FCC Part 15
EMI TEST REPORT

of

E.U.T. : Bluetooth Headset

MODEL : BH-1000

FCC ID. : OAJBH-1000

for

APPLICANT : J Communications Co., Ltd

ADDRESS : No.124-4, Ojeon-Dong, Uiwang-City,
Kyunggi-Do, Korea

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 34, LIN 5, DING FU TSUN, LINKOU HSIANG
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Report Number : ET91R-10-022-04

TEST REPORT CERTIFICATION

Applicant : J Communications Co., Ltd
No.124-4, Ojeon-Dong, Uiwang-City, Kyunggi-Do, Korea

Manufacturer : J Communications Co., Ltd
No.124-4, Ojeon-Dong, Uiwang-City, Kyunggi-Do, Korea

Description of EUT :

a) Type of EUT : Bluetooth Headset

b) Trade Name : Rhapsody Headset

c) Model No. : BH-1000

d) Power Supply : DC 3,6V-5,5 by Battery

e) Working Frequency : 2400MHz~2483.5MHz

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2001)

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

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

Issued Date : Nov. 29, 2002

Test Engineer : Tien Lu Liau
(Tien . Lu. Liau)

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 : Bluetooth Headset

b) Trade Name : Rhapsody Headset

c) Model No. : BH-1000

d) Power Supply : DC 3,6V-5,5V by Batery

1.2 Characteristics of Device

Any device that you want to use with the Bluetooth Headset has to be compatible with Bluetooth wireless technology and support the Headset Profile. To be able to use the Headset together with a mobile phone, you need to have a phone with built-in Bluetooth capability, or another Bluetooth audio gateway connected to it.

1.3 Test Methodology

For Bluetooth Headset, both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (1992). Other required measurements were illustrated in separate sections of this test report for details.

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 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

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

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For unintentional device, according to §15.107(a) Line Conducted Emission Limits is as following:

Frequency MHz	Emissions ì V	Emissions dBì V
0.45 - 30.0	250	48.0

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dBì V/m	Radiated ì V/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

(4) Hopping Channel Separation

According to 15.247(a)(1), frequency hopping system shall have , hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

(5) Number of Hopping frequencies used

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands shall use at least 75 hopping frequencies.

(6) Hopping Channel Bandwidth

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands, the maximum 20 dB bandwidth of the hopping channel is 1MHz.

(7) Dwell Time of each frequency within a 30-second period

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 30-second period.

(8) Output Power Requirement

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(9) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

2.3 Restricted Bands of Operation

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

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

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

2.4 Labeling Requirement

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

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

2.5 User Information

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

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation.

All measurement were intentional to maximum the emissions from EUT by varying the connection cables, therefore, the test result is sure to meet the applicable requirement.

3.2 Devices for Tested System

Device	Manufacture	Model / FCC ID.	Description
Bluetooth Headset*	J Communications Co., Ltd	BH-1000 OAJBH-1000	----

Remark "*" means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).
For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

4.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 5 and 6 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 to 360 with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

Note : A band pass filter was used to avoid pre-amplifier saturated when measure TX operation mode in frequency band above 1 GHz.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

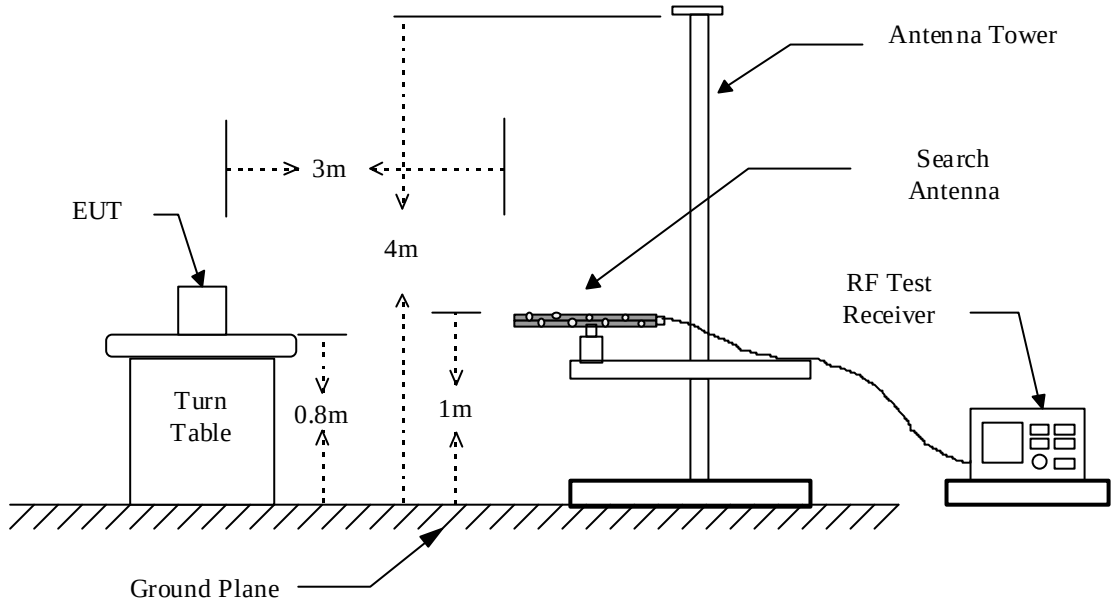
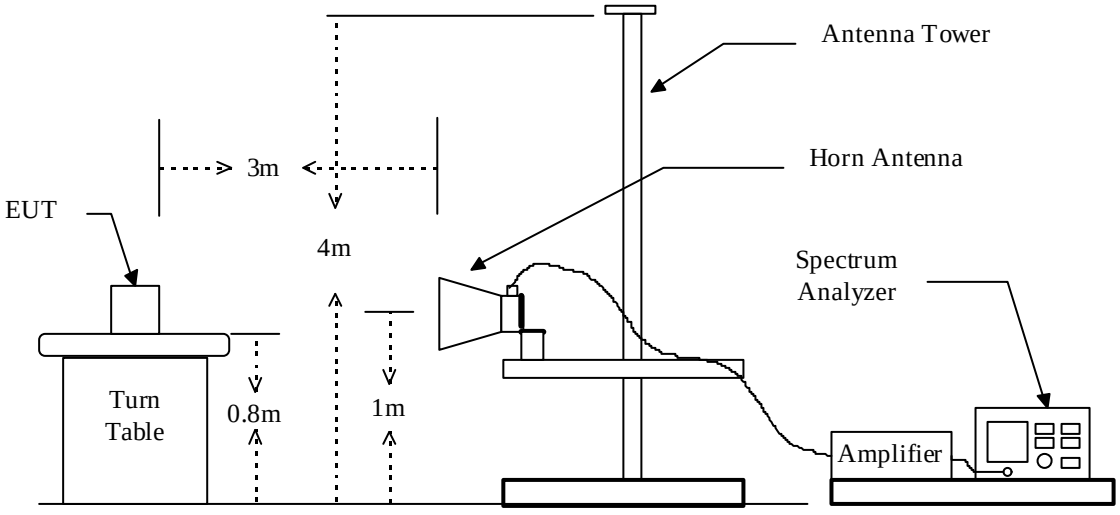


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8568B	01/10/2003
Pre-selector	Hewlett-Packard	85685A	01/10/2003
Quasi Peak Detector	Hewlett-Packard	85650A	01/10/2003
RF Test Receiver	Rohde & Schwarz	ESVS 30	08/05/2003
Log periodic Antenna	EMCO	3146	11/04/2003
Biconical Antenna	EMCO	3110B	11/04/2003
Horn Antenna	EMCO	3115	05/09/2003
Preamplifier	Hewlett-Packard	8447D	10/14/2003
Preamplifier	Hewlett-Packard	8449B	05/10/2003
Spectrum Analyzer	Hewlett-Packard	8564E	04/16/2003

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

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	300Hz

4.4 Radiated Emission Data

4.4.1 RF Portion

A.

Operation Mode : TX
Fundamental Frequency : 2402 MHz
Test Date : Oct. 11, 2002 Temperature: 23 ℃ Humidity : 62 %

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
*2400.558	---	---	---	---	-3.1	---	---	74.0	54.0	---	---	---
*4801.116	---	---	---	---	2.5	---	---	74.0	54.0	---	---	---
*7201.674	---	---	---	---	5.7	---	---	74.0	54.0	---	---	---
*9602.232	---	---	---	---	7.2	---	---	74.0	54.0	---	---	---
*12002.790	---	---	---	---	9.2	---	---	74.0	54.0	---	---	---
4803.884	48.4	33.8	48.5	33.1	2.5	51.0	36.3	74.0	54.0	-17.7	0	1.3
7205.826	---	---	---	---	5.7	---	---	74.0	54.0	---	---	---
9607.768	---	---	---	---	7.2	---	---	74.0	54.0	---	---	---
12009.710	---	---	---	---	9.2	---	---	74.0	54.0	---	---	---
14411.652	---	---	---	---	11.5	---	---	74.0	54.0	---	---	---

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emission level is too low to be measured, with a preamplifier of 35 dB.
3. Measuring data showed on above table was derived with peak detector function.
4. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.
5. The expanded uncertainty of the radiated emission tests is 3.53 dB.

B.

Operation Mode : TX
Fundamental Frequency : 2441 MHz
Test Date : Oct. 11, 2002 Temperature: 23 ℃ Humidity : 62 %

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
*2439.500	---	---	---	---	-2.9	---	---	74.0	54.0	---	---	---
*4879.000	---	---	---	---	2.7	---	---	74.0	54.0	---	---	---
*7318.500	---	---	---	---	5.9	---	---	74.0	54.0	---	---	---
*9758.000	---	---	---	---	7.3	---	---	74.0	54.0	---	---	---
*12197.500	---	---	---	---	9.3	---	---	74.0	54.0	---	---	---
4881.766	50.8	33.3	50.4	33.8	2.7	53.5	36.5	74.0	54.0	-17.5	90	1.3
7322.649	---	---	---	---	5.9	---	---	74.0	54.0	---	---	---
9763.532	---	---	---	---	7.3	---	---	74.0	54.0	---	---	---
12204.415	---	---	---	---	9.3	---	---	74.0	54.0	---	---	---
14645.298	---	---	---	---	11.6	---	---	74.0	54.0	---	---	---

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emission level is too low to be measured, with a preamplifier of 35 dB.
3. Measuring data showed on above table was derived with peak detector function.
4. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.
5. The expanded uncertainty of the radiated emission tests is 3.53 dB.

C.

Operation Mode : TX

Fundamental Frequency : 2480 MHz

Test Date : Oct. 11, 2002 Temperature: 23 ℃ Humidity : 62 %

Frequency	Reading (dBuV)				Factor	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin	Table Deg.	Ant. High
	H		V		(dB)	Peak	Ave	Peak	Ave.	(dB)	(Deg.)	
(MHz)	Peak	Ave	Peak	Ave	Corr.							(m)
2478.475	---	---	---	---	-2.8	---	---	74.0	54.0	---	---	---
4956.950	---	---	---	---	2.8	---	---	74.0	54.0	---	---	---
7435.425	---	---	---	---	6.1	---	---	74.0	54.0	---	---	---
9913.899	---	---	---	---	7.4	---	---	74.0	54.0	---	---	---
12392.374	---	---	---	---	9.4	---	---	74.0	54.0	---	---	---
4959.634	47.9	33.8	47.0	32.5	2.8	50.7	36.6	74.0	54.0	-17.4	0	1.4
7439.451	---	---	---	---	6.1	---	---	74.0	54.0	---	---	---
9919.268	---	---	---	---	7.4	---	---	74.0	54.0	---	---	---
12399.085	---	---	---	---	9.4	---	---	74.0	54.0	---	---	---
14878.902	---	---	---	---	11.5	---	---	74.0	54.0	---	---	---

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emission level is too low to be measured, with a preamplifier of 35 dB.
3. Measuring data showed on above table was derived with peak detector function.
4. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.
5. The expanded uncertainty of the radiated emission tests is 3.53 dB.

4.4.2 Other Emission

a) Emission frequencies below 1 GHz

Test Date : Oct. 11, 2002 Temperature: 23℃ Humidity : 62 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
30.000	H/V	---	-9.8	---	40.0	---	---	---
50.000	H/V	---	-14.1	---	40.0	---	---	---
256.014	H	34.1	-3.9	30.2	46.0	-15.8	0	2.0
287.955	H	39.4	-2.1	37.3	46.0	-8.7	90	2.0
319.958	H	44.8	-6.8	38.0	46.0	-8.0	0	2.0
500.000	H/V	---	-4.4	---	46.0	---	---	---
800.000	H/V	---	0.7	---	46.0	---	---	---

Note :

1. Remark "---" means that the emissions level is too low to be measured.

2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 5 GHz were too low to be measured with a pre-amplifier of 35 dB.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

where Corrected Factor

= Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

4.6 Photos of Radiation Measuring Setup

Please See Exhibit F_ Test Setup Photos

5 CONDUCTED EMISSION MEASUREMENT

5.1 Description

This EUT is excused from investigation of conducted emission, for it is powered by DC 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.

6 ANTENNA REQUIREMENT

6.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.2 Antenna Construction

The antenna is integrated on the Main PCB, no consideration of replacement.

7 HOPPING CHANNEL SEPARATION

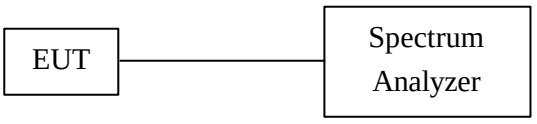
7.1 Standard Applicable

According to 15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.2 Measurement Procedure

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 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Figure 4 : Emission bandwidth measurement configuration.



7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Plotter	Hewlett-Packard	7440A	N/A

7.4 Measurement Data

Test Date : Nov. 11, 2002 Temperature: 27 ℃ Humidity: 70 %

1) CH 00: Adjacent Hopping Channel Separation is 997kHz
2) CH 39: Adjacent Hopping Channel Separation is 997kHz
3) CH 78: Adjacent Hopping Channel Separation is 997kHz

Note : 1. Please see appendix 1 for Plotted Data

2. The expanded uncertainty of the hopping channel separation tests is 2dB.

8 NUMBER OF HOPPING FREQUENCY USED

8.1 Standard Applicable

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands shall use at least 75 hopping frequencies.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hoppping mode. Record all the siganls from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Attenuator	Weinschel Engineering	1	N/A

8.4 Measurement Data

Test Date : Nov. 03, 2002 Temperature: 27 ℃ Humidity: 70 %

There are 79 hopping frequencies in a hopping sequence.

Note : 1. Please see appendix 2 for Plotted Data

2. The expanded uncertainty of umber of hopping frequency used tests is 2dB.

9 CHANNEL BANDWIDTH

9.1 Standard Applicable

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands, the maximum 20dB bandwidth of the hopping channel is 1MHz.

9.2 Measurement Procedure

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 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then 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. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Attenuator	Weinschel Engineering	1	N/A

9.4 Measurement Data

Test Date : Nov. 04, 2002 Temperature: 27 ℃ Humidity: 70 %

1) CH 00: Channel Bandwidth is 892 kHz
2) CH 39: Channel Bandwidth is 892 kHz
3) CH 78: Channel Bandwidth is 892 kHz

Note : 1. Please see appendix 3 for Plotted Data

2. The expanded uncertainty ofchannel bandwidth tests is 2dB.

10 DWELL TIME ON EACH CHANNEL

10.1 Standard Applicable

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 30-second period.

10.2 Measurement Procedure

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 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

10.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Attenuator	Weinschel Engineering	1	N/A

10.4 Measurement Data

Test Date : Nov. 03, 2002 Temperature: 27 ℃ Humidity: 70 %

1) CH 00: the dwell time is 103×3×667ì s = 0.206sec
2) CH 39: the dwell time is 103×3×667ì s = 0.206sec
3) CH 78: the dwell time is 103×3×667ì s = 0.206sec

The maximum time of occupancy for a particular channel is 249.9 msec in any 30 second period, which is less than the 400 msec allowed by the rules; therefore, it meets the requirements of this section.

Note : 1. Please see appendix 4 for Plotted Data

2. The expanded uncertainty of dwell time on each channel tests is 2dB.

11 OUTPUT POWER MEASUREMENT

11.1 Standard Applicable

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Measurement Procedure

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 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
4. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
5. Repeat above procedures until all frequencies measured were complete.

11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Attenuator	Weinschel Engineering	1	N/A

11.4 Measurement Data

Test Date : Nov. 17, 2002 Temperature: 27 ℃ Humidity: 70 %

1) CH 00: Output Peak Power is 2.67 dBm = **1.85** mW
2) CH 39: Output Peak Power is 3.67 dBm = **2.33** mW
3) CH 78: Output Peak Power is 2.00 dBm = **1.58** mW

Note : 1. Please see appendix 5 for Plotted Data

2. The expanded uncertainty of output power measurement tests is 2dB.

12 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

12.1 Standard Applicable

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

12.2 Measurement Procedure

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 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

12.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564E	04/14/2003
Plotter	Hewlett-Packard	7440A	N/A

12.4 Measurement Data

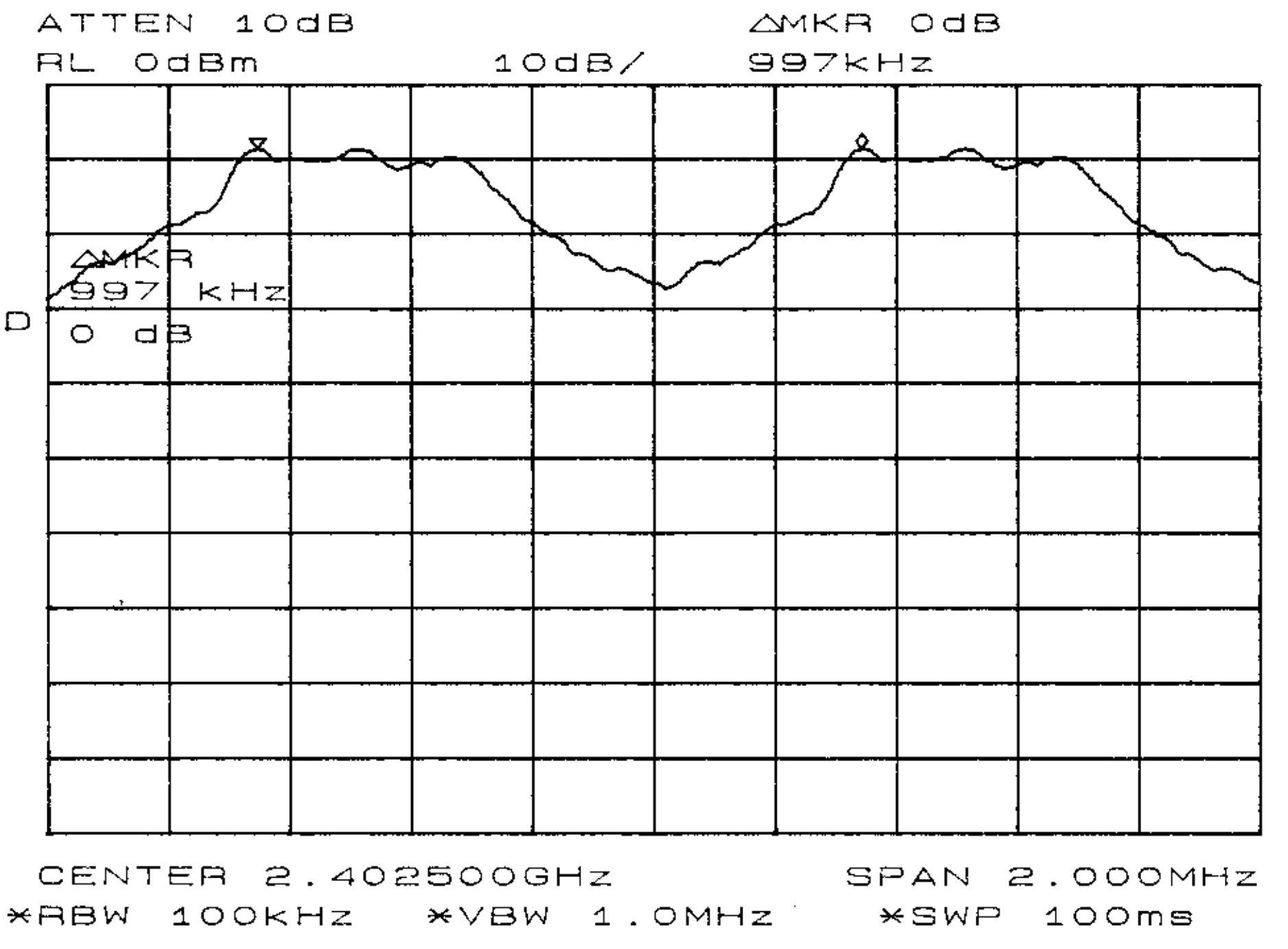
Test Date : Nov. 03, 2002 Temperature : 27 ℃ Humidity: 70 %

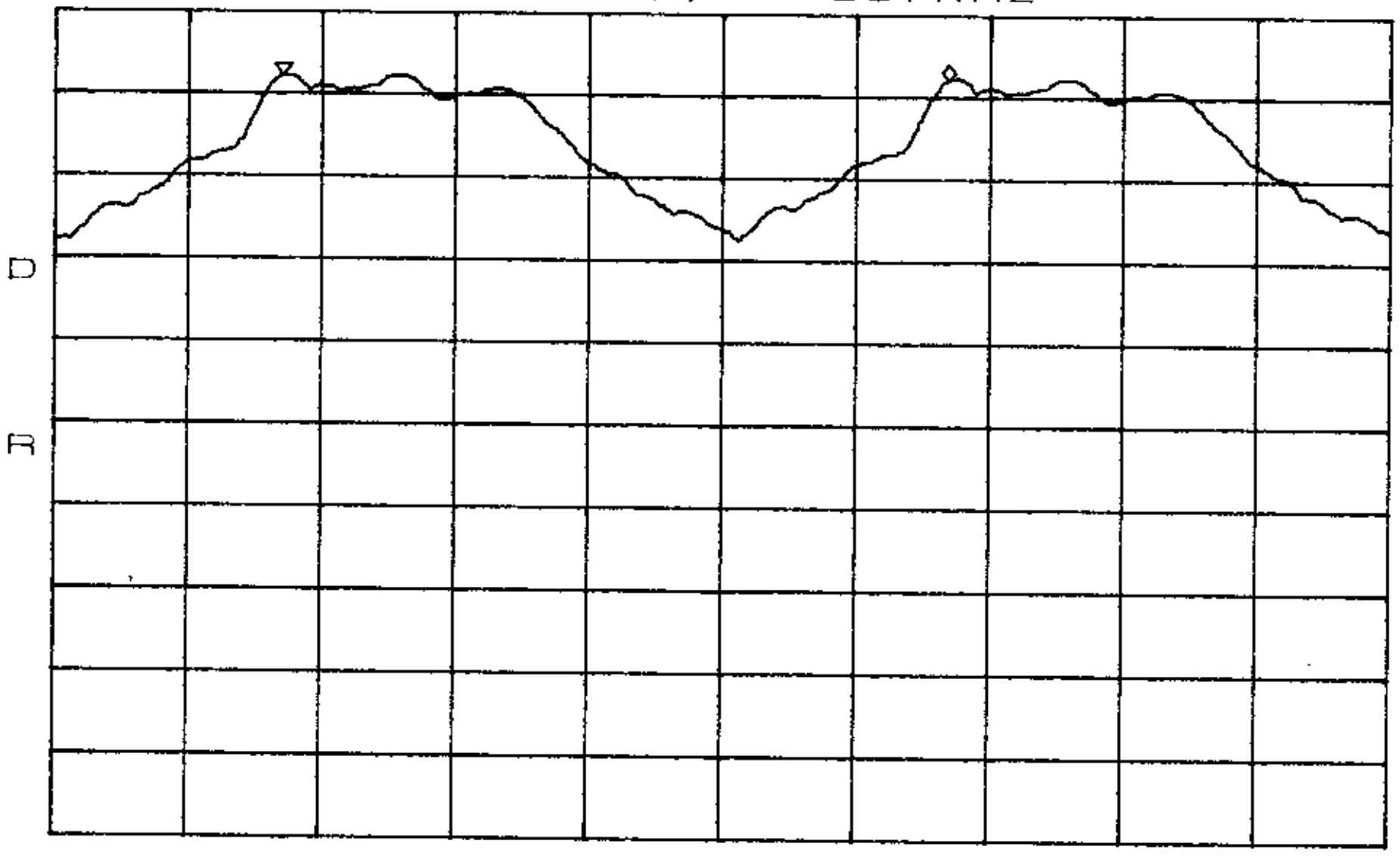
a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

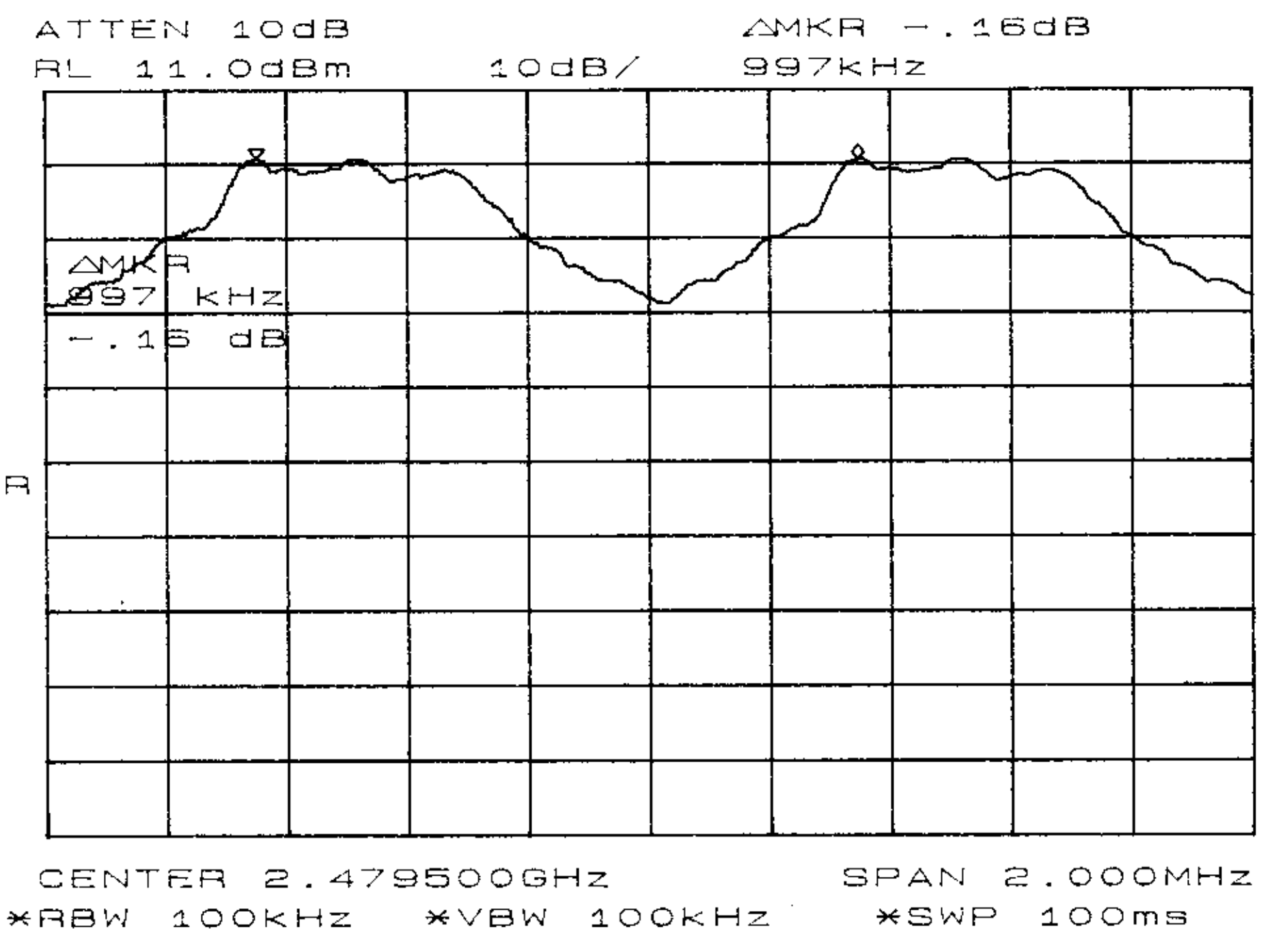
Note : 1. Please see appendix 6 for Plotted Data

2. The expanded uncertainty of the 100 KHz bandwidth of band edges tests is 1000Hz.

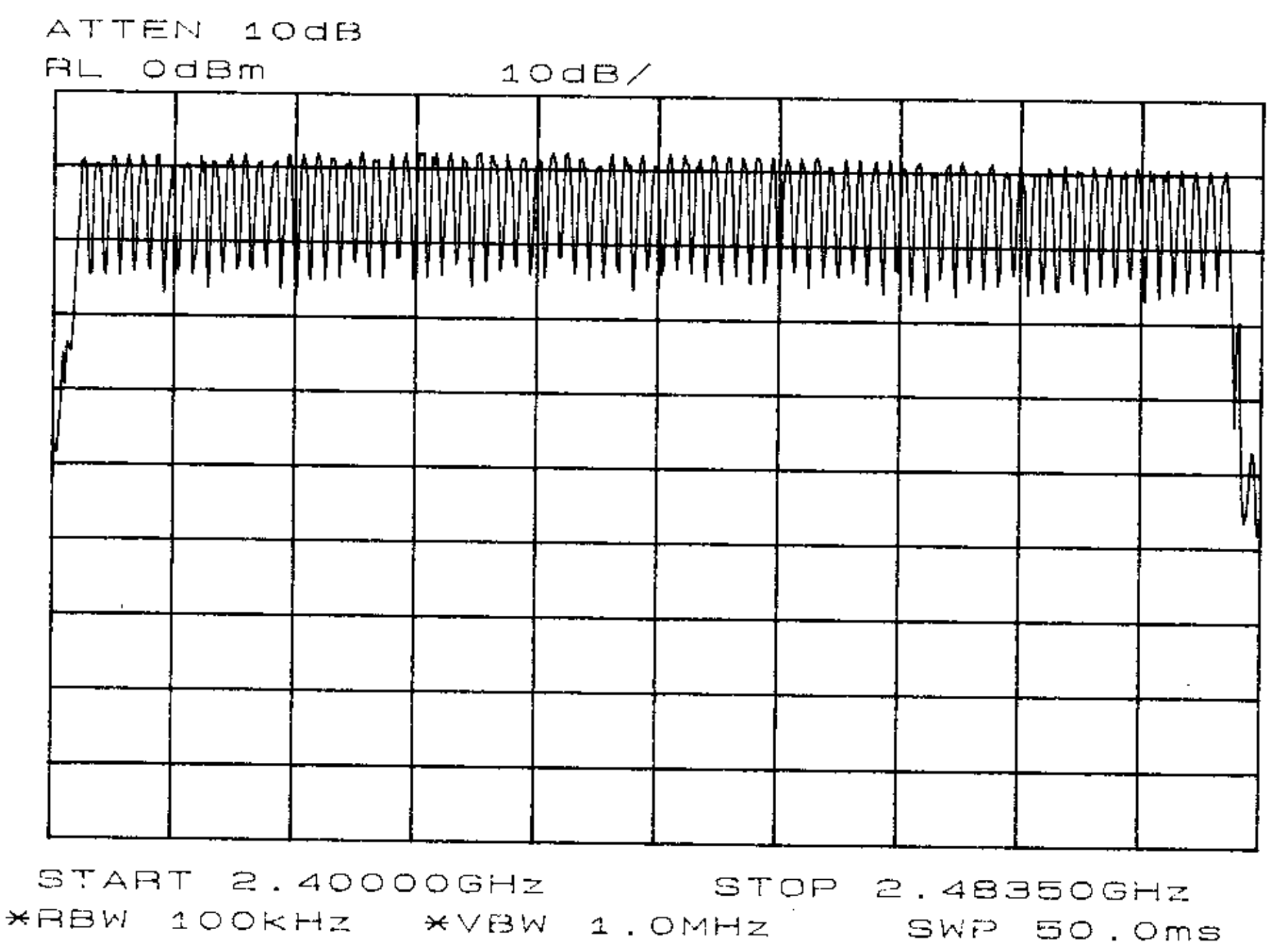
Appendix 1 : Plotted Data for Separation of Adjacent Channel


ATTEN 10dB
ΔMKR 0dB
RL 0dBm
10dB/
997kHz
ΔMKR
997 kHz
0 dB
D
CENTER 2.402500GHz
SPAN 2.000MHz
*RBW 100kHz
*VBW 1.0MHz
*SWP 100ms

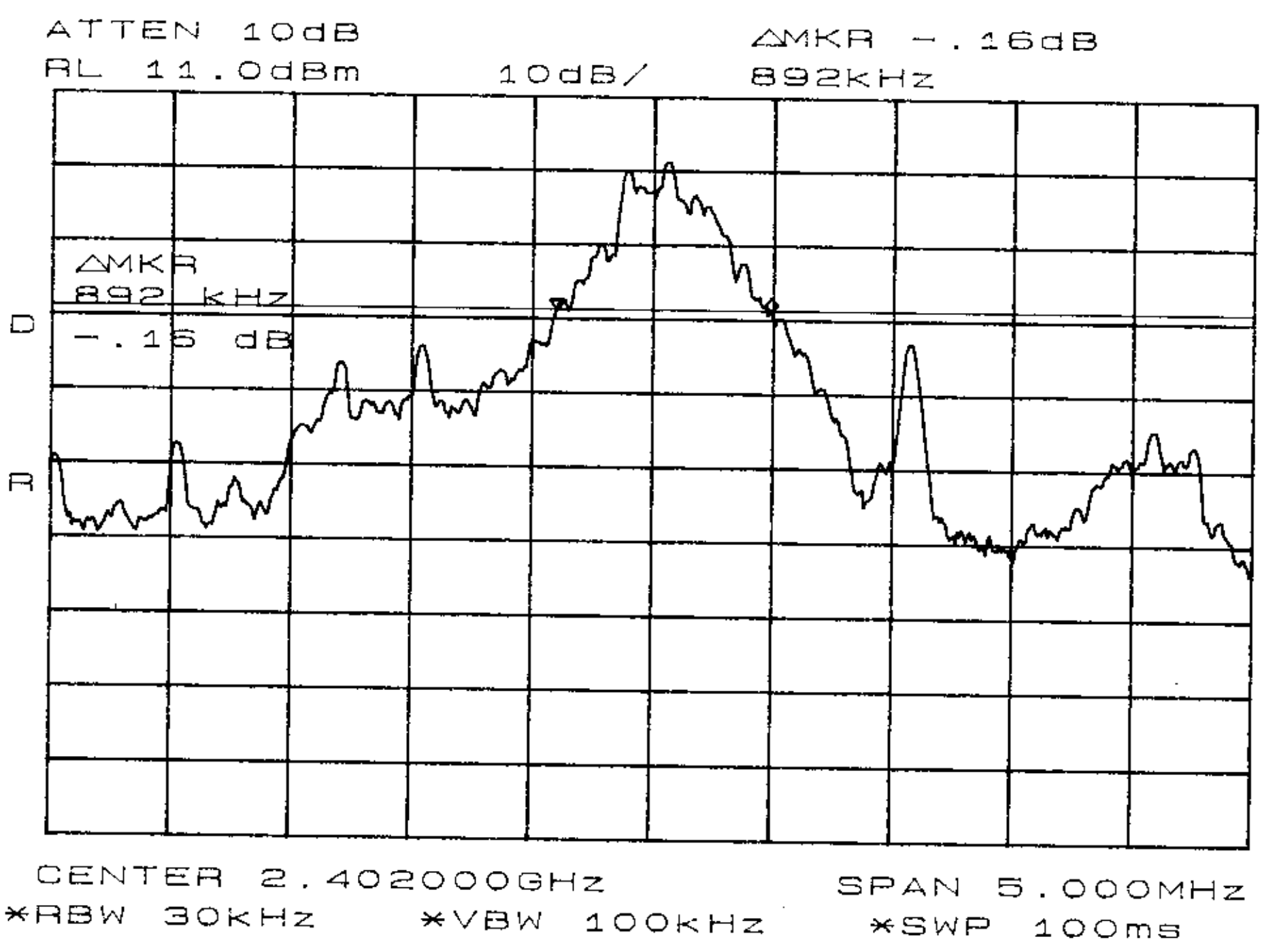

ATTEN 10dB
RL 11.0dBm
10dB/
ΔMKR -.16dB
997kHz
D
R
CENTER 2.441500GHz
SPAN 2.000MHz
*RBW 100kHz
*VBW 100kHz
*SWP 100ms

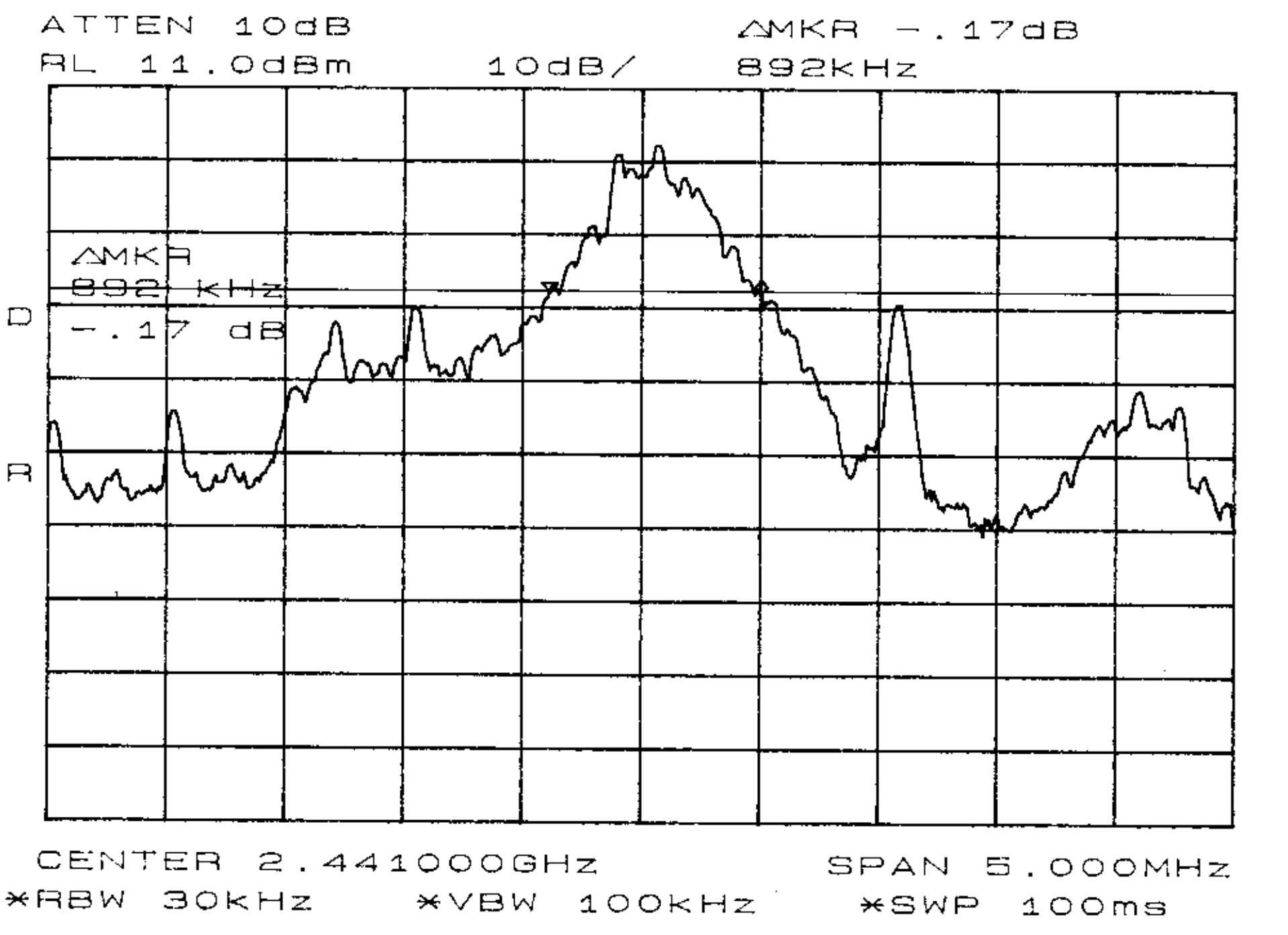

ATTEN 10dB
ΔMKR -.16dB
RL 11.0dBm
10dB/
997kHz
ΔMKR
997 kHz
-.16 dB
A
CENTER 2.479500GHz
SPAN 2.000MHz
*RBW 100kHz
*VBW 100kHz
*SWP 100ms

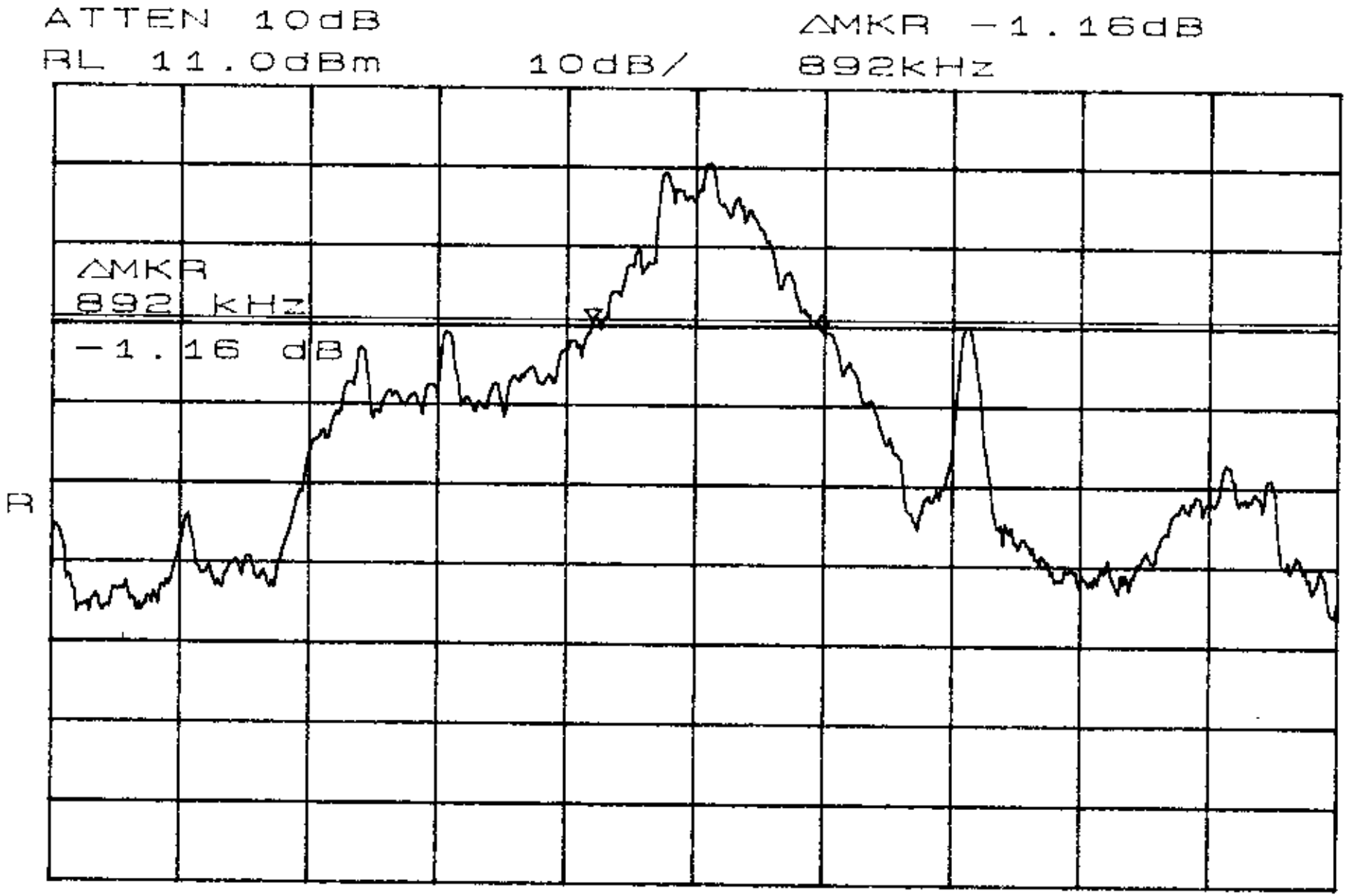
Appendix 2 : Plotted Data for Total Used Hopping Frequencies


ATTEN 10dB
RL 0dBm
10dB/
START 2.40000GHz
STOP 2.48350GHz
*RBW 100KHz
*VBW 1.0MHz
SWP 50.0ms

Appendix 3 : Plotted Data for Channel Bandwidth


ATTEN 10dB
RL 11.0dBm
10dB/
ΔMKR -.16dB
892kHz
ΔMKR
892 kHz
-.16 dB
D
R
CENTER 2.402000GHz
SPAN 5.000MHz
*RBW 30kHz
*VBW 100kHz
*SWP 100ms

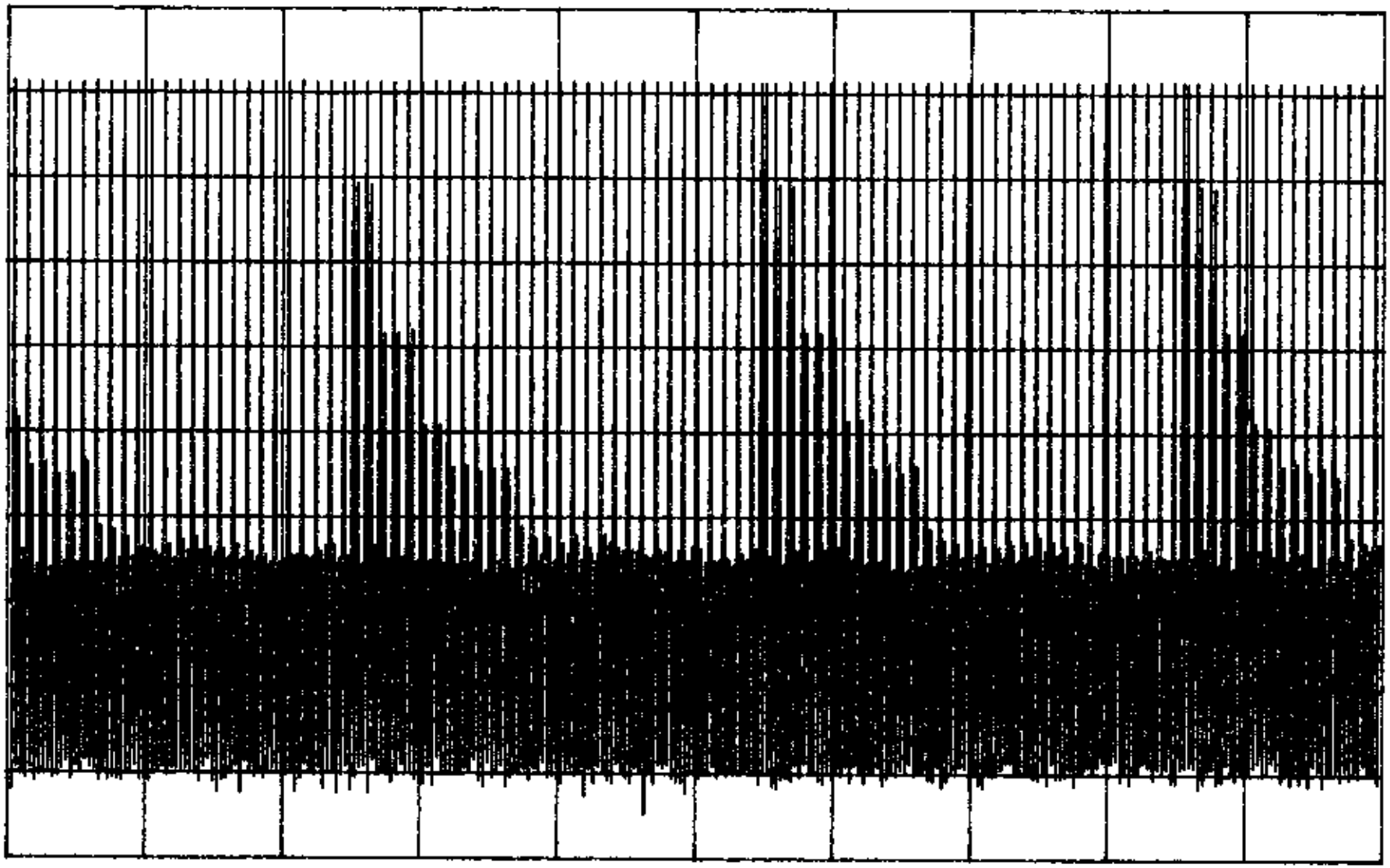

ATTEN 10dB
ΔMKR -.17dB
RL 11.0dBm
10dB/
892kHz
ΔMKR
892 kHz
-.17 dB
D
R
CENTER 2.441000GHz
SPAN 5.000MHz
*RBW 30kHz
*VBW 100kHz
*SWP 100ms


ATTEN 10dB
RL 11.0dBm
10dB/
ΔMKR −1.16dB
892kHz
ΔMKR
892 kHz
−1.16 dB
R
CENTER 2.480000GHz
SPAN 5.000MHz
*RBW 30KHz
*VBW 100KHz
*SWP 100ms

Appendix 4 : Plotted Data for Channel Dwell Time

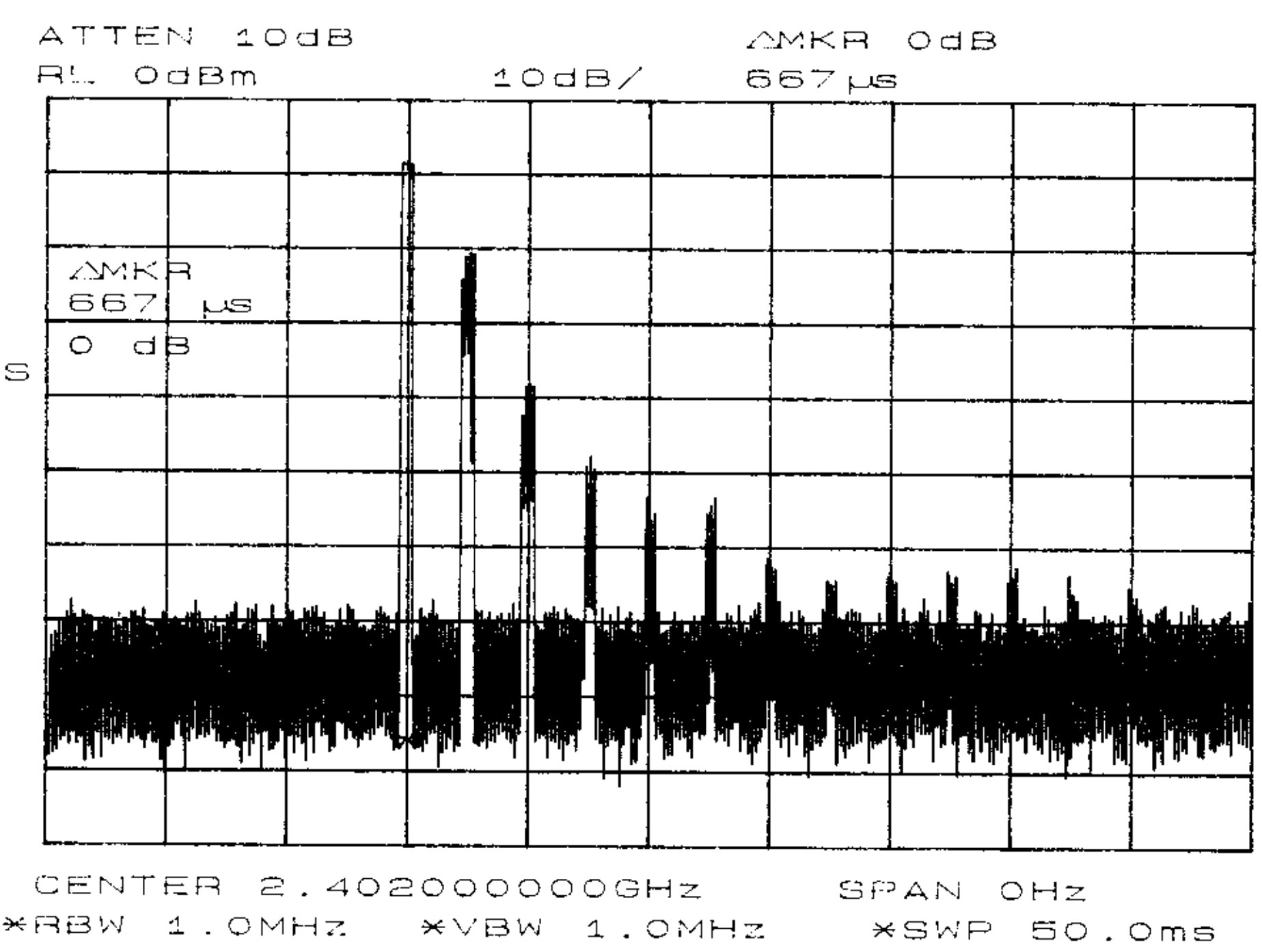
ATTEN 10dB

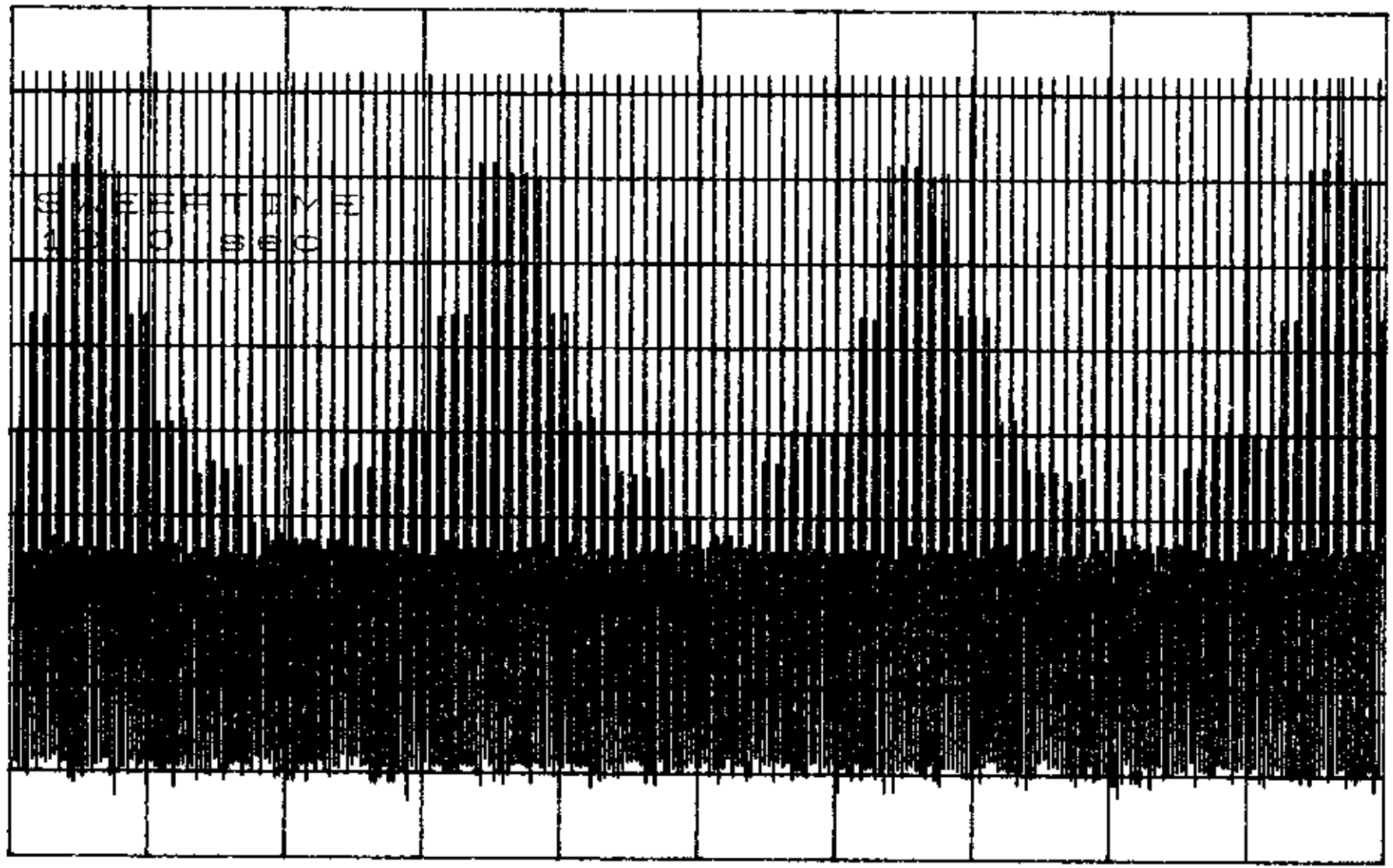
RL 0dBm 10dB/

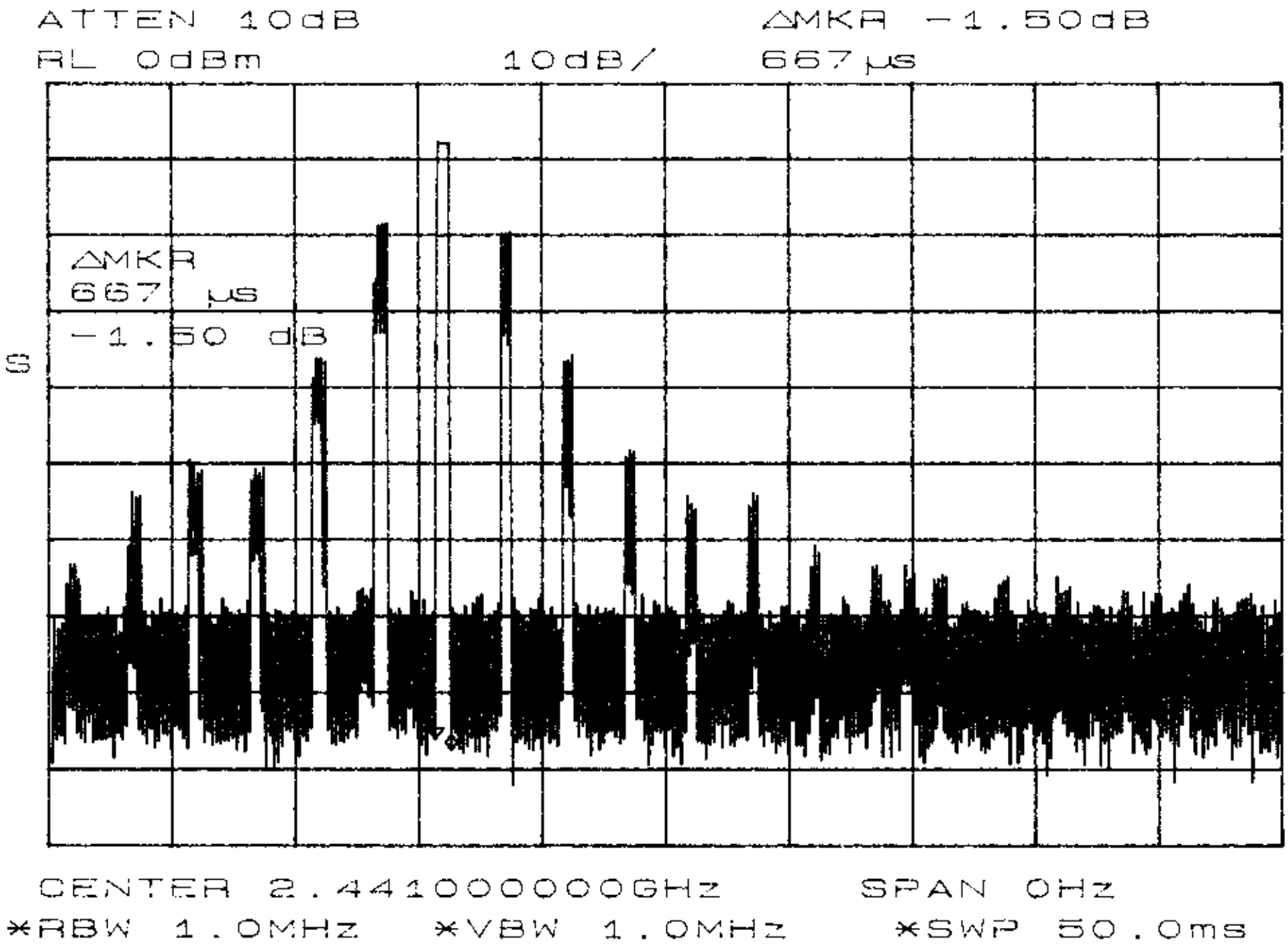


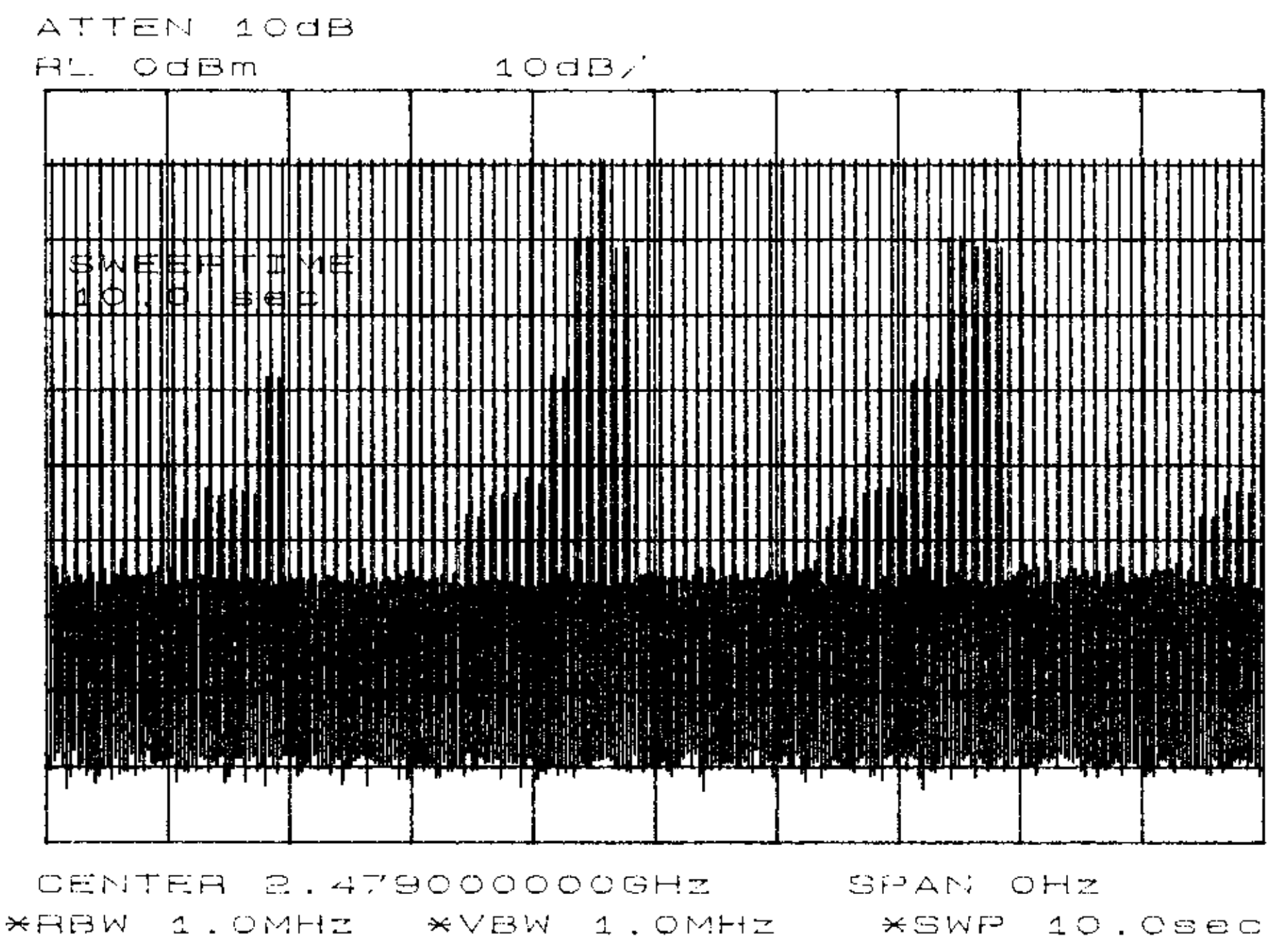
CENTER 2.402000000GHz SPAN 0Hz

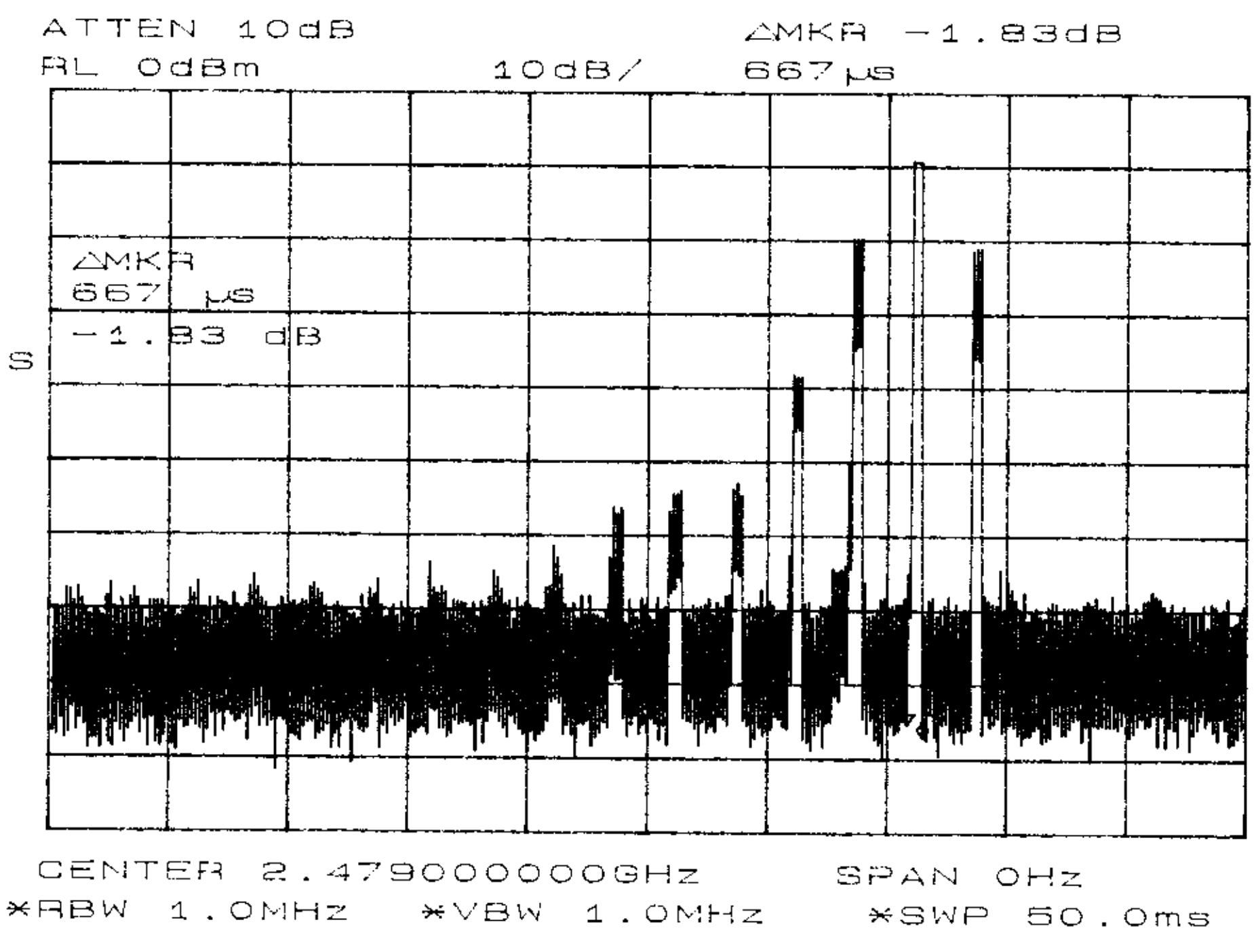
*RBW 1.0MHz *VBW 1.0MHz *SWP 10.0sec


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR 0dB
667µs
ΔMKR
667 µs
0 dB
S
CENTER 2.402000000GHz
SPAN 0Hz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 50.0ms

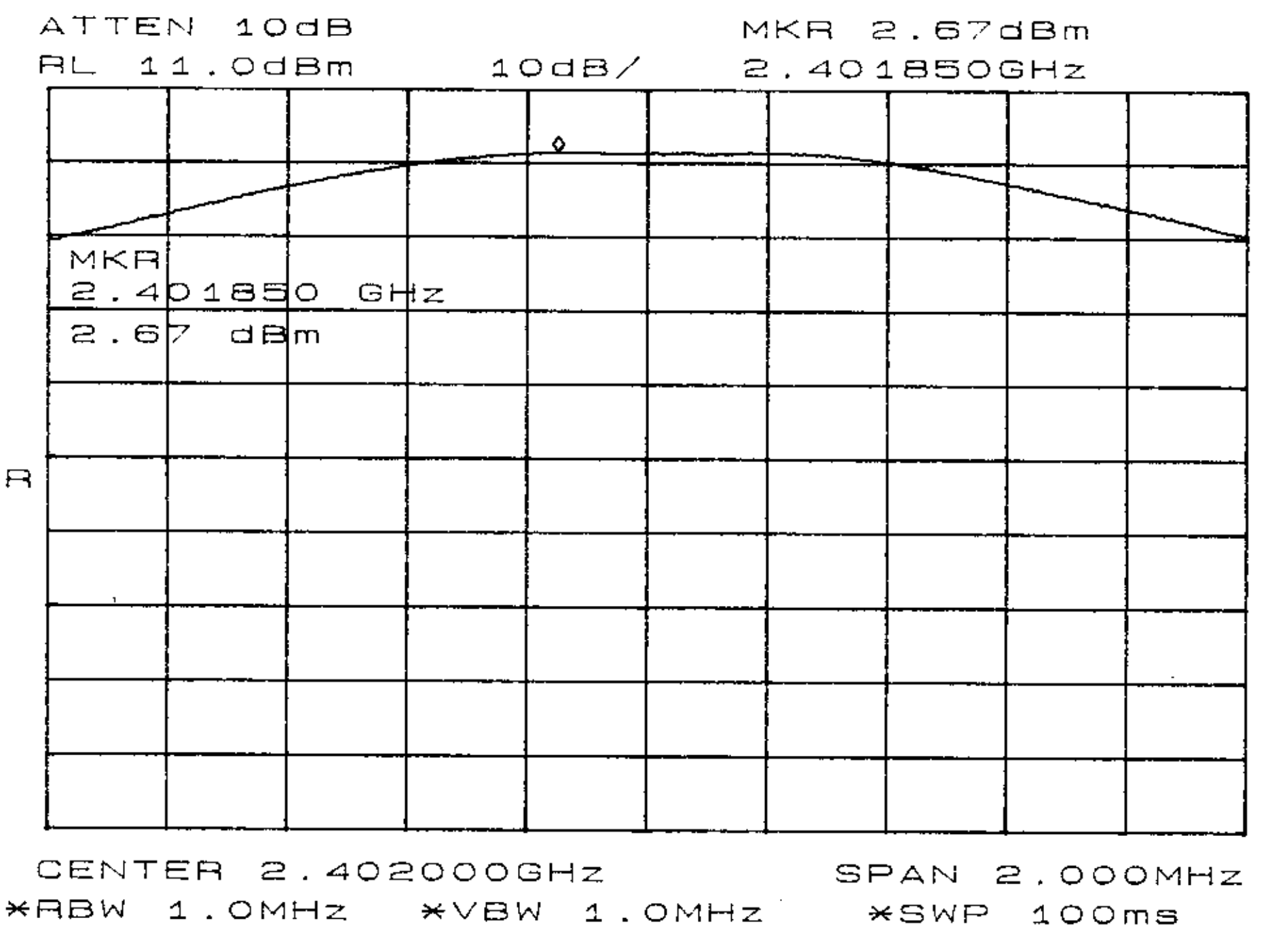

ATTEN 10dB
RL 0dBm
10dB/
CENTER 2.441000000GHz
SPAN 0Hz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 10.0sec

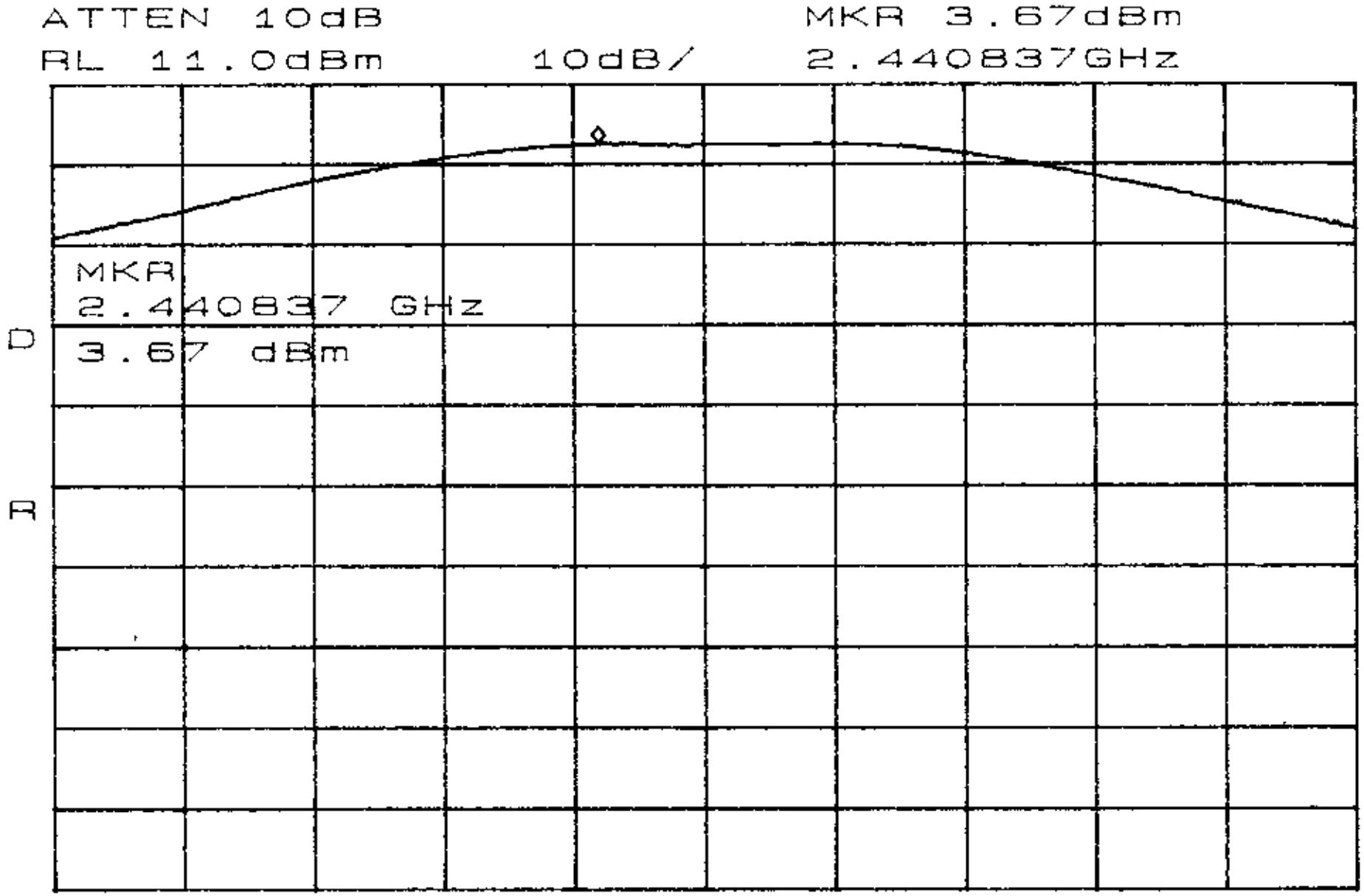

ATTEN 10dB
ΔMKR −1.50dB
RL 0dBm
10dB/
667µs
ΔMKR
667 µs
−1.50 dB
S
CENTER 2.441000000GHz
SPAN 0Hz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 50.0ms

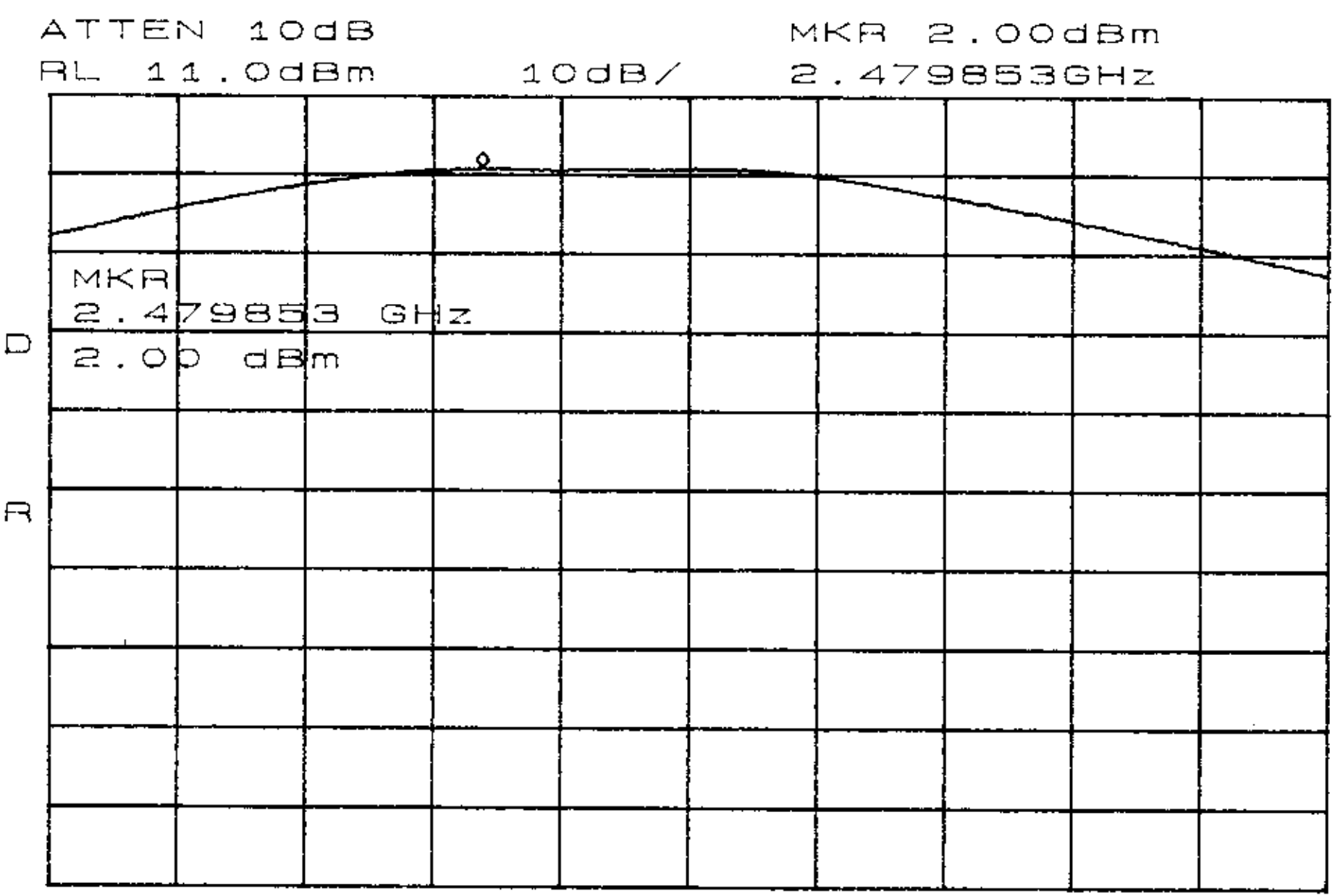

ATTEN 10dB
RL 0dBm
10dB/
SWEEP TIME
10.0 sec
CENTER 2.479000000GHz
SPAN 0Hz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 10.0sec


ATTEN 10dB
ΔMKR −1.83dB
RL 0dBm
10dB/
667µs
ΔMKR
667 µs
−1.83 dB
S
CENTER 2.479000000GHz
SPAN 0Hz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 50.0ms

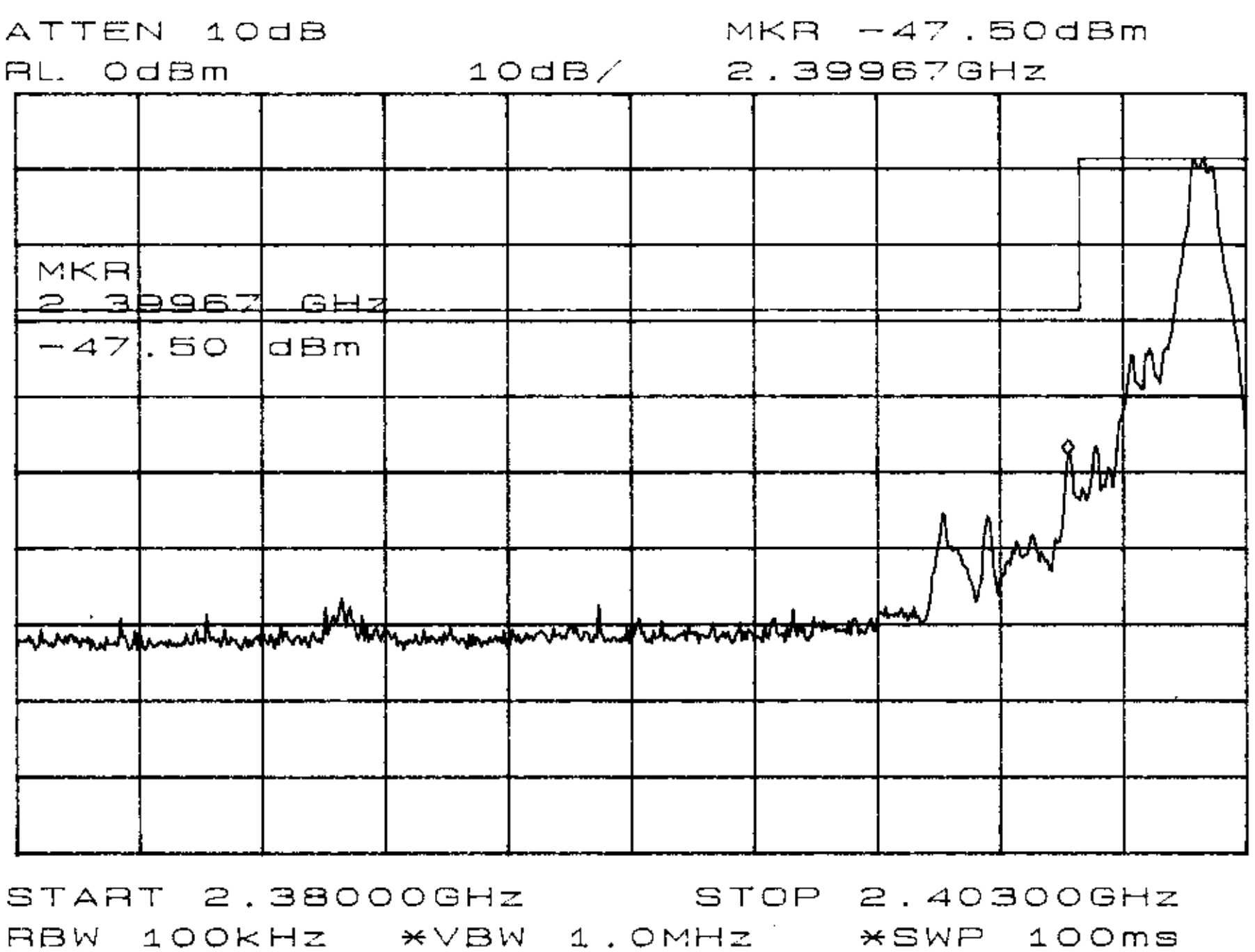
Appendix 5 : Plotted Data for Output Peak Power

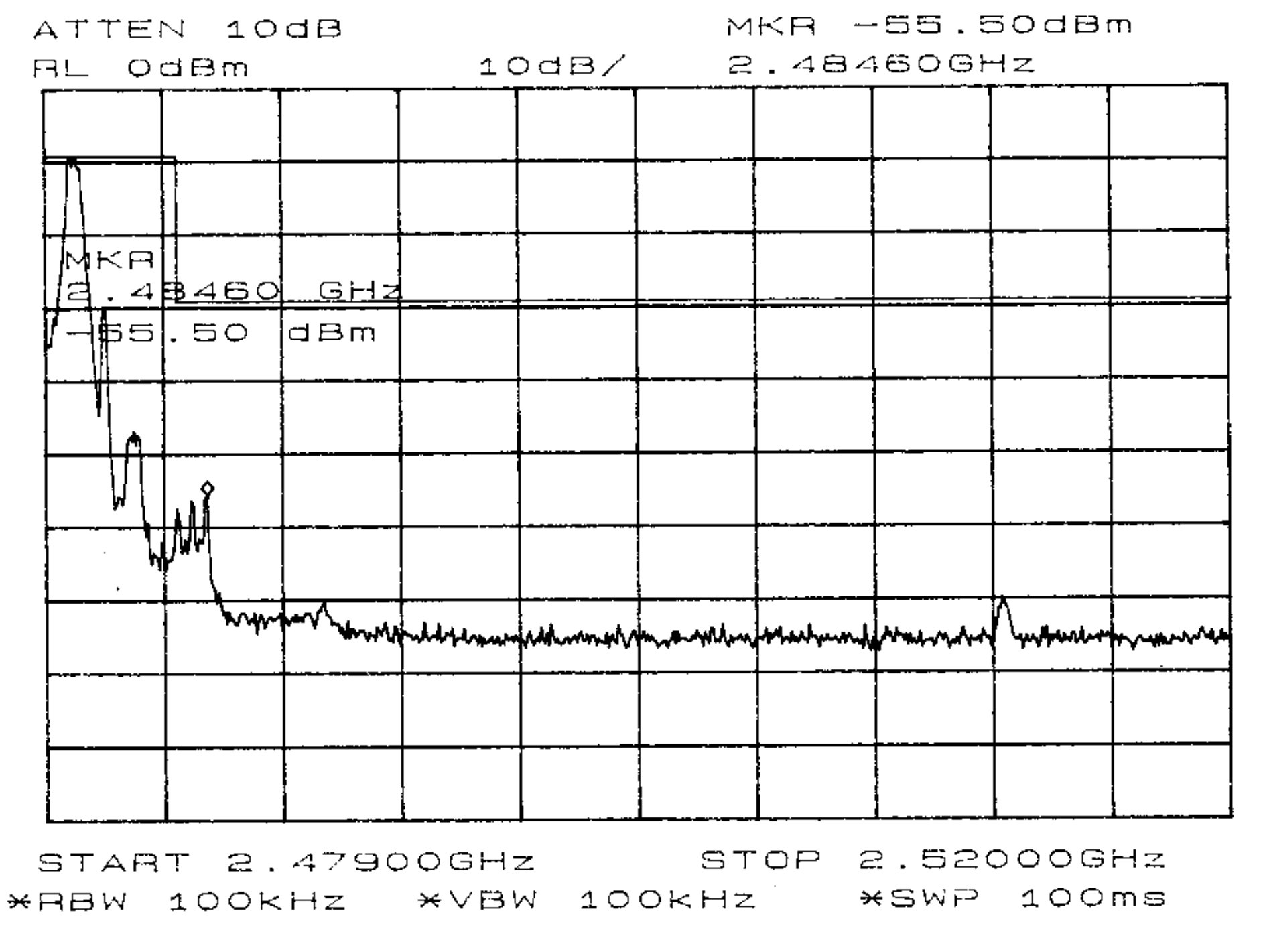

ATTEN 10dB
MKR 2.67dBm
RL 11.0dBm
10dB/
2.401850GHz
MKR
2.401850 GHz
2.67 dBm
R
CENTER 2.402000GHz
SPAN 2.000MHz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 100ms


ATTEN 10dB
MKR 3.67dBm
RL 11.0dBm
10dB/
2.440837GHz
MKR
2.440837 GHz
3.67 dBm
D
R
CENTER 2.441000GHz
SPAN 2.000MHz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 100ms


ATTEN 10dB
MKR 2.00dBm
RL 11.0dBm
10dB/
2.479853GHz
MKR
2.479853 GHz
2.00 dBm
D
R
CENTER 2.480177GHz
SPAN 2.000MHz
*RBW 1.0MHz
*VBW 1.0MHz
*SWP 100ms

Appendix 6 : Plotted Data for 100 kHz Bandwidth from Band Edge


ATTEN 10dB
MKR -47.50dBm
RL 0dBm
10dB/
2.39967GHz
MKR
2.39967 GHz
-47.50 dBm
START 2.38000GHz
STOP 2.40300GHz
*RBW 100kHz
*VBW 1.0MHz
*SWP 100ms


ATTEN 10dB
MKR -55.50dBm
RL 0dBm
10dB/
2.484600GHz
MKR
2.483460 GHz
-55.50 dBm
START 2.479000GHz
STOP 2.520000GHz
*RBW 100KHz
*VBW 100KHz
*SWP 100ms