

# FCC TEST REPORT

**REPORT NO.:** RF901206R01

**MODEL NO.:** GWT-4A

**RECEIVED:** Dec. 6, 2001

**TESTED:** Feb. 21 ~ Feb. 27, 2002

**APPLICANT:** GRAND WING SERVEO-TECH CO., LTD.

**ADDRESS:** 4F, No. 183, SEC 1., TA-TUNG RD., HIS CHIH CHEN,  
TAIPEI HSIEN 221 , 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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0528  
ILAC MRA



Lab Code: 200102-0

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## 1 CERTIFICATION

**PRODUCT :** Remote Control  
**BRAND NAME :** GWS  
**MODEL NO. :** GWT-4A  
**APPLICANT :** GRAND WING SERVO-TECH CO., LTD.  
**STANDARDS :** 47 CFR Part 95, Subpart C  
47 CFR Part 95, Subpart E  
47 CFR Part 2, Subpart J  
EIA/TIA 603

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from Feb. 21, 2002 to Feb. 27, 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: Mar. 7, 2002  
Gary Chang

CHECKED BY: Demi Chen, DATE: Mar. 7, 2002  
Demi Chen

APPROVED BY: Alan Lane, DATE: Mar. 7, 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 95			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
95.210 (a) 95.635	Radiated Emission Test	PASS	Meet the requirement of limit Minimum passing margin is -1.12dBm at 652.23MHz
95.623 (c)	Frequency Stability Test	PASS	Meet the requirement of limit
95.633 (b)	Emission Bandwidth Test	PASS	Meet the requirement of limit
95.631 (b)	Modulation Characteristics Test	PASS	Meet the requirement of limit
95.651	Crystal Access Restrictions Test	PASS	Meet the requirement of limit

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Remote Control
<b>MODEL NO.</b>	GWT-4A
<b>POWER SUPPLY</b>	12VDC from batteries 1.5V x 8 (AA size)
<b>MODULATION TYPE</b>	PPM
<b>CARRIER FREQUENCY OF EACH CHANNEL</b>	72.47MHz
<b>MAXIMUM OUTPUT POWER</b>	87.70mW
<b>BANDWIDTH OF EACH CHANNEL</b>	8KHz
<b>NUMBER OF CHANNEL</b>	1
<b>ANTENNA TYPE</b>	Dipole Antenna
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	NA
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:**

- 1.The EUT is a 72MHz radio control transmitter for aircraft operation.
- 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	72MHz		

### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

**47 CFR Part 95, Subpart C**

**47 CFR Part 95, Subpart E**

**47 CFR Part 2, Subpart J**

**EIA/TIA 603**

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 RADIATED EMISSIONS MEASUREMENT**

#### **4.1.1 LIMITS OF FUNDAMENTAL FREQUENCY MEASUREMENT**

The maximum transmitter output power is 0.75 W.

#### **4.1.2 LIMITS OF UNWANTED RADIATED EMISSIONS MEASUREMENT**

The unwanted emissions should be less than the transmitter field strength by at least  $56 + 10 \log (TP)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

#### 4.1.3 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. 27, 2003
* SCHWARZBECK Tunable Dipole Antenna	VHAP UHAP	896/897 879/880	Mar. 07, 2003
* CHASE BILOG Antenna	CBL6112A	2221	Aug. 2, 2002
SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 6, 2002
EMCO Horn Antenna	3115	9312-4192	April 9, 2003
AP Attenuator	8496B	3247A18505	Mar. 11, 2003
* 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
R&S SIGNAL GENERATOR	SMP04	100011	Apr. 29, 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 if tested.



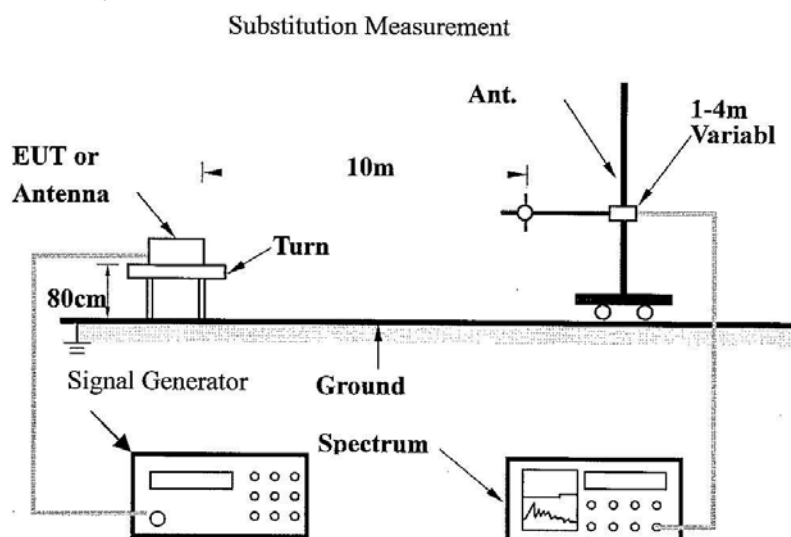
#### 4.1.4 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 1.5 meters away from the receiving antenna, which was mounted on antenna tower and its position at 1.5 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step 1-6 for horizontal polarization.

**NOTE:**

1. The resolution bandwidth of spectrum analyzer is 10 kHz and the video bandwidth is 300 kHz for spurious emission below 1GHz.
2. The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for spurious emission above 1GHz.
3. The resolution bandwidth of spectrum analyzer is 100kHz and the video bandwidth is 100kHz for the transmitter output measurement,.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITION

Enable the EUT under transmission condition continuously at specific channel frequencies individually.

## 4.1.7 TEST RESULT

<b>EUT</b>	Remote Control	<b>MODEL</b>	GWT-4A
<b>MODE</b>	72.47MHz	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>INPUT POWER</b>	12VDC	<b>DETECTOR FUNCTION</b>	Peak
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 70 % RH, 1050 hPa	<b>TESTED BY:</b> Gary Chang	

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 10 M</b>						
No.	Freq. (MHz)	Reading Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	*72.47	-10.69	30.12	19.43	28.75	-9.32
2	144.94	-65.45	34.20	-31.25	-26.00	-5.25
3	217.41	-76.16	30.14	-46.02	-26.00	-20.02
4	362.35	-82.36	36.48	-45.88	-26.00	-19.88
5	434.82	-84.77	40.84	-43.93	-26.00	-17.93
6	507.29	-85.23	46.00	-39.23	-26.00	-13.23
7	579.76	-78.67	56.20	-22.47	-26.00	-3.53
8	652.23	-71.31	44.19	-27.12	-26.00	-1.12
9	724.70	-82.86	43.87	-38.99	-26.00	-12.99

<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 10 M</b>						
No.	Freq. (MHz)	Reading Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	*72.47	-12.88	30.15	17.27	28.75	-11.48
2	144.94	-61.51	33.26	-28.25	-26.00	-2.28
3	217.41	-78.87	32.52	-46.35	-26.00	-20.35
4	362.35	-84.88	36.38	-48.50	-26.00	-22.50
5	652.23	-74.61	44.05	-30.56	-26.00	-4.56

**NOTE:**

1. "\*" = Fundamental frequency.
2. Emission level = Raw Value + Correction Factor
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Limit of Unwanted Radiation:  
The transmitter output power (ERP) in watts was calculated to be 87.70mW.  
Limit=19.43-(56+10log0.0877)=-26dBm.

## 4.2 FREQUENCY STABILITY

### 4.2.1 LIMIT OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.002% of the operating frequency over a temperature variation of -30 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.

### 4.2.2 TEST INSTRUMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ANRITSU SPECTRUM ANALYZER	MS2667C	M10281	Mar 12, 2002
WIT STANDARD TEMPERATURE AND	TH-4S-C	W901030	Jun 12, 2002

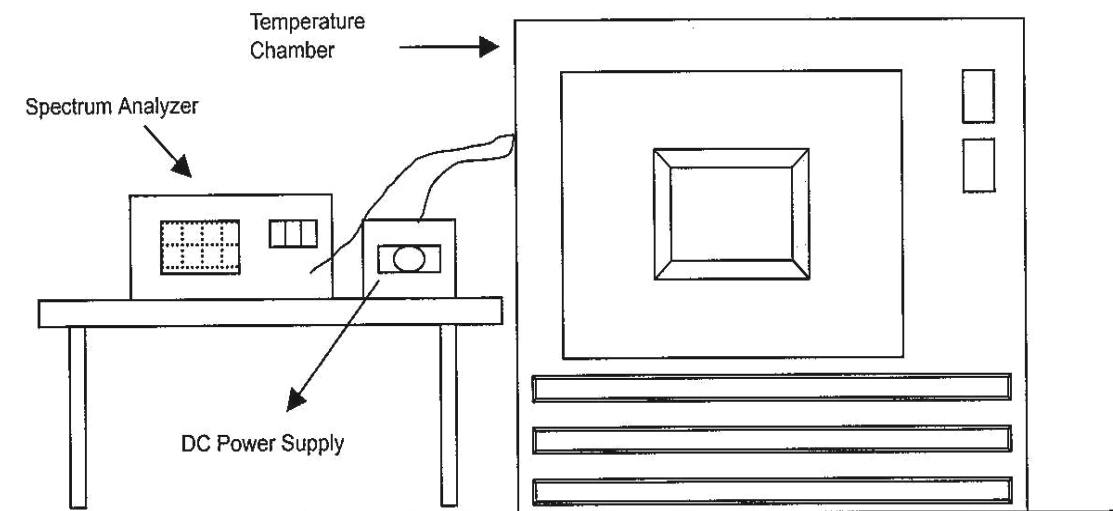
#### NOTES:

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.

#### 4.2.3 TEST PROCEDURE

- The EUT was situated inside the environmental test chamber and supply the EUT with nominal DC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

#### 4.2.4 TEST SETUP



#### 4.2.5 EUT OPERATING CONDITION

The EUT was set to enable EUT under transmission condition continuously at specific channel frequency.

## 4.2.6 TEST RESULT

Reference Frequency: 72.468MHz		LIMITS: $\pm 0.002\%$					
Temp. (°C)	Power (VDC)	Frequency Measured (MHz) and Frequency Deviation (%)					
		2 minute		5 minute		10 minute	
		(MHz)	%	(MHz)	%	(MHz)	%
50	13.8V	72.469540	-0.0006347	72.469548	-0.0006237	72.469552	-0.0006182
	12.0V	72.469508	-0.0006789	72.469512	-0.0006734	72.469520	-0.0006623
	9.1V	72.469320	-0.0009383	72.469300	-0.0009659	72.469330	-0.0009245
40	13.8V	72.469798	-0.0002787	72.469736	-0.0003643	72.469704	-0.0004084
	12.0V	72.469734	-0.0003670	72.469682	-0.0004388	72.469648	-0.0004857
	9.1V	72.469540	-0.0006347	72.469468	-0.0007341	72.469440	-0.0007727
30	13.8V	72.469988	-0.0000166	72.469954	-0.0000635	72.469962	-0.0000524
	12.0V	72.469994	-0.0000083	72.469938	-0.0000856	72.469908	-0.0001269
	9.1V	72.469716	-0.0003919	72.469680	-0.0004416	72.469648	-0.0004857
20	13.8V	72.470138	0.0001904	72.470124	0.0001711	72.470138	0.0001904
	12.0V	72.470052	0.0000718	72.470078	0.0001076	72.470088	0.0001214
	9.1V	72.469784	-0.0002981	72.469800	-0.0002760	72.469804	-0.0002705
10	13.8V	72.470190	0.0002622	72.470312	0.0004305	72.470608	0.0008390
	12.0V	72.470196	0.0002705	72.470560	0.0007727	72.470560	0.0007727
	9.1V	72.470230	0.0003174	72.470350	0.0004830	72.470440	0.0006071
0	13.8V	72.470776	0.0010708	72.470872	0.0012033	72.470876	0.0012088
	12.0V	72.470700	0.0009659	72.470796	0.0010984	72.470820	0.0011315
	9.1V	72.470760	0.0010487	72.470800	0.0011039	72.470830	0.0011453
-10	13.8V	72.470928	0.0012805	72.471016	0.0014020	72.471104	0.0015234
	12.0V	72.470912	0.0012585	72.471040	0.0014351	72.471084	0.0014958
	9.1V	72.470940	0.0012971	72.470970	0.0013385	72.471010	0.0013937
-12	13.8V	72.471248	0.0017221	72.471252	0.0017276	72.471264	0.0017442
	12.0V	72.471232	0.0017000	72.471228	0.0016945	72.471220	0.0016835
	9.1V	72.471070	0.0014765	72.471050	0.0014489	72.471060	0.0014627
-30	13.8V	72.471192	0.0016448	72.471160	0.0016007	72.471156	0.0015951
	12.0V	72.471164	0.0016062	72.471136	0.0015675	72.471120	0.0015455
	9.1V	72.470970	0.0013385	72.470870	0.0012005	72.470800	0.0011039

### 4.3 EMISSION BANDWIDTH

#### 4.3.1 LIMIT OF FREQUENCY STABILITY MEASUREMENT

An R/C transmitter is allowed to transmit any appropriate non-voice emission, which meets the emission limitations for an R/C transmitter. The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8kHz.

#### 4.3.2 TEST INSTRUMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSEK30	100049	July 16, 2002
SCHWARZBECK BROADBAND TEST ANTENNA	VULB 9163	121	April 2, 2002

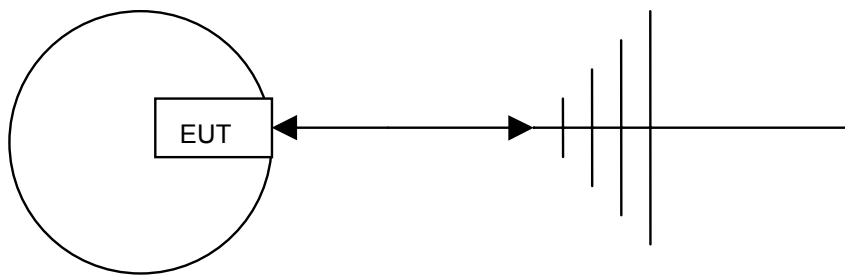
**NOTES:**

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

- a. The EUT was placed on the turn table .
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth and video bandwidth to 300Hz and select Peak function to scan the channel frequency.

#### 4.3.4 TEST SETUP



#### 4.3.5 EUT OPERATING CONDITION

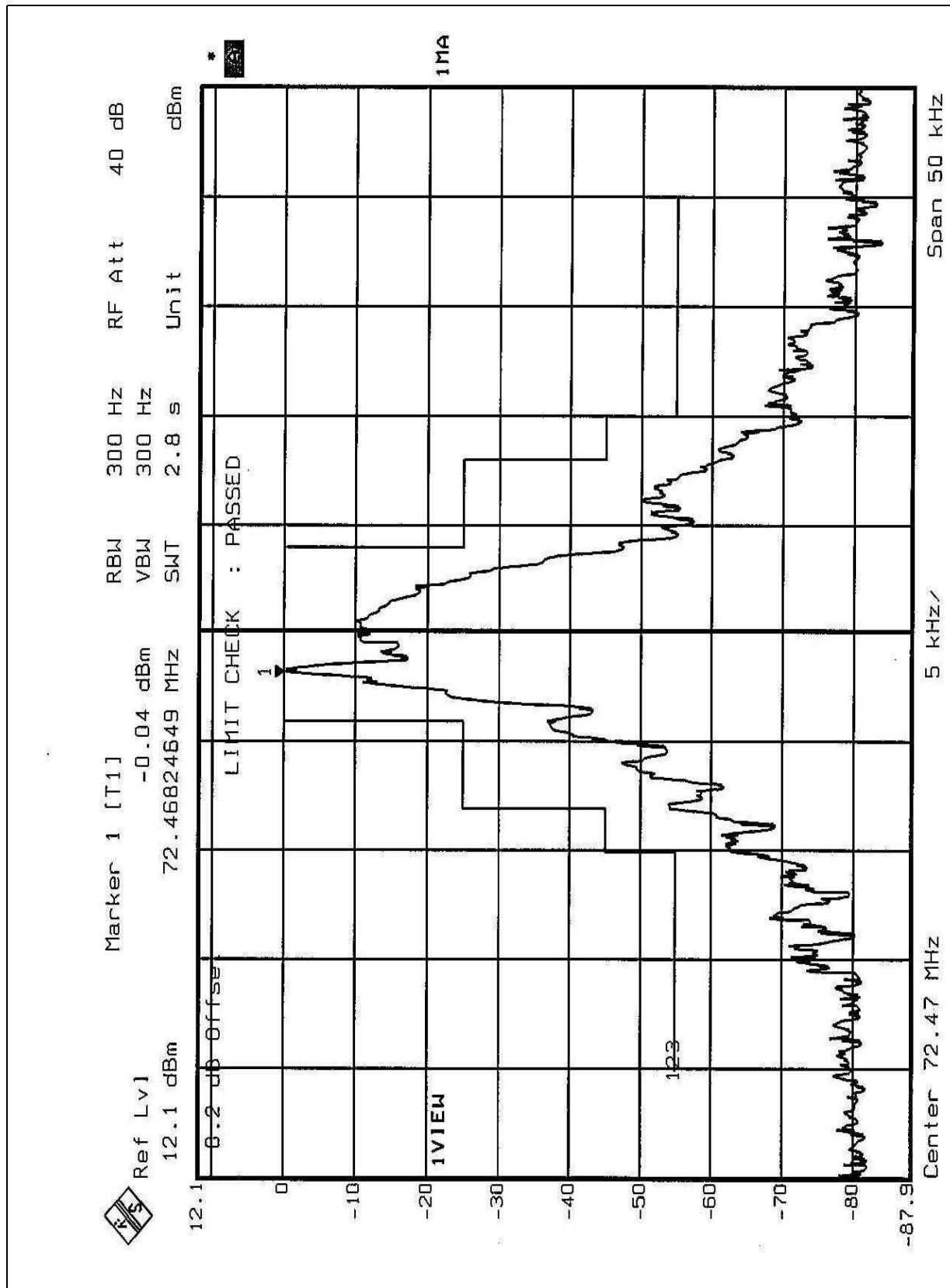
Same as item 4.2.5.





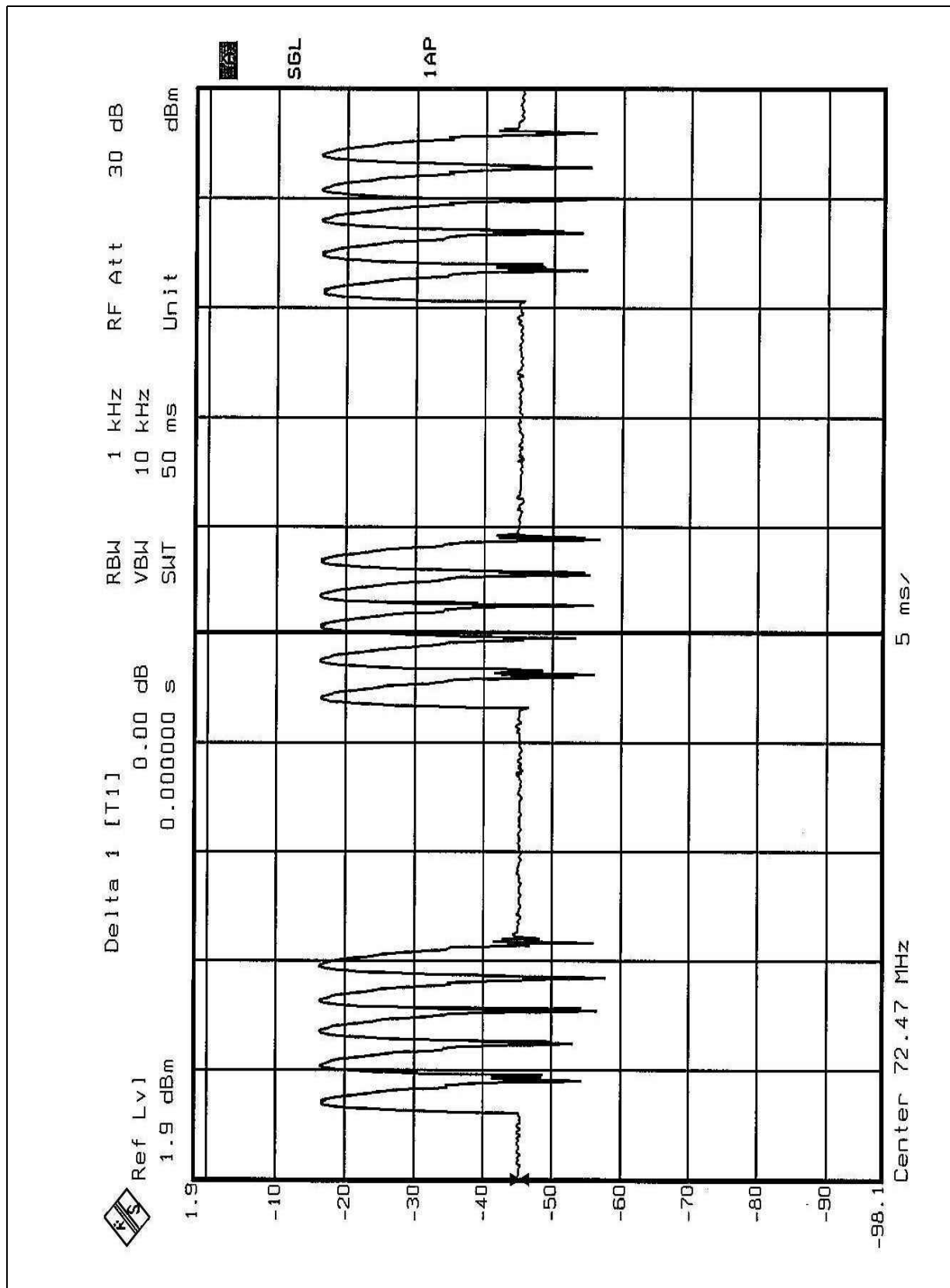
#### 4.3.6 TEST RESULT

The occupied bandwidth of the EUT complied with the emission bandwidth requirement. During testing, all control switches and buttons were investigated for the worse case modulated signal. The occupied bandwidth plot submitted was the worst case condition.



#### **4.4 MODULATION CHARACTERISTICS**

Please refer to next page for detail plots of the modulation characteristics.





#### **4.5 CRYSTAL ACCESS RESTRICTIONS**

The crystal of transmitter has been glued on the PCB after it has been plugged in, so it is not accessible for the user. Adjustment for the crystal is also not possible in this device.

## 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:

<b>USA</b>	FCC, NVLAP
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>New Zealand</b>	MoC
<b>Norway</b>	NEMKO
<b>R.O.C.</b>	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](http://www.adt.com.tw/index.5/phtml). If you have any comments, please feel free to contact us at the following:

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