING CHANNEL SEPARATION.....	34
4.5.1	LIMIT OF HOPPING CHANNEL SEPARATION	34
4.5.2	TEST INSTRUMENTS.....	34



4.5.3	TEST PROCEDURES	35
4.5.4	DEVIATION FROM TEST STANDARD	35
4.5.5	TEST SETUP	35
4.5.6	TEST RESULTS	36
4.6	MAXIMUM PEAK OUTPUT POWER	39
4.6.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT	39
4.6.2	INSTRUMENTS	39
4.6.3	TEST PROCEDURES	40
4.6.4	DEVIATION FROM TEST STANDARD	40
4.6.5	TEST SETUP	41
4.6.6	EUT OPERATING CONDITION	41
4.6.7	TEST RESULTS	42
4.7	RADIATED EMISSION MEASUREMENT	45
4.7.1	LIMITS OF RADIATED EMISSION MEASUREMENT	45
4.7.2	TEST INSTRUMENTS	46
4.7.3	TEST PROCEDURES	47
4.7.4	DEVIATION FROM TEST STANDARD	47
4.7.5	TEST SETUP	48
4.7.6	TEST RESULTS	49
4.8	BAND EDGES MEASUREMENT	53
4.8.1	LIMITS OF BAND EDGES MEASUREMENT	53
4.8.2	TEST INSTRUMENTS	53
4.8.3	TEST PROCEDURE	53
4.8.4	DEVIATION FROM TEST STANDARD	53
4.8.5	EUT OPERATING CONDITION	54
4.8.6	TEST RESULTS	54
4.9	ANTENNA REQUIREMENT	57
4.9.1	STANDARD APPLICABLE	57
4.9.2	ANTENNA CONNECTED CONSTRUCTION	57
5	INFORMATION ON THE TESTING LABORATORIES	58



1 CERTIFICATION

PRODUCT : WiFi video handset
BRAND NAME : UMEC
MODEL NO. : SY 832
APPLICANT : UNIVERSAL MICROELECTRONICS CO., LTD.
TESTED DATE: Feb. 08 to March 20, 2007
TEST ITEM : ENGINEERING SAMPLE
STANDARDS : 47 CFR Part 15, Subpart C (Section 15.247),
ANSI C63.4-2003

The above equipment (Model: SY 832) 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.

A handwritten signature in black ink, appearing to read 'Midoli Peng'.

PREPARED BY : _____, **DATE:** March 28, 2007
(Midoli Peng)

**TECHNICAL
ACCEPTANCE :** _____, **DATE:** March 28, 2007
Responsible for RF A handwritten signature in black ink, appearing to read 'Moris Lin'.

A handwritten signature in black ink, appearing to read 'Moris Lin'.

APPROVED BY : _____, **DATE:** March 28, 2007
(Hank Chung, Deputy Manager) A handwritten signature in black ink, appearing to read 'Hank Chung'.



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR 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 -10.42 dB at 2.956 MHz
15.247(a)(1) (I)-(ii)	Number of Hopping Frequency Used Spec.: At least 75 channels	PASS	Meet the requirement of limit
15.247(a)(1) (ii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit
15.247(a)(1) (I)-(ii)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit
15.247(a)(2)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Report reference
15.247(b)	Maximum Peak Output Power Spec.: max. 1W	PASS	Meet the requirement of limit
15.247(c)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -2.4 dB at 4960.0MHz
15.247(c)	Band Edge Measurement	PASS	Meet the requirement of limit

Note: The 2.4GHz test data please refer RF960205H09 & SA960205H09 for 2.4GHz.

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:

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

Measurement	Value
Radiated emissions (30MHz-1GHz)	2.53 dB
Radiated emissions (1GHz ~18GHz)	3.89 dB
Radiated emissions (18GHz ~20GHz)	2.21 dB



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WiFi video handset
MODEL NO.	SY 832
FCC ID	HTO-SY832
POWER SUPPLY	DC 5V from power adapter or 3.7V from battery
MODULATION TYPE	For 2.4GHz : CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM For Bluetooth : GFSK
RADIO TECHNOLOGY	For 2.4GHz : DSSS, OFDM For Bluetooth : FHSS
TRANSFER RATE	For 2.4GHz : 802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps For Bluetooth : 1 Mbits/s
FREQUENCY RANGE	For 2.4GHz :2412MHz ~ 2462MHz For Bluetooth :2402MHz ~ 2480MHz
NUMBER OF CHANNEL	For 2.4GHz : 11 For Bluetooth :79
OUTPUT POWER (For 2.4GHz)	802.11b: 20.845mW 802.11g: 22.387mW
OUTPUT POWER (For Bluetooth)	1.622 mW
ANTENNA TYPE	For 2.4GHz : PIFA Antenna (Antenna gain : - 3.0dBi) For Bluetooth : Chip antenna with 2dBi antenna gain
DATA CABLE	NA
I/O PORT	NA

NOTE:

1. The EUT was powered by following power adapter or battery:

Power adapter	
Brand:	UMEC
Model No.:	UP0101G-05PA
Input power :	AC 100-240V, 50/60Hz, 0.4A MAX
Output power :	DC 5V 1.6A
Battery	
Brand:	HELIX CO., LTD.
Model No.:	HNP-120B
Power Spec:	3.7V, 1700 mAh

2. The EUT was pre-tested under the following test modes for three different axes placements:

Test Mode	Description
Mode A	X-Y plane
Mode B	Z-X plane
Mode C	Z-Y plane

From the above modes, the worst emission level was found in **Mode A**. Therefore only the test data of the modes were recorded in this report individually.

3. The EUT operates in the 2.4GHz frequency spectrum with throughput of up to 54Mbps. **<The 2.4GHz test data please refer RF960205H09 & SA960205H09 for 2.4GHz >**
4. The EUT complies with IEEE 802.11g standards, and backwards compatible with IEEE 802.11b products. **<The 2.4GHz test data please refer RF960205H09 & SA960205H09 for 2.4GHz >**
5. Bluetooth technology is used for the EUT.
6. 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

Seventy-nine 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		

3.3 Test Mode Applicability and tested channel detail

EUT CONFIGURE MODE	Applicable to				Description
	PLC	RE<1G	RE ³ 1G	APCM	
-	√	√	√	√	NA

Where PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz

RE³1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations 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	0	FHSS	GFSK	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 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	78	FHSS	GFSK	DH5

- The EUT was pre-tested with the following modes:

Test Mode	Description
Mode A	With adapter
Mode B	With battery

The worst case was found in Mode A.



RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations 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	0, 39, 78	FHSS	GFSK	DH5

BANDEdge MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations 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	0, 78	FHSS	GFSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations 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	0, 39, 78	FHSS	GFSK	DH5



3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a WiFi video handset. 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.

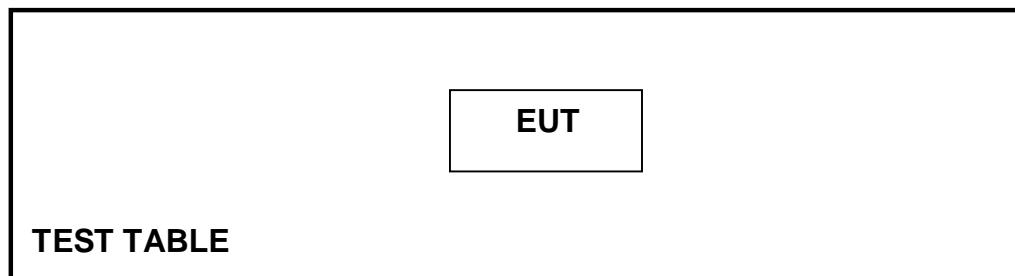
NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3.6 CONFIGURATION OF SYSTEM UNDER TEST



NOTE: 1. Please refer to the photos of test configuration in Item 5 also.



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
0.15-0.5 0.5-5 5-30	Quasi-peak	Average
	66 to 56	56 to 46
	56	46
	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

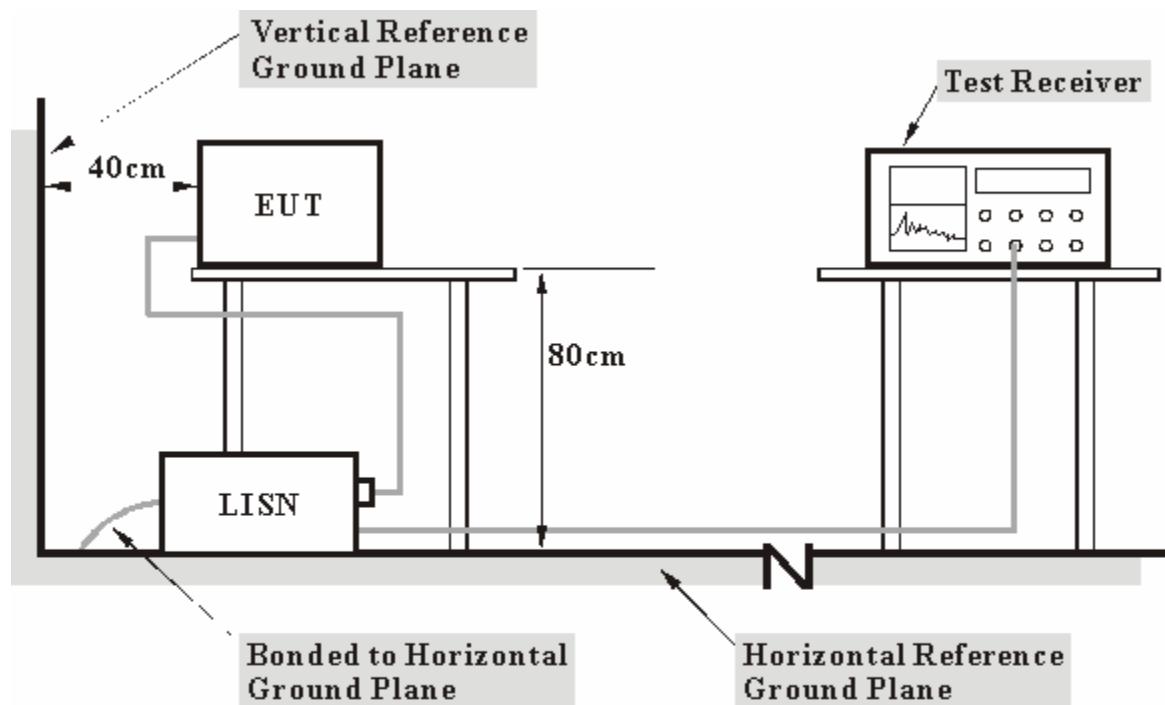
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100287	Mar. 06, 2008
Line-Impedance Stabilization Network(for EUT)	ENV-216	100072	Oct. 20, 2007
Line-Impedance Stabilization Network(for Peripheral)	KNW-407	8-1395-12	Aug. 15, 2007
RF Cable (JETBAO)	RG233/U	Cable_CA_01	Jul. 19, 2007
Terminator	50	1	Oct. 30, 2007
Software	ADT_Cond_V7.3.2	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 ADT Shielded Room No. A.
3. The VCCI Con A Registration No. is C-817.

4.1.3 TEST PROCEDURES

- a. The EUT/HOST was placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST 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/HOST were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

4.1.4 TEST SETUP



Note:

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



4.1.5 EUT OPERATING CONDITIONS

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

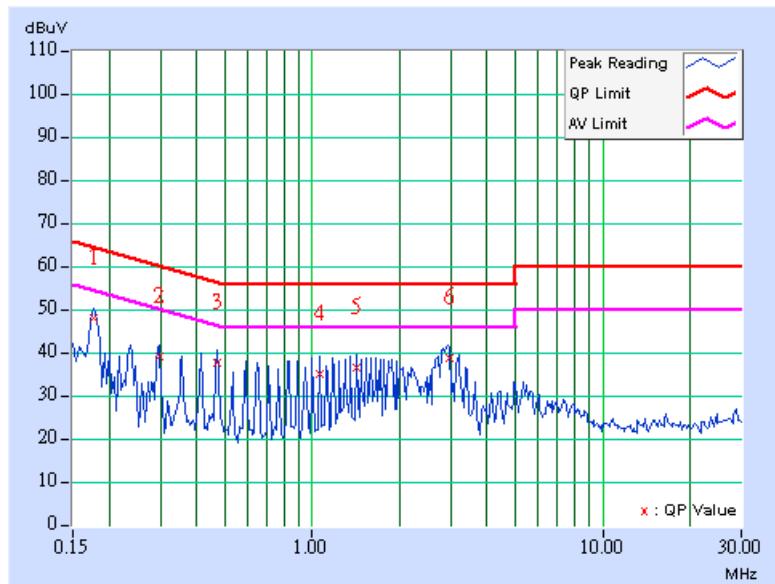
4.1.6 TEST RESULTS

INPUT POWER (SYSTEM)	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
PHASE	Line (L)	TRANSFER RATE	1Mbps
ENVIRONMENTAL CONDITIONS	14deg. C, 60%RH, 960hPa	TESTED BY	Wen Yu

No	Freq. Factor	Reading Value		Emission Level		Limit		Margin	
		[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.177	9.78	38.42	-	48.20	-	64.61	54.61	-16.41
2	0.297	9.80	29.54	-	39.34	-	60.32	50.32	-20.98
3	0.470	9.81	27.91	-	37.72	-	56.51	46.51	-18.79
4	1.060	9.90	25.25	-	35.15	-	56.00	46.00	-20.85
5	1.419	9.90	26.84	-	36.74	-	56.00	46.00	-19.26
6	2.956	9.90	28.95	-	38.85	-	56.00	46.00	-17.15

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.

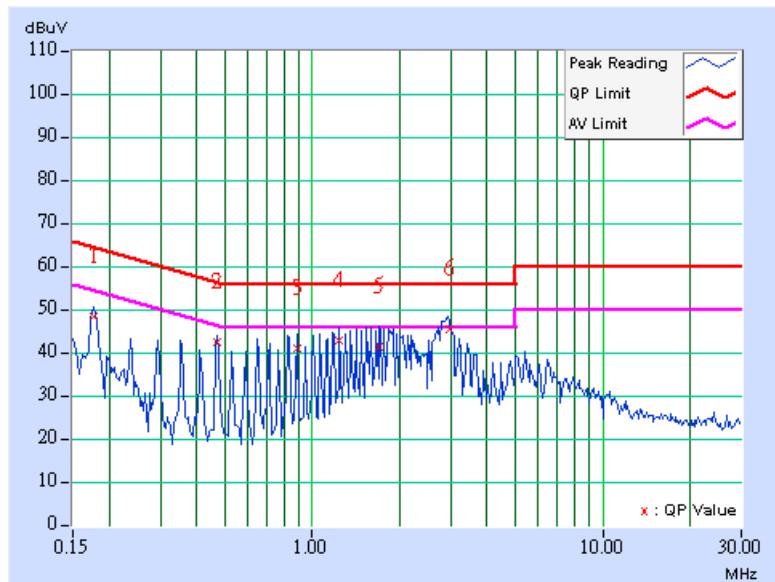


INPUT POWER (SYSTEM)	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
PHASE	Neutral (N)	TRANSFER RATE	1Mbps
ENVIRONMENTAL CONDITIONS	14deg. C, 60%RH, 960hPa	TESTED BY	Wen Yu

No	Freq. Factor	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.177	9.80	38.60	-	48.40	-	64.61	54.61	-16.21	-
2	0.470	9.81	32.64	-	42.45	-	56.51	46.51	-14.06	-
3	0.884	9.88	31.11	-	40.99	-	56.00	46.00	-15.01	-
4	1.240	9.92	32.88	-	42.80	-	56.00	46.00	-13.20	-
5	1.709	9.97	31.57	-	41.54	-	56.00	46.00	-14.46	-
6	2.956	10.00	35.58	-	45.58	-	56.00	46.00	-10.42	-

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.





4.2 NUMBER OF HOPPING FREQUENCY USED

4.2.1 LIMIT OF HOPPING FREQUENCY USED

At least 75 hopping frequencies, and should be equally spaced.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



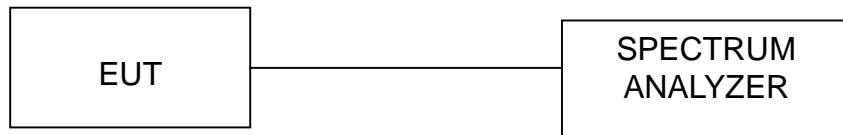
4.2.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.2.4 DEVIATION FROM TEST STANDARD

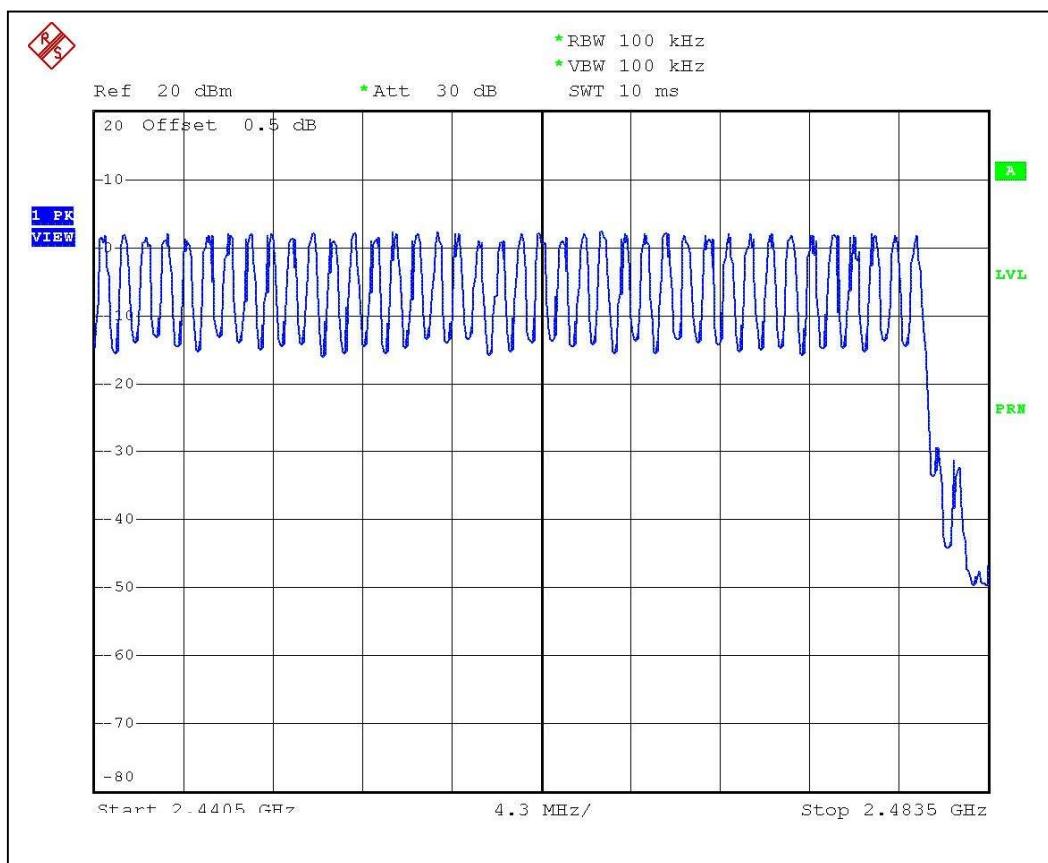
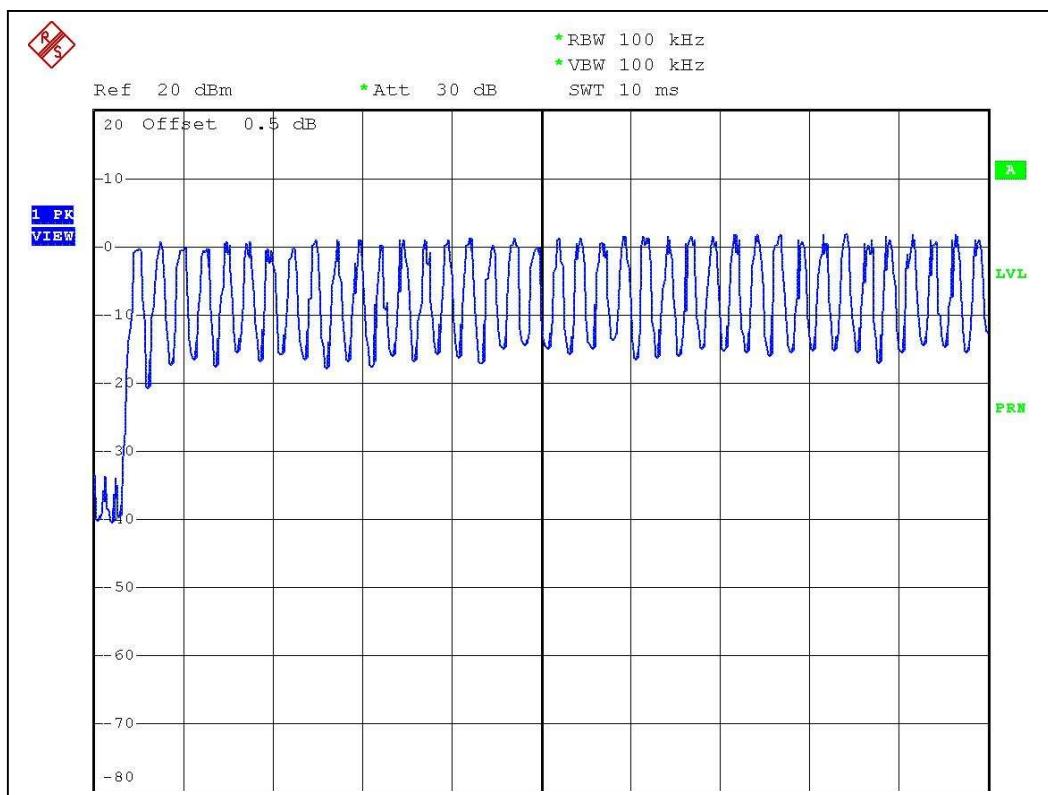
No deviation

4.2.5 TEST SETUP



4.2.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.





4.3 DWELL TIME ON EACH CHANNEL

4.3.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

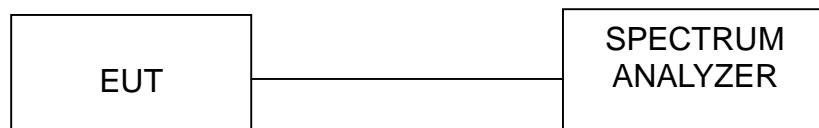
4.3.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency to be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP

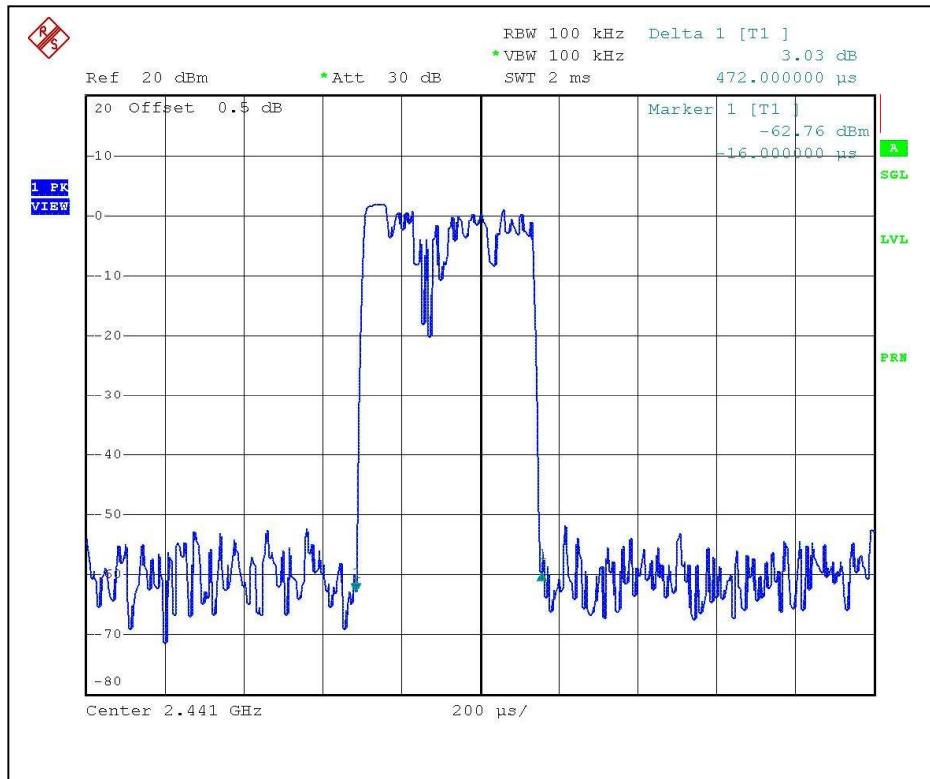
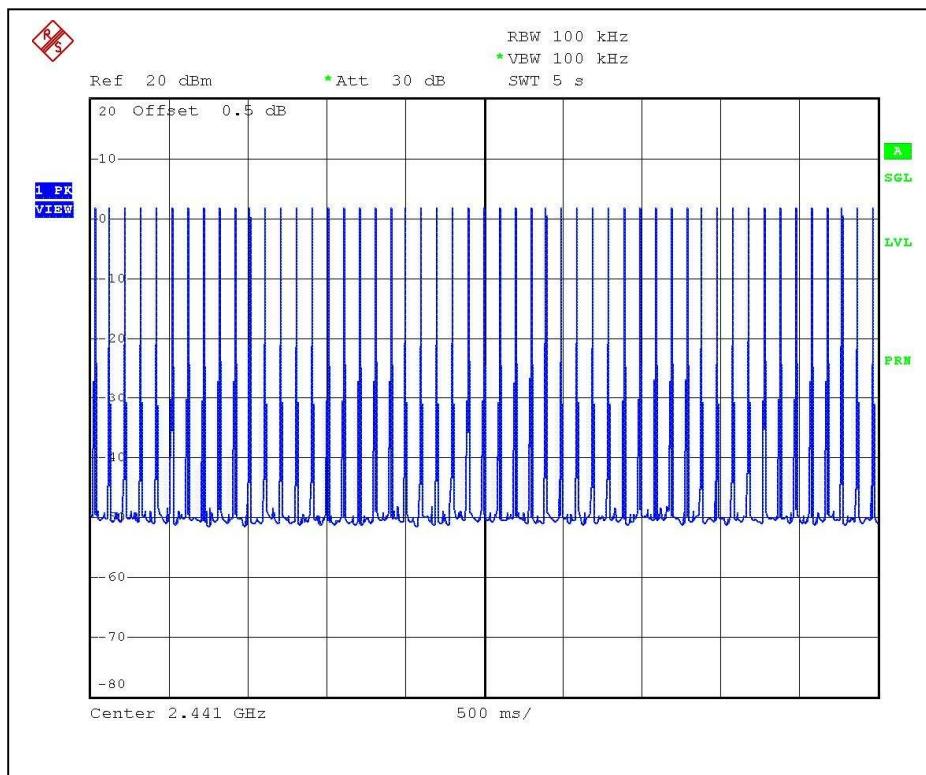


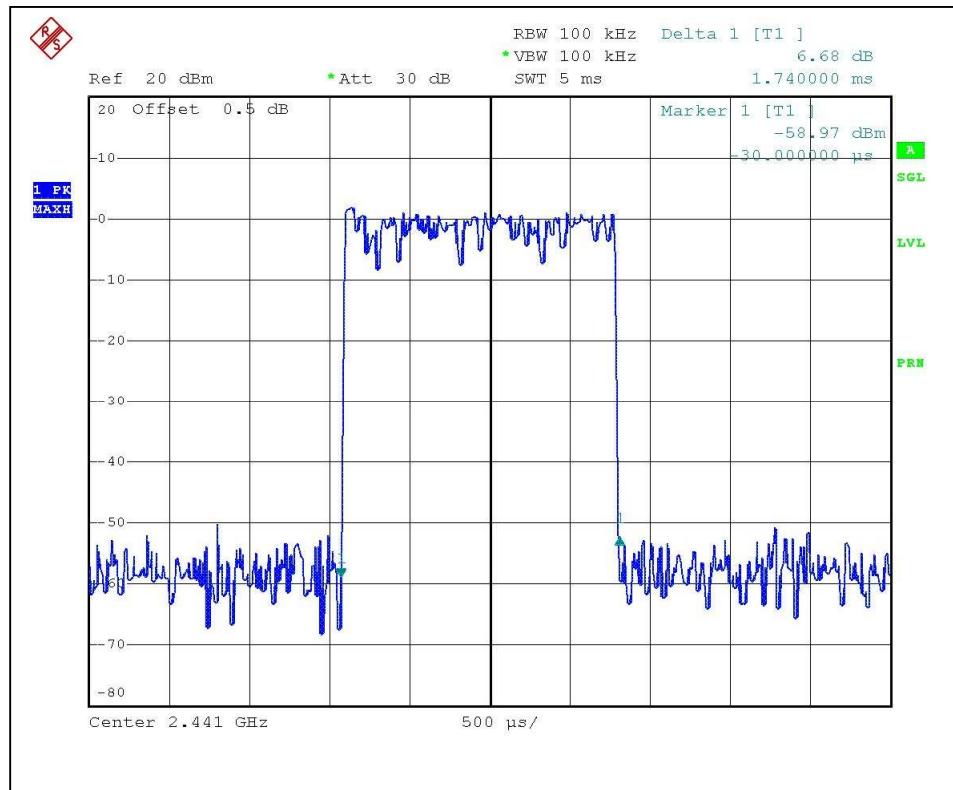
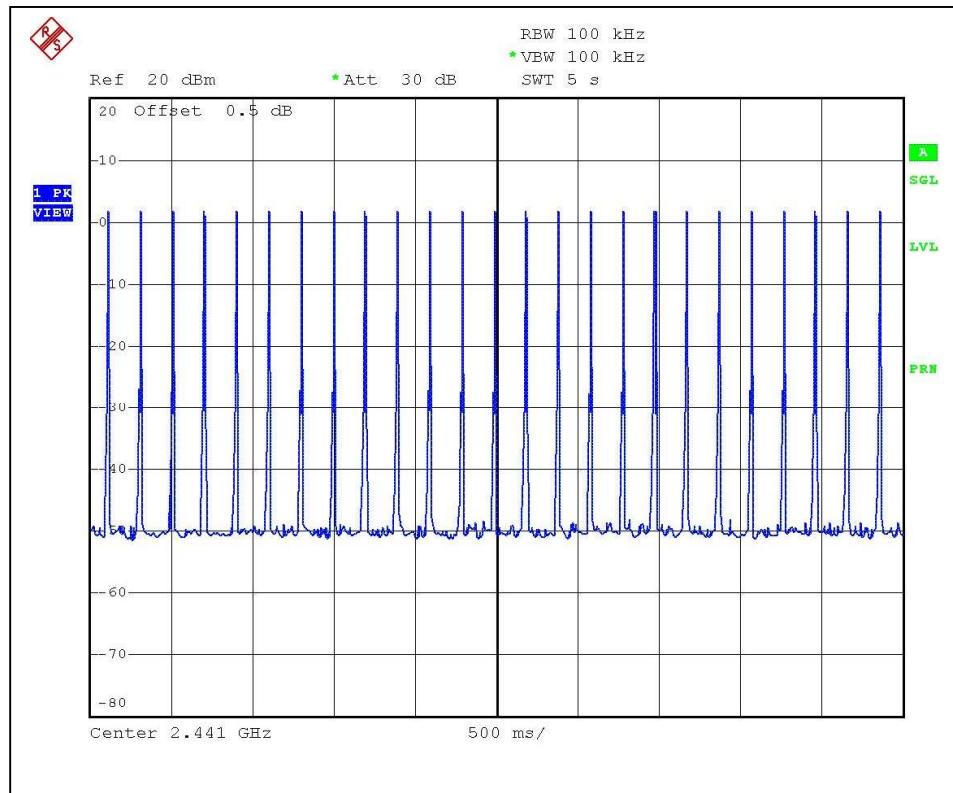


4.3.6 TEST RESULTS

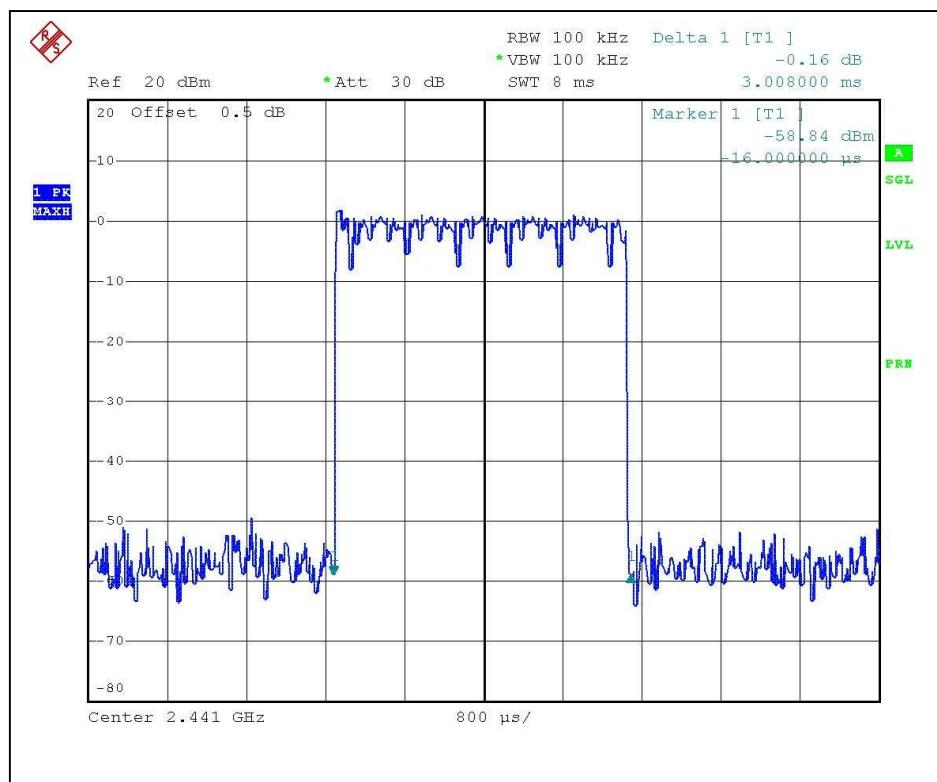
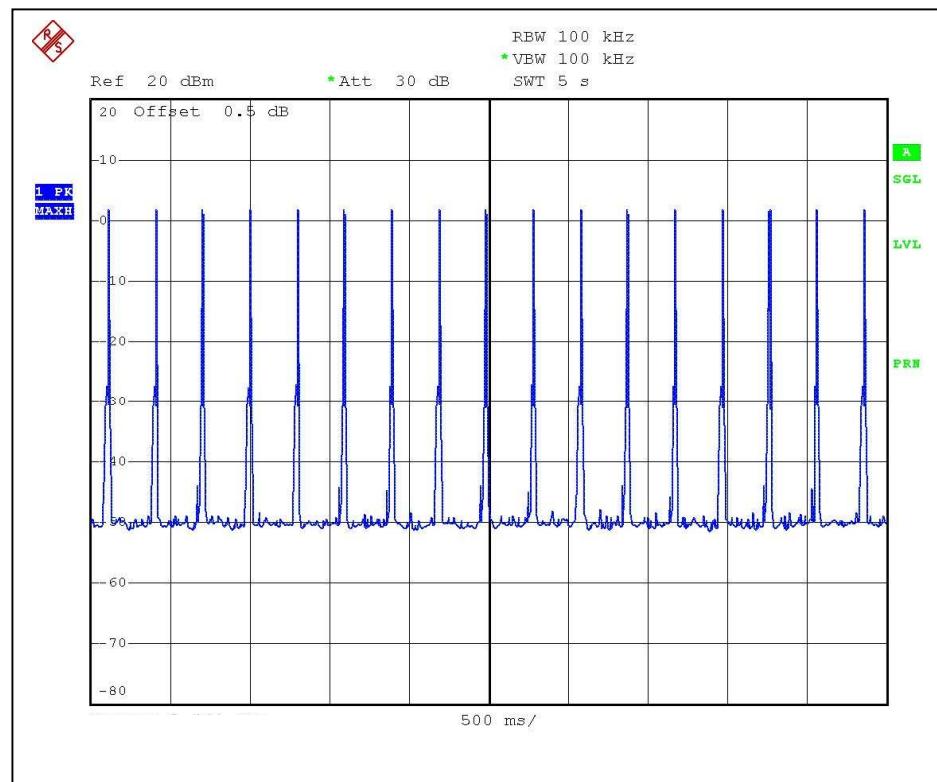
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	51 (times / 5 sec) *6.32=322.32 times	0.472	152.135	400
DH3	25 (times / 5 sec) *6.32=158.00 times	1.740	274.92	400
DH5	17 (times / 5 sec) *6.32=107.44 times	3.008	323.180	400

Test plots of the transmitting time slot are shown on next three pages.

DH1


DH3


DH5





4.4 CHANNEL BANDWIDTH

4.4.1 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

4.4.3 DEVIATION FROM TEST STANDARD

No deviation

4.4.4 TEST SETUP



4.4.5 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

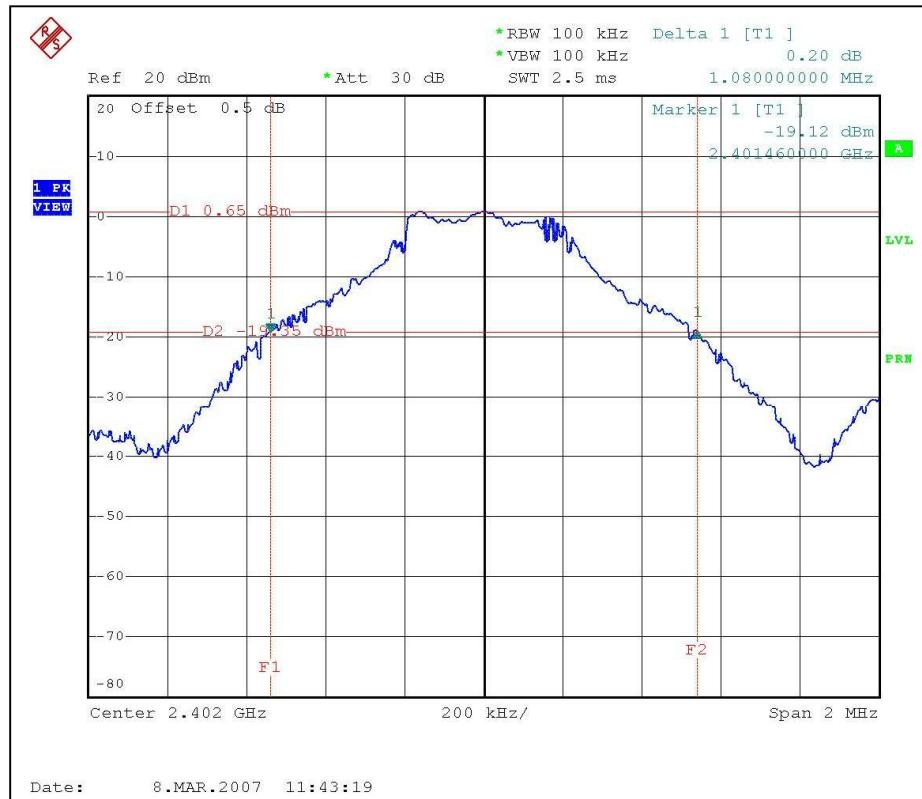


4.4.6 TEST RESULTS

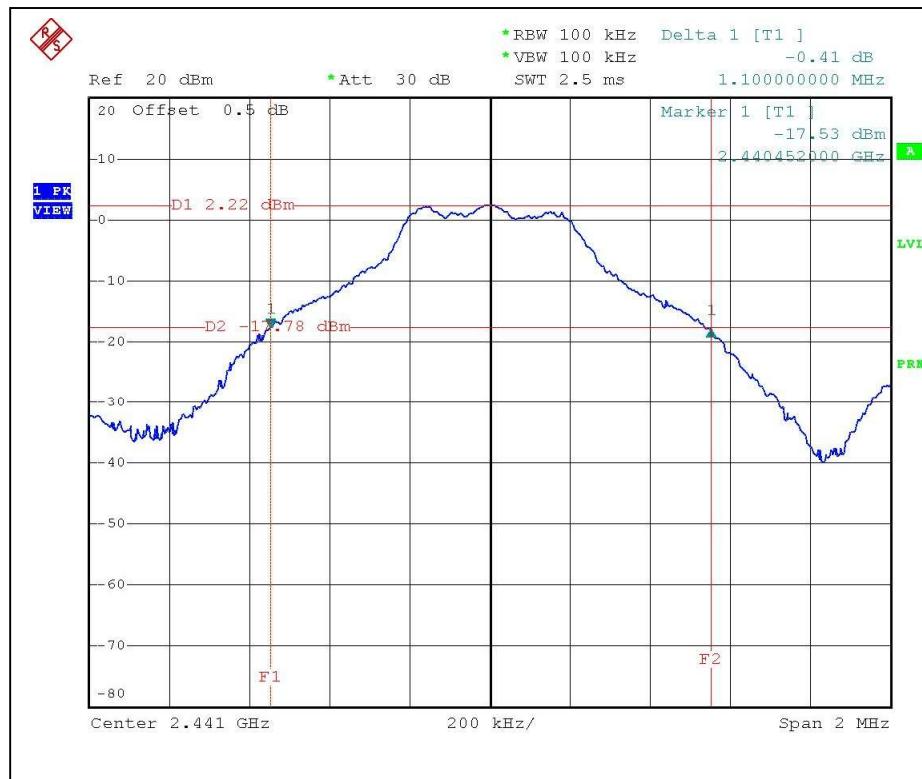
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 960 hPa	INPUT POWER (SYSTEM)	120VAC, 60 HZ
TESTED BY	Sky Liao		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)
0	2402	1080
39	2441	1100
78	2480	1092

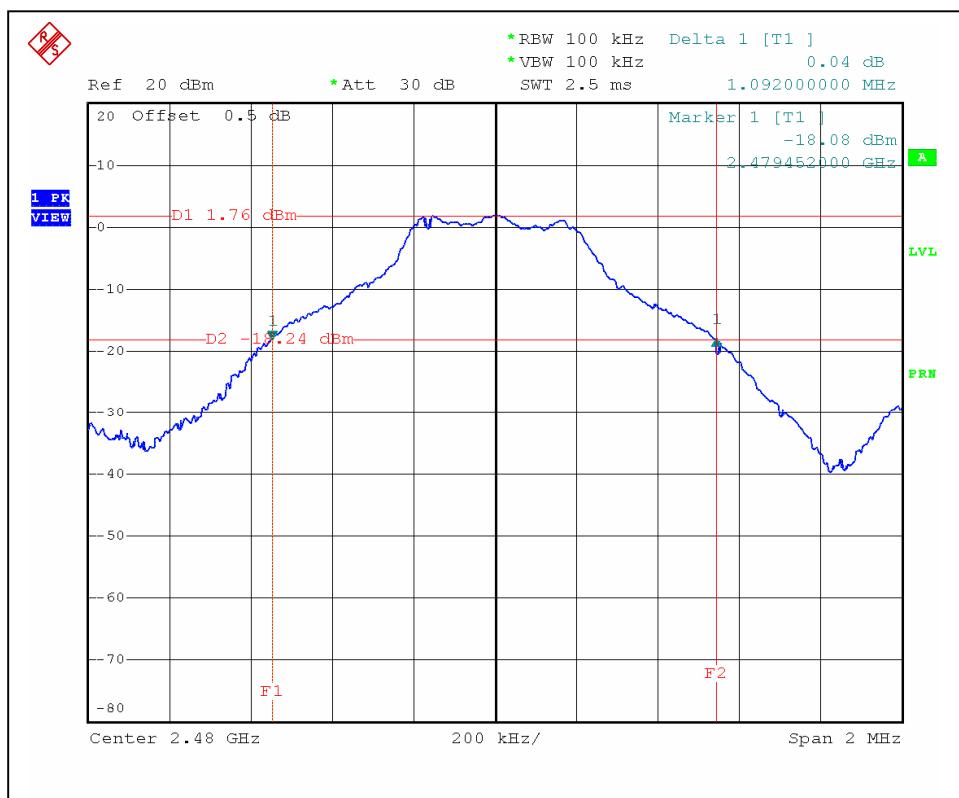
Channel 0



Channel 39



Channel 78





4.5 HOPPING CHANNEL SEPARATION

4.5.1 LIMIT OF HOPPING CHANNEL SEPARATION

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

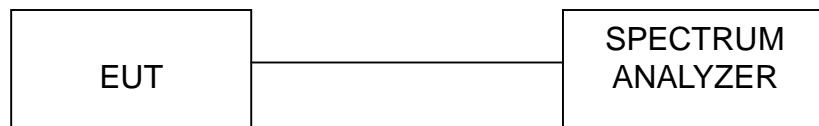
4.5.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



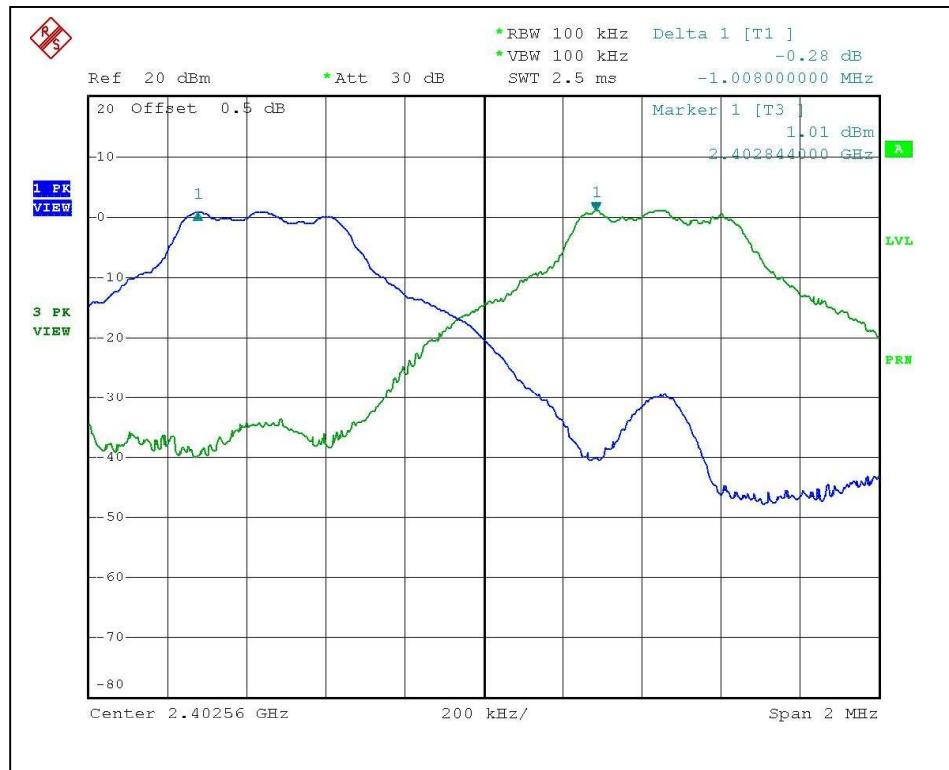


4.5.6 TEST RESULTS

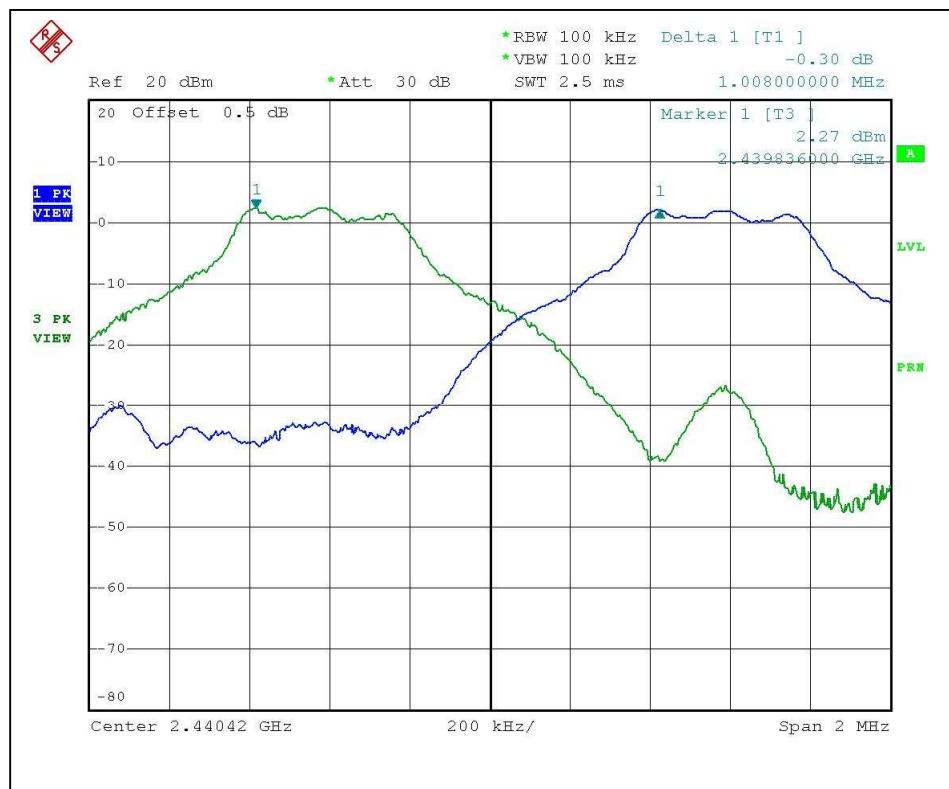
ENVIRONMENTAL CONDITIONS	18deg. C, 65%RH, 976 hPa	INPUT POWER (SYSTEM)	120VAC, 60 HZ
TESTED BY	Rex Huang		

Channel	Frequency (MHz)	Adjacent Channel Separation	Minimum Limit (kHz)	Pass / Fail
0	2402	1.008MHz	720	PASS
39	2441	1.008MHz	733	PASS
78	2480	1.000MHz	728	PASS

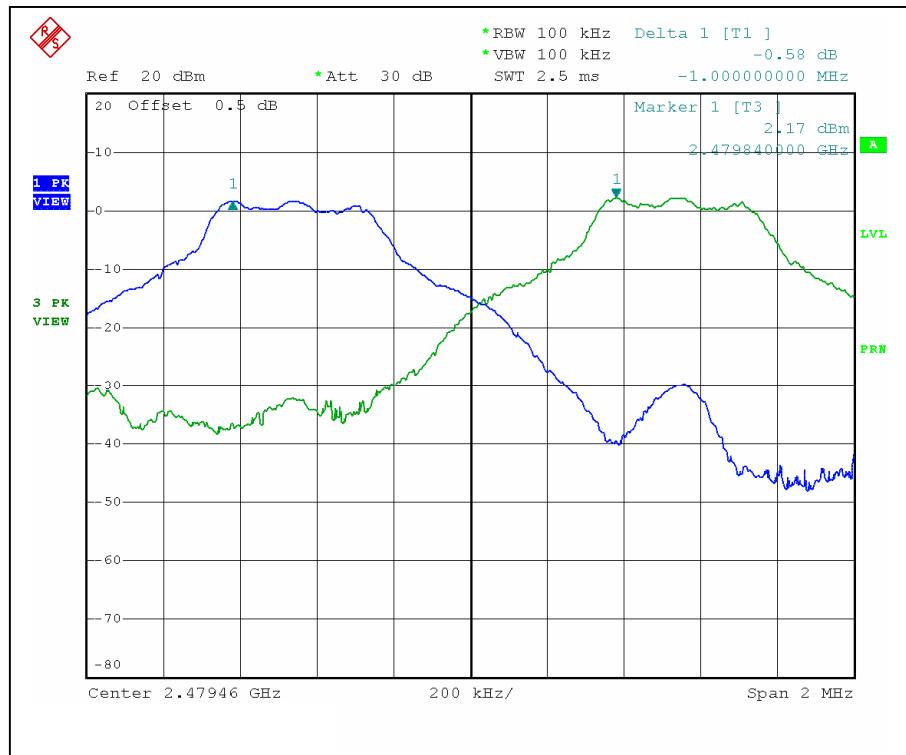
Channel 0



Channel 39



Channel 78





4.6 MAXIMUM PEAK OUTPUT POWER

4.6.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 1W.

4.6.2 INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



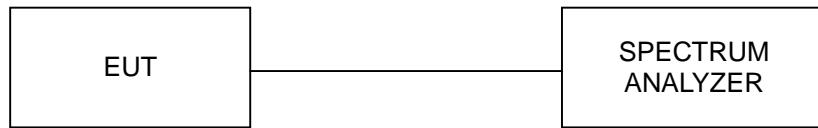
4.6.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 3 MHz VBW.
4. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.6.6 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

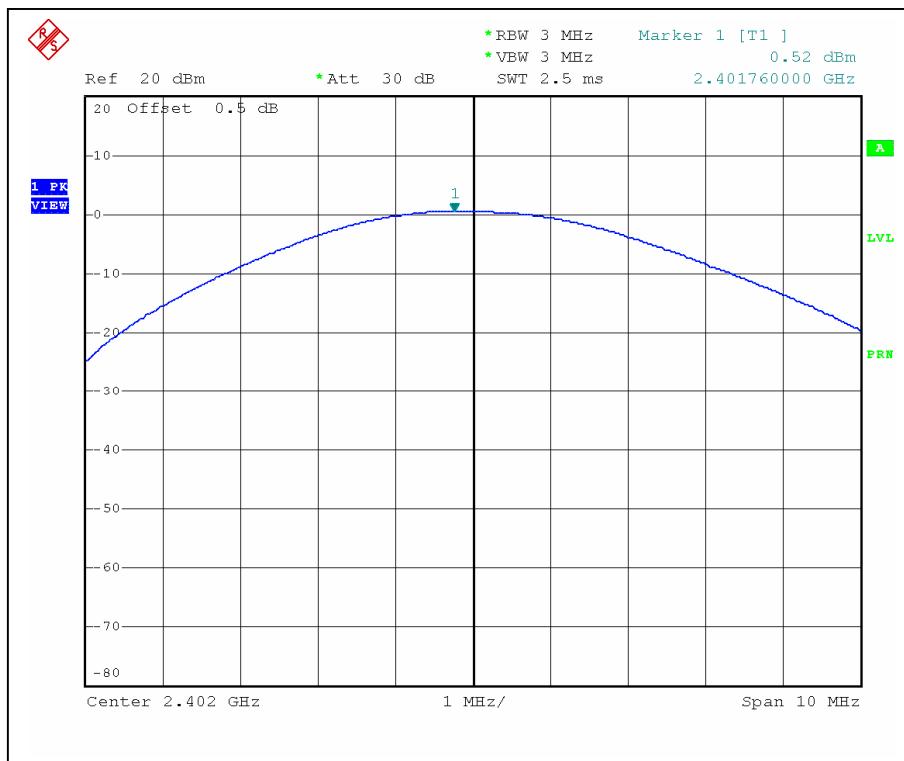


4.6.7 TEST RESULTS

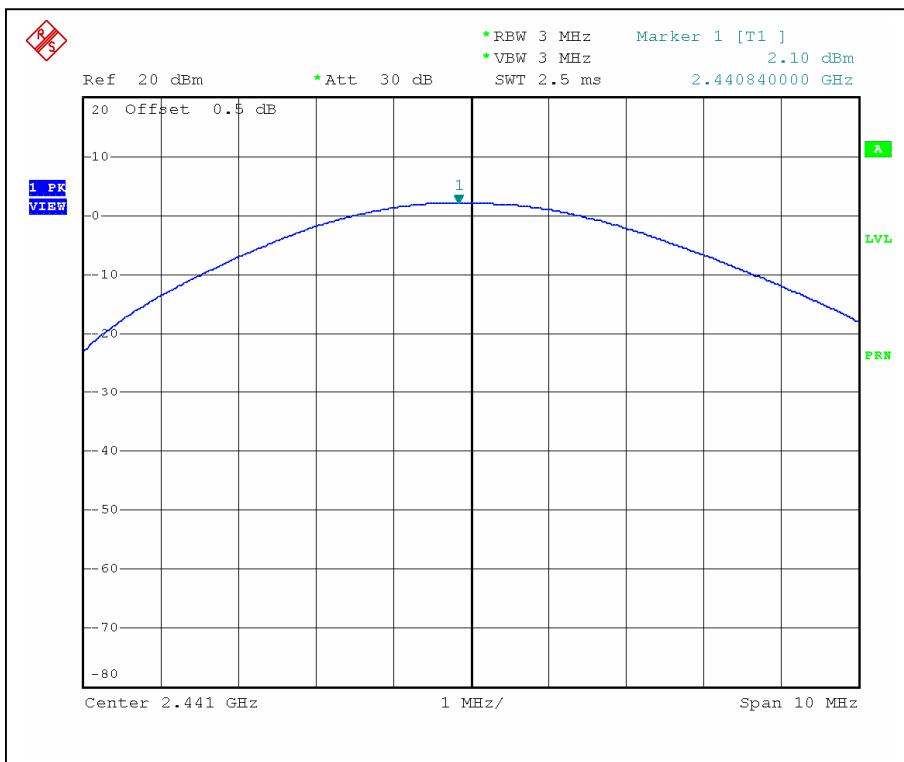
ENVIRONMENTAL CONDITIONS	25deg. C, 62%RH, 976 hPa	INPUT POWER (SYSTEM)	120VAC, 60 HZ
TESTED BY	Wen Yu		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	1.127	0.52	30	PASS
39	2441	1.622	2.10	30	PASS
78	2480	1.567	1.95	30	PASS

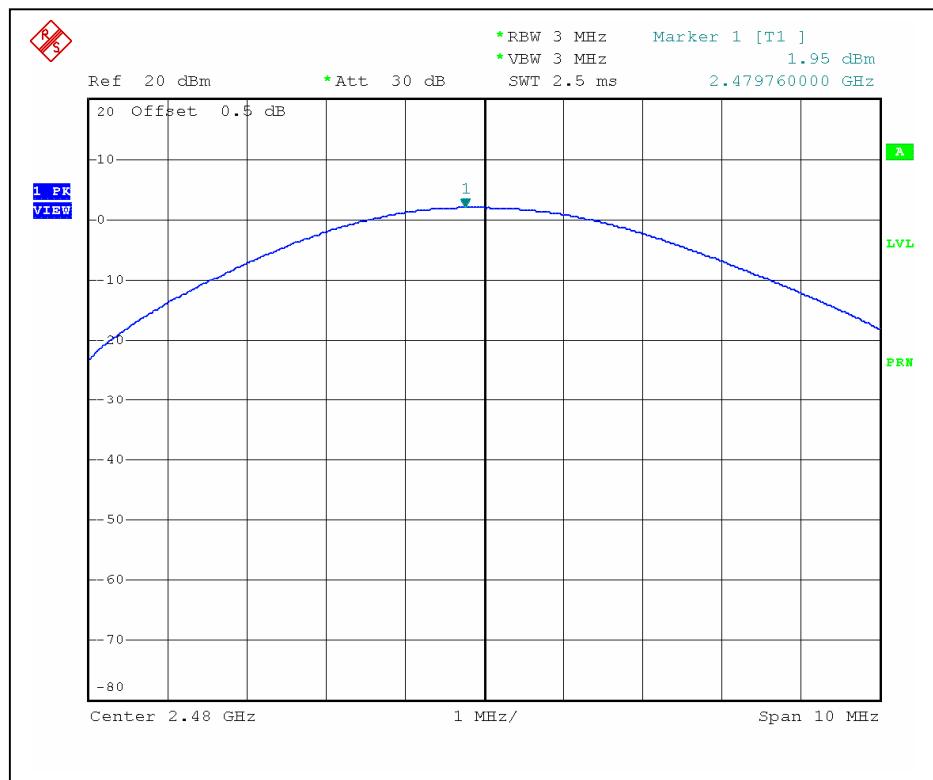
Channel 0



Channel 39



Channel 78



4.7 RADIATED EMISSION MEASUREMENT

4.7.1 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(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

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.



4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 03, 2007
HP Pre_Amplifier	8449B	3008A01922	Sep. 18, 2007
ROHDE & SCHWARZ Test Receiver	ESCS30	100375	Sep. 20, 2007
CHASE Broadband Antenna	VULB 9168	138	Dec. 11, 2007
Schwarzbeck Horn_Antenna	BBHA9120	D124	Jan. 01, 2008
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 05, 2008
SCHWARZBECK Biconical Antenna	VHBA9123	459	Jun. 08, 2009
SCHWARZBECK Periodic Antenna	UPA6108	1148	Jun. 08, 2009
RF Switches (ARNITSU)	CS-201	1565157	NA
RF CABLE (Chaintek)	SF102	22054-2	Nov. 14. 2007
RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M-1 GHz	Jul. 15, 2007
Software	ADT_Radiated_V 5.14	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Biconical and Periodic Antenna)and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.

3. The test was performed in ADT Open Site No. C.

4. The FCC Site Registration No. is 656396.

5. The VCCI Site Registration No. is R-1626.

6. The CANADA Site Registration No. is IC 4824A-3.

4.7.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 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 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

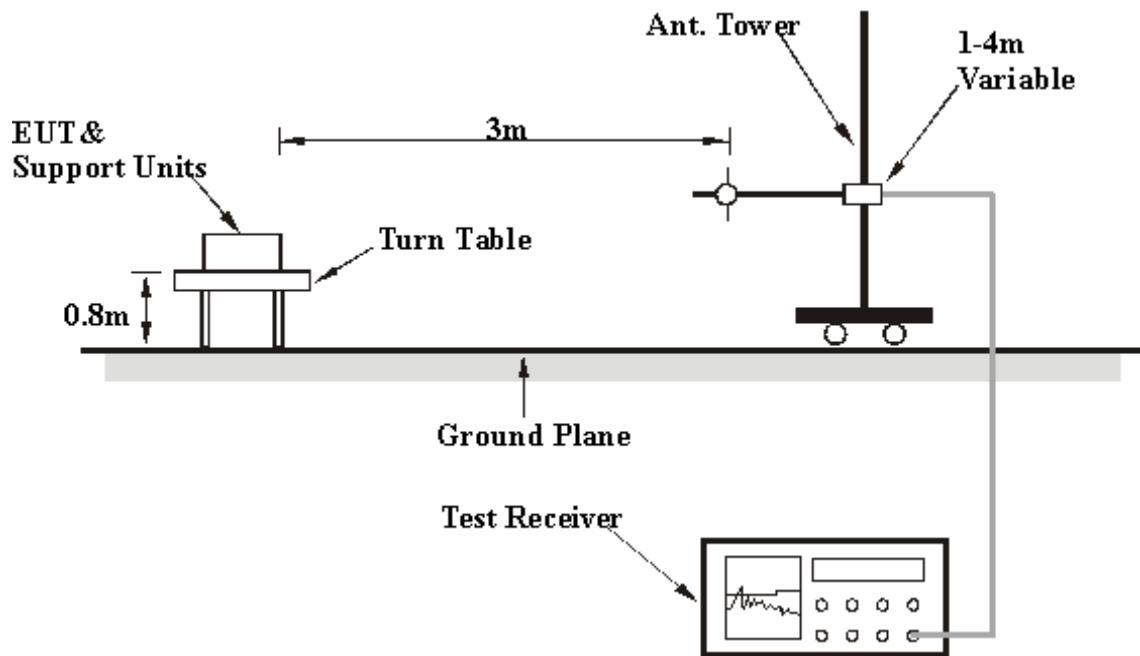
NOTE:

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

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



4.7.6 TEST RESULTS

CHANNEL	78	FREQUENCY RANGE	Below 1GHz
INPUT POWER (SYSTEM)	120VAC, 60 HZ	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	23deg. C, 64%RH, 976 hPa	TESTED BY	Rex Huang

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	72.01	28.80 QP	40.00	-11.20	1.46 H	257	16.72	12.08
2	133.34	31.60 QP	43.50	-11.90	1.63 H	313	18.71	12.89
3	186.23	38.70 QP	43.50	-4.80	1.35 H	248	26.15	12.55
4	240.02	38.10 QP	46.00	-7.90	1.24 H	172	24.76	13.34
5	292.59	40.90 QP	46.00	-5.10	1.37 H	81	24.43	16.47
6	346.13	40.30 QP	46.00	-5.70	1.10 H	326	22.96	17.34
7	718.31	33.40 QP	46.00	-12.60	1.05 H	245	7.03	26.37

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	62.12	33.70 QP	40.00	-6.30	1.00 V	129	20.24	13.46
2	110.04	18.90 QP	43.50	-24.60	1.00 V	247	8.23	10.67
3	240.01	25.80 QP	46.00	-20.20	1.00 V	85	12.46	13.34
4	292.62	35.10 QP	46.00	-10.90	1.00 V	36	18.63	16.47
5	345.96	27.90 QP	46.00	-18.10	1.00 V	212	10.56	17.34
6	505.37	35.30 QP	46.00	-10.70	1.24 V	287	13.38	21.92
7	718.25	32.40 QP	46.00	-13.60	1.13 V	265	6.03	26.37

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.



CHANNEL	Channel 0	FREQUENCY RANGE		1 ~25GHz		
INPUT POWER (SYSTEM)	120VAC, 60 Hz	DETECTOR FUNCTION			Peak(PK) Average (AV)	
ENVIRONMENTAL CONDITIONS	20 deg. C, 65%RH, 976 hPa	TESTED BY			Phoenix Huang	

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	1602.00	41.90 PK	74.00	-32.10	1.00 H	21	12.00	29.90
1	1602.00	38.60 AV	54.00	-15.40	1.00 H	21	8.70	29.90
2	2390.00	56.90 PK	74.00	-17.10	1.00 H	19	25.00	31.90
2	2390.00	44.70 AV	54.00	-9.30	1.00 H	19	12.70	31.90
3	*2402.00	84.00 PK			1.00 H	18	52.00	32.00
3	*2402.00	54.00 AV			1.00 H	18	22.00	32.00
4	4804.00	63.00 PK	74.00	-11.00	1.22 H	22	27.10	35.90
4	4804.00	33.00 AV	54.00	-21.00	1.22 H	22	-2.90	35.90
5	7206.00	53.00 PK	74.00	-21.00	1.56 H	22	10.90	42.10
5	7206.00	23.00 AV	54.00	-31.00	1.56 H	22	-19.10	42.10

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	1602.00	50.30 PK	74.00	-23.70	1.07 V	43	20.40	29.90
1	1602.00	47.10 AV	54.00	-6.90	1.07 V	43	17.20	29.90
2	2390.00	55.50 PK	74.00	-18.50	1.40 V	267	23.60	31.90
2	2390.00	44.80 AV	54.00	-9.20	1.40 V	267	12.90	31.90
3	*2402.00	88.60 PK			1.40 V	268	56.60	32.00
3	*2402.00	58.60 AV			1.40 V	268	26.60	32.00
4	4804.00	66.90 PK	74.00	-7.10	1.26 V	334	31.00	35.90
4	4804.00	36.90 AV	54.00	-17.10	1.26 V	334	1.00	35.90
5	7206.00	53.80 PK	74.00	-20.20	1.56 V	25	11.70	42.10
5	7206.00	23.80 AV	54.00	-30.20	1.56 V	25	-18.30	42.10

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 be equal to: $20\log(3.125/100) = -30\text{dB}$
7. Average value = peak reading +20log(duty cycle)



CHANNEL	Channel 39	FREQUENCY RANGE		1 ~25GHz
INPUT POWER (SYSTEM)	120VAC, 60 HZ	DETECTOR FUNCTION		Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 65%RH, 976 hPa	TESTED BY		Phoenix Huang

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	1628.00	47.30 PK	74.00	-26.70	1.57 H	134	17.40	29.90
1	1628.00	44.50 AV	54.00	-9.50	1.57 H	134	14.60	29.90
2	*2441.00	86.60 PK			1.46 H	317	54.50	32.10
2	*2441.00	56.60 AV			1.46 H	317	24.50	32.10
3	4882.00	64.50 PK	74.00	-9.50	1.32 H	247	28.40	36.10
3	4882.00	34.50 AV	54.00	-19.50	1.32 H	247	-1.60	36.10
4	7323.00	53.40 PK	74.00	-20.60	1.62 H	8	10.80	42.60
4	7323.00	23.40 AV	54.00	-30.60	1.62 H	8	-19.20	42.60

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	1628.00	49.90 PK	74.00	-24.10	1.00 V	0	20.00	29.90
1	1628.00	47.30 AV	54.00	-6.70	1.00 V	0	17.40	29.90
2	*2441.00	87.00 PK			1.36 V	235	54.90	32.10
2	*2441.00	57.00 AV			1.36 V	235	24.90	32.10
3	4882.00	69.70 PK	74.00	-4.30	1.30 V	353	33.60	36.10
3	4882.00	39.70 AV	54.00	-14.30	1.30 V	353	3.60	36.10
4	7323.00	53.50 PK	74.00	-20.50	1.52 V	19	10.90	42.60
4	7323.00	23.50 AV	54.00	-30.50	1.52 V	19	-19.10	42.60

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 be equal to: $20\log(3.125/100) = -30\text{dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$



CHANNEL	Channel 78	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120VAC, 60 HZ	DETECTOR FUNCTION	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 65%RH, 976 hPa	TESTED BY	Phoenix Huang

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	1654.00	47.30 PK	74.00	-26.70	1.50 H	129	17.30	30.00
1	1654.00	44.00 AV	54.00	-10.00	1.50 H	129	14.00	30.00
2	*2480.00	86.90 PK			1.48 H	314	54.60	32.30
2	*2480.00	56.90 AV			1.48 H	314	24.60	32.30
3	2483.50	58.40 PK	74.00	-15.60	1.48 H	314	26.10	32.30
3	2483.50	45.60 AV	54.00	-8.40	1.48 H	314	13.30	32.30
4	4960.00	65.50 PK	74.00	-8.50	1.47 H	249	29.20	36.30
4	4960.00	35.50 AV	54.00	-18.50	1.47 H	249	-0.80	36.30
5	7440.00	53.60 PK	74.00	-20.40	1.53 H	328	10.60	43.00
5	7440.00	23.60 AV	54.00	-30.40	1.53 H	328	-19.40	43.00

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	1654.00	51.10 PK	74.00	-22.90	1.05 V	85	21.10	30.00
1	1654.00	48.50 AV	54.00	-5.50	1.05 V	85	18.50	30.00
2	*2480.00	88.10 PK			1.37 V	116	55.80	32.30
2	*2480.00	58.10 AV			1.37 V	116	25.80	32.30
3	2483.50	57.20 PK	74.00	-16.80	1.37 V	116	24.90	32.30
3	2483.50	45.80 AV	54.00	-8.20	1.37 V	116	13.50	32.30
4	4960.00	71.60 PK	74.00	-2.40	1.16 V	0	35.30	36.30
4	4960.00	41.60 AV	54.00	-12.40	1.16 V	0	5.30	36.30
5	7440.00	55.90 PK	74.00	-18.10	1.68 V	4	12.90	43.00
5	7440.00	25.90 AV	54.00	-28.10	1.68 V	4	-17.10	43.00

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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 be equal to: $20\log(3.125/100) = -30\text{dB}$
7. Average value = peak reading +20log(duty cycle)



4.8 BAND EDGES MEASUREMENT

4.8.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

4.8.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 21, 2007

Note:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation



4.8.5 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 TEST RESULTS

The spectrum plots are attached on the following 2 pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(C).

Note - The delta method is only used up to 2 MHz away from the restricted bandage, The radiated emissions which located in other restricted frequency band, the result, please refer to 4.2.

NOTE (Peak):

The band edge emission plot on the following page show 49.88dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2 is 88.60dBuV/m, so the maximum field strength in restrict band is $88.60-49.88=38.72$ dBuV/m which is under 74 dBuV/m limit.

The band edge emission plot on the following page shows 47.98dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2 is 88.10dBuV/m, so the maximum field strength in restrict band is $88.10-47.98=40.12$ dBuV/m which is under 74 dBuV/m limit.

NOTE (Average):

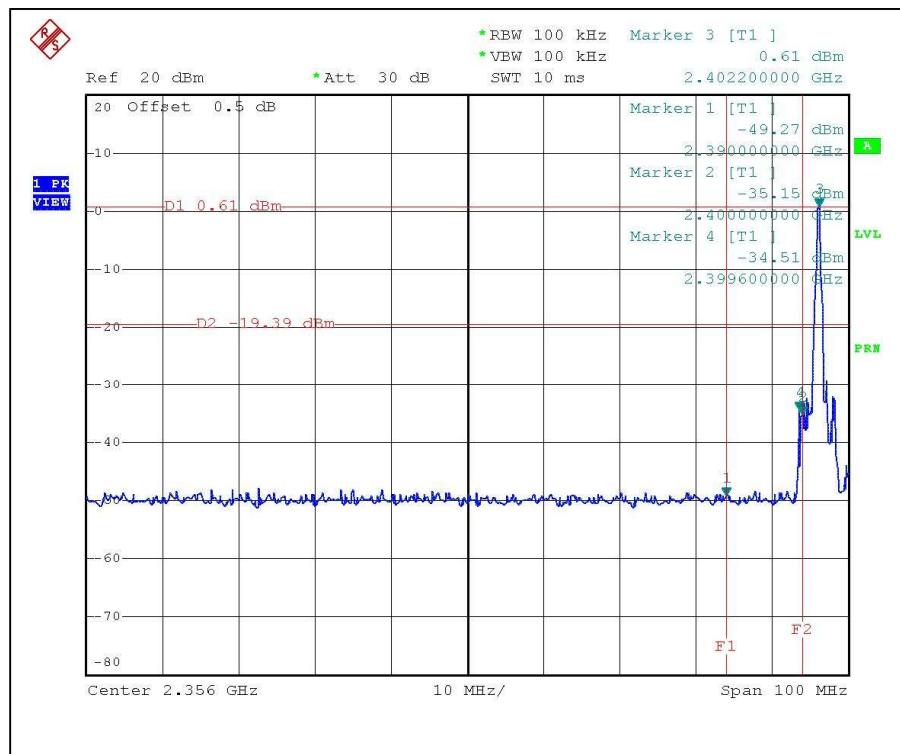
Average value = $38.72-30.00=8.72$ dBuV/m, which is under 54dBuV/m limit.

*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 be equal to: $20\log(3.125/100) = -30$ dB. Average value = peak reading - 30.00.

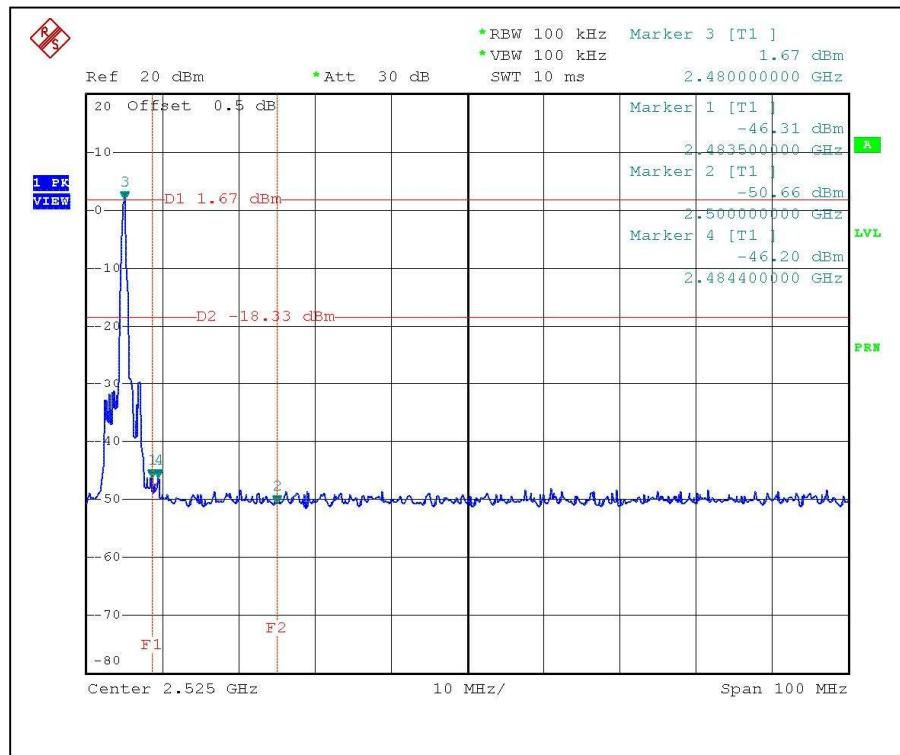
Average value = $47.98-30.00=17.98$ dBuV/m, which is under 54dBuV/m limit.

*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 be equal to: $20\log(3.125/100) = -30$ dB. Average value = peak reading - 30.00.

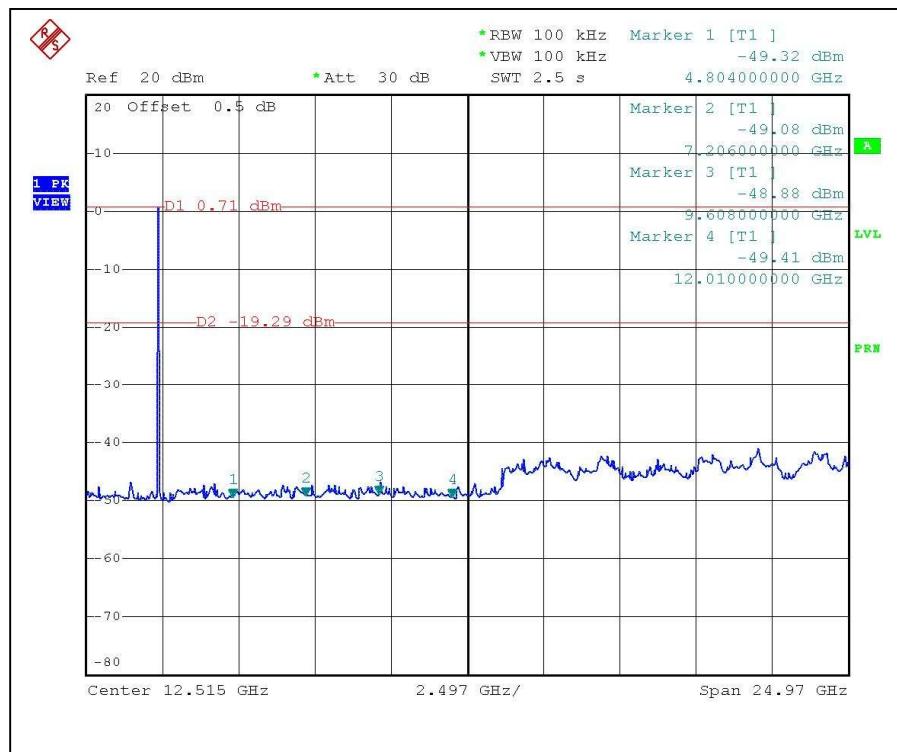
CH0



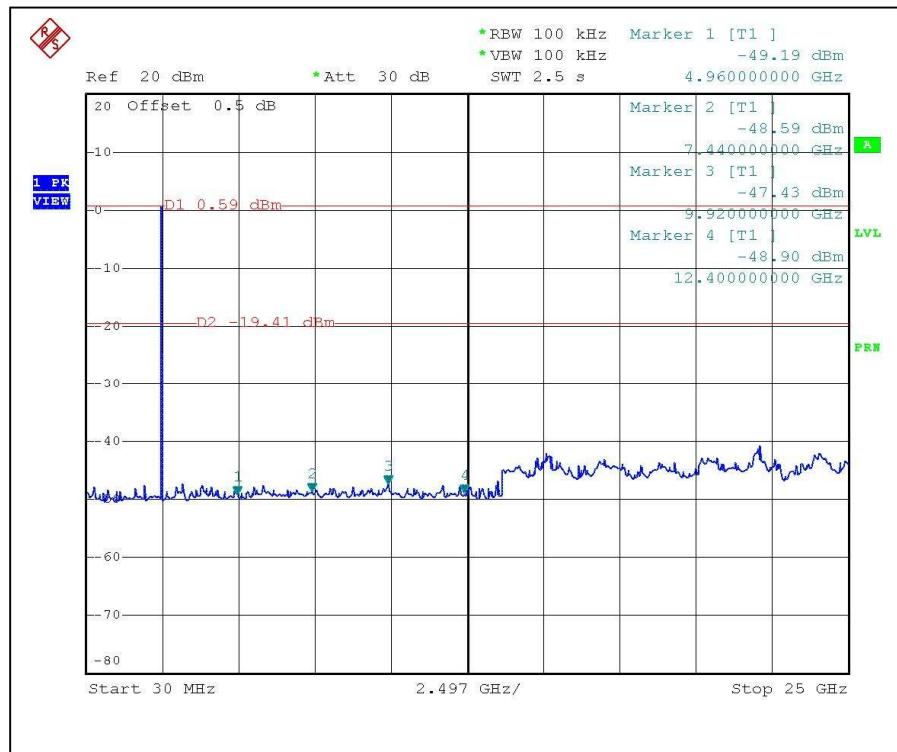
CH78



CH0



CH78





4.9 ANTENNA REQUIREMENT

4.9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Chip antenna without connector. The maximum Gain of the antenna is 2dBi



5 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.	CNLA, BSMI, NCC
Netherlands	Telefication
Singapore	PSB, 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: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343
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Web Site: www.adt.com.tw

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