

FCC TEST REPORT

REPORT NO.: RF970609A01

MODEL NO.: 1349

RECEIVED: June 9, 2008

TESTED: June 9 ~ 11, 2008

ISSUED: June 30, 2008

APPLICANT: MICROSOFT CORPORATION

ADDRESS: ONE MICROSOFT WAY REDMOND, WA
98052-6399, U.S.A

ISSUED BY: Advance Data Technology Corporation

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1. CERTIFICATION

PRODUCT: Microsoft® Arc Mouse
BRAND NAME: Microsoft®
MODEL NO.: 1349
APPLICANT: MICROSOFT CORPORATION
TESTED: June 9 ~ 11, 2008
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: FCC Part 15, Subpart C (Section 15.249),
ANSI C63.4-2003

The above equipment has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Annie Chang , **DATE:** June 30, 2008
(Annie Chang / Senior Specialist)

TECHNICAL
ACCEPTANCE : Jamison Chan , **DATE:** June 23, 2008
Responsible for RF (Jamison Chan / Supervisor)

APPROVED BY : Ken Liu , **DATE:** June 23, 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 15.249)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	Conducted Emission Test	N/A	The EUT power from batteries
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 12.209	PASS	Minimum passing margin is -1.73dB at 2483.500MHz
15.249 (b)(2)	Frequency Tolerance Limit: $\pm 0.001\%$	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
Radiated emissions	30MHz ~ 1GHz	3.75 dB
	1GHz ~ 40GHz	2.89 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Microsoft® Arc Mouse
MODEL NO.	1349
FCC ID	C3K1349
POWER SUPPLY	3.0Vdc from batteries
MODULATION TYPE	GFSK
FREQUENCY RANGE	2402MHz ~2479MHz
NUMBER OF CHANNEL	78
ANTENNA TYPE	Strip antenna with 1.45dBi gain
DATA CABLE	N/A
I/O PORTS	N/A
ASSOCIATED DEVICES	N/A

NOTE:

1. The EUT is a Microsoft® Arc Mouse, which is a transceiver.
2. The EUT has three samples, which are defined as their serial no. as follows:

Product	Model No.	Serial no.
Microsoft® Arc Mouse	1349	EV2-0813-FA276
		EV2-0813-FA260
		EV2-0813-FA231

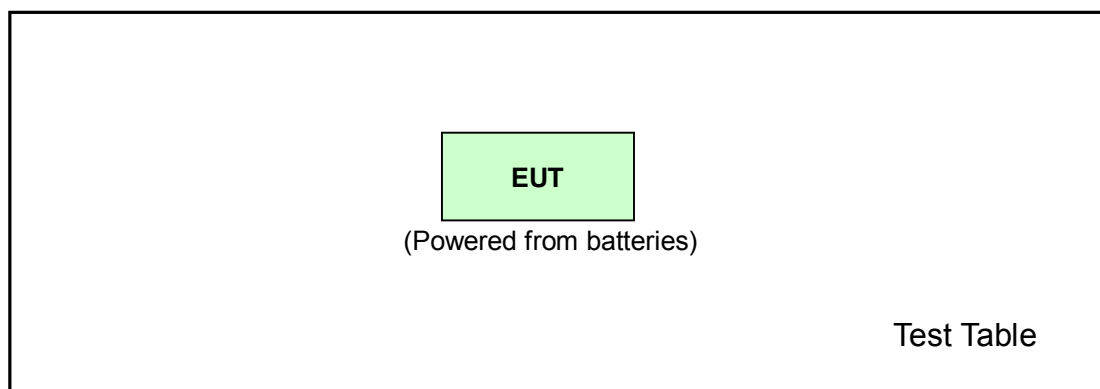
3. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

78 channels are provided to this EUT:

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460		
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	
A	Note	√	√	√	Serial No.: EV2-0813-FA276
B	Note	√	√	-	Serial No.: EV2-0813-FA260
C	Note	√	√	-	Serial No.: EV2-0813-FA231

Where PLC: Power Line Conducted Emission

RE<1G RE: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

Note: No need to concern of Conducted Emission due to the EUT is powered by batteries.

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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	0 to 77	77	GFSK
B	0 to 77	77	GFSK
C	0 to 77	77	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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	TEST ITEM
A	0 to 77	0, 38, 77	GFSK	Fundamental, Harmonics, Spurious Emission
B	0 to 77	0, 38, 77	GFSK	Spurious Emission
C	0 to 77	0, 38, 77	GFSK	Spurious Emission

FREQUENCY TOLERANCE:

- ☒ 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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	0 to 77	0, 38, 77	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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	0 to 77	0, 77	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. (15.249)

ANSI C63.4-2003

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

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

N/A

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	May 08, 2009
HP Preamplifier	8449B	3008A01201	Oct. 01, 2008
HP Preamplifier	8449B	3008A01292	Aug. 05, 2008
ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Dec. 05, 2008
Schwarzbeck Antenna	VULB 9168	137	May 01, 2009
Schwarzbeck Antenna	VHBA 9123	480	Apr. 22, 2009
EMCO Horn Antenna	3115	6714	Oct. 18, 2008
EMCO Horn Antenna	3115	9312-4192	Apr. 20, 2009
ADT. Turn Table	TT100	0306	NA
ADT. Tower	AT100	0306	NA
Software	ADT_Radiated_V 7.6.15	NA	NA
SUHNER RF cable	SF104-26.5	CABLE-CH6-17m-01	Nov. 04, 2008
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100035	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 ADT Chamber No. 6.
 4. The Industry Canada Reference No. IC 3789-6.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic. 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 method or average method as specified and then reported in data sheet.

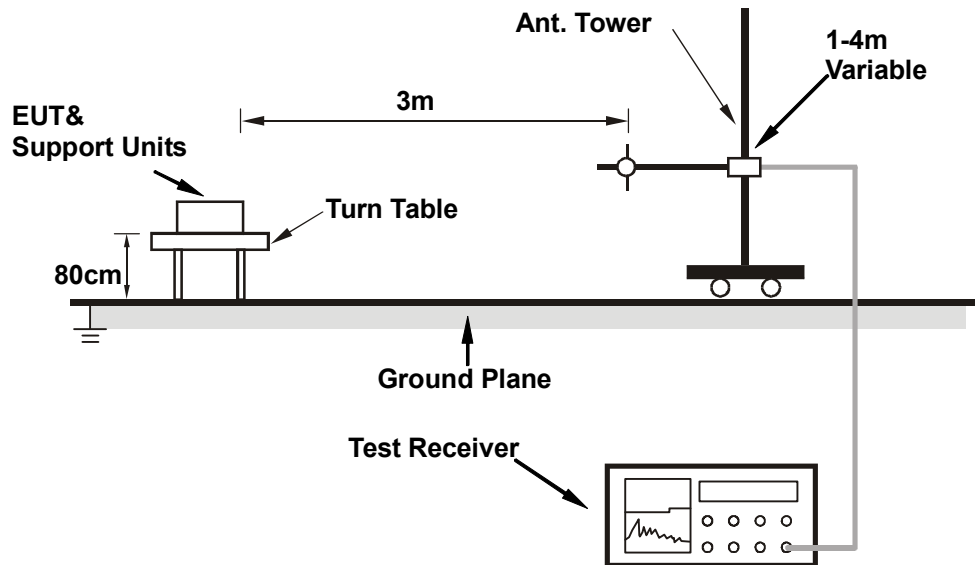
NOTE:

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

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

4.2.7 TEST RESULTS

RADIATED WORST CASE DATA: BELOW 1GHz

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Quasi-Peak
TESTED BY	Jun Wu		

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	39.719	22.06 QP	40.00	-17.94	1.42 H	178	6.77	15.29
2	127.194	28.56 QP	43.50	-14.94	1.39 H	187	14.95	13.61
3	138.858	29.91 QP	43.50	-13.59	1.34 H	352	15.75	14.16
4	164.128	24.12 QP	43.50	-19.38	1.30 H	208	10.19	13.93
5	790.060	25.08 QP	46.00	-20.92	1.20 H	70	-1.71	26.79
6	865.872	26.09 QP	46.00	-19.91	1.16 H	310	-1.83	27.92
7	933.908	27.04 QP	46.00	-18.96	1.04 H	109	-1.81	28.85

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	37.776	26.80 QP	40.00	-13.20	1.00 V	127	11.73	15.07
2	133.026	25.80 QP	43.50	-17.70	1.00 V	10	11.92	13.89
3	185.511	25.15 QP	43.50	-18.35	1.00 V	115	12.91	12.24
4	702.585	24.08 QP	46.00	-21.92	1.02 V	307	-0.54	24.62
5	741.463	24.41 QP	46.00	-21.59	1.12 V	205	-1.13	25.54
6	834.770	25.67 QP	46.00	-20.33	1.19 V	22	-1.83	27.50
7	920.301	26.84 QP	46.00	-19.16	1.32 V	208	-1.83	28.67

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

TEST MODE	B		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Quasi-Peak
TESTED BY	Jun Wu		

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	175.792	24.48 QP	43.50	-19.02	1.42 H	10	11.40	13.08
2	778.397	25.75 QP	46.00	-20.25	1.24 H	130	-0.73	26.48
3	801.723	25.73 QP	46.00	-20.27	1.18 H	4	-1.34	27.07
4	819.218	25.68 QP	46.00	-20.32	1.14 H	181	-1.62	27.30
5	875.591	25.93 QP	46.00	-20.07	1.10 H	277	-2.13	28.06
6	887.255	27.00 QP	46.00	-19.00	1.16 H	355	-1.22	28.22
7	933.908	27.26 QP	46.00	-18.74	1.02 H	115	-1.59	28.85
8	945.571	27.51 QP	46.00	-18.49	1.06 H	16	-1.50	29.01

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	63.046	22.09 QP	40.00	-17.91	1.00 V	10	8.91	13.18
2	451.824	27.39 QP	46.00	-18.61	1.02 V	127	7.25	20.14
3	519.860	31.17 QP	46.00	-14.83	1.05 V	346	9.48	21.69
4	568.457	27.04 QP	46.00	-18.96	1.06 V	289	4.24	22.80
5	591.784	29.54 QP	46.00	-16.46	1.10 V	220	6.17	23.37
6	904.749	27.09 QP	46.00	-18.91	1.33 V	241	-1.37	28.46
7	959.178	27.51 QP	46.00	-18.49	1.41 V	310	-1.65	29.16

- 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.

TEST MODE	C		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Quasi-Peak
TESTED BY	Jun Wu		

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	807.555	25.32 QP	46.00	-20.68	1.18 H	58	-1.83	27.15
2	840.601	25.82 QP	46.00	-20.18	1.15 H	10	-1.75	27.57
3	858.096	26.30 QP	46.00	-19.70	1.24 H	208	-1.51	27.81
4	881.423	26.94 QP	46.00	-19.06	1.10 H	229	-1.20	28.14
5	933.908	27.51 QP	46.00	-18.49	1.06 H	184	-1.34	28.85
6	953.347	27.98 QP	46.00	-18.02	1.01 H	19	-1.12	29.10

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	292.425	28.20 QP	46.00	-17.80	1.00 V	10	12.33	15.87
2	335.190	30.46 QP	46.00	-15.54	1.00 V	250	13.51	16.95
3	416.834	25.66 QP	46.00	-20.34	1.02 V	220	6.37	19.29
4	451.824	30.87 QP	46.00	-15.13	1.03 V	76	10.73	20.14
5	832.826	26.01 QP	46.00	-19.99	1.14 V	70	-1.46	27.47
6	935.852	26.96 QP	46.00	-19.04	1.32 V	166	-1.92	28.88
7	945.571	27.66 QP	46.00	-18.34	1.37 V	295	-1.35	29.01

- 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 DATA: ABOVE 1GHz (For Fundamental, Harmonics)

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	0
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	61.12 PK	74.00	-12.88	1.05 H	65	26.46	34.66
2	2390.000	47.50 AV	54.00	-6.50	1.05 H	65	12.84	34.66
3	*2402.000	94.59 PK	114.00	-19.41	1.14 H	334	59.90	34.69
4	*2402.000	72.00 AV	94.00	-22.00	1.14 H	334	37.31	34.69
5	4804.000	54.42 PK	74.00	-19.58	1.00 H	277	12.51	41.91
6	4804.000	41.65 AV	54.00	-12.35	1.00 H	277	-0.26	41.91

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	59.60 PK	74.00	-14.40	1.00 V	91	24.94	34.66
2	2390.000	47.56 AV	54.00	-6.44	1.00 V	91	12.90	34.66
3	*2402.000	85.30 PK	114.00	-28.70	1.00 V	91	50.61	34.69
4	*2402.000	66.70 AV	94.00	-27.30	1.00 V	91	32.01	34.69
5	4804.000	56.26 PK	74.00	-17.74	1.00 V	257	14.35	41.91
6	4804.000	43.68 AV	54.00	-10.32	1.00 V	257	1.77	41.91

- 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

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	38
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	*2440.000	95.48 PK	114.00	-18.52	1.12 H	332	60.71	34.77
2	*2440.000	72.67 AV	94.00	-21.33	1.12 H	332	37.90	34.77
3	4880.000	54.84 PK	74.00	-19.16	1.02 H	277	12.71	42.12
4	4880.000	42.38 AV	54.00	-11.62	1.02 H	277	0.25	42.12

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	*2440.000	85.62 PK	114.00	-28.38	1.13 V	275	50.85	34.77
2	*2440.000	66.92 AV	94.00	-27.08	1.13 V	275	32.15	34.77
3	4880.000	57.30 PK	74.00	-16.70	1.00 V	271	15.17	42.12
4	4880.000	44.77 AV	54.00	-9.23	1.00 V	271	2.64	42.12

- 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

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	*2479.000	96.35 PK	114.00	-17.65	1.00 H	290	61.50	34.85
2	*2479.000	73.09 AV	94.00	-20.91	1.00 H	290	38.24	34.85
3	2483.500	72.27 PK	74.00	-1.73	1.00 H	290	37.41	34.86
4	2483.500	48.43 AV	54.00	-5.57	1.00 H	290	13.57	34.86
5	4958.000	54.57 PK	74.00	-19.43	1.14 H	312	12.23	42.34
6	4958.000	42.15 AV	54.00	-11.85	1.14 H	312	-0.19	42.34

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	*2479.000	87.55 PK	114.00	-26.45	1.08 V	267	52.70	34.85
2	*2479.000	68.04 AV	94.00	-25.96	1.08 V	267	33.19	34.85
3	2483.500	65.05 PK	74.00	-8.95	1.08 V	267	30.19	34.86
4	2483.500	47.84 AV	54.00	-6.16	1.08 V	267	12.98	34.86
5	4958.000	57.38 PK	74.00	-16.62	1.00 V	267	15.04	42.34
6	4958.000	44.70 AV	54.00	-9.30	1.00 V	267	2.36	42.34

- 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.
 5. “ * ” : Fundamental frequency

RADIATED DATA: ABOVE 1GHz (For Spurious Emission)

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	0
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2747.000	48.02 PK	74.00	-25.98	1.00 H	275	11.82	36.20
2	2747.000	36.73 AV	54.00	-17.27	1.00 H	275	0.53	36.20

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	2747.000	45.31 PK	74.00	-28.69	1.00 V	331	9.11	36.20
2	2747.000	32.90 AV	54.00	-21.10	1.00 V	331	-3.30	36.20

- 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.

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	38
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2790.000	47.16 PK	74.00	-26.84	1.00 H	331	10.72	36.43
2	2790.000	37.25 AV	54.00	-16.75	1.00 H	331	0.81	36.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2790.000	46.71 PK	74.00	-27.29	1.00 V	331	10.27	36.43
2	2790.000	33.79 AV	54.00	-20.21	1.00 V	331	-2.65	36.43

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

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2835.000	46.51 PK	74.00	-27.49	1.00 H	328	9.84	36.67
2	2835.000	36.42 AV	54.00	-17.58	1.00 H	328	-0.25	36.67

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	2835.000	46.59 PK	74.00	-27.41	1.00 V	278	9.92	36.67
2	2835.000	33.54 AV	54.00	-20.46	1.00 V	278	-3.13	36.67

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

TEST MODE	B		
MODULATION TYPE	GFSK	CHANNEL	0
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2747.000	47.32 PK	74.00	-26.68	1.00 H	330	11.12	36.20
2	2747.000	36.49 AV	54.00	-17.51	1.00 H	330	0.29	36.20

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	2747.000	44.50 PK	74.00	-29.50	1.00 V	338	8.30	36.20
2	2747.000	32.12 AV	54.00	-21.88	1.00 V	338	-4.08	36.20

- 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.

TEST MODE	B		
MODULATION TYPE	GFSK	CHANNEL	38
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2790.000	47.01 PK	74.00	-26.99	1.00 H	329	10.57	36.43
2	2790.000	36.49 AV	54.00	-17.51	1.00 H	329	0.05	36.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2790.000	46.22 PK	74.00	-27.78	1.00 V	327	9.78	36.43
2	2790.000	33.18 AV	54.00	-20.82	1.00 V	327	-3.26	36.43

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

TEST MODE	B		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2835.000	47.17 PK	74.00	-26.83	1.00 H	274	10.50	36.67
2	2835.000	35.21 AV	54.00	-18.79	1.00 H	274	-1.46	36.67

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	2835.000	45.35 PK	74.00	-28.65	1.00 V	332	8.68	36.67
2	2835.000	33.16 AV	54.00	-20.84	1.00 V	332	-3.51	36.67

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

TEST MODE	C		
MODULATION TYPE	GFSK	CHANNEL	0
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2747.000	47.23 PK	74.00	-26.77	1.00 H	332	11.03	36.20
2	2747.000	37.27 AV	54.00	-16.73	1.00 H	332	1.07	36.20

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	2747.000	45.77 PK	74.00	-28.23	1.00 V	346	9.57	36.20
2	2747.000	32.32 AV	54.00	-21.68	1.00 V	346	-3.88	36.20

- 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.

TEST MODE	C		
MODULATION TYPE	GFSK	CHANNEL	38
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2790.000	48.29 PK	74.00	-25.71	1.00 H	330	11.85	36.43
2	2790.000	37.47 AV	54.00	-16.53	1.00 H	330	1.03	36.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2790.000	46.11 PK	74.00	-27.89	1.00 V	328	9.67	36.43
2	2790.000	33.42 AV	54.00	-20.58	1.00 V	328	-3.02	36.43

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

TEST MODE	C		
MODULATION TYPE	GFSK	CHANNEL	77
INPUT POWER	3.0Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 999hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

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	2835.000	46.70 PK	74.00	-27.30	1.00 H	331	10.03	36.67
2	2835.000	36.10 AV	54.00	-17.90	1.00 H	331	-0.57	36.67

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	2835.000	45.85 PK	74.00	-28.15	1.00 V	276	9.18	36.67
2	2835.000	33.40 AV	54.00	-20.60	1.00 V	276	-3.27	36.67

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

4.3 FREQUENCY TOLERANCE MEASUREMENT

4.3.1 LIMITS OF FREQUENCY TOLERANCE MEASUREMENT

Limit : $\pm 0.001\%$

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 12, 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 frequency tolerance of the carrier signal shall be maintained within $\pm 0.001\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 EUT OPERATING CONDITION

Same as Item 4.2.6

4.3.6 TEST RESULTS

TEST MODE	A		
MODULATION TYPE	GFSK	CHANNEL	0, 38, 77
INPUT POWER	3.0Vdc	ENVIRONMENTAL CONDITIONS	25deg. C, 75% RH, 997hPa
TESTED BY	Jun Wu		

CH 0

TEST CONDITION				Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(°C)	20	Vnom(V)	3.0	2401.9666	0	0
Tmin(°C)	-20	Vmin(V)	2.55	2401.9652	-1.4	-0.000058
		Vmax(V)	3.45	2401.9648	-1.8	-0.000075
Tmax(°C)	50	Vmin(V)	2.55	2401.9580	-8.6	-0.000358
		Vmax(V)	3.45	2401.9571	-9.5	-0.000396
Limit : ±0.001%						

CH 38

TEST CONDITION				Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(℃)	20	Vnom(V)	3.0	2439.9668	0	0
Tmin(℃)	-20	Vmin(V)	2.55	2439.9652	-1.6	-0.000066
		Vmax(V)	3.45	2439.9640	-2.8	-0.000115
Tmax(℃)	50	Vmin(V)	2.55	2439.9571	-9.7	-0.000398
		Vmax(V)	3.45	2439.9564	-10.4	-0.000426
Limit : ±0.001%						

CH 77

TEST CONDITION				Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(℃)	20	Vnom(V)	3.0	2478.9653	0	0
Tmin(℃)	-20	Vmin(V)	2.55	2478.9642	-1.1	-0.000044
		Vmax(V)	3.45	2478.9636	-1.7	-0.000069
Tmax(℃)	50	Vmin(V)	2.55	2478.9574	-7.9	-0.000319
		Vmax(V)	3.45	2478.9562	-9.1	-0.000367
Limit : ±0.001%						

4.4 BAND EDGES MEASUREMENT

4.4.1 LIMITS OF BAND EDGES MEASUREMENT

Below –50dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 12, 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 PROCEDURE

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

The spectrum plots are attached on the following pages.

4.4.4 DEVIATION FROM TEST STANDARD

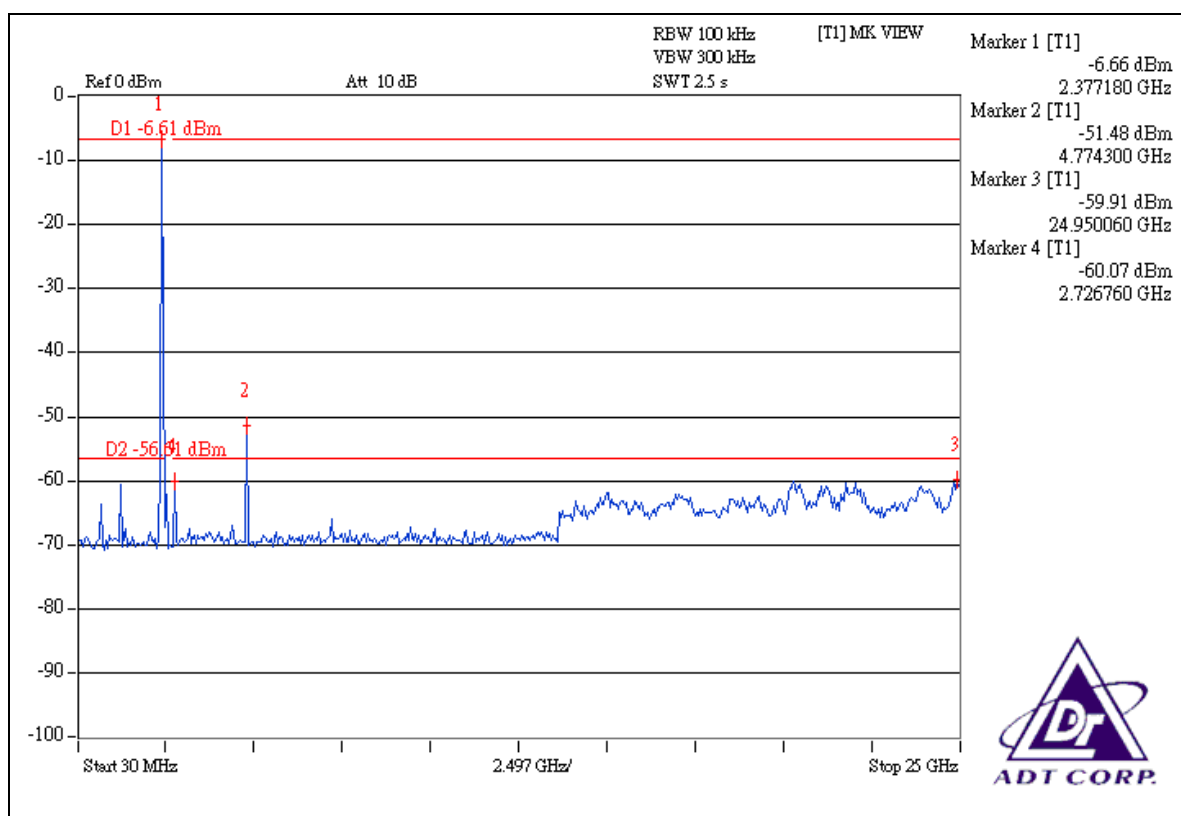
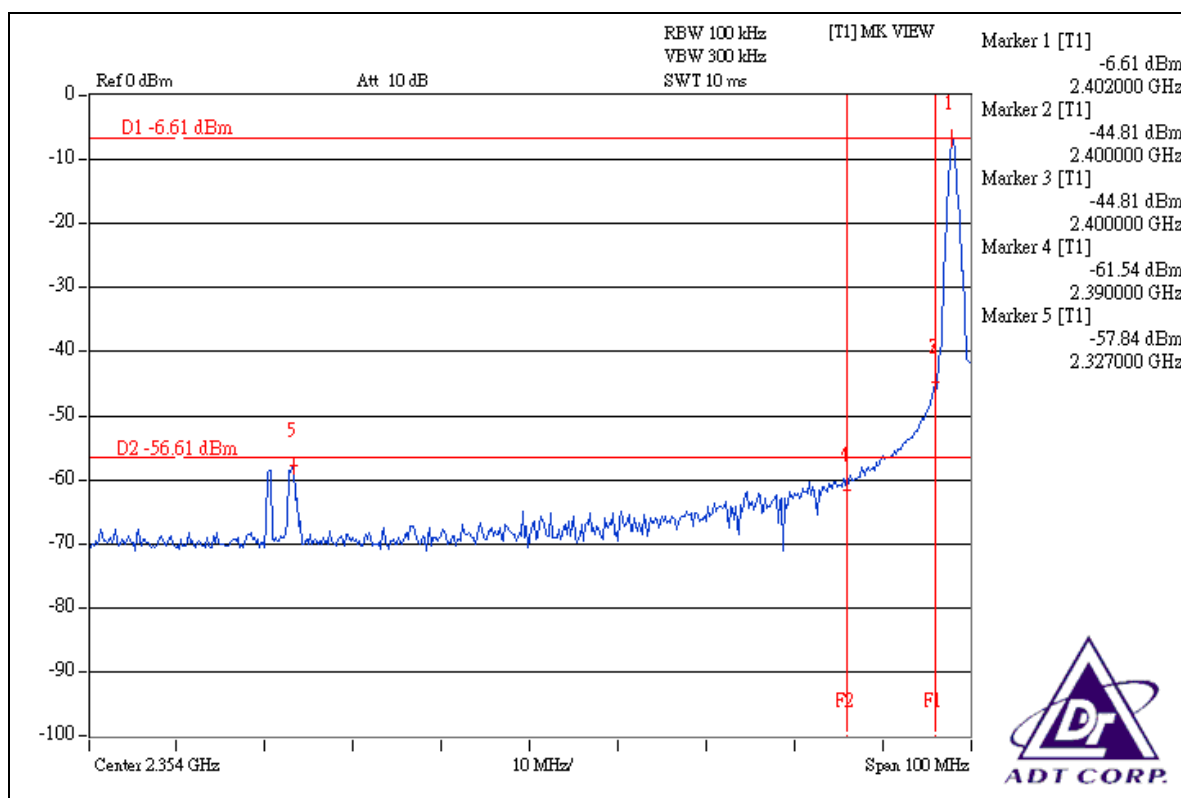
No deviation

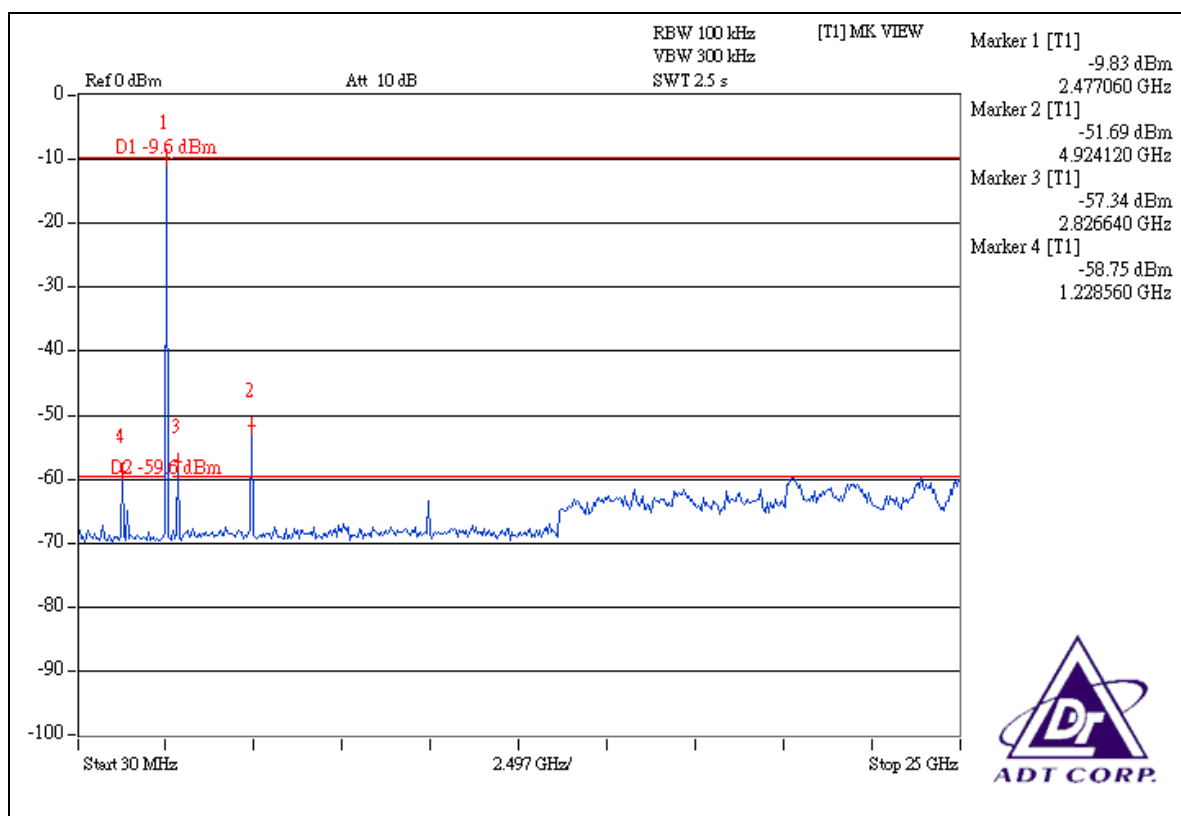
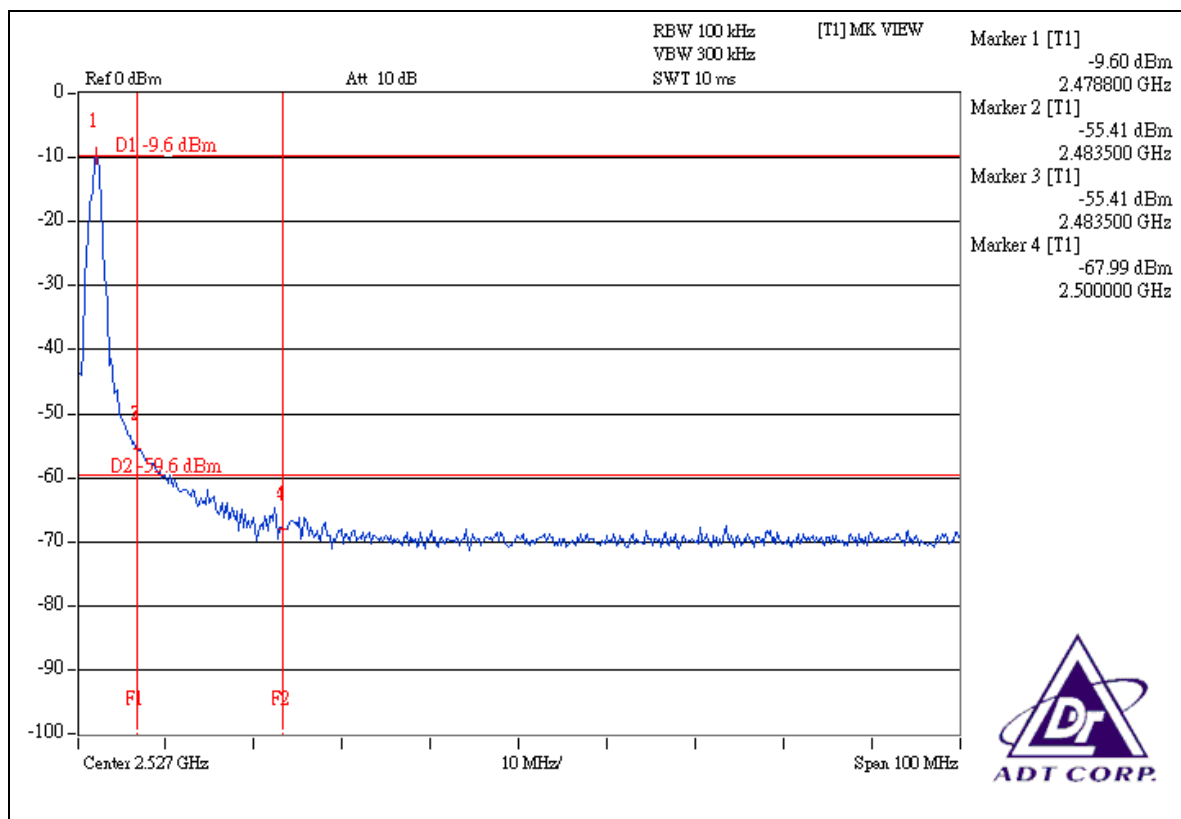
4.4.5 EUT OPERATING CONDITION

Same as Item 4.2.6

4.4.6 TEST RESULTS

The spectrum plots are attached on the following 4 images. D1 line indicates the highest level, and D2 line indicates the 50dB offset below D1. It shows compliance with the requirement in part 15.249(d).





5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6. INFORMATION ON THE TESTING LABORATORIES

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

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

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

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

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

--- END ---