

FCC TEST REPORT

REPORT NO.: RF921126R04

MODEL NO.: GWT-4All

RECEIVED: Nov. 26, 2003

TESTED: Dec. 10 ~ Dec. 19, 2003

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

ADDRESS: 4F, 183, Sec. 1, Ta-Tung Rd., Shi-Jr City,
Taipei Hsien 221 , Taiwan, R.O.C

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chia Pau Tsuen, Linkou Hsiang,
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1 CERTIFICATION

PRODUCT : Radio Control Transmitter
BRAND NAME : GWS
MODEL NO. : GWT-4AII
TEST ITEM : ENGINEERING SAMPLE
APPLICANT : GRAND WING SERVO-TECH CO., LTD.
STANDARDS : FCC Part 95, Subpart C
FCC Part 95, Subpart E
FCC Part 2, Subpart J
ANSI C63.4-1992

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from Dec. 10 to Dec. 19, 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: Windy Chou, **DATE:** January 30, 2004

Windy Chou

APPROVED BY: Ellis Wu, **DATE:** January 30, 2004

Ellis Wu, Manager

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 95			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
95.210 (a)	Transmitter Power Test	PASS	Meet the requirement of limit
95.635	Unwanted Radiated Test	PASS	Meet the requirement of limit Minimum passing margin is -9.92dB at 144.94MHz
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

NOTE: The information of measurement uncertainty is available upon the customer's request.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Radio Control Transmitter
MODEL NO.	GWT-4All
POWER SUPPLY	12Vdc from batteries
MODULATION TYPE	PPM (FM)
CARRIER FREQUENCY OF EACH CHANNEL	72.47MHz
MAXIMUM OUTPUT POWER	14.37 dBm
BANDWIDTH OF EACH CHANNEL	8KHz
NUMBER OF CHANNEL	1
EMISSION DESIGNATOR	8K00A1D
ANTENNA TYPE	Rod Antenna with 0dBi antenna gain
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	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
1	72.47MHz

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

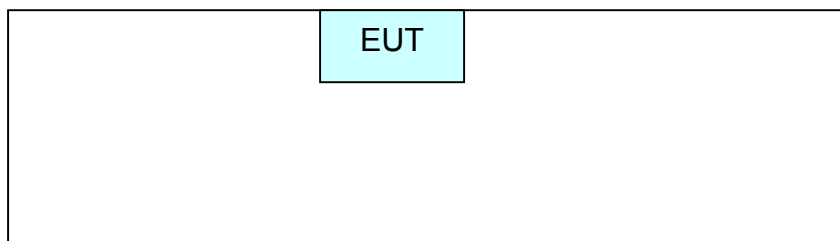
FCC Part 95, Subpart C
FCC Part 95, Subpart E
FCC Part 2, Subpart J
ANSI C63.4-1992

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

3.4 DESCRIPTION OF SUPPORT UNITS

NA

3.5 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST PROCEDURE AND RESULT

4.1 RADIATED EMISSION 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	8593E	3911A07465	July 07, 2004
* HP Preamplifier	8447D	2432A03504	June 10, 2004
* HP Preamplifier	8449B	3008A01201	Dec. 11, 2004
SCHAFFNER Tunable Dipole Antenna	VHBA 9123	459	Jun. 26, 2004
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Feb. 13, 2004
*Schwarzbeck Antenna	VULB9168	137	Apr. 03, 2004
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	June 30, 2004
*ADT. Turn Table	TT100	0306	NA
*ADT. Tower	AT100	0306	NA
*Software	ADT_Radiated_V5.14	NA	NA
*TIMES RF cable	LL142	CABLE-CH6-01	Apr. 30, 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 Chamber No. 6.

4.1.4 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 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.

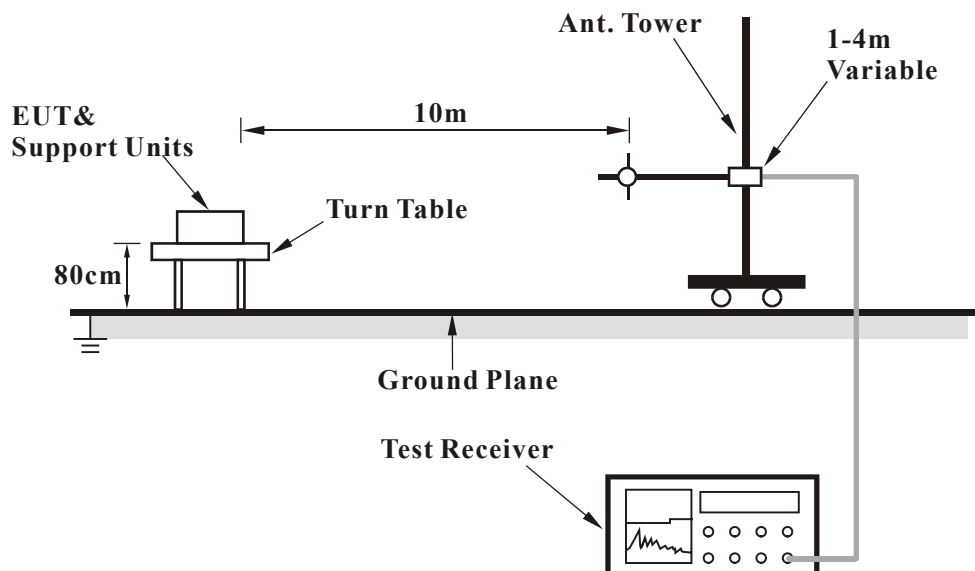
NOTE:

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 DEVIATION FROM TEST STANDARD

No deviation

4.1.6 TEST SETUP



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

4.1.7 EUT OPERATING CONDITION

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

4.1.8 TEST RESULT

EUT	Radio Control Transmitter	MODEL	GWT-4All
CARRIER FREQUENCY	72.47MHz	FREQUENCY RANGE	Below 1000 MHz
INPUT POWER	12Vdc from batteries	DETECTOR FUNCTION	Peak, Quasi-Peak
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 hPa	TESTED BY: Martin Lee	

ANTENNA POLARITY & TEST DISTANCE AT HORIZONTAL 10 M								
No.	Freq. (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBm)	Correction Factor (dB)
1	*72.45	2.90 PK	28.75	-25.85	1.07 H	32	-26.34	29.24
2	144.94	-35.92 QP	-26.00	-9.92	1.32 H	227	-65.52	29.60
3	217.41	-41.71 QP	-26.00	-15.71	1.24 H	52	-68.93	27.22
4	289.88	-45.67 QP	-26.00	-19.67	1.41 H	82	-70.97	25.30
5	362.35	-42.58 QP	-26.00	-16.58	1.52 H	37	-69.78	27.20
6	434.82	-42.84 QP	-26.00	-16.84	1.27 H	84	-71.64	28.80
7	507.65	-46.24 QP	-26.00	-20.24	1.52 H	278	-75.82	29.58

ANTENNA POLARITY & TEST DISTANCE AT VERTICAL 10 M								
No.	Freq. (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBm)	Correction Factor (dB)
1	*72.45	14.37 PK	28.75	-14.38	1.62 V	85	-10.20	24.57
2	144.94	-38.01 QP	-26.00	-12.01	1.12 V	52	-61.70	23.69
3	217.41	-53.21 QP	-26.00	-27.21	1.32 V	34	-79.11	25.90
4	289.88	-53.51 QP	-26.00	-27.51	1.72 V	62	-78.89	25.38
5	362.35	-46.76 QP	-26.00	-20.76	1.02 V	35	-75.26	28.50
6	434.83	-50.38 QP	-26.00	-24.38	1.62 V	335	-79.18	28.80
7	507.65	-55.10 QP	-26.00	-29.10	1.36 V	82	-84.70	29.60
8	579.77	-52.72 QP	-26.00	-26.72	1.62 V	320	-83.82	31.10
9	652.24	-53.07 QP	-26.00	-27.07	1.52 V	68	-85.17	32.10
10	724.71	-49.33 QP	-26.00	-23.33	1.06 V	98	-83.53	34.20

NOTE:

- Unwanted emissions more than 20kHz from the channel center frequency shall be attenuated at least $56 + \log(\text{maximum output power}) = 14.37 - (56 + 10 \log(0.027)) = -20 \text{ dBm}$
- Emission level(dBm) = Raw Value(dBm) + Correction Factor(dB) + Free space lose (dB)
- Correction Factor(dB) = Antenna Factor (dBd) + Cable Factor (dB)
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value.
- "*" = Fundamental frequency.

4.2 FREQUENCY STABILITY

4.2.1 LIMIT OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% 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	Apr. 10, 2004
WIT STANDARD TEMPERATURE AND HUMIDITY CHAMBER	TH-4S-C	W901030	Jul. 17, 2004

NOTE:

The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

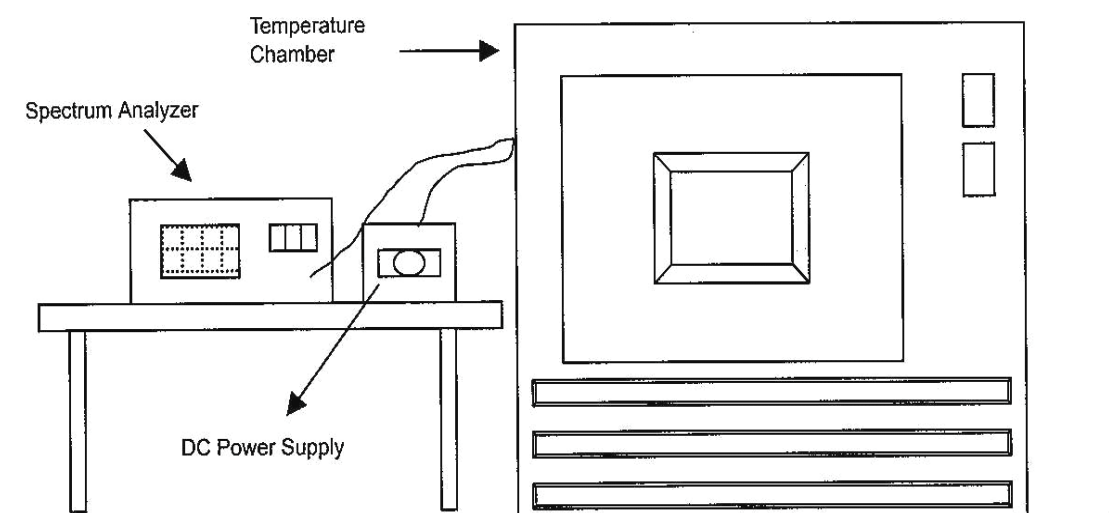
4.2.3 TEST PROCEDURE

- 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 b and c 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 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



4.2.6 EUT OPERATING CONDITION

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

4.2.7 TEST RESULT

Operating frequency: 72.47MHz				Limit : $\pm 0.002\%$			
Temp. (°C)	Power supply (VAC)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	13.8	72.4690	-0.00138	72.4689	-0.00152	72.4688	-0.00166
	12.0	72.4688	-0.00166	72.4687	-0.00179	72.4689	-0.00152
	8.8	72.4704	0.00055	72.4706	0.00083	72.4705	0.00069
40	13.8	72.4698	-0.00028	72.4695	-0.00069	72.4698	-0.00028
	12.0	72.4694	-0.00083	72.4696	-0.00055	72.4701	0.00014
	8.8	72.4709	0.00124	72.4705	0.00069	72.4707	0.00097
30	13.8	72.4707	0.00097	72.4707	0.00097	72.4708	0.00110
	12.0	72.4708	0.00110	72.4708	0.00110	72.4707	0.00097
	8.8	72.4711	0.00152	72.4710	0.00138	72.4710	0.00138
20	13.8	72.4706	0.00083	72.4705	0.00069	72.4706	0.00083
	12.0	72.4708	0.00110	72.4706	0.00083	72.4708	0.00110
	8.8	72.4708	0.00110	72.4706	0.00083	72.4705	0.00069
10	13.8	72.4703	0.00041	72.4704	0.00055	72.4706	0.00083
	12.0	72.4704	0.00055	72.4708	0.00110	72.4705	0.00069
	8.8	72.4710	0.00138	72.4708	0.00110	72.4707	0.00097
0	13.8	72.4705	0.00069	72.4707	0.00097	72.4707	0.00097
	12.0	72.4708	0.00110	72.4706	0.00083	72.4706	0.00083
	8.8	72.4705	0.00069	72.4702	0.00028	72.4703	0.00041
-10	13.8	72.4706	0.00083	72.4708	0.00110	72.4706	0.00083
	12.0	72.4708	0.00110	72.4706	0.00083	72.4707	0.00097
	8.8	72.4706	0.00083	72.4708	0.00110	72.4709	0.00124
-20	13.8	72.4706	0.00083	72.4706	0.00083	72.4708	0.00110
	12.0	72.4708	0.00110	72.4706	0.00083	72.4706	0.00083
	8.8	72.4705	0.00069	72.4707	0.00097	72.4706	0.00083

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	Aug. 12, 2004

NOTES:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

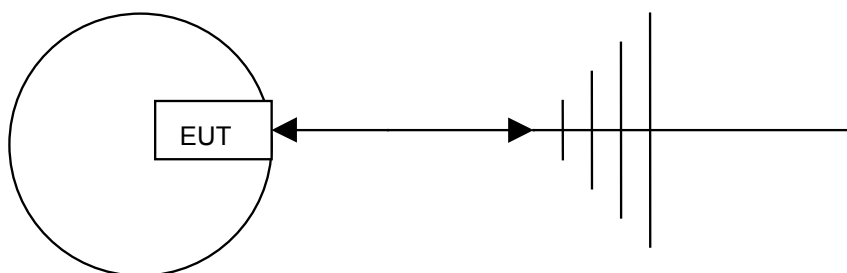
4.3.3 TEST PROCEDURE

- a. The EUT was placed on the turning 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.
- d. The 26dB bandwidth was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITION

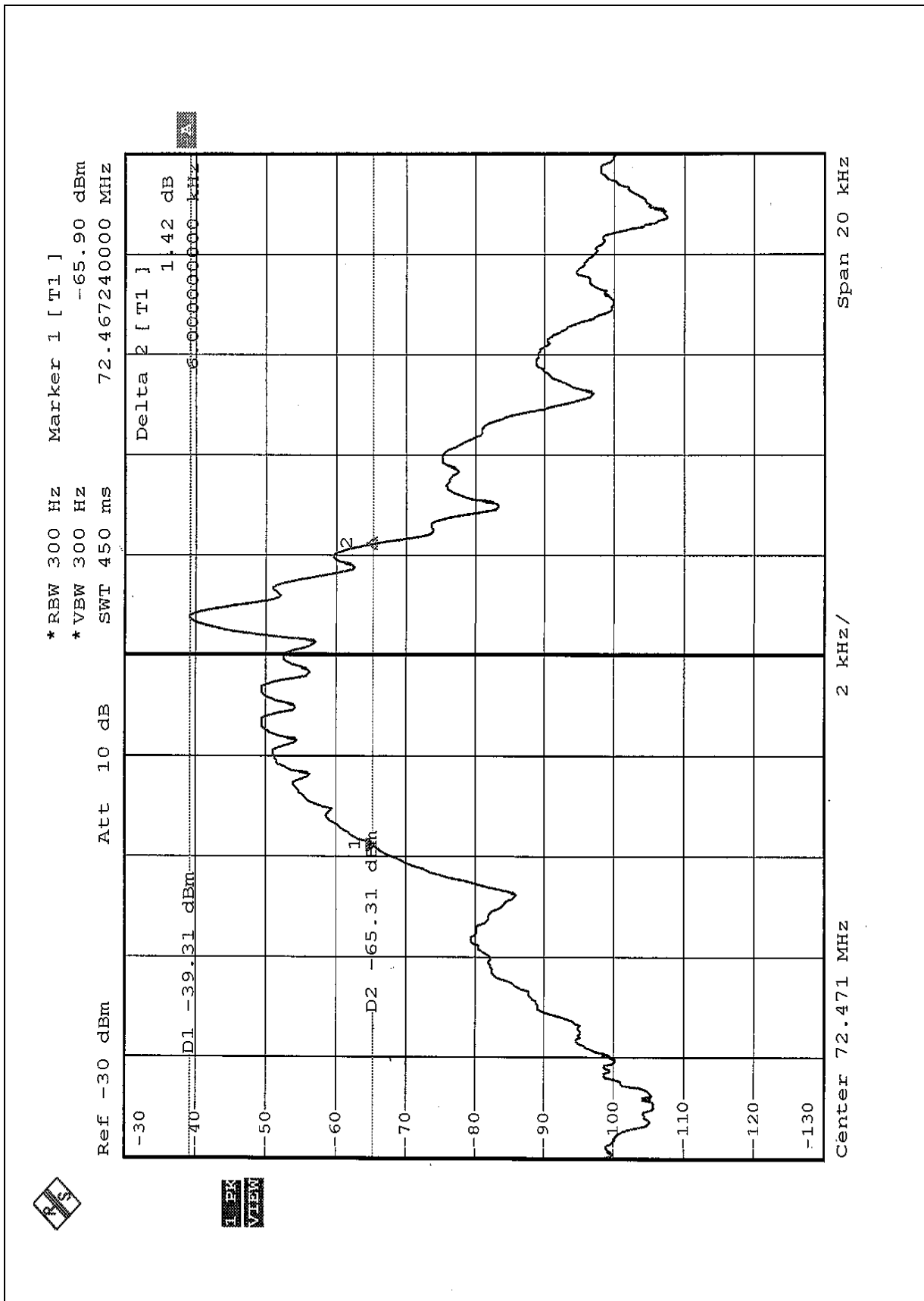
Same as item 4.2.5.

4.3.7 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.

CHANNEL FREQUENCY (MHz)	26dB BANDWIDTH (kHz)	MAXIMUM LIMIT (kHz)	PASS/FAIL
72.47	6.00	8.00	PASS

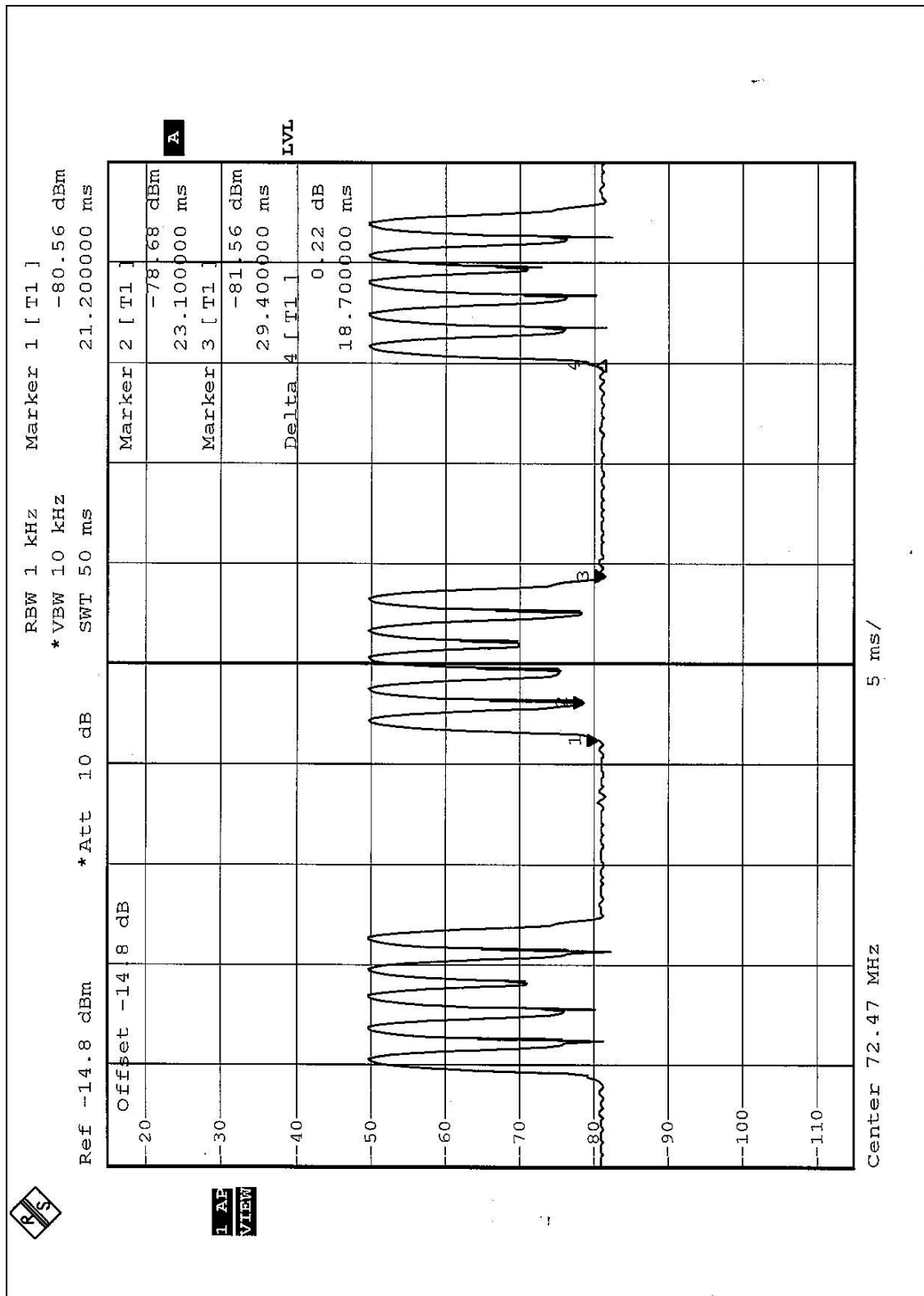
Test results please refer to next page.





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:

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