1.0 **Summary of Tests**

Samjoo Electronics - Model No.: 39510
FCC ID: NR839510

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Out of Band Radiated Emission	15.247(c)	N/A
Radiated Emission in Restricted Bands	15.35(b)(c)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Radiated Emission from Receiver L.O.	15.109	Pass
Processing Gain Measurements	15.247(e)	Provided by applicant
Antenna Requirement	15.203	Pass

Test Engineer: Xi-Ming Yang Date: 5-5-98
Xi-Ming Yang

EMC Site Manager: Date: 5-8-98
David Chernomordik

2.0 General Description

2.1 Product Description

The Samjoo Electronics Model No.: 39510 is a 900 MHz direct sequence spread spectrum cordless telephone.

A prototype version of the sample was received on April 12, 1998 in good condition.

Overview of 900 MHz Direct Sequence Spread Spectrum

Applicant	**Samjoo Electronics**
Trade Name & Model No.	**Samjoo, 39510**
FCC Identifier	**NR839510**
Use of Product	Cordless Phone
Manufacturer & Model of Spread Spectrum Module	N/A
Type of Transmission	Direct Sequence
Rated RF Output (mW)	0.031
Frequency Range (MHz)	902-928
Number of Channel(s)	20
Antenna(s) & Gain, dBi	2
Processing Gain Measurements	[X] Will be provided to ITS for submission with the application [ ] Will be provided directly to the FCC reviewing engineer by the client or manufacturer of the spread spectrum module
Antenna Requirement	[X] The EUT 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 (attach supporting documentation if using this option).
Manufacturer name & address	Unical Enterprises, Inc. 16960 Gale Avenue, City of Industry, California 91745

2.2 Related Submittal(s) Grants

A separate FCC Part 68 application has been prepared.

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

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

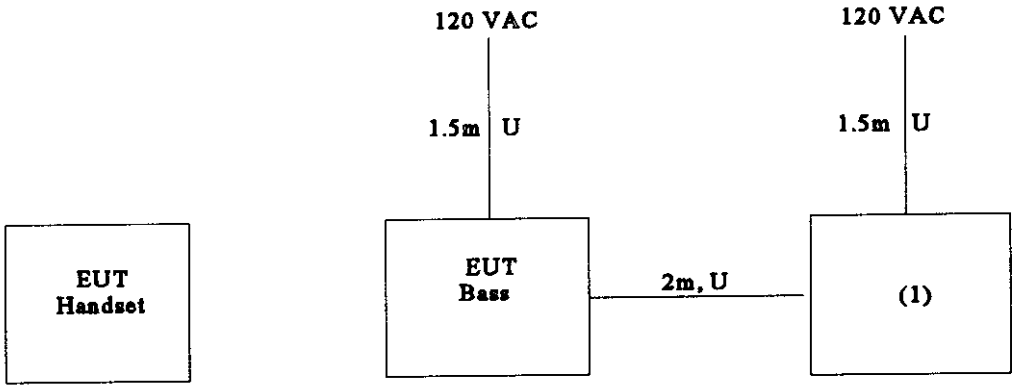
3.0 System Test Configuration

3.1 Support Equipment and description

The FCC ID's for all equipment used in the tested system (included inserted cards, which have grants) are:

Item #	Description	Model No.	Serial No.	FCC ID
1	Teltone Telephone Line Simulator	TLS-3150a	019666	N/A

3.2 Block Diagram of Test Setup



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

3.3 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 radiated emission 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.

3.4 Software Exercise Program

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.

3.5 Mode of Operation During Test

3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Samjoo Electronics prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

3.7 Additions, deviations and exclusions from standards

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

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals
FCC Rules 15.247(b): (Base Unit)

[ ] The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[ ] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximun RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

For antennas with gains of 6 dBi or less , maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

Max. antenna gain =		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Ch: 903.6	14.8	30.2
Mid Ch: 914.4	14.6	28.8
Hi Ch: 926.4	13.50	22.4

Cable loss: 0 dB External Attenuation: 0 dB

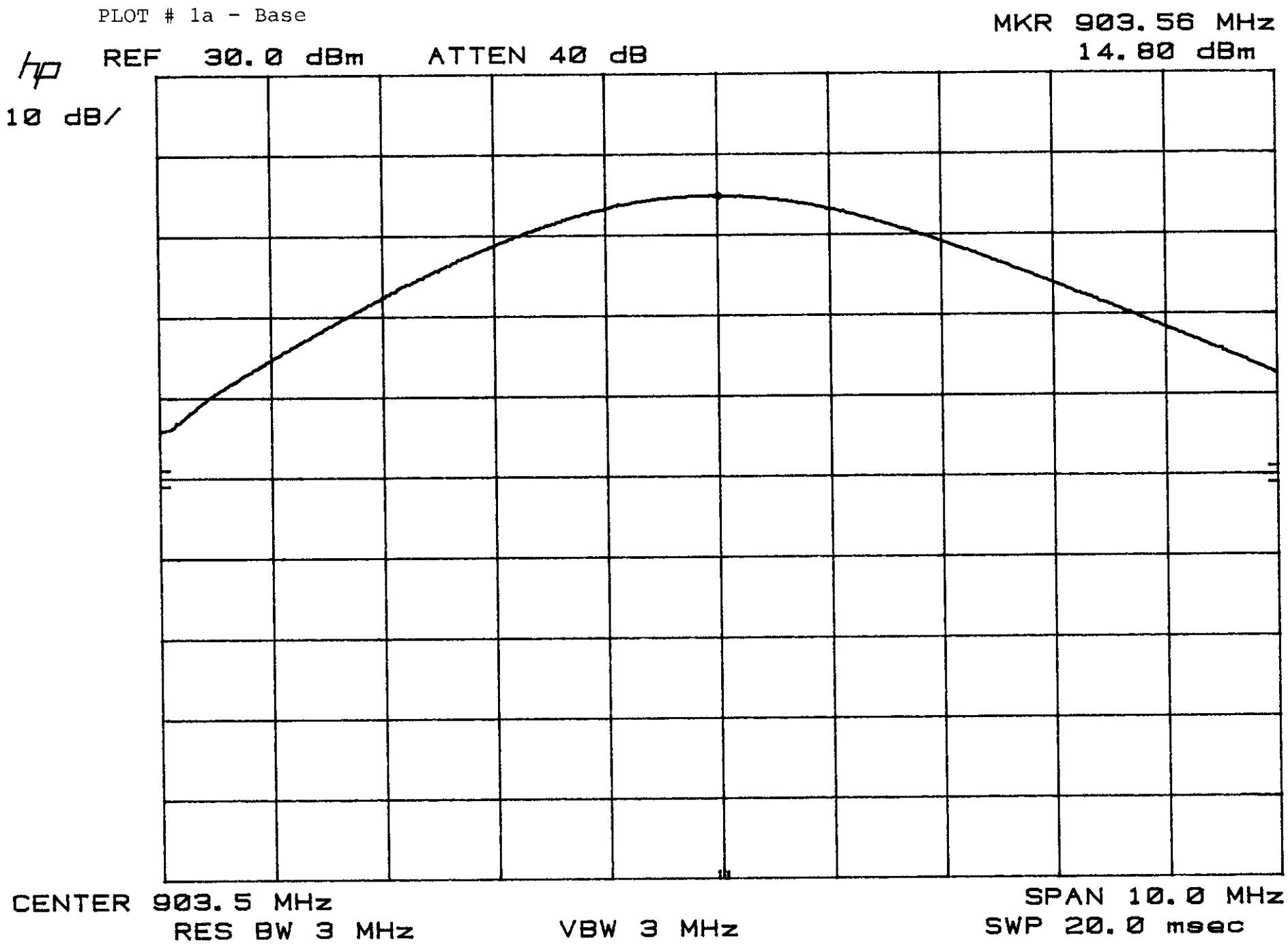
Cable loss, external attenuation: [ ] included in OFFSET function
[ ]added to SA raw reading

EUT Transmit Antenna Gain(dBi) + dBm max. output level = 16.8 dBm (36 dBm or less)

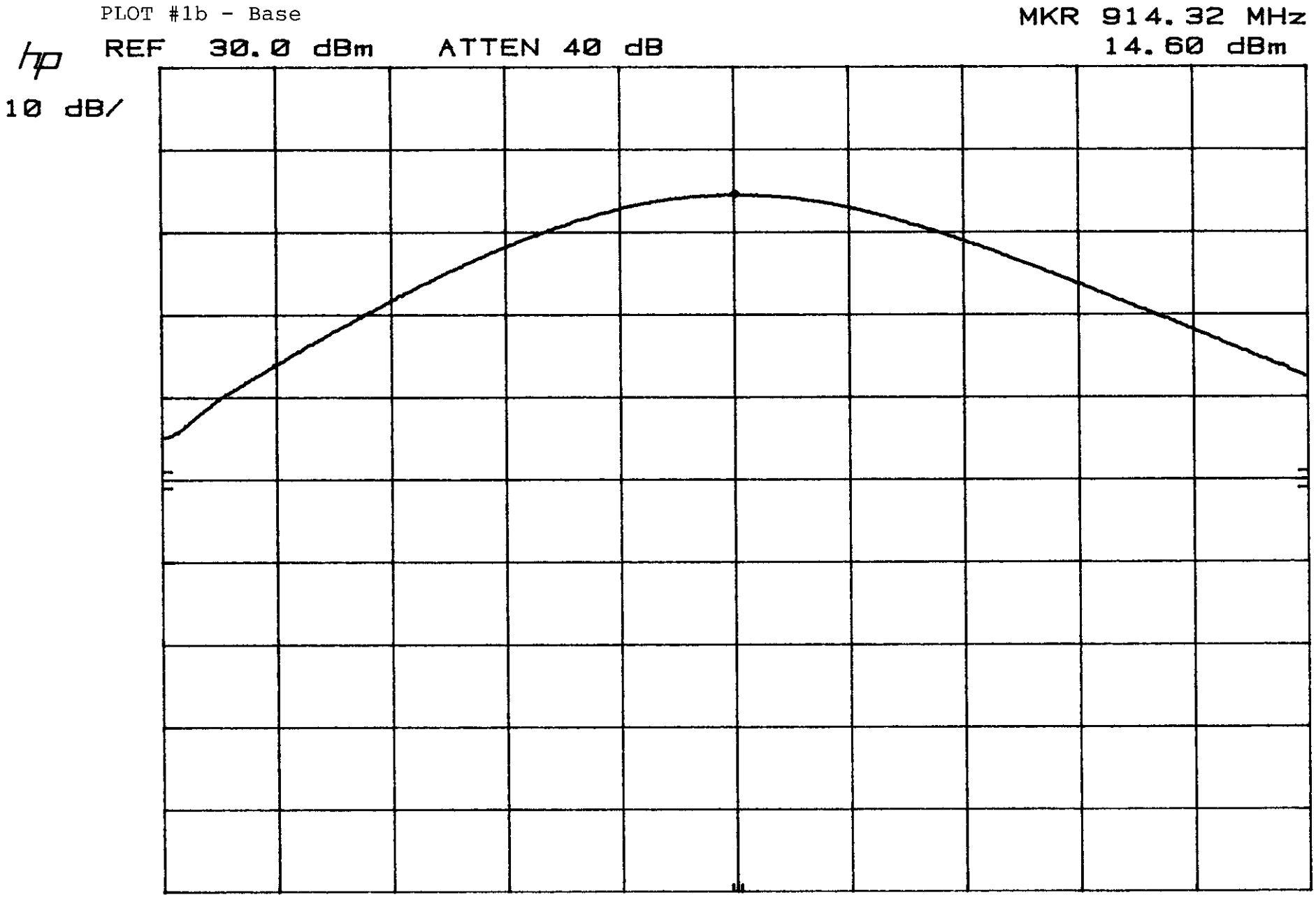
Please refer to the attached plots for details:

Plot 1a: Low Channel Output Power
Plot 1b: Middle Channel Output Power
Plot 1c: High Channel Output Power

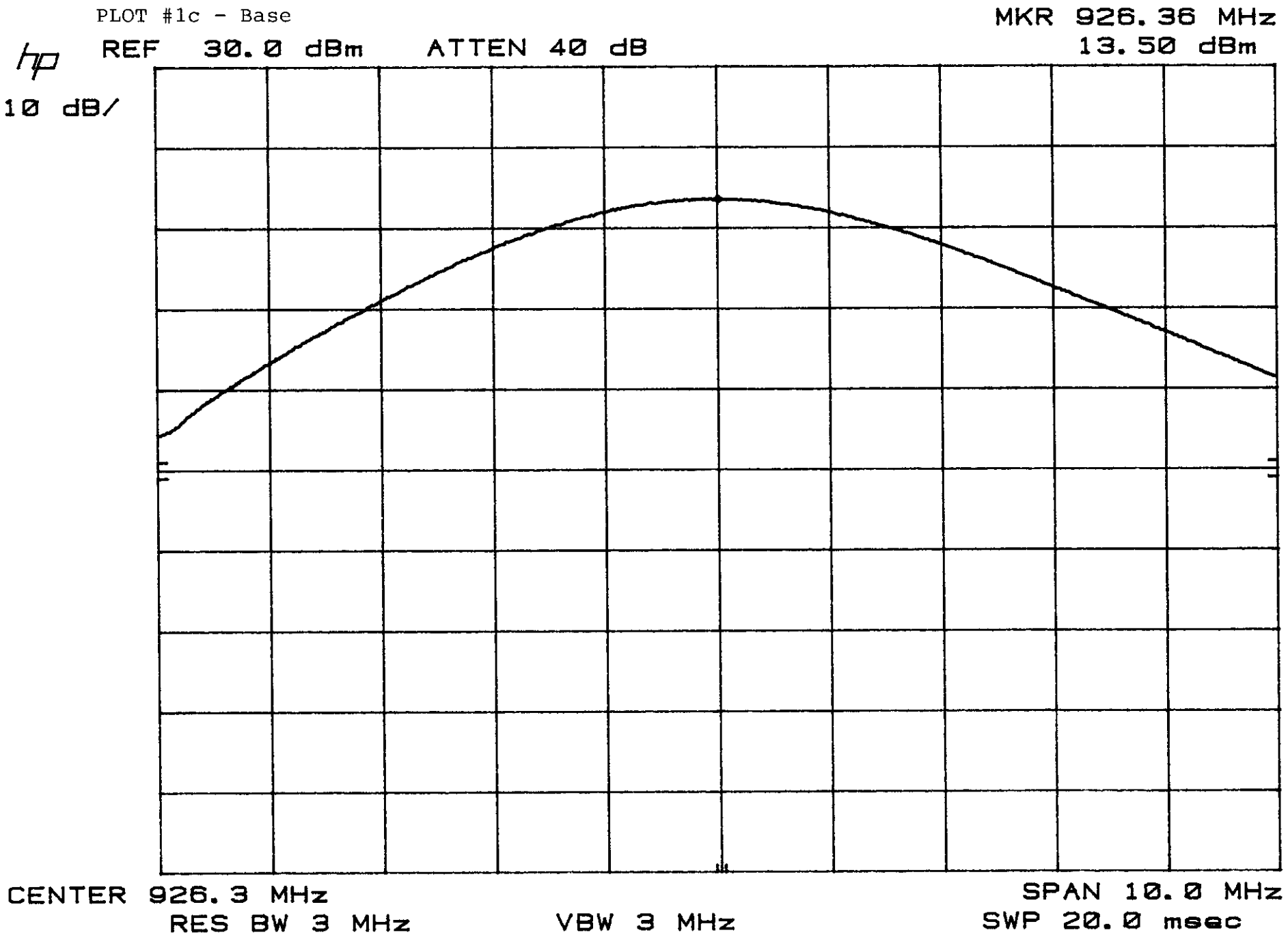
PLOT # 1a - Base


MKR 903.56 MHz
14.80 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 903.5 MHz
RES BW 3 MHz
VBW 3 MHz
SPAN 10.0 MHz
SWP 20.0 msec

PLOT #1b - Base


REF 30.0 dBm
ATTEN 40 dB
MKR 914.32 MHz
14.60 dBm
10 dB/
CENTER 914.3 MHz
RES BW 3 MHz
VBW 3 MHz
SPAN 10.0 MHz
SWP 20.0 msec

PLOT #1c - Base


MKR 926.36 MHz
13.50 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 926.3 MHz
SPAN 10.0 MHz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

4.1(a) Maximum Conducted Output Power at Antenna Terminals
FCC Rules 15.247(b): (Handset Unit)

[ ] The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[ ] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximun RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

For antennas with gains of 6 dBi or less , maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

Max. antenna gain = 2		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Ch: 903.6	14.90	30.9
Mid Ch: 914.4	14.2	26.3
Hi Ch: 926.4	13.8	24.0

Cable loss: 0 dB External Attenuation: 0 dB

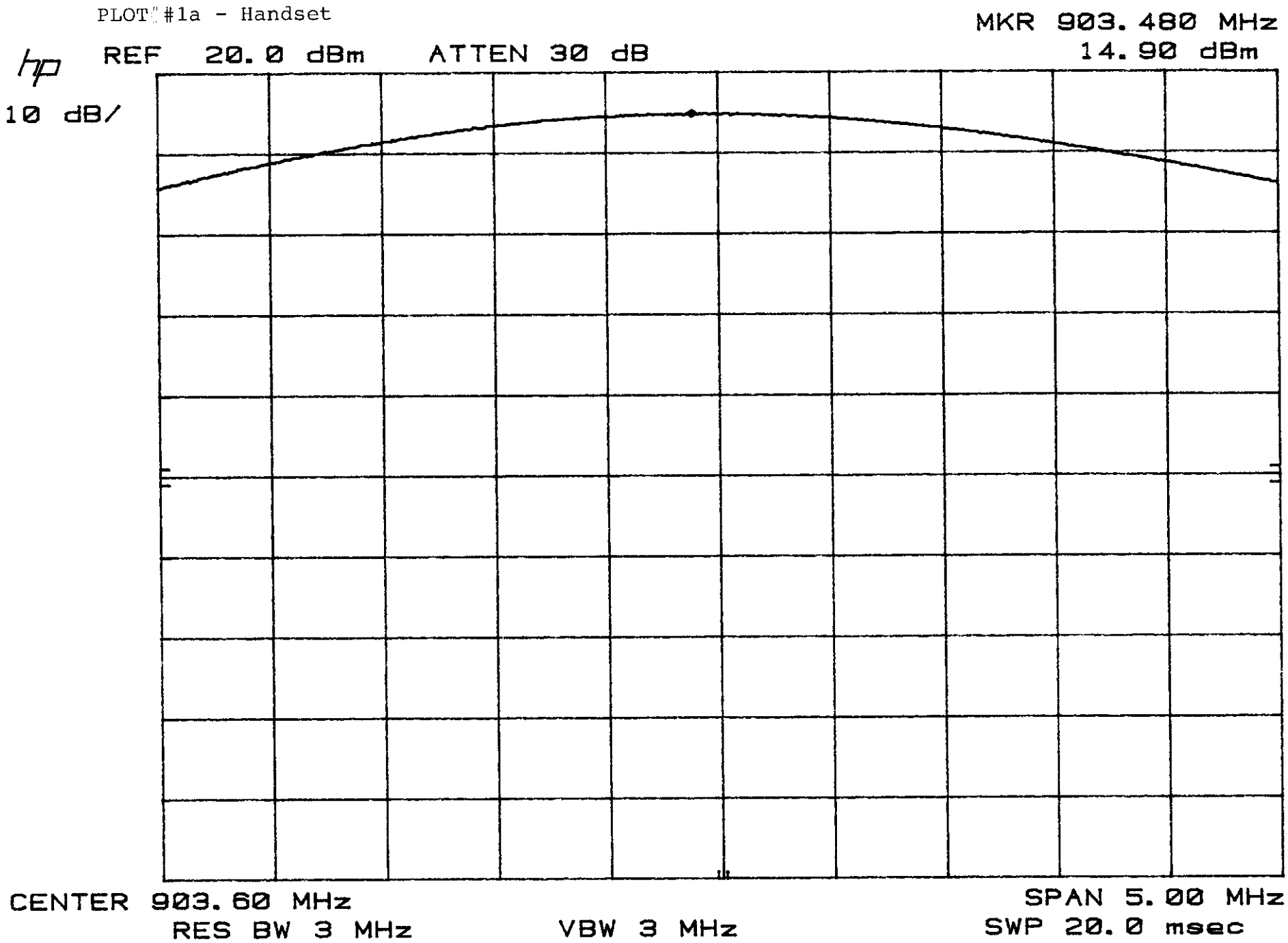
Cable loss, external attenuation: [ ] included in OFFSET function
[ ]added to SA raw reading

EUT Transmit Antenna Gain(dBi) + dBm max. output level = 16.9 dBm (36 dBm or less)

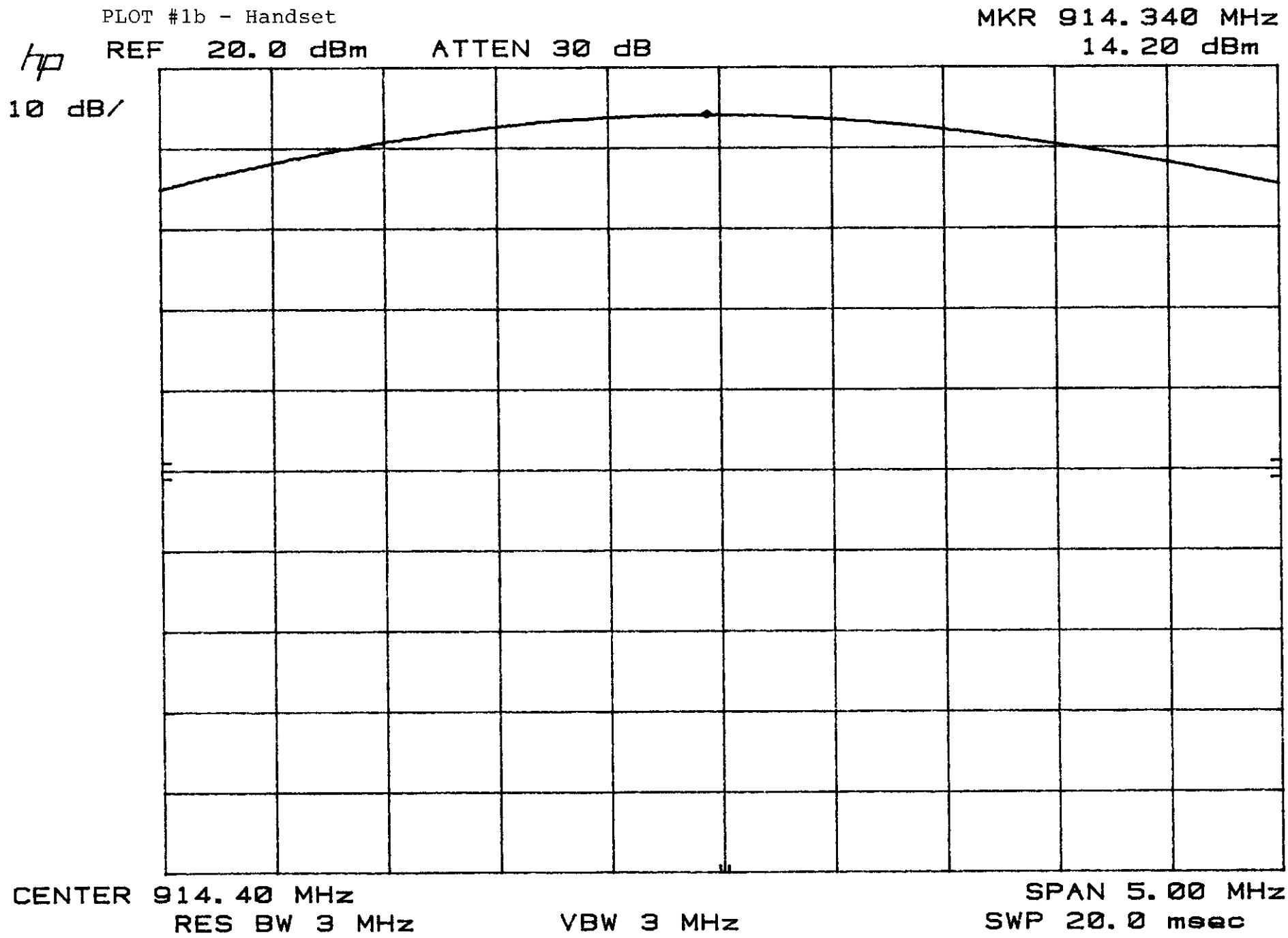
Please refer to the attached plots for details:

Plot 1a: Low Channel Output Power
Plot 1b: Middle Channel Output Power
Plot 1c: High Channel Output Power

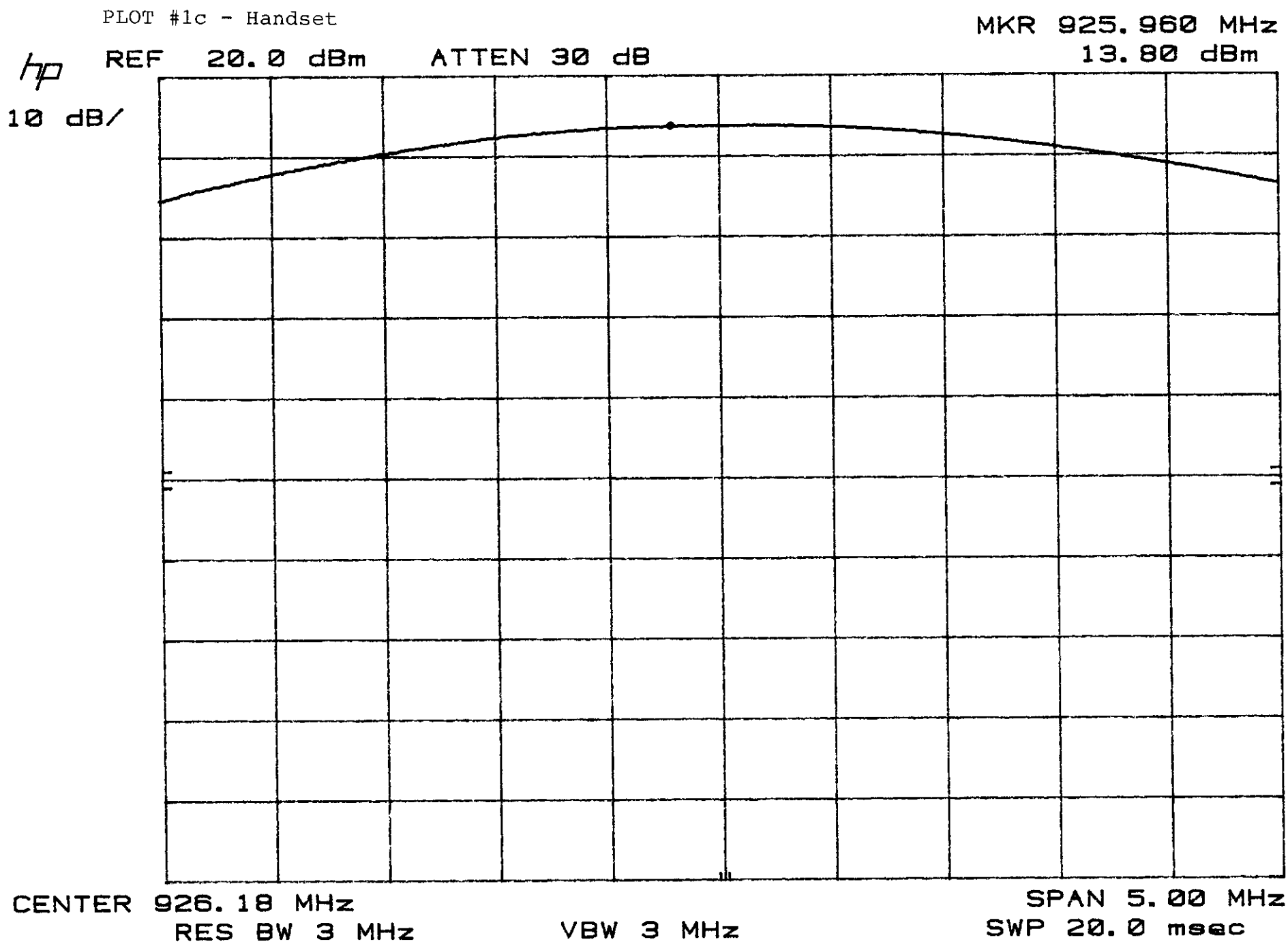
PLOT #1a - Handset



PLOT #1b - Handset



PLOT #1c - Handset



4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2): (Base Unit)

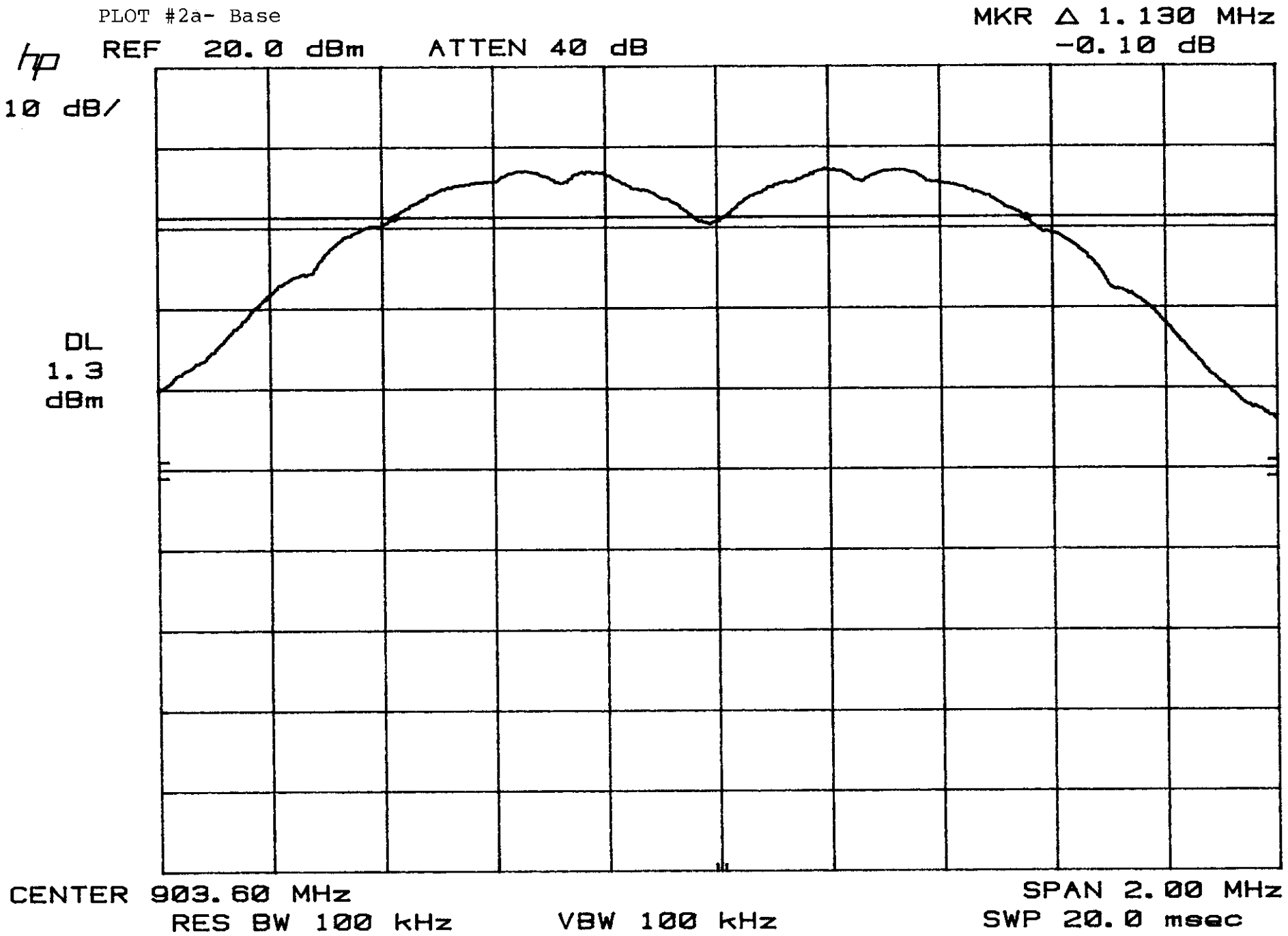
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

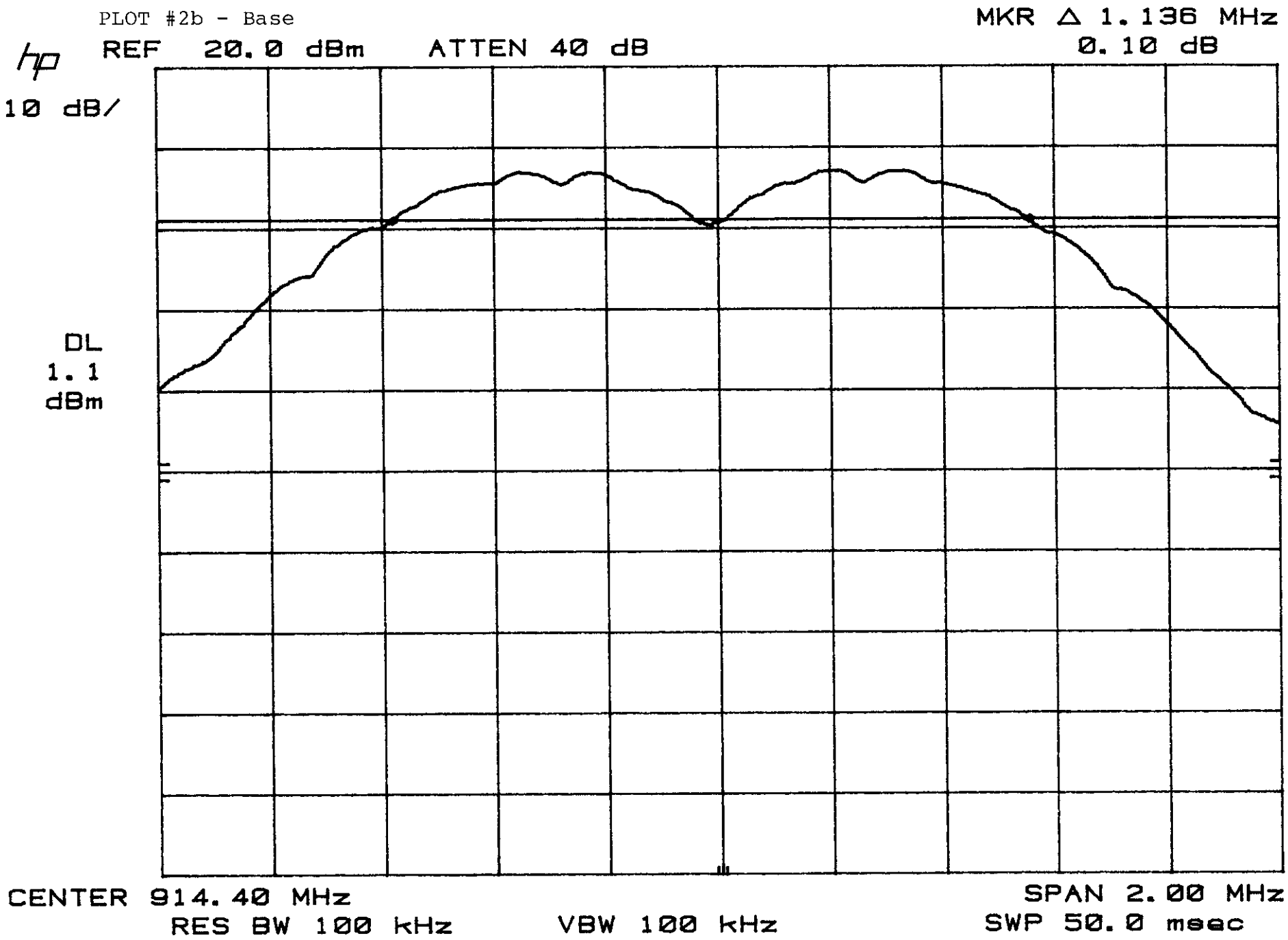
Frequency (MHz)	Max. 6 dB Bandwidth (kHz)
926.4	1.130

Refer to the following plots for 6 dB bandwidth sharp:

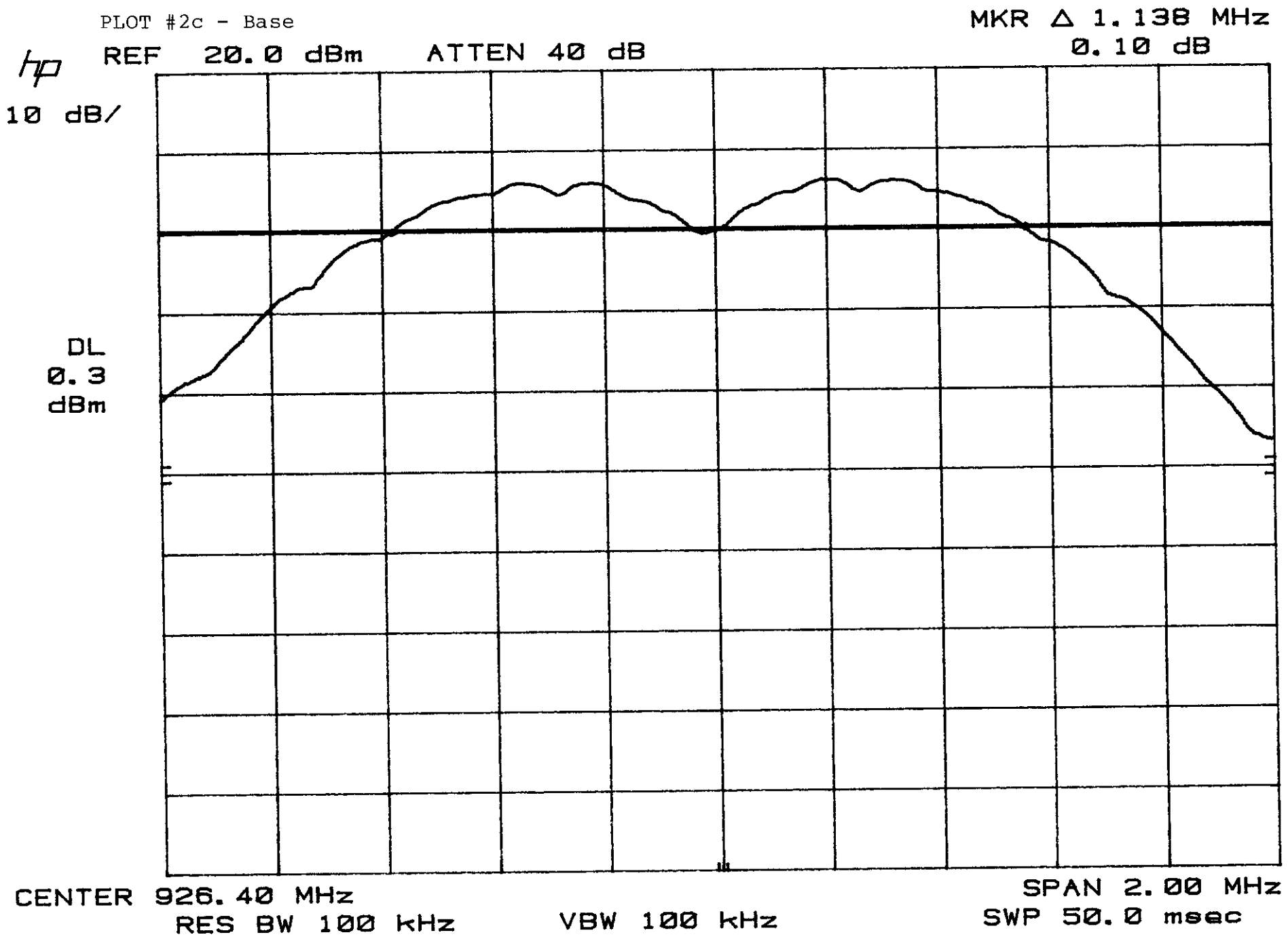
Plot 2a: Low Channel 6 dB RF Bandwidth
Plot 2b: Middle Channel 6 dB RF Bandwidth
Plot 2c: High Channel 6 dB RF Bandwidth

PLOT #2a- Base


MKR Δ 1.130 MHz
-0.10 dB
REF 20.0 dBm
ATTEN 40 dB
10 dB/
DL
1.3
dBm
CENTER 903.60 MHz
SPAN 2.00 MHz
RES BW 100 kHz
VBW 100 kHz
SWP 20.0 msec


PLOT #2b - Base
MKR Δ 1.136 MHz
0.10 dB
REF 20.0 dBm
ATTEN 40 dB
10 dB/
DL
1.1
dBm
CENTER 914.40 MHz
SPAN 2.00 MHz
RES BW 100 kHz
VBW 100 kHz
SWP 50.0 msec

PLOT #2c - Base


MKR Δ 1.138 MHz
0.10 dB
REF 20.0 dBm
ATTEN 40 dB
10 dB/
DL
0.3
dBm
CENTER 926.40 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 2.00 MHz
SWP 50.0 msec

4.2(a) Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2): (Handset Unit)

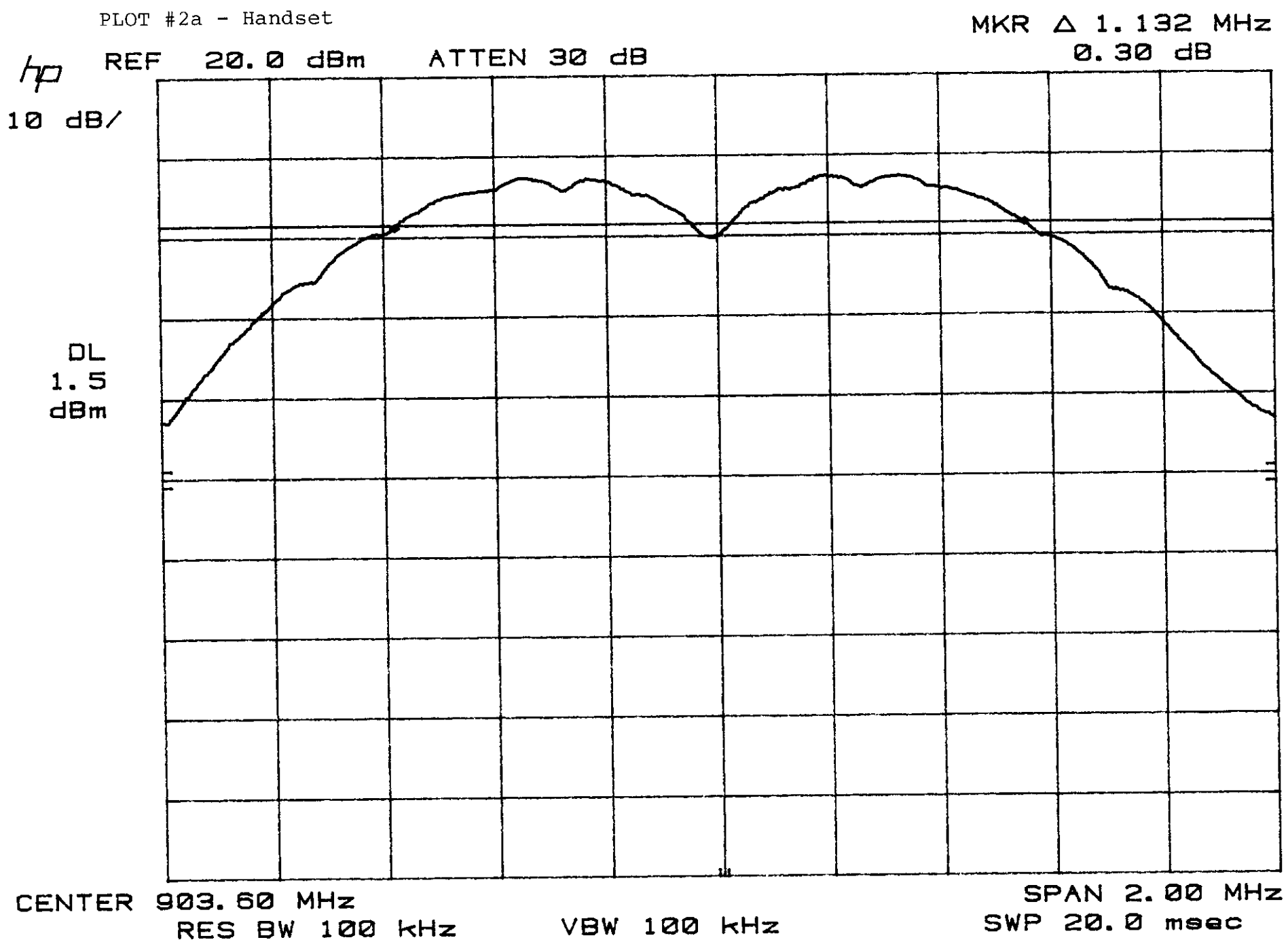
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	Max. 6 dB Bandwidth (kHz)
914.4	1.130

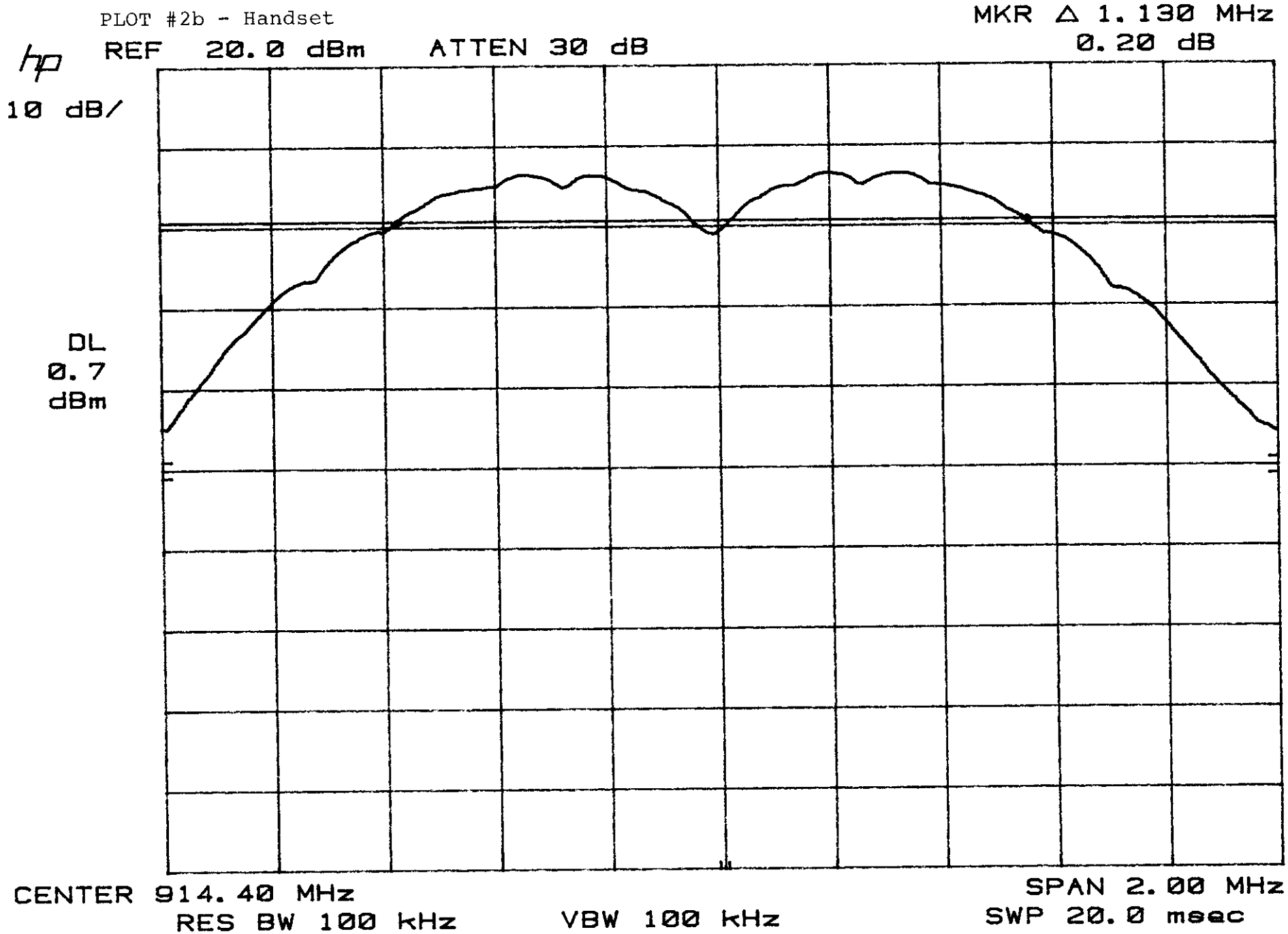
Refer to the following plots for 6 dB bandwidth sharp:

Plot 2a: Low Channel 6 dB RF Bandwidth
Plot 2b: Middle Channel 6 dB RF Bandwidth
Plot 2c: High Channel 6 dB RF Bandwidth

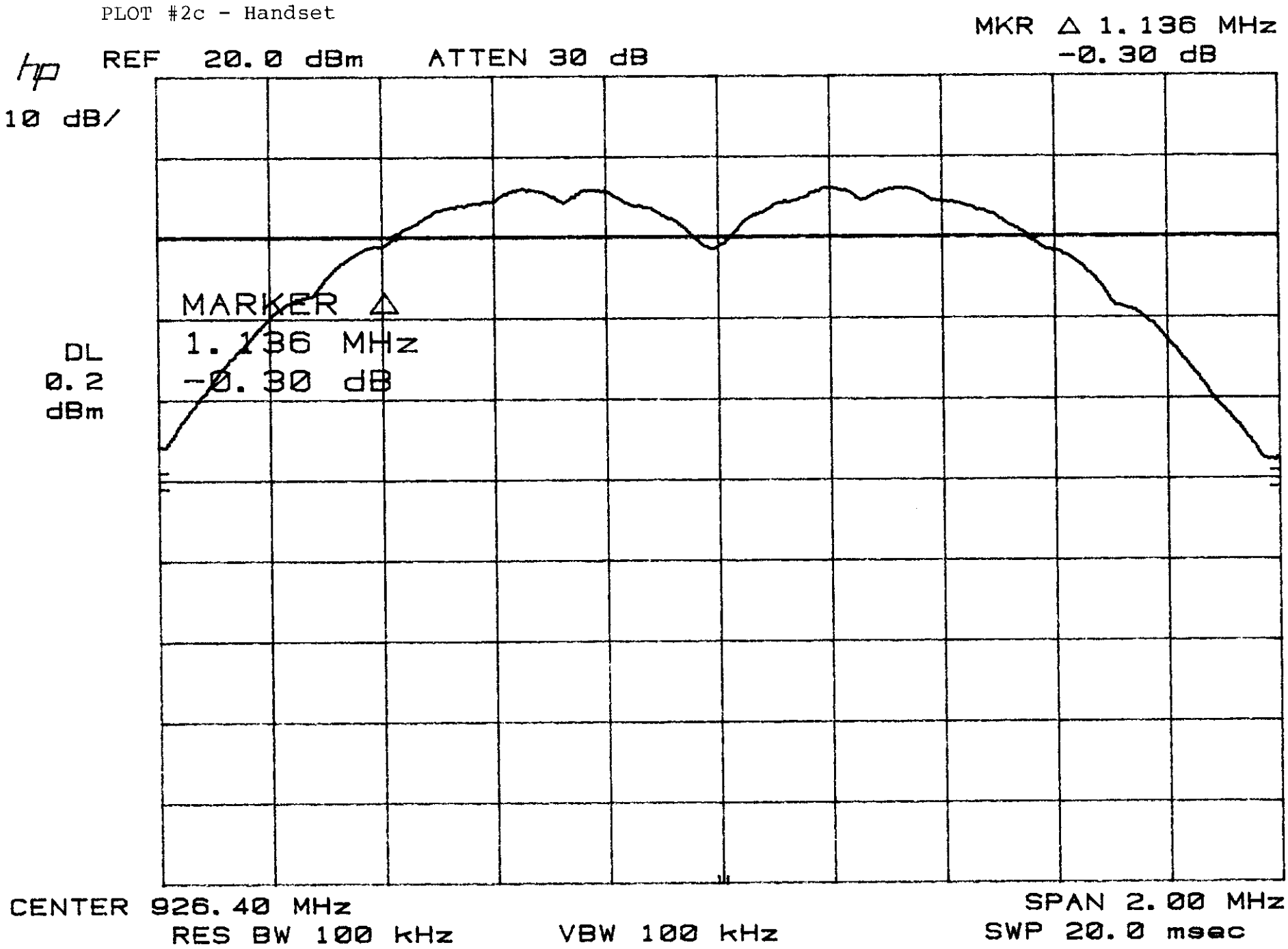
PLOT #2a - Handset



PLOT #2b - Handset



PLOT #2c - Handset



4.3 Maximum Power Density Reading, FCC Rule 15.247(d): (Base Unit)

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz - Fstart, kHz)/3 kHz

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

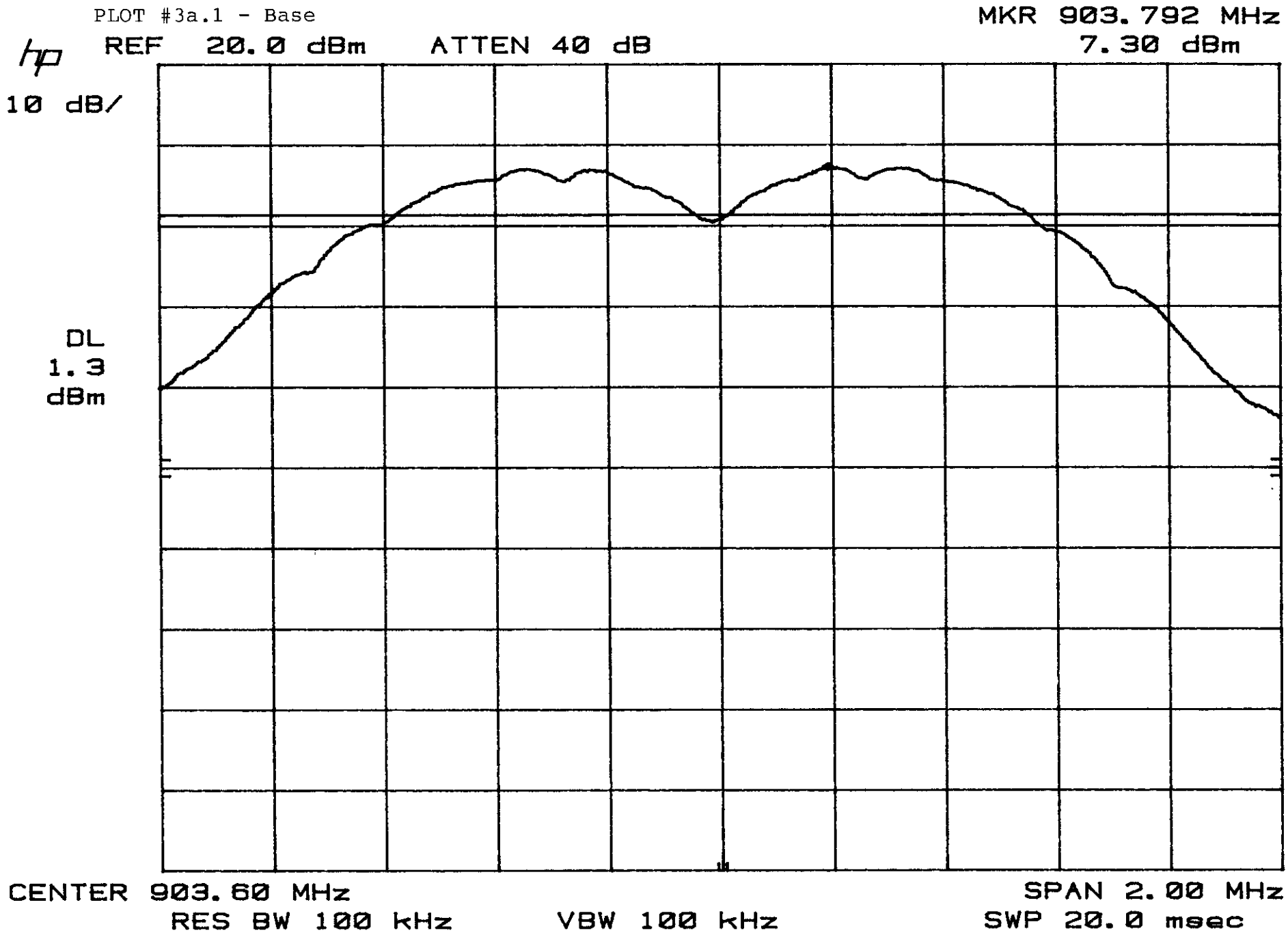
Frequency (MHz)	Power Density (dBm)
903.84	1.1

Frequency Span = 1200 kHz

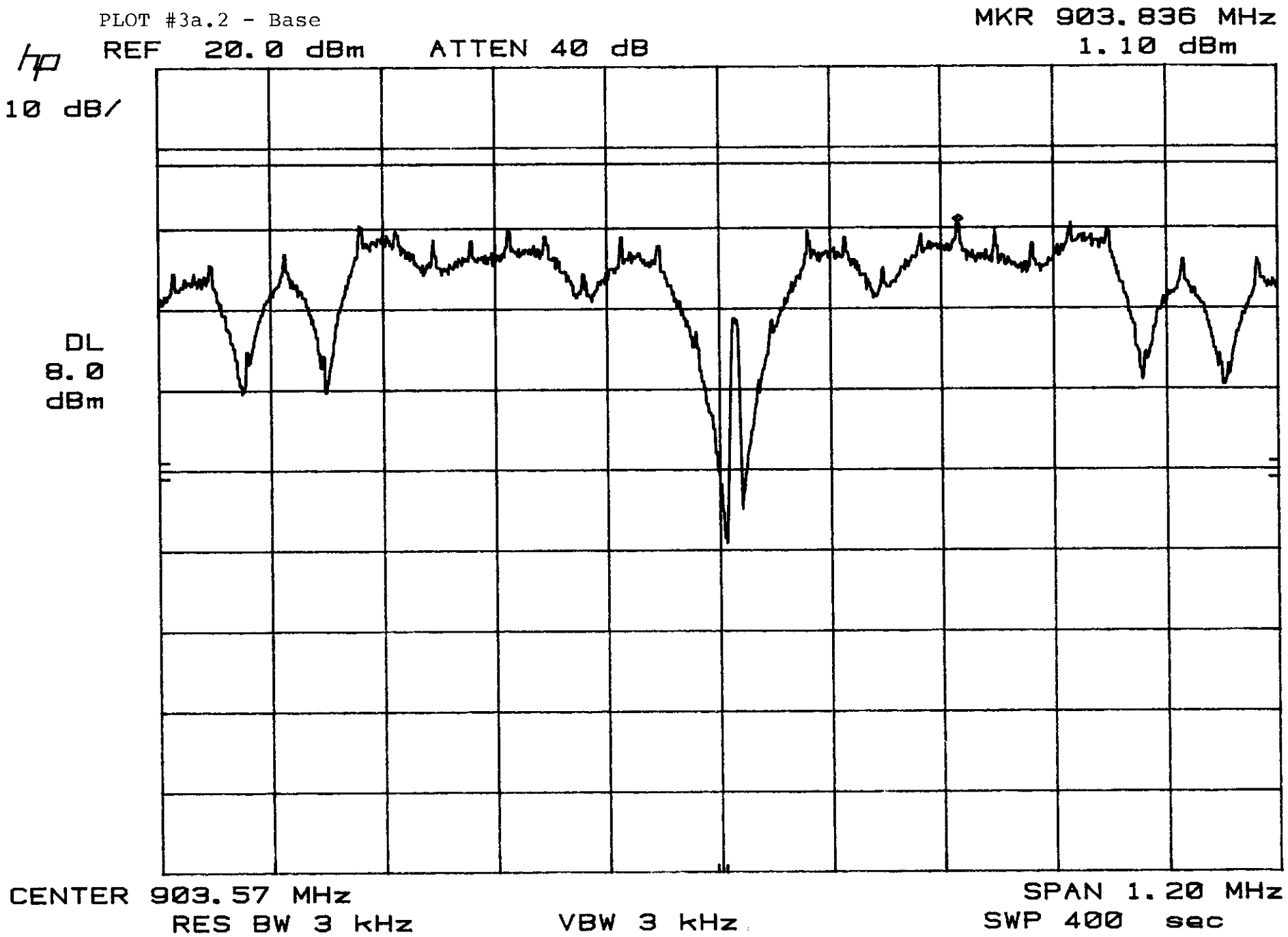
Sweep Time = Frequency Span/3 kHz = 400 seconds

Refer to the following plots for power density data:

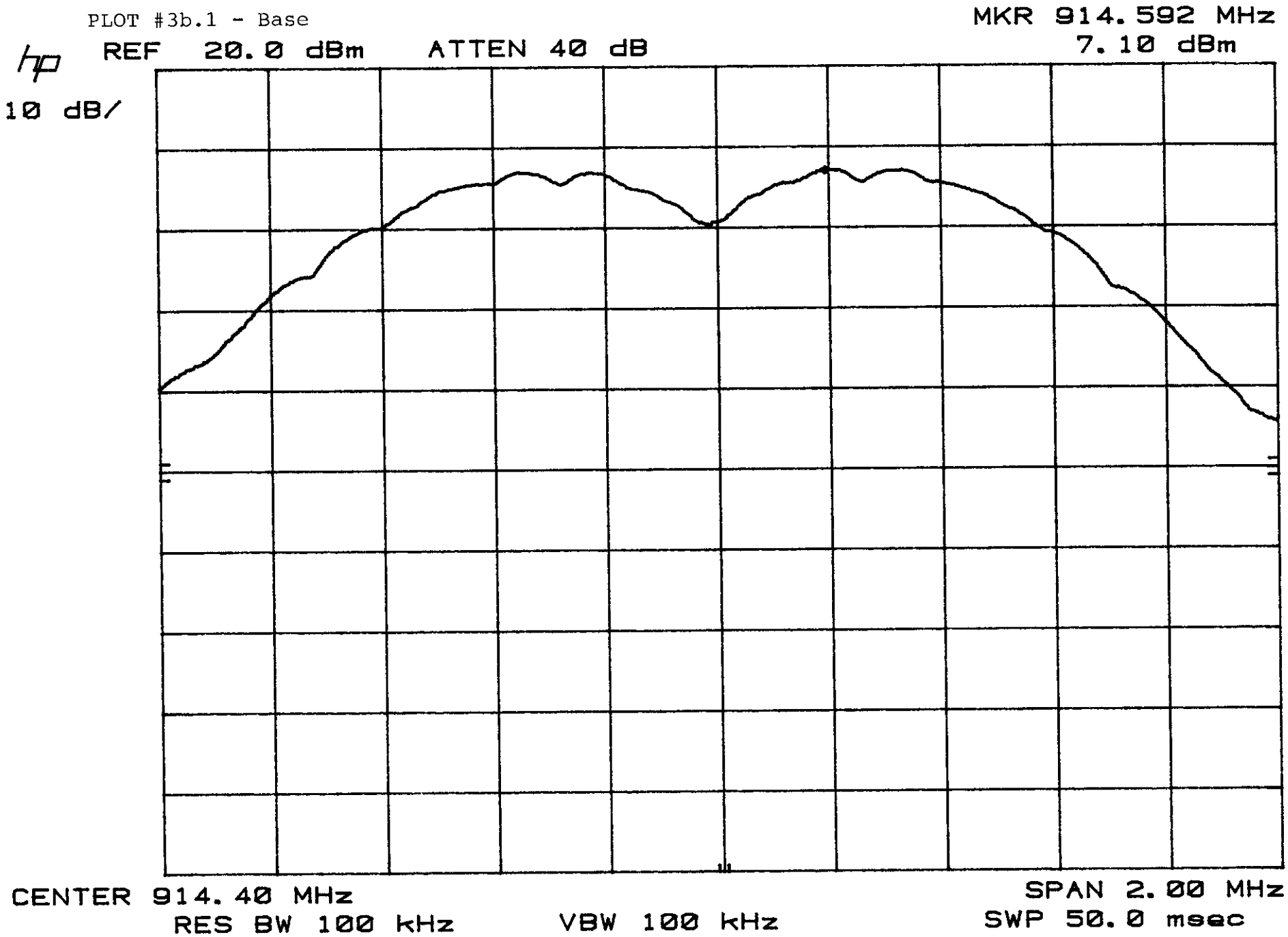
Plot 3a.1 - 3a.2: Low Channel Power Density
Plot 3b.1 - 3b.2: Middle Channel Power Density
Plot 3c.1 - 3c.2: High Channel Power Density

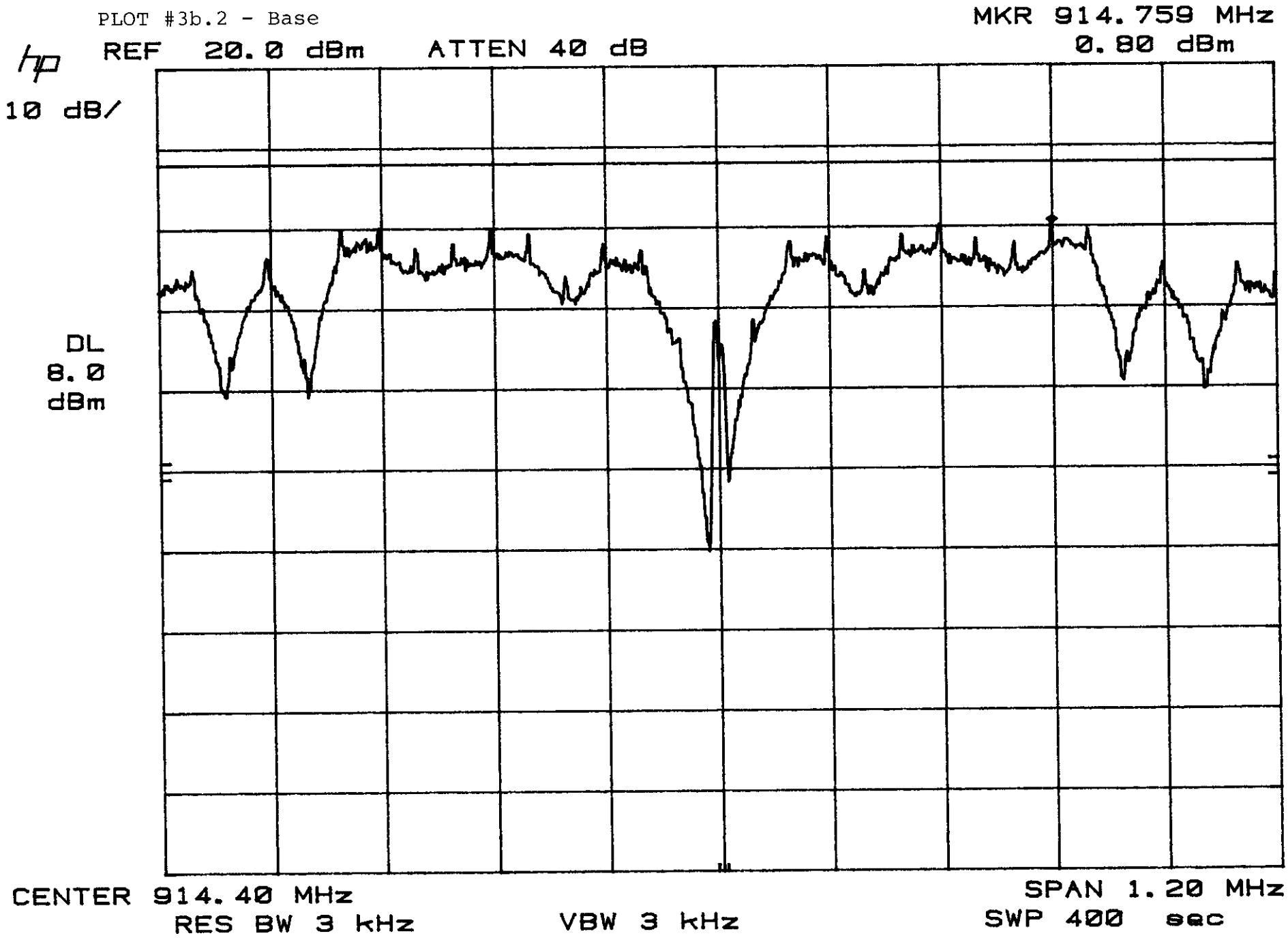

PLOT #3a.1 - Base
MKR 903.792 MHz
REF 20.0 dBm
ATTEN 40 dB
7.30 dBm
10 dB/
DL
1.3
dBm
CENTER 903.60 MHz
SPAN 2.00 MHz
RES BW 100 kHz
VBW 100 kHz
SWP 20.0 msec

PLOT #3a.2 - Base

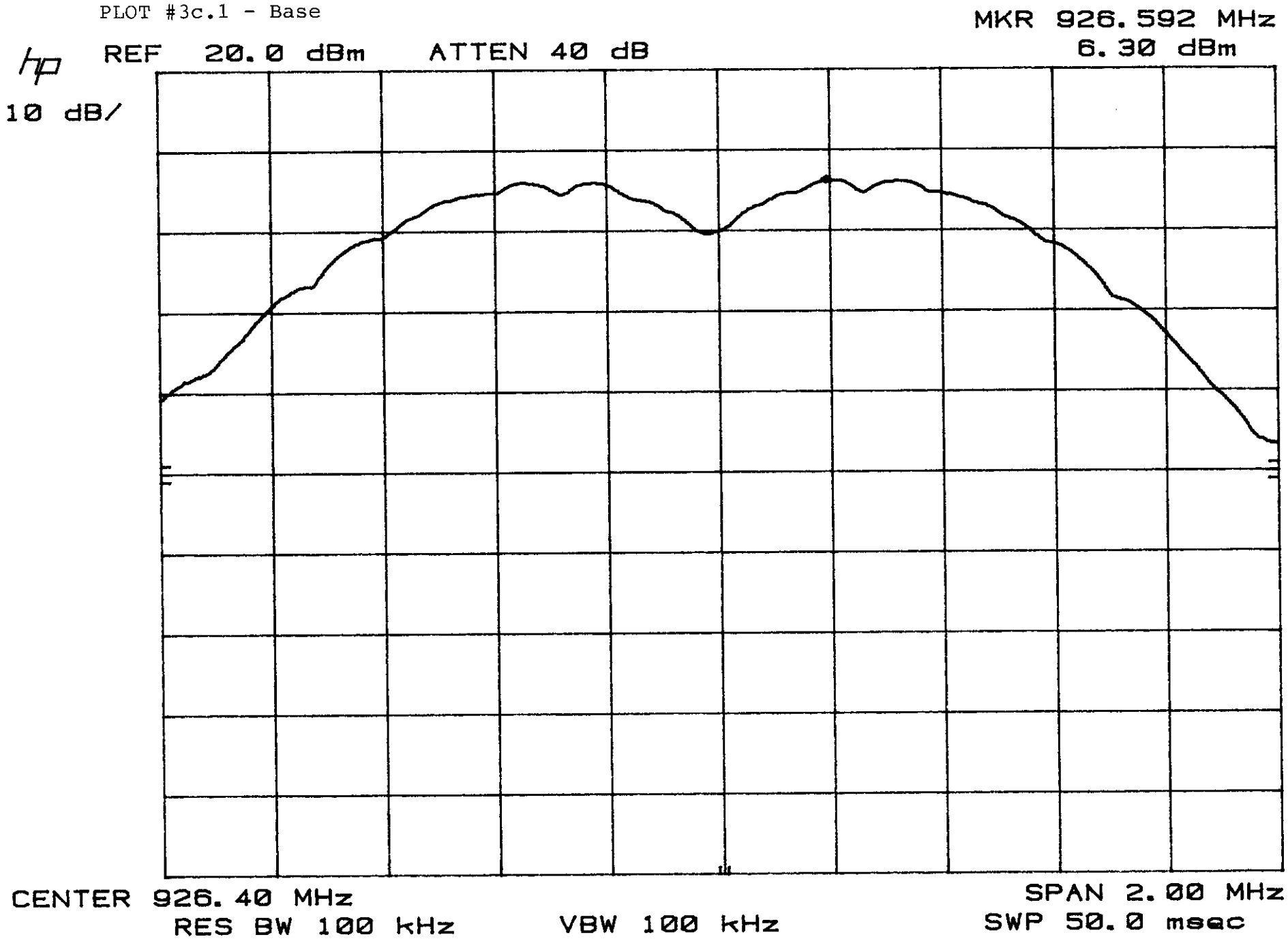


PLOT #3b.1 - Base

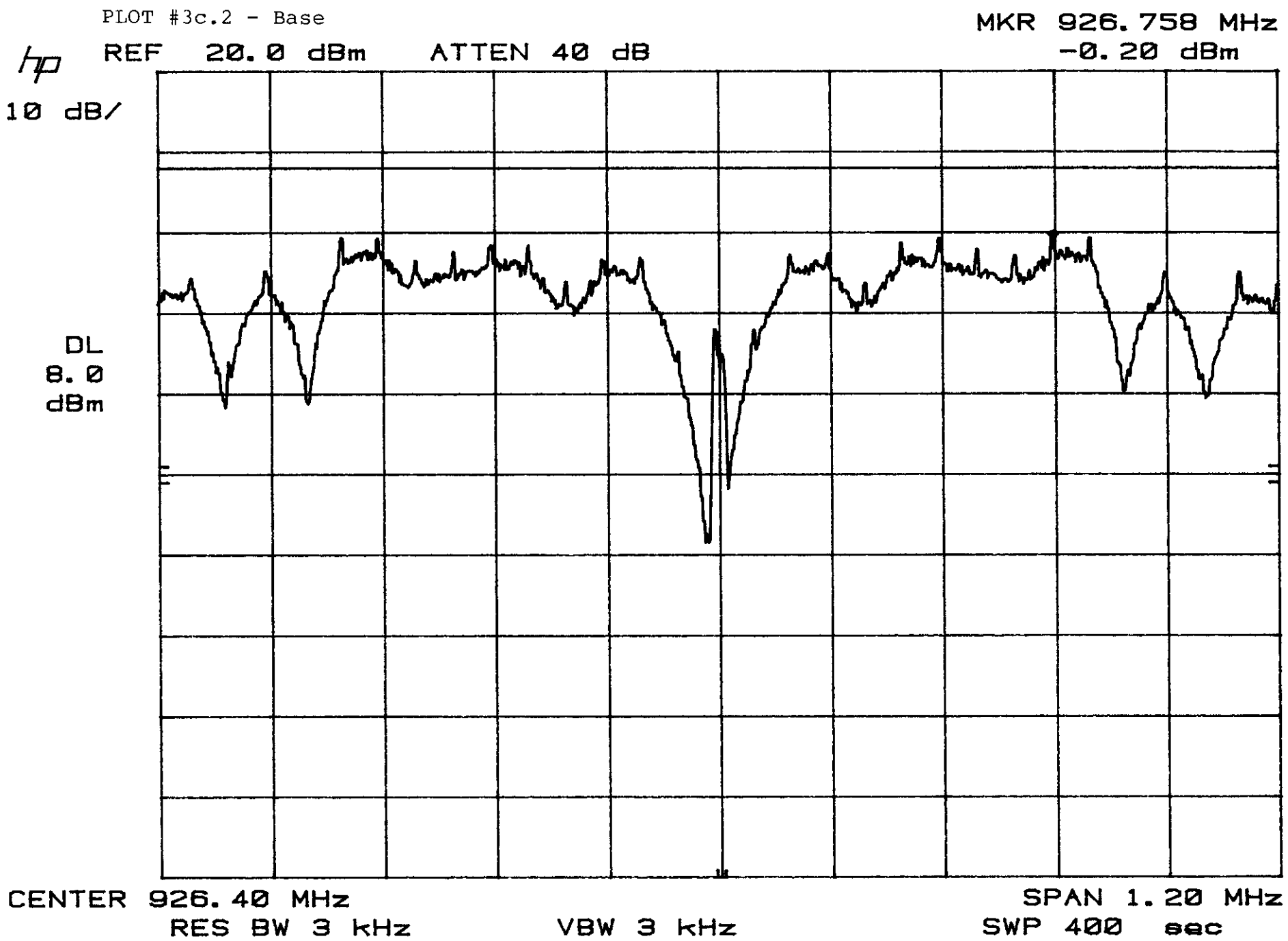



PLOT #3b.2 - Base
MKR 914.759 MHz
0.80 dBm
REF 20.0 dBm
ATTEN 40 dB
10 dB/
DL
8.0
dBm
CENTER 914.40 MHz
RES BW 3 kHz
VBW 3 kHz
SPAN 1.20 MHz
SWP 400 sec

PLOT #3c.1 - Base



PLOT #3c.2 - Base



4.3(a) Maximum Power Density Reading, FCC Rule 15.247(d): (Handset Unit)

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz - Fstart, kHz)/3 kHz

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Frequency (MHz)	Power Density (dBm)
903.84	1.10

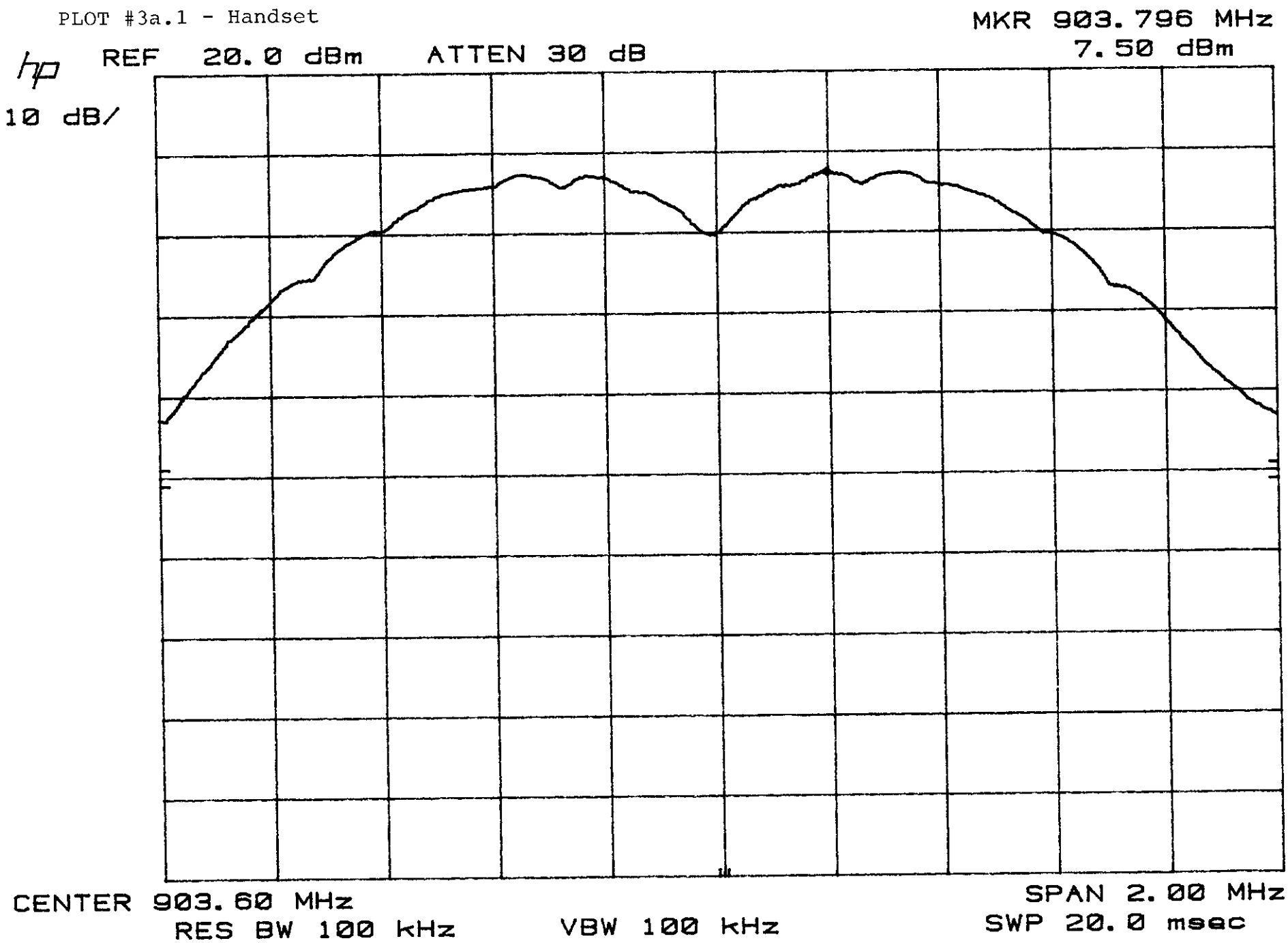
Frequency Span = 1200 kHz

Sweep Time = Frequency Span/3 kHz = 400 seconds

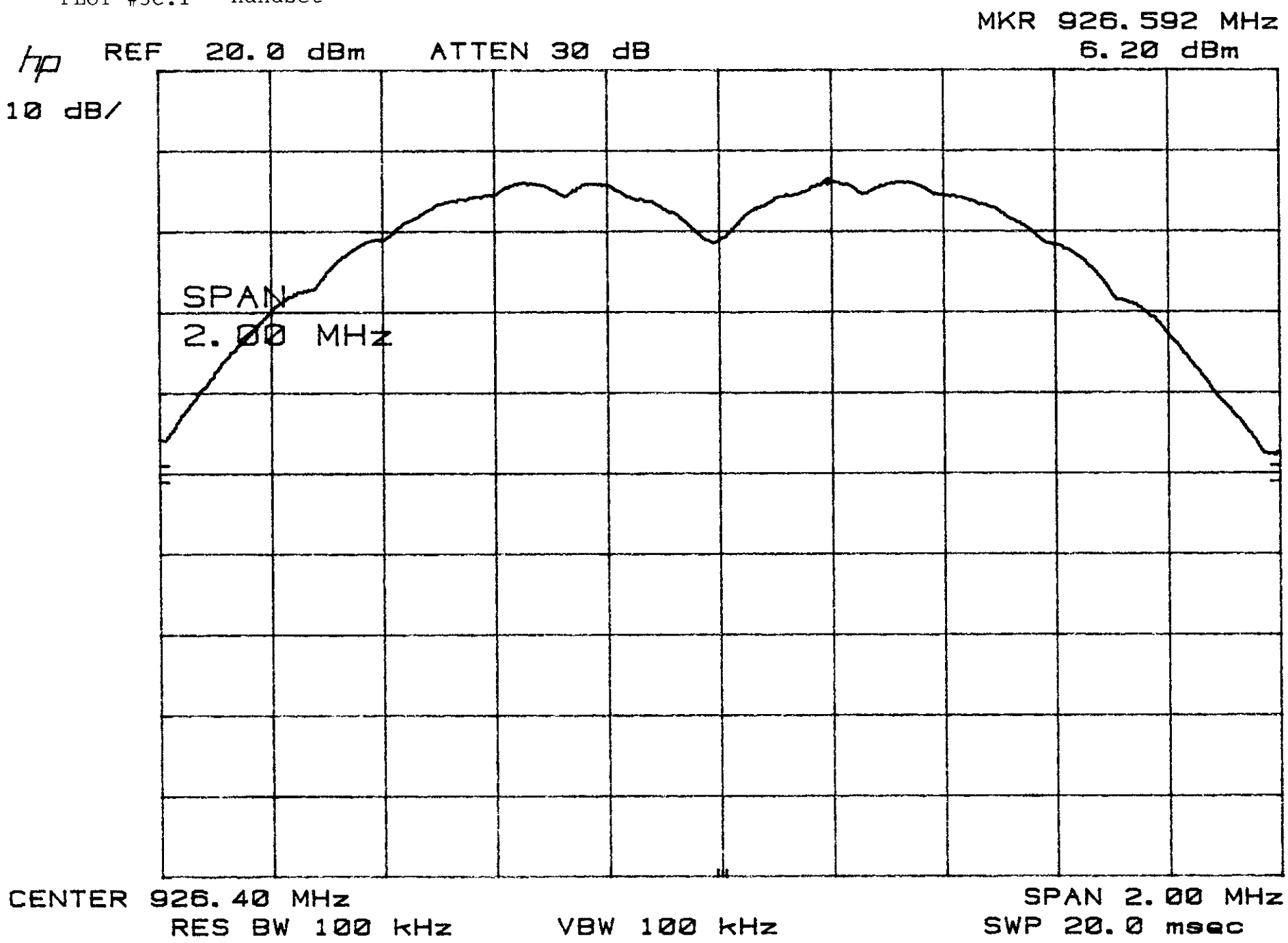
Refer to the following plots for power density data:

Plot 3a.1 - 3a.2: Low Channel Power Density
Plot 3b.1 - 3b.2: Middle Channel Power Density
Plot 3c.1 - 3c.2: High Channel Power Density

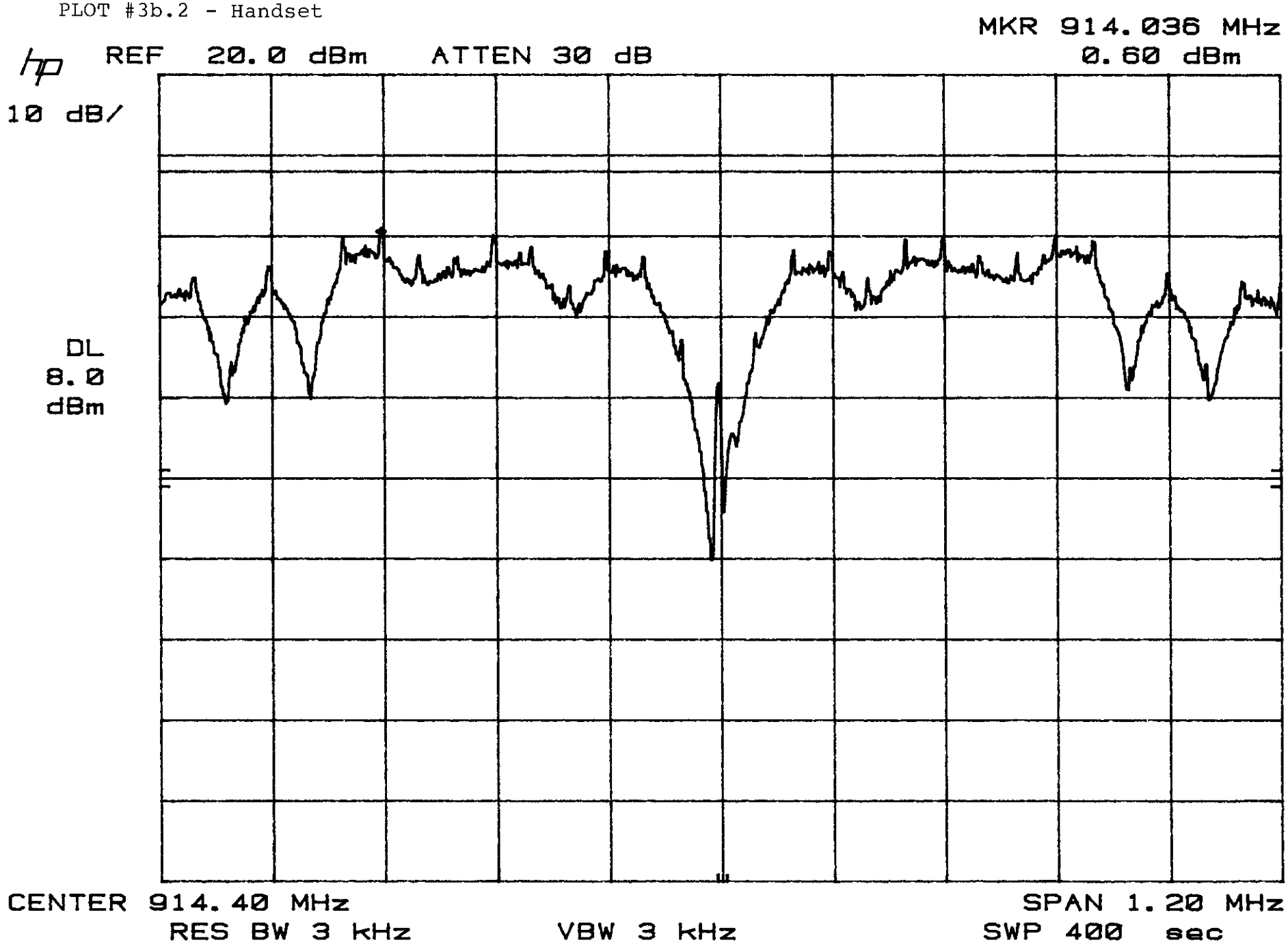
PLOT #3a.1 - Handset



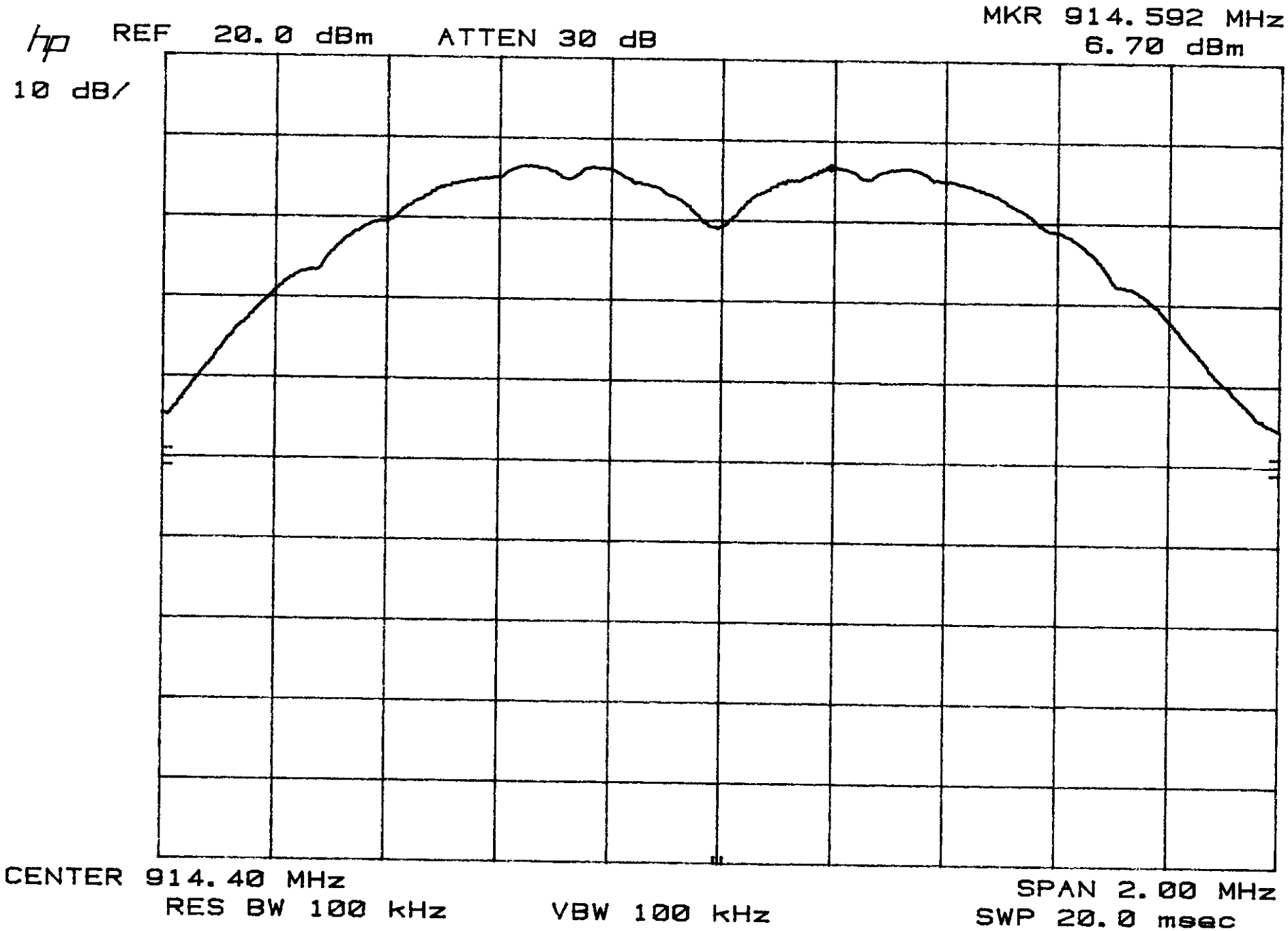
PLOT #3c.1 - Handset



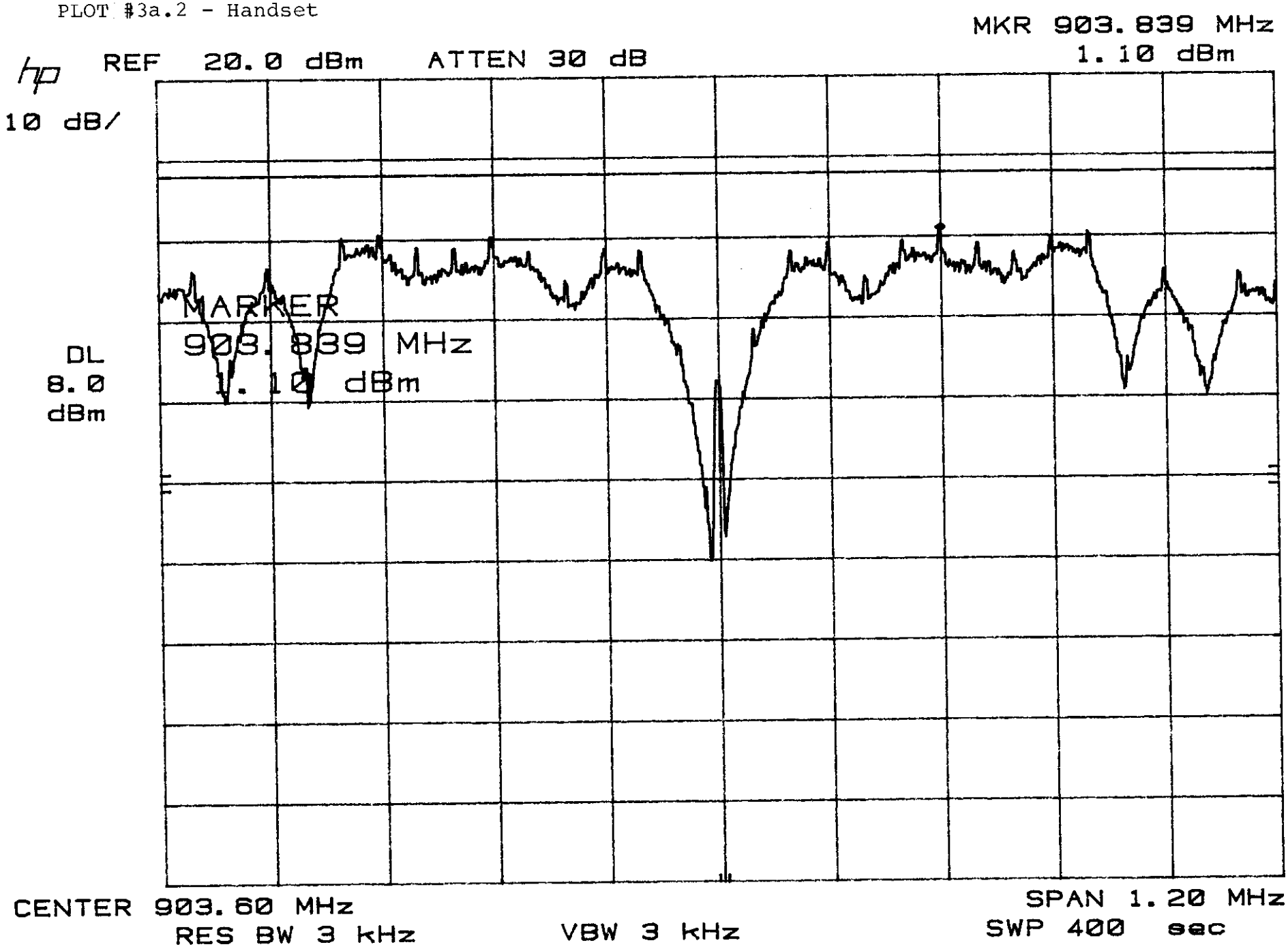
PLOT #3b.2 - Handset



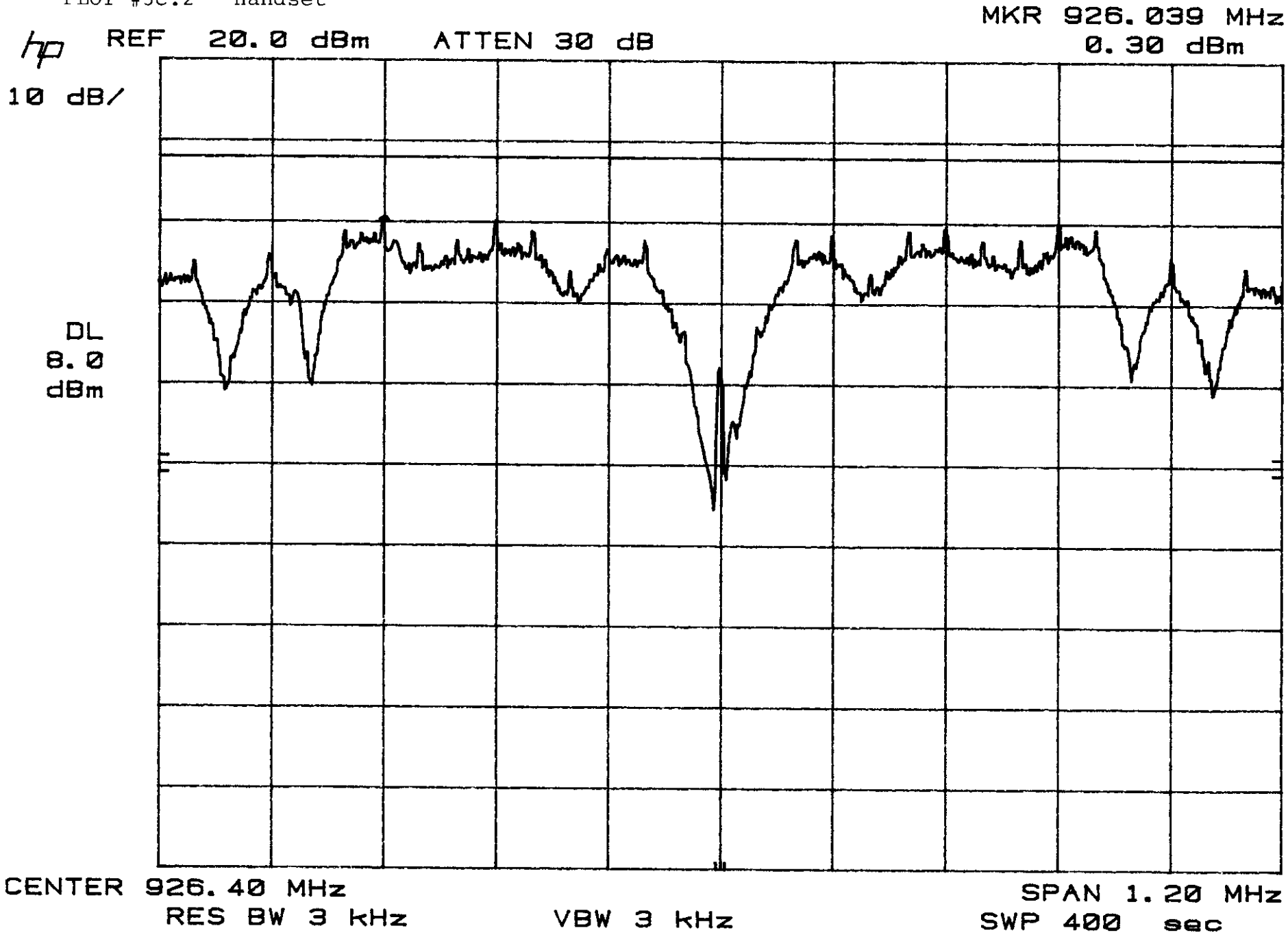
PLOT #3b.1 - Handset



PLOT #3a.2 - Handset



PLOT #3c.2 - Handset



4.4 Out of Band Conducted Emissions, FCC Rule 15.247(c): (Base Unit)

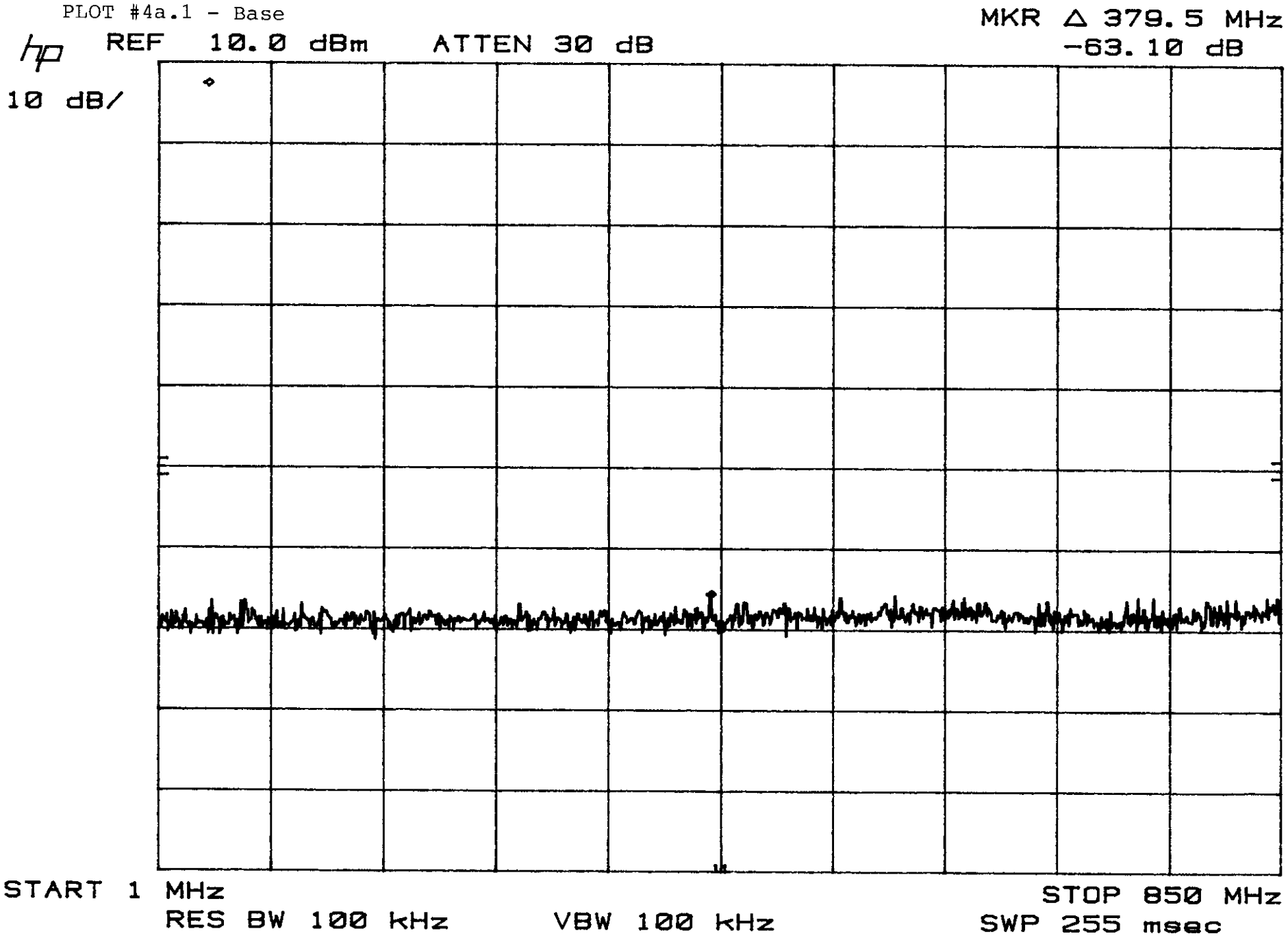
In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

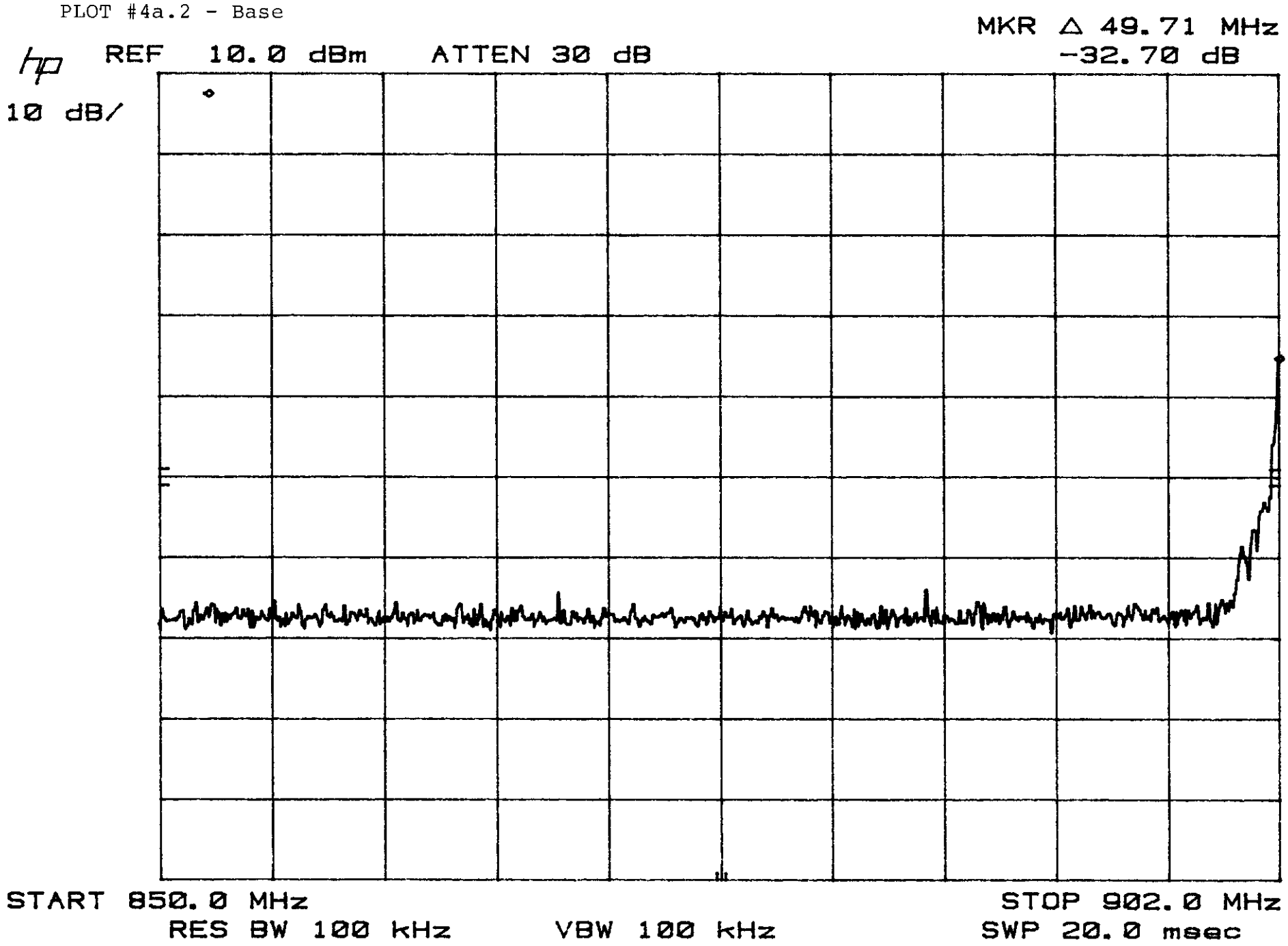
Refer to the following plots for out of band conducted emissions data:

Plot 4a.1 - 4a.6: Low Channel Emissions
Plot 4b.1 - 4b.5: Middle Channel Emissions
Plot 4c.1 - 4c.5: High Channel Emissions

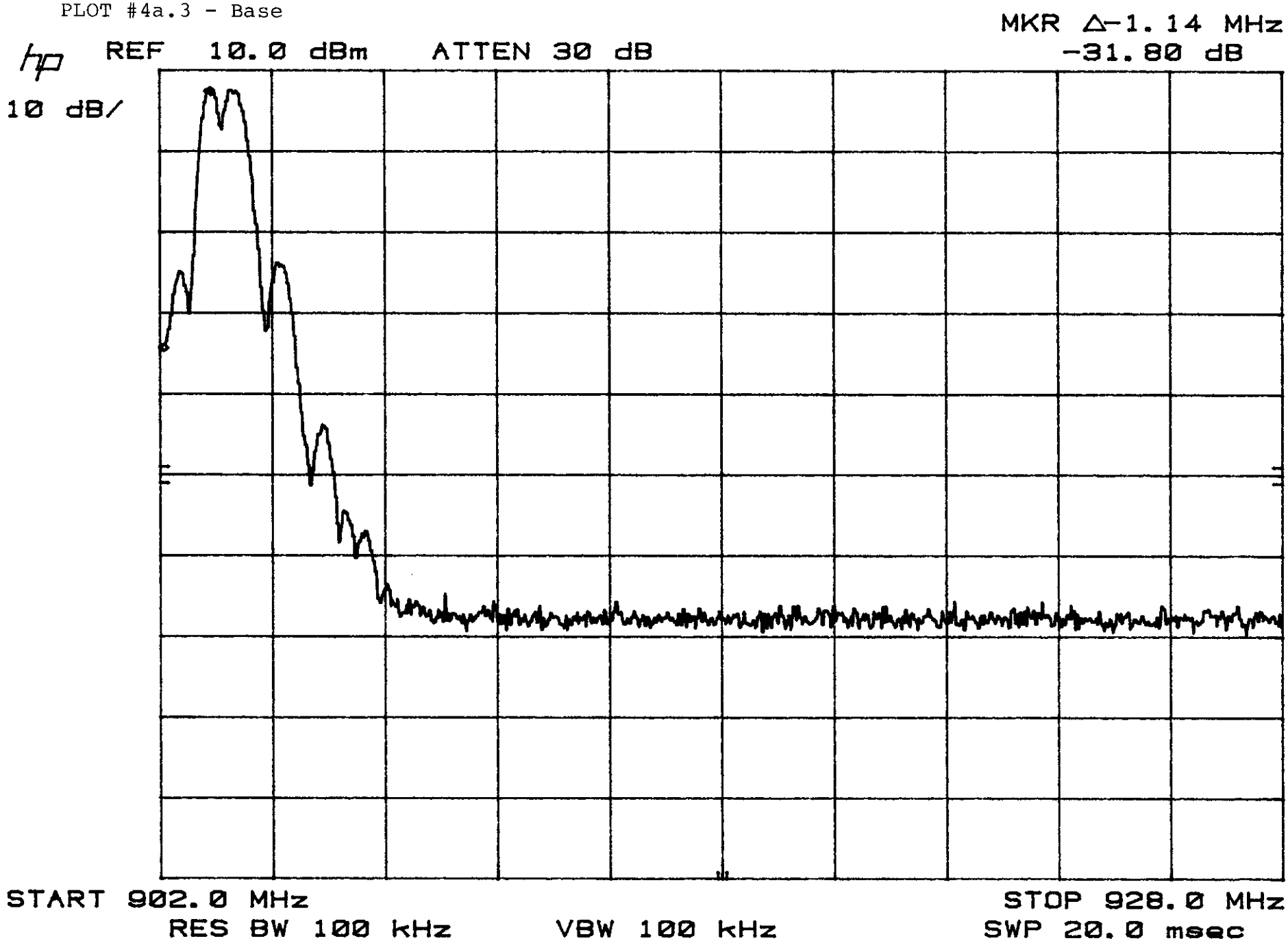
PLOT #4a.1 - Base



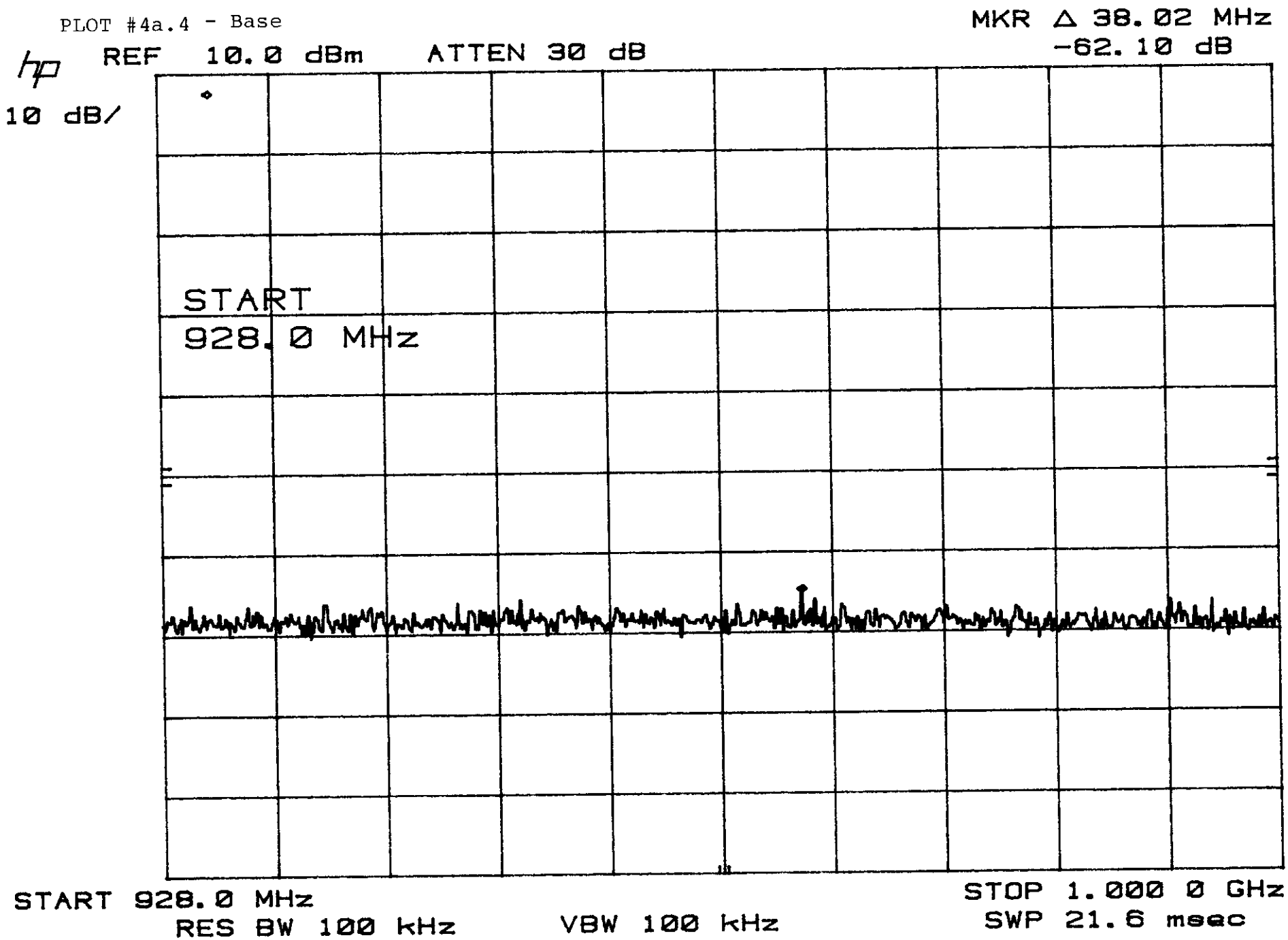
PLOT #4a.2 - Base



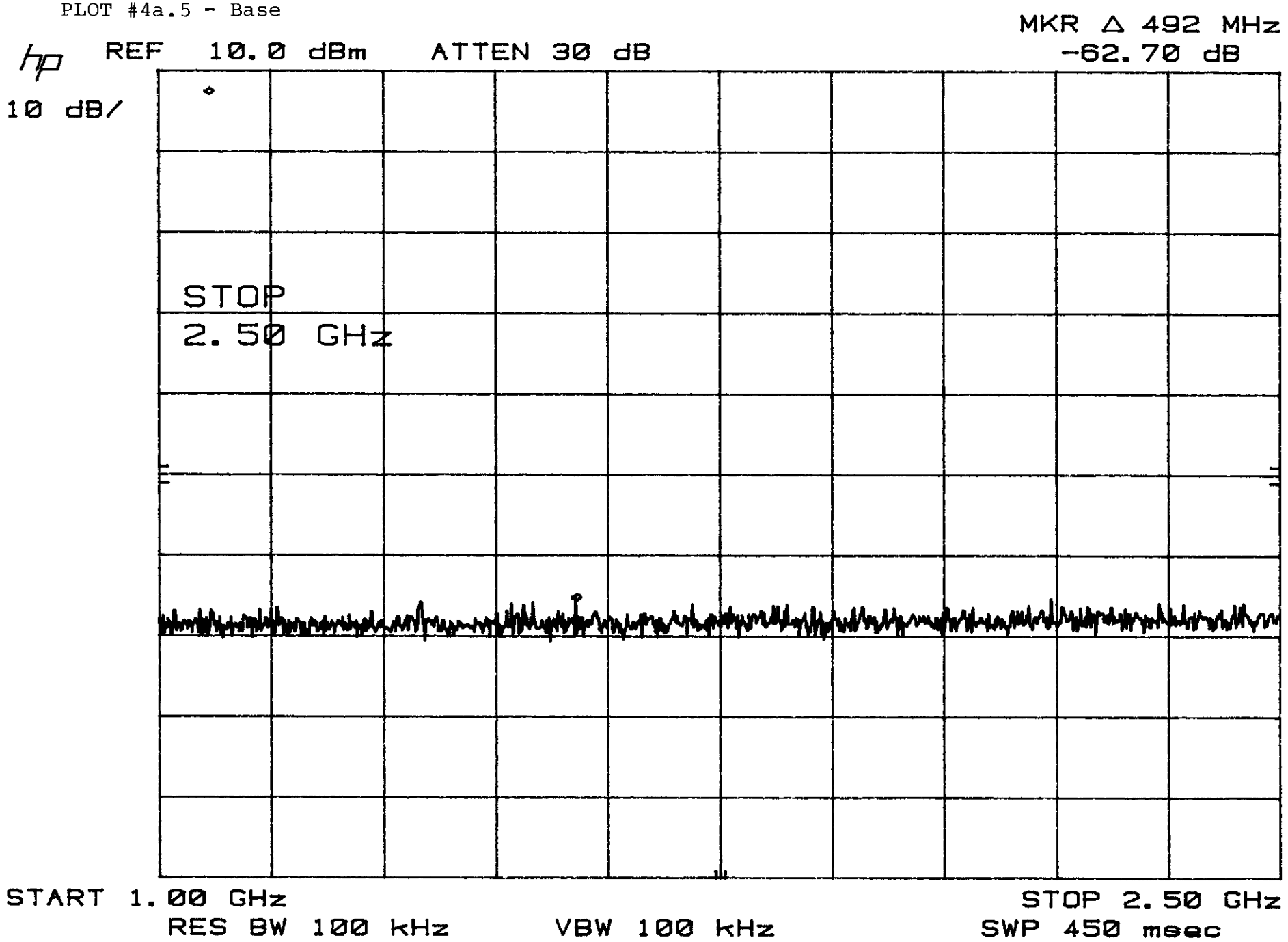
PLOT #4a.3 - Base



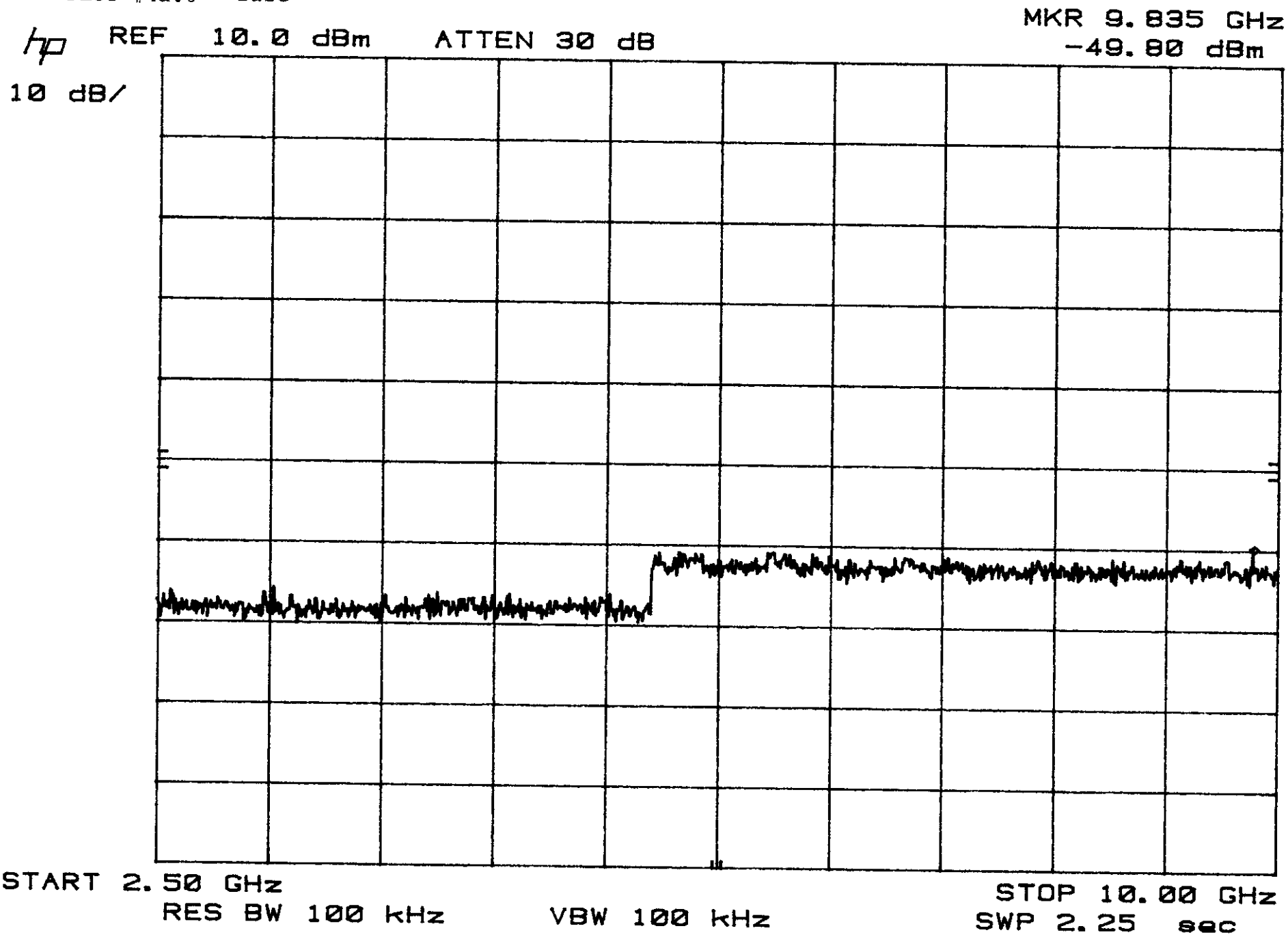
PLOT #4a.4 - Base



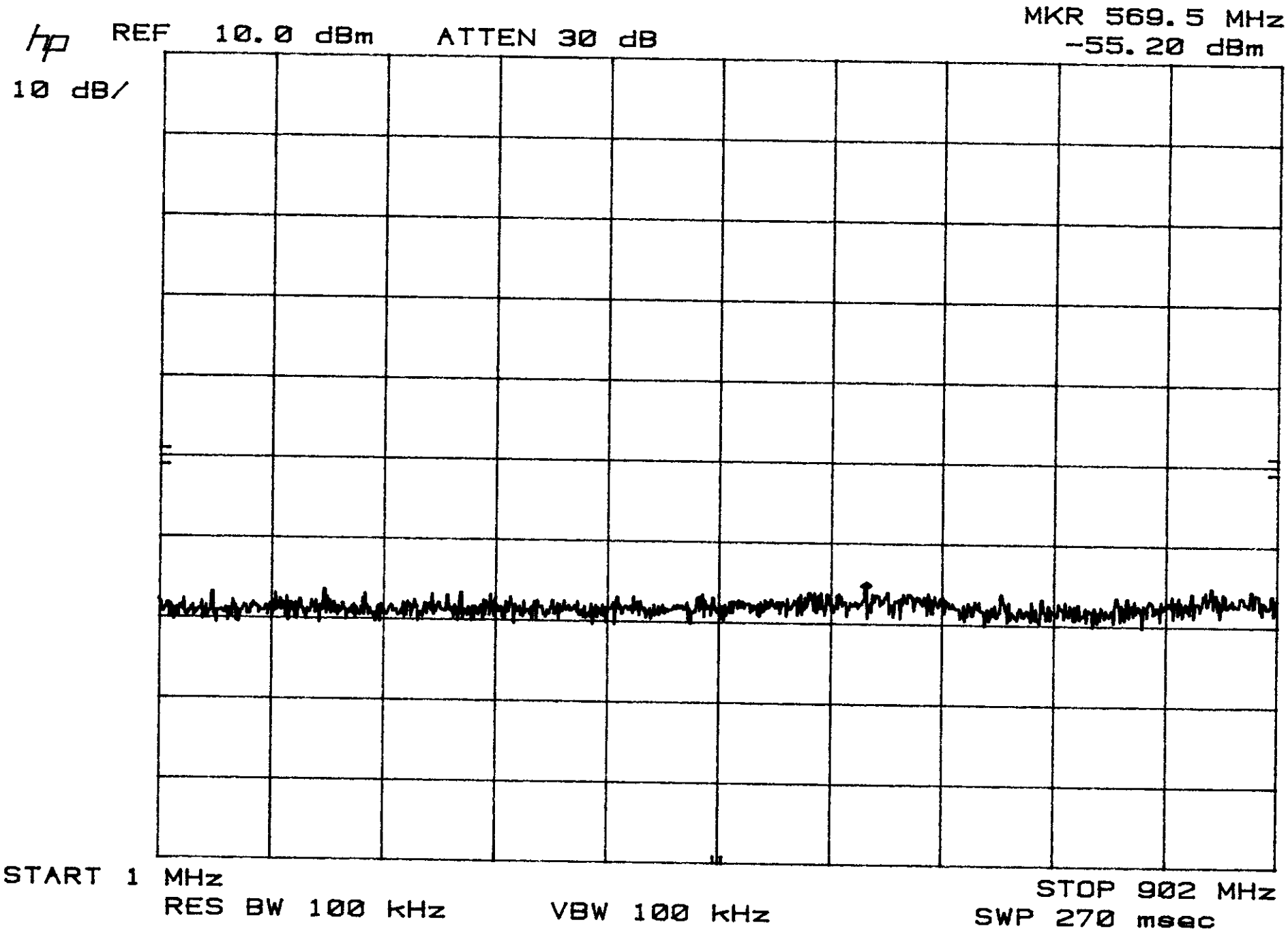
PLOT #4a.5 - Base



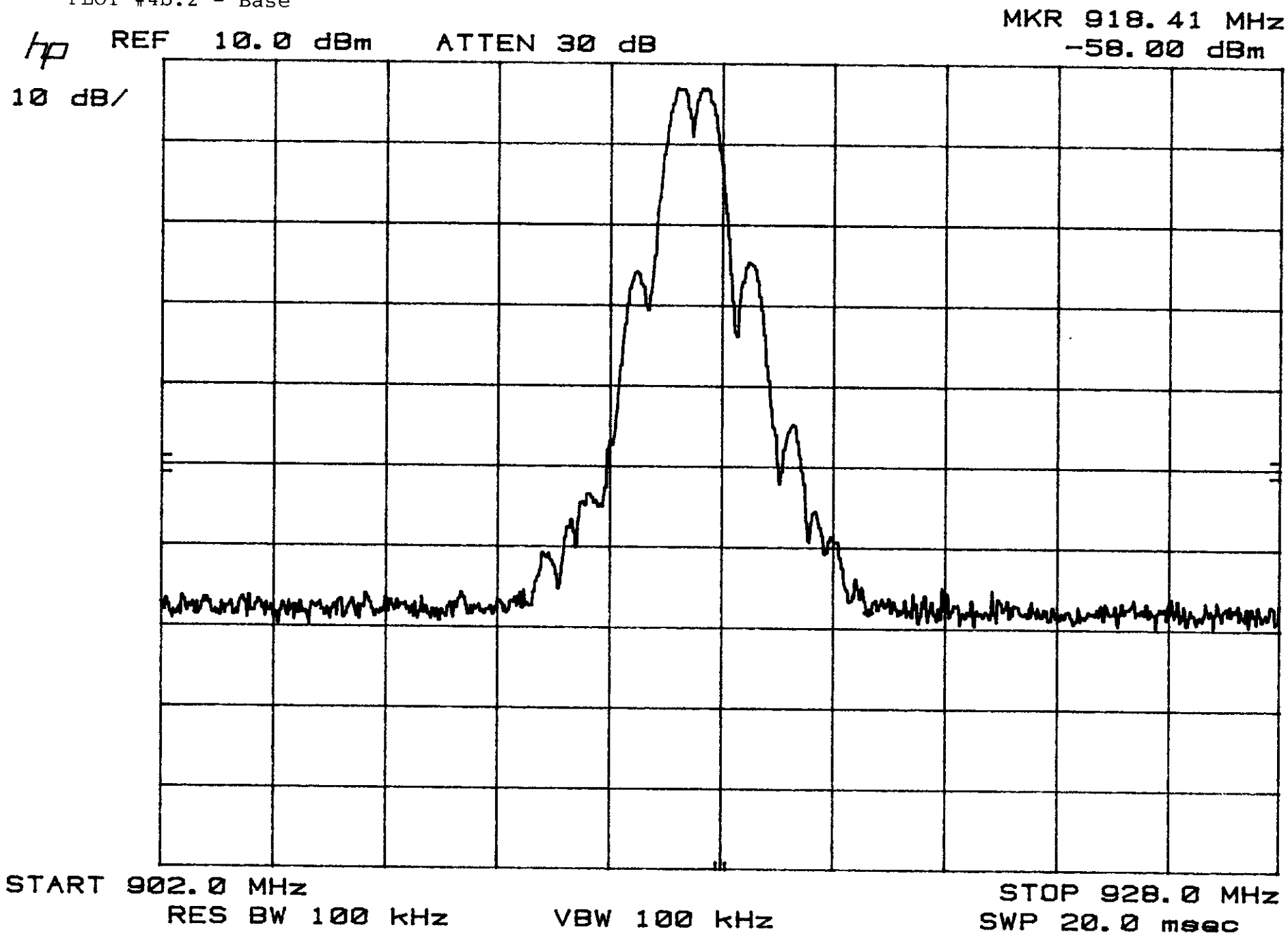
PLOT #4a.6 - Base



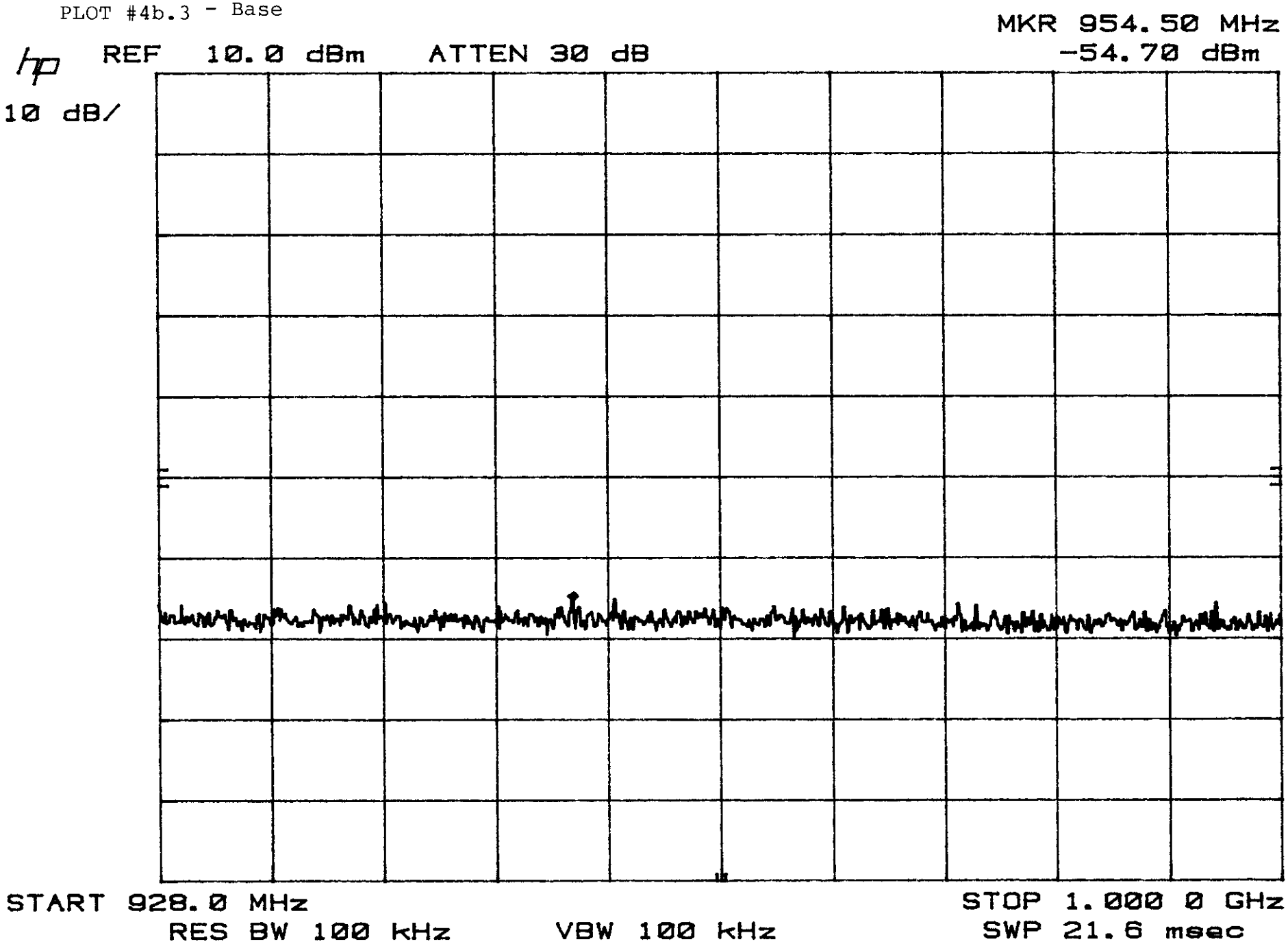
PLOT #4b.1 - Base



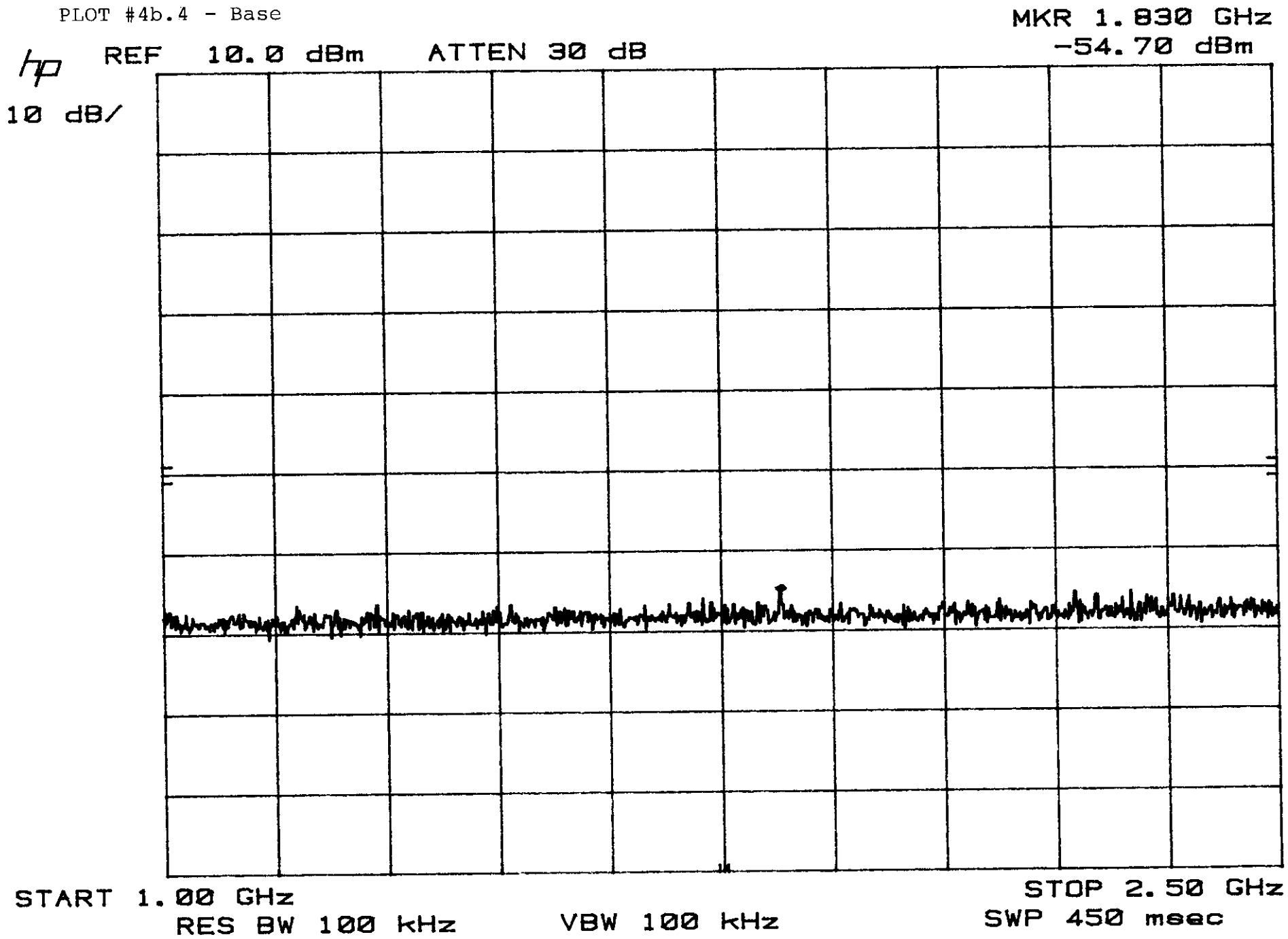
PLOT #4b.2 - Base



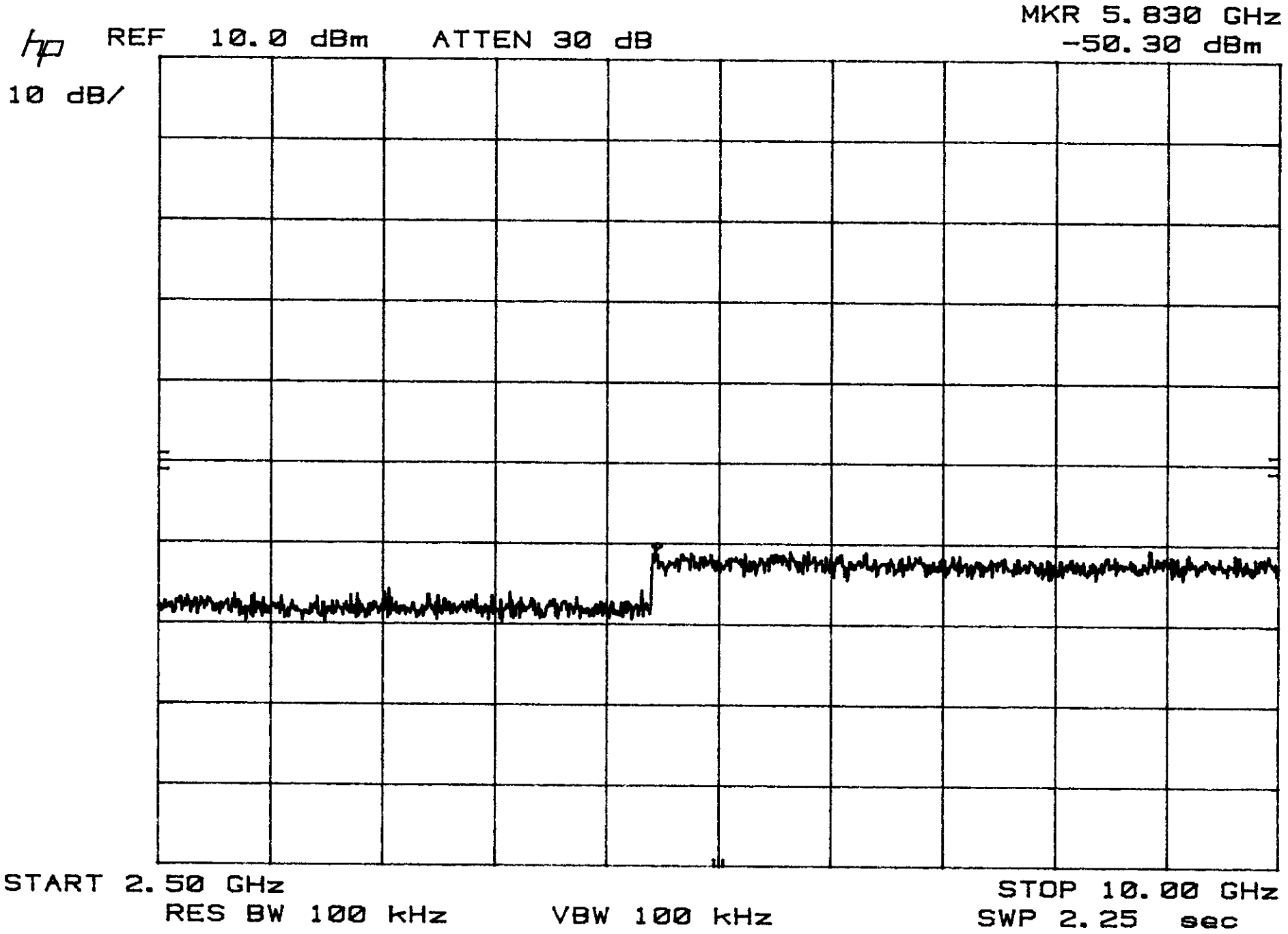
PLOT #4b.3 - Base



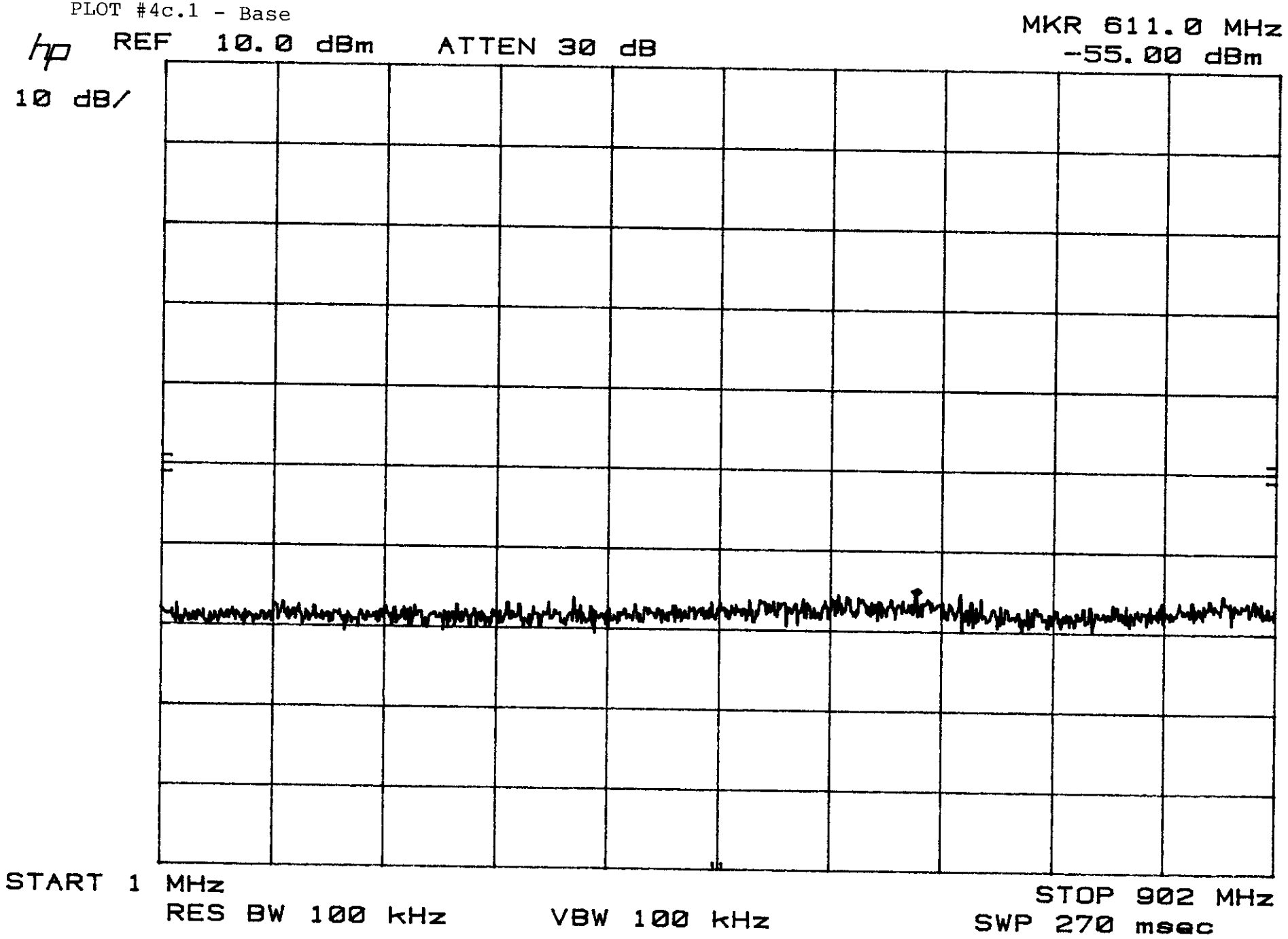
PLOT #4b.4 - Base



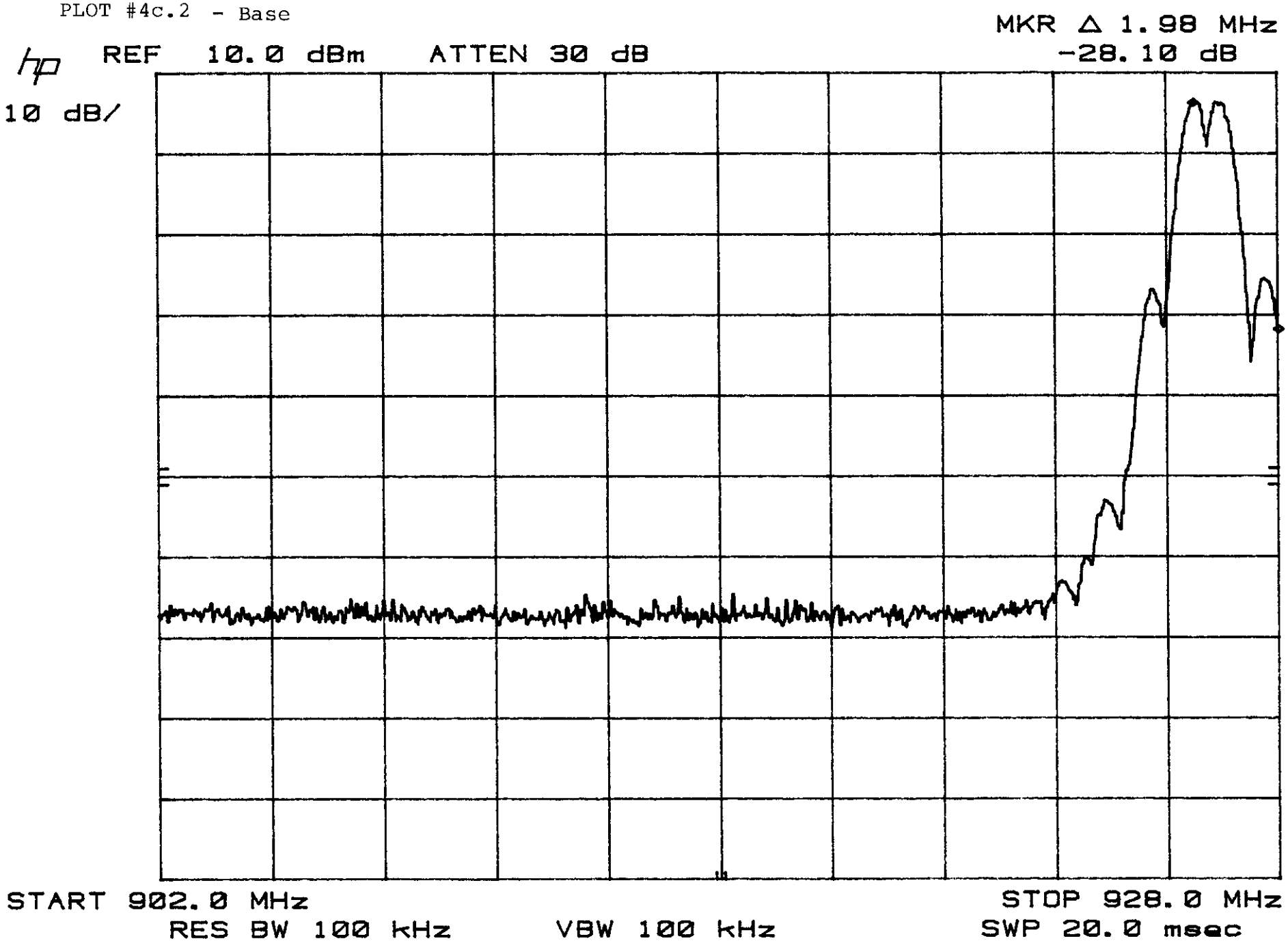
PLOT #4b.5 - Base



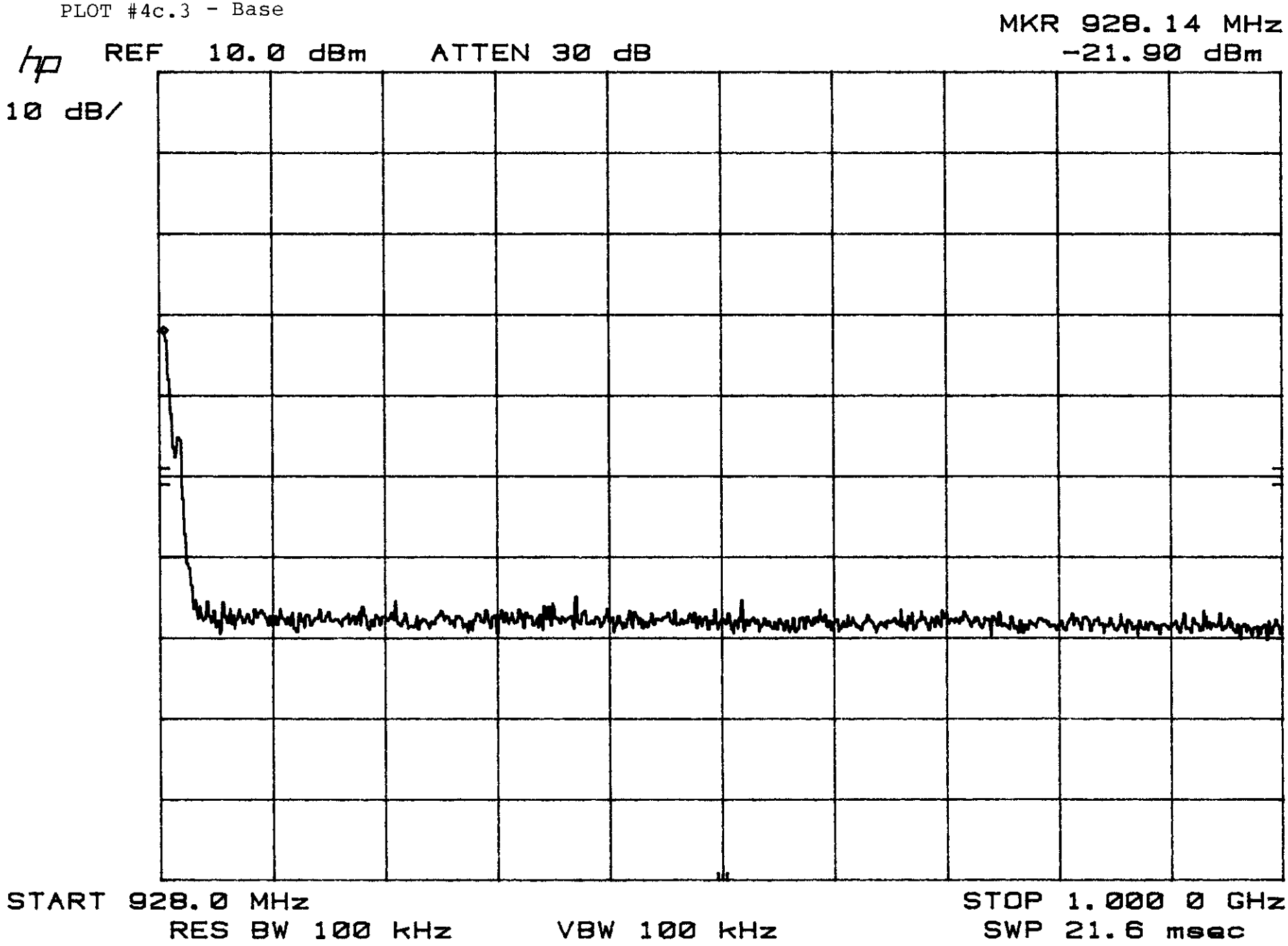
PLOT #4c.1 - Base



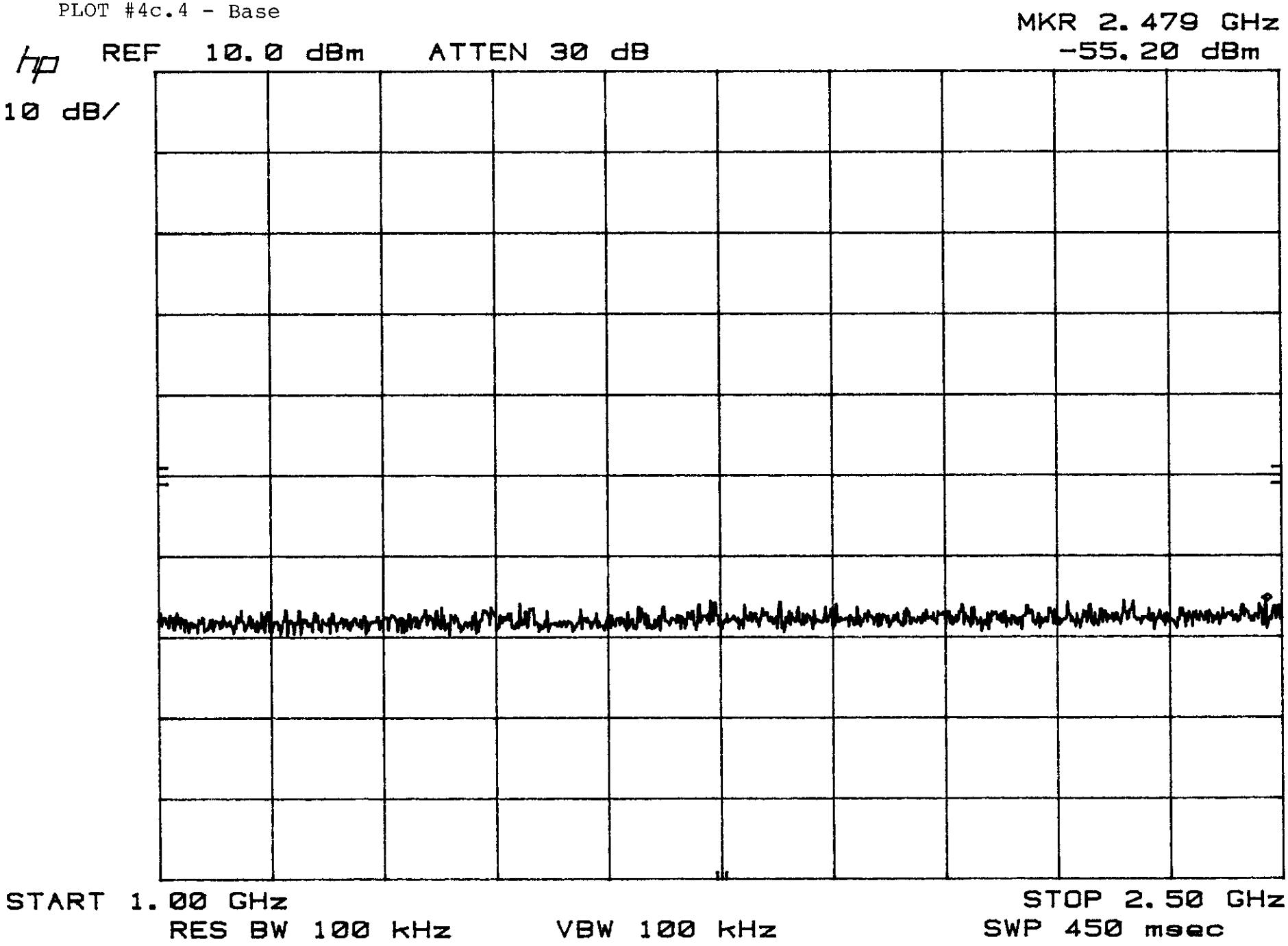
PLOT #4c.2 - Base



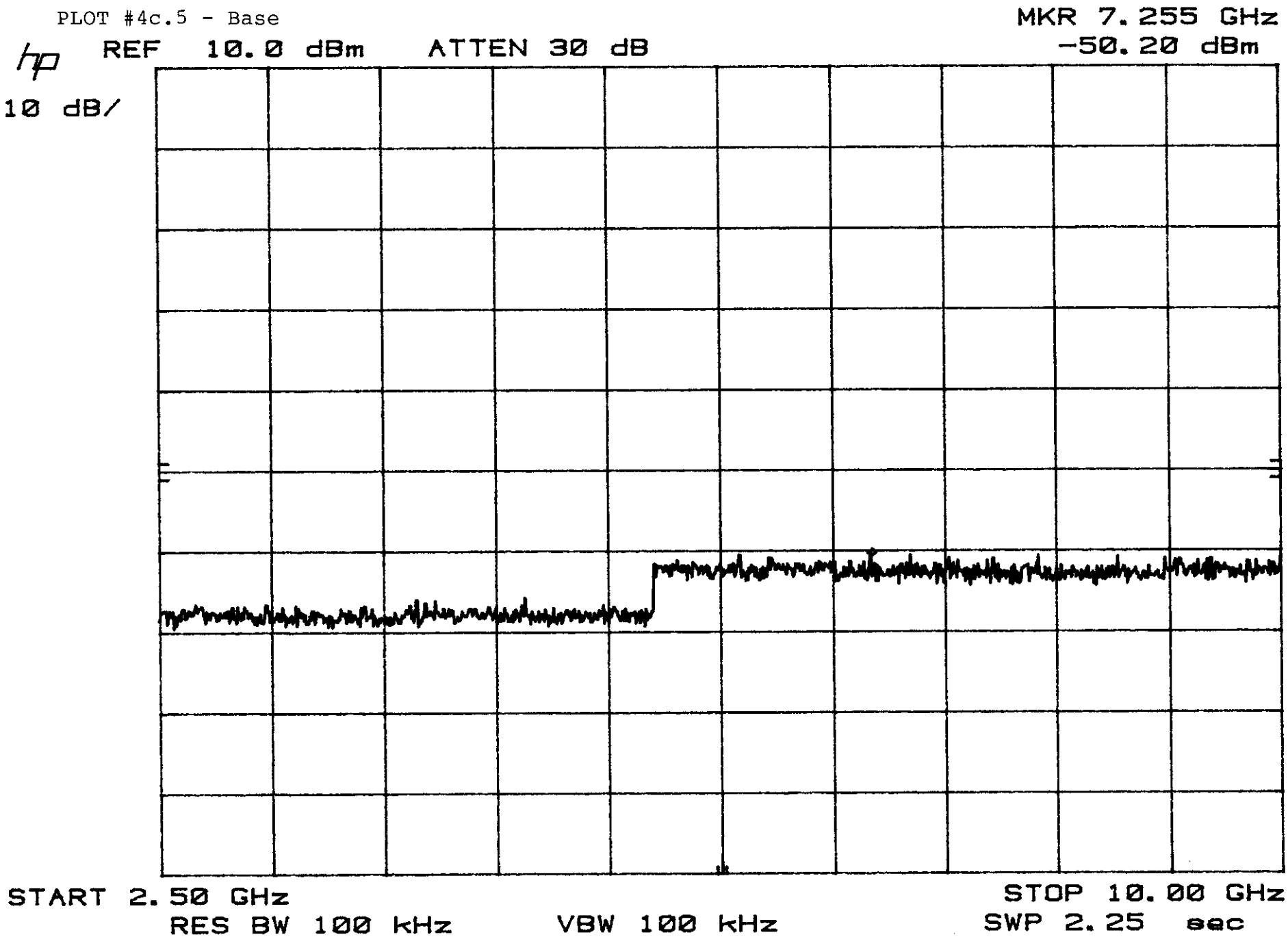
PLOT #4c.3 - Base



PLOT #4c.4 - Base



PLOT #4c.5 - Base



4.4(a) Out of Band Conducted Emissions, FCC Rule 15.247(c): (Handset Unit)

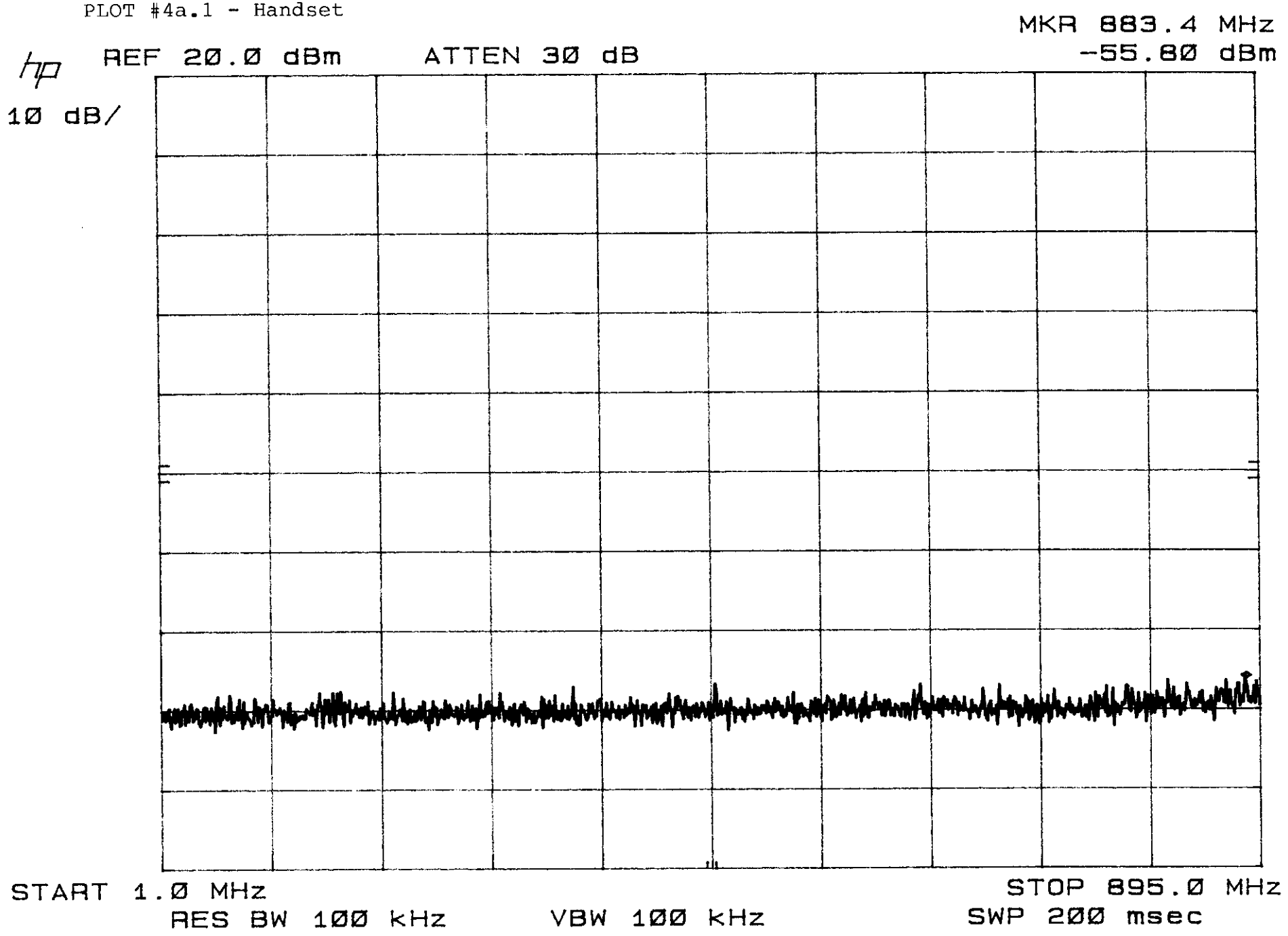
In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

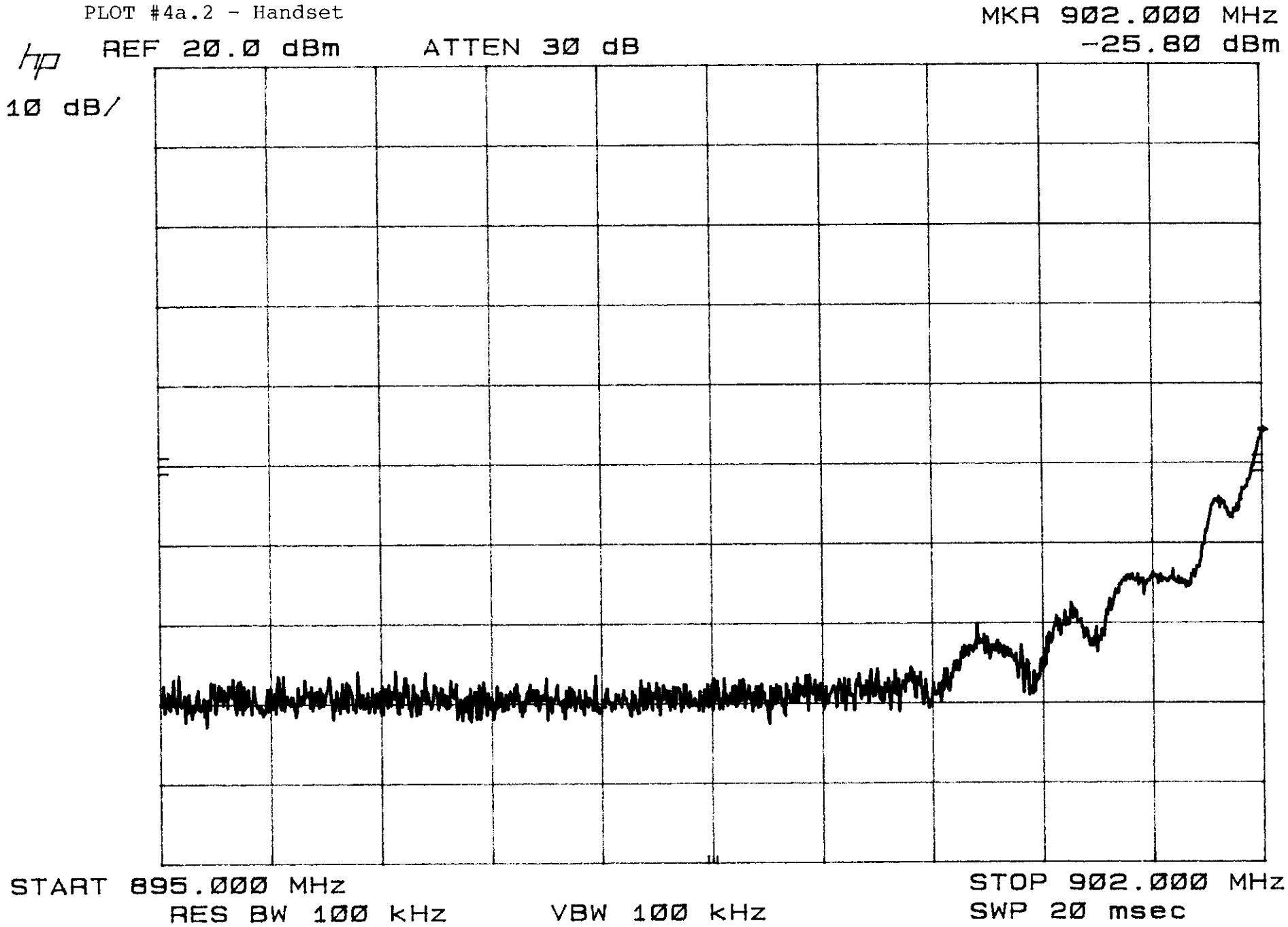
Refer to the following plots for out of band conducted emissions data:

Plot 4a.1 - 4a.4: Low Channel Emissions
Plot 4b.1 - 4b.5: Middle Channel Emissions
Plot 4c.1 - 4c.5: High Channel Emissions

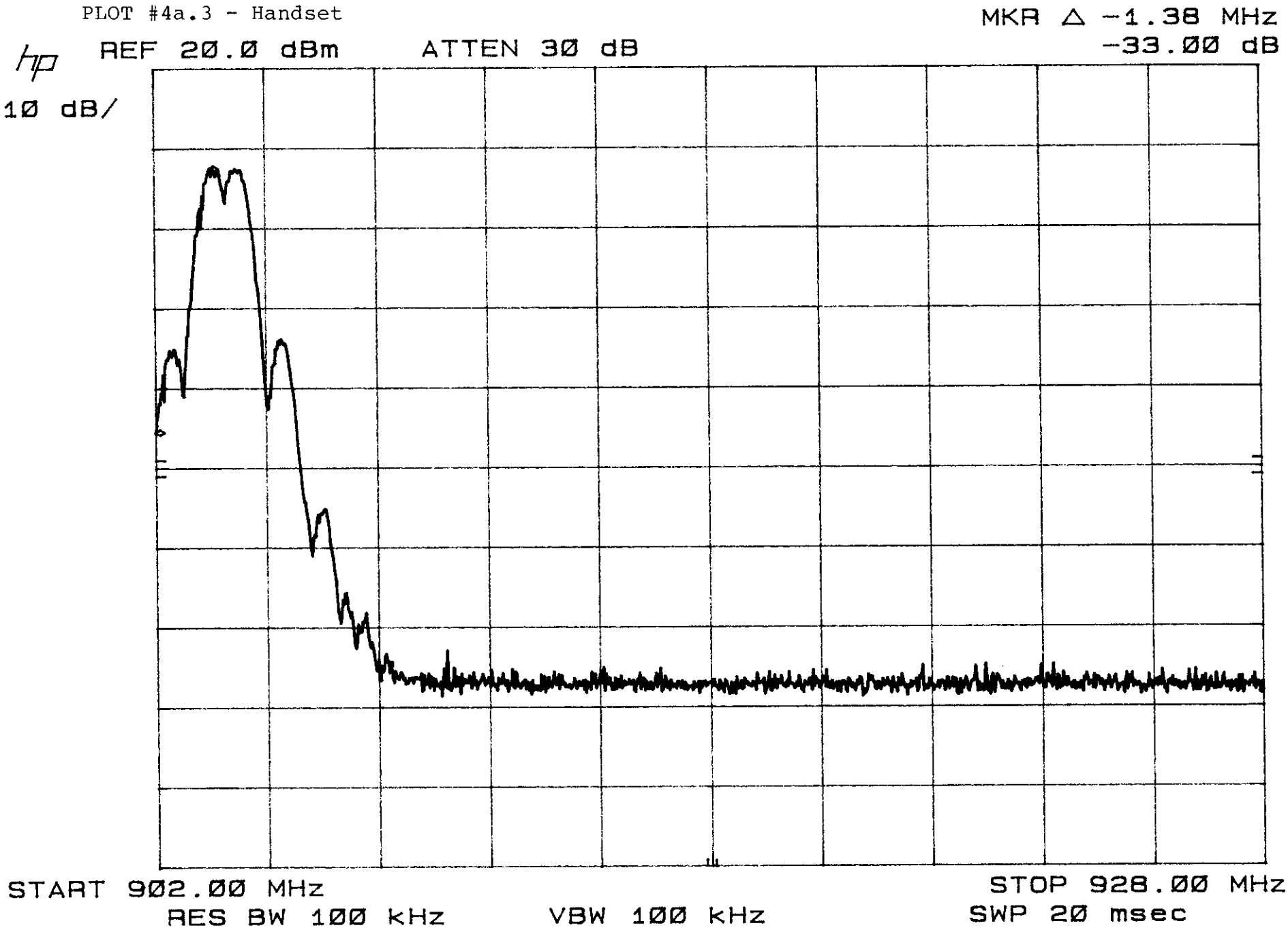
PLOT #4a.1 - Handset



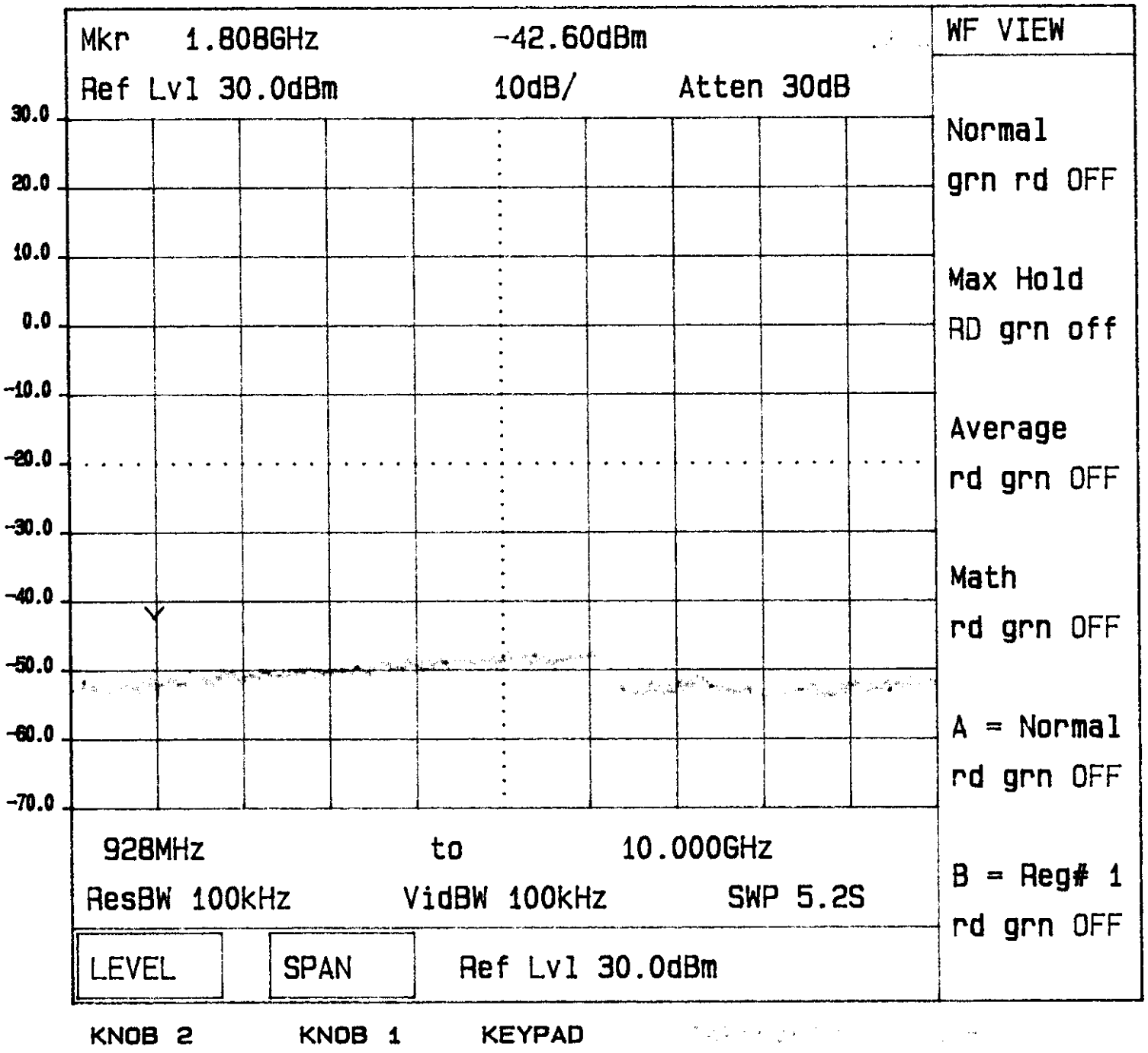
PLOT #4a.2 - Handset



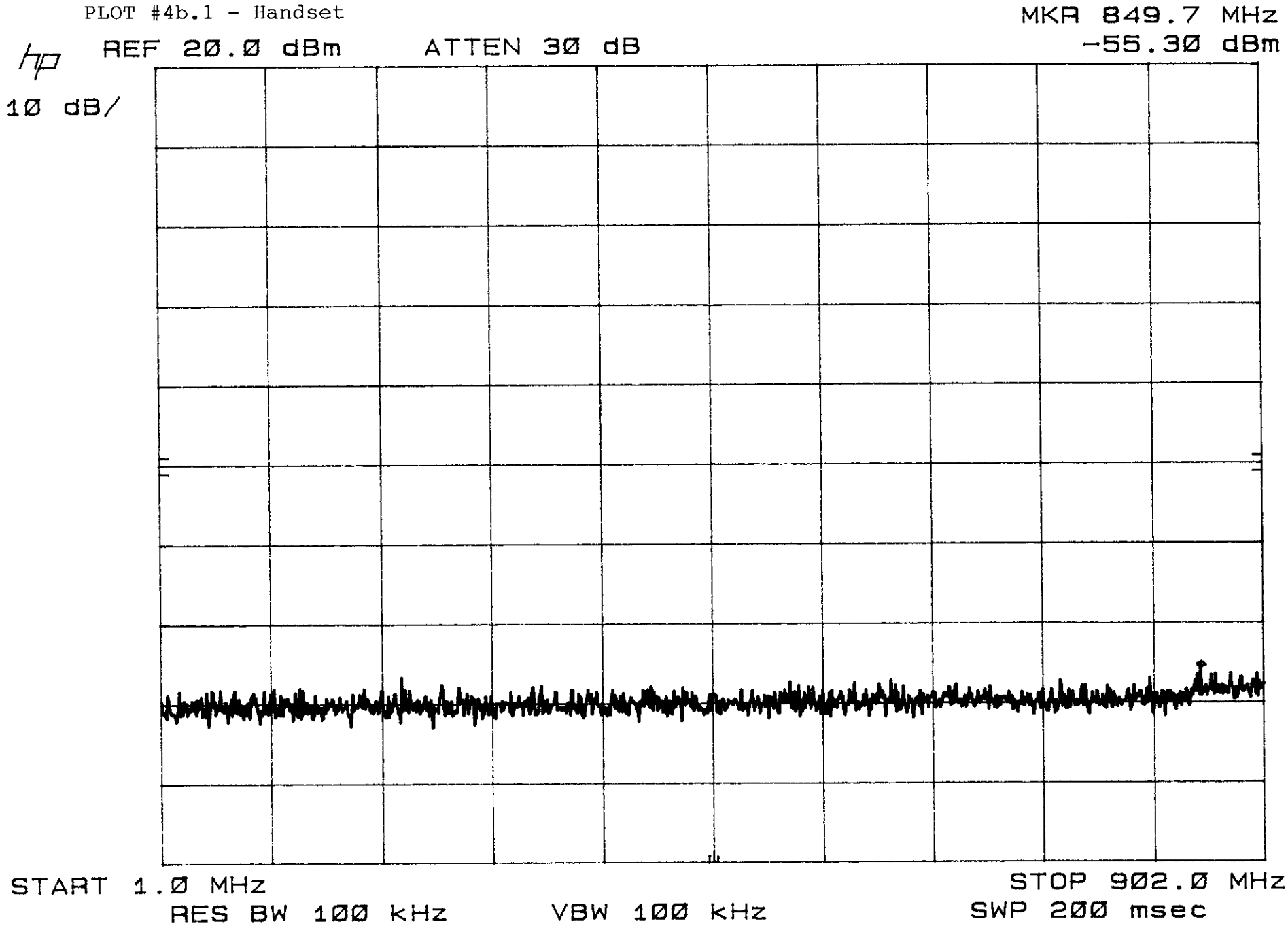
PLOT #4a.3 - Handset



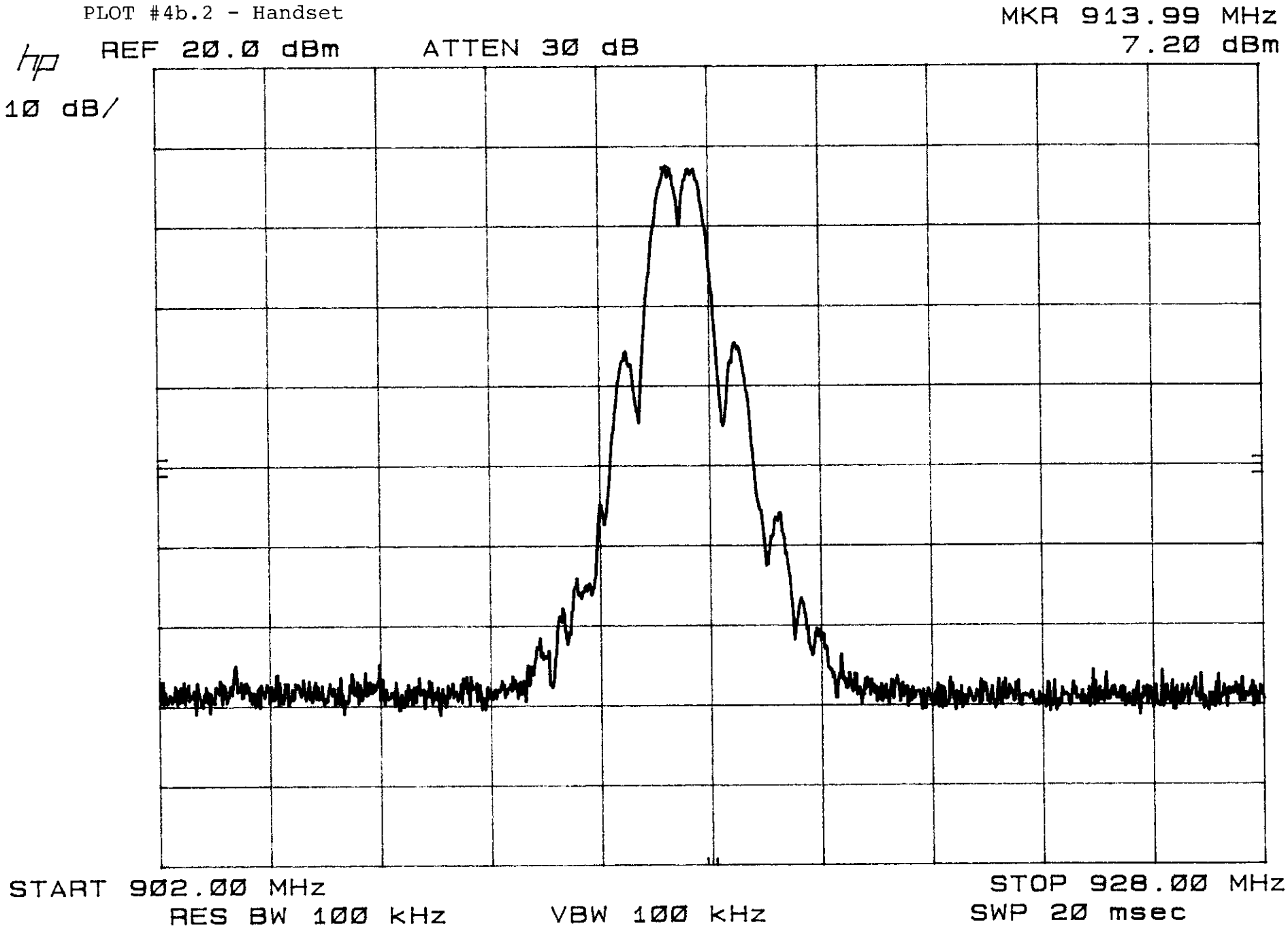
PLOT #4a.4 - Handset



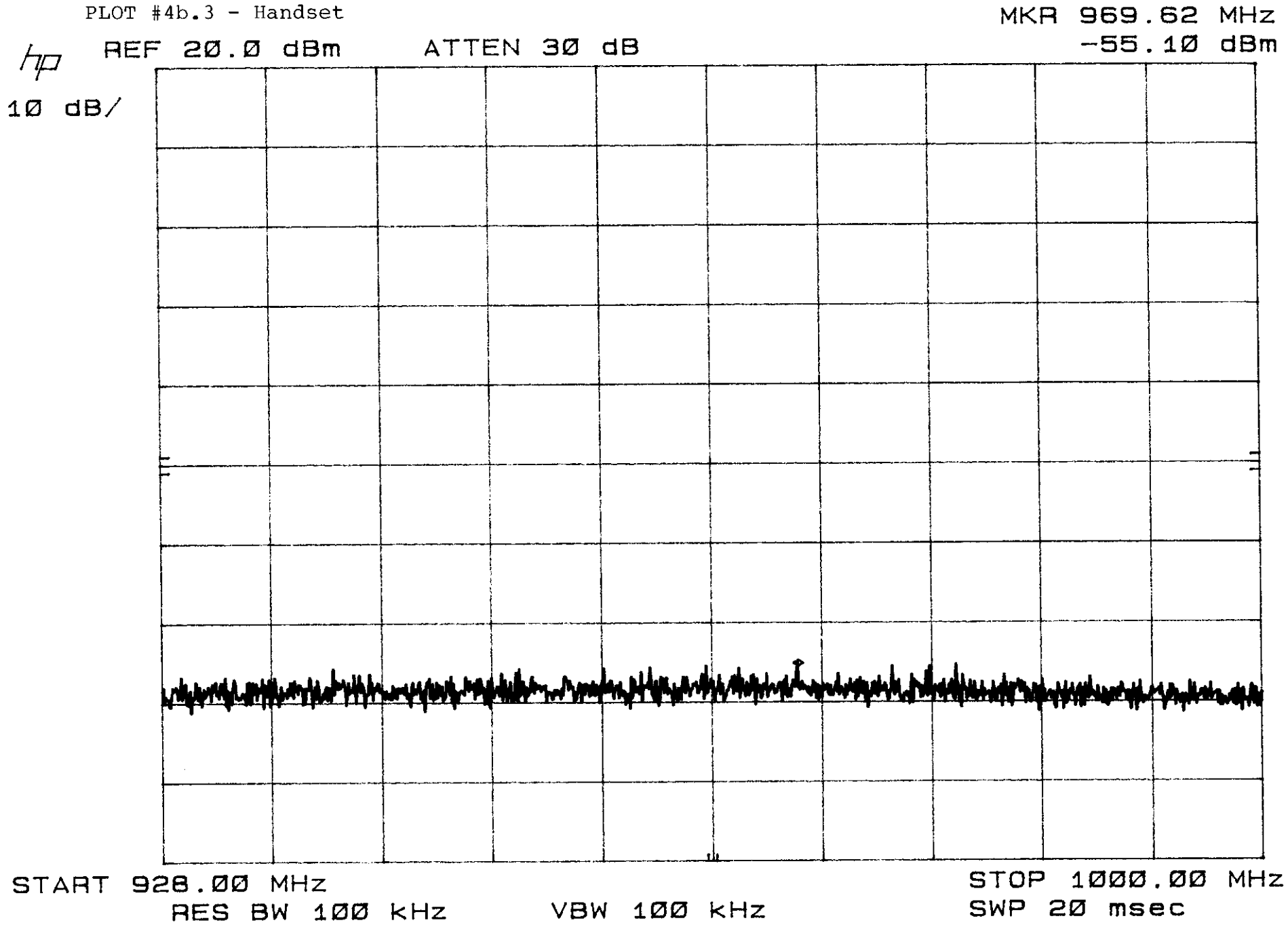
PLOT #4b.1 - Handset



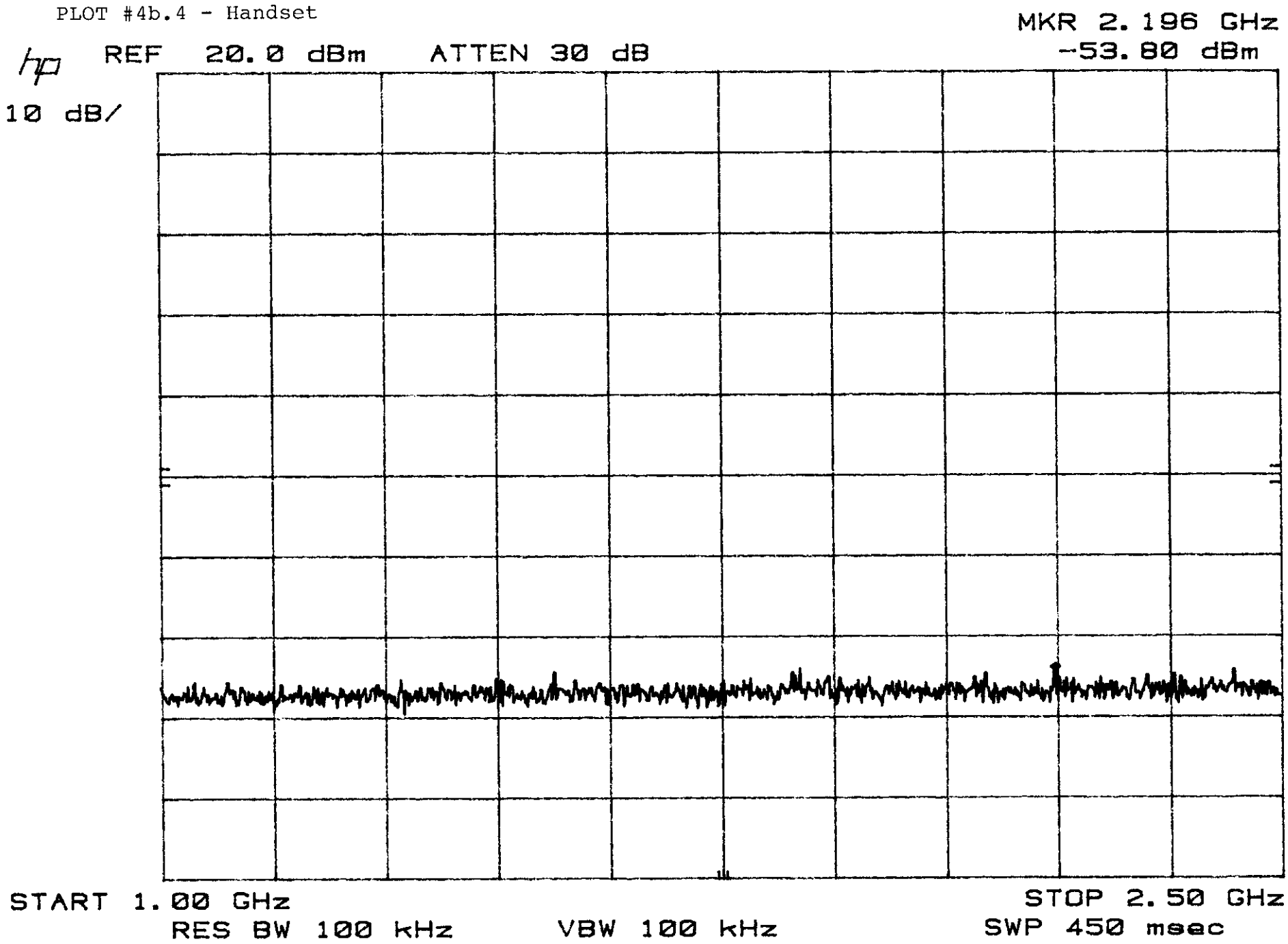
PLOT #4b.2 - Handset



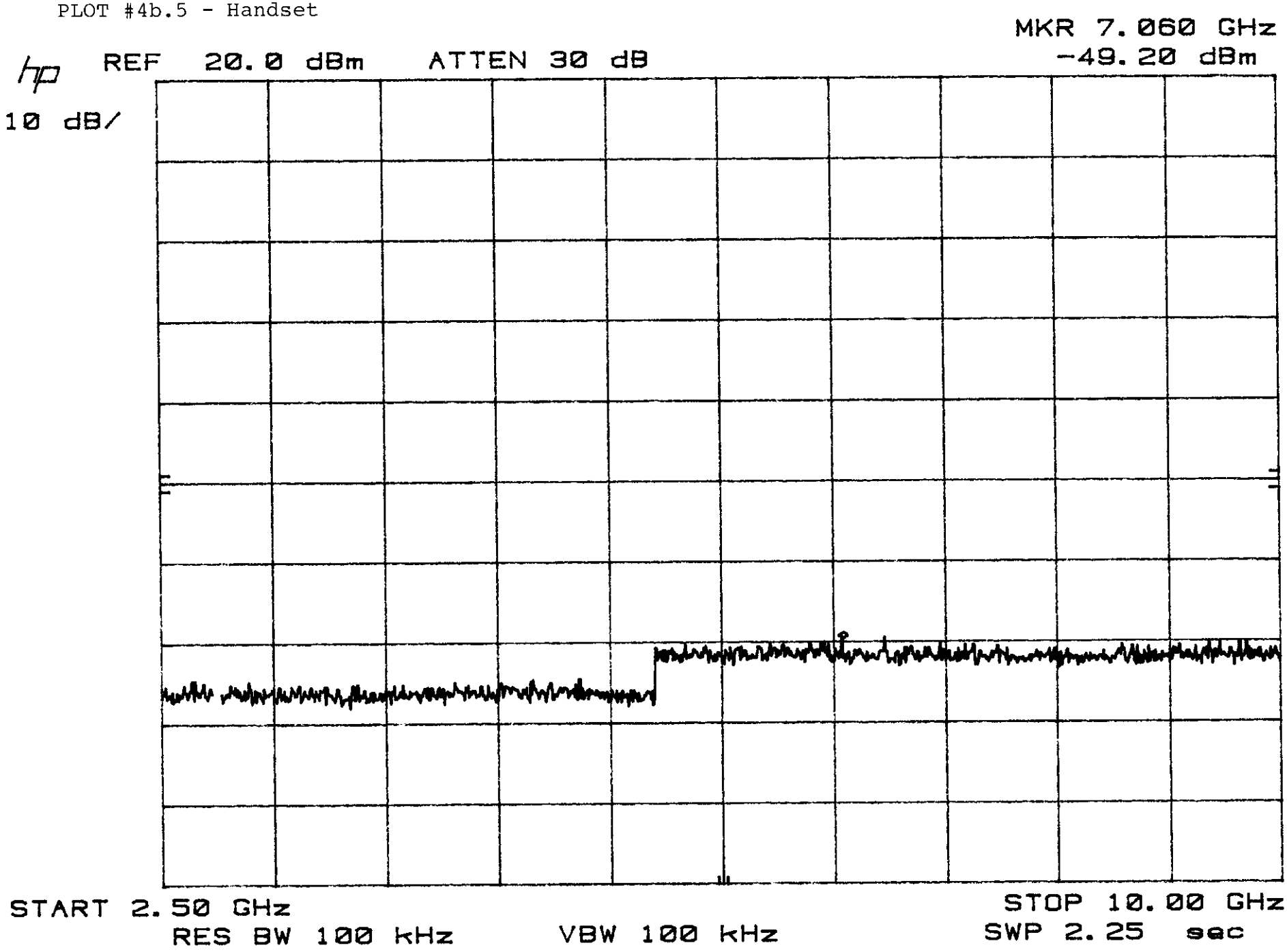
PLOT #4b.3 - Handset



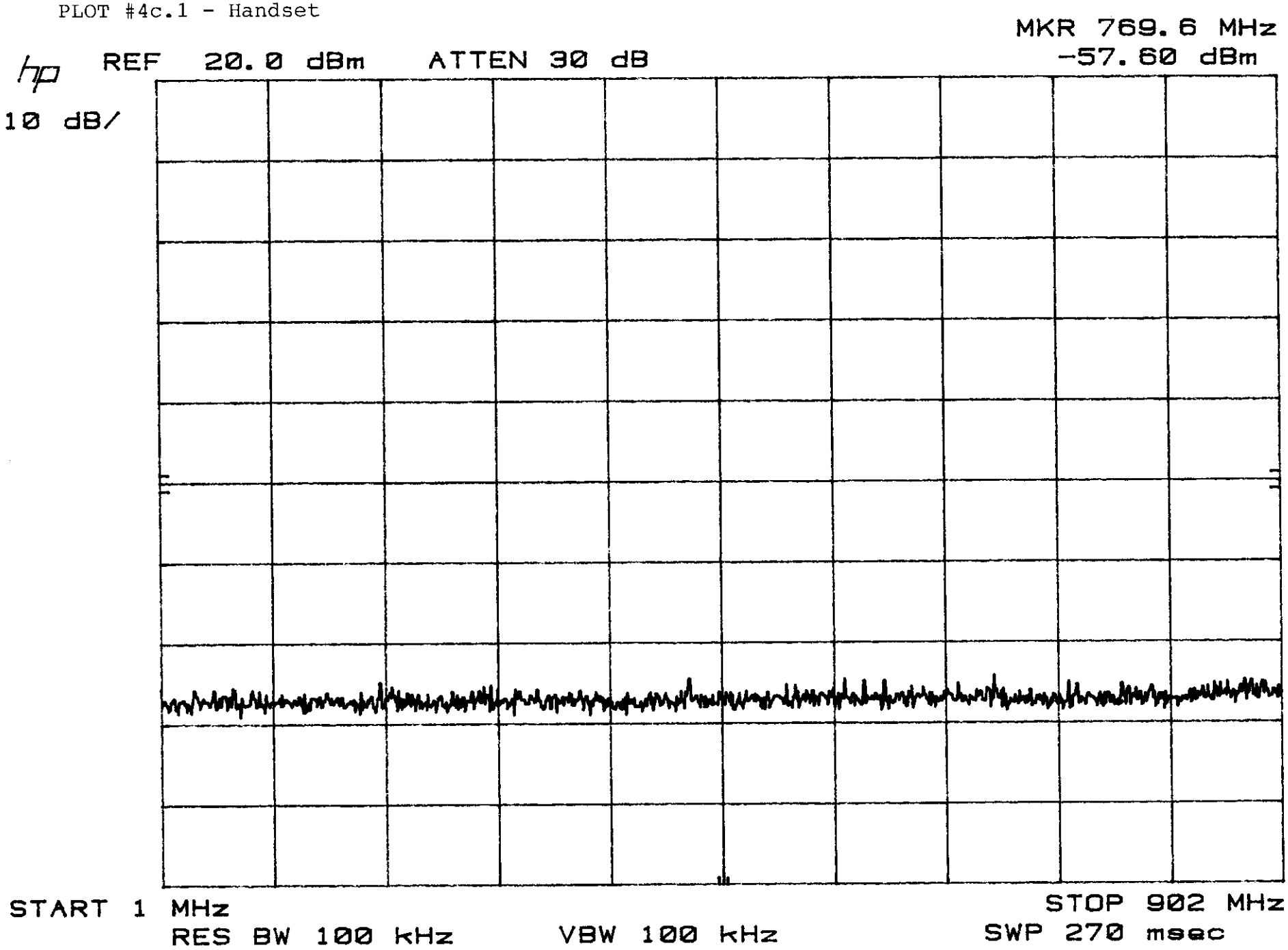
PLOT #4b.4 - Handset



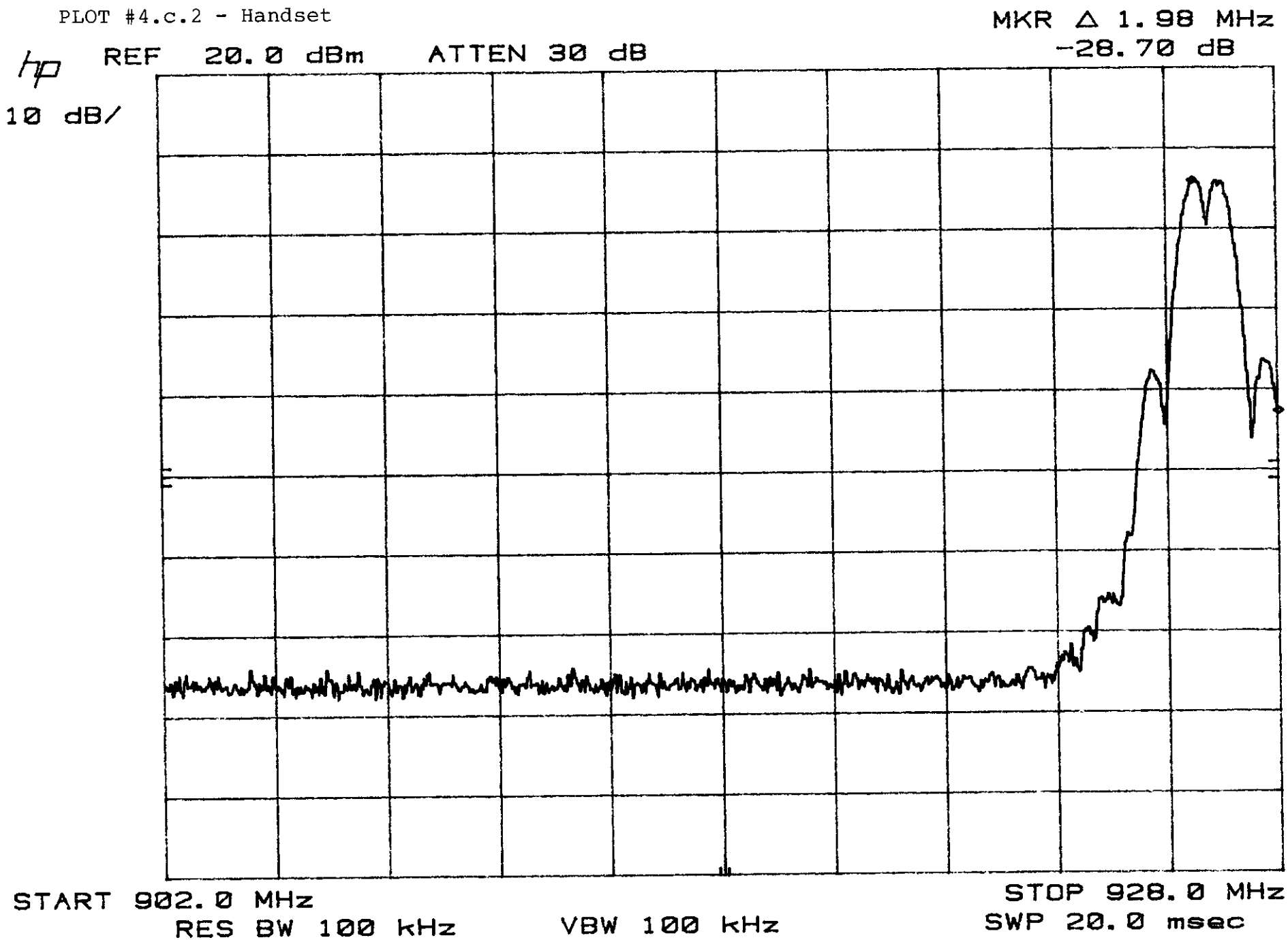
PLOT #4b.5 - Handset



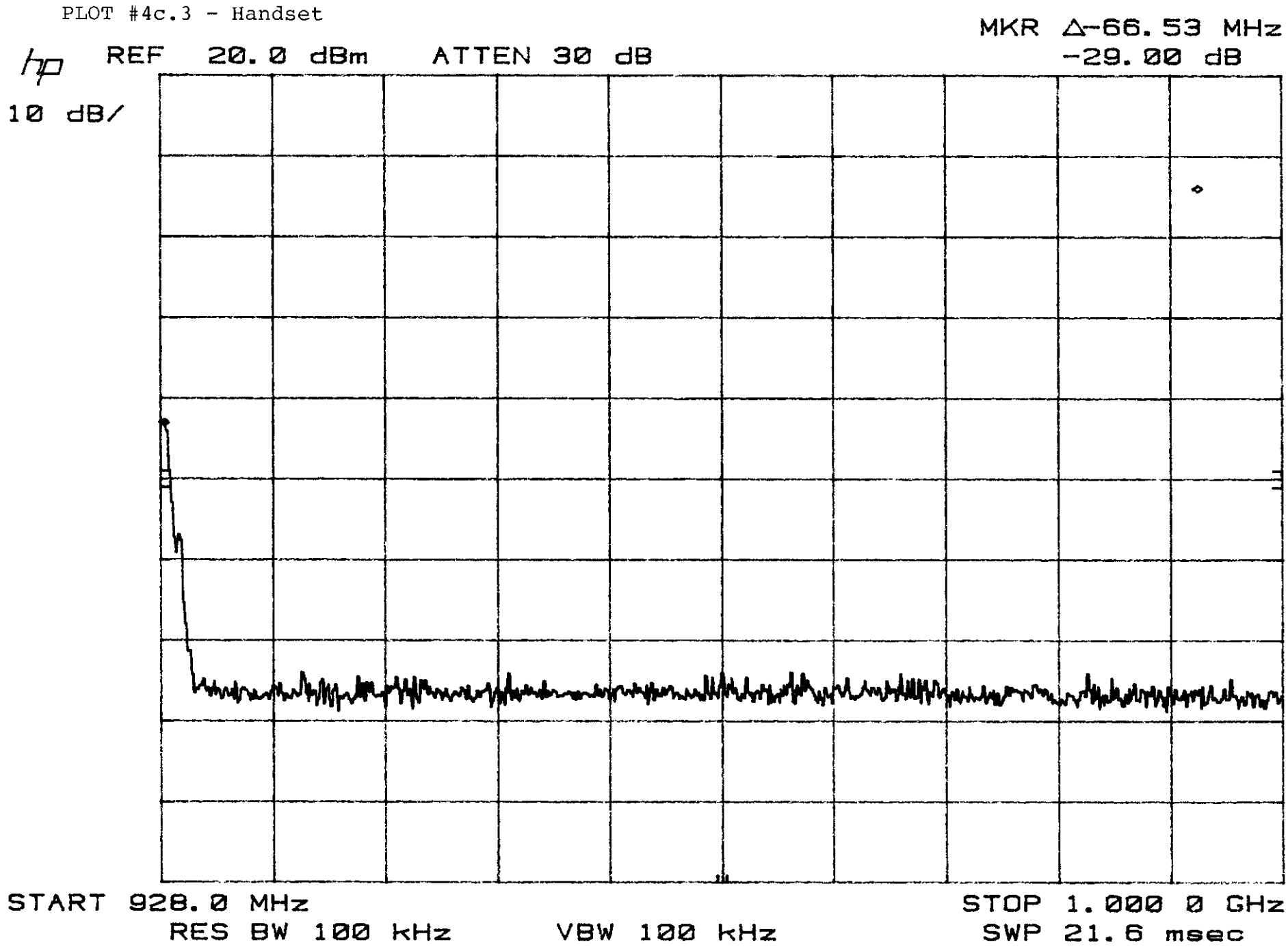
PLOT #4c.1 - Handset



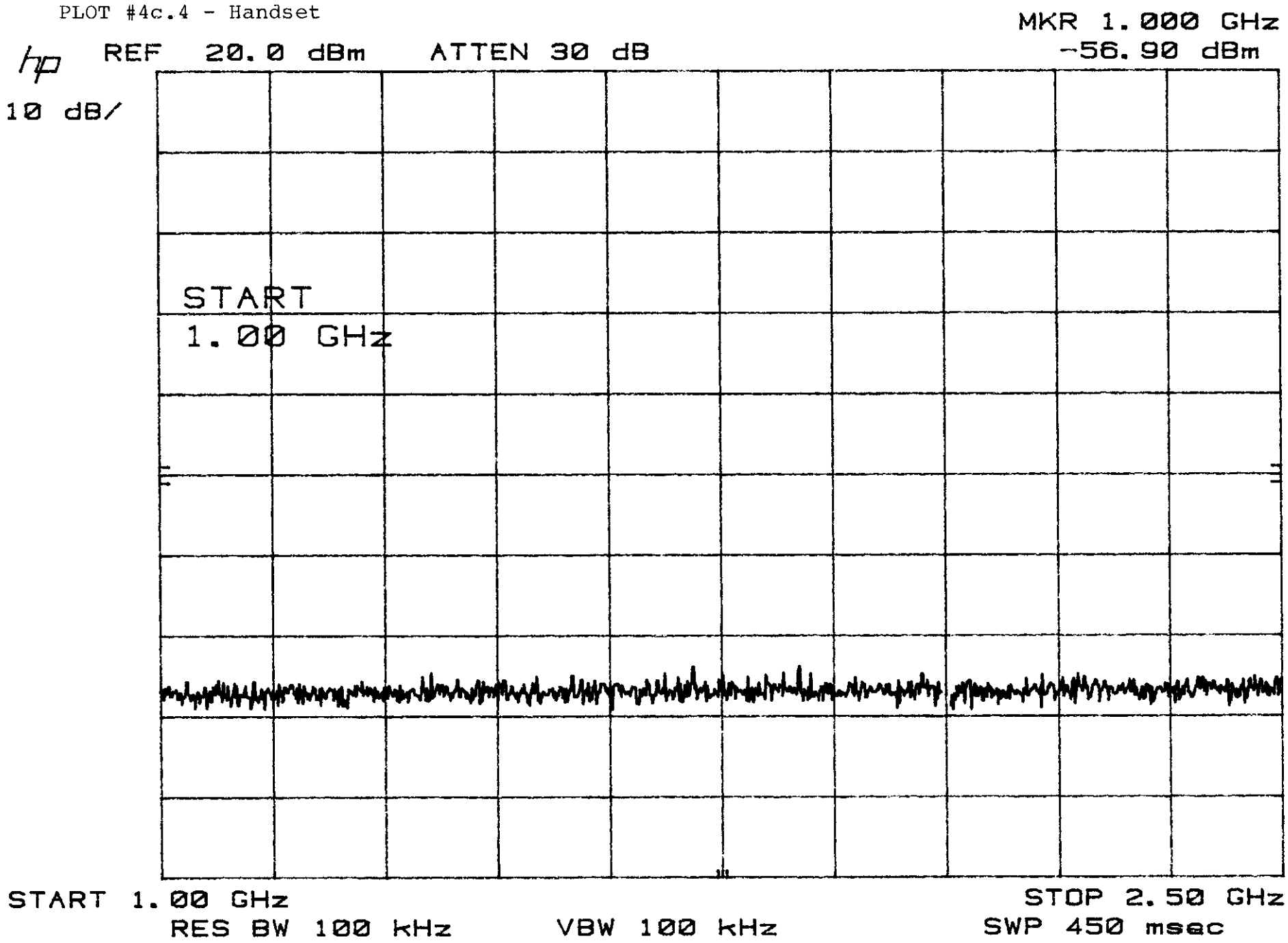
PLOT #4.c.2 - Handset



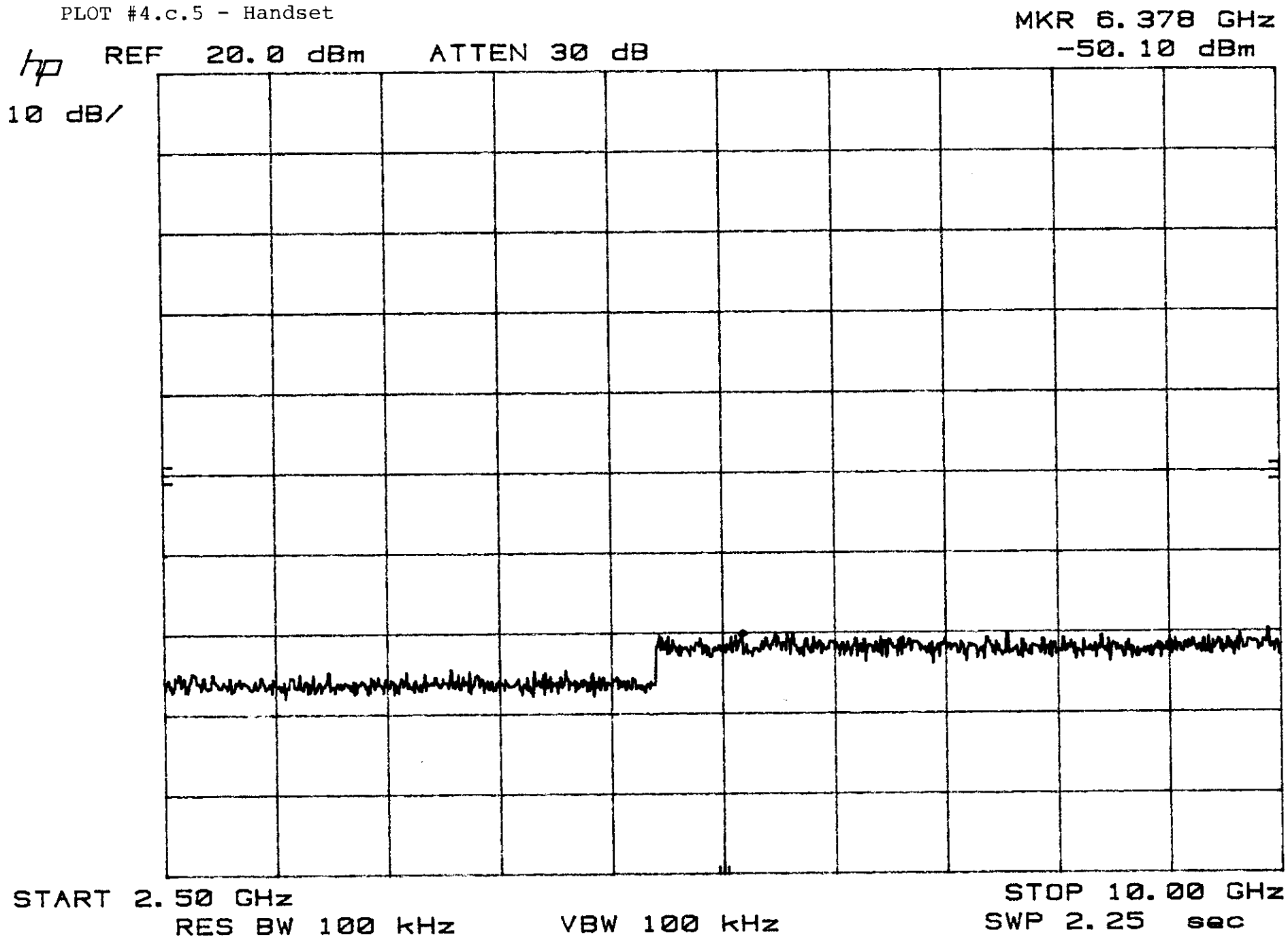
PLOT #4c.3 - Handset



PLOT #4c.4 - Handset



PLOT #4.c.5 - Handset



4.5 Out of Band Radiated Emissions (for emissions in 4. above that are less than 26 dB below carrier), FCC Rule 15.247(c):

For out of band emissions that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[x] Not required
[ ] See attached data sheet

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Radiated emission measurements were performed from 30 MHz to 1000 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.

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

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Base Unit Tx Ch 1 @ 903.6MHz)
Engineer: Xi-Ming Yang X.M.
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
2710.8	V	40.0*	31.2	-28.2	2.3	45.3	74.0	-28.7
2710.8	V	35.0	31.2	-28.2	2.3	40.3	54.0	-13.7
3614.4	V	37.0*	32.7	-27.8	2.8	44.7	74.0	-29.3
3614.4	V	32.0	32.7	-27.8	2.8	39.7	54.0	-14.3
4518.0	V	31.0*	34.1	-27.9	3.1	40.3	74.0	-33.7
4518.0	V	23.0	34.1	-27.9	3.1	32.3	54.0	-21.7
5421.6	V	31.0*	35.8	-28.3	3.5	42.0	74.0	-32.0
5421.6	V	21.0	35.8	-28.3	3.5	32.0	54.0	-22.0
8132.4	H	35.0*	38.5	-27.2	4.8	51.1	74.0	-22.9
8132.4	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9036.0	H	35.0*	38.8	-26.8	5.1	52.1	74.0	-21.9
9036.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Hand Set Tx Ch 1 @ 903.6MHz)
Engineer: Xi-Ming Yang X. M.
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
2710.8	V	50.4*	31.2	-28.2	2.3	55.7	74.0	-18.3
2710.8	V	44.0	31.2	-28.2	2.3	49.3	54.0	-4.7
3614.4	V	34.0*	32.7	-27.8	2.8	41.7	74.0	-32.3
3614.4	V	26.0	32.7	-27.8	2.8	33.7	54.0	-20.3
4518.0	V	32.0*	34.1	-27.9	3.1	41.3	74.0	-32.7
4518.0	V	21.0	34.1	-27.9	3.1	30.3	54.0	-23.7
5421.6	V	30.0*	35.8	-28.3	3.5	41.0	74.0	-33.0
5421.6	V	21.0	35.8	-28.3	3.5	32.0	54.0	-22.0
8132.4	H	43.0*	38.5	-27.2	4.8	59.1	74.0	-14.9
8132.4	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9036.0	H	34.0*	38.8	-26.8	5.1	51.1	74.0	-22.9
9036.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Base Unit Tx Ch 10 @ 914.4MHz)
Engineer: Xi-Ming Yang X.M
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
2743.2	V	40.0*	31.2	-28.2	2.3	45.3	74.0	-28.7
2743.2	V	36.0	31.2	-28.2	2.3	41.3	54.0	-12.7
3657.6	V	35.0*	32.7	-27.8	2.8	42.7	74.0	-31.3
3657.6	V	29.0	32.7	-27.8	2.8	36.7	54.0	-17.3
4572.0	V	32.0*	34.1	-27.9	3.1	41.3	74.0	-32.7
4572.0	V	21.0	34.1	-27.9	3.1	30.3	54.0	-23.7
7315.2	V	36.0*	35.8	-28.3	3.5	47.0	74.0	-27.0
7315.2	V	24.0	35.8	-28.3	3.5	35.0	54.0	-19.0
8229.6	H	35.0*	38.5	-27.2	4.8	51.1	74.0	-22.9
8229.6	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9144.0	H	35.0*	38.8	-26.8	5.1	52.1	74.0	-21.9
9144.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Hand Set Tx Ch 10 @ 914.4MHz)
Engineer: Xi-Ming Yang X.M.
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
2743.2	V	51.0*	31.2	-28.2	2.3	56.3	74.0	-17.7
2743.2	V	44.4	31.2	-28.2	2.3	49.7	54.0	-4.3
3657.6	V	32.0*	32.7	-27.8	2.8	39.7	74.0	-34.3
3657.6	V	22.0	32.7	-27.8	2.8	29.7	54.0	-24.3
4572.0	V	31.0*	34.1	-27.9	3.1	40.3	74.0	-33.7
4572.0	V	22.0	34.1	-27.9	3.1	31.3	54.0	-22.7
7315.2	V	36.0*	35.8	-28.3	3.5	47.0	74.0	-27.0
7315.2	V	24.0	35.8	-28.3	3.5	35.0	54.0	-19.0
8229.6	H	35.0*	38.5	-27.2	4.8	51.1	74.0	-22.9
8229.6	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9144.0	H	35.0*	38.8	-26.8	5.1	52.1	74.0	-21.9
9144.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Base Unit Tx Ch 20 @ 926.4MHz)
Engineer: Xi-Ming Yang X.M.
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
2779.2	V	39.6*	31.2	-28.2	2.3	44.9	74.0	-29.1
2779.2	V	32.0	31.2	-28.2	2.3	37.3	54.0	-16.7
3705.6	V	35.7*	32.7	-27.8	2.8	43.4	74.0	-30.6
3705.6	V	29.1	32.7	-27.8	2.8	36.8	54.0	-17.2
4632.0	V	32.0*	34.1	-27.9	3.1	41.3	74.0	-32.7
4632.0	V	21.0	34.1	-27.9	3.1	30.3	54.0	-23.7
7411.2	V	35.0*	35.8	-28.3	3.5	46.0	74.0	-28.0
7411.2	V	24.0	35.8	-28.3	3.5	35.0	54.0	-19.0
8337.6	H	35.0*	38.5	-27.2	4.8	51.1	74.0	-22.9
8337.6	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9264.0	H	35.0*	38.8	-26.8	5.1	52.1	74.0	-21.9
9264.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Hand Set Tx Ch 20 @ 926.4MHz)
Engineer: Xi-Ming Yang X. M.
Date of test: Appril 13, 1998

FCC15.247 Radiated Emissions

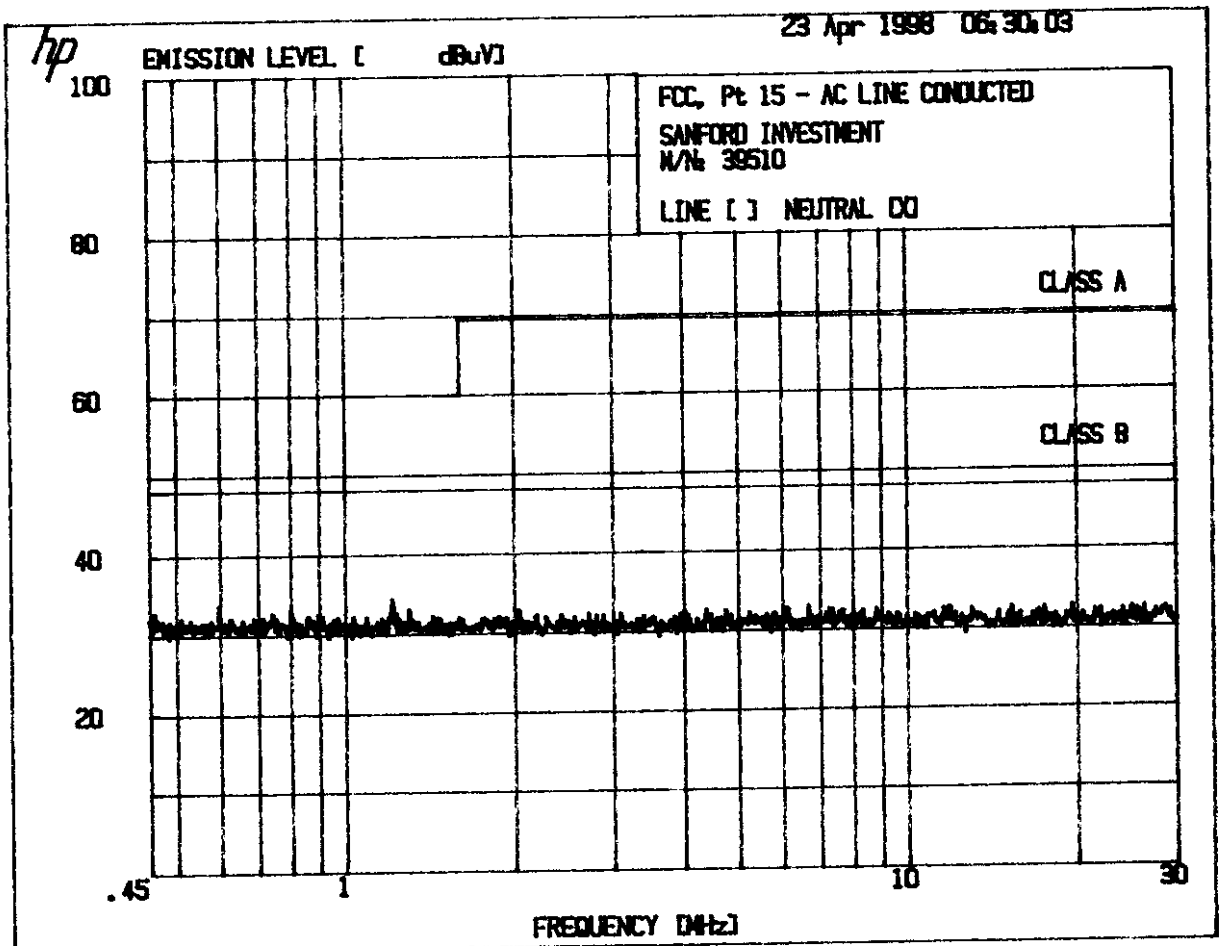
Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	Limit dB(uV/m)	Margin dB
2779.2	V	46.0*	31.2	-28.2	2.3	51.3	74.0	-22.7
2779.2	V	38.8	31.2	-28.2	2.3	44.1	54.0	-9.9
3705.6	V	31.0*	32.7	-27.8	2.8	38.7	74.0	-35.3
3705.6	V	21.0	32.7	-27.8	2.8	28.7	54.0	-25.3
4632.0	V	34.0*	34.1	-27.9	3.1	43.3	74.0	-30.7
4632.0	V	24.0	34.1	-27.9	3.1	33.3	54.0	-20.7
7411.2	V	34.0*	35.8	-28.3	3.5	45.0	74.0	-29.0
7411.2	V	24.0	35.8	-28.3	3.5	35.0	54.0	-19.0
8337.6	H	34.0*	38.5	-27.2	4.8	50.1	74.0	-23.9
8337.6	H	24.0	38.5	-27.2	4.8	40.1	54.0	-13.9
9264.0	H	35.0*	38.8	-26.8	5.1	52.1	74.0	-21.9
9264.0	H	24.0	38.8	-26.8	5.1	41.1	54.0	-12.9

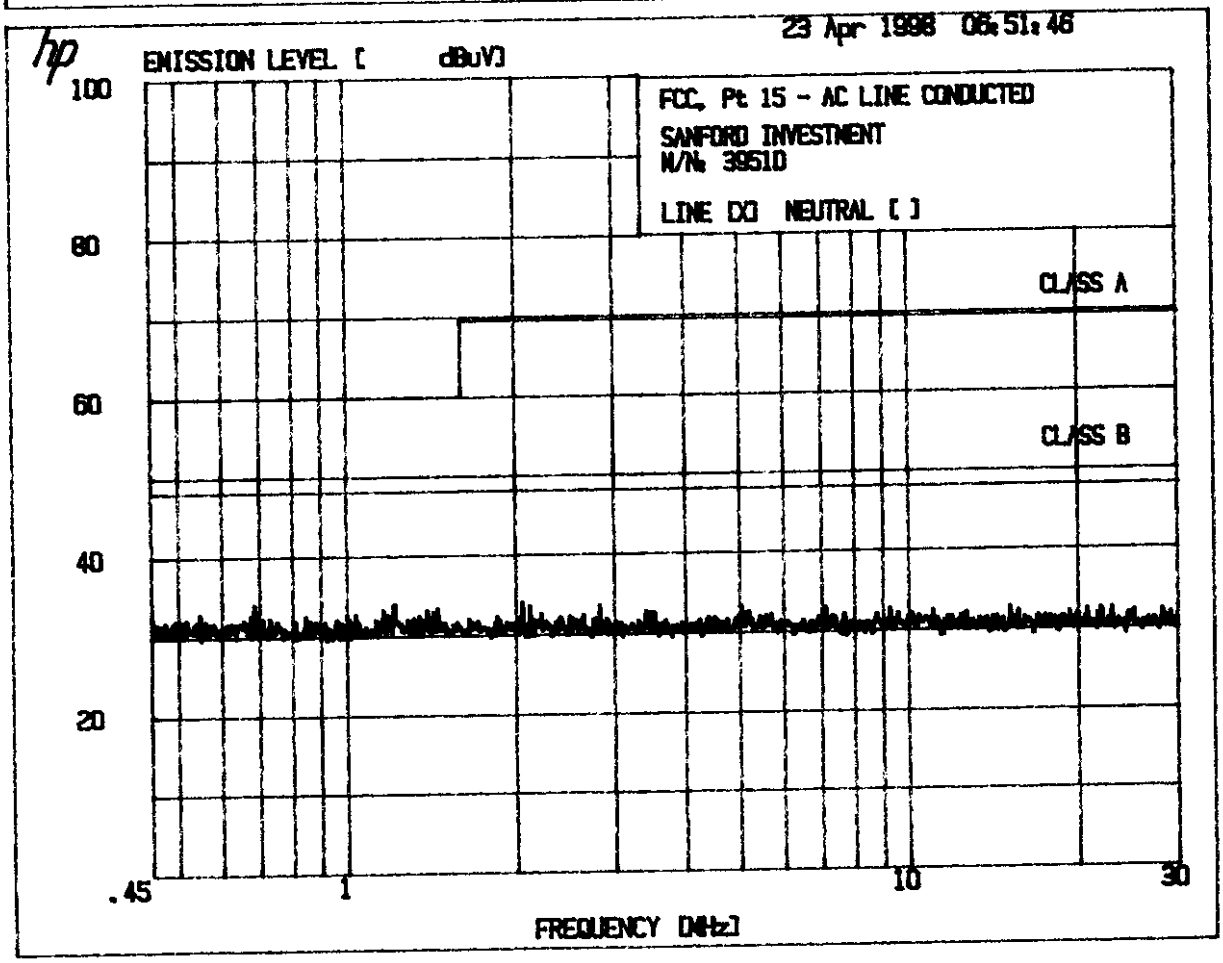
Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Readings with * are Peak-Readings, all the other are Average-Reading**

4.8 AC Line Conducted Emission, FCC Rule 15.207:

[ ] Not required; battery operation only

[x] Test data attached


23 Apr 1998 06:30:03
EMISSION LEVEL [dBuV]
FCC, Pt 15 - AC LINE CONDUCTED
SANFORD INVESTMENT
M/N: 39510
LINE [ ] NEUTRAL [X]
CLASS A
CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


23 Apr 1998 06:51:46
EMISSION LEVEL [dBuV]
FCC, Pt 15 - AC LINE CONDUCTED
SANFORD INVESTMENT
M/N: 39510
LINE [X] NEUTRAL [ ]
CLASS A
CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

23 Apr 1998 06:30:03

3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

SANFORD INVESTMENT
M/N: 39510

LINE [ ] NEUTRAL [X]

PEAKS FOUND ABOVE 33 dBuV

PEAK#	FREQ (MHz)	AMPL(dBuV)
1	.6011	33.9
2	.8063	33.3
3	1.221	34.5
4	1.312	33.2
5	2.055	33.0
6	6.709	33.1

23 Apr 1998 06:51:48

3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

SANFORD INVESTMENT
M/N: 39510

LINE [X] NEUTRAL [ ]

PEAKS FOUND ABOVE 33 dBuV

PEAK#	FREQ (MHz)	AMPL(dBuV)
1	.5527	33.0
2	.6303	34.2
3	1.171	33.4
4	1.221	34.1
5	1.403	33.3
6	1.463	33.4
7	2.072	34.3
8	2.134	33.8
9	2.839	33.8
10	5.065	33.3
11	7.144	33.1

4.10 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Ref: 15.109

[ ] Not required - No digital part
[X] Test results are attached
[ ] Included in the separate DOC report.

4.11 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation), FCC Ref: 15.109, 15.111

[ ] Not required - EUT operation above 960 MHz only

[ ] Not required - EUT is transmitter only

[ ] Not performed; exempt until June 1999

[X] Test results are attached

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Base Unit)
Engineer: Xi-Ming Yang X.M.
Date of test: Appril 13, 1998

FCC15.109 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
40.0	V	12.0	12.4	0.0	0.0	24.4	40.0	-15.6
128.0	V	14.0	11.9	0.0	0.0	25.9	43.5	-17.6
133.0	V	18.7	11.7	0.0	0.0	30.4	46.0	-15.6
172.8	V	19.0	15.7	0.0	0.0	34.7	46.0	-11.3
177.5	V	18.0	16.3	0.0	0.0	34.3	46.0	-11.7
196.8	H	19.0	17.0	0.0	0.0	36.0	46.0	-10.0
230.4	H	21.0	11.8	0.0	0.0	32.8	46.0	-13.2
241.9	H	17.0	12.2	0.0	0.0	29.2	46.0	-16.8
540.0	H	15.0	18.4	0.0	0.0	33.4	46.0	-12.6

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

ITS Intertek Testing Services

Company: Sanford Investment
Project #: J98000689
Model: 39510 (Hand set)
Engineer: Xi-Ming Yang X.M.
Date of test: Appril 13, 1998

FCC15.109 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
40.0	V	16.0	12.4	0.0	0.0	28.4	40.0	-11.6
130.0	V	16.0	11.7	0.0	0.0	27.7	43.5	-15.8
244.8	H	14.1	12.2	0.0	0.0	26.3	46.0	-19.7
259.4	H	15.0	12.2	0.0	0.0	27.2	46.0	-18.8
278.4	H	13.5	13.4	0.0	0.0	26.9	46.0	-19.1
297.6	H	13.0	14.1	0.0	0.0	27.1	46.0	-18.9
523.7	H	13.0	18.5	0.0	0.0	31.5	46.0	-14.5

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

4.12 Processing Gain Measurements, FCC Rule 15.247(e)

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

X	Refer to attached test procedure and data sheets.
	Refer to circuit analysis and processing gain calculations provided by manufacturer.

4.13 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time in 100 msec/100

Duty cycle correction, dB = 20 * log(DC)

X	See attached spectrum analyzer chart(s) for transmitter timing
	See transmitter timing diagram provided by manufacturer

PROCESS GAIN MESUREMENT

MODEL NO. : NWB # 39510

TEST METHOD

THE PROCESSING GAIN MAY BE MEASURED USING THE CW JAMMING MARGIN METHOD.
FIGURE 1 SHOWS THE TEST CONFIGURATION. THE TEST CONSIST OF STEPPING A SIGNAL GENERATOR IN 50 KHz INCREMENTS ACROSS THE PASSBAND OF THE SYSTEM (UP TO 960 KHz AWAY IN RLS DCT). AT EACH POINT, THE GENERATOR LEVEL REQUIRED TO PRODUCE THE RECOMMENDED BIT ERROR RATE (BER) (SET AT BER = 10e-3) IS RECORDED.
THE LEVEL IS JAMMING LEVEL. THE OUTPUT POWER OF THE TRANSMITTING UNIT IS MEASURED AT THE SAME POINT. THE JAMMER TO SIGNAL (J/S) RATIO IS THEN CALCURATED.
DISCARD THE WORST 20 % OF THE J/S DATA POINTS. THE LOWEST REMAINNING J/S RATIO IS USED TO CALCURATE THE PROCESSING GAIN.
THE MAXIMUM IMPLEMENTATION LOSS A SYSTEM CAN CLAIM IN CALCURATING PROCASSING GAIN IS 2 dB . THE EQUATION TO CALCURATE THE PROCESSING GAIN (Gp) IS THE FOLLOWING.

Gp = (S/N) o + Mj + Lsys

(S/N) o = SIGNAL TO NOISE RATIO REQUIRED @ BER OF 1e-3 = 8.0 dB FOR DBPSK

Mj = JAMMING MARGINE (J/S) in dB.

Lsys = SYSTEM IMPLEMENTATION LOSSES = 2 dB

S = SIGNAL POWER - ATTENUATION - COMBINE LOSS - CABLE LOSS

= - 4.0 - 19.8 - 3.6 - 0.8 = - 28.2

J = SIGNAL GENERATOR OUTPUT LEVEL (N) - CAL FACTOR - COMBINE LOSS

= N - 0.3 - 3.6 dB

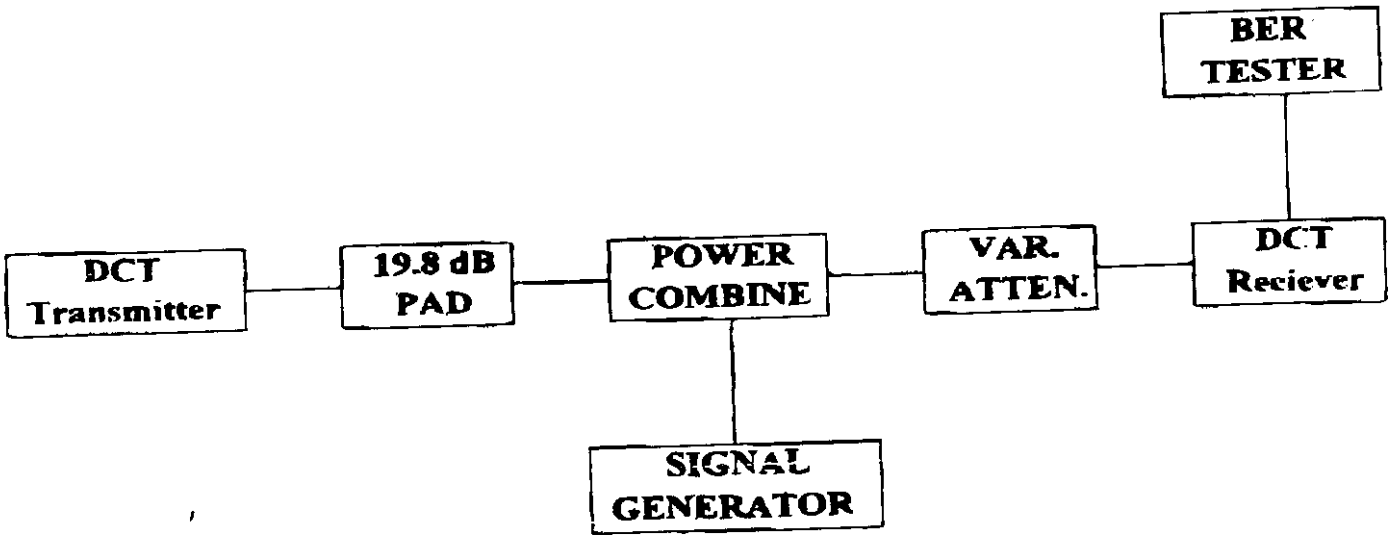


FIGURE 1 : JAMMING TEST SETUP.

Test Equipment :

Signal Generator : Gigatronics 6100

BER Tester : Rockwell FCC Test Suport Program Ver. 1.0

5.0 Equipment Photographs

Photographs of the EUT are attached.

7.3 Antenna gain and Mounting Information

The antennas are permanently attached to the phones.

8.0 Instruction Manual

Attached is a preliminary copy of the Instruction Manual.

This manual will be provided to the end-user with each unit sold/leased in the United States.