FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Wireless Microphone System

FCC ID. : M5X-707T

MODEL : 707T

Working Frequency : 614-806MHz

for

APPLICANT : MIPRO ELECTRONICS CO., LTD.
ADDRESS : 814, Pei-Kang Road, Chia-Yi, Taiwan, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 8 LANE 29, WENMIMG ROAD,
LOSHAN TSUN, KWEISHAN HSIANG,
TAOYUAN, TAIWAN, R.O.C.

Tel:(03)3280026-32
Fax:(03)3280034
Report Number : ET90R-06-056-01

TEST REPORT CIRTIFICATION

Applicant : MIPRO ELECTRONICS CO., LTD.
814, Pei-Kang Road, Chia-Yi, Taiwan, R.O.C.

Manufacturer : MIPRO ELECTRONICS CO., LTD.
814, Pei-Kang Road, Chia-Yi, Taiwan, R.O.C.

Description of EUT :

a) Type of EUT	: Wireless Microphone System
b) Trade Name	: MIPRO
c) Model No.	: 707T
d) FCC ID	: M5X-707T
e) Working Frequency	: 614-806MHz
f) Power Supply	: DC 3V Batteries

Regulation Applied : FCC Rules and Regulations Part 74 Subpart H (1999) & Part 15 Subpart B

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 : Jul. 24, 2001

Test Engineer : Jeff Chuang
(Jeff Chuang)

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 Microphone System
b) Trade Name : MIPRO
c) Model No. : 707T
d) FCC ID : M5X-707T
e) Working Frequency : 614-806MHz
f) Power Supply : DC 3V Batteries

1.2 Characteristics of Device:

The EUT is a frequency modulation Wireless Microphone System with following features :

Operation Frequency Range: 614MHz to 806MHz. Type of emission is 180KF3E for headset.

1. To adjust GT/MT Switch, and Gain Control, Simply push down both snap locks on the sides of battery cover and flip it backwards to expose the adjustment panel.
2. Before power on, ascertain if same channel was set up for both receiver and micrphone. If not adjust to same channel accordingly.
3. The LED indicator flashes briefly when power on indicating normal battery status. If not flash occurs it has either no battery, the battery is drained or installed incorrectly. Change accordingly.
4. Plug the microphone connector into the input jack and tighten the connector screw by clockwise direction.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4. 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.

3. OUTPUT POWER MEASUREMENT

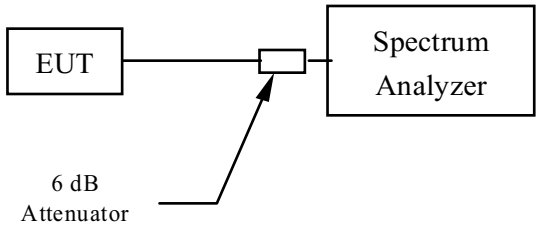
3.1 Provision Applicable

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

3.2 Measurement Procedure

The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.

Figure 1 : Output power measurement configuration



3.3 Test Data

A. Channel Low

Operated mode : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 60 %

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Output Power (mW)	Limit (mW)
615.0	8.39	6	14.39	27.48	250

(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

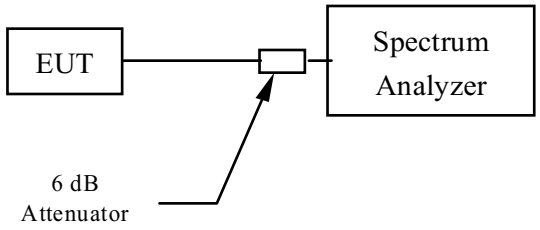
3.1 Provision Applicable

According to § 74.861(e)(1)(i), the output power shall not exceed 50 milliwatts.

3.2 Measurement Procedure

The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.

Figure 1 : Output power measurement configuration



3.3 Test Data

A. Channel Low

Operated mode : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 60 %

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Output Power (mW)	Limit (mW)
615.0	8.39	6	14.39	27.48	250

B. Channel Mid

Operated mode : Normal Test Date : Jul. 13, 2001
Temperature : 25 ℃ Humidity : 60 %

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Output Power (mW)	Limit (mW)
710. 0	9.63	6	15.63	36.56	250

C. Channel High

Operated mode : Normal Test Date : Jul. 13, 2001
Temperature : 25 ℃ Humidity : 60 %

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Output Power (mW)	Limit (mW)
805.0	8.26	6	14.26	26.67	250

Please see Appendix 1 for plotted data.

3.3 Result Calculation

The measured result is calculated as following equation :

Result = Reading + Cable Loss + Attenuation of Attenuator

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

3.4 Output Power Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Test Receiver	R&S	ESBI	05/15/2002
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 2.

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 2, 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.

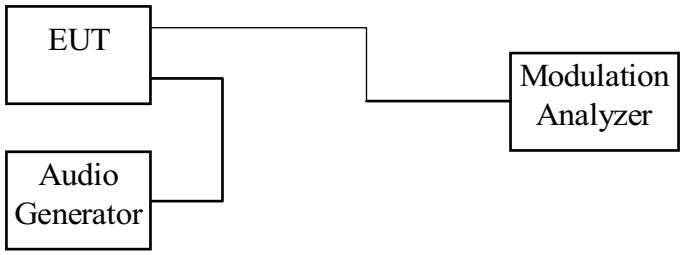
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

C) Frequency response of all circuits

1. Position the EUT as shown in figure 2.

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 2 : Modulation characteristic measurement configuration

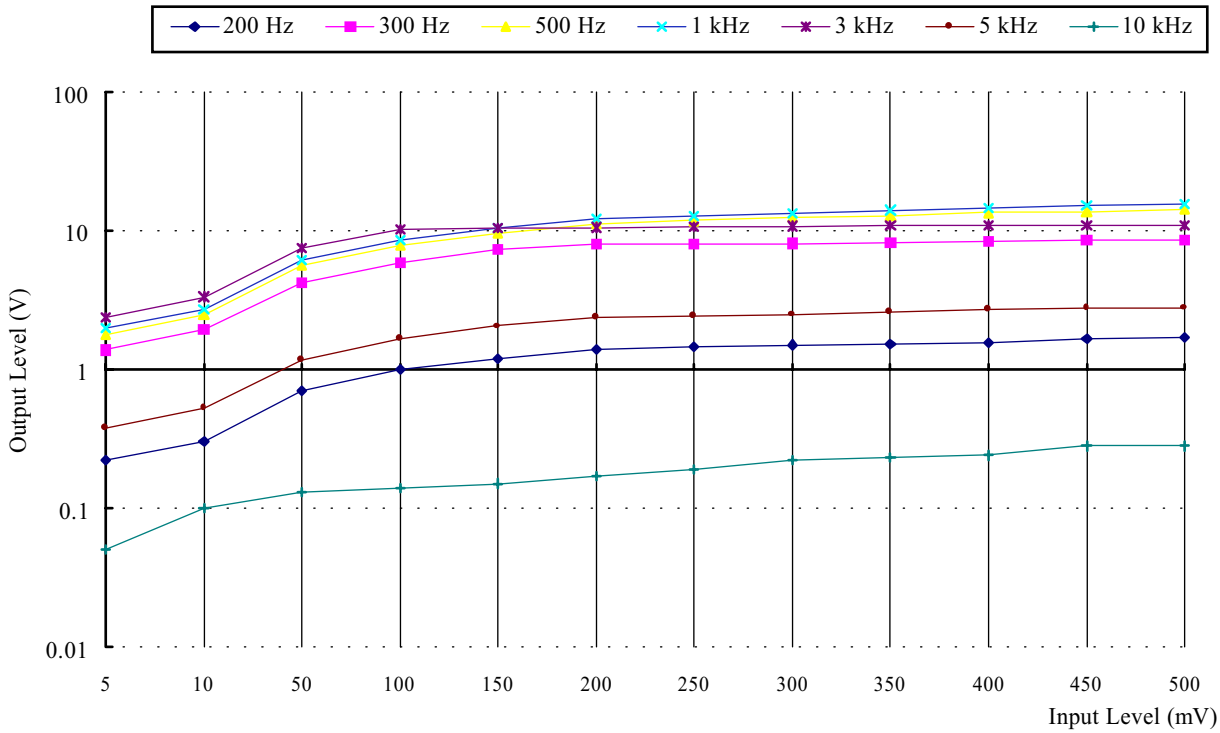


4.3 Measurement Instrument

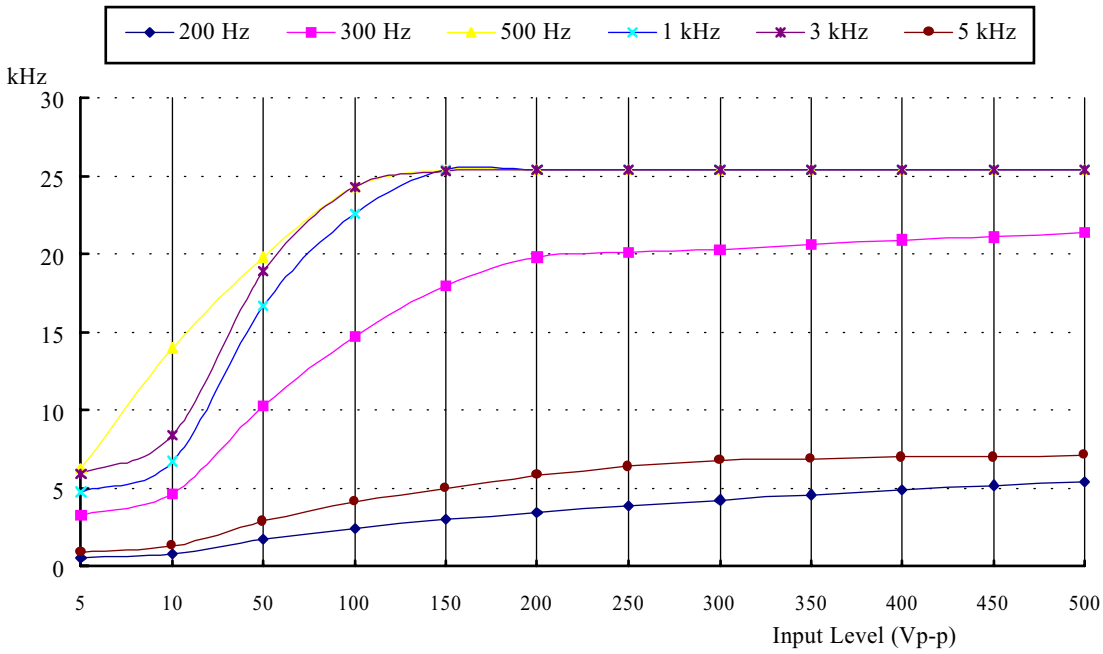
Equipment	Manufacturer	Model No.	Next Cal. Date
Modulation Analyzer	Hewlett-Packard	8901A	12/01/2001
Multifunction Synthesizer	Hewlett-Packard	8904A	11/24/2001
Oscillscope	Lecroy	9350A	12/01/2001

4.4 Measurement Result

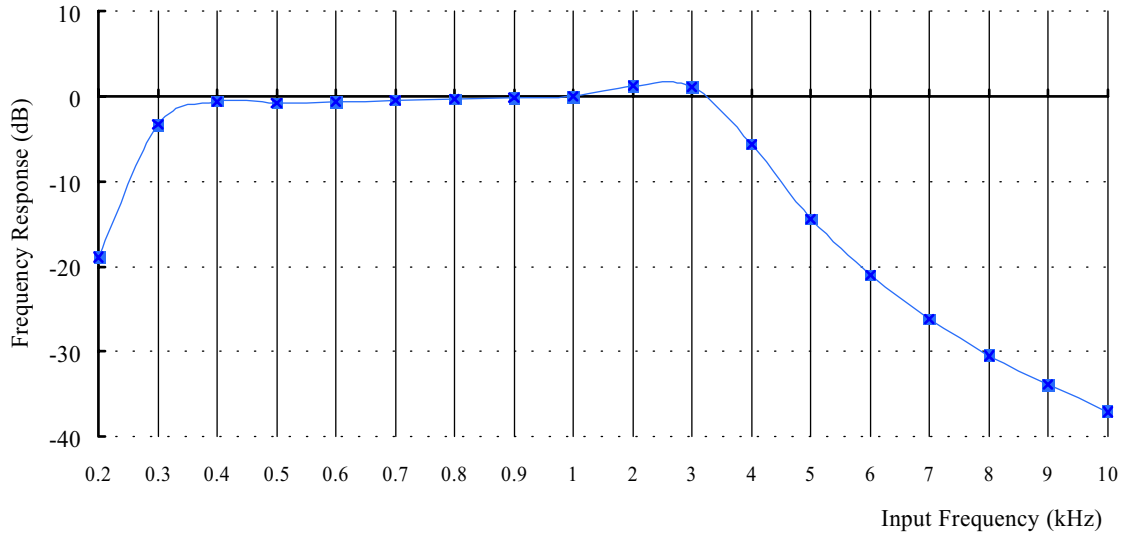
A). Frequency response



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.

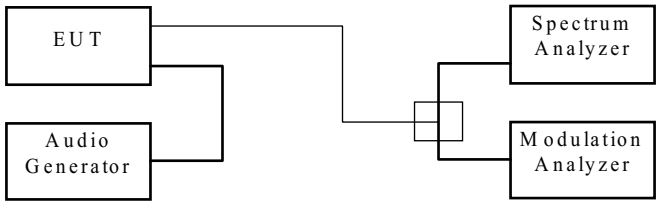
5.2 Measurement Method

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 3, 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 3 : Occupied bandwidth measurement configuration



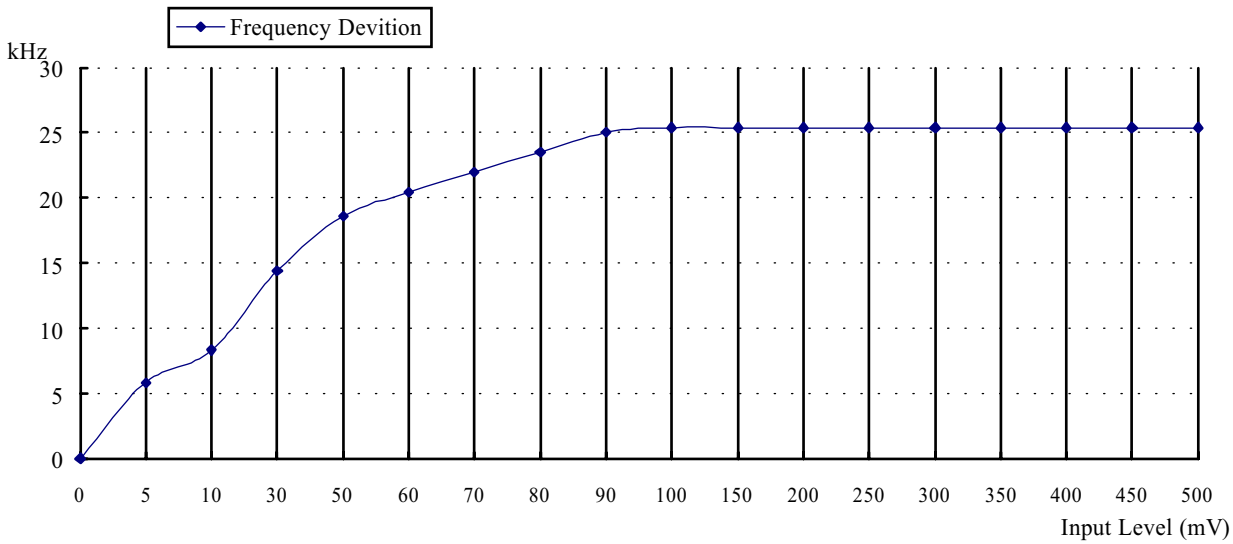
5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	R&S	ESBI	05/15/2002
Modulation Analyzer	Hewlett-Packard	8901A	12/01/2001
Multifunction Synthesizer	Hewlett-Packard	8904A	11/24/2002
Plotter	Hewlett-Packard	7440A	N/A

5.4 Bandwidth Measured

5.4.1 Input Level Derived

Input Audio Frequency : 2.5 kHz, Sine Wave



The Level input to produce 50% modulation is 50 mV, therefore the magnitude 16 dB greater than it is 315.5 mV.

5.4.2 Occupied Bandwidth Plotted

The Channel Low 26 dB Bandwidth is 163.3KHz.
The Channel Mid 26 dB Bandwidth is 189.2KHz.
The Channel High 26 dB Bandwidth is 164.2KHz.

Please see appendix 2 for plotted data.

6. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

6.1 Provisions Applicable

According to § 2.1051, 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.

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.

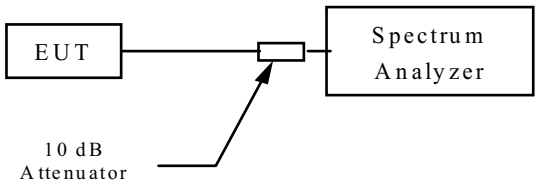
(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(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 configure per figure 4, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer frequency span from 30 MHz to 1 GHz, record any frequency attenuated less than 20 dB relative to the permitted emission and then adjust the analyzer frequency span from 1 GHz to 8 GHz and record emissions frequency should be measured.
3. Adjust the analyzer for each frequency measured above on a 2 MHz frequency span and 1MHz resolution bandwidth. Record the highest value on spectrum analyzer.

Figure 4 : Conducted spurious emission measurement configuration



6.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Test Receiver	R&S	ESBI	05/15/2002
Plotter	Hewlett-Packard	7440A	N/A

6.3 Measurement Data

A. Channel Low

Operated mode : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 65 %

Unmodulated carrier power is 14.39 dBm , or 27.48 mW (Conducted).
The limit of spurious or harmonics is 14.39-[43+10log(output power in W)], or -13dBm

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
1225.00	-55.3	10	-45.3	-13.0	-32.3
1842.00	-63.2	10	-53.2	-13.0	-40.2
1458.00	-71.3	10	-61.3	-13.0	-48.3
3075.00	-62.5	10	-52.5	-13.0	-39.5
3692.00	-64.8	10	-54.8	-13.0	-41.8
4308.00	-69.0	10	-59.0	-13.0	-46.0
5533.00	-68.5	10	-58.5	-13.0	-45.5
6150.00	-65.7	10	-55.7	-13.0	-42.7

B. Channel Mid

Operated mode : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 65 %

Unmodulated carrier power is 15.63 dBm , or 36.56 mW (Conducted).
The limit of spurious or harmonics is 15.63-[43+10log(output power in W)], or -13dBm

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
1419.00	-57.7	10	-47.7	-13.0	-34.7
2125.00	-60.3	10	-50.3	-13.0	-37.3
2831.00	-71.0	10	-61.0	-13.0	-48.0
4967.00	-71.8	10	-61.8	-13.0	-48.8

Please see appendix 2 for plotted data.

C. Channel High

Operated mode : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 65 %

Unmodulated carrier power is 14.26 dBm , or 26.67 mW (Conducted).
The limit of spurious or harmonics is 14.26-[43+10log(output power in W)], or -13dBm

Frequency (MHz)	SA Reading (dBm)	Attenuator (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
907.00	-58.5	10	-48.5	-13.0	-35.5
1605.00	-58.7	10	-48.7	-13.0	-35.7
2410.00	-59.8	10	-49.8	-13.0	-36.8
3215.00	-59.0	10	-49.0	-13.0	-36.0
4020.00	-70.7	10	-60.7	-13.0	-47.7
4825.00	-74.0	10	-64.0	-13.0	-51.0
5630.00	-65.2	10	-55.2	-13.0	-42.2
6435.00	-53.7	10	-43.7	-13.0	-30.7
7240.00	-47.3	10	-37.3	-13.0	-24.3
8045.00	-63.3	10	-53.3	-13.0	-40.3

Please see appendix 2 for plotted data.

7. FIELD STRENGTH OF EMISSION

7.1 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.

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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.

7.2 Measurement Procedure

1. Setup the configuration per figure 5 and 6 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 100 kHz 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 5 : Frequencies measured below 1 GHz configuration

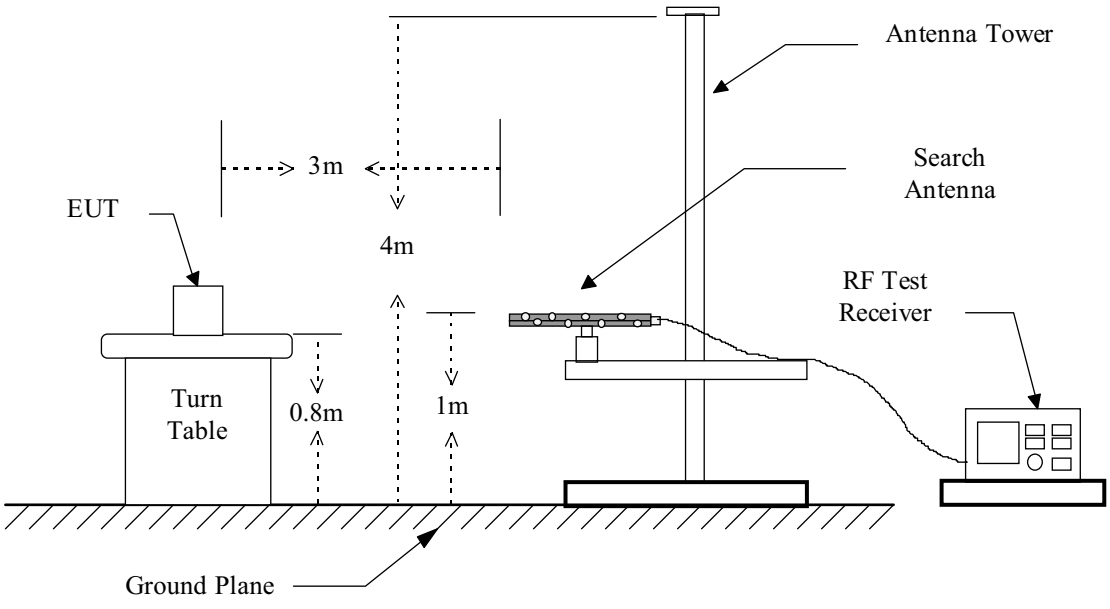
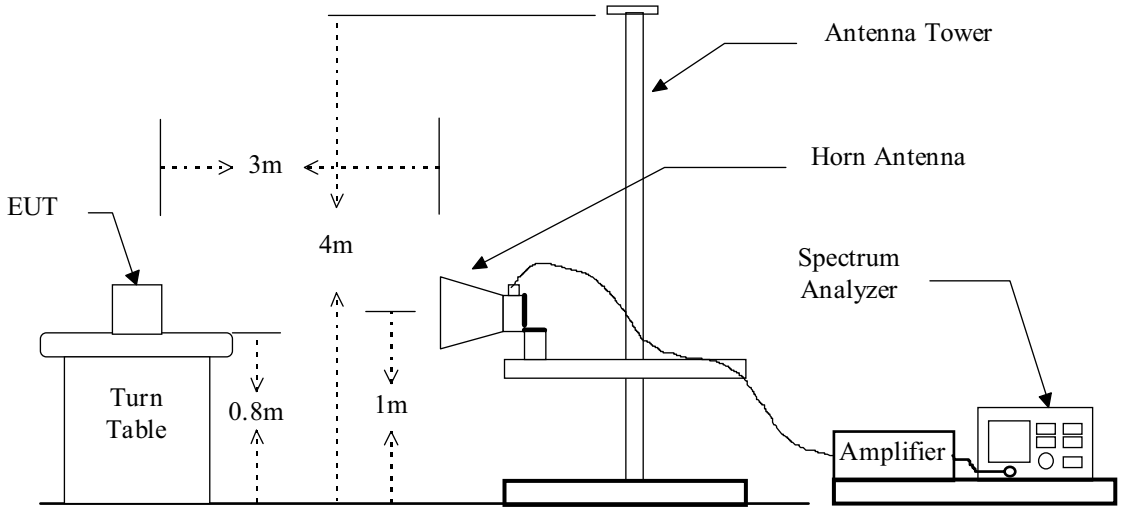


Figure 6 : Frequencies measured above 1 GHz configuration



7.3 Measuring Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8568B	12/21/2001
Quasi Peak Detector	Hewlett-Packard	85650A	01/01/2002
Pre-selector	Hewlett-Packard	85685A	01/01/2002
Spectrum Analyzer	Hewlett-Packard	8564E	05/22/2002
Horn Antenna	EMCO	3115	05/14/2002
Log periodic Antenna	EMCO	3146	11/03/2001
Biconical Antenna	EMCO	3110B	11/02/2001
Preamplifier	Hewlett-Packard	8449B	05/10/2002
Preamplifier	Hewlett-Packard	8447D	12/29/2001

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

7.4 Measuring Data

A. Channel Low

Operated mode : Normal Test Date : Jul. 13, 2001
Temperature : 25 ℃ Humidity : 65 %

Unmodulated carrier output power is 13.5 dBm , or 22.4 mW (ERP).
The limit of spurious or harmonics is calculated as following :

-13.5-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Cable Loss (dB)	Result (dBm)		Amp. Gain	Limit (dBm)	Margin (dB)
615.00	84.0	85.9	10.2	15.8	2.3	7.9	13.5	0.0	27.0	-13.5
1230.00	71.5	81.9	-33.3	-25.8	1.3	-34.6	-27.1	37.5	-13.0	-14.1
1845.00	55.0	69.3	-45.3	-26.7	1.3	-47.7	-31.0	36.5	-13.0	-18.0
2460.00	48.6	56.3	-53.7	-45.2	1.8	-55.4	-46.9	36.3	-13.0	-33.9
3075.00	52.0	50.0	-45.5	-48.0	1.8	-47.3	-49.8	36.2	-13.0	-34.3
3690.00	44.3	44.2	-52.2	-52.1	2.2	-54.3	-54.3	36.1	-13.0	-41.3
4305.00	48.2	45.5	-48.4	-50.6	2.2	-50.5	-52.7	35.4	-13.0	-37.5
4920.00	---	53.0	---	---	2.2	---	---	35.7	-13.0	---
5535.00	45.3	---	-47.8	---	2.6	-50.4	---	35.3	-13.0	-37.4
6150.00	44.4	47.2	-48.2	-44.4	2.6	-50.8	-47.3	35.6	-13.0	-34.3

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. 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.
3. 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 : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 65 %

Unmodulated carrier output power is 11.6 dBm , or 14.5 mW (ERP).

The limit of spurious or harmonics is calculated as following :

-11.6-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Cable Loss (dB)	Result (dBm)		Amp. Gain	Limit (dBm)	Margin (dB)
710.00	81.5	83.7	9.0	13.9	2.3	6.7	11.6	0.0	27.0	-15.4
1419.99	70.3	75.0	-37.9	-30.0	1.3	-39.2	-31.3	37.0	-13.0	-18.3
2130.04	54.5	60.8	-49.8	-40.8	1.8	-51.5	-42.5	36.5	-13.0	-29.5
2840.00	54.7	53.2	-47.0	-47.3	1.8	-48.8	-49.1	36.2	-13.0	-35.8
3550.00	54.8	51.5	-40.2	-46.7	1.8	-42.0	-48.5	36.1	-13.0	-29.0
4260.00	47.7	45.1	-48.9	-51.0	2.2	-51.0	-53.1	35.4	-13.0	-38.0
4970.00	43.4	44.8	-51.4	-48.3	2.2	-53.6	-50.5	35.7	-13.0	-37.5
5680.00	---	45.2	---	-47.9	2.6	---	-50.5	35.5	-13.0	-37.5
6390.00	47.2	52.7	-45.1	-39.8	2.6	-47.7	-42.3	35.8	-13.0	-29.3
7100.00	51.7	---	-38.5	---	2.6	-41.1	---	35.6	-13.0	-28.1

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. 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.
3. 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 : Normal
Test Date : Jul. 13, 2001
Temperature : 25 ℃
Humidity : 65 %

Unmodulated carrier output power is 11.9 dBm , or 15.4 mW (ERP).

The limit of spurious or harmonics is calculated as following :

-11.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Cable Loss (dB)	Result (dBm)		Amp. Gain	Limit (dBm)	Margin (dB)
805.00	80.6	83.4	9.1	14.5	2.6	6.5	11.9	0.0	27.0	-15.1
1610.00	69.7	78.9	-37.0	-27.4	1.3	-38.3	-28.8	37.0	-13.0	-15.8
2415.00	54.3	67.4	-45.1	-34.5	1.8	-46.8	-36.2	36.3	-13.0	-23.2
3220.00	56.9	58.5	-42.8	-39.2	1.8	-44.5	-40.9	36.2	-13.0	-27.9
4025.00	47.3	48.5	-46.9	-46.9	2.2	-49.1	-49.1	35.4	-13.0	-36.1
4830.00	---	---	---	---	2.2	---	---	35.7	-13.0	---
5635.00	44.8	45.3	-48.9	-46.7	2.6	-51.5	-49.3	35.3	-13.0	-36.3
6440.00	48.0	54.3	-44.2	-38.2	2.6	-46.7	-40.8	35.8	-13.0	-27.8
7245.00	56.6	57.6	-33.2	-33.7	2.6	-35.8	-36.3	35.6	-13.0	-22.8
8050.00	51.3	53.0	-38.8	-37.1	2.9	-41.8	-40.1	36.1	-13.0	-27.1

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. 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.
3. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

7.5 Radiated Measurement Photos

Please see Setup Photos In Exhibit F.

8. FREQUENCY STABILITY MEASUREMENT

8.1 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.

8.2 Measurement Procedure

A) Frequency stability versus environmental temperature

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. 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

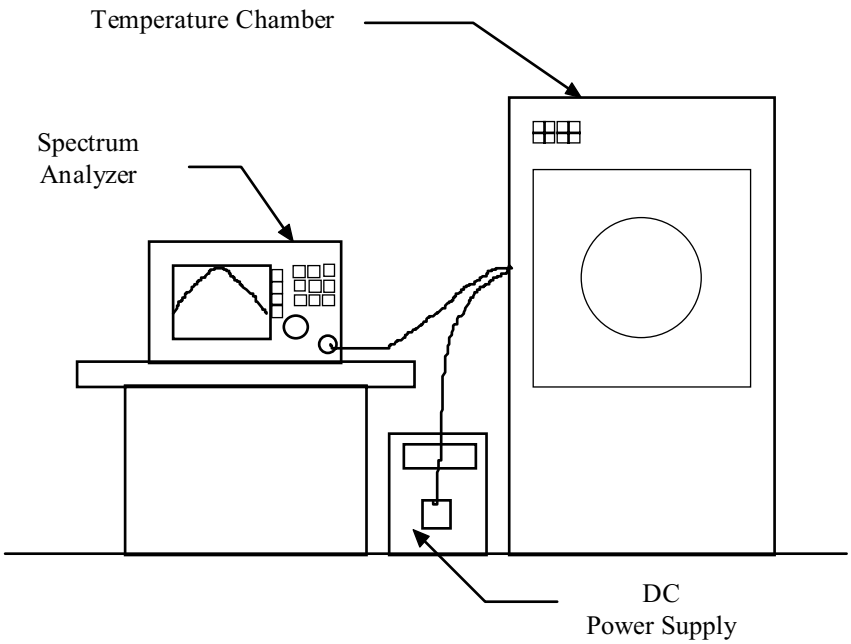
1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15℃ to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃ shall be used. Install new batteries in the EUT.

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 7 : Frequency stability measurement configuration



8.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	HP	8564E	05/22/2002
Temperature Chamber	ACS	EOS 200T	01/17/2002

8.4 Measurement Data

A1. Frequency stability versus enviroment tempture

Reference Frequency : 614.997 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.	614.9995	0.0004	614.9790	-0.0029	614.9737	-0.0038
	New Batt.	614.9989	0.0003	614.9964	-0.0001	615.0145	0.0028
	New Batt.	615.0189	0.0036	615.0124	0.0025	615.0144	0.0028
40	New Batt.	615.0133	0.0027	614.9922	-0.0008	614.9824	-0.0024
	New Batt.	614.9884	-0.0014	615.0134	0.0027	615.0144	0.0028
	New Batt.	614.9960	-0.0002	615.0135	0.0027	614.9792	-0.0029
30	New Batt.	615.0144	0.0028	614.9747	-0.0036	614.9867	-0.0017
	New Batt.	615.0005	0.0006	614.9790	-0.0029	615.0017	0.0008
	New Batt.	614.9760	-0.0034	614.9984	0.0002	615.0059	0.0014
20	New Batt.	614.9995	0.0004	615.0177	0.0034	614.9792	-0.0029
	New Batt.	614.9943	-0.0004	614.9957	-0.0002	615.0191	0.0036
	New Batt.	614.9836	-0.0022	615.0167	0.0032	615.0090	0.0020
10	New Batt.	614.9967	0.0000	614.9809	-0.0026	614.9901	-0.0011
	New Batt.	614.9804	-0.0027	615.0059	0.0014	614.9963	-0.0001
	New Batt.	614.9786	-0.0030	615.0050	0.0013	614.9908	-0.0010
0	New Batt.	615.0001	0.0005	614.9765	-0.0033	615.0088	0.0019
	New Batt.	615.0049	0.0013	614.9766	-0.0033	615.0167	0.0032
	New Batt.	615.0104	0.0022	615.0021	0.0008	614.9946	-0.0004
-10	New Batt.	614.9872	-0.0016	614.9835	-0.0022	615.0019	0.0008
	New Batt.	614.9742	-0.0037	614.9909	-0.0010	614.9784	-0.0030
	New Batt.	615.0153	0.0030	614.9758	-0.0034	615.0019	0.0008
-20	New Batt.	614.9862	-0.0018	615.0190	0.0036	615.0062	0.0015
	New Batt.	615.0196	0.0037	615.0099	0.0021	614.9893	-0.0013
	New Batt.	615.0095	0.0020	614.9746	-0.0036	615.0164	0.0032

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

Reference Frequency : 614.997 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	615.0001	0.0005	615.0064	0.0015	615.0122	0.0025

B1. Frequency stability versus enviroment tempture

Reference Frequency : 709.987 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.	709.9694	-0.0012	709.9958	0.0025	709.9526	-0.0036
	New Batt.	709.9696	-0.0012	709.9646	-0.0019	709.9995	0.0030
	New Batt.	709.9809	0.0004	709.9527	-0.0036	709.9813	0.0005
40	New Batt.	709.9541	-0.0034	709.9668	-0.0016	709.9858	0.0011
	New Batt.	709.9604	-0.0025	710.0050	0.0038	709.9531	-0.0035
	New Batt.	710.0036	0.0036	709.9786	0.0001	709.9580	-0.0028
30	New Batt.	709.9743	-0.0005	709.9836	0.0008	709.9510	-0.0038
	New Batt.	709.9789	0.0001	709.9955	0.0025	709.9839	0.0008
	New Batt.	709.9619	-0.0023	709.9507	-0.0038	710.0013	0.0033
20	New Batt.	709.9876	0.0014	709.9535	-0.0035	709.9531	-0.0035
	New Batt.	709.9538	-0.0034	709.9508	-0.0038	709.9968	0.0026
	New Batt.	709.9660	-0.0017	709.9513	-0.0038	709.9536	-0.0034
10	New Batt.	709.9794	0.0002	709.9758	-0.0003	710.0040	0.0037
	New Batt.	709.9854	0.0010	709.9552	-0.0032	709.9533	-0.0035
	New Batt.	709.9679	-0.0014	709.9636	-0.0020	709.9883	0.0015
0	New Batt.	709.9560	-0.0031	709.9882	0.0014	709.9611	-0.0024
	New Batt.	709.9992	0.0030	709.9611	-0.0024	709.9902	0.0017
	New Batt.	709.9736	-0.0006	709.9715	-0.0009	709.9697	-0.0012
-10	New Batt.	709.9829	0.0007	709.9800	0.0003	709.9791	0.0002
	New Batt.	709.9963	0.0026	709.9859	0.0011	709.9742	-0.0005
	New Batt.	709.9940	0.0023	709.9952	0.0024	709.9955	0.0025
-20	New Batt.	709.9696	-0.0012	709.9895	0.0016	709.9706	-0.0010
	New Batt.	709.9941	0.0023	709.9987	0.0029	709.9817	0.0005
	New Batt.	709.9996	0.0030	709.9528	-0.0035	710.0035	0.0036

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

Reference Frequency : 614.997 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	709.9696	-0.0012	709.9665	-0.0016	709.9923	0.0020

C1. Frequency stability versus enviroment tempture

Reference Frequency : 805.000 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.	805.0235	0.0029	804.9711	-0.0036	804.9812	-0.0023
	New Batt.	805.0013	0.0002	805.0041	0.0005	804.9831	-0.0021
	New Batt.	805.0010	0.0001	804.9817	-0.0023	804.9763	-0.0029
40	New Batt.	805.0208	0.0026	805.0224	0.0028	805.0144	0.0018
	New Batt.	805.0164	0.0020	805.0013	0.0002	804.9953	-0.0006
	New Batt.	804.9783	-0.0027	805.0227	0.0028	805.0239	0.0030
30	New Batt.	804.9883	-0.0015	805.0107	0.0013	805.0133	0.0017
	New Batt.	805.0186	0.0023	804.9880	-0.0015	805.0198	0.0025
	New Batt.	804.9728	-0.0034	805.0064	0.0008	805.0231	0.0029
20	New Batt.	805.0226	0.0028	805.0190	0.0024	804.9762	-0.0030
	New Batt.	804.9955	-0.0006	804.9766	-0.0029	804.9877	-0.0015
	New Batt.	804.9702	-0.0037	805.0173	0.0021	805.0126	0.0016
10	New Batt.	805.0132	0.0016	805.0119	0.0015	804.9936	-0.0008
	New Batt.	804.9875	-0.0016	805.0248	0.0031	804.9740	-0.0032
	New Batt.	804.9763	-0.0029	805.0182	0.0023	804.9709	-0.0036
0	New Batt.	805.0132	0.0016	805.0172	0.0021	805.0058	0.0007
	New Batt.	805.0283	0.0035	804.9993	-0.0001	804.9944	-0.0007
	New Batt.	804.9868	-0.0016	805.0008	0.0001	804.9845	-0.0019
-10	New Batt.	805.0169	0.0021	804.9865	-0.0017	804.9749	-0.0031
	New Batt.	805.0122	0.0015	805.0101	0.0013	804.9855	-0.0018
	New Batt.	805.0096	0.0012	805.0215	0.0027	804.9904	-0.0012
-20	New Batt.	804.9895	-0.0013	805.0159	0.0020	804.9944	-0.0007
	New Batt.	805.0261	0.0032	804.9748	-0.0031	805.0009	0.0001
	New Batt.	805.0039	0.0005	805.0099	0.0012	804.9736	-0.0033

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

Reference Frequency : 614.997 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	804.9802	-0.0025	804.9766	-0.0029	805.0291	0.0036

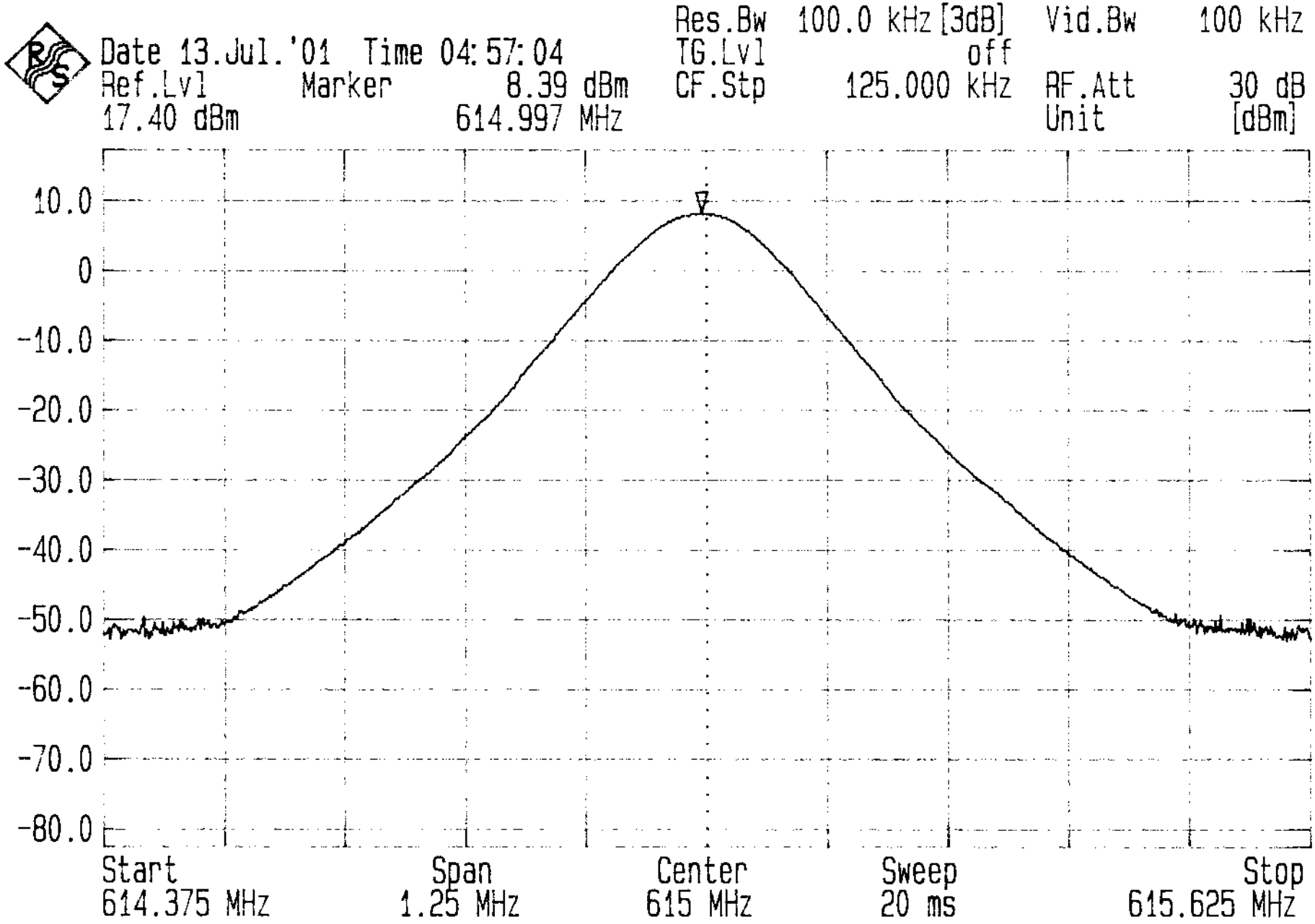
9 CONDUCTED EMISSION MEASUREMENT

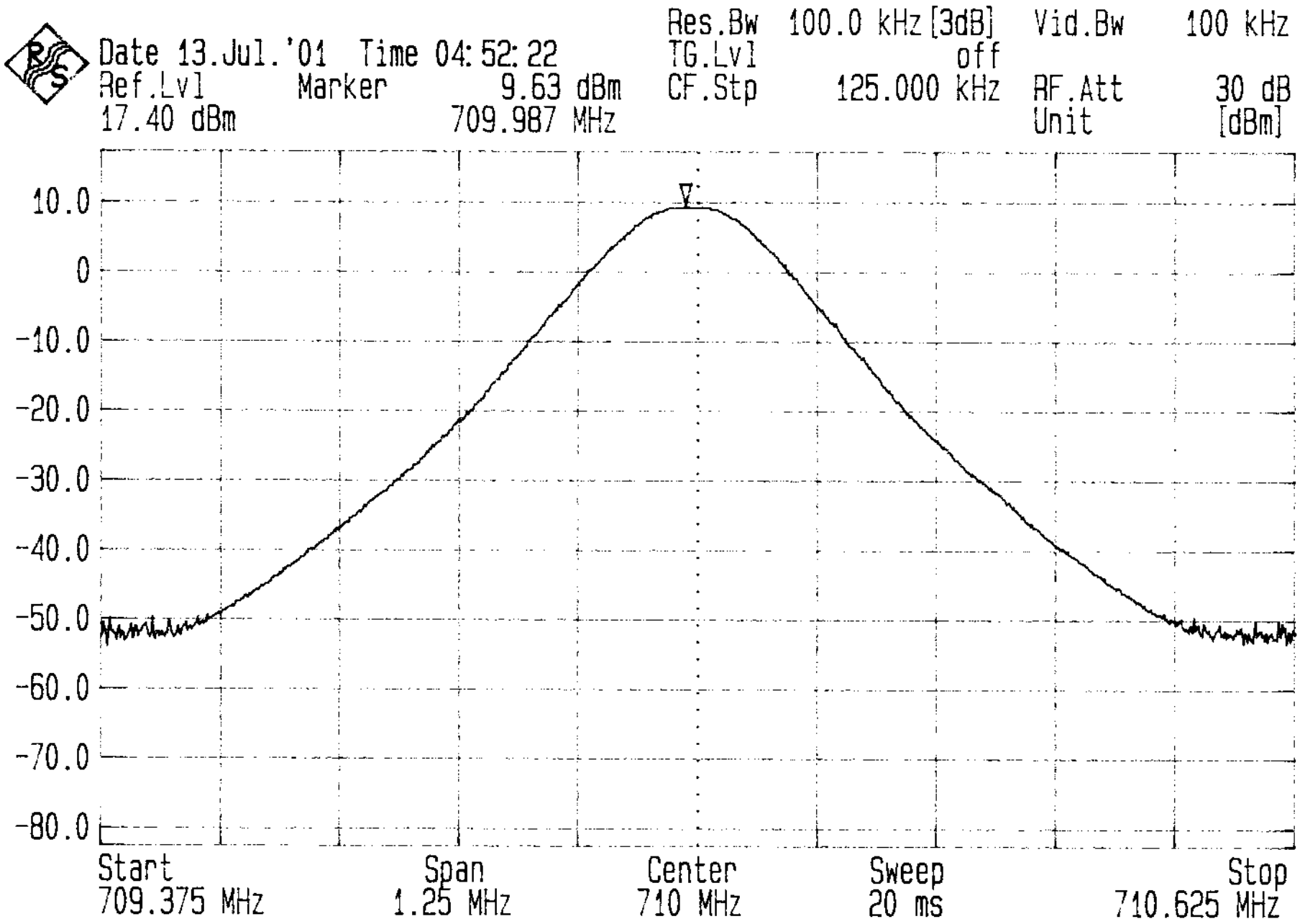
9.1 Standard Applicable

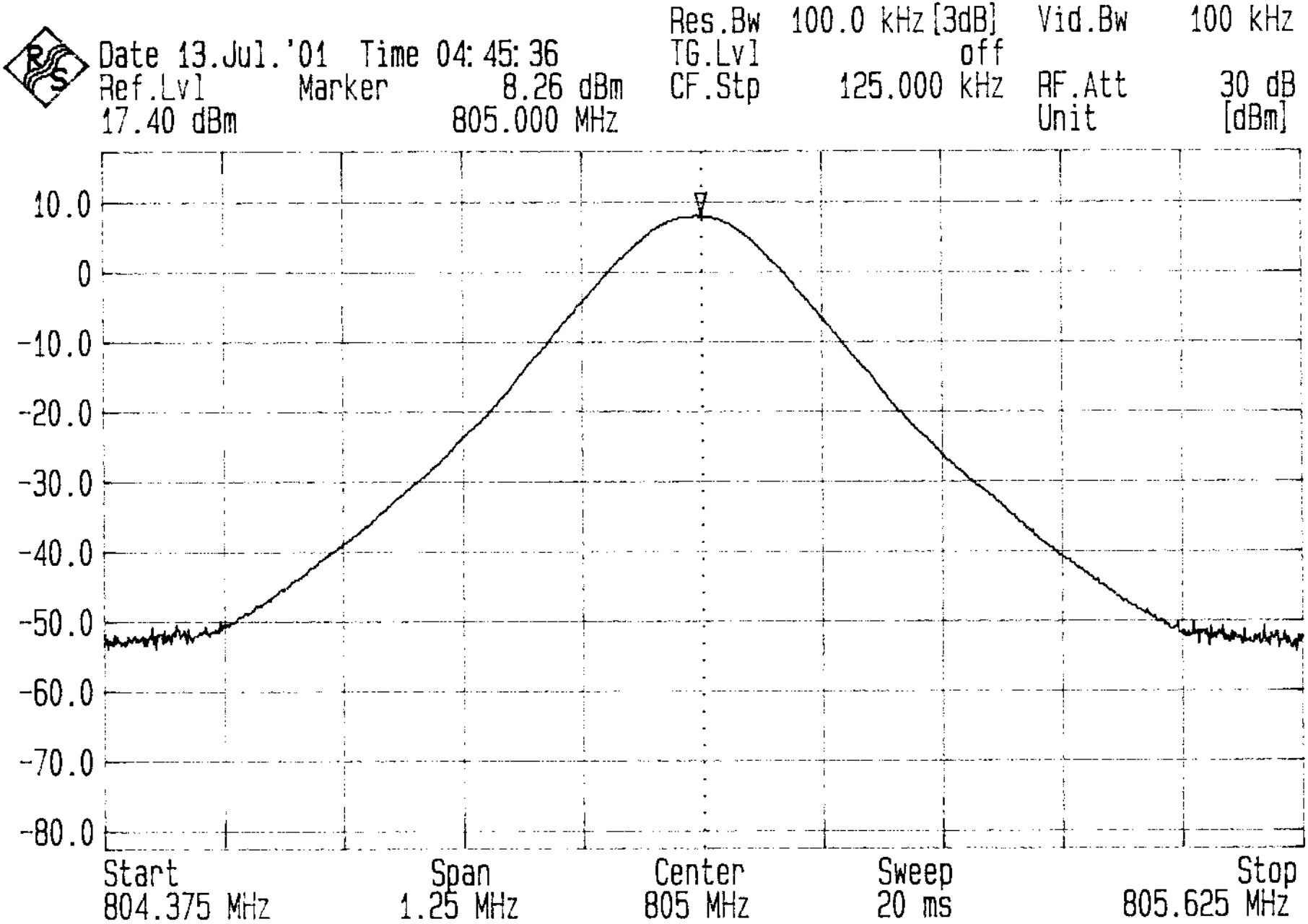
This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to § 15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC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

For intentional device, Line Conducted Emission Limits are in accordance to § 15.207(a), any emissions level shall not exceed 48 dBuV.

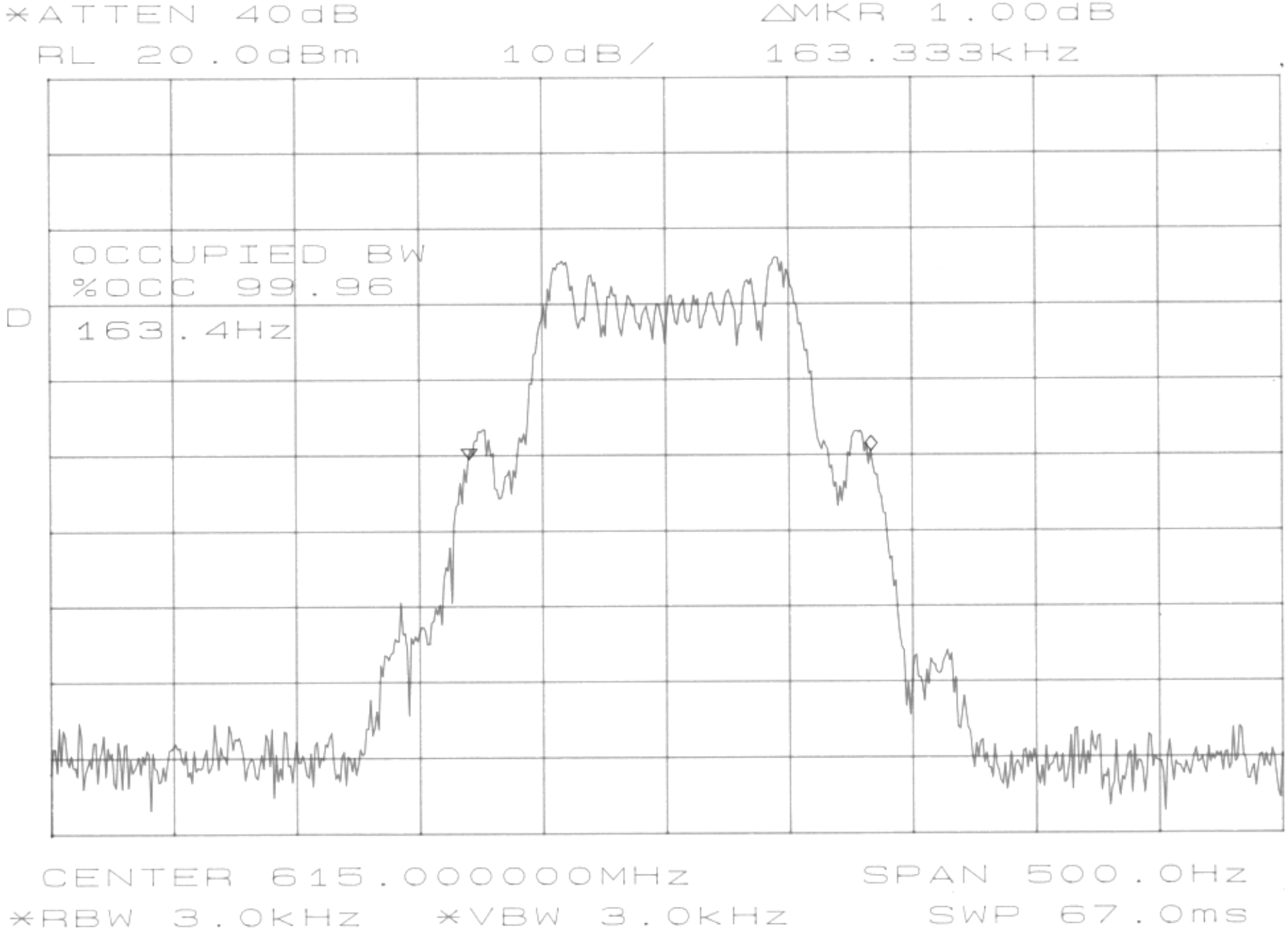
Appendix 1 : Ouput Power Plotted Data

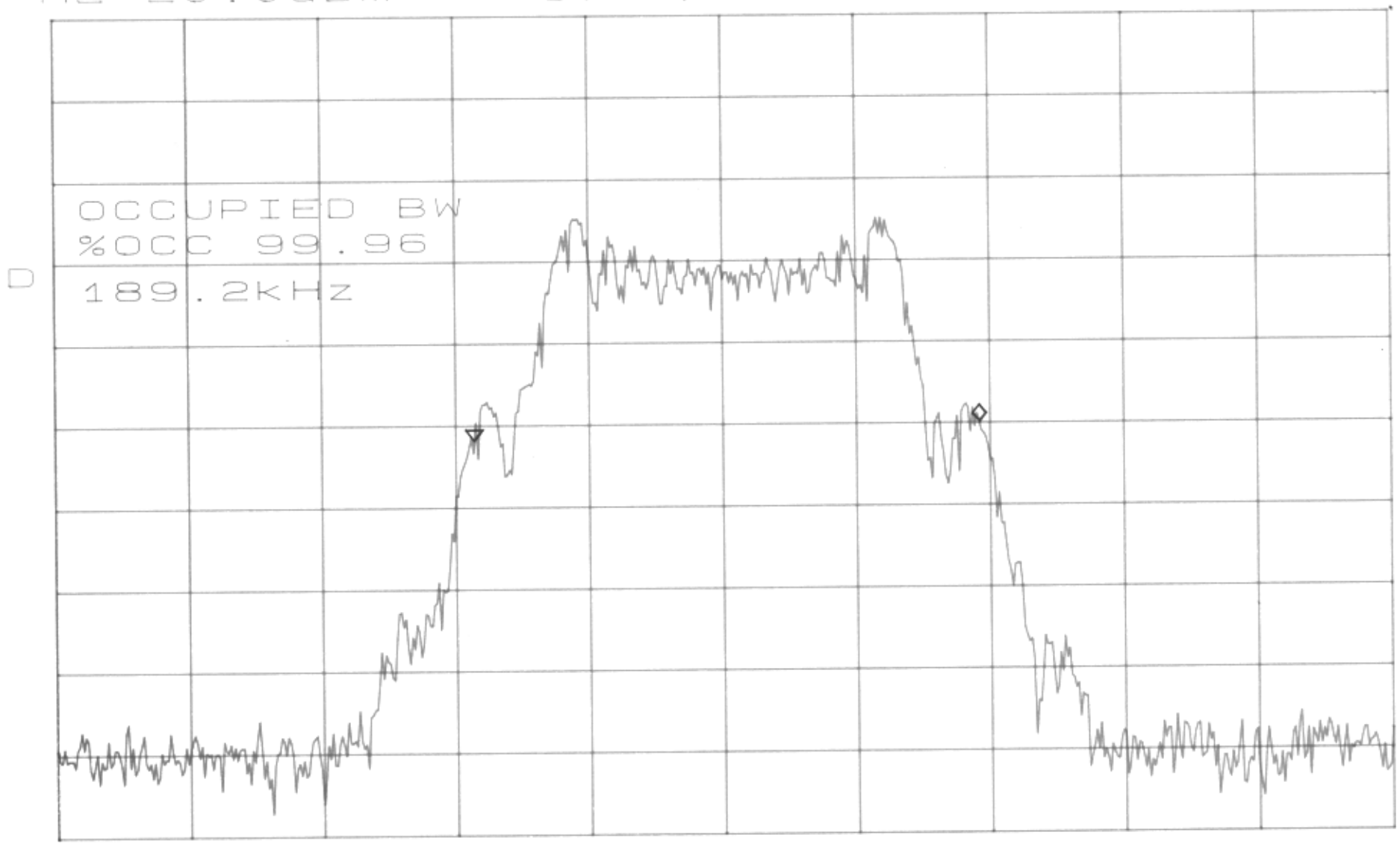

Date 13.Jul.'01 Time 04:57:04
Ref.Lvl
17.40 dBm
Marker
8.39 dBm
614.997 MHz
Res.Bw 100.0 kHz [3dB]
TG.Lvl
off
CF.Stp
125.000 kHz
Vid.Bw 100 kHz
RF.Att 30 dB
Unit [dBm]
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Start
614.375 MHz
Span
1.25 MHz
Center
615 MHz
Sweep
20 ms
Stop
615.625 MHz

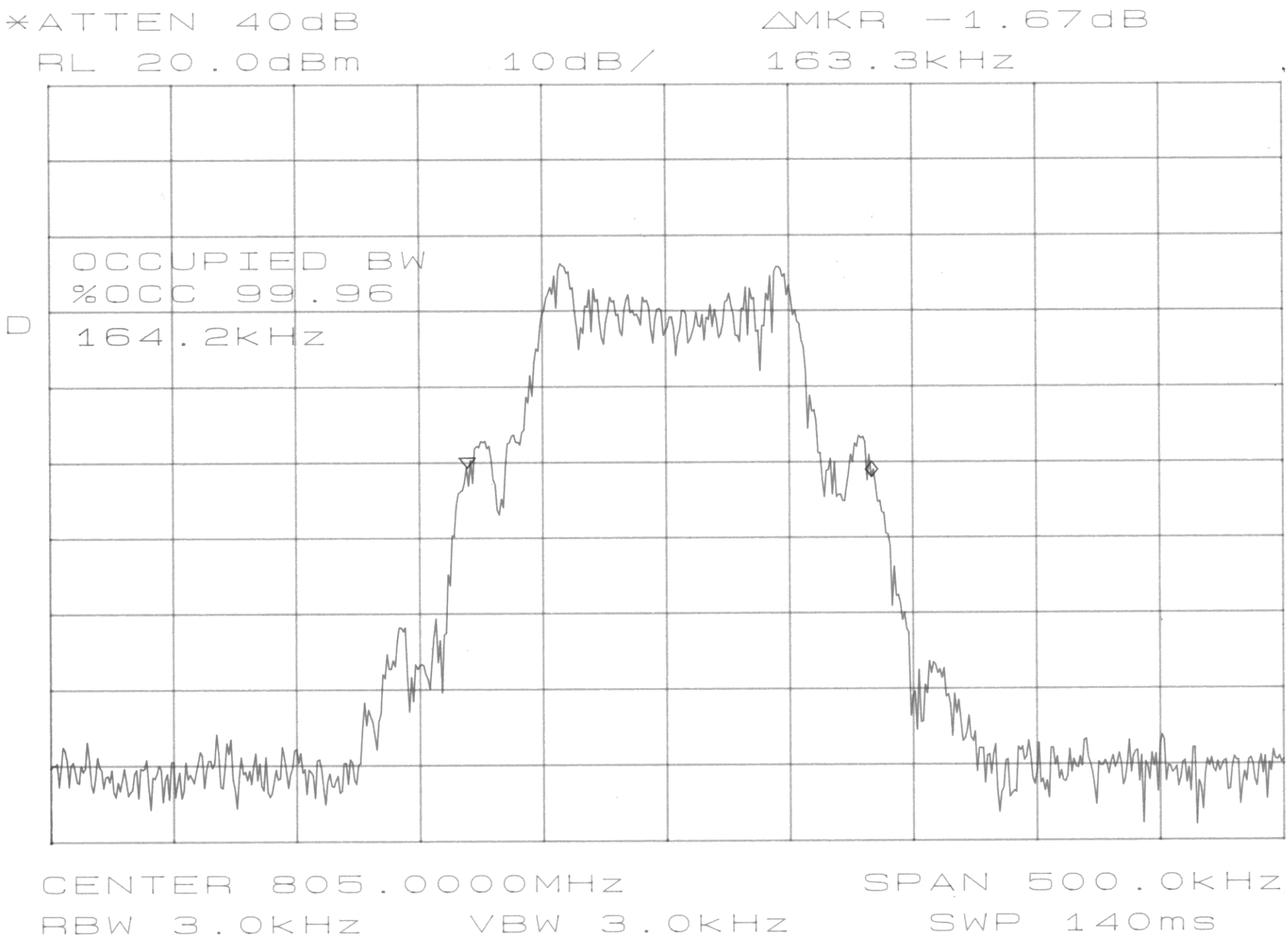

Date 13.Jul.'01 Time 04:52:22
Ref.Lvl
17.40 dBm
Marker
9.63 dBm
709.987 MHz
Res.Bw 100.0 kHz [3dB]
TG.Lvl
off
CF.Stp
125.000 kHz
Vid.Bw 100 kHz
RF.Att 30 dB
Unit [dBm]
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Start
709.375 MHz
Span
1.25 MHz
Center
710 MHz
Sweep
20 ms
Stop
710.625 MHz


Date 13.Jul.'01 Time 04:45:36
Ref.Lvl
17.40 dBm
Marker
8.26 dBm
805.000 MHz
Res.Bw 100.0 kHz [3dB]
TG.Lvl
off
CF.Stp
125.000 kHz
Vid.Bw 100 kHz
RF.Att 30 dB
Unit [dBm]
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Start
804.375 MHz
Span
1.25 MHz
Center
805 MHz
Sweep
20 ms
Stop
805.625 MHz

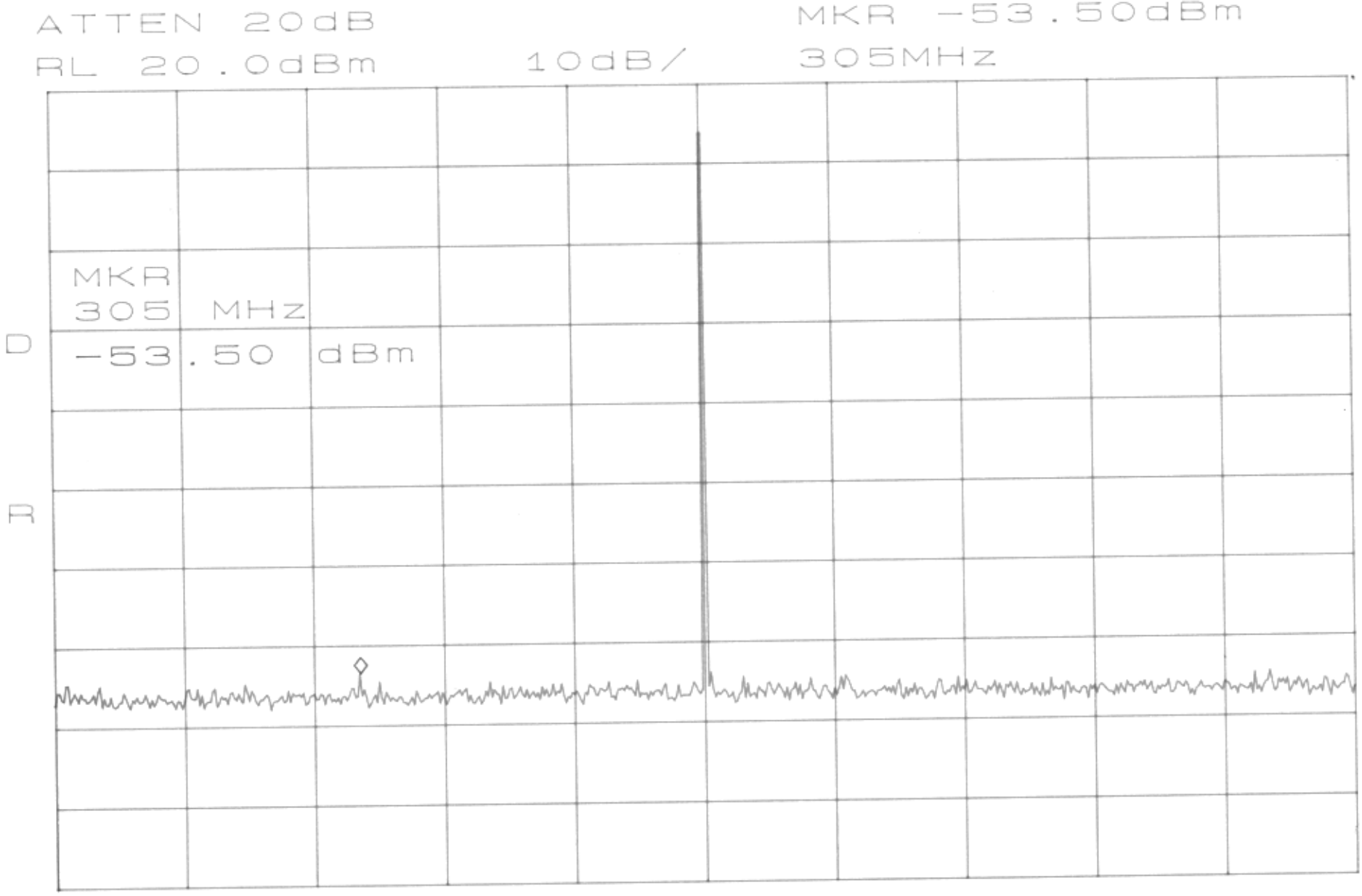
Appendix 2 : Occupied Emission Bandwidth Plotted Data

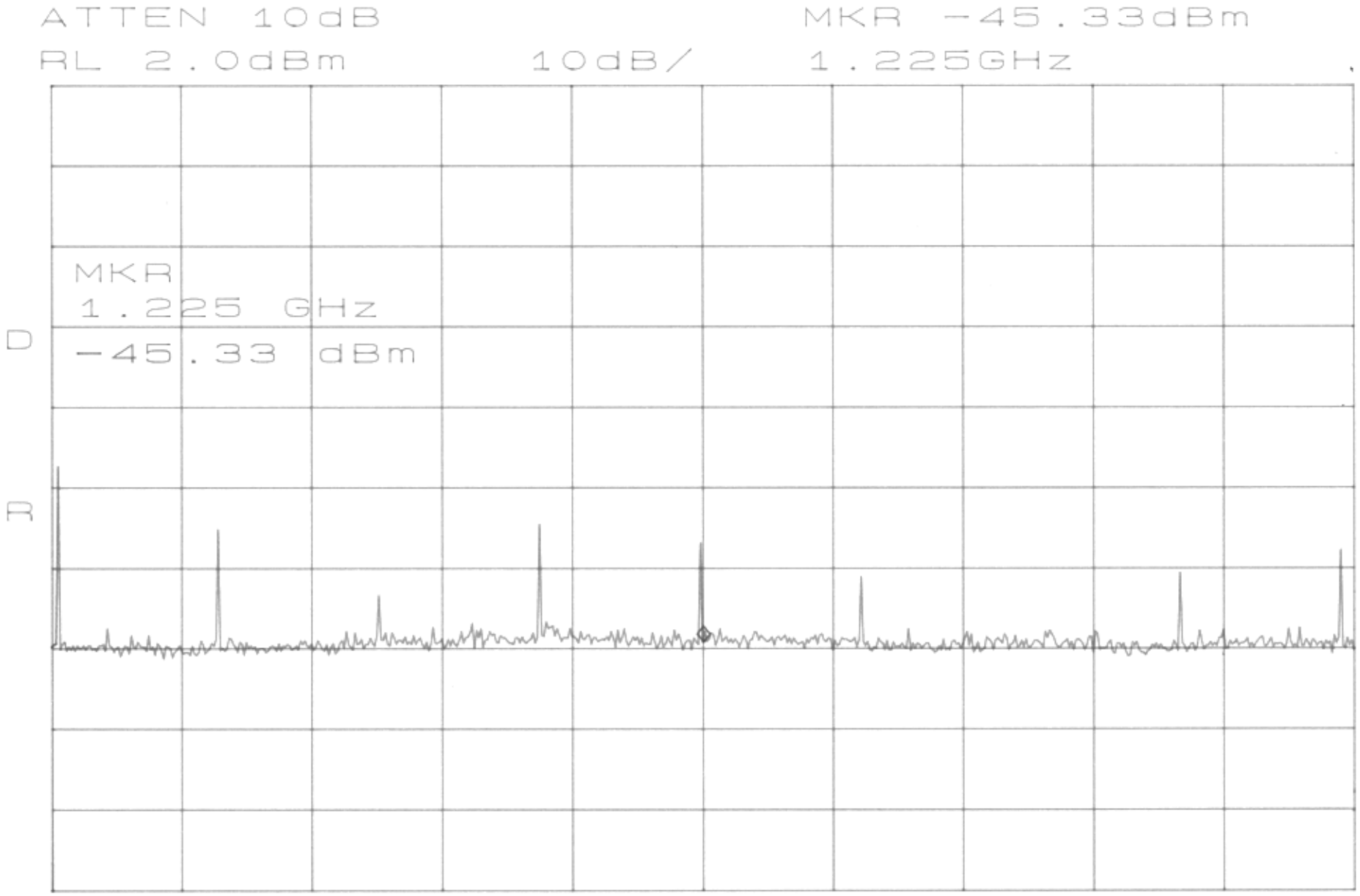

*ATTEN 40dB
RL 20.0dBm
10dB/
ΔMKR 1.00dB
163.333kHz
OCCUPIED BW
%OCC 99.96
163.4Hz
D
CENTER 615.000000MHz
SPAN 500.0Hz
*RBW 3.0kHz
*VBW 3.0kHz
SWP 67.0ms

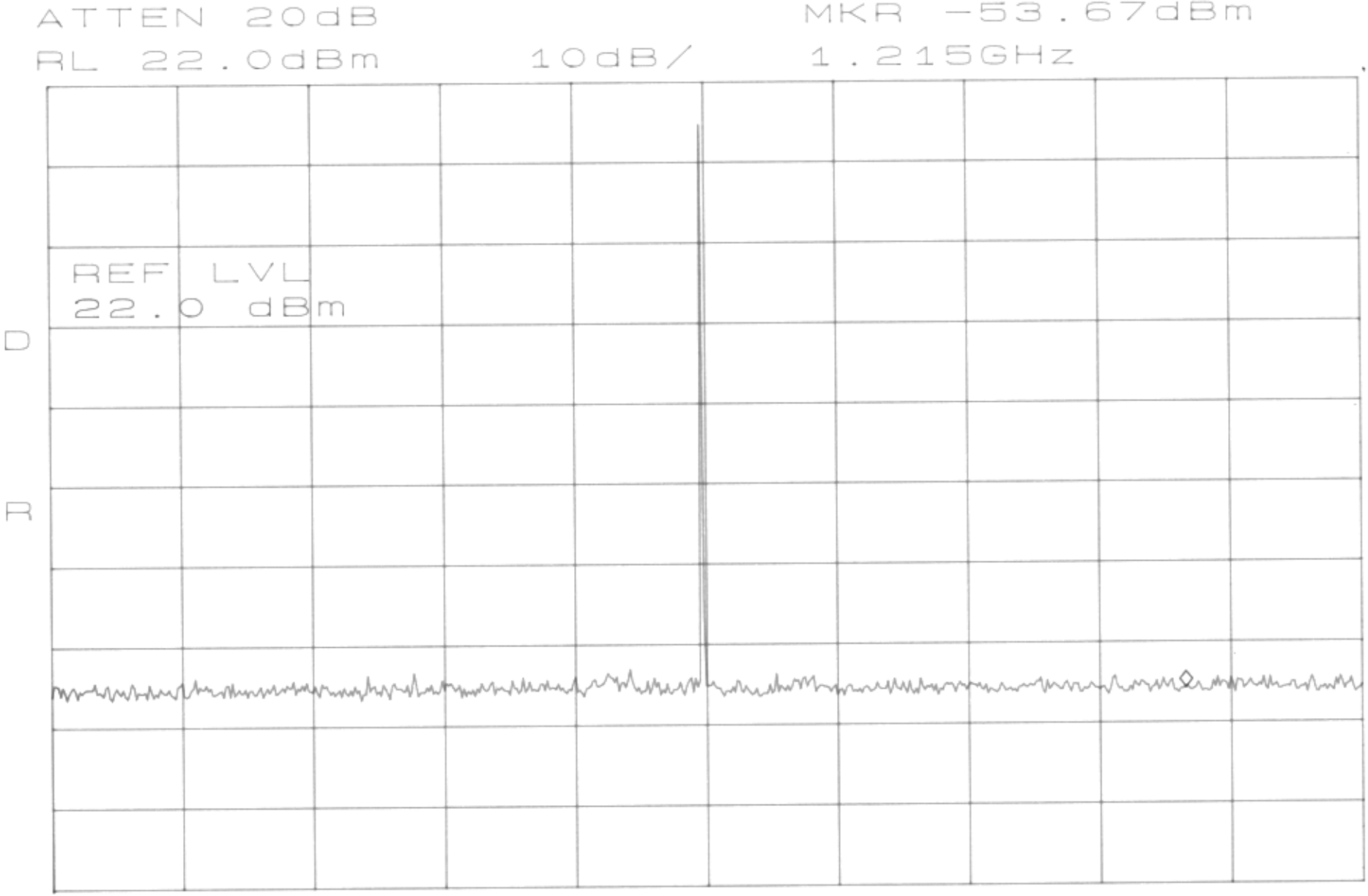

*ATTEN 40dB
RL 20.0dBm
10dB/
ΔMKR 2.17dB
189.2kHz
OCCUPIED BW
%OCC 99.96
189.2kHz
D
CENTER 710.0000MHz
SPAN 500.0kHz
RBW 3.0kHz
VBW 3.0kHz
SWP 140ms

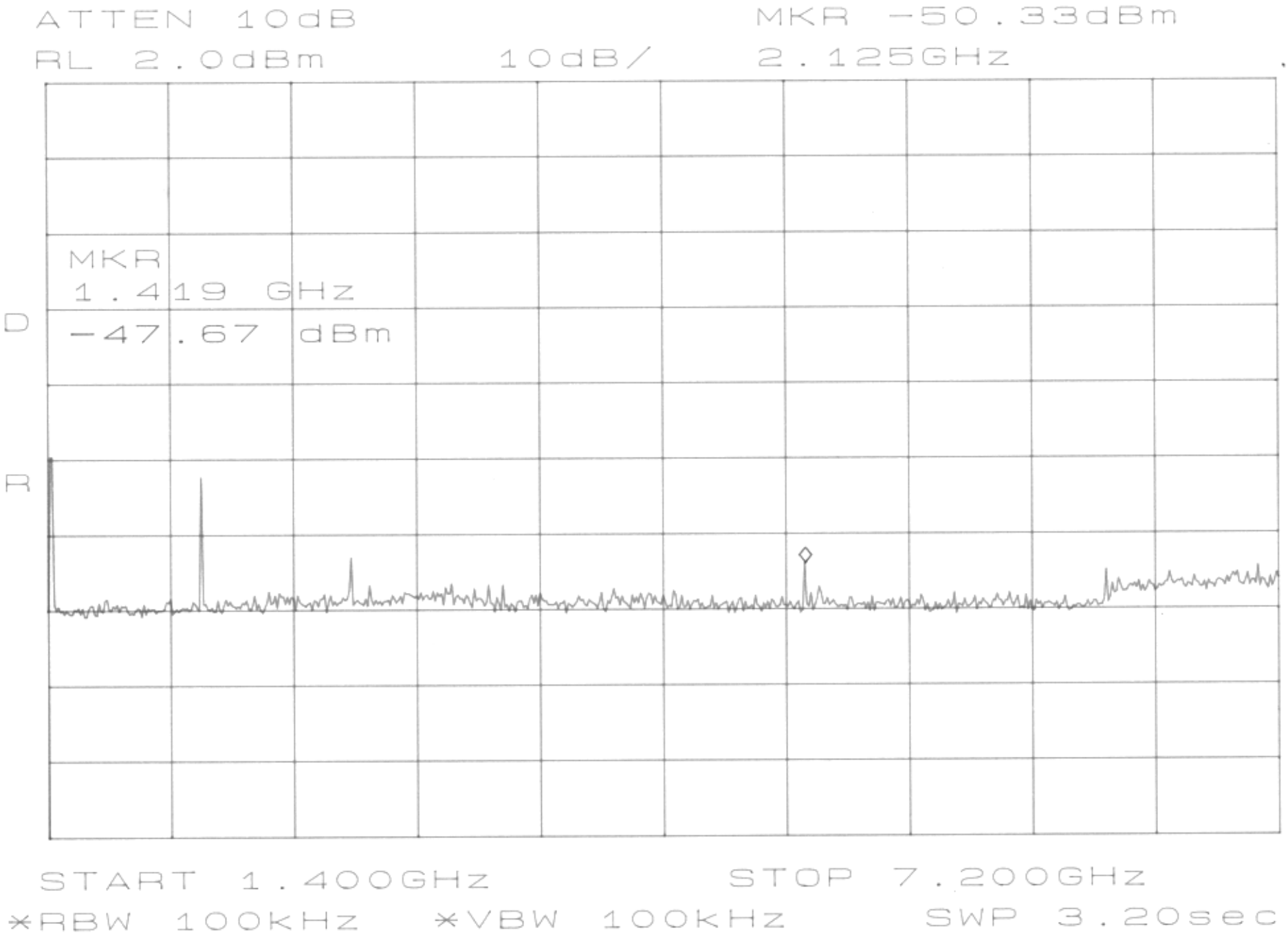

*ATTEN 40dB
△MKR -1.67dB
RL 20.0dBm
10dB/
163.3kHz
OCCUPIED BW
%OCC 99.96
D
164.2kHz
CENTER 805.0000MHz
SPAN 500.0kHz
RBW 3.0kHz
VBW 3.0kHz
SWP 140ms

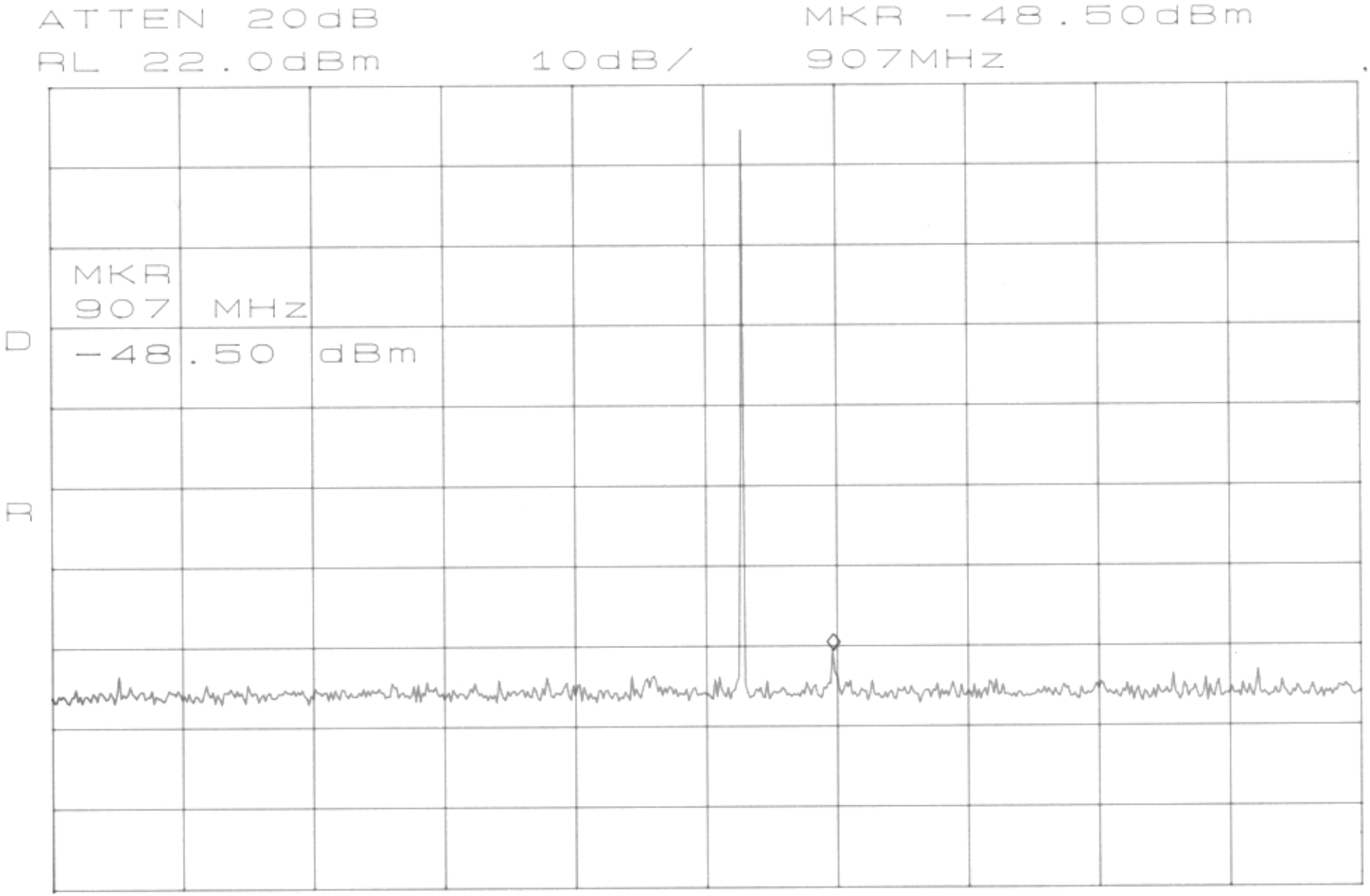
Appendix 3 : Spuriuos Emissions at Antenna Terminal

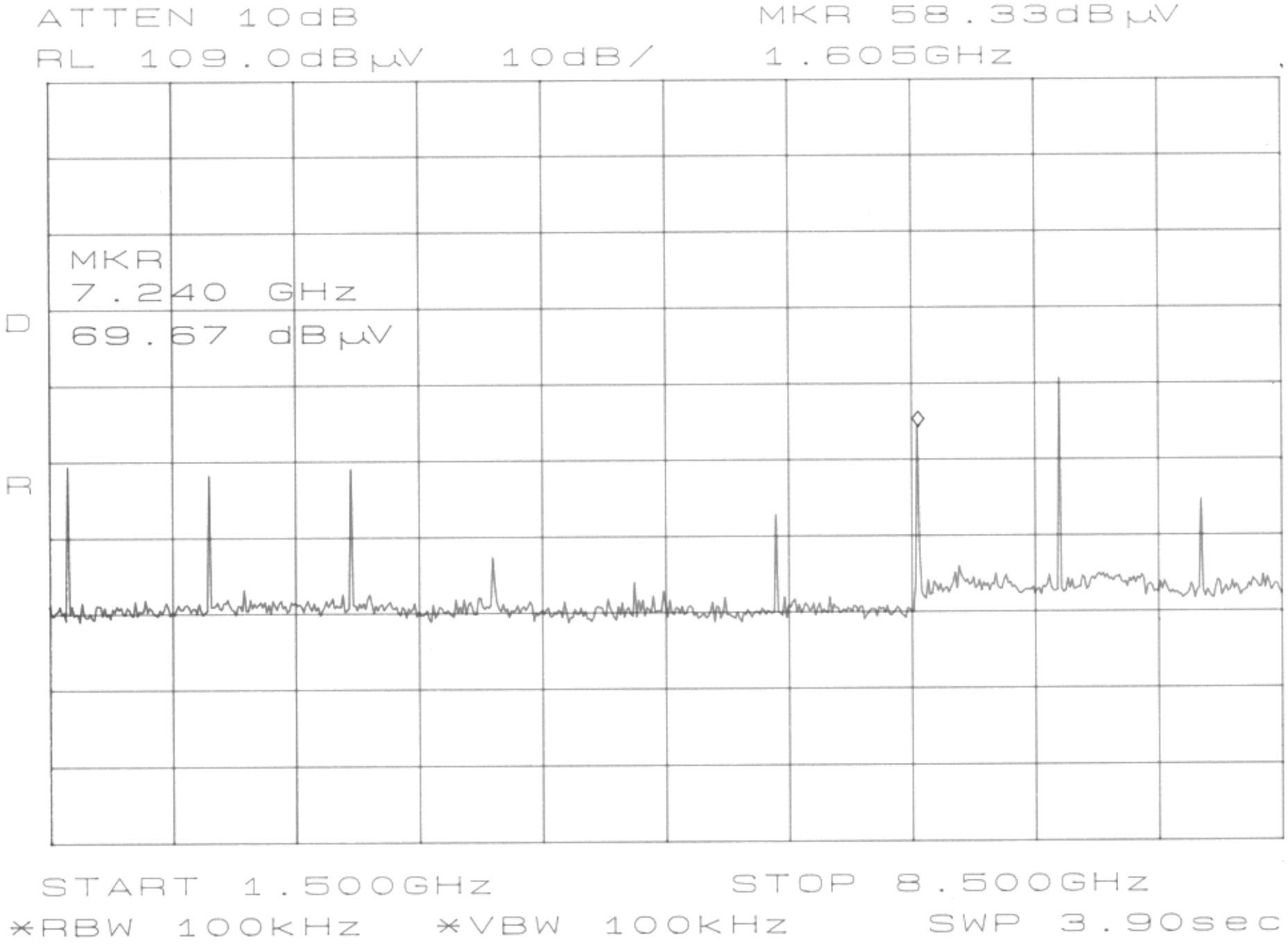

ATTEN 20dB
RL 20.0dBm
10dB/
MKR -53.50dBm
305MHz
MKR
305 MHz
-53.50 dBm
D
R
START 30MHz
STOP 1.200GHz
*RBW 100kHz
*VBW 100kHz
SWP 650ms


ATTEN 10dB
MKR -45.33dBm
RL 2.0dBm
10dB/
1.225GHz
MKR
1.225 GHz
-45.33 dBm
D
R
START 1.200GHz
STOP 6.200GHz
*RBW 100kHz
*VBW 100kHz
SWP 2.80sec


ATTEN 20dB
MKR -53.67dBm
RL 22.0dBm
10dB/
1.215GHz
REF LVL
22.0 dBm
D
R
START 30MHz
STOP 1.400GHz
*RBW 100kHz
*VBW 100kHz
SWP 750ms


ATTEN 10dB
MKR -50.33dBm
RL 2.0dBm
10dB/
2.125GHz
MKR
1.419 GHz
-47.67 dBm
D
R
START 1.400GHz
STOP 7.200GHz
*RBW 100kHz
*VBW 100kHz
SWP 3.20sec


ATTEN 20dB
RL 22.0dBm
10dB/
MKR -48.50dBm
907MHz
MKR
907 MHz
-48.50 dBm
D
R
START 30MHz
STOP 1.500GHz
*RBW 100kHz
*VBW 100kHz
SWP 810ms


ATTEN 10dB
MKR 58.33dBµV
RL 109.0dBµV
10dB/
1.605GHz
MKR
7.240 GHz
69.67 dBµV
D
R
START 1.500GHz
STOP 8.500GHz
*RBW 100kHz
*VBW 100kHz
SWP 3.90sec