FCC TEST REPORT

REPORT NO.: RF910118R09
MODEL NO.: TSAZ-002
RECEIVED: Jan. 18, 2002
TESTED: Jan. 21, 2002

APPLICANT: TopSeed Technology Corp.

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

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chia Pau Tsuen, Linkou Hsiang, Taipei, Taiwan, R.O.C.

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ILAC MRA
0528

Lab Code: 200102-0

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1 CERTIFICATION

PRODUCT :	RF Keyboard
BRAND NAME :	TopSeed
MODEL NO :	TSAZ-002
APPLICANT :	TopSeed Technology Corp.
STANDARDS :	47 CFR Part 15, Subpart C(15.249) ANSI C63.4-1992, Canada RSS 210

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility on Jan. 21, 2002. 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.

TESTED BY: Gary Chang , DATE: Jan. 31, 2002
Gary Chang

CHECKED BY: Demi Chen , DATE: Jan. 31, 2002
Demi Chen

APPROVED BY: Alan Lane , DATE: Jan. 31, 2002
Dr. Alan Lane
Manager

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
STANDARD PARAGRAPH	**TEST TYPE**	**RESULT**	**REMARK**
15.207	Conducted Emission Test	NA	Power supply is 3VDC from batteries
15.249(C)	Radiated Emission Test	PASS	Minimum passing margin is –2.1dBuV at 1824.00 MHz
15.249(C)	Band edge Test	PASS	NA

NOTE: The receiver part to communicate with the EUT has been verified to comply with FCC Part 15, Subpart B, Class B (DoC). The test report can be provided upon request.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	RF Keyboard
MODEL NO.	TSAZ-002
POWER SUPPLY	3VDC from battery
MODULATION TYPE	FSK
CARRIER FREQUENCY OF EACH CHANNEL	912MHz
BANDWIDTH OF EACH CHANNEL	1MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Integral antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is the transmitter part of a RF Keyboard.
2. For more detailed features description of the EUT, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF TEST MODES

One channel was provided in this EUT.

Channel	Frequency	Channel	Frequency
1	912MHz		

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC CFR 47 Part 15, Subpart C (15.249)

ANSI C63.4-1992, Canada RSS 210

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

3.4 DESCRIPTION OF SUPPORT UNITS

NA

4 TEST PROCEDURE AND RESULT

4.1 CONDUCTED EMISSION MEASUREMENT

NA

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.249 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	
902-928	Peak	Average
	114	94

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Other Frequencies (MHz)	Field Strength of Fundamental	
	uV/meter	dBuV/meter
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

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 INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8590L	3544A01176	May 7, 2002
* HP Preamplifier	8447D	2944A08485	May 7, 2002
* HP Preamplifier	8449B	3008A01201	Dec. 06, 2002
* HP Preamplifier	8449B	3008A01292	Aug. 21, 2002
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Jan. 25, 2002
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 23, 2002
* CHASE BILOG Antenna	CBL6112A	2221	Aug. 2, 2002
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 6, 2002
* EMCO Horn Antenna	3115	9312-4192	April 15, 2002
* EMCO Turn Table	1060	1115	NA
* SHOSHIN Tower	AP-4701	A6Y005	NA
* Software	AS61D4	NA	NA
* ANRITSU RF Switches	MP59B	M35046	Aug. 2, 2002
* TIMES RF cable	LMR-600	CABLE-ST5-01	Aug. 2, 2002
Open Field Test Site	Site 5	ADT-R05	July 28, 2002
VCCI Site Registration No.	Site 5	R-1039	NA

NOTE: 1. The measurement uncertainty is less than +/- 3.0dB, 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.

3. "*" = These equipment are used for the final measurement.

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

4.2.3 TEST PROCEDURE

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.

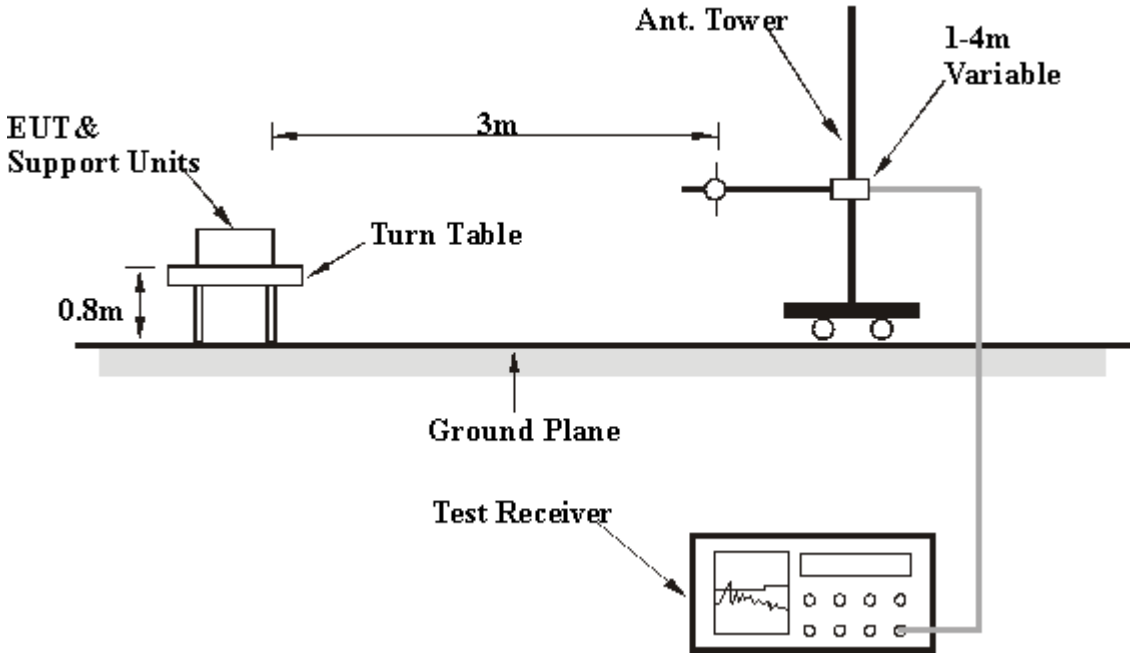
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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 the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.

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.

4.2.4 TEST SETUP



For the actual test configuration, please refer to the related item in this test report - Photographs of the Test Configuration.

4.2.5 EUT OPERATING CONDITION

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

4.2.6 TEST RESULT

EUT	RF Keyboard	**MODEL**	TSAZ-002
FREQUENCY RANGE	30-1000 MHz		
INPUT POWER	3VDC	**DETECTOR FUNCTION**	Quasi-Peak / Peak
ENVIRONMENTAL CONDITIONS	16 deg. C, 70 % RH, 1050 hPa	**TESTED BY**: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	137.40	29.5 QP	43.50	-14.00	1.04H	281	17.40	10.95	1.15	0.00	-12.10
2	217.40	29.7 QP	46.00	-16.30	1.09H	92	18.20	9.97	1.50	0.00	-11.47
3	314.20	30.4 QP	46.00	-15.60	1.10H	242	15.00	13.48	1.92	0.00	-15.40
4	*911.98	88.7 PK	114.00	-25.30	1.46H	297	91.16	20.90	3.63	27.00	2.46
5	*911.98	86.5 QP	94.00	-7.50	1.46H	297	61.95	20.90	3.63	0.00	-24.54.
6	926.25	37.7 QP	46.00	-8.30	1.34H	71	13.00	21.02	3.69	0.00	-24.72

NOTE:
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
2. Correction Factor(dB) = Pre-Amplifier Factor (dB) - Antenna Factor (dB) - Cable Factor (dB)
3. Pre-Amplifier Factor (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
4. The other emission levels were very low against the limit.
5. Margin value = Emission level – Limit value.
6. “*” = Fundamental frequency

EUT	RF Keyboard	**MODEL**	TSAZ-002
FREQUENCY RANGE	30-1000 MHz		
INPUT POWER	3VDC	**DETECTOR FUNCTION**	Quasi-Peak / Peak
ENVIRONMENTAL CONDITIONS	16 deg. C, 70 % RH, 1050 hPa	**TESTED BY**: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M											
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	120.70	31.7 QP	43.50	-11.80	1.03V	124	19.00	11.65	1.08	0.00	-12.73
2	143.70	29.2 QP	43.50	-14.30	1.20V	193	17.40	10.58	1.18	0.00	-11.76
3	216.80	29.6 QP	46.00	-16.40	1.08V	53	18.10	9.97	1.50	0.00	-11.48
4	911.99	84.1 PK	114.00	-29.90	1.98V	6	86.60	20.90	3.63	27.00	2.46
5	911.98	82.5 QP	94.00	-11.50	1.98V	6	58.00	20.90	3.63	0.00	-24.54.
6	926.23	36.7 QP	46.00	-9.30	1.05V	337	12.00	21.02	3.69	0.00	-24.73

NOTE:
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
2. Correction Factor(dB) = Pre-Amplifier Factor (dB) - Antenna Factor (dB) - Cable Factor (dB)
3. Pre-Amplifier Factor (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
4. The other emission levels were very low against the limit.
5. Margin value = Emission level – Limit value.
6. “*” = Fundamental frequency

EUT	RF Keyboard	MODEL	TSAZ-002
MODE	Channel 1	FREQUENCY RANGE	Above 1 GHz
INPUT POWER	3VDC	DETECTOR FUNCTION	Peak / Average
ENVIRONMENTAL CONDITIONS	16 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	1824.00	53.7 PK	74.00	-20.30	1.32H	326	57.80	25.29	5.67	35.05	4.09
2	1824.00	51.7 AV	54.00	-2.30	1.32H	326	55.80	25.29	5.67	35.05	4.09
3	2736.00	49.5 PK	74.00	-24.50	1.46H	300	51.20	28.09	5.21	34.95	1.65
4	3648.00	51.8 PK	74.00	-22.20	1.44H	68	51.40	28.91	6.26	34.72	-0.44

NOTE:
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
2. Correction Factor(dB) = Pre-Amplifier Factor (dB) - Antenna Factor (dB) - Cable Factor (dB)
3. Pre-Amplifier Factor (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
4. The other emission levels were very low against the limit.
5. Margin value = Emission level – Limit value.

EUT	RF Keyboard	MODEL	TSAZ-002
MODE	Channel 1	FREQUENCY RANGE	Above 1 GHz
INPUT POWER	3VDC	DETECTOR FUNCTION	Peak / Average
ENVIRONMENTAL CONDITIONS	16 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M											
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	1824.00	53.9 PK	74.00	-20.10	1.29V	15	58.00	25.29	5.67	35.05	4.09
2	1824.00	51.9 AV	54.00	-2.10	1.29V	15	56.00	25.29	5.67	35.05	4.09
3	2736.00	50.3 PK	74.00	-23.70	1.21V	30	52.00	28.09	5.21	34.95	1.65
4	3647.00	51.4 PK	74.00	-22.60	1.38V	37	51.00	28.91	6.26	34.72	-0.44

NOTE:
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
2. Correction Factor(dB) = Pre-Amplifier Factor (dB) - Antenna Factor (dB) - Cable Factor (dB)
3. Pre-Amplifier Factor (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
4. The other emission levels were very low against the limit.
5. Margin value = Emission level – Limit value.

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	July 17, 2002

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

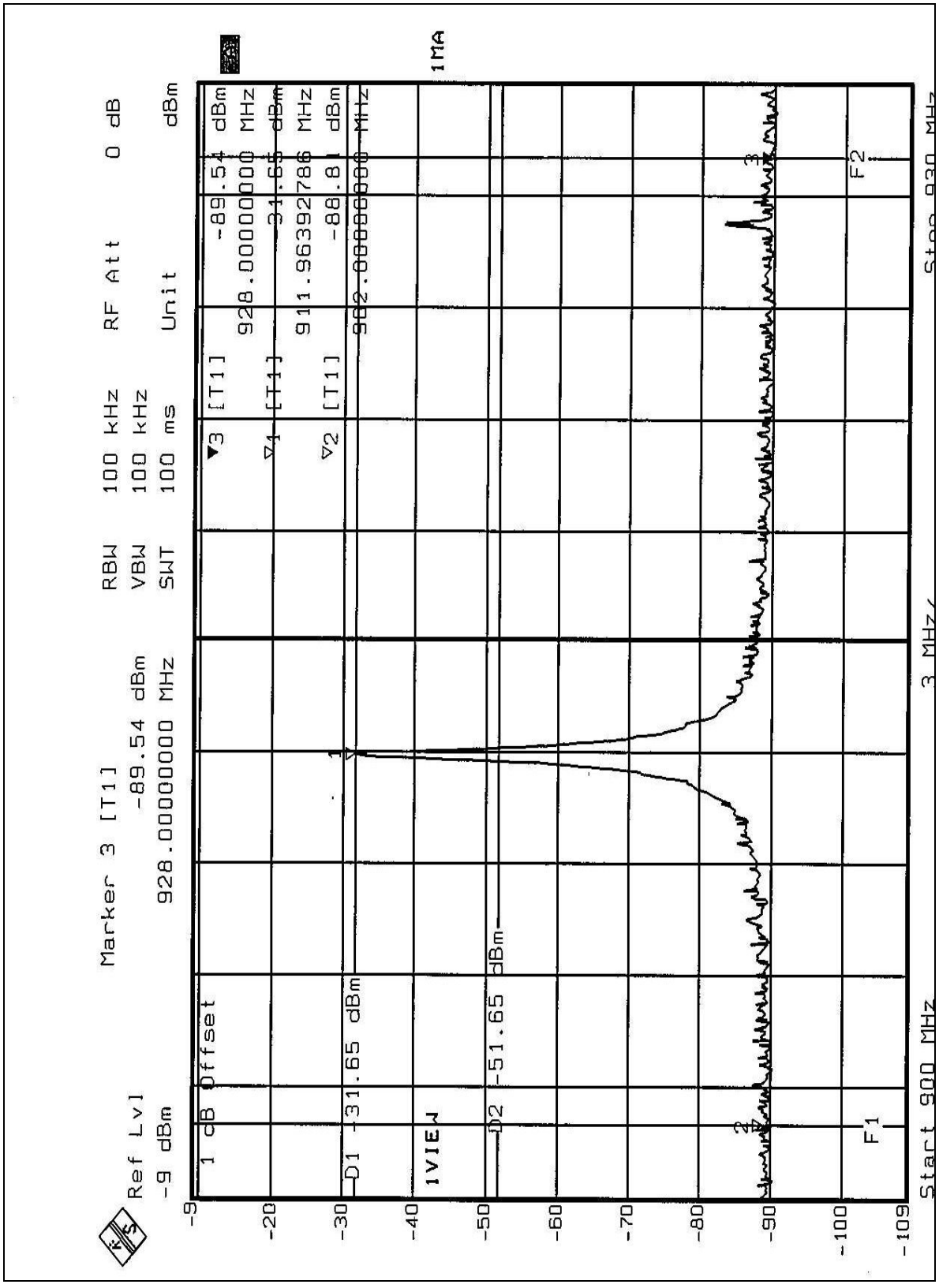
The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 kHz bandwidth from band edge. The band edges was measured and recorded.

4.3.4 EUT OPERATING CONDITION

Same as Item 3.4.5

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 Lvl
-9 dBm
1 dB Offset
Marker 3 [T1]
-89.54 dBm
928.00000000 MHz
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 0 dB
Unit dBm
▼3 [T1]
-89.54 dBm
928.00000000 MHz
▽1 [T1]
-31.65 dBm
911.96392786 MHz
▽2 [T1]
-88.81 dBm
902.00000000 MHz
1MA
1VIEW
D1 -31.65 dBm
D2 -51.65 dBm
F1
F2
Start 900 MHz
3 MHz/
Stop 930 MHz

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