## 1.0 Test Summary

| FCC RULE | DESCRIPTION OF TEST | RESULT | PAGE |
|---|---|---|---|
| 2.985 | RF Power Output | Pass | 3 |
| 22.913 | Effective Radiated Power | Pass | 4 |
| 2.987 | Modulation Requirements | Pass | 5 |
| 22.915(d)(1) | Audio Filter Characteristics | Pass | 8 |
| 2.989(c)<br>22.917(b)(d) | Emission Limitation, Occupied Bandwidth | Pass | 12 |
| 22.917(e)<br>22.917(f) | Out of Band Emissions at Antenna Terminals<br>Mobile Emissions In Base Frequency Range | Pass | 15 |
| 2.993 | Field Strength of Spurious Radiation | Pass | 16 |
| 15.107 | Line Conducted Emissions | N/A | N/A |
| 2.995(a) | Frequency Stability vs. Temperature | Pass | 18 |
| 2.995(d)(2) | Frequency Stability vs. Voltage | Pass | 20 |

Xi-Ming Yang
Xi-Ming Yang
Test Engineer

5-27-98
Date

## 1.2 Product Description

The Philips Model NRMTCA620-1B is a dual mode AMPS and NAMPS cellular radio telephone.

The receiver section is a dual conversion superheterodyne architecture with a 92.61 MHz first IF and 450 kHz second IF. The transmitter is a cascade of a directly modulated PLL (Phase locked loop) synthesizer, buffer and power amplifier, voice, data, and control signals for the AMPS/NAMPS mode are processed by a baseband processor. Overall control of the radio is handled by a microcontroller.

## 2.0 **RF Power Output**, FCC §2.985(a)

### 2.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the spectrum analyzer reading.

Tests were performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitters.

### 2.2 Test Equipment

Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782

### 2.3 Test Results

Refer to the attached plots:

Plot #2.3.a
Plot #2.3.b
Plot #2.3.c

| RF POWER OUTPUT | | | |
|---|---|---|---|
| **Level** | **824.04 MHz P dBm** | **836.52 MHz P dBm** | **848.97 MHz P dBm** |
| 0, 1, 2 | 26.4 | 26.1 | 27.4 |
| 3 | 22.4 | 22.5 | 22.6 |
| 4 | 18.1 | 18.3 | 18.3 |
| 5 | 14.6 | 14.9 | 15.0 |
| 6 | 10.2 | 10.5 | 10.7 |
| 7 | 4.7 | 5.3 | 5.6 |

## 3.0 **Effective Radiated Power**, FCC § 22.913

The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

### 3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidths of the spectrum analyzer were set to 100 kHz. The maximum emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading was recorded.

The ERP was calculated as follows:

$$ERP(dBm) = E(dBuV/m) + 20 \log D - 10 \log 30 - 10 \log G - 90$$

where D = 3m, distance
G = 1.64, gain of half-wave dipole

The test was performed at three frequencies (low, middle, and high channels).

In addition, the Equivalent Isotropic Radiated Power (EIRP) in dBpW was calculated as follows:

$$EIRP_{(dBpW)} = ERP_{(dBm)} + 90 + 10 \log 1.64$$

### 3.2 Test Equipment

Rhode & Schwartz SMH Signal Generator
Hewlett Packard HP8566B Spectrum Analyzer
Attenuator 20 dB

### 3.3 Test Results

Refer to the attached data sheet. The EUT passed the test.

Mode: Transmitting at 824, 836.5, 849 MHz
Test Site: 1
Engineer: Xi-Ming-Yang

**FCC Part 22, Effective Radiated Power**

| Frequency MHz | SA Reading dB(uV) | Antenna Factor dB(1/m) | Cable Loss dB | Field Strengh dB(uV/m) | ERP dBm | EIRP dB(pW) |
|---|---|---|---|---|---|---|
| 824.0 | 101.3 | 22.0 | 3.8 | 127.1 | 29.7 | 121.8 |
| 836.5 | 97.2 | 22.0 | 3.8 | 123.0 | 25.6 | 117.8 |
| 849.0 | 101.7 | 22.0 | 3.8 | 127.5 | 30.1 | 122.2 |

Note: All measurements were made at 3 m

## 4.0 **Modulation Deviation Limiting**, FCC § 2.987, § 22.915(c)s

### 4.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

At three different modulating frequencies, the output level of the audio generator was varied and the FM deviation level was recorded (Table 4.1a).

### 4.2 Test Equipment

Marconi 2955A Radio Communication Test Set
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

### 4.3 Test Results

Please refer to the attached data sheets.

The maximum deviation is 11.2 kHz and do not exceed 12 kHz.

The EUT passed the test.

**Table 4.1.a**
**Modulation Deviation Limiting**

| Output Level mV | FM Deviation in kHz at Indicated Modulating Frequency | | | |
|---|---|---|---|---|
| | 3000 Hz | 2.8 kHz | 1000 Hz | 300 Hz |
| 1 | 4.4 | 4.0 | 1.7 | 0.4 |
| 2 | 5.7 | 5.6 | 2.0 | 0.6 |
| 5 | 8.8 | 8.8 | 3.1 | 0.9 |
| 10 | 9.9 | 10.0 | 4.5 | 1.1 |
| 20 | 10.3 | 10.5 | 6.1 | 1.5 |
| 30 | 10.4 | 10.6 | 7.6 | 1.9 |
| 40 | 10.5 | 10.7 | 8.6 | 2.2 |
| 50 | 10.5 | 10.7 | 9.3 | 2.4 |
| 60 | 10.5 | 10.8 | 9.3 | 2.7 |
| 70 | 10.5 | 10.8 | 9.3 | 2.8 |
| 80 | 10.5 | 10.8 | 9.3 | 3.1 |
| 90 | 10.5 | 10.8 | 9.3 | 3.5 |
| 100 | 10.5 | 10.8 | 9.4 | 3.9 |
| 150 | 10.5 | 10.8 | 10.2 | 6.7 |
| 200 | 10.5 | 10.8 | 10.4 | 8.2 |
| 250 | 10.6 | 10.8 | 10.3 | 9.3 |
| 300 | 10.6 | 10.8 | 10.4 | 9.8 |
| 400 | 10.6 | 10.8 | 10.6 | 10.1 |
| 450 | 10.6 | 10.8 | 10.6 | 10.5 |
| 500 | 10.6 | 10.8 | 10.6 | 10.8 |
| 600 | 10.6 | 10.8 | 10.7 | 11.1 |
| 650 | 10.6 | 10.8 | 10.7 | 11.2 |
| 700 | 10.6 | 10.8 | 10.7 | 11.2 |
| 800 | 10.6 | 10.8 | 10.8 | 11.3 |
| 900 | 10.6 | 10.8 | 10.8 | 11.4 |
| 1000 | 10.6 | 10.8 | 10.8 | 11.4 |

Test conditions:
Middle channel, 836.52 MHz

**Table 4.1.b**
**Peak Frequency Deviation**

| Frequency kHz | Initial Deviation kHz | Peak Deviation kHz | Steady State Deviation kHz |
|---|---|---|---|
| 0.3 | 2.1 | 9.6 | 9.6 |
| 0.5 | 3.9 | 9.9 | 9.9 |
| 0.7 | 5.5 | 10.2 | 10.2 |
| 0.9 | 7.1 | 10.6 | 10.6 |
| 1.0 | 8.0 | 10.5 | 10.5 |
| 1.2 | 9.3 | 10.3 | 10.3 |
| 1.4 | 9.8 | 10.4 | 10.4 |
| 1.6 | 10.0 | 10.6 | 10.6 |
| 1.8 | 10.2 | 10.7 | 10.7 |
| 2.0 | 10.3 | 10.7 | 10.7 |
| 2.4 | 10.4 | 10.7 | 10.6 |
| 2.8 | 10.7 | 10.8 | 10.8 |
| 3.0 | 10.5 | 10.6 | 10.6 |

Test Conditions:

$V_{inp}$ = 35 mV

Deviation = 8 kHz at 1 kHz modulation frequency

Middle Channel f = 836.52 MHz

10.7 **Audio Filter Characteristics**, FCC § 22.915(d)

For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:

(I) In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least 40 log (f/3) dB, where f is the frequency of the signal in kHz.

(ii) In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.

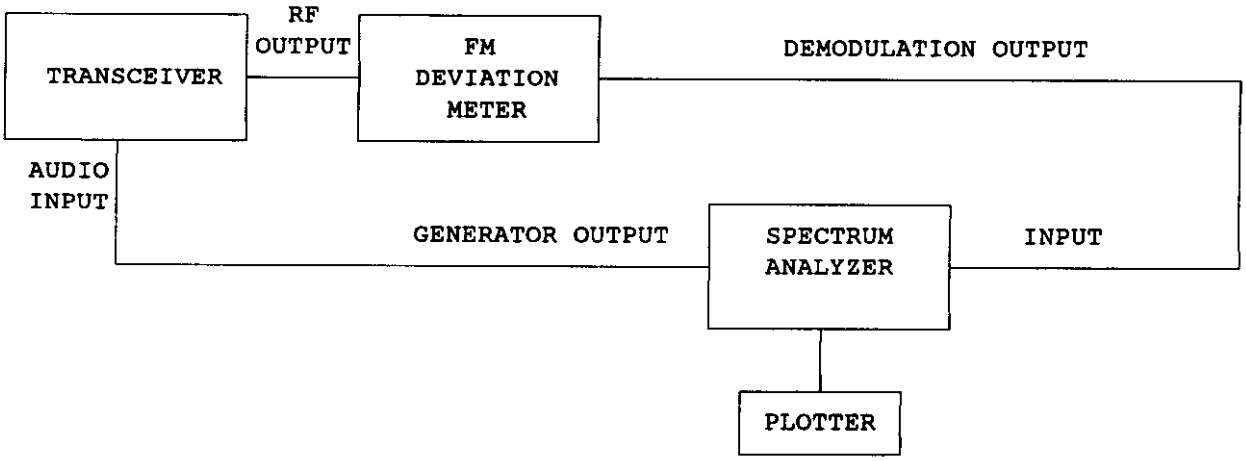
(iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through suffecient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupledl into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

The audio signal at the transceiver audio input was adjusted to obtain 8-9 kHz deviation at the more sensitive modulation frequency (approximately 2.7 kHz). The audio frequency was varied from 300 Hz to 30 kHz and the deviation was measured while maintaining a constant input level. Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated (See Table 5-1).

The block diagram of the test setup is shown below.



On that block diagram, the HP 3885A spectrum analyzer having the tracing generator, and the Marconi 2955A Radio Communication Test Set having an output of a demodulator, are used. After the calibration was made (the -20 dBm reading of the spectrum analyzer corresponds to the 9 kHz deviation) the spectrum analyzer was set to scan the frequency from 300 Hz to 30 kHz, with the same audio input level as described above, and with compressor OFF and expander OFF.

The audio filter response was plotted directly from the spectrum analyzer (Refer to Plots # 5.1.a, 5.1.b, & 5.1.c).

5.2 Test Equipment

Marconi Instruments 2955A Radio Communications Test Set
HP 3588A Spectrum Analyzer
HP 7470A Plotter
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

5.3 Test Results

Refer to the attached data sheet and plot.

The EUT meets the requirements.

| Table 5.1<br>Audio Filter Characteristic | | |
|---|---|---|
| Modulation Frequency kHz | Relative Level dBm | Attenuation dB |
| 0.3 | -40.7 | 11.9 |
| 0.4 | -37.4 | 8.6 |
| 0.5 | -35.1 | 6.3 |
| 0.6 | -33.4 | 4.6 |
| 0.7 | -32.0 | 3.2 |
| 0.8 | -30.8 | 2.0 |
| 0.9 | -29.7 | 0.9 |
| 1.0 | -28.8 | 0 |
| 1.2 | -26.9 | -1.9 |
| 1.4 | -25.3 | -3.5 |
| 1.6 | -24.0 | -4.8 |
| 1.8 | -23.0 | -5.8 |
| 2.0 | -22.2 | -6.6 |
| 2.5 | -20.7 | -8.1 |
| 2.85 | -20.3 | -8.5 |
| 3.0 | -20.6 | -8.2 |
| 3.2 | -21.8 | -7.0 |
| 3.5 | -29.0 | 0.2 |
| 4.0 | -43.6 | 14.8 |

-

| Table 5.1 Audio Filter Characteristic (Continuation) | | |
|---|---|---|
| Modulation Frequency kHz | Relative Level, dBm | Attenuation dB |
| 4.5 | -57.6 | 28.8 |
| 5.0 | -71.3 | 41.5 |
| 5.5 | -83.1 | 54.3 |
| 5.9 | -84.8* | 56.0 |
| 6.0 | -86.8* | 58.0 |
| 6.1 | -81.3* | 52.5 |
| 8.0 | -87.0* | 58.2 |
| 10.0 | -80.4* | 51.6 |
| 15.0 | -89.0* | 60.2 |
| 20.0 | -99.3* | 70.5 |
| 30.0 | 97.3* | 68.5 |

Test conditions:

Middle Channel, 836.52 MHz
Audio Input Level: 6.5 mV
*Noise Floor

6.0 **Emission Limitations, Occupied Bandwidth**, FCC § 22.917(b)(d), FCC § 2.989(b)(1)

For F3E/F3D emission mask uses with audio filter, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency: at least 60 dB or 43 + 10 log P dB, whichever is the lesser attenuation.

For F1D emission mask, the mean power of emissions must be attenuated below the mean power of the unmodualted carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but no more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;

(2) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple ofthe carrier frequency: at least 60 dB or 43 +10 log P db, whichever is the lesser attenuation.

6.1 Test Procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation. The audio generator was connected to the audio input of the transceiver.

The spectrum with no modulation was recorded. The audio input signal was adjusted to obtain the frequencies deviation equal 6 kHz at the audio frequency of maximum response which was determined measuring deviation versus frequency from 300 Hz to 3.5 kHz and was found 2.8 kHz. The audio input level was increased by 16 dB. The audio frequency was set to the frequency 2.5 kHz.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ±50 kHz and ±100 kHz from the carrier frequency. The same plots has been done for wideband emissions, SAT, ST, DTMF9, Voice, some of the combinations of these modulating signals and in NAMPS mode.

Note: Some of the plots were only done in the frequency band of ±50 kHz since it was clear from these plots, that the levels of emissions were well below the limits.

6.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter
Marconi 2955A Radio Communication Test Set
HP 7470A Plotter

6.3 Test Results

Refer to the attached plots.

The EUT passed the test.

Emission Limitations, Occupied Bandwidth Plots:

| Plot Number | Description |
|---|---|
| 6.3.a | Wideband emissions (8 kHz deviation), scan 100 kHz |
| 6.3.b | Wideband emissions (8 kHz deviation), scan 200 kHz |
| 6.3.c | DTMF "9" |
| 6.3.d | SAT (6 kHz, 2 kHz deviation) |
| 6.3.e.1 | ST (10 kHz, 8 kHz deviation), scan 100 kHz, RBW = 300 Hz |
| 6.3.e.2 | ST (10 kHz, 8 kHz deviation), scan 100 kHz. RBW = 100 Hz |
| 6.3.f | ST (10 kHz, 8 kHz deviation), scan 200 kHz, RBW = 300 Hz |
| 6.3.g.1 | SAT & ST, RBW = 300 Hz |
| 6.3.g.2 | SAT & ST, RBW = 100 Hz |
| 6.3.h | DTMF & SAT (8 kHz, 6 kHz deviation), scan 100 kHz |
| 6.3.i | DTMF & SAT, Scan 200 kHz |
| 6.3.j | Voice (2.5 kHz), scan 200 kHz |
| 6.3.k | Voice (2.5 kHz), scan 100 kHz |
| 6.3.l | NAMPS Voice (1 kHz) |
| 3.3.m | NAMPS Voice (2.5 kHz) |

7.0 Out of Band Emissions at Antenna Terminals , FCC § 22.917(e), FCC § 22.917(f)

Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least 43 + 10 log P dB.

Mobile Emissions in Base Frequency Range:

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80 dBm at the transmit antenna connector.

7.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 30 kHz. The audio modulating signal was adjusted like it is described in Section 6.1 of this report. Sufficient scans were taken to show the outband emissions if any up to 10th harmonic.

7.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter

7.3 Test Results

Refer to the attached plots.

The EUT passed the test.

| ANTENNA OUTPUT CONDUCTED EMISSIONS SPECTRUM ANALYZER PLOTS | |
|---|---|
| **Plot Number** | **Description** |
| 7.3.a - 7.3.c | Low, Middle & High Channels, 1 - 30 MHz |
| 7.3.d - 7.3.f | Low, Middle & High Channels 30 - 1000 MHz |
| 7.3.g - 7.3.i | Low, Middle & High Channels, 1 - 2.5 GHz |
| 7.3.j - 7.3.l | Low, Middle, & High Channels, 2.5 - 10 GHz |
| 7.3.m - 7.3.o | Low, Middle, & High Channels, 869 - 894 MHz |
| 7.3.p | NAMPS, Middle Channel, 1 - 30 MHz |
| 7.3.r | NAMPS, Middle Channel 30 - 1000 MHz |
| 7.3.s | NAMPS, Middle Channel, 1 - 2.5 GHz |
| 7.3.t | NAMPS, Middle Channel, 2.0 - 10 GHz |
| 7.3.q | NAMPS, Middle Channel, 869 - 894 MHz |

## 8.0 **Field Strength of Spurious Radiation**, FCC § 2.993, § 22.917(e)

### 8.1 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of each of the three fundamental frequency (low, middle, and high channels) was investigated.

The spurious emissions attenuation was calculated as the difference between EIRP in dB(pW) at the fundamental frequency (See Section 3) and at the spurious emissions frequency.

### 8.2 Test Equipment

EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Tektronix 2782 Spectrum Analyzer
Low Pass Filter
Preamplifier

### 8.3 Test Results

Refer to the attached data sheets.

The EUT passed the test.

# INTERTEK TESTING SERVICES

| | | | |
|---|---|---|---|
| Company: | Philips | Project #: | J98014902 |
| EUT: | Cell Phone | Date of Test: | 5/14/98 |
| Model: | TCA620-1B | Test Site #: | 1 |
| Test Mode: | Tx @ 824.04 MHz | Engineer: | Xi-Ming Yang |

## FCC Part 22 Radiated Emissions

| Frequency (MHz) | Antenna Location (m) | Antenna Polariz. H/V | Reading (dBuV) | Antenna Factor (dB/m) | Preamp (dB) | Cable Loss (dB) | Field Strength dBuV/m | Spurious Attenuation (dB) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1648.1 | 3.0 | H | 46.6 | 24.7 | 0.0 | 2.1 | 73.4 | 53.7 | -14.1 |
| 2472.3 | 3.0 | V | 45.2 | 24.7 | 0.0 | 3.6 | 73.5 | 53.6 | -14.0 |
| 3296.2 | 3.0 | V | 43.7 | 24.7 | -28.1 | 4.1 | 44.4 | 82.7 | -43.1 |
| 4120.2 | 3.0 | V | 53.5 | 24.7 | -27.6 | 4.5 | 55.1 | 72.0 | -32.4 |
| 4944.2 | 3.0 | H | 59.2 | 24.7 | -27.8 | 4.7 | 60.8 | 66.3 | -26.7 |
| 5768.3 | 3.0 | H | 58.1 | 24.7 | -28.0 | 5.1 | 59.9 | 67.2 | -27.6 |
| 6592.3 | 3.0 | H | 44.8 | 24.7 | -28.5 | 5.7 | 46.7 | 80.4 | -40.8 |
| 7416.3 | 3.0 | H | 40.3 | 24.7 | -29.0 | 6.1 | 42.1 | 85.0 | -45.4 |
| 8240.4 | 3.0 | H | 44.0 | 24.7 | -29.0 | 6.3 | 46.0 | 81.1 | -41.5 |

Note: Negative signs (-) in the Margin column signify levels below the limit.
Field strength at the fundamental frequency equals 127.1 dBuV/m.
Spurious emissions attenuation limit equals 43 + 10log P = 39.6 dB.

# INTERTEK TESTING SERVICES

| | | | |
|---|---|---|---|
| Company: | Philips | Project #: | J98014902 |
| EUT: | Cell Phone | Date of Test: | 5/14/98 |
| Model: | TCA620-1B | Test Site #: | 1 |
| Test Mode: | Tx @ 836.52 MHz | Engineer: | Xi-Ming Yang X.M. |

FCC Part 22 Radiated Emissions

| Frequency (MHz) | Antenna Location (m) | Antenna Polariz. H/V | Reading (dBuV) | Antenna Factor (dB/m) | Preamp (dB) | Cable Loss (dB) | Field Strength dBuV/m | Spurious Attenuation (dB) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1673.0 | 3.0 | V | 43.9 | 24.7 | 0.0 | 2.1 | 70.7 | 52.3 | -13.2 |
| 2509.5 | 3.0 | V | 31.8 | 24.7 | 0.0 | 3.6 | 60.1 | 62.9 | -23.8 |
| 3396.1 | 3.0 | V | 43.4 | 24.7 | -28.1 | 4.1 | 44.1 | 78.9 | -39.8 |
| 4182.6 | 3.0 | V | 54.2 | 24.7 | -27.6 | 4.5 | 55.8 | 67.2 | -28.1 |
| 5019.1 | 3.0 | H | 56.7 | 24.7 | -27.8 | 4.7 | 58.3 | 64.7 | -25.6 |
| 5856.6 | 3.0 | H | 57.3 | 24.7 | -28.0 | 5.1 | 59.1 | 63.9 | -24.8 |
| 6692.2 | 3.0 | H | 46.8 | 24.7 | -28.5 | 5.7 | 48.7 | 74.3 | -35.2 |
| 7528.7 | 3.0 | H | 41.1 | 24.7 | -29.0 | 6.1 | 42.9 | 80.1 | -41.0 |
| 8365.2 | 3.0 | H | 43.8 | 24.7 | -29.0 | 6.3 | 45.8 | 77.2 | -38.1 |

Note: Negative signs (-) in the Margin column signify levels below the limit.
Field strength at the fundamental frequency equals 123.0 dBuV/m.
Spurious emissions attenuation limit equals 43 + 10log P = 39.1 dB.

# INTERTEK TESTING SERVICES

| | | | |
|---|---|---|---|
| Company: | Philips | Project #: | J98014902 |
| EUT: | Cell Phone | Date of Test: | 5/14/98 |
| Model: | TCA620-1B | Test Site #: | 1 |
| Test Mode: | Tx @ 848.97 MHz | Engineer: | Xi-Ming Yang X.M. |

FCC Part 22 Radiated Emissions

| Frequency (MHz) | Antenna Location (m) | Antenna Polariz. H/V | Reading (dBuV) | Antenna Factor (dB/m) | Preamp (dB) | Cable Loss (dB) | Field Strength dBuV/m | Spurious Attenuation (dB) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1697.9 | 3.0 | V | 37.2 | 26.7 | 0.0 | 2.1 | 66.0 | 61.5 | -21.1 |
| 2546.9 | 3.0 | H | 42.4 | 30.5 | 0.0 | 3.6 | 76.5 | 51.0 | -10.6 |
| 3395.9 | 3.0 | H | 56.5 | 32.7 | -28.1 | 4.1 | 65.2 | 62.3 | -21.9 |
| 4244.8 | 3.0 | V | 53.1 | 34.0 | -27.6 | 4.5 | 64.0 | 63.5 | -23.1 |
| 5093.8 | 3.0 | V | 52.3 | 35.1 | -27.8 | 4.7 | 64.3 | 63.2 | -22.8 |
| 5942.8 | 3.0 | V | 60.3 | 36.1 | -28.0 | 5.1 | 73.5 | 54.0 | -13.6 |
| 6791.9 | 3.0 | V | 45.6 | 37.2 | -28.5 | 5.7 | 60.0 | 67.5 | -27.1 |
| 7640.7 | 3.0 | V | 41.6 | 37.8 | -29.0 | 6.1 | 56.5 | 71.0 | -30.6 |
| 8489.7 | 3.0 | V | 40.2 | 38.8 | -29.0 | 6.3 | 56.3 | 71.2 | -30.8 |

Note: Negative signs (-) in the Margin column signify levels below the limit.
Field strength at the fundamental frequency equals 127.5 dBuV/m.
Spurious emissions attenuation limit equals 43 + 10log P = 40.4 dB.

# INTERTEK TESTING SERVICES

Company: Philips
EUT: Cell Phone
Model: TCA620-1B
Test Mode: Rx

Project #: J98014902
Date of Test: 5/14/98
Test Site #: 1
Engineer: Xi-Ming Yang X.M.

## FCC Part 15.109 Class B Radiated Emissions

| Frequency (MHz) | Antenna Location (m) | Antenna Polariz. (H=0/V=1) | Reading (dBuV) | Antenna Factor (dB/m) | Preamp (dB) | Correction Factor (dB) | Cable Loss (dB) | Corrected Reading (dBuV/m) | Limit At 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 30.7 | 3.0 | 0 | 30.2 | 15.3 | -22.5 | 0.0 | 0.8 | 23.8 | 40.0 | -16.2 |
| 46.2 | 3.0 | 1 | 37.7 | 9.1 | -22.5 | 0.0 | 0.8 | 25.1 | 40.0 | -14.9 |
| 61.4 | 3.0 | 0 | 47.7 | 5.8 | -22.5 | 0.0 | 1.1 | 32.1 | 40.0 | -7.9 |
| 77.3 | 3.0 | 0 | 35.2 | 7.9 | -22.5 | 0.0 | 1.5 | 22.1 | 40.0 | -17.9 |
| 93.4 | 3.0 | 0 | 19.8 | 7.8 | -22.5 | 0.0 | 1.9 | 7.1 | 43.5 | -36.4 |
| 107.3 | 3.0 | 0 | 44.9 | 7.3 | -22.6 | 0.0 | 2.1 | 31.7 | 43.5 | -11.8 |
| 167.0 | 3.0 | 0 | 22.4 | 9.0 | -22.6 | 0.0 | 2.3 | 11.1 | 43.5 | -32.4 |
| 971.6 | 3.0 | 0 | 33.5 | 24.6 | -22.2 | 0.0 | 6.1 | 42.0 | 54.0 | -12.0 * |

Note: Negative signs (-) in the Margin column signify levels below the limit.
'*' indicates Local Oscillator.

## 9.0 **Line Conducted Emissions**, FCC § 15.107

### 9.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the DC power supply (Topward Electric Instrument, Model No.: TPS 4000), that was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

9.2 Test Configuration Setup - Line Conducted Emissions

Not applicable, the EUT is battery operated.

9.3 Test Results - Line Conducted Emissions

Not applicable, the EUT is battery operated.

10.0 **Frequency Stability vs Temperature**, FCC § 2.995(a), § 22.355
Frequency Tolerance: ±2.5 ppm

10.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external PTT cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the external PTT switch was activated, and the frequency output was recorded from the counter.

10.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Goldstar DC Power Supply, GR303
Rohde & Schwarz ESVP Test Receiver

10.3 Test Results

Refer to the test data below.

The EUT passed the test.

Frequency: 836.52 MHz
Tolerance: ± 2091 Hz

| FREQUENCY STABILITY VS TEMPERATURE | | |
|---|---|---|
| **Temperature, C** | **Frequency (MHz)** | **Difference (Hz)** |
| 60 | 836.519466 | -534 |
| 50 | 836.520110 | 110 |
| 40 | 836.519895 | -105 |
| 30 | 836.520125 | 125 |
| 20 | 836.520290 | 240 |
| 10 | 836.520275 | 275 |
| 0 | 836.520010 | 10 |
| -10 | 836.519425 | -575 |
| -20 | 836.519860 | -140 |
| -30 | 836.519430 | -570 |

11.0 **Frequency Stability vs Voltage,** FCC 2.995(d)(2), §22.355
Frequency Tolerance: ±2.5 ppm

11.1 Test Procedure

An external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115% of the DC nominal value and for 85% of the nominal value.

11.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
DC Power Supply
Rohde & Schwarz ESVP Test Receiver

11.3 Test Results.

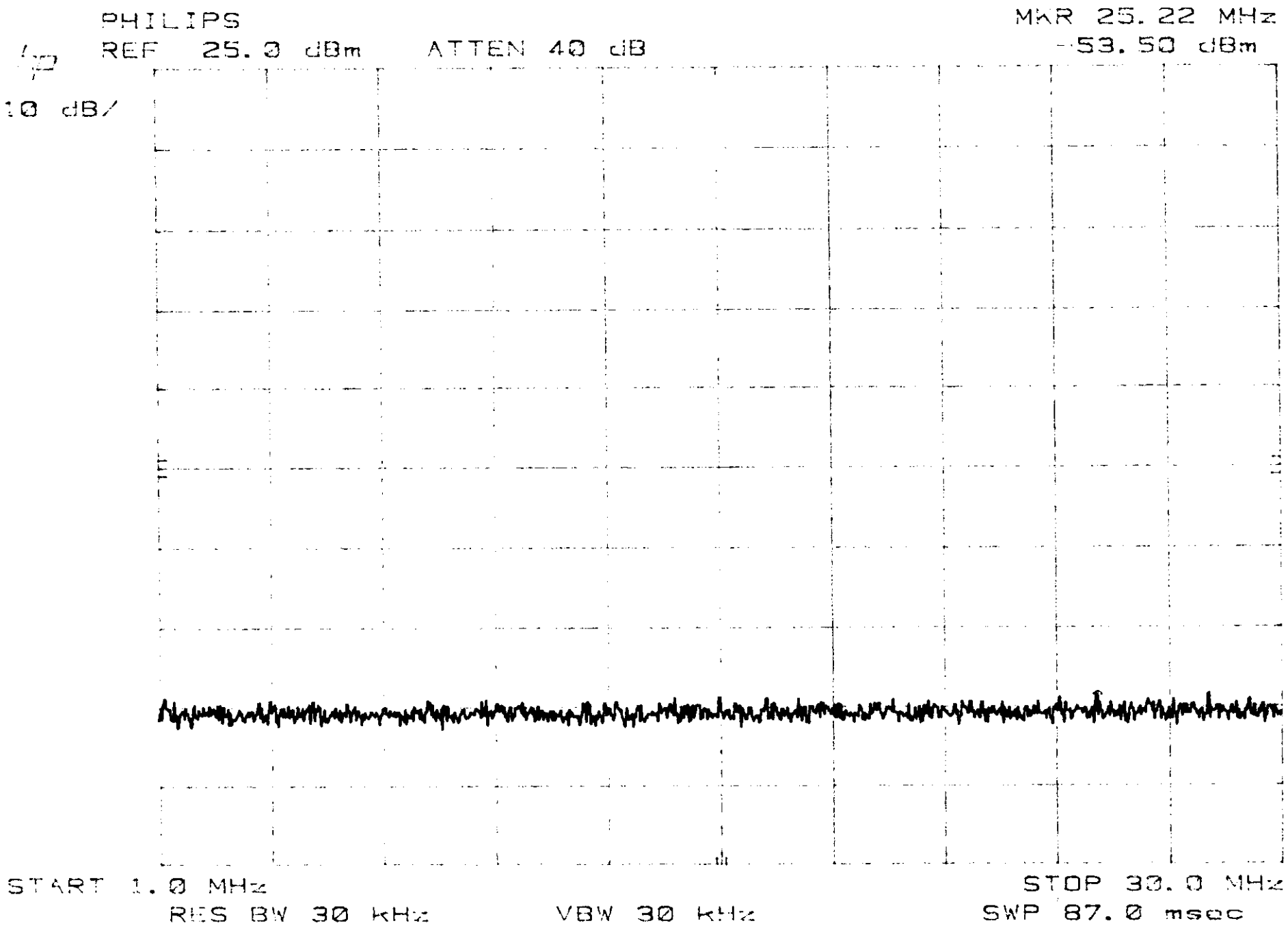
Refer to the test data below.

Frequency: 836.52 MHz
Tolerance: ± 2091 Hz

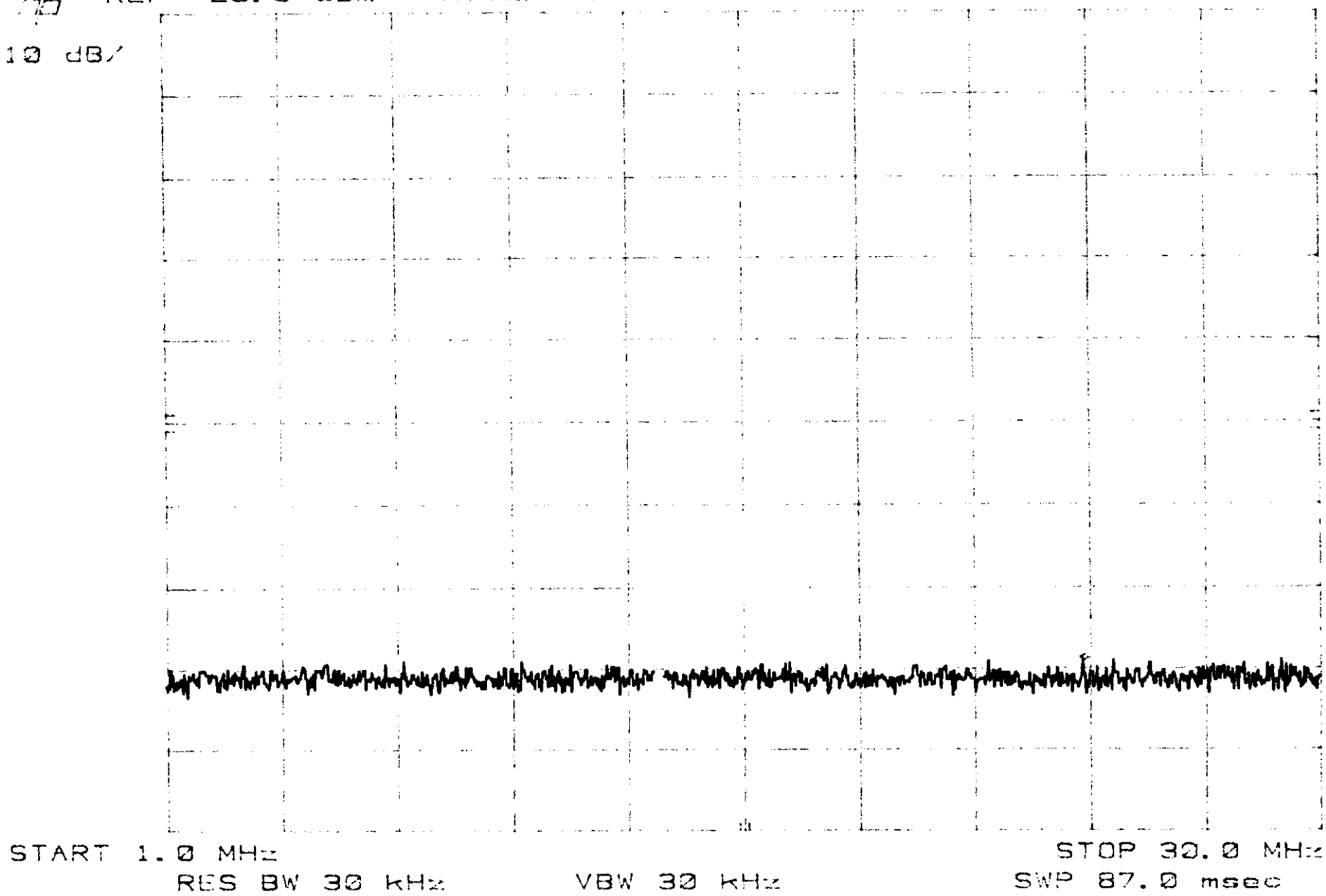
| Frequency Stability vs. Voltage | | |
|---|---|---|
| **Voltage** | **Frequency (MHz)** | **Difference (Hz)** |
| 4.65 ( 85%) | 836.519310 | -690 |
| 4.80 (100%) | 836.519120 | -880 |
| 4.95 (115%) | 836.519310 | -690 |
| 4.40 (Minimum) | 836.519910 | -90 |

The EUT passed the test.

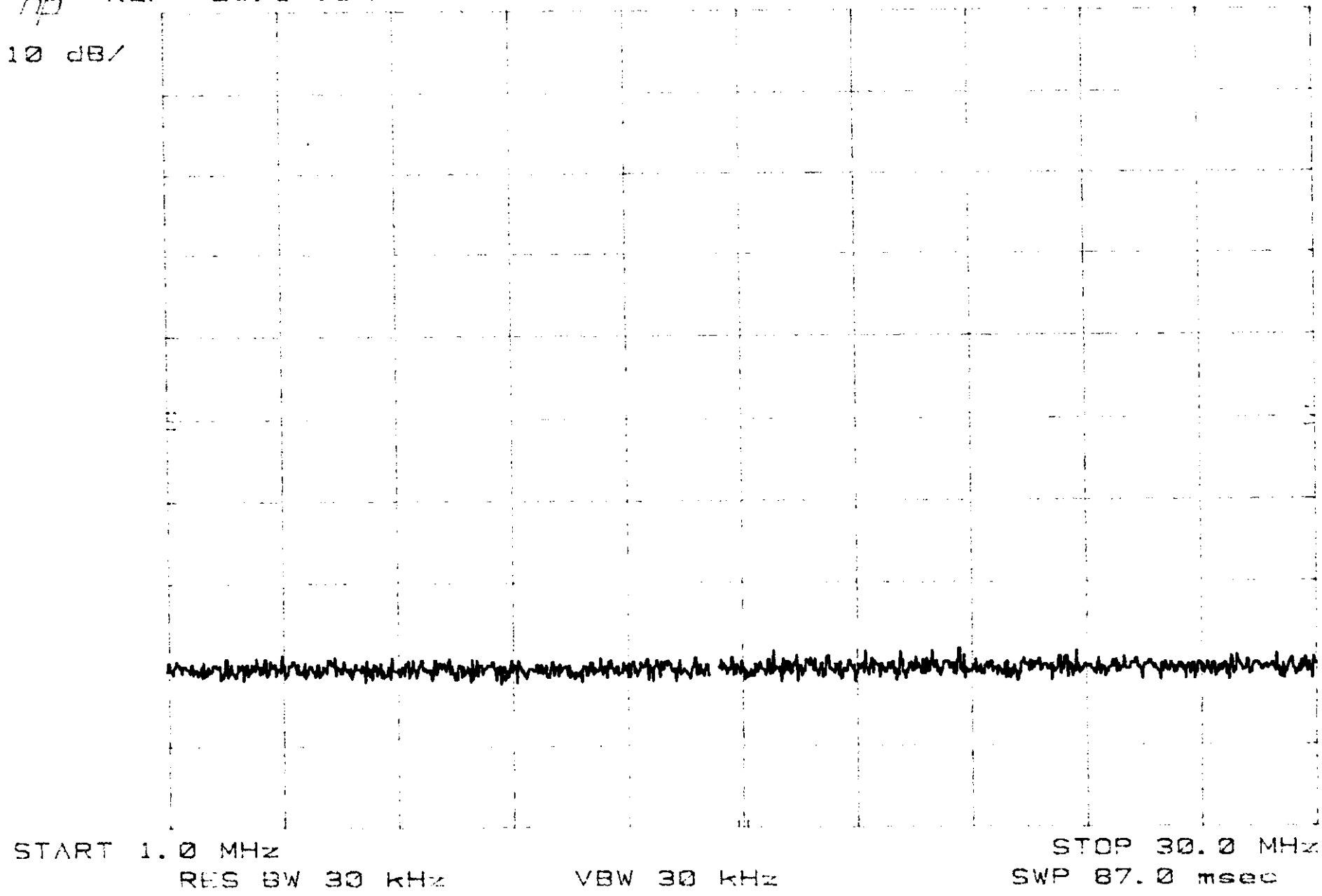
Plot 7.3.a


PHILIPS
REF 25.3 dBm
ATTEN 40 dB
MKR 25.22 MHz
-53.50 dBm
10 dB/
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 87.0 msec

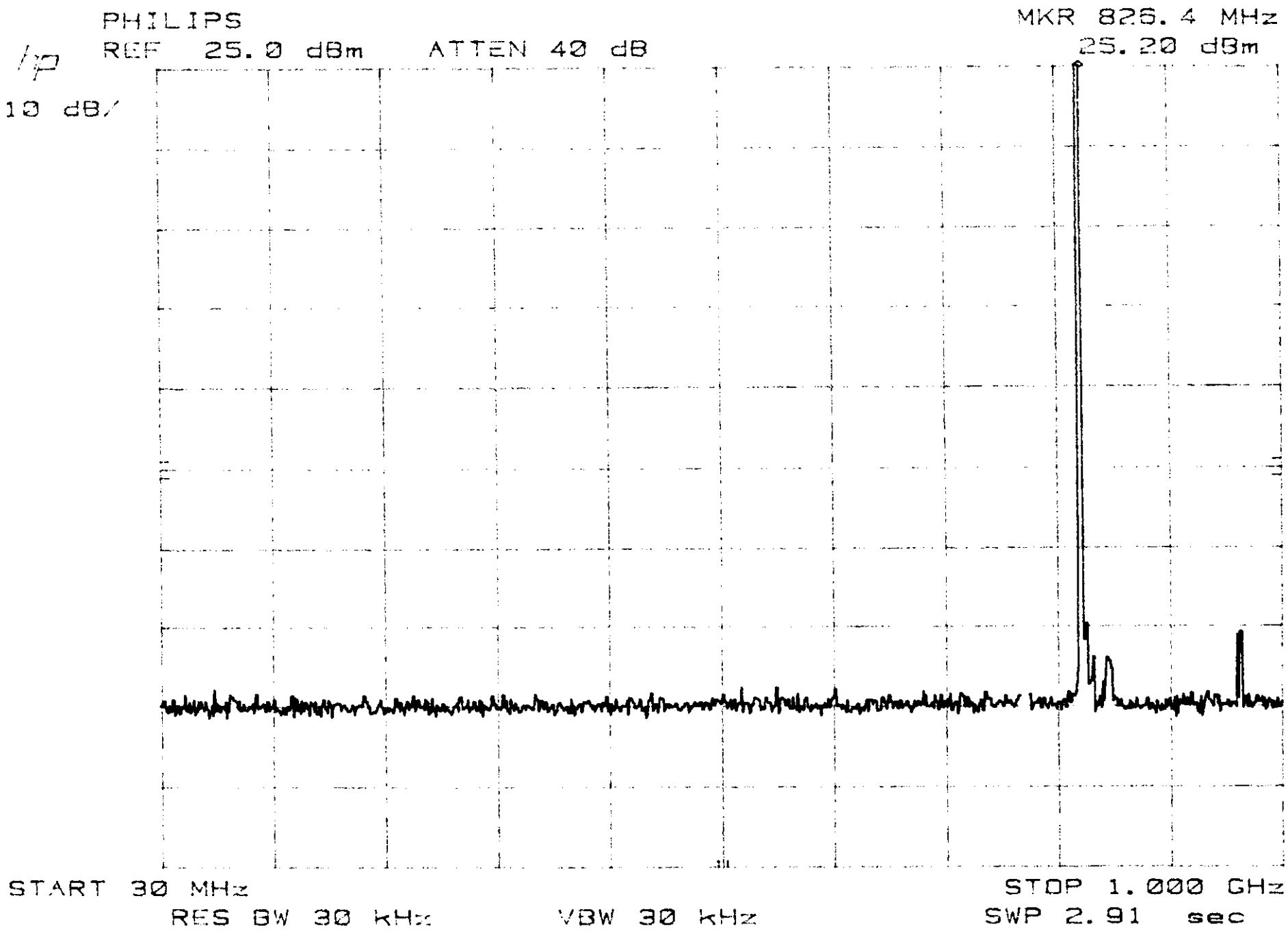
Plot 7.3.b


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 24.03 MHz
-53.60 dBm
10 dB/
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 87.0 msec

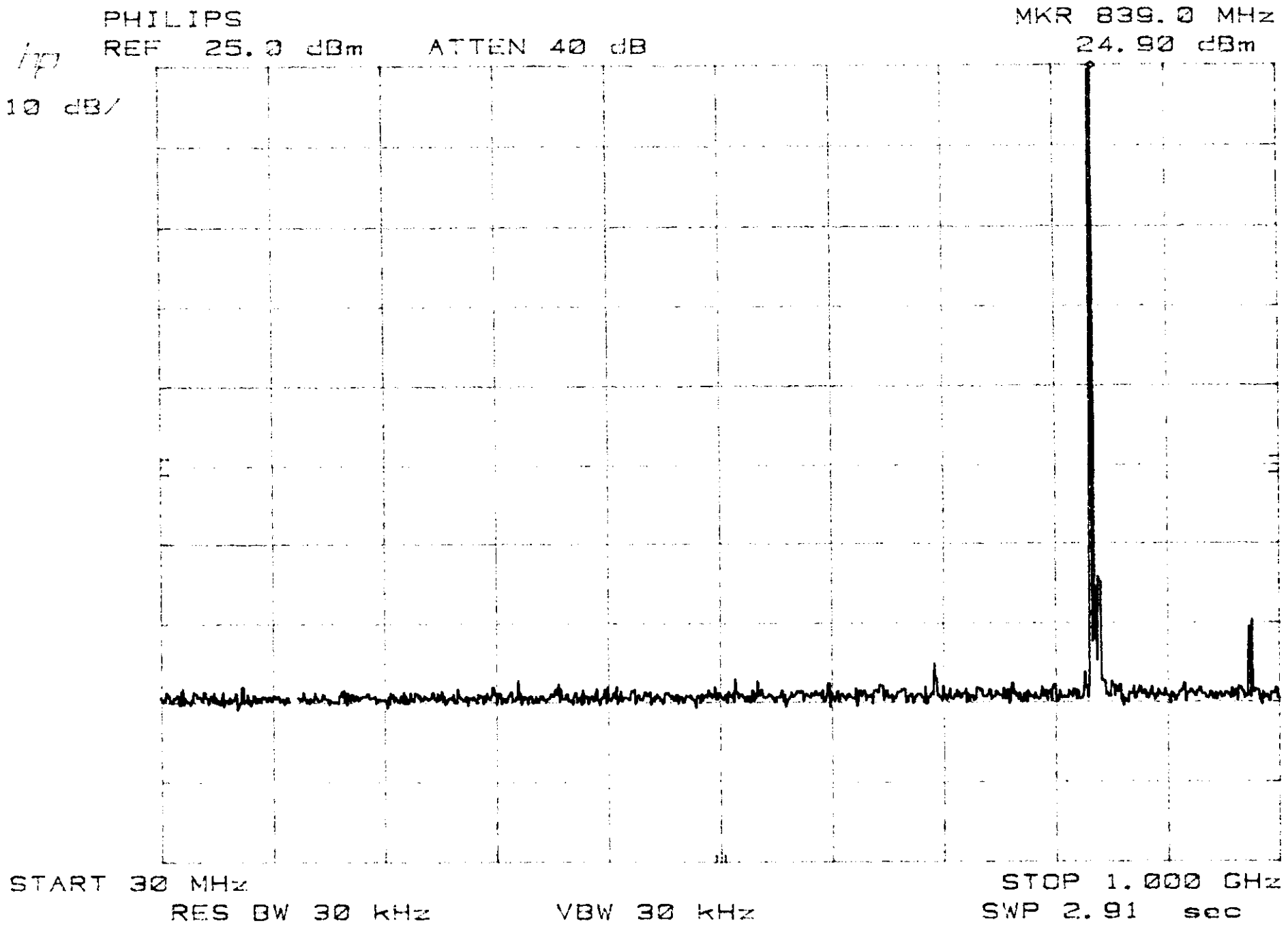
Plot 7.3.C


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 4.39 MHz
-56.00 dBm
10 dB/
START 1.0 MHz
STOP 30.0 MHz
RES BW 30 kHz
VBW 30 kHz
SWP 87.0 msec

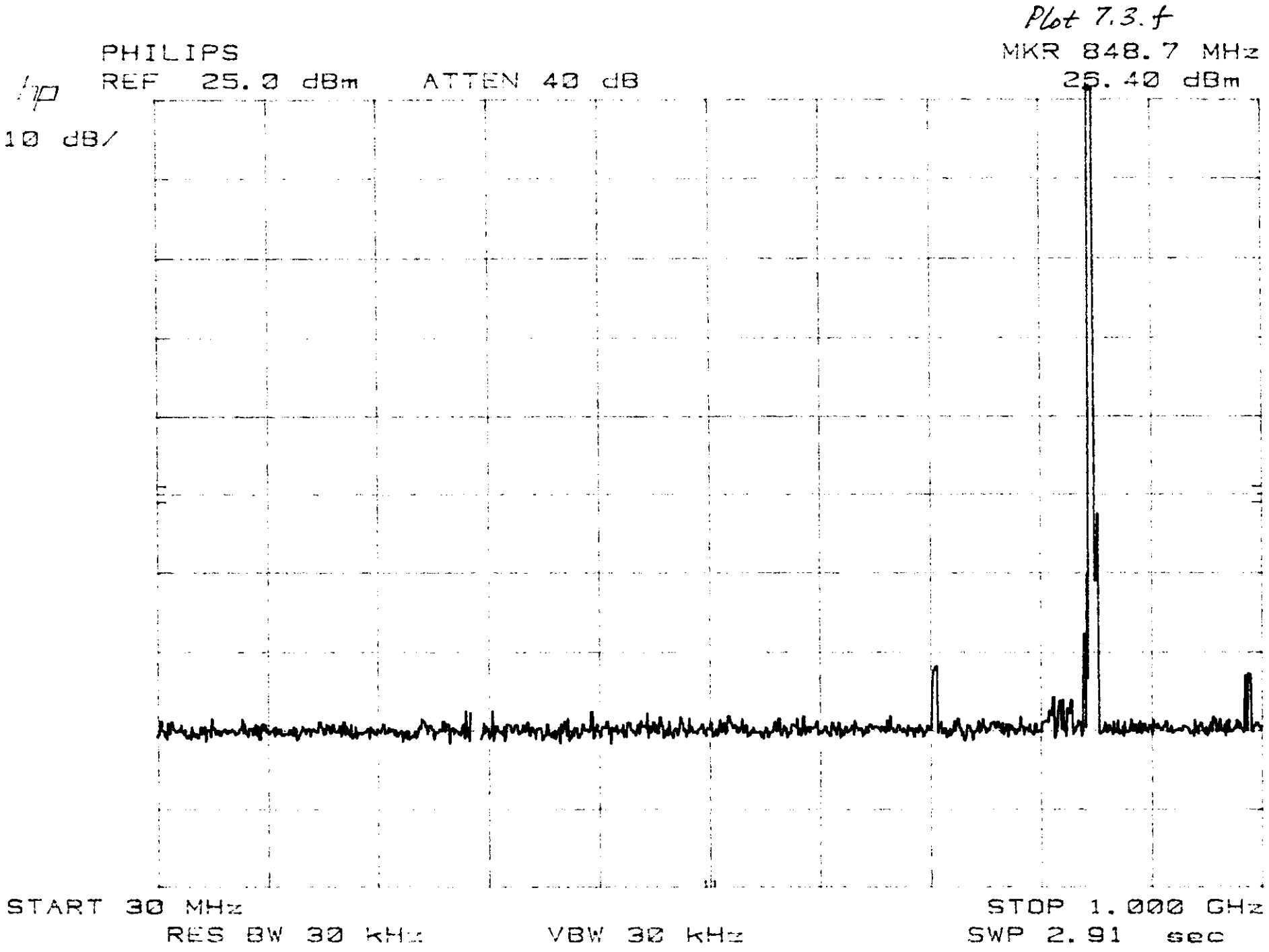
Plot 7.3.d


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 826.4 MHz
25.20 dBm
10 dB/
START 30 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 2.91 sec

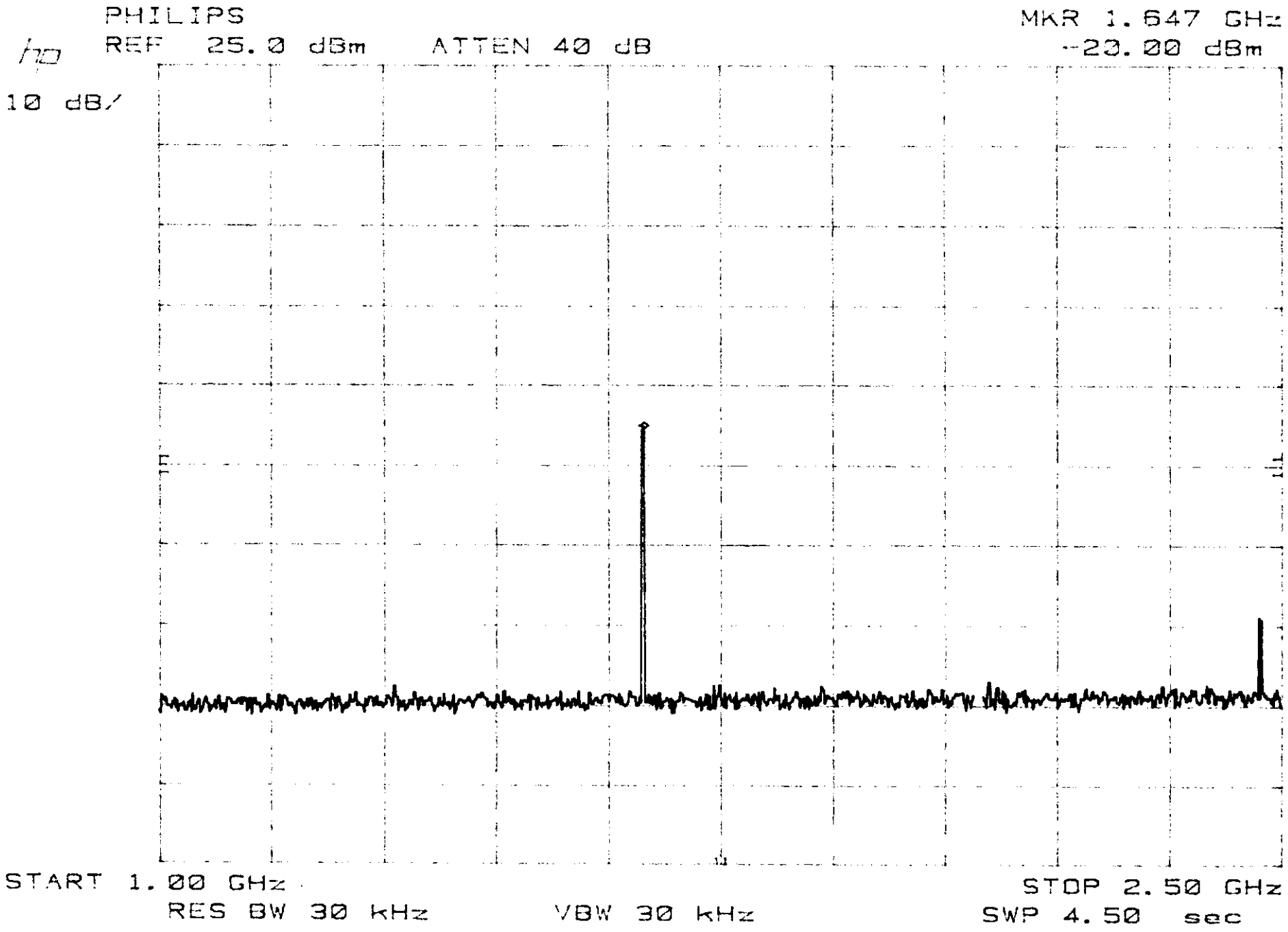
Plot 7.3.e


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 839.0 MHz
24.90 dBm
10 dB/
START 30 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 2.91 sec

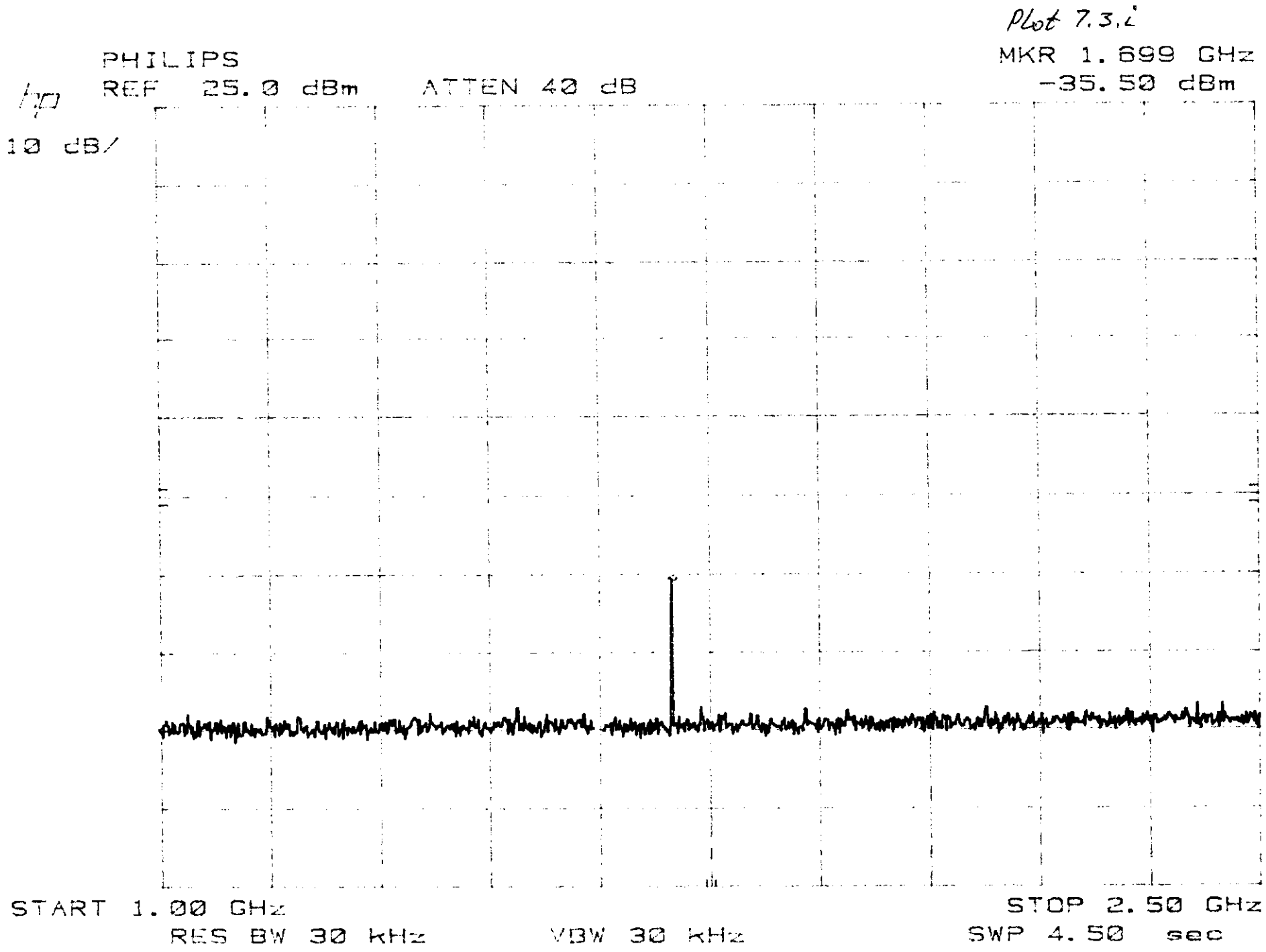
Plot 7.3.f


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 848.7 MHz
25.40 dBm
10 dB/
START 30 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 2.91 sec

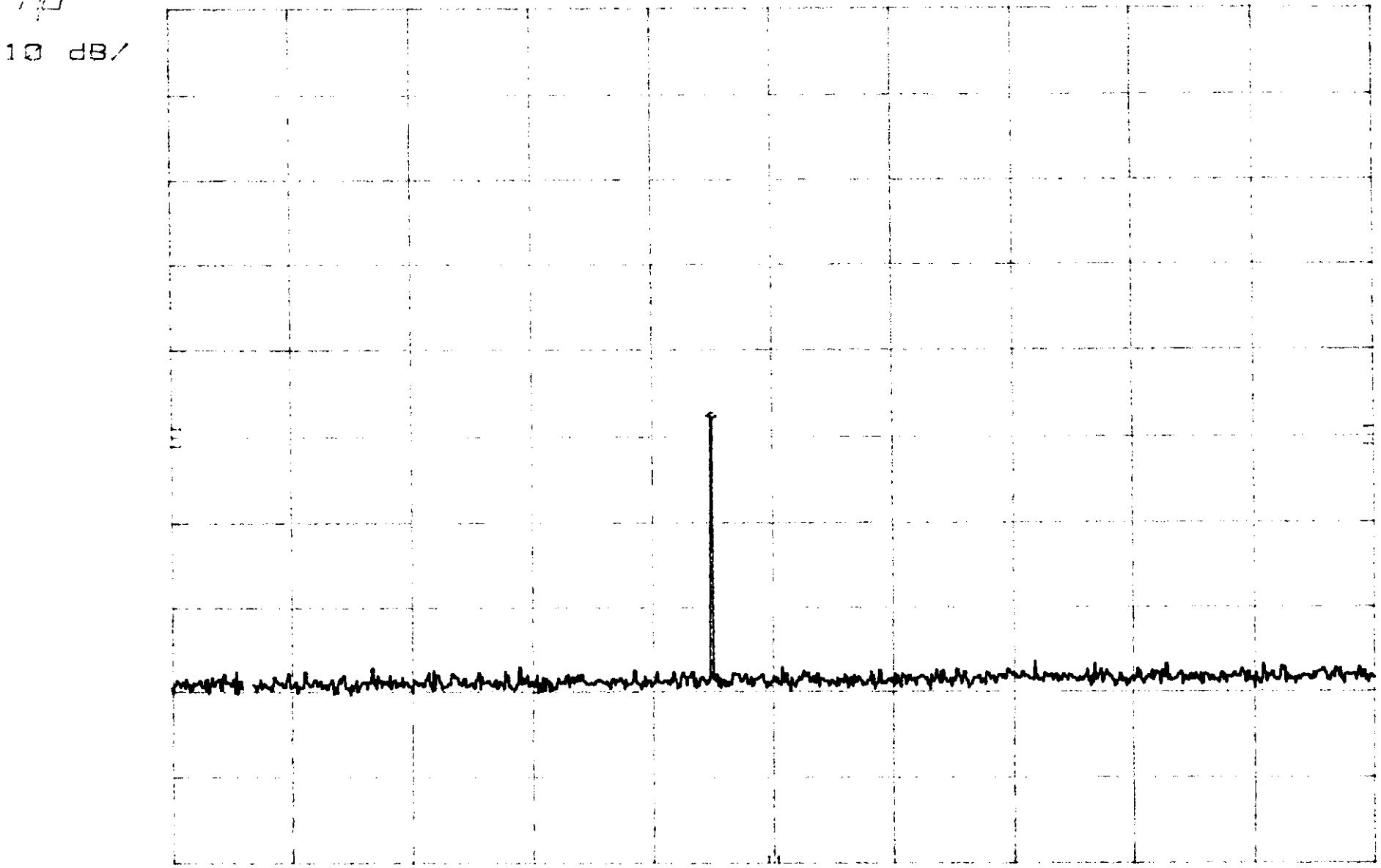
Plot 7.3.g


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 1.647 GHz
-23.00 dBm
10 dB/
START 1.00 GHz
RES BW 30 kHz
VBW 30 kHz
STOP 2.50 GHz
SWP 4.50 sec

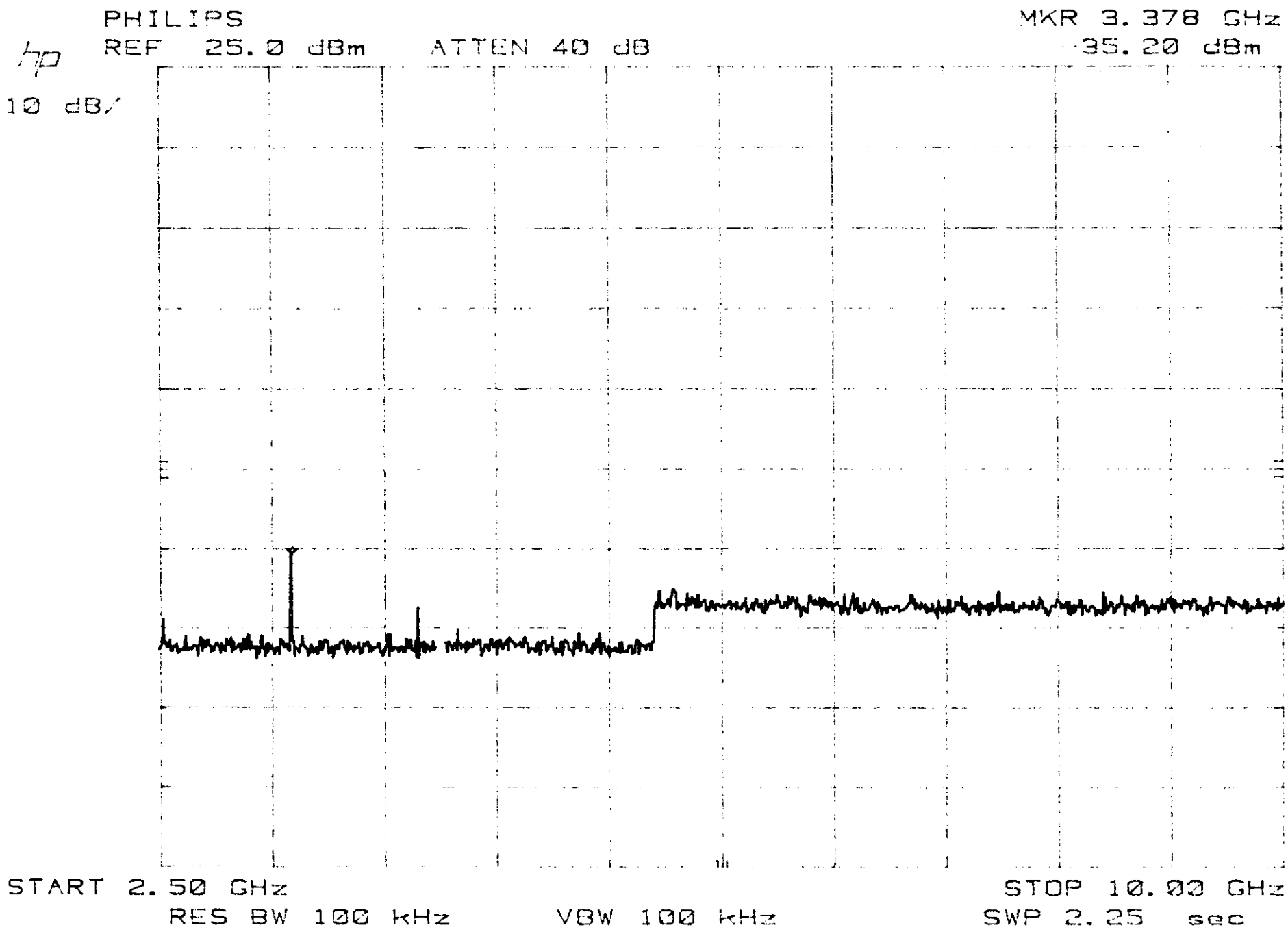
Plot 7.3.i


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 1.699 GHz
-35.50 dBm
10 dB/
START 1.00 GHz
STOP 2.50 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 4.50 sec

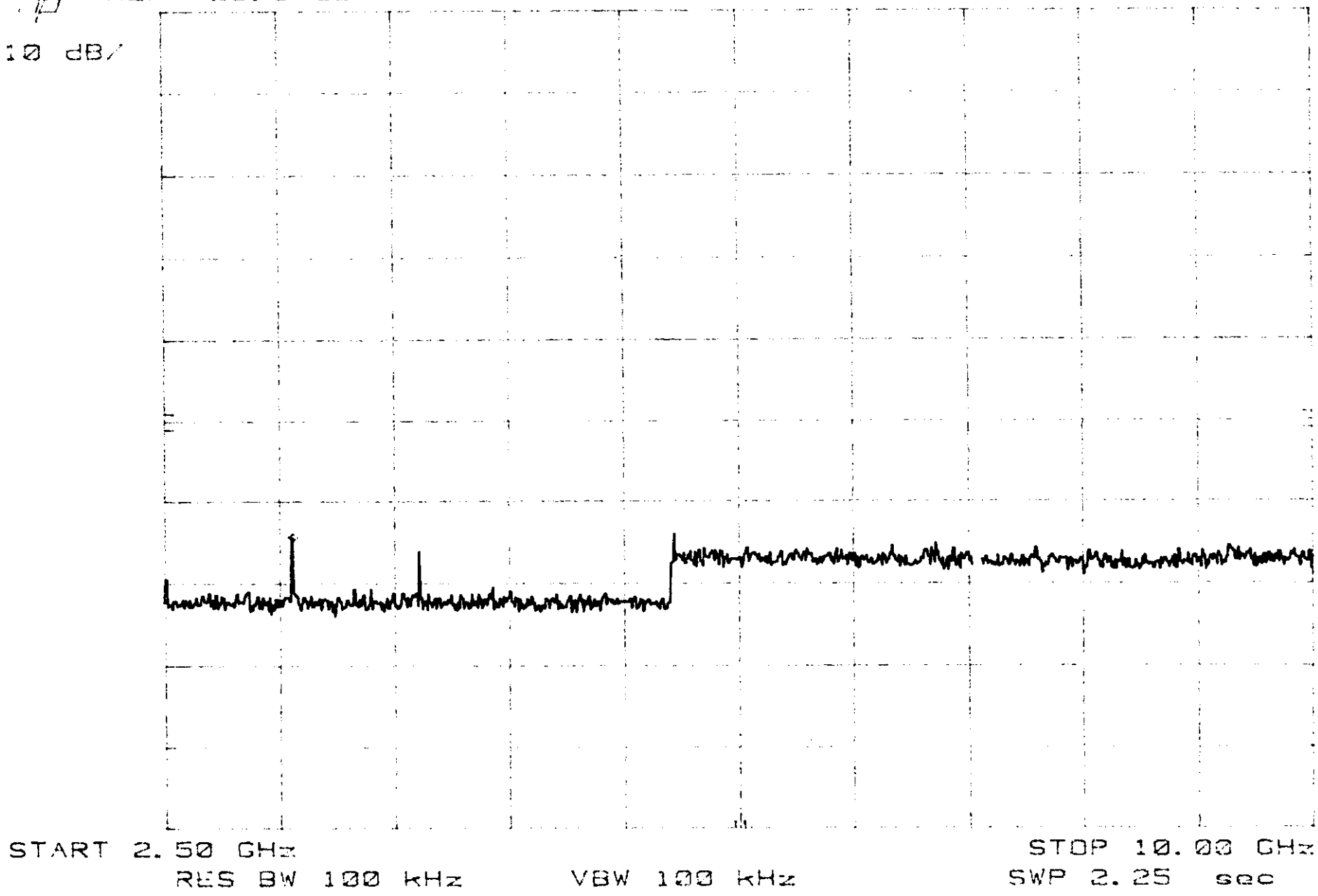
Plot 7.3.h


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 1.674 GHz
-22.60 dBm
10 dB/
START 1.00 GHz
STOP 2.50 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 4.50 sec

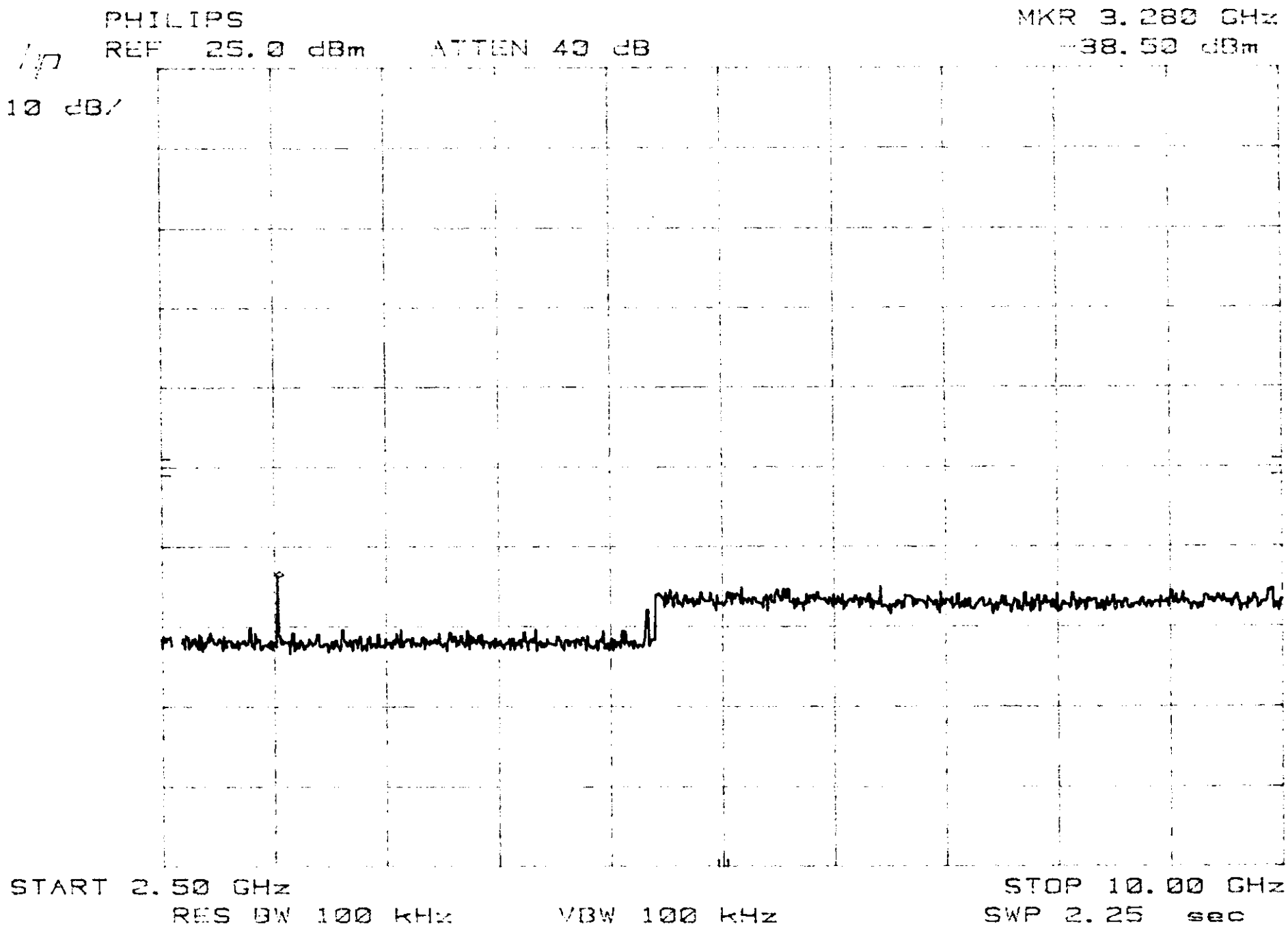
Plot 7.3.L


PHILIPS
MKR 3.378 GHz
REF 25.0 dBm
ATTEN 40 dB
-35.20 dBm
10 dB/
START 2.50 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 100 kHz
SWP 2.25 sec

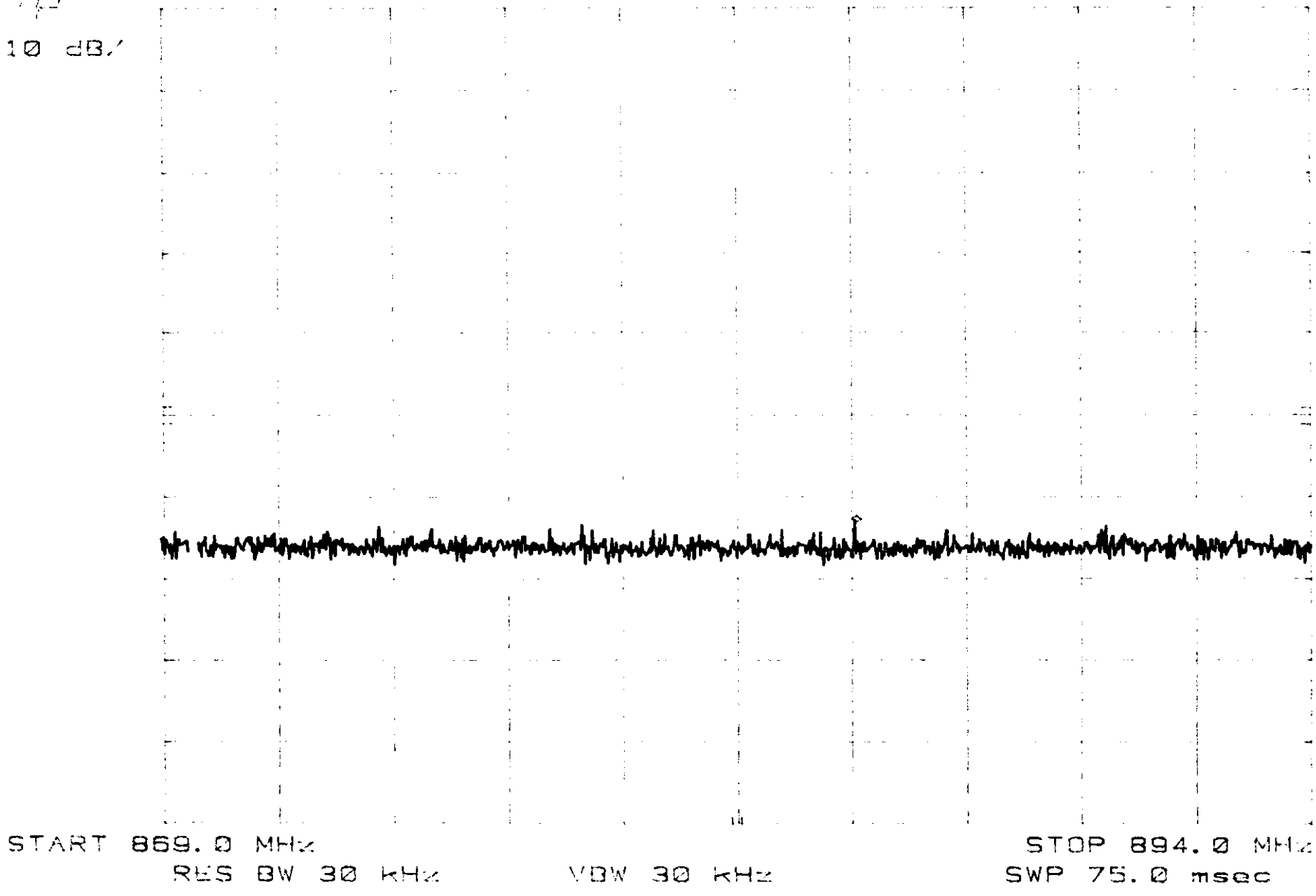
Plot 7.3.K


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 3.333 GHz
-39.30 dBm
10 dB/
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec

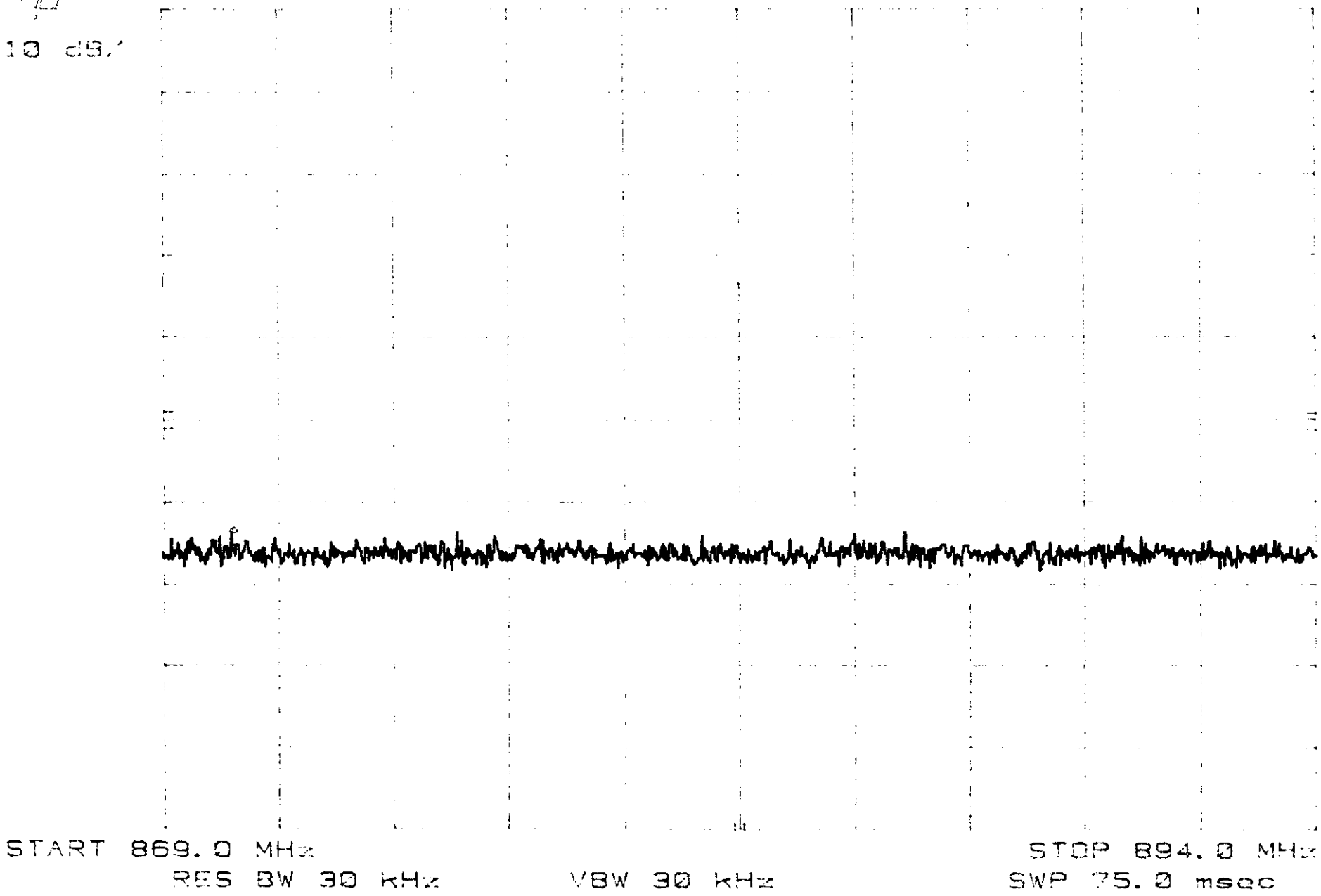
Plot 7.3.j


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 3.280 GHz
-38.50 dBm
10 dB/
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec

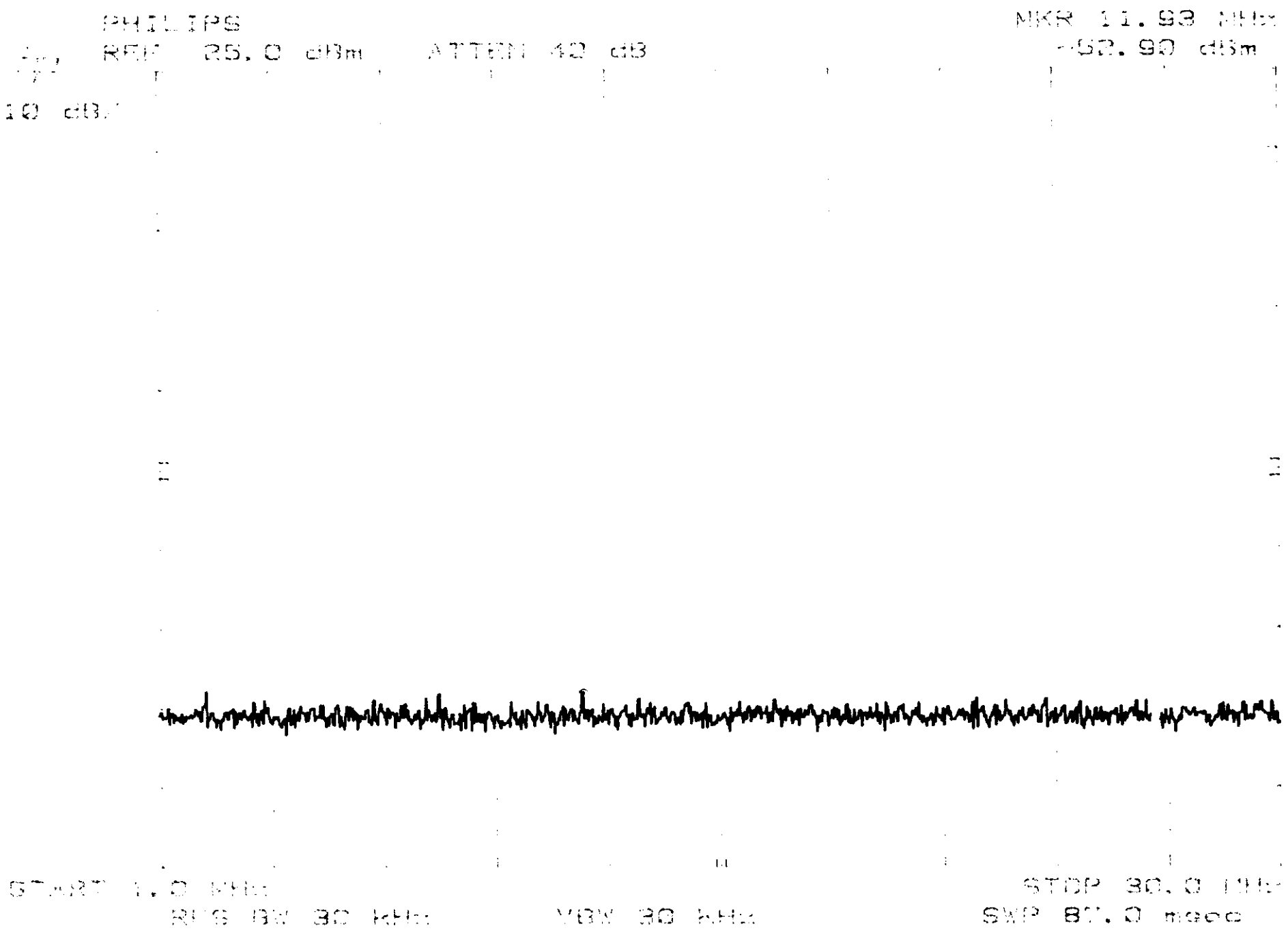
Plot 7.3.M


PHILIPS
REF -20.0 dBm
ATTEN 10 dB
MKR 884.10 MHz
-82.50 dBm
10 dB/
START 869.0 MHz
STOP 894.0 MHz
RES BW 30 kHz
VBW 30 kHz
SWP 75.0 msec

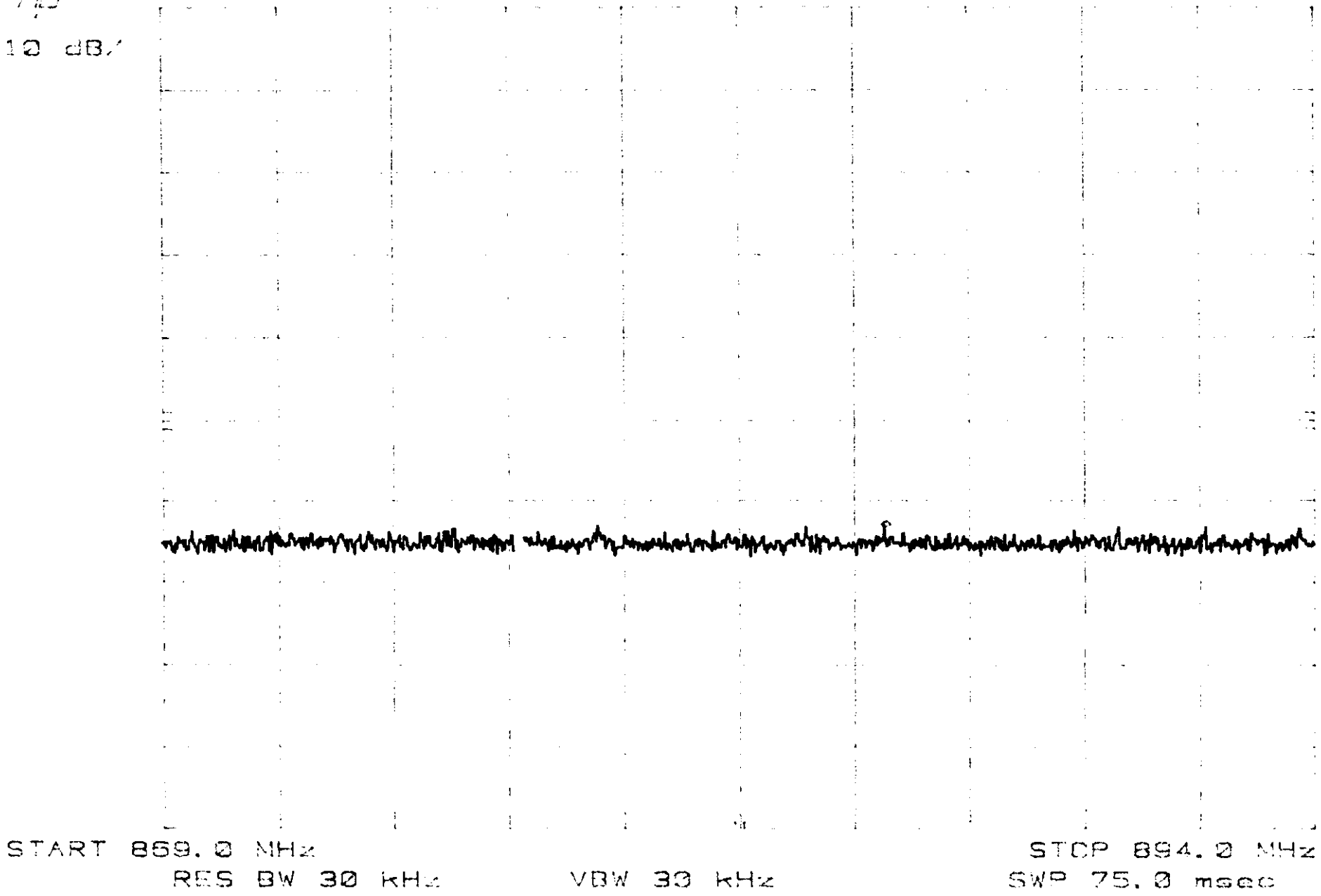
Plot 7.3.2


PHILIPS
REF -20.0 dBm
ATTEN 10 dB
MKR 870.50 MHz
-83.40 dBm
10 dB/
START 869.0 MHz
STOP 894.0 MHz
RES BW 30 kHz
VBW 30 kHz
SWP 75.0 msec

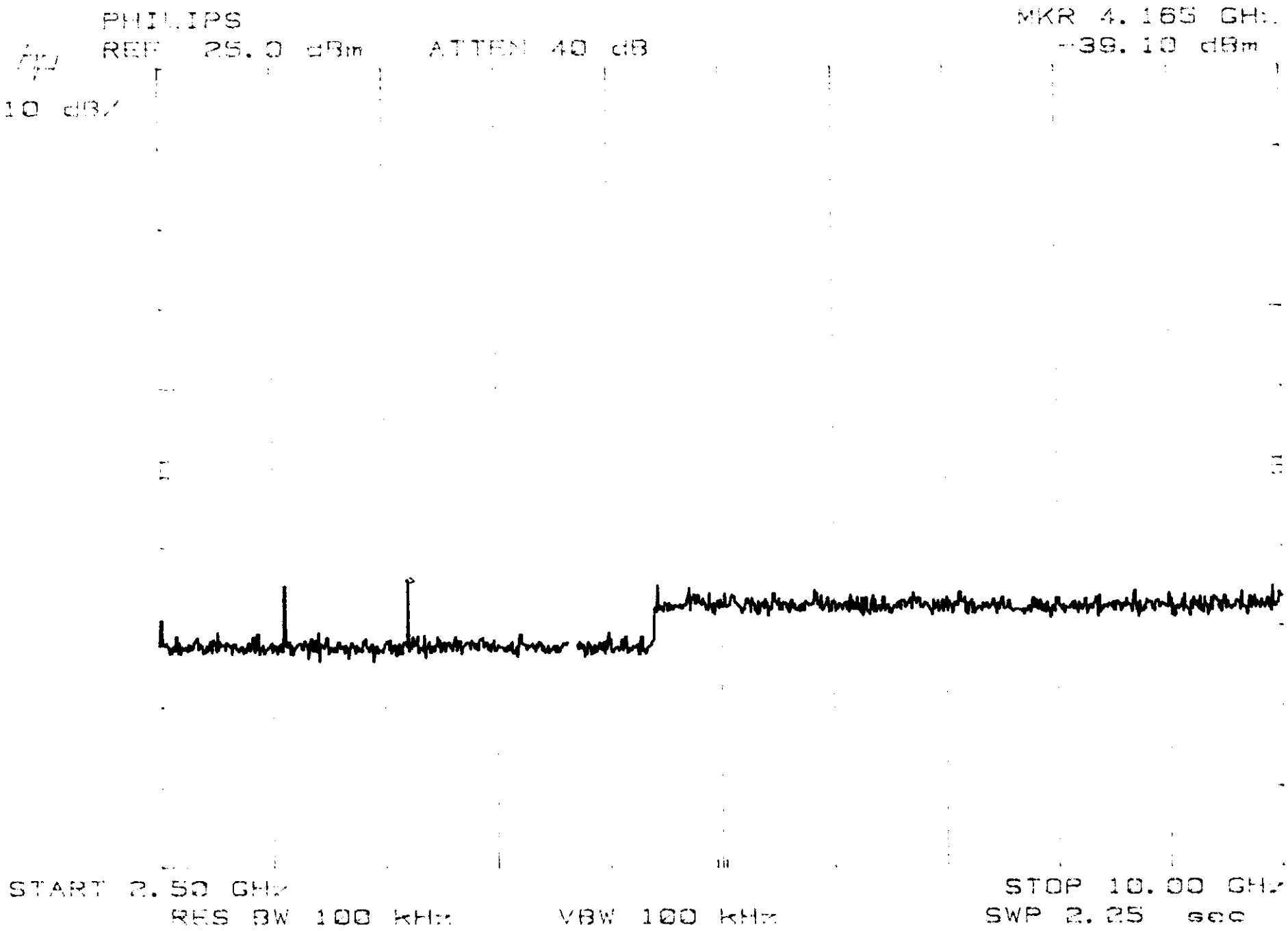
Plot 7.3,p


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 11.93 MHz
-52.90 dBm
10 dB/
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 81.0 msec

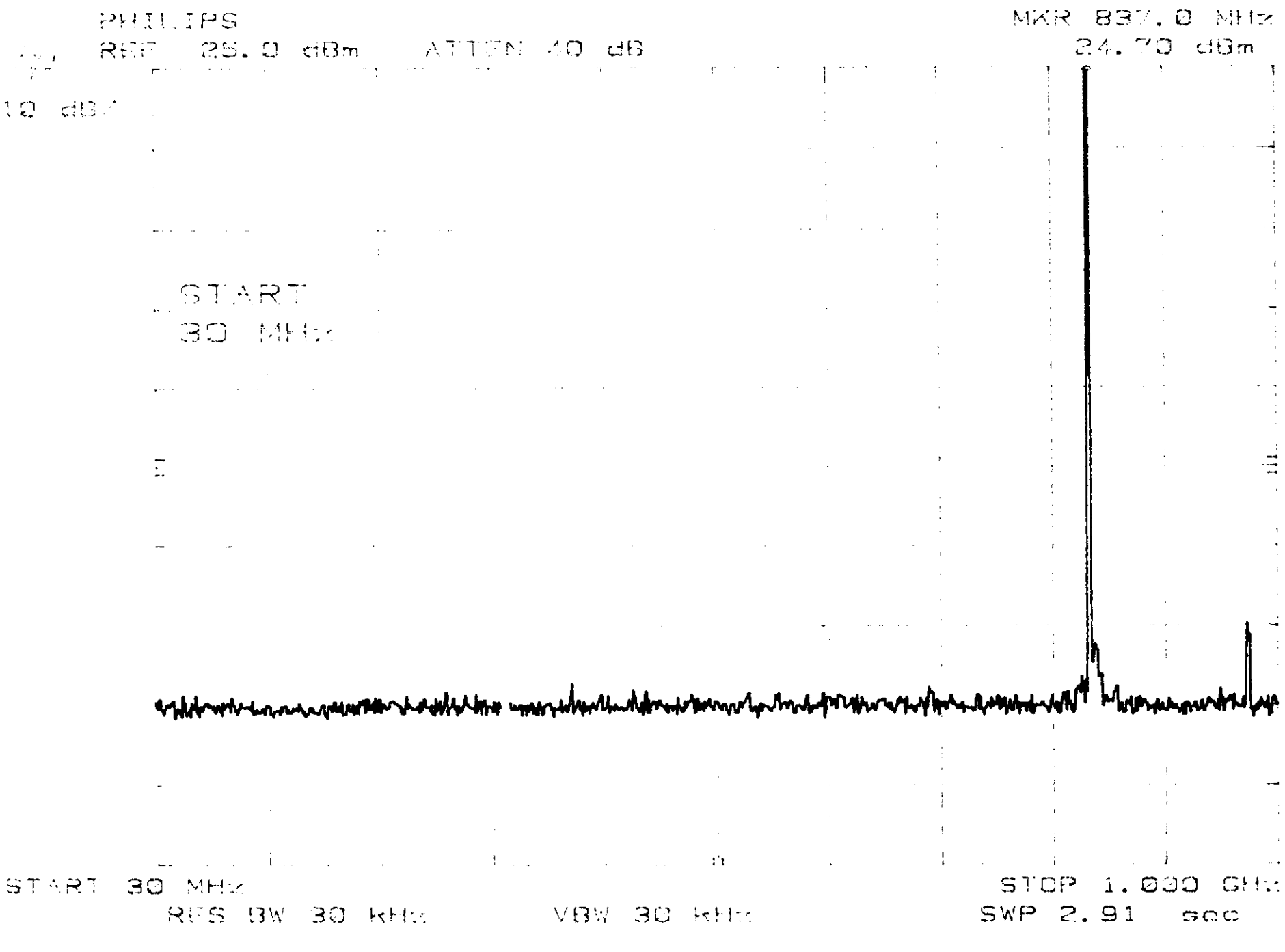
Plot 7.3.0


PHILIPS
REF -20.0 dBm
ATTEN 10 dB
MKR 884.68 MHz
-82.90 dBm
10 dB/
START 869.0 MHz
STOP 894.0 MHz
RES BW 30 kHz
VBW 30 kHz
SWP 75.0 msec

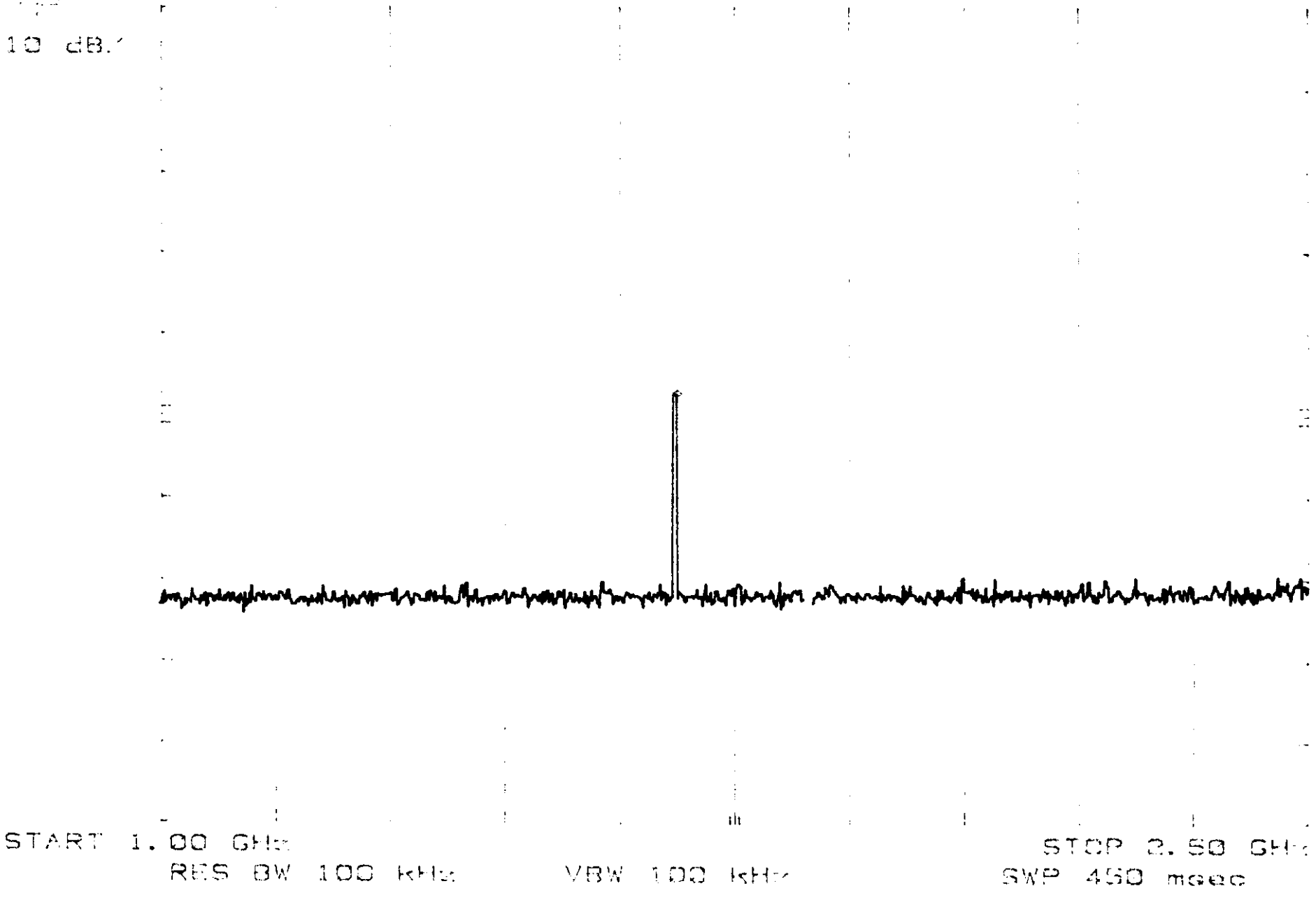
Plot 7.3.t


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 4.165 GHz
-39.10 dBm
10 dB/
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec

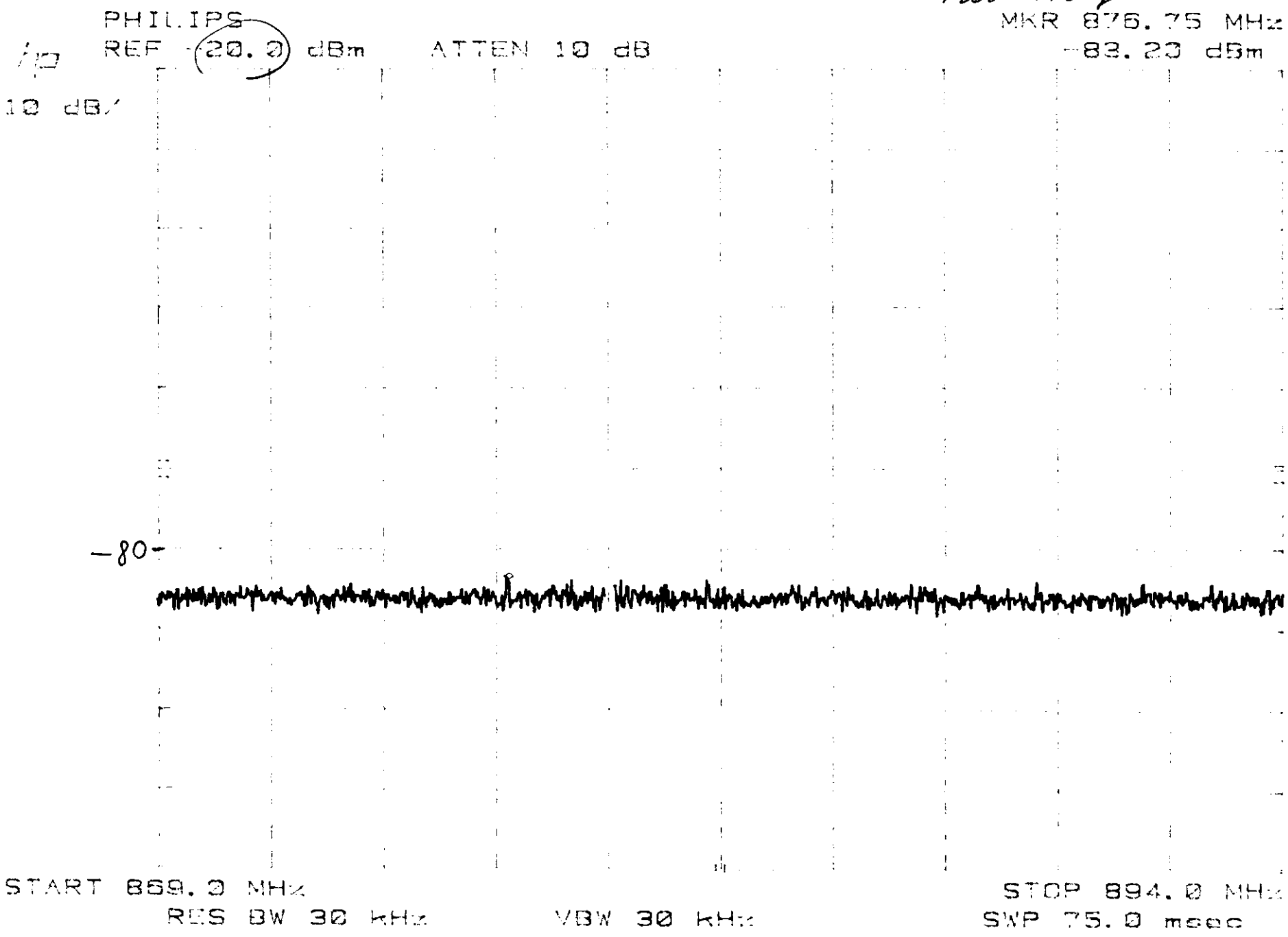
Plot 7.3, r


PHILIPS
MKR 837.0 MHz
24.70 dBm
10 dB/
START
30 MHz
START 30 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 30 kHz
SWP 2.91 sec

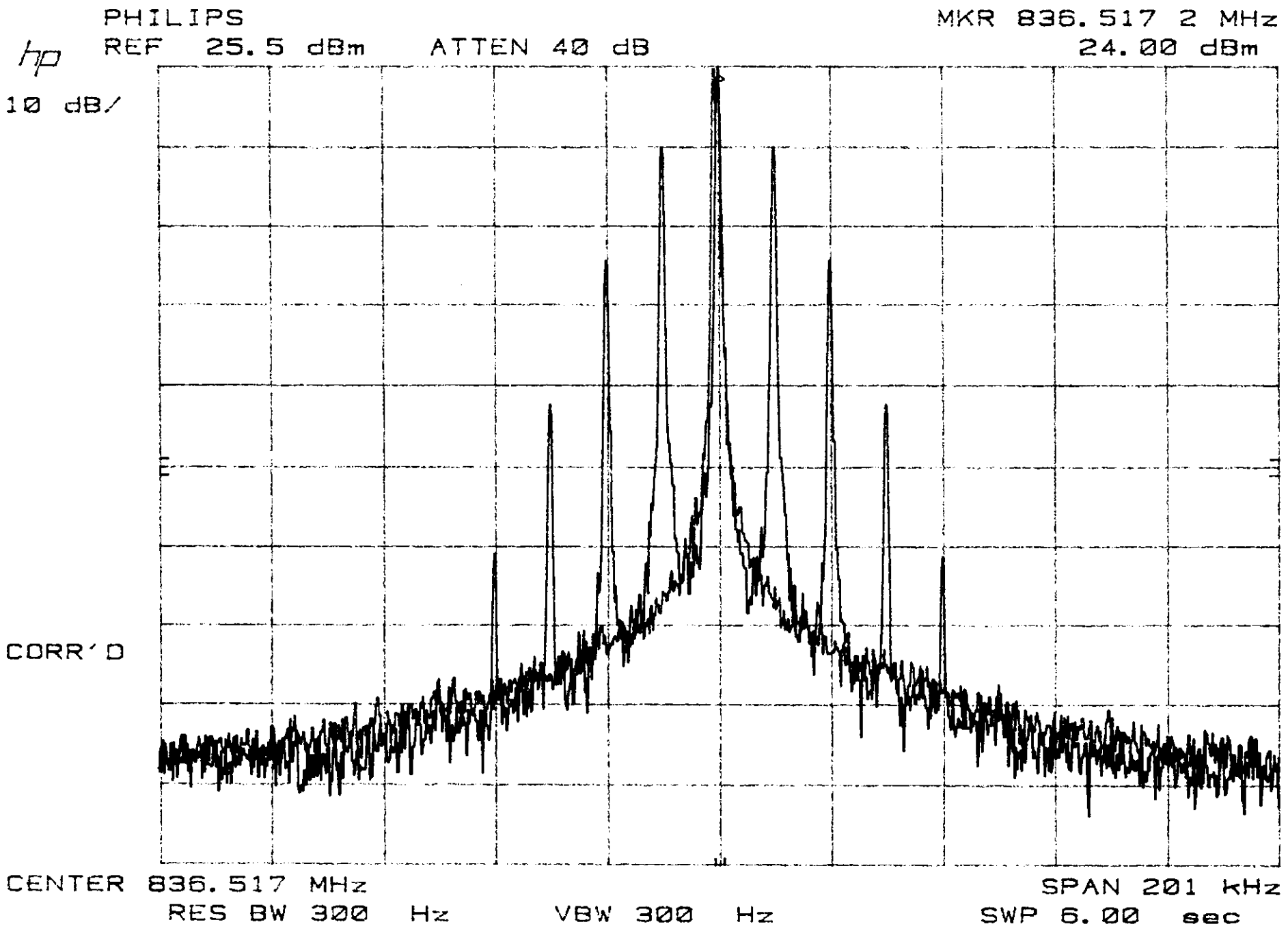
Plot 7.3.s


PHILIPS
REF 25.0 dBm
ATTEN 40 dB
MKR 1.674 GHz
-23.30 dBm
10 dB/
START 1.00 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 450 msec

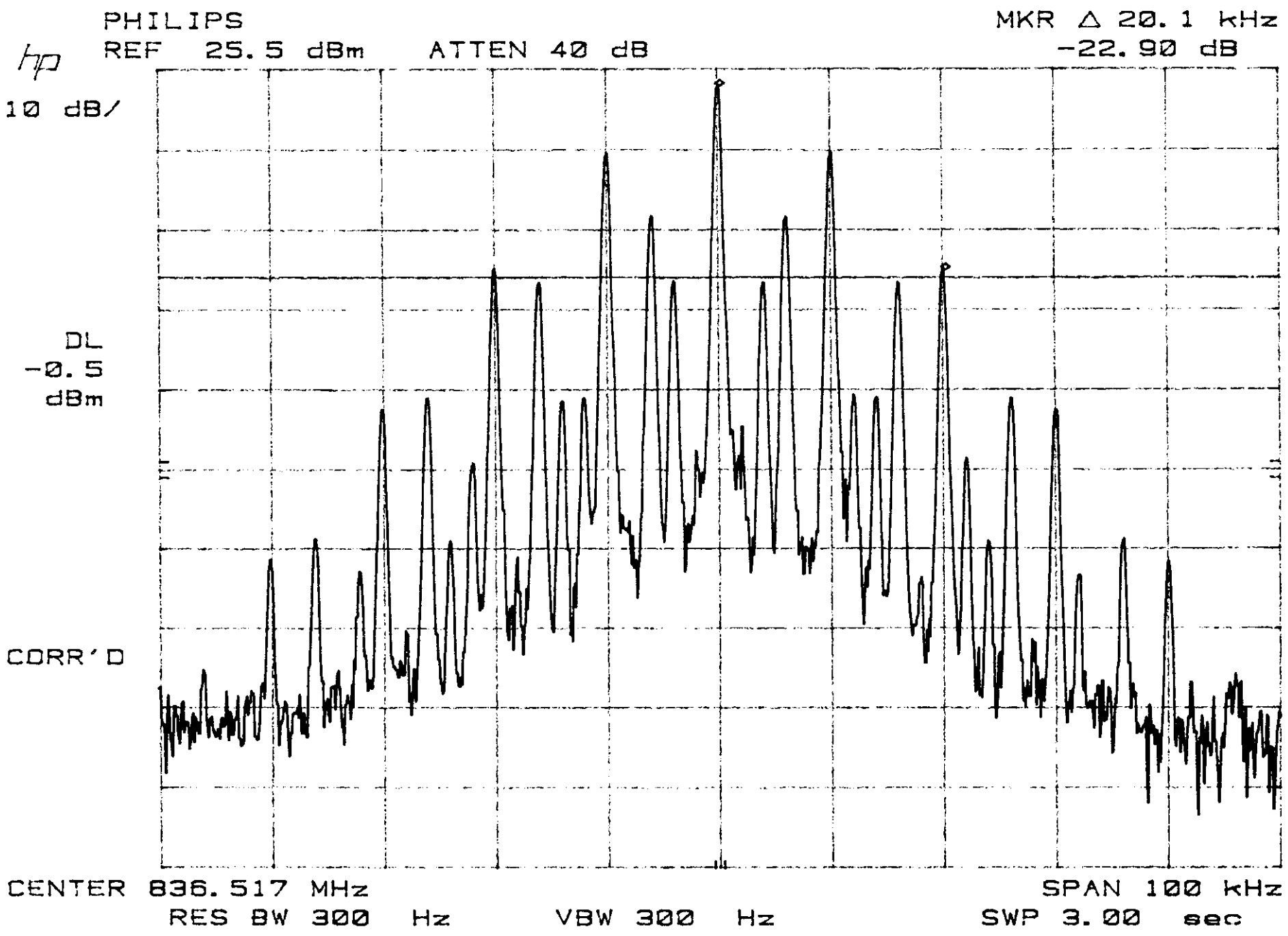
Plot 7.3.9


PHILIPS
REF 20.0 dBm
ATTEN 10 dB
MKR 876.75 MHz
-83.23 dBm
10 dB/
-80-
START 869.0 MHz
STOP 894.0 MHz
RES BW 30 kHz
VBW 30 kHz
SWP 75.0 msec

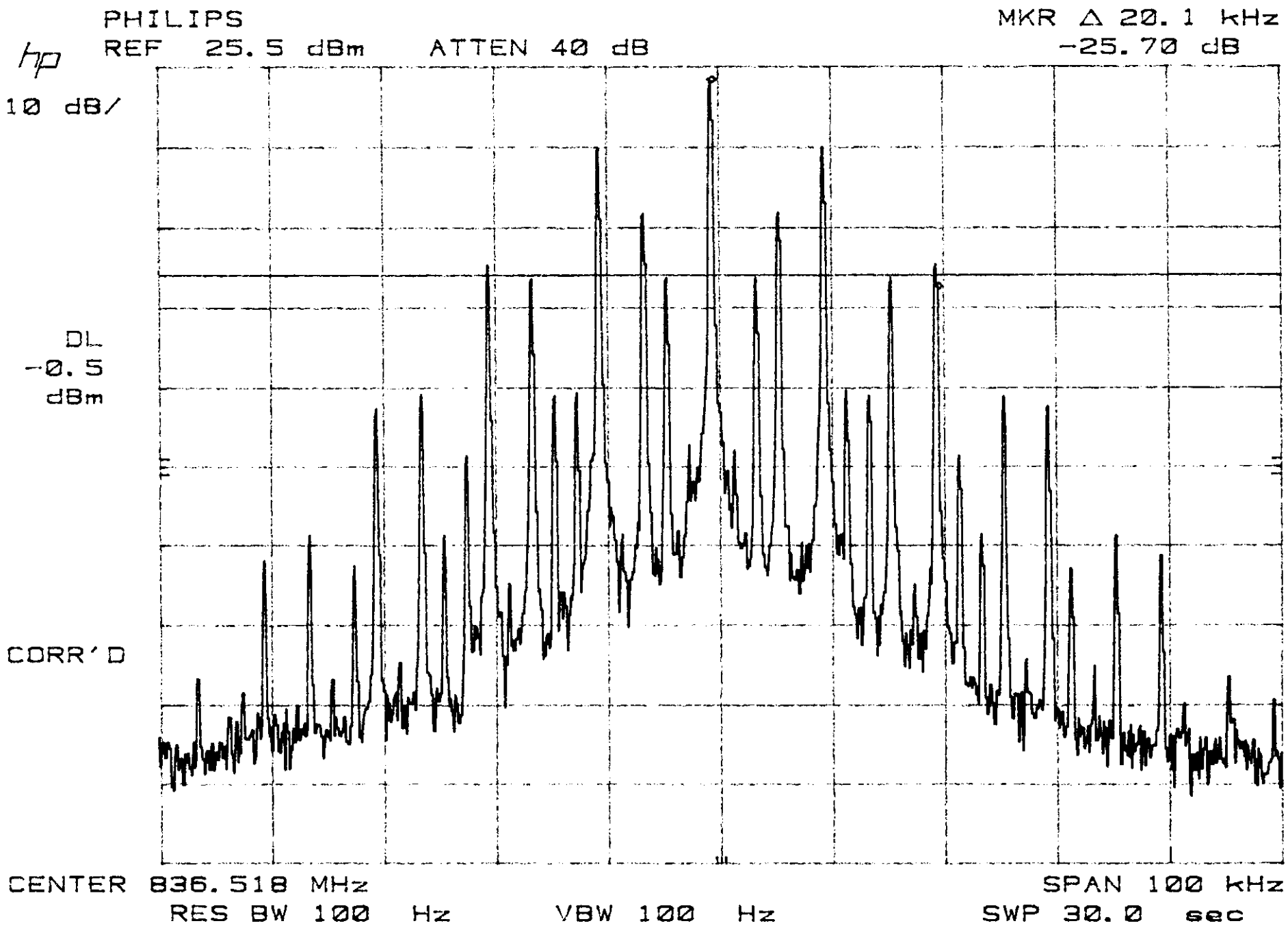
Plot 6.3.f


PHILIPS
hp
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 2 MHz
24.00 dBm
10 dB/
CORR'D
CENTER 836.517 MHz
SPAN 201 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 6.00 sec

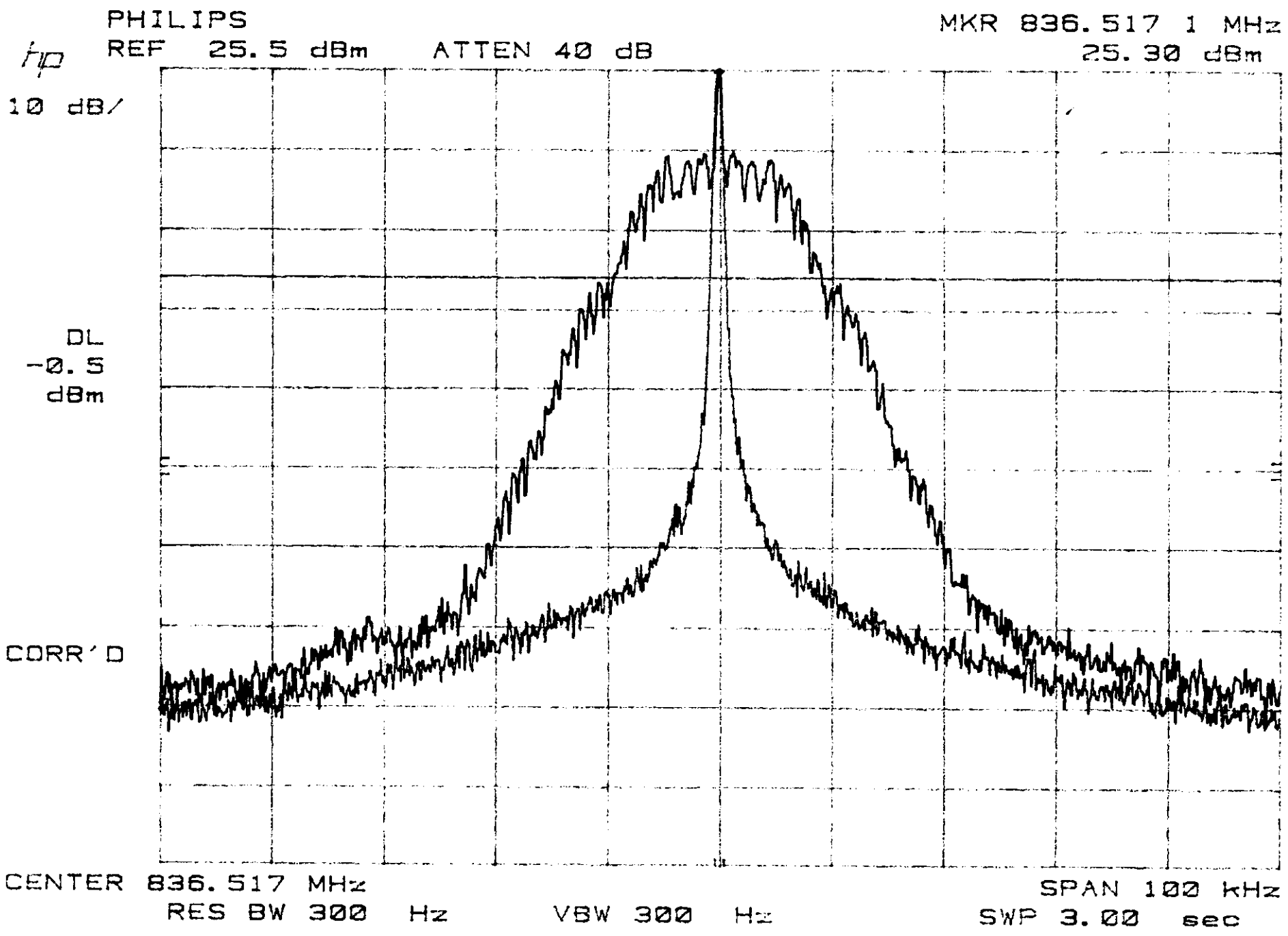
Plot 6.3.g.1


PHILIPS
MKR Δ 20.1 kHz
REF 25.5 dBm
ATTEN 40 dB
-22.90 dB
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.517 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

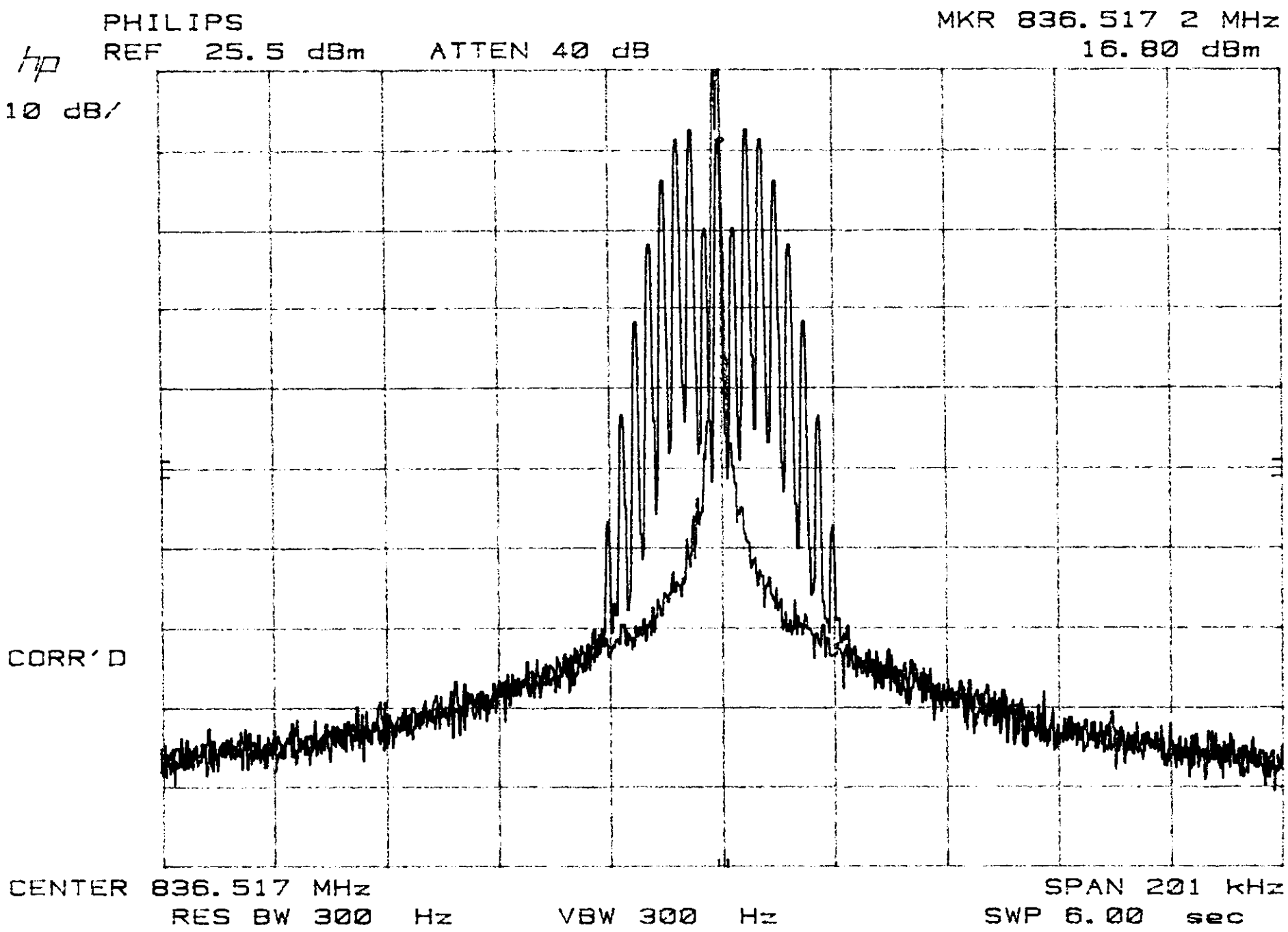
Plot 6.3.g.2


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR Δ 20.1 kHz
-25.70 dB
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.518 MHz
SPAN 100 kHz
RES BW 100 Hz
VBW 100 Hz
SWP 30.0 sec

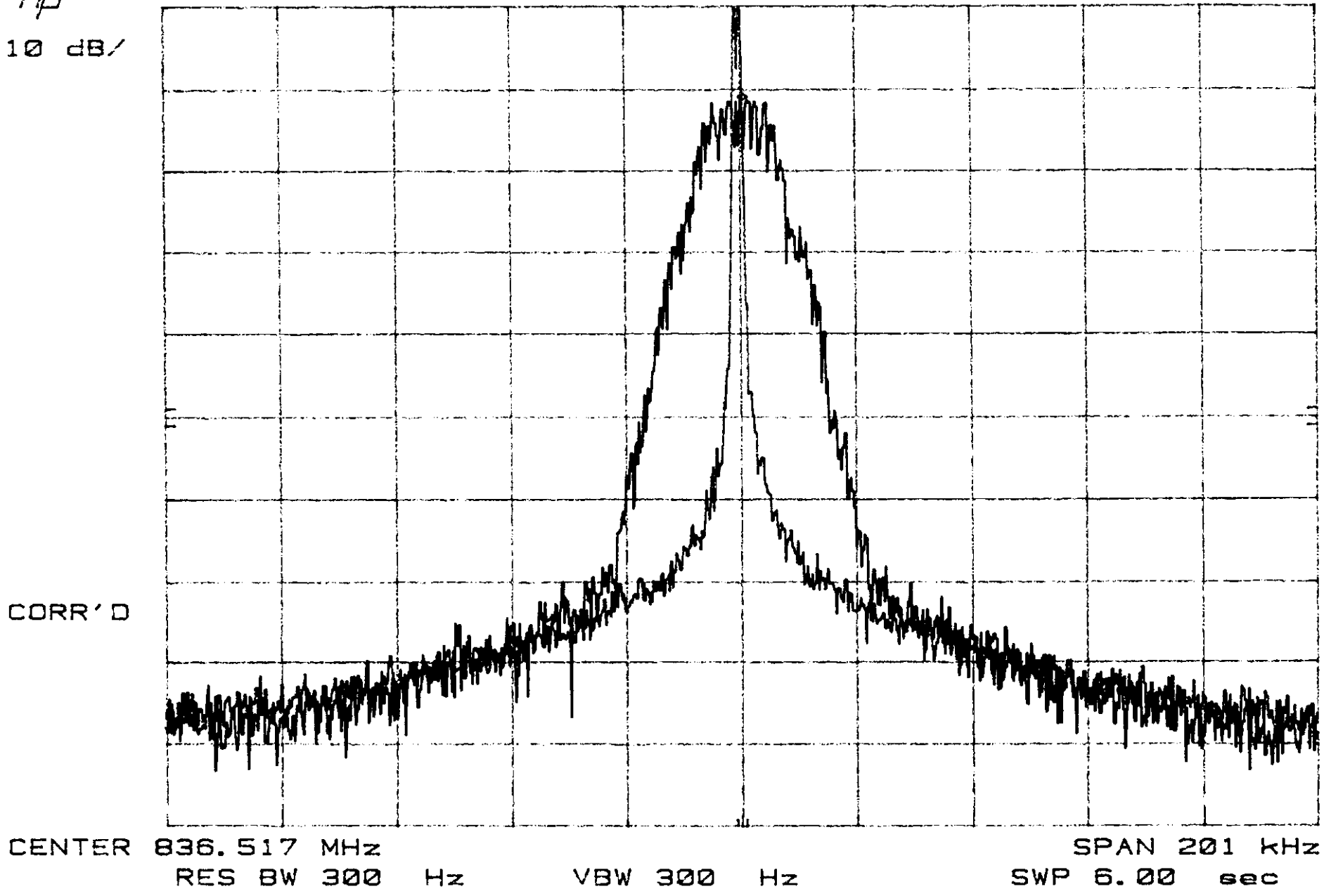
Plot 6.3.k


PHILIPS
hp
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 1 MHz
25.30 dBm
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.517 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

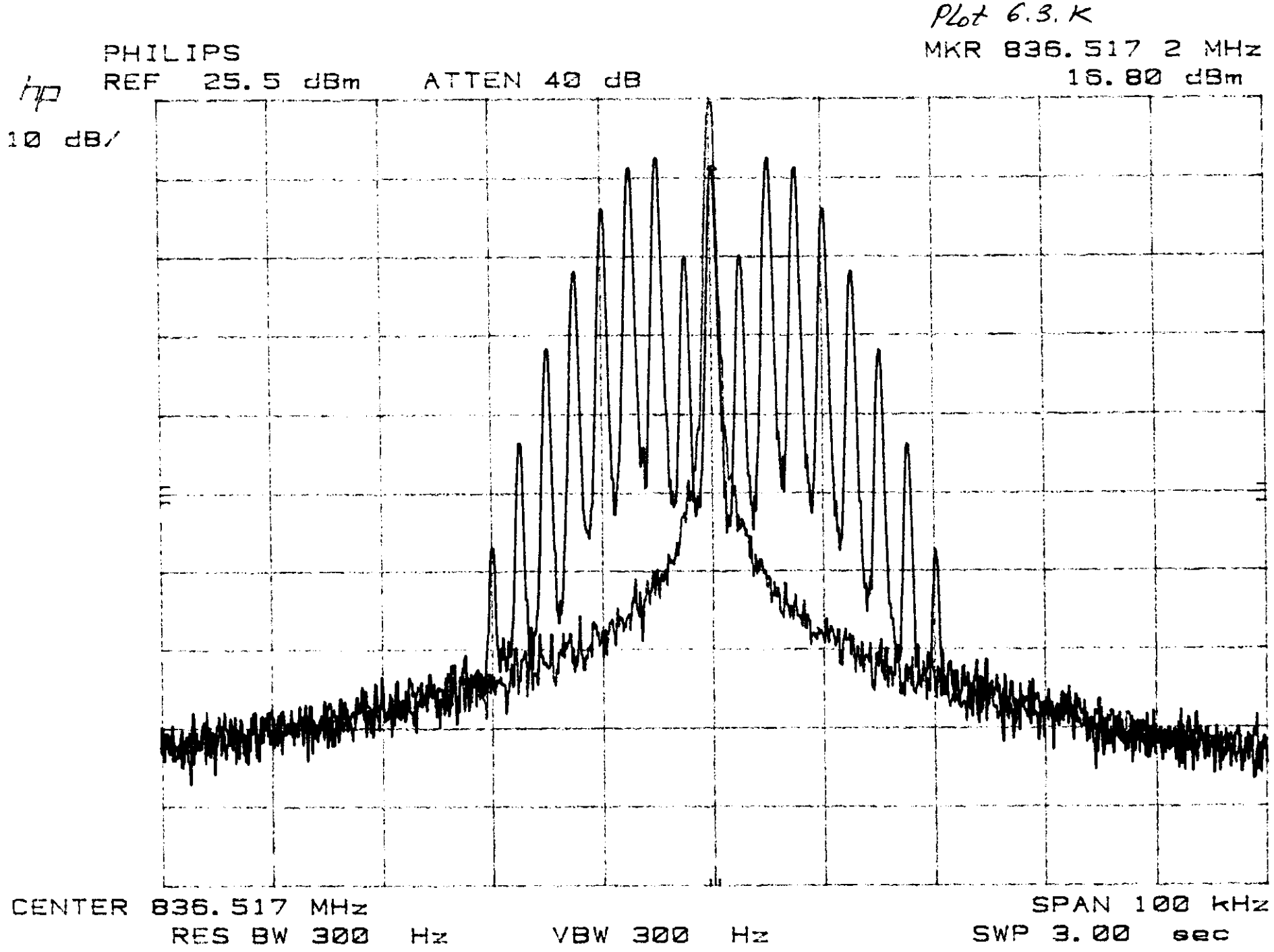
Plot 6.3.j


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 2 MHz
16.80 dBm
10 dB/
CORR'D
CENTER 836.517 MHz
SPAN 201 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 6.00 sec

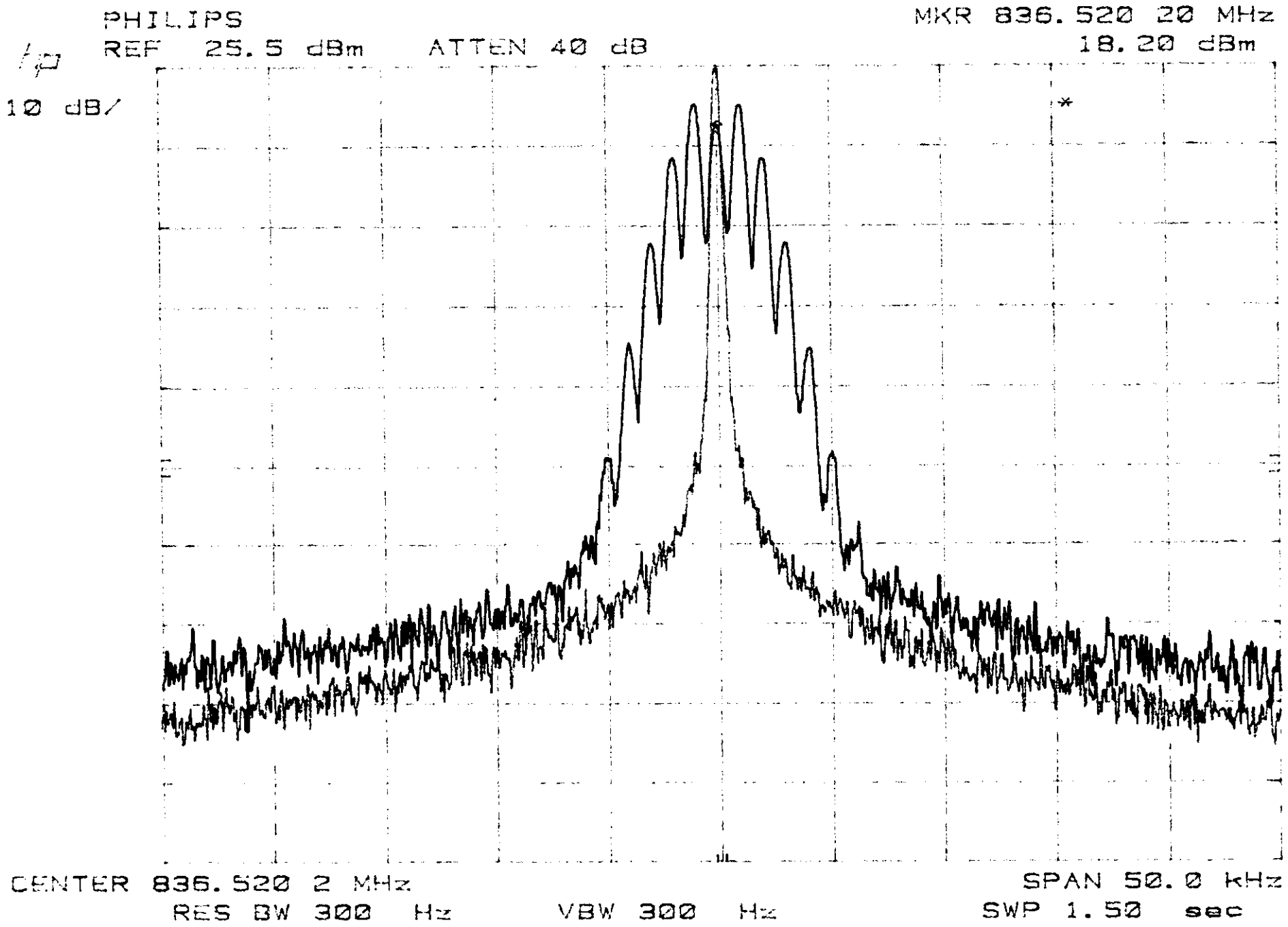
Plot 6.3.i


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 6 MHz
14.60 dBm
10 dB/
CORR'D
CENTER 836.517 MHz
SPAN 201 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 6.00 sec

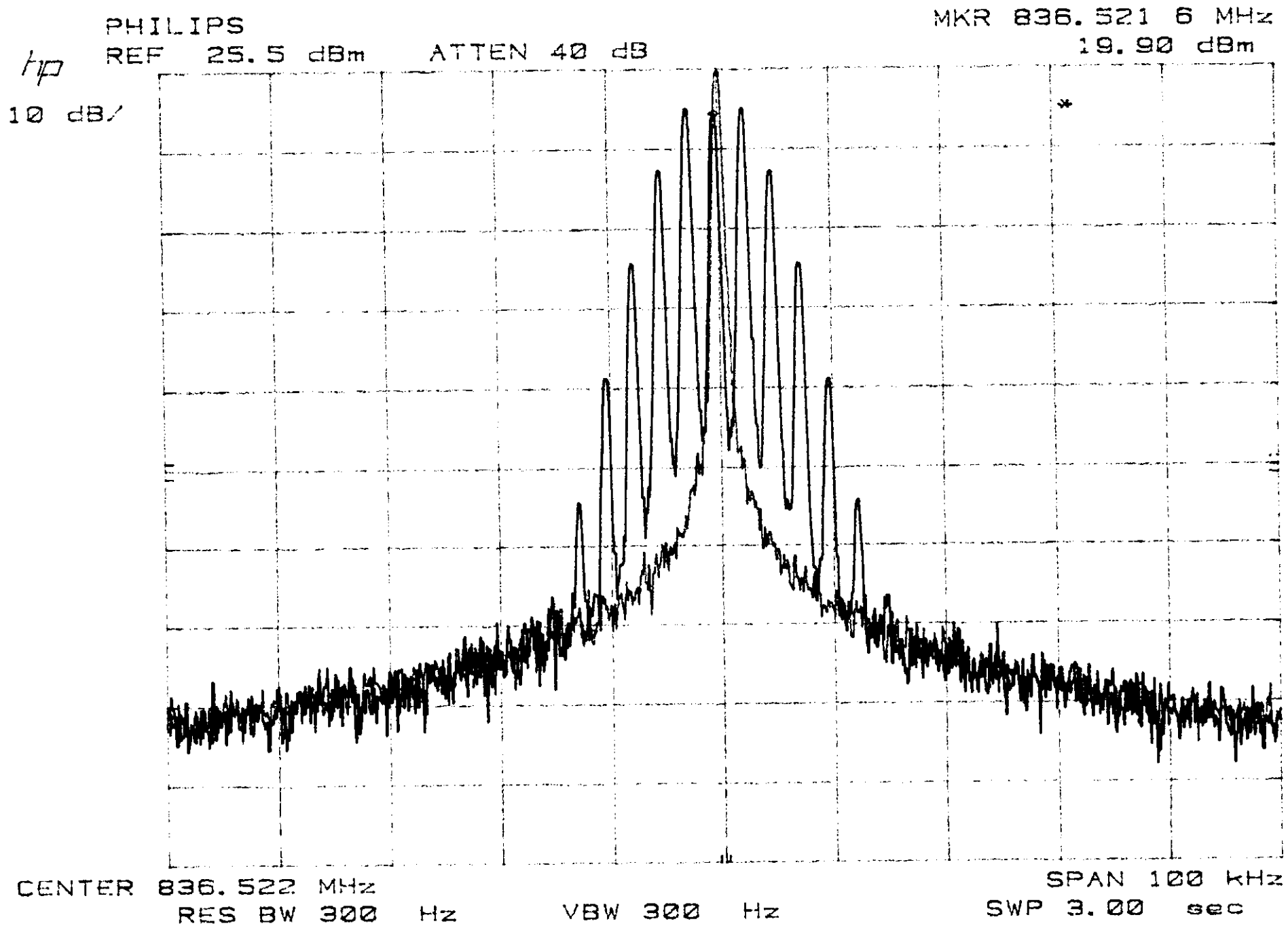
Plot 6.3.K


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 2 MHz
16.80 dBm
10 dB/
CENTER 836.517 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

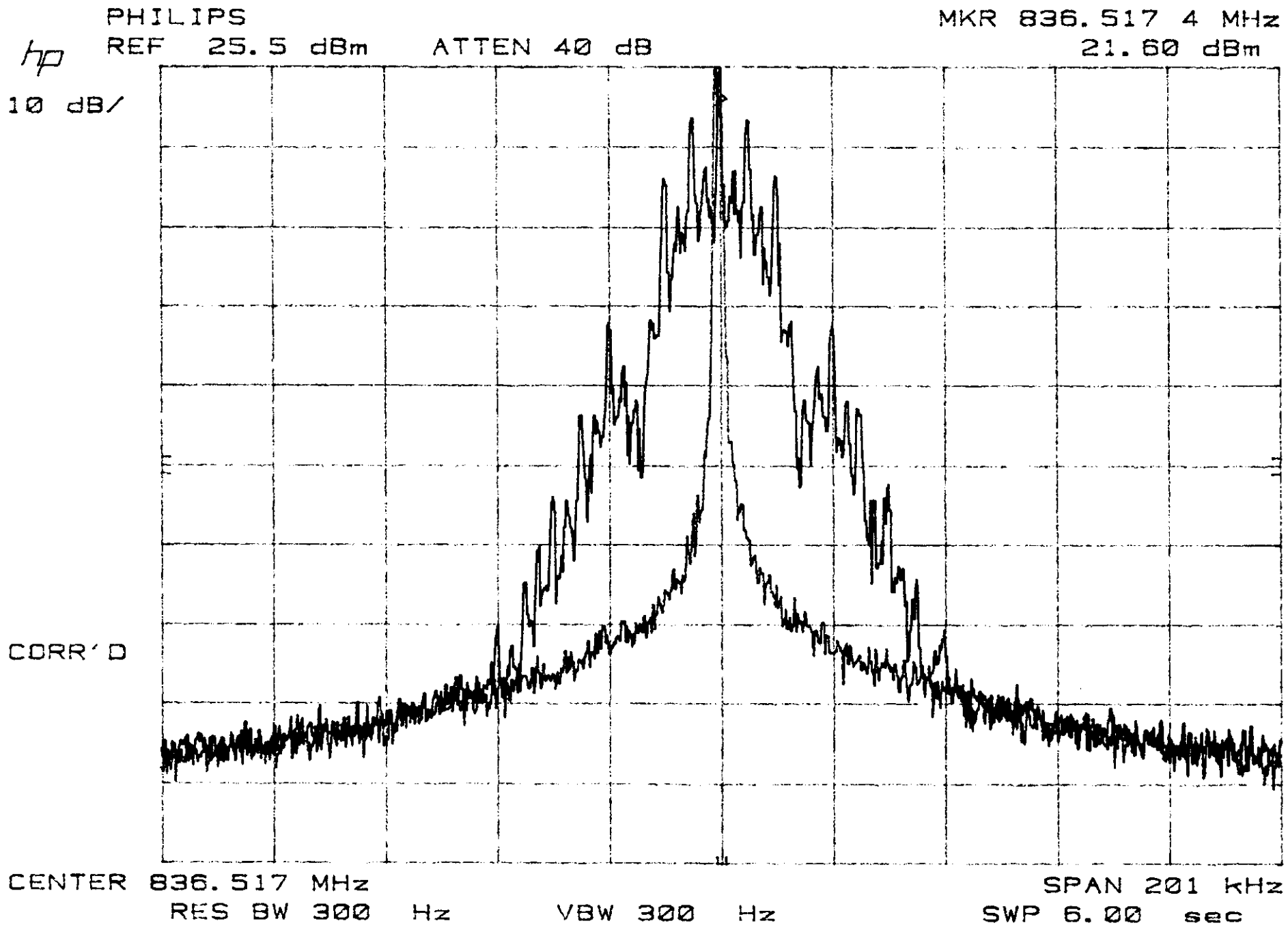
Plot 6.3.1


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.520 20 MHz
18.20 dBm
10 dB/
CENTER 836.520 2 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 50.0 kHz
SWP 1.50 sec

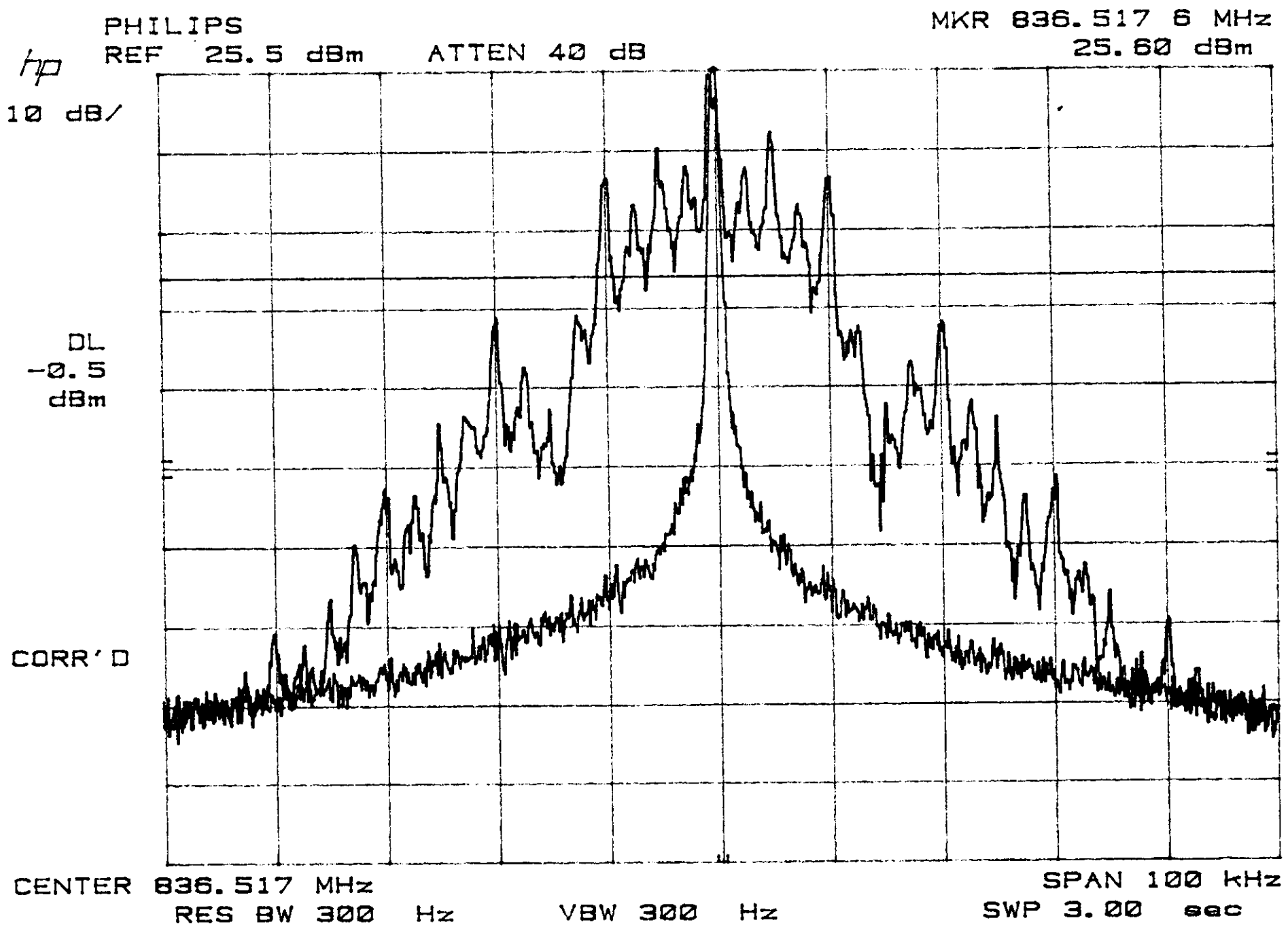
Plot 6.3.m


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.521 6 MHz
19.90 dBm
hp
10 dB/
CENTER 836.522 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

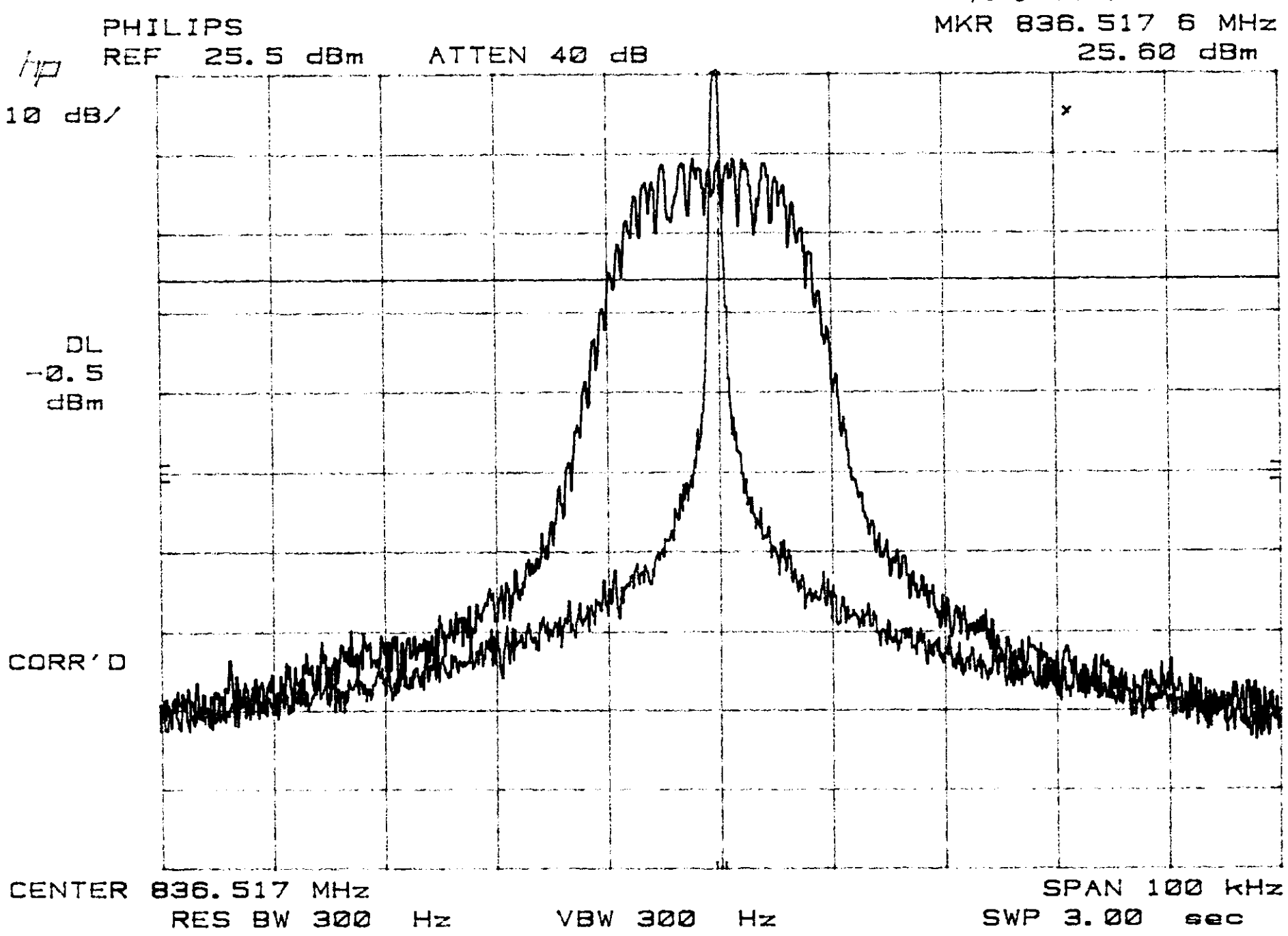
Plot 6.3.b


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 4 MHz
21.60 dBm
10 dB/
CORR'D
CENTER 836.517 MHz
SPAN 201 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 6.00 sec

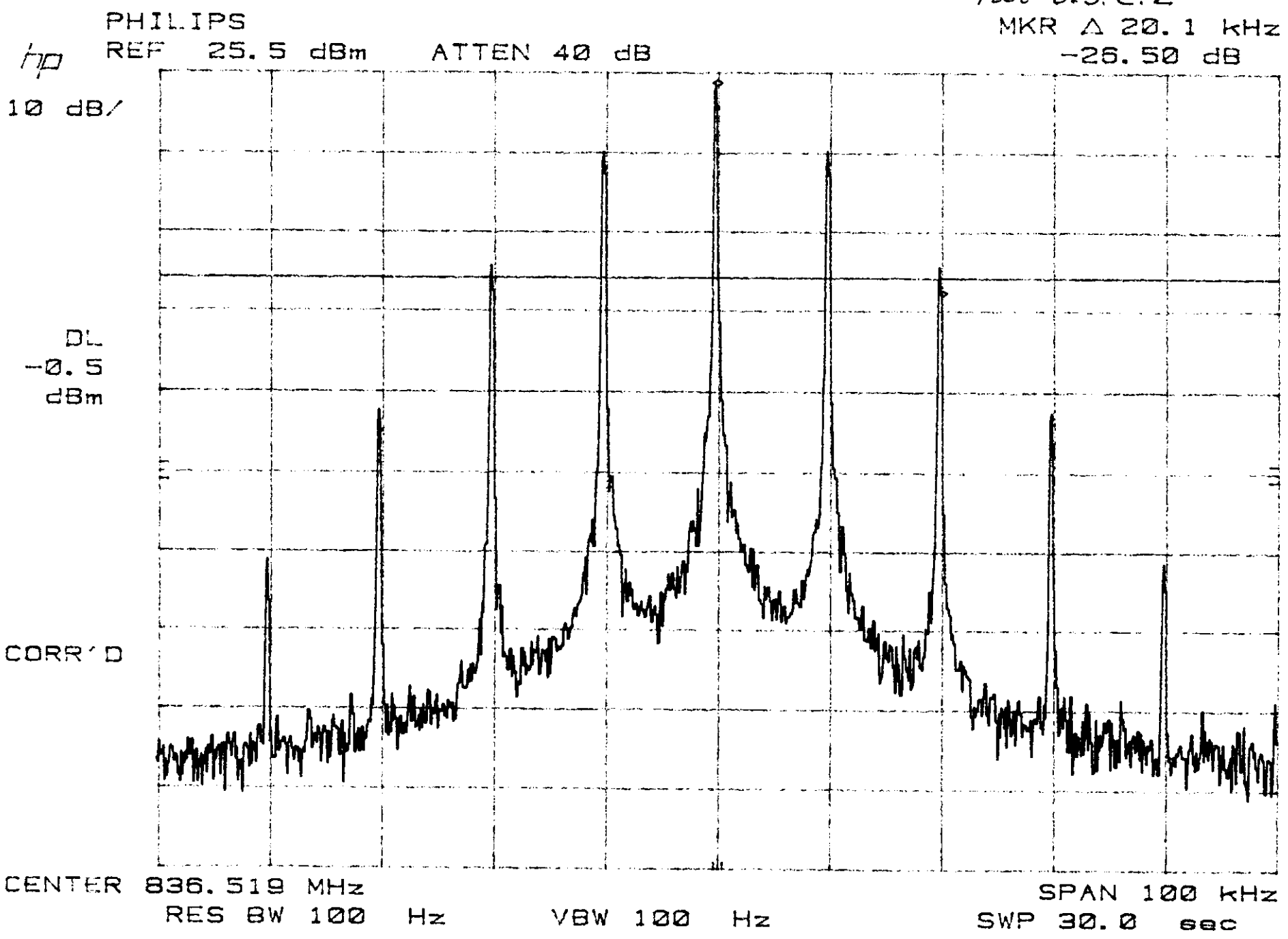
Plot 6.3.a


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 6 MHz
25.60 dBm
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.517 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

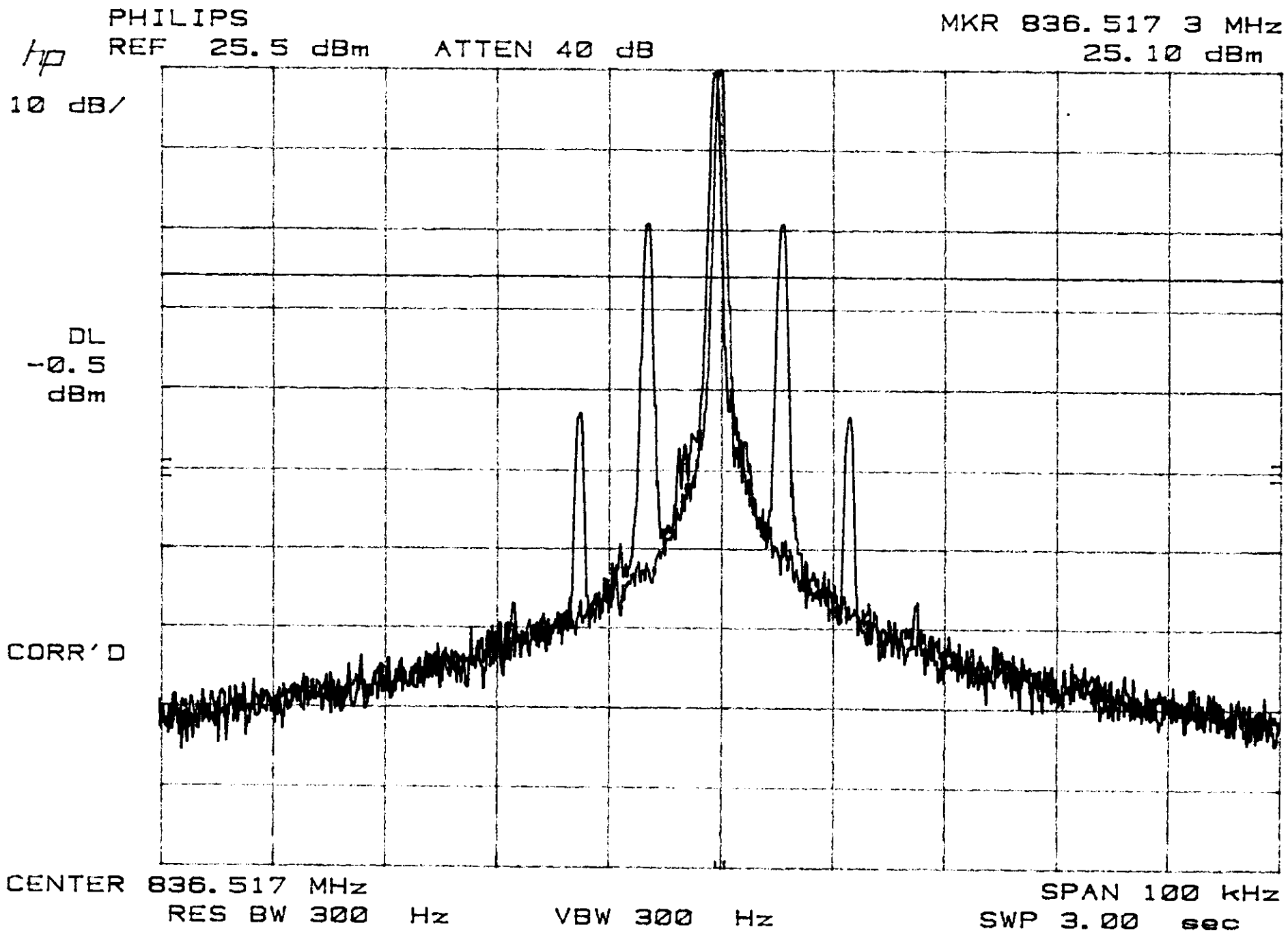
Plot 6.3.c


PHILIPS
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 6 MHz
25.60 dBm
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.517 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

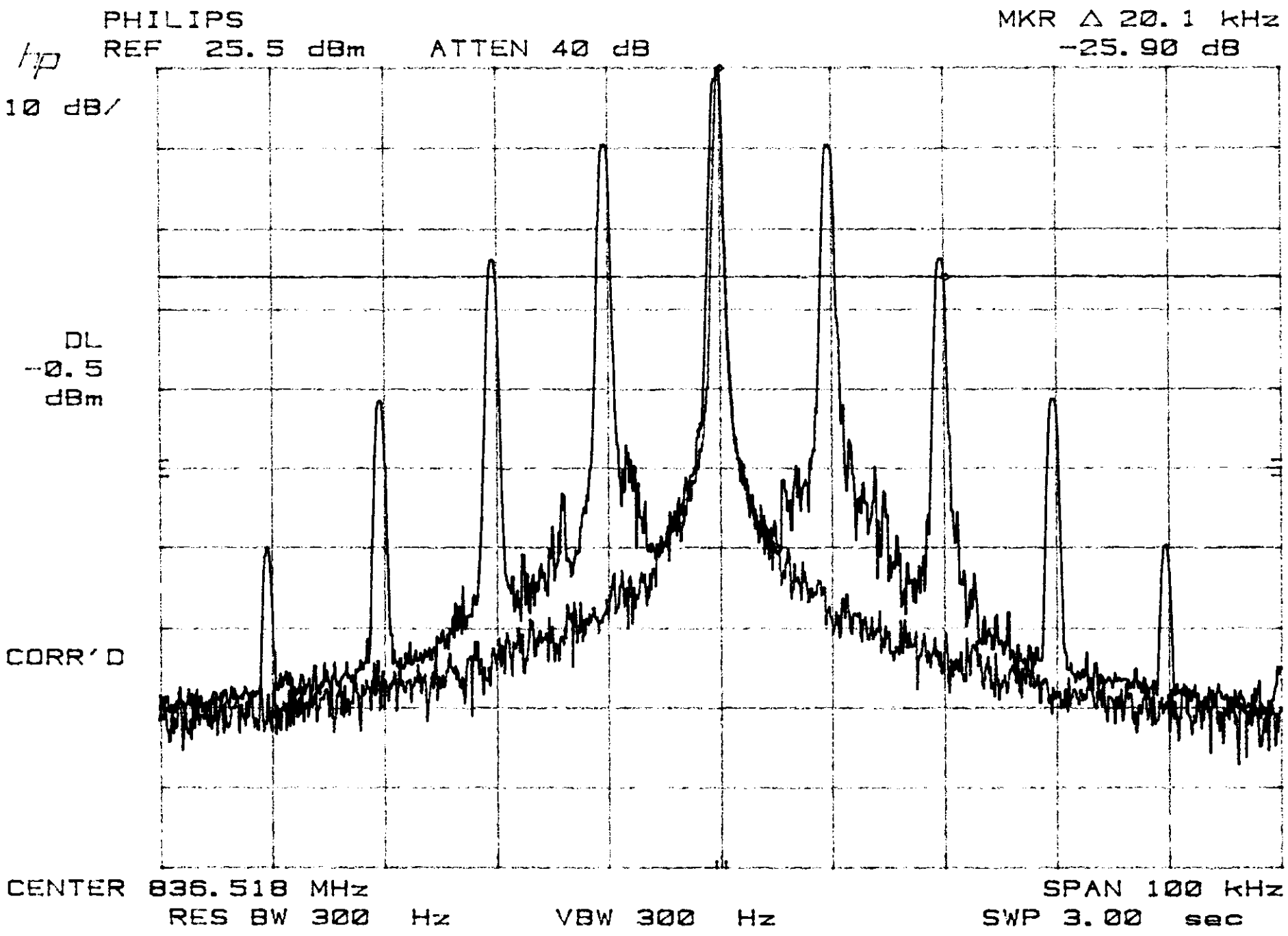
Plot 6.3.e.2


PHILIPS
hp
REF 25.5 dBm
ATTEN 40 dB
MKR Δ 20.1 kHz
-26.50 dB
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.519 MHz
SPAN 100 kHz
RES BW 100 Hz
VBW 100 Hz
SWP 30.0 sec

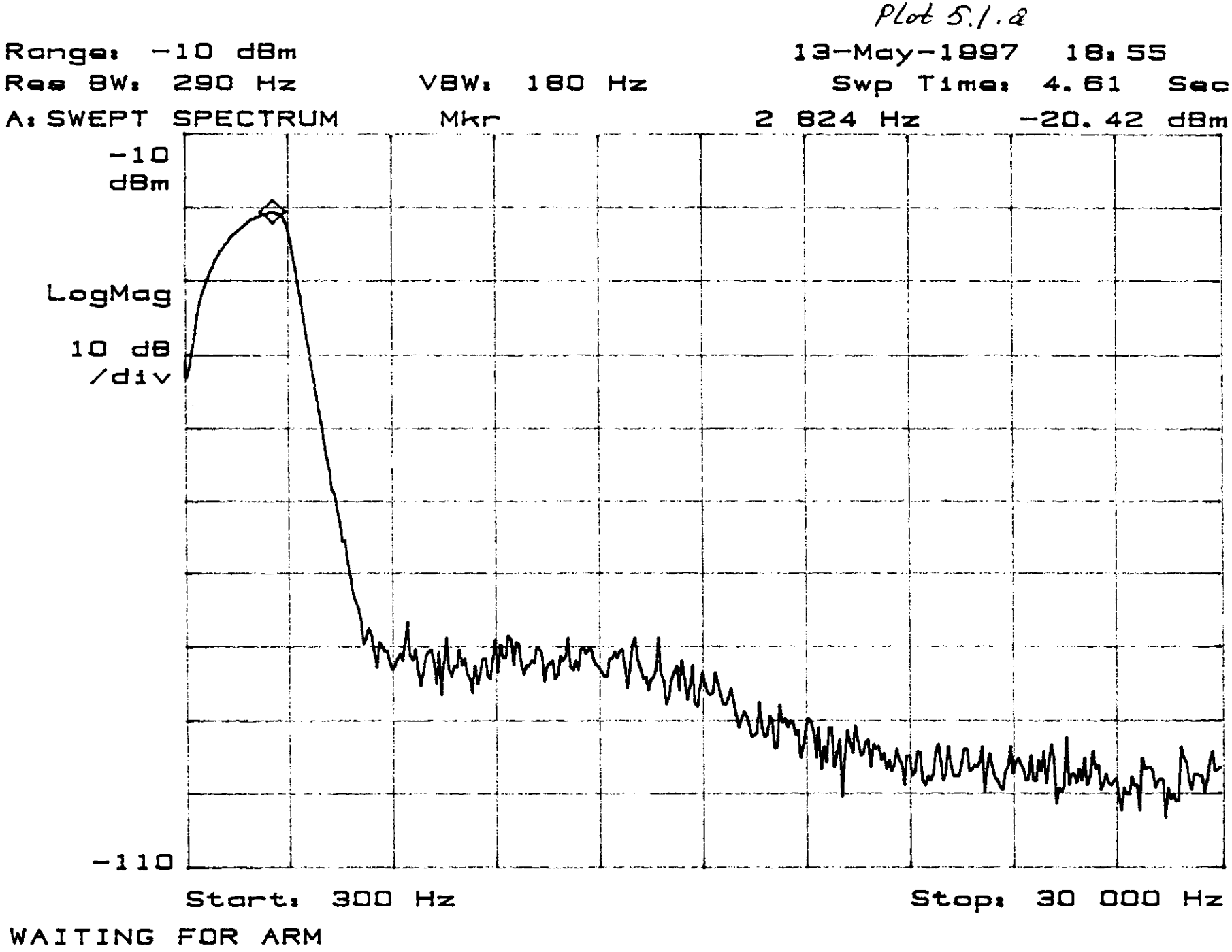
Plot 6.3.d


PHILIPS
hp
REF 25.5 dBm
ATTEN 40 dB
MKR 836.517 3 MHz
25.10 dBm
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.517 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

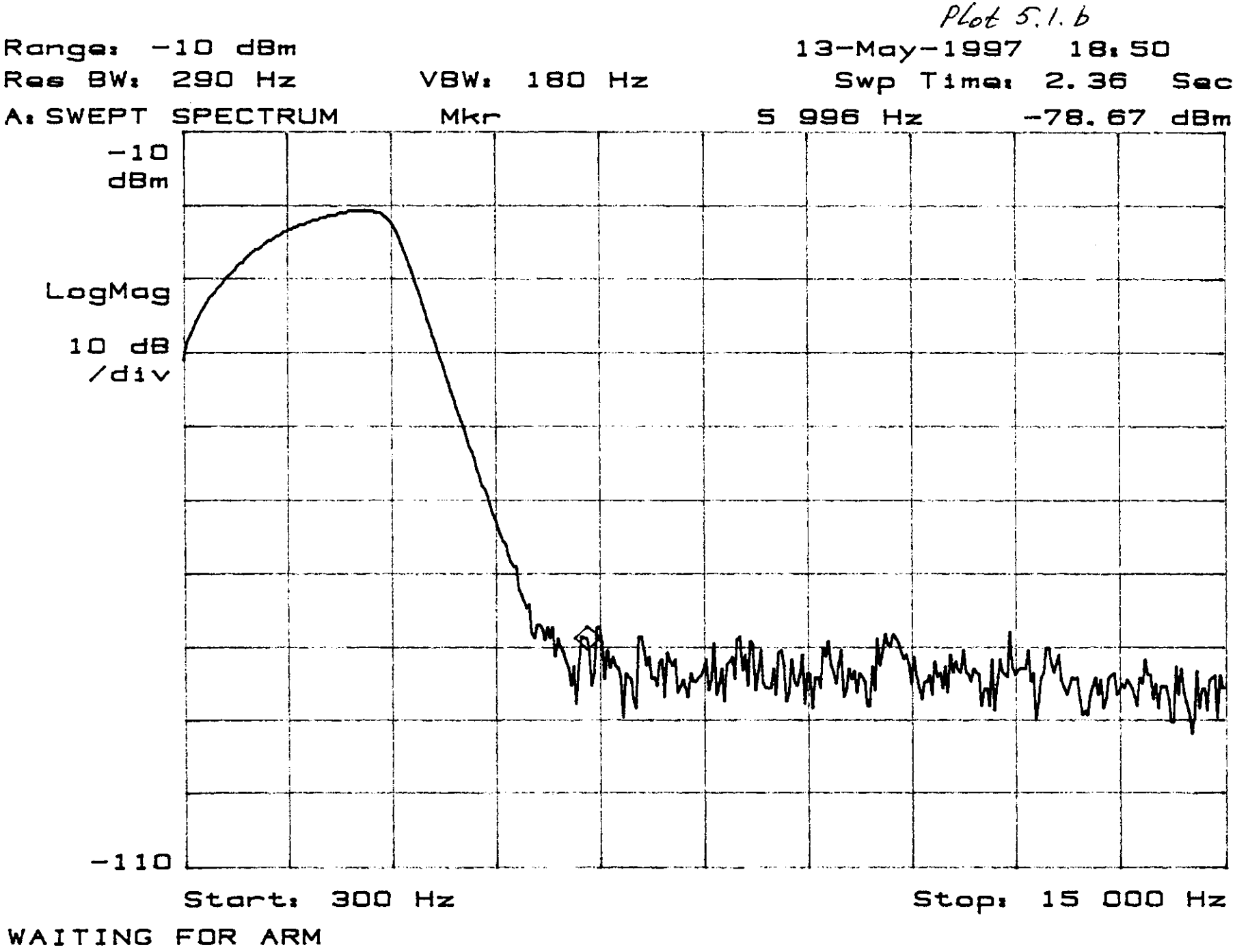
Plot 6.3.e.1


PHILIPS
MKR Δ 20.1 kHz
REF 25.5 dBm
ATTEN 40 dB
-25.90 dB
10 dB/
DL
-0.5
dBm
CORR'D
CENTER 836.518 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 300 Hz
SWP 3.00 sec

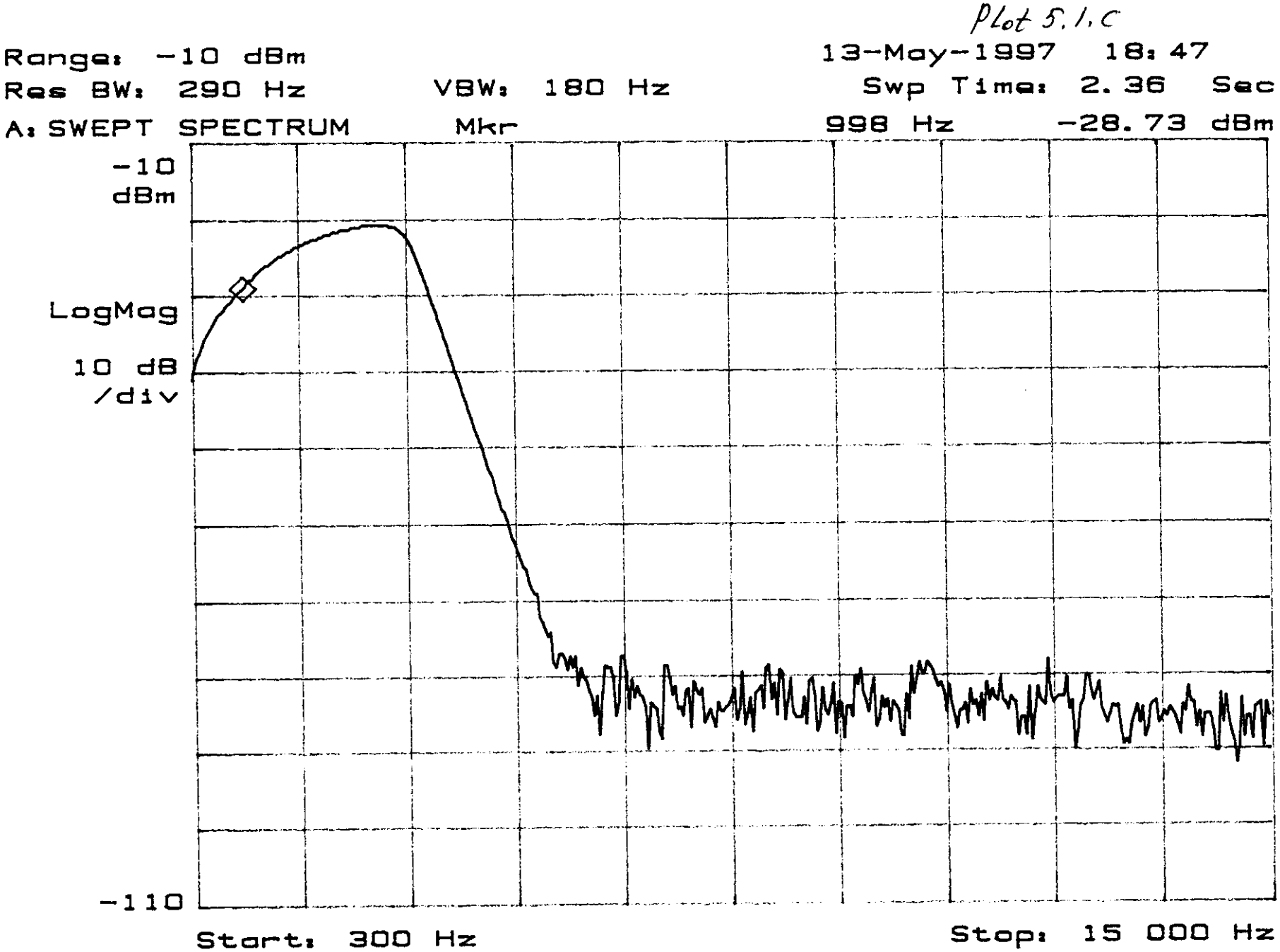
Plot 5.1.a


Range: -10 dBm
13-May-1997 18:55
Res BW: 290 Hz
VBW: 180 Hz
Swp Time: 4.61 Sec
A: SWEPT SPECTRUM
Mkr
2 824 Hz
-20.42 dBm
-10
dBm
LogMag
10 dB
/div
-110
Start: 300 Hz
Stop: 30 000 Hz
WAITING FOR ARM

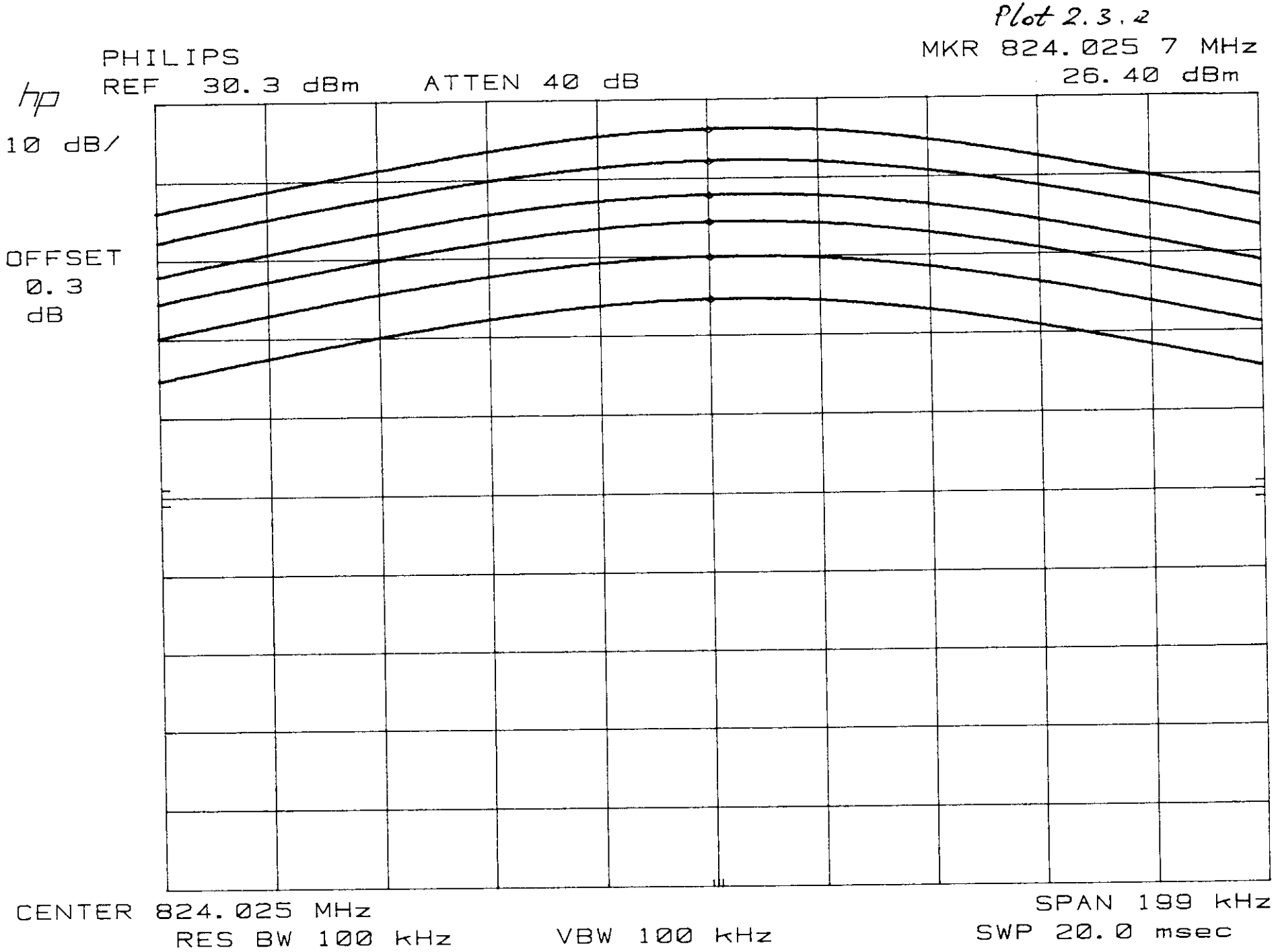
Plot 5.1.b


Range: -10 dBm
13-May-1997 18:50
Res BW: 290 Hz
VBW: 180 Hz
Swp Time: 2.36 Sec
A: SWEPT SPECTRUM
Mkr
5 996 Hz
-78.67 dBm
-10
dBm
LogMag
10 dB
/div
-110
Start: 300 Hz
Stop: 15 000 Hz
WAITING FOR ARM

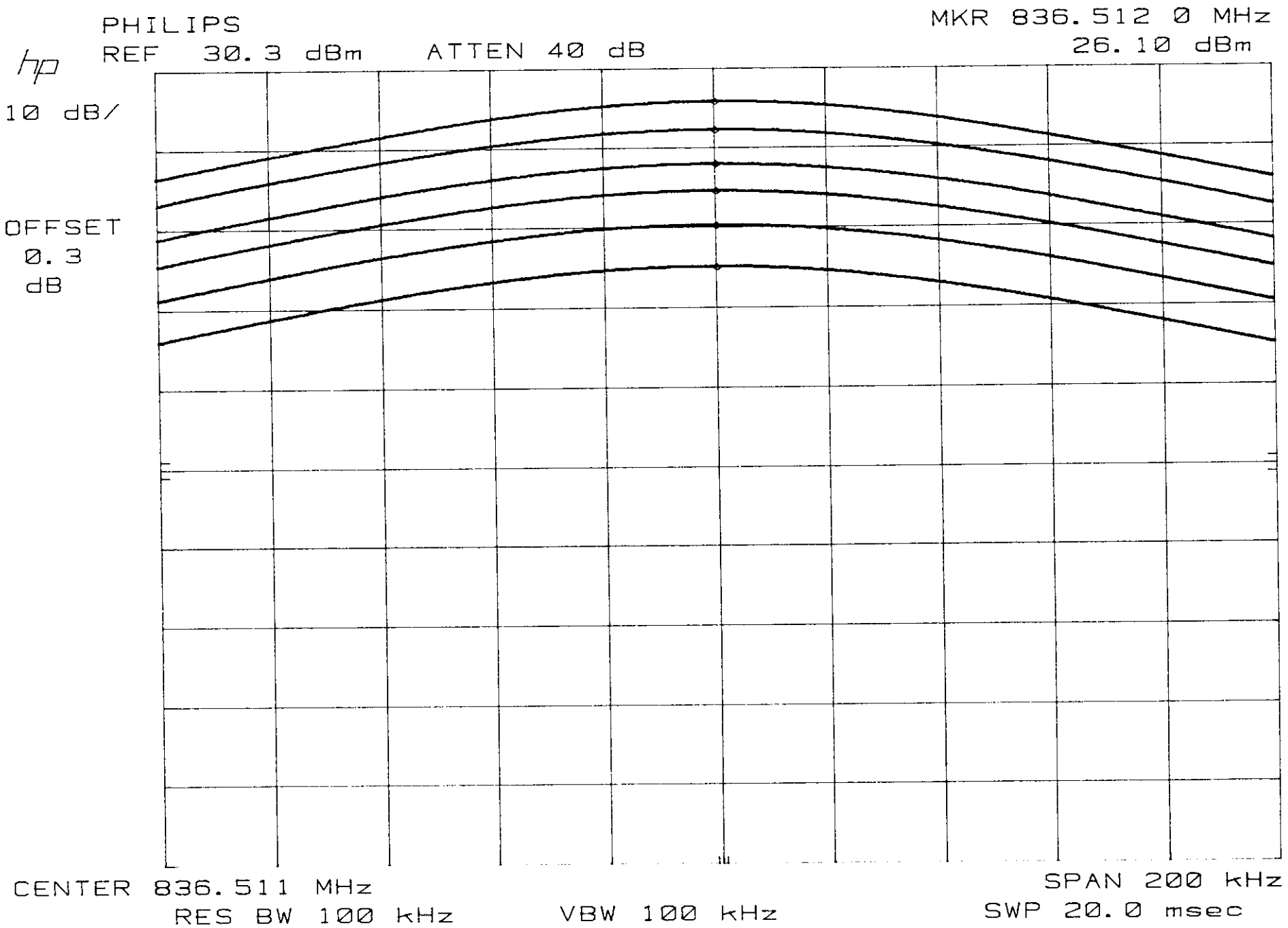
Plot 5.1.C


Range: -10 dBm
13-May-1997 18:47
Res BW: 290 Hz
VBW: 180 Hz
Swp Time: 2.36 Sec
A: SWEPT SPECTRUM
Mkr
998 Hz
-28.73 dBm
-10
dBm
LogMag
10 dB
/div
-110
Start: 300 Hz
Stop: 15 000 Hz
WAITING FOR ARM

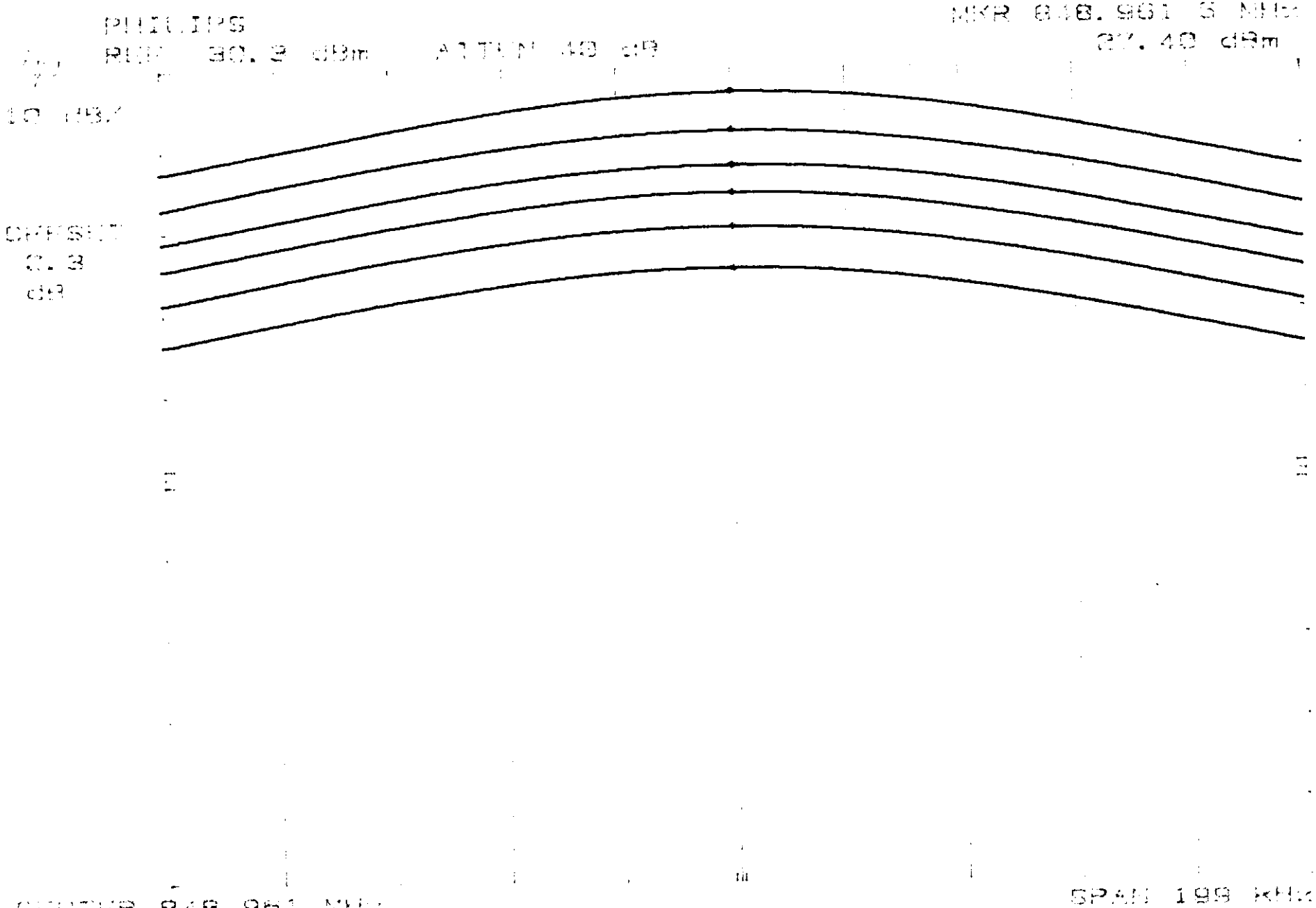
Plot 2.3.2


PHILIPS
REF 30.3 dBm
ATTEN 40 dB
MKR 824.025 7 MHz
26.40 dBm
hp
10 dB/
OFFSET
0.3
dB
CENTER 824.025 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 199 kHz
SWP 20.0 msec

Plot 2.3.b


PHILIPS
REF 30.3 dBm
ATTEN 40 dB
MKR 836.512 0 MHz
26.10 dBm
10 dB/
OFFSET
0.3
dB
CENTER 836.511 MHz
SPAN 200 kHz
RES BW 100 kHz
VBW 100 kHz
SWP 20.0 msec

Plot 2.3.c


PHILIPS
MKR 848.951 5 MHz
8%.40 dBm
10 dB/
OFFSET
2.3
dB
CENTER 848.951 MHz
SPAN 199 kHz
RES BW 100 kHz
VBW 100 kHz
SWP 20.0 msec