

## TEST TYPES AND RESULTS (FOR BLUETOOTH)

### CONDUCTED EMISSION MEASUREMENT

#### LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Nov. 11, 2006
RF signal cable Woken	5D-FB	Cable-HYC01-01	Jan. 06, 2007
LISN ROHDE & SCHWARZ	ESH3-Z5	100312	Feb. 15, 2007
LISN ROHDE & SCHWARZ	ESH2-Z5	100104	Feb. 07, 2007
Software ADT	ADT_Cond_V3	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Shielded Room 1.
  3. The VCCI Site Registration No. is C-2040.

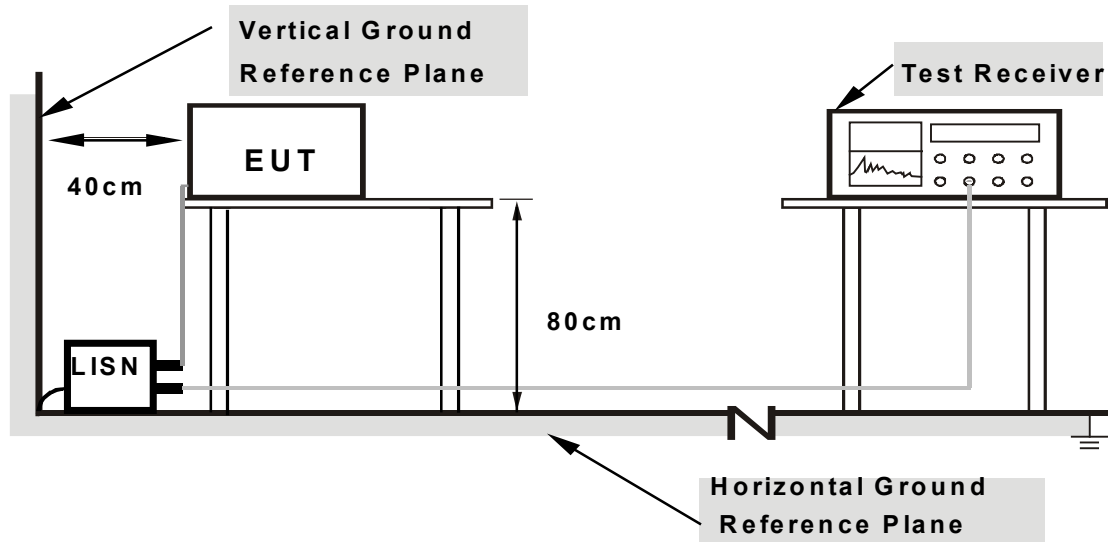
## TEST PROCEDURES

- 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.

## DEVIATION FROM TEST STANDARD

No deviation

## TEST SETUP



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) 80 cm from EUT and at least 80 from other units and other metal planes**

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

## EUT OPERATING CONDITIONS

Same as 4.1.6

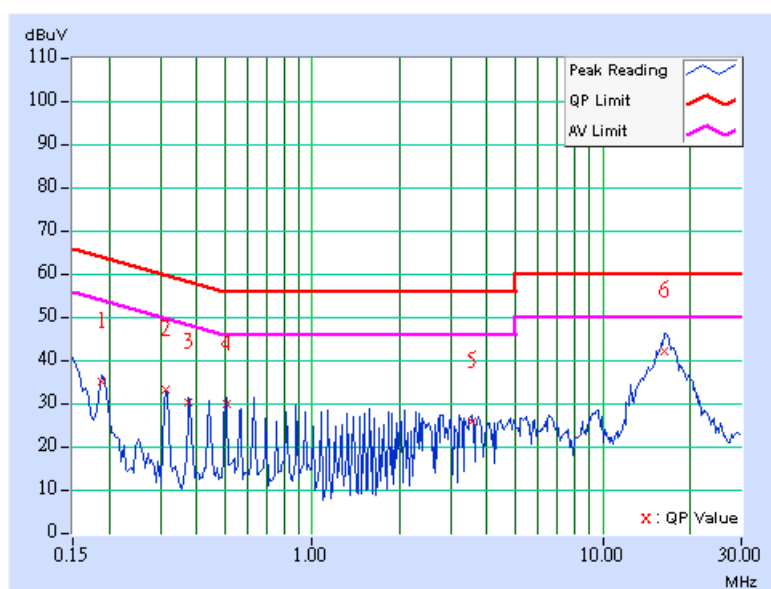
## TEST RESULTS

### Conducted Worst-Case Data

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TESTED BY	Match Tsui		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	34.50	-	34.60	-	64.08	54.08	-29.48	-
2	0.314	0.10	32.72	-	32.82	-	59.86	49.86	-27.04	-
3	0.377	0.10	29.84	-	29.94	-	58.35	48.35	-28.41	-
4	0.505	0.12	29.38	-	29.50	-	56.00	46.00	-26.50	-
5	3.527	0.41	25.41	-	25.82	-	56.00	46.00	-30.18	-
6	16.367	0.68	41.65	-	42.33	-	60.00	50.00	-17.67	-

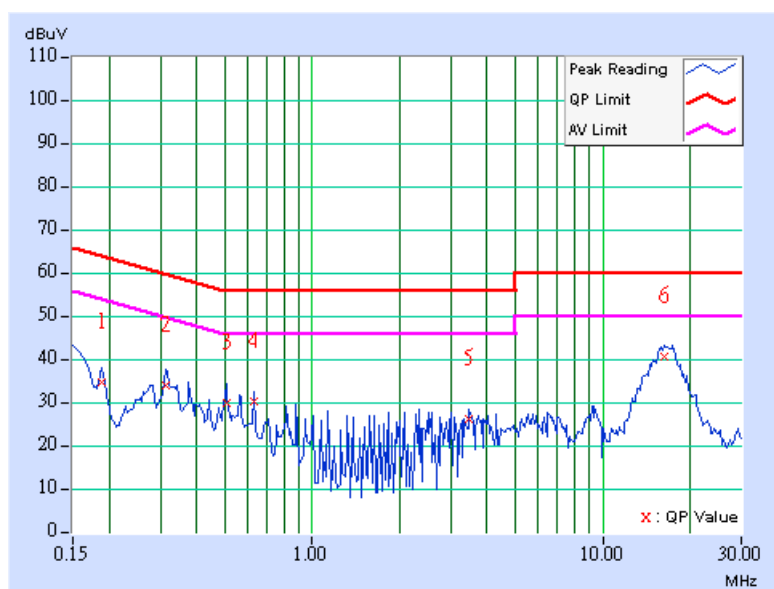
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TESTED BY	Match Tsui		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	34.24	-	34.34	-	64.08	54.08	-29.74	-
2	0.314	0.10	33.54	-	33.64	-	59.86	49.86	-26.22	-
3	0.505	0.10	29.50	-	29.60	-	56.00	46.00	-26.40	-
4	0.630	0.10	29.82	-	29.92	-	56.00	46.00	-26.08	-
5	3.465	0.32	25.84	-	26.16	-	56.00	46.00	-29.84	-
6	16.305	0.56	40.27	-	40.83	-	60.00	50.00	-19.17	-

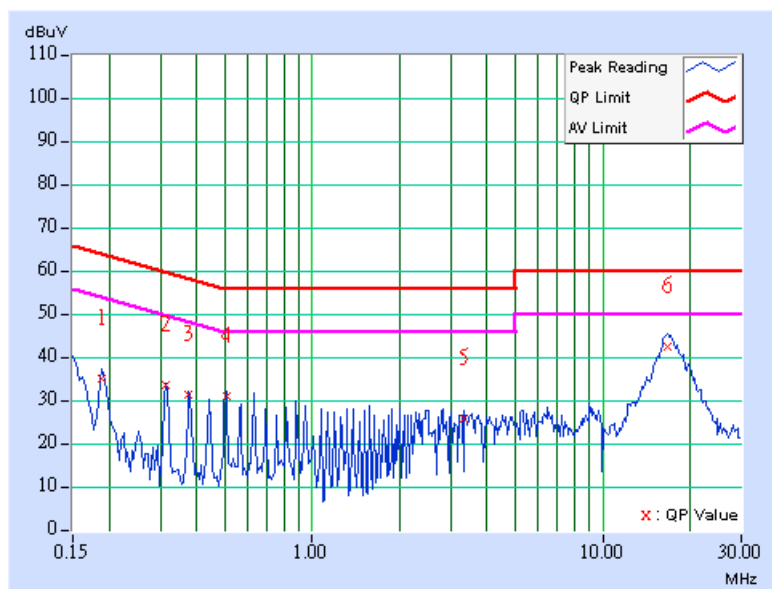
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value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



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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	34.60	-	34.70	-	64.08	54.08	-29.38	-
2	0.314	0.10	33.18	-	33.28	-	59.86	49.86	-26.58	-
3	0.377	0.10	30.70	-	30.80	-	58.35	48.35	-27.55	-
4	0.505	0.12	30.28	-	30.40	-	56.00	46.00	-25.60	-
5	3.336	0.38	25.24	-	25.62	-	56.00	46.00	-30.38	-
6	16.626	0.70	41.99	-	42.69	-	60.00	50.00	-17.31	-

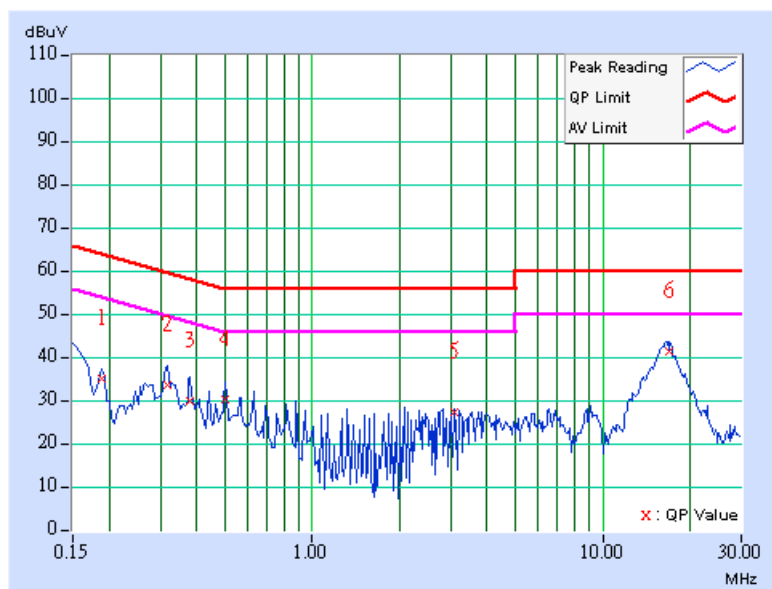
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value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



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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	34.54	-	34.64	-	64.08	54.08	-29.44	-
2	0.318	0.10	33.25	-	33.35	-	59.76	49.76	-26.41	-
3	0.380	0.10	29.40	-	29.50	-	58.27	48.27	-28.77	-
4	0.502	0.10	29.96	-	30.06	-	56.00	46.00	-25.94	-
5	3.086	0.29	27.00	-	27.29	-	56.00	46.00	-28.71	-
6	17.008	0.57	41.09	-	41.66	-	60.00	50.00	-18.34	-

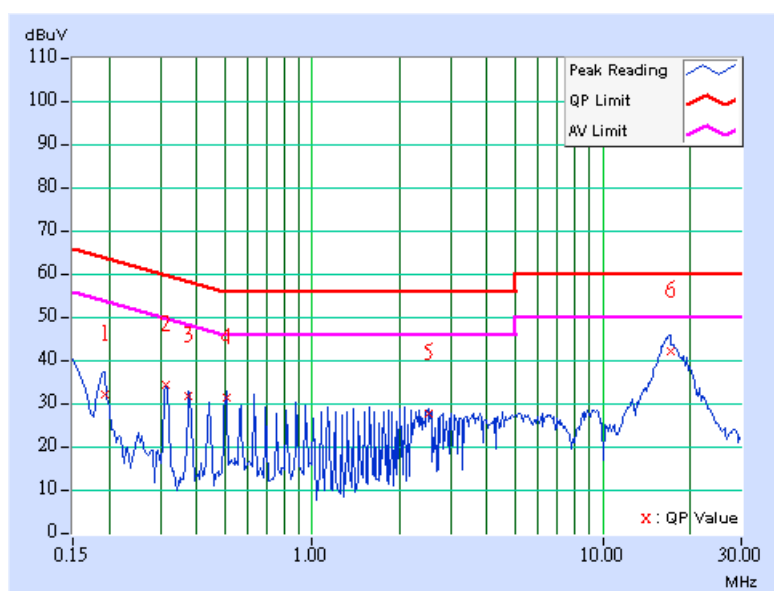
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TESTED BY	Match Tsui		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.193	0.10	31.36	-	31.46	-	63.91	53.91	-32.45	-
2	0.314	0.10	33.70	-	33.80	-	59.86	49.86	-26.06	-
3	0.377	0.10	31.16	-	31.26	-	58.35	48.35	-27.09	-
4	0.505	0.12	30.86	-	30.98	-	56.00	46.00	-25.02	-
5	2.520	0.27	27.04	-	27.31	-	56.00	46.00	-28.69	-
6	17.065	0.71	41.59	-	42.30	-	60.00	50.00	-17.70	-

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

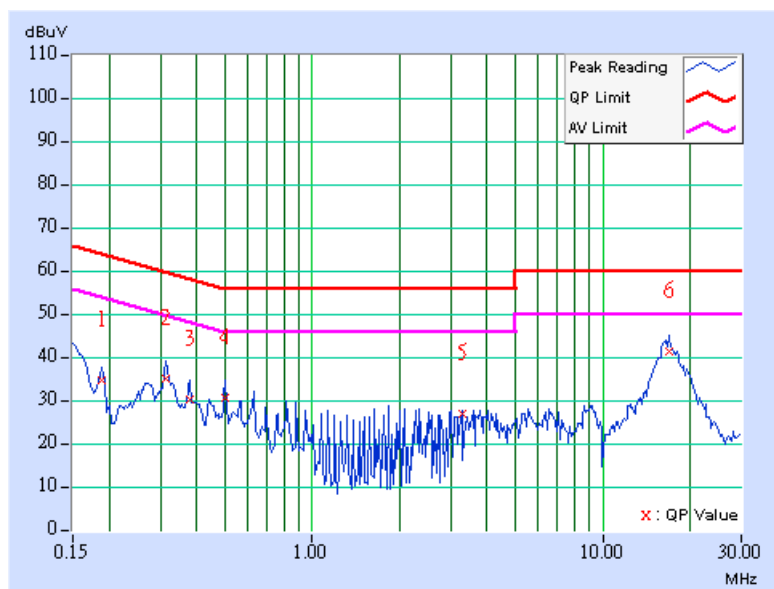




EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	PHASE	Line 2
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TESTED BY	Match Tsui		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	34.42	-	34.52	-	64.08	54.08	-29.56	-
2	0.314	0.10	34.56	-	34.66	-	59.86	49.86	-25.20	-
3	0.380	0.10	29.76	-	29.86	-	58.27	48.27	-28.41	-
4	0.502	0.10	30.14	-	30.24	-	56.00	46.00	-25.76	-
5	3.273	0.31	26.33	-	26.64	-	56.00	46.00	-29.36	-
6	16.879	0.57	40.78	-	41.35	-	60.00	50.00	-18.65	-

- 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.



## RADIATED EMISSION MEASUREMENT

### 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.



## TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESI7	100033	May. 19, 2006
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100025	Dec. 05, 2006
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Jun. 01, 2006
HORN Antenna SCHWARZBECK	9120D	9120D-408	Jan. 08, 2007
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Jan. 19, 2007
Preamplifier Agilent	8447D	2944A10633	Nov. 04, 2006
Preamplifier Agilent	8449B	3008A01964	Oct. 30, 2006
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	214377/4	Dec. 13, 2006
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	219272/4	Dec. 13, 2006
Software ADT.	ADT_Radiated_V5.14	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA
Turn Table ADT.	TT100.	TT93021703	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA
26GHz ~ 40GHz Amplifier	AMF-6F-2600400	923362	Mar. 27, 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 HwaYa Chamber 2.

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

4. The VCCI Site Registration No. is R-237.

5. The IC Site Registration No. is IC4924-3.

## 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.

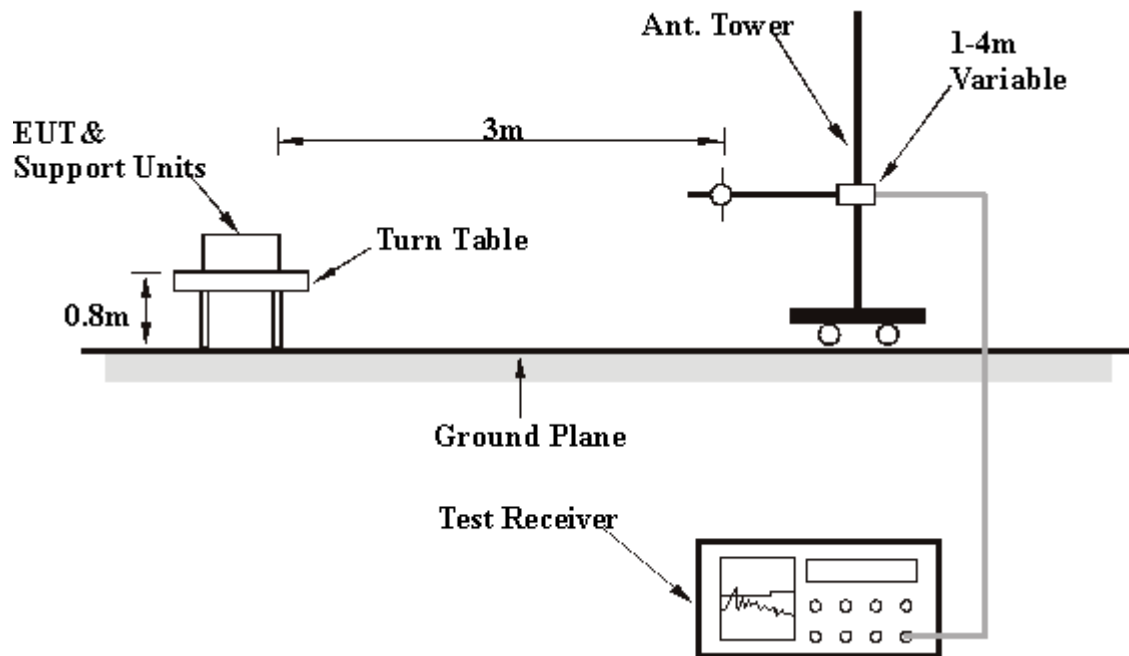
### NOTE:

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.

## DEVIATION FROM TEST STANDARD

No deviation

## TEST SETUP



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

## EUT OPERATING CONDITIONS

Same as 4.1.6



## TEST RESULTS

### Radiated Worst Case Data: Below 1GHz

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	Below 1000MHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Quasi-Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH, 991hPa
TESTED BY	Morgan Chen		

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	214.67	28.03 QP	43.50	-15.47	1.00 H	346	16.42	11.61
2	239.94	34.62 QP	46.00	-11.38	1.00 H	343	22.25	12.37
3	300.20	28.12 QP	46.00	-17.88	1.00 H	310	12.23	15.89
4	624.83	30.98 QP	46.00	-15.02	1.00 H	22	7.63	23.35
5	720.08	28.91 QP	46.00	-17.09	1.00 H	355	3.82	25.10
6	768.68	29.11 QP	46.00	-16.89	1.00 H	307	2.68	26.43
7	817.27	32.97 QP	46.00	-13.03	1.00 H	316	6.14	26.83
8	860.04	29.48 QP	46.00	-16.52	1.00 H	334	2.26	27.22
9	891.14	28.39 QP	46.00	-17.61	1.00 H	334	0.89	27.50
10	912.53	30.72 QP	46.00	-15.28	1.00 H	313	2.95	27.77

- 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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	Below 1000MHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Quasi-Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH, 991hPa
TESTED BY	Morgan Chen		

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	432.38	31.99 QP	46.00	-14.01	1.00 V	136	13.12	18.87
2	459.60	29.34 QP	46.00	-16.66	1.25 V	103	9.91	19.43
3	512.08	31.86 QP	46.00	-14.14	1.00 V	157	11.17	20.69
4	527.64	33.49 QP	46.00	-12.51	1.00 V	16	12.53	20.96
5	566.51	33.66 QP	46.00	-12.34	1.00 V	40	11.70	21.95
6	620.94	31.86 QP	46.00	-14.14	1.00 V	286	8.54	23.32
7	<b>624.83</b>	<b>36.82 QP</b>	<b>46.00</b>	<b>-9.18</b>	<b>1.25 V</b>	<b>103</b>	<b>13.47</b>	<b>23.35</b>
8	675.37	32.43 QP	46.00	-13.57	1.25 V	331	8.50	23.93
9	700.64	31.53 QP	46.00	-14.47	1.00 V	31	7.20	24.33
10	729.80	31.16 QP	46.00	-14.84	1.00 V	40	5.67	25.49
11	766.73	33.70 QP	46.00	-12.30	1.25 V	313	7.28	26.42
12	799.78	31.50 QP	46.00	-14.50	1.00 V	121	4.83	26.67
13	817.27	32.81 QP	46.00	-13.19	1.00 V	16	5.98	26.83
14	863.93	29.87 QP	46.00	-16.13	1.25 V	331	2.61	27.26
15	900.86	30.03 QP	46.00	-15.97	1.25 V	52	2.43	27.59
16	912.53	32.78 QP	46.00	-13.22	1.50 V	124	5.01	27.77
17	1000.00	37.37 QP	54.00	-16.63	1.00 V	2	9.03	28.34

- 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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	A

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	40.52 PK	74.00	-33.48	1.07 H	25	8.61	31.91
1	2390.00	31.40 AV	54.00	-22.60	1.07 H	25	-0.51	31.91
2	*2402.00	85.23 PK			1.07 H	25	53.25	31.98
2	*2402.00	55.23 AV			1.07 H	25	23.25	31.98
3	3204.00	43.44 PK	74.00	-30.56	1.18 H	18	9.93	33.51
3	3204.00	31.65 AV	54.00	-22.35	1.18 H	18	-1.86	33.51
4	4804.00	55.59 PK	74.00	-18.41	1.13 H	29	18.10	37.49
4	4804.00	25.59 AV	54.00	-28.41	1.13 H	29	-11.90	37.49

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	41.55 PK	74.00	-32.45	1.22 V	336	9.64	31.91
1	2390.00	32.43 AV	54.00	-21.57	1.22 V	336	0.52	31.91
2	*2402.00	86.44 PK			1.22 V	336	54.46	31.98
2	*2402.00	56.44 AV			1.22 V	336	24.46	31.98
3	3204.00	44.35 PK	74.00	-29.65	1.01 V	151	10.84	33.51
3	3204.00	32.60 AV	54.00	-21.40	1.01 V	151	-0.91	33.51
4	4804.00	57.12 PK	74.00	-16.88	1.10 V	39	19.63	37.49
4	4804.00	27.12 AV	54.00	-26.88	1.10 V	39	-10.37	37.49

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .





EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	A

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	84.51 PK			1.05 H	26	52.29	32.22
1	*2441.00	54.51 AV			1.05 H	26	22.29	32.22
2	3254.00	43.11 PK	74.00	-30.89	1.16 H	12	9.45	33.66
2	3254.00	31.22 AV	54.00	-22.78	1.16 H	12	-2.44	33.66
3	4882.00	55.32 PK	74.00	-18.68	1.10 H	36	17.76	37.56
3	4882.00	25.32 AV	54.00	-28.68	1.10 H	36	-12.24	37.56

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	85.45 PK			1.16 V	354	53.23	32.22
1	*2441.00	55.45 AV			1.16 V	354	23.23	32.22
2	3254.00	44.12 PK	74.00	-29.88	1.05 V	148	10.46	33.66
2	3254.00	32.42 AV	54.00	-21.58	1.05 V	148	-1.24	33.66
3	4882.00	56.58 PK	74.00	-17.42	1.08 V	45	19.02	37.56
3	4882.00	26.58 AV	54.00	-27.42	1.08 V	45	-10.98	37.56

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	A

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	83.56 PK			1.02 H	16	51.10	32.47
1	*2480.00	53.56 AV			1.02 H	16	21.09	32.47
2	2483.50	39.56 PK	74.00	-34.44	1.02 H	16	7.07	32.49
2	2483.50	31.56 AV	54.00	-22.44	1.02 H	16	-0.93	32.49
3	3306.00	43.19 PK	74.00	-30.81	1.02 H	139	9.38	33.81
3	3306.00	31.42 AV	54.00	-22.58	1.02 H	139	-2.39	33.81
4	4960.00	56.12 PK	74.00	-17.88	1.07 H	38	18.53	37.59
4	4960.00	26.12 AV	54.00	-27.88	1.07 H	38	-11.47	37.59

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	84.79 PK			1.20 V	328	52.32	32.47
1	*2480.00	54.79 AV			1.20 V	328	22.32	32.47
2	2483.50	40.79 PK	74.00	-33.21	1.20 V	328	8.30	32.49
2	2483.50	32.79 AV	54.00	-21.21	1.20 V	328	0.30	32.49
3	3306.00	44.25 PK	74.00	-29.75	1.04 V	148	10.44	33.81
3	3306.00	32.46 AV	54.00	-21.54	1.04 V	148	-1.35	33.81
4	4960.00	57.02 PK	74.00	-16.98	1.08 V	42	19.43	37.59
4	4960.00	27.02 AV	54.00	-26.98	1.08 V	42	-10.57	37.59

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .



### Radiated Worst Case Data: Above 1GHz

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	37.28 PK	74.00	-36.72	1.05 H	20	5.37	31.91
1	2390.00	29.28 AV	54.00	-24.72	1.05 H	20	-2.63	31.91
2	*2402.00	84.28 PK			1.05 H	20	52.30	31.98
2	*2402.00	54.28 AV			1.05 H	20	22.30	31.98
3	3204.00	43.32 PK	74.00	-30.68	1.13 H	15	9.81	33.51
3	3204.00	30.58 AV	54.00	-23.42	1.13 H	15	-2.93	33.51
4	4804.00	55.40 PK	74.00	-18.60	1.16 H	25	17.91	37.49
4	4804.00	25.40 AV	54.00	-28.60	1.16 H	25	-12.09	37.49

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	38.35 PK	74.00	-35.65	1.25 V	342	6.44	31.91
1	2390.00	30.35 AV	54.00	-23.65	1.25 V	342	-1.56	31.91
2	*2402.00	85.35 PK			1.25 V	342	53.37	31.98
2	*2402.00	55.35 AV			1.25 V	342	23.37	31.98
3	3204.00	44.25 PK	74.00	-29.75	1.02 V	148	10.74	33.51
3	3204.00	32.49 AV	54.00	-21.51	1.02 V	148	-1.02	33.51
4	4804.00	56.10 PK	74.00	-17.90	1.12 V	29	18.61	37.49
4	4804.00	26.10 AV	54.00	-27.90	1.12 V	29	-11.39	37.49

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	83.25 PK			1.08 H	16	51.03	32.22
1	*2441.00	53.25 AV			1.08 H	16	21.03	32.22
2	3254.00	43.20 PK	74.00	-30.80	1.10 H	12	9.54	33.66
2	3254.00	30.42 AV	54.00	-23.58	1.10 H	12	-3.24	33.66
3	4882.00	55.01 PK	74.00	-18.99	1.12 H	345	17.45	37.56
3	4882.00	25.01 AV	54.00	-28.99	1.12 H	345	-12.55	37.56

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	84.30 PK			1.20 V	340	52.08	32.22
1	*2441.00	54.30 AV			1.20 V	340	22.08	32.22
2	3254.00	44.10 PK	74.00	-29.90	1.05 V	152	10.44	33.66
2	3254.00	32.37 AV	54.00	-21.63	1.05 V	152	-1.29	33.66
3	4882.00	56.03 PK	74.00	-17.97	1.10 V	32	18.47	37.56
3	4882.00	26.03 AV	54.00	-27.97	1.10 V	32	-11.53	37.56

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	8DPSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH, 991hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Morgan Chen	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	81.05 PK			1.03 H	16	48.58	32.47
1	*2480.00	51.05 AV			1.03 H	16	18.58	32.47
2	2483.50	35.05 PK	74.00	-38.95	1.03 H	16	2.56	32.49
2	2483.50	28.05 AV	54.00	-25.95	1.03 H	16	-4.44	32.49
3	3306.00	43.05 PK	74.00	-30.95	1.15 H	12	9.24	33.81
3	3306.00	31.29 AV	54.00	-22.71	1.15 H	12	-2.52	33.81
4	4960.00	54.08 PK	74.00	-19.92	1.18 H	8	16.49	37.59
4	4960.00	24.08 AV	54.00	-29.92	1.18 H	8	-13.51	37.59

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	82.11 PK			1.17 V	339	49.64	32.47
1	*2480.00	52.11 AV			1.17 V	339	19.64	32.47
2	2483.50	36.11 PK	74.00	-37.89	1.17 V	339	3.62	32.49
2	2483.50	29.11 AV	54.00	-24.89	1.17 V	339	-3.38	32.49
3	3306.00	44.02 PK	74.00	-29.98	1.06 V	148	10.21	33.81
3	3306.00	32.32 AV	54.00	-21.68	1.06 V	148	-1.49	33.81
4	4960.00	55.01 PK	74.00	-18.99	1.12 V	28	17.42	37.59
4	4960.00	25.01 AV	54.00	-28.99	1.12 V	28	-12.58	37.59

- 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:  $20\log(3.125/100) = -30$  dB.
  6. Average value = peak reading  $-20\log(\text{duty cycle})$ .



## NUMBER OF HOPPING FREQUENCY USED

### LIMIT OF HOPPING FREQUENCY USED

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

### 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.

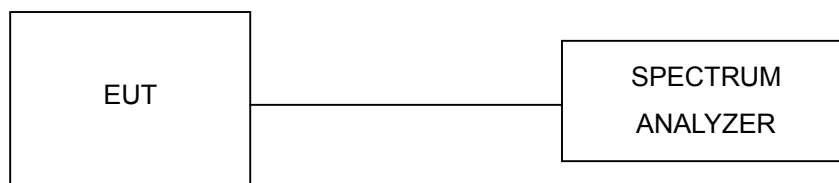
### TEST PROCEDURES

- 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.

## DEVIATION FROM TEST STANDARD

No deviation.

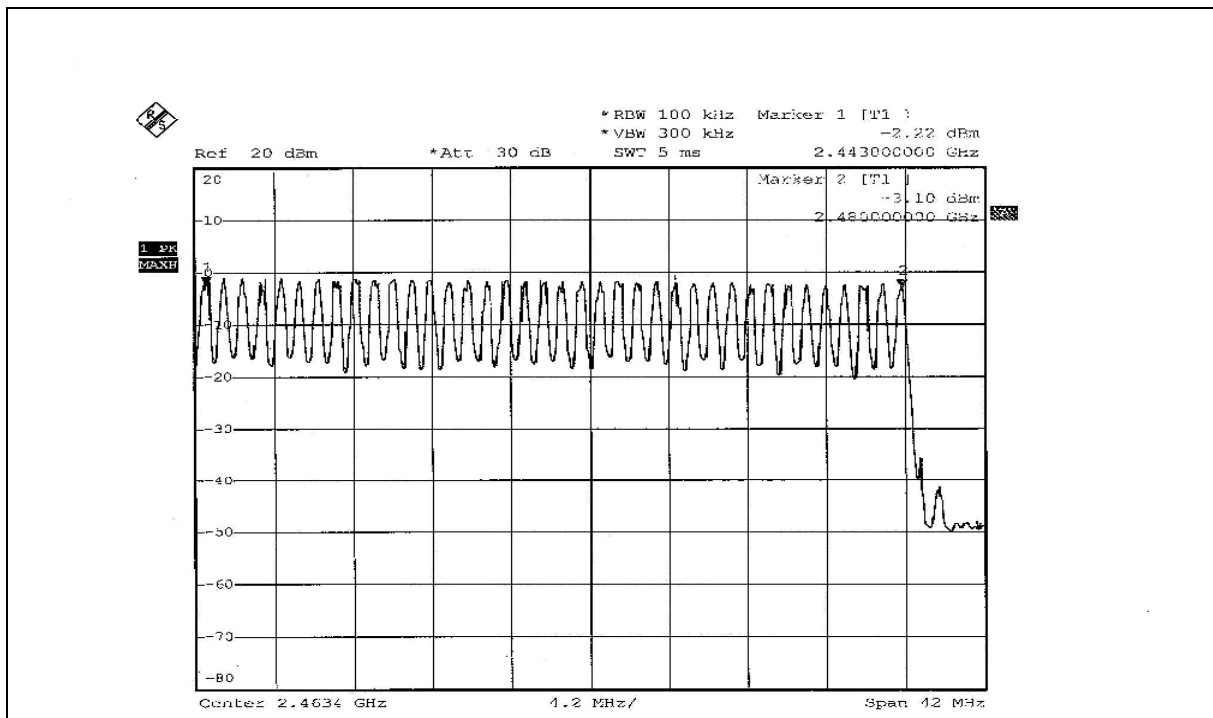
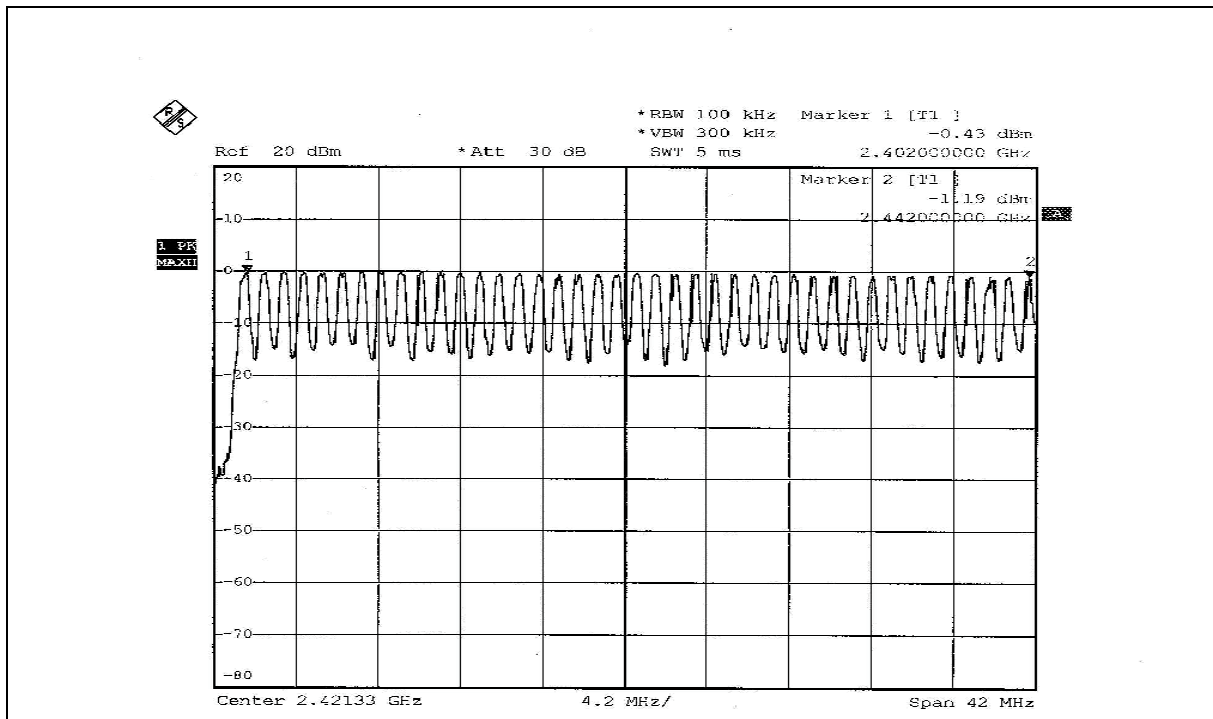
## TEST SETUP



## TEST RESULTS

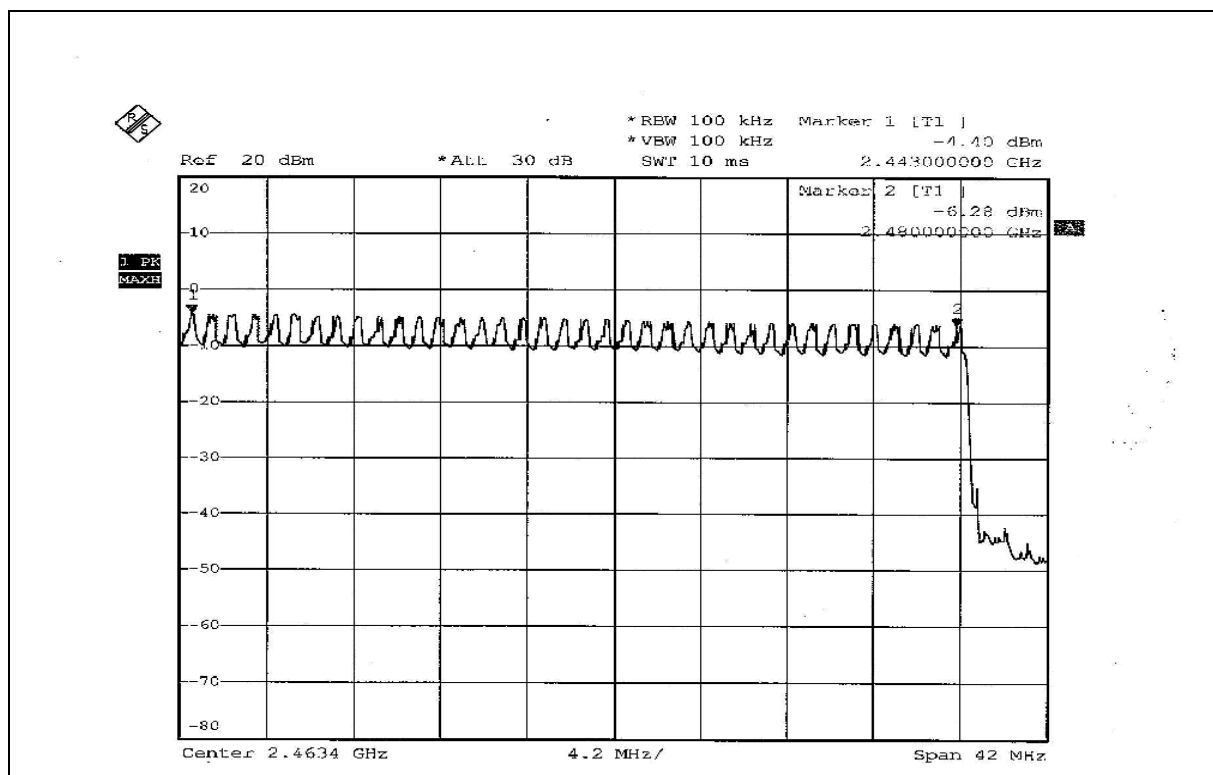
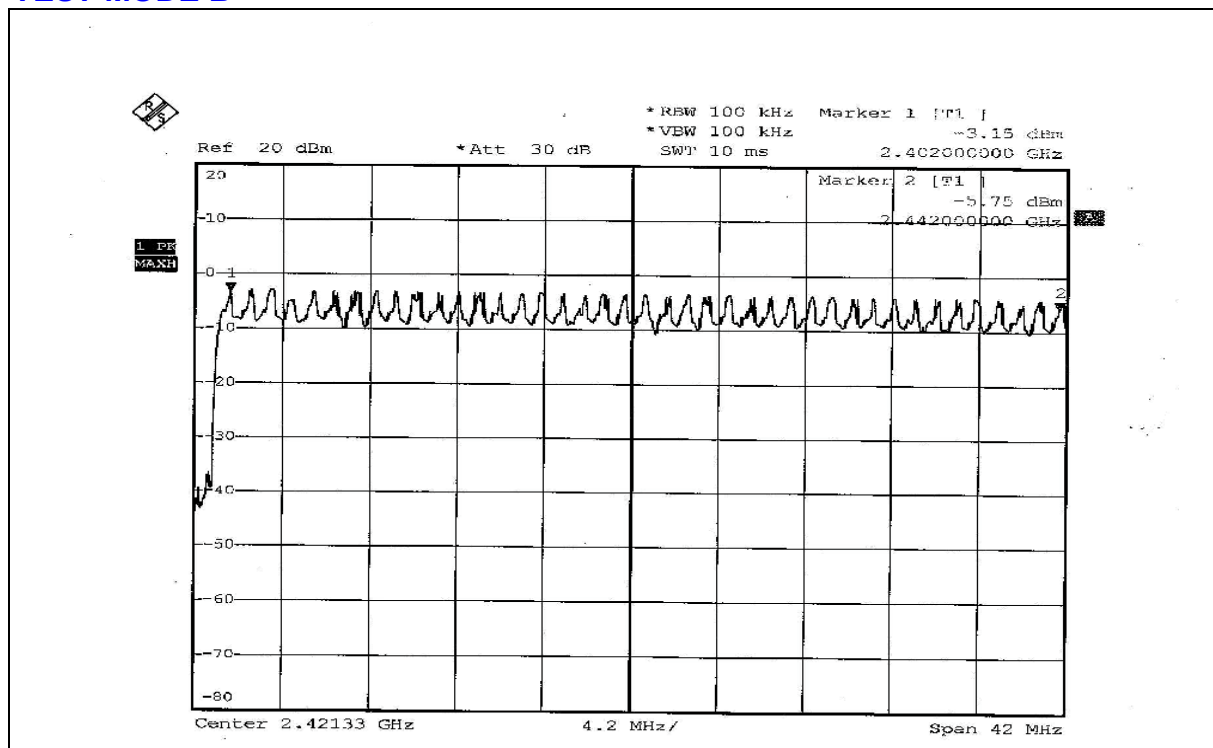
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

# TEST MODE A





## TEST MODE B





## DWELL TIME ON EACH CHANNEL

### 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.

### 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.

### 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.

### DEVIATION FROM TEST STANDARD

No deviation.

## TEST SETUP



## TEST RESULTS

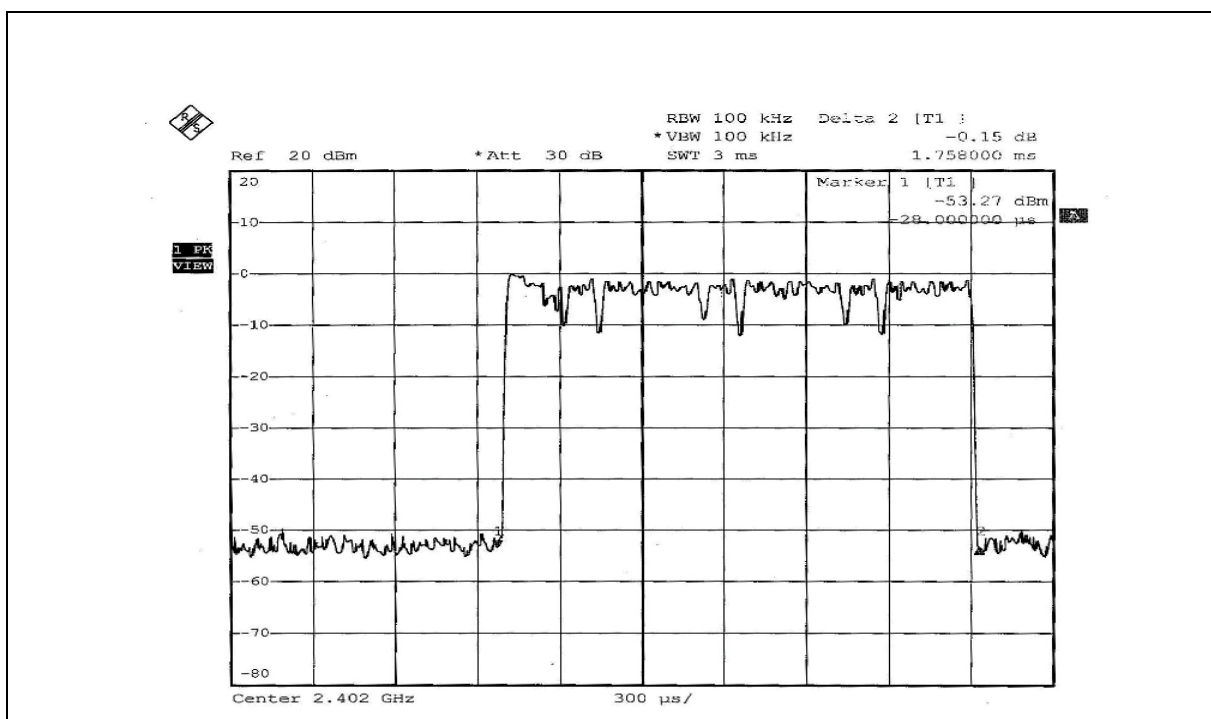
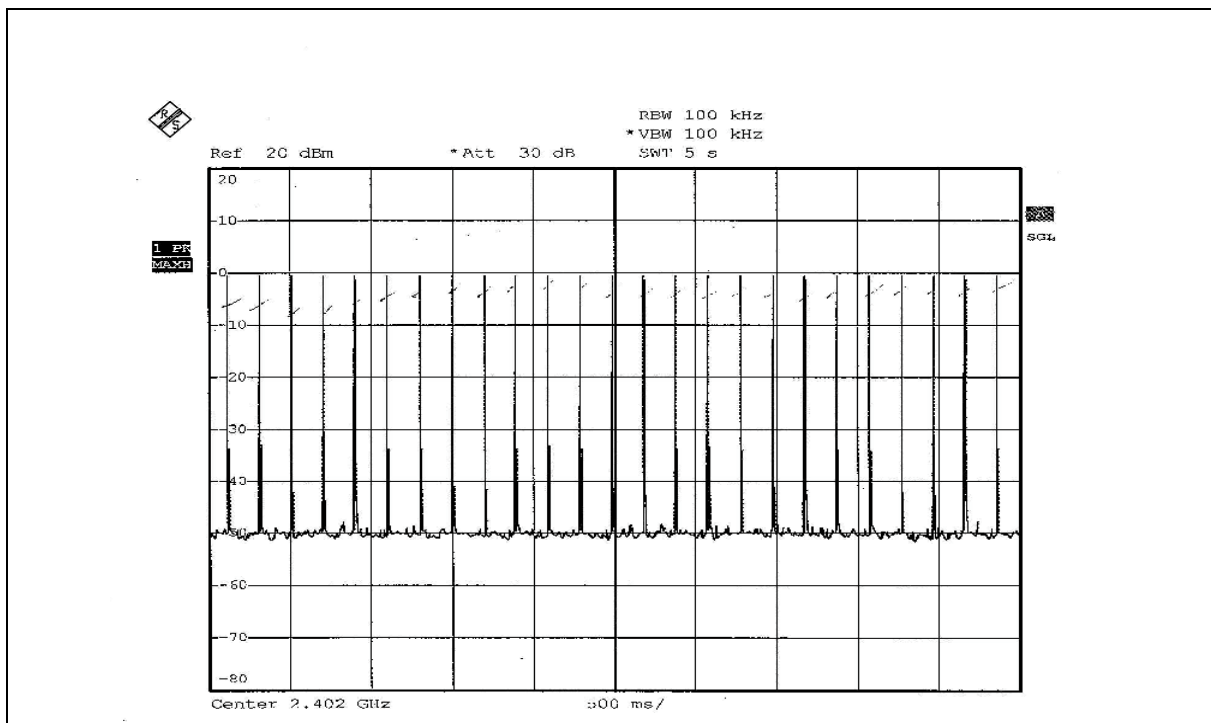
### TEST MODE A

MODE	NUMBER OF TRANSMISSION IN A 31.6 (79HOPPING * 0.4)	LENGTH OF TRANSMISSION TIME (msec)	RESULT (msec)	LIMIT (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.492	154.472	400
DH3	25 (times / 5 sec) * 6.32 = 158.00times	1.758	277.764	400
DH5	17 (times / 5 sec) * 6.32 = 107.44 times	3.018	324.25	400

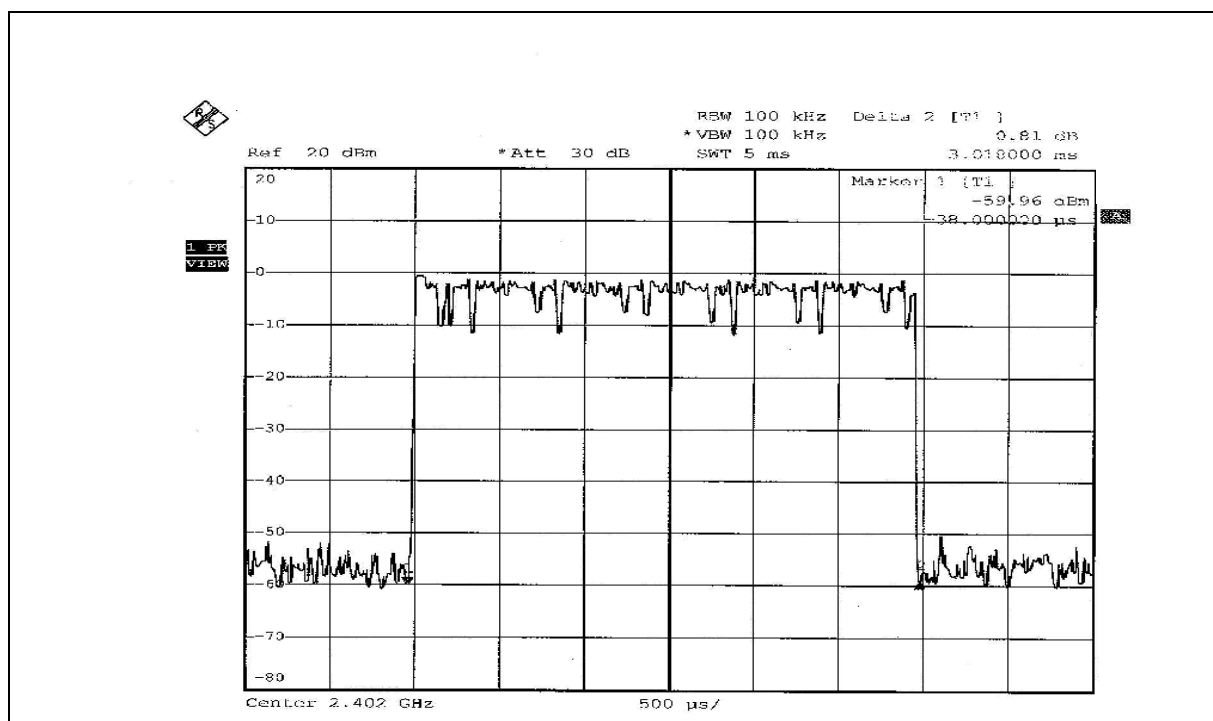
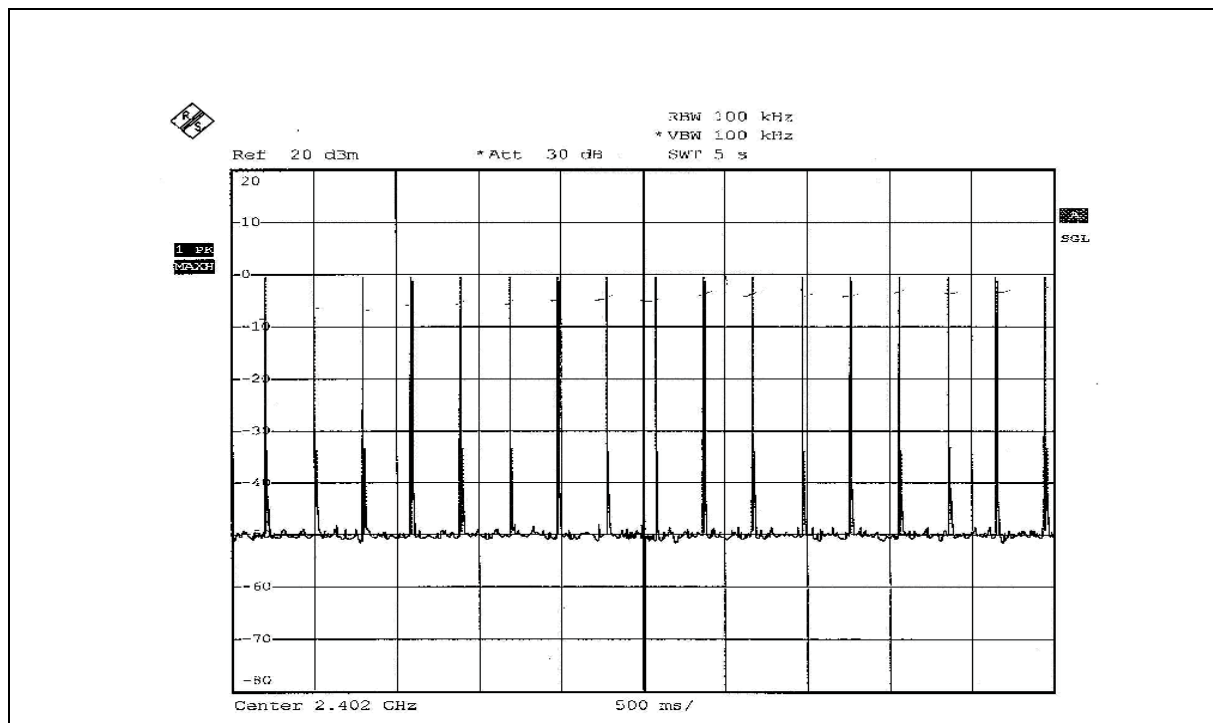
**NOTE:** Test plots of the transmitting time slots are shown on next 3 pages.



DH3



DH5

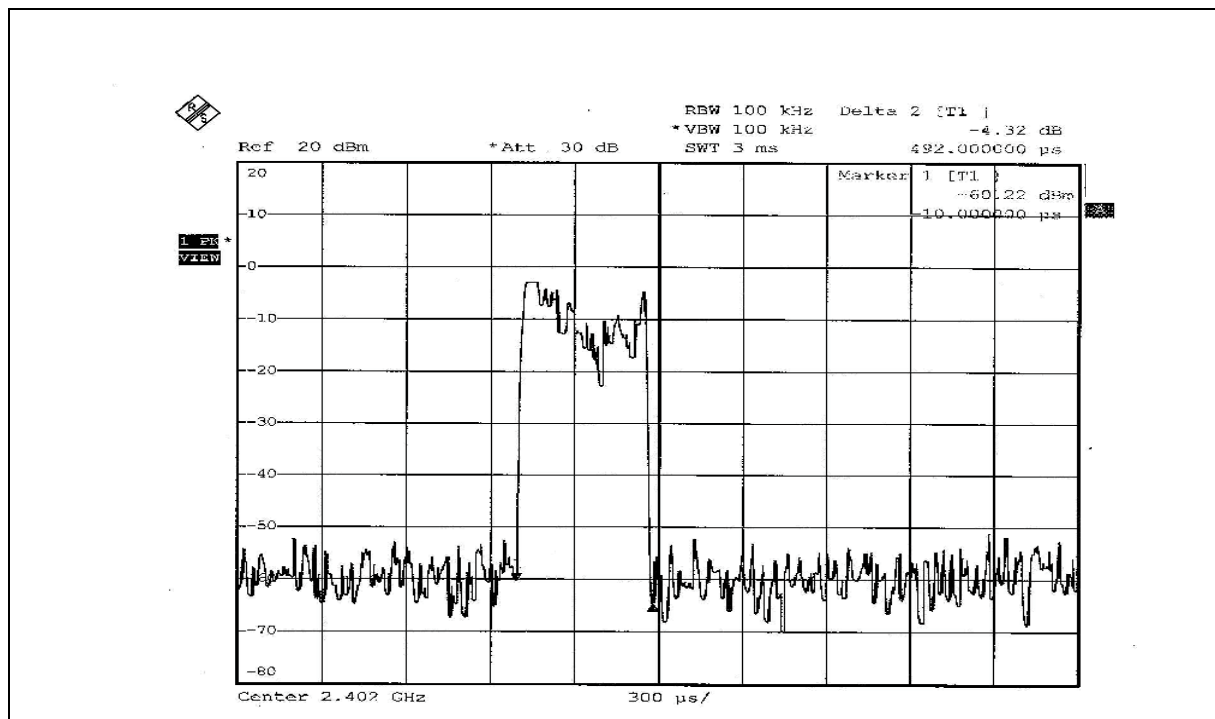
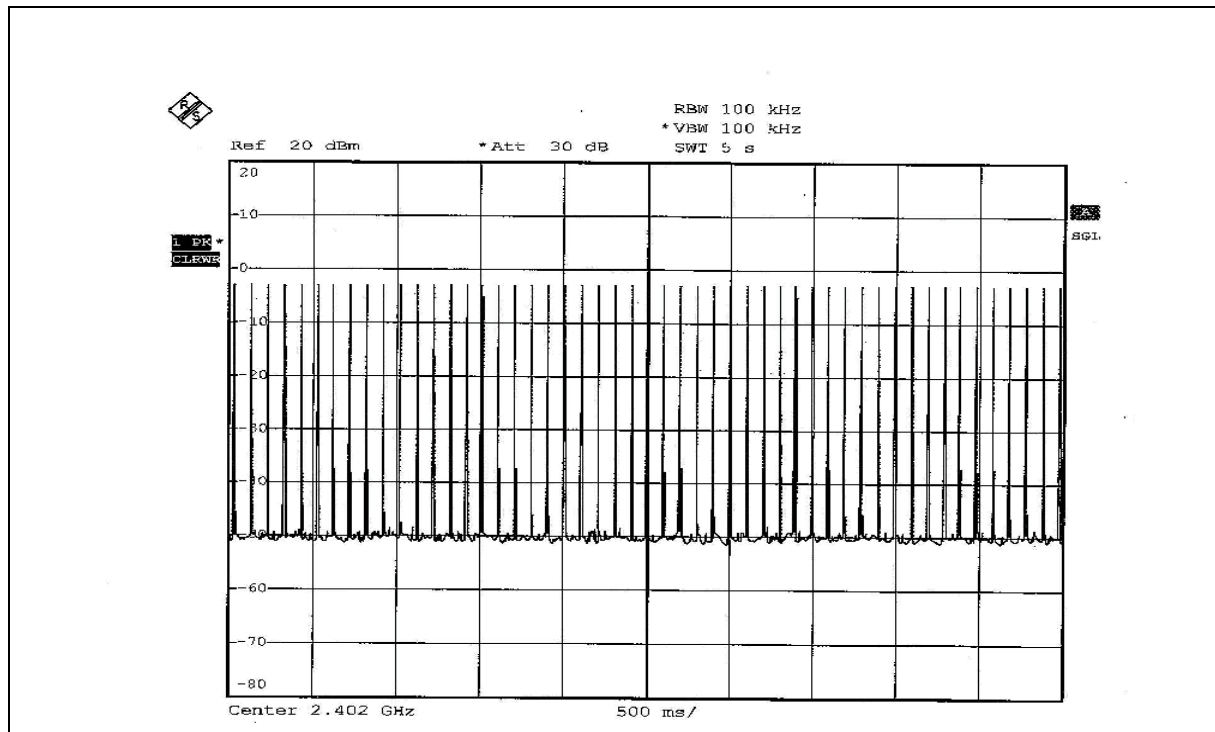


## TEST MODE B

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	0.492	158.58	400
DH3	25 (times / 5 sec) * 6.32 = 158.00times	1.746	275.87	400
DH5	16 (times / 5 sec) * 6.32 = 101.12 times	3.05	308.42	400

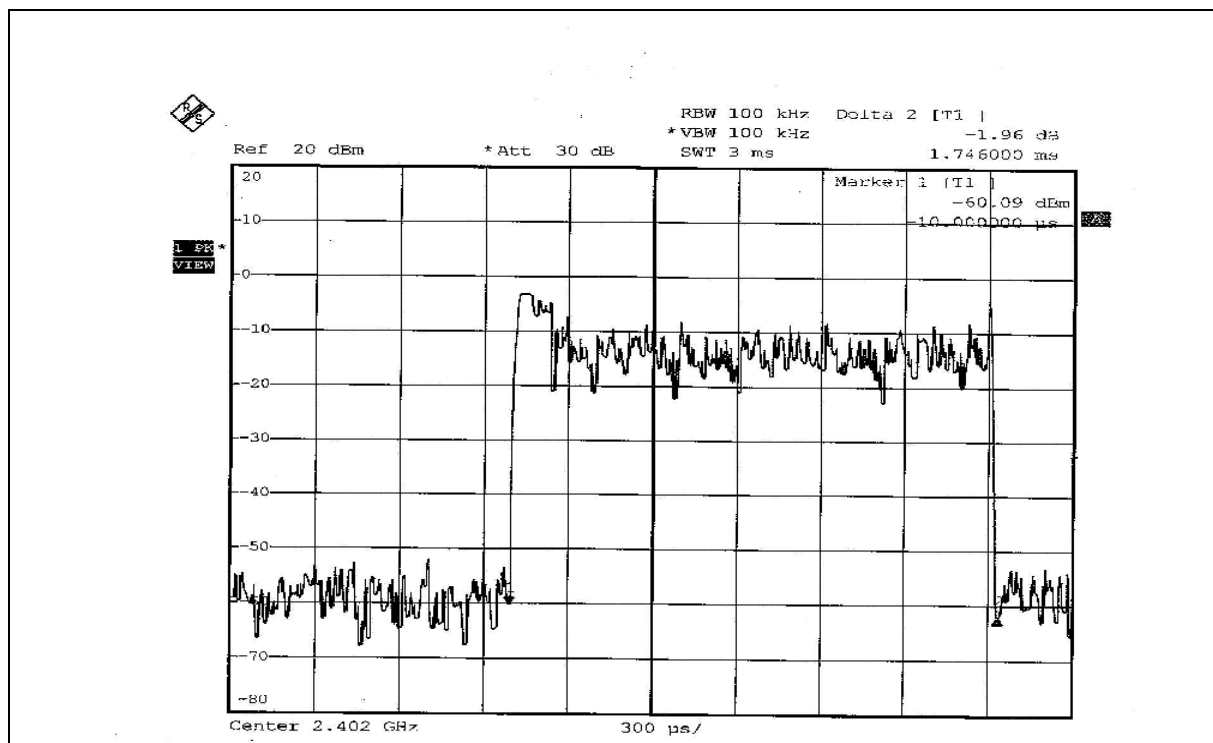
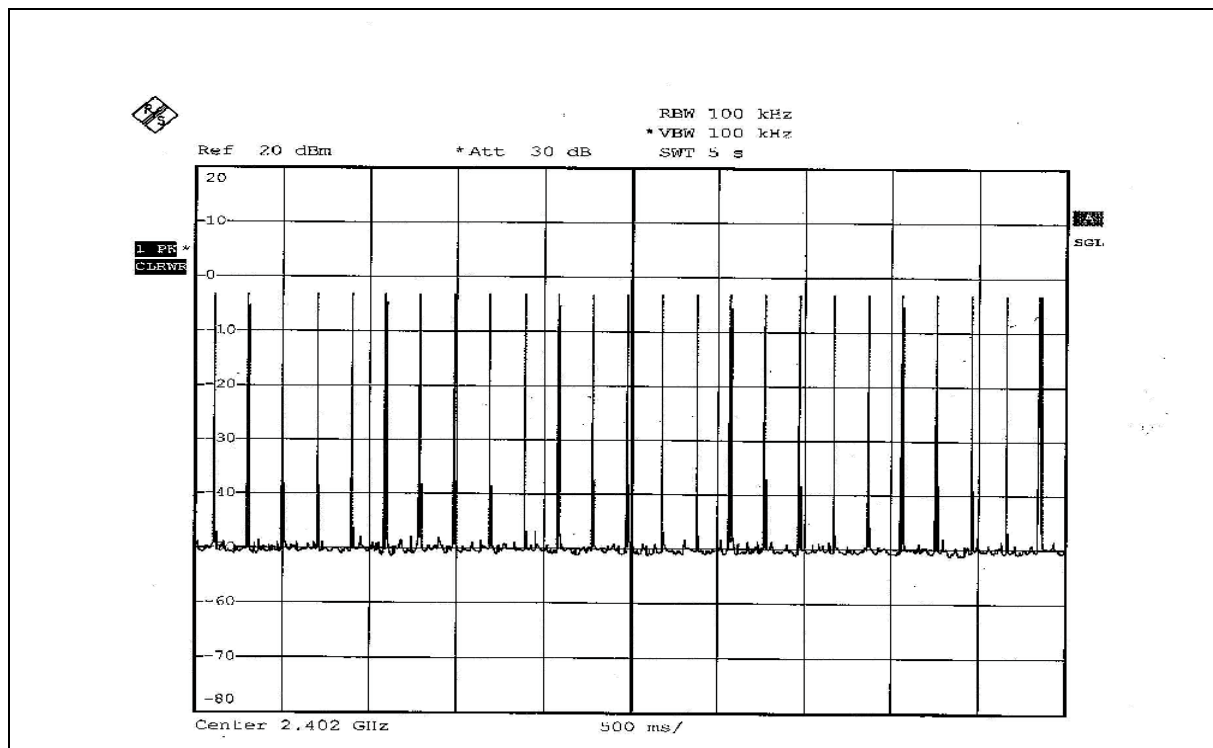
**NOTE:** Test plots of the transmitting time slots are shown on next 3 pages.

DH1

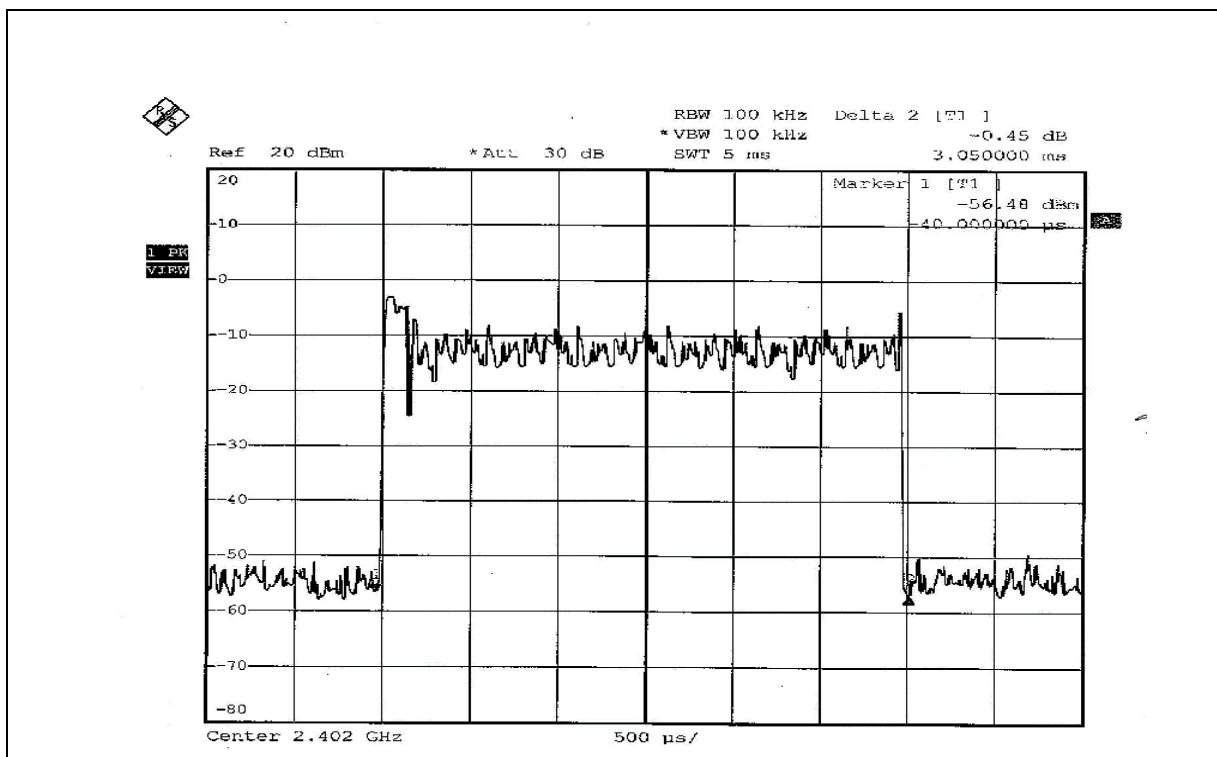
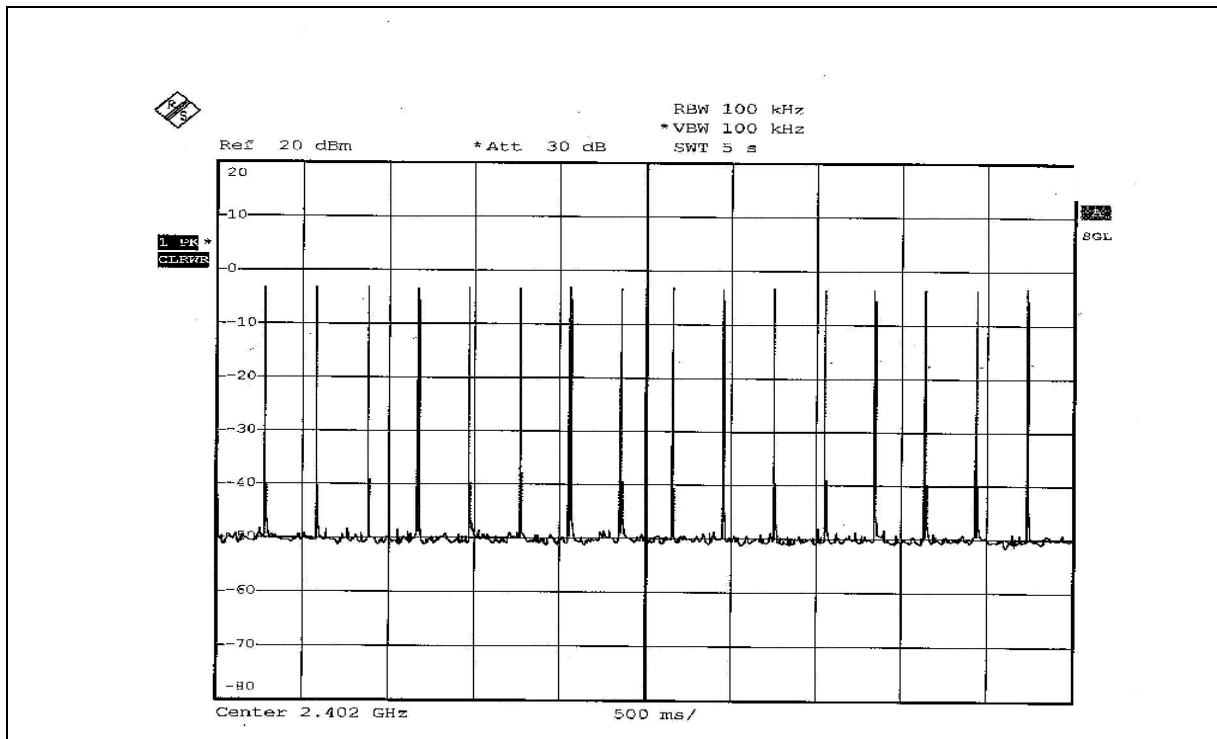




DH3



DH5





## CHANNEL BANDWIDTH

### 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, the 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

### 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.

### 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.

### DEVIATION FROM TEST STANDARD

No deviation.

## TEST SETUP



## EUT OPERATING CONDITION

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



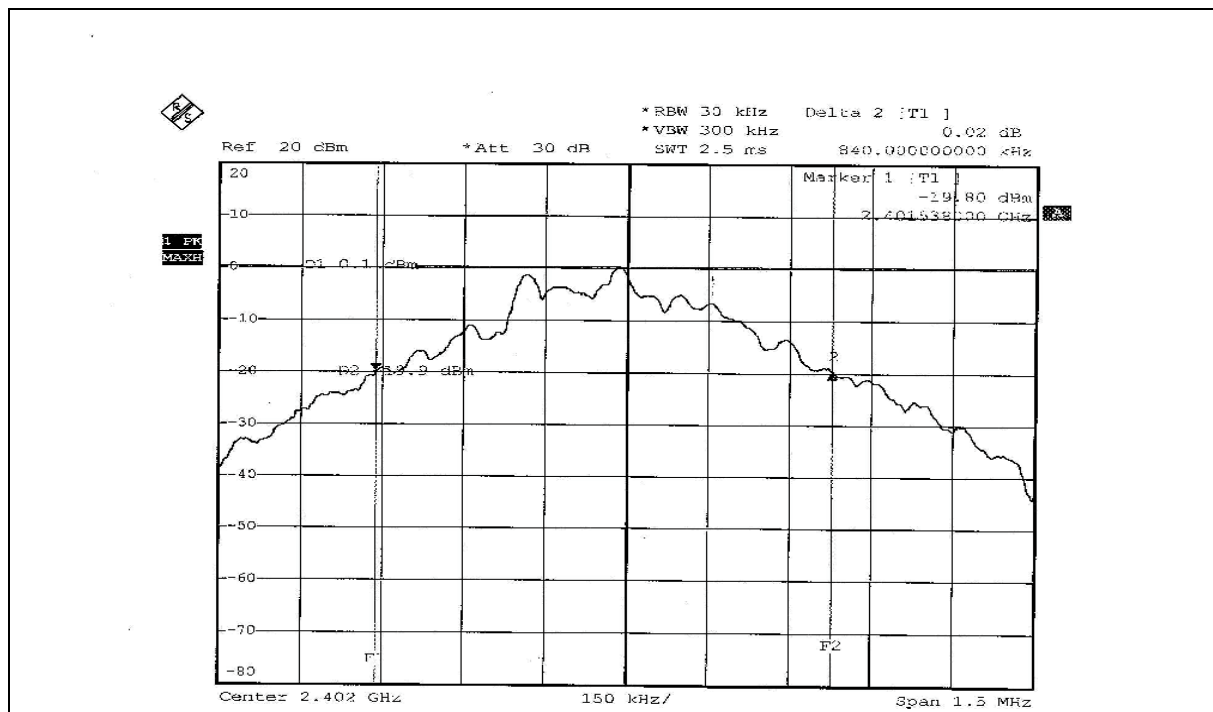
## TEST RESULTS

### TEST MODE A

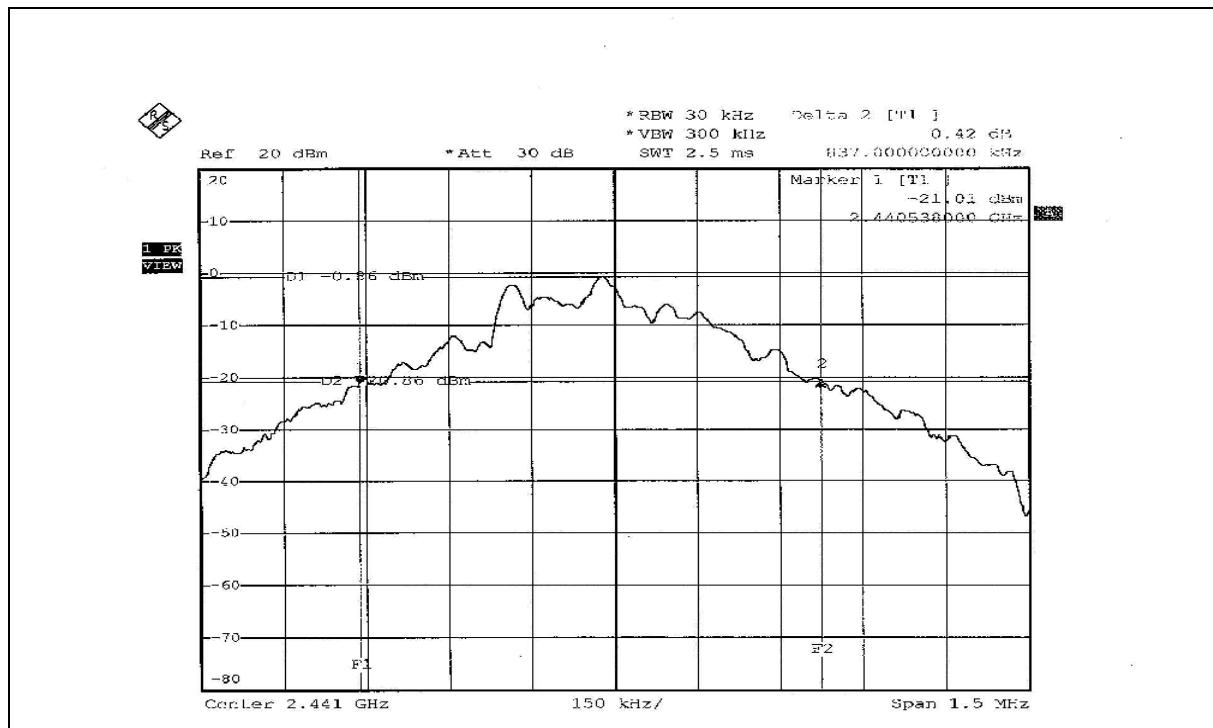
<b>MODULATION TYPE</b>	GFSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>20dB BANDWIDTH (MHz)</b>
0	2402	0.840
39	2441	0.837
78	2480	0.843

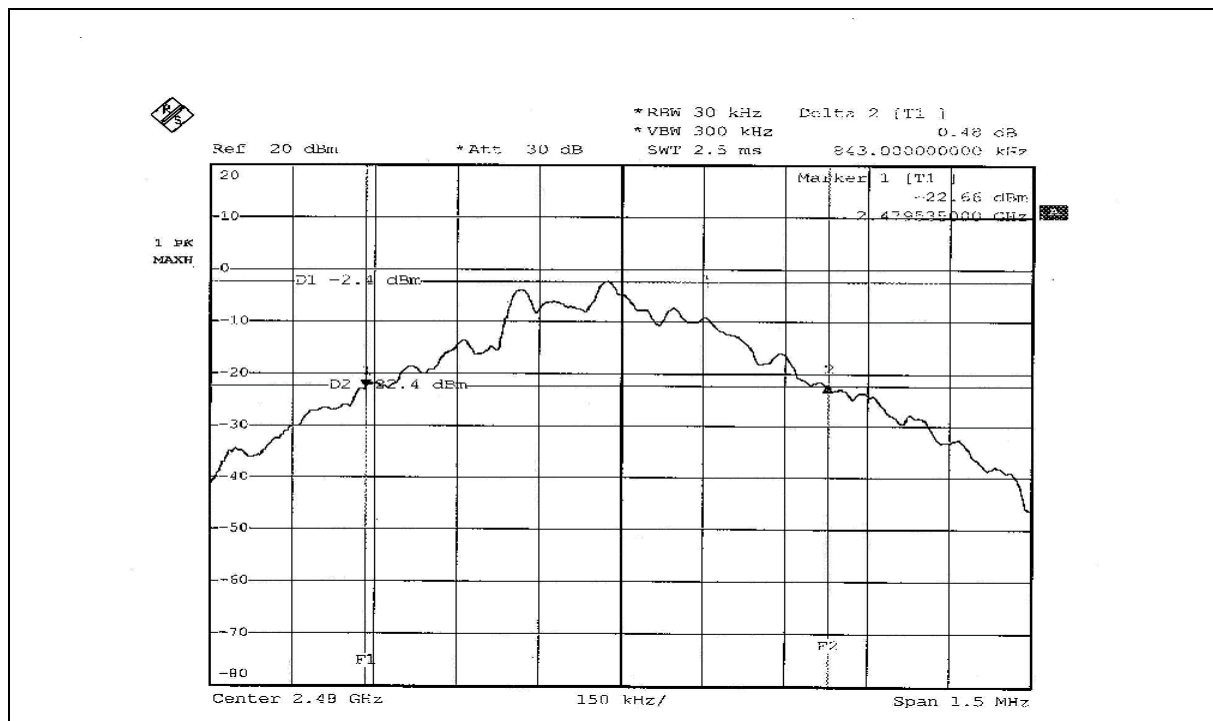
CH 0



CH 39



CH 78





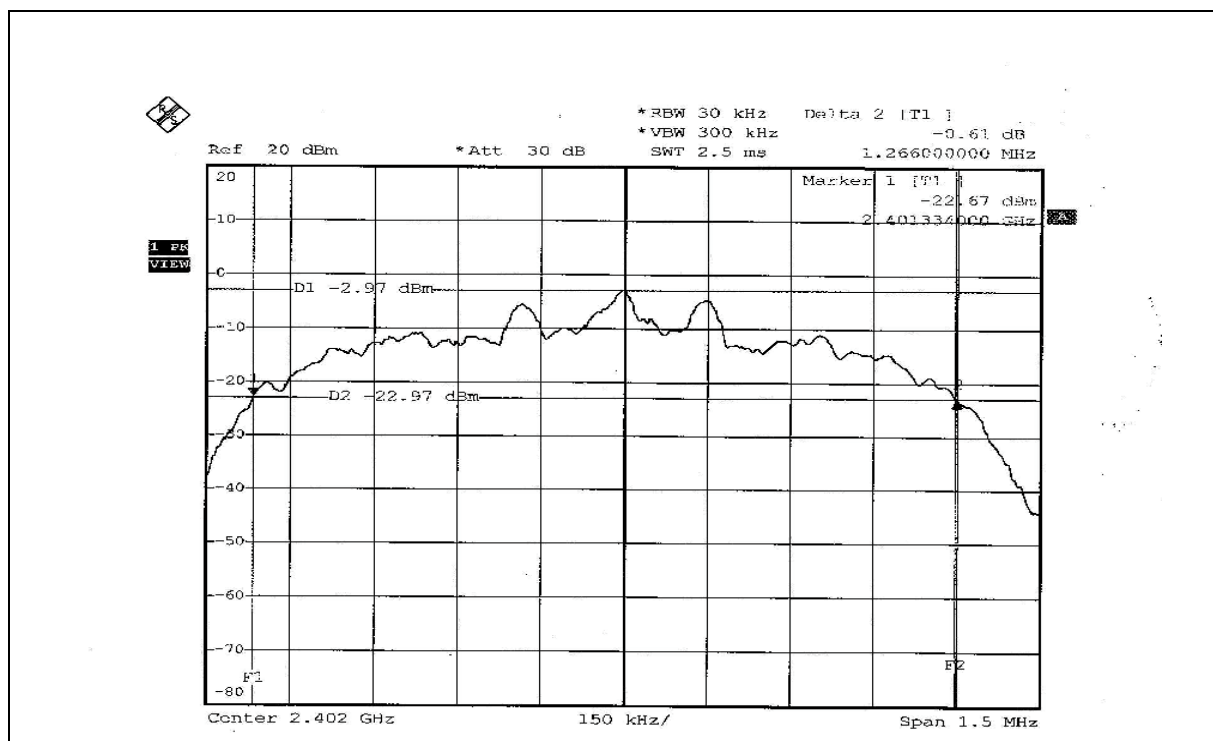
## TEST MODE B

<b>MODULATION TYPE</b>	8DPSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

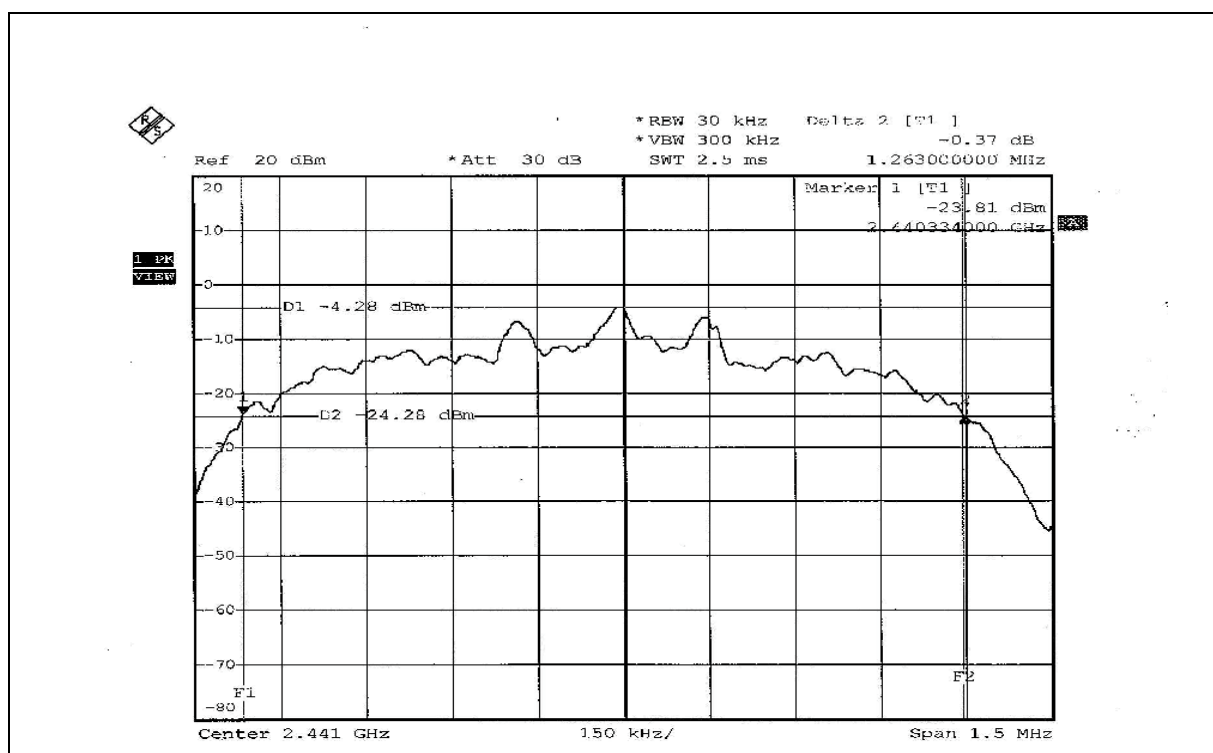
<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>20dB BANDWIDTH (MHz)</b>
0	2402	1.266
39	2441	1.263
78	2480	1.269



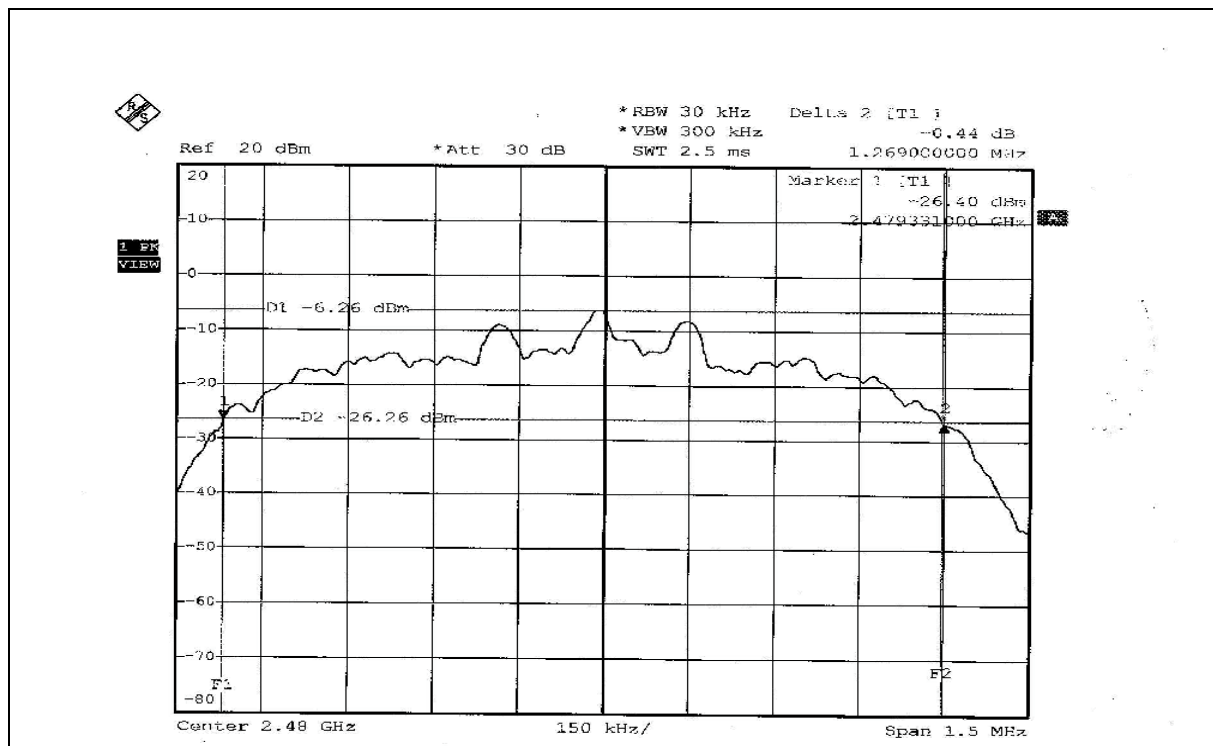
### CH 0



### CH 39



CH 78



## HOPPING CHANNEL SEPARATION

### LIMIT OF HOPPING CHANNEL SEPARATION

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

### 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.

### 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.

### DEVIATION FROM TEST STANDARD

No deviation.

### TEST SETUP



## TEST RESULTS

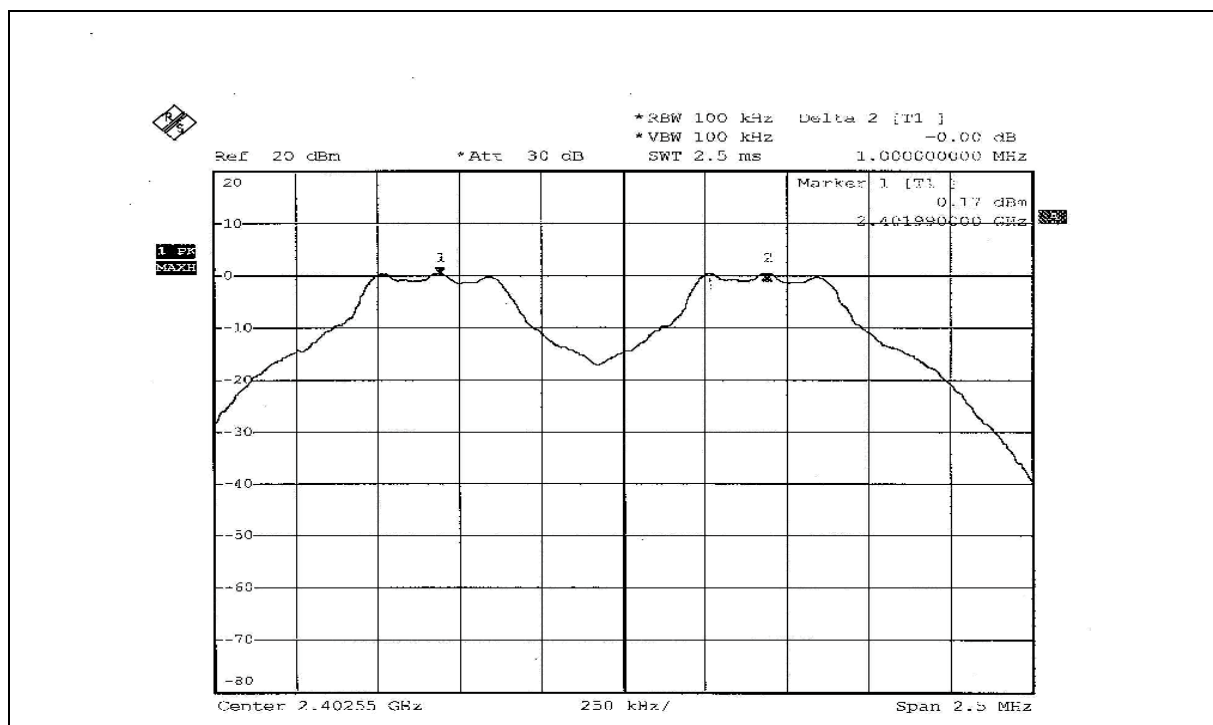
### TEST MODE A

<b>MODULATION TYPE</b>	GFSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

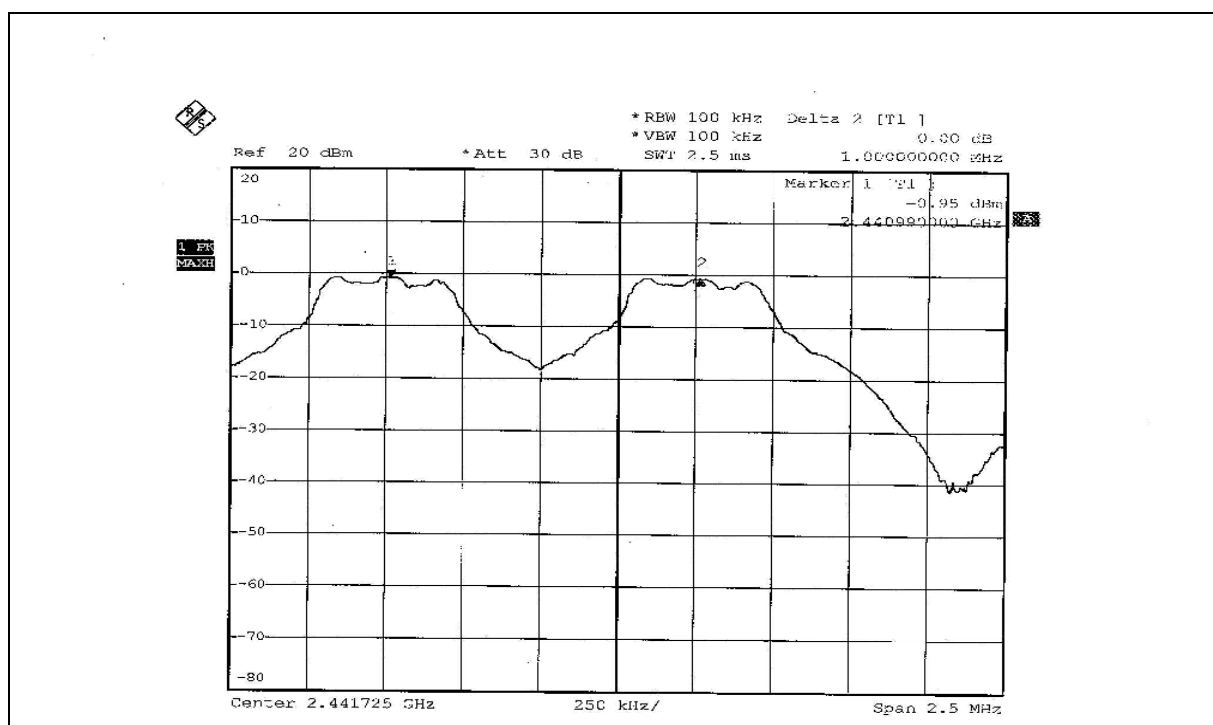
CHANNEL	FREQUENCY (MHZ)	ADJACENT CHANNEL SEPARATION (MHZ)	20DB BANDWIDTH (MHZ)	MINIMUM LIMIT (MHZ)	PASS / FAIL
0	2402	1.001	0.840	0.560	PASS
39	2441	1.002	0.837	0.558	PASS
78	2480	1.002	0.843	0.562	PASS

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

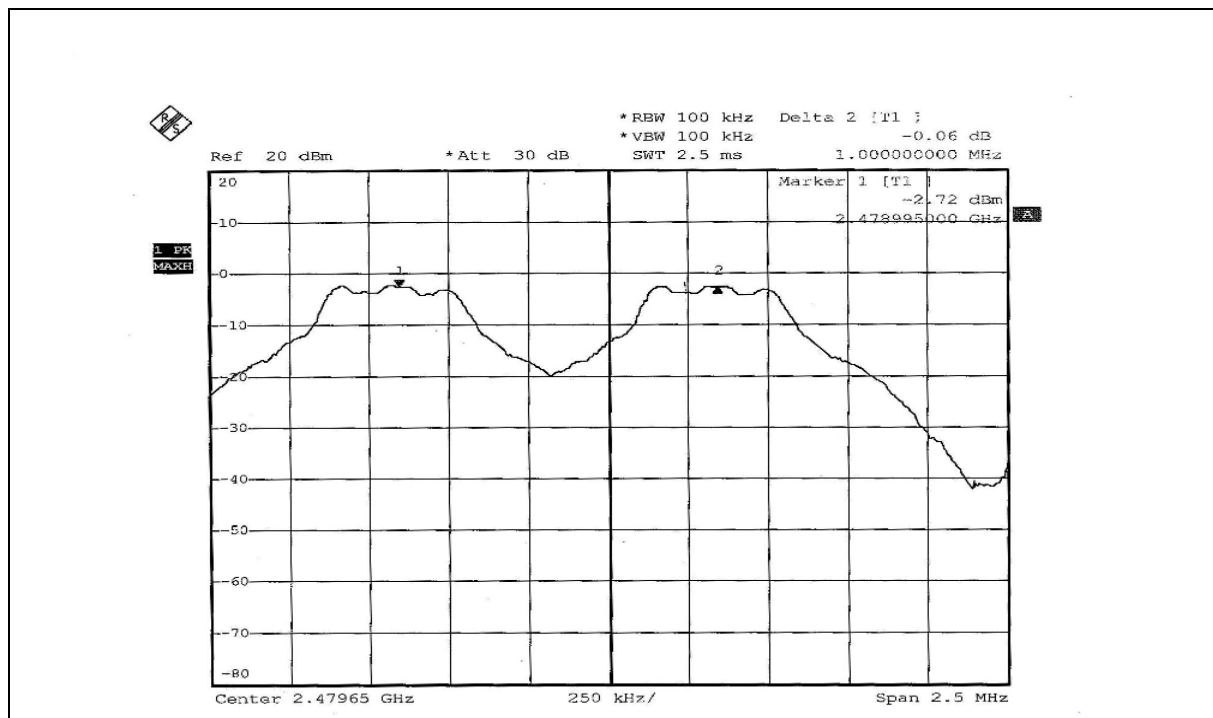
CH 0



CH 39



CH 78





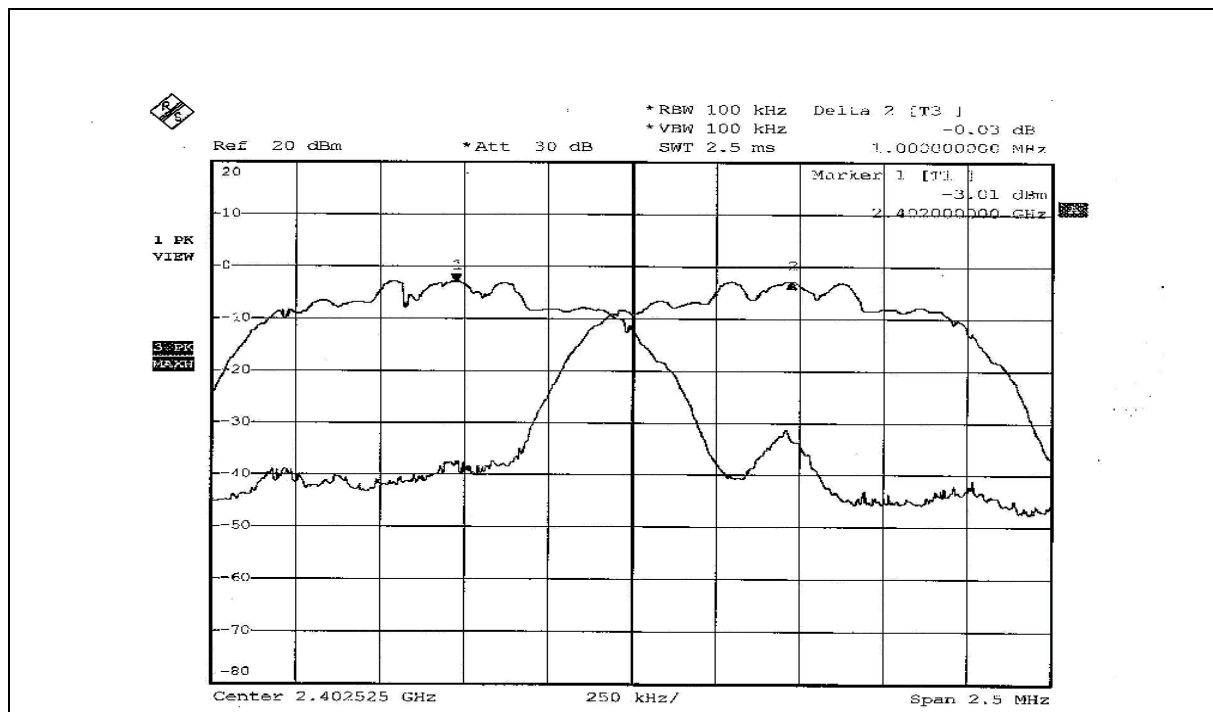
## TEST MODE B

<b>MODULATION TYPE</b>	8DPSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

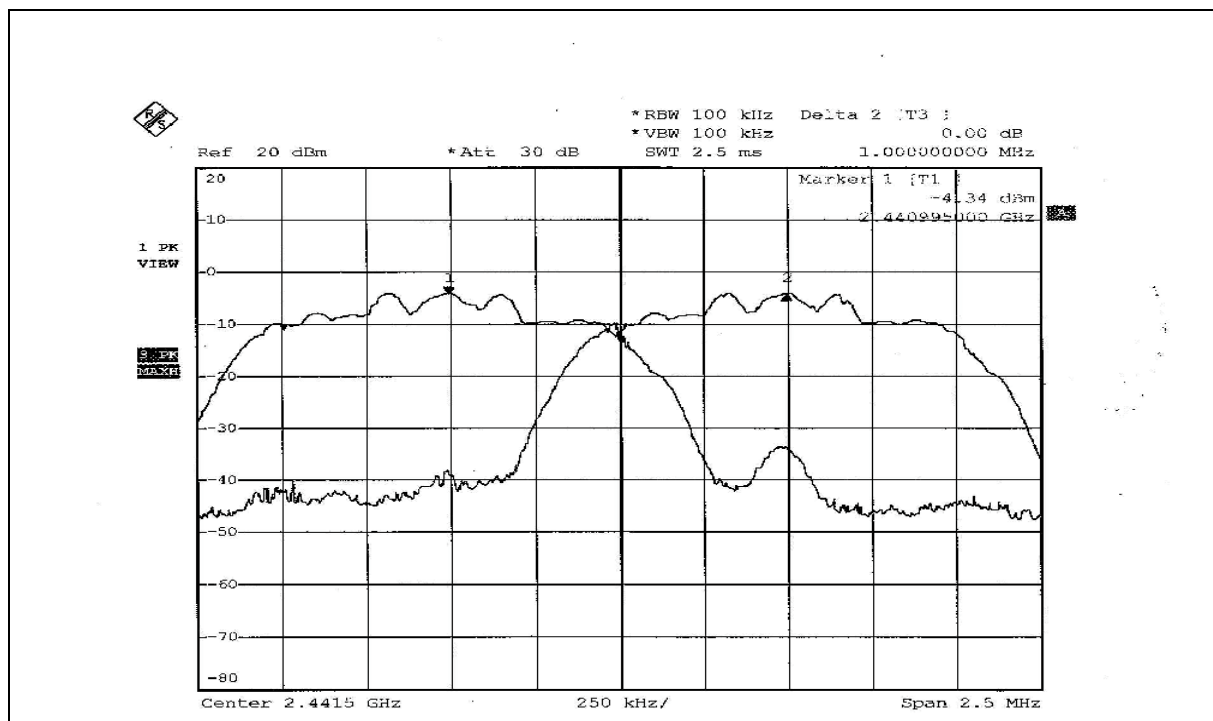
<b>CHANNEL</b>	<b>FREQUENCY (MHz)</b>	<b>ADJACENT CHANNEL SEPARATION (MHz)</b>	<b>20dB BANDWIDTH (MHz)</b>	<b>MINIMUM LIMIT (MHz)</b>	<b>PASS / FAIL</b>
0	2402	1.000	1.266	0.844	PASS
39	2441	1.000	1.263	0.842	PASS
78	2480	1.004	1.269	0.846	PASS

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

CH 0

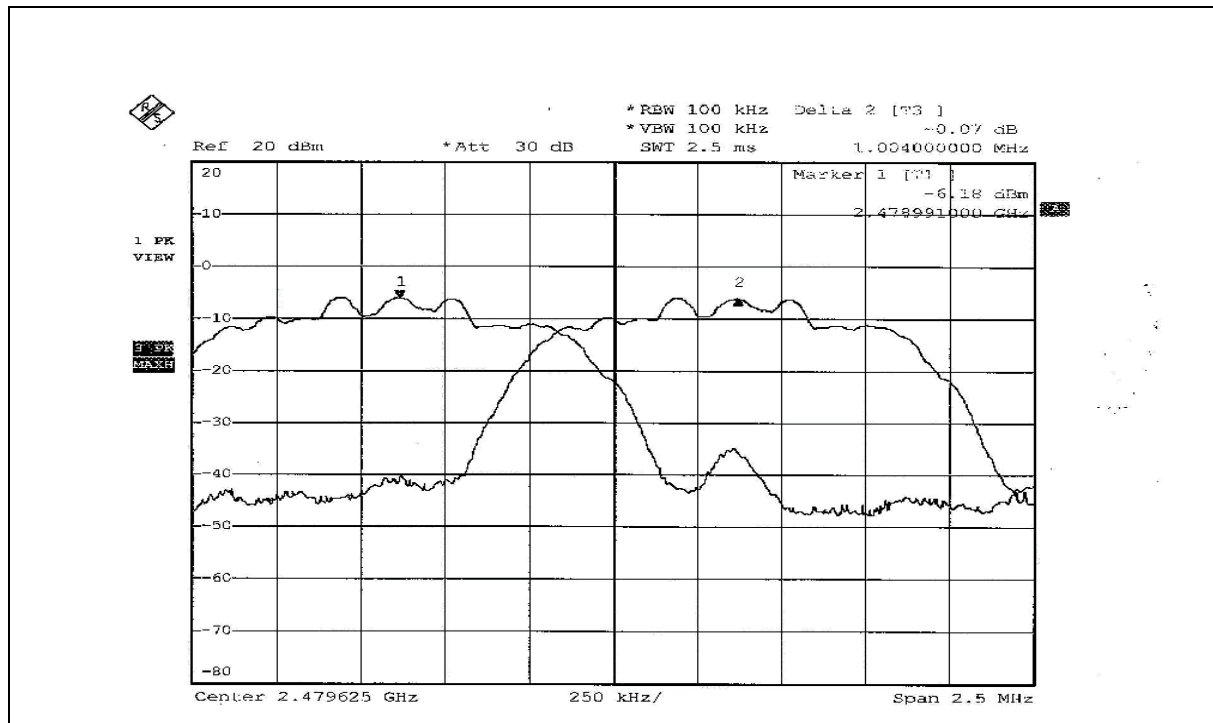


CH 39





CH 78





## MAXIMUM PEAK OUTPUT POWER

### LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 125mW.

### 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.

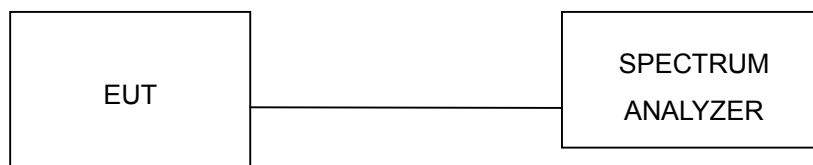
### TEST PROCEDURES

- 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.

### DEVIATION FROM TEST STANDARD

No deviation

## TEST SETUP



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

## EUT OPERATING CONDITION

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



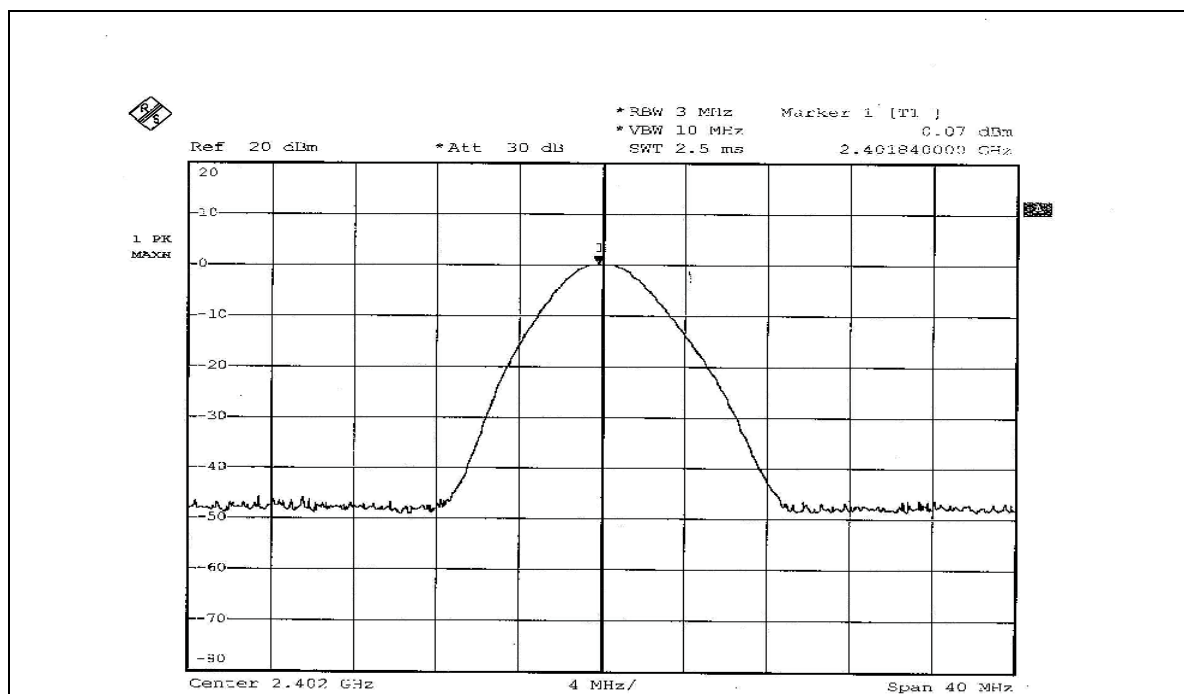
## TEST RESULTS

### TEST MODE A

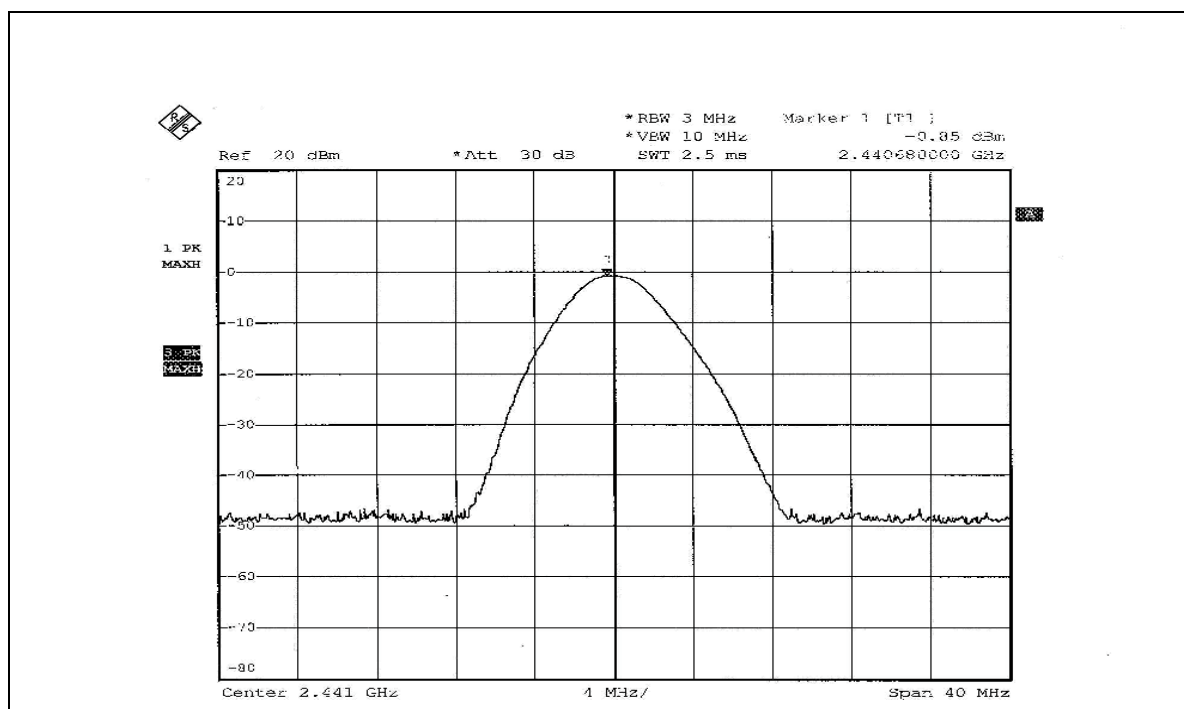
<b>MODULATION TYPE</b>	GFSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	1.016	0.07	125	PASS
39	2441	0.822	-0.85	125	PASS
78	2480	0.596	-2.25	125	PASS

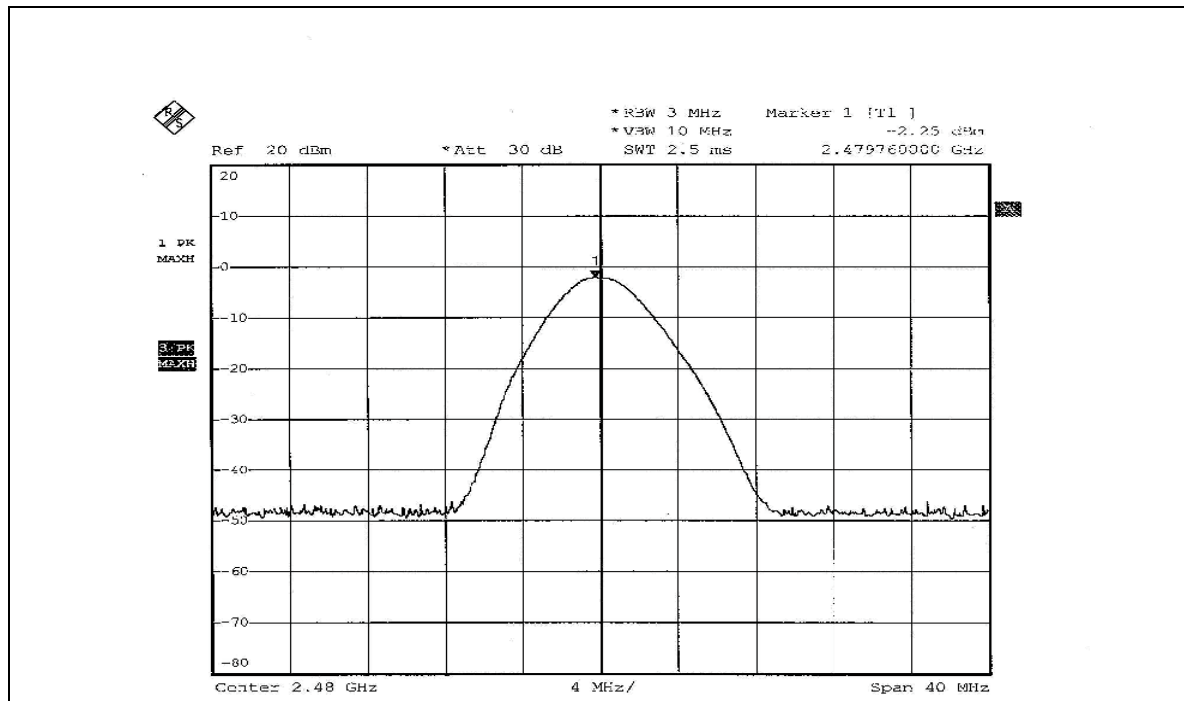
### CH 0



### CH 39



CH 78



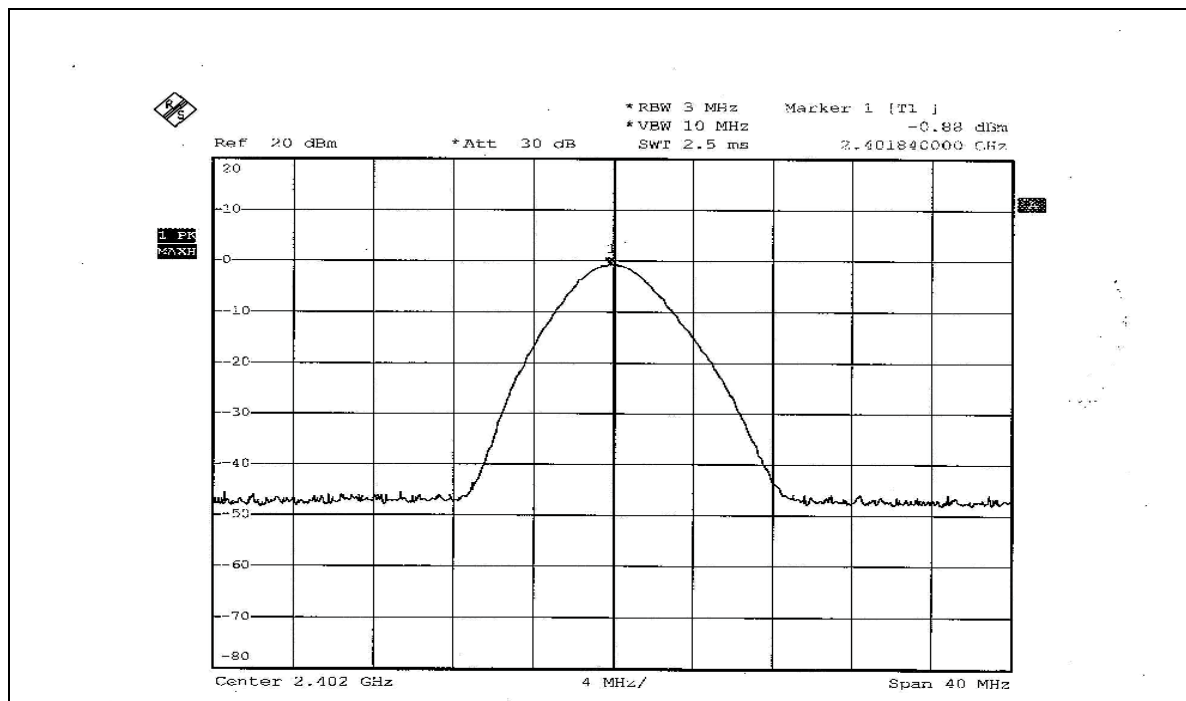


### TEST MODE B

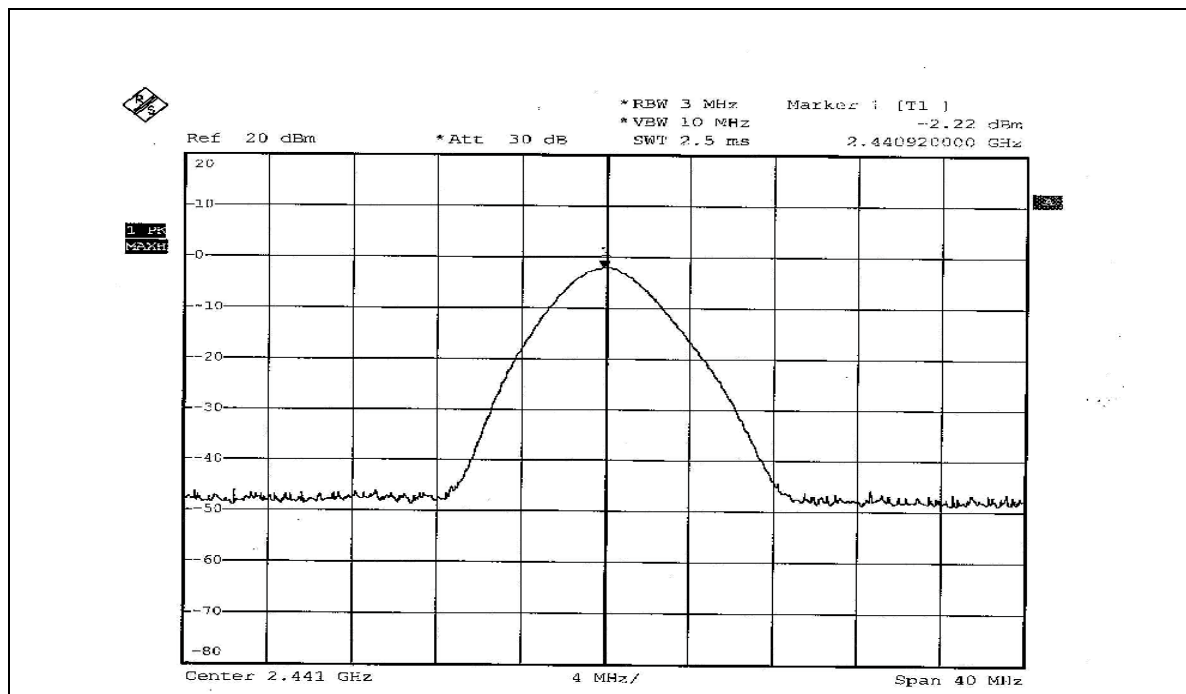
<b>MODULATION TYPE</b>	8DPSK	<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 54%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Morgan Chen

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	0.817	-0.88	125	PASS
39	2441	0.600	-2.22	125	PASS
78	2480	0.380	-4.20	125	PASS

CH 0

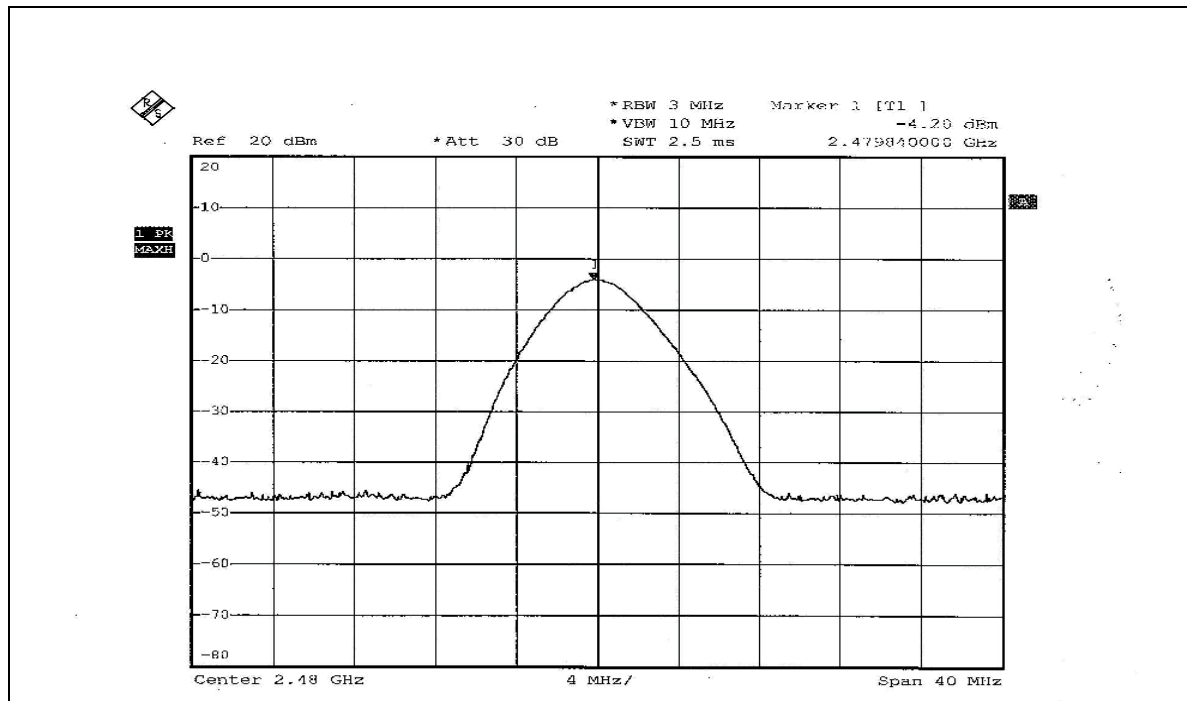


CH 39





CH 78





## BAND EDGES MEASUREMENT

### LIMITS OF BAND EDGES MEASUREMENT

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

### 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.

### 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.

### DEVIATION FROM TEST STANDARD

No deviation.

### EUT OPERATING CONDITION

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

## 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).

## TEST MODE A

### NOTE 1:

The band edge emission plot on the next page shows 49.03dBc between carrier maximum power and local maximum emission in restrict band (2.3880GHz). The emission of carrier strength list in the test result of channel 0 at the item 6.2.7 is 86.44dBuV/m (Peak), so the maximum field strength in restrict band is  $86.44 - 49.03 = 37.41$  dBuV/m, which is under 74 dBuV/m limit.

Average value =  $37.41 - 30 = 7.41$  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

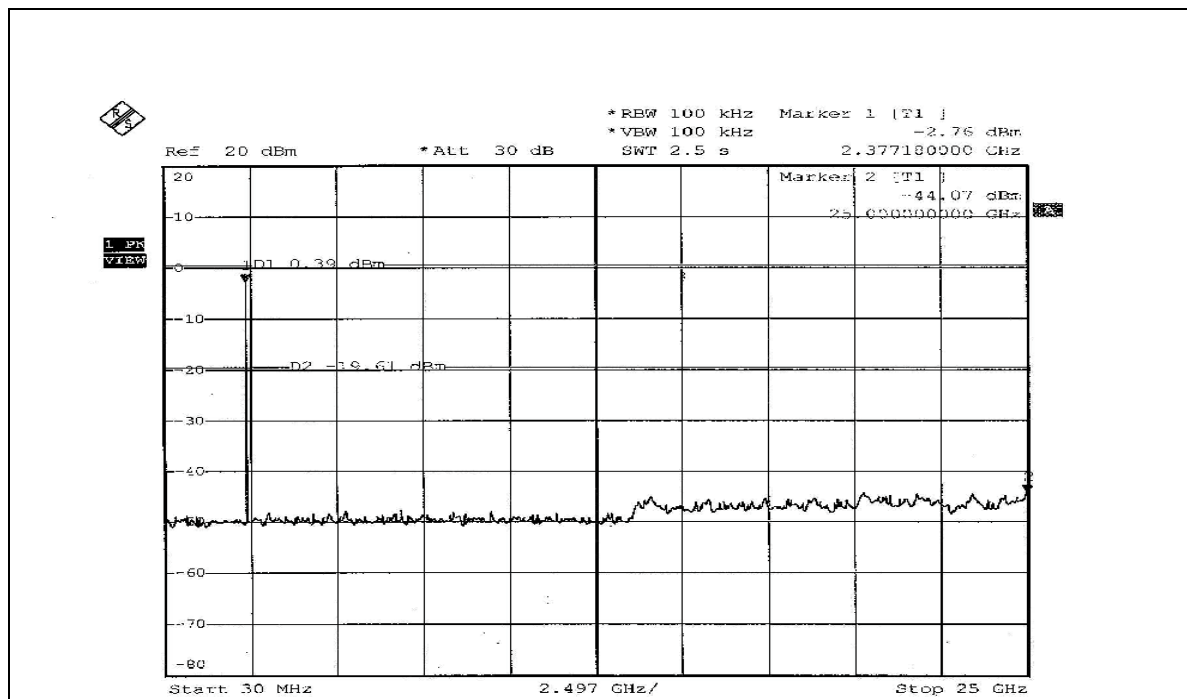
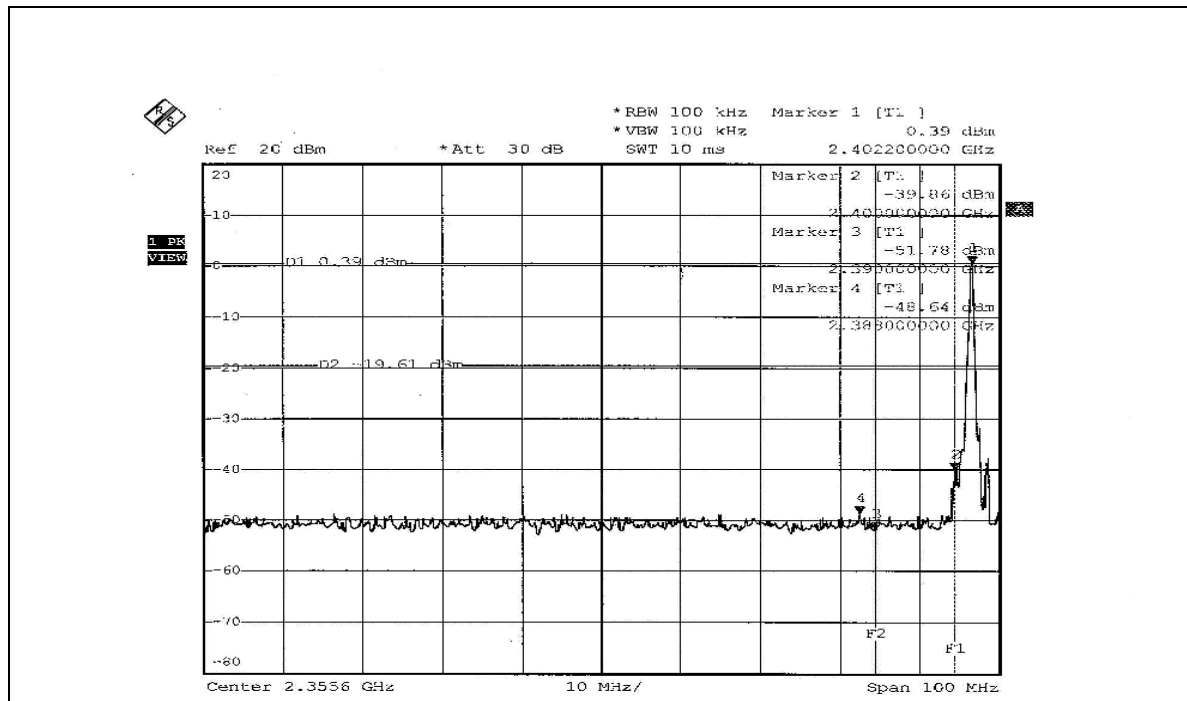
### NOTE 2:

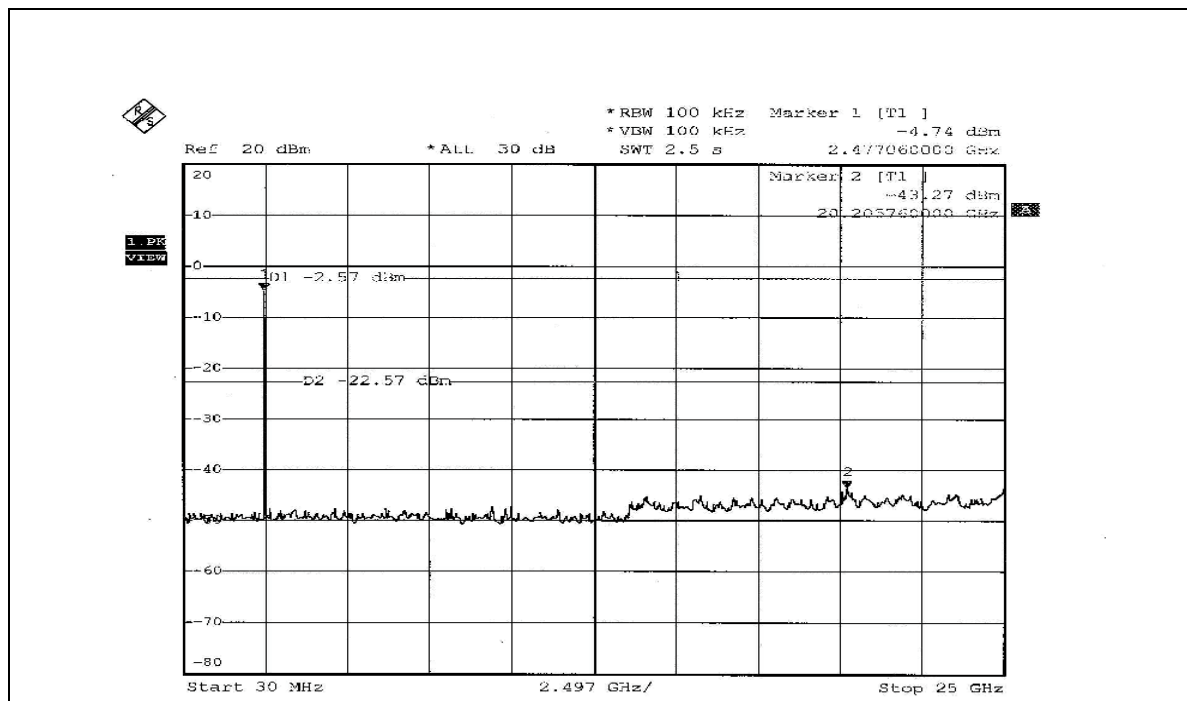
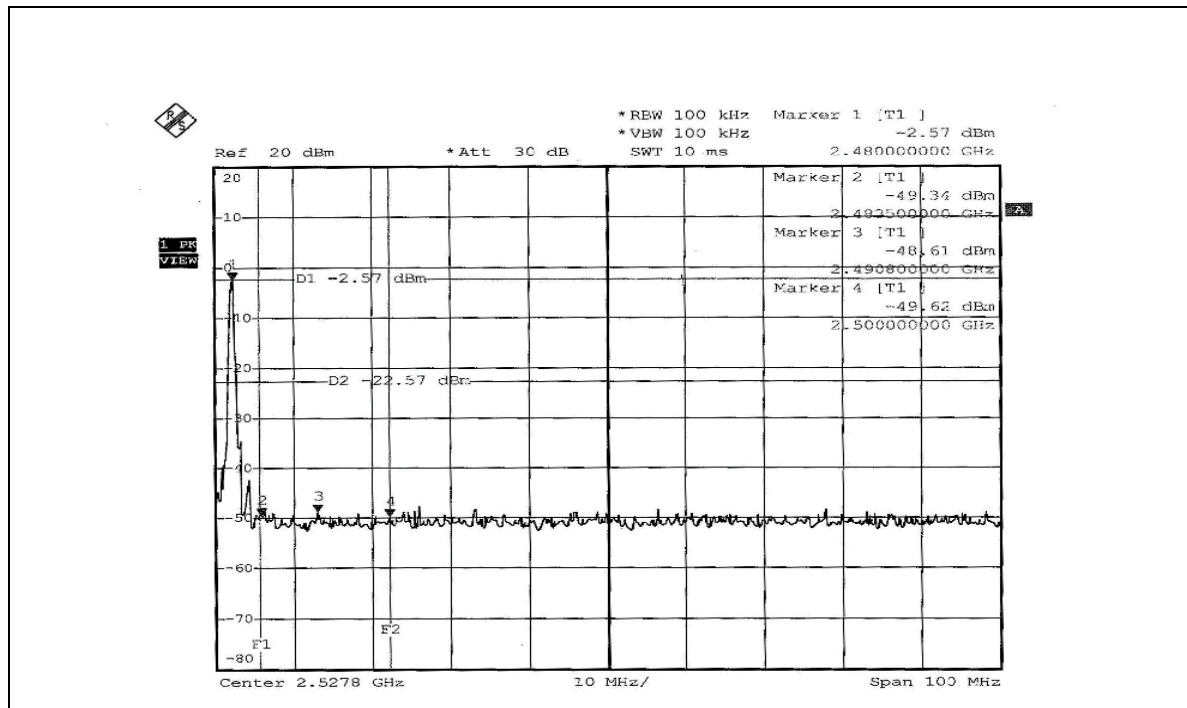
The band edge emission plot on the next second page shows 46.04dBc between carrier maximum power and local maximum emission in restrict band (2.4908GHz). The emission of carrier strength list in the test result of channel 78 at the item 6.2.7 is 84.79dBuV/m (Peak), so the maximum field strength in restrict band is  $84.79 - 46.04 = 38.75$  dBuV/m, which is under 74 dBuV/m limit.

Average value =  $38.75 - 30 = 8.75$  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





## TEST MODE B

### NOTE 1:

The band edge emission plot on the next page shows 44.64dBc between carrier maximum power and local maximum emission in restrict band (2.34212GHz). The emission of carrier strength list in the test result of channel 0 at the item 6.2.7 is 85.35dBuV/m (Peak), so the maximum field strength in restrict band is  $85.35 - 44.64 = 40.71$ dBuV/m, which is under 74 dBuV/m limit.

Average value =  $40.71 - 30 = 10.71$ 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

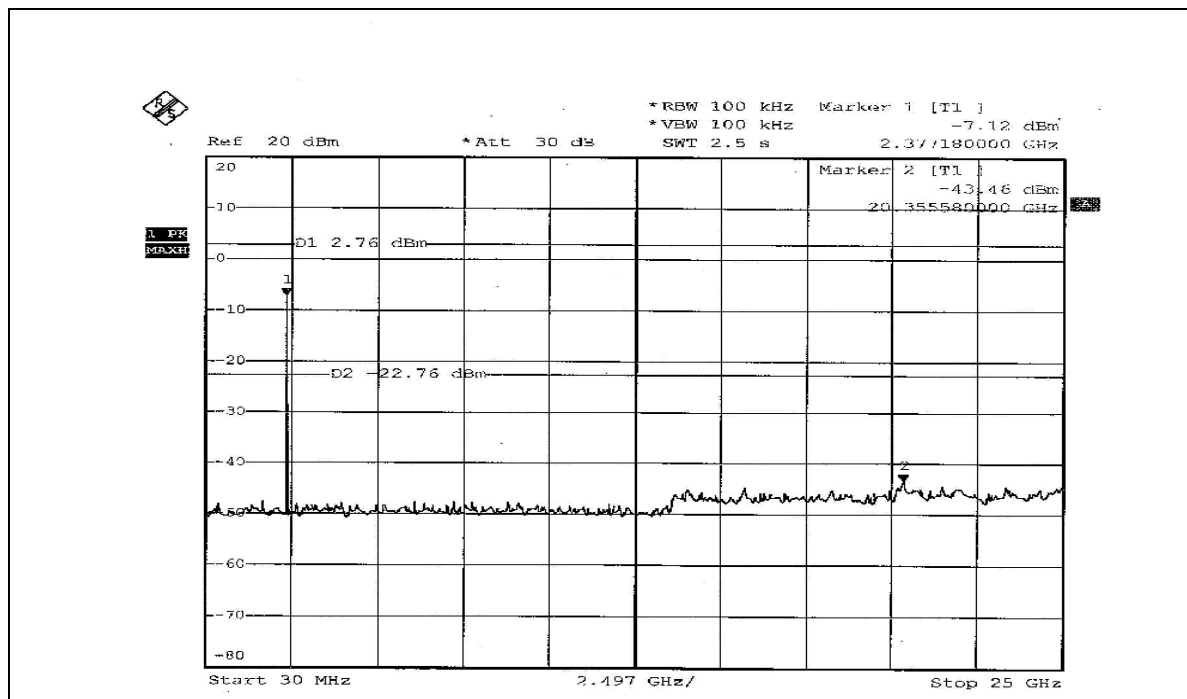
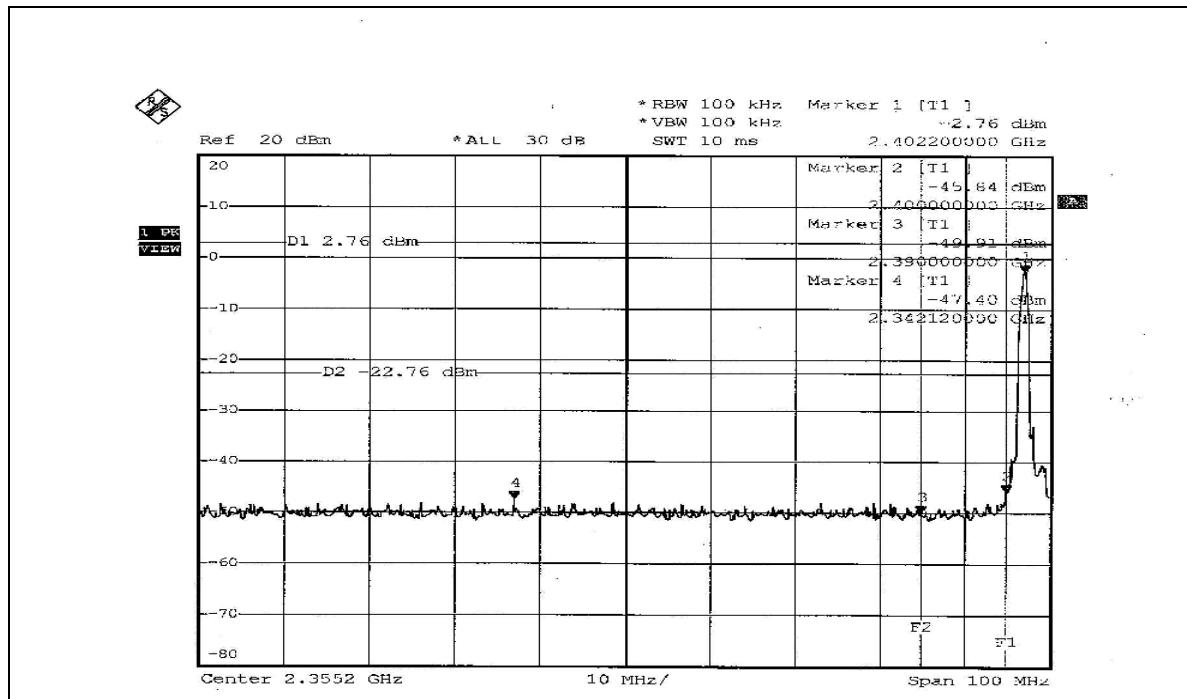
### NOTE 2:

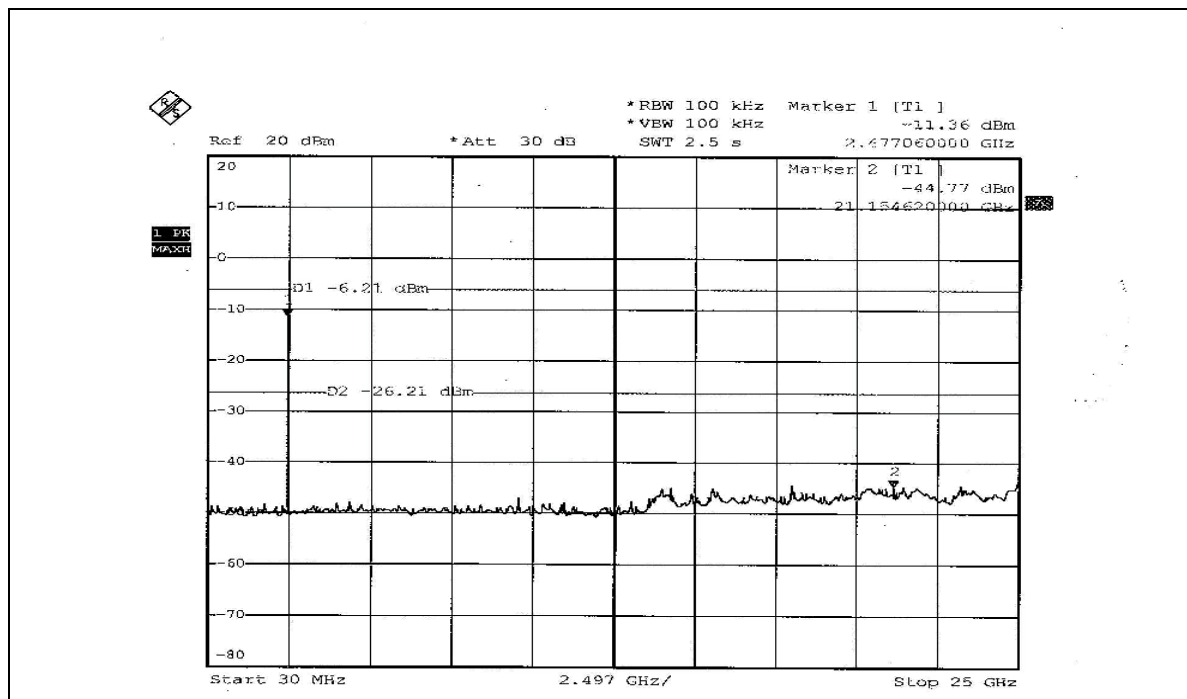
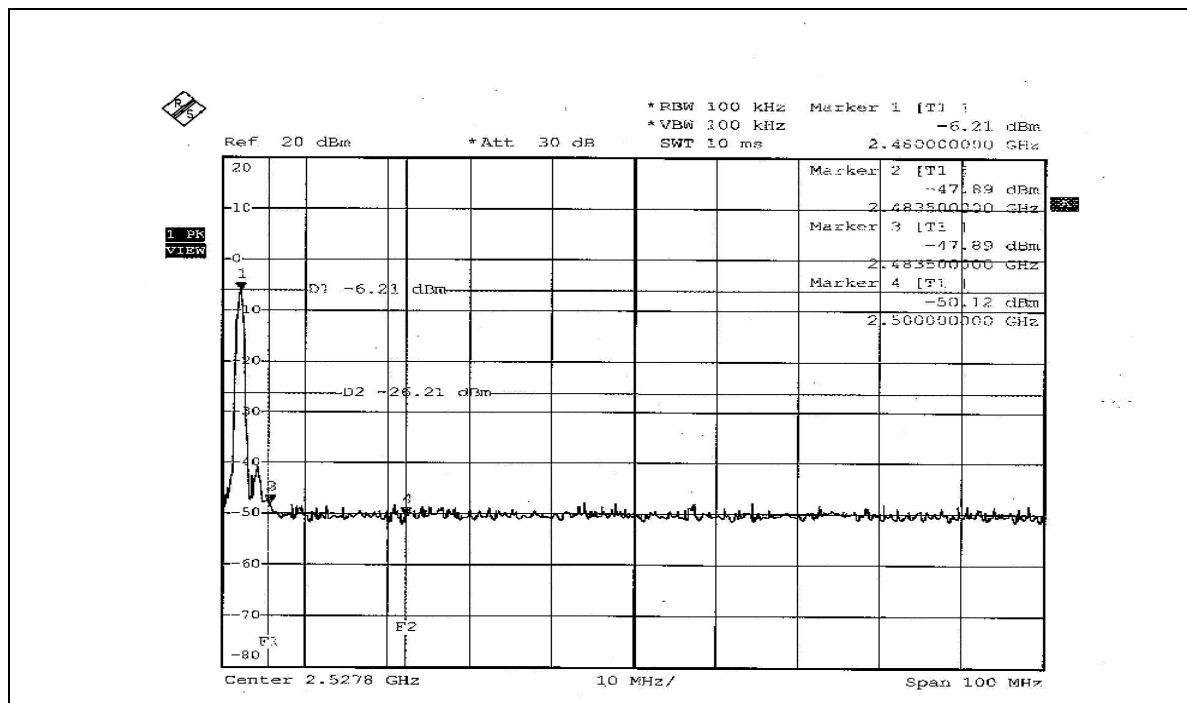
The band edge emission plot on the next second page shows 41.68dBc between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 78 at the item 6.2.7 is 82.11dBuV/m (Peak), so the maximum field strength in restrict band is  $82.11 - 41.68 = 40.43$ dBuV/m, which is under 74 dBuV/m limit.

Average value =  $40.43 - 30 = 10.43$ 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









## **ANTENNA REQUIREMENT**

### **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.

### **ANTENNA CONNECTED CONSTRUCTION**

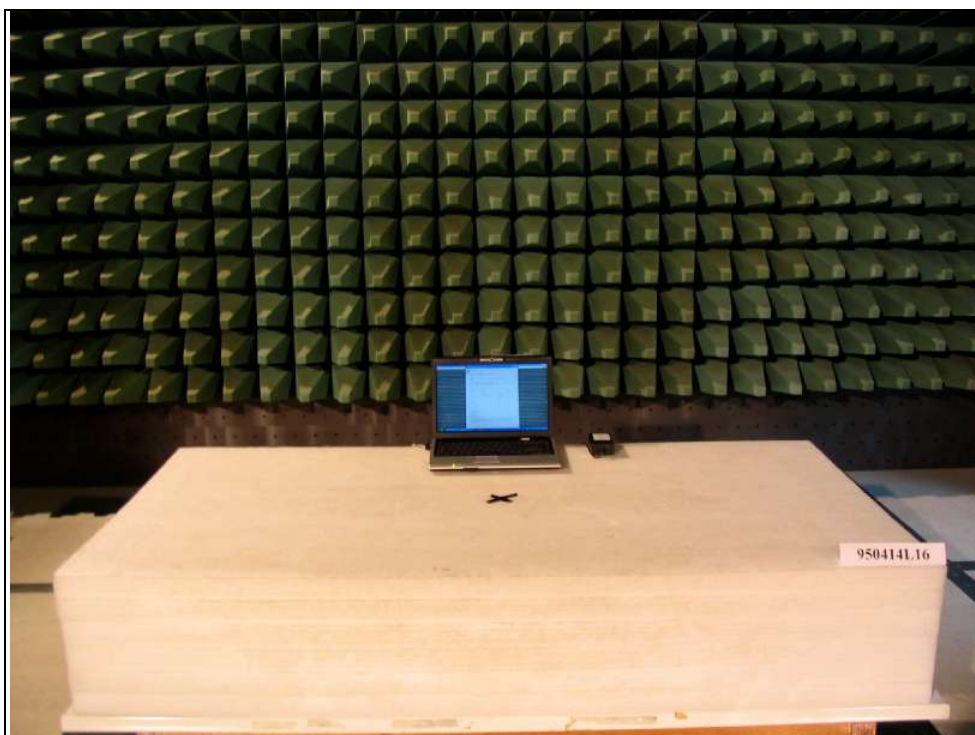
The antenna used in this product is PIFA antenna with UFL antenna connector. The maximum gain of this antenna is  $-1.51038\text{dBi}$ .

## PHOTOGRAPHS OF THE TEST CONFIGURATION

### CONDUCTED EMISSION TEST



## RADIATED EMISSION TEST





## 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.

<b>USA</b>	FCC, UL, A2LA
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	CNLA, BSMI, DGT
<b>Netherlands</b>	Telefication
<b>Singapore</b>	PSB , GOST-ASIA(MOU)
<b>Russia</b>	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](http://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:**

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Fax: 886-2-26052943

**Hsin Chu EMC/RF Lab:**

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Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**

Tel: 886-3-3183232

Fax: 886-3-3185050

**Linko RF Lab.**

Tel: 886-3-3270910

Fax: 886-3-3270892

**Web Site:** [www.adt.com.tw](http://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.