FCC TEST REPORT

REPORT NO.: RF920619R10
MODEL NO.: TSBQ-2401
RECEIVED: June 17, 2003
TESTED: August 22, 2003

APPLICANT: TopSeed Technology Corp.

ADDRESS: 9F-3, No.16, Jain Ba Rd., Chung Ho City, Taipei Hsien, Taiwan 235, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chiapau Tsun, Linko, Taipei, Taiwan, R.O.C.

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ILAC MRA

Lab Code: 200102-0

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1 CERTIFICATION

PRODUCT :	2.4GHz Wireless Remote Pointer
MODEL NO.:	TSBQ-2401
BRAND:	TopSeed
APPLICANT :	TopSeed Technology Corp.
TEST ITEM:	ENGINEERING SAMPLE
STANDARDS :	47 CFR Part 15, Subpart C (Section 15.249), ANSI C63.4-1992

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility on August 22, 2003. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

PREPARED BY: _____ , **DATE:** August 26, 2003
Stephanie Hung

APPROVED BY: _____ , **DATE:** August 26, 2003
Dr.Alan Lane JVP

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**REMARK**
15.207	Conducted Emission Test	N/A	NA
15.249	Radiated Emission Test	PASS	Minimum passing margin is –6.20dB at 4960.00MHz
15.249	Band edge Test	PASS	Meet the requirement of limit

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	2.4GHz Wireless Remote Pointer
MODEL NO.	TSBQ-2401
BRAND	TopSeed
POWER SUPPLY	3.0VDC from batteries for TX 5.0VDC from host equipment for RX
MODULATION TYPE	FSK
TRANSFER RATE	10Kbps
FREQUENCY RANGE	2.405 GHz ~2.480GHz
NUMBER OF CHANNEL	16
ANTENNA TYPE	Printed Antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is the transmitter part of 2.4GHz Wireless Remote Pointer.
2. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Sixteen channels are provided in the EUT

Channel	Frequency	Channel	Frequency
1	2405 MHz	9	2445 MHz
2	2410 MHz	10	2450 MHz
3	2415 MHz	11	2455 MHz
4	2420 MHz	12	2460 MHz
5	2425 MHz	13	2465 MHz
6	2430 MHz	14	2470 MHz
7	2435 MHz	15	2475 MHz
8	2440 MHz	16	2480 MHz

NOTE:

1. Below 1000MHz, the channel1, 8, 16 were pre-tested in chamber. The channel 16,worst case one, was chosen for final test.
2. Above 1000MHz, the channel 1, 8, 16 were tested individually.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a 2.4GHz Wireless Remote Pointer. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 15, Subpart C. (15.249)
ANSI C63.4 : 1992

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

3.4 DESCRIPTION OF SUPPORT UNITS

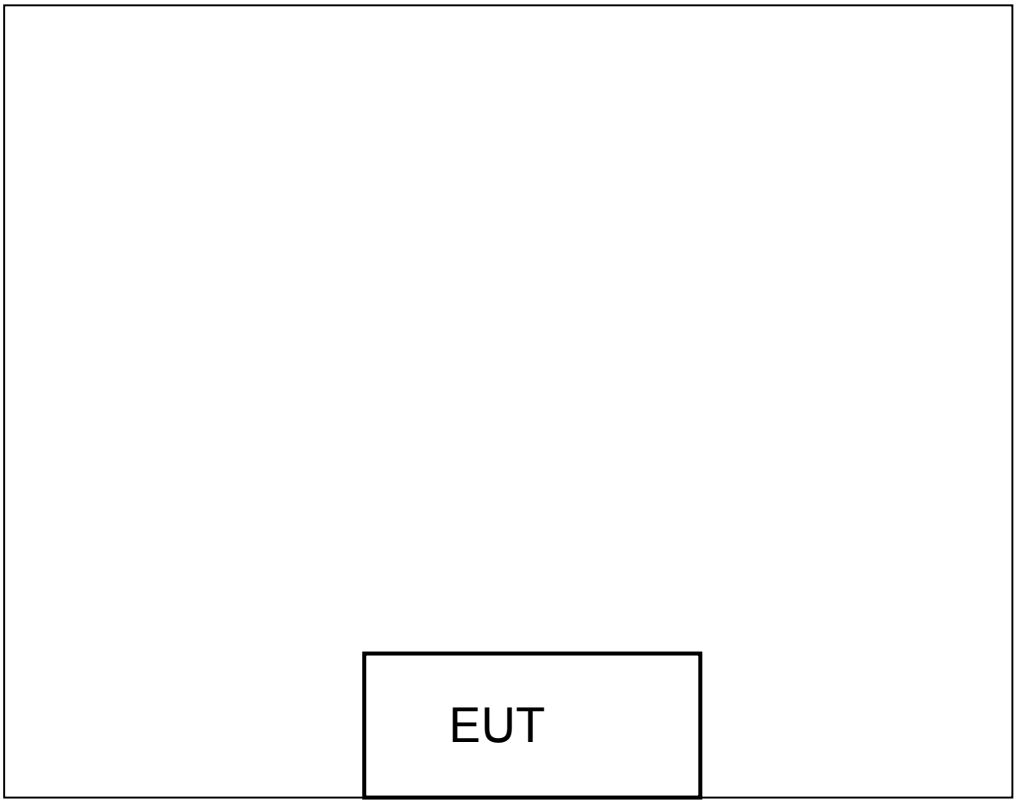
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	Dell	PP01L	TW-09C748-12800-16M-5064	DoC
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	NA
2	1.2m 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).

3.5 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The field strength of emission from fundamental frequency shall comply with the followng:

Frequencies (MHz)	Field strength (dBuV/m)	
	Peak	Average
2400 ~ 2483.5	114	94

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.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
*HP Spectrum Analyzer	8590L	3520A00667	Aug. 26, 2003
*CHASE Preamplifier	CPA9231A/4	3215	Nov. 06, 2003
* HP Preamplifier	8449B	3008A01201	Dec. 01, 2003
* HP Preamplifier	8449B	3008A01292	August 12, 2004
* ROHDE & SCHWARZ TEST RECEIVER	ESVS10	846285/012	Sept. 16, 2003
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Feb. 13, 2004
SCHAFFNER Tunable Dipole Antenna	VHBA 9123	459	Nov. 22, 2003
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* CHASE BILOG Antenna	CBL6112B	2751	March 21, 2004
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	June 30, 2004
* EMCO Horn Antenna	3115	9312-4192	Mar. 23 2004
* CHANCE Turn Table & Tower Controller	ACS-I	NA	NA
* Software	ADT_Radiated_V5.14	NA	NA
* ANRITSU RF Switches	MP59B	M51167	Aug. 20, 2004
* TIMES RF cable	LMR-600	CABLE-ST6-01	Aug. 20, 2004

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. "*" = These equipment are used for the final measurement.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The test was performed in ADT Open Site No. 6.
5. The VCCI Site Registration No. is R-728.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

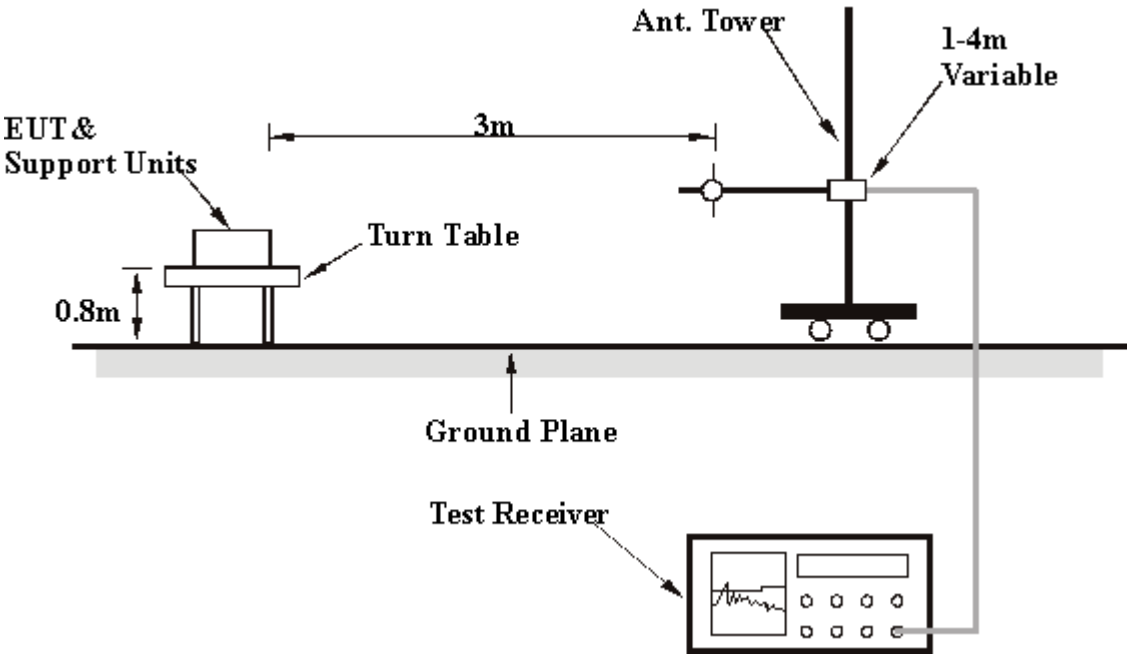
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at low, middle and highest channel frequencies individually.

4.1.7 TEST RESULTS

EUT	2.4GHz Wireless Remote Pointer	**MODEL**	TSBQ-2401
MODE	Channel 16	**FREQUENCY RANGE**	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Quasi-Peak
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH, 991hPa	**TESTED BY**: Steven Lu	

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	31.94	24.3 QP	40.00	-15.70	1.50 H	286	11.30	13.00
2	43.61	19.1 QP	40.00	-20.90	1.50 H	142	4.60	14.50
3	632.61	23.2 QP	46.00	-22.80	1.00 H	172	0.20	23.00
4	708.42	24.3 QP	46.00	-21.70	1.50 H	250	0.10	24.20
5	828.94	26.0 QP	46.00	-20.00	1.25 H	61	0.00	25.90
6	947.52	27.1 QP	46.00	-18.90	1.50 H	40	-0.60	27.70

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	31.94	21.7 QP	40.00	-18.30	1.00 V	13	8.80	13.00
2	45.55	21.8 QP	40.00	-18.20	1.00 V	97	7.30	14.50
3	640.38	23.9 QP	46.00	-22.10	1.50 V	271	0.80	23.10
4	743.41	24.6 QP	46.00	-21.40	1.50 V	334	-0.50	25.20
5	792.00	25.4 QP	46.00	-20.60	1.50 V	250	-0.10	25.60
6	840.60	25.7 QP	46.00	-20.30	1.25 V	19	-0.40	26.00

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	2.4GHz Wireless Remote Pointer	**MODEL**	TSBQ-2401
CHANNEL	Channel 1	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz		
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH, 991hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY: Steven Lu			

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	*2405.00	90.6 PK	114.00	-23.40	1.54 H	212	59.00	31.50
1	*2405.00	80.2 AV	94.00	-13.83	1.54 H	212	48.57	31.50
2	4810.00	55.6 PK	74.00	-18.40	1.27 H	351	17.20	38.40
2	4810.00	45.2 AV	54.00	-8.83	1.27 H	351	6.77	38.40

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	*2405.00	87.7 PK	114.00	-26.30	1.21 V	167	56.20	31.50
1	*2405.00	77.3 AV	94.00	-16.70	1.21 V	167	45.77	31.50
2	4810.00	53.9 PK	74.00	-20.10	1.78 V	202	15.50	38.40
2	4810.00	43.5 AV	54.00	-10.53	1.78 V	202	5.07	38.40

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.
6. The average value of fundamental frequency and harmonic frequency is: Average = Peak value + 20log(Duty cycle), Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log\frac{12.40\text{ms}}{41.20\text{ms}} = -10.43\text{dB}$$

please see page 15 for the plotter

EUT	2.4GHz Wireless Remote Pointer	**MODEL**	TSBQ-2401
CHANNEL	Channel 8	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz		
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH, 991hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY: Steven Lu			

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3M

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	*2440.00	89.8 PK	114.00	-24.70	1.16 H	360	58.20	31.60
1	*2440.00	79.4 AV	94.00	-14.60	1.16 H	360	47.77	31.60
2	4880.00	56.2 PK	74.00	-17.80	1.13 H	0	17.70	38.50
2	4880.00	45.8 AV	54.00	-8.23	1.13 H	0	7.27	38.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3M

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	*2440.00	88.3 PK	114.00	-25.70	1.14 V	161	56.70	31.60
1	*2440.00	77.9 AV	94.00	-16.10	1.14 V	161	46.27	31.60
2	4880.00	57.0 PK	74.00	-17.00	1.56 V	205	18.50	38.50
2	4880.00	46.6 AV	54.00	-7.40	1.56 V	205	8.07	38.50

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.
6. . The average value of fundamental frequency and harmonic frequency is: Average = Peak value +20(Duty cycle), Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log\frac{12.40\text{ms}}{41.20\text{ms}} = -10.43\text{dB}$$

please see page 15 for the plotter

EUT	2.4GHz Wireless Remote Pointer	**MODEL**	TSBQ-2401
CHANNEL	Channel 16	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz		
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH, 991hPa	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
TESTED BY: Steven Lu			

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3M

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	87.9 PK	114.00	-26.10	1.15 H	338	56.10	31.80
1	*2480.00	77.5 AV	94.00	-16.50	1.15 H	338	45.67	31.80
2	4960.00	58.2 PK	74.00	-15.80	1.02 H	27	19.70	38.50
2	4960.00	47.8 AV	54.00	-6.20	1.02 H	27	9.27	38.50

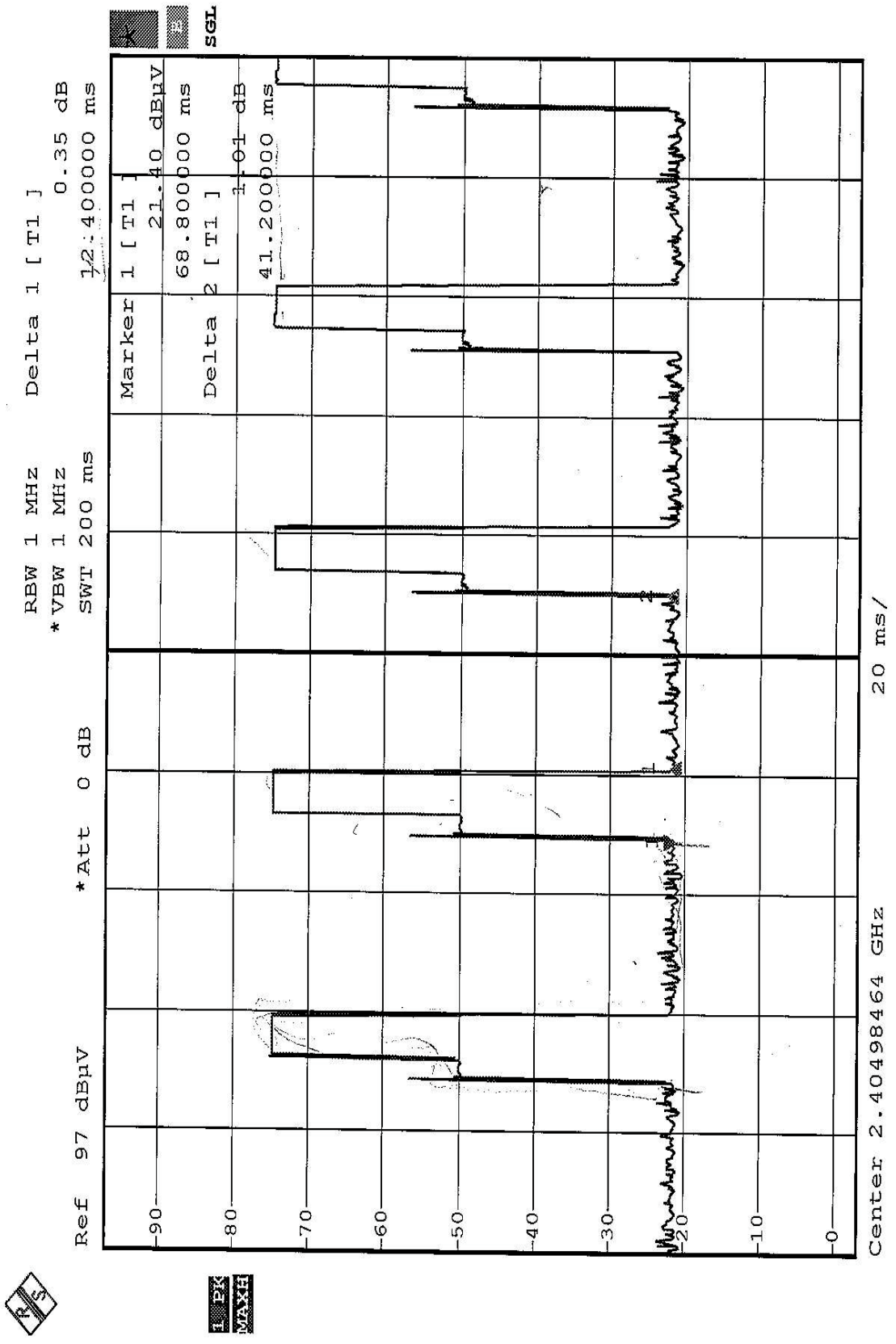
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3M

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	86.2 PK	114.00	-27.80	1.16 V	330	54.40	31.80
1	*2480.00	75.8 AV	94.00	-18.20	1.16 V	330	43.97	31.80
2	4960.00	57.2 PK	74.00	-16.80	1.55 V	241	18.70	38.50
2	4960.00	46.8 AV	54.00	-7.20	1.55 V	241	8.27	38.50

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.
6. The average value of fundamental frequency and harmonic frequency is: Average = Peak value + 20log(Duty cycle), Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log\frac{12.40\text{ms}}{41.20\text{ms}} = -10.43\text{dB}$$

please see page 15 for the plotter.


RBW 1 MHz
*VBW 1 MHz
SWT 200 ms
Delta 1 [T1]
0.35 dB
12.400000 ms
*Att 0 dB
Ref 97 dBµV
Marker 1 [T1]
21.40 dBµV
68.800000 ms
Delta 2 [T1]
1.01 dB
41.200000 ms
SGL
1 PK MAXH
Center 2.40498464 GHz
20 ms/
90
80
70
60
50
40
30
20
10
0

4.3 BAND EDGES MEASUREMENT

4.3.1 LIMITS OF BAND EDGES MEASUREMENT

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

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	August 12, 2004

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST PROCEDURE

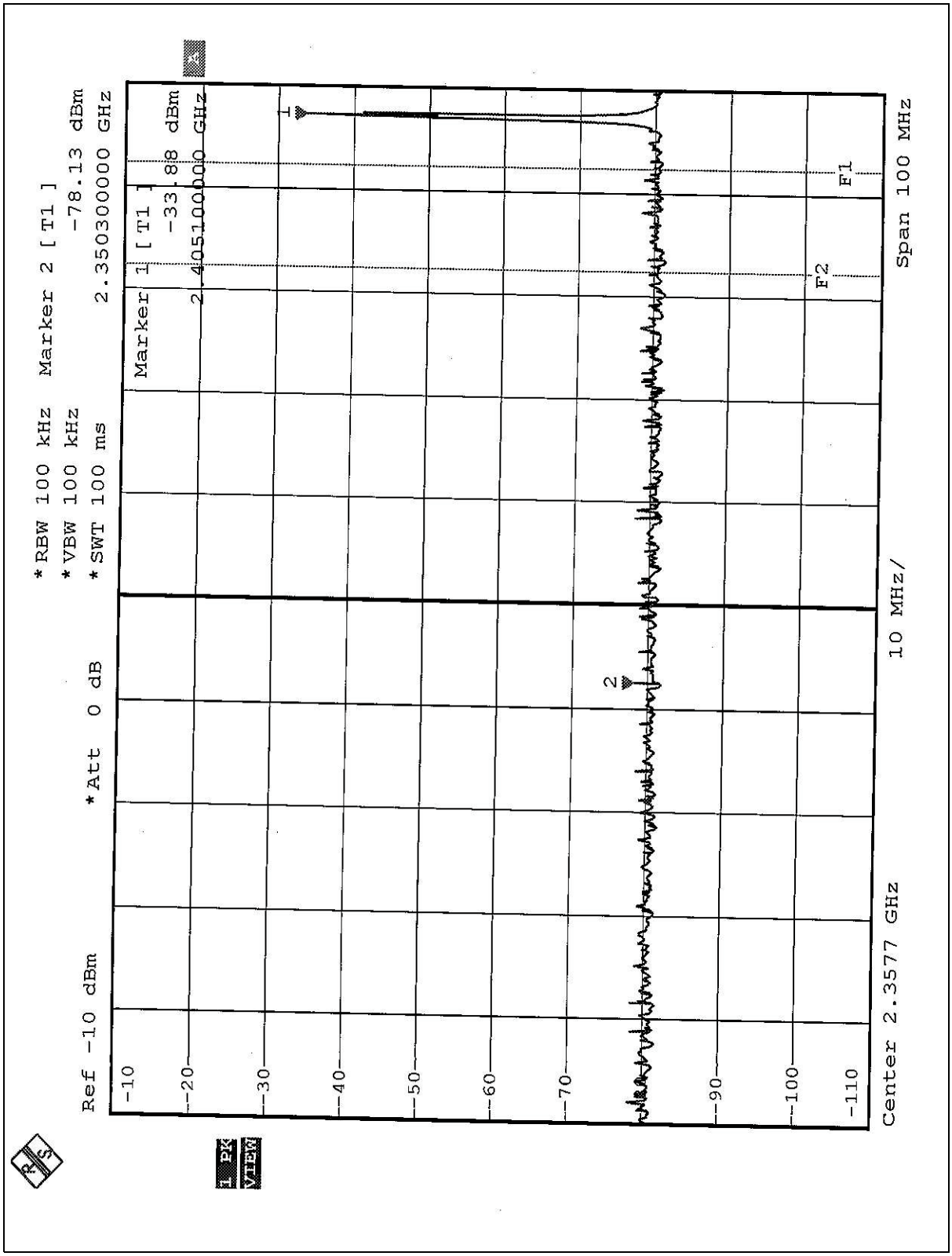
The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

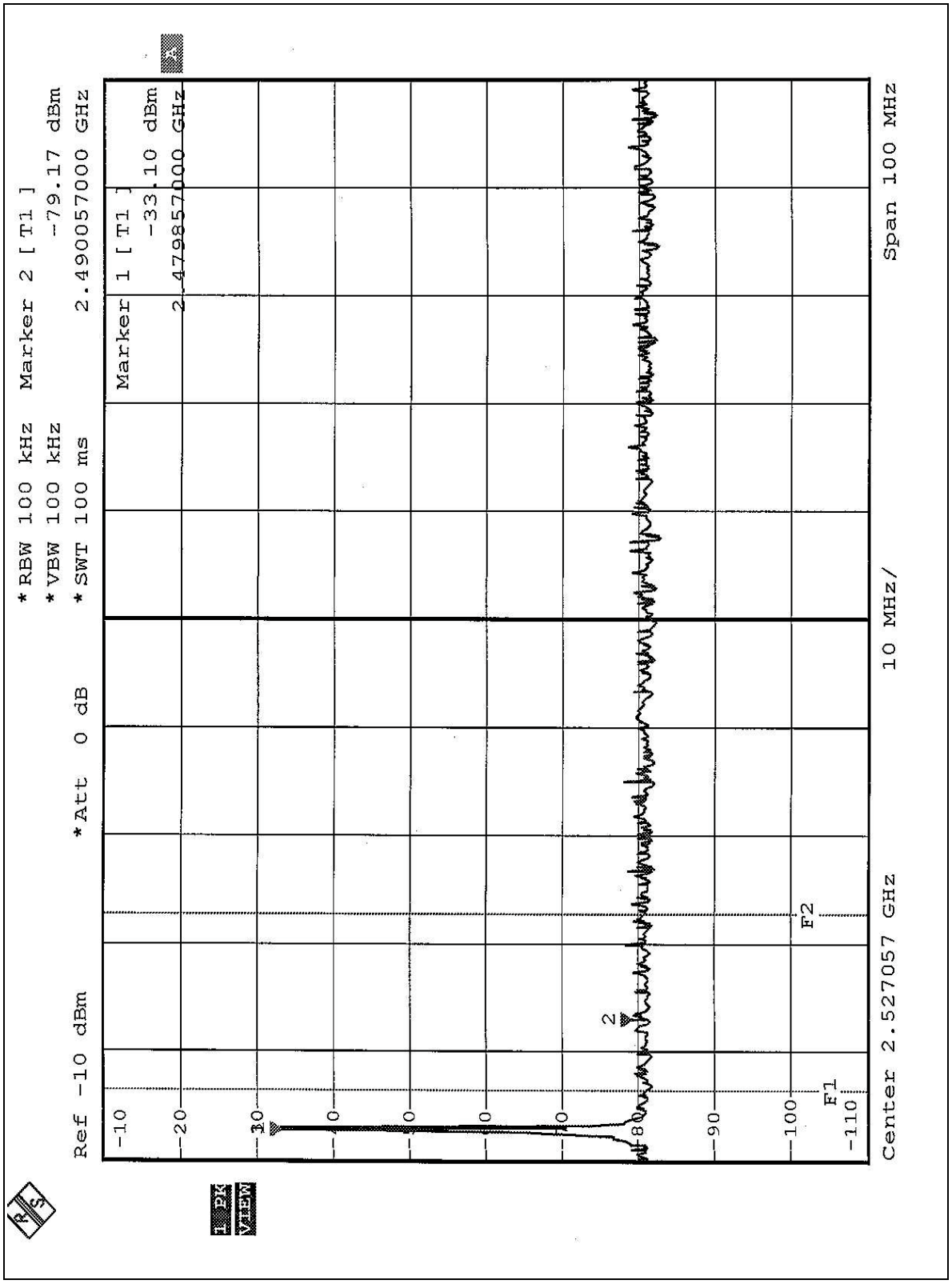
4.3.4 EUT OPERATING CONDITION

Same as Item 4.3.5

4.3.5 TEST RESULTS

The spectrum plots are attached on the following 1 page. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.249(C).


Ref -10 dBm
*Att 0 dB
*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 2 [T1]
-78.13 dBm
2.35030000 GHz
Marker 1 [T1]
-33.88 dBm
2.40510000 GHz
Center 2.3577 GHz
10 MHz/
Span 100 MHz
F1
F2
1 PK VIEW
-10
-20
-30
-40
-50
-60
-70
-90
-100
-110


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 2 [T1]
-79.17 dBm
2.490057000 GHz
Marker 1 [T1]
-33.10 dBm
2.479857000 GHz
Ref -10 dBm
*Att 0 dB
Center 2.527057 GHz
10 MHz/
Span 100 MHz
F1
F2
MKR
MKR

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST

6 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
R.O.C.	BSMI, DGT, CNLA

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:

Lin Kou EMC Lab:
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Fax: 886-2-26052943

Hsin Chu EMC Lab:
Tel: 886-35-935343
Fax: 886-35-935342

Lin Kou Safety Lab:
Tel: 886-2-26093195
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Lin Kou RF&Telecom Lab
Tel: 886-3-3270910
Fax: 886-3-3270892

Email: service@mail.adt.com.tw
Web Site: www.adt.com.tw

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