FCC TEST REPORT

REPORT NO.: RF971015A09

MODEL NO.: RF-NANMSEA, MORFDAUL

RECEIVED: Oct. 15, 2008

TESTED: Oct. 16 ~ 24, 2008

ISSUED: Nov. 3, 2008

APPLICANT: PRIMAX ELECTRONICS LTD.

ADDRESS: No. 669, Ruey Kuang Road, Neihu, Taipei, Taiwan, R.O.C.

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.

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1. CERTIFICATION

PRODUCT:	Dongle of Rocketfish Nano Laptop Laser Mouse
MODEL NO.:	MORFDAUL (**BRAND NAME:** PRIMAX) RF-NANMSEA (**BRAND NAME:** Rocketfish)
APPLICANT:	PRIMAX ELECTRONICS LTD.
TESTED:	Oct. 16 ~ 24, 2008
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	FCC Part 15, Subpart C (Section 15.247), ANSI C63.4-2003

The above equipment (Model: RF-NANMSEA) 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 , **DATE:** Nov. 3, 2008
(Annie Chang / Senior Specialist)

TECHNICAL ACCEPTANCE : Jamison Chan , **DATE:** Nov. 3, 2008
Responsible for RF
(Jamison Chan / Supervisor)

APPROVED BY : Ken Liu , **DATE:** Nov. 3, 2008
(Ken Liu / Deputy Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.247)			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
15.207	AC Power Conducted Emission	PASS	Minimum passing margin is –15.79dB at 3.816MHz
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is –8.10dB at 521.804MHz
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit.
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	2.44 dB
Radiated emissions	30MHz ~ 1GHz	3.72 dB
	1GHz ~ 40GHz	2.89 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Dongle of Rocketfish Nano Laptop Laser Mouse
MODEL NO.	RF-NANMSEA, MORFDAUL
FCC ID	EMJDMORFDAUL
POWER SUPPLY	5Vdc from host equipment
MODULATION TYPE	GFSK
OUTPUT POWER	0.267mW
OPERATING FREQUENCY	2402MHz ~ 2474MHz
NUMBER OF CHANNEL	73
ANTENNA TYPE	Chip antenna with -6.04dBi gain
DATA CABLE	N/A
I/O PORTS	USB port
ASSOCIATED DEVICES	N/A

NOTE:

1. The EUT is a dongle, which is a transceiver.

2. The EUT has following models, which are identical to each other except for their brand name only for marketing differentiation as follows:

Brand Name	Model No.	Description
PRIMAX	MORFDAUL	marketing differentiation
Rocketfish	RF-NANMSEA	

For the test, model: **RF-NANMSEA** was selected as the representative model and its data was recorded in this report.

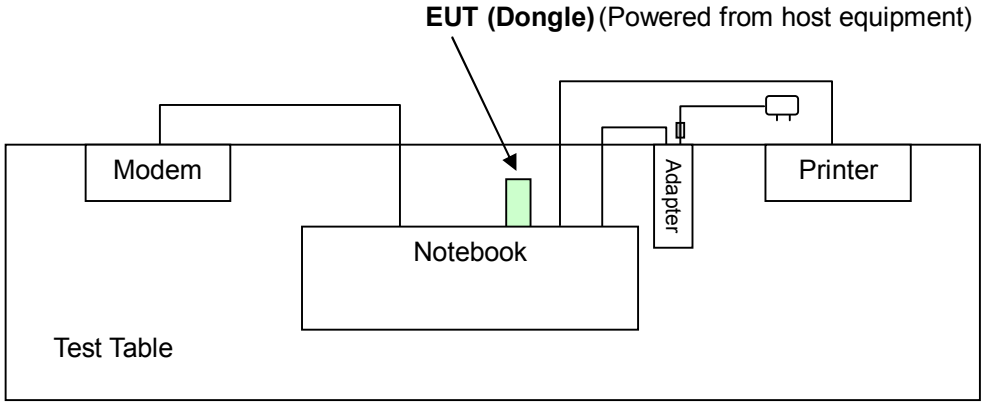
3. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

73 channels are provided to this EUT:

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455		
14	2416	34	2436	54	2456		
15	2417	35	2437	55	2457		
16	2418	36	2438	56	2458		
17	2419	37	2439	57	2459		
18	2420	38	2440	58	2460		
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	
-	√	√	√	√	-

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz
RE≥1G: Radiated Emission above 1GHz APCM: Antenna Port Conducted Measurement

POWER LINE CONDUCTED EMISSION TEST:

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 72	0	GFSK

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 72	0	GFSK

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 72	0, 36, 72	GFSK

BANDEDGE MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 72	0, 72	GFSK

ANTENNA PORT CONDUCTED MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 72	0, 36, 72	GFSK

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.247)

ANSI C63.4-2003

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

NOTE: The product has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP05L	20375526736	FCC DoC Approved
2	PRINTER	EPSON	LQ-300+	DCGY017054	FCC DoC Approved
3	MODEM	ACEEX	1414	980020520	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
3	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.

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

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 0.5-5 5-30	66 to 56 56 60	56 to 46 46 50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. 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 DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	838251/021	Dec. 20, 2007	Dec. 19, 2008
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	100218	Nov. 21, 2007	Nov. 20, 2008
LISN With Adapter (for EUT)	AD10	C10Ada-001	Nov. 22, 2007	Nov. 21, 2008
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100219	Nov. 09, 2007	Nov. 08, 2008
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100220	Oct. 26, 2007	Oct. 25, 2008
Software	ADT_Cond_V7.3.5	NA	NA	NA
Software	ADT_ISN_V7.3.5	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C10.01	Feb. 27, 2008	Feb. 26, 2009
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010773	Feb. 14, 2008	Feb. 13, 2009

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 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.

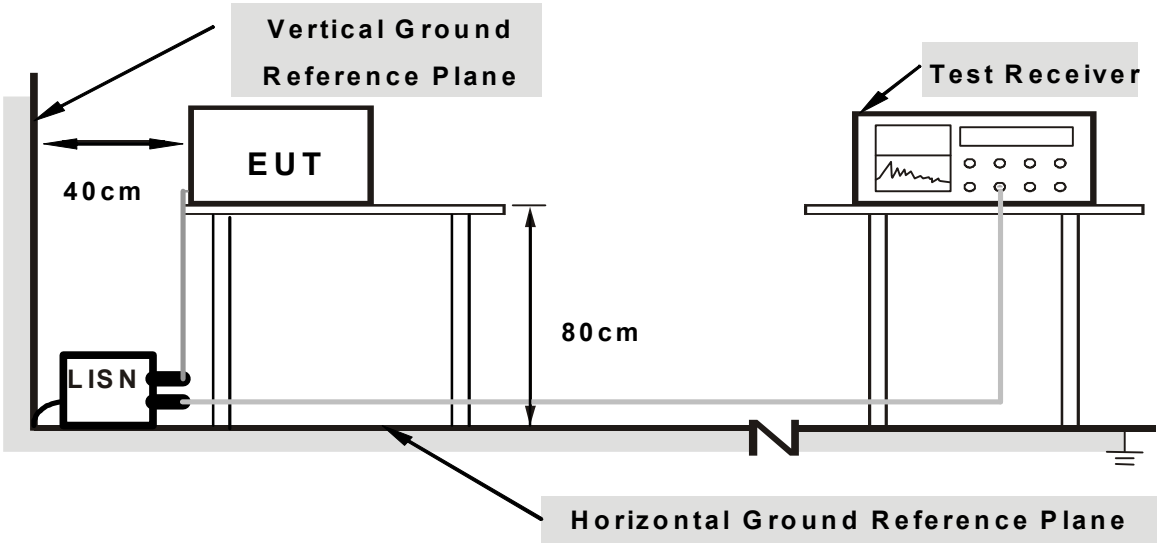
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

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 from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

a. Connected the EUT to a notebook placed on a testing table.
b. The notebook ran a test program (provided by manufacturer) to enable EUT under transmission/receiving condition continuously at specific channel frequency.
c. The notebook sent "H" messages to its screen.
d. The notebook sent messages to printer and the printer printed them out
e. The notebook sent messages to modem.
f. Repeated c ~ f.

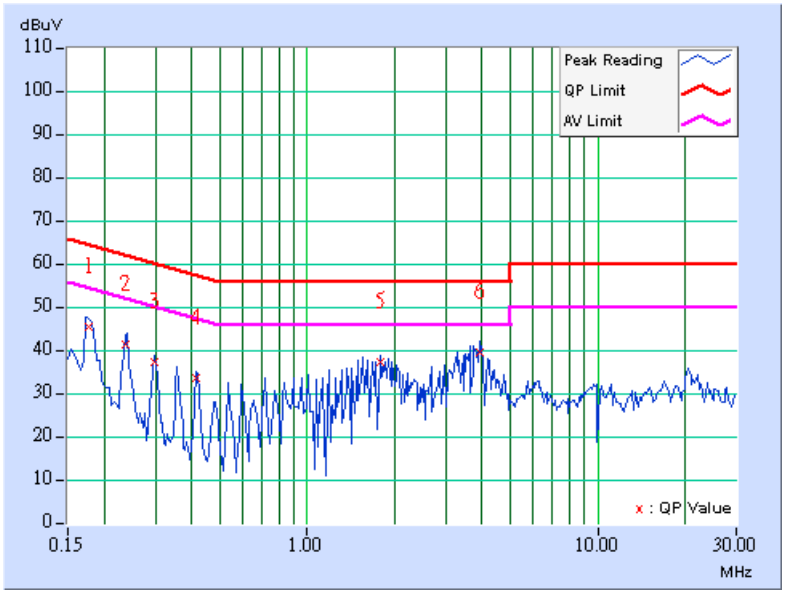
4.1.7 TEST RESULTS

CONDUCTED WORST CASE DATA

MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 80% RH, 1006hPa	**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	0.177	0.20	45.28	-	45.48	-	64.61	54.61	-19.13	-
2	0.238	0.22	41.20	-	41.42	-	62.16	52.16	-20.74	-
3	0.298	0.22	37.00	-	37.22	-	60.29	50.29	-23.06	-
4	0.416	0.23	33.41	-	33.64	-	57.54	47.54	-23.89	-
5	1.789	0.27	37.06	-	37.33	-	56.00	46.00	-18.67	-
6	3.938	0.36	39.11	-	39.47	-	56.00	46.00	-16.53	-

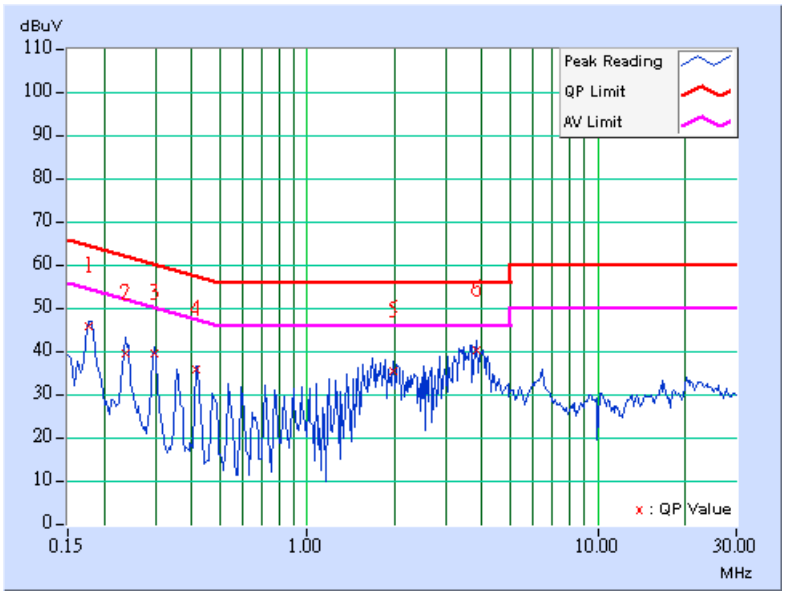
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 80% RH, 1006hPa	**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	0.177	0.20	45.48	-	45.68	-	64.61	54.61	-18.93	-
2	0.237	0.22	39.17	-	39.39	-	62.19	52.19	-22.80	-
3	0.298	0.22	39.35	-	39.57	-	60.29	50.29	-20.72	-
4	0.417	0.22	35.44	-	35.66	-	57.51	47.51	-21.85	-
5	1.969	0.27	35.39	-	35.66	-	56.00	46.00	-20.34	-
6	**3.816**	**0.33**	**39.88**	**-**	**40.21**	**-**	**56.00**	**46.00**	**-15.79**	**-**

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 DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	May 09, 2008	May 08, 2009
HP Preamplifier	8449B	3008A01924	Sep. 03, 2008	Sep. 02, 2009
HP Preamplifier	8449B	3008A01292	Aug. 06, 2008	Aug. 05, 2009
ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Dec. 06, 2007	Dec. 05, 2008
Schwarzbeck Antenna	VULB 9168	137	May 02, 2008	May 01, 2009
Schwarzbeck Antenna	VHBA 9123	480	Apr. 23, 2008	Apr. 22, 2009
EMCO Horn Antenna	3115	9312-4192	Apr. 21, 2008	Apr. 20, 2009
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V 7.6.15	NA	NA	NA
SUHNER RF cable	SF104-26.5	CABLE-CH6-17m -01	Nov. 05, 2007	Nov. 04, 2008
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100035	Mar. 26, 2008	Mar. 25, 2009

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 Chamber No. 6.
4. The Industry Canada Reference No. IC 3789-6.
5. The FCC Site Registration No. is 447212.

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. 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's 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

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 method or average method as specified and then reported in data sheet.

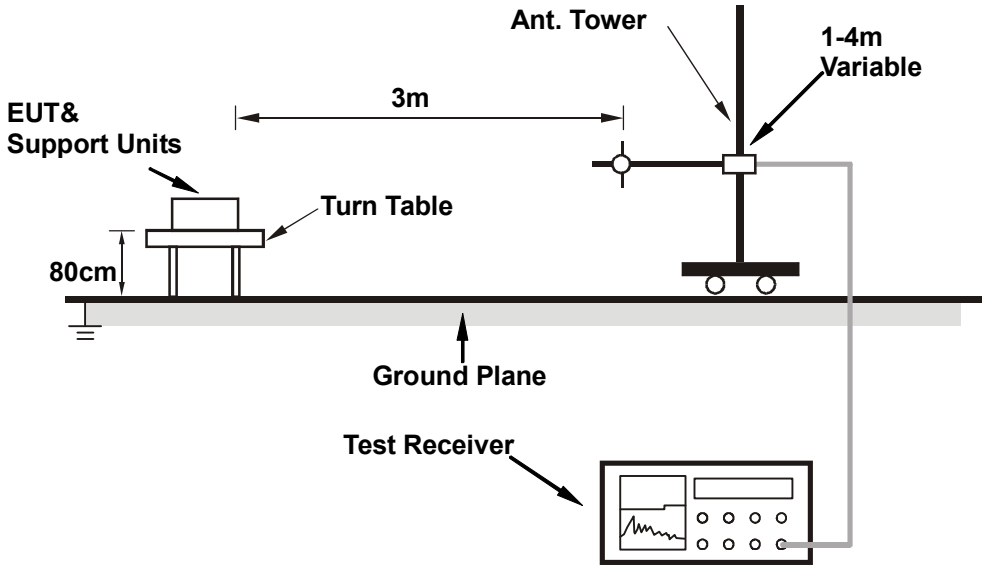
NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) 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 item 4.1.6.

4.2.7 TEST RESULTS

RADIATED WORST CASE DATA: BELOW 1GHz

MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 74% RH, 1002hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Chad Lee		

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	125.251	31.48 QP	43.50	-12.02	1.05 H	82	17.96	13.52
2	199.118	30.03 QP	43.50	-13.47	1.00 H	127	18.35	11.69
3	306.032	37.49 QP	46.00	-8.51	1.09 H	265	21.34	16.15
4	**521.804**	**37.90 QP**	**46.00**	**-8.10**	**1.84 H**	**112**	**16.16**	**21.74**
5	605.391	36.19 QP	46.00	-9.81	1.00 H	253	12.58	23.62
6	735.631	33.72 QP	46.00	-12.28	1.14 H	241	8.32	25.40

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	169.960	30.05 QP	43.50	-13.45	1.14 V	322	16.51	13.54
2	249.659	34.13 QP	46.00	-11.87	1.47 V	136	18.94	15.19
3	292.425	31.70 QP	46.00	-14.30	1.08 V	163	15.83	15.87
4	521.804	37.28 QP	46.00	-8.72	1.00 V	202	15.55	21.74
5	601.503	37.45 QP	46.00	-8.55	1.00 V	178	13.87	23.58
6	630.661	34.51 QP	46.00	-11.49	1.13 V	109	10.68	23.83

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)
3The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

RADIATED DATA: ABOVE 1GHz

MODULATION TYPE	GFSK	**CHANNEL**	0
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 73% RH, 1006hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY	Chad Lee		

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	2390.000	60.78 PK	74.00	-13.22	1.00 H	32	27.48	33.30
2	2390.000	44.65 AV	54.00	-9.35	1.00 H	32	11.35	33.30
3	*2402.000	93.03 PK			1.00 H	32	59.68	33.35
4	*2402.000	68.78 AV			1.00 H	32	35.43	33.35
5	4804.000	55.18 PK	74.00	-18.82	1.00 H	222	14.79	40.39
6	4804.000	45.03 AV	54.00	-8.97	1.00 H	222	4.64	40.39

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	2390.000	61.28 PK	74.00	-12.72	1.00 V	270	27.98	33.30
2	2390.000	44.35 AV	54.00	-9.65	1.00 V	270	11.05	33.30
3	*2402.000	88.64 PK			1.00 V	270	55.29	33.35
4	*2402.000	66.34 AV			1.00 V	270	32.99	33.35
5	4804.000	56.14 PK	74.00	-17.86	1.00 V	340	15.75	40.39
6	4804.000	43.76 AV	54.00	-10.24	1.00 V	340	3.37	40.39

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

MODULATION TYPE	GFSK	**CHANNEL**	36
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 73% RH, 1006hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY	Chad Lee		

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	*2438.000	91.79 PK			1.00 H	25	58.28	33.51
2	*2438.000	67.54 AV			1.00 H	25	34.03	33.51
3	4876.000	55.84 PK	74.00	-18.16	1.00 H	216	15.28	40.56
4	4876.000	44.07 AV	54.00	-9.93	1.00 H	216	3.51	40.56

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	*2438.000	85.99 PK			1.00 V	291	52.48	33.51
2	*2438.000	66.42 AV			1.00 V	291	32.91	33.51
3	4876.000	56.03 PK	74.00	-17.97	1.09 V	79	15.47	40.56
4	4876.000	43.42 AV	54.00	-10.58	1.09 V	79	2.86	40.56

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. " * " : Fundamental frequency

MODULATION TYPE	GFSK	**CHANNEL**	72
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**FREQUENCY RANGE**	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 73% RH, 1006hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY	Chad Lee		

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	*2474.000	92.24 PK			1.15 H	32	58.57	33.67
2	*2474.000	68.63 AV			1.15 H	32	34.96	33.67
3	2483.500	58.11 PK	74.00	-15.89	1.15 H	32	24.39	33.72
4	2483.500	45.02 AV	54.00	-8.98	1.15 H	32	11.30	33.72
5	4948.000	55.11 PK	74.00	-18.89	1.22 H	145	14.38	40.73
6	4948.000	43.92 AV	54.00	-10.08	1.22 H	145	3.19	40.73

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	*2474.000	86.59 PK			1.00 V	158	52.92	33.67
2	*2474.000	65.16 AV			1.00 V	158	31.49	33.67
3	2483.500	57.35 PK	74.00	-16.65	1.00 V	158	23.63	33.72
4	2483.500	44.91 AV	54.00	-9.09	1.00 V	158	11.19	33.72
5	4948.000	56.11 PK	74.00	-17.89	1.02 V	15	15.38	40.73
6	4948.000	43.12 AV	54.00	-10.88	1.02 V	15	2.39	40.73

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

4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP 40	100035	Mar. 26, 2008	Mar. 25, 2009

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 PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP

4.3.6 EUT OPERATING CONDITIONS

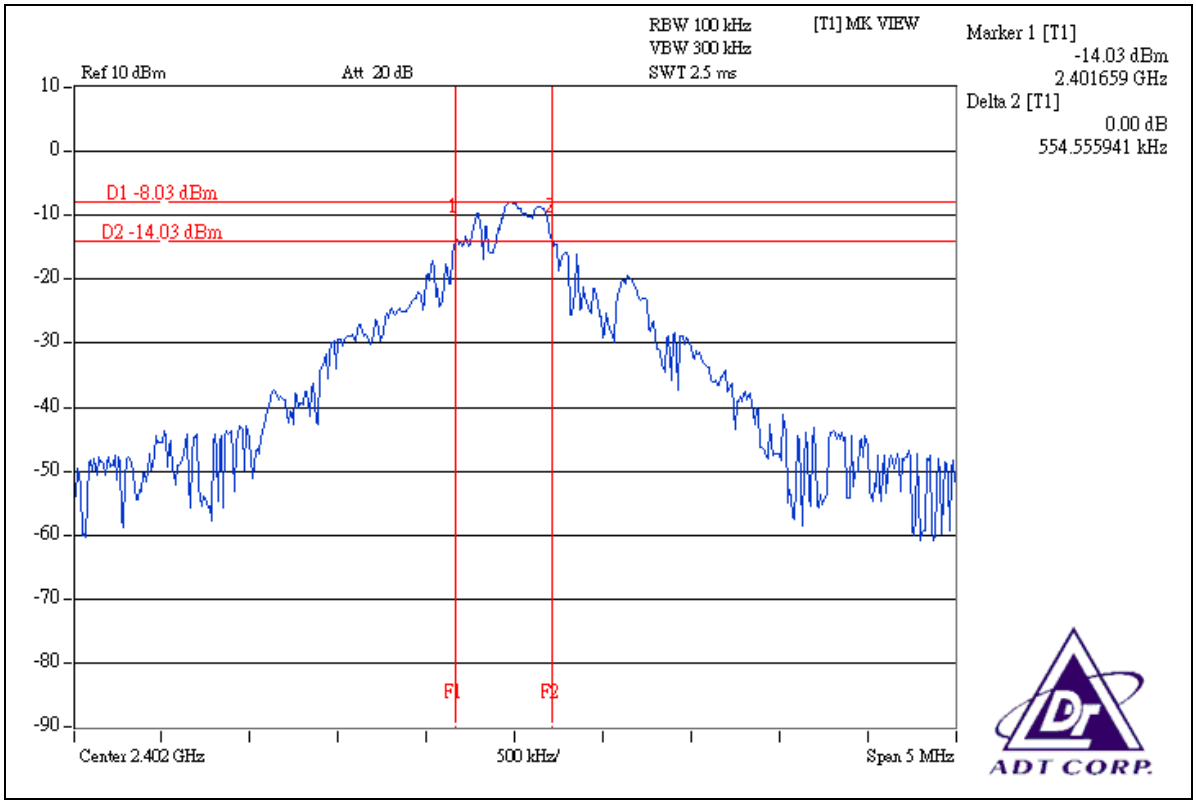
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

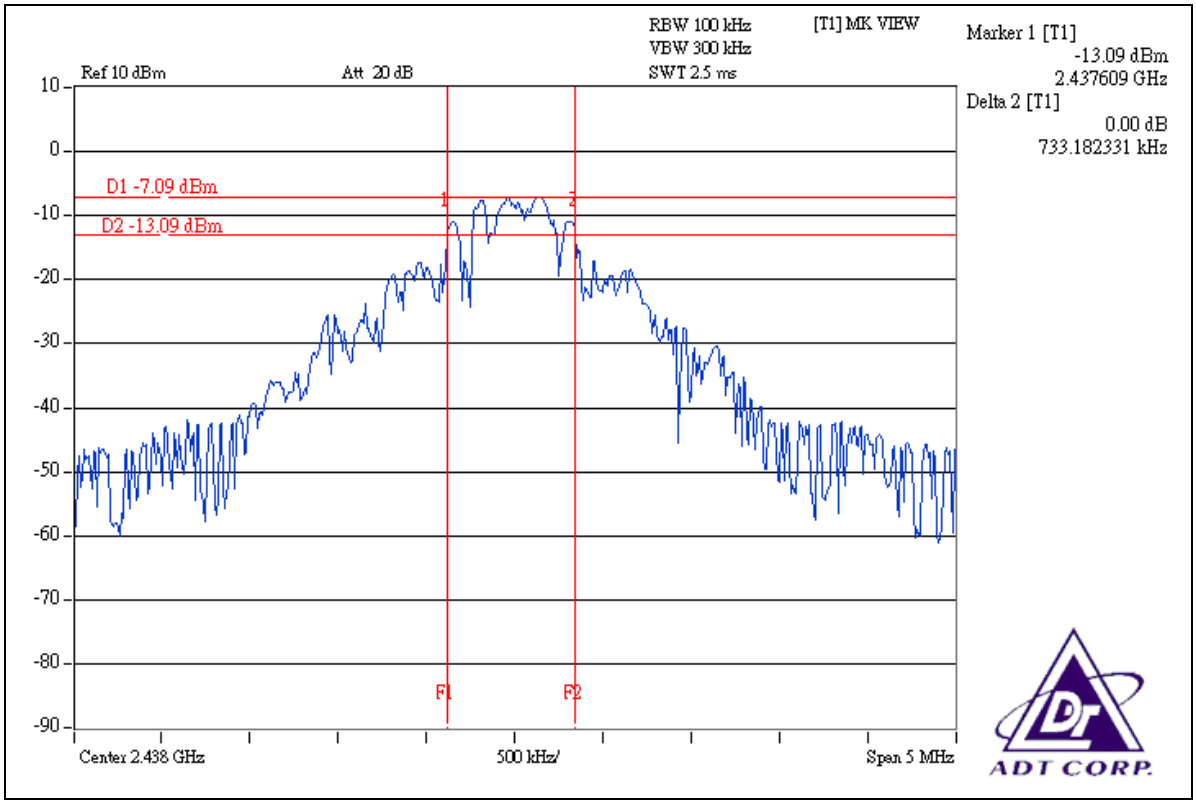
MODULATION TYPE	GFSK	CHANNEL	0, 36, 72
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	24deg. C, 74% RH, 1006hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
0	2402	0.554	0.5	PASS
36	2438	0.733	0.5	PASS
72	2474	0.601	0.5	PASS

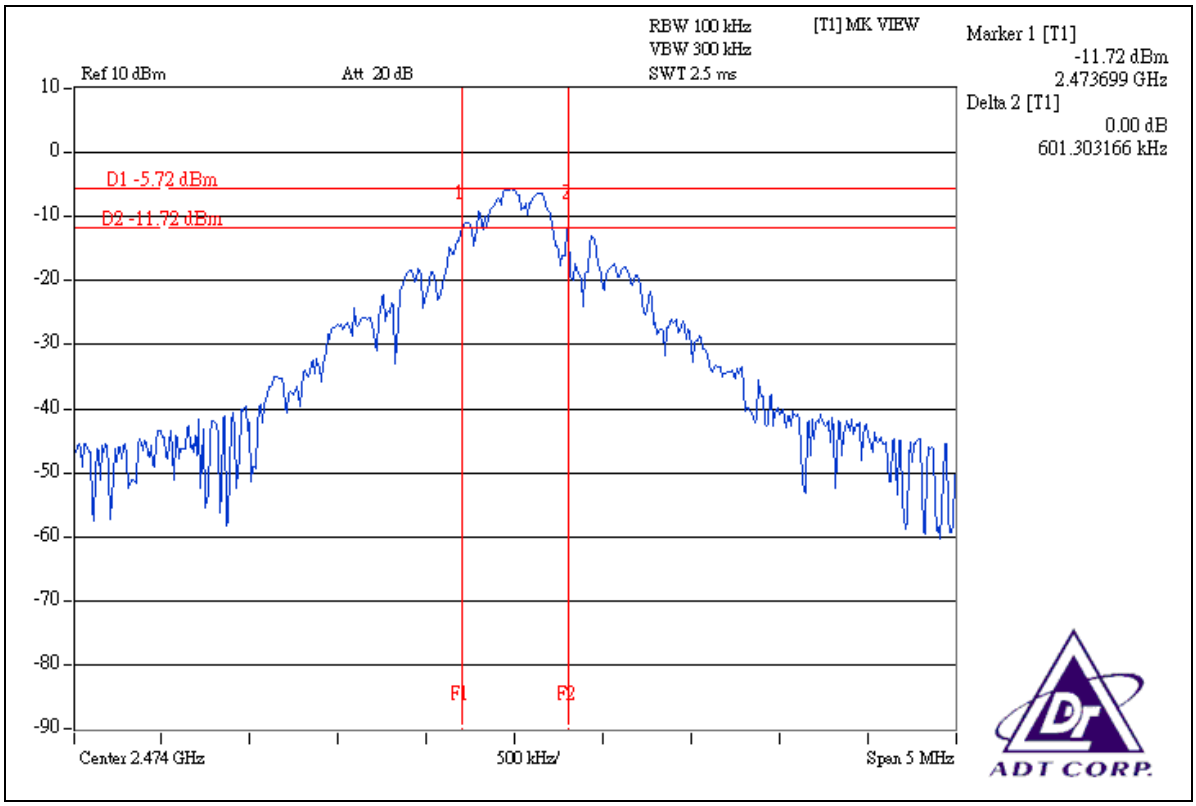
CH 0



CH 36


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-13.09 dBm
2.437609 GHz
Delta 2 [T1]
0.00 dB
733.182331 kHz
Ref 10 dBm
Att 20 dB
D1 -7.09 dBm
D2 -13.09 dBm
F1
F2
Center 2.438 GHz
500 kHz/
Span 5 MHz

CH 72


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-11.72 dBm
2.473699 GHz
Delta 2 [T1]
0.00 dB
601.303166 kHz
Ref 10 dBm
Att 20 dB
D1 -5.72 dBm
D2 -11.72 dBm
F1
F2
Center 2.474 GHz
500 kHz/
Span 5 MHz

4.4 MAXIMUM PEAK OUTPUT POWER

4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP 40	100035	Mar. 26, 2008	Mar. 25, 2009

NOTE: 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

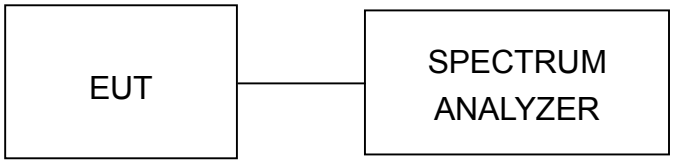
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring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

Note: The spectrum plots are attached on following pages.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

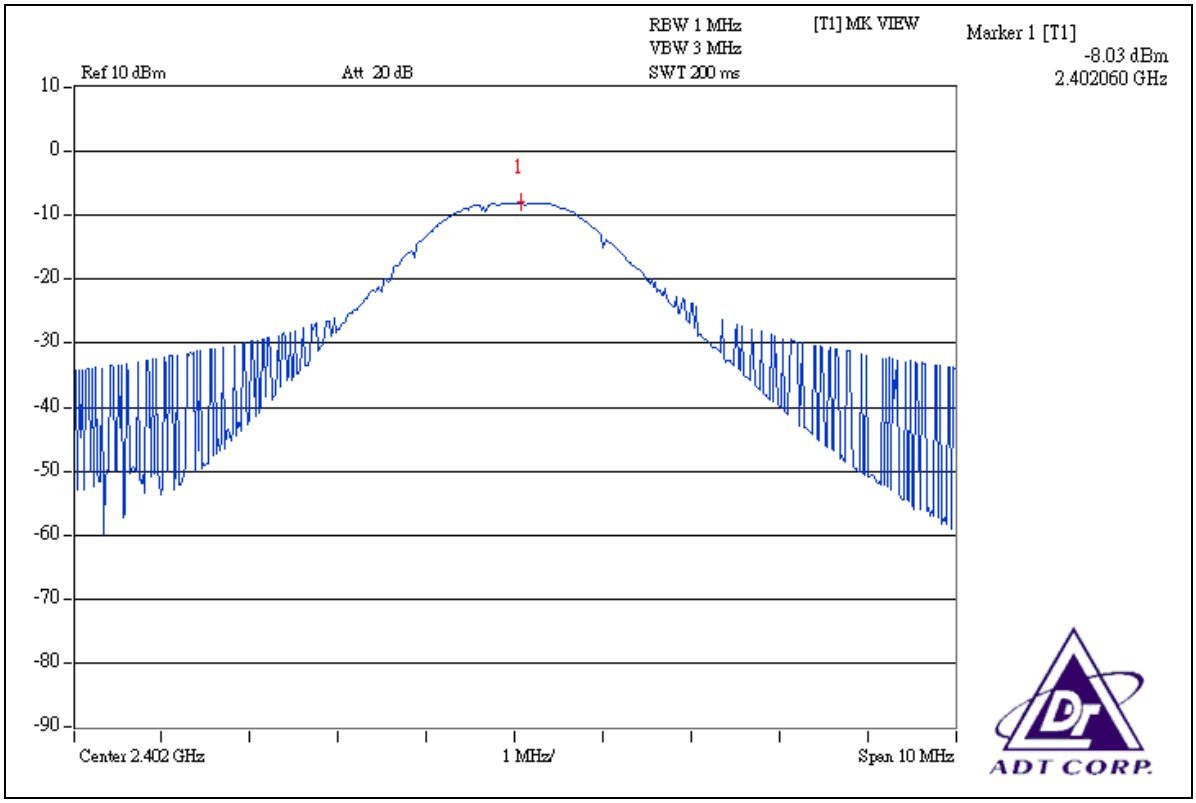
Same as Item 4.3.6

4.4.7 TEST RESULTS

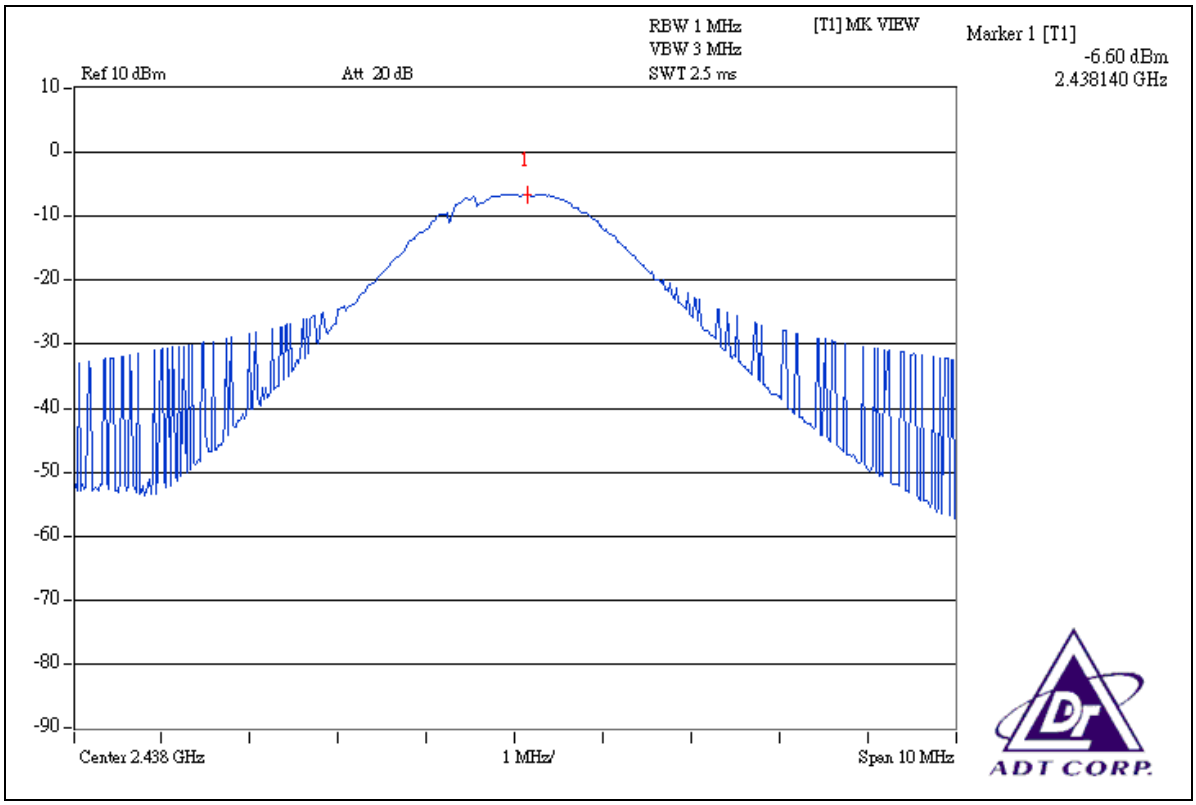
MODULATION TYPE	GFSK	**CHANNEL**	0, 36, 72
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	24deg. C, 74% RH, 1006hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER OUTPUT (mW)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	-8.03	0.157	30	PASS
36	2438	-6.60	0.219	30	PASS
72	2474	-5.73	0.267	30	PASS

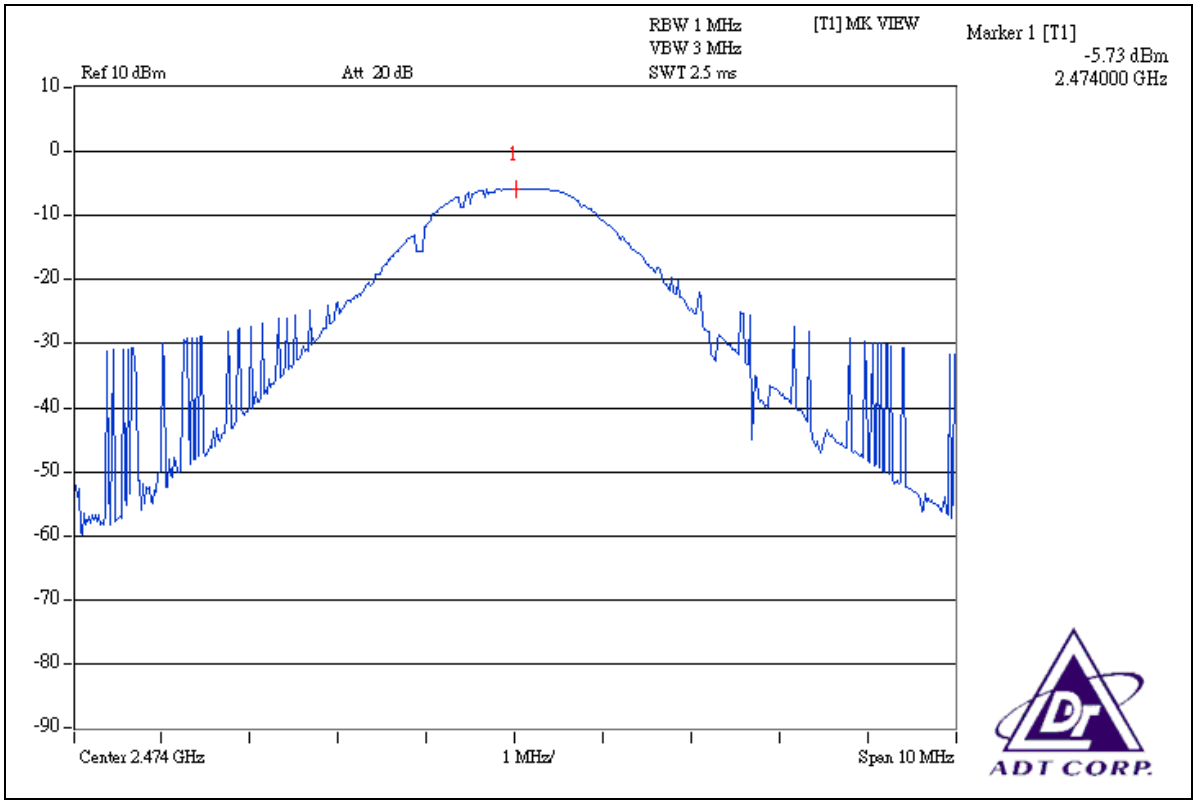
CH 0


RBW 1 MHz
VBW 3 MHz
SWT 200 ms
[T1] MK VIEW
Marker 1 [T1]
-8.03 dBm
2.402060 GHz
Ref 10 dBm
Att 20 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1
Center 2.402 GHz
1 MHz/
Span 10 MHz
ADT CORP.

CH 36


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-6.60 dBm
2.438140 GHz
Ref 10 dBm
Att 20 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1
Center 2.438 GHz
1 MHz/
Span 10 MHz
ADT CORP.

CH 72


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
-5.73 dBm
2.474000 GHz
Ref 10 dBm
Att 20 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.474 GHz
1 MHz/
Span 10 MHz
ADT CORP.

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP 40	100035	Mar. 26, 2008	Mar. 25, 2009

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

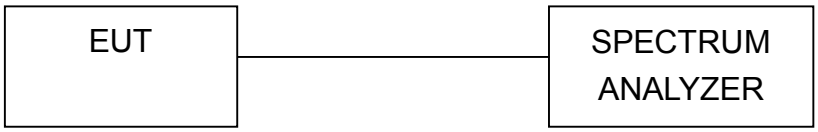
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

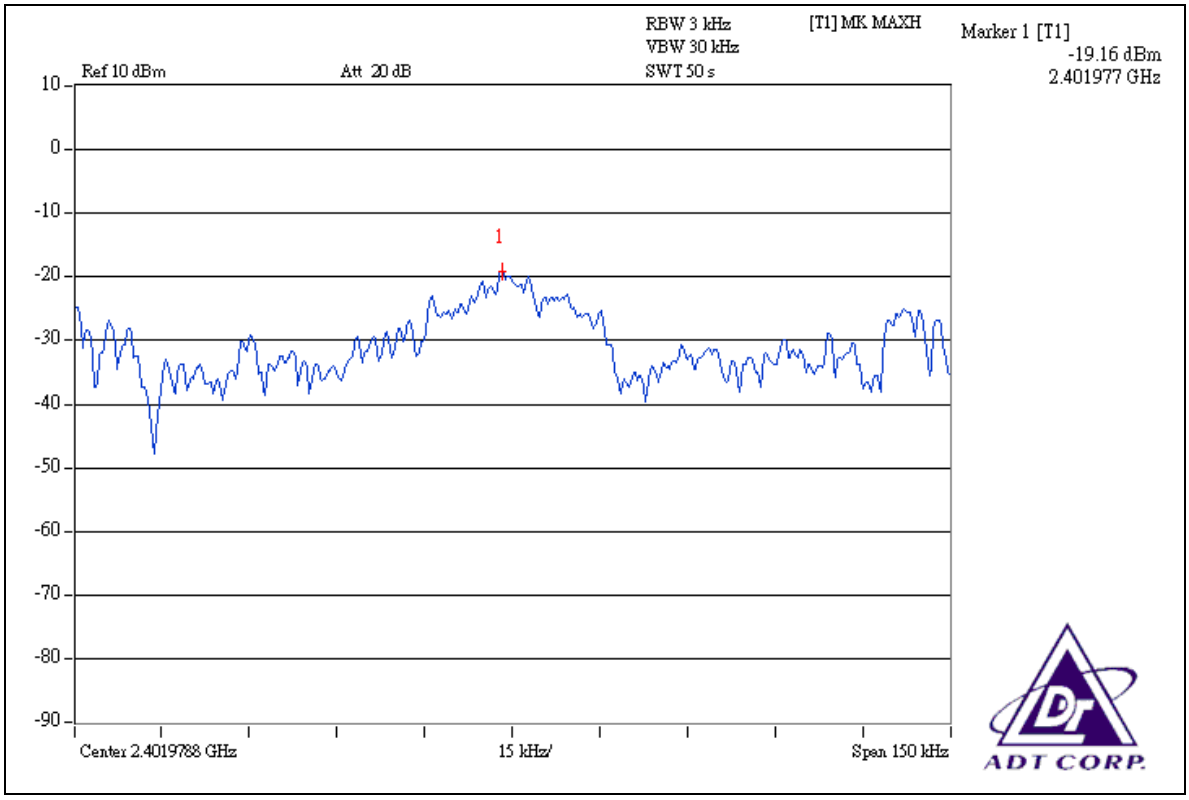
Same as Item 4.3.6

4.5.7 TEST RESULTS

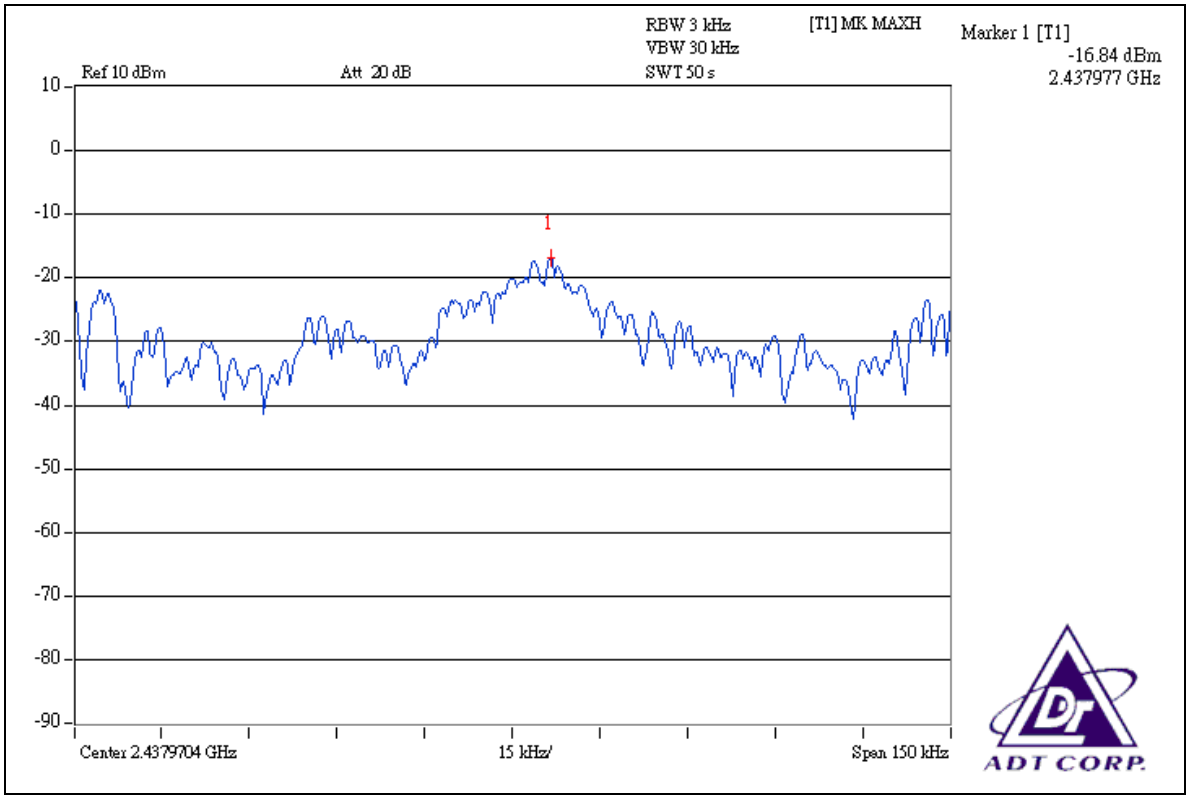
MODULATION TYPE	GFSK	CHANNEL	0, 36, 72
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	24deg. C, 74% RH, 1006hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
0	2402	-19.16	8	PASS
36	2438	-16.84	8	PASS
72	2474	-16.02	8	PASS

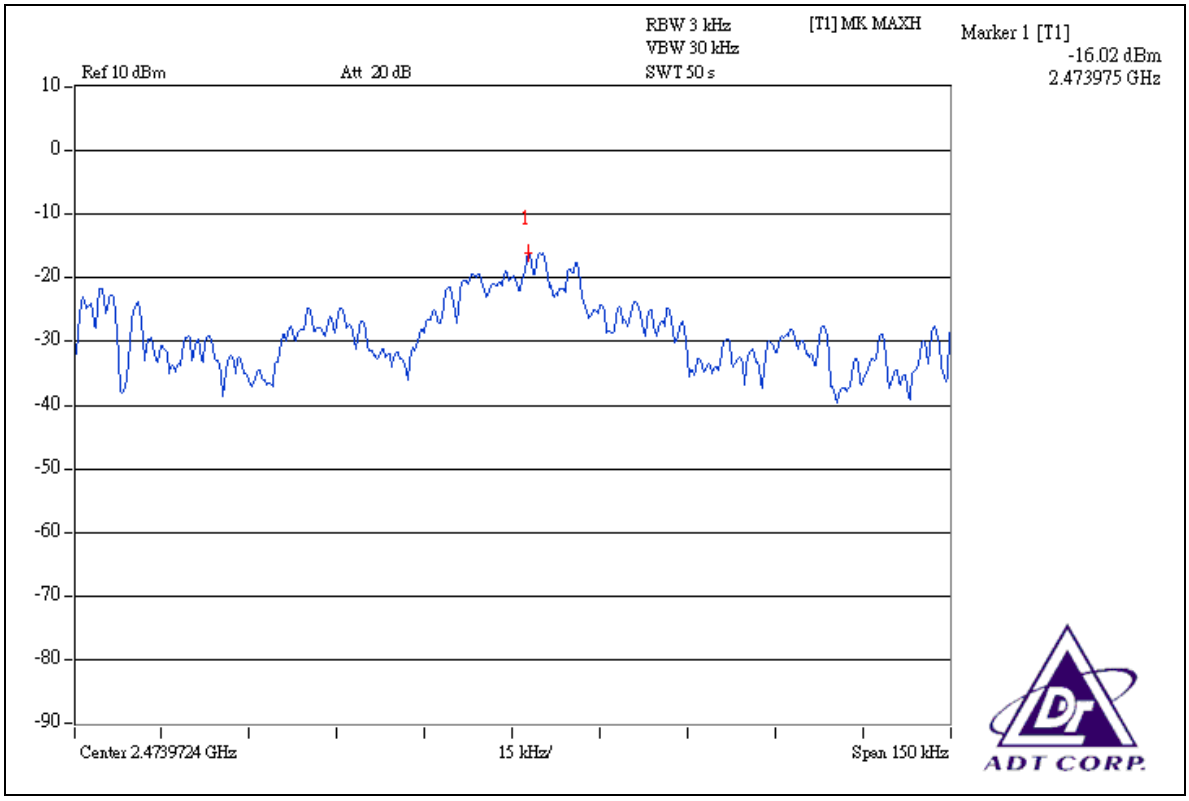
CH 0



CH 36


RBW 3 kHz
VBW 30 kHz
SWT 50 s
[T1] MK MAXH
Marker 1 [T1]
-16.84 dBm
2.437977 GHz
Ref 10 dBm
Att 20 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4379704 GHz
15 kHz/
Span 150 kHz
ADT CORP.

CH 72


RBW 3 kHz
VBW 30 kHz
SWT 50 s
[T1] MK MAXH
Marker 1 [T1]
-16.02 dBm
2.473975 GHz
Ref 10 dBm
Att 20 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4739724 GHz
15 kHz/
Span 150 kHz
ADT CORP.

4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP 40	100035	Mar. 26, 2008	Mar. 25, 2009

NOTE: 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 PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW=100kHz, VBW=300kHz; Average RBW=1MHz, VBW= 1kHz are attached on the following pages.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 EUT OPERATING CONDITION

Same as Item 4.3.6

4.6.6 TEST RESULTS

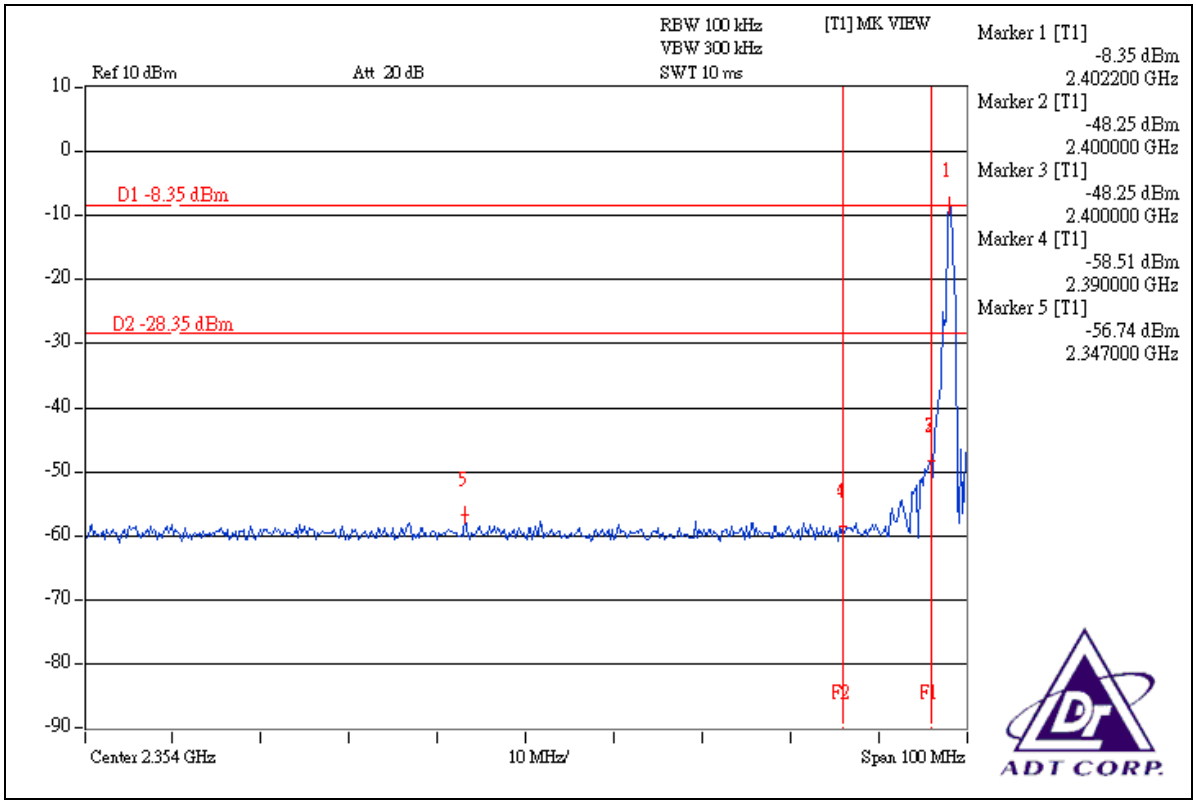
The spectrum plots are attached on the following 6 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

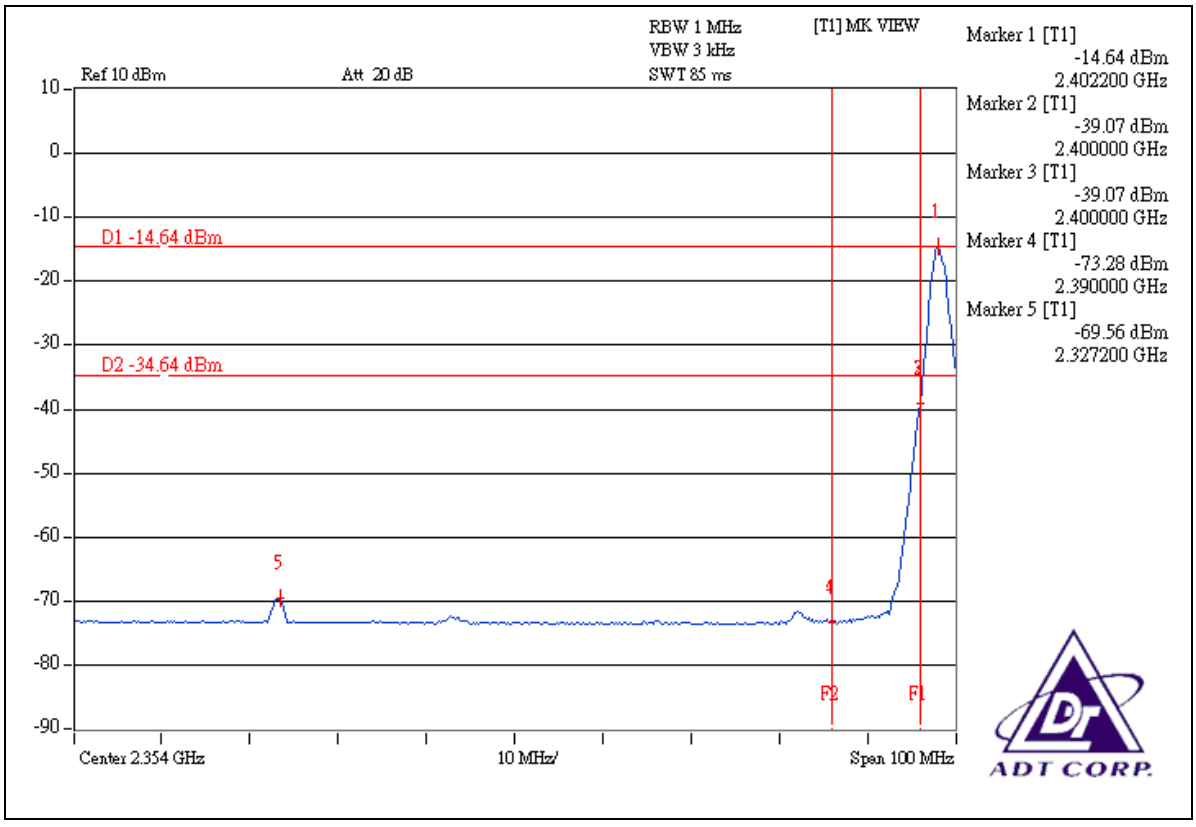
Note 1:
The band edge emission plot on the next page shows 48.39dBc between carrier maximum power and local maximum emission in restrict band (2.3470GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 93.03dBuV/m (Peak), so the maximum field strength in restrict band is 93.03-48.39=44.64dBuV/m which is under 74dBuV/m limit.

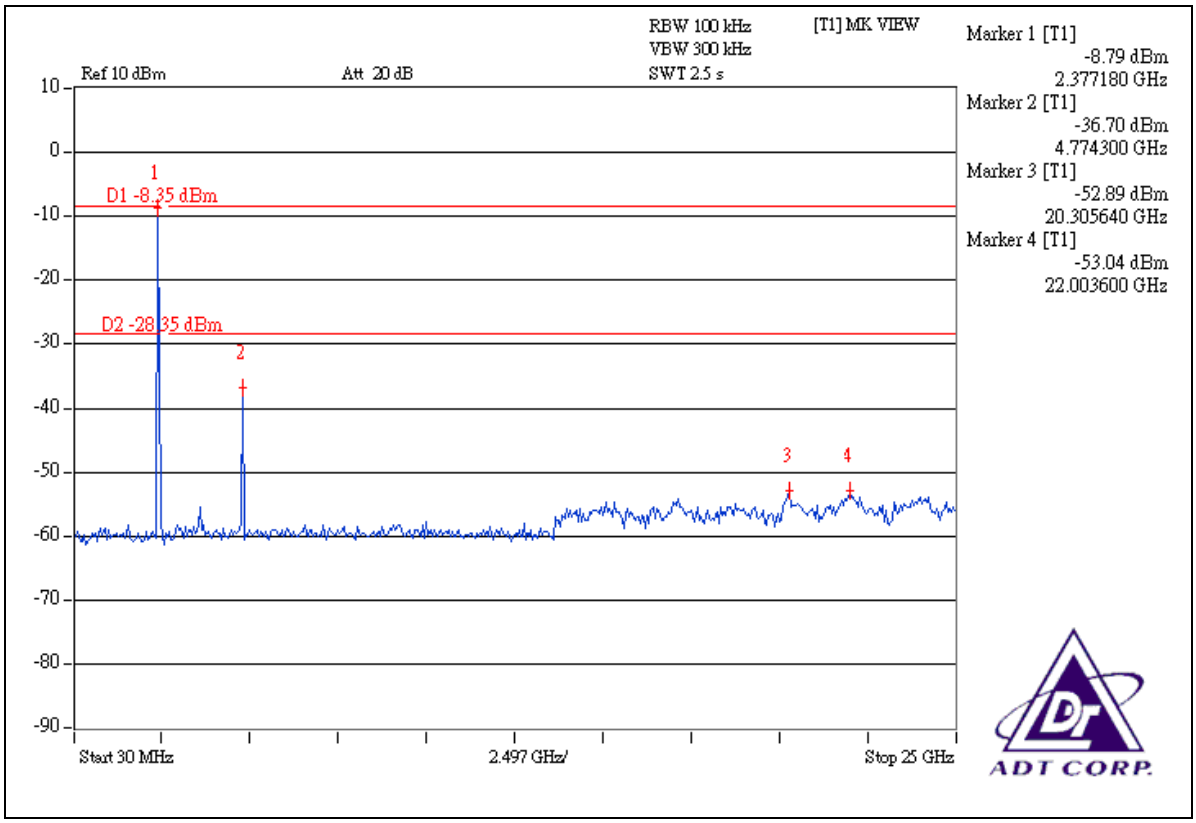
The band edge emission plot the next page shows 54.92dBc between carrier maximum power and local maximum emission in restrict band (2.3272GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 68.78dBuV/m (Average), so the maximum field strength in restrict band is 68.78-54.92=13.86dBuV/m which is under 54dBuV/m limit.

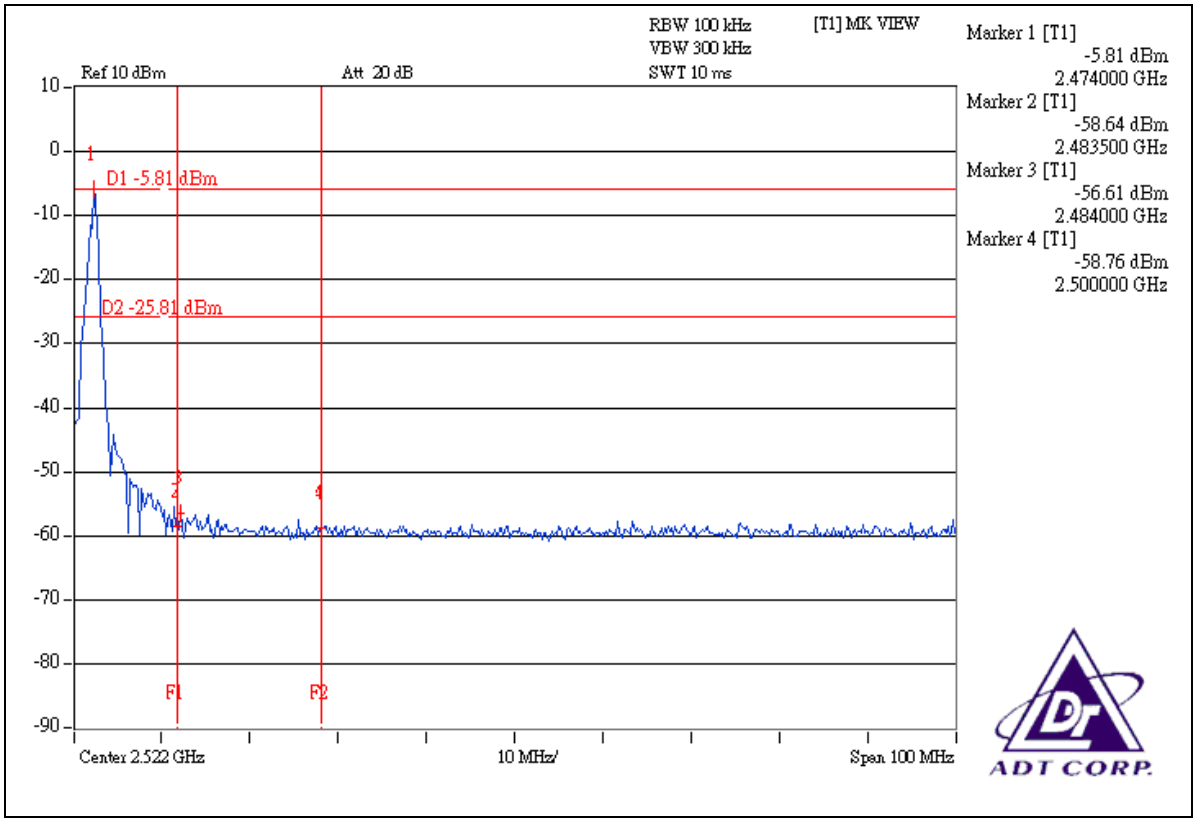
Note 2:
The band edge emission plot on the next second page shows 50.80dBc between carrier maximum power and local maximum emission in restrict band (2.4840GHz). The emission of carrier strength list in the test result of channel 72 at the item 4.2.7 is 92.24dBuV/m (Peak), so the maximum field strength in restrict band is 92.24-50.80=41.44dBuV/m which is under 74dBuV/m limit.

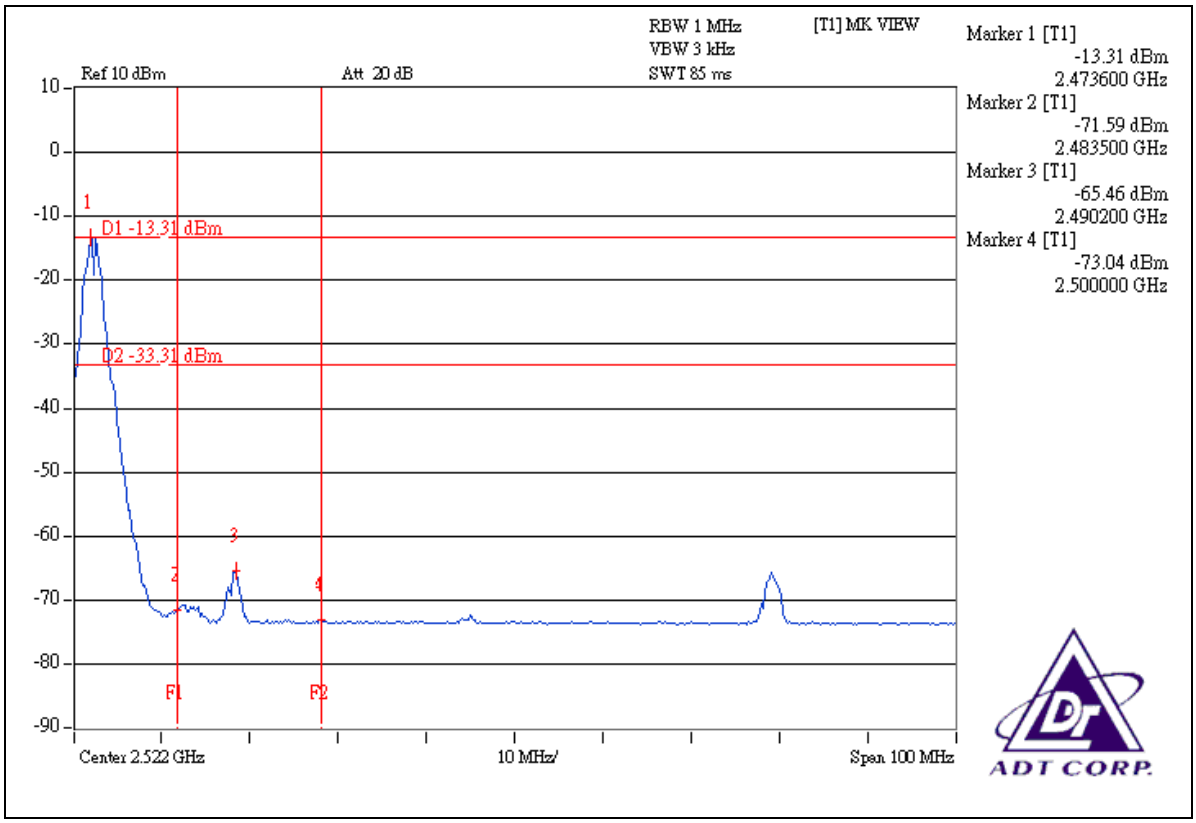
The band edge emission plot on the next third page shows 52.15dBc between carrier maximum power and local maximum emission in restrict band (2.4902GHz). The emission of carrier strength list in the test result of channel 72 at the item 4.2.7 is 68.63dBuV/m (Average), so the maximum field strength in restrict band is 68.63-52.15=16.48dBuV/m which is under 54dBuV/m limit.

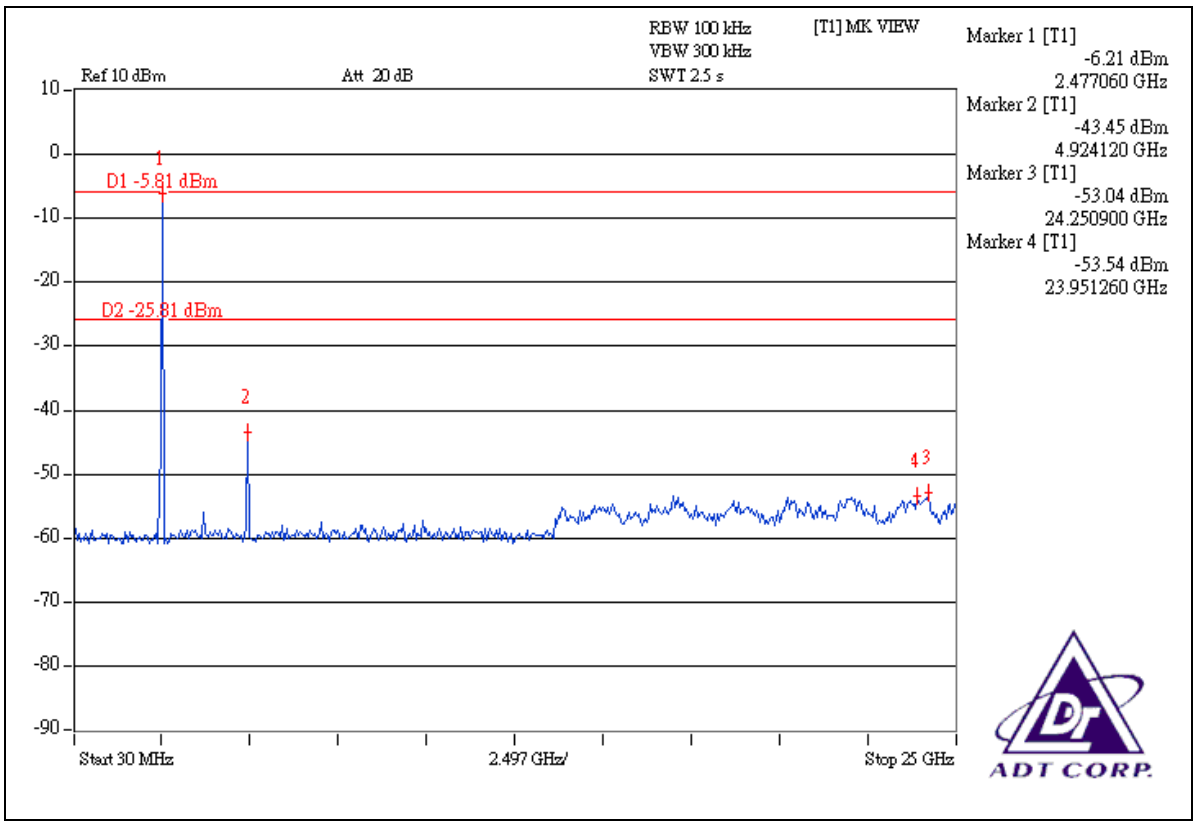

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
D1 -8.35 dBm
D2 -28.35 dBm
Marker 1 [T1]
-8.35 dBm
2.402200 GHz
Marker 2 [T1]
-48.25 dBm
2.400000 GHz
Marker 3 [T1]
-48.25 dBm
2.400000 GHz
Marker 4 [T1]
-58.51 dBm
2.390000 GHz
Marker 5 [T1]
-56.74 dBm
2.347000 GHz
F2
F1
Center 2.354 GHz
10 MHz/
Span 100 MHz


RBW 1 MHz
VBW 3 kHz
SWT 85 ms
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
D1 -14.64 dBm
D2 -34.64 dBm
Marker 1 [T1]
-14.64 dBm
2.402200 GHz
Marker 2 [T1]
-39.07 dBm
2.400000 GHz
Marker 3 [T1]
-39.07 dBm
2.400000 GHz
Marker 4 [T1]
-73.28 dBm
2.390000 GHz
Marker 5 [T1]
-69.56 dBm
2.327200 GHz
F2
F1
Center 2.354 GHz
10 MHz/
Span 100 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
D1 -8.35 dBm
D2 -28.35 dBm
Marker 1 [T1]
-8.79 dBm
2.377180 GHz
Marker 2 [T1]
-36.70 dBm
4.774300 GHz
Marker 3 [T1]
-52.89 dBm
20.305640 GHz
Marker 4 [T1]
-53.04 dBm
22.003600 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
D1 -5.81 dBm
D2 -25.81 dBm
Marker 1 [T1]
-5.81 dBm
2.474000 GHz
Marker 2 [T1]
-58.64 dBm
2.483500 GHz
Marker 3 [T1]
-56.61 dBm
2.484000 GHz
Marker 4 [T1]
-58.76 dBm
2.500000 GHz
Center 2.522 GHz
10 MHz/
Span 100 MHz


RBW 1 MHz
VBW 3 kHz
SWT 85 ms
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
Marker 1 [T1]
-13.31 dBm
2.473600 GHz
Marker 2 [T1]
-71.59 dBm
2.483500 GHz
Marker 3 [T1]
-65.46 dBm
2.490200 GHz
Marker 4 [T1]
-73.04 dBm
2.500000 GHz
D1 -13.31 dBm
D2 -33.31 dBm
F1
F2
Center 2.522 GHz
10 MHz/
Span 100 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 10 dBm
Att 20 dB
Marker 1 [T1]
-6.21 dBm
2.477060 GHz
Marker 2 [T1]
-43.45 dBm
4.924120 GHz
Marker 3 [T1]
-53.04 dBm
24.250900 GHz
Marker 4 [T1]
-53.54 dBm
23.951260 GHz
D1 -5.81 dBm
D2 -25.81 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

4.7 ANTENNA REQUIREMENT

4.7.1 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 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Chip antenna without connector. The maximum gain of the antenna is -6.04dBi.

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6. INFORMATION ON THE TESTING LABORATORIES

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

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

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

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

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

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