WASHINGTON LABORATORIES, LTD.

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FCC CERTIFICATION REPORT

prepared for

EMR Corporation

22402 North 19th Avenue
Phoenix, AZ 85027

FCC ID: M7G-UHF 450-70

November 5, 1998

WLL PROJECT #: 4717X

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STATEMENT OF QUALIFICATIONS

for

Chad M. Beattie

Washington Laboratories, Ltd.

I have seven years of electronics experience with an Associates in Electronic Systems Technology. The last year being directly involved in EMI testing. I am qualified to perform EMC testing to the methods described in this test report. The measurements taken within this report are accurate within my ability to perform the tests and within the tolerance of the measuring instrumentation.

By: 

Chad M. Beattie
Compliance Engineer

Date: November 5, 1998

-- EMR Corp. --

MANUFACTURING QUALITY R.F. FILTERING AND AMPLIFICATION PRODUCTS

Chief, Authorizations Branch
Federal Communications Commission
7435 Oakland Mills Road
Columbia, MD 21046

RE: LETTER OF AGENCY

This letter is to serve notice that Washington Laboratories, Ltd. is hereby authorized to act on our behalf in connection with the Application for Equipment Authorization attached herewith.

We certify that we are not subject to denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, U.S.C. 862. Further, no party, as defined in 47 CFR 1.2002(b), to the application is subject to denial of federal benefits, that includes FCC benefits.

Signed,

William F. Liske

President
EMR Corporation

22402 N. 19th Avenue - Phoenix, Arizona 85027-9990 - TEL: 602-581-2875 - 800-796-2875 - FAX (602) 582-9499
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FCC CERTIFICATION REPORT

For

EMR Corporation

1.0 Introduction

This report has been prepared on behalf of EMR Corporation in support of their application for FCC Certification under Part 90 of the FCC Rules and Regulations.

The Equipment Under Test was a 19" Rack Mounted UHF Power Amplifier (Model UHF 450-70).

All measurements were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code 200066-0) as an independent FCC test laboratory.

Measurements were made on the Equipment Under Test in accordance with FCC Rule Part 2, specifically the requirements stipulated in:

2.985 RF Power Output
2.987 Modulation Characteristics
2.989 Occupied Bandwidth
2.991 Spurious Emissions at Antenna Terminals
2.993 Field Strength of Spurious Radiation
2.995 Frequency Stability

All results reported herein relate only to the item tested. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government. The measurement uncertainty of the data contained herein is ±2.3 dB. Refer to Appendix B for Statement of Measurement Uncertainty.

1.1 Summary

The UHF Amplifier complies with the technical requirements of Part 90 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The UHF Amplifier series is intended for use in commercial communication systems. Applications include land mobile repeaters, trunking, and data systems. The amplifier is a 70 watt power amplifier operating in the frequency range of 450-490 MHz. The amplifier is powered by an externally supplied 13.6 VDC power source. Testing was performed at the low (450 MHz), middle (470 MHz), and high (490 MHz) frequencies of operation for the amplifier.

3.0 Test Configuration

3.1 RF Output Power (FCC Rule Part 2.985)

The input of the UHF Amplifier was connected to the output of the Tait Electronics T2000II mobile radio (FCC ID: CAS 2000-6231). The RF input power from the T2000II transmitter was 4 Watts at 450 MHz and 4.3 Watts at 470 and 490 MHz. The output from the amplifier was connected to a 40 Watt attenuator and then to the input of an HP 8564E RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the 40 dB attenuator. The RF output power across a 50 ohm load termination was measured directly by the analyzer.

RESULTS: The measured RF output power at 450 MHz was 48.18 dBm, or 65.8 W.

RESULTS: The measured RF output power at 470 MHz was 48.7 dBm, or 74.1 W.

RESULTS: The measured RF output power at 490 MHz was 48.17 dBm, or 65.6 W.

3.2 Modulation Characteristics (FCC Rule Part 2.987)

The EUT does not contain any modulating limiting circuitry or low pass filtering since the unit provides only amplification of the RF signal supplied from a FCC approved device. The amplifier does not change the frequency deviation of the radio.

3.3 Occupied Bandwidth (FCC Rule Part 2.989)

The EUT does not contain any circuitry that will increase the bandwidth since the unit provides only amplification of the RF signal supplied from a FCC approved device. The amplifier does not change the bandwidth of the radio.

3.4 Spurious Emissions at Antenna Terminals (FCC Rule Part 2.991)

Spurious emissions were measured by connecting the antenna terminal of the amplifier to the input of an HP 8564E spectrum analyzer. The amplifier was supplied with a 2400 Hz modulated signal from a mobile radio (FCC ID: CAS 2000-6231). Per Section 90.210(d) of the FCC Rules, any emission shall be attenuated below the unmodulated carrier power by the following:

1) On any frequency from the center of the authorized bandwidth f_o to 5.625 kHz removed from f_o: 0 dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88$ kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5: At least 50 + 10log (P) dB or 70 dB whichever is the lesser attenuation.

For the EUT:

@ 450 MHz 50 + 10 Log 65.8 W = 68.2 dB

@ 470 MHz 50 + 10 Log 74.1 W = 68.7 dB

@ 490 MHz 50 + 10 Log 65.6 W = 68.2 dB

The emissions were checked up to the tenth harmonic of the carrier frequency (4.9 GHz) of the mobile radio; all emissions above 1 GHz were suppressed at least 73 dB below the unmodulated carrier level. Appendix A1, A2 and A3 show plots of the spurious emissions up to a frequency of 5 GHz.

RESULTS: All frequencies removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz are suppressed by at least $7.27(f_d - 2.88$ kHz) dB.

RESULTS: All frequencies removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz are suppressed by at least 50 + 10log (P) dB. The amplifier was tested at the high, low and middle of its operating frequency range.

LIMIT: 68.2 dB @ 450 MHz and 490 MHz operation
68.7 dB @ 470 MHz operation

Appendix A3, A4 and A5 are spurious emissions plots of the input signal supplied to the input of the amplifier via the FCC approved radio.

3.5 Radiated Emissions Testing (FCC Rule Part 2.993)

The amplifier was tested with a mobile radio (FCC ID: CAS 2000-6231), which programmable for the frequency of operation for the amplifier. The unit was tested with a 50 ohm load (the output impedance of the antenna port) attached to the antenna port.

The EUT was placed on an 80 cm high, 1 X 1.5 meters non-conductive motorized turntable for radiated testing on a 3 meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to peak. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth.

3.5.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limit, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Table 1. The AFc in dB/m is algebraically added to the Spectrum Analyzer Voltage in dBuV to obtain the Radiated Electric Field in dBuV/m. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Voltage: VdBuV

Composite Antenna Factor: AFcdB/m

Electric Field: EdBuV/m = VdBuV + AFcdB/m

To convert to linear units: EuV/m=antilog (EdBuV/m/20)

RESULTS: The EUT complies with the requirements. Data is recorded in Table 1.
LIMIT: 84.4 dBuV/m (16595.9 uV/m)

Table 1

FCC Part 90 3M Radiated Emissions Data - Site 2

CLIENT: EMR Corporation
FCC ID: M7G-UHF 450-70
DATE: 11 September 98
BY: Chad M. Beattie
JOB #: 4717X

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	Afc dB/m	E-Field dBuV/m	Limit dBuV/m	Margin dB
Channel 11 (450 MHz)								
900.00	V	135.0	1.5	24.0	32.2	56.2	84.4	-28.2
900.00	H	0.0	1.8	25.2	32.2	57.4	84.4	-27.0
1350.00	V	0.0	1.0	64.4	-14.2	50.2	84.4	-34.2
1350.00	H	270.0	1.0	58.7	-14.2	44.5	84.4	-39.9
1800.00	V	180.0	1.0	67.5	-9.0	58.5	84.4	-25.9
1800.00	H	135.0	1.0	63.6	-9.0	54.6	84.4	-29.8
2250.00	V	180.0	1.0	63.8	-6.8	57.0	84.4	-27.4
2250.00	H	180.0	1.0	47.5	-6.8	40.7	84.4	-43.7
2700.00	V	225.0	1.0	57.1	-6.9	50.2	84.4	-34.2
2700.00	H	225.0	1.0	56.7	-6.9	49.8	84.4	-34.6
3150.00	V	180.0	1.0	48.3	-6.8	41.5	84.4	-42.9
3150.00	H	180.0	1.0	46.0	-6.8	39.2	84.4	-45.2
3600.00	V	180.0	1.0	57.5	-5.8	51.7	84.4	-32.7
3600.00	H	225.0	1.0	54.8	-5.8	49.0	84.4	-35.4
4050.00	V	0.0	1.0	36.5	-5.1	31.4	84.4	-53.0
4050.00	H	180.0	1.0	36.1	-5.1	31.0	84.4	-53.4
4500.00	V	180.0	1.0	43.4	-4.1	39.3	84.4	-45.1
4500.00	H	180.0	1.0	42.0	-4.1	37.9	84.4	-46.5
Channel 12 (470 MHz)								
940.00	V	135.0	1.5	27.6	32.5	60.1	84.4	-24.3
940.00	H	0.0	2.0	26.7	32.5	59.2	84.4	-25.2
1410.00	V	0.0	1.0	61.0	-13.0	48.0	84.4	-36.4
1410.00	H	270.0	1.0	59.4	-13.0	46.4	84.4	-38.0
1880.00	V	180.0	1.0	64.7	-8.0	56.7	84.4	-27.7
1880.00	H	180.0	1.0	58.5	-8.0	50.5	84.4	-33.9
2350.00	V	180.0	1.0	61.0	-6.7	54.3	84.4	-30.1
2350.00	H	180.0	1.0	54.6	-6.7	47.9	84.4	-36.5
2820.00	V	180.0	1.0	57.3	-7.0	50.3	84.4	-34.1
2820.00	H	180.0	1.0	53.5	-7.0	46.5	84.4	-37.9
3290.00	V	135.0	1.0	46.5	-6.5	40.0	84.4	-44.4
3290.00	H	225.0	1.0	46.5	-6.5	40.0	84.4	-44.4
3760.00	V	180.0	1.0	52.0	-5.4	46.6	84.4	-37.8
3760.00	H	225.0	1.0	49.9	-5.4	44.5	84.4	-39.9
4230.00	V	225.0	1.0	35.4	-4.6	30.8	84.4	-53.6
4230.00	H	0.0	1.0	36.6	-4.6	32.0	84.4	-52.4

Table 1 (cont'd.)

FCC Part 90 Class B 3M Radiated Emissions Data - Site 2

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	Afc dB/m	E-Field dBuV/m	Limit dBuV/m	Margin dB
Channel 12 (470 MHz) cont'd.								
4700.00	V	180.0	1.0	39.6	-3.6	36.0	84.4	-48.4
4700.00	H	180.0	1.0	42.2	-3.6	38.6	84.4	-45.8
Channel 13 (490 MHz)								
980.00	V	0.0	1.5	28.0	32.7	60.7	84.4	-23.7
980.00	H	180.0	2.0	22.9	32.7	55.6	84.4	-28.8
1470.00	V	180.0	1.0	56.9	-12.5	44.4	84.4	-40.0
1470.00	H	270.0	1.0	56.5	-12.5	44.0	84.4	-40.4
1960.00	V	180.0	1.0	64.2	-7.0	57.2	84.4	-27.2
1960.00	H	180.0	1.0	56.6	-7.0	49.6	84.4	-34.8
2450.00	V	180.0	1.0	45.5	-6.7	38.8	84.4	-45.6
2450.00	H	180.0	1.0	35.0	-6.7	28.3	84.4	-56.1
2940.00	V	180.0	1.0	71.8	-7.1	64.7	84.4	-19.7
2940.00	H	225.0	1.0	67.8	-7.1	60.7	84.4	-23.7
3430.00	V	225.0	1.0	65.0	-6.1	58.9	84.4	-25.5
3430.00	H	180.0	1.0	67.3	-6.1	61.2	84.4	-23.2
3920.00	V	180.0	1.0	44.1	-5.3	38.8	84.4	-45.6
3920.00	H	270.0	1.0	43.8	-5.3	38.5	84.4	-45.9
4410.00	V	0.0	1.0	48.8	-4.2	44.6	84.4	-39.8
4410.00	H	0.0	1.0	47.0	-4.2	42.8	84.4	-41.6
4900.00	V	180.0	1.0	32.6	-3.1	29.5	84.4	-54.9
4900.00	H	180.0	1.0	41.2	-3.1	38.1	84.4	-46.3

3.6 Frequency Stability (FCC Rule Part 2.995)

The requirements of Section 2.995 call for the carrier frequency to be stable under different power supply voltages and over a wide temperature extreme. The amplifier was not tested for frequency stability as it's purpose is only to amplify the signal from the transmitter.

3.7 Transient Frequency Behavior (FCC Part 90.214)

The requirements of Section 90.214 call out transient frequency behavior for the carrier frequency. The amplifier was not tested for the transient frequency behavior since it's purpose is to amplify the signal from the transmitter module and not produce a carrier frequency.

Table 2

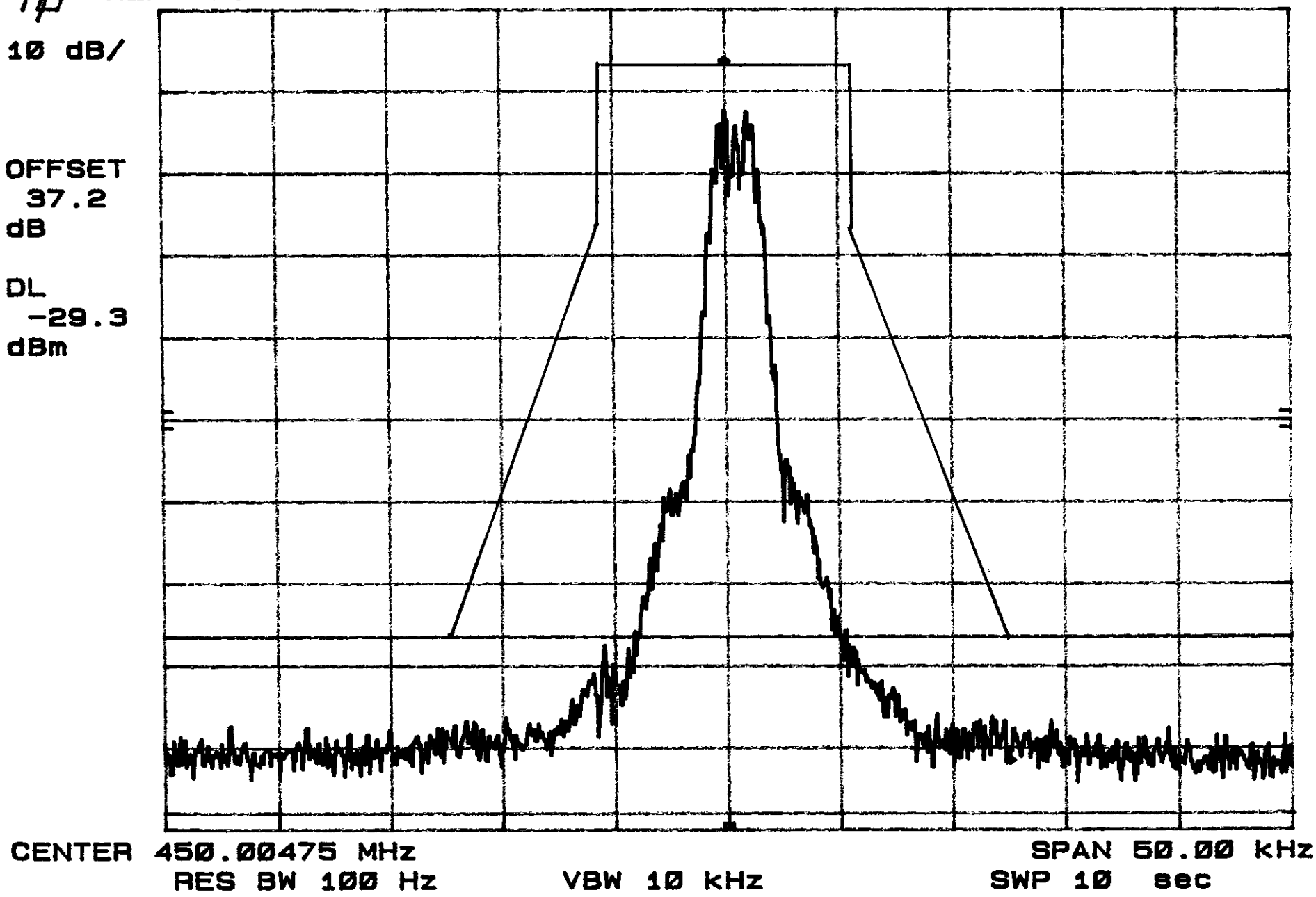
EMC Test Equipment Calibration Information

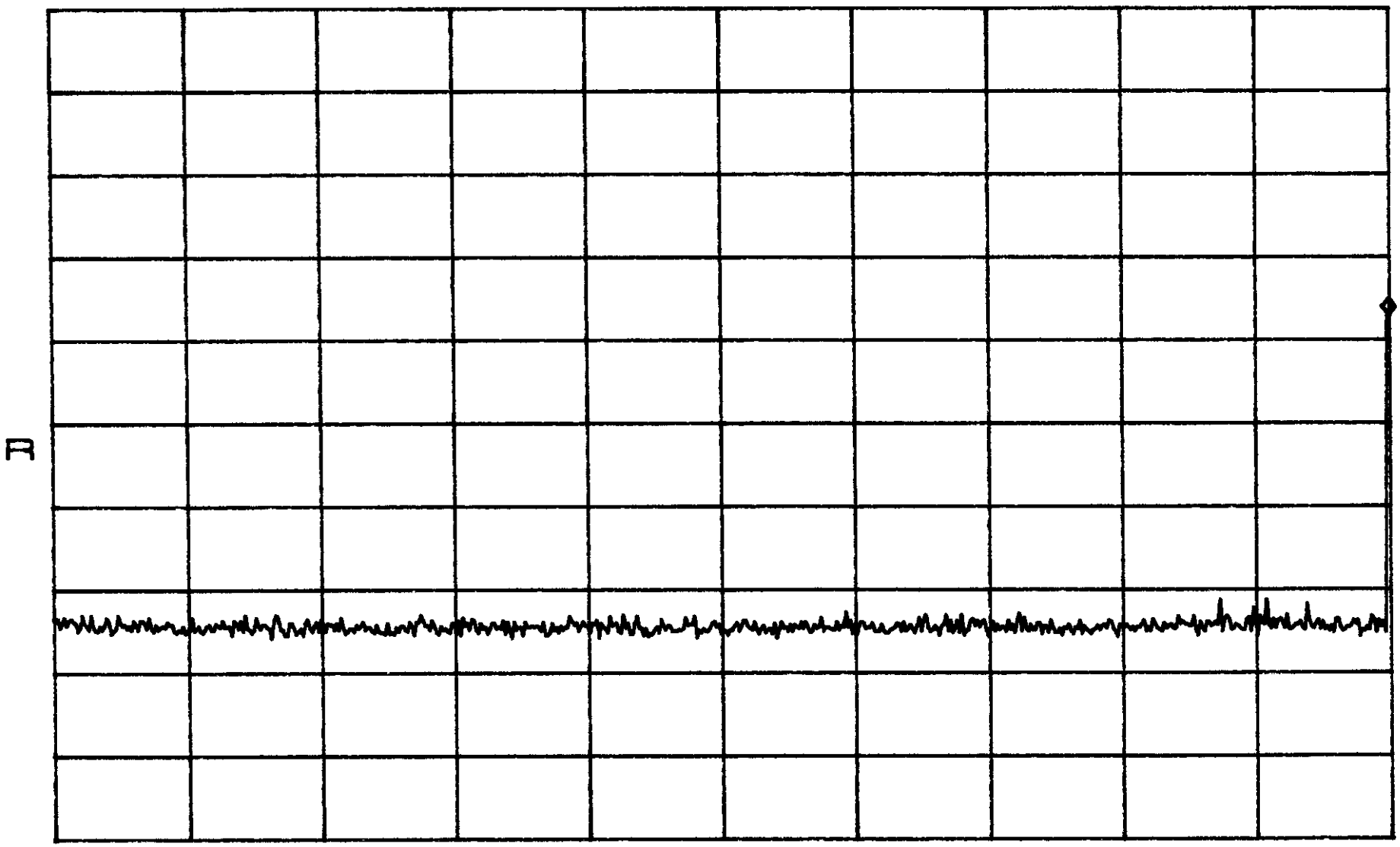
Equipment	Serial Number	Date Calibrated	Calibration Due
Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520 (Site 1)	044	6/5/98	6/5/99
Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520A (Site 2)	1118	10/1/97	10/1/98
Antenna Research Associates, Inc. Horn Antenna DRG-118/A	1010	9/9/98	9/9/99
Boonton Modulation Meter 82AD/01A/S10/S13	167219	4/28/98	4/28/99
Dressler Coupling/Decoupling Network CDN-T2	9607004B	10/15/97	10/15/98
Dressler Coupling/Decoupling Network CDN-M2	9606003B	10/15/97	10/15/98
Dressler Coupling/Decoupling Network CDN-M3	9607013B	10/15/97	10/15/98
Dressler Coupling/Decoupling Network CDN-S1	9609002B	10/15/97	10/15/98
Dressler Coupling/Decoupling Network CDN-S9	9610003C	10/15/97	10/15/98
Dressler Coupling/Decoupling Network CDN-S25	9612001C	10/15/97	10/15/98
Electromechanics Company Model 3301B Active Rod Antenna	2428	4/14/98	4/14/99
Electromechanics Company Model 3104P Biconical Antenna	3192	6/5/98	6/5/99
Electromechanics Company Biconical Antenna Model 3110B	1078	6/5/98	6/5/99
Electromechanics Company Biconilog Antenna Model 3143	1184	11/9/95	N/A
Electromechanics Company Log Periodic Antenna Model 3146A	1129	6/5/98	6/5/99
Electromechanics Company Log Periodic Antenna Model 3146	1709	6/5/98	6/5/99
Electromechanics Company Field Probe Set Model 7122	9202-1094	10/17/97	10/17/98
Electromechanics Company 8116-50-TS-100-N	962509	9/4/98	9/4/99
Electromechanics Company 8116-50-TS-100-N	962510	9/4/98	9/4/99
Electromechanics Company 8116-50-TS-100-N	962507	9/4/98	9/4/99
Electromechanics Company 8116-50-TS-100-N	962508	9/4/98	9/5/99
ENI 50 Watt Power Amplifier: 550LA	9306311	N/A	N/A
Fischer Custom Communications EM Injection Clamp F-203I	266	3/17/98	3/17/99
Haefely PEFT Generator Model PEFT.1	081 979-10	7/01/98	7/01/99
Haefely PSD 25B Electrostatic Discharge Simulator	082597-35	9/19/97	9/19/98
Haefely PSURGE 6.1 Surge Generator with Haefely PHV 30.2 Hybrid Network. With 16.1 Coupling/Decoupling Network	083295-08	9/23/97	9/23/98
Hewlett-Packard Preamplifier: HP 8447D	2727A06203	5/21/98	5/21/99
Hewlett-Packard Preamplifier: HP 8449B	3008A00729	11/20/97	11/20/98
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 1)	2811A01283	8/5/98	8/5/99
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 2)	3303A01786	6/24/98	6/24/99
Hewlett-Packard RF Preselector: HP 85685A (Site 1)	2817A00744	8/5/98	8/5/99
Hewlett-Packard RF Preselector: HP 85685A (Site 2)	3221A01395	6/24/99	6/24/99
Hewlett-Packard Function Generator: 3312A	1432A12339	5/13/96	N/A
Hewlett-Packard Spectrum Analyzer: HP 8564E	3643A00657	7/21/98	7/21/99
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 2)	2926U07140	6/24/98	6/24/99
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 1)	2928A04750	8/5/98	8/5/99
Hewlett-Packard Spectrum Analyzer: HP 8593A	3009A00739	6/15/98	6/15/99
Hewlett-Packard Signal Generator: HP 8656B	2926U8140	9/9/98	9/9/99
Hewlett-Packard Signal Generator: HP 8648C	3347A00242	5/20/98	5/20/99
Instruments for Industry 100 Watt Amplifier: SMX100	2095-0896	N/A	N/A
Kalmus 100 Watt Amplifier: 757LCB-CE	8256-1	N/A	N/A
KeyTek ECAT System w/E411, E4552 and E501 Modules	9305232	12/8/97	12/8/98
KeyTek ESD Simulator: MZ-15/EC	9604310	4/28/98	4/28/99
Kikusui PCR 2000L AC Power Supply	15030820	7/8/98	7/8/99
Racal Dana Frequency Counter 1992 S/N:	2806	2/19/98	2/19/99
Solar Electronics Current Probe 9215-1N	935005	1/19/98	1/19/99
Solar Electronics LISN 8012-50-R-24-BNC	8379493	8/13/98	8/13/99
Solar Electronics LISN 8028-50-TS-24-BNC	N/A	8/13/98	8/13/99
Solar Electronics LISN 8028-50-TS-24-BNC	N/A	8/13/98	8/13/99
Tektronix Oscilloscope TDS-540	B0101162	4/22/98	4/22/99
Wandel & Goltermann E-Field Probe Model EMR-200	K-0024	6/15/98	6/15/99
WLL S1 Coupling Network	CN01	10/15/97	10/15/98

APPENDIX A1

SPURIOUS EMISSIONS AT ANTENNA OUTPUT TERMINAL PLOT – 450 MHz

15 Sept. 98
ch 11 @ 450 MHz
MKR Δ 12.50 kHz
-85.20 dB




ATTEN 20dB
MKR 3.00dBm
RL 40.0dBm
10dB/
450.0MHz
R
START 30.0MHz
STOP 450.0MHz
*RBW 100KHz
*VBW 30KHz
SWP 350ms

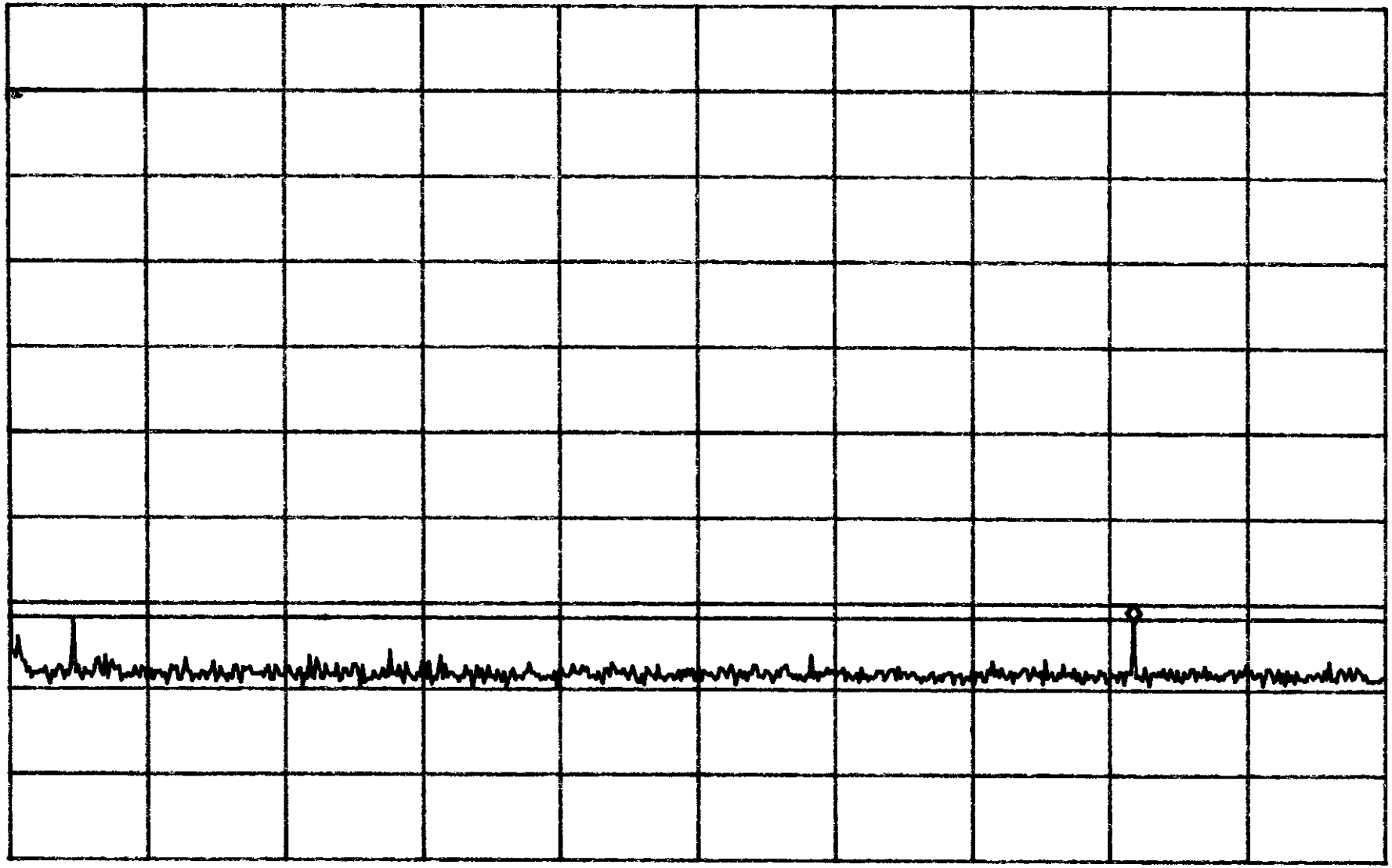
8 Oct 98

EMA RF AMP TX @ 450 MHz 4717H

*ATTEN 20dB

MKR -20.16dBm

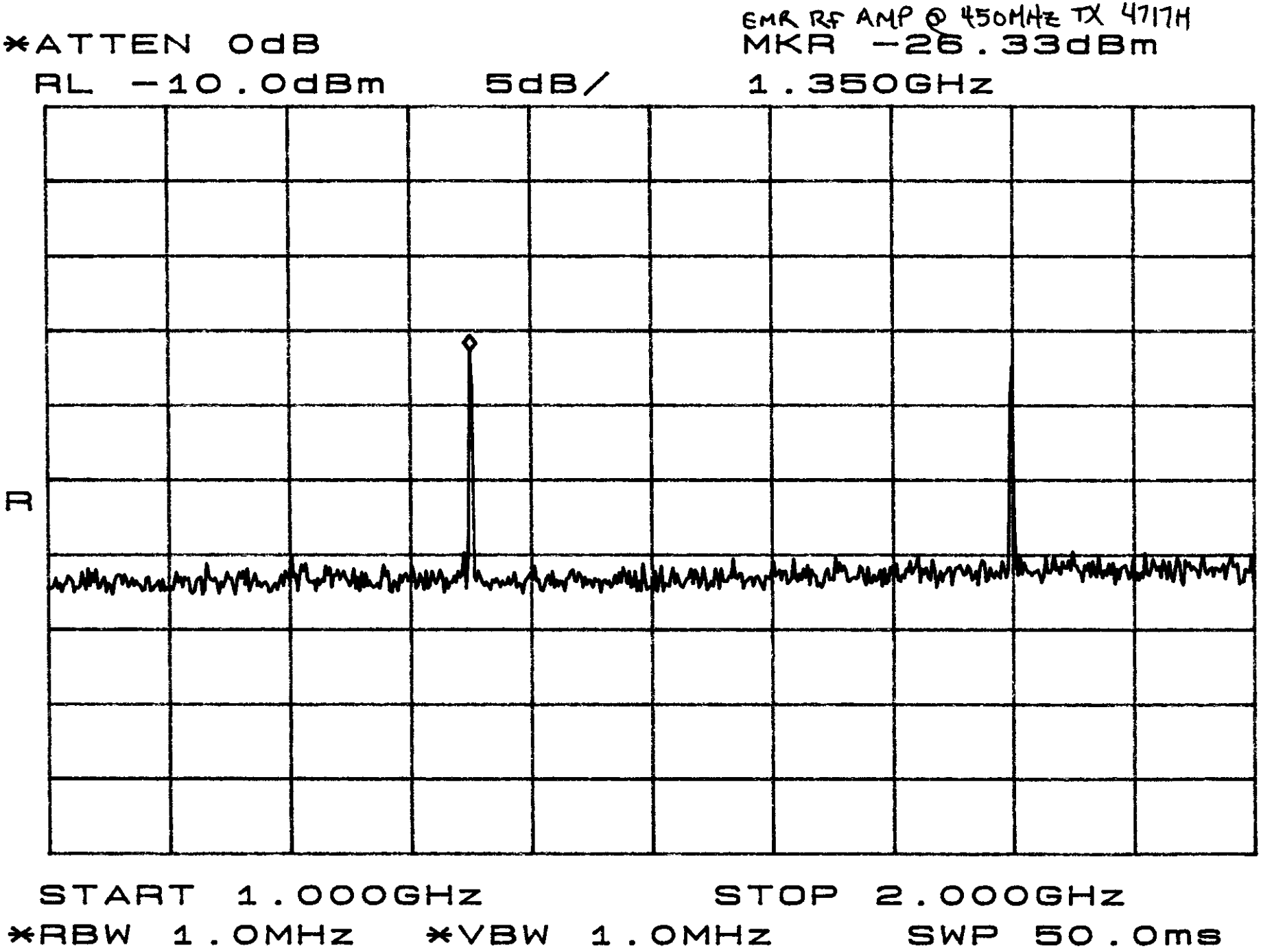
RL 51.8dBm 10dB/ 900.1MHz



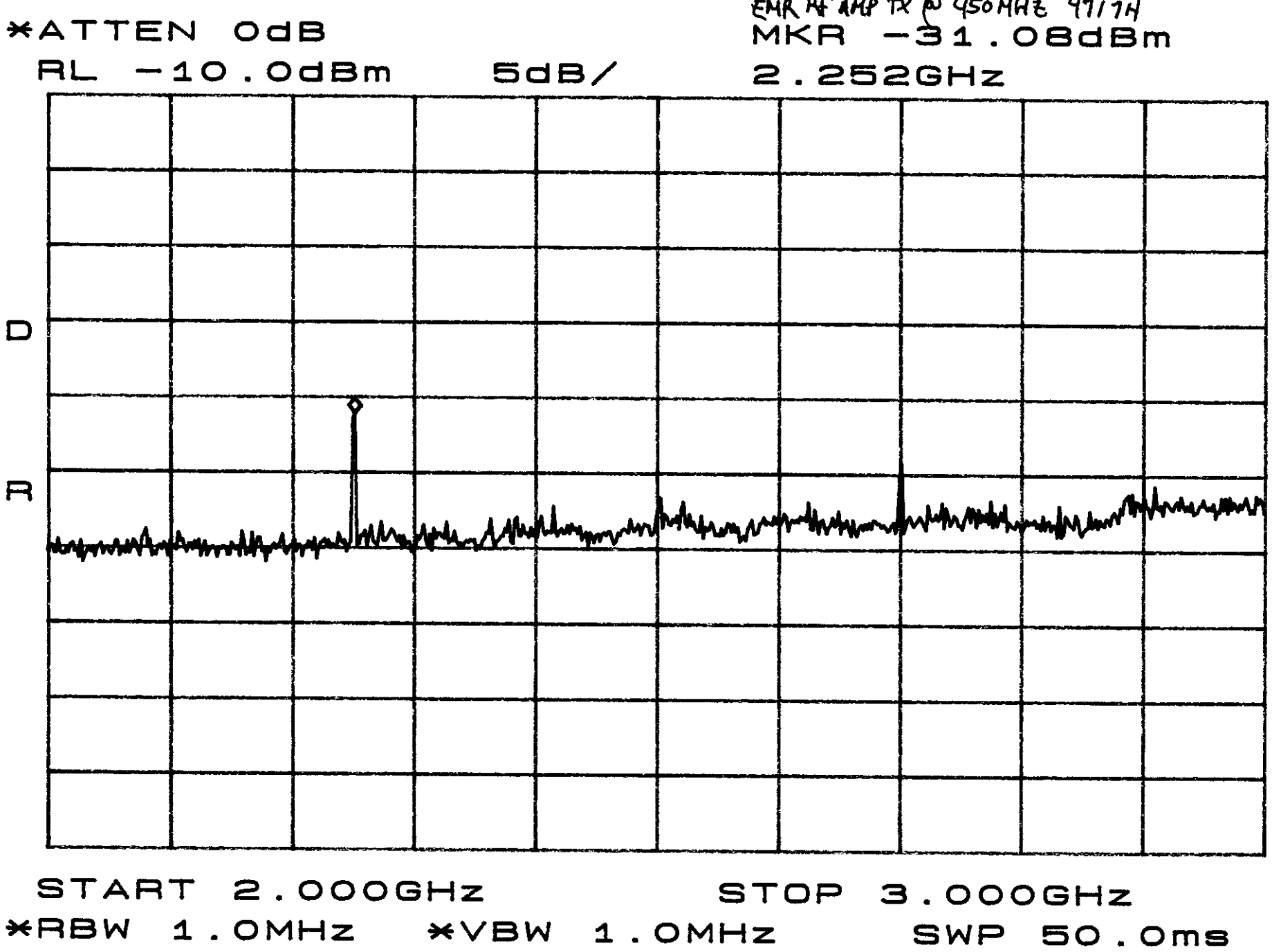
START 450.0MHz STOP 1.0000GHz

*RBW 100kHz *VBW 100kHz SWP 140ms

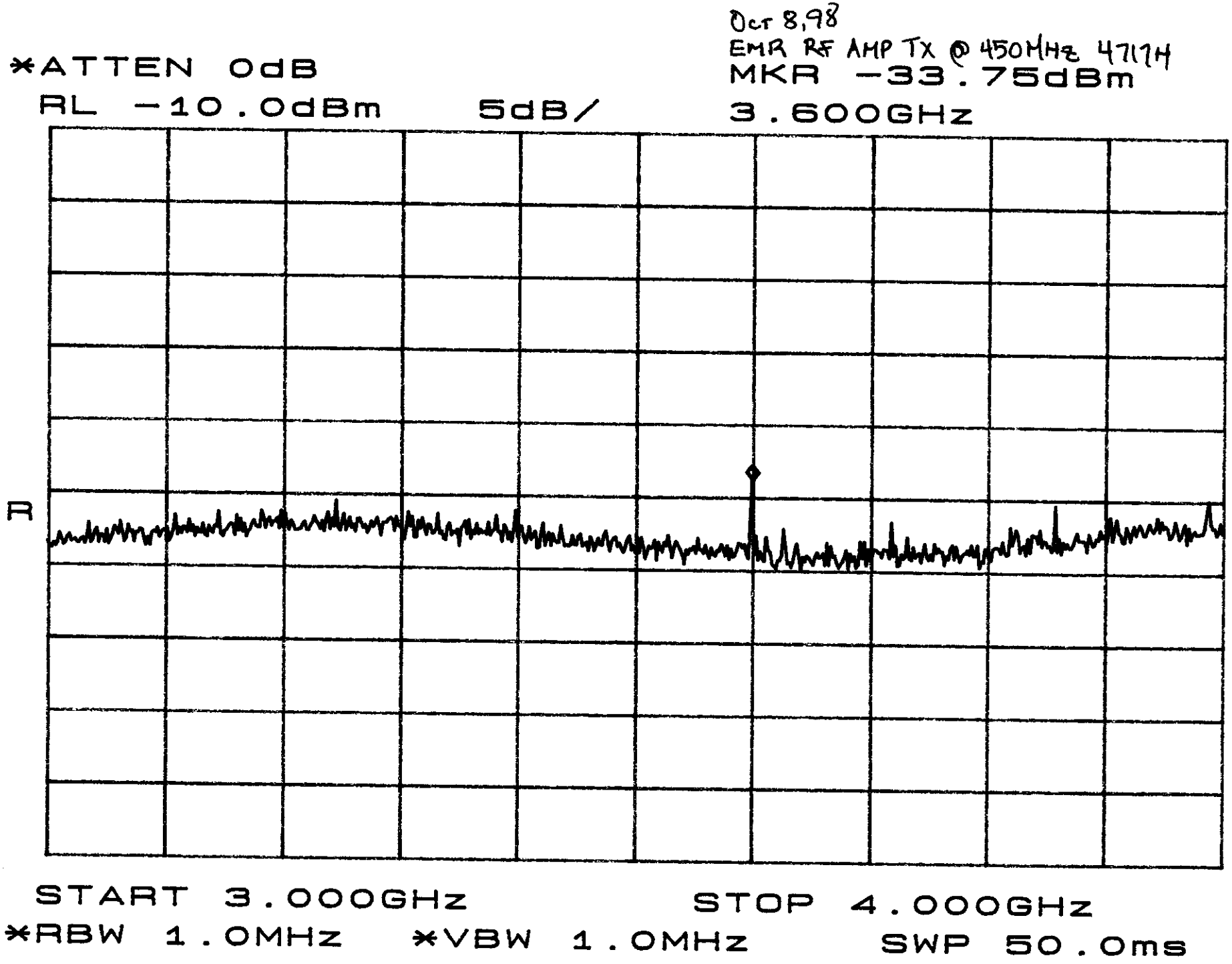
8 Oct 98
EMR RF AMP @ 450MHz TX 4717H



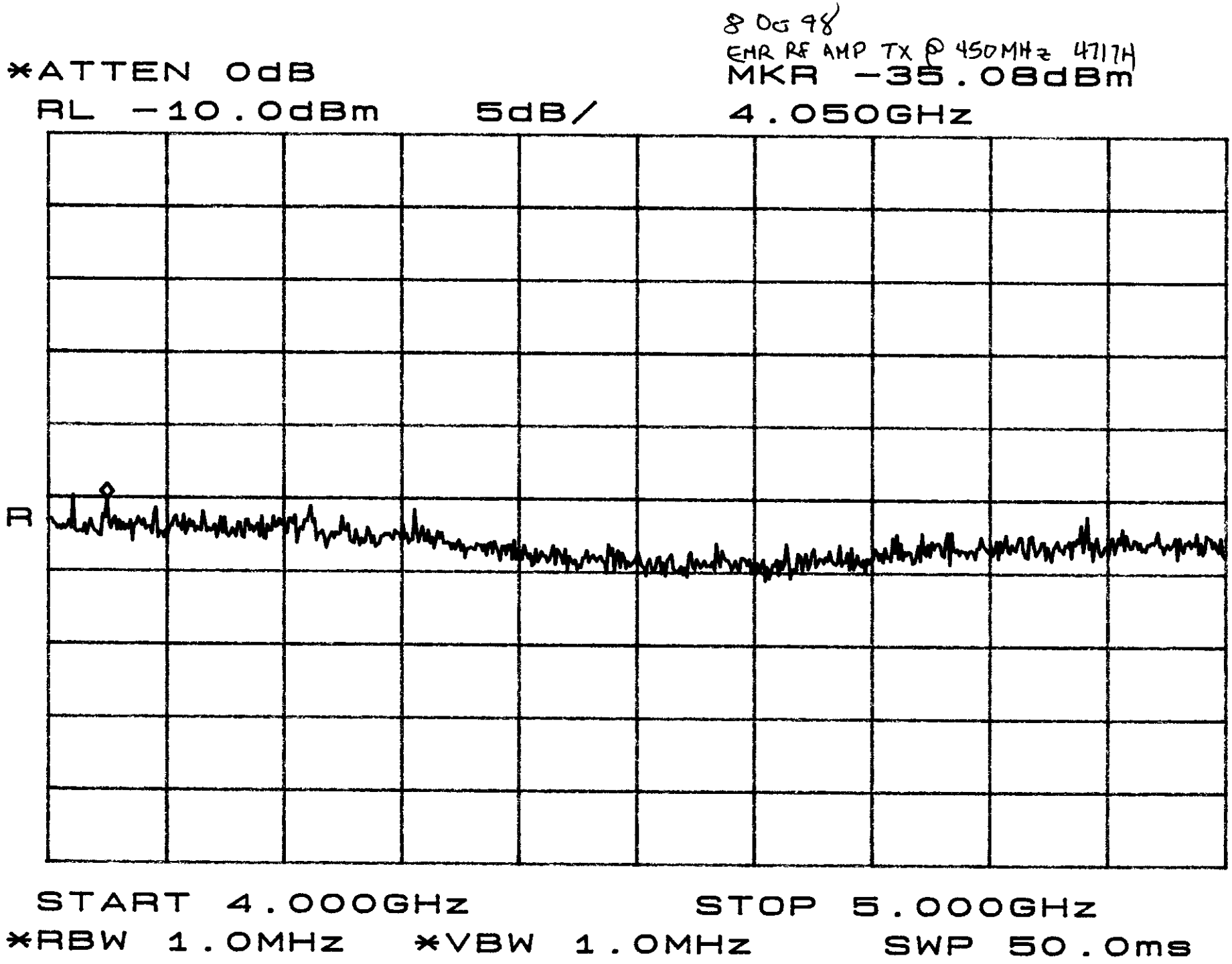
8 Oct 98
EMR RF AMP TX @ 450MHz 47/7H



Oct 8,98
EMR RF AMP TX @ 450MHz 4717H



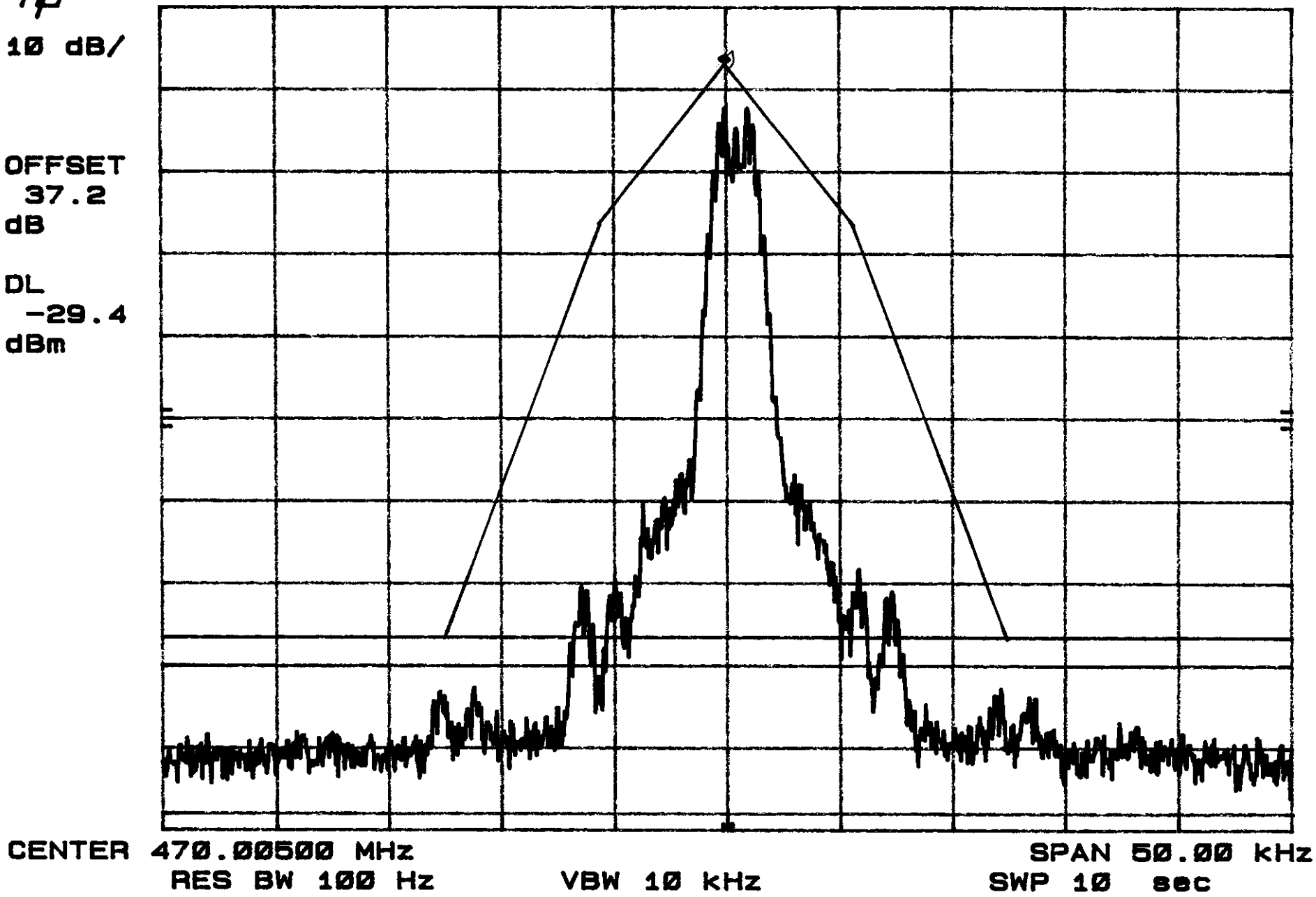
8 Oct 98
EMR RF AMP TX @ 450MHz 4717H

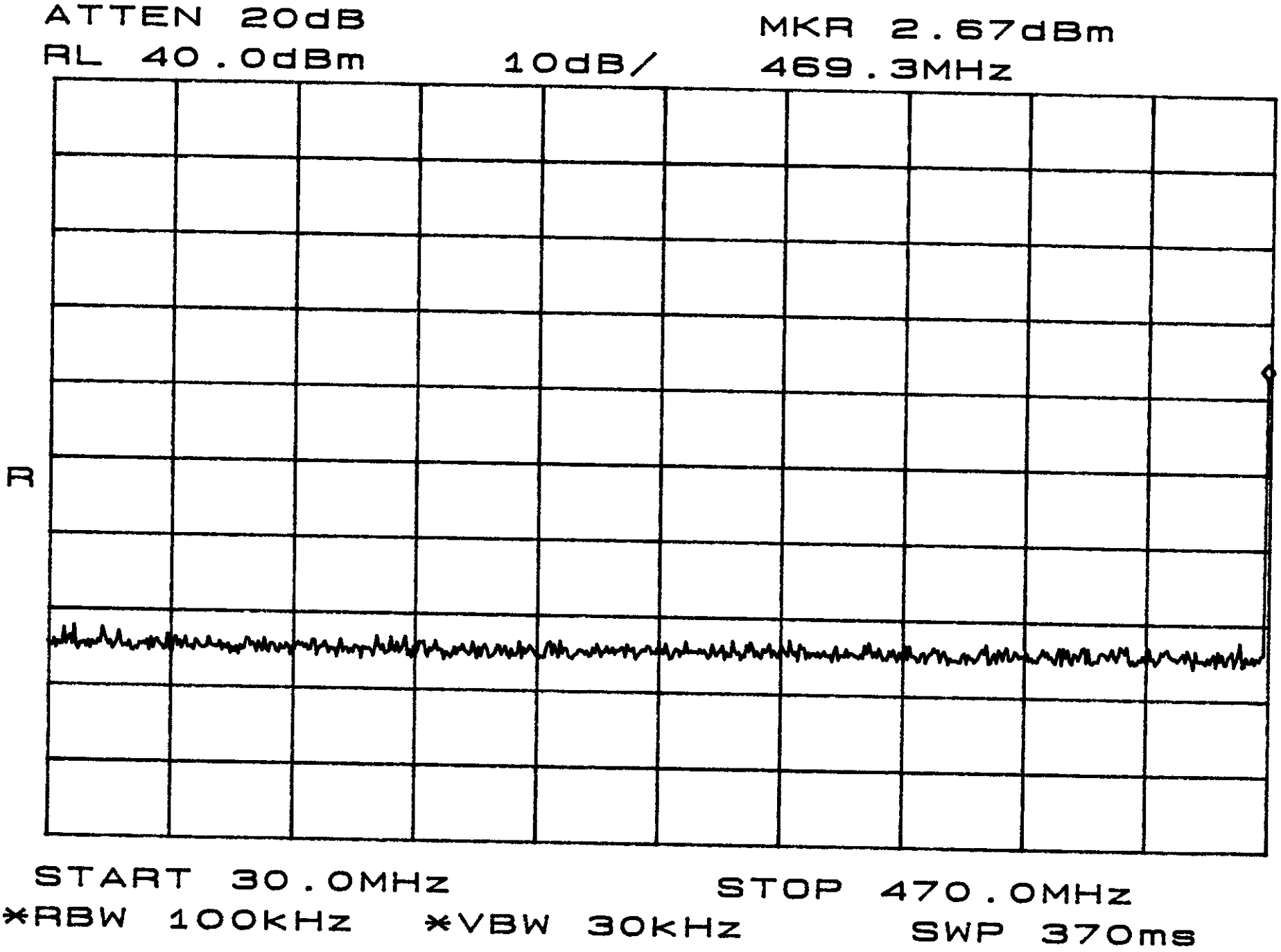


APPENDIX A2

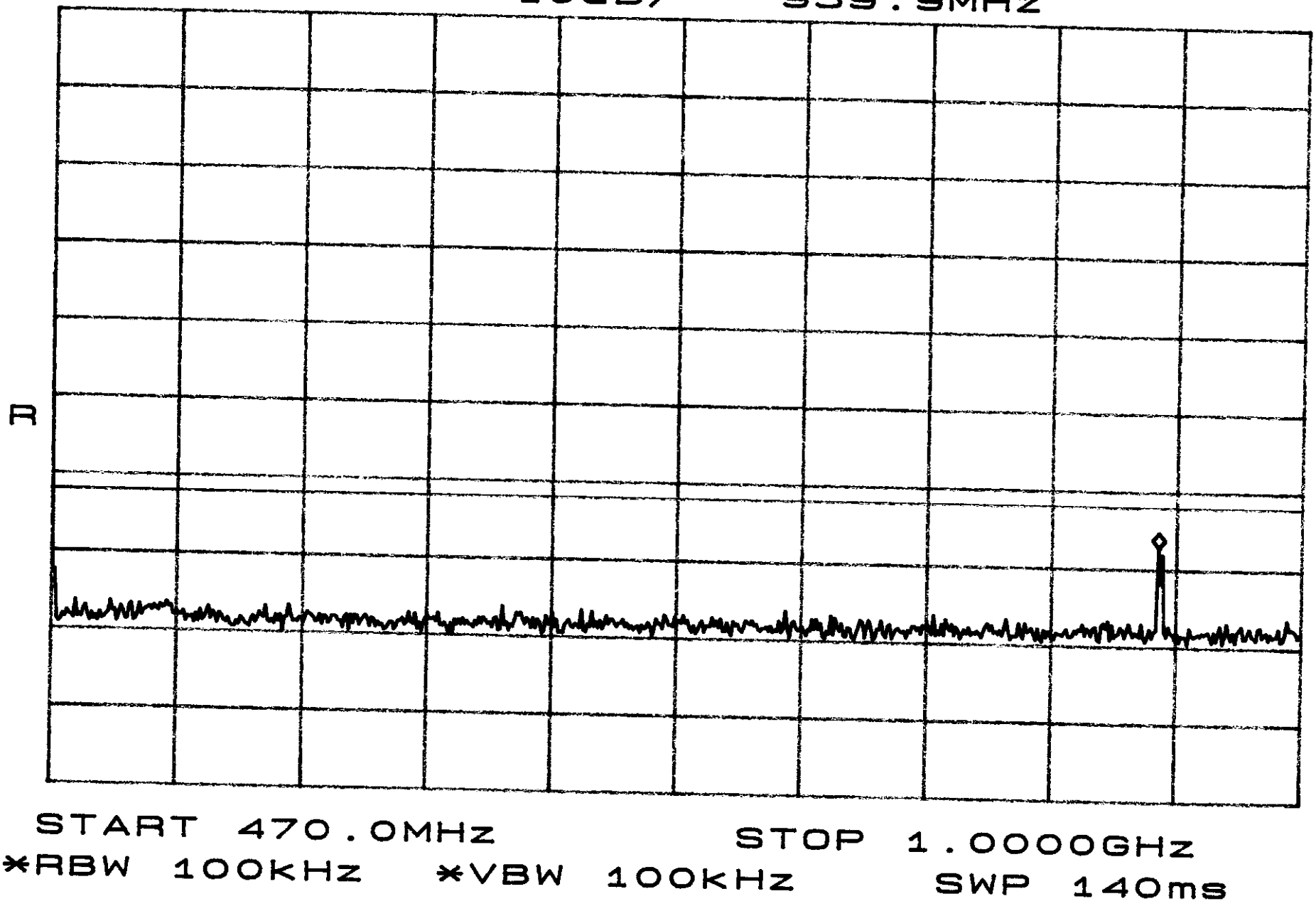
SPURIOUS EMISSIONS AT ANTENNA OUTPUT TERMINAL PLOT – 470 MHz

15 Sept 98
CH 12 @ 470 MHz
MKR Δ 12.50 kHz
-83.70 dB



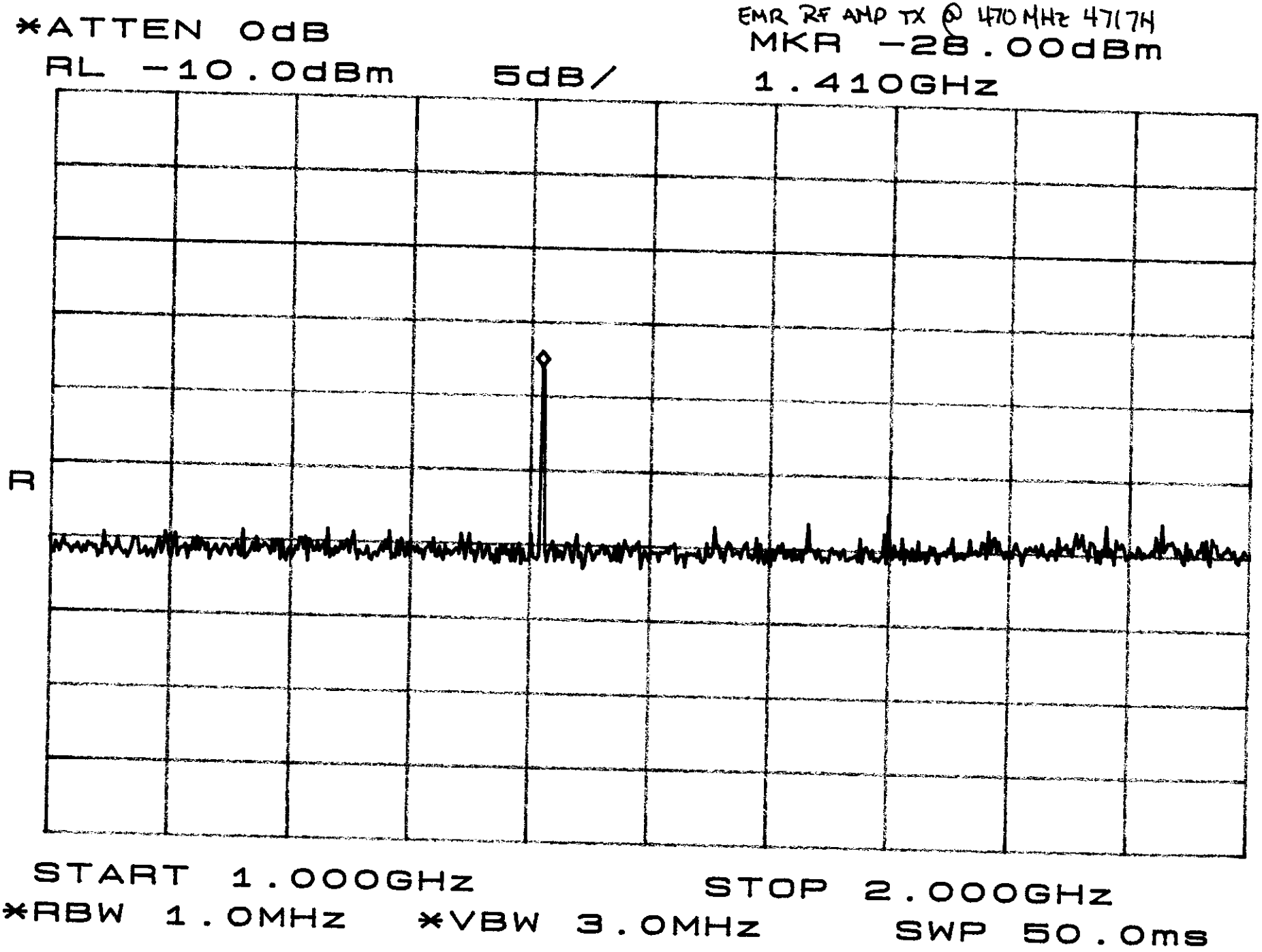

ATTEN 20dB
RL 40.0dBm
10dB/
MKR 2.67dBm
469.3MHz
R
START 30.0MHz
STOP 470.0MHz
*RBW 100KHz
*VBW 30KHz
SWP 370ms

9Oct98
EMR RF AMP TX @ 470 MHz 47(7H

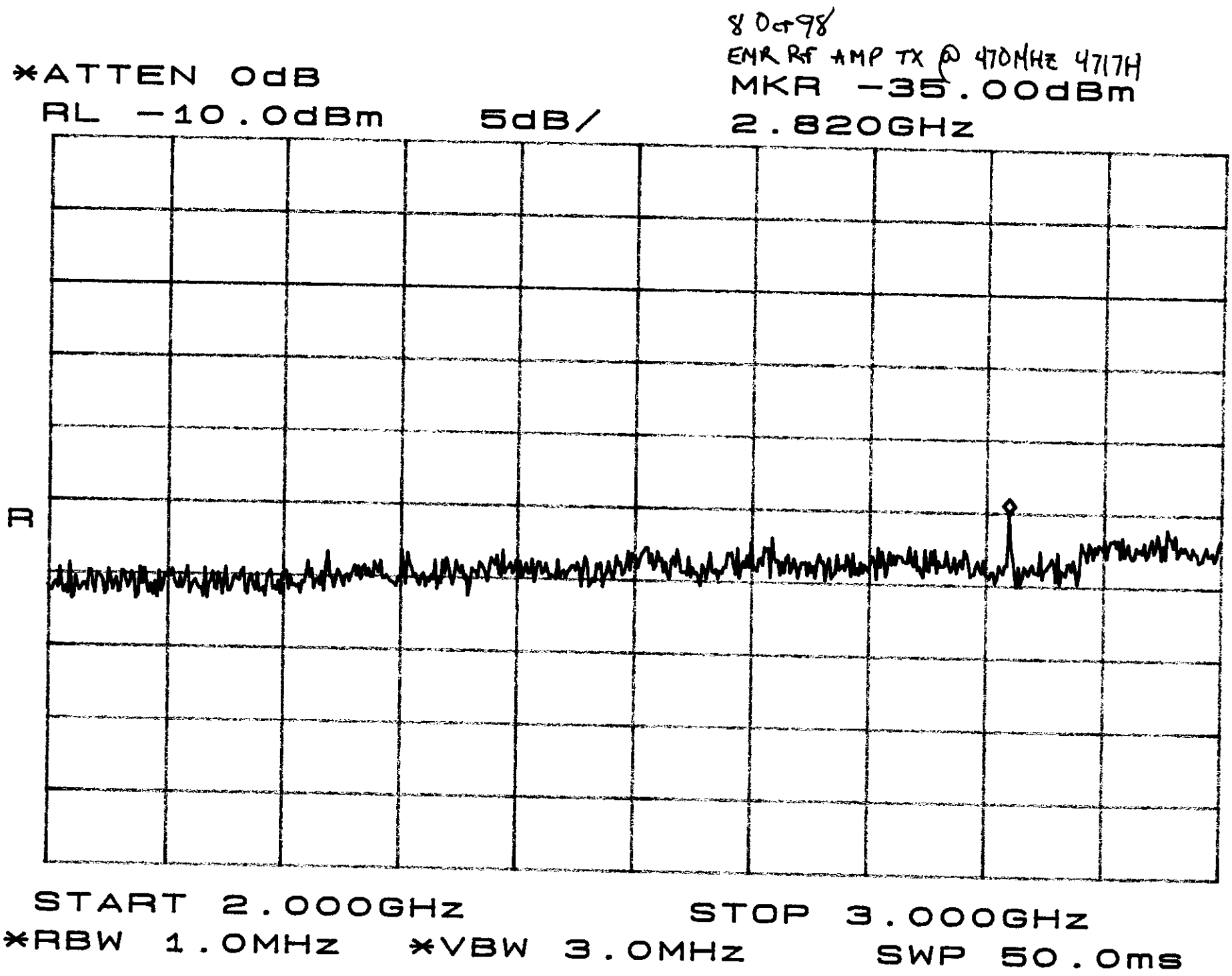


8 Oct 98

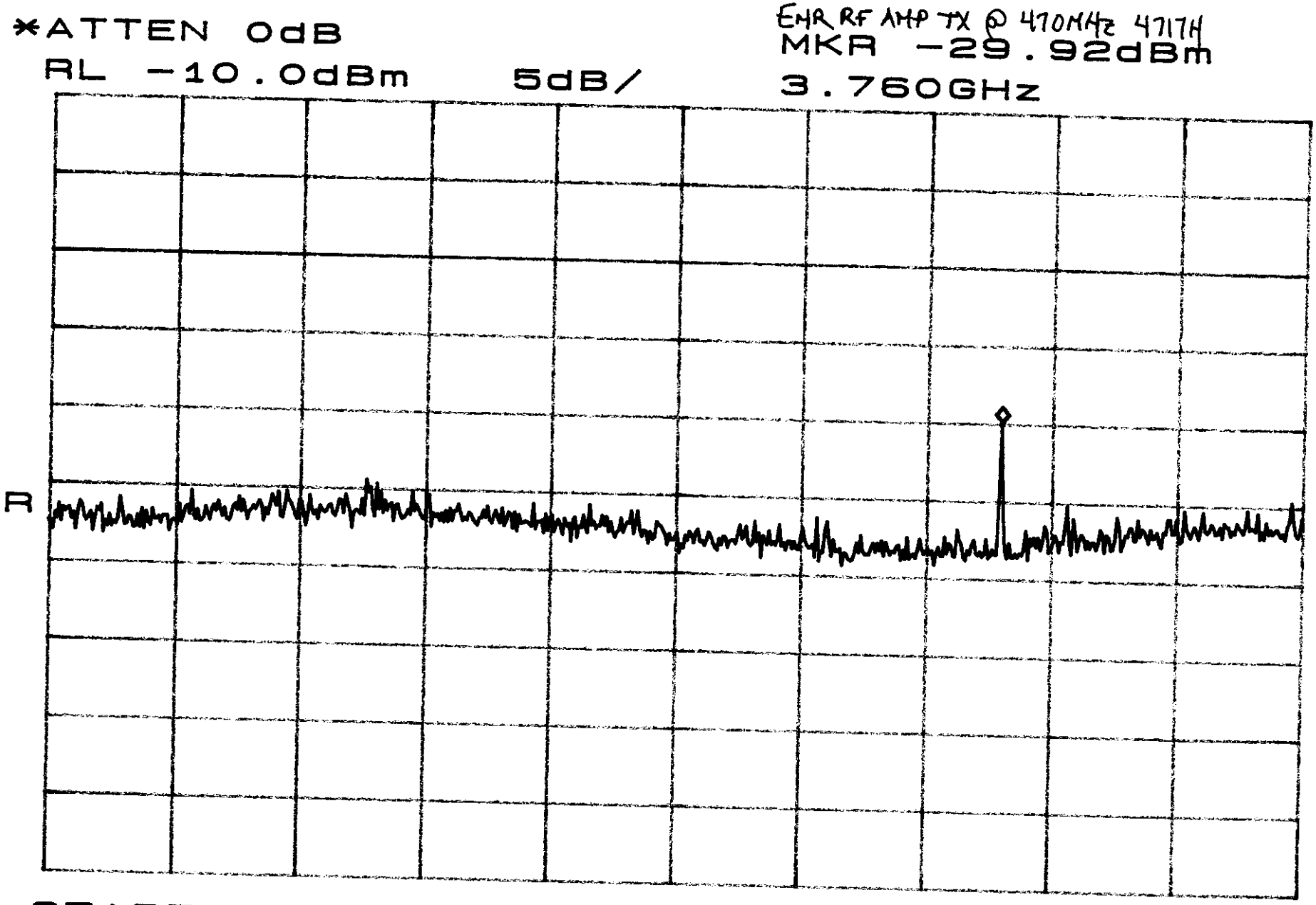
EMR RF AMP TX @ 470 MHz 47(7H



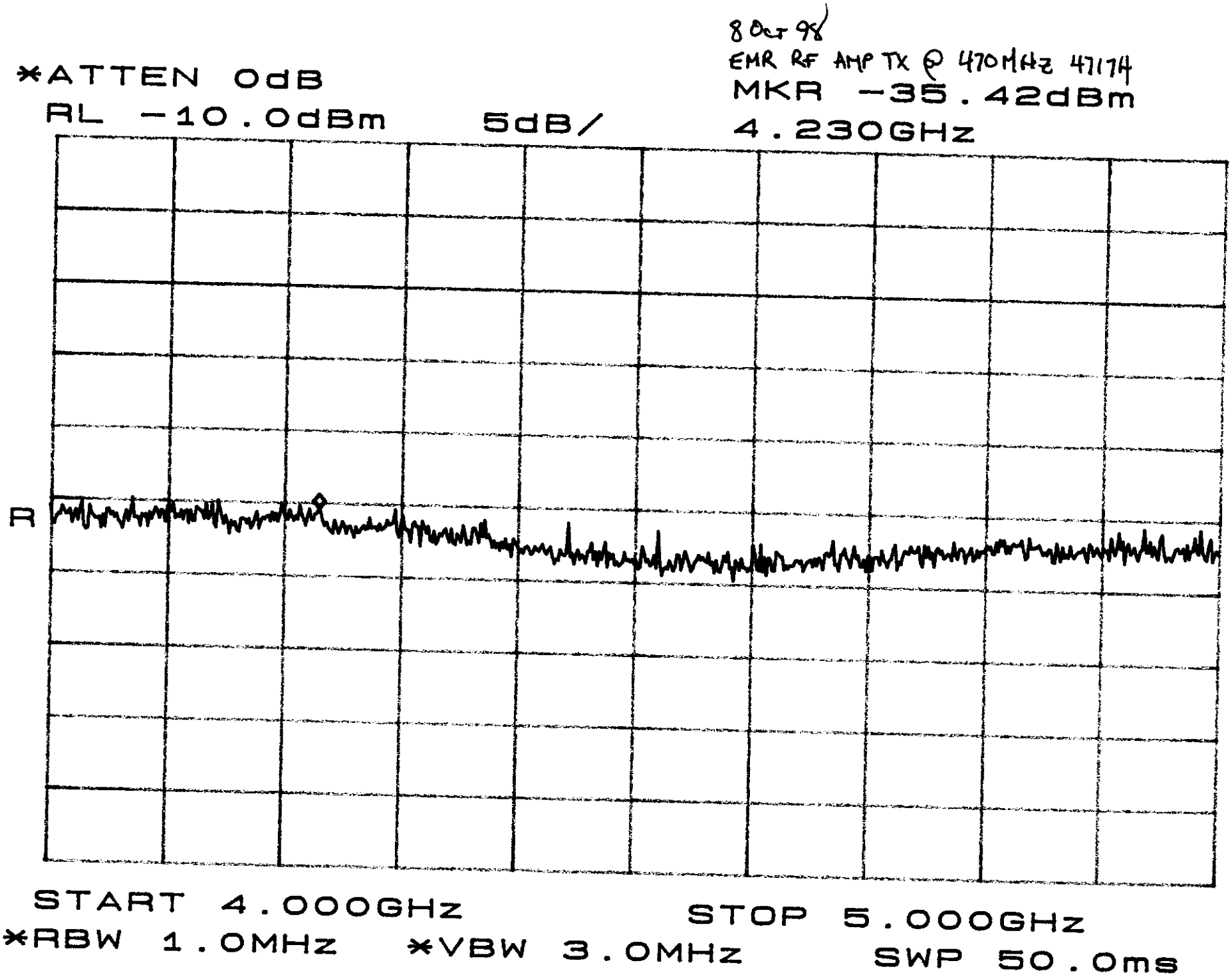
8 Oct 98
ENR RF AMP TX @ 470MHz 4717H



8 Oct 98
EHR RF AMP TX @ 470MHz 47117H

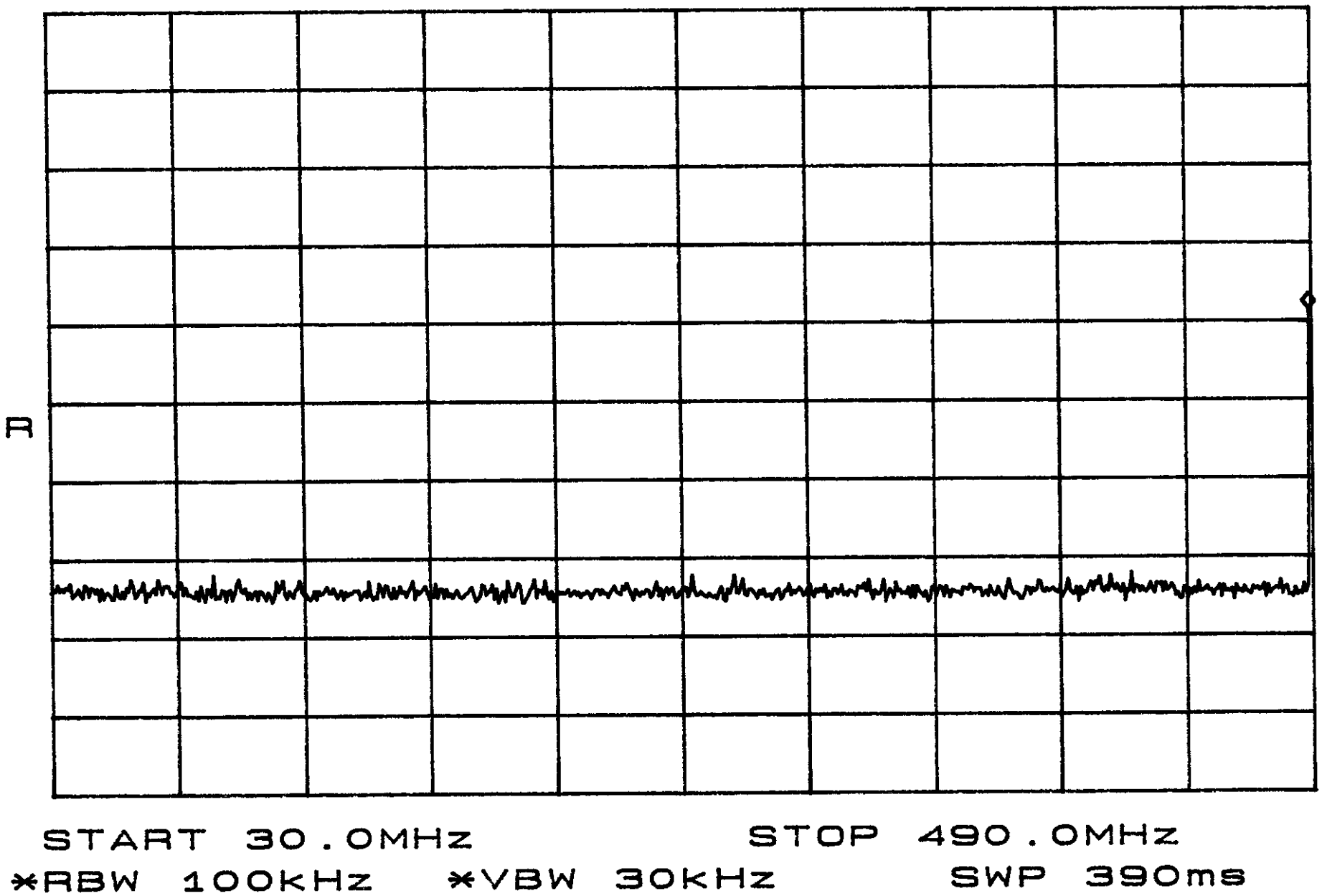


8 Oct 98
EMR RF AMP TX @ 470MHz 47174

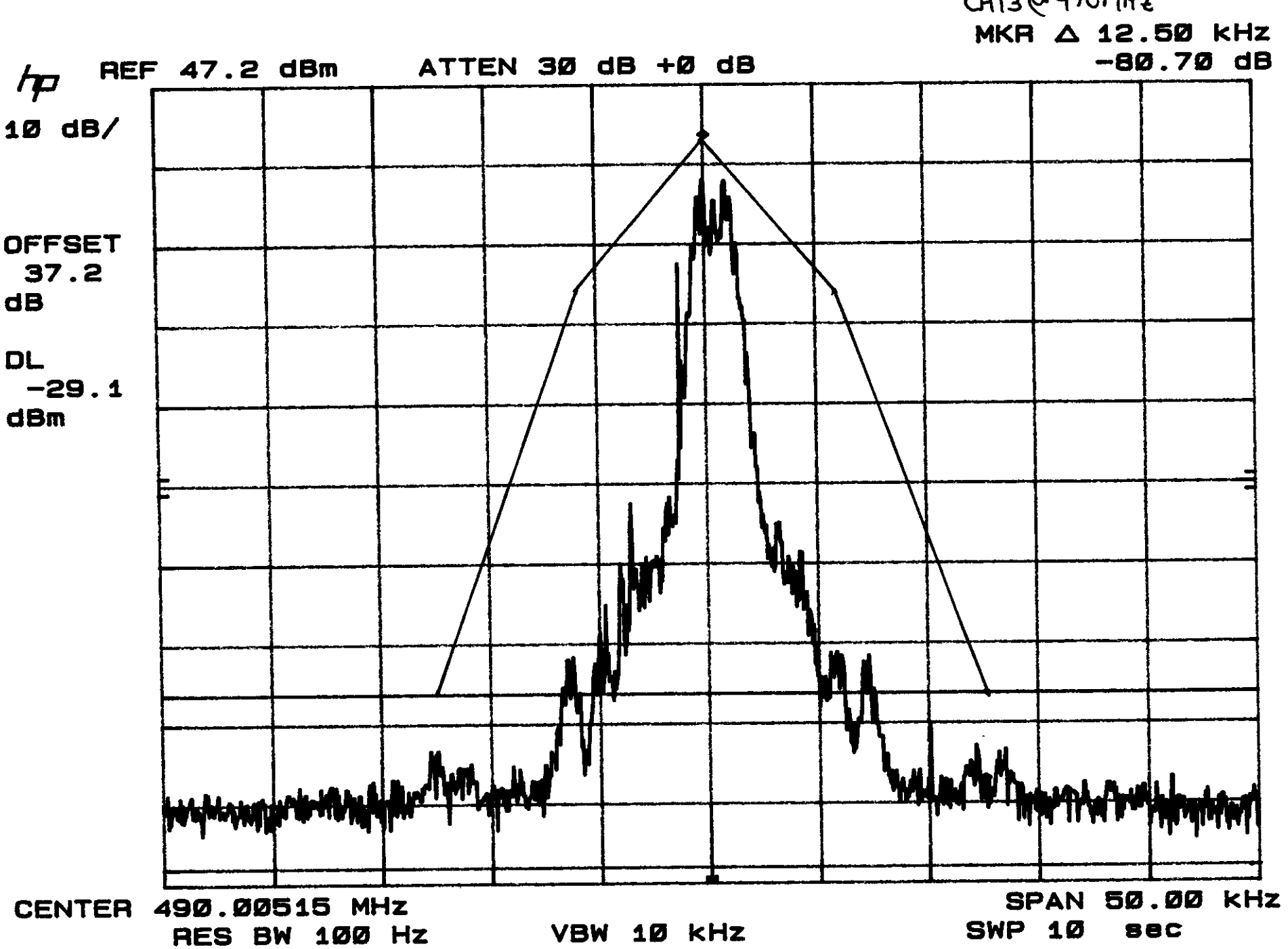


APPENDIX A3

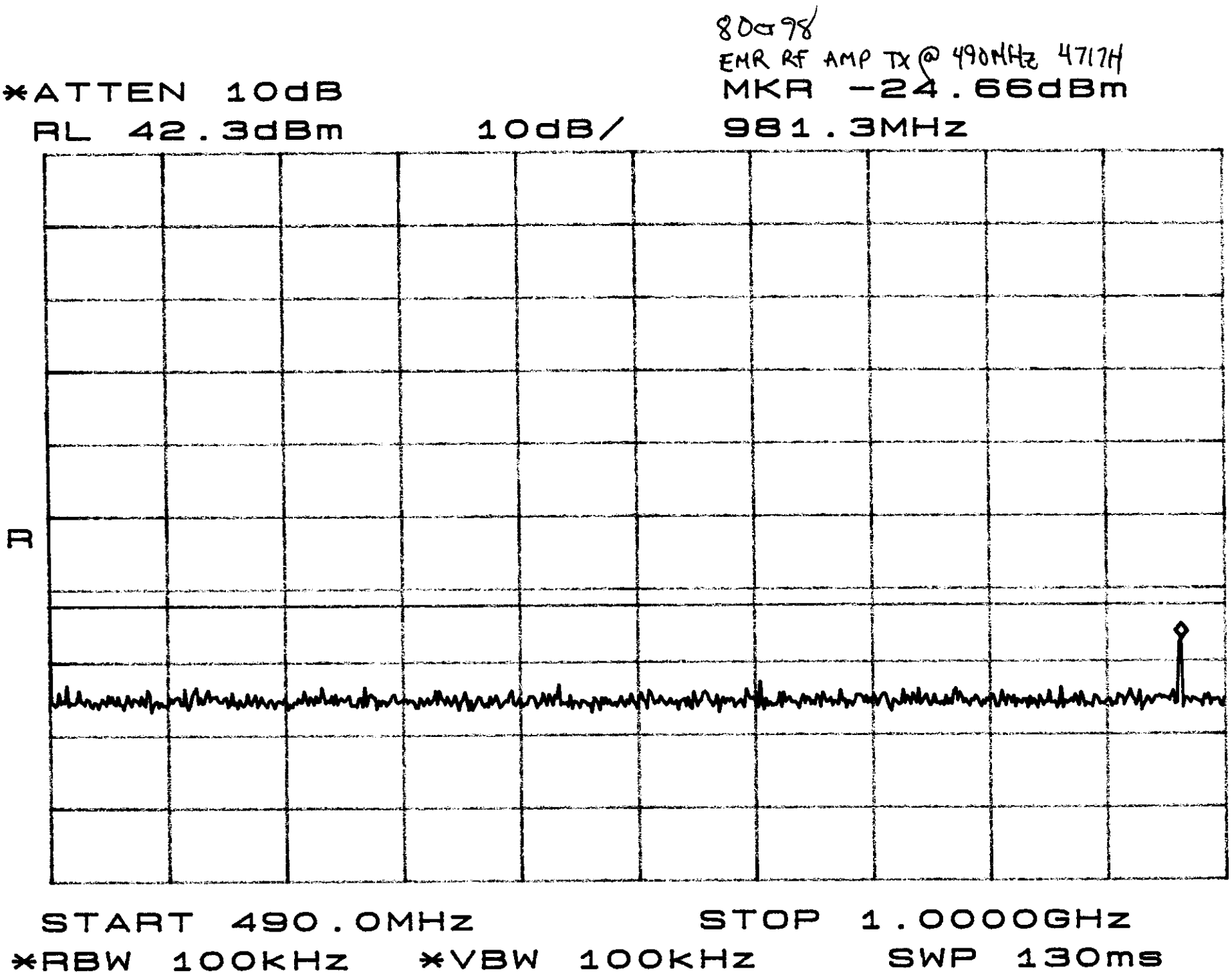
SPURIOUS EMISSIONS AT ANTENNA OUTPUT TERMINAL PLOT – 490 MHz


ATTEN 20dB
MKR 1.50dBm
RL 40.0dBm
10dB/
489.2MHz
R
START 30.0MHz
STOP 490.0MHz
*RBW 100kHz
*VBW 30kHz
SWP 390ms

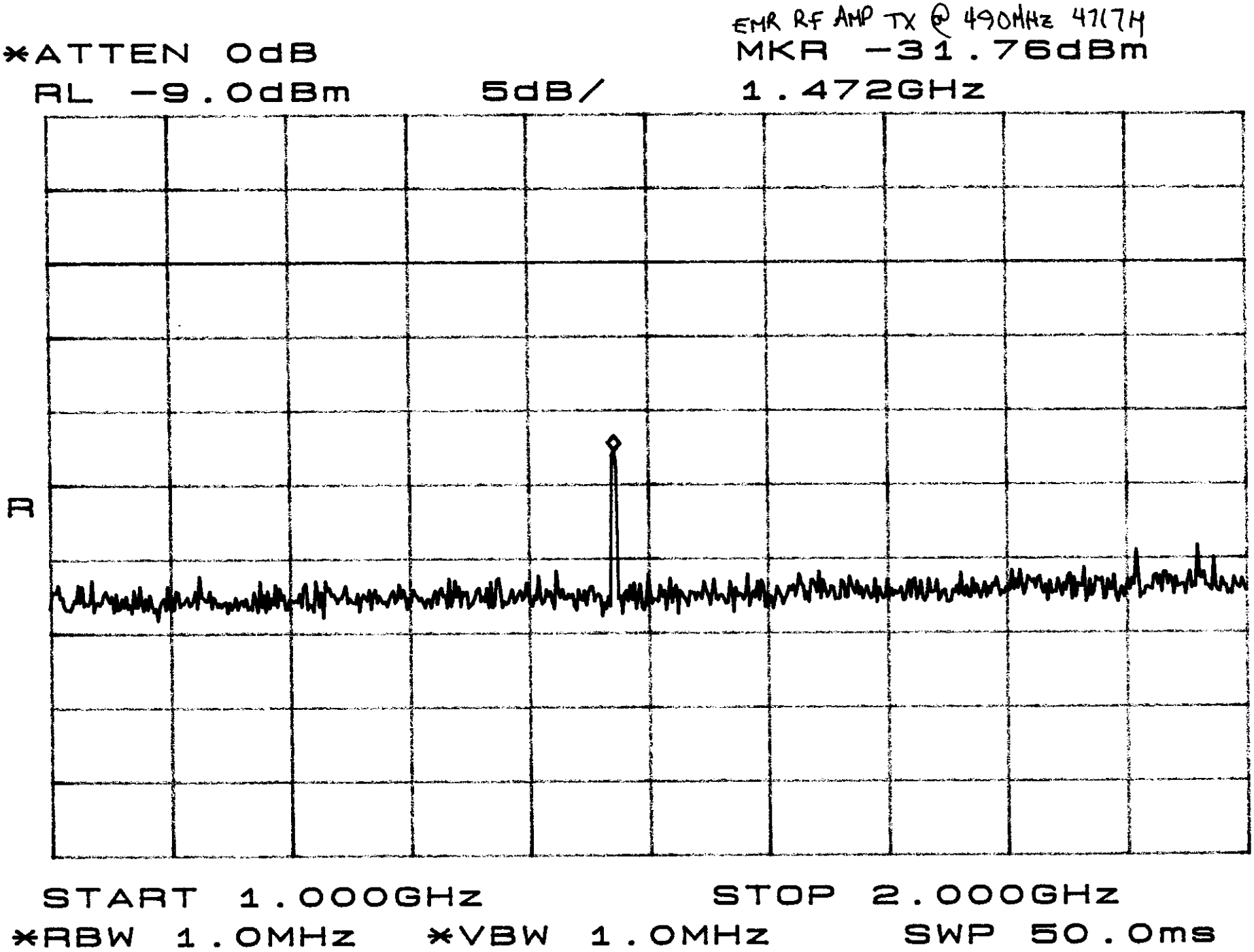
15 Sep 98
CH13 @ 490MHz



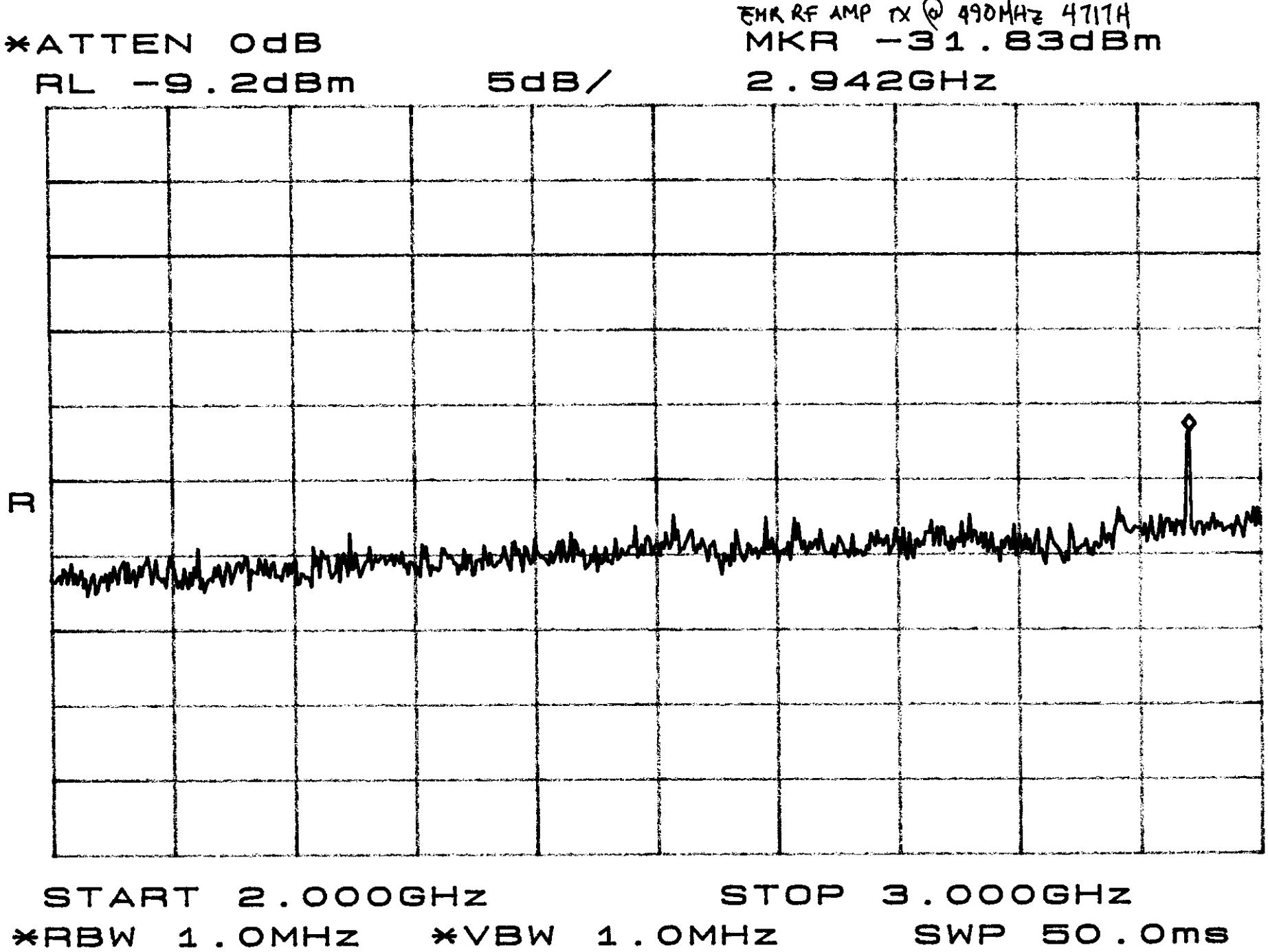
8 of 98
EMR RF AMP TX @ 490MHz 4717H



8 Oct 98
EMR RF AMP TX @ 490MHz 4717H

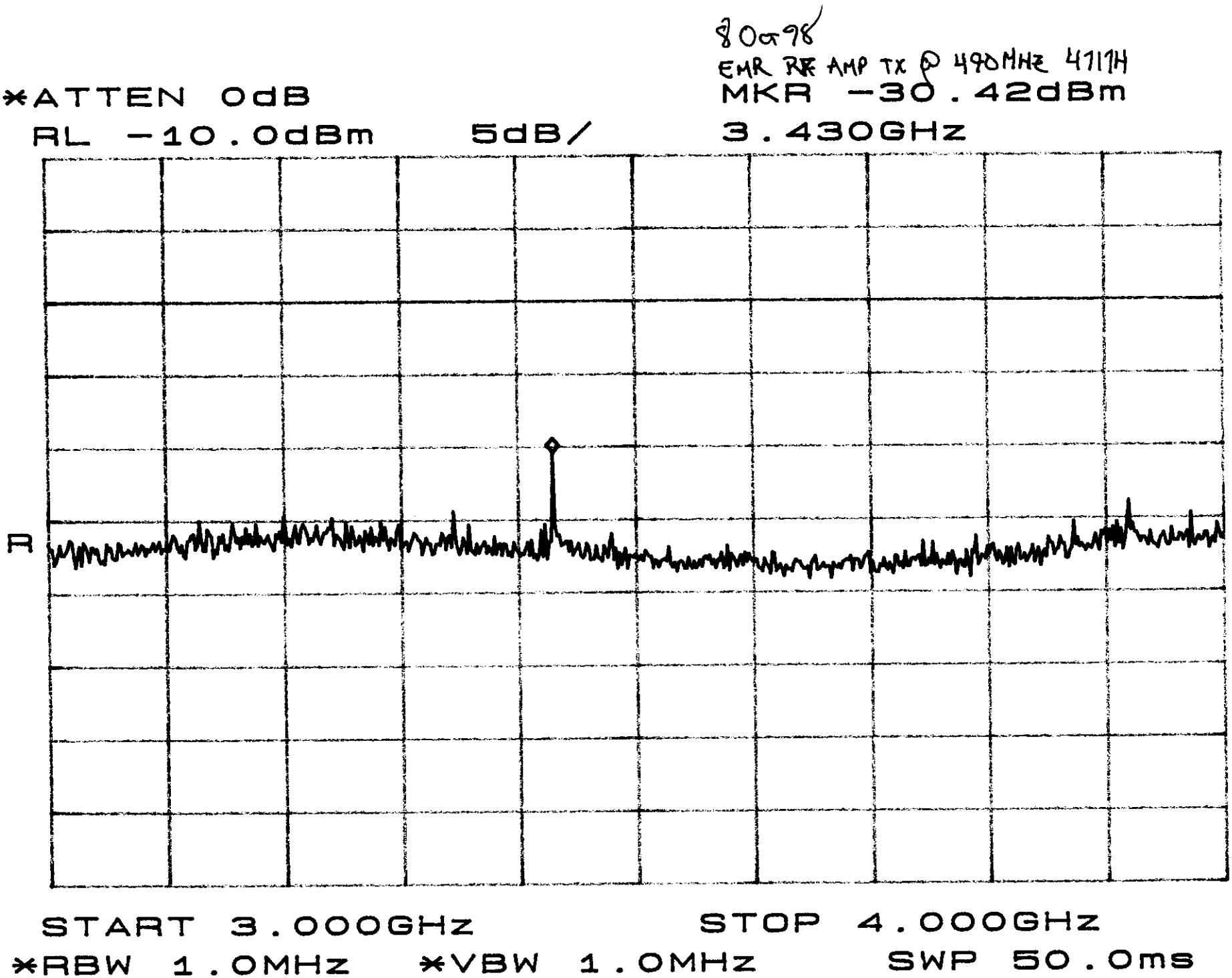


8 Oct 98
EMR RF AMP TX @ 490MHz 4717H

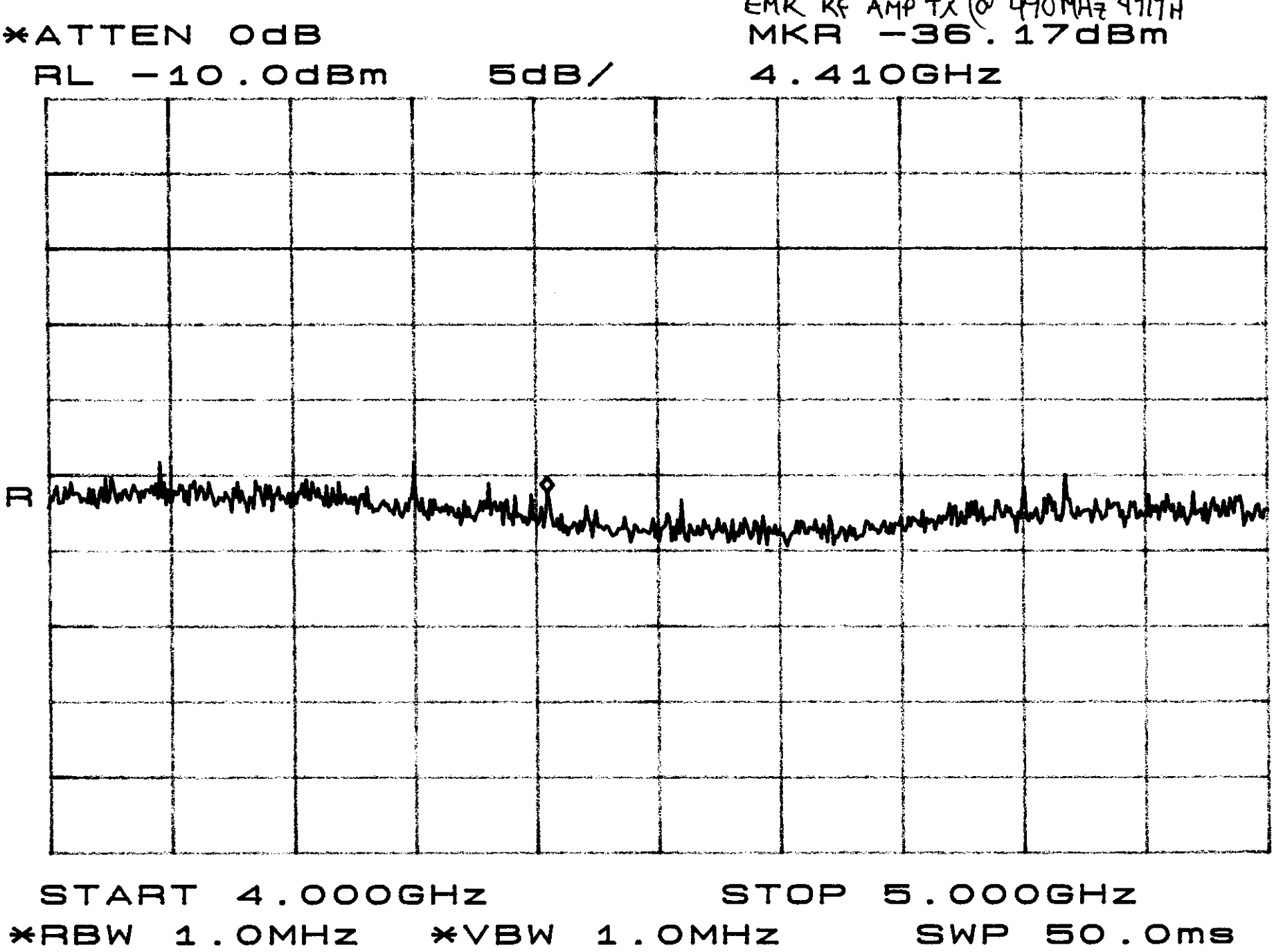


8 of 98

EMR RF AMP TX @ 490MHz 4717H

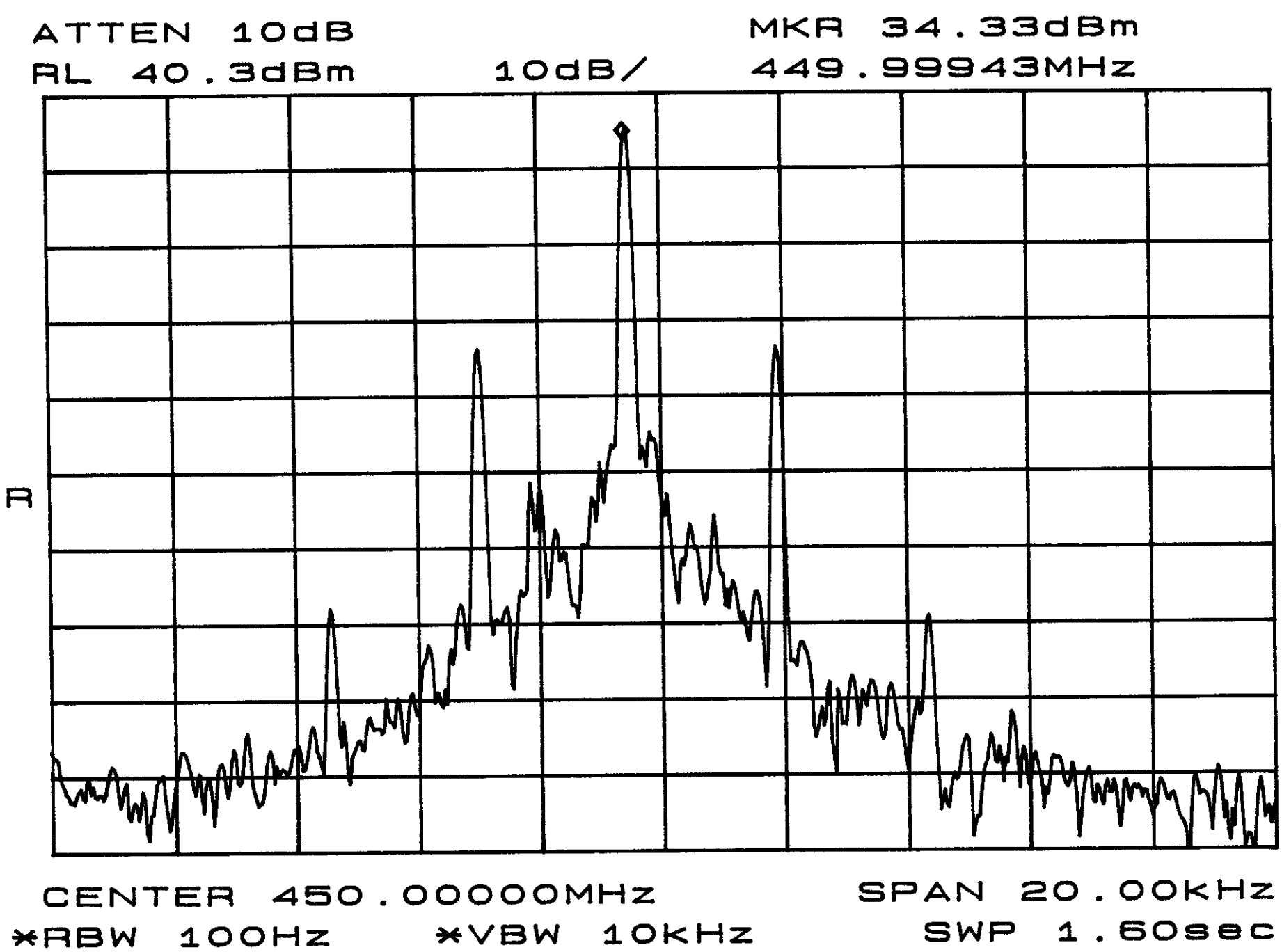


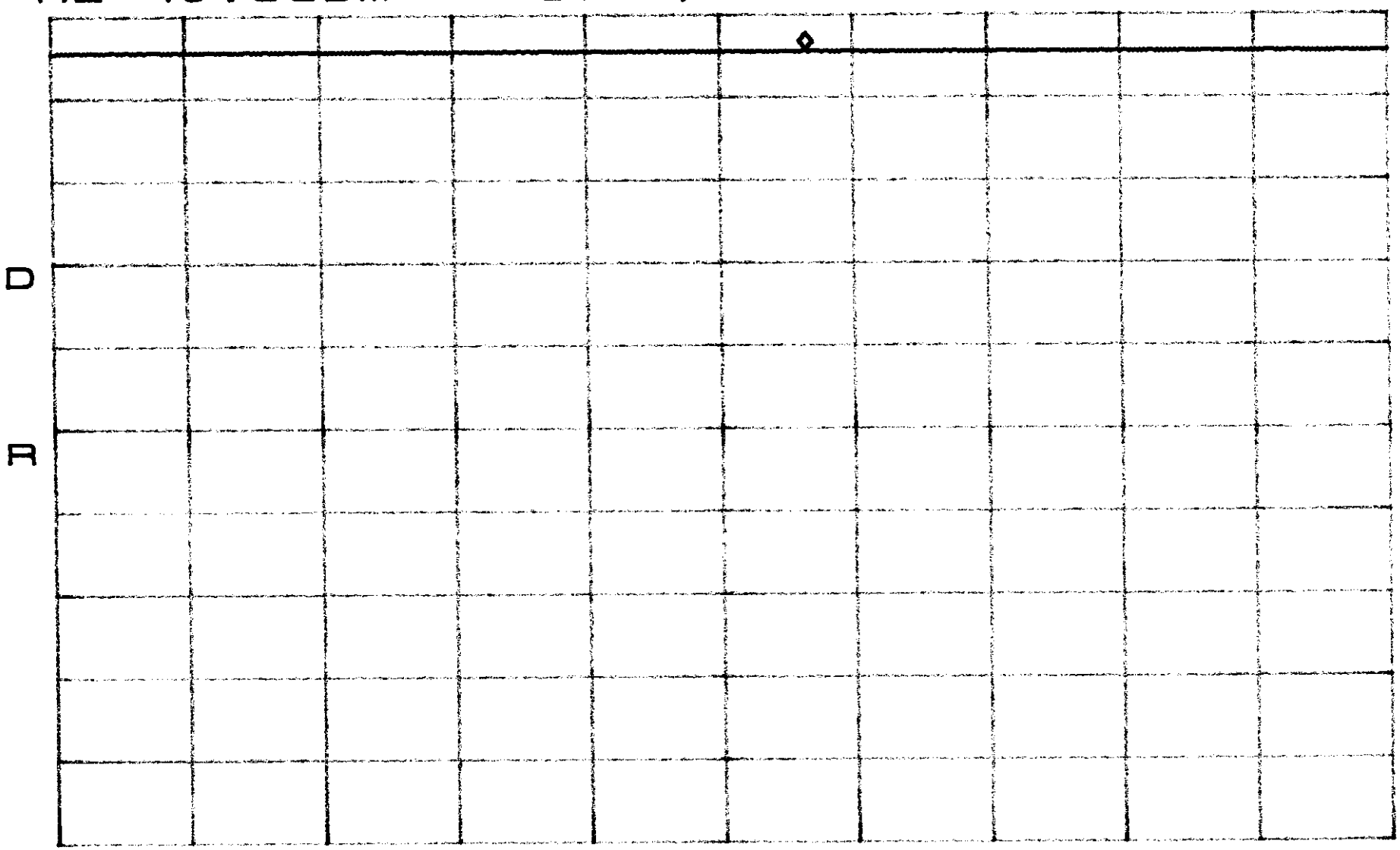
8 of 98
EMR RF AMP TX @ 490MHz 4117H

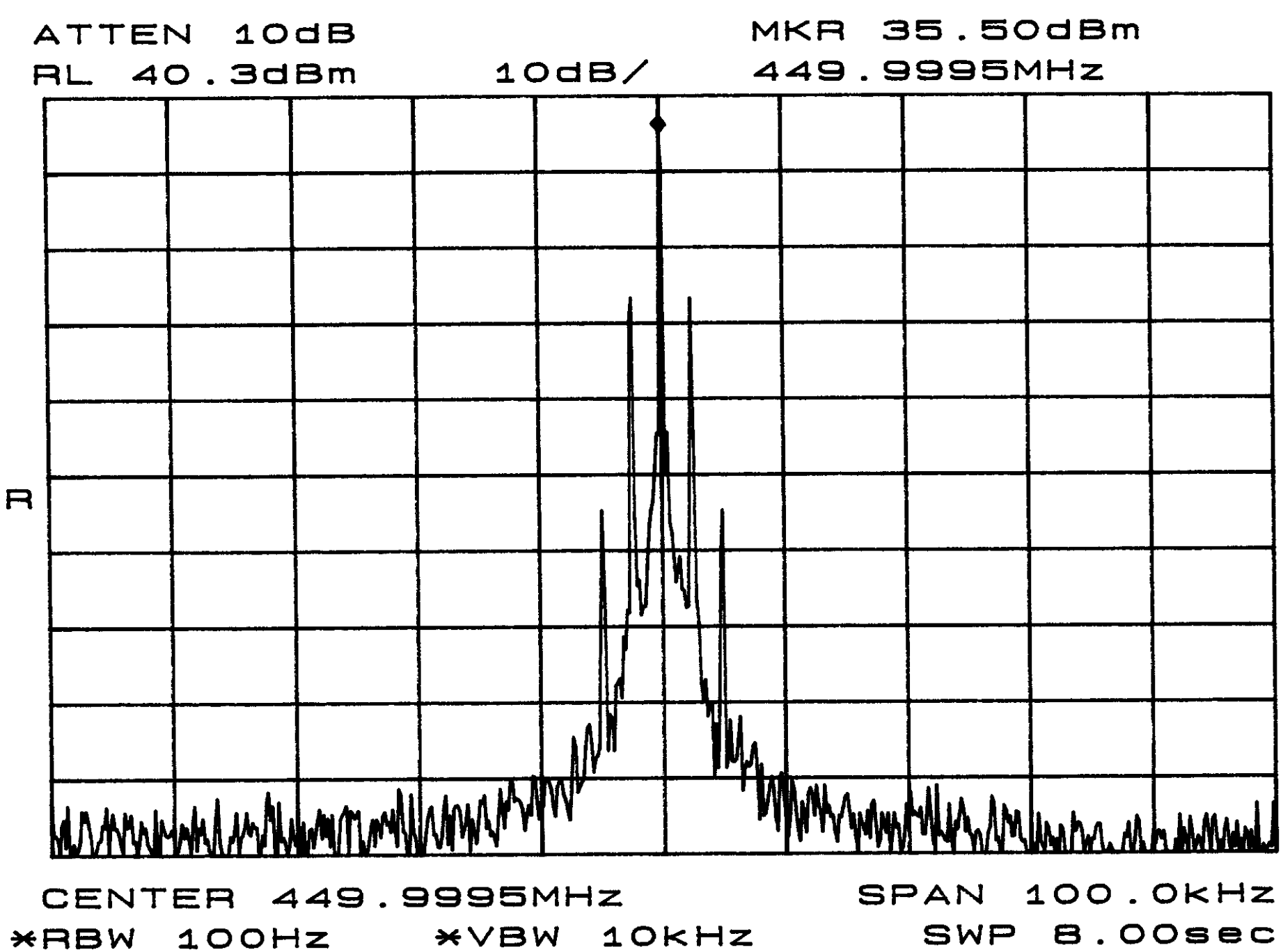


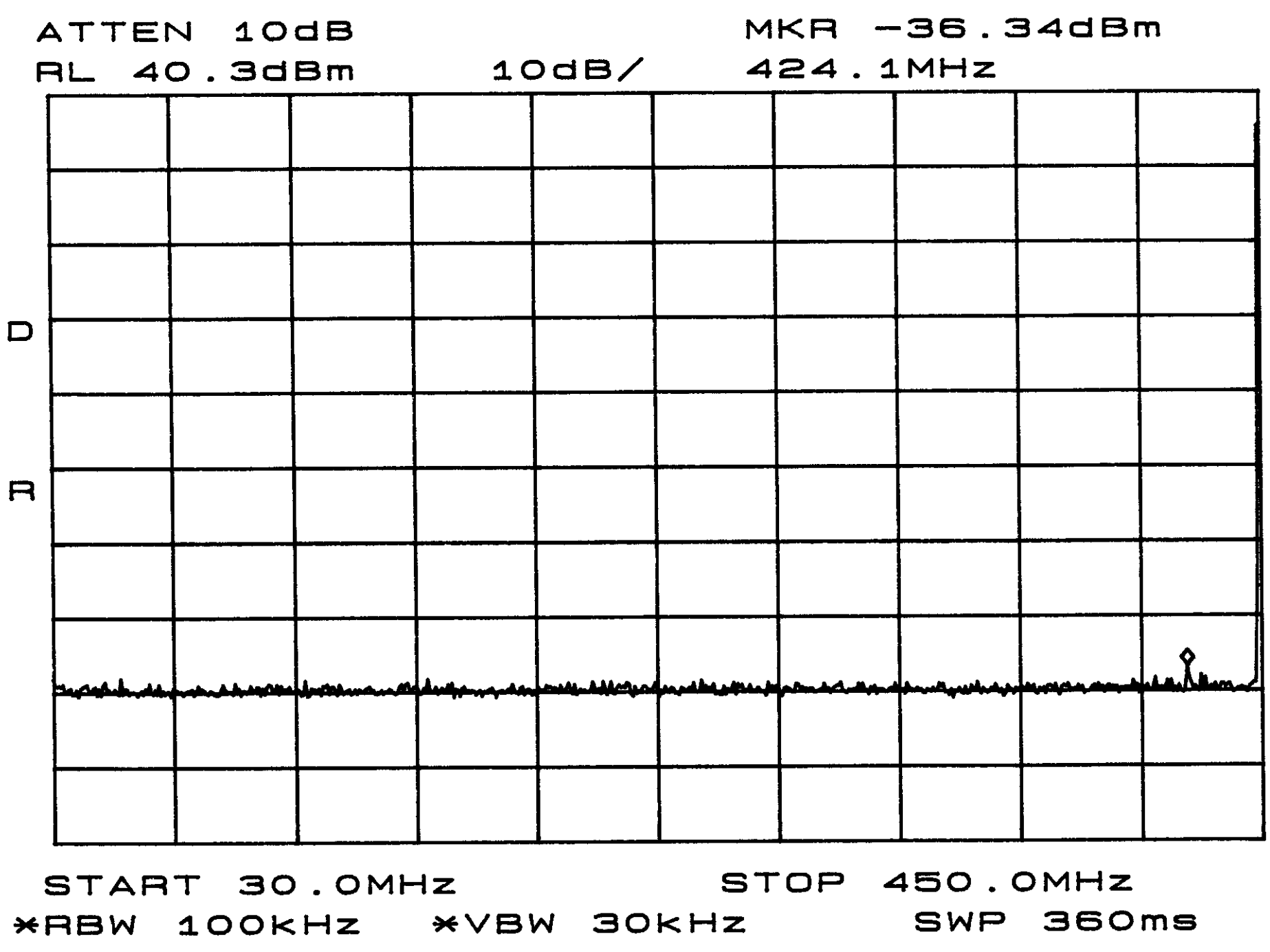
APPENDIX A4

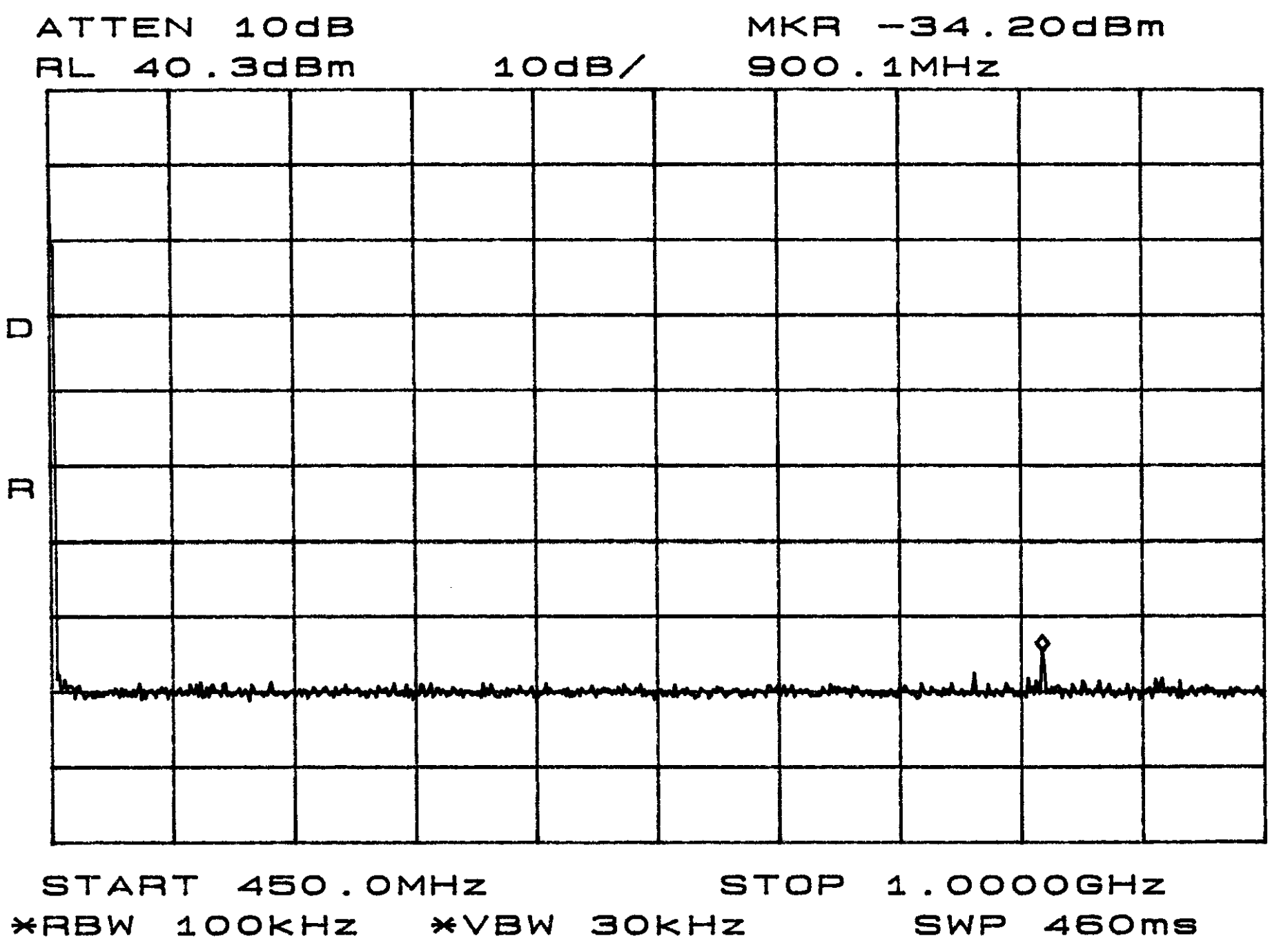
SPURIOUS EMISSIONS PLOT OF INPUT TO AMPLIFIER – 450 MHz

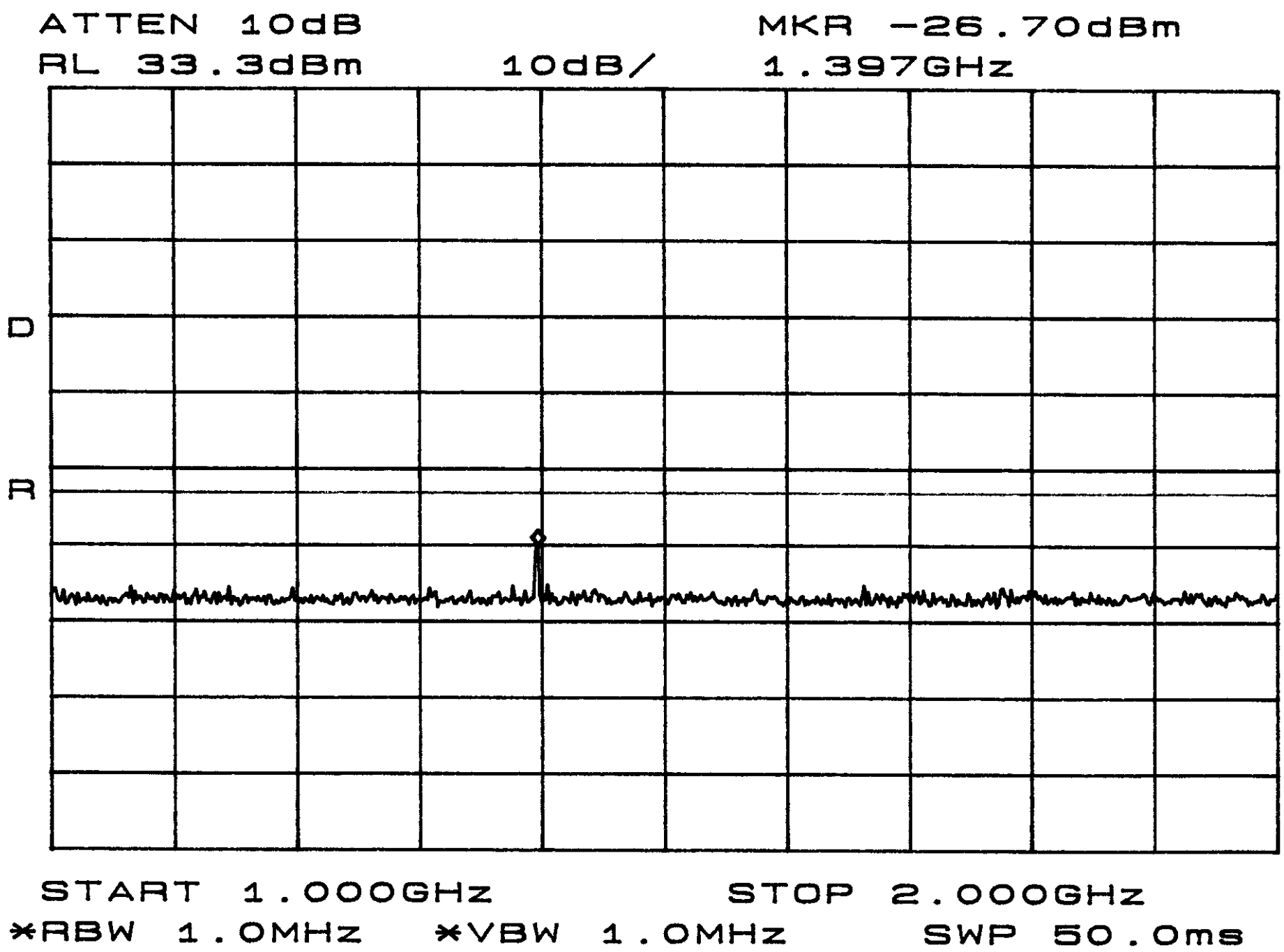

ATTEN 10dB
RL 40.3dBm
10dB/
MKR 34.33dBm
449.99943MHz
R
CENTER 450.00000MHz
SPAN 20.00kHz
*RBW 100Hz
*VBW 10kHz
SWP 1.60sec

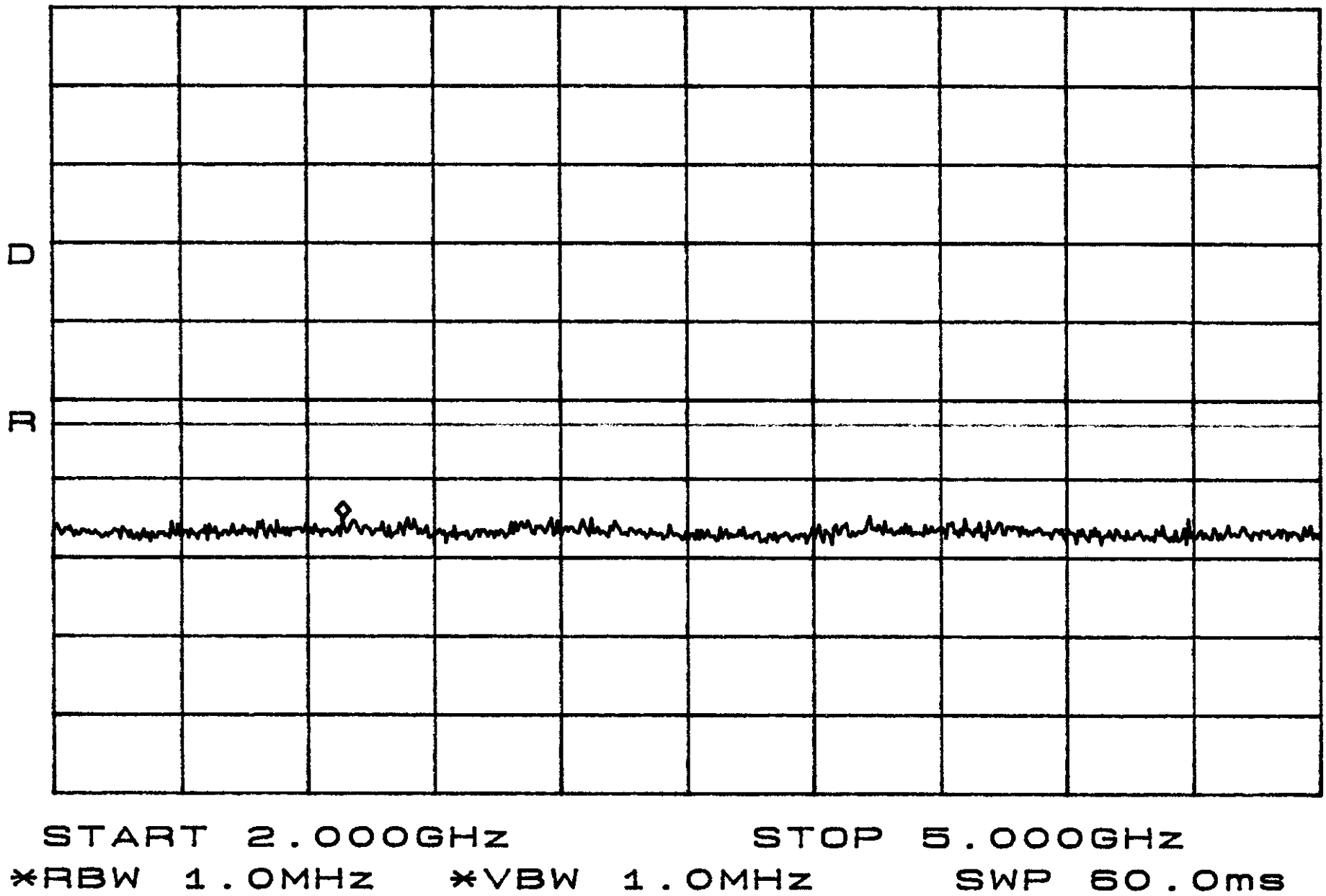

ATTEN 10dB
MKR 36.00dBm
RL 40.3dBm
10dB/
28.250ms
D
R
CENTER 450.000000MHz
SPAN 0Hz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
RL 40.3dBm
10dB/
MKR 35.50dBm
449.9995MHz
R
CENTER 449.9995MHz
SPAN 100.0kHz
*RBW 100Hz
*VBW 10kHz
SWP 8.00sec


ATTEN 10dB
MKR -36.34dBm
RL 40.3dBm
10dB/
424.1MHz
D
R
START 30.0MHz
STOP 450.0MHz
*RBW 100kHz
*VBW 30kHz
SWP 360ms

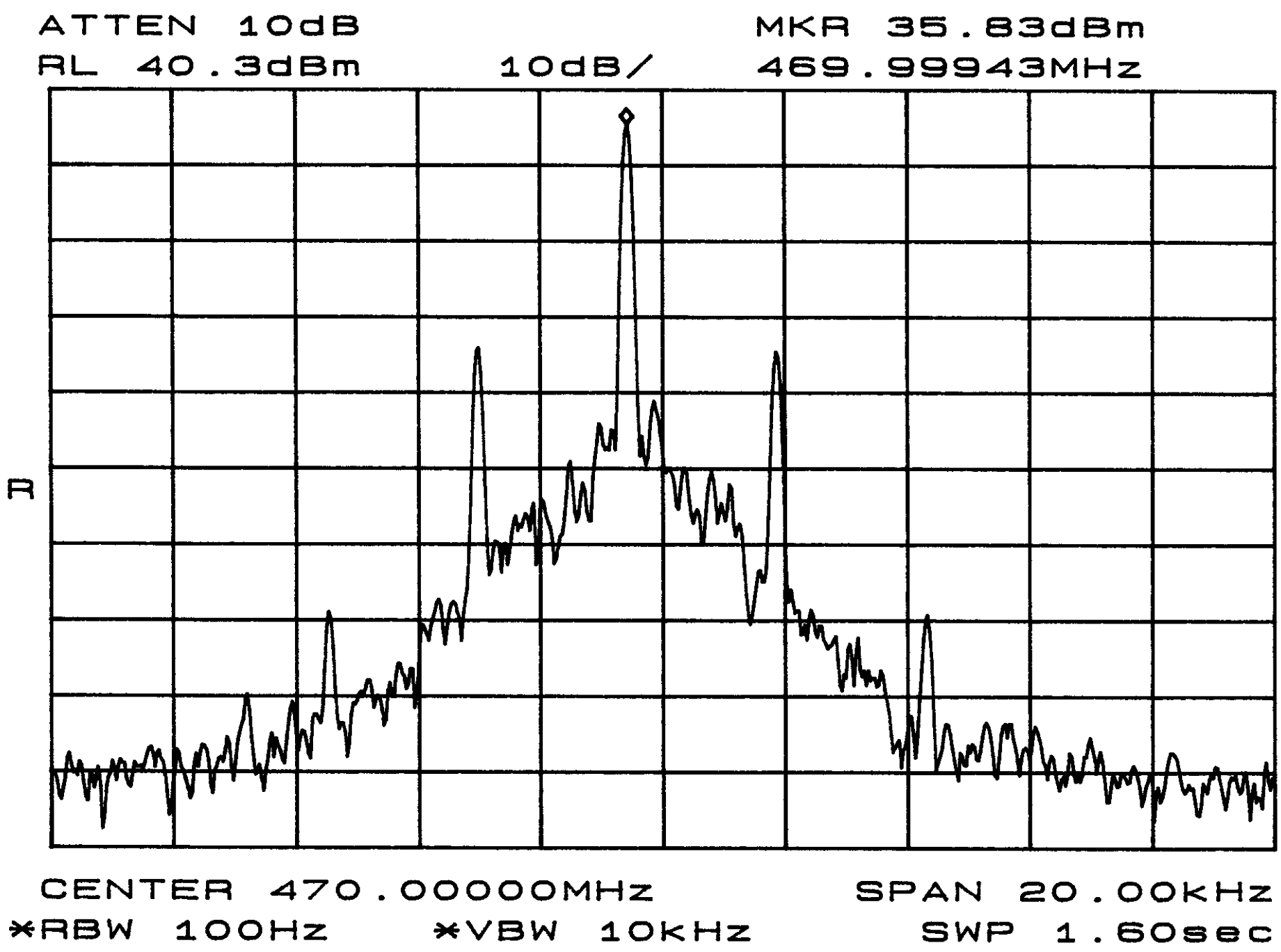

ATTEN 10dB
MKR -34.20dBm
RL 40.3dBm
10dB/
900.1MHz
D
R
START 450.0MHz
STOP 1.0000GHz
*RBW 100KHz
*VBW 30KHz
SWP 460ms

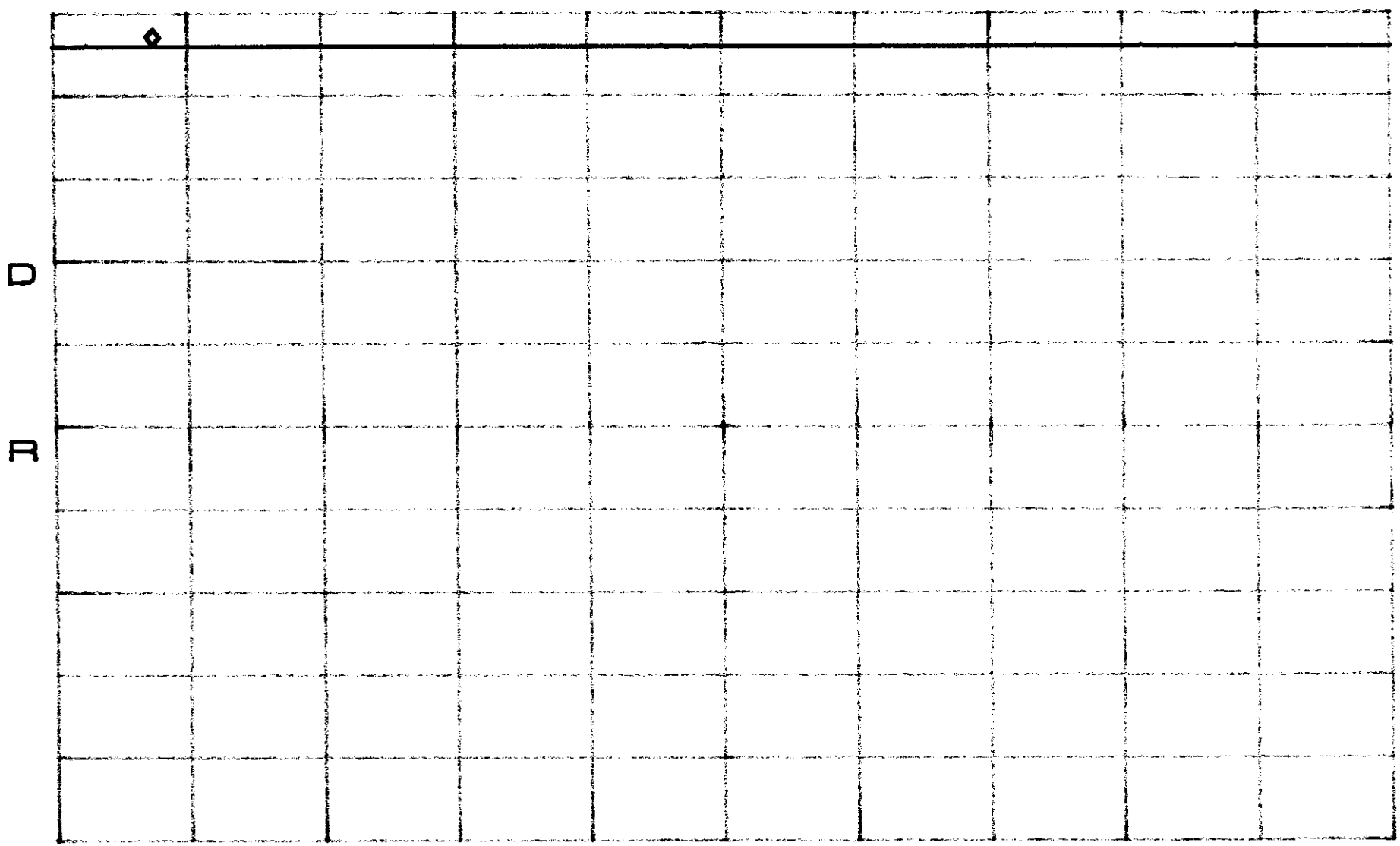

ATTEN 10dB
MKR -26.70dBm
RL 33.3dBm
10dB/
1.397GHz
D
R
START 1.000GHz
STOP 2.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 50.0ms

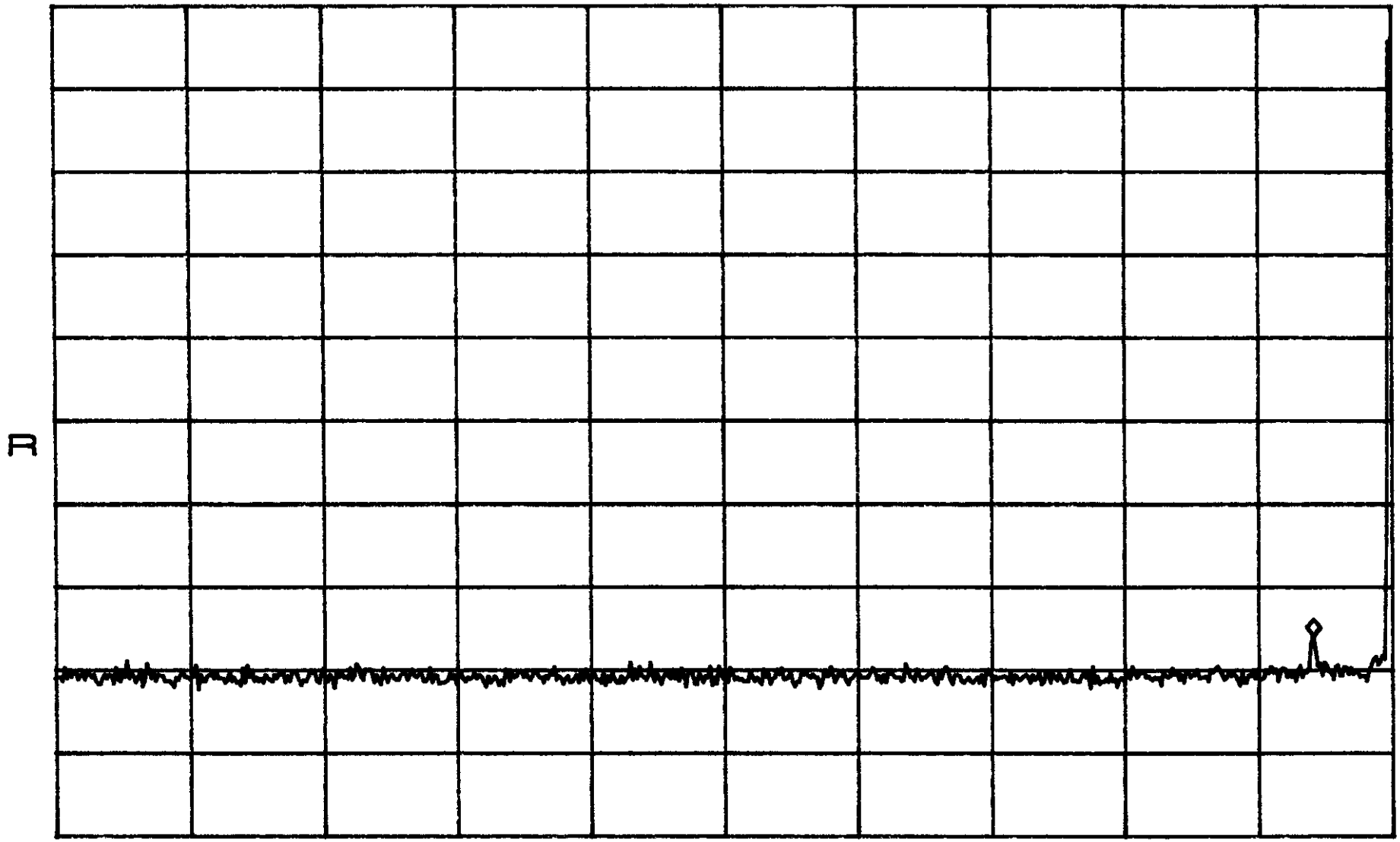

ATTEN 10dB
MKR -31.70dBm
RL 33.3dBm
10dB/
2.685GHz
D
R
START 2.000GHz
STOP 5.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 60.0ms

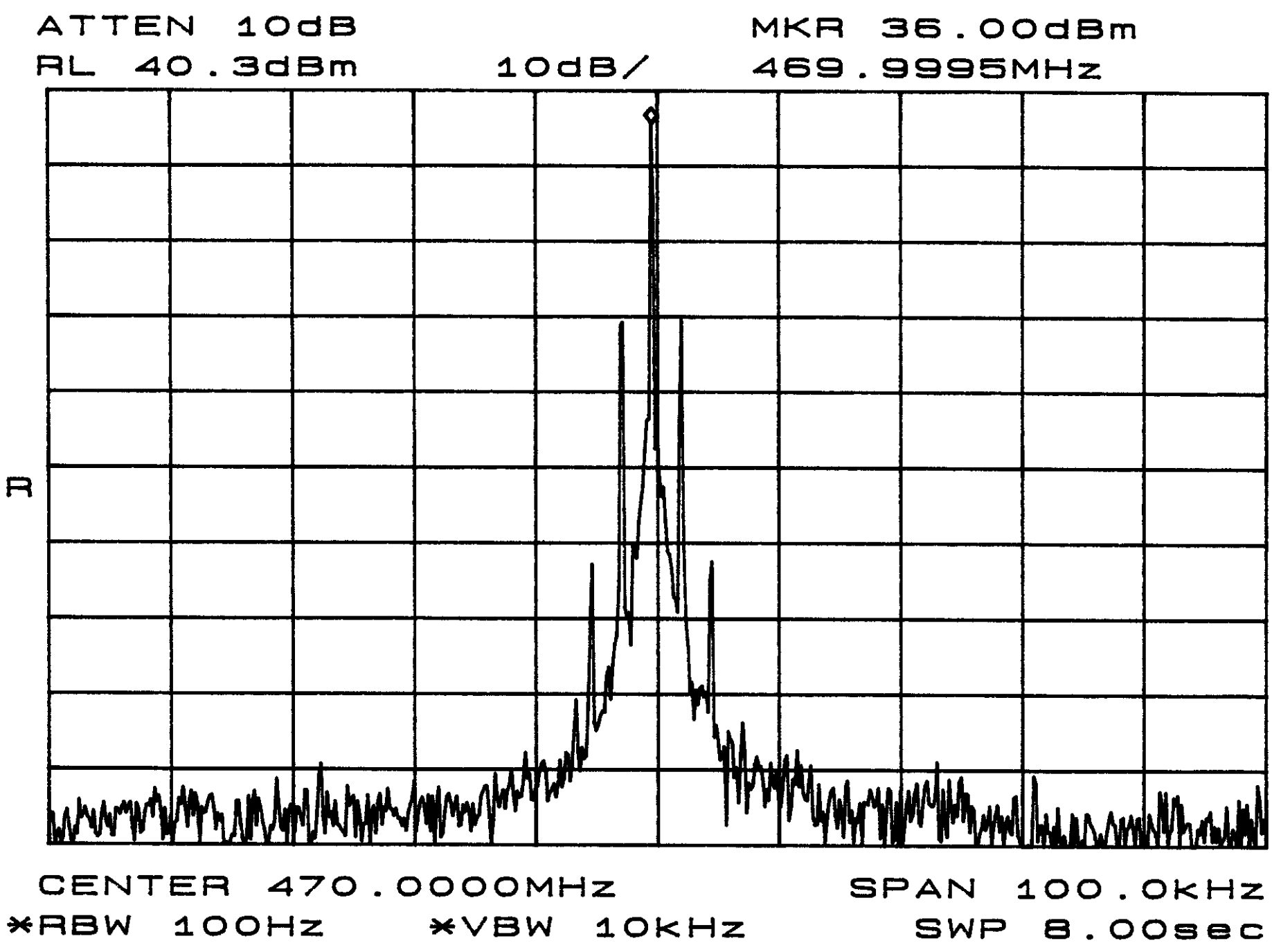
APPENDIX A5

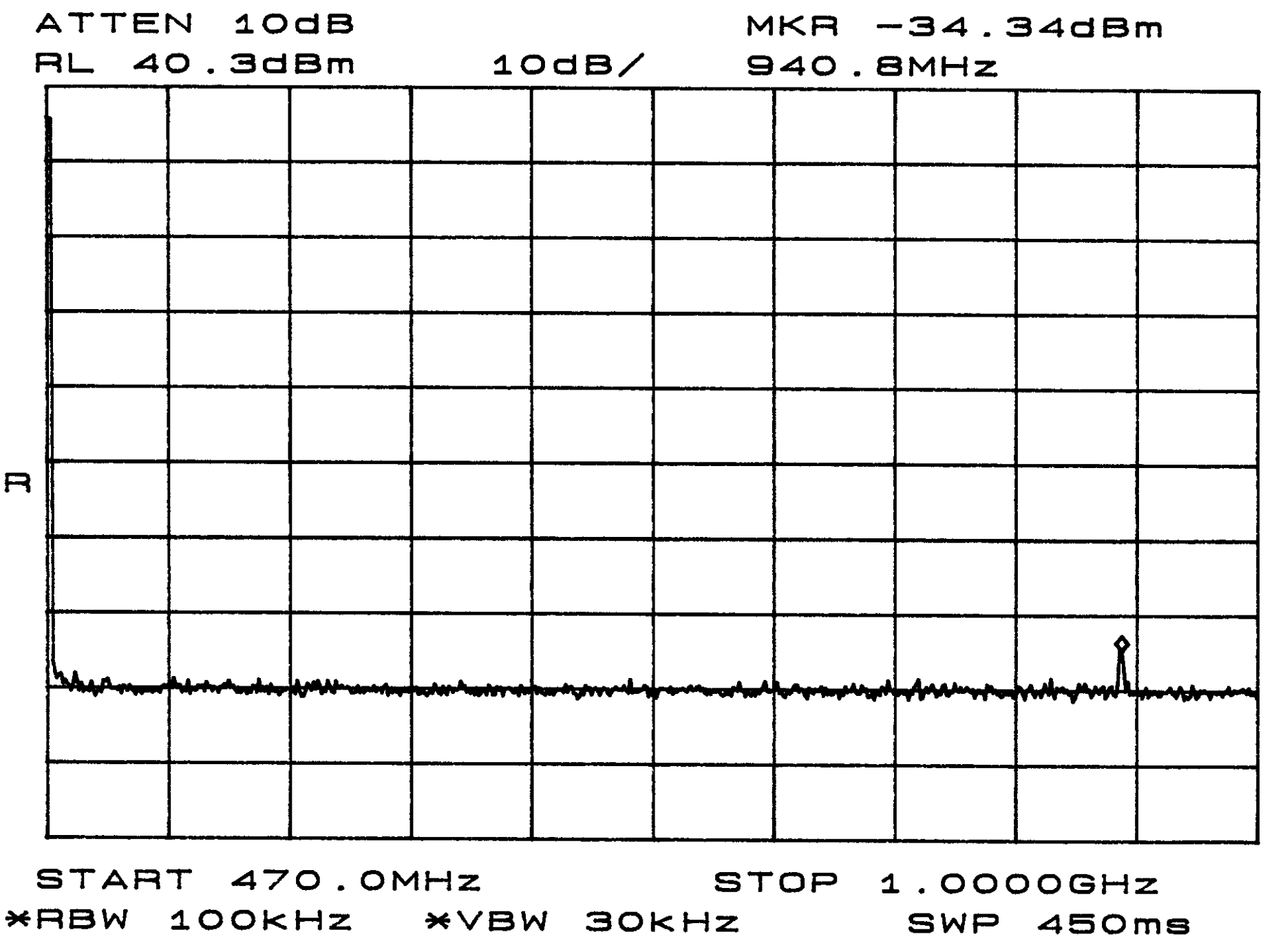
SPURIOUS EMISSIONS PLOT OF INPUT TO AMPLIFIER – 470 MHz

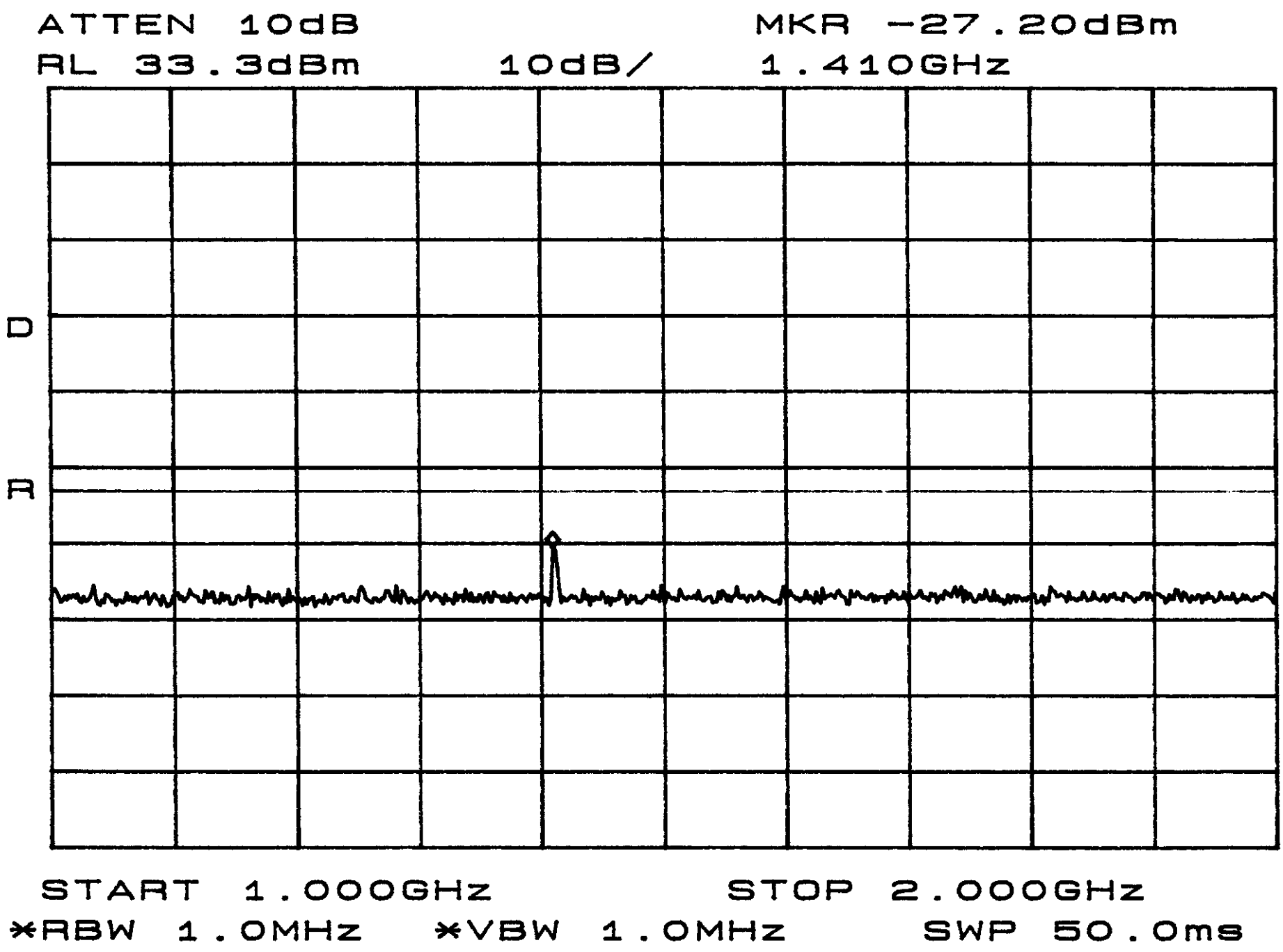

ATTEN 10dB
MKR 35.83dBm
RL 40.3dBm
10dB/
469.99943MHz
R
CENTER 470.00000MHz
SPAN 20.00kHz
*RBW 100Hz
*VBW 10kHz
SWP 1.60sec

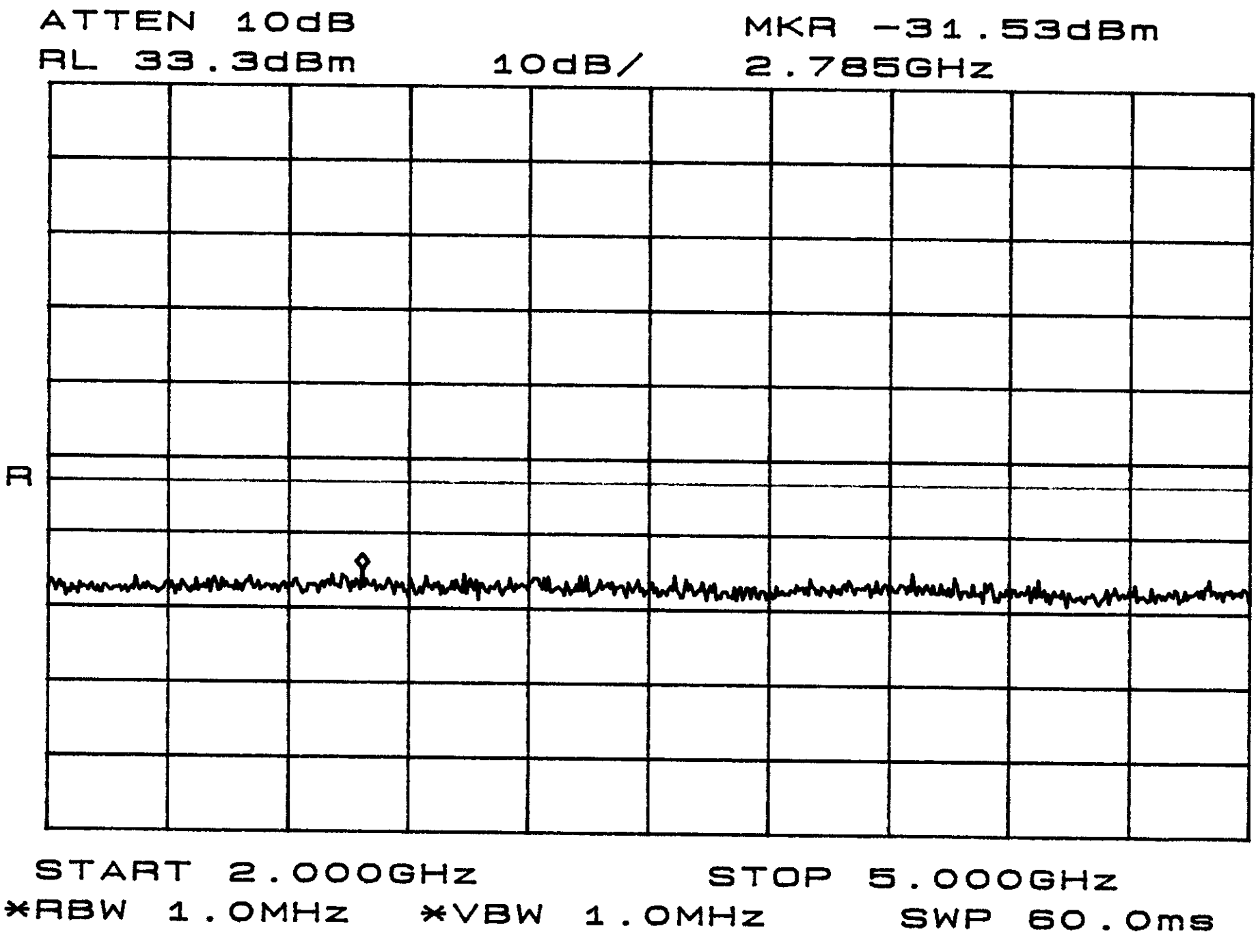

ATTEN 10dB
MKR 36.33dBm
RL 40.3dBm
10dB/
3.750ms
D
R
CENTER 470.000000MHz
SPAN 0Hz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
MKR -35.50dBm
RL 40.3dBm
10dB/
444.3MHz
R
START 30.0MHz
STOP 470.0MHz
*RBW 100kHz
*VBW 30kHz
SWP 370ms


ATTEN 10dB
MKR 36.00dBm
RL 40.3dBm
10dB/
469.9995MHz
R
CENTER 470.0000MHz
SPAN 100.0kHz
*RBW 100Hz
*VBW 10kHz
SWP 8.00sec

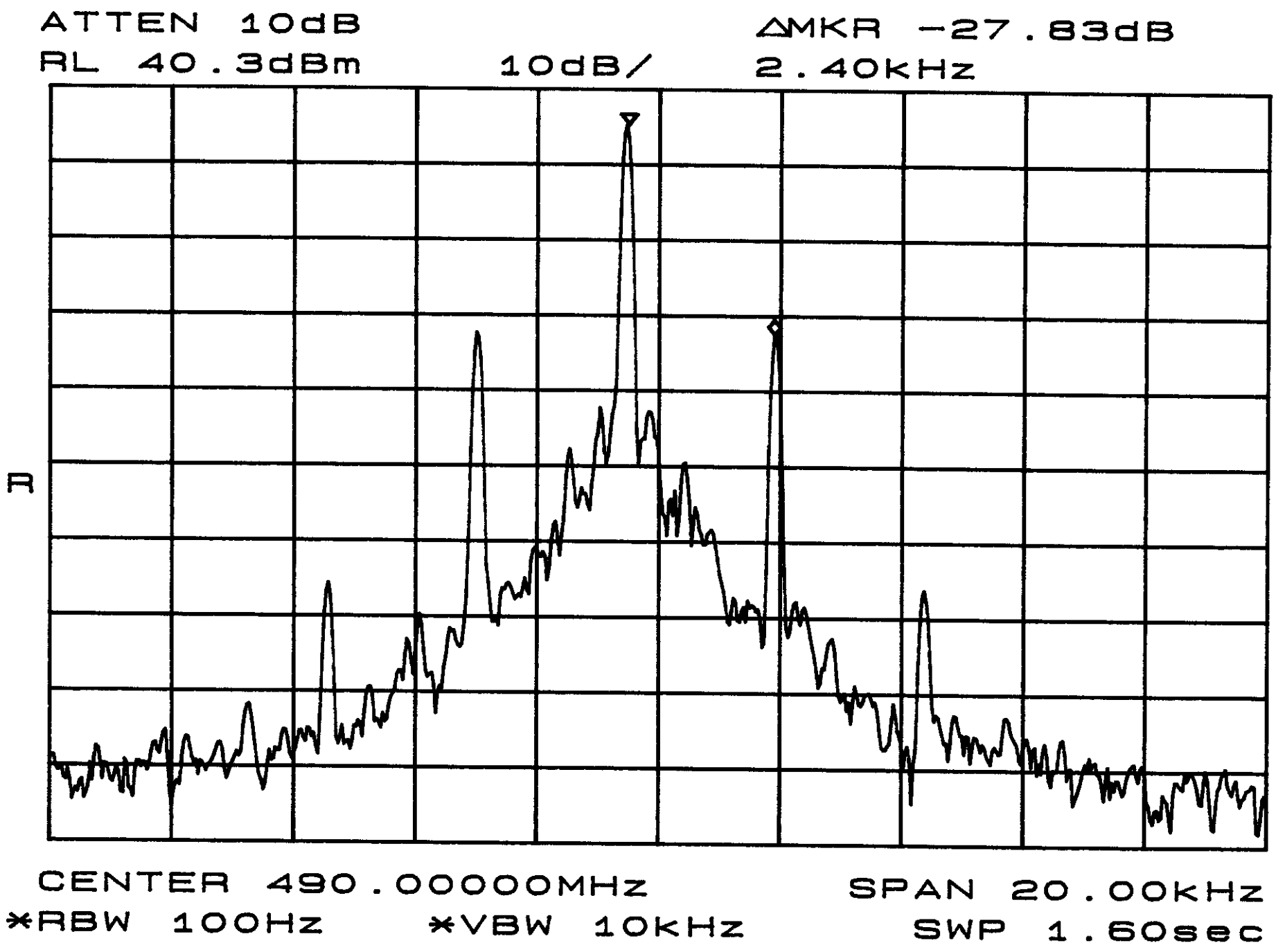

ATTEN 10dB
MKR -34.34dBm
RL 40.3dBm
10dB/
940.8MHz
R
START 470.0MHz
STOP 1.0000GHz
*RBW 100kHz
*VBW 30kHz
SWP 450ms

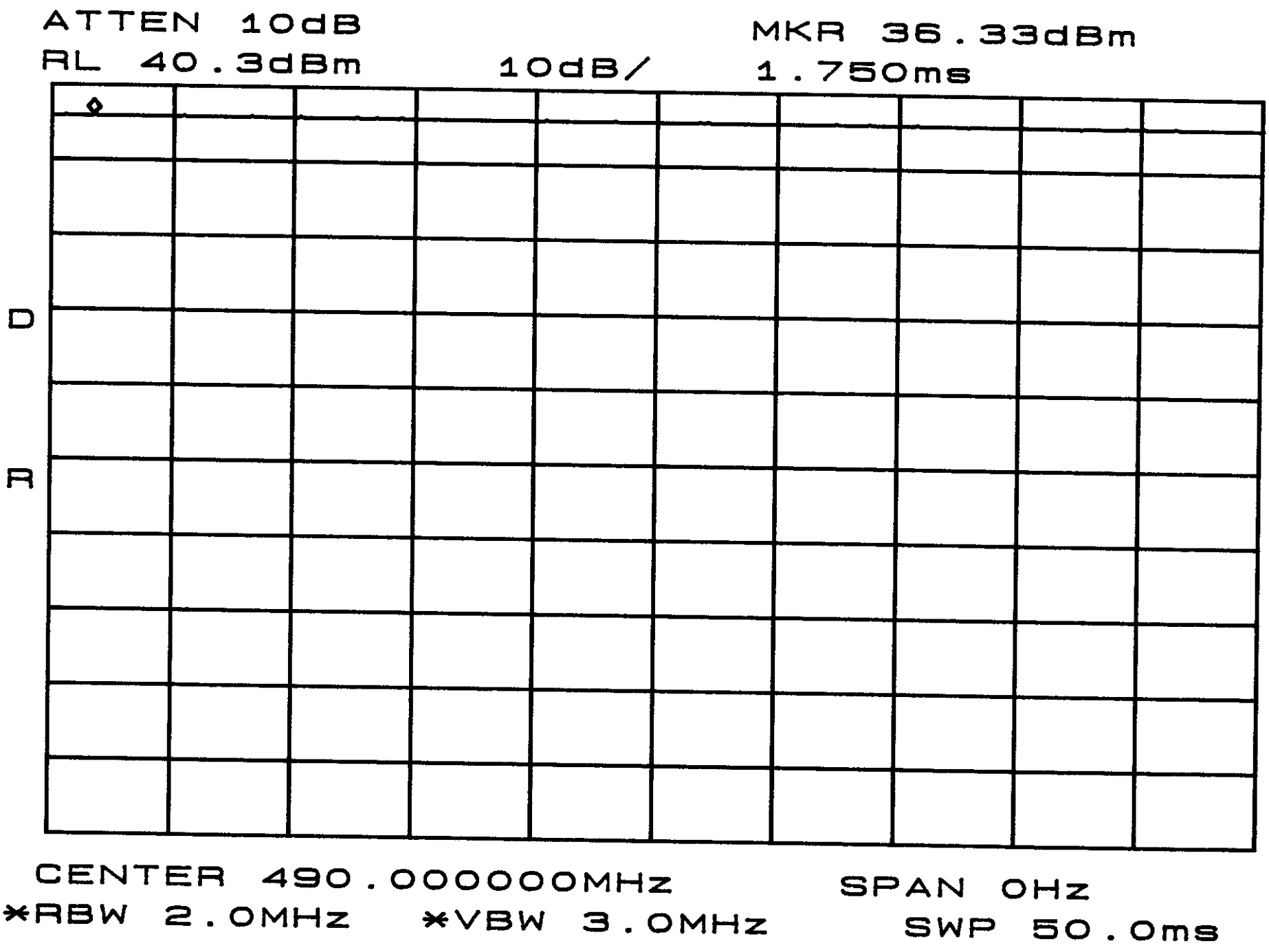

ATTEN 10dB
MKR -27.20dBm
RL 33.3dBm
10dB/
1.410GHz
D
R
START 1.000GHz
STOP 2.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 50.0ms

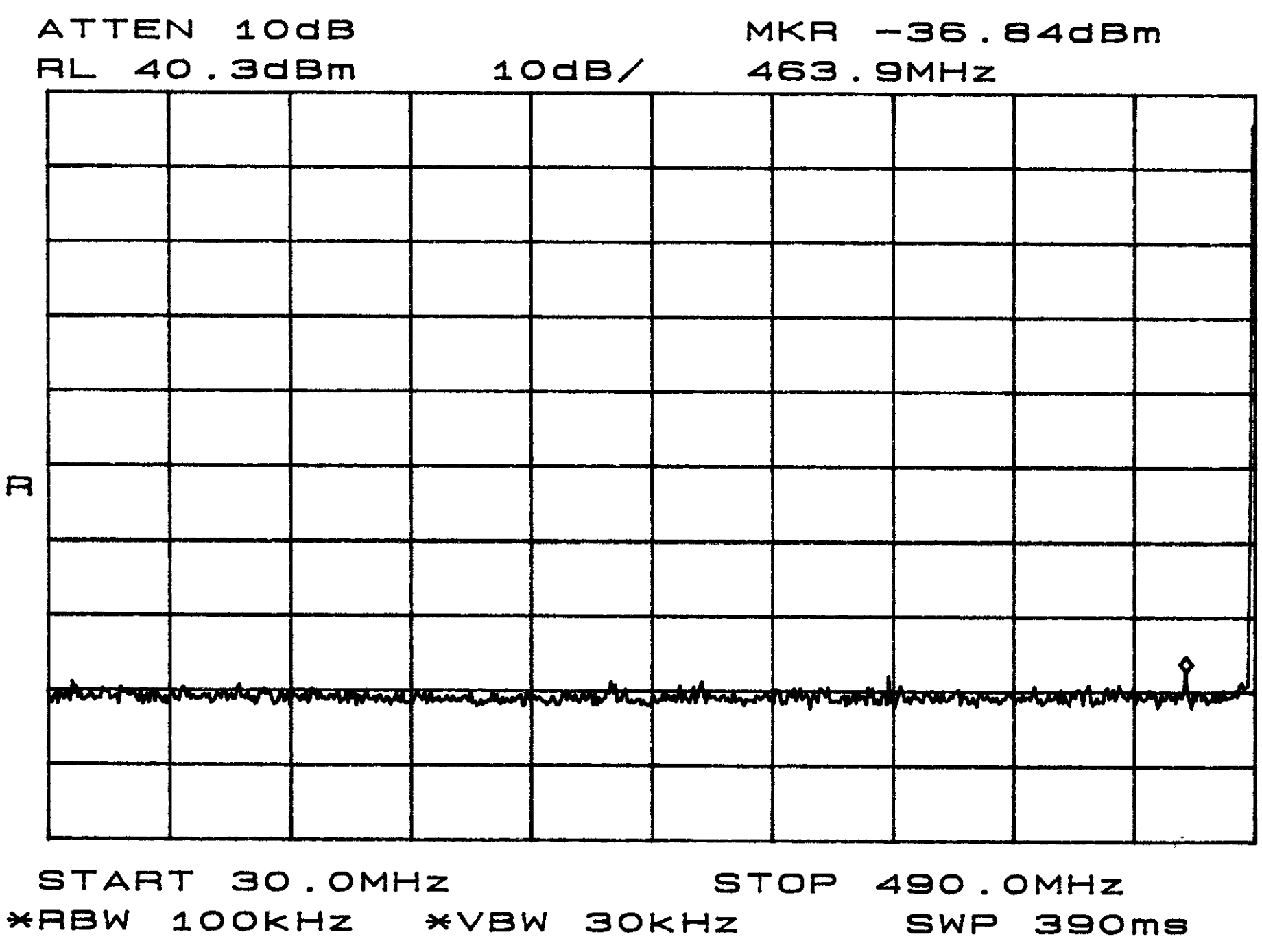

ATTEN 10dB
MKR -31.53dBm
RL 33.3dBm
10dB/
2.785GHz
R
START 2.000GHz
STOP 5.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 60.0ms

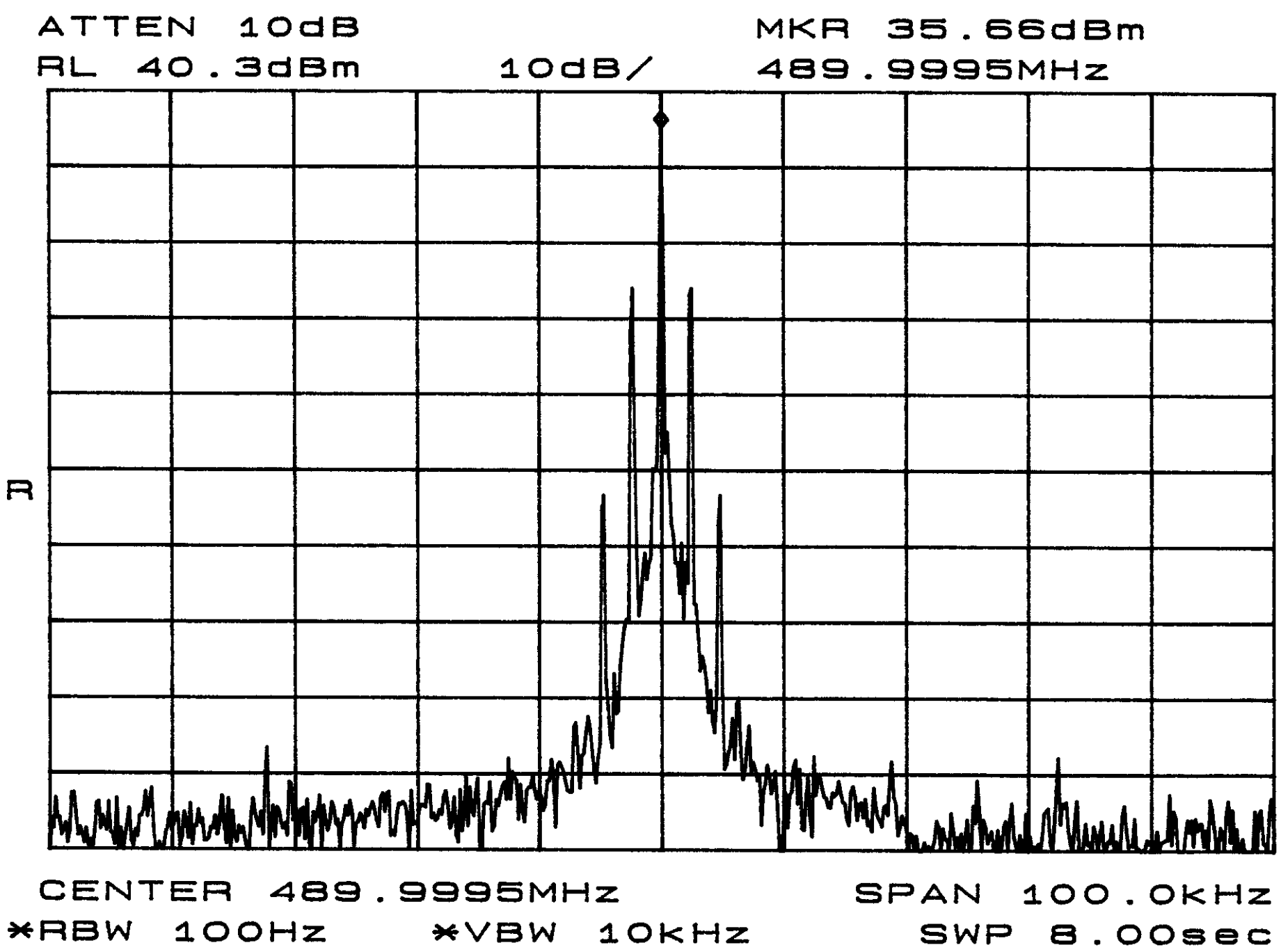
APPENDIX A6

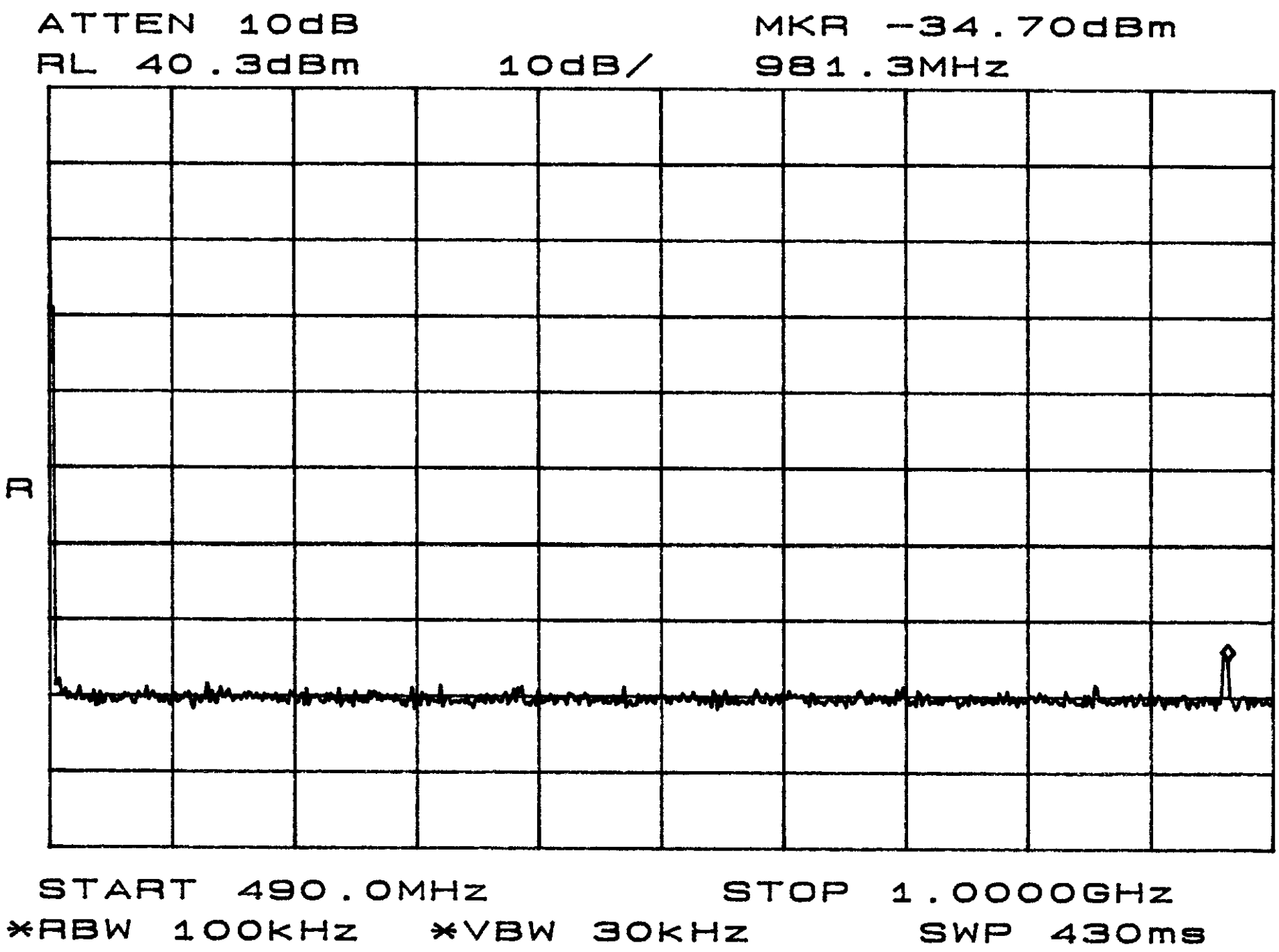
SPURIOUS EMISSIONS PLOT OF INPUT TO AMPLIFIER – 490 MHz

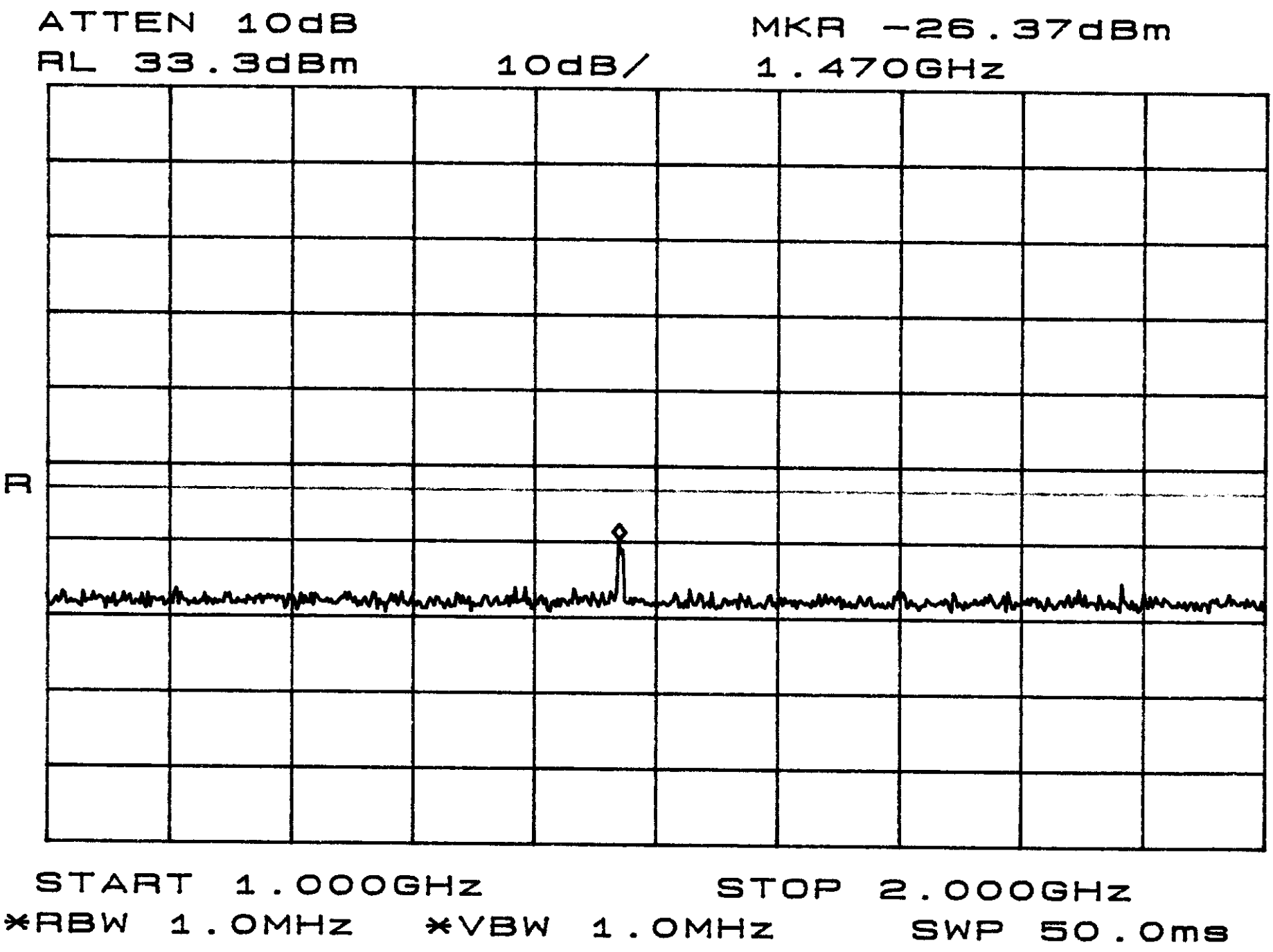

ATTEN 10dB
RL 40.3dBm
10dB/
ΔMKR -27.83dB
2.40kHz
R
CENTER 490.00000MHz
SPAN 20.00kHz
*RBW 100Hz
*VBW 10kHz
SWP 1.60sec

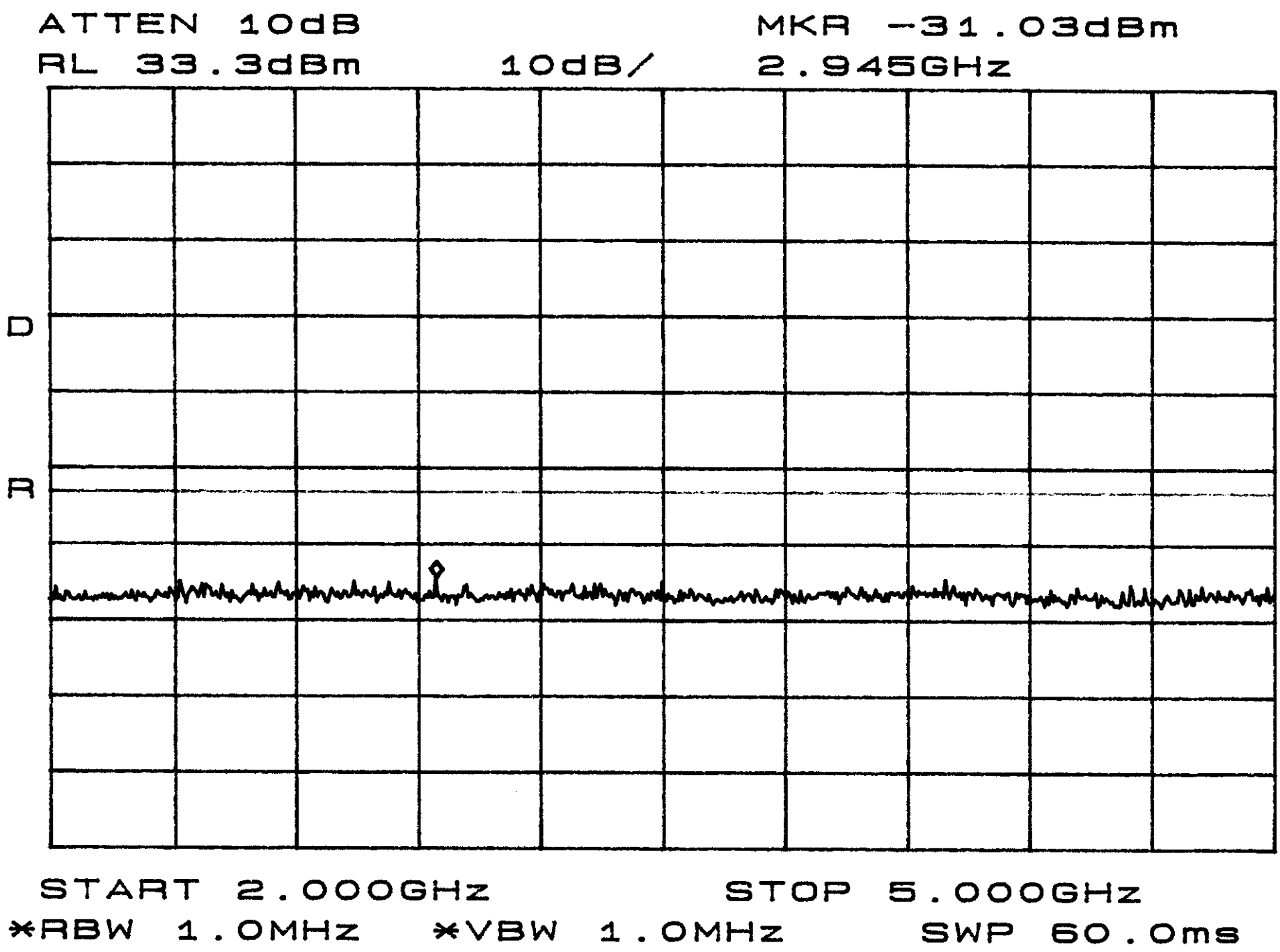

ATTEN 10dB
RL 40.3dBm
10dB/
MKR 36.33dBm
1.750ms
D
R
CENTER 490.000000MHz
SPAN 0Hz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
MKR -36.84dBm
RL 40.3dBm
10dB/
463.9MHz
R
START 30.0MHz
STOP 490.0MHz
*RBW 100KHz
*VBW 30KHz
SWP 390ms


ATTEN 10dB
MKR 35.66dBm
RL 40.3dBm
10dB/
489.9995MHz
R
CENTER 489.9995MHz
SPAN 100.0kHz
*RBW 100Hz
*VBW 10kHz
SWP 8.00sec


ATTEN 10dB
MKR -34.70dBm
RL 40.3dBm
10dB/
981.3MHz
R
START 490.0MHz
STOP 1.0000GHz
*RBW 100kHz
*VBW 30kHz
SWP 430ms


ATTEN 10dB
MKR -26.37dBm
RL 33.3dBm
10dB/
1.470GHz
R
START 1.000GHz
STOP 2.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 50.0ms


ATTEN 10dB
MKR -31.03dBm
RL 33.3dBm
10dB/
2.945GHz
D
R
START 2.000GHz
STOP 5.000GHz
*RBW 1.0MHz
*VBW 1.0MHz
SWP 60.0ms

APPENDIX B

STATEMENT OF MEASUREMENT UNCERTAINTY

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:
A = Antenna calibration uncertainty, in dB = 2 dB
B = Spectrum Analyzer uncertainty, in dB = 1 dB
C = Site uncertainty, in dB = 4 dB
n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB