FCC TEST REPORT

REPORT NO.: RF940829A02K

MODEL NO.: HS-57W

VERSION: HW:2.1 PS:1.8E MV:2.5 B5.2

RECEIVED: Mar. 27, 2006

TESTED: May 22 ~ July 21, 2006

ISSUED: July 24, 2006

APPLICANT: Nokia Corporation

ADDRESS: P.O. BOX 86 (Joensuunkatu 7E) FIN-24101 Salo, Finland

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang 244, Taipei Hsien, Taiwan, R.O.C.

0528

No.: 2177-01

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1. CERTIFICATION

PRODUCT:	Bluetooth Headset
MODEL NO.:	HS-57W
BRAND NAME:	NOKIA
APPLICANT:	Nokia Corporation
TESTED:	May 22 ~ July 21, 2006
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	FCC Part 15, Subpart C (Section 15.247) ANSI C63.4-2003

The above equipment 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 : Annie Chang (Annie Chang) , **DATE:** July 24, 2006

TECHNICAL ACCEPTANCE : Ken Liu (Ken Liu) , **DATE:** July 24, 2006
Responsible for RF

APPROVED BY : Gary Chang (Gary Chang / Supervisor) , **DATE:** July 24, 2006

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 –27.04dB at 0.455MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, whichever is greater (see Note 1) 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Spec.: max. 30dBm (see Note 1)	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is –8.12dB at 2390.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.

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:

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

MEASUREMENT	UNCERTAINTY
Conducted emissions	2.44 dB
Radiated emissions	3.86 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Bluetooth Headset
MODEL NO.	HS-57W
FCC ID	PYAWE02M
POWER SUPPLY	3.7Vdc from battery, 5.0Vdc from adapter
MODULATION TYPE	GFSK
RADIO TECHNOLOGY	FHSS
TRANSFER RATE	723Kbps
FREQUENCY RANGE	2402 MHz ~ 2480 MHz
NUMBER OF CHANNEL	79
OUTPUT POWER	2.472mW
ANTENNA TYPE	Dipole antenna with -3dBi gain
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is Headset with Bluetooth technology.

2. This report is a supplementary report of the original report no.: RF940829A02 issued on Feb. 6, 2006. The main changes are as follows:
   a. The addition of a new model as follows:

Brand	Model No.	Remark
NOKIA	HS-24W (Original)	Differentiation of outer appearance
	HS-57W (Additional)	

   b. Minor change in the shape of Enclosure and Push Button.
   c. Removing Electro plating from Push Button.

3. This report is prepared for FCC Class II permissive change.

4. The EUT was power supplied from the following power adapter:

Brand	NOKIA
Model	AC-4U
AC I/P Rating	100-240V, 125mA, 50-60Hz
DC O/P Rating	5.0V, 890mA

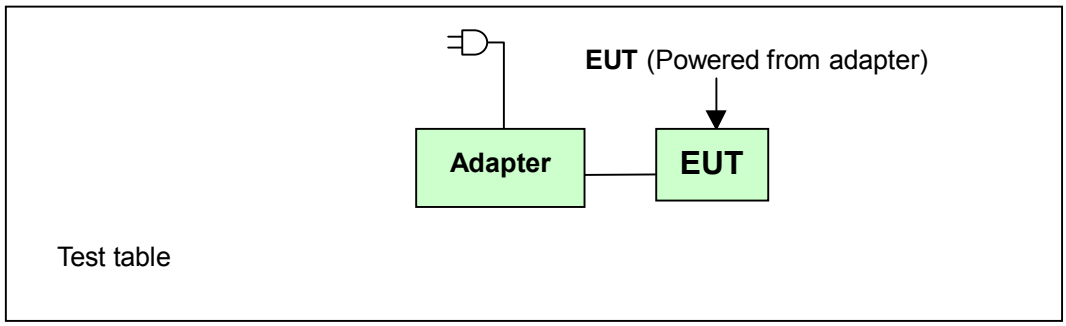
5. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

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	2431	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
	PLC	RE<1G	RE≥1G	APCM	
-	√	√	√	√	EUT with adapter (powered from adapter)

Where **PLC:** Power Line Conducted Emission **RE<1G:** Radiated Emission below 1GHz
RE≥1G: 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, 39, 78	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, packet types and X, Y, Z Axis.

☒ 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	78	FHSS	GFSK	DH5	X

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet types and X, Y, Z Axis

☒ 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	X

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

3.3.3 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 (Section 15.247)
ANSI C63.4-2003

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

3.3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with its power adapter.

4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 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.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	838251/021	Nov. 23, 2006
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	100218	Nov. 22, 2006
LISN With Adapter (for EUT)	AD10	C10Ada-001	Nov. 22, 2006
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100219	Nov. 22, 2006
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100220	Nov. 22, 2006
Software	ADT_Cond_V7.3.2	NA	NA
Software	ADT_ISN_V7.3.2	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C10.01	Mar. 30, 2007
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010773	Feb. 23, 2007

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. 10.

3. The VCCI Site Registration No. C-1852.

4.1.3 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.

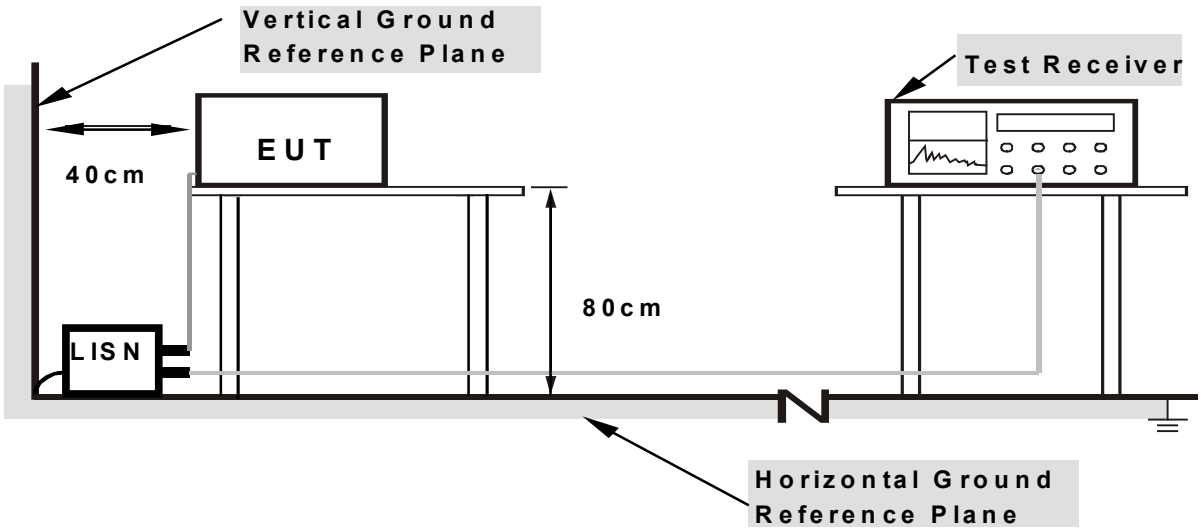
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 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 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.

4.1.6 EUT OPERATING CONDITIONS

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

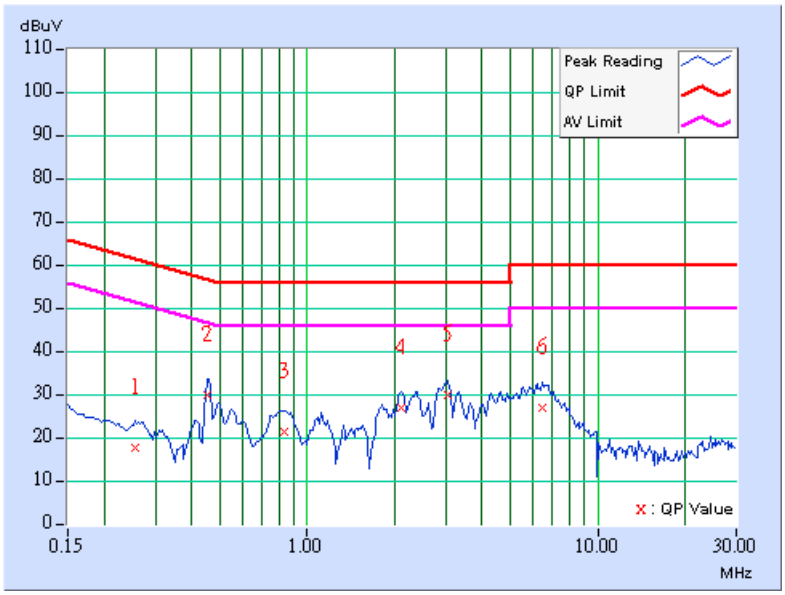
4.1.7 TEST RESULTS

CONDUCTED WORST CASE DATA

MODULATION TYPE	GFSK	CHANNEL	0
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	PHASE	Line 1
TESTED BY	Jamison Chan		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.256	0.20	17.22	-	17.42	-	61.58	51.58	-44.16	-
2	**0.455**	**0.20**	**29.55**	**-**	**29.75**	**-**	**56.79**	**46.79**	**-27.04**	**-**
3	0.830	0.20	20.85	-	21.05	-	56.00	46.00	-34.95	-
4	2.109	0.31	26.59	-	26.90	-	56.00	46.00	-29.10	-
5	3.031	0.40	29.31	-	29.71	-	56.00	46.00	-26.29	-
6	6.469	0.62	26.35	-	26.97	-	60.00	50.00	-33.03	-

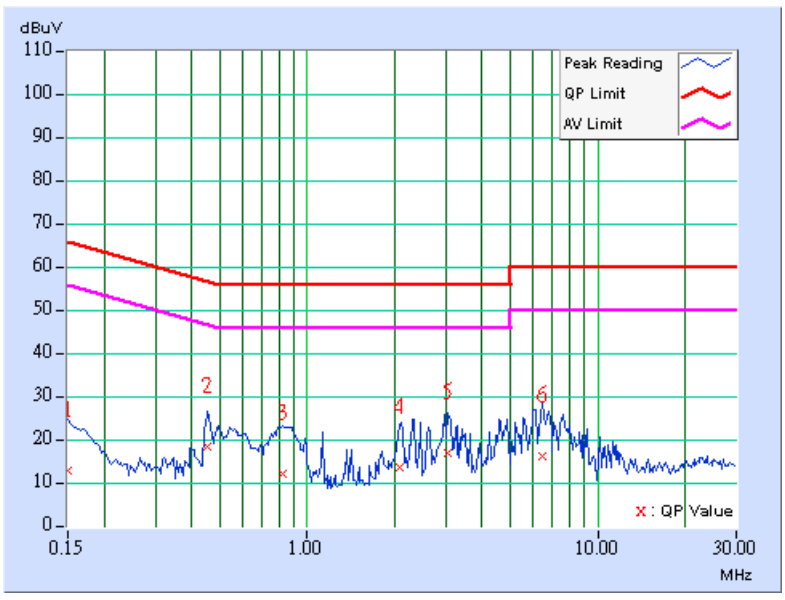
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	**PHASE**	Line 2
TESTED BY	Jamison Chan		

No	Freq.	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.	Q.P.	AV.
1	0.150	0.20	12.76	-	12.96	-	66.00	56.00	-53.04	-
2	0.455	0.19	18.21	-	18.40	-	56.79	46.79	-38.39	-
3	0.826	0.13	12.01	-	12.14	-	56.00	46.00	-43.86	-
4	2.078	0.11	13.27	-	13.38	-	56.00	46.00	-42.62	-
5	3.055	0.21	16.66	-	16.87	-	56.00	46.00	-39.13	-
6	6.430	0.38	15.75	-	16.13	-	60.00	50.00	-43.87	-

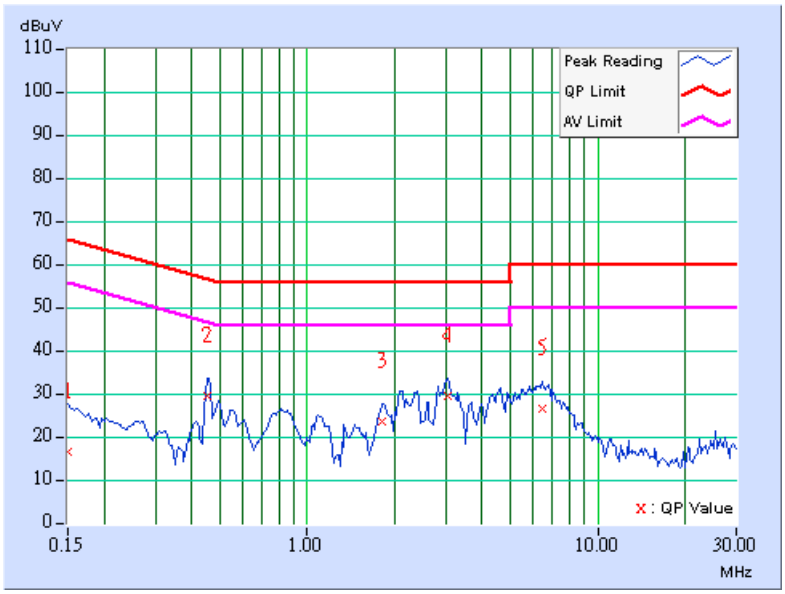
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	39
INPUT POWER	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	**PHASE**	Line 1
TESTED BY	Jamison Chan		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.20	15.95	-	16.15	-	66.00	56.00	-49.85	-
2	0.455	0.20	29.10	-	29.30	-	56.79	46.79	-27.49	-
3	1.813	0.28	23.16	-	23.44	-	56.00	46.00	-32.56	-
4	3.055	0.41	28.85	-	29.26	-	56.00	46.00	-26.74	-
5	6.422	0.62	26.10	-	26.72	-	60.00	50.00	-33.28	-

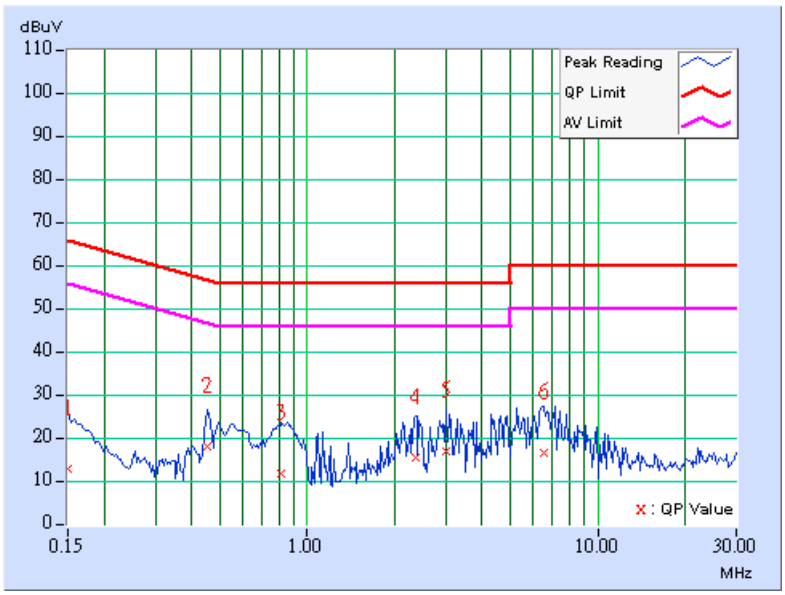
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	39
INPUT POWER	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	**PHASE**	Line 2
TESTED BY	Jamison Chan		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.20	12.44	-	12.64	-	66.00	56.00	-53.36	-
2	0.455	0.19	17.93	-	18.12	-	56.79	46.79	-38.67	-
3	0.818	0.13	11.58	-	11.71	-	56.00	46.00	-44.29	-
4	2.355	0.14	15.21	-	15.35	-	56.00	46.00	-40.65	-
5	3.023	0.20	16.79	-	16.99	-	56.00	46.00	-39.01	-
6	6.512	0.38	16.37	-	16.75	-	60.00	50.00	-43.25	-

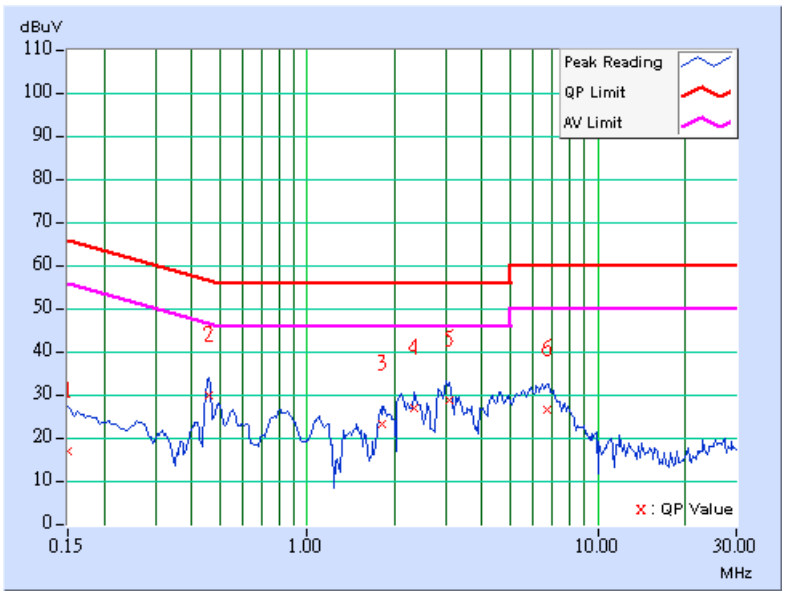
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	78
INPUT POWER	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	**PHASE**	Line 1
TESTED BY	Jamison Chan		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.20	16.25	-	16.45	-	66.00	56.00	-49.55	-
2	0.459	0.20	29.21	-	29.41	-	56.72	46.72	-27.31	-
3	1.809	0.28	22.83	-	23.11	-	56.00	46.00	-32.89	-
4	2.348	0.33	26.28	-	26.61	-	56.00	46.00	-29.39	-
5	3.078	0.41	28.39	-	28.80	-	56.00	46.00	-27.20	-
6	6.668	0.63	25.90	-	26.53	-	60.00	50.00	-33.47	-

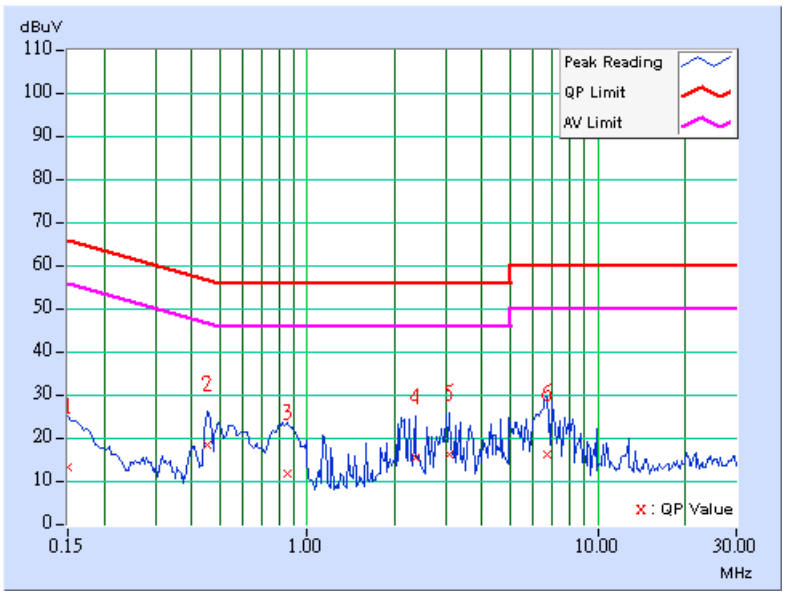
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	78
INPUT POWER	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 80%RH, 1001hPa	**PHASE**	Line 2
TESTED BY	Jamison Chan		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.20	12.87	-	13.07	-	66.00	56.00	-52.93	-
2	0.455	0.19	18.13	-	18.32	-	56.79	46.79	-38.47	-
3	0.853	0.12	11.44	-	11.56	-	56.00	46.00	-44.44	-
4	2.355	0.14	15.30	-	15.44	-	56.00	46.00	-40.56	-
5	3.094	0.21	15.91	-	16.12	-	56.00	46.00	-39.88	-
6	6.703	0.39	15.86	-	16.25	-	60.00	50.00	-43.75	-

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 RADIATED EMISSION MEASUREMENT

4.2.1 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

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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	May 21, 2007
HP Preamplifier	8449B	3008A01924	Sep. 06, 2006
HP Preamplifier	8449B	3008A01638	Sep. 21, 2006
ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Nov. 01, 2006
Schwarzbeck Antenna	VULB 9168	137	Feb. 21, 2007
Schwarzbeck Antenna	VHBA 9123	480	Mar. 30, 2007
EMCO Horn Antenna	3115	6714	Oct. 26, 2006
EMCO Horn Antenna	3115	9312-4192	Mar. 14, 2007
ADT. Turn Table	TT100	0306	NA
ADT. Tower	AT100	0306	NA
Software	ADT_Radiated_V 7.6.011	NA	NA
TIMES RF cable	LL142	CABLE-CH6-01	Dec. 19, 2006
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100036	Mar. 16. 2007

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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Chamber No. 6.
4. The Industry Canada Reference No. IC 3789-6.

4.2.3 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.

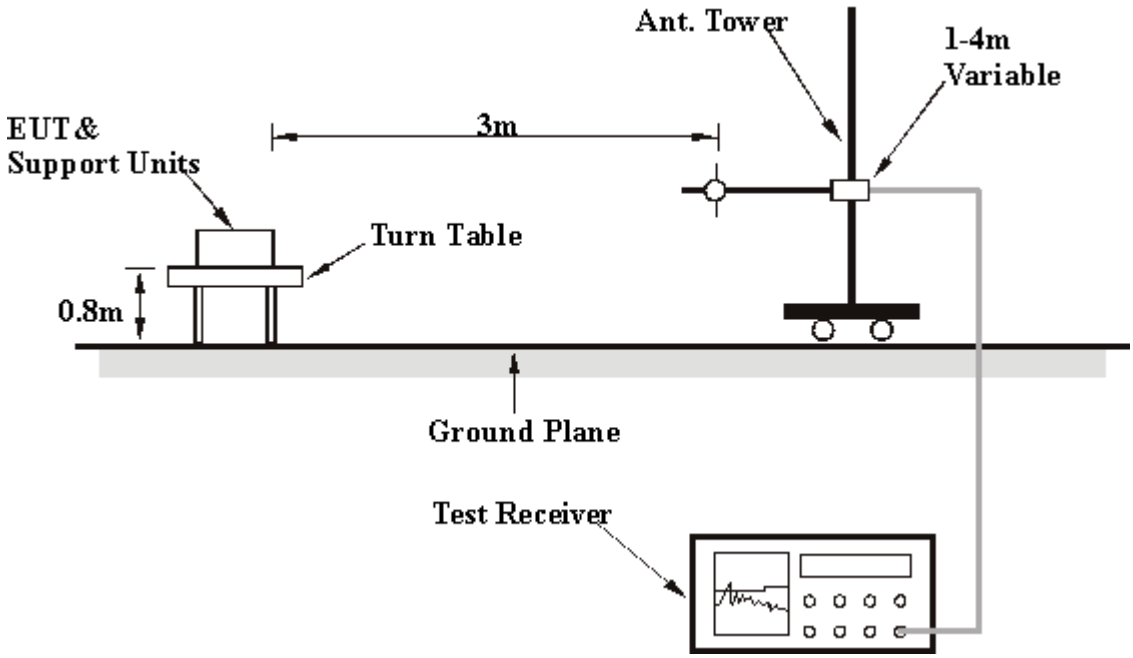
NOTE:

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 and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection (PK) 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.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



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

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS

RADIATED WORST CASE DATA: BELOW 1GHz

MODULATION TYPE	GFSK	**CHANNEL**	78
INPUT POWER	120Vac, 60 Hz	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 60% RH, 996hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Jamison Chan		

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	45.56	24.02 QP	40.00	-15.98	1.17 H	241	8.44	15.58
2	778.40	27.33 QP	46.00	-18.67	1.88 H	226	-0.61	27.94
3	831.02	27.49 QP	46.00	-18.51	2.19 H	13	-0.81	28.30
4	871.71	27.15 QP	46.00	-18.85	1.37 H	29	-1.78	28.93
5	953.34	29.83 QP	46.00	-16.17	1.58 H	315	-0.82	30.65
6	970.84	30.87 QP	54.00	-23.13	3.00 H	71	0.35	30.52

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	111.74	25.21 QP	43.50	-18.29	1.00 V	359	14.89	10.32
2	776.66	27.87 QP	46.00	-18.13	1.22 V	301	-0.06	27.93
3	805.62	27.28 QP	46.00	-18.72	1.52 V	318	-0.81	28.09
4	854.22	27.15 QP	46.00	-18.85	1.13 V	214	-1.40	28.55
5	900.88	27.88 QP	46.00	-18.12	1.02 V	299	-1.68	29.56
6	951.40	30.31 QP	46.00	-15.69	1.08 V	312	-0.36	30.67

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.

RADIATED WORST CASE DATA: ABOVE 1GHz

MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 60% RH, 996hPa	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
TESTED BY	Jamison Chan		

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	46.31 PK	74.00	-27.69	1.02 H	302	12.35	33.96
1	1602.00	36.09 AV	54.00	-17.91	1.02 H	302	2.13	33.96
2	2390.00	57.20 PK	74.00	-16.80	1.31 H	309	20.98	36.22
2	2390.00	45.98 AV	54.00	-8.02	1.31 H	309	9.76	36.22
3	*2402.00	96.95 PK			1.31 H	309	60.72	36.23
3	*2402.00	66.95 AV			1.31 H	309	30.72	36.23
4	4804.00	55.72 PK	74.00	-18.28	1.02 H	88	11.21	44.51
4	4804.00	25.72 AV	54.00	-28.28	1.02 H	88	-18.79	44.51

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	47.21 PK	74.00	-26.79	1.00 V	31	13.25	33.96
1	1602.00	37.09 AV	54.00	-16.91	1.00 V	31	3.13	33.96
2	2390.00	55.63 PK	74.00	-18.37	1.28 V	86	19.41	36.22
2	**2390.00**	**45.88 AV**	**54.00**	**-8.12**	**1.28 V**	**86**	**9.66**	**36.22**
3	*2402.00	93.55 PK			1.28 V	86	57.32	36.23
3	*2402.00	63.55 AV			1.28 V	86	27.32	36.23
4	4804.00	56.21 PK	74.00	-17.79	1.01 V	217	11.70	44.51
4	4804.00	26.21 AV	54.00	-27.79	1.01 V	217	-18.30	44.51

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. 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: 20log(3.125/100)= -30 dB.
6. Average value = peak reading + 20log(duty cycle).

MODULATION TYPE	GFSK	**CHANNEL**	39
INPUT POWER	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 60% RH, 996hPa	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
TESTED BY	Jamison Chan		

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	47.19 PK	74.00	-26.81	1.18 H	306	13.13	34.06
1	1628.00	37.63 AV	54.00	-16.37	1.18 H	306	3.57	34.06
2	*2441.00	96.03 PK			1.25 H	200	59.71	36.32
2	*2441.00	66.03 AV			1.25 H	200	29.71	36.32
3	4882.00	56.81 PK	74.00	-17.19	1.00 H	192	12.48	44.33
3	4882.00	26.81 AV	54.00	-27.19	1.00 H	192	-17.52	44.33

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	46.05 PK	74.00	-27.95	1.08 V	32	11.99	34.06
1	1628.00	38.01 AV	54.00	-15.99	1.08 V	32	3.95	34.06
2	*2441.00	94.18 PK			1.11 V	351	57.86	36.32
2	*2441.00	64.18 AV			1.11 V	351	27.86	36.32
3	4882.00	57.51 PK	74.00	-16.49	1.29 V	202	13.18	44.33
3	4882.00	27.51 AV	54.00	-26.49	1.29 V	202	-16.82	44.33

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. 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: 20log(3.125/100)= -30 dB.
6. Average value = peak reading + 20log(duty cycle).

MODULATION TYPE	GFSK	**CHANNEL**	78
INPUT POWER	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 60% RH, 996hPa	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
TESTED BY	Jamison Chan		

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	47.02 PK	74.00	-26.98	1.02 H	301	12.86	34.16
1	1654.00	36.91 AV	54.00	-17.09	1.02 H	301	2.75	34.16
2	*2480.00	96.11 PK			1.03 H	8	59.70	36.41
2	*2480.00	66.11 AV			1.03 H	8	29.70	36.41
3	2483.50	58.02 PK	74.00	-15.98	1.03 H	8	21.61	36.41
3	2483.50	45.78 AV	54.00	-8.22	1.03 H	8	9.37	36.41
4	4960.00	58.63 PK	74.00	-15.37	1.00 H	199	14.20	44.43
4	4960.00	28.63 AV	54.00	-25.37	1.00 H	199	-15.80	44.43

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	48.05 PK	74.00	-25.95	1.25 V	73	13.89	34.16
1	1654.00	38.62 AV	54.00	-15.38	1.25 V	73	4.46	34.16
2	*2480.00	92.62 PK			1.03 V	300	56.21	36.41
2	*2480.00	62.62 AV			1.03 V	300	26.21	36.41
3	2483.50	59.74 PK	74.00	-14.26	1.03 V	300	23.33	36.41
3	2483.50	43.83 AV	54.00	-10.17	1.03 V	300	7.42	36.41
4	4960.00	57.11 PK	74.00	-16.89	1.11 V	272	12.68	44.43
4	4960.00	27.11 AV	54.00	-26.89	1.11 V	272	-17.32	44.43

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. 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: 20log(3.125/100)= -30 dB.
6. Average value = peak reading + 20log(duty cycle).

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies, and should be equally spaced.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK30	100049	Aug. 14, 2006

NOTE: 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

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. 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.

c. 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.

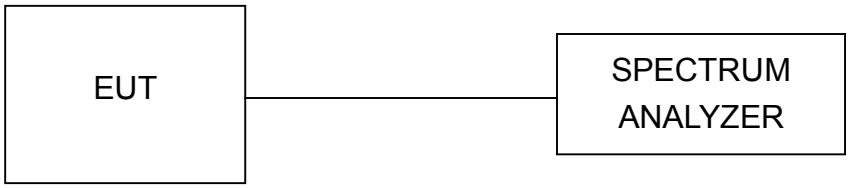
d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

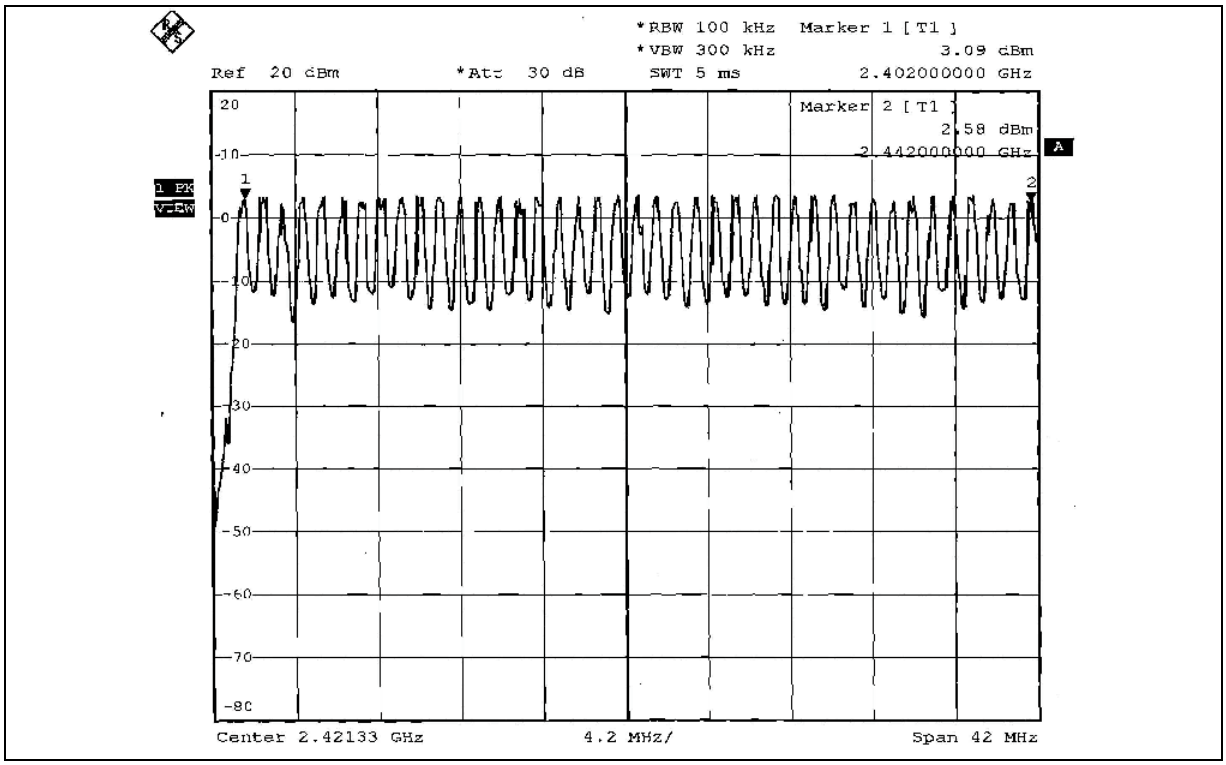
No deviation.

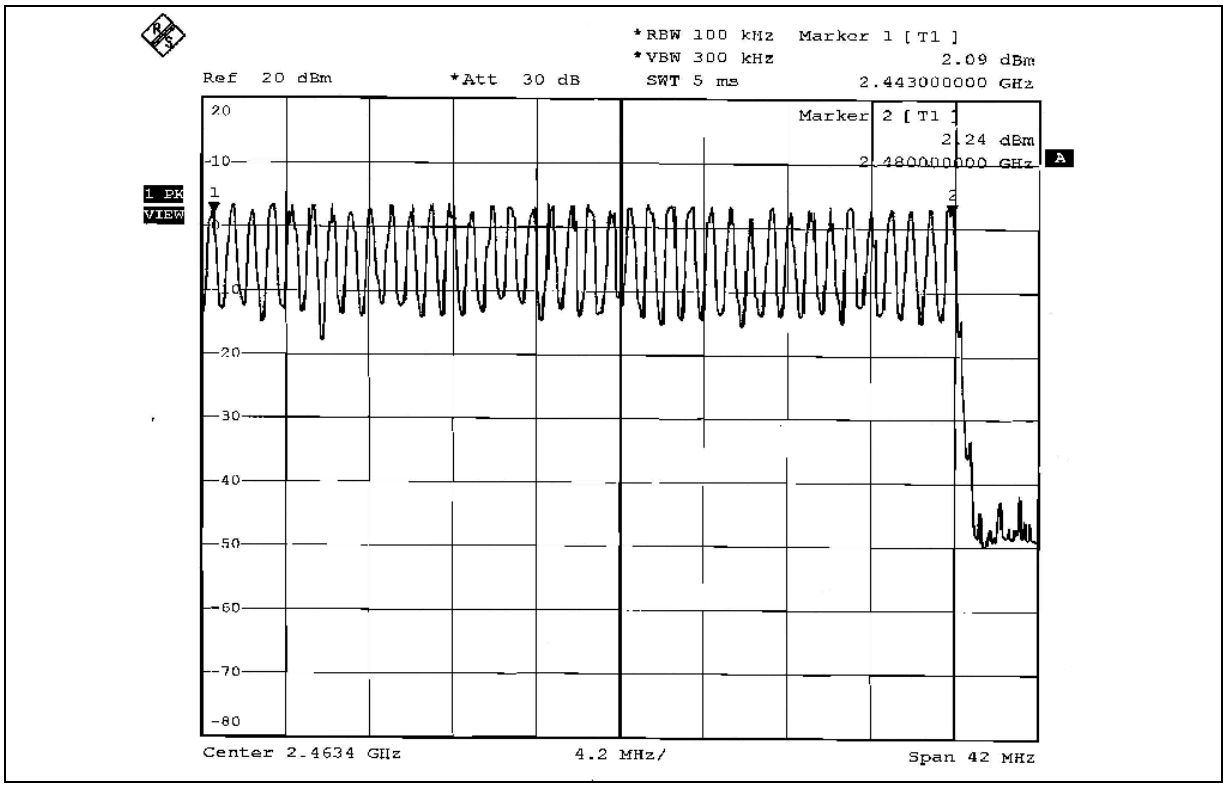
4.3.5 TEST SETUP



4.3.6 TEST RESULTS

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


*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
3.09 dBm
2.402000000 GHz
Ref 20 dBm
*Att 30 dB
Marker 2 [T1]
2.58 dBm
2.442000000 GHz
1 PK
V-BW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.42133 GHz
4.2 MHz/
Span 42 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
2.09 dBm
2.443000000 GHz
Ref 20 dBm
*Att 30 dB
Marker 2 [T1]
2.24 dBm
2.480000000 GHz
1 PK
VIEW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK30	100049	Aug. 14, 2006

NOTES: The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. 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.

c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.

d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.

e. Repeat above procedures until all different time-slot modes have been completed.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

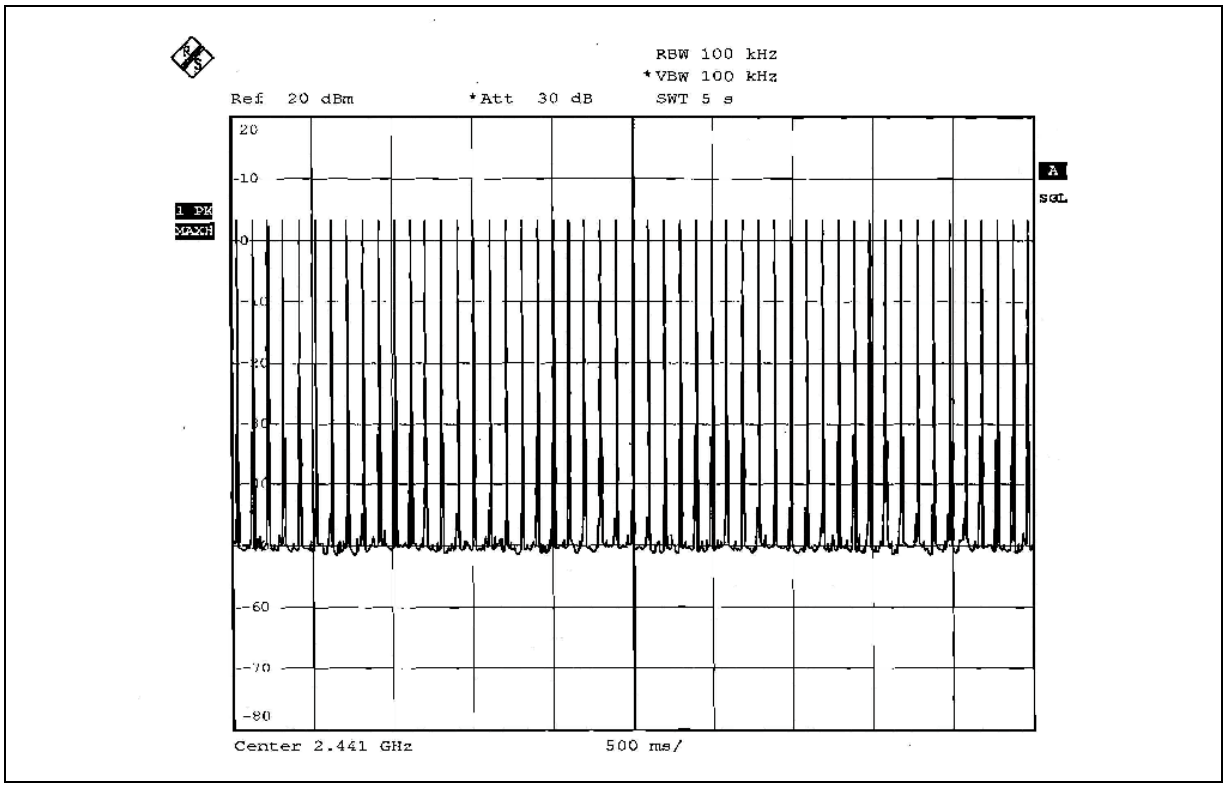
4.4.5 TEST SETUP

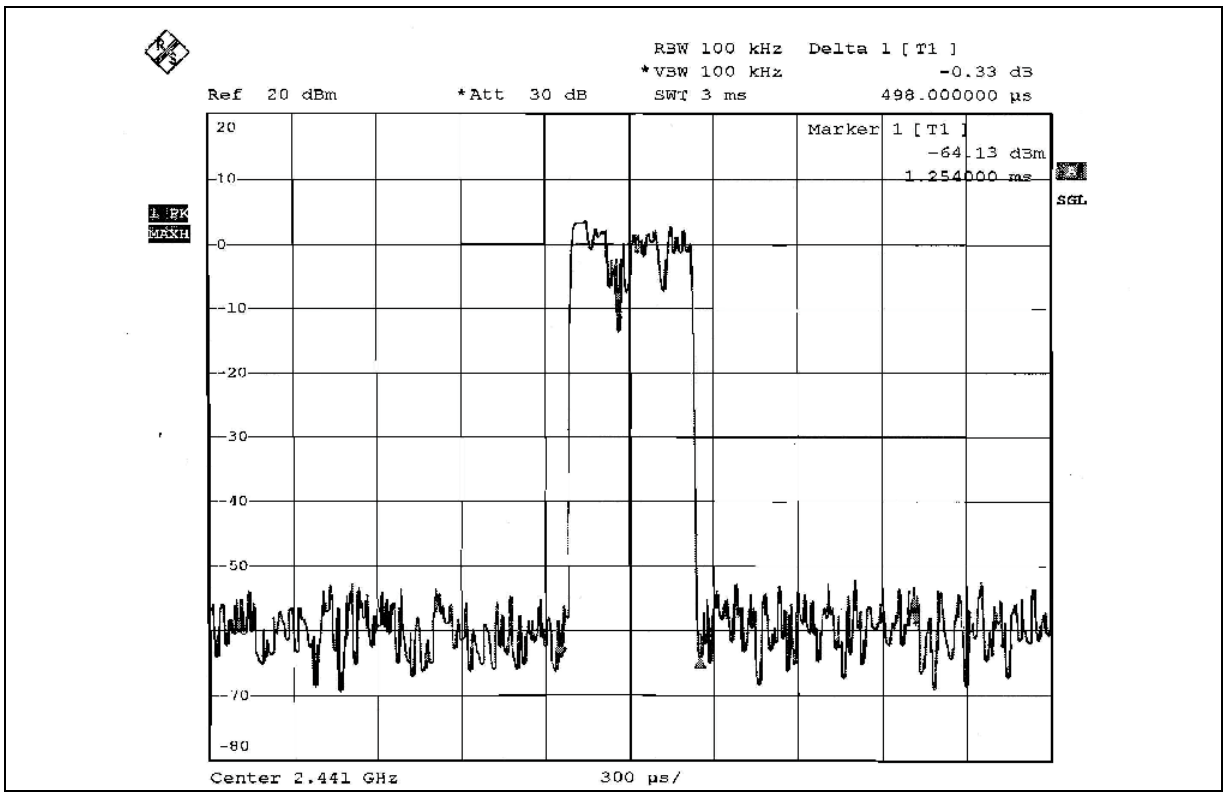
4.4.6 TEST RESULTS

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	0.498	160.515	400
DH3	25 (times / 5 sec) *6.32=158.00 times	1.752	276.816	400
DH5	17 (times / 5 sec) *6.32=107.44 times	3.050	327.692	400

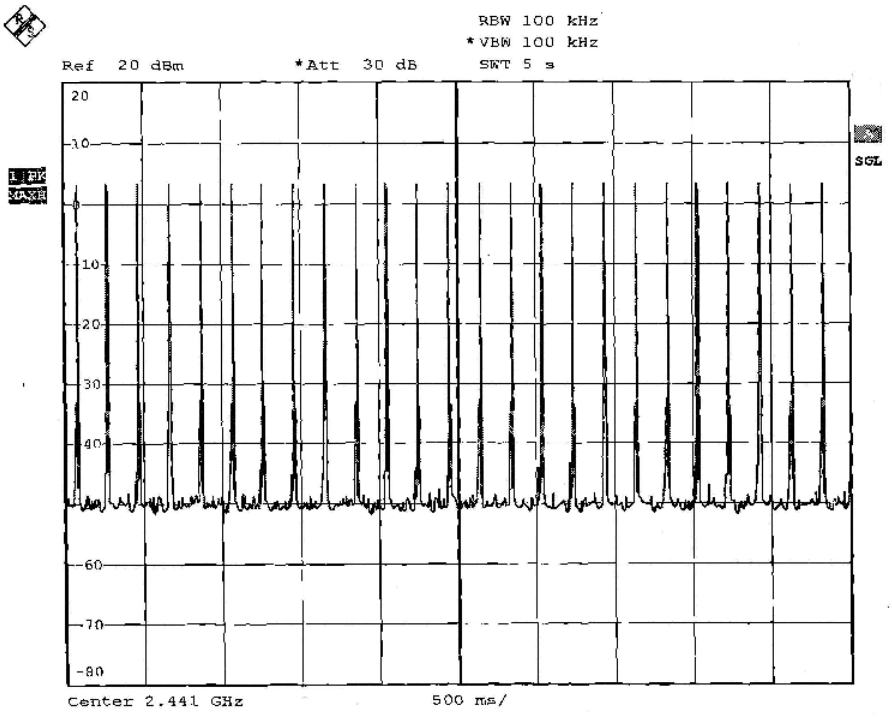
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

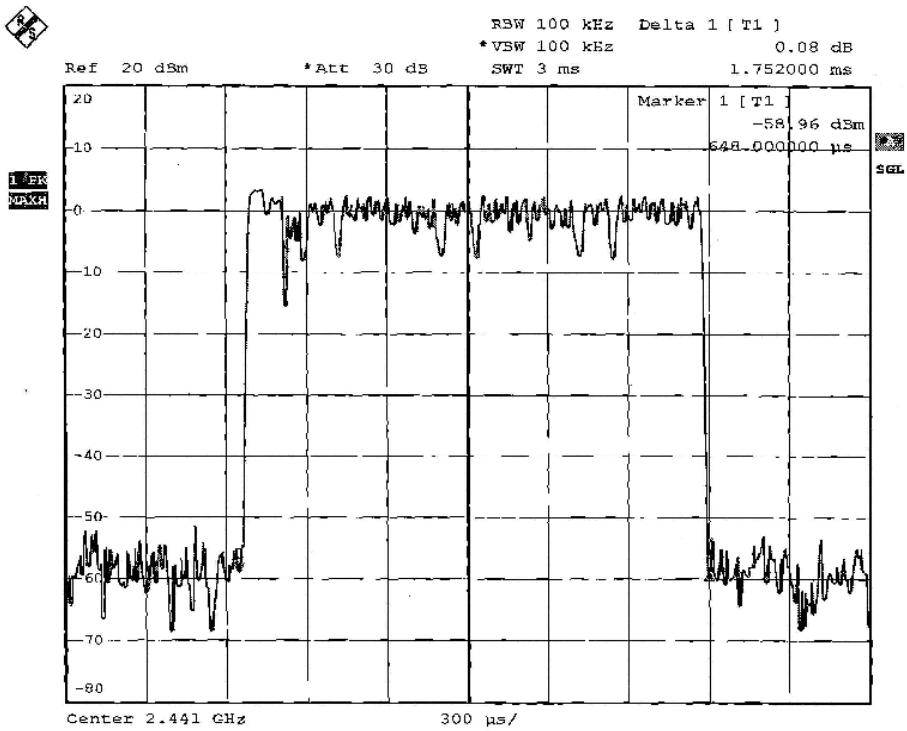
DH1


RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 5 s
1 PK
MAXH
A
SGL
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441 GHz
500 ms/

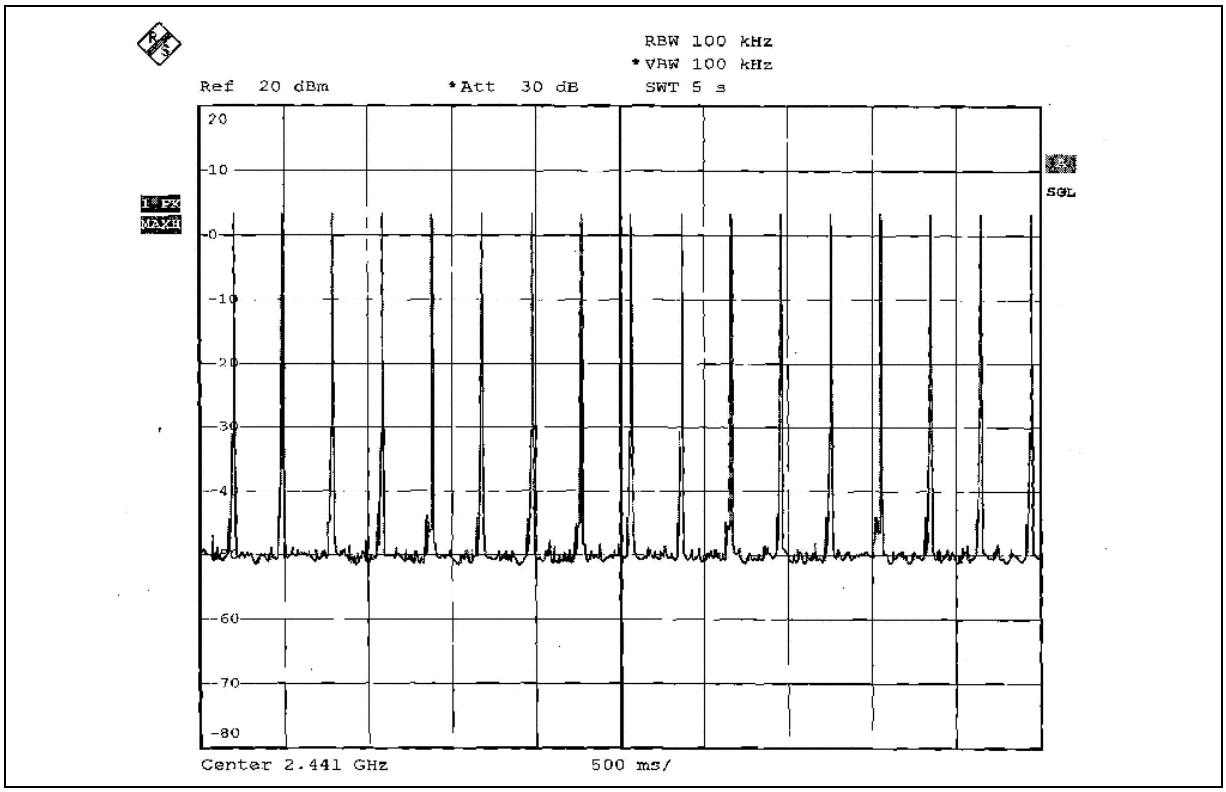

RBW 100 kHz
Delta 1 [T1]
*VBW 100 kHz
-0.33 dB
Ref 20 dBm
*Att 30 dB
SWT 3 ms
498.000000 µs
Marker 1 [T1]
-64.13 dBm
1.254000 ms
1 PK
MAXH
A
SGL
20
10
0
-10
-20
-30
-40
-50
-70
-80
Center 2.441 GHz
300 µs/

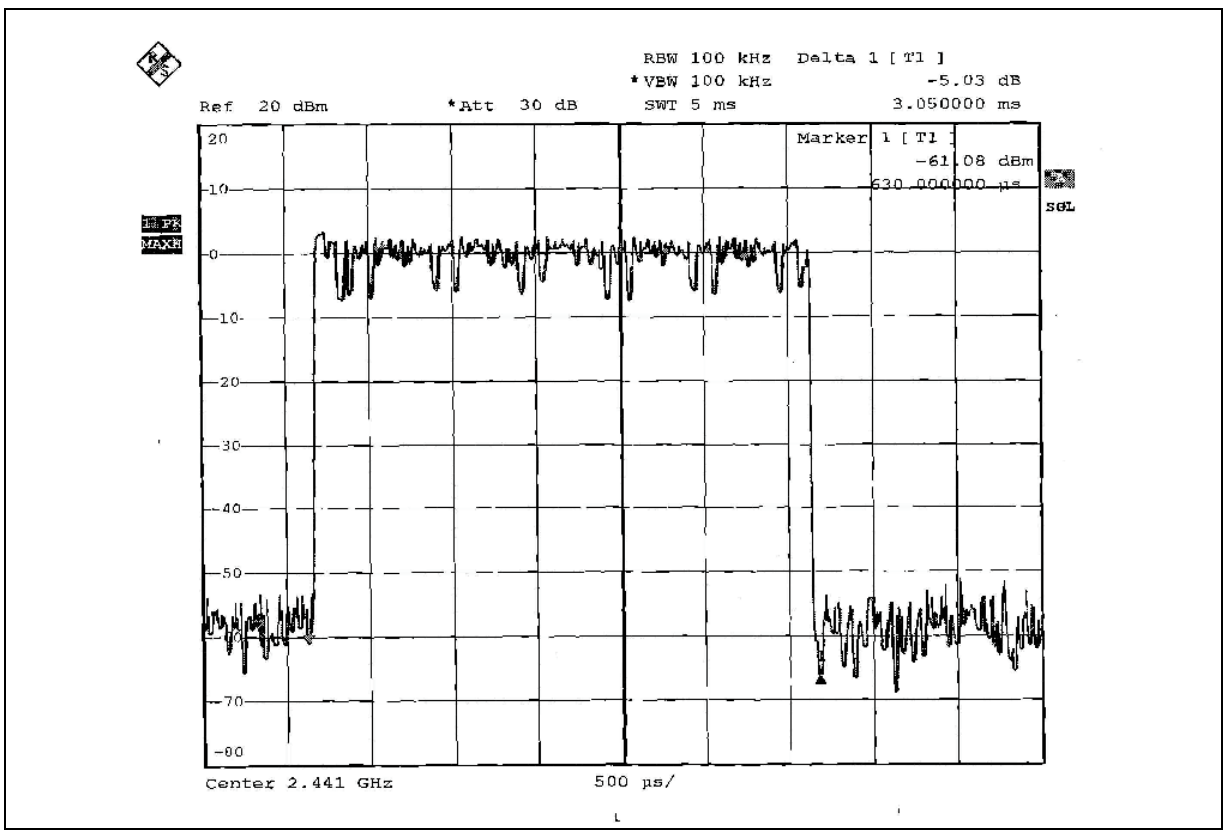
DH3


RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 5 s
SGL
Center 2.441 GHz
500 ms/


RBW 100 kHz
Delta 1 [T1]
*VBW 100 kHz
0.08 dB
Ref 20 dBm
*Att 30 dB
SWT 3 ms
1.752000 ms
Marker 1 [T1]
-58.96 dBm
648.000000 µs
SGL
Center 2.441 GHz
300 µs/

DH5


RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 5 s
1 PK MAXH
SGL
20
10
0
-10
-20
-30
-40
-60
-70
-80
Center 2.441 GHz
500 ms/


RBW 100 kHz
Delta 1 [T1]
*VBW 100 kHz
-5.03 dB
Ref 20 dBm
*Att 30 dB
SWT 5 ms
3.050000 ms
Marker 1 [T1]
-61.08 dBm
630.000000 µs
1 PK MAXH
SGL
20
10
0
-10
-20
-30
-40
-50
-70
-80
Center 2.441 GHz
500 µs/

4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK30	100049	Aug. 14, 2006

NOTE: 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 PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. 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 EUT OPERATING CONDITION

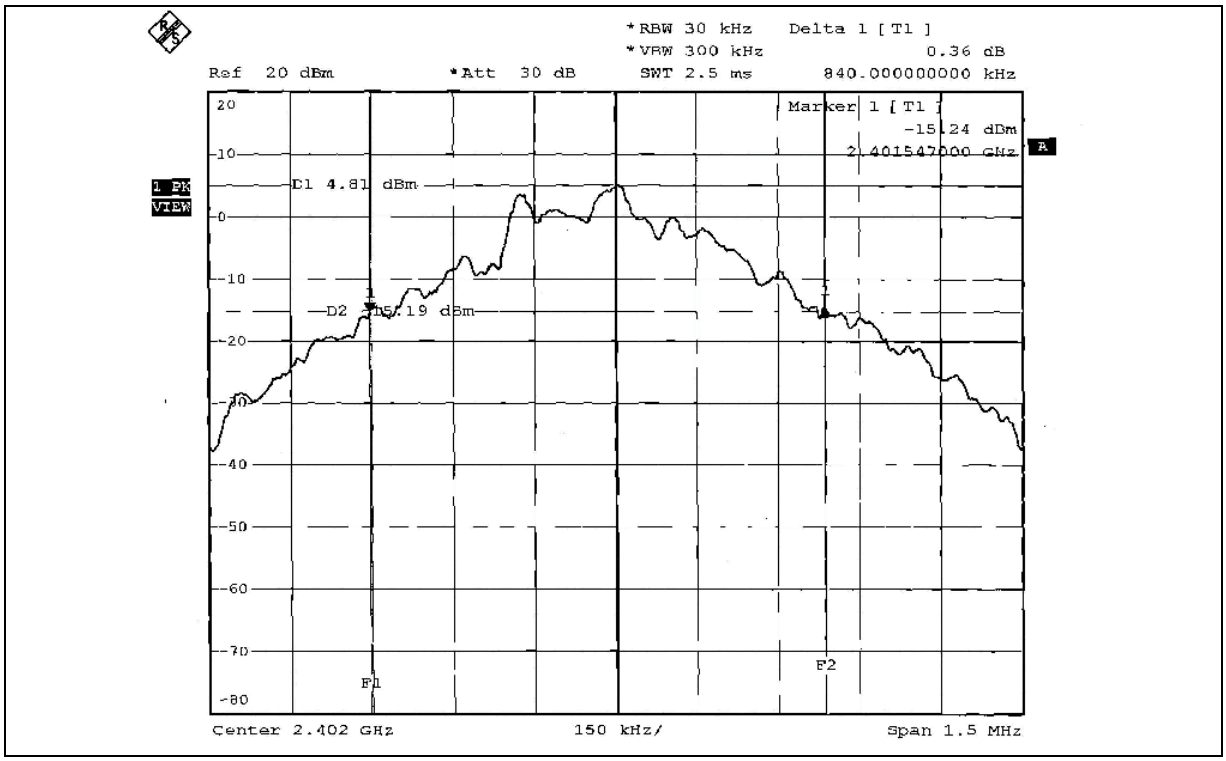
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

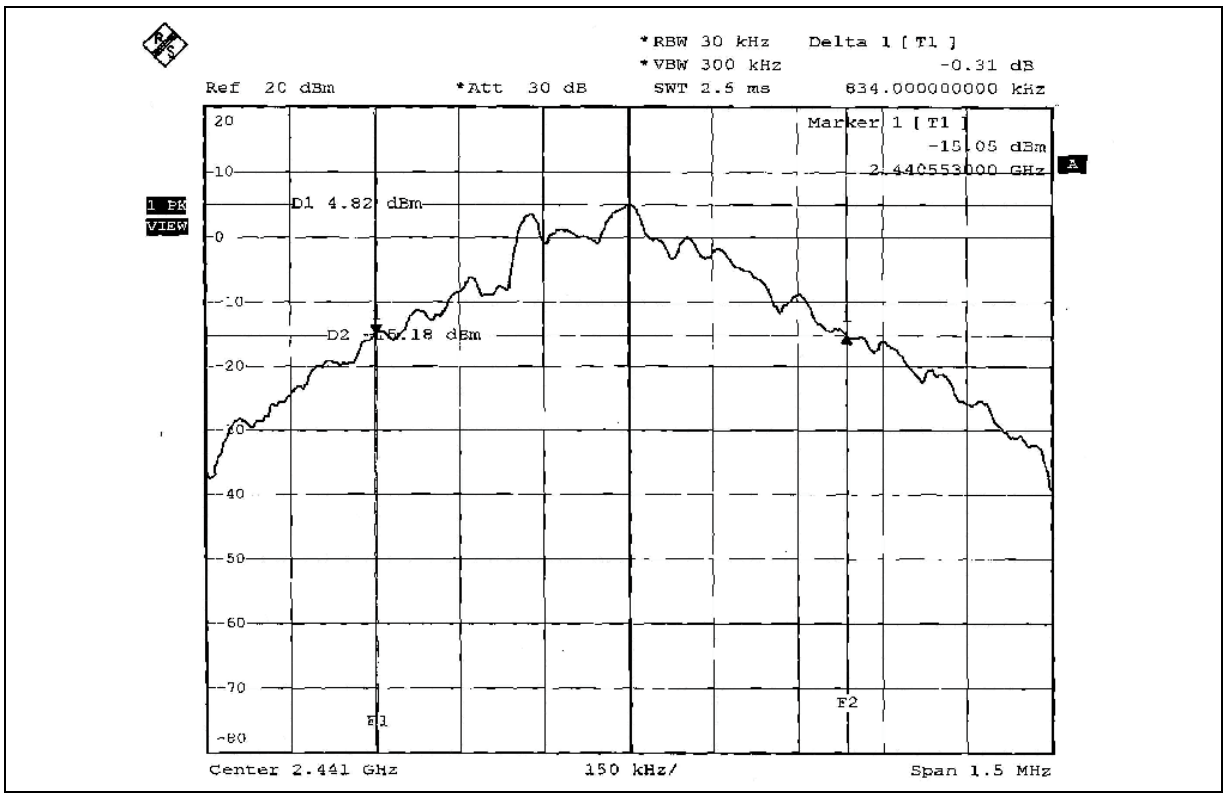
MODULATION TYPE	GFSK	**CHANNEL**	0, 39, 78
INPUT POWER	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	18deg. C, 75% RH, 1001hPa
TESTED BY	Jamison Chan		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.840
39	2441	0.834
78	2480	0.840

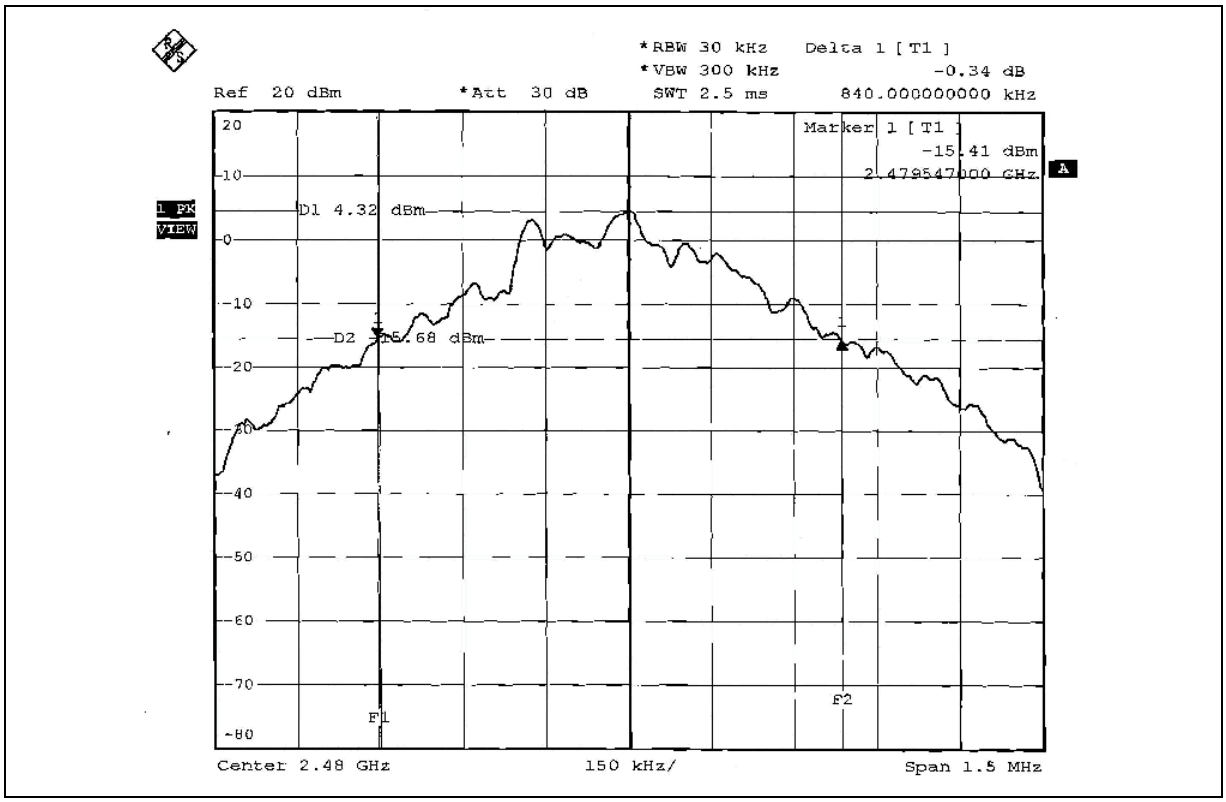
CH 0


*RBW 30 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.36 dB
840.000000000 kHz
Ref 20 dBm
*Att 30 dB
Marker 1 [T1]
-15.24 dBm
2.401547000 GHz
1 PK VIEW
D1 4.81 dBm
D2 -5.19 dBm
F1
F2
Center 2.402 GHz
150 kHz/
Span 1.5 MHz

CH 39


*RBW 30 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.31 dB
834.000000000 kHz
Ref 20 dBm
*Att 30 dB
Marker 1 [T1]
-15.05 dBm
2.440553000 GHz
1 PK VIEW
D1 4.82 dBm
D2 -5.18 dBm
F1
F2
Center 2.441 GHz
150 kHz/
Span 1.5 MHz

CH 78


*RBW 30 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.34 dB
840.000000000 kHz
Ref 20 dBm
*Att 30 dB
Marker 1 [T1]
-15.41 dBm
2.479547000 GHz
1 PK
VIEW
D1 4.32 dBm
D2 -15.68 dBm
F1
F2
Center 2.48 GHz
150 kHz/
Span 1.5 MHz

4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25kHz or 20dB hopping channel bandwidth (whichever is greater).

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK30	100049	Aug. 14, 2006

NOTES: 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.
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.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

4.6.5 TEST SETUP

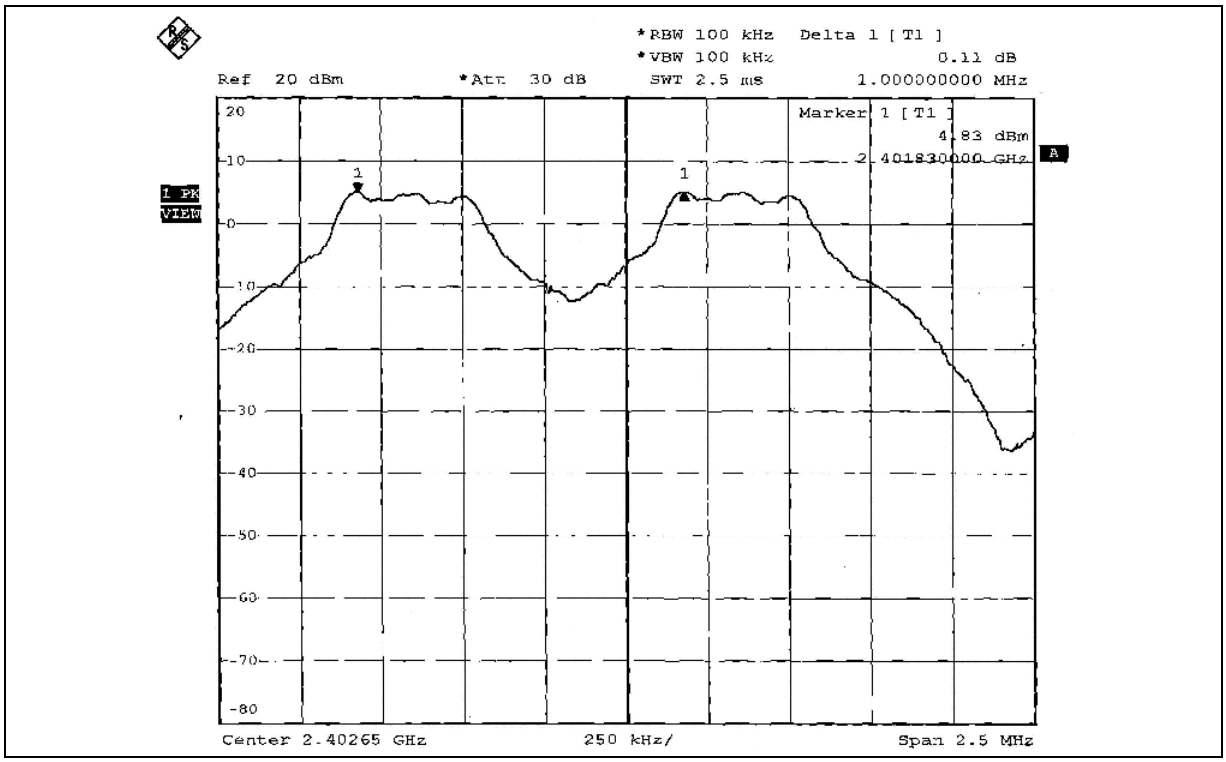
4.6.6 TEST RESULTS

MODULATION TYPE	GFSK	**CHANNEL**	0, 39, 78
INPUT POWER	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	18deg. C, 75% RH, 1001hPa
TESTED BY	Jamison Chan		

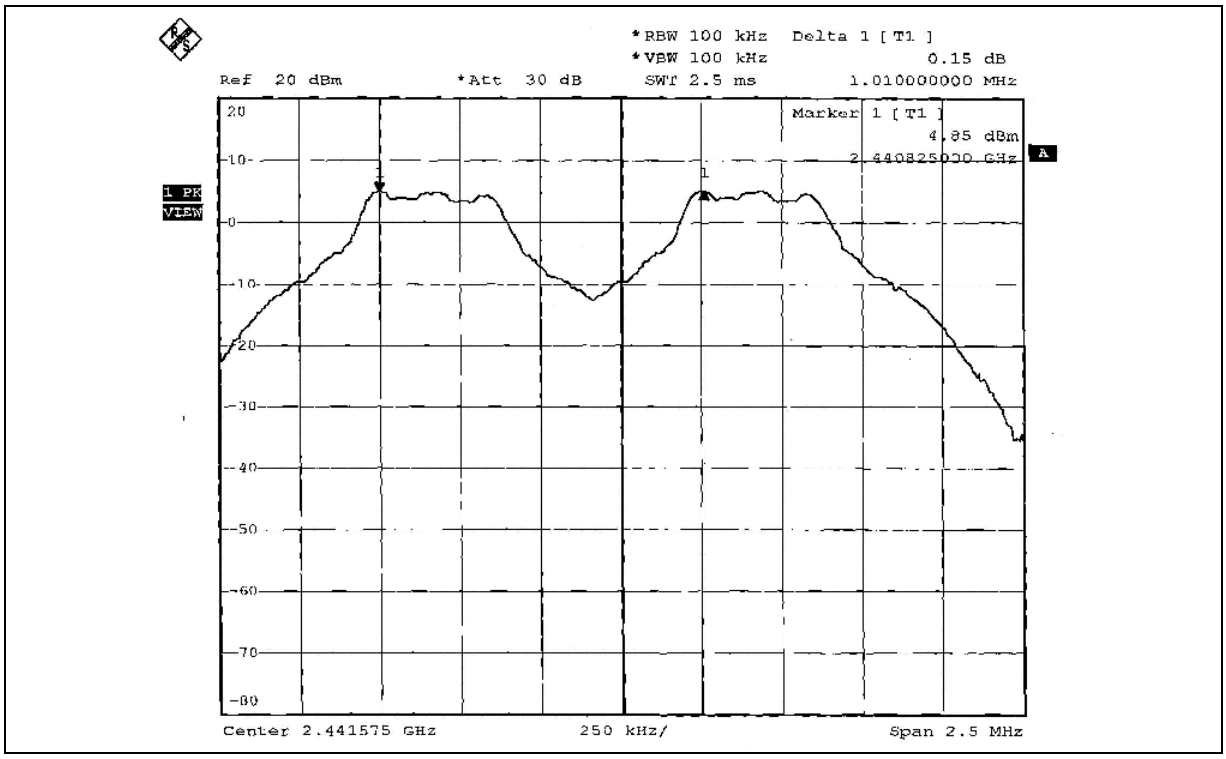
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.000	0.840	PASS
39	2441	1.010	0.834	PASS
78	2480	1.005	0.840	PASS

NOTE: The minimum limit is 20dB bandwidth. Test results please refer to next two pages.

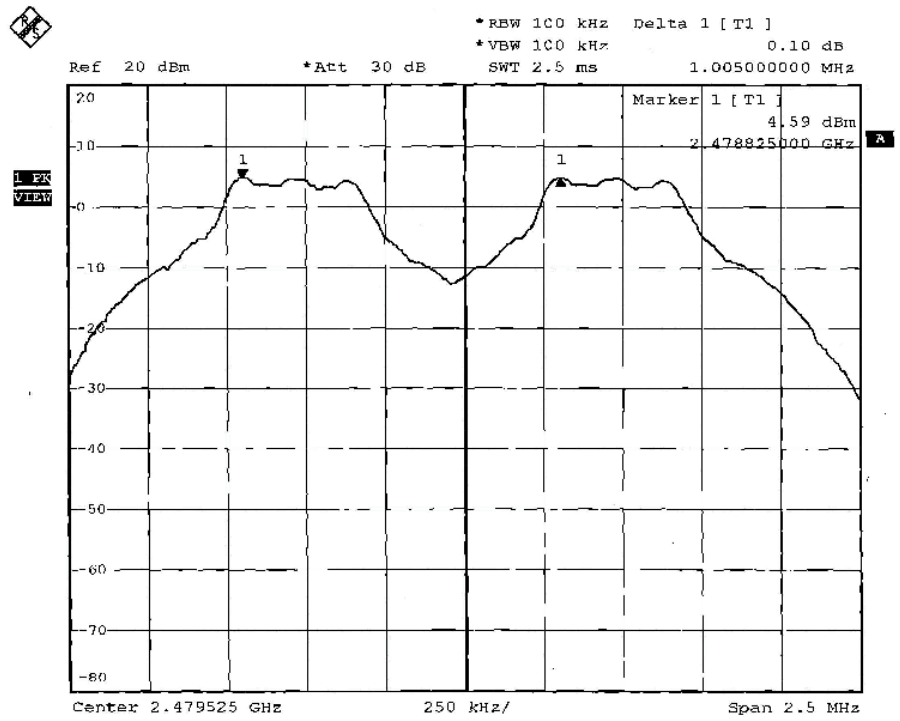
CH 0


*RBW 100 kHz
*VBW 100 kHz
Delta 1 [T1]
0.11 dB
Ref 20 dBm
*Att 30 dB
SWT 2.5 ms
1.000000000 MHz
Marker 1 [T1]
4.83 dBm
2.401830000 GHz
1 PK VIEW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.40265 GHz
250 kHz/
Span 2.5 MHz

CH 39


*RBW 100 kHz
*VBW 100 kHz
Delta 1 [T1]
0.15 dB
Ref 20 dBm
*Att 30 dB
SWT 2.5 ms
1.010000000 MHz
Marker 1 [T1]
4.85 dBm
2.440825000 GHz
1 PK VIEW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.441575 GHz
250 kHz/
Span 2.5 MHz

CH 78


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
0.10 dB
1.005000000 MHz
Ref 20 dBm
*Att 30 dB
Marker 1 [T1]
4.59 dBm
2.478825000 GHz
1 PK
VIEW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.479525 GHz
250 kHz/
Span 2.5 MHz

4.7 MAXIMUM PEAK OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYEER	FSEK30	100049	Aug. 14, 2006

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.7.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

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 EUT OPERATING CONDITION

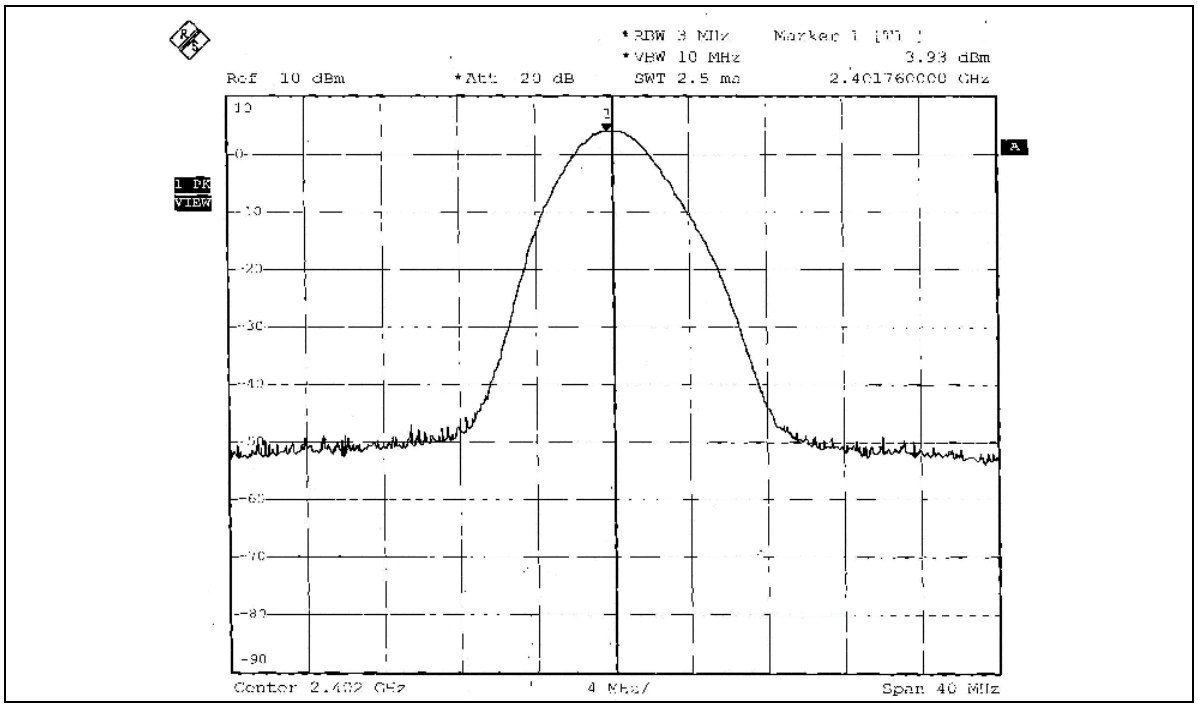
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

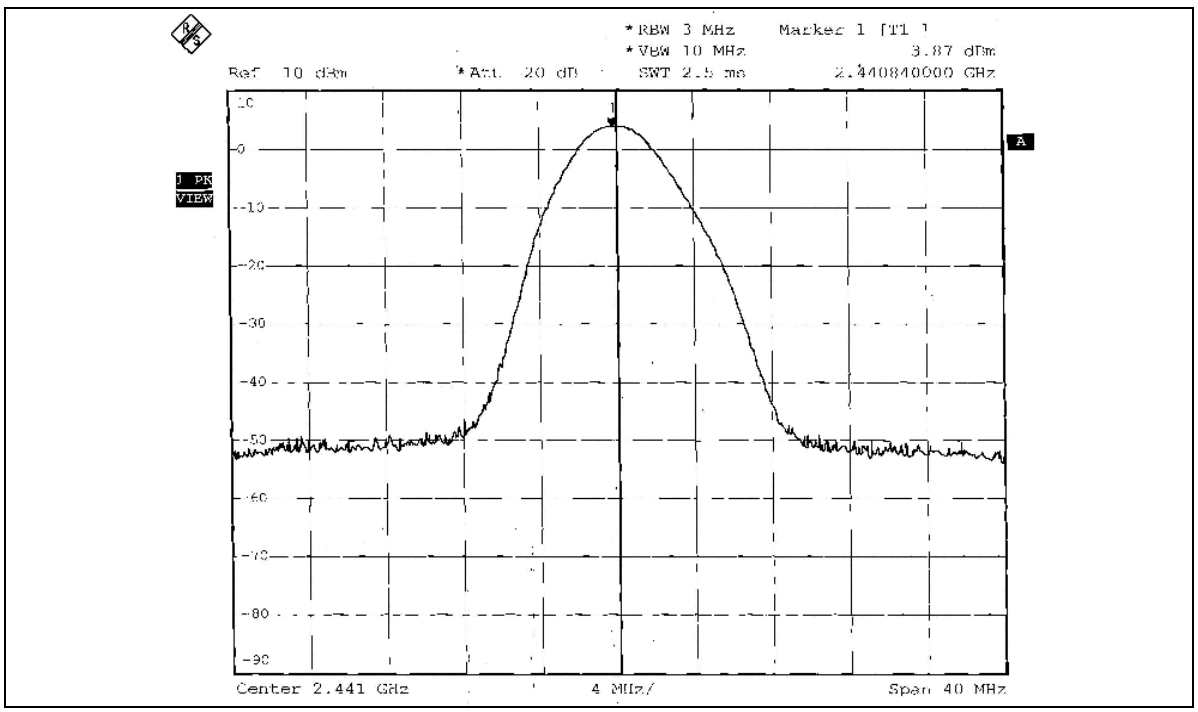
MODULATION TYPE	GFSK	**CHANNEL**	0, 39, 78
INPUT POWER	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	18deg. C, 75% RH, 1001hPa
TESTED BY	Jamison Chan		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	2.472	3.93	30	PASS
39	2441	2.438	3.87	30	PASS
78	2480	2.350	3.71	30	PASS

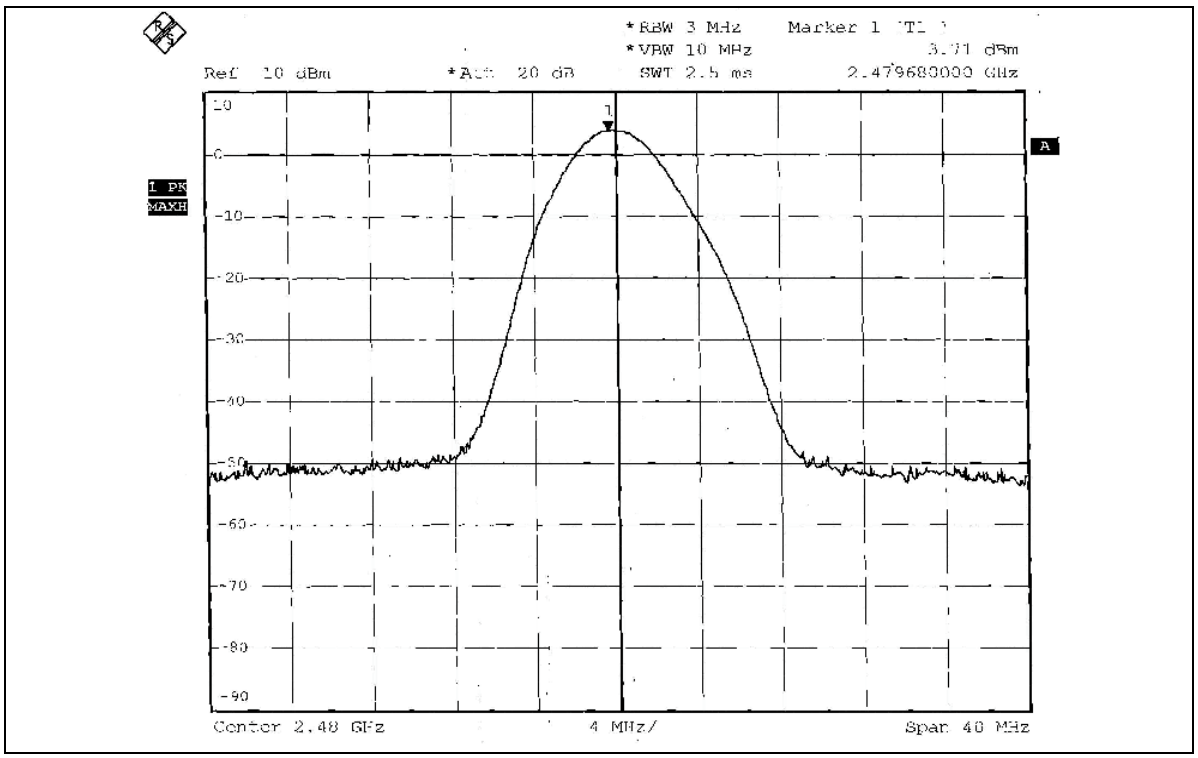
CH 0


*RBW 3 MHz
*VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
3.93 dBm
2.401760000 GHz
Ref 10 dBm
*Att 20 dB
1 PK
VIEW
A
Center 2.402 GHz
4 MHz/
Span 40 MHz

CH 39


*RBW 3 MHz
*VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
3.87 dBm
2.440840000 GHz
Ref 10 dBm
*Att 20 dB
1 PK
VIEW
A
Center 2.441 GHz
4 MHz/
Span 40 MHz

CH 78


*RBW 3 MHz
*VBW 10 MHz
SWT 2.5 ms
Ref 10 dBm
*Att 20 dB
2.479680000 GHz
1 PK
MAXH
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.48 GHz
4 MHz/
Span 40 MHz

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
SPECTRUM ANALYZER	FSEK30	100049	Aug. 14, 2006

NOTES: 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 lose 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

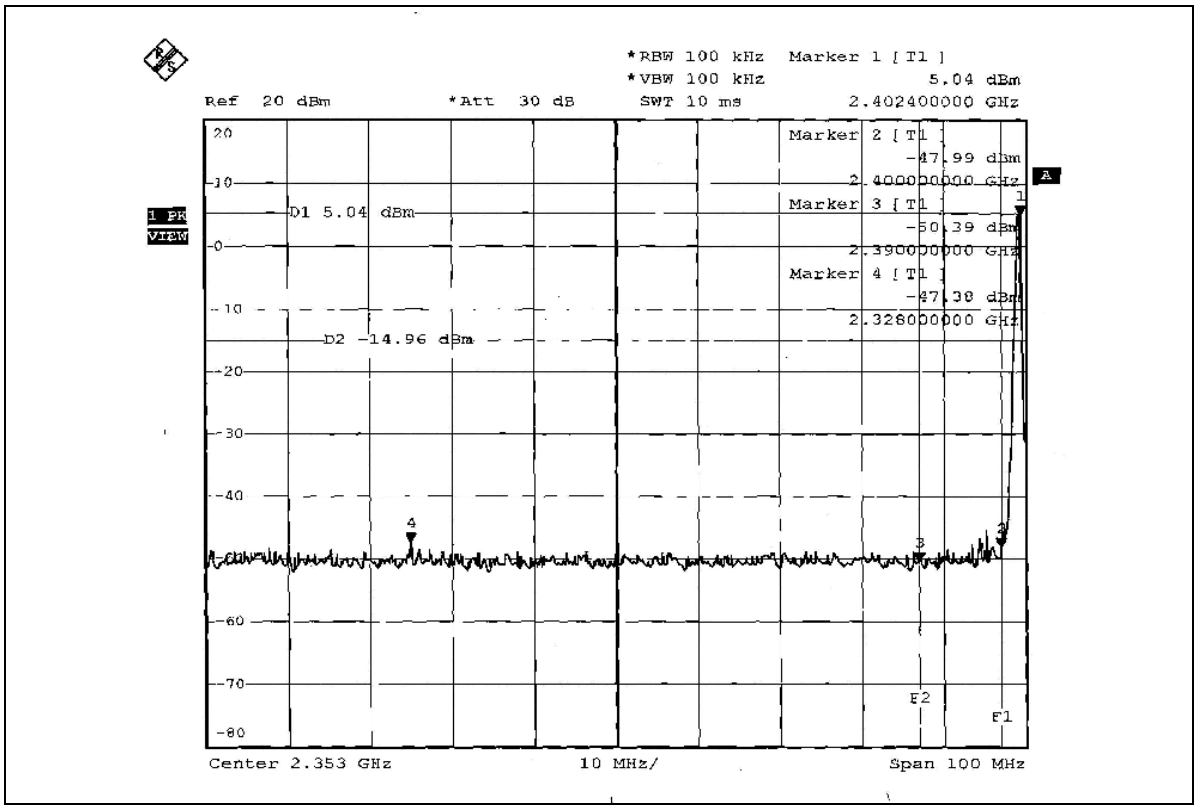
The spectrum plots are attached on the following 4 images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

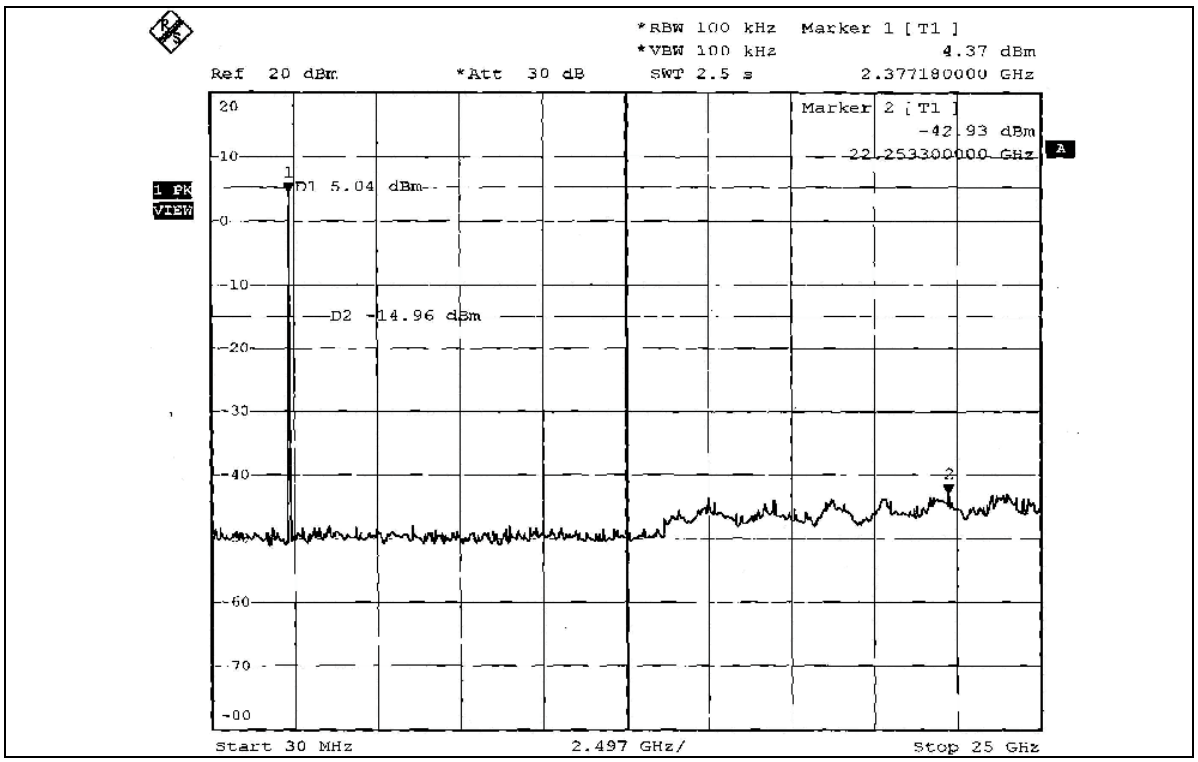
NOTE 1:
The band edge emission plot on page 52 shows 52.42dBc between carrier maximum power and local maximum emission in restrict band (2.3280GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 98.86dBuV/m (Peak), so the maximum field strength in restrict band is 98.86 –52.42 = 46.44dBuV/m, which is under 74 dBuV/m limit.

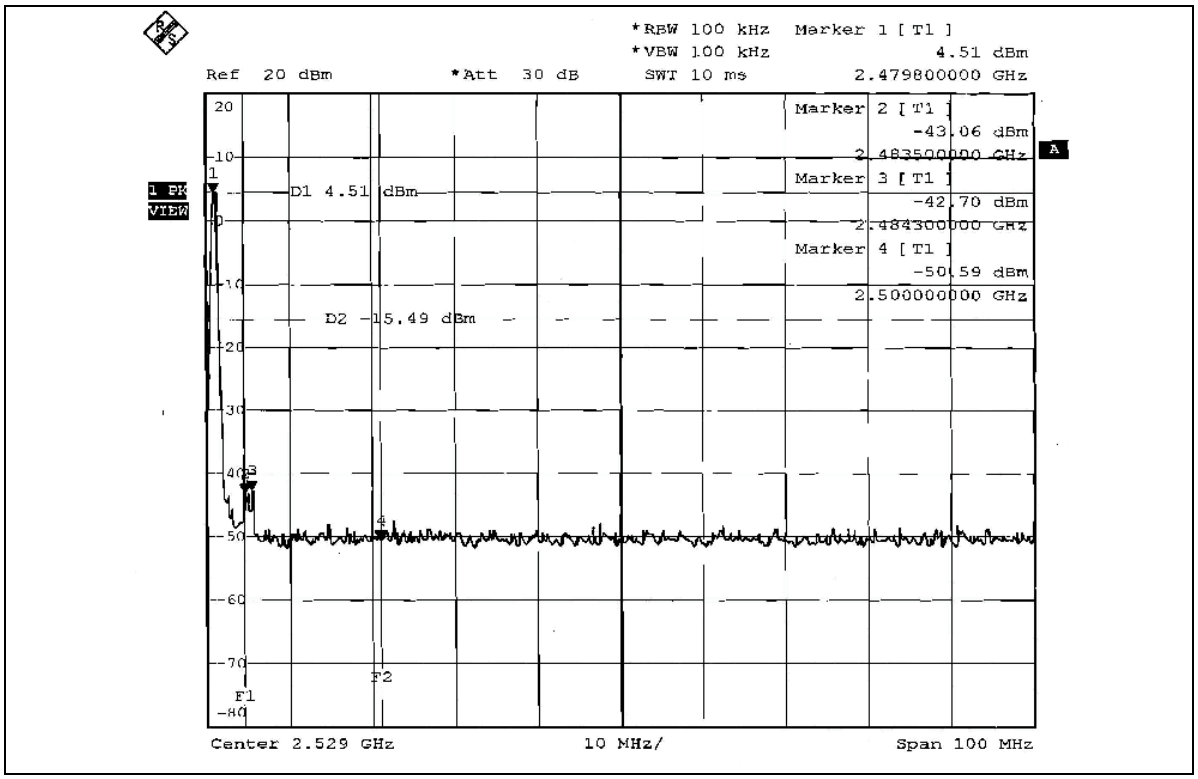
Average value = 46.44-30.00=16.44dBuV/m, which is under 54dBuV/m limit.
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle be equal to: 20log(3.125/100)= -30 dB.
Average value = peak reading – 30.00.

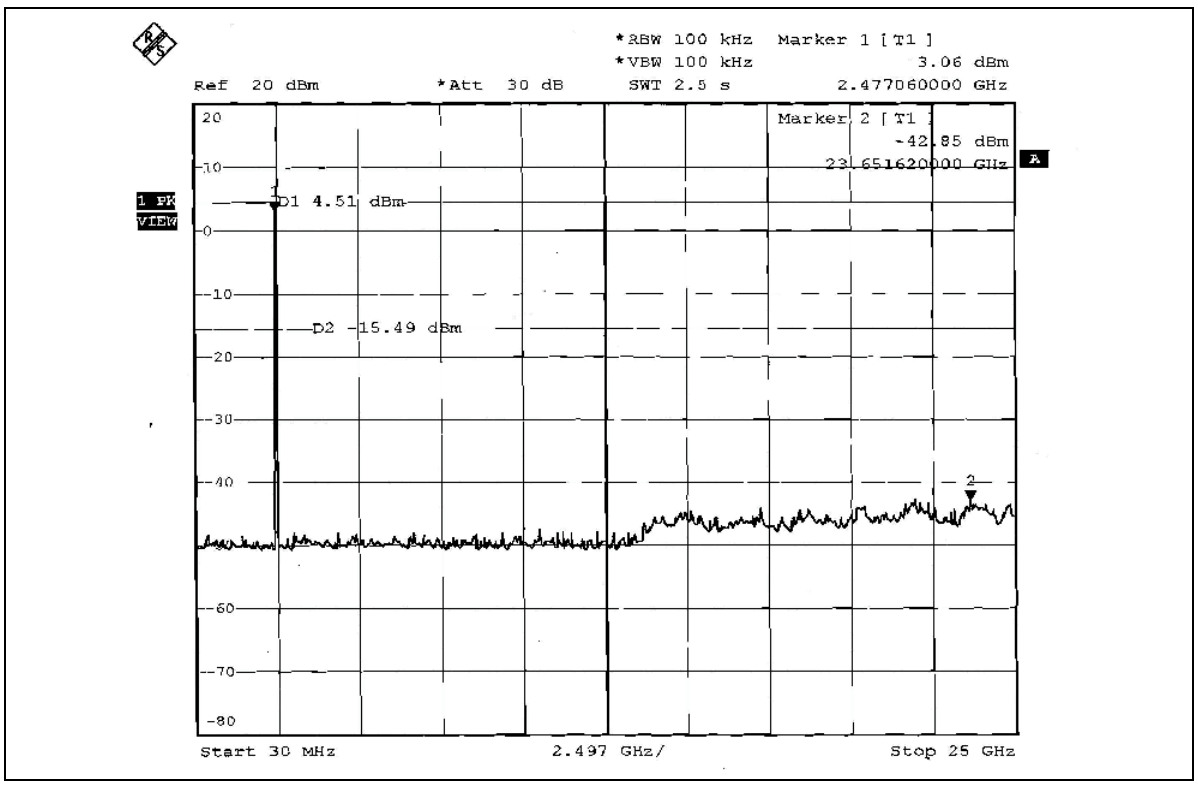
NOTE 2:
The band edge emission plot on page 53 shows 47.21dBc between carrier maximum power and local maximum emission in restrict band (2.4843GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2.7 is 99.43dBuV/m (Peak), so the maximum field strength in restrict band is 99.43 –47.21 = 52.22dBuV/m, which is under 74 dBuV/m limit.

Average value = 52.22-30.00=22.22dBuV/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: 20log(3.125/100)= -30 dB.
Average value = peak reading – 30.00.


*RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 10 ms
Marker 1 [T1]
5.04 dBm
2.402400000 GHz
Marker 2 [T1]
-47.99 dBm
2.400000000 GHz
Marker 3 [T1]
-50.39 dBm
2.390000000 GHz
Marker 4 [T1]
-47.38 dBm
2.328000000 GHz
D1 5.04 dBm
D2 -14.96 dBm
1 PK
VIEW
A
F2
F1
Center 2.353 GHz
10 MHz/
Span 100 MHz


*RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 2.5 s
Marker 1 [T1]
4.37 dBm
2.377180000 GHz
Marker 2 [T1]
-42.93 dBm
22.253300000 GHz
D1 5.04 dBm
D2 -14.96 dBm
1 PK
VIEW
A
Start 30 MHz
2.497 GHz/
Stop 25 GHz


*RBW 100 kHz
*VBW 100 kHz
SWT 10 ms
Marker 1 [T1]
4.51 dBm
2.479800000 GHz
Ref 20 dBm
*Att 30 dB
Marker 2 [T1]
-43.06 dBm
2.483500000 GHz
Marker 3 [T1]
-42.70 dBm
2.484300000 GHz
Marker 4 [T1]
-50.59 dBm
2.500000000 GHz
1 PK
VIEW
D1 4.51 dBm
D2 -15.49 dBm
F1
F2
Center 2.529 GHz
10 MHz/
Span 100 MHz


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
3.06 dBm
2.477060000 GHz
Ref 20 dBm
*Att 30 dB
Marker 2 [T1]
-42.85 dBm
23.651620000 GHz
1 PK
VIEW
D1 4.51 dBm
D2 -15.49 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

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 Dipole antenna without antenna connector. The maximum gain of this antenna is -3dBi.

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.	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: 886-2-26051924

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.

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.