FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Wireless Bodypack Transmitter Microphone

FCC ID. : JEBUT-9

MODEL : UT-9

Working Frequency : 630MHz-770MHz

for

APPLICANT : MASCOT ELECTRIC CO., LTD.

ADDRESS : No. 85, Chang Hsing First Street, Tai-Tzu Village, Jen-Te Hsian, Tainan Hsien, Taiwan

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 34, LIN 5, DING FU TSUN, LINKOU HSIANG

TAIPEI HSIEN, TAIWAN, R.O.C.

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Report Number : ET93R-04-040-04

TEST REPORT CIRTIFICATION

Applicant : MASCOT ELECTRIC CO., LTD.
No. 85, Chang Hsing First Street, Tai-Tzu Village,
Jen-Te Hsian, Tainan Hsien, Taiwan.

Manufacturer : MASCOT ELECTRIC CO., LTD.
No. 85, Chang Hsing First Street, Tai-Tzu Village,
Jen-Te Hsian, Tainan Hsien, Taiwan.

Description of EUT :

a) Type of EUT	: Wireless Bodypack Transmitter Microphone
b) Trade Name	: MASCOT
c) Model No.	: UT-9
d) FCC ID	: JEBUT-9
e) Working Frequency	: 630MHz-770MHz
f) Power Supply	: DC 3V Batteries

Regulation Applied : FCC Rules and Regulations Part 74 Subpart H (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.

Issued Date : MAY 11, 2004

Test Engineer : Kevin Lee
(Kevin Lee)

Approve & Authorized Signer : Will Yauo
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: Wireless Bodypack Transmitter Microphone
b) Trade Name	: MASCOT
c) Model No.	: UT-9
d) FCC ID	: NTMWT480T-EJ8LT
e) Working Frequency	: 630MHz-770MHz
f) Power Supply	: Model:SP41-120500 : input 120VAC 60Hz 9W output 12VDC 500mA

1.2 Characteristics of Device:

The EUT is A frequency modulation Wireless Microphone with following features:

1. Operation Frequency Range:630 - 660MHz; 740 - 770MHz.
2. Type of Modulation:FM, 161KF3E.
3. The emission designator is 161KF3E. The calculation is (2M+2DK), K=1 and (2 x 32.768 + 2 x 48) = 161.5kHz, so the emission designator is 161KF3E.
4. This Wireless Microphone operates within UHF band with PLL synthesized.

1.3 Test Methodology

Both Wireless Bodypack Transmitter Microphone conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4 (2001). and section 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 of Part 2 of CFR 47

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No. 34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

2. REQUIREMENTS OF PROVISIONS

2.1 Definition

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

2.2 Frequencies Available

According to sec. 74.802 of Part 74, the following frequencies are available for low power auxiliary station :

Frequencies (MHz)

26.100-26.480	455.000-456.000
54.000-72.000	470.000-488.000
76.000-88.000	488.000-494.000
161.625-161.775	614.000-806.000
174.000-216.000	450.000-451.000
944.000-952.000	

2.3 Requirements for Radio Equipment on Certification

(1) RF Output Power

For transmitters, the power output shall be measured at the RF output terminals.

(2) Modulation Characteristics

For Voice Modulated Communication Equipment, a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.

(3) Occupied Bandwidth

For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

(4) Spurious Emissions at Antenna Terminals

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

(5) Field Strength of Spurious Emissions

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation.

(6) Frequencies Tolerance

a) The frequency stability shall be measured with variation of ambient temperature.
b) The frequency stability shall be measured with variation of primary supply voltage.

2.4 Labeling Requirement

Each equipment for which a type acceptance application is filed on or after May 1,1981, shall bear an identification plate or label pursuant to §2.925（Identification of equipment） and § 2.926（FCC identifier）.

3. OUTPUT POWER MEASUREMENT

3.1 Provision Applicable

According to §74.861(e)(1)(ii), the output power shall not exceed 250 milliwatts.

3.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
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 ◦ , and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

Figure 2 : Frequencies measured below 1 GHz configuration

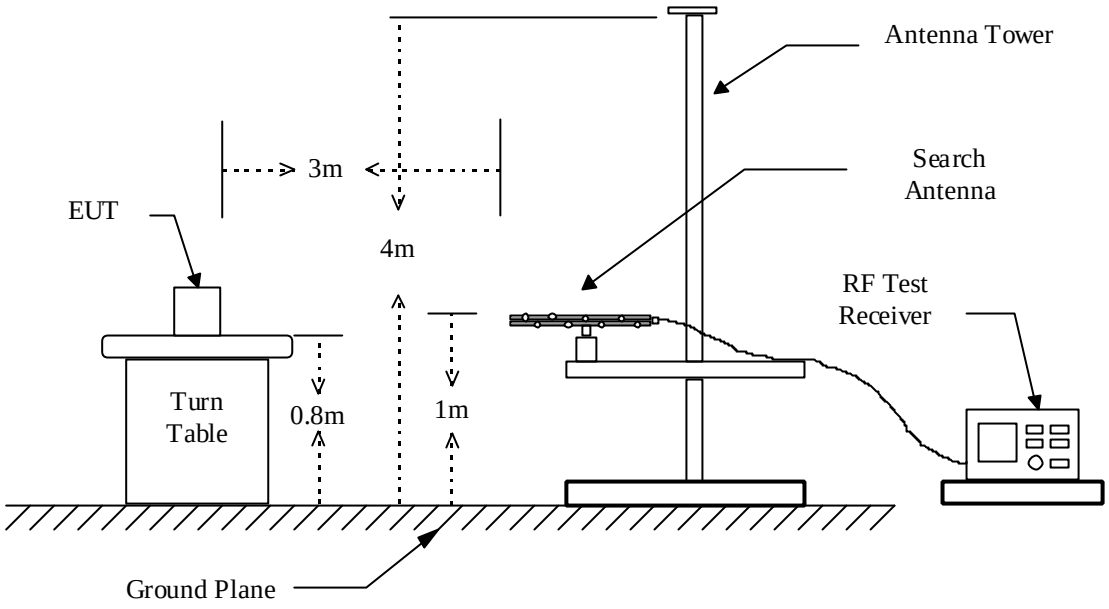
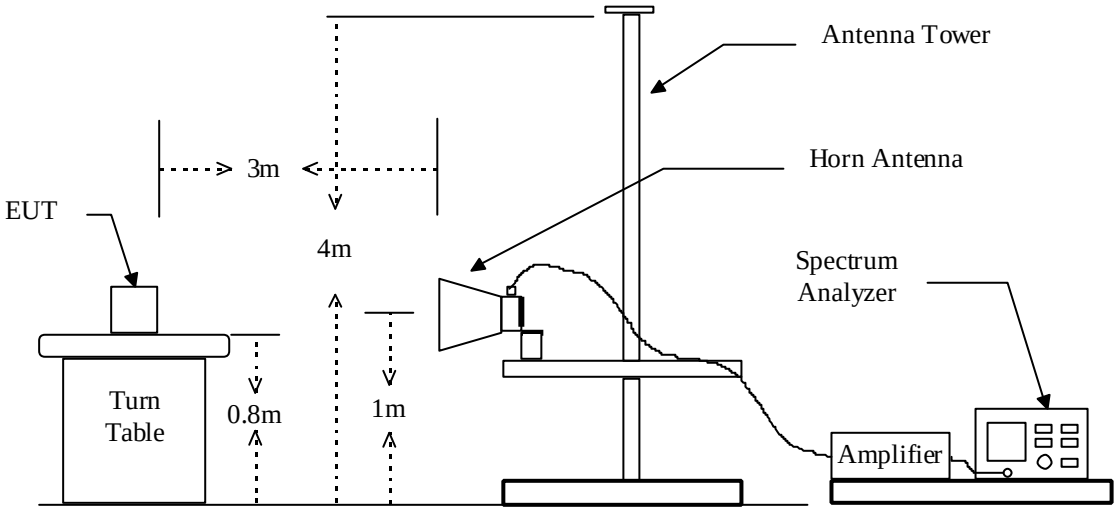


Figure 1 : Frequencies measured above 1 GHz configuration



3.3 Test Data

1. 630~660 MHz

A. Channel Low (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
630.076	82.8	12.2	2.3	----	9.9	9.7	250

B. Channel Mid (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
644.912	81.6	10.1	2.4	----	7.7	5.8	250

C. Channel High (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
659.892	78.2	6.7	2.4	----	4.3	2.7	250

Note: For measured frequency below 1GHz, a tuned dipole antenna is used.

2. 740~770 MHz

A. Channel Low (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
740.086	81.6	11.7	2.5	----	9.2	8.3	250

B. Channel Mid (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
754.912	80.8	10.9	2.5	----	8.4	6.9	250

C. Channel High (ERP)

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 24 ℃ Humidity : 57 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
769.884	81.2	14.0	2.6	----	11.4	13.8	250

Note: For measured frequency below 1GHz, a tuned dipole antenna is used.

3.4 Result Calculation

Result calculation is as following :

Result = SG Reading + Cable Loss + Antenna Gain Corrected

Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

$$mW = \log^{-1}[\frac{Result(dBm)}{10}]$$

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Test Receiver	R & S	ESBI	05/31/2004
Plotter	HP	7440A	N/A

4. MODULATION CHARACTERISTICS

4.1 Provisions Applicable

According to §2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be measured.

4.2 Measurement Method

A) Frequency response of audio circuits

1. Position the EUT as shown in figure 3.

2. Vary the modulating frequency from 100 Hz to 5000 Hz with varying the input voltage from 0V to maximum permitted input voltage, and observe the change in output.

B) Modulation Limit

1. Position the EUT as shown in figure 3, adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.

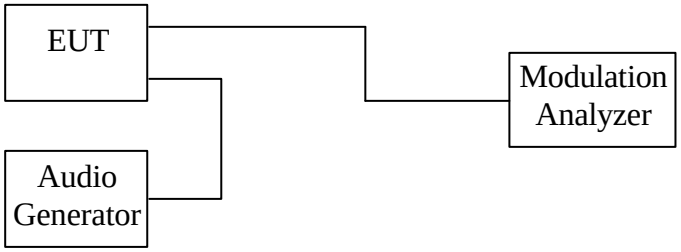
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

C) Frequency response of all circuits

1. Position the EUT as shown in figure 3.

2. Vary the modulating frequency from 100 Hz to 15000 Hz with constant input voltage (derived from 5.4(a) of this test report), and observe the change in output.

Figure 3 : Modulation characteristic measurement configuration



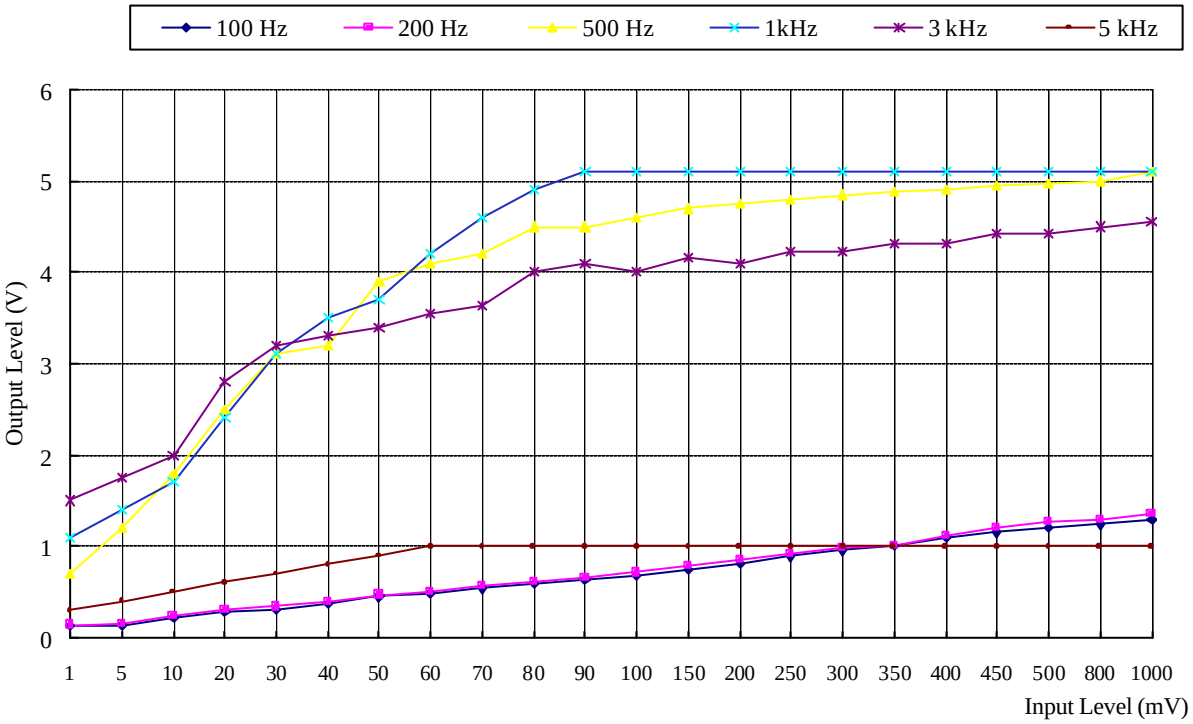
4.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Modulation Analyzer	Hewlett-Packard	8901A	11/30/2004
Multifunction Synthesizer	Hewlett-Packard	8904A	12/11/2004
Oscillscope	Lecroy	9350A	05/31/2004

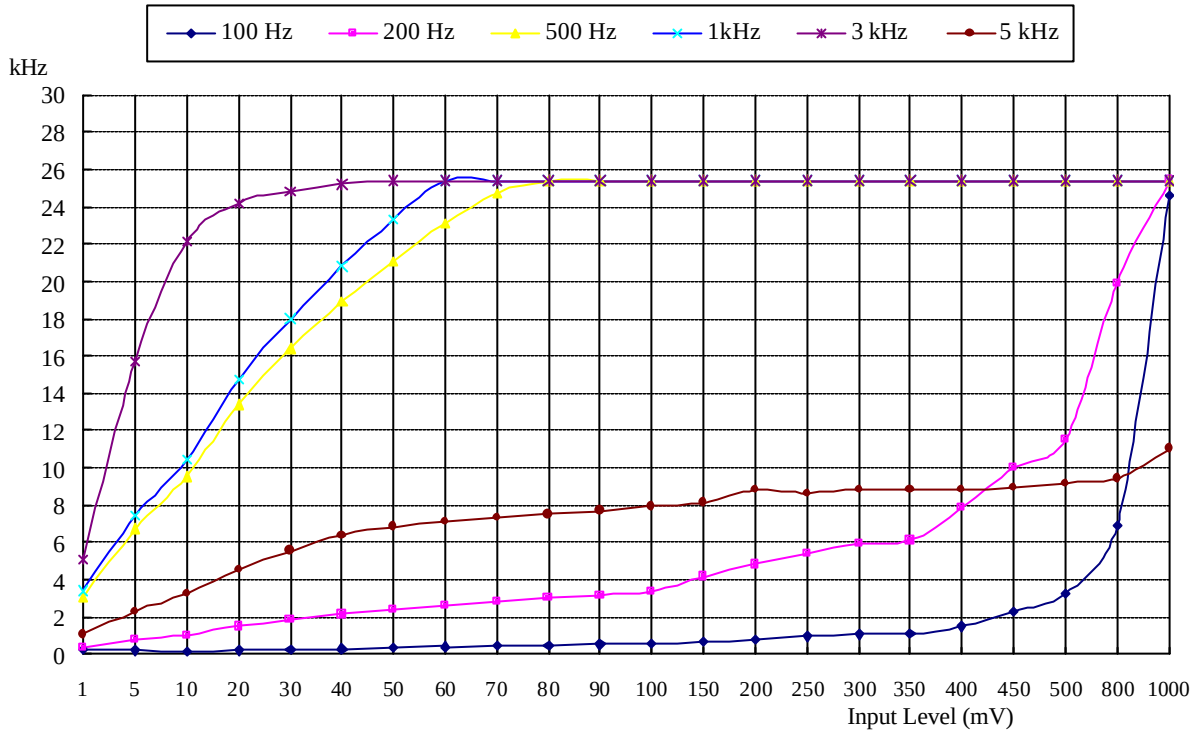
4.4 Measurement Result

1. 630.000~660.000 MHz

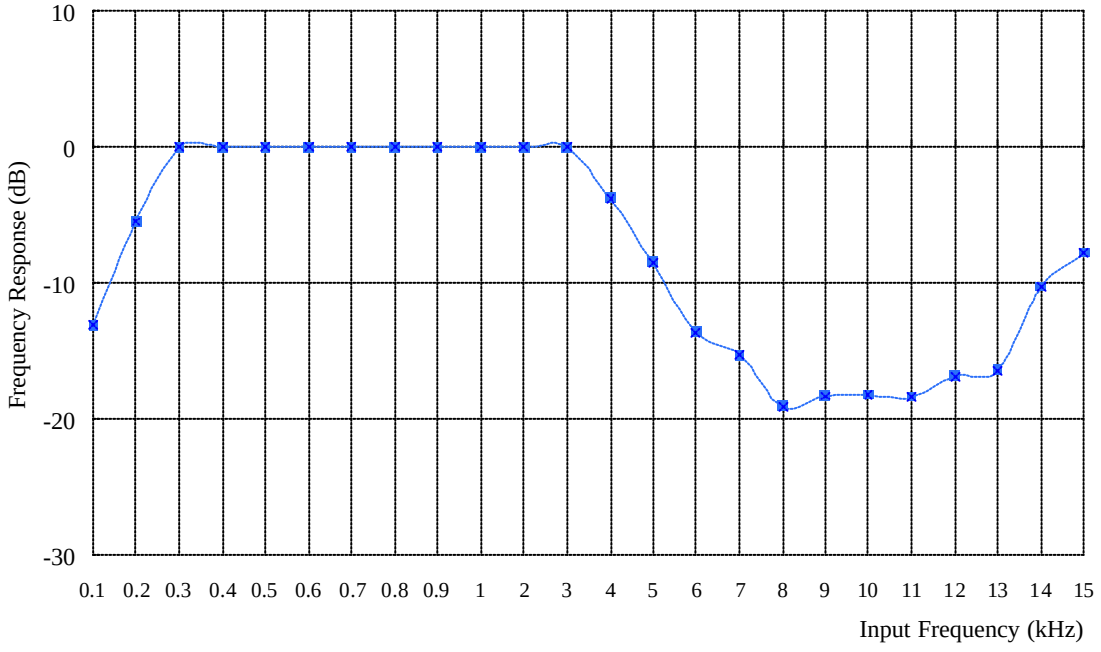
A). Frequency response



B). Modulation Limit

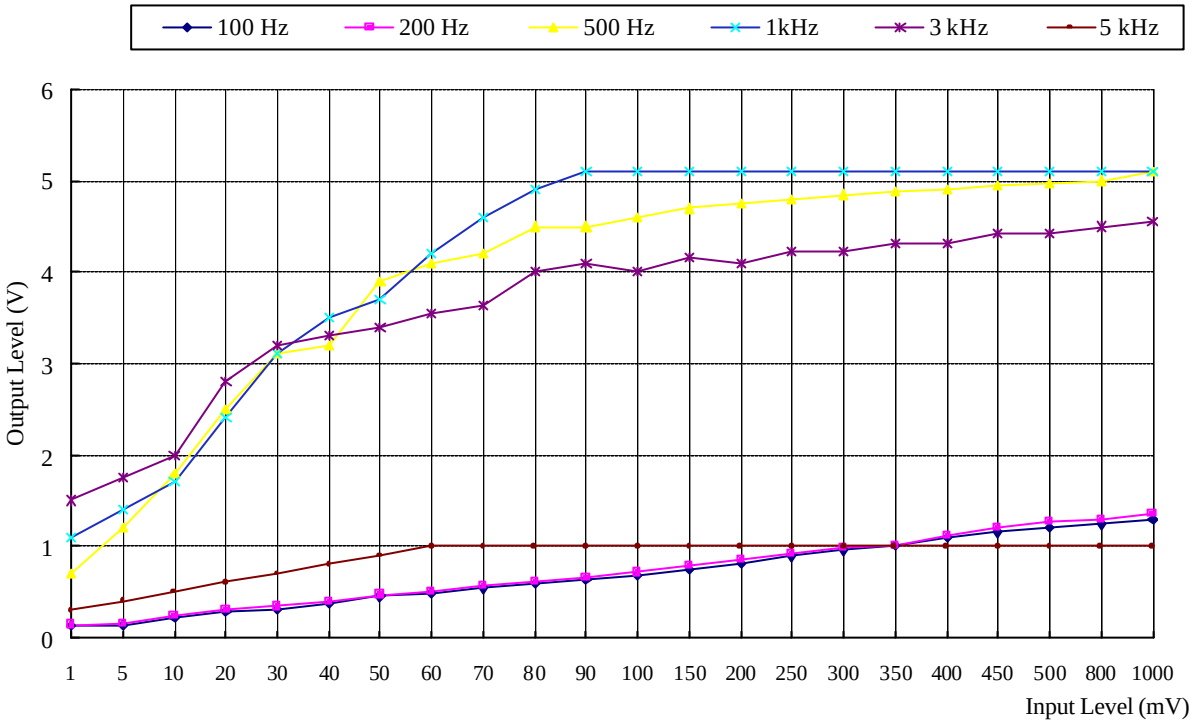


C). Frequency response of all circuits

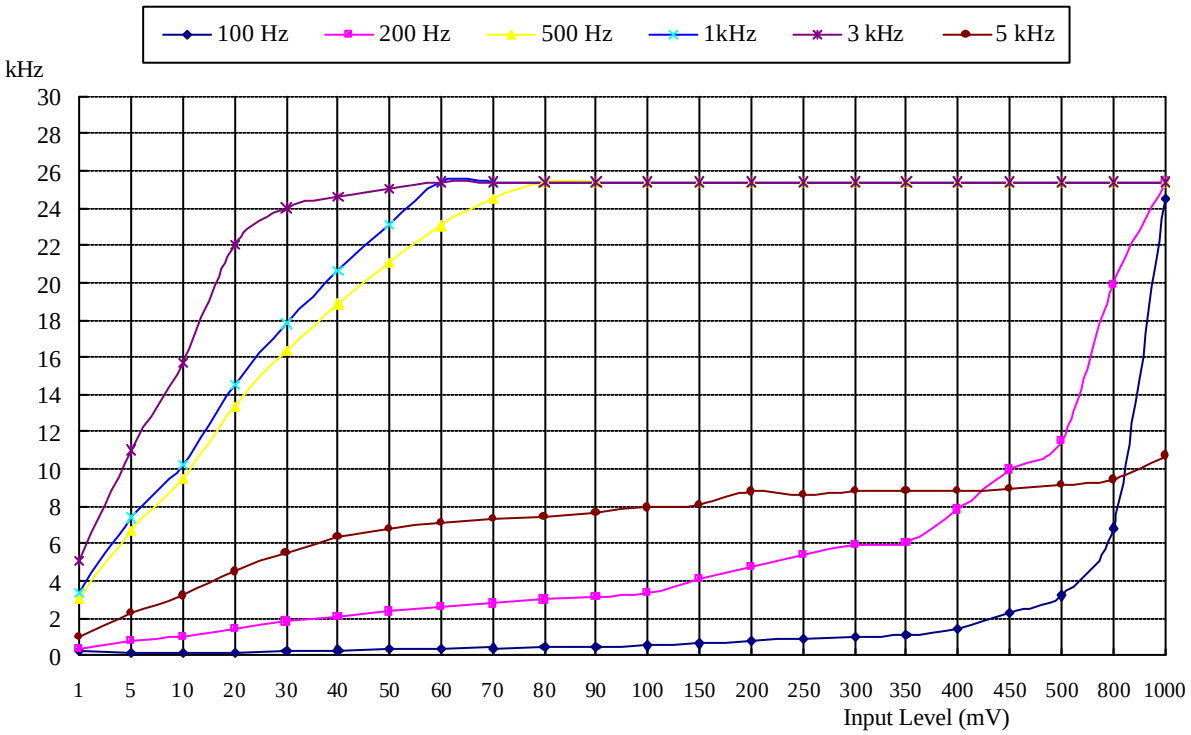


2. 740.000~770.000 MHz

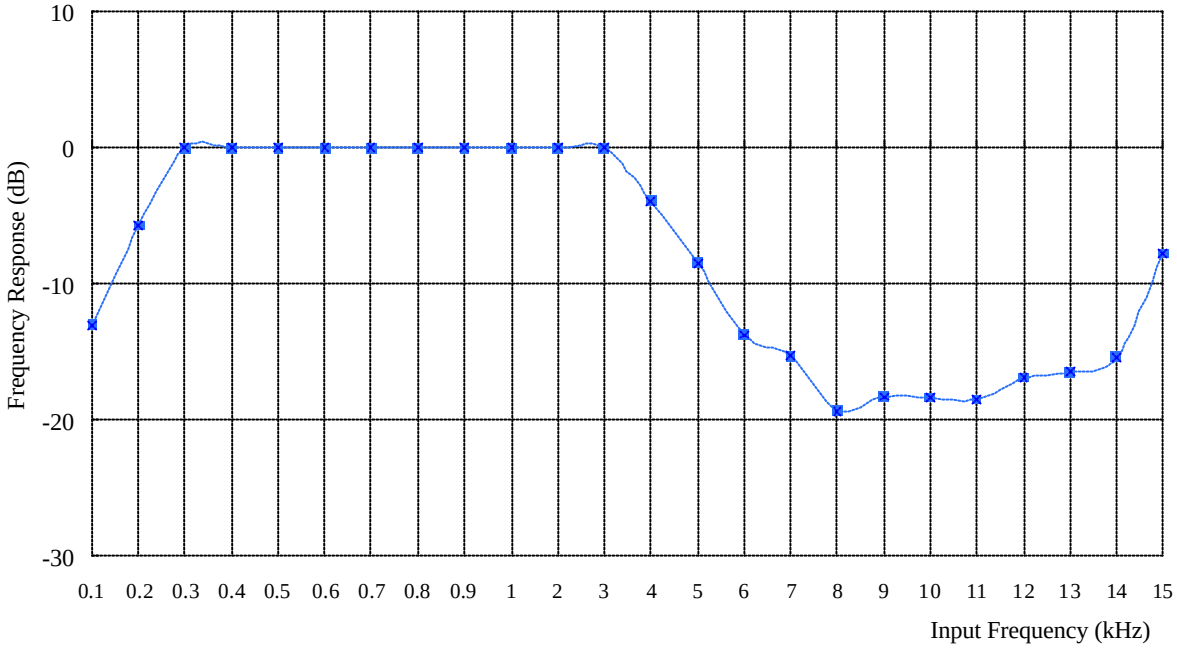
A). Frequency response



B). Modulation Limit



C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.
According to §74.861(e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

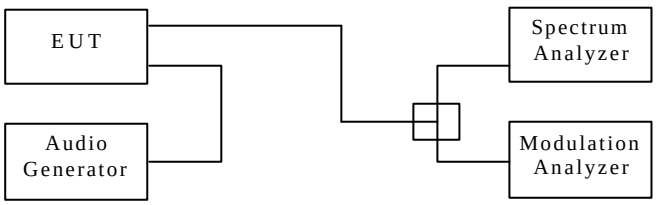
5.2 Measurement Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT as shown in figure 4, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Apply a 2.5 kHz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

Figure 4 : Occupied bandwidth measurement configuration



5.3 Occupied Bandwidth Test Equipment

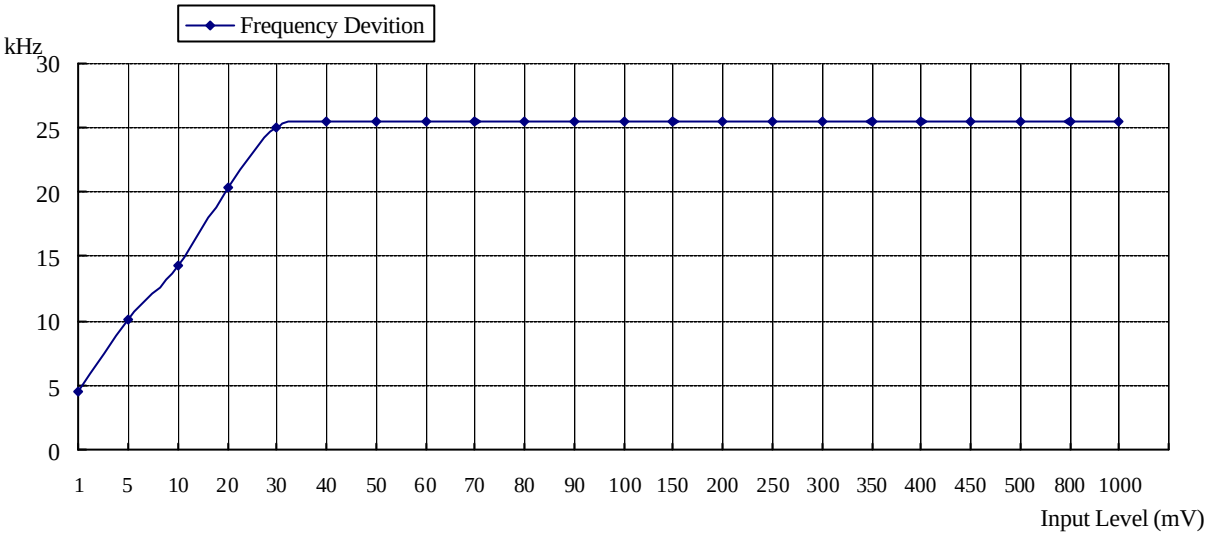
Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	R & S	ESBI	11/30/2004
Modulation Analyzer	Hewlett-Packard	8901A	12/11/2004
Multifunction Synthesizer	Hewlett-Packard	8904A	05/31/2004
Plotter	Hewlett-Packard	7440A	N/A

5.4 Bandwidth Measured

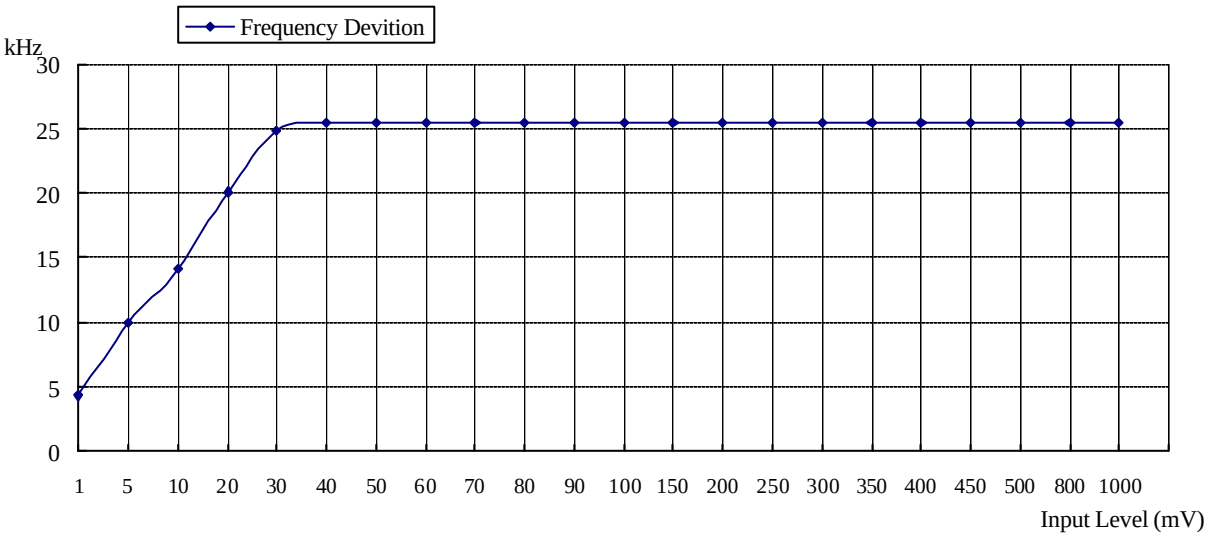
5.4.1 Input Level Derived

1. 630~660 MHz

Input Audio Frequency : 2.5 kHz, Sine Wave



2. 740~770 MHz



The Level input to produce 50 % modulation is 20 mV, therefore the magnitude 16 dB greater than it is 126 mV.

5.4.2 Occupied Bandwidth Plotted

1. 630~660 MHz

The Channel Low 26 dB Bandwidth is 89.1KHz.
The Channel Mid 26 dB Bandwidth is 92.7KHz.
The Channel High 26 dB Bandwidth is 90.8KHz.

2. 740~770 MHz

The Channel Low 26 dB Bandwidth is 78.6KHz.
The Channel Mid 26 dB Bandwidth is 80.2KHz.
The Channel High 26 dB Bandwidth is 78.6KHz.
Please see appendix 1 for plotted data.

6. FIELD STRENGTH OF EMISSION

6.1 Provisions Applicable

According to §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to §74.861(e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the follwing sceedule:

(i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(iii) on any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log(output power in watts) dB.

6.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
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 ◦ , and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.

7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

6.3 Measuring Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8564E	07/21/2004
Horn Antenna	EMCO	3115	05/28/2004
Log periodic Antenna	EMCO	3146	12/22/2004
Biconical Antenna	EMCO	3110B	11/04/2004
Preamplifier	Hewlett-Packard	8449B	06/30/2004
Preamplifier	Hewlett-Packard	8447D	02/18/2005

Measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

6.4 Measuring Data

1. 630~660 MHz

A. Channel Low

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 9.9 dBm , or 9.7 mW (ERP).

The limit of spurious or harmonics is calculated as following :

9.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1260.152	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
1890.228	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2520.304	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3150.380	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3780.456	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4410.532	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
5040.608	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5670.684	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
6300.760	---	---	---	---	12.1	-2.0	2.60	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

B. Channel Mid

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 7.7 dBm , or 5.8 mW (ERP).
The limit of spurious or harmonics is calculated as following :

7.7 -[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1289.824	---	---	---	---	7.3	-2.0	1.33	---	---	-13.0	---
1934.736	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2579.648	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3224.560	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3869.472	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4514.384	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5159.296	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5804.208	---	---	---	---	11.5	-2.0	2.60	---	---	-13.0	---
6449.120	---	---	---	---	12.2	-2.0	2.60	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

C. Channel High

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 4.3 dBm , or 2.7 mW (ERP).
The limit of spurious or harmonics is calculated as following :

4.3-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1319.784	---	---	---	---	7.3	-2.0	1.33	---	---	-13.0	---
1979.676	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2639.568	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
3299.460	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3959.352	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4619.244	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5279.136	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5939.028	---	---	---	---	11.7	-2.0	2.60	---	---	-13.0	---
6598.920	---	---	---	---	12.1	-2.0	2.60	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

2.740~770 MHz

A. Channel Low

Operated mode : TX Test Date : Apr. 21, 2004

Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 9.2 dBm , or 8.3 mW (ERP).

The limit of spurious or harmonics is calculated as following :

9.2-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1480.172	---	---	---	---	7.3	-2.0	1.3	---	---	-13.0	---
2220.258	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
2960.344	---	---	---	---	9.6	-2.0	1.7	---	---	-13.0	---
3700.430	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4440.516	---	---	---	---	10.6	-2.0	2.1	---	---	-13.0	---
5180.602	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5920.688	---	---	---	---	11.7	-2.0	2.6	---	---	-13.0	---
6660.774	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
7400.860	---	---	---	---	11.6	-2.0	2.9	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

B. Channel Mid

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 8.4 dBm , or 3.9 mW (ERP).
The limit of spurious or harmonics is calculated as following :

8.4-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1509.824	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2264.736	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
3019.648	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3774.560	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4529.472	---	---	---	---	10.7	-2.0	2.1	---	---	-13.0	---
5284.384	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6039.296	---	---	---	---	11.0	-2.0	2.6	---	---	-13.0	---
6794.208	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
7549.120	---	---	---	---	11.6	-2.0	2.9	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

C. Channel High

Operated mode : TX Test Date : Apr. 21, 2004
Temperature : 25℃ Humidity : 65%

Unmodulated carrier output power is 11.4 dBm , or 13.8 mW (ERP).
The limit of spurious or harmonics is calculated as following :

11.4-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1539.768	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2309.652	---	---	---	---	9.3	-2.0	1.7	---	---	-13.0	---
3079.536	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3849.420	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4619.304	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5389.188	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6159.072	---	---	---	---	11.9	-2.0	2.5	---	---	-13.0	---
6928.956	---	---	---	---	11.8	-2.0	2.5	---	---	-13.0	---
7698.840	---	---	---	---	11.5	-2.0	2.9	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading + Cable Loss + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

D. Emission mask plots

Please see appendix 2 for plotted data.

6.5 Radiated Measurement Photos

Please See Exhibit-F-Test_Setup_Photos

7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

According to §2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30? to +50? centigrade, and according to §2.1055 (d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to §74.861(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

7.2 Measurement Procedure

A) Frequency stability versus environmental temperature

1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15? to 25? . Otherwise, an environmental chamber set for a temperature of 20? shall be used. Install new batteries in the EUT.

2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.

3. Set the temperature of chamber to 50? . Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.

4. Repeat step 2 with a 10? decreased per stage until the lowest temperature -30? is measured, record all measurement frequencies.

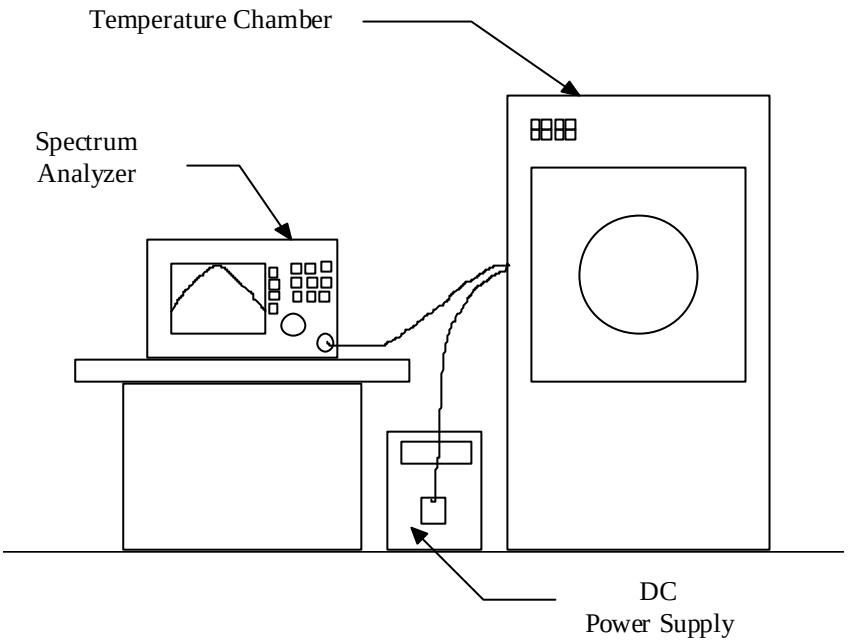
B) Frequency stability versus input voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15? to 25? . Otherwise, an environmental chamber set for a temperature of 20? shall be used. Install new batteries in the EUT.

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.

3. For battery operated only device, supply the EUT primary voltage at the battery operating end point which is specified by the manufacturer and record the frequency.

Figure 5 : Frequency stability measurement configuration



7.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	HP	8564E	07/21/2004
Temperature Chamber	MALLIER	MCT-2X-M	10/22/2004

7.4 Measurement Data

A1. Frequency stability versus enviroment tempture

Reference Frequency : 630.076 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	630.0748	-0.00019	630.0768	0.00013	630.0754	-0.00010
40		630.0773	0.00020	630.0770	0.00016	630.0756	-0.00007
30		630.0747	-0.00021	630.0757	-0.00004	630.0750	-0.00016
20		630.0767	0.00011	630.0760	0.00000	630.0759	-0.00002
10		630.0759	-0.00001	630.0752	-0.00013	630.0748	-0.00020
0		630.0771	0.00018	630.0761	0.00002	630.0747	-0.00020
-10		630.0747	-0.00021	630.0759	-0.00002	630.0765	0.00008
-20		630.0757	-0.00006	630.0761	0.00002	630.0759	-0.00001
-30		740.0986	-0.00154	740.1216	0.00157	740.0888	-0.00286

A2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 630.076 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	630.0759	-0.00002	630.0766	0.00010	630.0768	0.00012

B1. Frequency stability versus enviroment tempture

Reference Frequency : 644.912 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	644.9125	0.00008	644.9127	0.00011	644.9132	0.00019
40		644.9110	-0.00015	644.9122	0.00004	644.9114	-0.00010
30		644.9125	0.00008	644.9108	-0.00019	644.9113	-0.00010
20		644.9110	-0.00016	644.9111	-0.00014	644.9114	-0.00009
10		644.9106	-0.00021	644.9119	-0.00002	644.9135	0.00023
0		644.9123	0.00005	644.9106	-0.00022	644.9115	-0.00008
-10		644.9126	0.00010	644.9126	0.00009	644.9129	0.00014
-20		644.9120	-0.00001	644.9111	-0.00014	644.9134	0.00021
-30		794.7919	-0.00266	794.7912	-0.00274	794.7920	-0.00264

B2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 644-912 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	644.9107	-0.00021	644.9118	-0.00003	644.9130	0.00015

C1. Frequency stability versus enviroment tempture

Reference Frequency : 659.892 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	659.8927	0.00010	659.8906	-0.00021	659.8906	-0.00021
40		659.8935	0.00022	659.8924	0.00007	659.8913	-0.00010
30		659.8922	0.00003	659.8930	0.00015	659.8934	0.00021
20		659.8930	0.00015	659.8933	0.00020	659.8927	0.00010
10		659.8906	-0.00022	659.8905	-0.00023	659.8909	-0.00017
0		659.8920	0.00000	659.8931	0.00017	659.8914	-0.00009
-10		659.8926	0.00010	659.8929	0.00014	659.8930	0.00015
-20		659.8925	0.00008	659.8929	0.00013	659.8923	0.00004
-30		805.3065	-0.00106	805.3101	-0.00061	805.2872	-0.00345

C2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 659-892 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	659.8908	-0.00019	659.8932	0.00018	659.8909	-0.00016

D1. Frequency stability versus enviroment tempture

Reference Frequency : 740.086 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	740.0853	-0.00009	740.0872	0.00016	740.0856	-0.00006
40		740.0858	-0.00003	740.0861	0.00002	740.0873	0.00017
30		740.0877	0.00023	740.0874	0.00019	740.0858	-0.00003
20		740.0868	0.00011	740.0868	0.00011	740.0872	0.00017
10		740.0866	0.00008	740.0856	-0.00006	740.0852	-0.00010
0		740.0865	0.00007	740.0845	-0.00020	740.0873	0.00018
-10		740.0862	0.00003	740.0875	0.00020	740.0845	-0.00020
-20		740.0852	-0.00011	740.0872	0.00017	740.0848	-0.00016
-30		740.0986	-0.00154	740.1216	0.00157	740.0888	-0.00286

D2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 740-086 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	740.0868	0.00010	740.0845	-0.00020	740.0861	0.00001

E1. Frequency stability versus enviroment tempture

Reference Frequency : 754.912 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	754.9116	-0.00006	754.9122	0.00003	754.9127	0.00009
40		754.9116	-0.00006	754.9121	0.00001	754.9115	-0.00006
30		754.9116	-0.00006	754.9123	0.00003	754.9103	-0.00022
20		754.9127	0.00009	754.9124	0.00005	754.9128	0.00011
10		754.9136	0.00021	754.9109	-0.00015	754.9124	0.00006
0		754.9106	-0.00019	754.9124	0.00006	754.9120	0.00001
-10		754.9135	0.00020	754.9123	0.00003	754.9112	-0.00010
-20		754.9111	-0.00012	754.9104	-0.00021	754.9108	-0.00016
-30		794.7919	-0.00266	794.7912	-0.00274	794.7920	-0.00264

E2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 759.912 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	754.9106	-0.00019	754.9118	-0.00003	754.9108	-0.00016

F1. Frequency stability versus enviroment tempture

Reference Frequency : 769.844 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	769.8857	0.00022	769.8843	0.00004	769.8825	-0.00019
40		769.8835	-0.00006	769.8832	-0.00010	769.8832	-0.00011
30		769.8840	0.00000	769.8832	-0.00011	769.8826	-0.00018
20		769.8828	-0.00015	769.8854	0.00018	769.8824	-0.00021
10		769.8851	0.00014	769.8854	0.00019	769.8853	0.00017
0		769.8827	-0.00017	769.8826	-0.00018	769.8832	-0.00010
-10		769.8840	0.00000	769.8835	-0.00006	769.8829	-0.00015
-20		769.8826	-0.00018	769.8831	-0.00012	769.8824	-0.00021
-30		805.3065	-0.00106	805.3101	-0.00061	805.2872	-0.00345

F2. Frequency stability versus end-point supplied voltage (2Vdc)

Reference Frequency : 769-844 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vdc)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	769.8847	0.00009	769.8824	-0.00020	769.8857	0.00021

8 CONDUCTED EMISSION MEASUREMENT

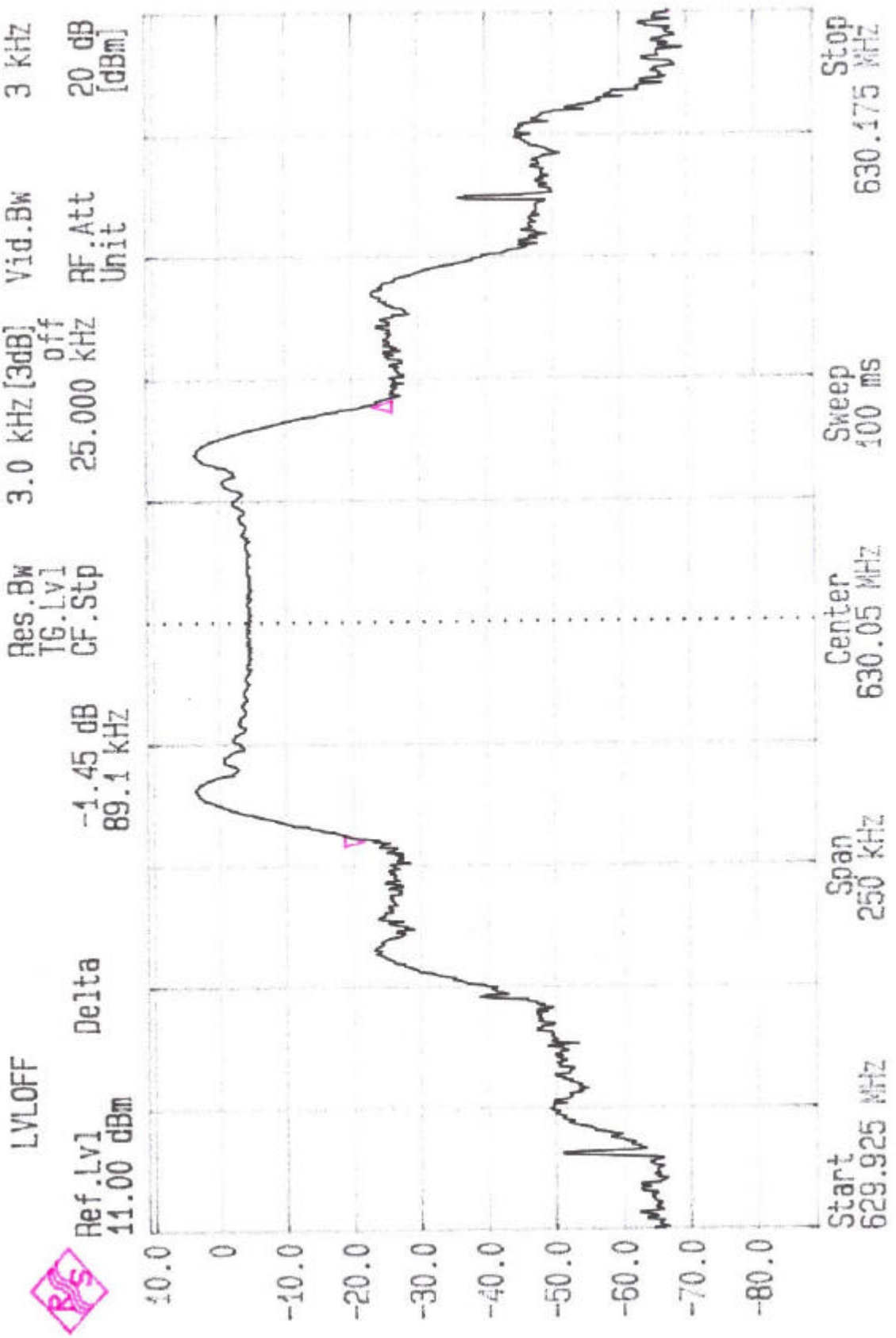
8.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to §15.207 (c), 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.

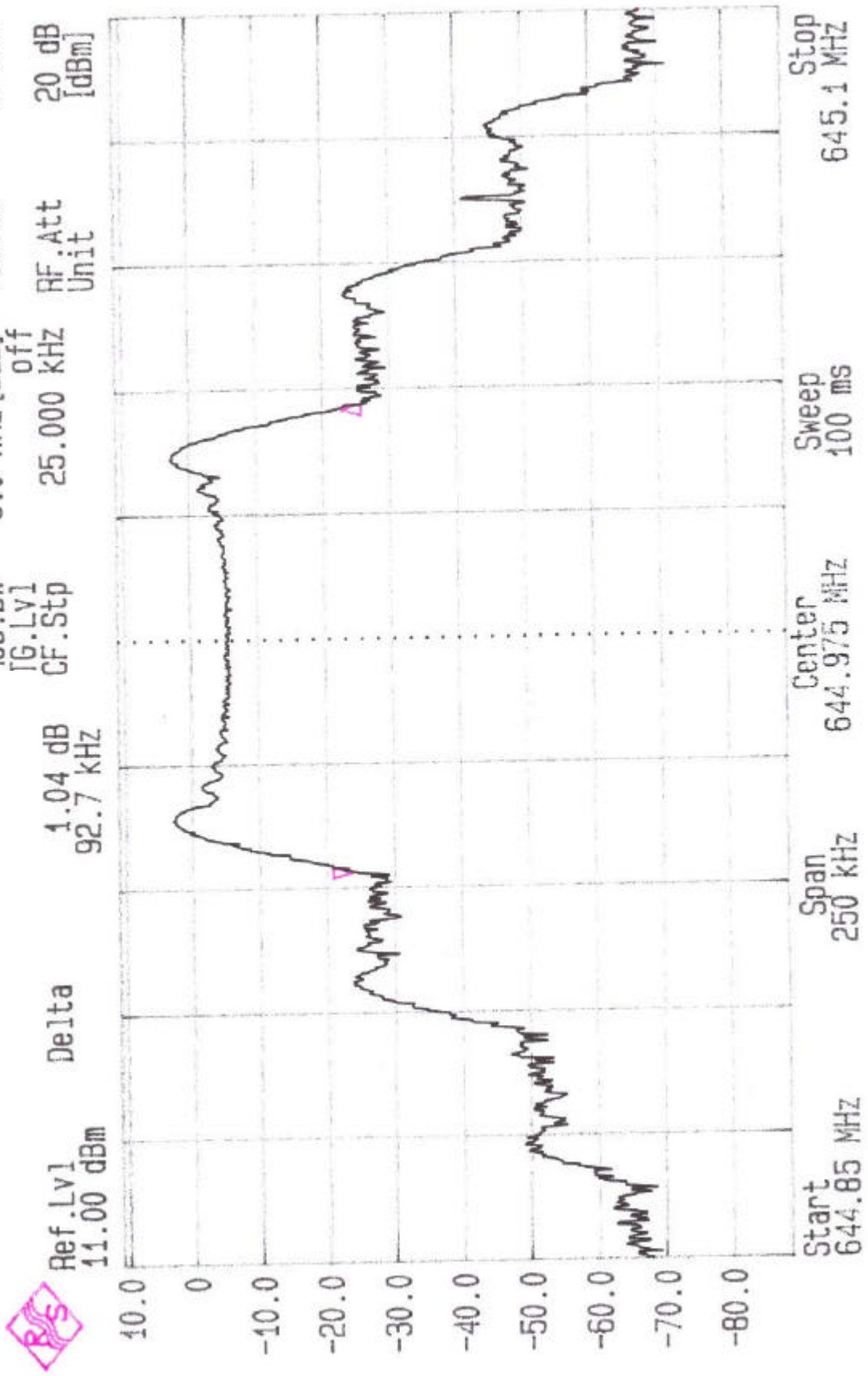
For intentional device, Line Conducted Emission Limits are in accordance to §15.207(a)

Appendix 1 : Occupied Emission Bandwidth Plotted Data

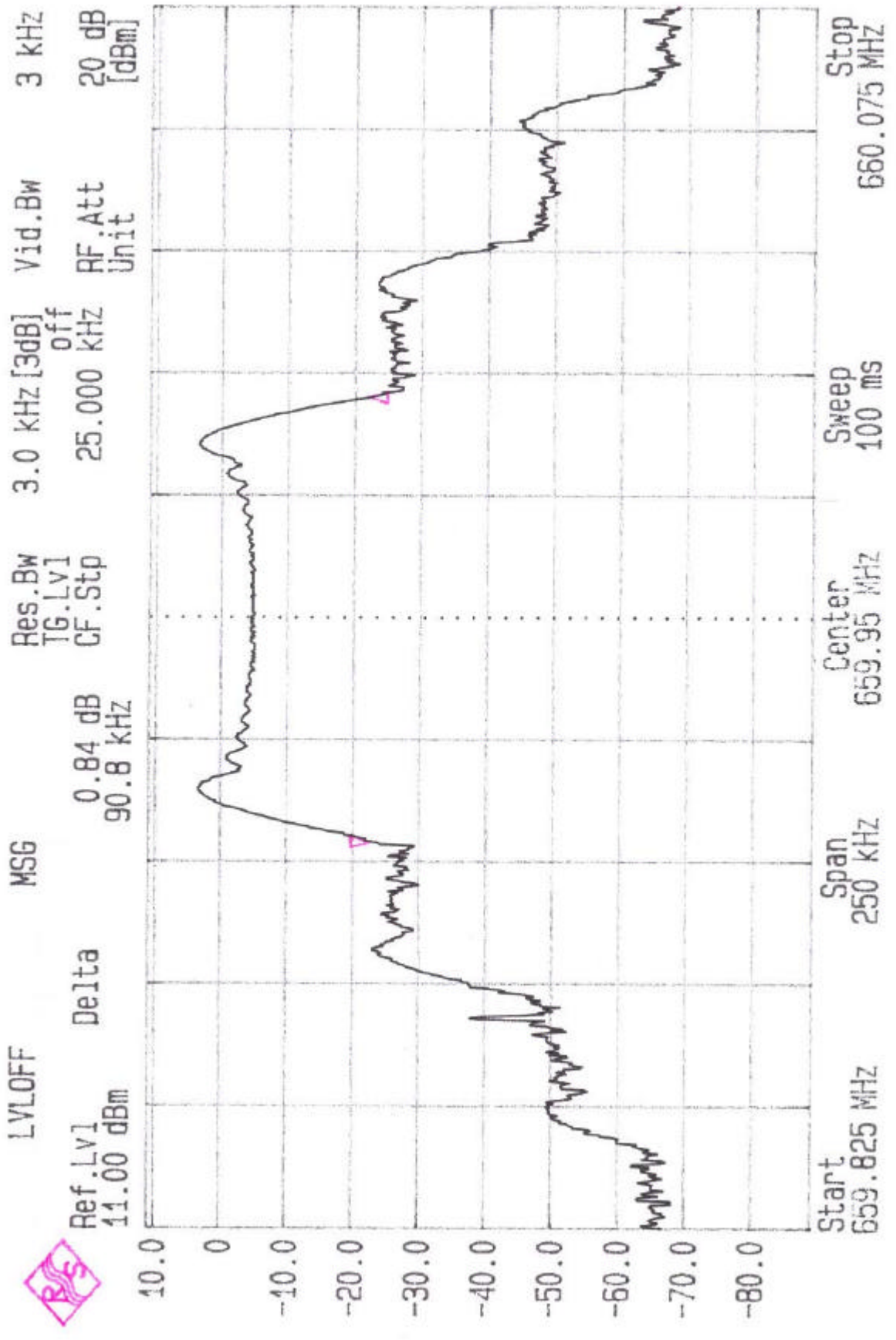
630.000~660.00MHz



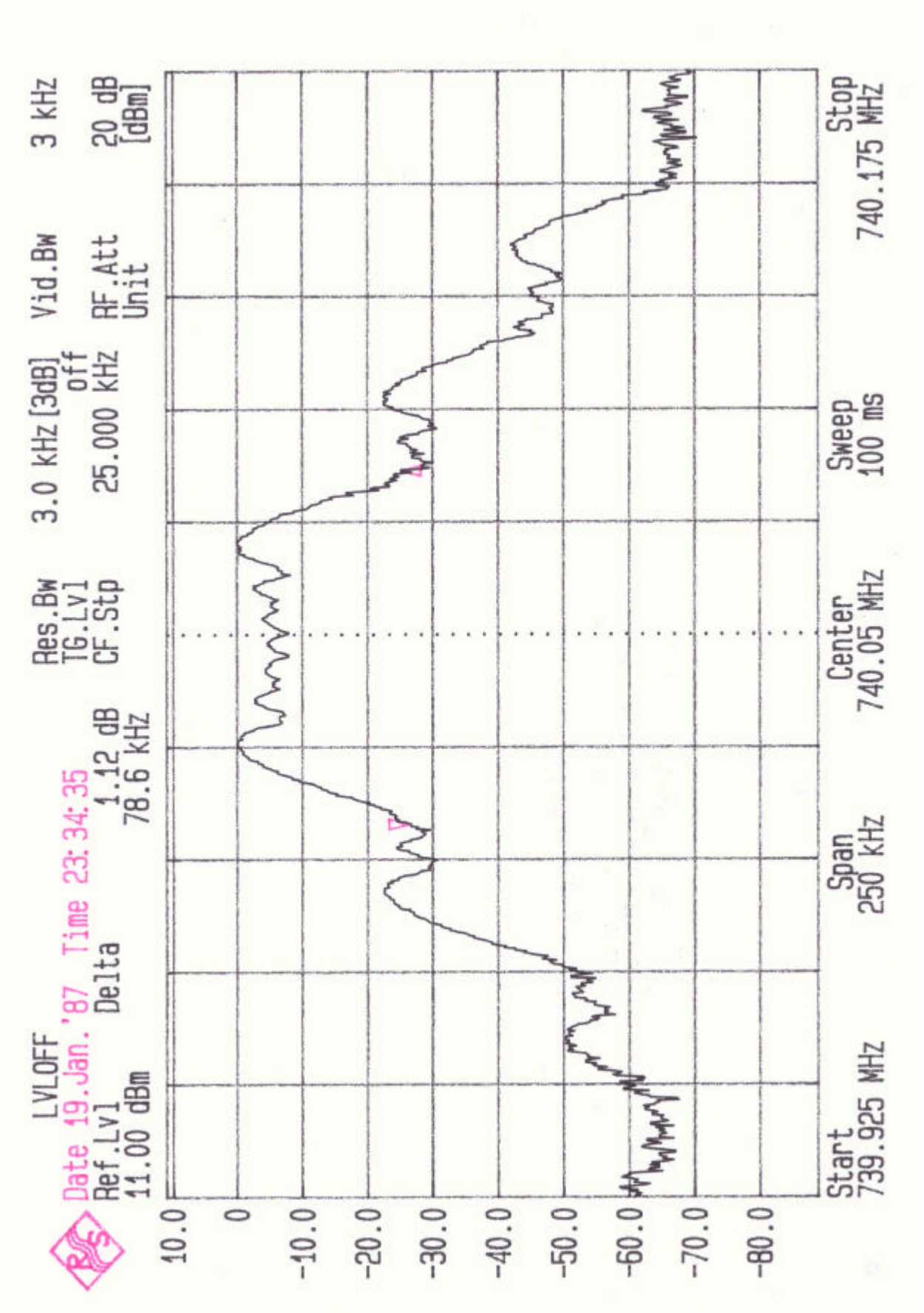
630.000~660.00MHz



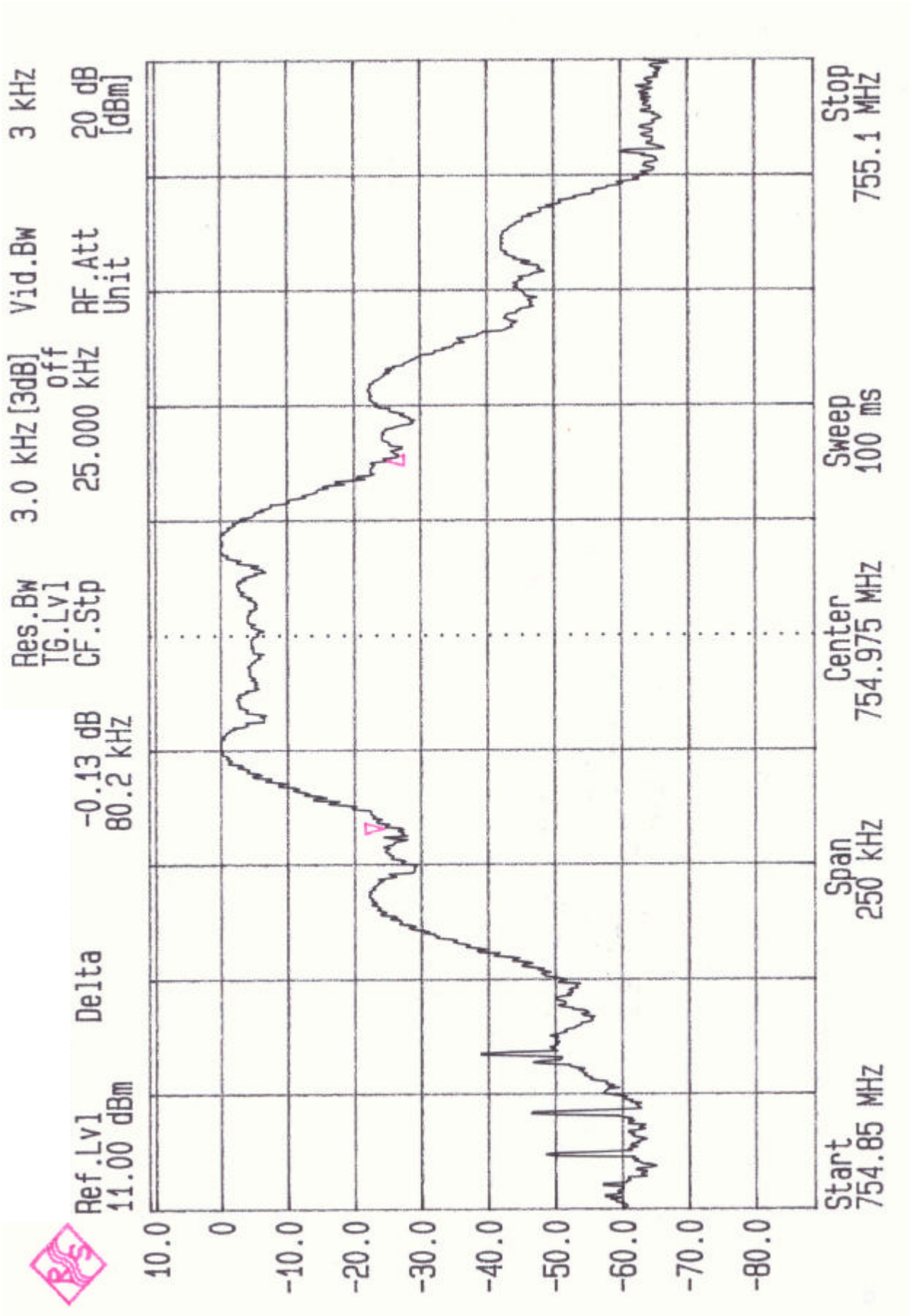
630.000~660.00MHz



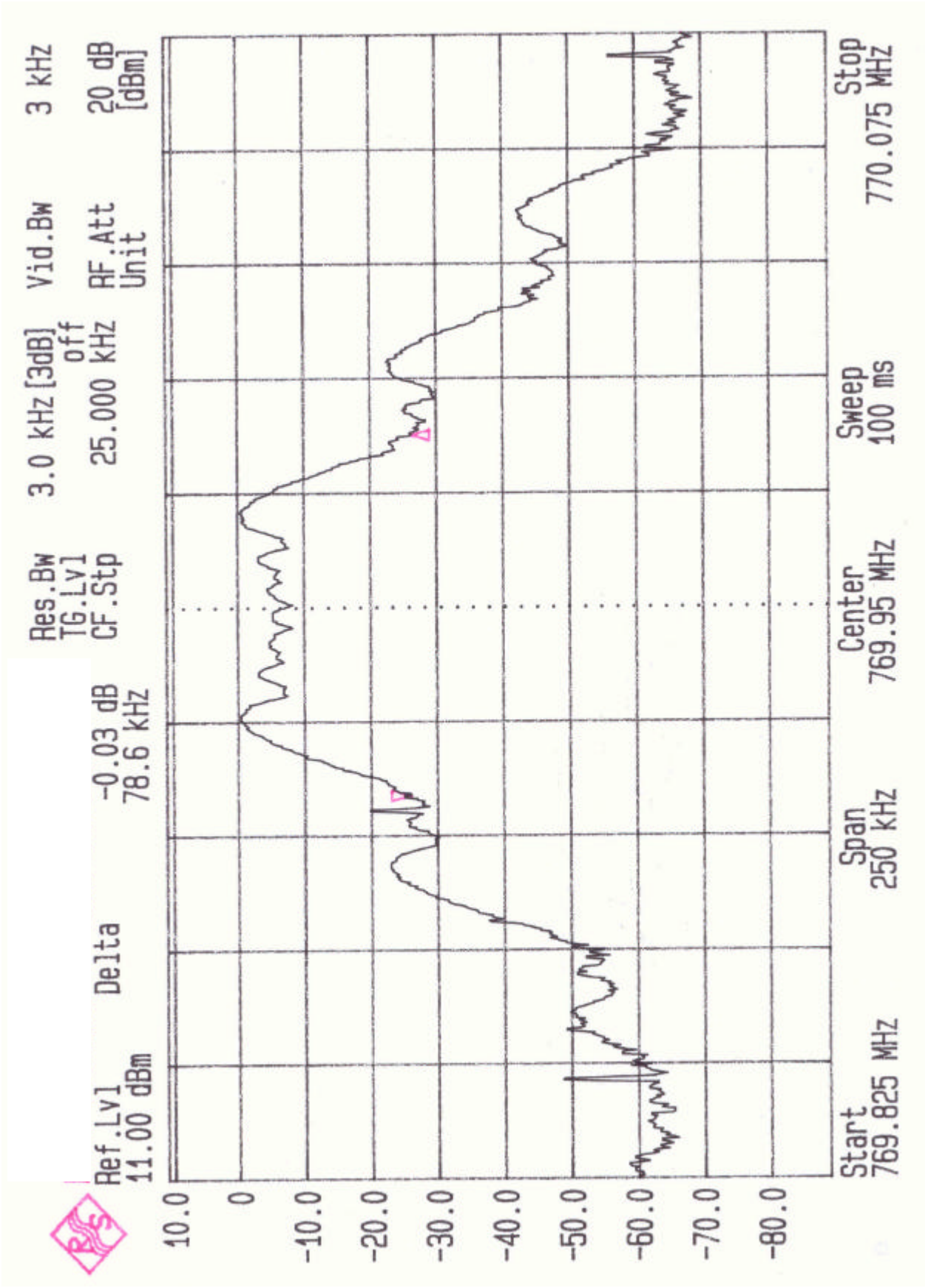
740.000~770.00MHz



740.000~770.00MHz

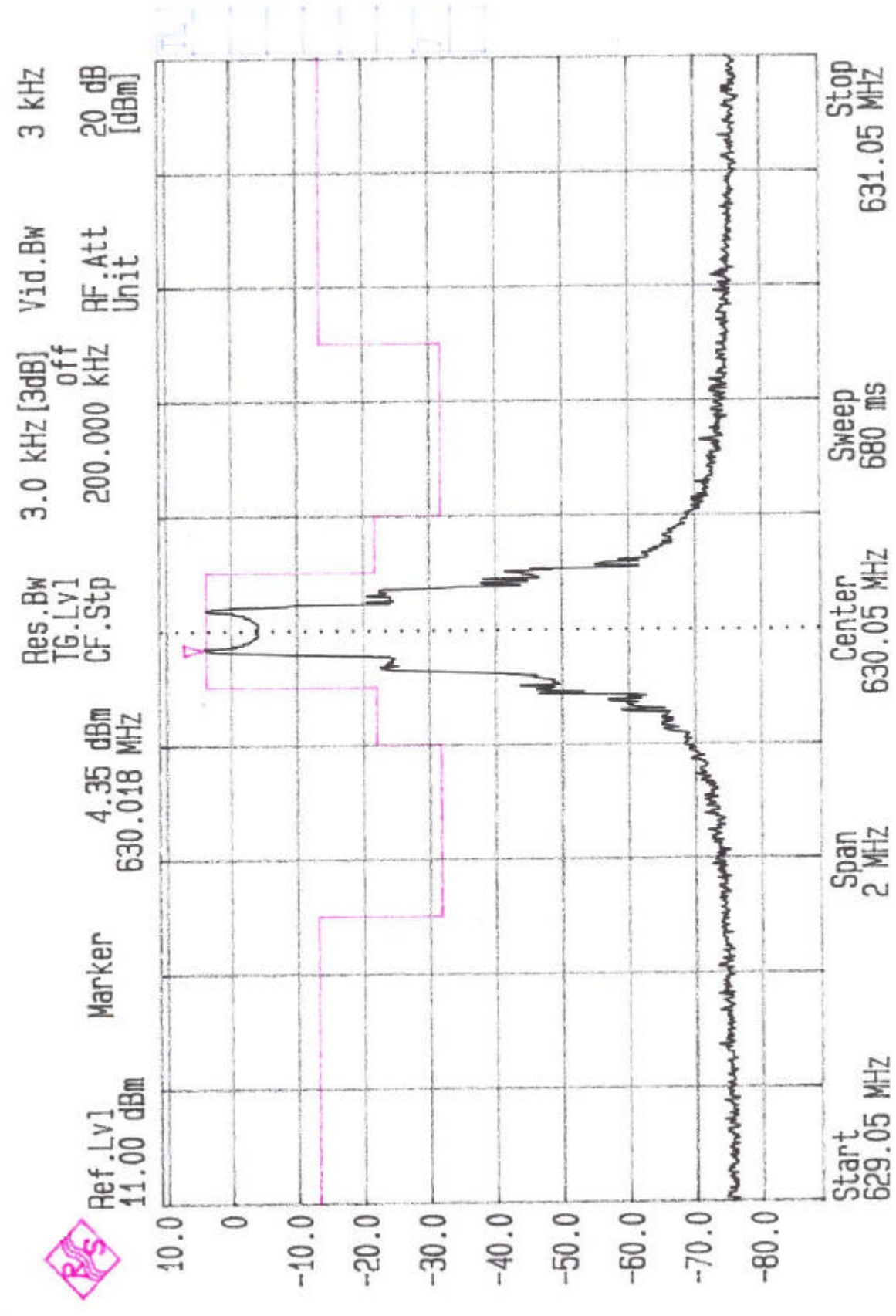


740.000~770.00MHz

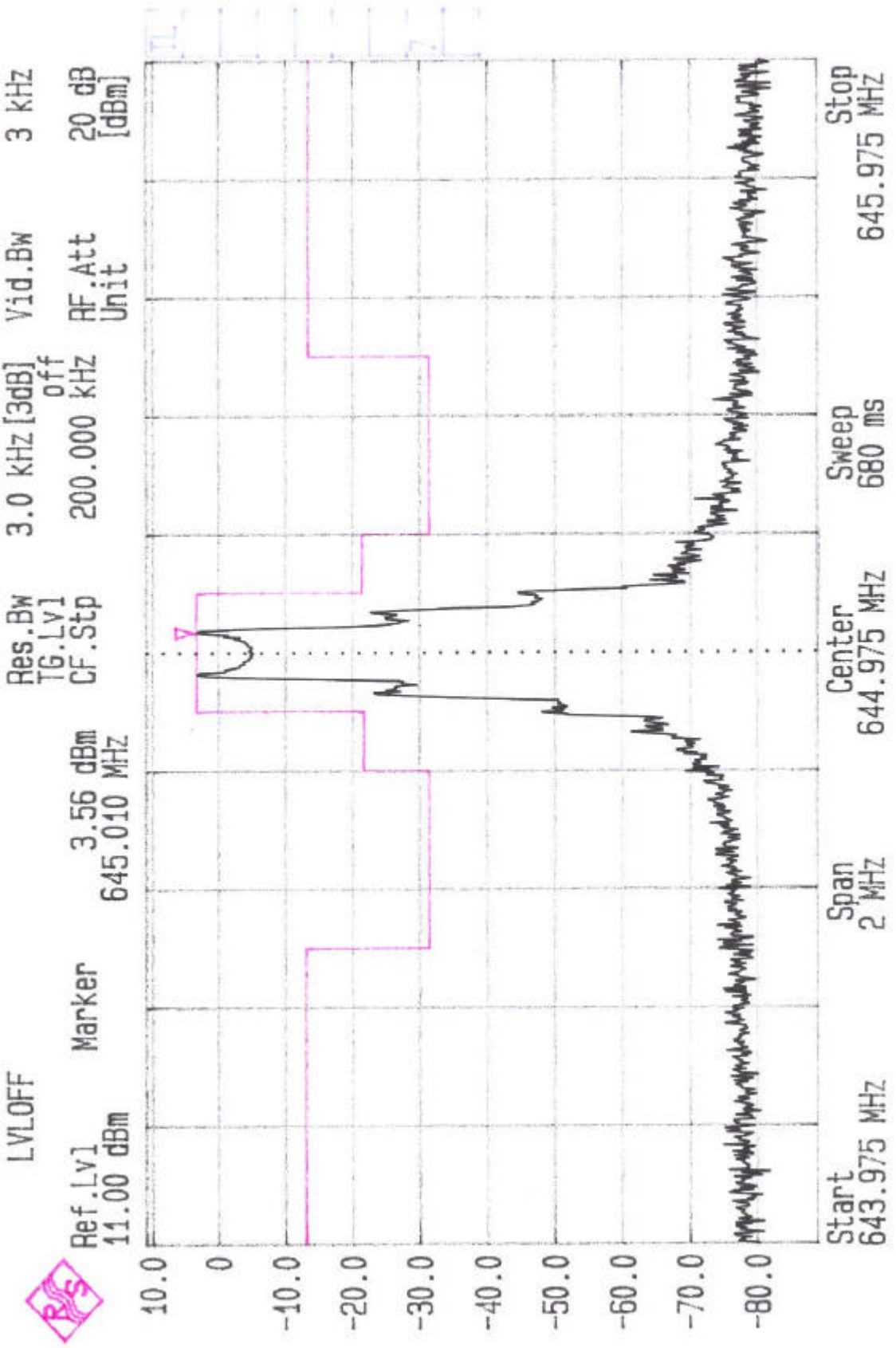


Appendix 2 : Emission Mask Plotted Data

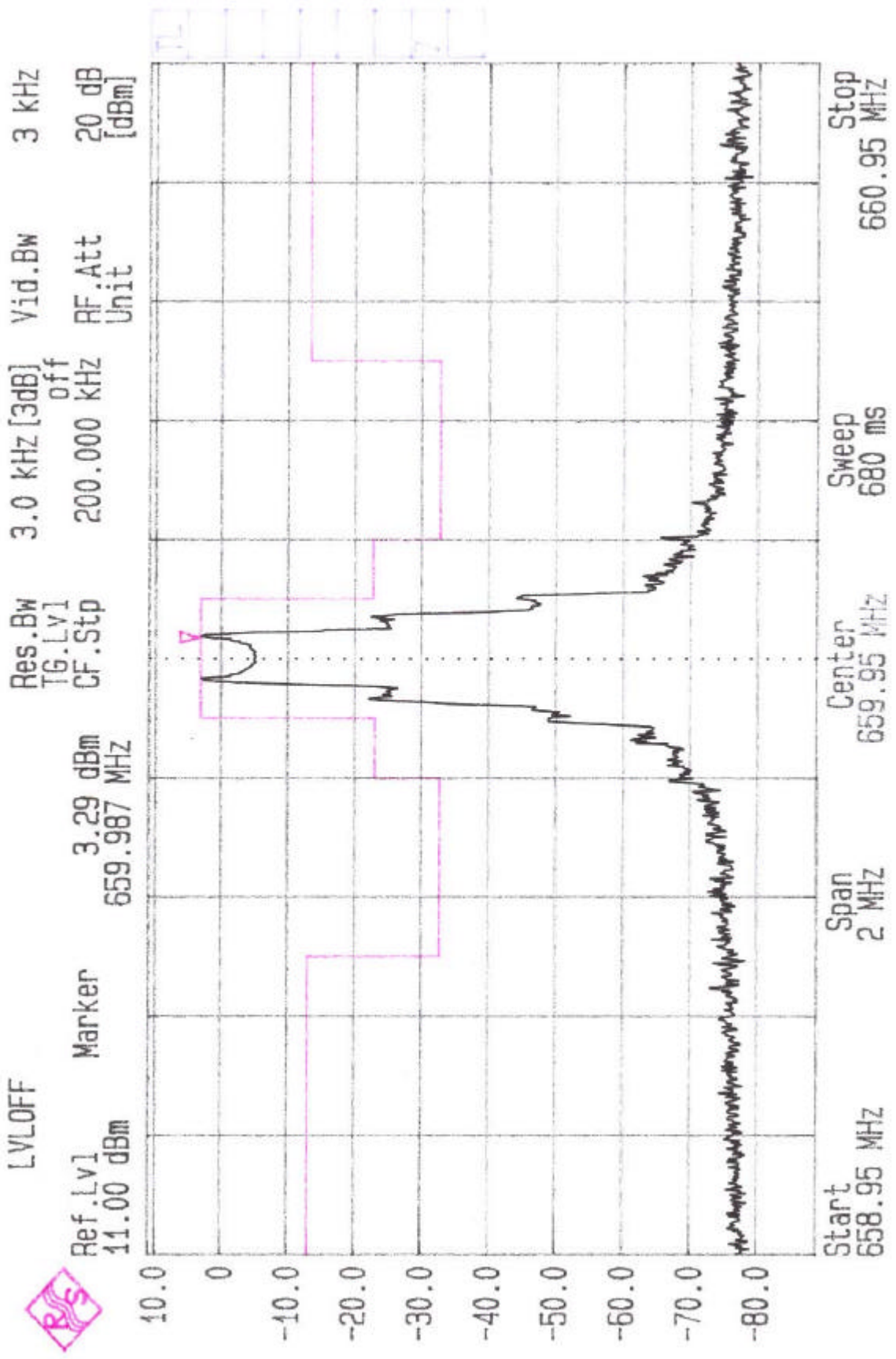
630.000~660.00MHz



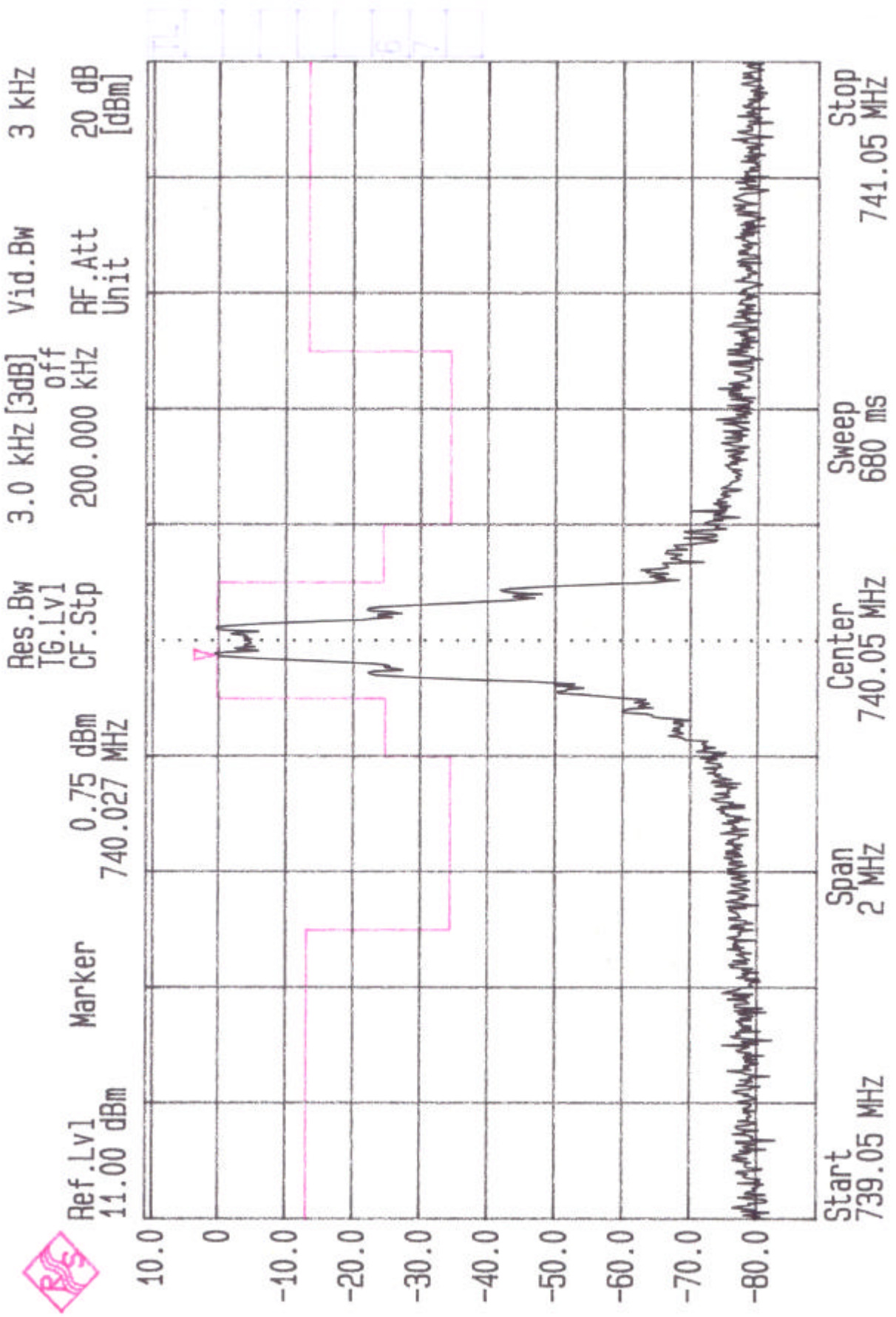
630.000~660.00MHz



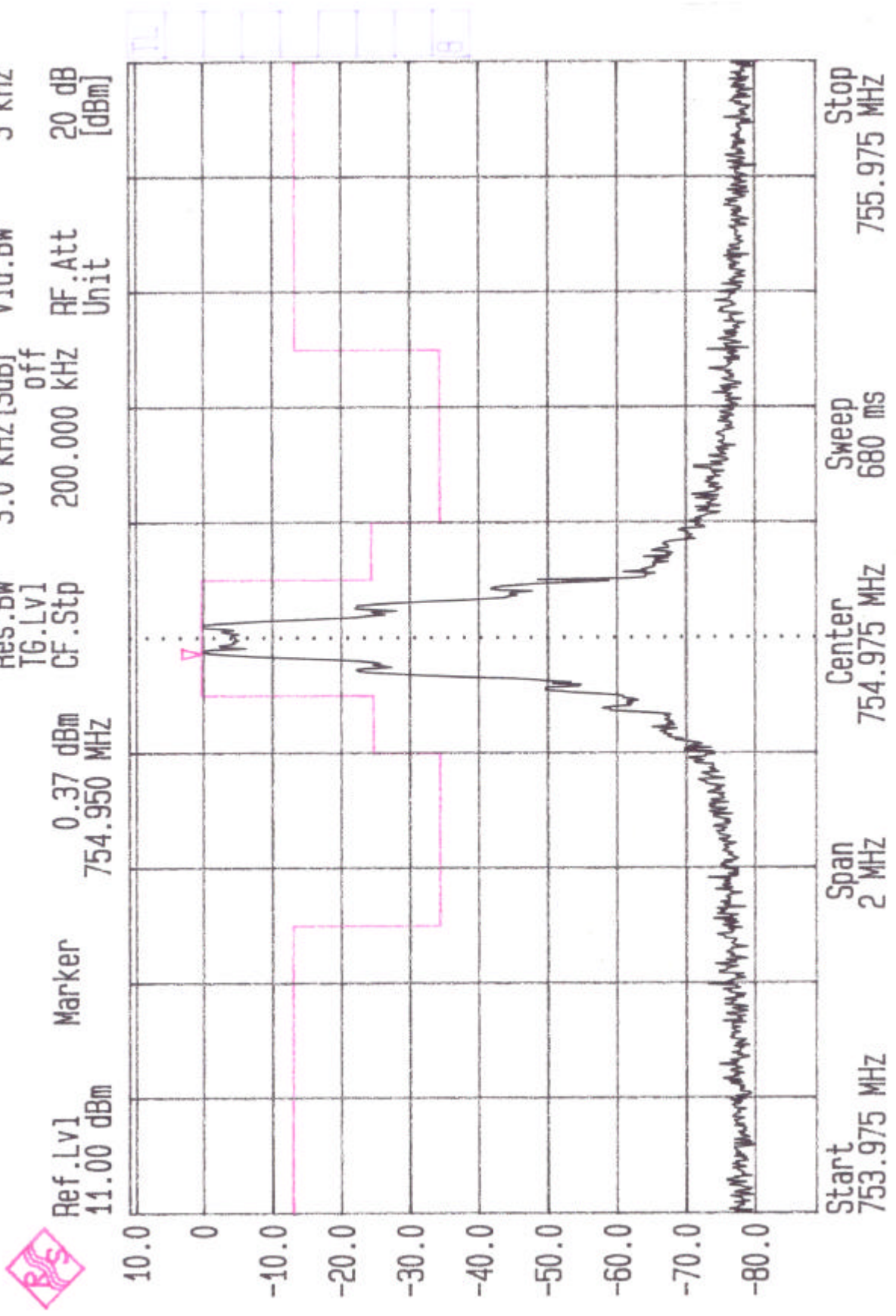
630.000~660.00MHz



740.000~770.00MHz



740.000~770.00MHz



740.000~770.00MHz