Intertek Testing Services

APPLICATION FOR FCC CERTIFICATION

X Wire

Wireless Transmitter

Model: XT904

FCC ID: NH491699TX904

Report # J98025862

Number of Pages: 13

Date of Report: October 12, 1998

Table of Contents

0.0 **Summary of Test Results**

X Wire - Model No.: XT904
FCC ID: NH491699TX904

TEST	REFERENCE	RESULTS
Radiated Emission	15.249	Complies
Conducted Emission	15.207	Not Applicable
Antenna Requirement	15.203	Complies

Test Engineer: Xi-Ming Yang Date: 10/20/98
Xi-Ming Yang

EMC Site Mgr.: David Chernomordik Date: 10/20/98
David Chernomordik

1.0 General Description

1.1 Product Description

The XWire Model XT904 is a handheld wireless digital transmitter.

Please refer to the attached reference manual for more details.

1.2 Related Submittal(s) Grants

This is an Application for Certification of a low power transmitter. One transmitter is included in this Application. This specific report details the emission characteristics of transmitter.

The model number for the receiver associated with this transmitter is XR904. The receiver is subject to the DoC authorization process. A DoC report is now being prepared for the receiver.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is Site 1. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

2.0 System Test Configuration

2.1 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For the measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

2.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

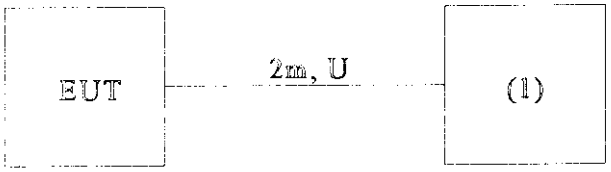
For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

2.3 System Test Configuration

2.3.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	IR Dynamic Microphone	MC103	N/A	N/A

2.3.2 Block Diagram of Test Setup



* = EUT	S = Shielded;	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	

2.4 Equipment Modification

Any modifications installed previous to testing by X Wire will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

2.5 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

3.0 Emission Results

AC line conducted emission measurements were performed from 0.45 MH to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for > 1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

FS = RR + LF

where FS = Field Strength in dB(μV/m)
RR = RA - AG in dB(μV)
LF = CF + AF in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB(μV/m). This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dB(μV) AF = 7.4 dB/m
RR = 23.0 dB(μV) CF = 1.6 dB
LF = 9.0 dB AG = 29.0 dB

FS = RR + LF
FS = 23 + 9 = 32 dB(μV/m)

Level in μV/m = Common Antilogarithm {[32 dB(μV/m)]/20} = 39.8 μV/m

3.3 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	**Passed** by 0.8 dB at 906 MHz

Note: a) All emissions not reported are at least 20 dB below the limits

ITS Intertek Testing Services

Company: Xwire
Project #: J98025863
Model: TX904 (TX @ 906 MHz)
Engineer: Xi-Ming Yang
Date of test: September 14, 1998

FCC 15.249 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
906.0	V	67.5	23.6	2.1	0.0	0.0	93.2	94.0	-0.8
1811.9	V	48.0*	26.5	2.3	-29.3	0.0	47.5	74.0	-26.5
1811.9	V	39.1	26.5	2.3	-29.3	0.0	38.6	54.0	-15.4
2718.0	V	49.0*	29.0	2.3	-28.2	0.0	52.1	74.0	-21.9
2718.0	V	41.2	29.0	2.3	-28.2	0.0	44.3	54.0	-9.7
3623.4	H	47.0*	31.3	2.8	-27.8	0.0	53.3	74.0	-20.7
3623.4	H	38.8	31.3	2.8	-27.8	0.0	45.1	54.0	-8.9
4529.4	V	46.0*	32.1	3.2	-27.9	0.0	53.4	74.0	-20.6
4529.4	V	37.2	32.1	3.2	-27.9	0.0	44.6	54.0	-9.4
5434.7	H	34.0*	34.4	3.5	-28.8	0.0	43.1	74.0	-30.9
5434.7	H	24.8	34.4	3.5	-28.8	0.0	33.9	54.0	-20.1
6340.8	V	46.0*	34.3	4.0	-28.0	0.0	56.3	74.0	-17.7
6340.8	V	37.0	34.3	4.0	-28.0	0.0	47.3	54.0	-6.7
7246.4	V	40.0*	37.0	4.5	-28.0	0.0	53.5	74.0	-20.5
7246.4	V	31.0	37.0	4.5	-28.0	0.0	44.5	54.0	-9.5
8153.5	H	33.0*	36.9	4.8	-27.2	0.0	47.5	74.0	-26.5
8153.5	H	24.0	36.9	4.8	-27.2	0.0	38.5	54.0	-15.5
9058.5	H	33.0*	38.2	5.2	-26.8	0.0	49.6	74.0	-24.4
9058.5	H	25.0	38.2	5.2	-26.8	0.0	41.6	54.0	-12.4

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * is Peak-reading.**

ITS Intertek Testing Services

Company: Xwire
Project #: J98025863
Model: TX904 (Tx @ 912 MHz)
Engineer: Xi-Ming Yang
Date of test: September 14, 1998

FCC 15.249 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
912.0	V	67.2	23.6	2.1	0.0	0.0	92.9	94.0	-1.1
1823.7	V	40.0*	26.5	2.3	-29.3	0.0	39.5	74.0	-34.5
1823.7	V	30.0	26.5	2.3	-29.3	0.0	29.5	54.0	-24.5
2735.9	H	48.0*	29.0	2.3	-28.2	0.0	51.1	74.0	-22.9
2735.9	H	39.9	29.0	2.3	-28.2	0.0	43.0	54.0	-11.0
3647.4	H	45.0*	31.3	2.8	-27.8	0.0	51.3	74.0	-22.7
3647.4	H	36.0	31.3	2.8	-27.8	0.0	42.3	54.0	-11.7
4559.2	V	45.0*	32.1	3.2	-27.9	0.0	52.4	74.0	-21.6
4559.2	V	35.0	32.1	3.2	-27.9	0.0	42.4	54.0	-11.6
5470.7	V	39.0*	34.4	3.5	-28.8	0.0	48.1	74.0	-25.9
5470.7	V	28.0	34.4	3.5	-28.8	0.0	37.1	54.0	-16.9
6382.7	V	41.0*	34.3	4.0	-28.0	0.0	51.3	74.0	-22.7
6382.7	V	32.6	34.3	4.0	-28.0	0.0	42.9	54.0	-11.1
7297.9	V	38.0*	37.0	4.5	-28.0	0.0	51.5	74.0	-22.5
7297.9	V	29.7	37.0	4.5	-28.0	0.0	43.2	54.0	-10.8
8206.4	H	34.0*	36.9	4.8	-27.2	0.0	48.5	74.0	-25.5
8206.4	H	25.0	36.9	4.8	-27.2	0.0	39.5	54.0	-14.5
9118.4	V	35.0*	38.2	5.2	-26.8	0.0	51.6	74.0	-22.4
9118.4	V	25.0	38.2	5.2	-26.8	0.0	41.6	54.0	-12.4

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * is Peak-reading.**

ITS Intertek Testing Services

Company: Xwire
Project #: J98025863
Model: TX904 (Tx @ 924 MHz)
Engineer: Xi-Ming Yang
Date of test: September 14, 1998

FCC 15.249 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
924.0	V	67.4	23.6	2.1	0.0	0.0	93.1	94.0	-0.9
1848.0	H	50.0*	26.5	2.3	-29.3	0.0	49.5	74.0	-24.5
1848.0	H	41.0	26.5	2.3	-29.3	0.0	40.5	54.0	-13.5
2771.3	V	55.0*	29.0	2.3	-28.2	0.0	58.1	74.0	-15.9
2771.3	V	46.0	29.0	2.3	-28.2	0.0	49.1	54.0	-4.9
3696.9	V	45.0*	31.3	2.8	-27.8	0.0	51.3	74.0	-22.7
3696.9	V	36.2	31.3	2.8	-27.8	0.0	42.5	54.0	-11.5
4619.4	V	45.0*	32.1	3.2	-27.9	0.0	52.4	74.0	-21.6
4619.4	V	36.0	32.1	3.2	-27.9	0.0	43.4	54.0	-10.6
5543.2	H	40.0*	34.4	3.5	-28.8	0.0	49.1	74.0	-24.9
5543.2	H	31.0	34.4	3.5	-28.8	0.0	40.1	54.0	-13.9
6467.0	V	37.0*	34.3	4.0	-28.0	0.0	47.3	74.0	-26.7
6467.0	V	28.6	34.3	4.0	-28.0	0.0	38.9	54.0	-15.1
7390.8	V	38.0*	37.0	4.5	-28.0	0.0	51.5	74.0	-22.5
7390.8	V	29.0	37.0	4.5	-28.0	0.0	42.5	54.0	-11.5
8314.8	H	34.0*	36.9	4.8	-27.2	0.0	48.5	74.0	-25.5
8314.8	H	25.0	36.9	4.8	-27.2	0.0	39.5	54.0	-14.5
9238.8	H	34.0*	38.2	5.2	-26.8	0.0	50.6	74.0	-23.4
9238.8	H	25.0	38.2	5.2	-26.8	0.0	41.6	54.0	-12.4

Note:
1. All measurement were made at 3 meters
2. Negative signs (-) in the margin column signify levels below the limit.
3. Reading with * is Peak-reading.

ITS Intertek Testing Services

Company: Xwire
Project #: J98025863
Model: TX904
Engineer: Xi-Ming Yang
Date of test: September 14, 1998

FCC 15 Class B Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
32.0	V	15.0	13.5	0.4	0.0	0.0	28.9	40.0	-11.1
120.0	V	16.0	9.8	1.0	0.0	0.0	26.8	43.5	-16.7
128.0	V	13.0	11.2	1.0	0.0	0.0	25.2	43.5	-18.3
160.0	V	14.0	9.8	1.1	0.0	0.0	24.9	43.5	-18.6
255.9	H	15.8	13.3	1.2	0.0	0.0	30.3	46.0	-15.7
320.0	H	10.7	15.5	1.5	0.0	0.0	27.7	46.0	-18.3
400.0	H	6.6	16.9	1.6	0.0	0.0	25.1	46.0	-20.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * is Peak-reading.**

3.5 Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	**Not applicable, the EUT is a battery powered device.**

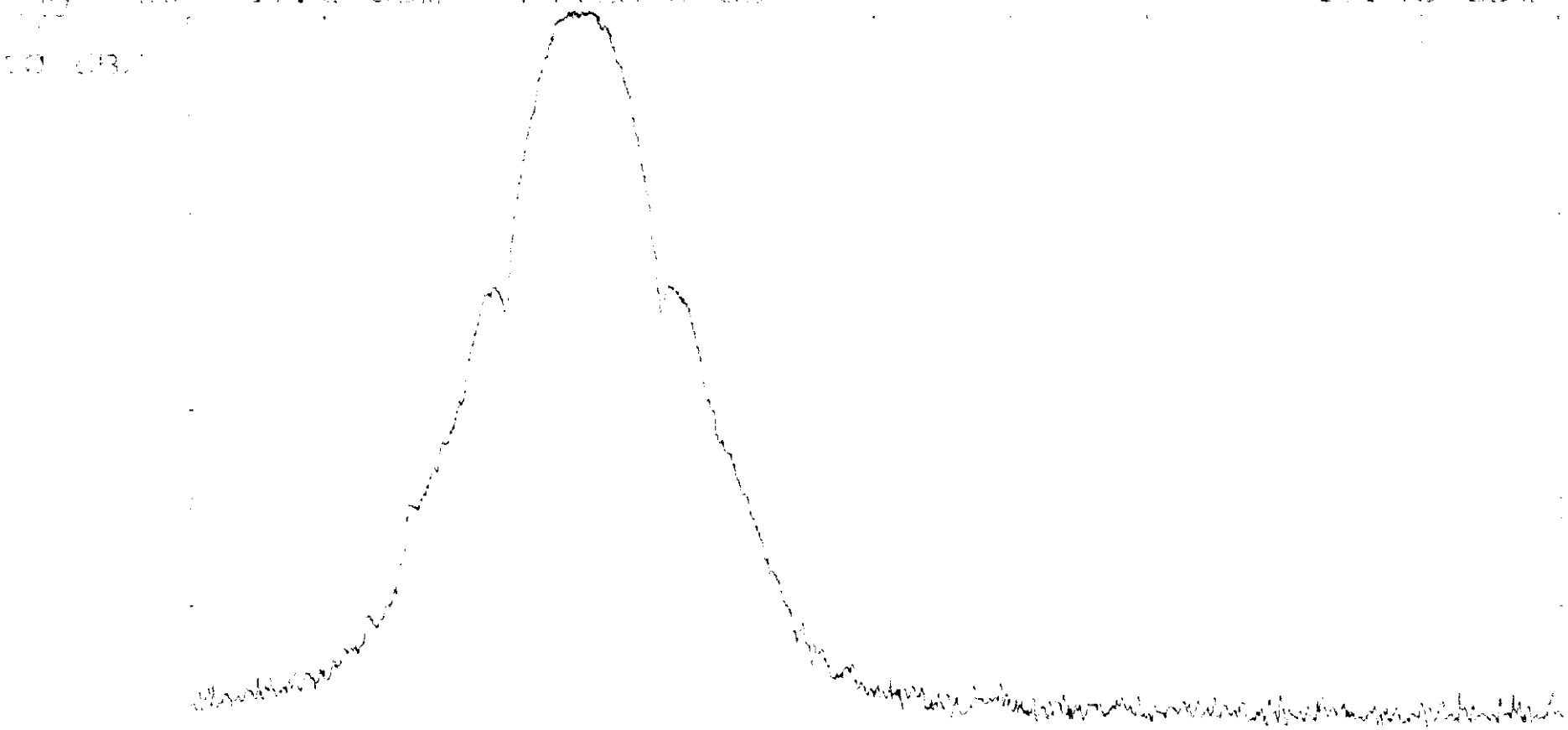
Note: a) A complete scan from 0.45 - 30 MHz was made.

4.0 Out of Band Emission Plot

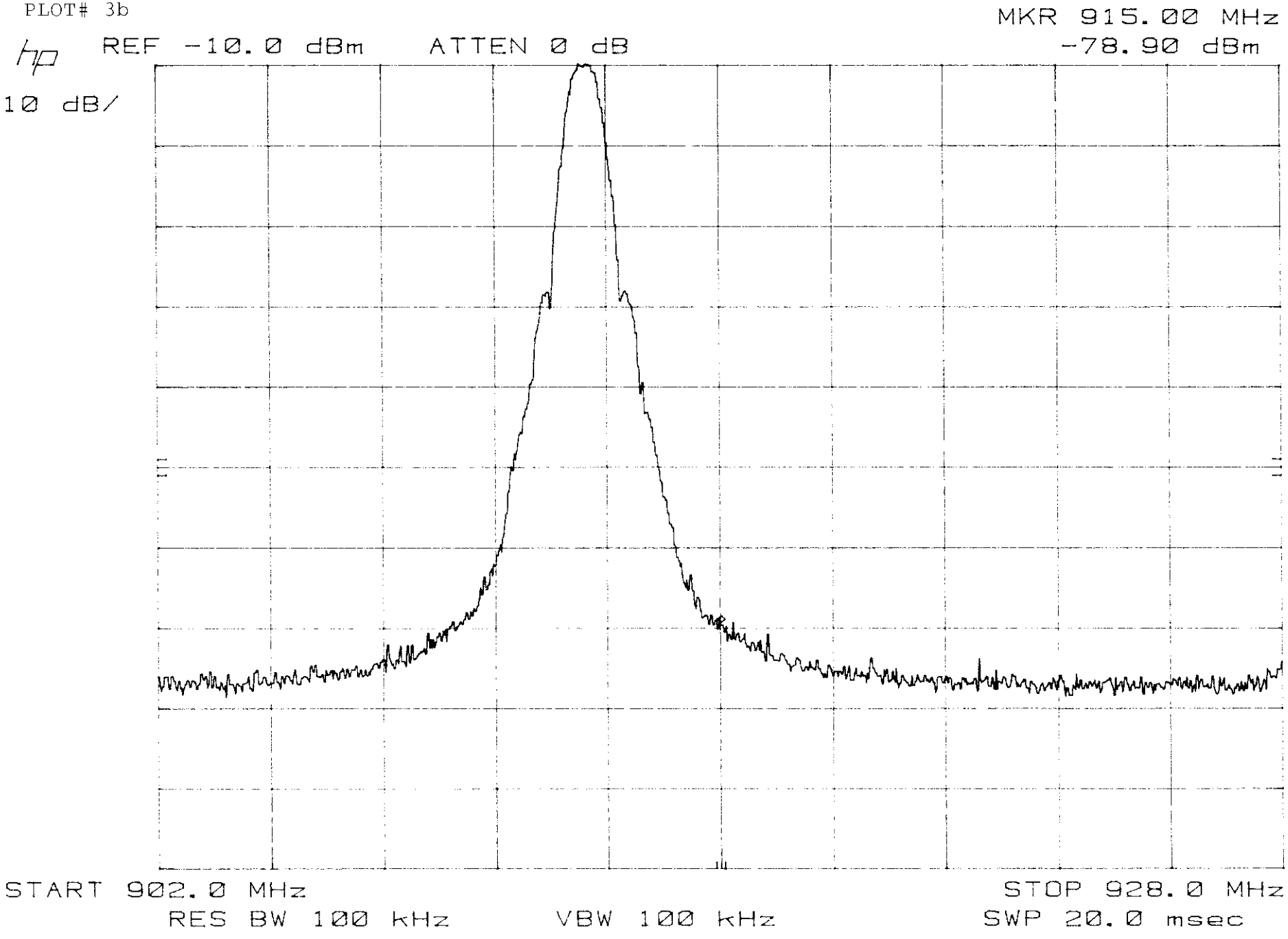
The following plots show the relative spurious emission level of the transmitter.

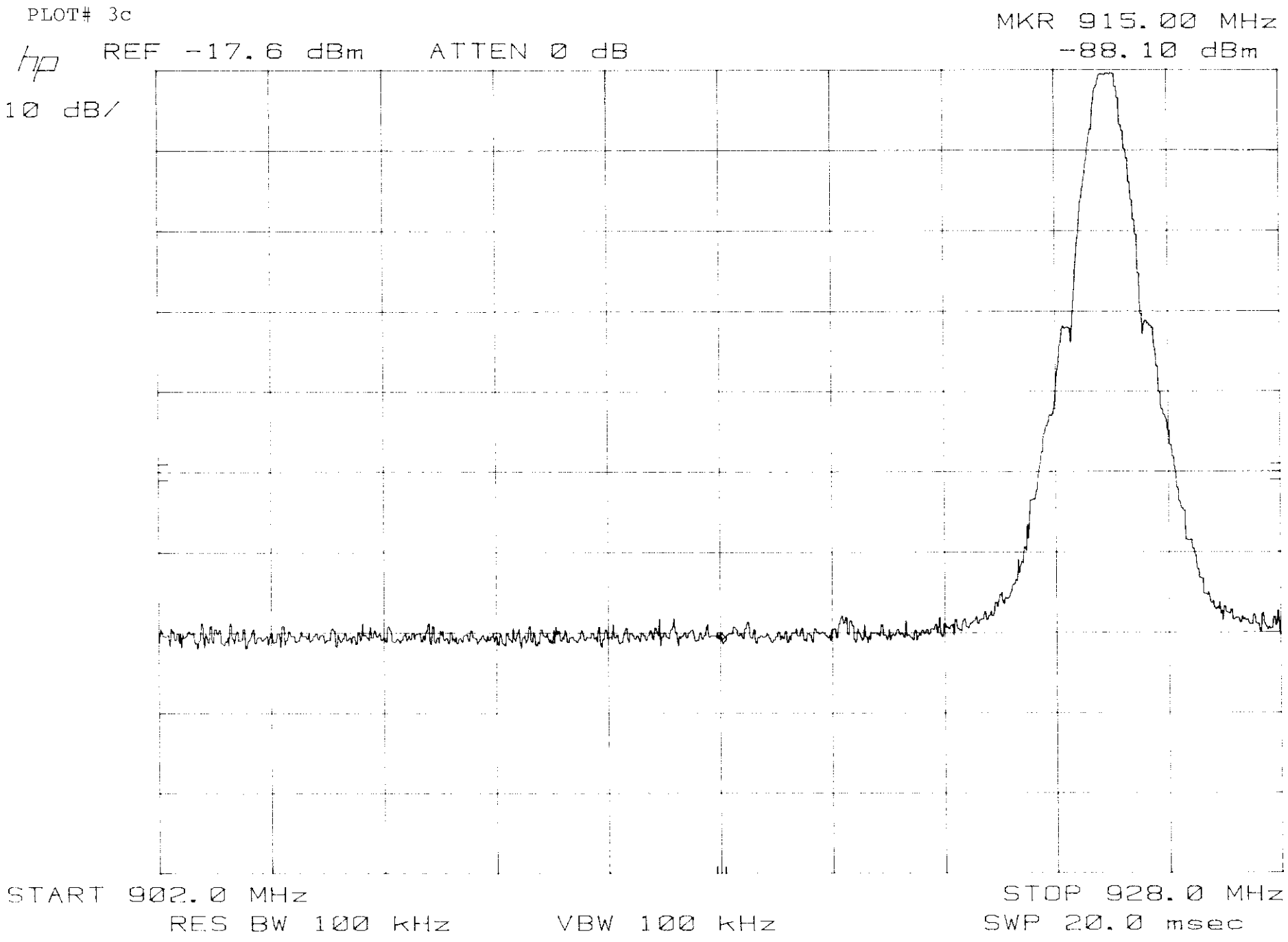
Plot #	Description
3a	Low Channel, Band Edge Scan
3b	Middle Channel, Band Edge Scan
3c	High Channel, Band Edge Scan
3d - 3e	902 MHz - 10000 MHz Scan
3f - 3g	902 MHz - 10000 MHz Scan
3h - 3i	902 MHz - 10000 MHz Scan

PLOT # 3a

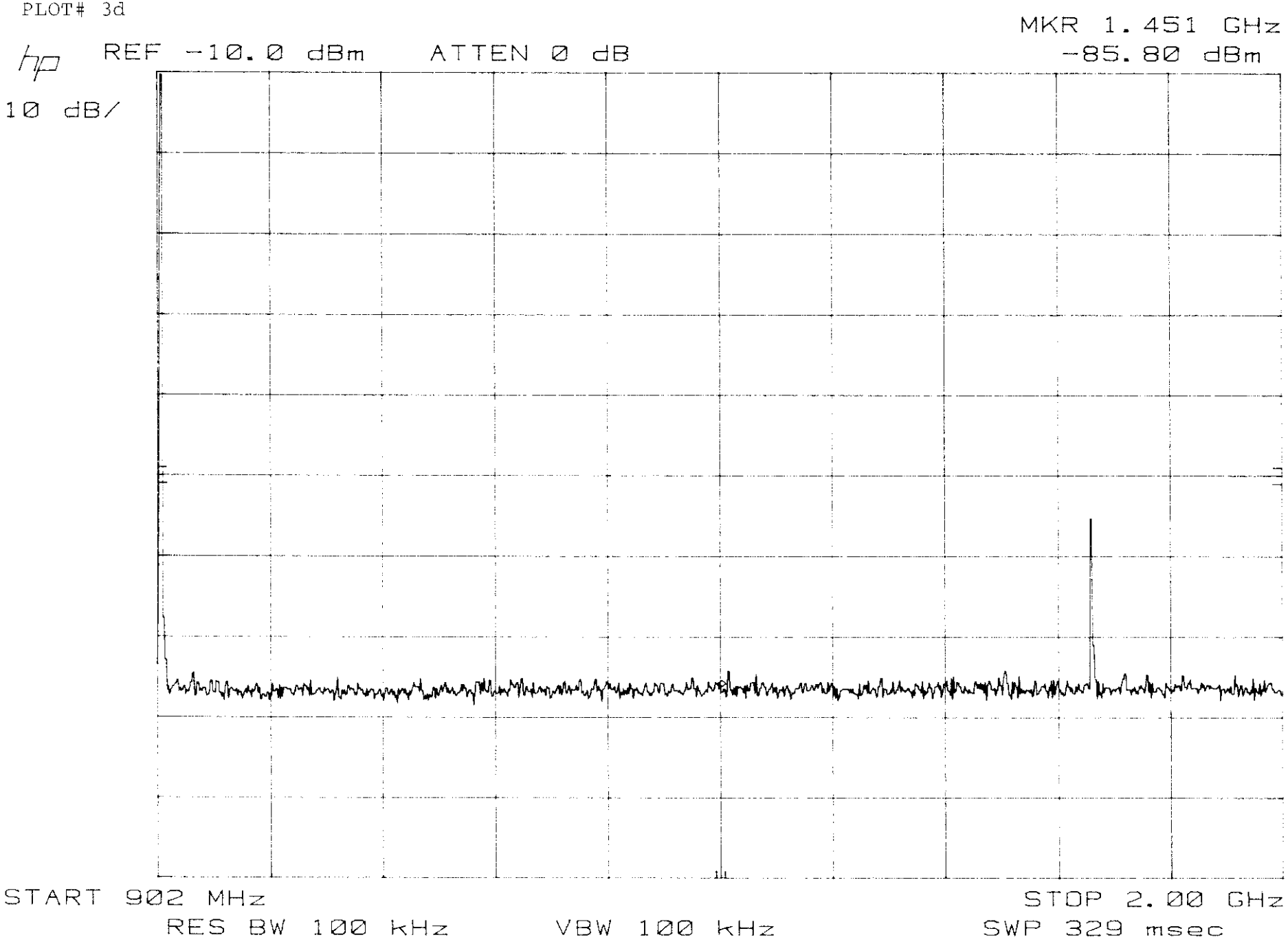


PLOT# 3b

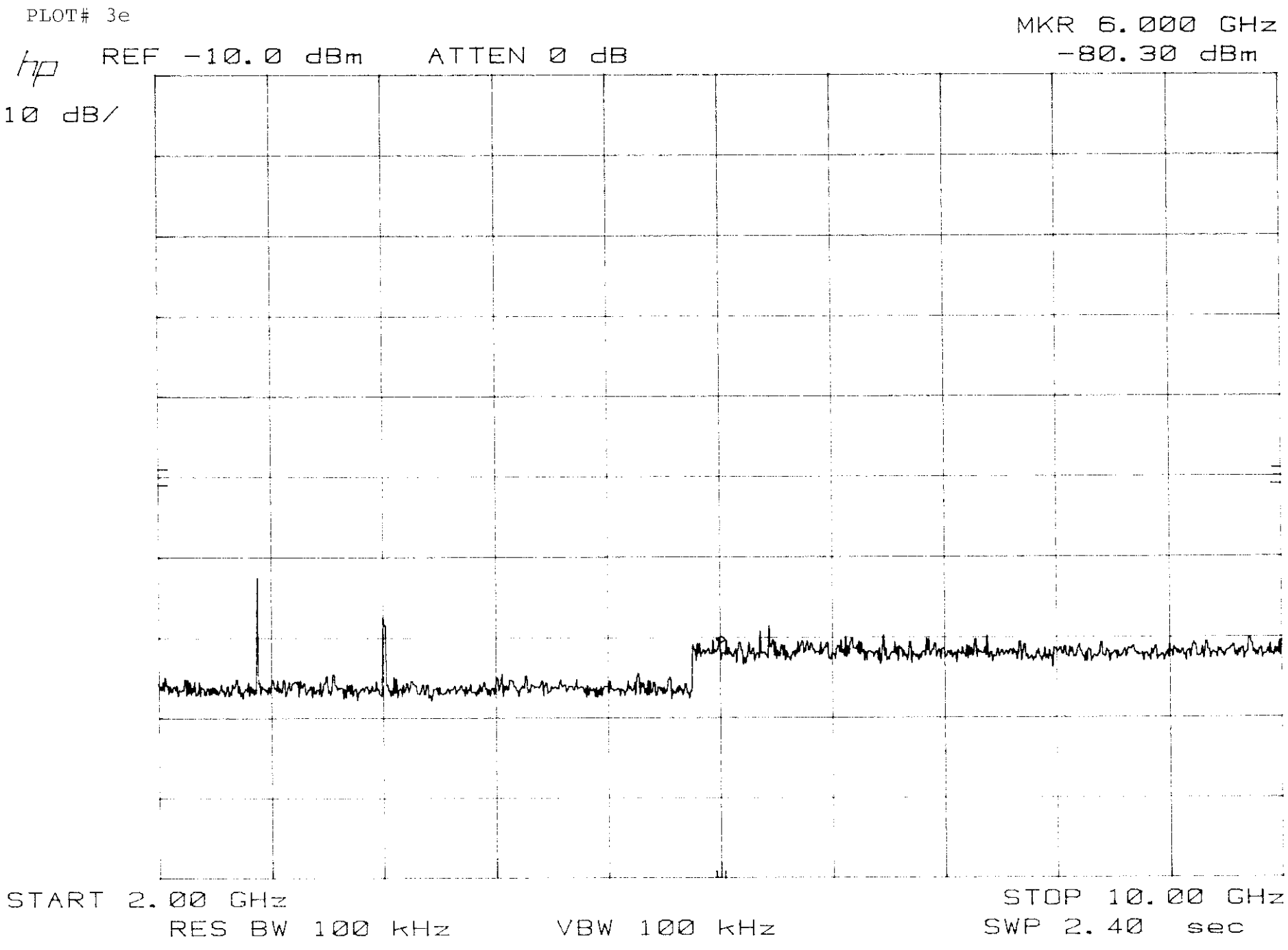

REF -10.0 dBm
ATTEN 0 dB
MKR 915.00 MHz
-78.90 dBm
10 dB/
START 902.0 MHz
RES BW 100 kHz
VBW 100 kHz
STOP 928.0 MHz
SWP 20.0 msec

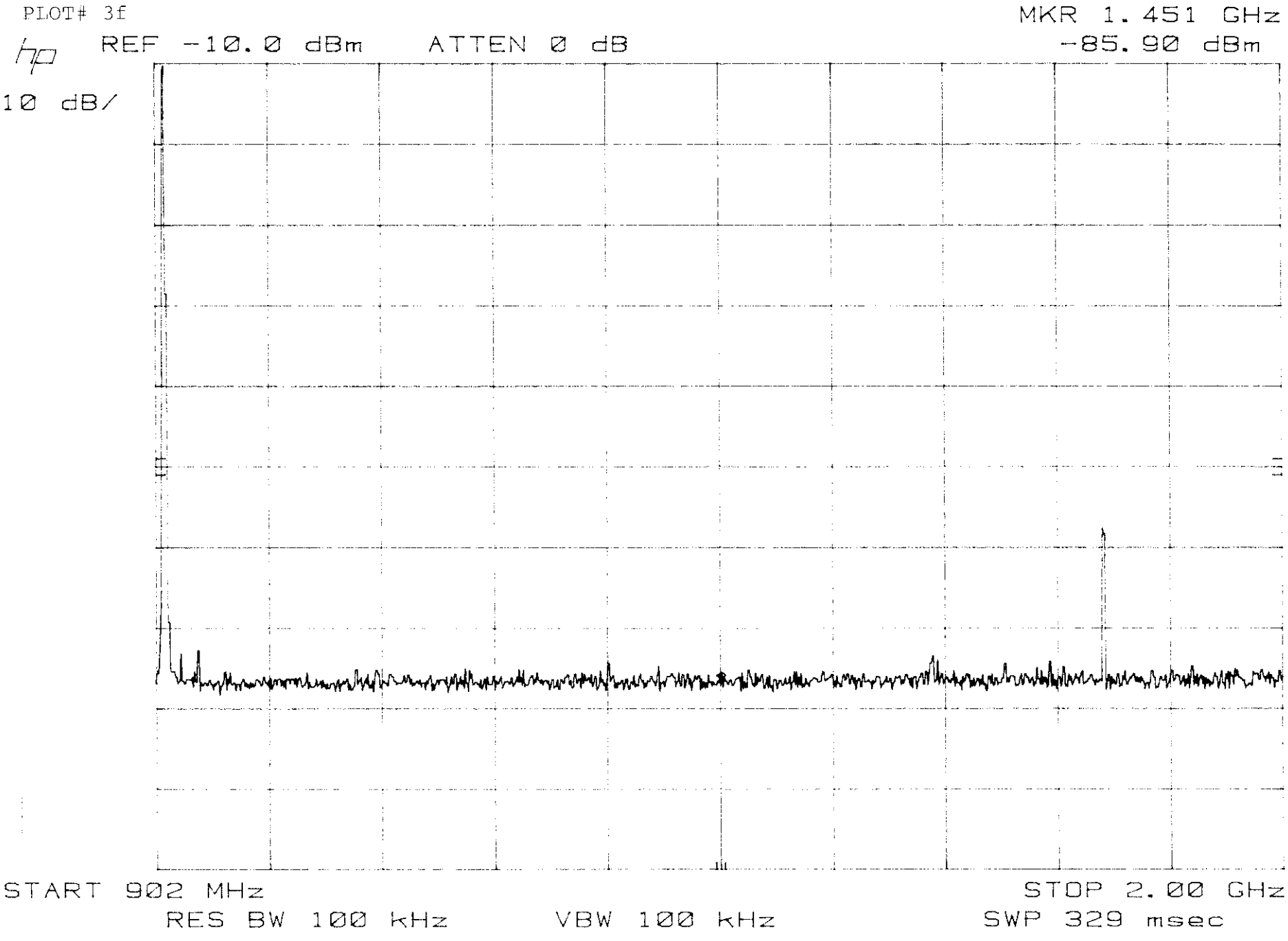

PLOT# 3c
REF -17.6 dBm
ATTEN 0 dB
MKR 915.00 MHz
-88.10 dBm
10 dB/
START 902.0 MHz
STOP 928.0 MHz
RES BW 100 kHz
VBW 100 kHz
SWP 20.0 msec

PLOT# 3d

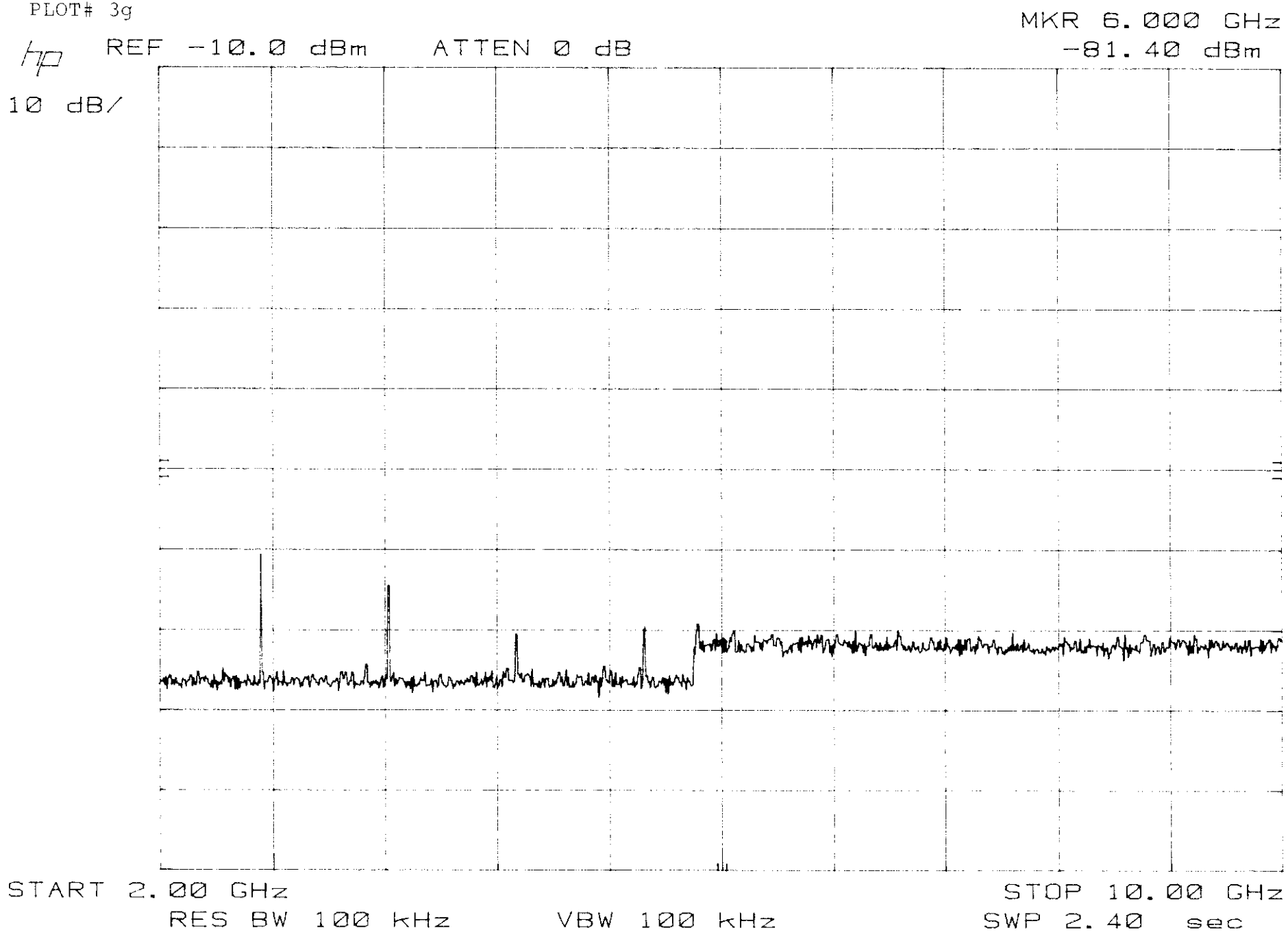

REF -10.0 dBm
ATTEN 0 dB
MKR 1.451 GHz
-85.80 dBm
10 dB/
START 902 MHz
STOP 2.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 329 msec

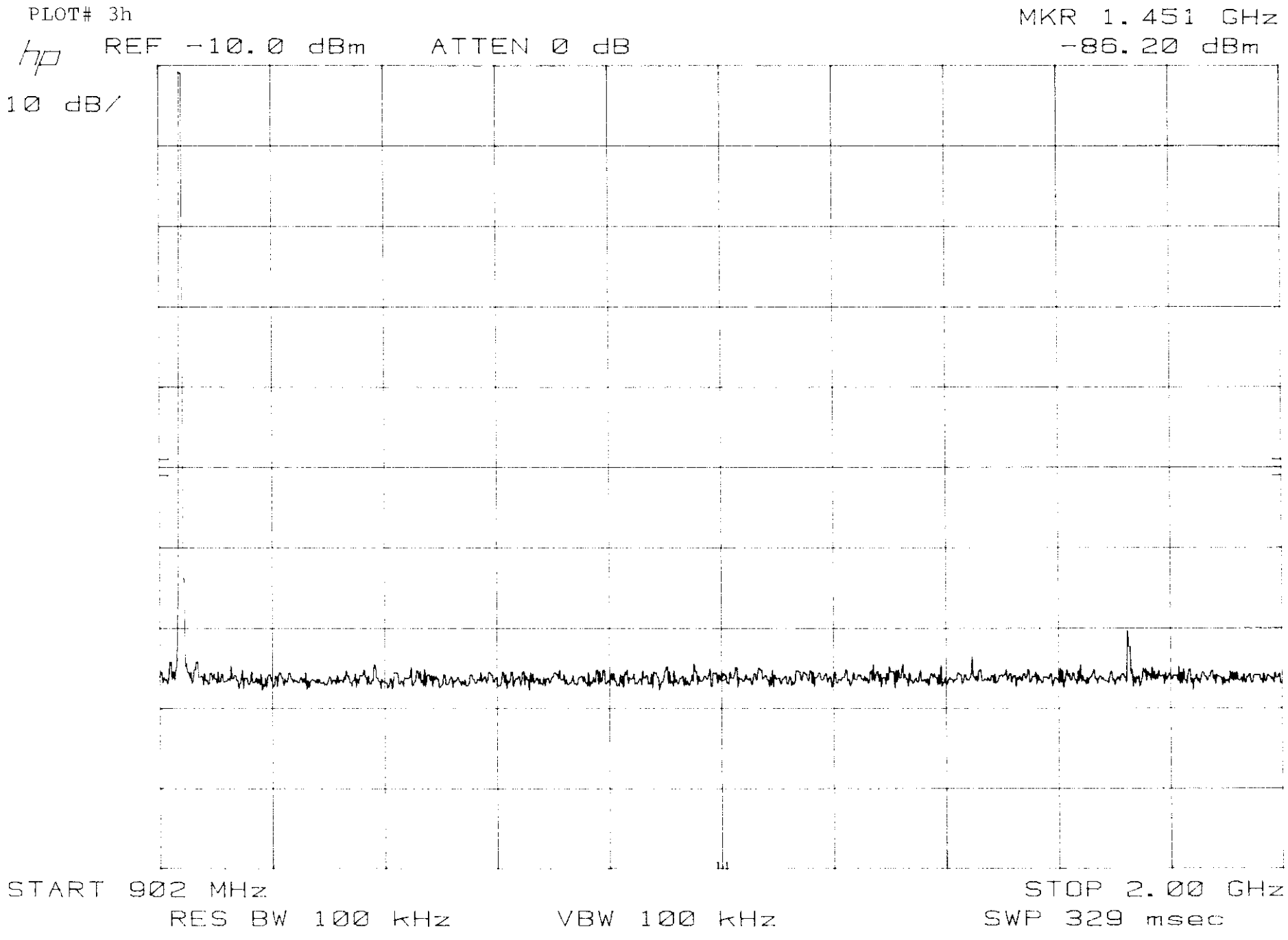
PLOT# 3e

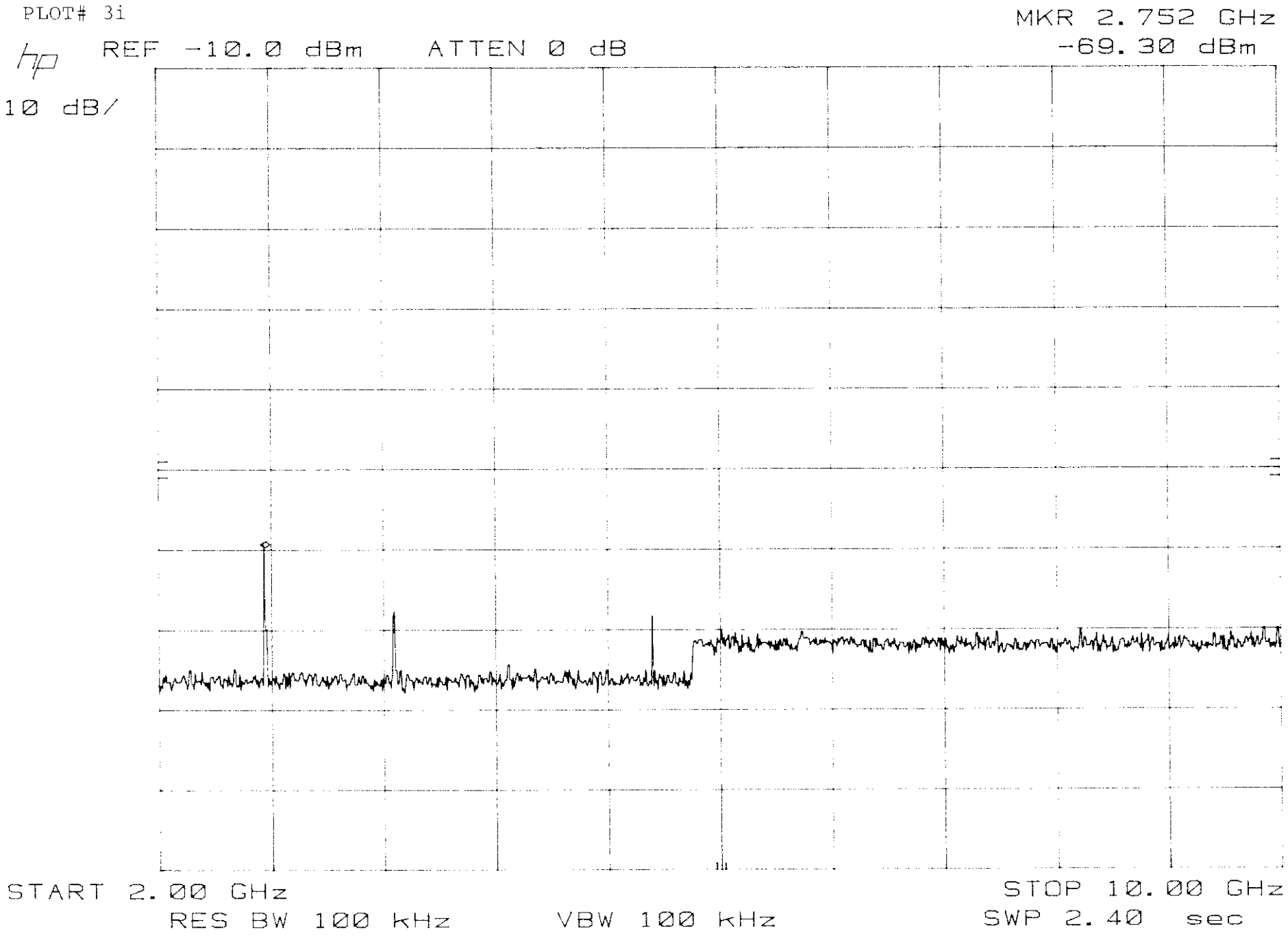

MKR 6.000 GHz
-80.30 dBm
REF -10.0 dBm
ATTEN 0 dB
10 dB/
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 2.40 sec


PLOT# 3f
MKR 1.451 GHz
-85.90 dBm
REF -10.0 dBm
ATTEN 0 dB
10 dB/
START 902 MHz
STOP 2.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 329 msec

PLOT# 3g


REF -10.0 dBm
ATTEN 0 dB
MKR 6.000 GHz
-81.40 dBm
10 dB/
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 2.40 sec


PLOT# 3h
MKR 1.451 GHz
REF -10.0 dBm
ATTEN 0 dB
-86.20 dBm
10 dB/
START 902 MHz
STOP 2.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 329 msec


PLOT# 3i
MKR 2.752 GHz
-69.30 dBm
REF -10.0 dBm
ATTEN 0 dB
10 dB/
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 2.40 sec

5.0 Antenna Requirement

✔	The transmitter uses a permanently connected antenna.
	The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but does NOT use a standard antenna jack or electrical connector.
	The EUT requires professional installation. Please refer to the attached documentation for details).

6.0 List of Exhibits

Exhibit 1 **ID Label Format**

Exhibit 2 **ID Label Location**

Exhibit 3 **Equipment Photographs**

Exhibit 4 **Block Diagram**

Exhibit 5 **Circuit Diagram**

Exhibit 6 **Test Setup Photos**

Exhibit 7 **Instruction Manual**