

# ***FCC Part 15 Subpart C***

## ***EMI TEST REPORT***

*of*

E.U.T. : FM Modulator Wireless

FCC ID. : RVQCPE-0402-1

MODEL : RFM-W1

Working Frequency : 88.2 MHz~89.1 MHz

*for*

APPLICANT : CHENG PU ELECTRONIC CO., LTD.

ADDRESS : No. 15, Lane 60, Sec. 1, Jinhua Rd., South District,  
Tainan City 702, Taiwan (R.O.C.)

Test Performed by

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Report Number : ET92S-12-115

## TEST REPORT CERTIFICATION

Applicant : CHENG PU ELECTRONIC CO., LTD.  
No. 15, Lane 60, Sec. 1, Jinhua Rd., South District, Tainan City 702,  
Taiwan (R.O.C.)

Manufacturer : CHENG PU ELECTRONIC CO., LTD.  
No. 15, Lane 60, Sec. 1, Jinhua Rd., South District, Tainan City 702,  
Taiwan (R.O.C.)

Description of EUT :  
a) Type of EUT : FM Modulator Wireless  
b) Trade Name : ----  
c) Model No. : RFM-W1  
d) FCC ID : RVQCPE-0402-1  
e) Working Frequency : 88.2 MHz~89.1 MHz  
f) Power Supply : DC 12V or DC 3V (battery)

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2003)

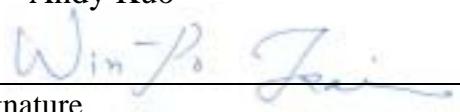
I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note : 1. The results of the testing report relate only to the items tested.  
2. The testing report shall not be reproduced except in full, without the written approval of ETC.

Test Date : Feb. 06, 2004

Test Engineer : 

Andy Kuo

Approve & Authorized  
Signer : 

Signature  
Win-Po Tsai  
Manager of EMC Testing Department  
Electronics Testing Center, Taiwan

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## 1. GENERAL INFORMATION

### 1.1 Product Description

a) Type of EUT	: FM Modulator Wireless
b) Trade Name	: ----
c) Model No.	: RFM-W1
d) FCC ID	: RVQCPE-0402-1
e) Working Frequency	: 88.2 MHz~89.1 MHz
f) Power Supply	: DC 12V or DC 3V (battery)

### 1.2 Characteristics of Device:

The “FM Modulator Wireless” can transmit 88.2MHz~89.1MHz for audio signal to FM radio receiver. Users can use DC 12V power at car and DC 3V battery in home. Product specification described was obtained from user’s manual or data sheet.

### 1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.4 and FCC CFR 47 Part 2 and Part 15.

### 1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.

This site has been accreditation as a FCC filing site.

## 2. DEFINITION AND LIMITS

### 2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

### 2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

Remark “\*\*” : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

### 2.3 Limitation

#### (1) Conducted Emission Limits :

According to 15.231(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Quasi-Peak Limit (dBuV)	Average Limit (dBuV)
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

\* Decreases with the logarithm of the frequency.

**(2) Bandwidth of Emission Limits :**

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

**(3) Radiated Emission Limits :**

According to 15.239 (b), the field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

According to 15.239 (c), the field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209, as following table:

Other Frequencies (MHz)	Field Strength of Fundamental	
	µV/meter	dBµV/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 20 dB under any condition of modulation.

**2.4 Labeling Requirement**

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**2.5 User Information**

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 EUT configuration and operating

The test sample (EUT) that provide by applicant has two channels to select (88.7MHz and 89.1MHz). Select 88.7MHz to be the final test.

The EUT was operated continuously in its normal operating mode for the purpose of the measurements.

The EUT connected with the following peripheral devices.

#### 3.2 Devices for Tested System

Device	Manufacture	Model	Cable Description
* FM Modulator Wireless	CHENG PU ELECTRONIC CO., LTD.	RFM-W1	0.45m, Unshielded Signal Line 1.8m, Unshielded Power Line
Walkman	A-ros	ESP	----
DC Power Supply	GW	GPC-6030D	1.8m, Unshielded Power Line

Remark “\*” means equipment under test.

#### 3.3 Deviation Statement

(If any deviation from additions to or exclusions from test method must be stated)

N/A

#### 3.4 Modification Record

N/A

## 4. RADIATED EMISSION MEASUREMENT

### 4.1 Applicable Standard

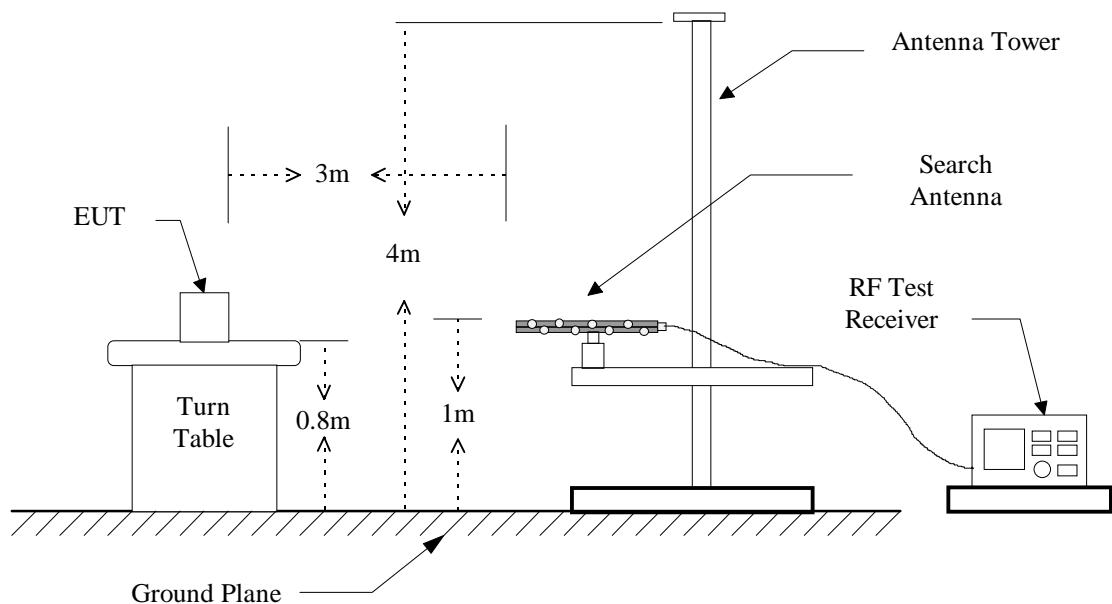
According to 15.239 (b), the field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

According to 15.239 (c), the field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209.

### 4.2 Measurement Procedure

1. Setup the configuration per figure 1 for frequencies measured below 1 GHz. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions and then each selected frequency is precisely measured. As the same purpose, for emission measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
4. Repeat step 3 until all frequencies that need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Check the frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration



### 4.3 Test Data

#### 4.3.1 Fundamental and Harmonics emission

Temperature : 13  
 Humidity : 80 %  
 Operated mode : 88.7MHz Transmitting  
 Test Date : Feb. 06, 2004

##### a. Power Supply: DC 3 V

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB/m)	Result @3m (dBuV/m) Peak AVG	Limit @3m (dBuV/m) Peak AVG	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
88.700	H	29.1	10.1	39.2 ***	68.0 48.0	-8.8	180	1.0
88.700	V	23.7	10.1	33.8 ***	68.0 48.0	-14.2	180	1.0

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB/m)	Result @3m (dBuV/m) Peak	Limit @3m (dBuV/m) QP	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
177.400	H	13.3	14.1	27.4	43.5	-16.1	164	1.0
177.400	V	---	14.1	---	43.5	---	---	---
266.100	H	10.6	15.7	26.3	46.0	-19.7	177	1.0
266.100	V	---	---	---	---	---	---	---
354.800	H	---	---	---	---	---	---	---
354.800	V	---	---	---	---	---	---	---
443.500	H	---	---	---	---	---	---	---
443.500	V	---	---	---	---	---	---	---
532.200	H/V	---	---	---	---	---	---	---
620.900	H/V	---	---	---	---	---	---	---
709.600	H/V	---	---	---	---	---	---	---
798.300	H/V	---	---	---	---	---	---	---
887.000	H/V	---	---	---	---	---	---	---

**Note :**

1. "---" means the noise is too low to be measured.
2. "\*\*\*" means the Peak result of the noise is lower the AVG limit, no AVG measurement applied.
3. If the measured frequencies fall in the restricted frequency band, the limit employed is § 15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

## b. Power Supply: DC 12 V

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB/m)	Result @3m (dBuV/m) Peak AVG	Limit @3m (dBuV/m) Peak AVG	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
88.700	H	27.3	10.1	37.4 ***	68.0 48.0	-10.6	180	2.1
88.700	V	26.3	10.1	36.4 ***	68.0 48.0	-11.6	180	2.0

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB/m)	Result @3m (dBuV/m) Peak	Limit @3m (dBuV/m) QP	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
177.400	H	---	---	---	---	---	---	---
177.400	V	12.5	14.1	26.6	43.5	-16.9	170	2.0
266.100	H	---	---	---	---	---	---	---
266.100	V	---	---	---	---	---	---	---
354.800	H	---	---	---	---	---	---	---
354.800	V	---	---	---	---	---	---	---
443.500	H	---	---	---	---	---	---	---
443.500	V	---	---	---	---	---	---	---
532.200	H/V	---	---	---	---	---	---	---
620.900	H/V	---	---	---	---	---	---	---
709.600	H/V	---	---	---	---	---	---	---
798.300	H/V	---	---	---	---	---	---	---
887.000	H/V	---	---	---	---	---	---	---

## Note :

1. "---" means the noise is too low to be measured.
2. "\*\*\*" means the Peak result of the noise is lower the AVG limit, no AVG measurement applied.
3. If the measured frequencies fall in the restricted frequency band, the limit employed is § 15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

## 4.3.2 Other Emission

Temperature : 13  
 Humidity : 80 %  
 Operated mode : 88.7MHz Transmitting  
 Test Date : Feb. 06, 2004  
 Power Supply : DC 12 V

Emission Frequency ( MHz )	Meter Reading ( dBuV )		CORR'd Factor ( dB )	Results ( dBuV/m )		Limit (3m) (dBuV/m)	Margins ( dB )	Table Degree (deg)		Ant. High (m)	
	HOR.	VERT.		HOR.	VERT.			HOR.	VERT.	HOR.	VERT.
31.940	***	7.9#	13.1	***	21.0#	40.0	-19.0	***	166	***	1.8
38.730	***	10.6#	13.2	***	23.8#	40.0	-16.2	***	187	***	2.1
58.130	7.8#	14.1#	13.2	21.0#	27.3#	40.0	-12.7	240	242	2.0	2.0

Note :

1. The EUT power in turn from both DC 12V and DC 3V(battery) power to get the worst data. Take down the worst data in the final measurement.
2. Remark “\*\*\*” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. The estimated measurement uncertainty of the result measurement is:  
 $\pm 4.6\text{dB}(30\text{MHz} \leq f \leq 300\text{MHz})$   
 $\pm 4.4\text{dB}(300\text{MHz} < f \leq 1\text{GHz})$

#### 4.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{CORR. FACTOR}$$

where CORR. FACTOR = Antenna FACTOR + Cable FACTOR

Assume a receiver reading of 22.5 dB  $\mu$  V is obtained. The Antenna Factor of 14.5 and a Cable Factor of 1.5 is added . The total of field strength is 38.5 dB  $\mu$  V/m.

$$\text{RESULT} = 22.5 + 14.5 + 1.5 = 38.5 \text{ dB } \mu \text{ V/m}$$

$$\begin{aligned} \text{Level in } \mu \text{ V/m} &= \text{Common Antilogarithm}[(38.5 \text{ dB } \mu \text{ V/m})/20] \\ &= 84.14 \text{ } \mu \text{ V/m} \end{aligned}$$

#### 4.5 Radiated Test Equipment

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
EMI Test Receiver	Hewlett-Packard	8546A	3411A00192	Aug. 27, 2004
BiconiLog Antenna	SCHWARZBECK	9160	3059	Oct. 28, 2004

Note: The standards used to perform this calibration are traceable to NML/ROC, NIST/USA and NPL.

#### 4.6 Measuring Instrument Setup

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz

#### 4.7 Photos of Radiation Measuring Setup

DC 3V input



DC 12V input



## 5. BANDWIDTH OF EMISSION

### 5.1 Applicable Standard Plot Graphic of Bandwidth

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

### 5.2 Bandwidth Test Equipment

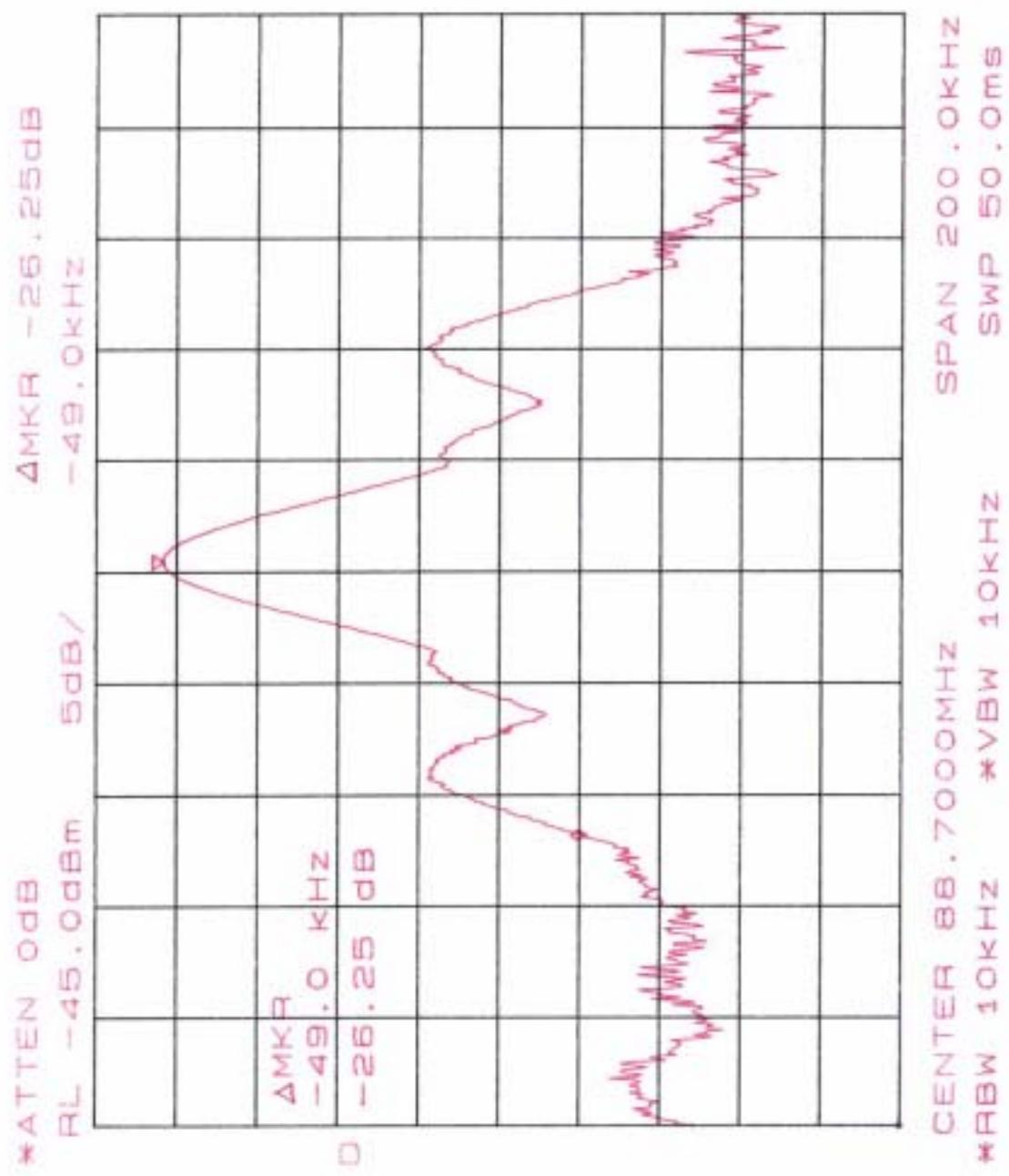
Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Agilent	8564EC	Sep. 16, 2005
Plotter	Hewlett-Packard	7550A	N/A

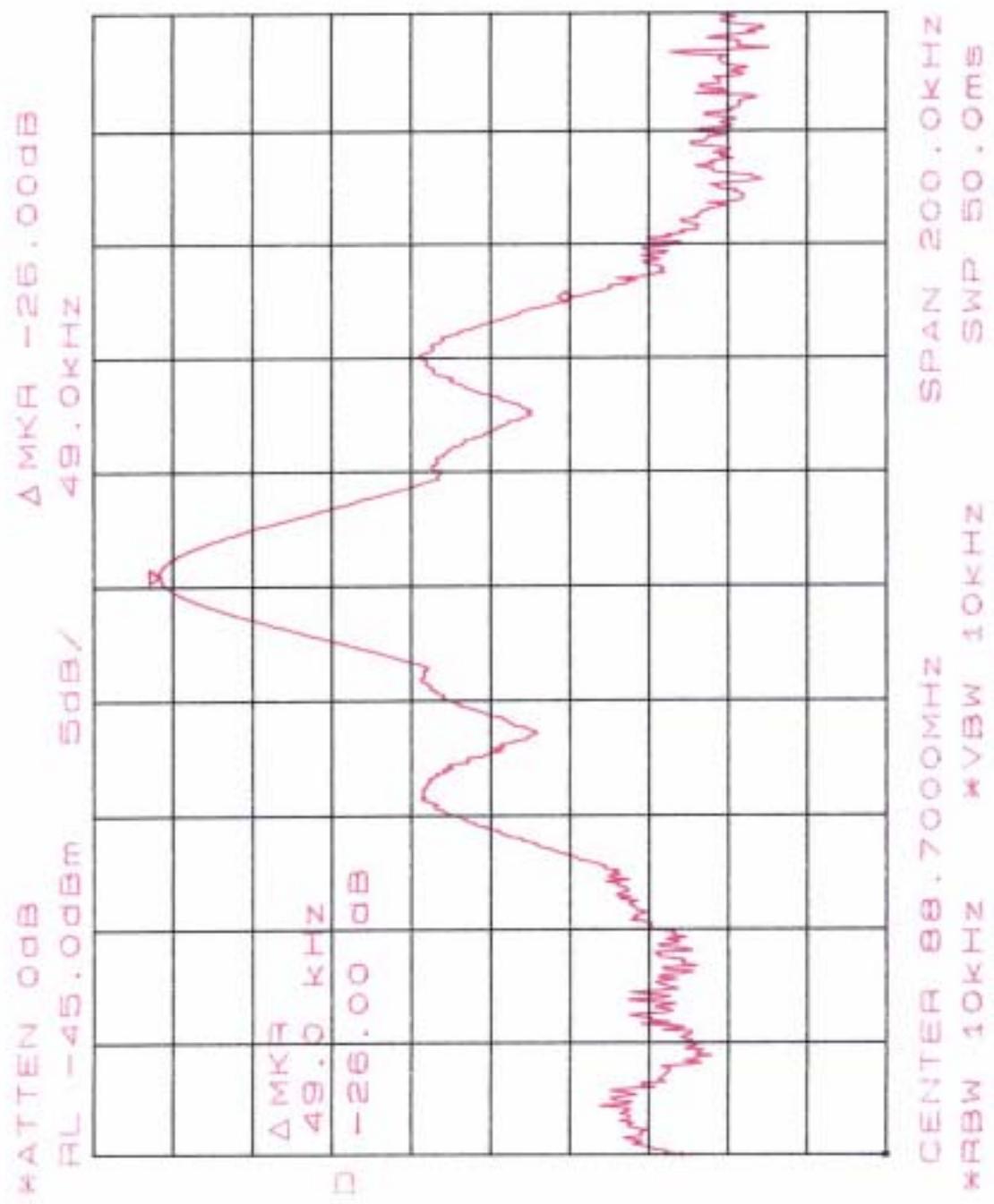
### 5.3 Plot Graphic of Bandwidth

The emission bandwidth limit for this transmitter is 200kHz.

The Result = 98.0 kHz

\*Plotted graphics please see next two pages.





## 6. CONDUCTED EMISSION MEASUREMENT

### 6.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to § 15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.