FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Wireless Handheld Transmitter Microphone

FCC ID. : JEBUF-9

MODEL : UF-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

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Report Number : ET93R-04-041-04

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	:
b) Trade Name	: MASCOT
c) Model No.	: UF-9
d) FCC ID	: JEBUF-9
e) Working Frequency	: 630MHz-770MHz
f) Power Supply	: Model:SP41-120500 input:120VAC 60Hz 9W output:12VDC 500mA

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 Handheld Transmitter Microphone
b) Trade Name	: MASCOT
c) Model No.	: UF-9
d) FCC ID	: JEBUF-9
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. There are 16 channel available and channel used can be selected from a DIP switch.

1.3 Test Methodology

Both Wireless Handheld 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

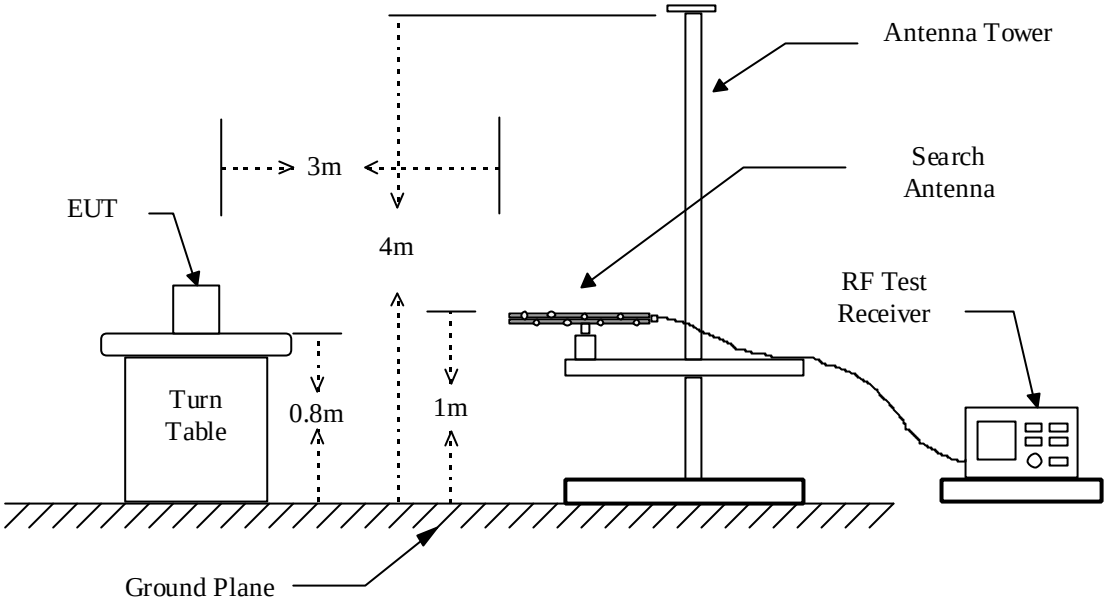
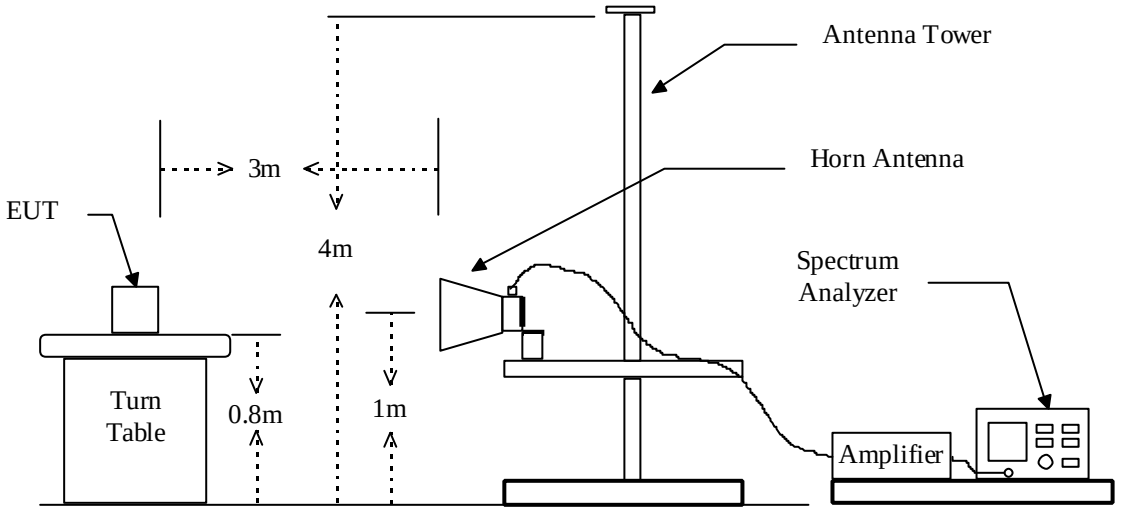


Figure 1 : Frequencies measured above 1 GHz configuration



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)
630.015	73.4	70.6	2.3	---	0.5	1.2	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)
644.812	74.8	71.5	2.4	---	0.9	1.3	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)
659.931	74.8	71.5	2.4	---	0.9	1.3	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)
740.062	75.4	5.5	2.5	---	3.0	2.0	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)
754.921	73.2	3.3	2.5	---	1.8	1.51	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)
769.911	72.0	4.8	2.6	---	2.2	1.7	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.

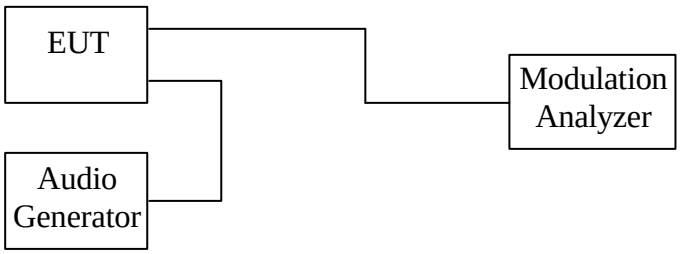
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

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



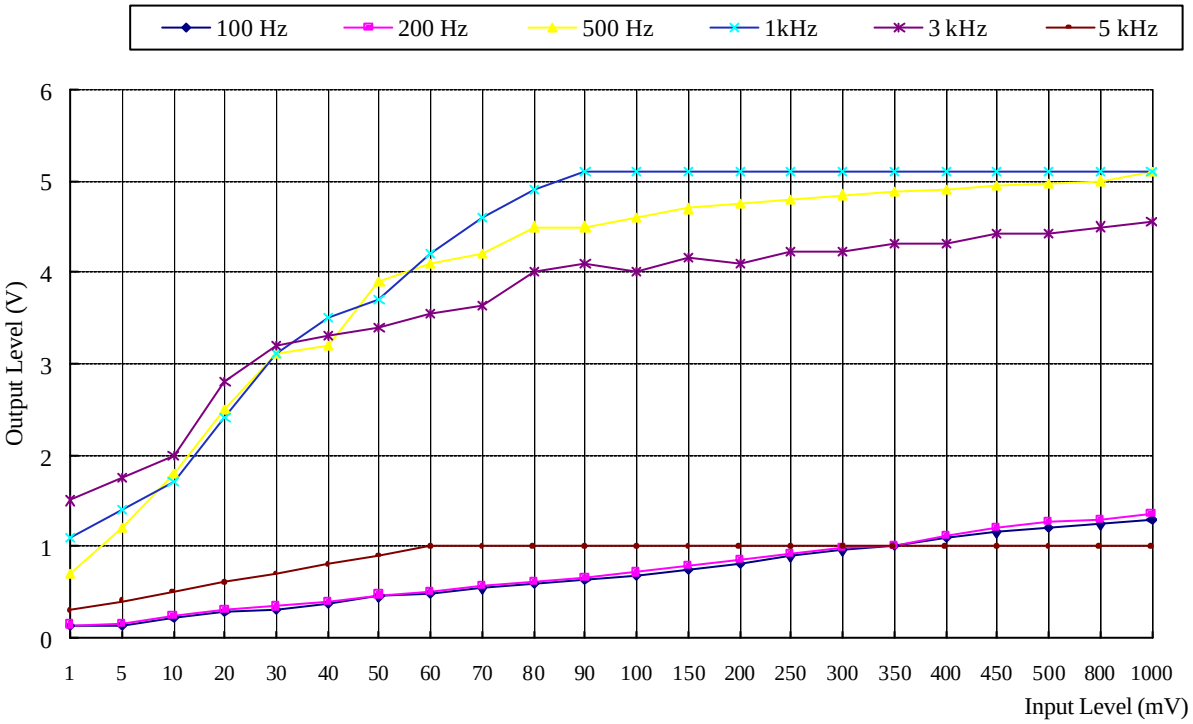
4.3 Measurement Instrument

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

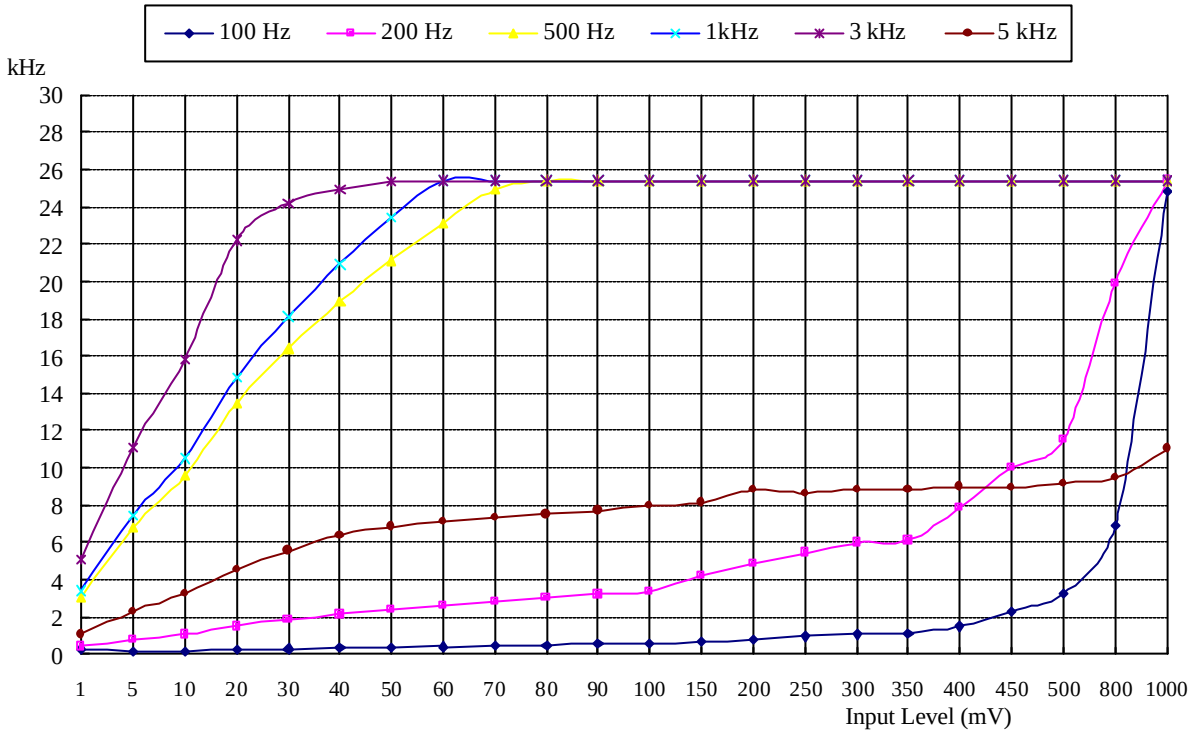
4.4 Measurement Result

1. 630.000~660.000 MHz

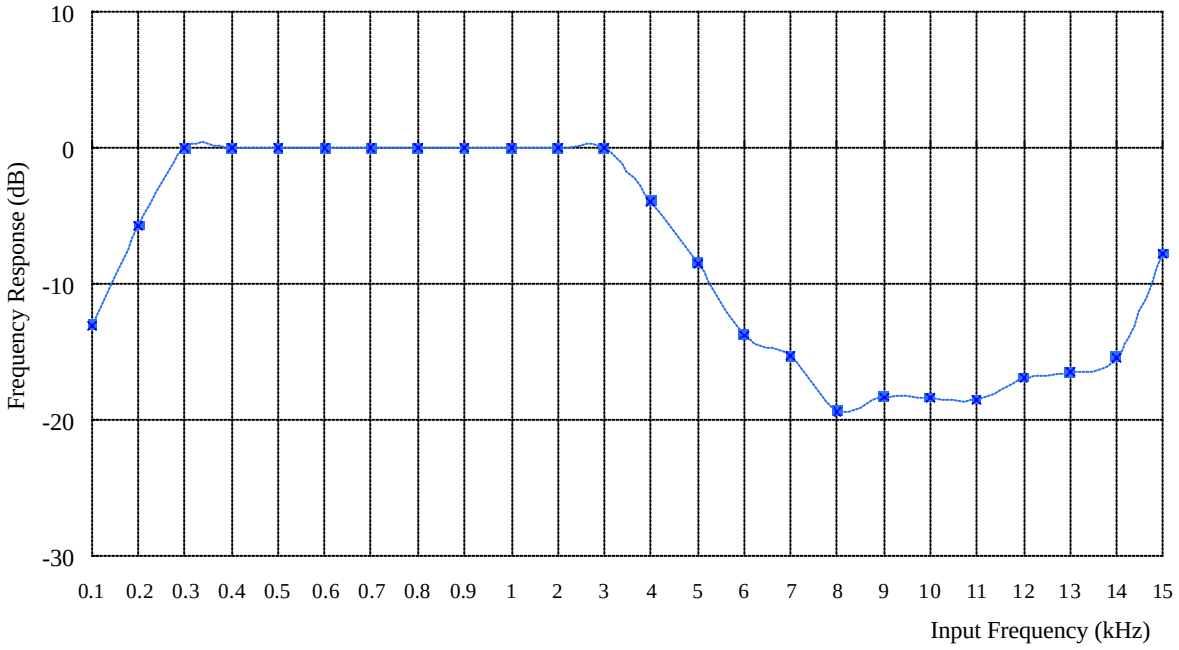
A). Frequency response



B). Modulation Limit

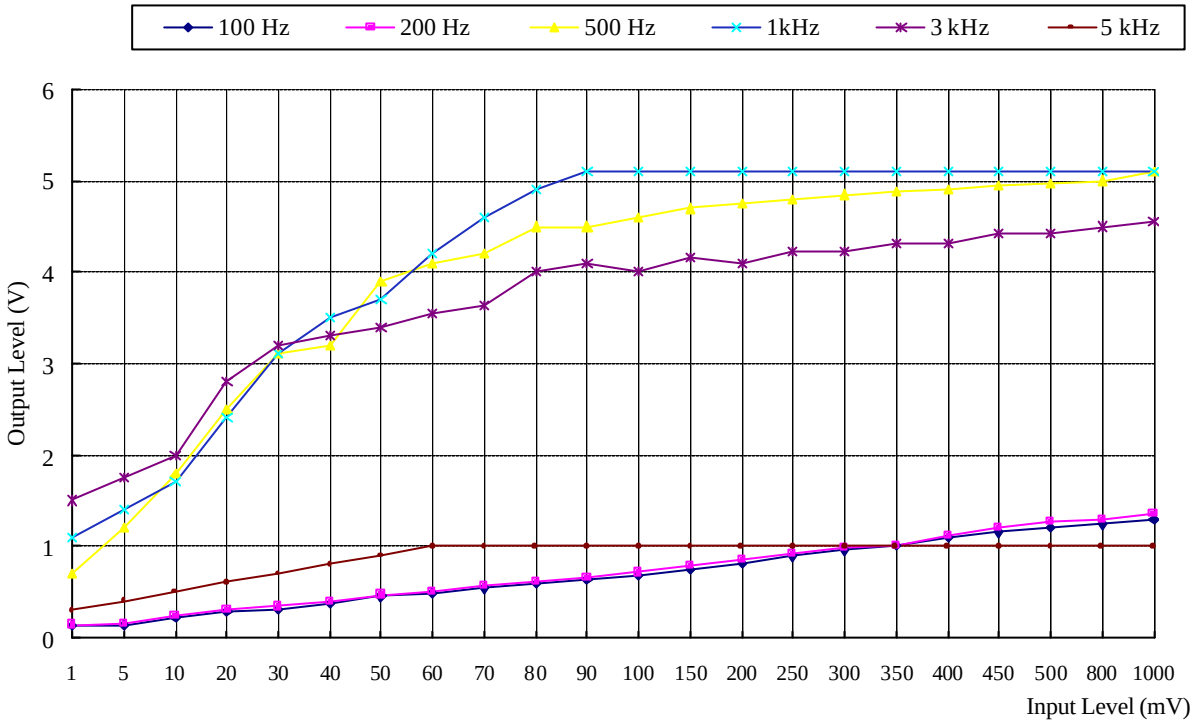


C). Frequency response of all circuits

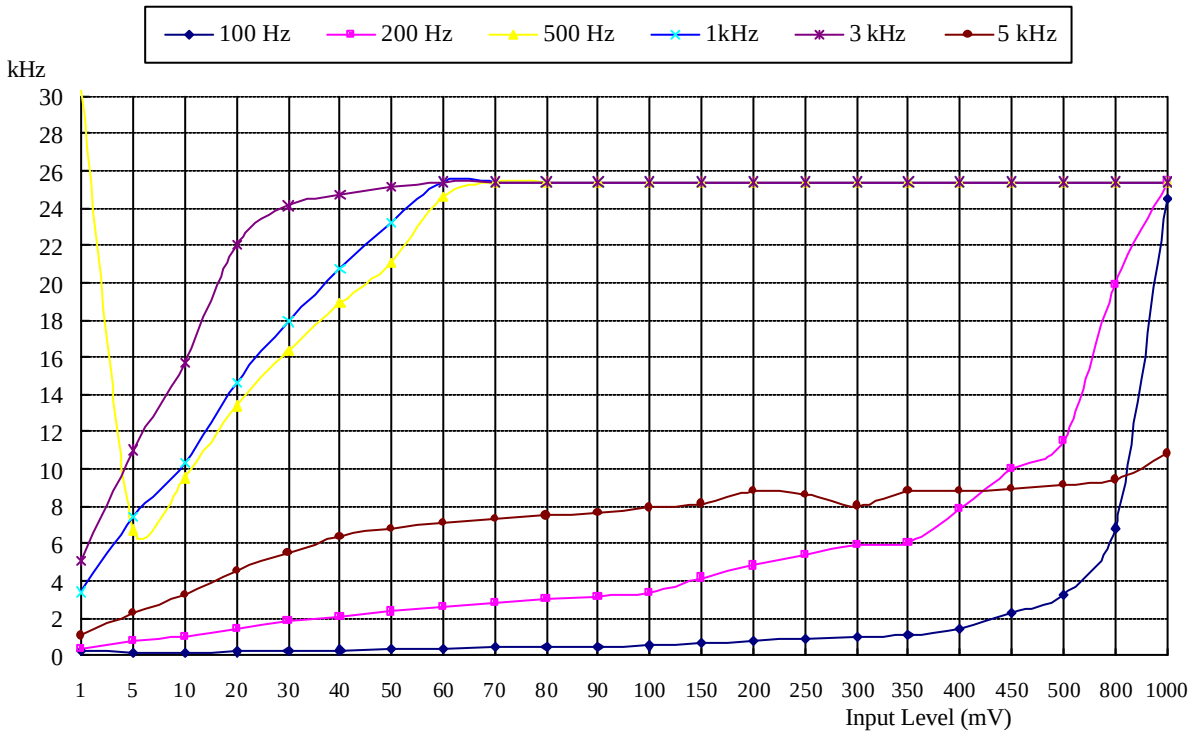


2. 740.000~770.000 MHz

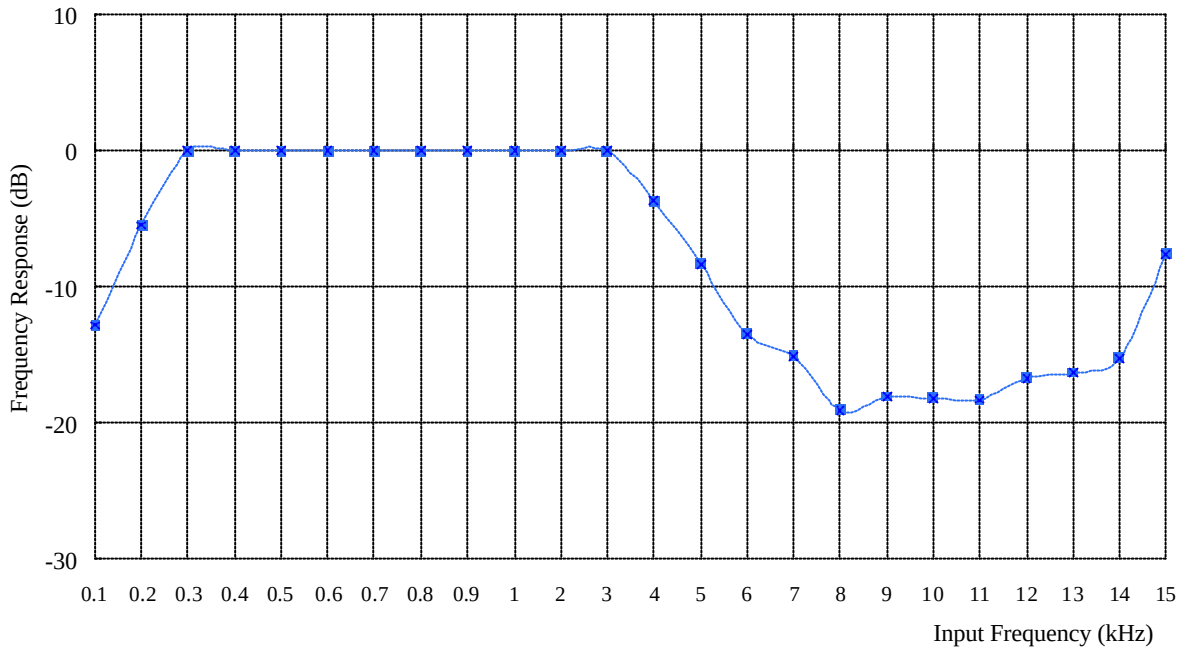
A). Frequency response



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.

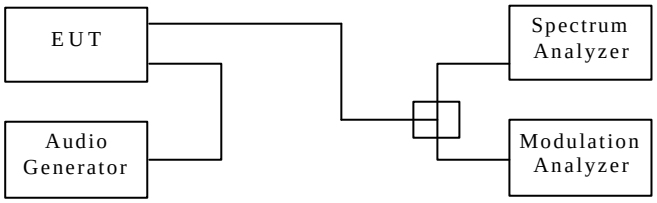
5.2 Measurement Method

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

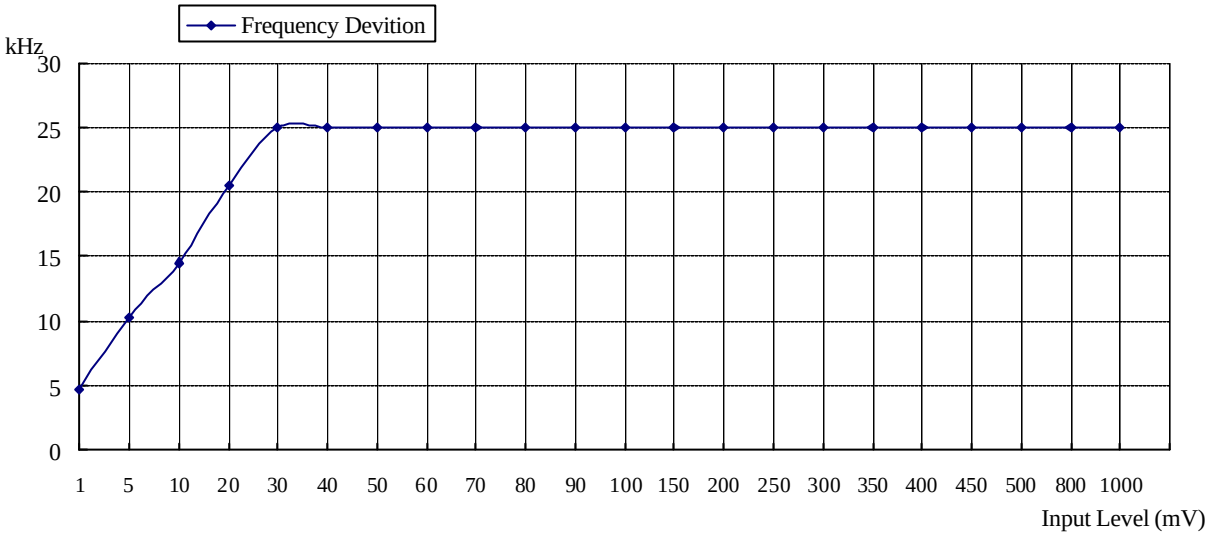
Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	R & S	ESBI	05/31/2004
Modulation Analyzer	Hewlett-Packard	8901A	11/30/2004
Multifunction Synthesizer	Hewlett-Packard	8904A	11/04/2004
Plotter	Hewlett-Packard	7440A	N/A

5.4 Bandwidth Measured

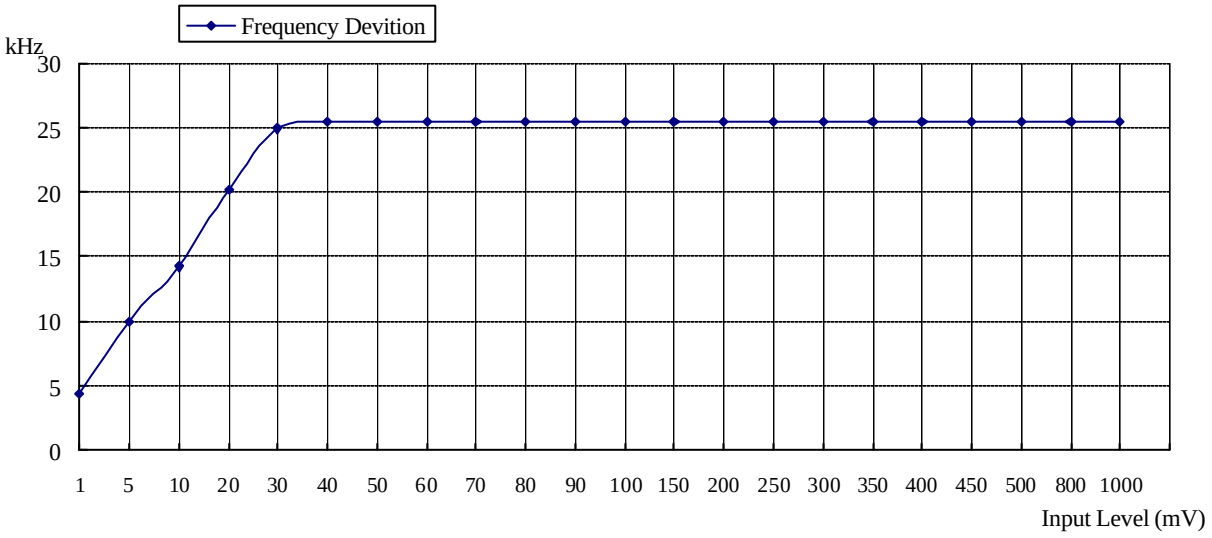
5.4.1 Input Level Derived

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 79.1KHz.
The Channel Mid 26 dB Bandwidth is 80.0KHz.
The Channel High 26 dB Bandwidth is 79.4KHz.

2. 740~770 MHz

The Channel Low 26 dB Bandwidth is 80.0KHz.
The Channel Mid 26 dB Bandwidth is 80.0KHz.
The Channel High 26 dB Bandwidth is 79.4KHz.

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 0.5 dBm , or 1.2 mW (ERP).

The limit of spurious or harmonics is calculated as following :

0.5-[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)
1260.030	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
1890.045	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2520.060	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3150.075	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3780.090	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4410.105	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
5040.120	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5670.135	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
6300.150	---	---	---	---	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 0.9 dBm , or 1.3 mW (ERP).
The limit of spurious or harmonics is calculated as following :

0.9-[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)
1289.624	---	---	---	---	7.3	-2.0	1.33	---	---	-13.0	---
1934.436	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2579.248	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3224.060	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3868.872	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4513.684	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5158.496	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5803.308	---	---	---	---	11.5	-2.0	2.60	---	---	-13.0	---
6448.120	---	---	---	---	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 0.9 dBm , or 1.3 mW (ERP).
The limit of spurious or harmonics is calculated as following :

0.9-[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)
1319.862	---	---	---	---	7.3	-2.0	1.33	---	---	-13.0	---
1979.793	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2639.724	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
3299.655	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3959.586	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4619.517	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5279.448	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5939.379	---	---	---	---	11.7	-2.0	2.60	---	---	-13.0	---
6599.310	---	---	---	---	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 3.0 dBm , or 2.0 mW (ERP).
The limit of spurious or harmonics is calculated as following :

3.0-[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)
1480.124	---	---	---	---	7.3	-2.0	1.3	---	---	-13.0	---
2220.186	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
2960.248	---	---	---	---	9.6	-2.0	1.7	---	---	-13.0	---
3700.310	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4440.372	---	---	---	---	10.6	-2.0	2.1	---	---	-13.0	---
5180.434	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5920.496	---	---	---	---	11.7	-2.0	2.6	---	---	-13.0	---
6660.558	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
7400.620	---	---	---	---	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
Temperature : 25℃
Test Date : Apr. 21, 2004
Humidity : 65%

Unmodulated carrier output power is 1.8 dBm , or 1.51 mW (ERP).
The limit of spurious or harmonics is calculated as following :

1.8-[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)
1509.842	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2264.763	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
3019.684	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3774.605	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4529.526	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5284.447	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6039.368	---	---	---	---	11.0	-2.0	2.6	---	---	-13.0	---
6794.289	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
7549.210	---	---	---	---	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
Temperature : 25℃
Test Date : Apr. 21, 2004
Humidity : 65%

Unmodulated carrier output power is 2.2 dBm , or 1.7 mW (ERP).
The limit of spurious or harmonics is calculated as following :

2.2-[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)
1539.822	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2309.733	---	---	---	---	9.3	-2.0	1.7	---	---	-13.0	---
3079.644	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3849.555	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4619.466	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5389.377	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6159.288	---	---	---	---	11.9	-2.0	2.5	---	---	-13.0	---
6929.199	---	---	---	---	11.8	-2.0	2.5	---	---	-13.0	---
7699.110	---	---	---	---	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.

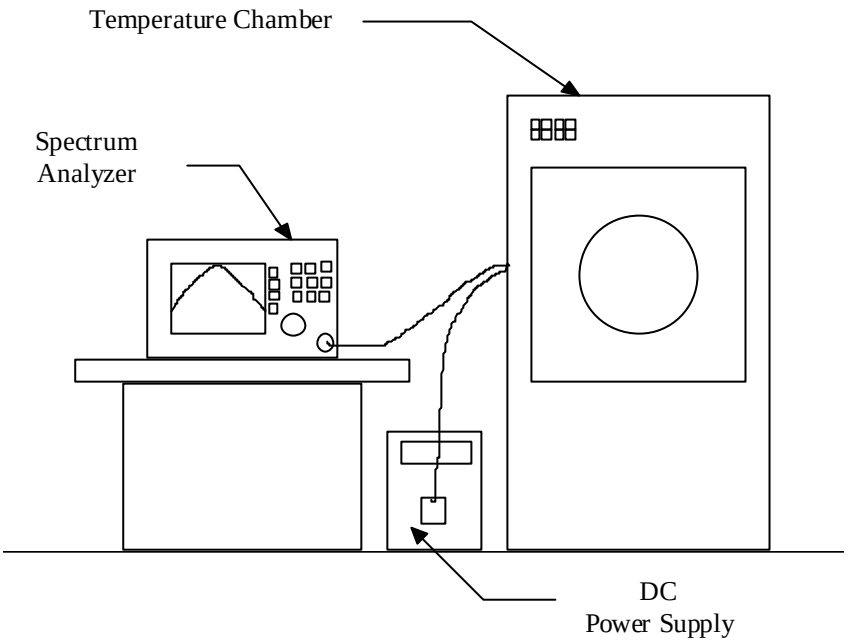
B) Frequency stability versus input voltage

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 : 630.015 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.	630.0310	0.00254	630.0313	0.00258	630.0296	0.00232
40		629.9952	-0.00314	630.0053	-0.00153	630.0257	0.00170
30		630.0386	0.00375	630.0132	-0.00029	630.0230	0.00127
20		630.0045	-0.00167	630.0150	0.00000	630.0208	0.00092
10		630.0327	0.00281	630.0176	0.00042	630.0106	-0.00070
0		629.9937	-0.00338	630.0221	0.00112	630.0027	-0.00196
-10		630.0265	0.00183	630.0309	0.00253	629.9982	-0.00267
-20		629.9914	-0.00375	630.0342	0.00305	630.0055	-0.00151
-30		630.0124	-0.00041	630.0271	0.00192	630.0025	-0.00198

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

Reference Frequency : 630.015 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	630.0315	0.00263	630.0255	0.00167	630.0271	0.00192

B1. Frequency stability versus enviroment tempture

Reference Frequency : 644.812 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.	644.8042	-0.00120	644.8135	0.00023	644.8033	-0.00135
40		644.8296	0.00272	644.8362	0.00376	644.8273	0.00238
30		644.8294	0.00270	644.8120	0.00000	644.8065	-0.00086
20		644.8130	0.00015	644.7989	-0.00203	644.7963	-0.00244
10		644.7904	-0.00335	644.8318	0.00307	644.7925	-0.00302
0		644.8015	-0.00162	644.8022	-0.00153	644.7959	-0.00249
-10		644.8051	-0.00108	644.7990	-0.00202	644.8000	-0.00186
-20		644.7958	-0.00251	644.8136	0.00024	644.7990	-0.00201
-30		644.8117	-0.00004	644.7897	-0.00346	644.8213	0.00144

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

Reference Frequency : 644.812 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	644.7947	-0.00269	644.8117	-0.00004	644.8017	-0.00159

C1. Frequency stability versus enviroment tempture

Reference Frequency : 659.931 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.	659.9404	0.00142	659.9085	-0.00342	659.9351	0.00062
40		659.9181	-0.00196	659.9175	-0.00204	659.9188	-0.00185
30		659.9365	0.00083	659.9073	-0.00360	659.9495	0.00280
20		659.9465	0.00235	659.9167	-0.00216	659.9425	0.00174
10		659.9535	0.00340	659.9122	-0.00285	659.9517	0.00313
0		659.9469	0.00240	659.9304	-0.00010	659.9078	-0.00352
-10		659.9522	0.00322	659.9503	0.00293	659.9232	-0.00118
-20		659.9538	0.00345	659.9261	-0.00074	659.9389	0.00120
-30		659.9462	0.00230	659.9327	0.00026	659.9270	-0.00061

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

Reference Frequency : 659.931 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	659.9085	-0.00341	659.9423	0.00171	659.9550	0.00363

D1. Frequency stability versus enviroment tempture

Reference Frequency : 740.062 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.	740.0670	0.00067	740.0569	-0.00069	740.0591	-0.00039
40		740.0736	0.00157	740.0849	0.00309	740.0468	-0.00206
30		740.0870	0.00338	740.0511	-0.00147	740.0840	0.00297
20		740.0849	0.00310	740.0784	0.00221	740.0877	0.00347
10		740.0384	-0.00319	740.0364	-0.00346	740.0605	-0.00020
0		740.0836	0.00292	740.0526	-0.00126	740.0361	-0.00349
-10		740.0817	0.00266	740.0370	-0.00337	740.0728	0.00146
-20		740.0449	-0.00230	740.0627	0.00009	740.0557	-0.00085
-30		740.0758	0.00186	740.0435	-0.00250	740.0573	-0.00064

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

Reference Frequency : 740.062 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	740.0723	0.00140	740.0503	-0.00159	740.0670	0.00068

E1. Frequency stability versus enviroment tempture

Reference Frequency : 754.921 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.	754.9360	0.00198	754.9372	0.00214	754.9237	0.00035
40		754.9332	0.00162	754.9123	-0.00115	754.9432	0.00294
30		754.9070	-0.00185	754.9448	0.00315	754.9188	-0.00029
20		754.9464	0.00337	754.9409	0.00264	754.9224	0.00018
10		754.9299	0.00118	754.9075	-0.00179	754.9445	0.00312
0		754.9367	0.00208	754.9380	0.00225	754.9355	0.00193
-10		754.9464	0.00337	754.9447	0.00314	754.9428	0.00288
-20		754.9487	0.00367	754.9314	0.00137	754.9371	0.00213
-30		754.9382	0.00228	754.9458	0.00328	754.9426	0.00287

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

Reference Frequency : 759.921 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	754.8951	-0.00343	754.9346	0.00181	754.9297	0.00115

F1. Frequency stability versus enviroment tempture

Reference Frequency : 769.911 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.	769.9147	0.00048	769.9329	0.00285	769.8866	-0.00317
40		769.8989	-0.00157	769.9011	-0.00129	769.9209	0.00128
30		769.9346	0.00306	769.8859	-0.00326	769.9210	0.00130
20		769.8921	-0.00245	769.9374	0.00343	769.9234	0.00162
10		769.9286	0.00229	769.9256	0.00189	769.8943	-0.00217
0		769.9138	0.00037	769.8884	-0.00293	769.9097	-0.00017
-10		769.9214	0.00135	769.9230	0.00156	769.8992	-0.00153
-20		769.8824	-0.00372	769.9231	0.00157	769.8841	-0.00350
-30		769.9095	-0.00019	769.8982	-0.00166	769.9031	-0.00103

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

Reference Frequency : 769.911 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	769.9226	0.00151	769.9256	0.00189	769.9191	0.00105

8 CONDUCTED EMISSION MEASUREMENT

8.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

8.2 Measurement Procedure

1. Setup the configuration per figure 3.

2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.

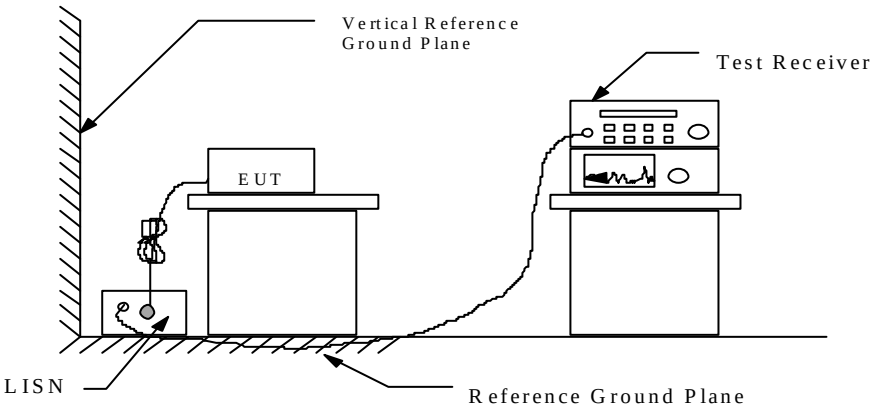
3. Record the 6 or 8 highest emissions relative to the limit.

4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.

5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.

6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



8.3 Conducted Emission Data

Operation Mode : Charger
Test Date : MAY 02, 2004 Temperature : 25 ℃ Humidity: 60 %

Freq.	Meter Reading (dBμV)				Factor	Limit (dBμV)		Result (dBμV)			
	Q.P Value		AVG. Value			Q.P	AVG.	Q.P Value		AVG. Value	
(MHz)	N	L1	N	L1	(dB)	Value	Value	N	L1	N	L1
0.812	10.1	11.8	----	----	0.3	56.0	46.0	10.4	12.1	----	----
1.753	10.4	12.1	----	----	0.5	56.0	46.0	10.9	12.6	----	----
2.992	10.4	10.3	----	----	0.5	56.0	46.0	10.9	10.8	----	----
6.457	11.3	10.4	----	----	0.7	60.0	50.0	12.0	11.1	----	----
12.863	11.7	11.5	----	----	1.0	60.0	50.0	12.7	12.5	----	----
25.062	12.5	11.9	----	----	1.5	60.0	50.0	14.0	13.4	----	----

Note : 1. Please see appendix 3 for Plotted Data
2. The expanded uncertainty of the conducted emission tests is 2.45 dB.

8.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dBμV is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dBμV.

RESULT = 22.5 + 0.1 = 22.6 dBμV
Level in μV = Common Antilogarithm[(22.6 dBμV)/20]
= 13.48 μV

8.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

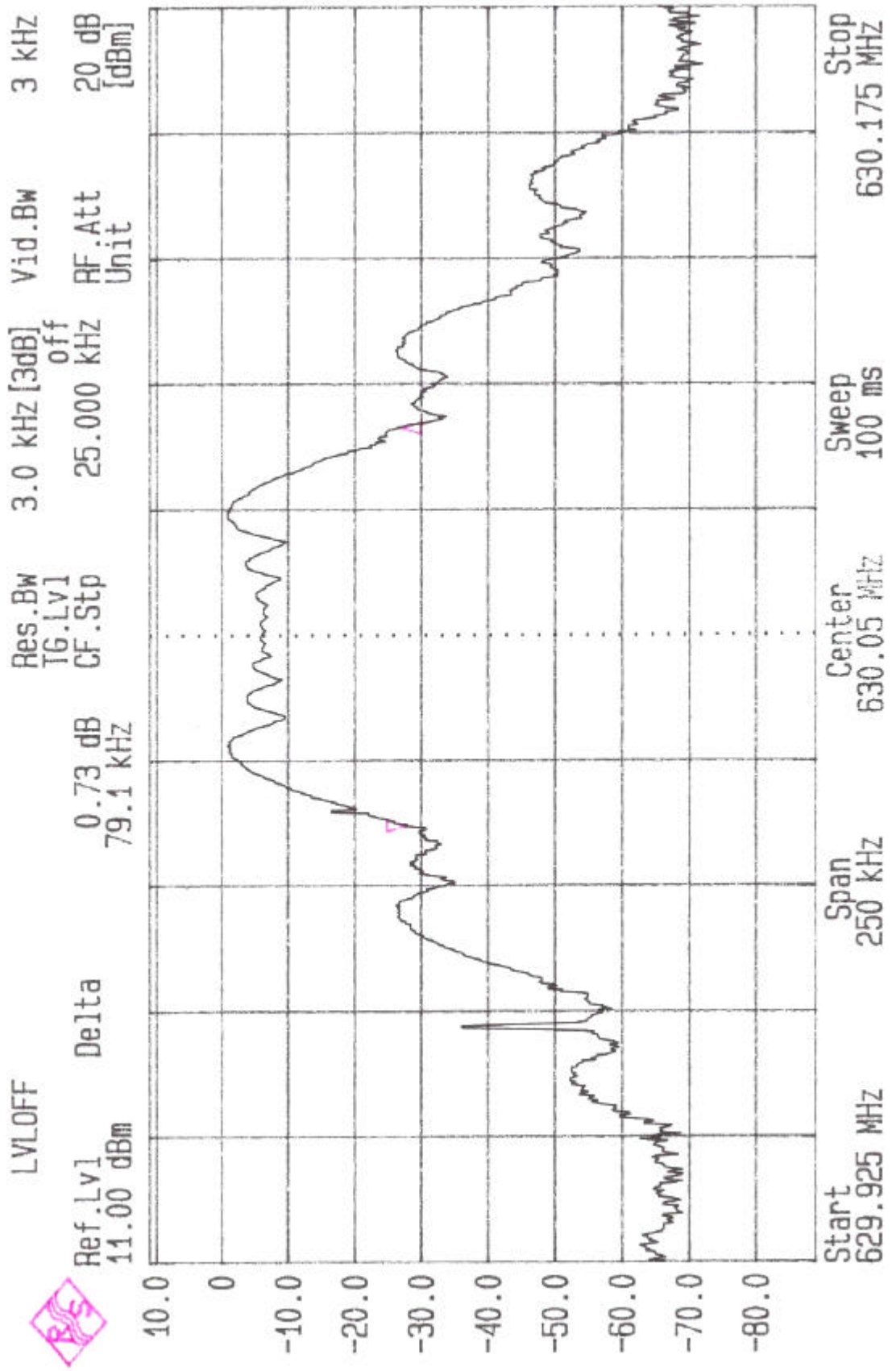
Equipment	Manufacturer	Model No.	Next Cal. Due
EMI Test Receiver	Rohde and Schwarz	ESCS30	12/01/2004
Line Impedance Stabilization network	Rohde and Schwarz	ESH2-Z5	09/20/2004
Line Impedance Stabilization network	Kyoritsu	KNW-407	12/24/2004
Shielded Room	Riken	----	N/A
Monitor	IBM	E54	N/A
Printer	HP	LASERJET 1000	N/A
Computer	ACER	Veriton 7500G	N/A

8.6 Photos of Conduction Measuring Setup

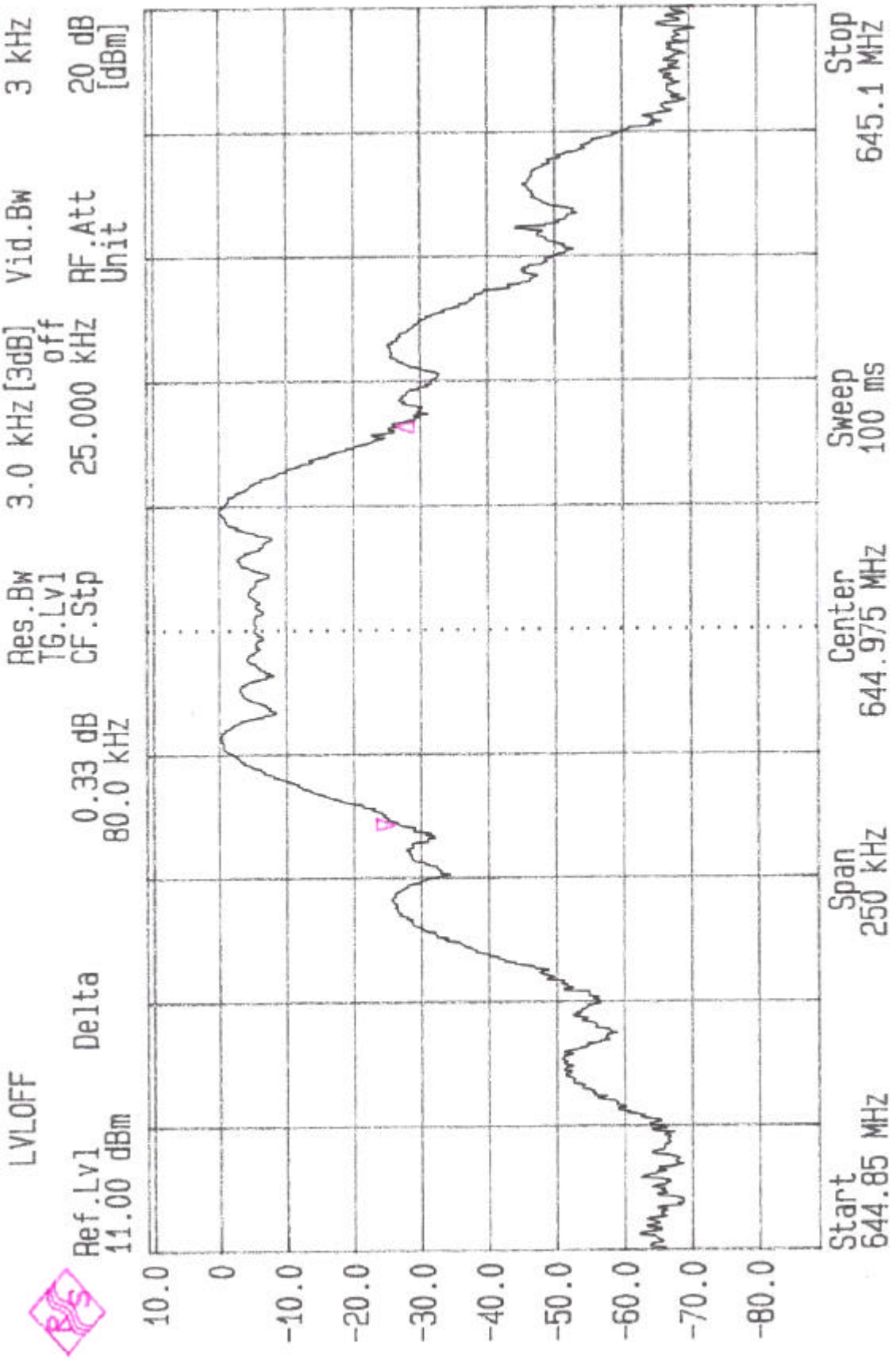
Please See Exhibit-F-Test_Setup_Photos

Appendix 1 : Occupied Emission Bandwidth Plotted Data

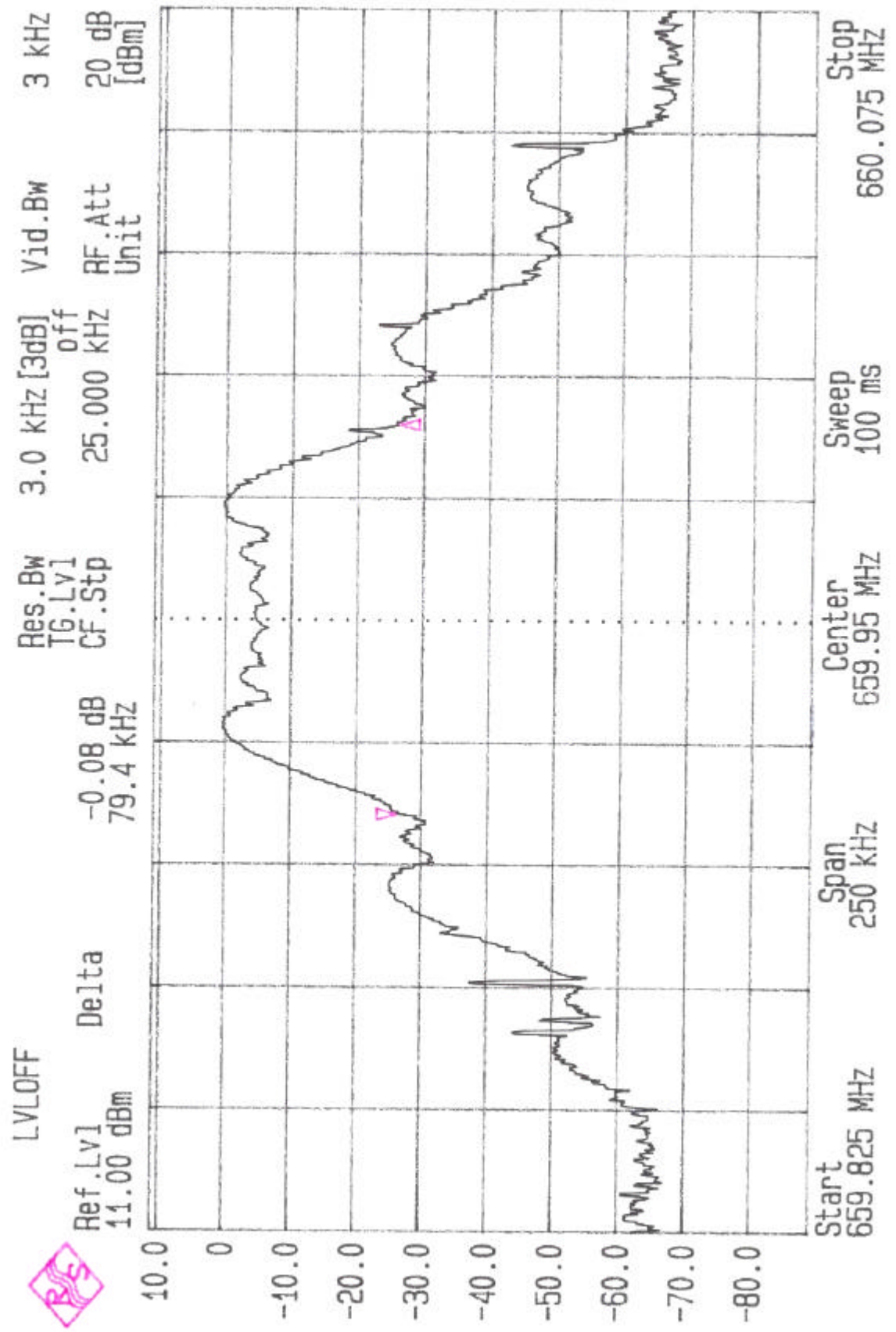
630.000~660.00MHz



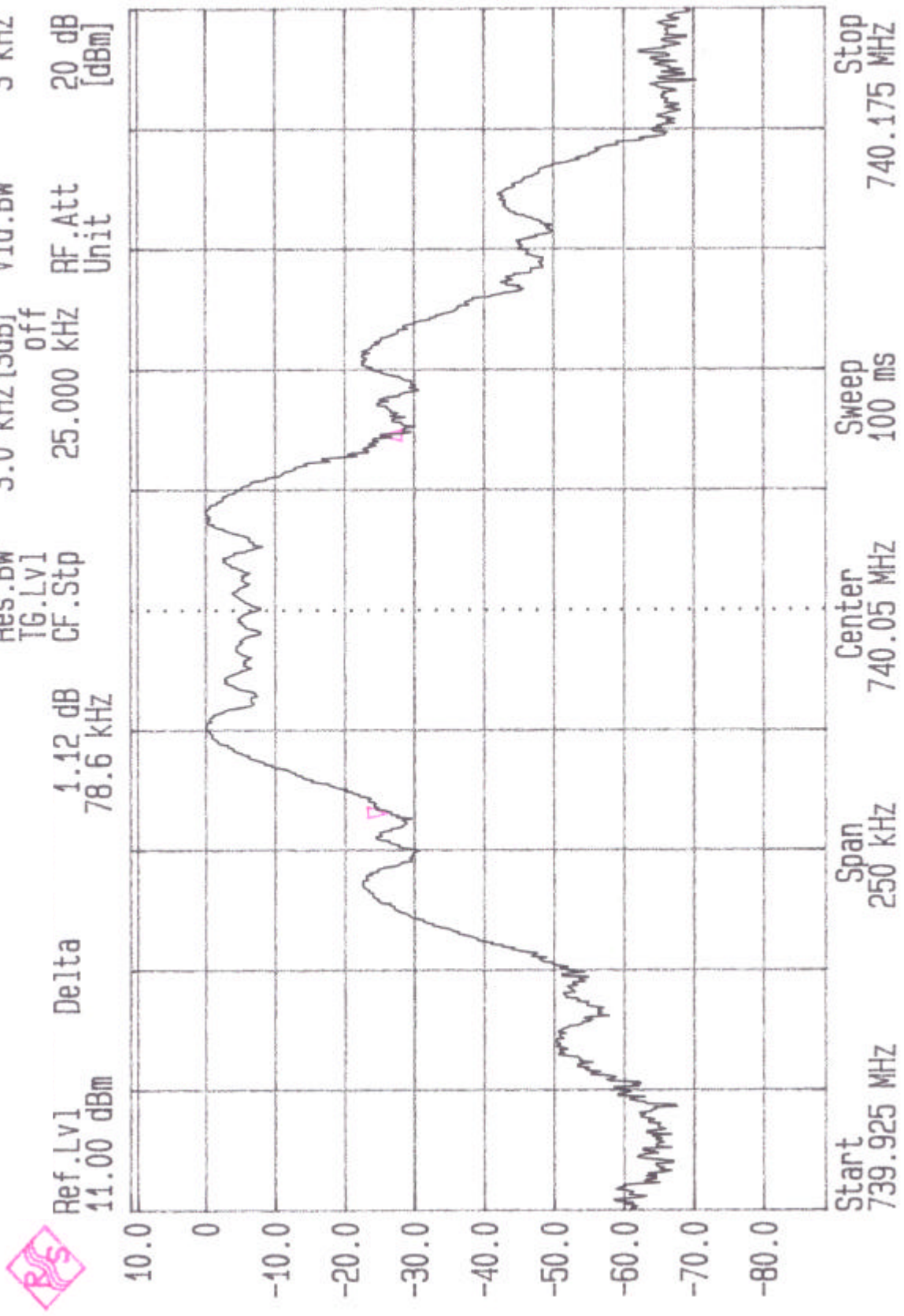
630.000~660.00MHz



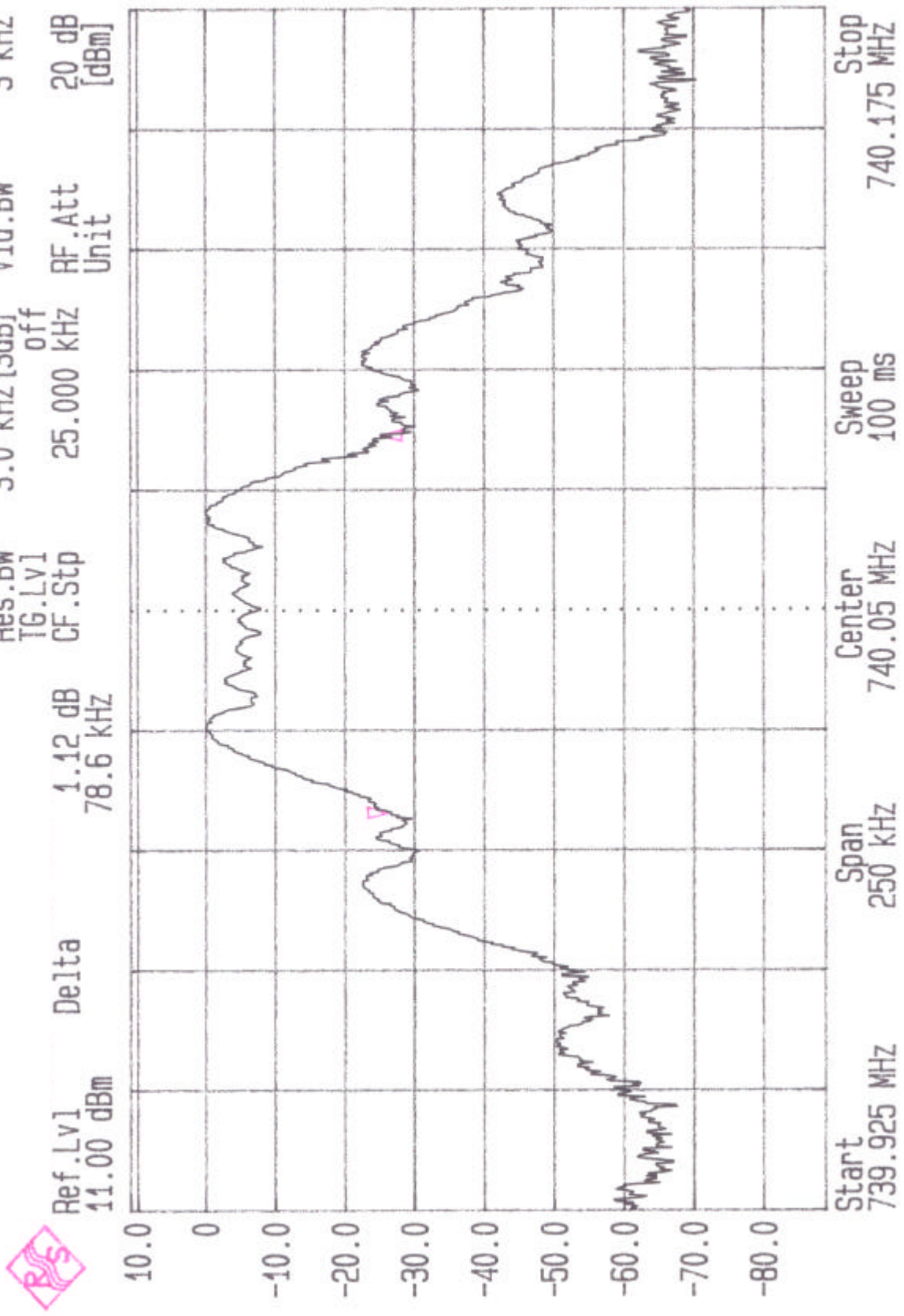
630.000~660.00MHz



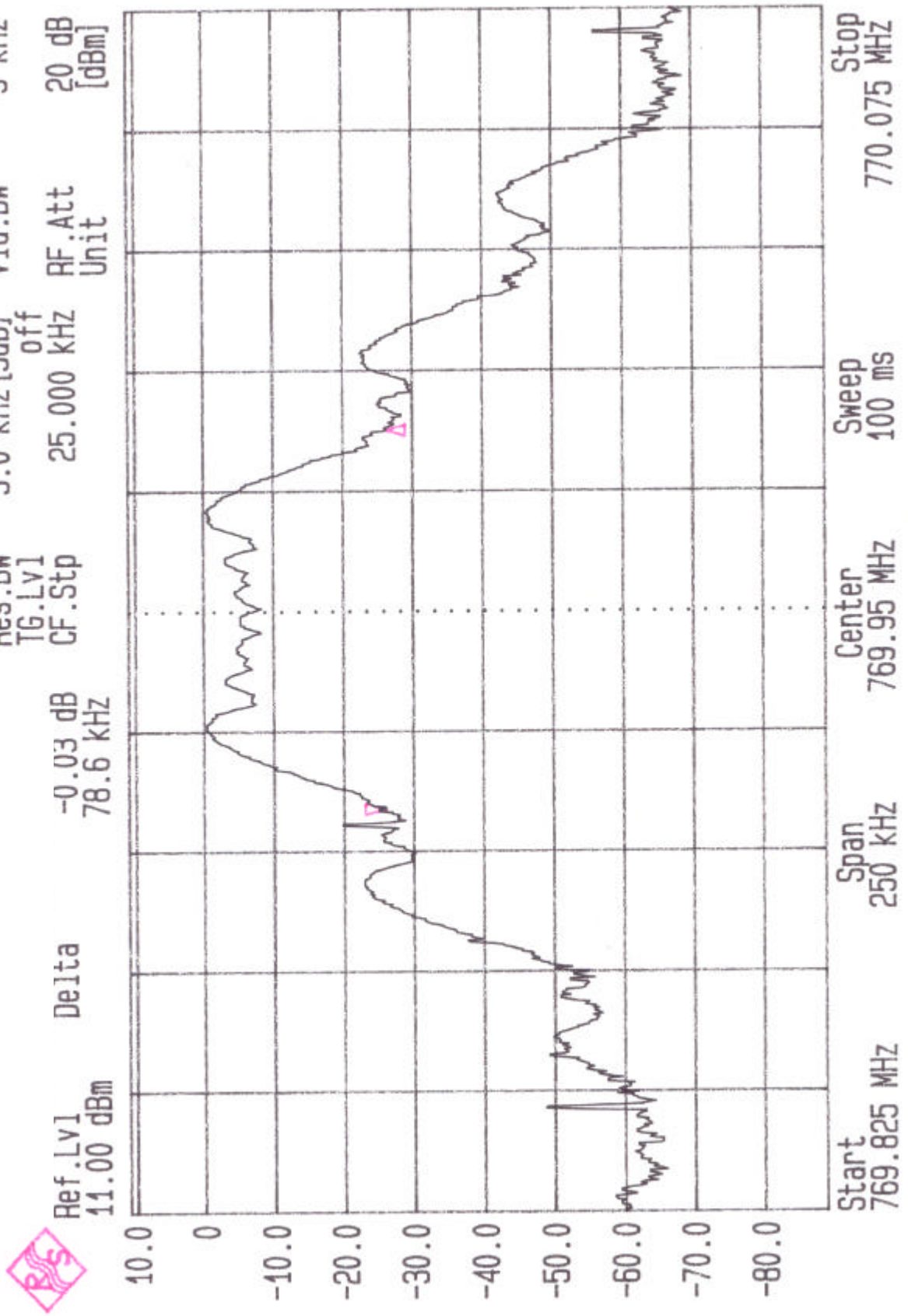
740.000~770.00MHz



740.000~770.00MHz

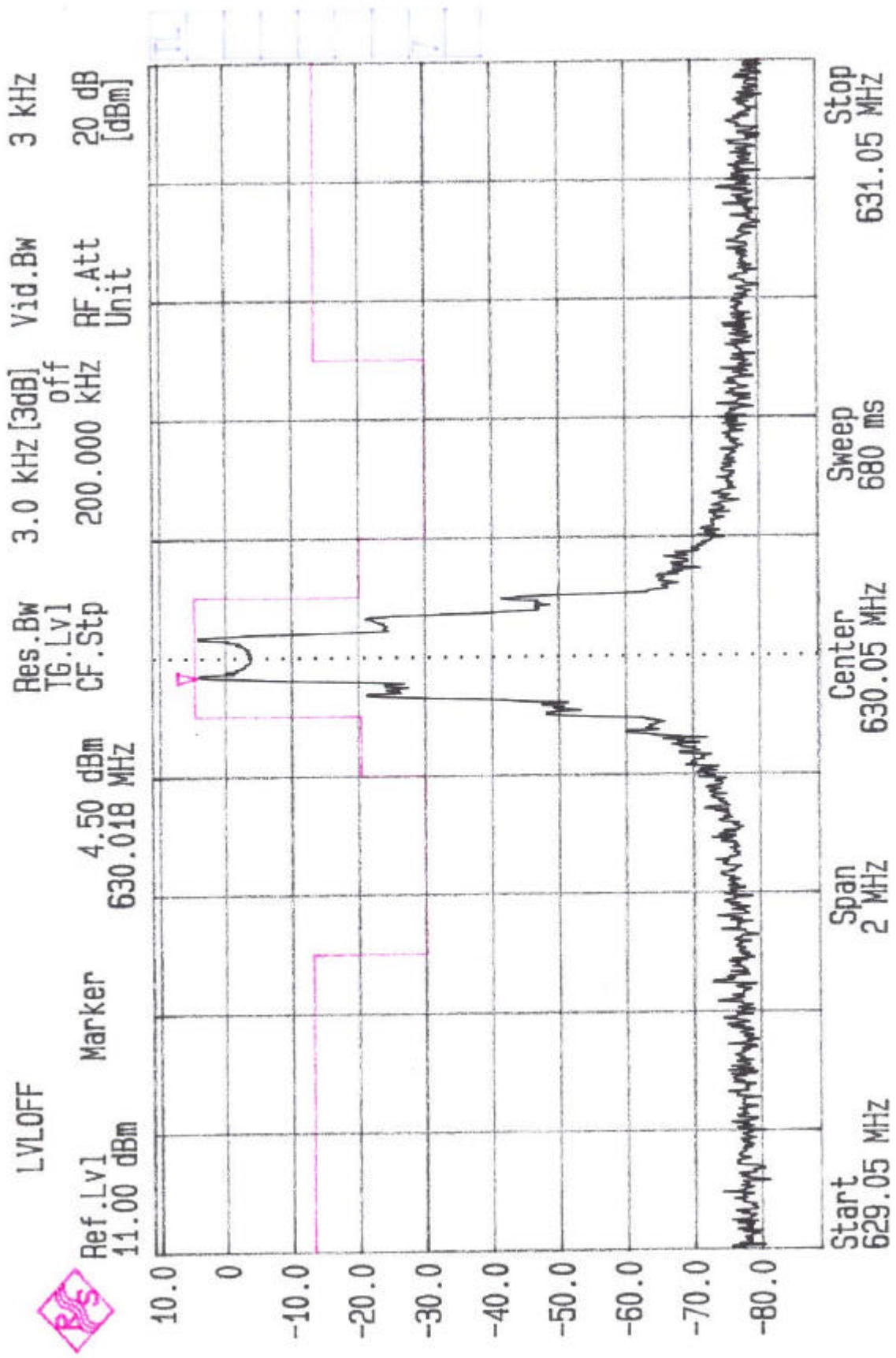


740.000~770.00MHz

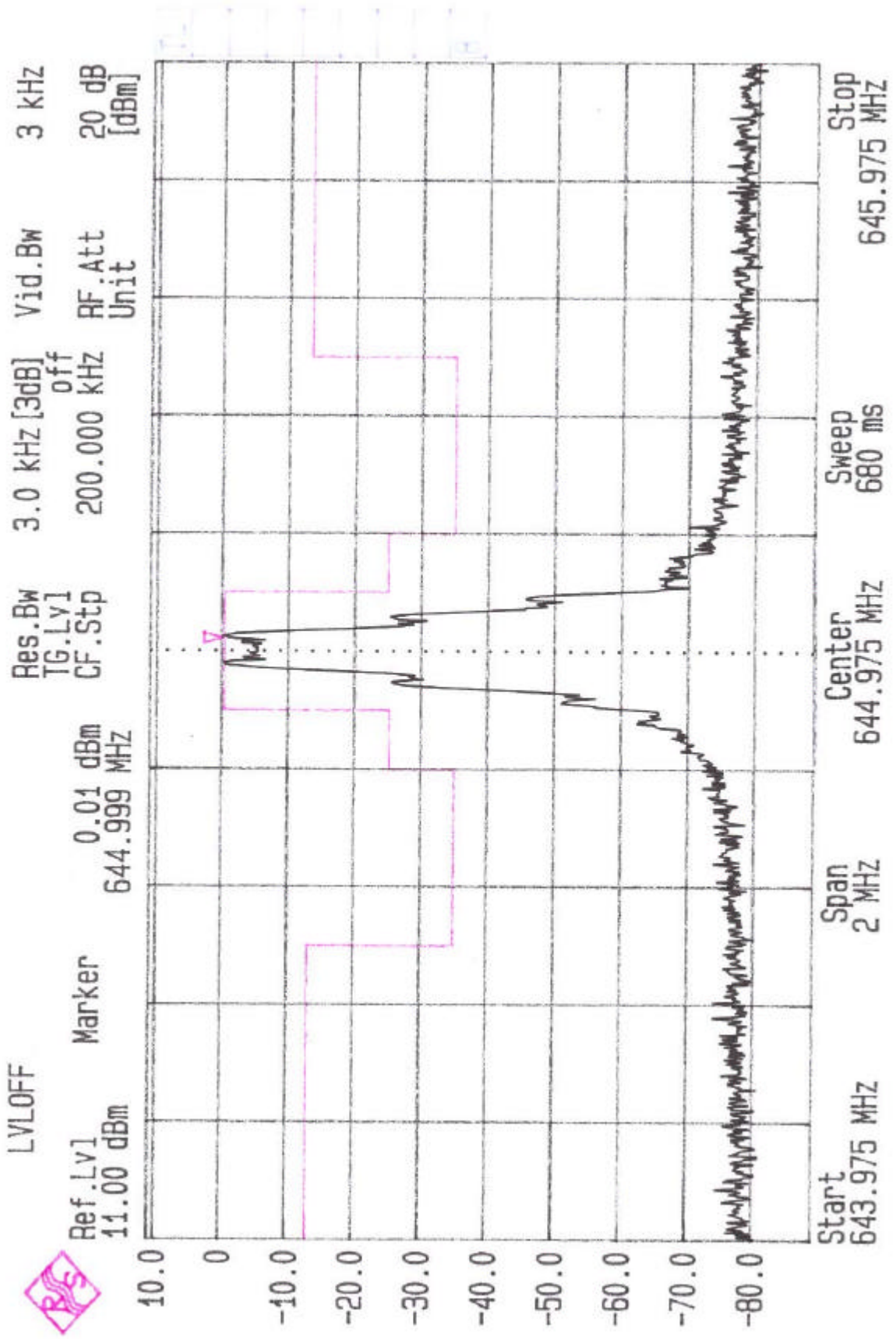


Appendix 2 : Emission Mask Plotted Data

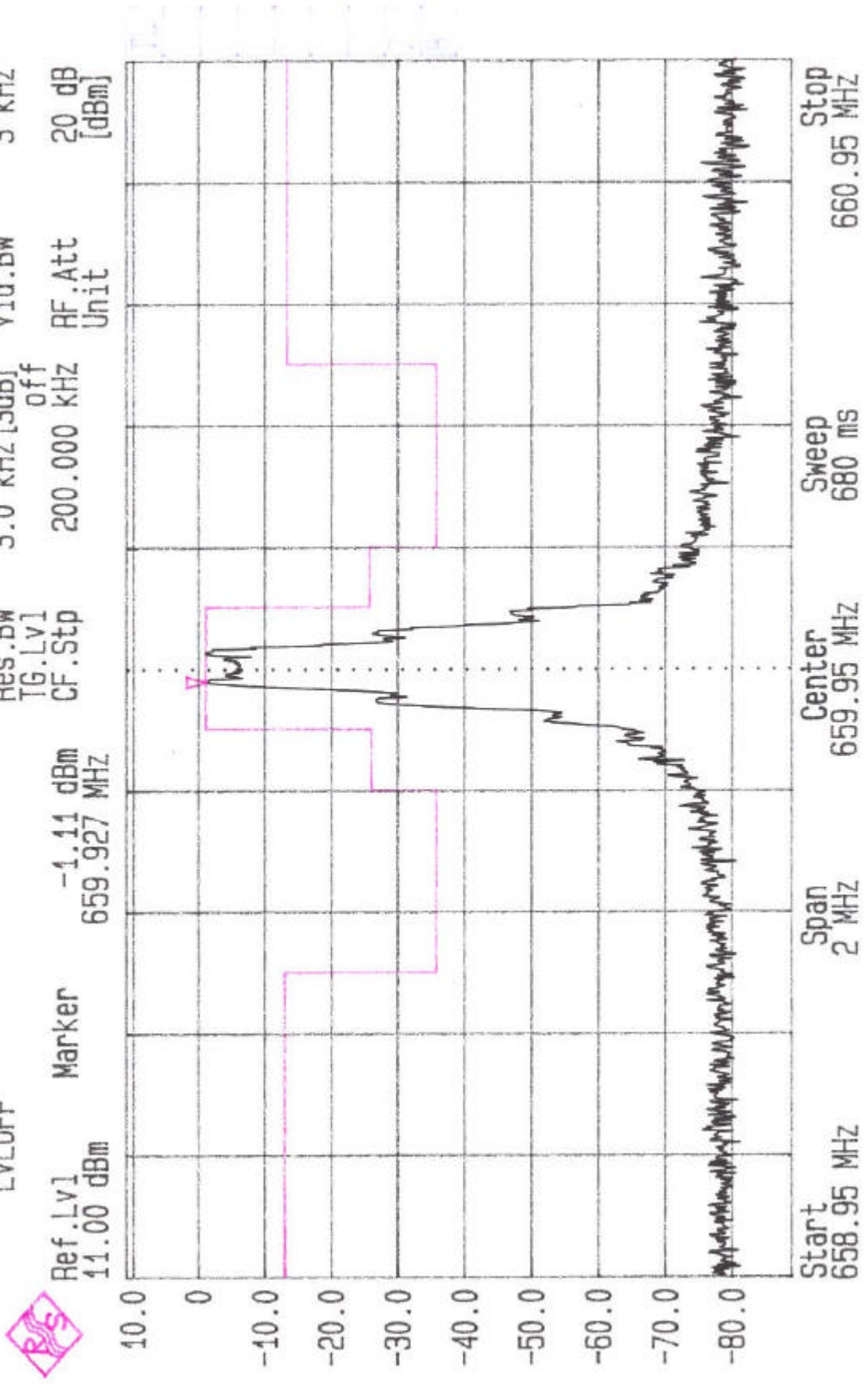
630.000~660.00MHz



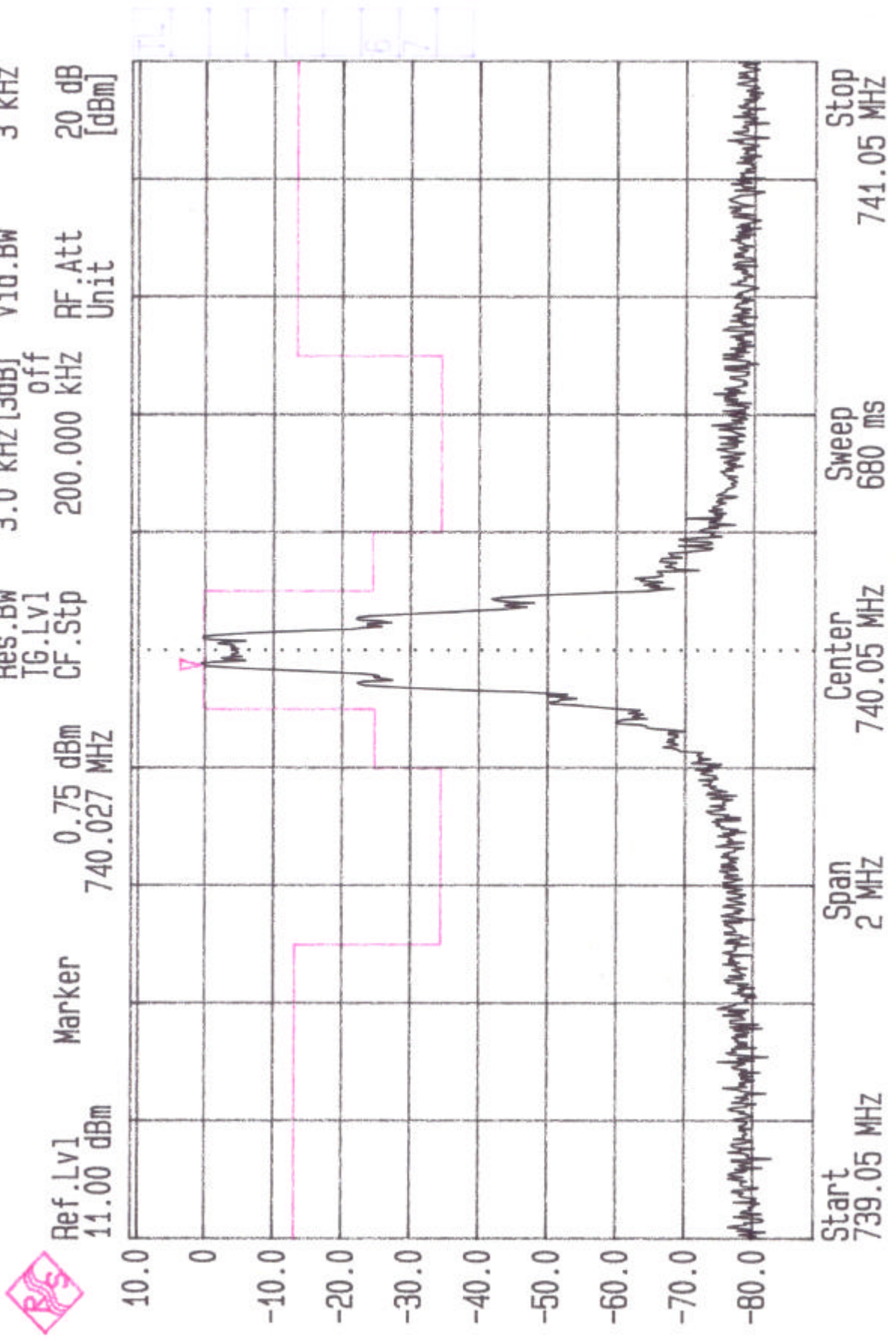
630.000~660.00MHz



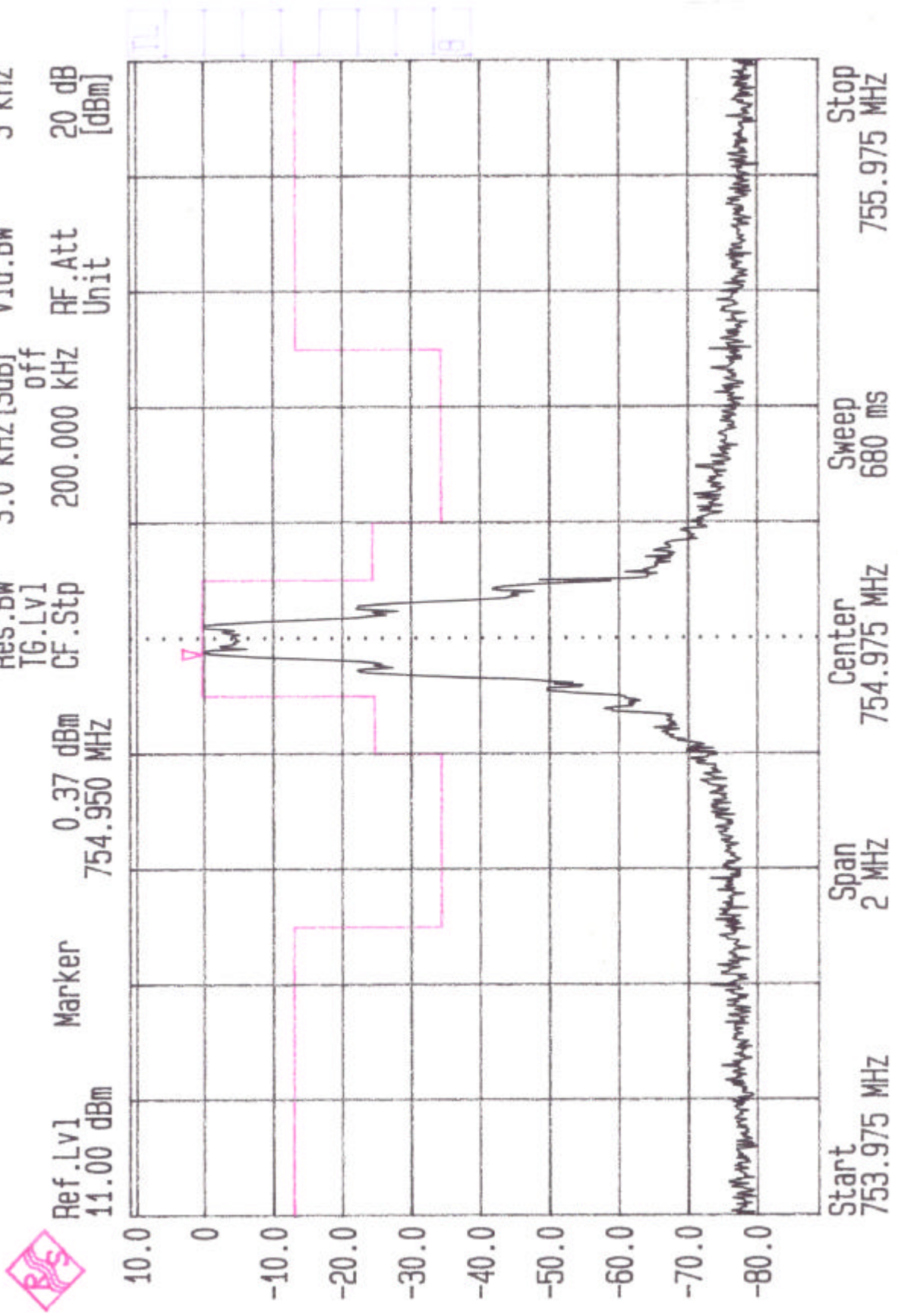
630.000~660.00MHz



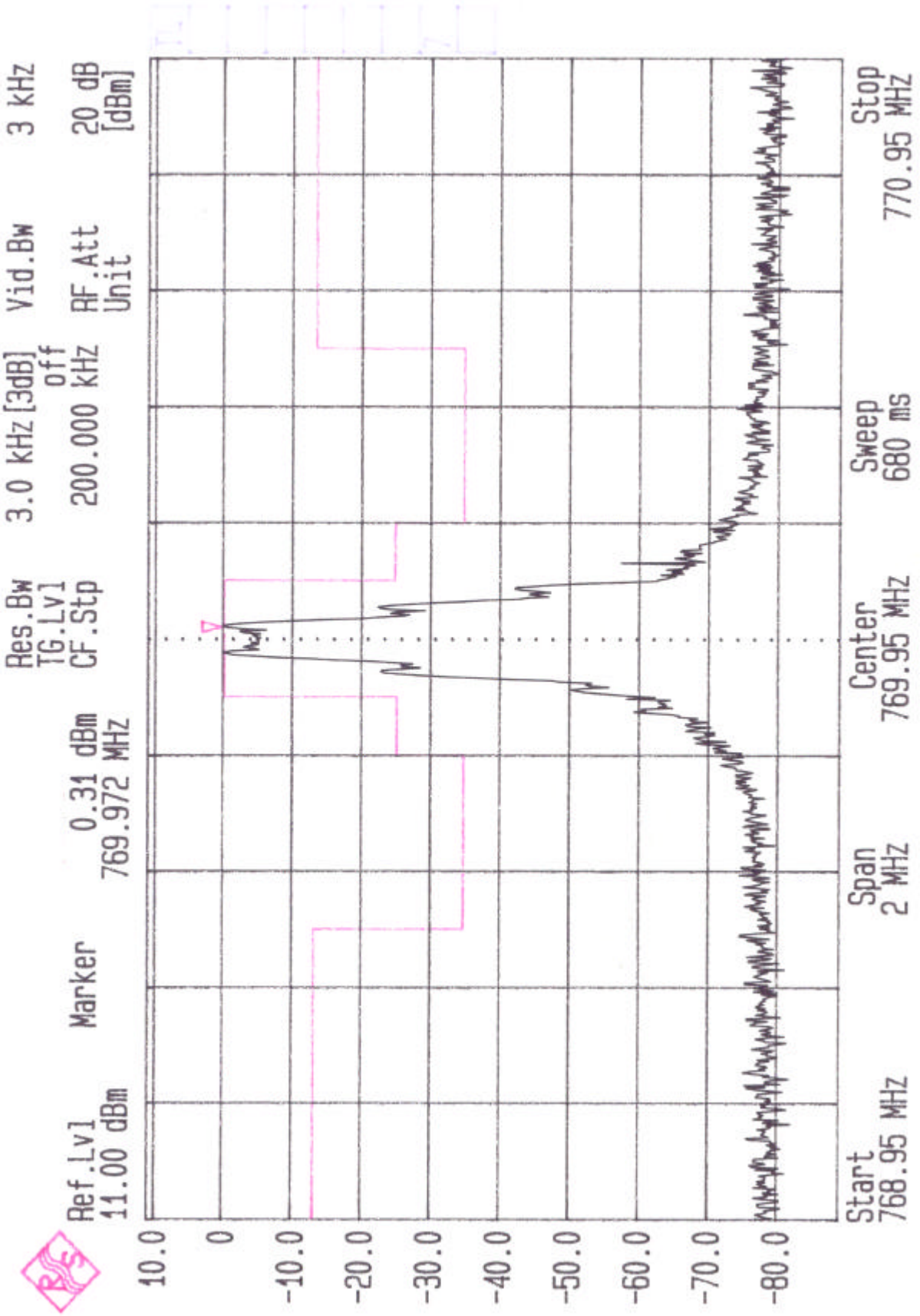
740.000~770.00MHz



740.000~770.00MHz



740.000~770.00MHz



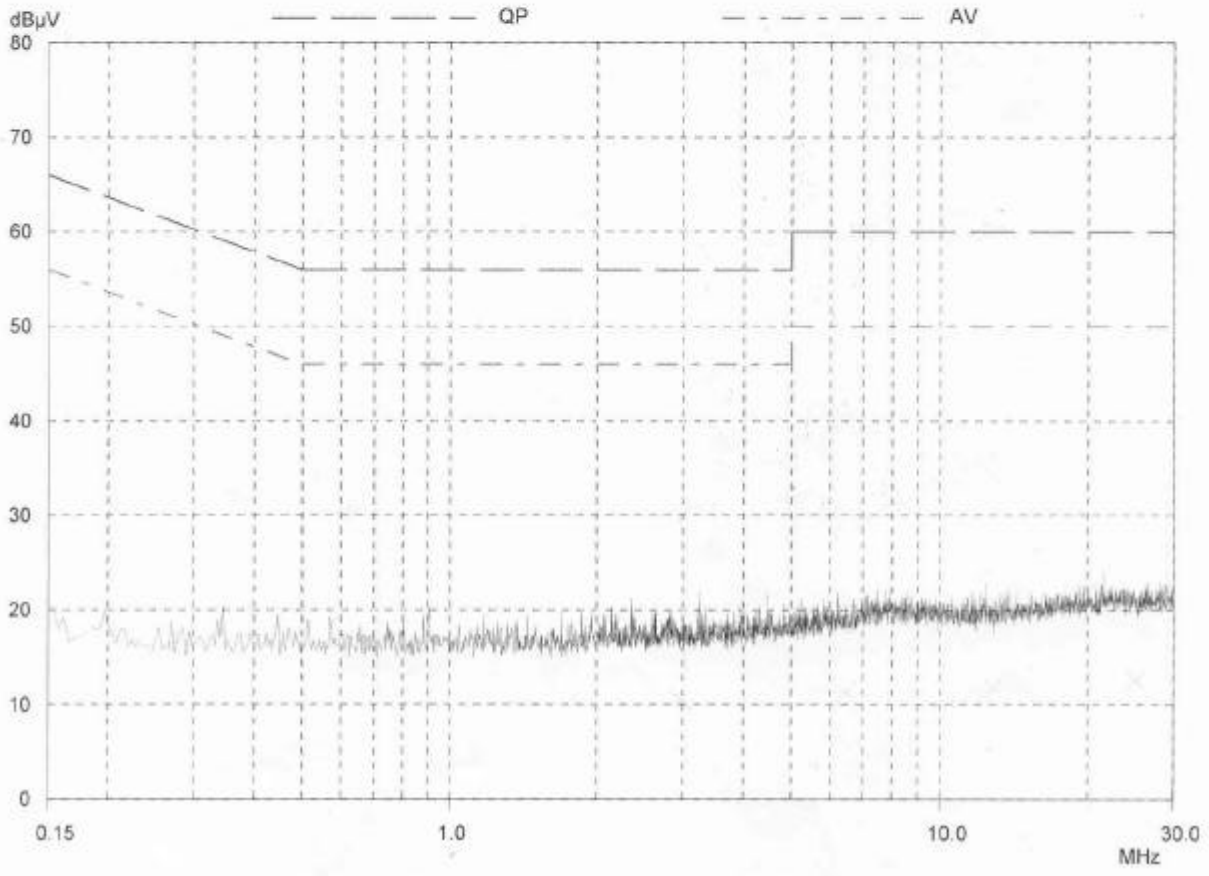
Appendix 3 : Plotted Data of Conducted Emissions

CONDUCTION EMISSION TEST

Peak Value

EUT: UF-9
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: CHARGER
N

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB



CONDUCTION EMISSION TEST

Peak Value

EUT: UF-9
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: CHARGER
L1

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB