

CERTIFICATE OF COMPLIANCE **FCC PARTS 24(E) & 22.901(d) CERTIFICATION**

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Applicant Information:

MODOTTEL CO., LTD.
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Shingil-5Dong, YongDungPo-Ku,
Seoul, Korea

FCC Classification:

Part 24 Licensed Portable Transmitter Held to Ear (PCE)

FCC Rule Part(s):

§24(E), §22.901(d), §2

FCC ID:

POQWPE-2100

Model(s):

WPE-2100

Equipment Type:

Dual-Band PCS/Cellular CDMA Phone

Tx Frequency Range:

1851.25 - 1908.75 MHz (PCS CDMA)

824.70 - 848.31 MHz (Cellular CDMA)

Rx Frequency Range:

1931.25 - 1988.75 MHz (PCS CDMA)

869.70 - 893.31 MHz (Cellular CDMA)

Max. RF Output Power:

0.340 Watts EIRP (PCS CDMA)

0.234 Watts ERP (Cellular CDMA)

Frequency Tolerance(s):

150 Hz (PCS CDMA)

300 Hz (Cellular CDMA)

Emission Designator(s):

1M25F9W

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Research Inc. The results and statements contained in this report pertain only to the device(s) evaluated.



Shawn McMillen
General Manager
Celltech Research Inc.



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MEASUREMENT REPORT - FCC PARTS 24(E) & 22.901(d)

1.1 SCOPE

Measurement and determination of electromagnetic emissions (EME) from radio frequency devices for compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 GENERAL INFORMATION - §2.1033(a)

<u>APPLICANT:</u>	
MODOTTEL CO., LTD. 2F. DongNam Bldg. 448-16 Shingil-5Dong, YongDungPo-Ku, Seoul, Korea	
FCC ID	POQWPE-2100
Model(s)	WPE-2100
EUT Type	Dual-Band PCS/Cellular CDMA Phone
Classification	Part 24 Licensed Portable Transmitter Held to Ear (PCE)
Rule Part(s)	§24(E), §22.901(d), §2
Max. RF Output Power	0.340 Watts EIRP (PCS CDMA) 0.234 Watts ERP (Cellular CDMA)
Tx Freq. Range(s)	1851.25 - 1908.75 MHz (PCS CDMA) 824.70 - 848.31 MHz (Cellular CDMA)
Rx Freq. Range(s)	1931.25 - 1988.75 MHz (PCS CDMA) 869.70 - 893.31 MHz (Cellular CDMA)
Emission Designator(s)	1M25F9W
Modulation(s)	PCS CDMA / Cellular CDMA
Frequency Tolerance(s)	± 150 Hz (PCS) / ± 300 Hz (Cellular)
Battery Type(s)	Standard Life: 3.7V 550mA/h Lithium Ion Extended Life: 3.7V 950mA/h Lithium Ion
Antenna Type	Retractable Whip (1/4λ)

2.1 MEASUREMENT PROCEDURES

2.2 RF OUTPUT POWER MEASUREMENT - 2.1046

The conducted power was measured with a Gigatronics 8650A Universal Power Meter using modulated average power mode. An offset was entered into the power meter to correct for the losses of the attenuator and cable installed before the sensor input. The transmitter terminal was coupled to the power meter and the EUT was placed into test mode via keypad access or a base station simulator at a full data rate in the “always up” power control mode. All subsequent tests were performed using the same tune up procedures.

2.3 OCCUPIED BANDWIDTH EMISSION LIMITS - §2.1049(c), §24.238

The antenna output terminal of the EUT was connected to the input of a 50Ω spectrum analyzer through a matched 30dB attenuator. The radio transmitter was operating at maximum output power. 100% of the in-band modulation was below the specified mask per §22.917 and §24.238.

- (a) On any frequency removed from the assigned carrier frequency by more than 20kHz, up to and including 45kHz, the sideband was at least 26dB below the carrier.
- (b) On any frequency removed from the assigned carrier frequency by more than 45kHz, up to and including 90kHz, the sideband was at least 45dB below the carrier.
- (c) On any frequency removed from the assigned carrier frequency by more than 90kHz, up to the first multiple of the carrier frequency, the sideband was at least 60dB below the carrier of $40 + \log_{10}(\text{mean power output in Watts})$ dB, whichever was the smaller attenuation.

2.4 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

The level of the carrier and the various conducted spurious frequencies were measured by means of a calibrated spectrum analyzer. The spectrum was scanned from 10MHz to 20GHz. The antenna output terminal of the EUT was connected to the input of a 50Ω spectrum analyzer through a matched 30dB attenuator and coaxial cable.

2.5 EMISSION DESIGNATOR - §2.202

Calculation: 2M + 2DK

CDMA BW = 1.25 MHz

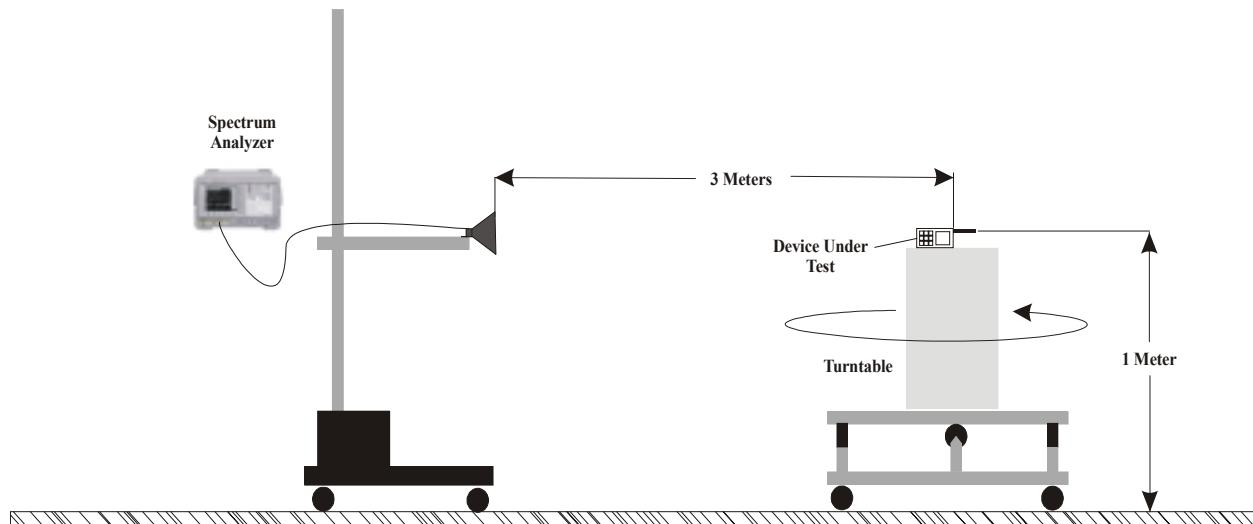
F = Frequency Modulation

9 = Composite Digital Info

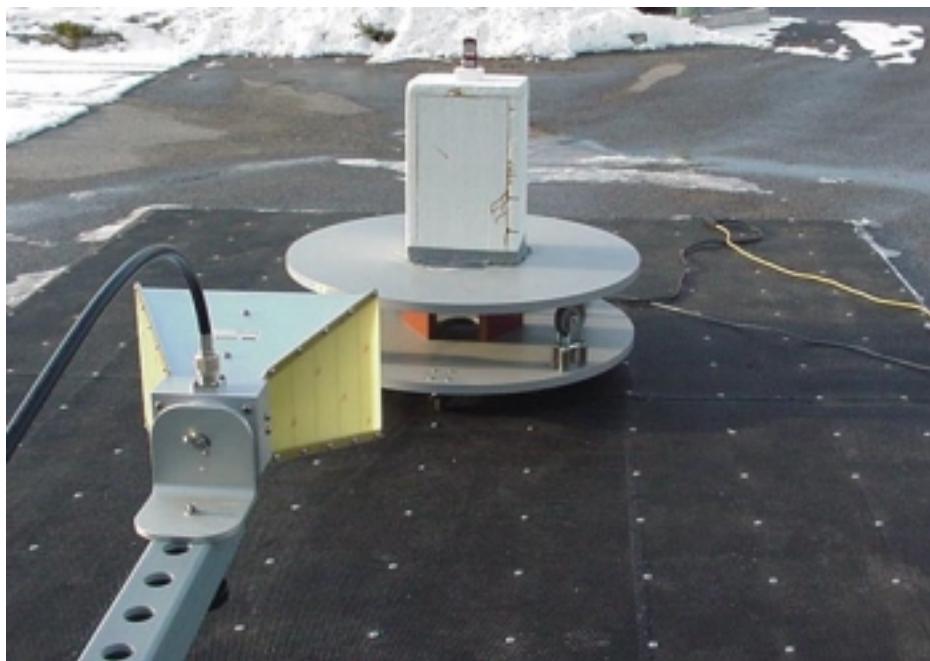
W = Combination (Audio/Data)

2.6 FIELD STRENGTH OF SPURIOUS RADIATION - §2.1053

Radiated and harmonic emissions were measured on a 3-meter outdoor site. The EUT was placed on the turntable with the transmitter transmitting into a non-radiating load. A receiving antenna located 3 meters from the turntable received any signal radiated from the transmitter and its operating accessories. The receiving antenna was varied in height from 1 to 4 meters and the polarization was varied (horizontal and vertical) to determine the worst-case emission level.



Radiated Measurement Test Setup Diagram



Radiated Measurement Test Setup Photograph

2.7 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055, §24.235

The minimum frequency stability shall be ± 300 Hz (Cellular CDMA) and ± 150 Hz (PCS CDMA) referenced to a received carrier frequency from a base station. This meets the requirement for operational accuracy of 0.00005% for digital mode. A base station simulator was used in order to measure the error in the frequency.

Measurement Method:

The frequency stability of the transmitter was measured by:

1. Temperature:

The temperature was varied from -30°C to +60°C at intervals no more than 10°C throughout the temperature range using an environmental chamber. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement.

2. Primary Supply Voltage:

The primary supply voltage was set at the specified nominal rating and reduced to the battery operating endpoint specified by the manufacturer. When the battery voltage reaches the operating endpoint the device turns off. The voltage was measured at the terminals of the power supply or at the input to the cable normally provided with the equipment.

Time Period and Procedure:

1. The carrier frequency of the transmitter was measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment was subjected to an overnight “soak” at -30°C without any power applied.
3. After the overnight “soak” at -30°C, the measurement of the carrier frequency of the transmitter was made within a three-minute interval after applying power to the transmitter.

Frequency measurements were made at 10°C intervals up to +60°C, then back to room temperature. A minimum period of one hour was provided to allow stabilization of the equipment at each temperature level.

3.1 TEST DATA

3.2 EFFECTIVE ISOTROPIC RADIATED POWER OUTPUT - §24.232(b)

PCS CDMA MODE (1900MHz)

Freq. Tuned	EUT Conducted Power	Max. Field Strength of EUT (dBm) (Horizontal Polarization)		Horn Gain	Horn Forward Conducted Power	EIRP of EUT Horn Gain + Horn Forward Conducted Power	
(MHz)	(dBm)	Antenna Retracted	Antenna Extended	(dBi)	(dBm)	(dBm)	Watts
1851.25	24.5	- 16.62	- 13.20	6.67	17.60	24.27	0.267
1880.00	24.5	- 16.50	- 13.08	6.68	18.23	24.91	0.310
1908.75	24.5	- 16.55	- 13.13	6.69	18.63	25.32	0.340
1908.75	24.5	- 16.53	- 13.11	6.69	18.51	25.20	0.331*

Notes:

1. EIRP Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A horn antenna was substituted in place of the EUT. A CDMA signal with the same bandwidth as the EUT was generated, amplified, and fed through a directional coupler. The height and direction of the horn antenna was adjusted in order to give the field of maximum intensity. The power to the antenna was adjusted in order to give the same field strength reading as previously recorded for the EUT. The power at the coupler port was recorded at this point. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

2. EIRP measurements were performed for both horizontal and vertical antenna polarizations. The worst-case configuration is reported.

3. EIRP measurements were performed with both standard and *extended life batteries.

3.3 EFFECTIVE RADIATED POWER OUTPUT - §2.1046

CELLULAR CDMA MODE (800MHz)

Freq. Tuned (MHz)	EUT Conducted Power (dBm)	Max. Field Strength of EUT (dBm) (Horizontal Polarization)		Dipole Gain (dBd)	Dipole Forward Conducted Power (dBm)	ERP of EUT Dipole Gain + Dipole Forward Conducted Power (dBm) Watts	
		Antenna Retracted	Antenna Extended			(dBm)	Watts
824.70	24.5	- 14.77	- 11.35	- 1.44	24.65	23.21	0.209
835.89	24.5	- 15.14	- 11.72	- 1.34	24.89	23.55	0.226
848.31	24.5	- 14.52	- 11.10	- 1.24	24.93	23.69	0.234
848.31	24.5	- 14.52	- 11.10	- 1.24	24.86	23.62	0.230*

Notes:

1. ERP Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A half-wave dipole was substituted in place of the EUT. A CDMA signal with the same bandwidth as the EUT was generated, amplified, and fed through a directional coupler. The height and direction of the dipole was adjusted in order to give the field of maximum intensity. The power to the dipole was adjusted in order to give the same field strength reading as previously recorded for the EUT. The power at the coupler port was recorded at this point. The feed point for the dipole was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the dipole antenna. The conducted power at the antenna feed point was recorded. The ERP level was determined by adding the dipole forward conducted power and the dipole gain in dB. For readings above 1GHz the above method is repeated using standard gain horn antennas.

2. ERP measurements were performed for both horizontal and vertical antenna polarizations. The worst-case configuration is reported.

3. ERP measurements were performed with both standard and *extended life batteries.

3.4 FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (PCS CDMA)

Operating Frequency (MHz): 1851.25
 Channel: 25 (Low)
Measured Cond. Pwr. (dBm): 24.50
Measured EIRP (dBm): 24.27
Modulation: PCS CDMA
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 37.3 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
3702.50	-89.43	-56.74	6.6	H	-50.14	-52.28	76.55
5553.75	-91.54	-53.33	7.8	H	-45.53	-47.67	71.94
7405.00	-93.48	-59.40	7.75	H	-51.65	-53.79	78.06
9256.25	-95.57	-61.55	7.6	H	-53.95	-56.09	80.36
11107.50	-97.08	-63.92	8.5	H	-55.42	-57.56	81.83
12958.75	-99.19	-66.31	8.8	H	-57.51	-59.65	83.92
14810.00	-100.77	-69.49	9.6	H	-59.89	-62.03	86.30
16661.25	-101.21	-69.08	9.0	H	-60.08	-62.22	86.49
18512.50	-102.14	-68.93	9.3	H	-59.63	-61.77	86.04

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (PCS CDMA)

Operating Frequency (MHz): 1880.00
 Channel: 600 (Mid)
 Measured Cond. Pwr. (dBm): 24.50
 Measured EIRP (dBm): 24.91
 Modulation: PCS CDMA
 Distance: 3 Meters
 Limit: $43 + 10 \log (W) = 37.9 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
3760.00	-86.36	-54.27	6.6	H	-47.67	-49.81	74.72
5640.00	-88.21	-55.33	7.8	H	-47.53	-49.67	74.58
7520.00	-90.67	-57.99	7.75	H	-50.24	-52.38	77.29
9400.00	-92.06	-60.14	7.6	H	-52.54	-54.68	79.59
11280.00	-93.98	-62.12	8.5	H	-53.62	-55.76	80.67
13160.00	-96.67	-64.79	8.8	H	-55.99	-58.13	83.04
15040.00	-99.14	-67.76	9.6	H	-58.16	-60.30	85.21
16920.00	-100.86	-69.93	9.0	H	-60.93	-63.07	87.98
18800.00	-101.52	-70.61	9.3	H	-61.31	-63.45	88.36

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (PCS CDMA)

Operating Frequency (MHz): 1908.75
 Channel: 1175 (High)
 Measured Cond. Pwr. (dBm): 24.50
 Measured EIRP (dBm): 25.32
 Modulation: PCS CDMA
 Distance: 3 Meters
 Limit: $43 + 10 \log (W) = 38.3 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
3817.50	-85.89	-55.40	6.6	H	-48.80	-50.94	76.26
5726.25	-87.42	-52.72	7.8	H	-44.92	-47.06	72.38
7635.00	-89.28	-54.40	7.75	H	-46.65	-48.79	74.11
9543.75	-92.33	-55.31	7.6	H	-47.71	-49.85	75.17
11452.50	-95.50	-59.64	8.5	H	-51.14	-53.28	78.60
13361.25	-97.15	-60.17	8.8	H	-51.37	-53.51	78.83
15270.00	-99.69	-63.21	9.6	H	-53.61	-55.75	81.07
17178.75	-100.98	-65.00	9.0	H	-56.00	-58.14	83.46
19087.50	-101.74	-64.53	9.3	H	-55.23	-57.37	82.69

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (800MHz CDMA)

Operating Frequency (MHz): 824.70
Channel: 1013 (Low)
Measured Cond. Pwr. (dBm): 24.50
Measured ERP (dBm): 23.21
Modulation: CDMA
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 36.2 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
1649.40	-91.45	-66.56	6.6	H	-59.96	-62.10	85.31
2474.10	-92.84	-64.04	7.8	H	-56.24	-58.38	81.59
3298.80	-94.15	-66.57	7.75	H	-58.82	-60.96	84.17
4123.50	-96.67	-69.65	7.6	H	-62.05	-64.19	87.40
4948.20	-98.53	-71.17	8.5	H	-62.67	-64.81	88.02
5772.90	-99.45	-70.57	8.8	H	-61.77	-63.91	87.12
6597.60	-100.32	-71.44	9.6	H	-61.84	-63.98	87.19
7422.30	-101.22	-73.69	9.0	H	-64.69	-66.83	90.04
8247.00	-102.58	-77.37	9.3	H	-68.07	-70.21	93.42

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (800MHz CDMA)

Operating Frequency (MHz): 835.89
 Channel: 363 (Mid)
 Measured Cond. Pwr. (dBm): 24.50
 Measured ERP (dBm): 23.55
 Modulation: CDMA
 Distance: 3 Meters
 Limit: $43 + 10 \log (W) = 36.5 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
1671.78	-90.36	-67.97	6.6	H	-61.37	-63.51	87.06
2507.67	-91.75	-62.45	7.8	H	-54.65	-56.79	80.34
3343.56	-93.07	-66.79	7.75	H	-59.04	-61.18	84.73
4179.45	-94.82	-66.93	7.6	H	-59.33	-61.47	85.02
5015.34	-96.56	-70.60	8.5	H	-62.10	-64.24	87.79
5851.23	-98.18	-71.05	8.8	H	-62.25	-64.39	87.94
6687.12	-99.33	-72.25	9.6	H	-62.65	-64.79	88.34
7523.01	-100.62	-75.19	9.0	H	-66.19	-68.33	91.88
8358.90	-101.95	-76.24	9.3	H	-66.94	-69.08	92.63

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

FIELD STRENGTH OF SPURIOUS RADIATION - § 2.1053 (800MHz CDMA)

Operating Frequency (MHz): 848.31
Channel: 777 (High)
Measured Cond. Pwr. (dBm): 24.50
Measured ERP (dBm): 23.69
Modulation: CDMA
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 36.7 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	ERP (dBm)	dBc
1696.62	-91.51	-69.62	6.6	H	-63.02	-65.16	88.85
2544.93	-93.22	-64.42	7.8	H	-56.62	-58.76	82.45
3393.24	-94.63	-69.05	7.75	H	-61.30	-63.44	87.13
4241.55	-95.55	-68.53	7.6	H	-60.93	-63.07	86.76
5089.86	-97.43	-72.07	8.5	H	-63.57	-65.71	89.40
5938.17	-98.61	-71.73	8.8	H	-62.93	-65.07	88.76
6786.48	-99.76	-72.88	9.6	H	-63.28	-65.42	89.11
7634.79	-101.04	-76.51	9.0	H	-67.51	-69.65	93.34
8483.10	-102.28	-77.07	9.3	H	-67.77	-69.91	93.60

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The video bandwidth and resolution bandwidth were set to 3MHz. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the horn forward conducted power and the horn antenna gain in dB.

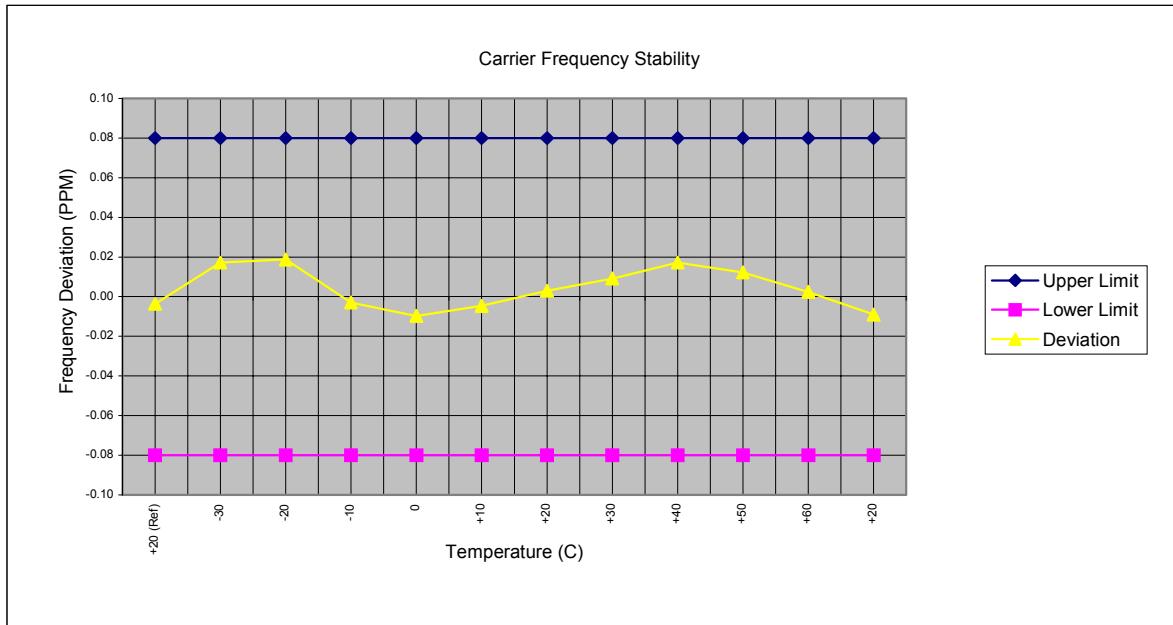
Notes:

1. All other spurious emissions were found to be below the magnitude of each harmonic.
2. Spurious emissions more than 20 dB below the limit are reported, though not required per §2.1051.
3. Radiated spurious measurements were performed with both standard and extended life batteries. The worst-case configuration is reported (standard life battery).

3.5 FREQUENCY STABILITY - § 24.235 (PCS CDMA)

Carrier Frequency (GHz): 1.88
Channel: 600
Mode: PCS CDMA
Deviation Limit (PPM): 0.08

Temperature (C)	Voltage (%)	Power (VDC)	Carrier Frequency Deviation		Specification	
			(Hz)	(PPM)	Lower Limit (PPM)	Upper Limit (PPM)
+20 (Ref)	100	3.7	-6.77	-0.004	0.08	-0.08
-30	100	3.7	32.32	0.017	0.08	-0.08
-20	100	3.7	35.19	0.019	0.08	-0.08
-10	100	3.7	-5.63	-0.003	0.08	-0.08
0	100	3.7	-18.28	-0.010	0.08	-0.08
+10	100	3.7	-8.75	-0.005	0.08	-0.08
+20	100	3.7	5.50	0.003	0.08	-0.08
+30	100	3.7	17.11	0.009	0.08	-0.08
+40	100	3.7	32.42	0.017	0.08	-0.08
+50	100	3.7	23.04	0.012	0.08	-0.08
+60	100	3.7	4.47	0.002	0.08	-0.08
+20	Battery Endpoint	3.3	-16.86	-0.009	0.08	-0.08



FREQUENCY STABILITY - § 2.1055 (800MHz CDMA)

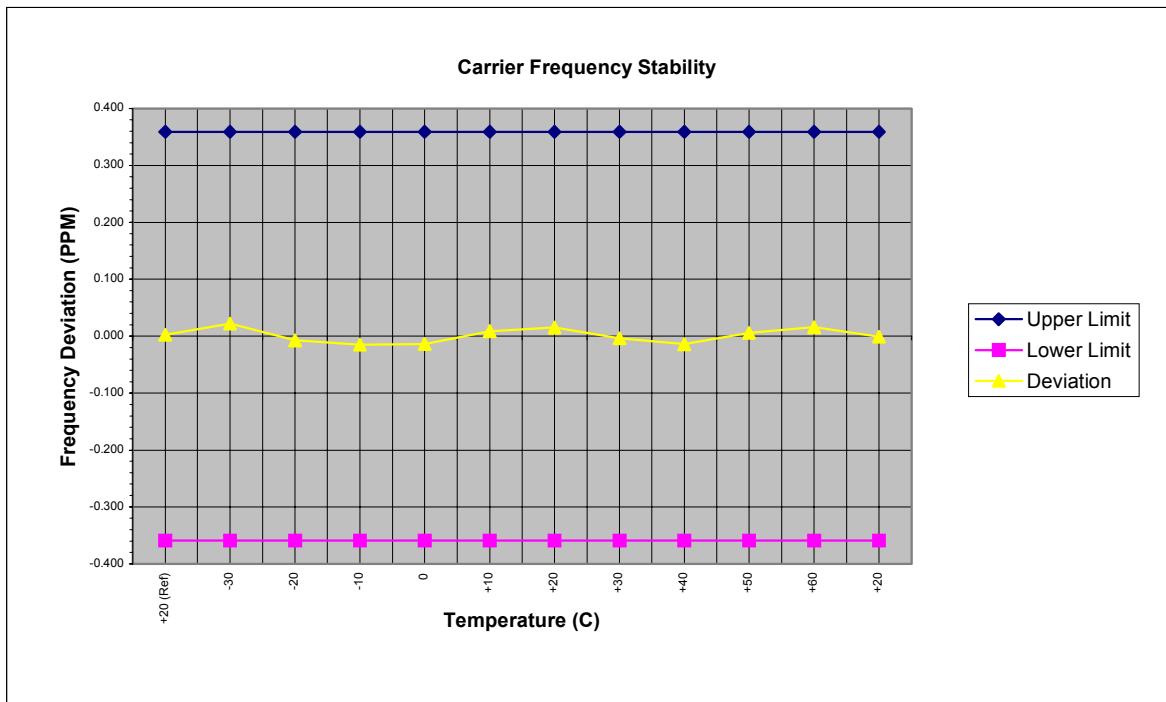
Carrier Frequency (MHz): 835.89

Channel: 363

Mode: CDMA

Deviation Limit (PPM): 0.359

Temperature (C)	Voltage (%)	Power (VDC)	Carrier Frequency Deviation		Specification	
			(Hz)	(PPM)	Lower Limit (PPM)	Upper Limit (PPM)
+20 (Ref)	100	3.7	1.87	0.002	0.359	-0.359
-30	100	3.7	18.45	0.022	0.359	-0.359
-20	100	3.7	-6.06	-0.007	0.359	-0.359
-10	100	3.7	-12.58	-0.015	0.359	-0.359
0	100	3.7	-11.32	-0.014	0.359	-0.359
+10	100	3.7	7.27	0.009	0.359	-0.359
+20	100	3.7	12.62	0.015	0.359	-0.359
+30	100	3.7	-3.33	-0.004	0.359	-0.359
+40	100	3.7	-11.98	-0.014	0.359	-0.359
+50	100	3.7	4.76	0.006	0.359	-0.359
+60	100	3.7	13.07	0.016	0.359	-0.359
+20	Battery Endpoint	3.3	-0.83	-0.001	0.359	-0.359



4.1 TEST EQUIPMENT

Type	Model	Calibration Due Date	Serial No.
HP Signal Generator	8648D (9kHz-4.0GHz)	Nov. 2002	3847A00611
Rohde & Schwarz Signal Generator	SMR40 (10MHz-40GHz)	Nov. 2002	835537/022
Gigatronics Power Meter	8652A	Oct. 2002	1835272
Gigatronics Power Sensor	80701A (0.05-18GHz)	Sept. 2002	1833535
Gigatronics Power Sensor	80701A (0.05-18GHz)	Sept. 2002	1833542
Amplifier Research Power Amp.	5S1G4 (5W, 800MHz-4.2GHz)	N/A	26235
Microwave System Amplifier	HP 83017A (0.5-26.5GHz)	N/A	3123A00587
Network Analyzer	HP 8753E (30kHz-3GHz)	Nov. 2002	US38433013
Audio Analyzer	HP 8903B	Nov. 2002	3729A18691
Modulation Analyzer	HP 8901A	July 2002	3749A07154
Frequency Counter	HP 53181A (3GHz)	May 2002	3736A05175
DC Power Supply	HP E3611A	N/A	KR83015294
CDMA Base Station Simulator	Agilent E8285A	Feb. 2003	US40332926
Multi-Device Controller	EMCO 2090	N/A	9912-1484
Mini Mast	EMCO 2075	N/A	0001-2277
Turntable	EMCO 2080-1.2/1.5	N/A	0002-1002
Double Ridged Horn Antenna	ETS 3115 (1-18GHz)	Oct. 2002	6267
Double Ridged Horn Antenna	ETS 3115 (1-18GHz)	Oct. 2002	6276
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept. 2002	9120A-239
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept. 2002	9120A-240
Roberts Dipoles	ETS DB-4 (400MHz-1GHz)	June 2002	6276
Spectrum Analyzer	HP 8594E	March 2003	3543A02721
Spectrum Analyzer	HP E4408B	Nov. 2002	US39240170
Shielded Screen Room	Lindgren R.F. 18W-2/2-0	N/A	16297
Environmental Chamber	ESPEC ECT-2(Temperature/Humidity)	Feb. 2003	0510154-B

5.1 CONCLUSION

The data in this measurement report shows that the MODOTTEL CO., LTD. Model: WPE-2100 Dual-Band PCS/Cellular CDMA Phone FCC ID: POQWPE-2100 complies with all the requirements of Parts 2, 22.901(d) and 24(E) of the FCC rules.

TEST PLOTS

Part 24 PCS CDMA EMC Test Plots

hp

15:32:46 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 25

Ref 24.5 dBm

#Atten 5 dB

Mkr1 2.500 GHz

-27 dBm

Peak

Log

10

dB/

Offst

31

dB

DI

-13.0

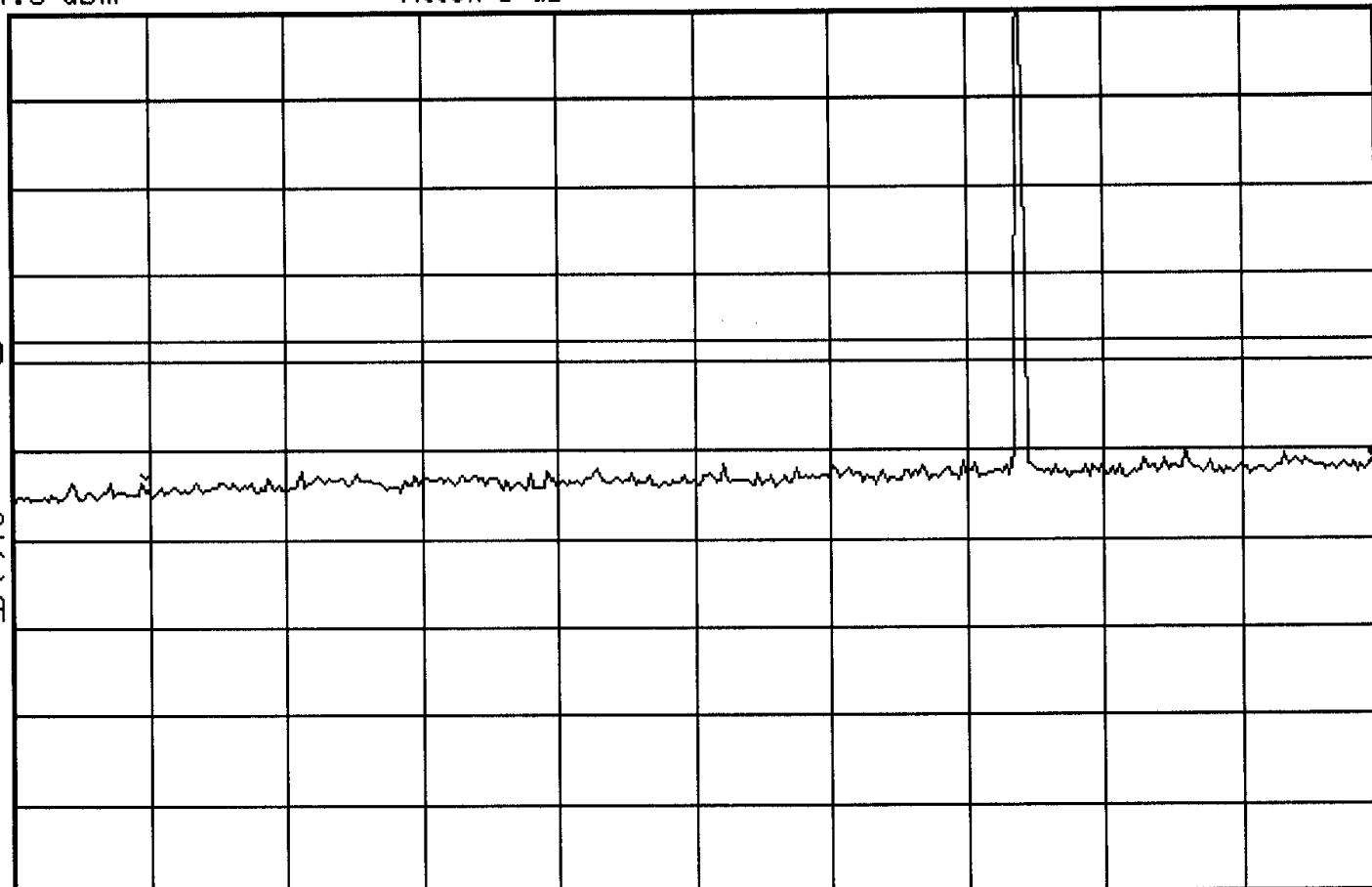
dBm

>

W1 W2

S3 FC

AA



Start 10 MHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 2.5 GHz

#Sweep 2 s

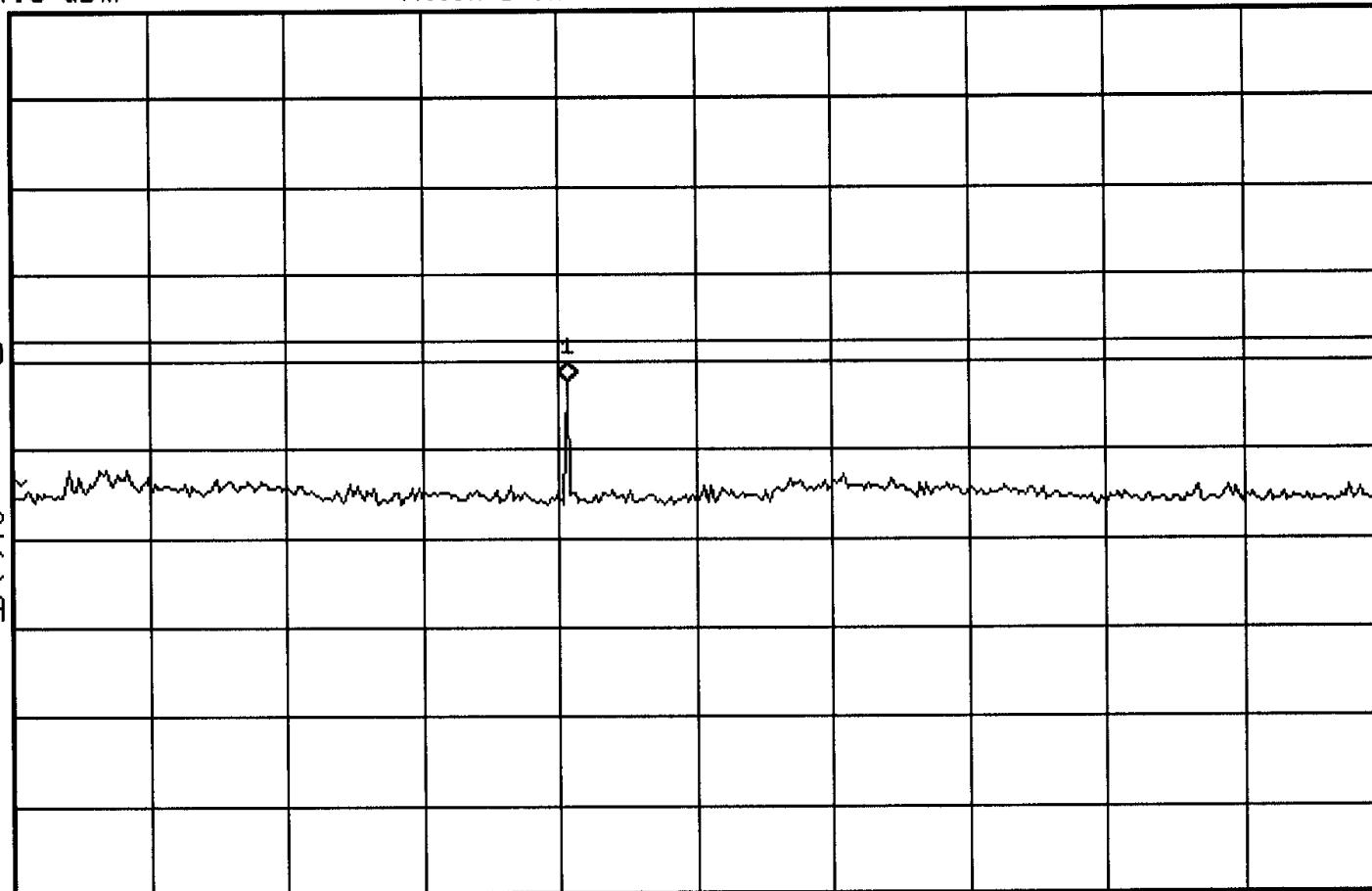
160

15:33:09 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 25
Ref 24.5 dBm #Atten 5 dB

Mkr1 5.556 GHz
-17.67 dBm

Peak
Log
10
dB/
Offst
31
dB
DI
-13.
dBm



Start 2.5 GHz

#Res BW 3 MHz

*VBW 3 MHz

Stop 10 GHz

#Sweep 2 s

hp

15:33:28 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 25

Ref 24.5 dBm

#Atten 5 dB

Mkr1 13.45 GHz

-28.52 dBm

Peak

Log

10

dB/

Offset

31

dB

DI

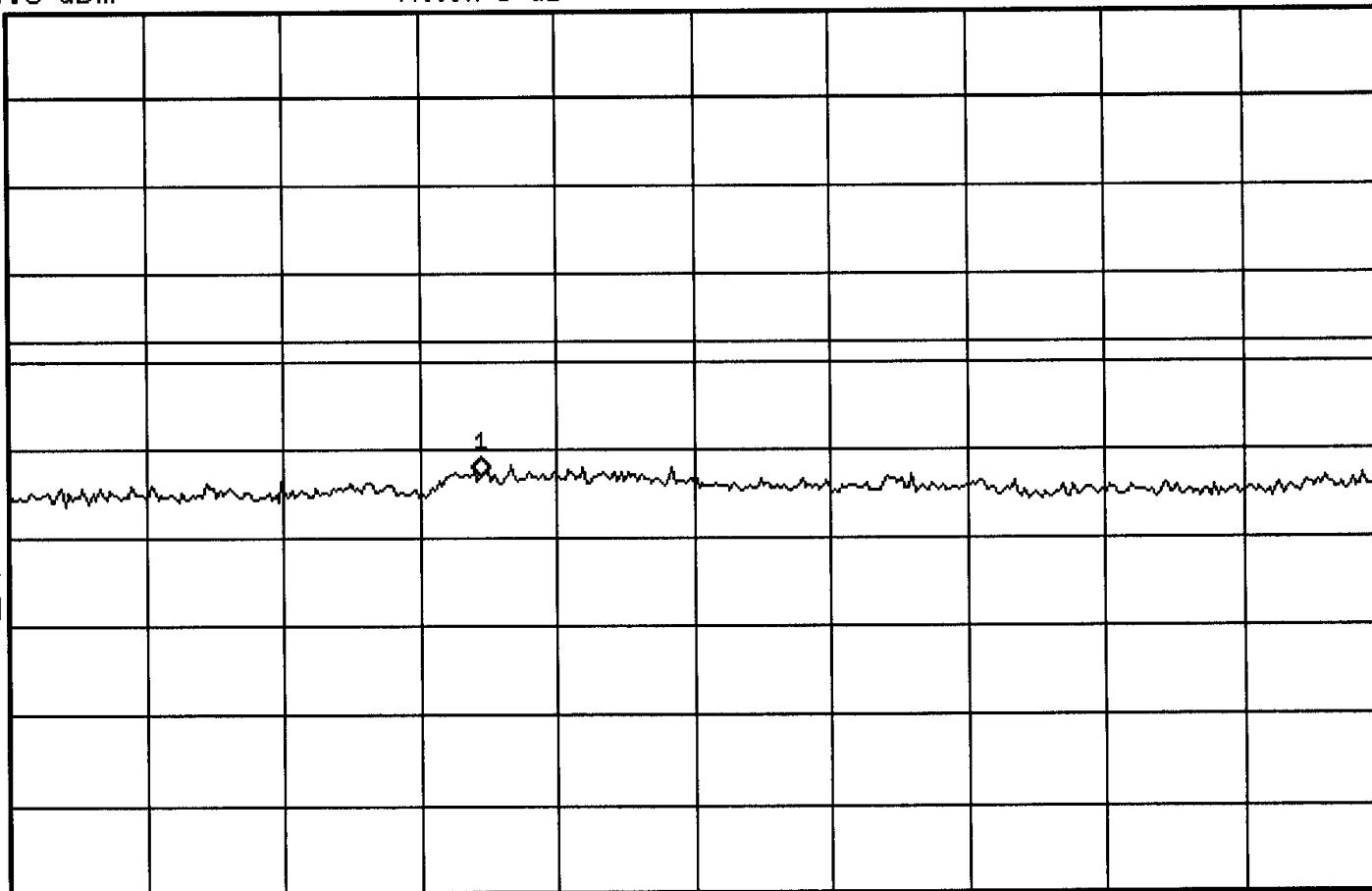
-13.0

dBm

W1 W2

S3 FC

AA



Start 10 GHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 20 GHz

#Sweep 2 s

hp

15:30:47 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 600

Ref 24.5 dBm

#Atten 5 dB

Mkr1 2.500 GHz

-26.93 dBm

Peak

Log

10

dB/

Offset

31

dB

DI

-13.0

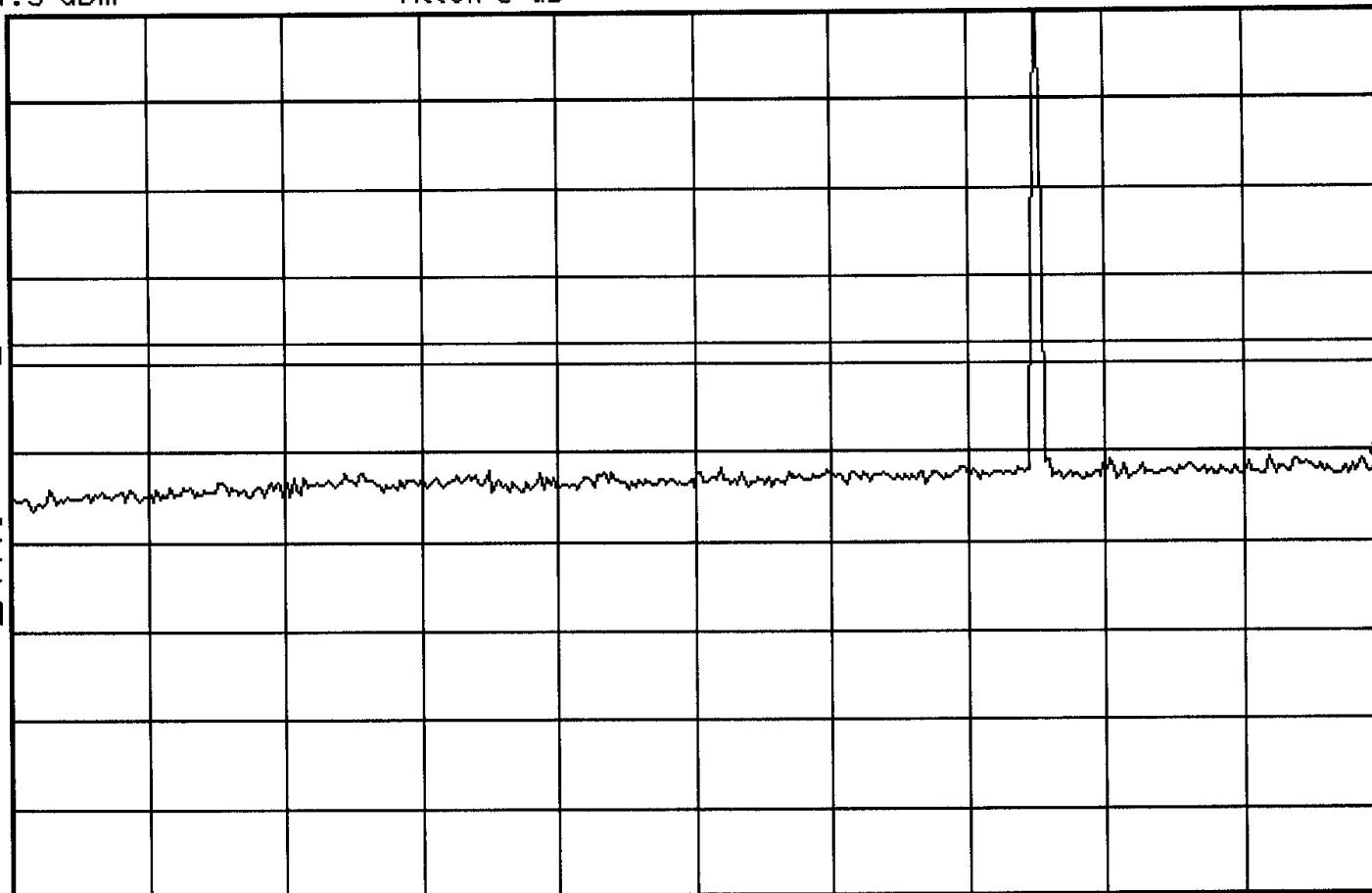
dBm

>

W1 W2

S3 FC

AA



Start 10 MHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 2.5 GHz

#Sweep 2 s

hp

15:30:02 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 600

Ref 24.5 dBm

#Atten 5 dB

Mkr1 5.650 GHz

-17.31 dBm

Peak

Log

10

dB/

Offst

31

dB

DI

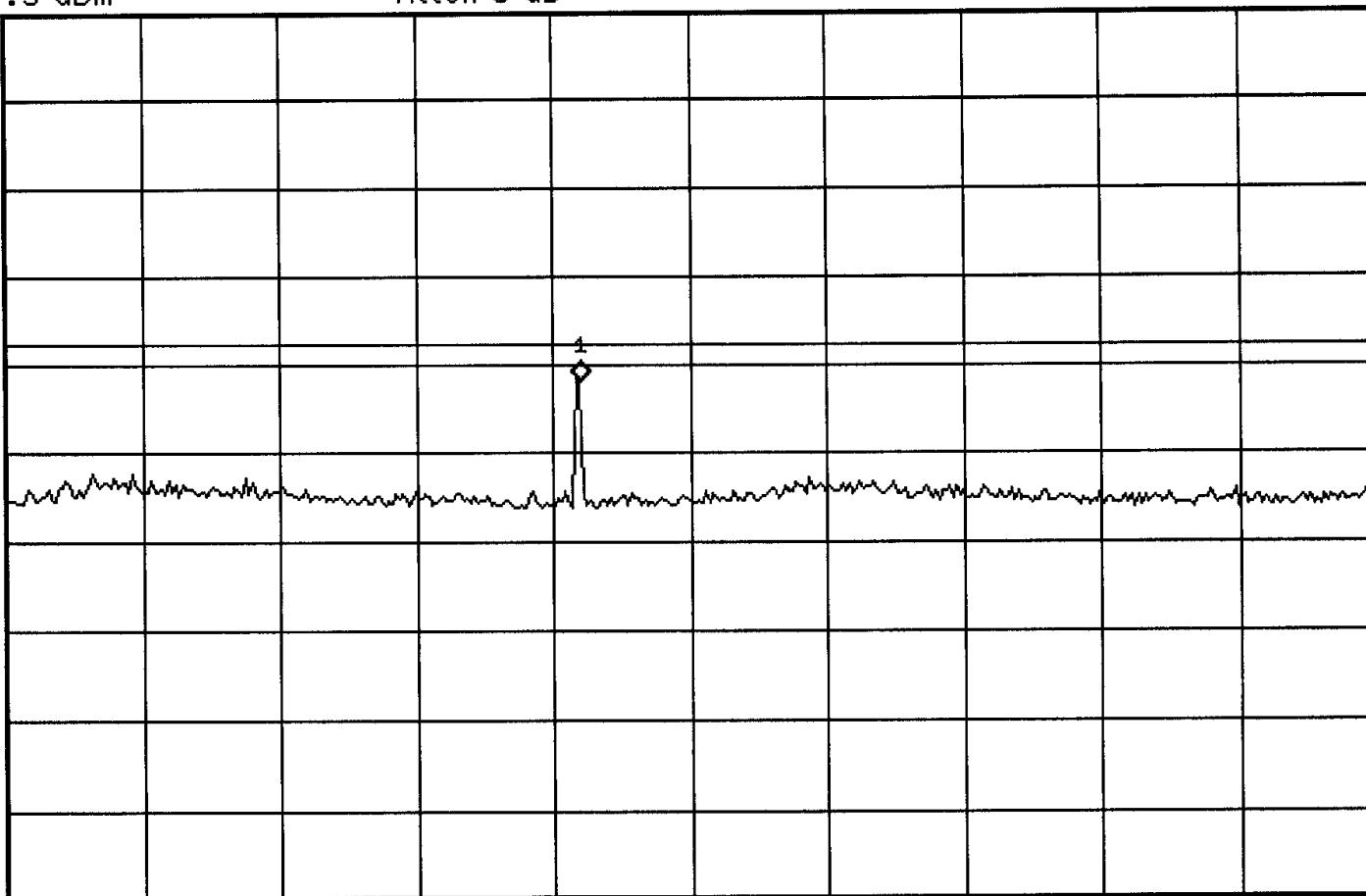
-13.0

dBm

W1 W2

S3 FC

AA



Start 2.5 GHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 10 GHz

#Sweep 2 s

hp

15:29:42 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 600

Ref 24.5 dBm

#Atten 5 dB

Mkr1 15.33 GHz

-29.7 dBm

Peak

Log

10

dB/

Offset

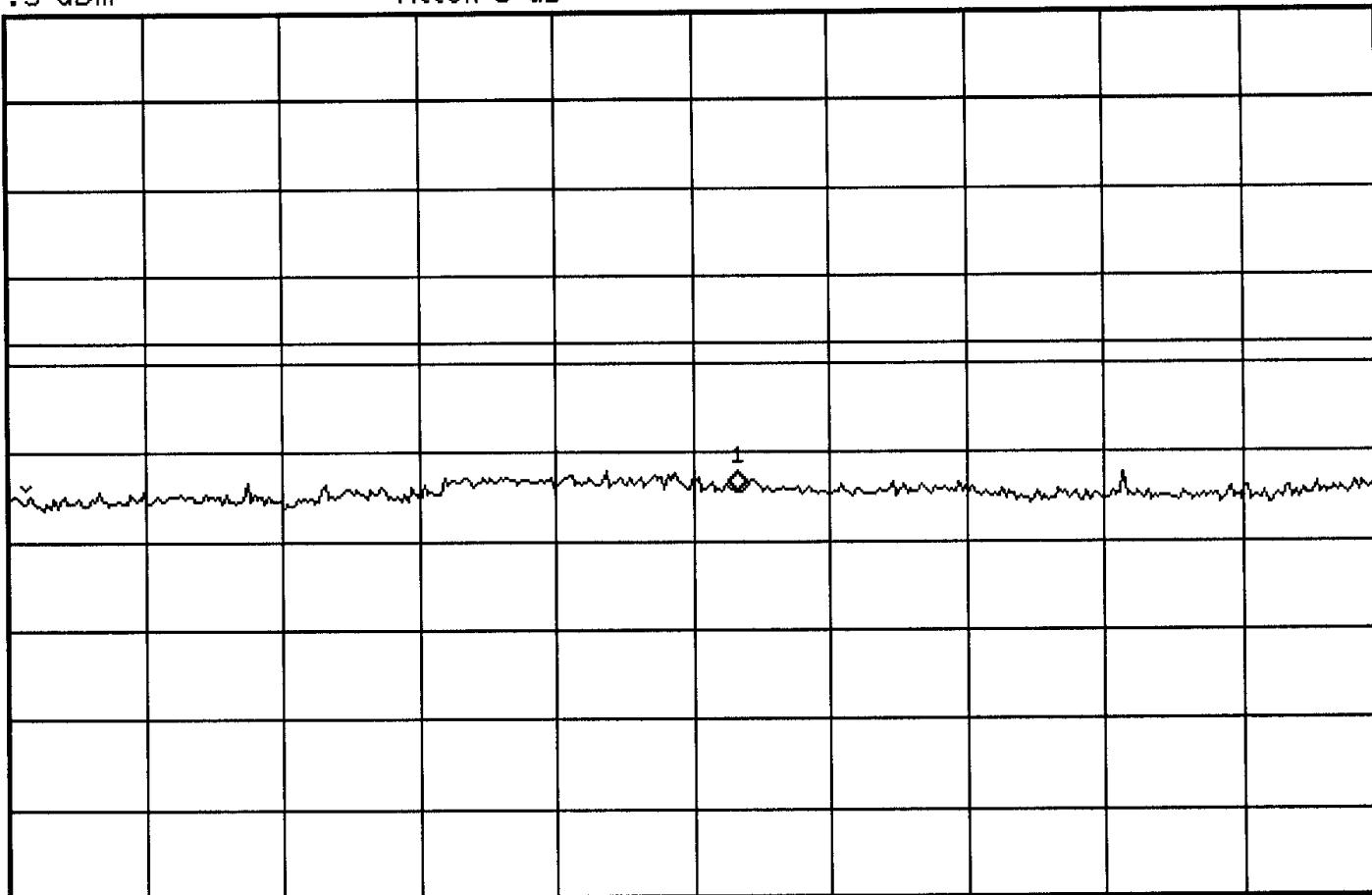
31

dB

DI

-13.0

dBm



Start 10 GHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 20 GHz

#Sweep 2 s

hp

15:27:44 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 1175

Ref 24.5 dBm

#Atten 5 dB

Mkr1 2.488 GHz

-27.04 dBm

Peak

Log

10

dB/

Offset

31

dB

DI

-13.0

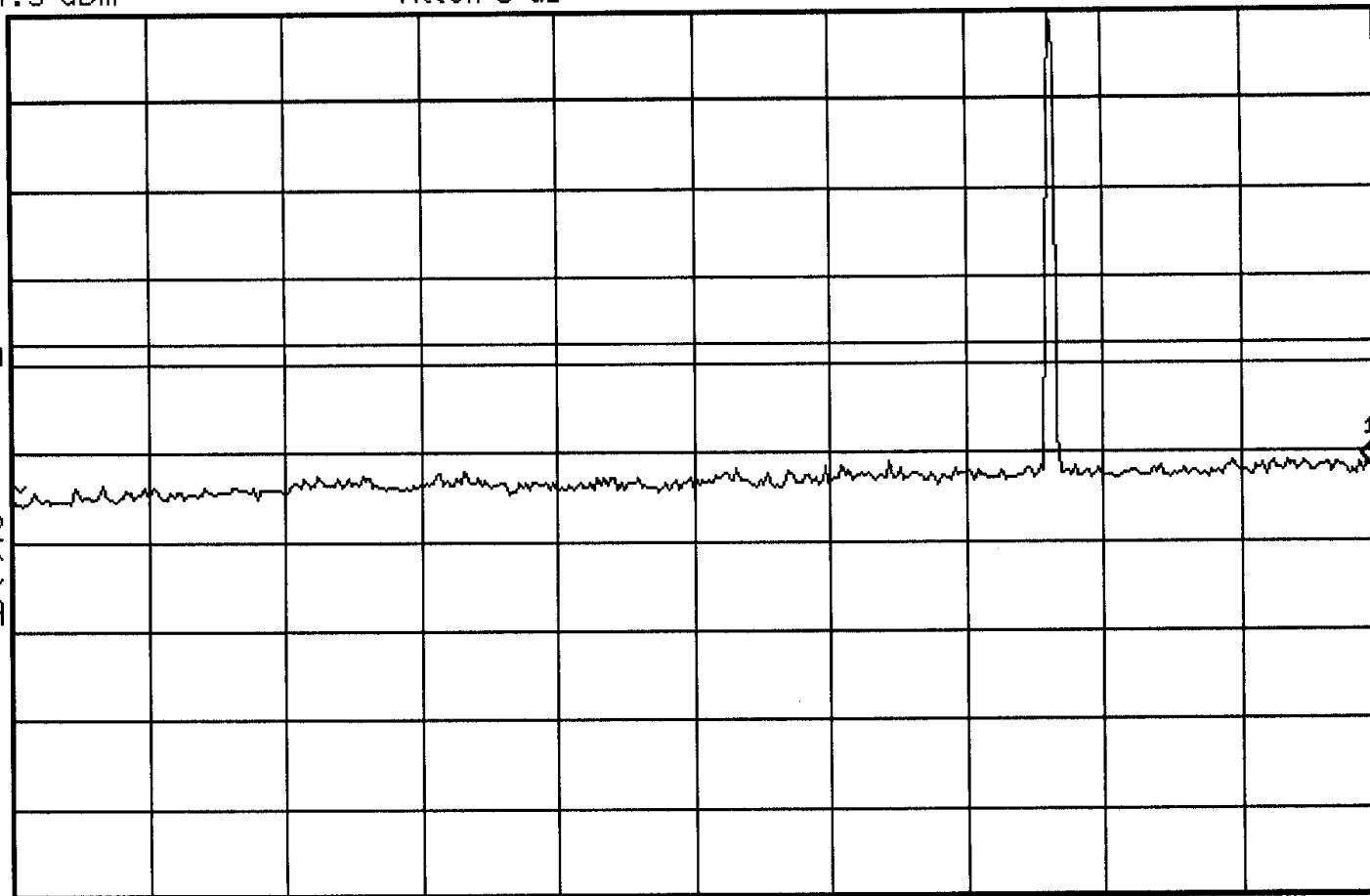
dBm

.

W1 W2

S3 FC

AA



Start 10 MHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 2.5 GHz

#Sweep 2 s

hp

15:28:08 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 1175

Ref 24.5 dBm

#Atten 5 dB

Mkr1 5.725 GHz

-23.71 dBm

Peak

Log

10

dB/

Offset

31

dB

DI

-13.0

dBm

W1 W2

S3 FC

AA

1

Start 2.5 GHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 10 GHz

#Sweep 2 s

hp

15:28:28 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA COND SPURS CH 1175

Ref 24.5 dBm

#Atten 5 dB

Mkr1 14.35 GHz

-28.02 dBm

Peak

Log

10

dB/

Offset

31

dB

DI

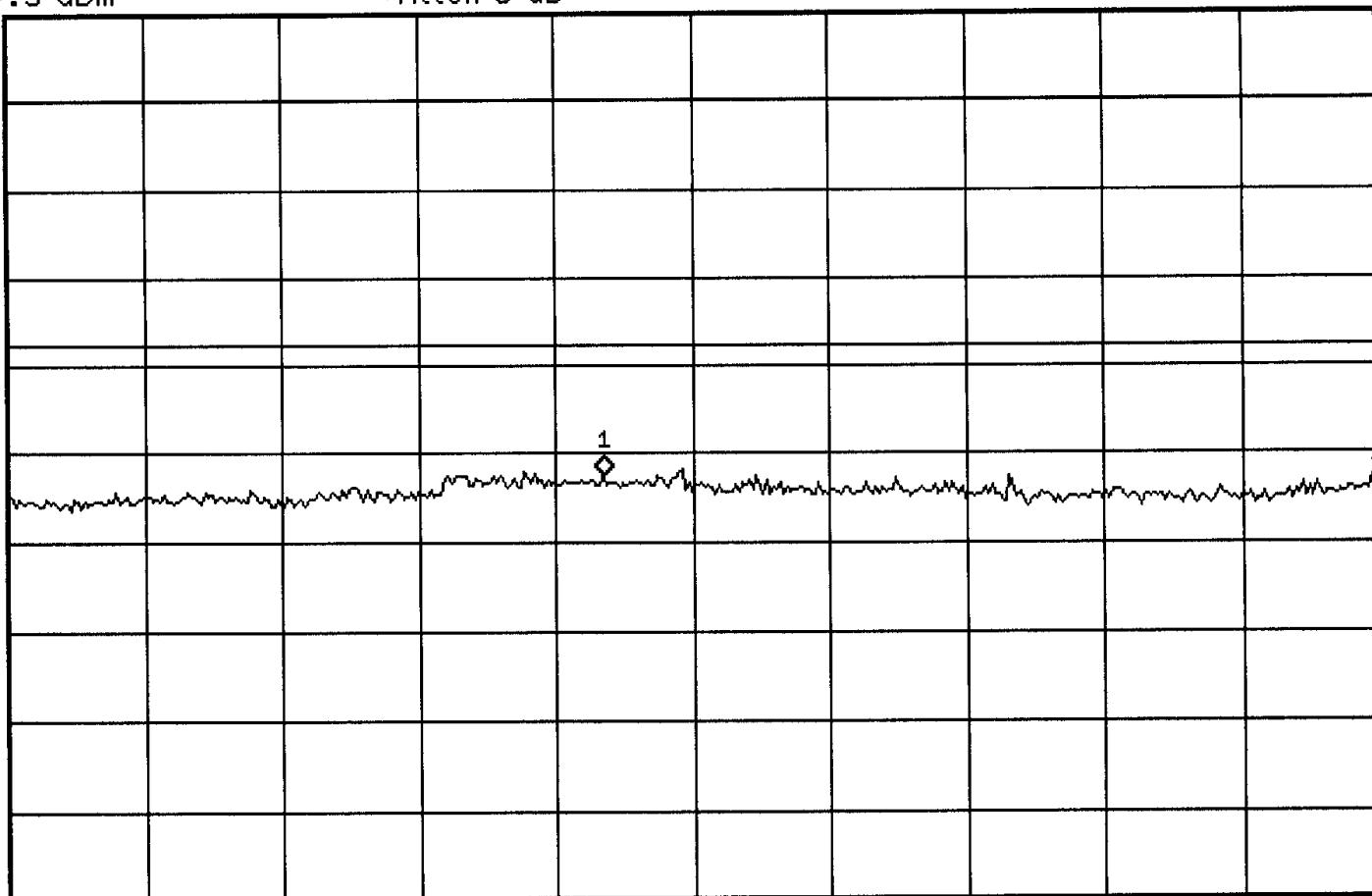
-13.0

dBm

W1 W2

S3 FC

AA



Start 10 GHz

#Res BW 3 MHz

#VBW 3 MHz

Stop 20 GHz

#Sweep 2 s

hp

11:45:31 Jan 29, 2002

WITHUS WPE-2100 RECEIVER SPURS

Ref -79 dBm

Atten 5 dB

Mkr1 1.97378 GHz

-89.65 dBm

Peak

Log

10

dB/

0ffst

1.1

dB

DI

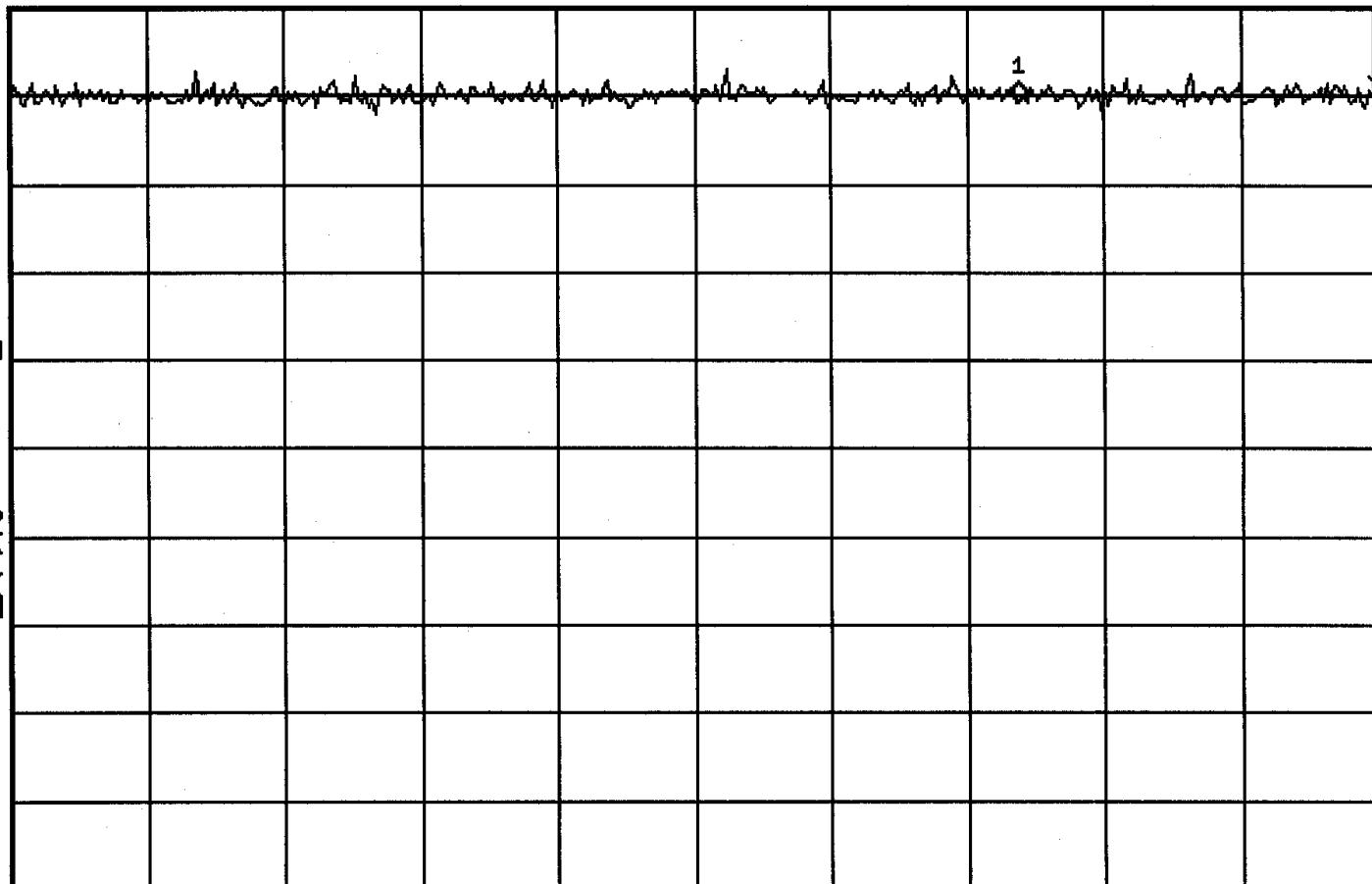
-13.0

dBm

W1 S2

S3 FC

AA



Start 1.931 GHz

*Res BW 30 kHz

VBW 30 kHz

Stop 1.989 GHz

#Sweep 5 s

hp

14:33:16 Jan 29, 2002

WITHUS WPE-2100 BAND EDGE PCS CDMA LOW CH

Ref 24.5 dBm

#Atten 5 dB

Peak

Log

10

dB/

Offset

31

dB

DI

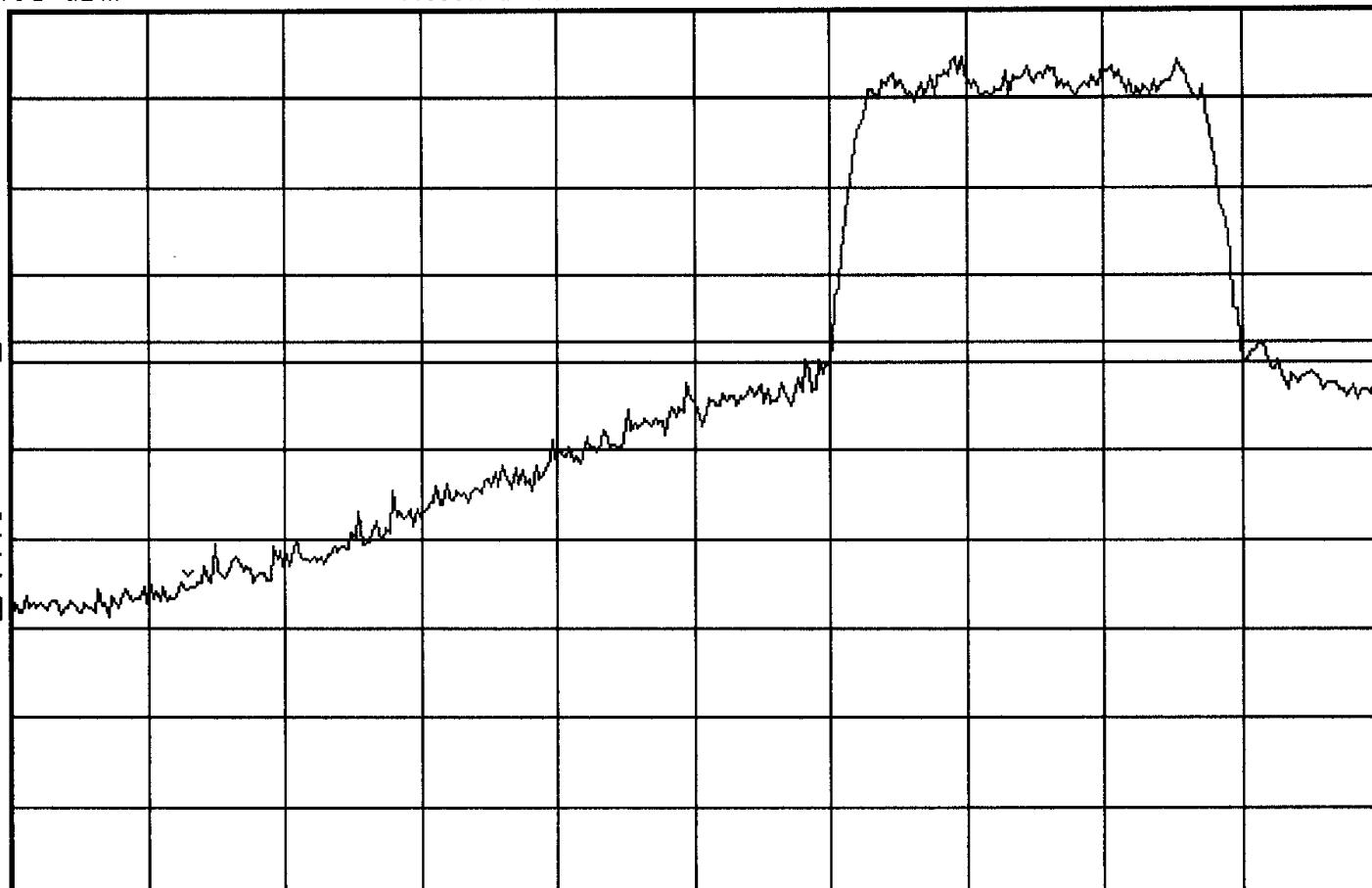
-13.0

dBm

S1 W2

S3 FC

AA



Center 1.85 GHz

#Res BW 30 kHz

#VBW 30 kHz

Span 5 MHz

#Sweep 2 s

hp

15:35:57 Jan 29, 2002

WITHUS WPE-2100 BAND EDGE PCS CDMA HIGH CH

Ref 24.5 dBm

#Atten 5 dB

Peak

Log

10

dB/

0ffst

31

dB

DI

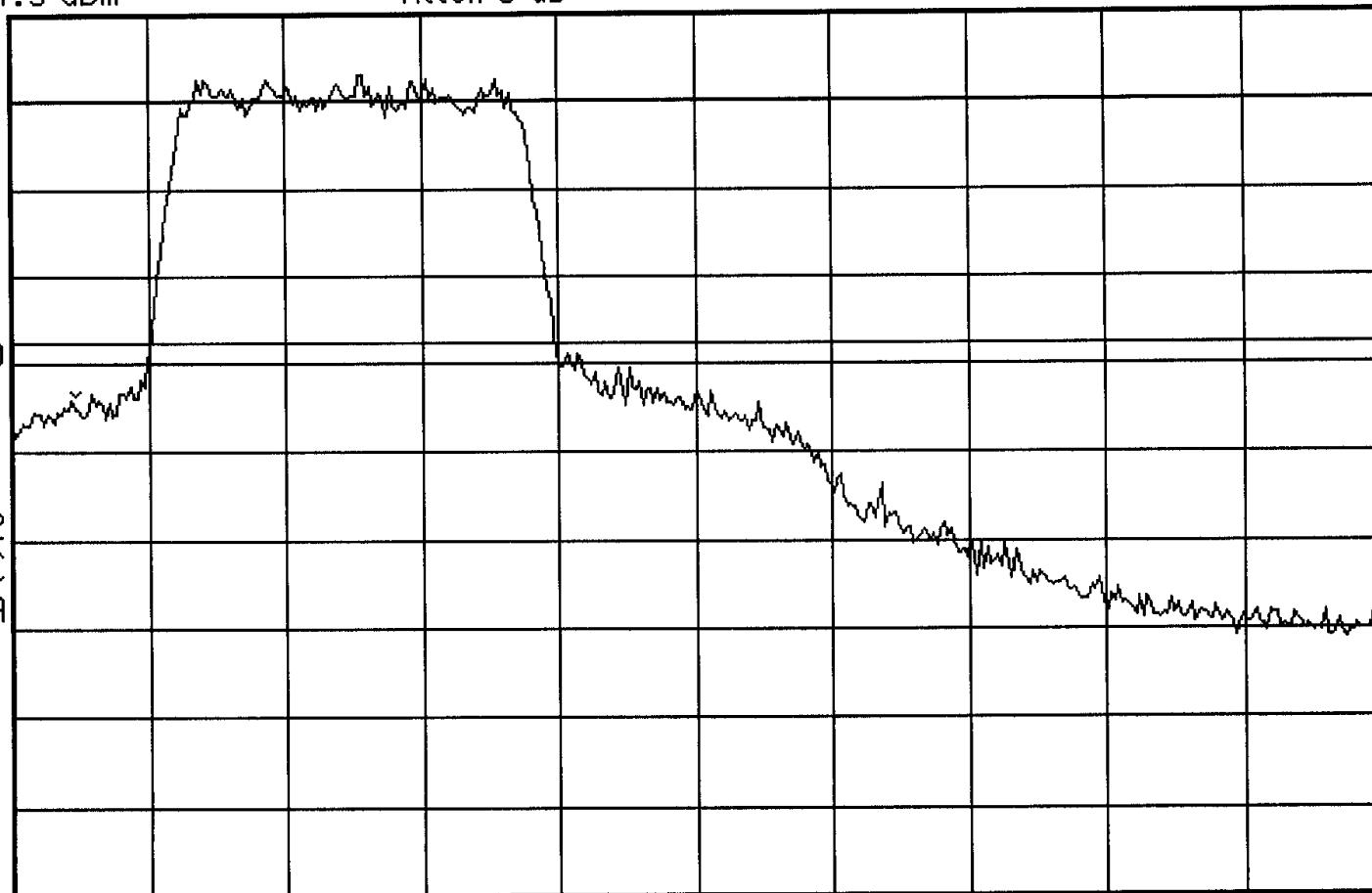
-13.0

dBm

W1 W2

S3 FC

AA



Center 1.91 GHz

#Res BW 30 kHz

#VBW 30 kHz

Span 5 MHz

#Sweep 2 s

hp

15:38:11 Jan 29, 2002

WITHUS WPE-2100 OCCUPIED BANDWIDTH

Ref 24.5 dBm

#Atten 5 dB

Samp

Log

10

dB/

Offset

31

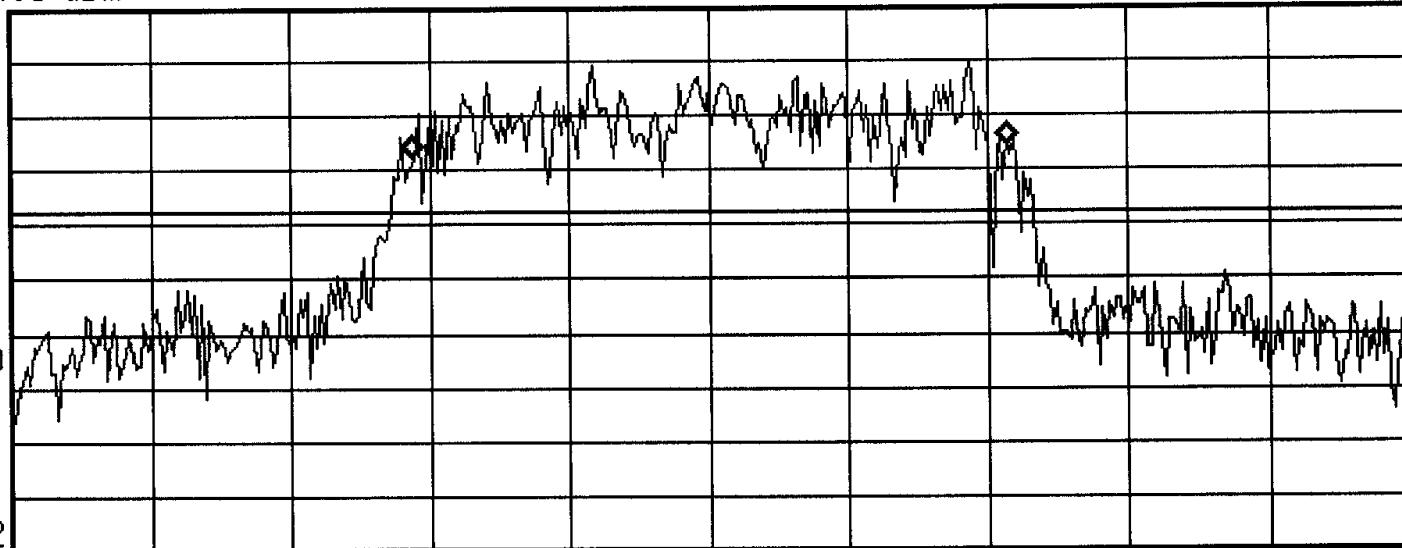
dB

DI

-13.0

dBm

W1 S2



Center 1.88 GHz

#Res BW 30 kHz

#VBW 30 kHz

Span 3 MHz

Sweep 9.167 ms

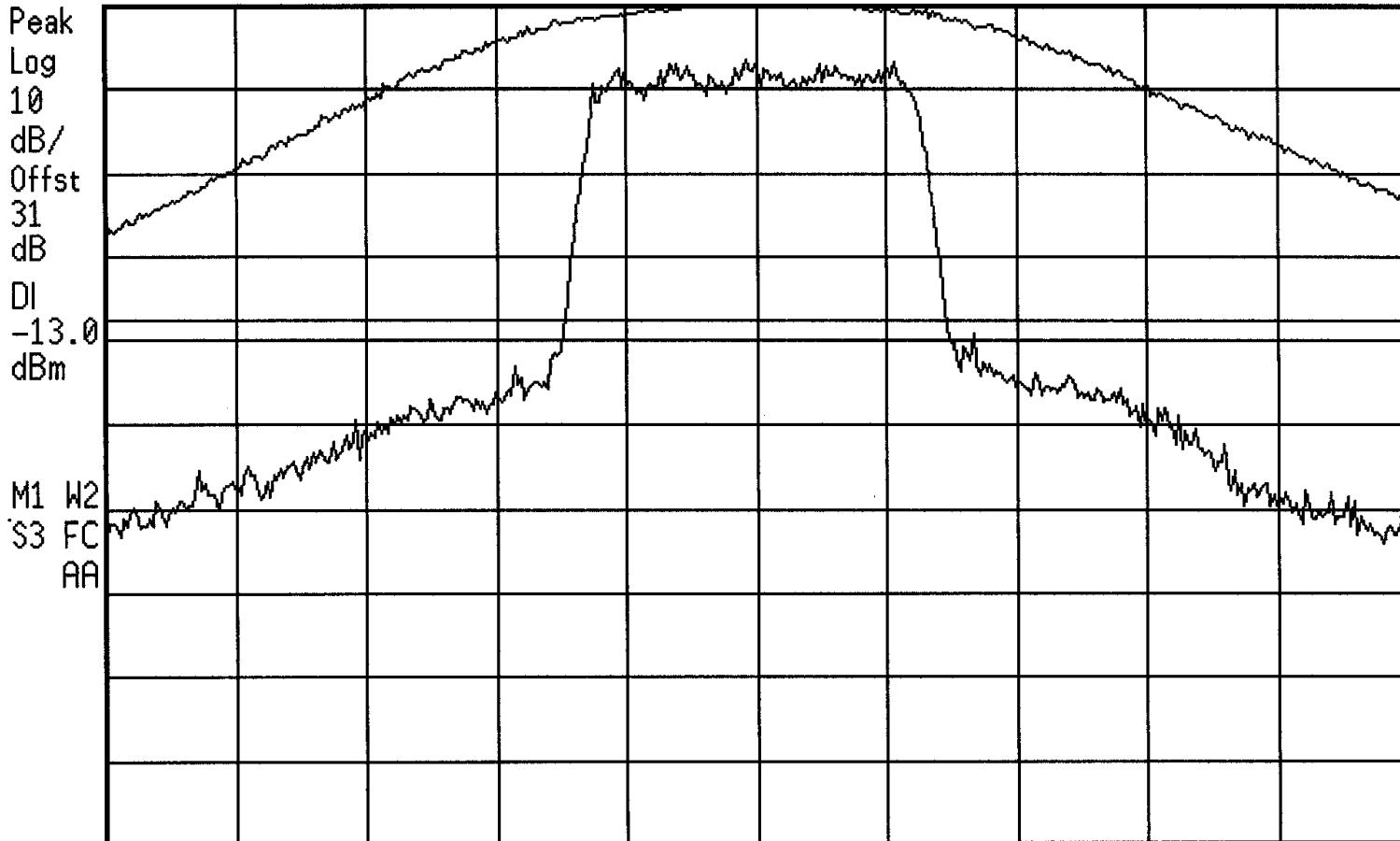
Occupied Bandwidth Results (measuring..)

Occupied Bandwidth
1.282 MHz

Occ BW % Pwr 99.00 %

Transmit Freq Error 862.7 Hz

hp 15:20:17 Jan 29, 2002
WITHUS WPE-2100 PCS CDMA CH 25
Ref 24.5 dBm Atten 5 dB



Center 1.851 GHz
*Res BW 30 kHz

*VBW 30 kHz

Span 5 MHz
*Sweep 2.083 s

hp

15:17:56 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA CH 600

Ref 24.5 dBm

*Atten 5 dB

Peak

Log

10

dB/

Offset

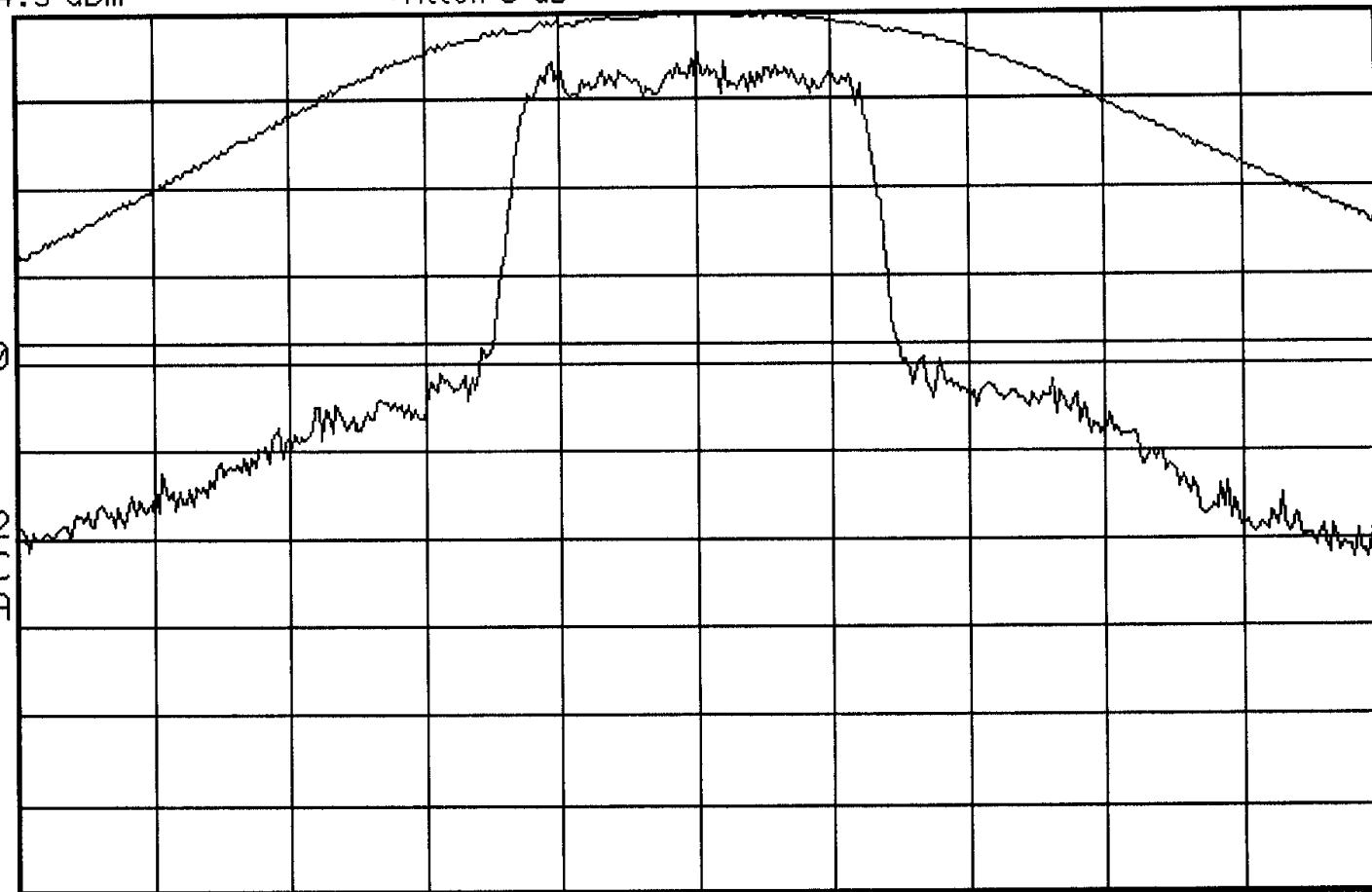
31

dB

DI

-13.0

dBm



Center 1.88 GHz

#Res BW 30 kHz

*VBW 30 kHz

Span 5 MHz

#Sweep 2 s

hp

15:23:30 Jan 29, 2002

WITHUS WPE-2100 PCS CDMA CH 1175

Ref 24.5 dBm

#Atten 5 dB

Peak

Log

10

dB/

Offset

31

dB

DI

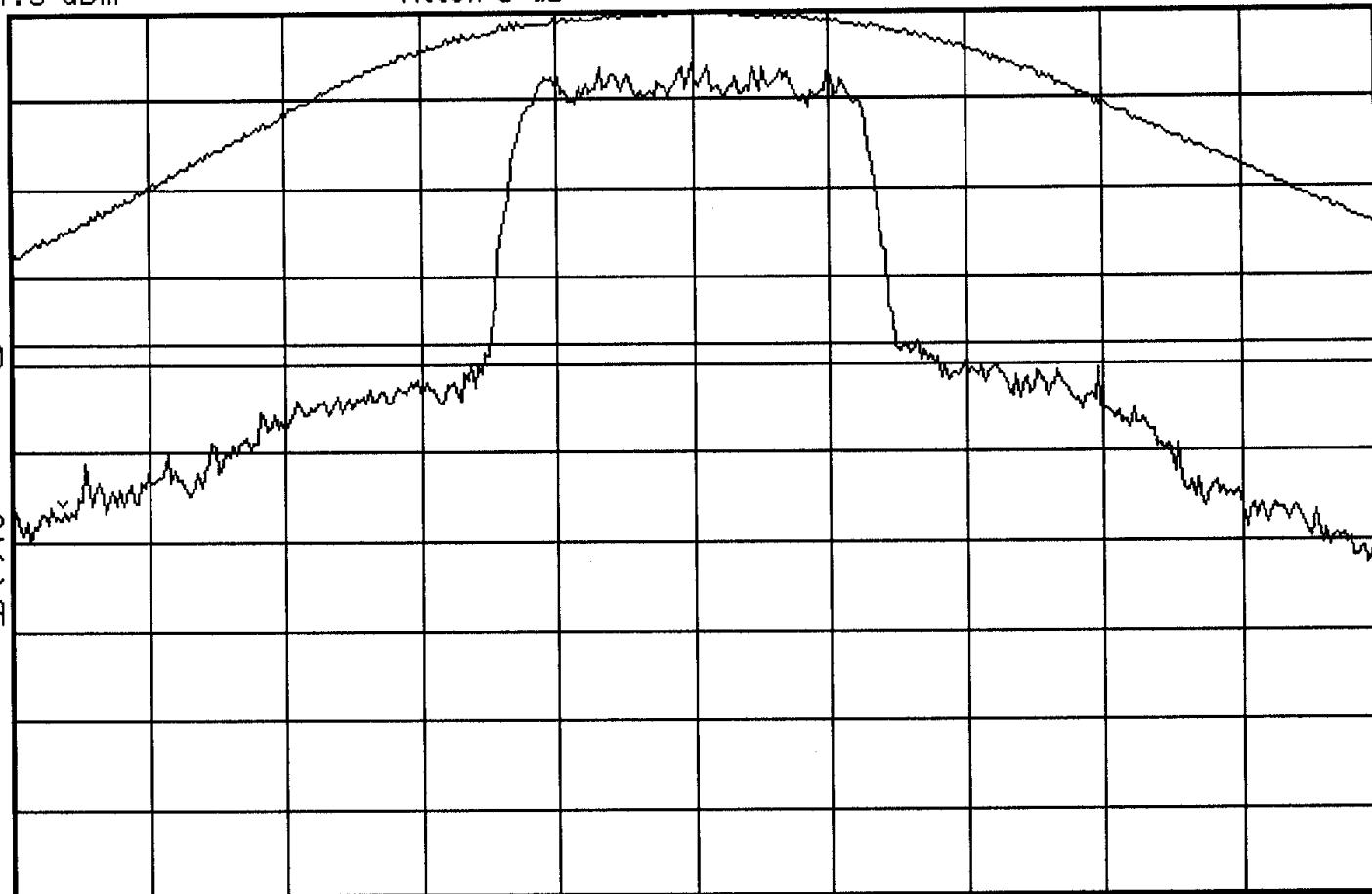
-13.0

dBm

M1 W2

S3 FC

AA



Center 1.909 GHz

#Res BW 30 kHz

#VBW 30 kHz

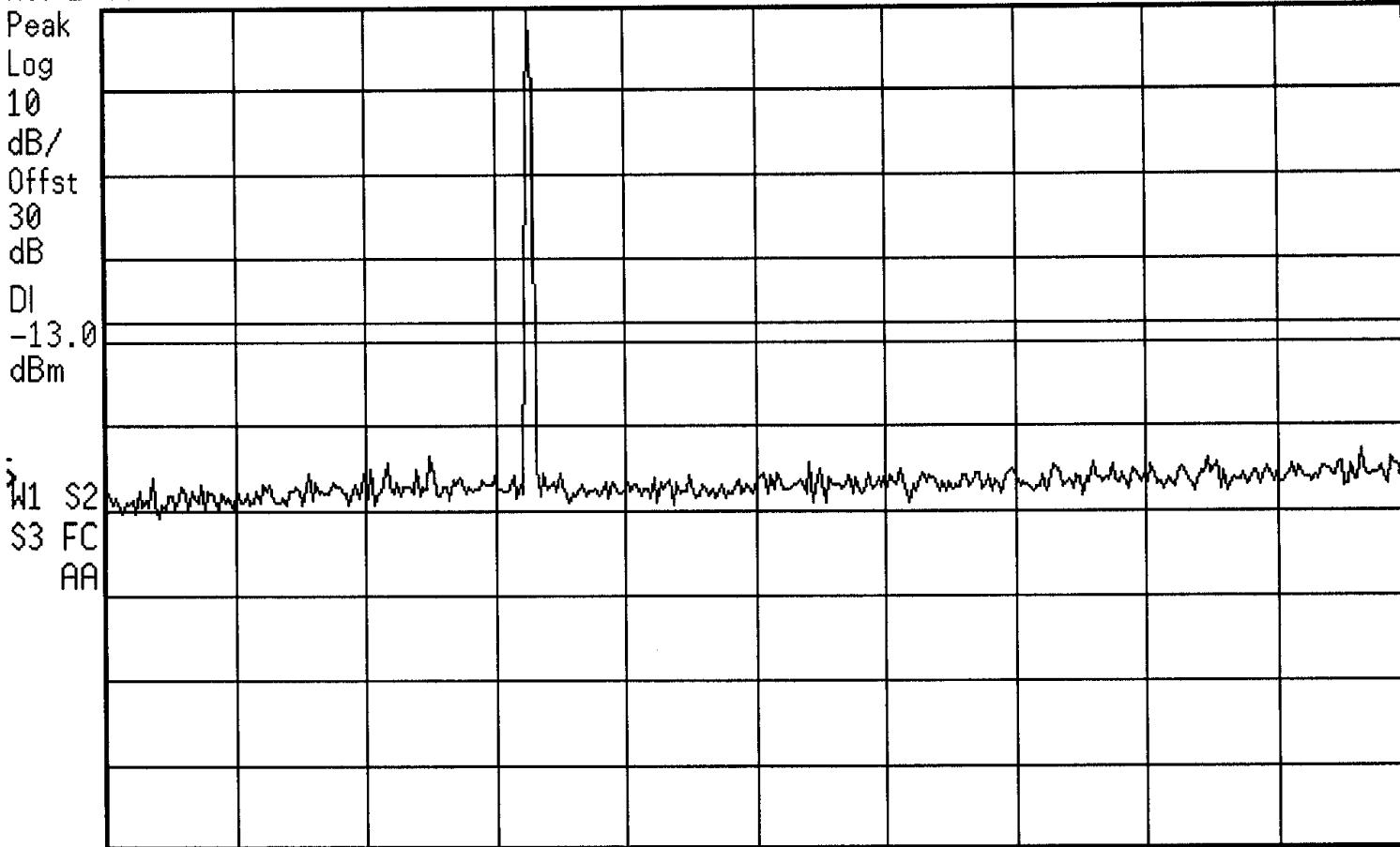
Span 5 MHz

#Sweep 2 s

Part 22 800MHz CDMA EMC Test Plots

hp 15:46:26 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 1013
Ref 24.5 dBm #Atten 5 dB

Mkr1 2.500 GHz
-32.5 dBm



Start 10 MHz
#Res BW 3 MHz

#VBW 3 MHz

Stop 2.5 GHz
#Sweep 5 ms

hp

15:47:51 Jan 29, 2002

WITHUS WPE-2100 CDMA COND SPURS CH 1013

Ref 24.5 dBm

#Atten 5 dB

Mkr1 2.988 GHz

-29.96 dBm

Peak

Log

10

dB/

0ffst

30

dB

DI

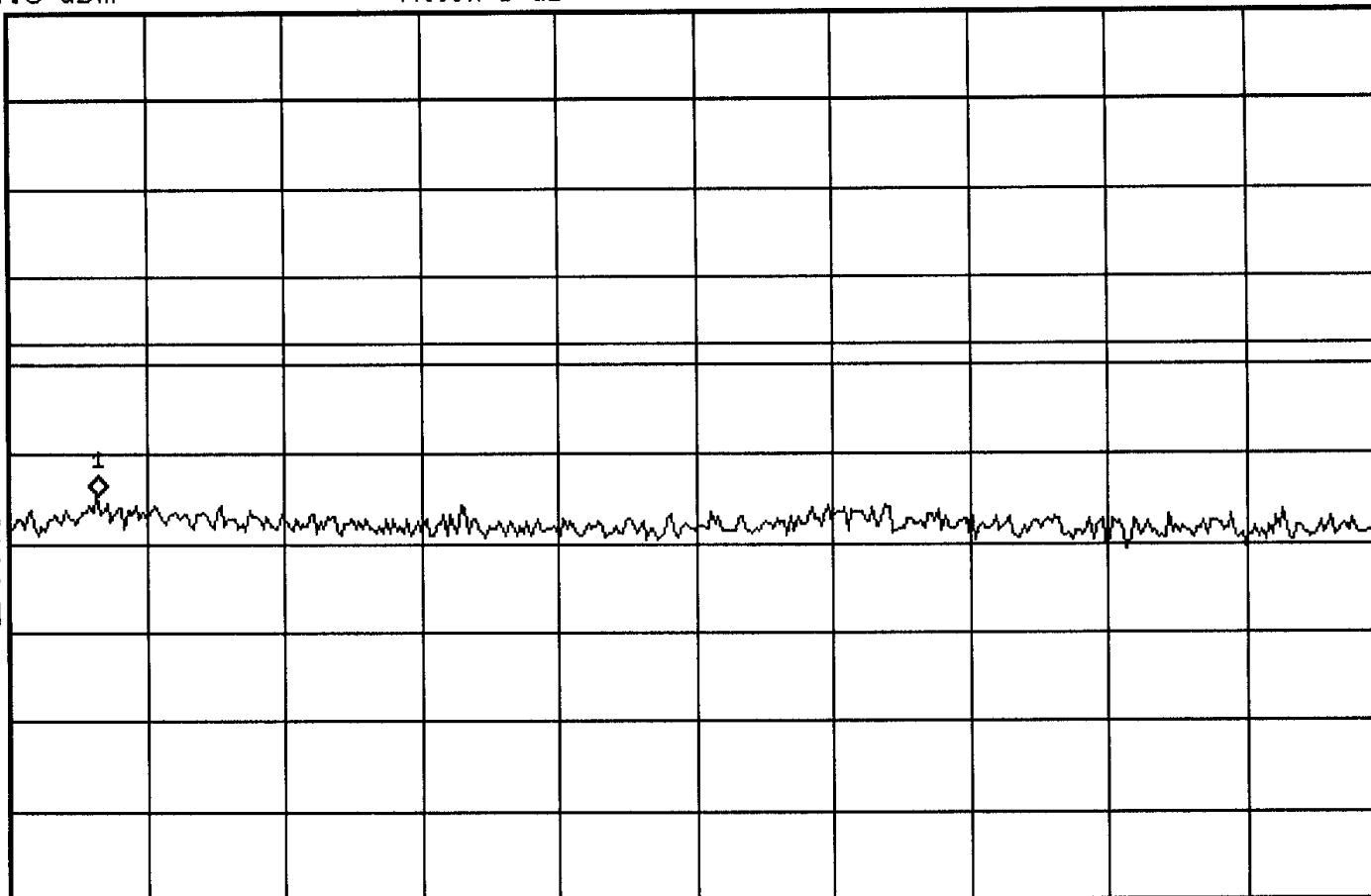
-13.0

dBm

W1 S2

S3 FC

AA



Start 2.5 GHz

#Res BW 3 MHz

Stop 10 GHz

#VBW 3 MHz

Sweep 18.75 ms

[hp] 15:49:44 Jan 29, 2002

WITHUS WPE-2100 CDMA COND SPURS CH 1013

Ref 24.5 dBm

#Atten 5 dB

Mkr1 14.93 GHz

-31.04 dBm

Peak

Log

10

dB/

Offst

30

dB

DI

-13.0

dBm

W1 S2

S3 FC

AA

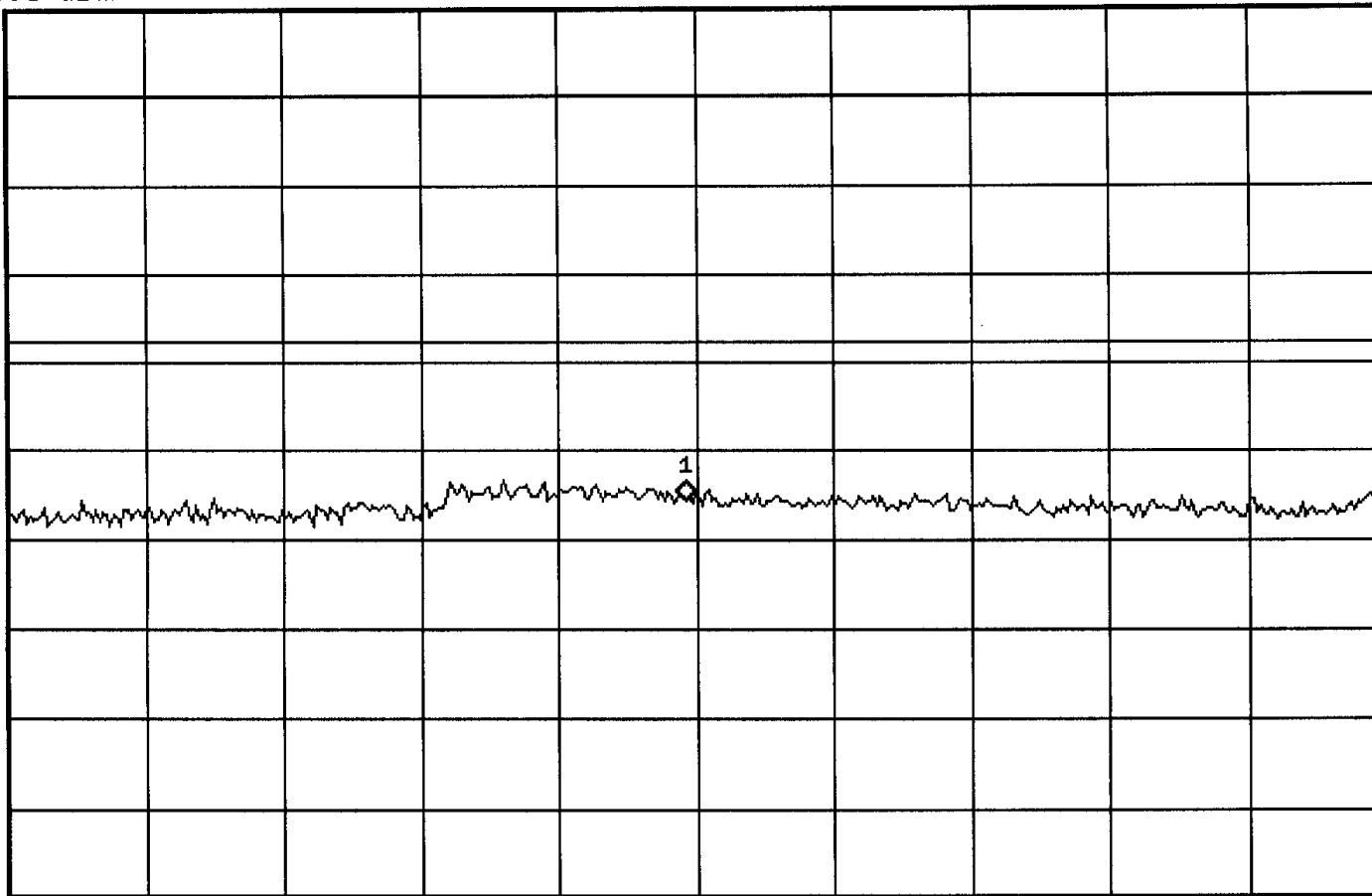
Start 10 GHz

#Res BW 3 MHz

*VBW 3 MHz

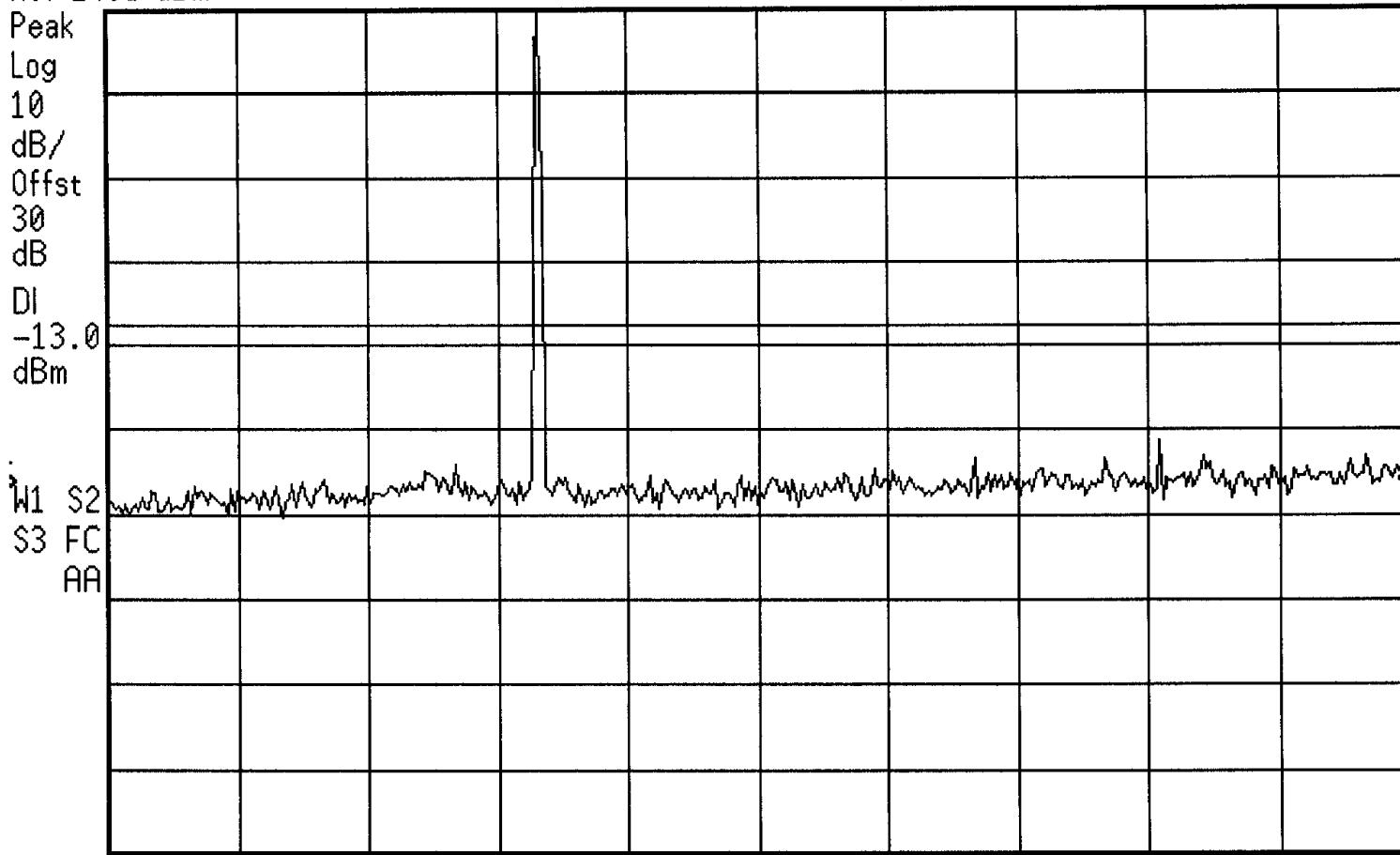
Stop 20 GHz

Sweep 100 ms



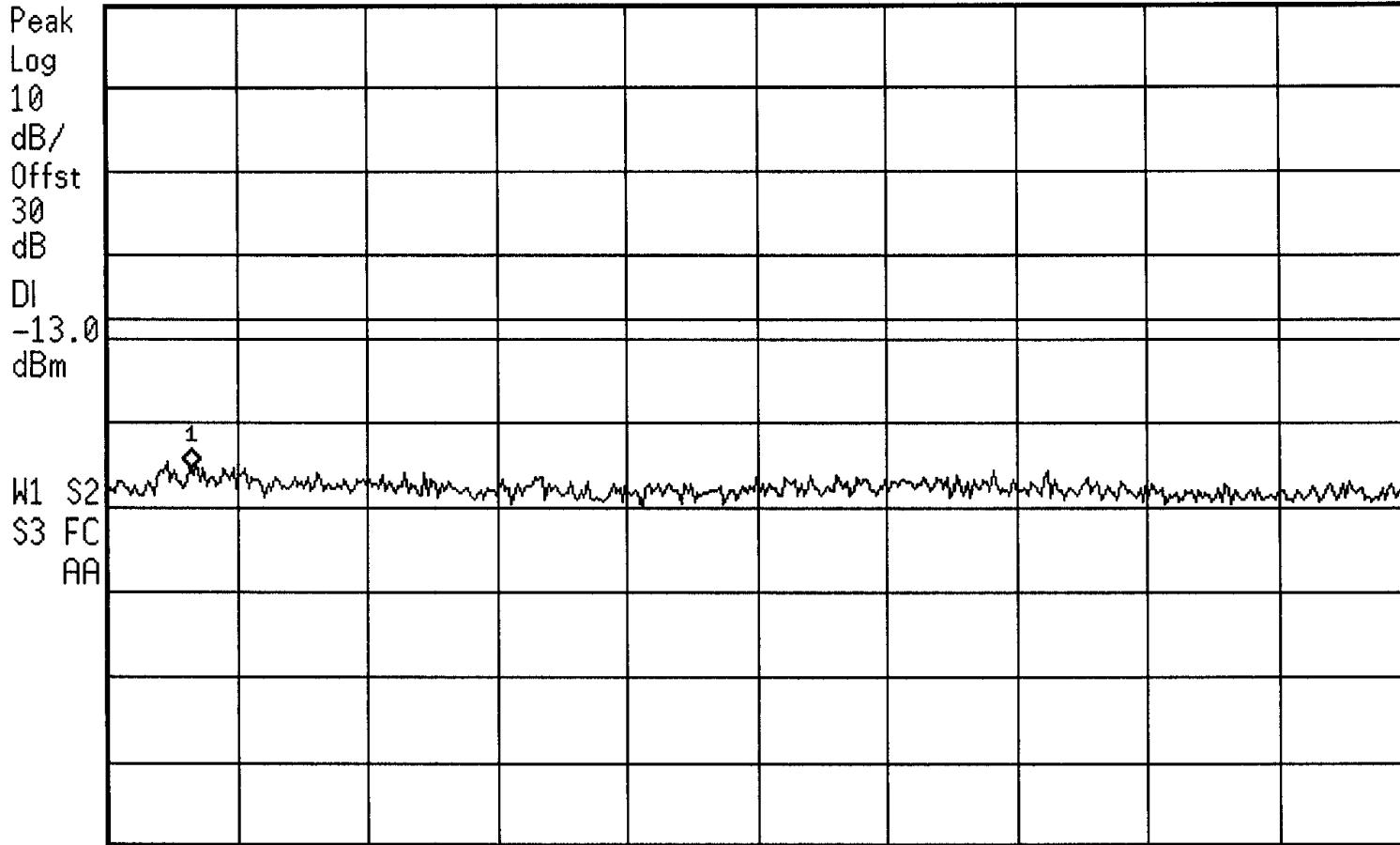
hp 15:54:24 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 363
Ref 24.5 dBm #Atten 5 dB

Mkr1 2.494 GHz
-32.38 dBm



hp 15:54:58 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 363
Ref 24.5 dBm #Atten 5 dB

Mkr1 2.988 GHz
-30.73 dBm



Start 2.5 GHz
#Res BW 3 MHz

*VBW 3 MHz

Stop 10 GHz
Sweep 18.75 ms

hp

15:55:18 Jan 29, 2002

WITHUS WPE-2100 CDMA COND SPURS CH 363

Ref 24.5 dBm

#Atten 5 dB

Mkr1 14.33 GHz

-29.82 dBm

Peak

Log

10

dB/

0ffst

30

dB

DI

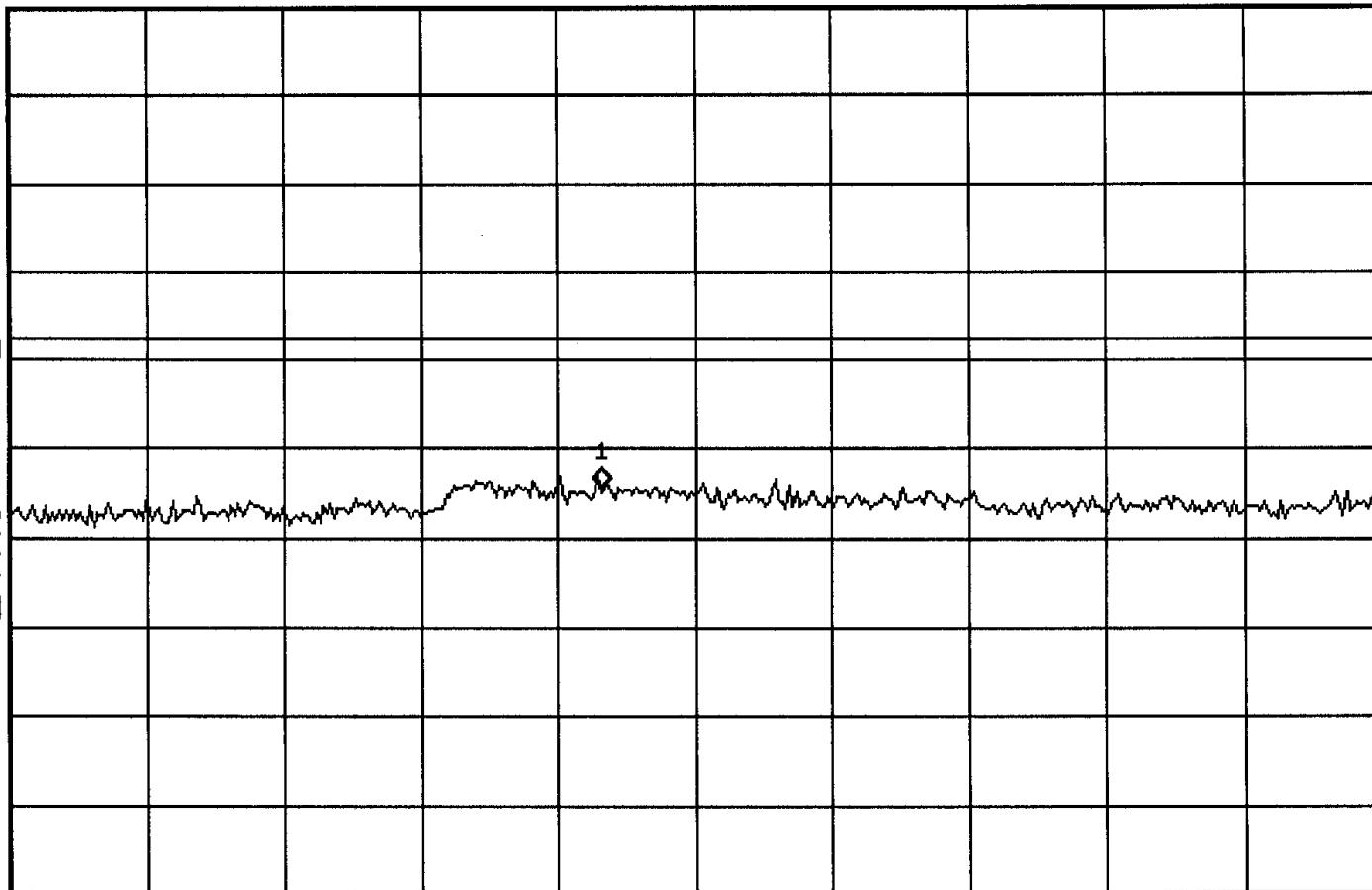
-13.0

dBm

W1 S2

S3 FC

AA



Start 10 GHz

#Res BW 3 MHz

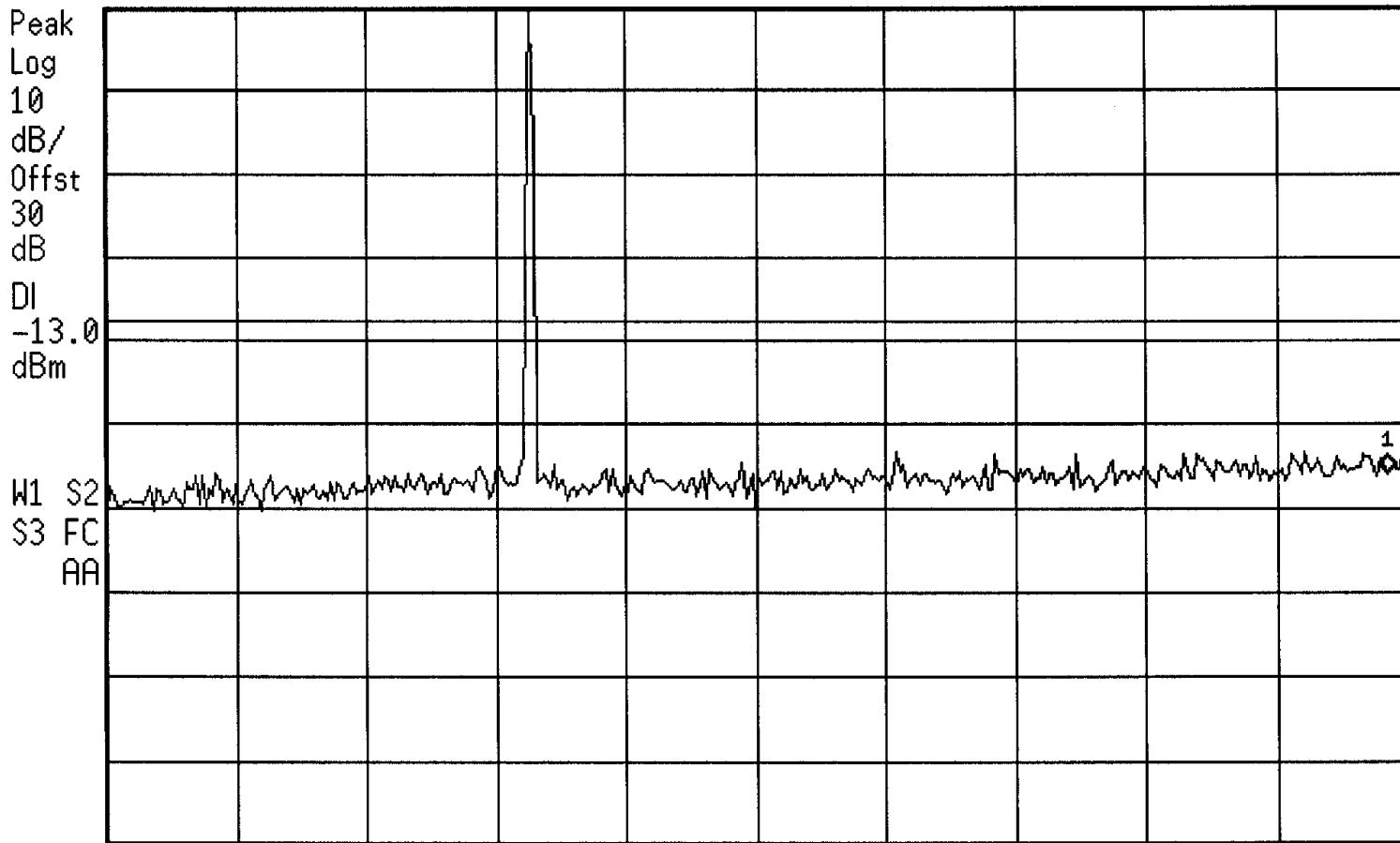
#VBW 3 MHz

Stop 20 GHz

Sweep 100 ms

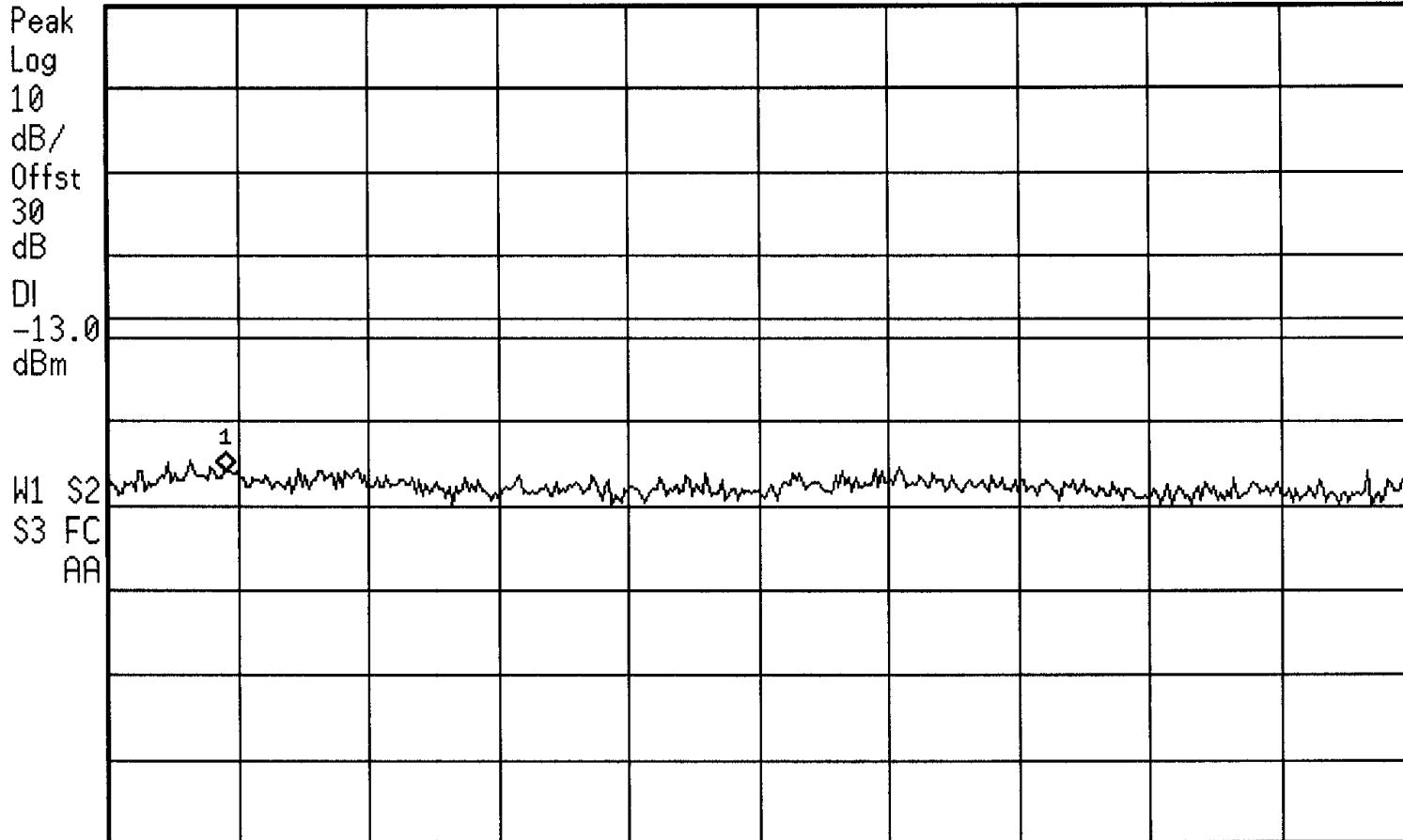
hp 15:57:59 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 777
Ref 24.5 dBm #Atten 5 dB

Mkr1 2.537 GHz
-31.29 dBm



hp 15:57:17 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 777
Ref 24.5 dBm #Atten 5 dB

Mkr1 3.175 GHz
-31.49 dBm



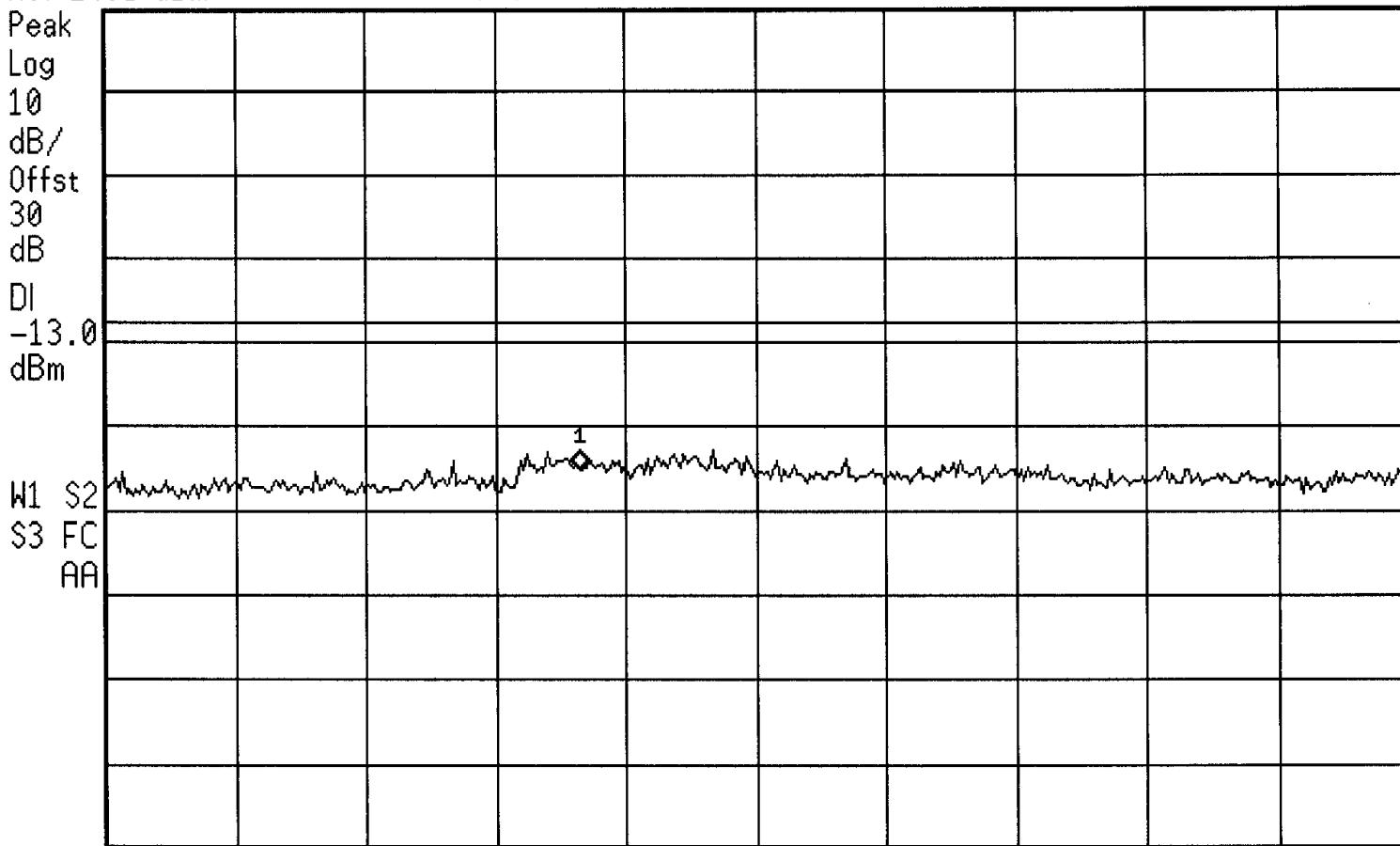
Start 2.5 GHz
#Res BW 3 MHz

#VBW 3 MHz

Stop 10 GHz
Sweep 18.75 ms

hp 15:57:35 Jan 29, 2002
WITHUS WPE-2100 CDMA COND SPURS CH 777
Ref 24.5 dBm #Atten 5 dB

Mkr1 13.65 GHz
-30.68 dBm



Start 10 GHz
#Res BW 3 MHz

#VBW 3 MHz

Stop 20 GHz
Sweep 100 ms

hp

11:50:26 Jan 29, 2002

WITHUS WPE-2100 RECEIVER SPURS

Ref -79 dBm

Atten 5 dB

Mkr1 872.63 MHz

-85.93 dBm

Peak

Log

10

dB/

0ffst

1.1

dB

DI

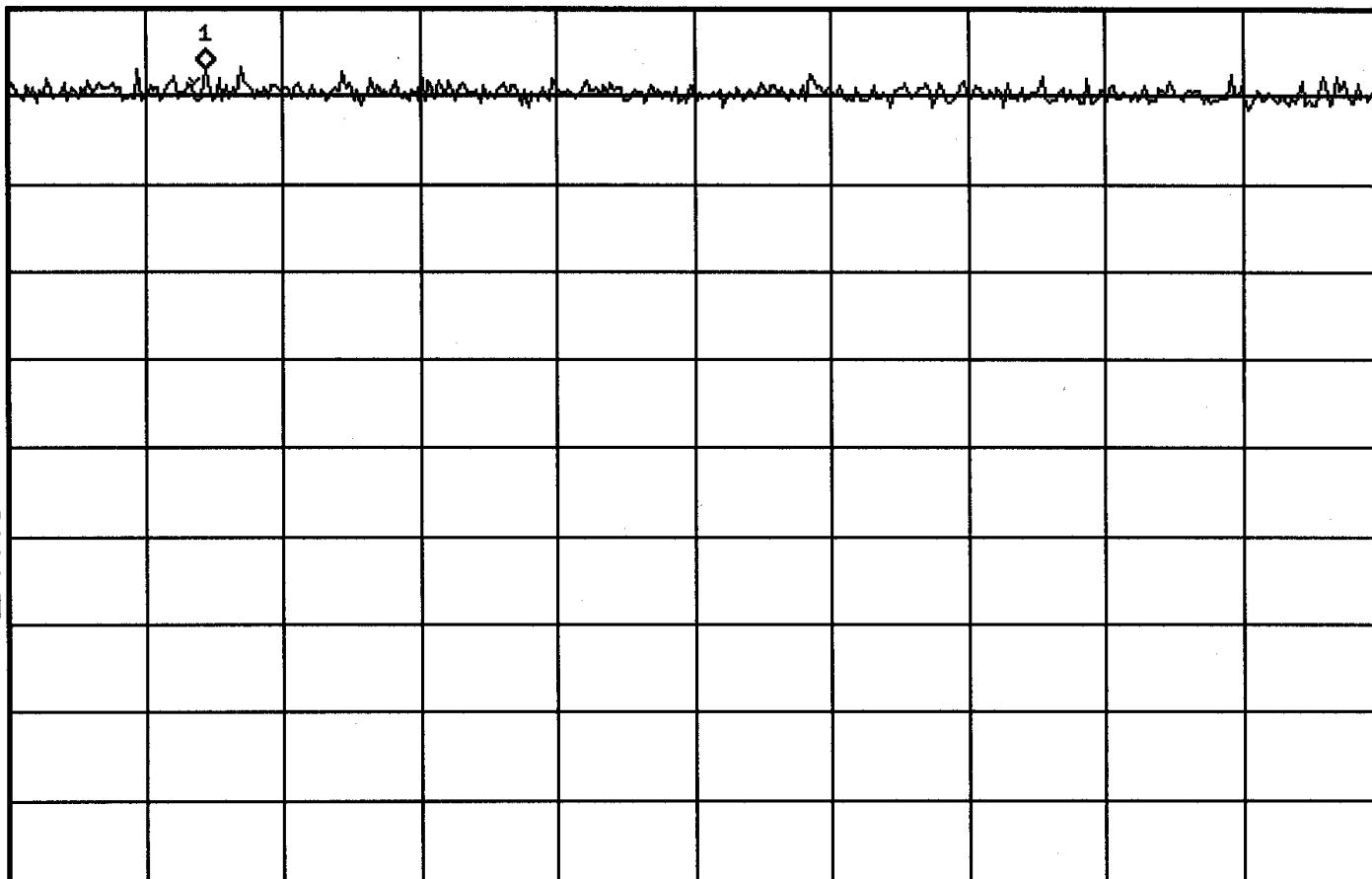
-13.0

dBm

W1 S2

S3 FC

AA



Start 869 MHz

#Res BW 30 kHz

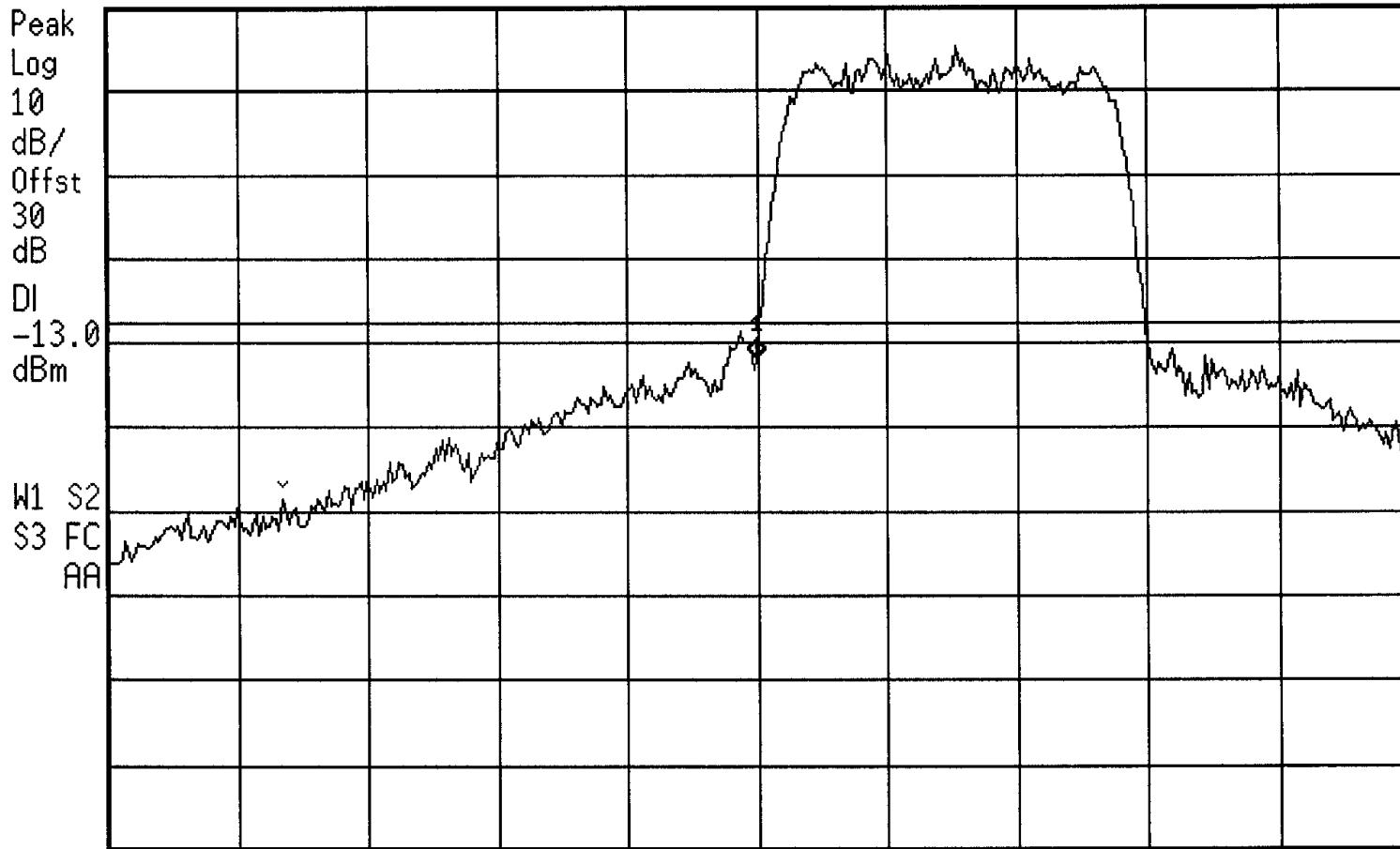
VBW 30 kHz

Stop 894 MHz

#Sweep 5 s

hp 16:08:25 Jan 29, 2002
WITHUS WPE-2100 BAND EDGE CDMA LOW CH
Ref 24.5 dBm #Atten 5 dB

Mkr1 824.000 MHz
-17.25 dBm



hp

16:10:57 Jan 29, 2002

WITHUS WPE-2100 BAND EDGE CDMA HIGH CH

Ref 24.5 dBm

#Atten 5 dB

Mkr1 849.000 MHz

-16.81 dBm

Peak

Log

10

dB/

Offst

30

dB

DI

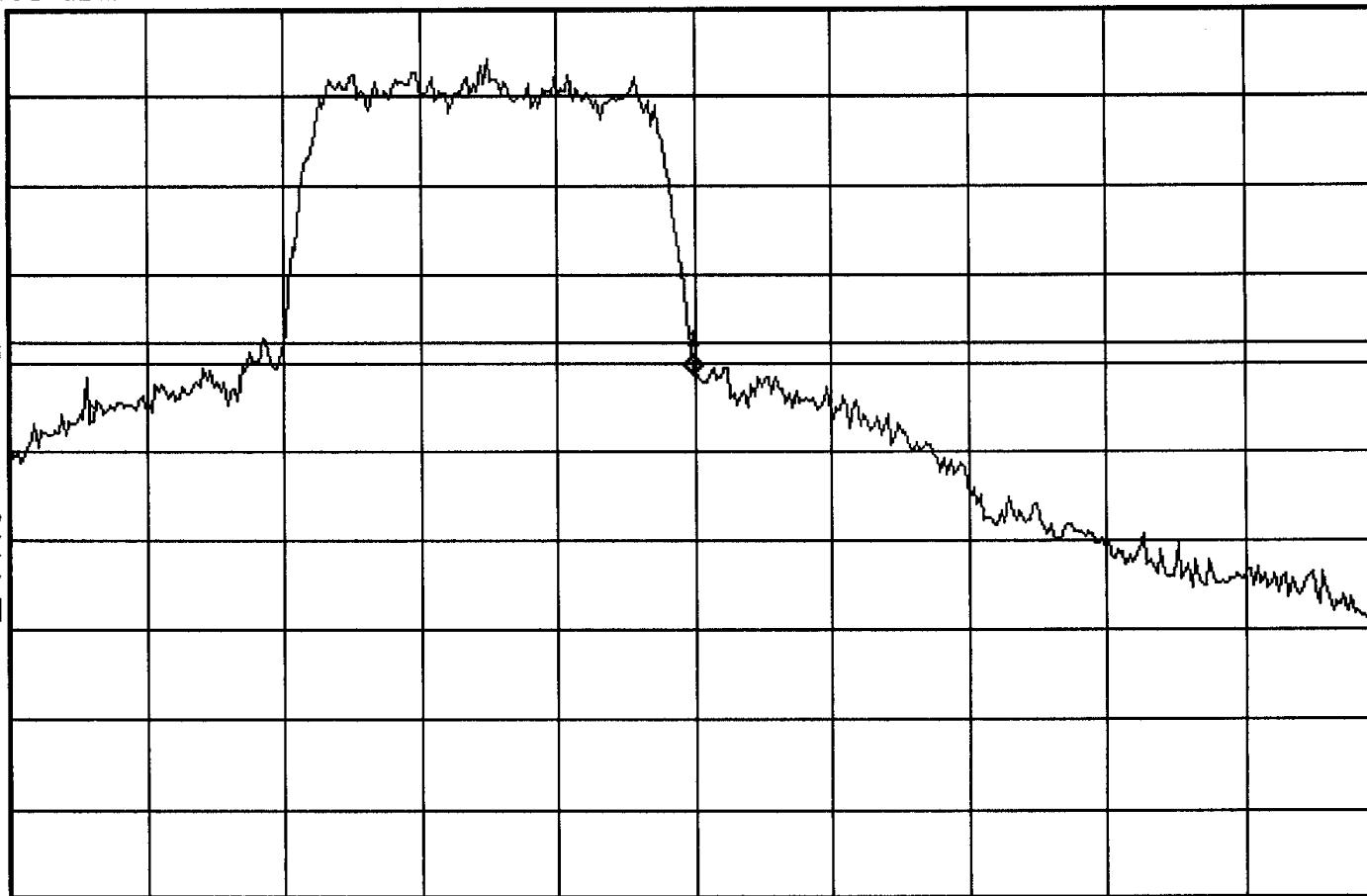
-13.0

dBm

W1 S2

S3 FC

AA



Center 849 MHz

#Res BW 30 kHz

#VBW 30 kHz

Span 5 MHz

#Sweep 2.083 s

[hp] 16:19:30 Jan 29, 2002

WITHUS WPE-2100 CDMA CH 1013

Ref 24.5 dBm

#Atten 5 dB

Peak

Log

10

dB/

0ffst

30

dB

DI

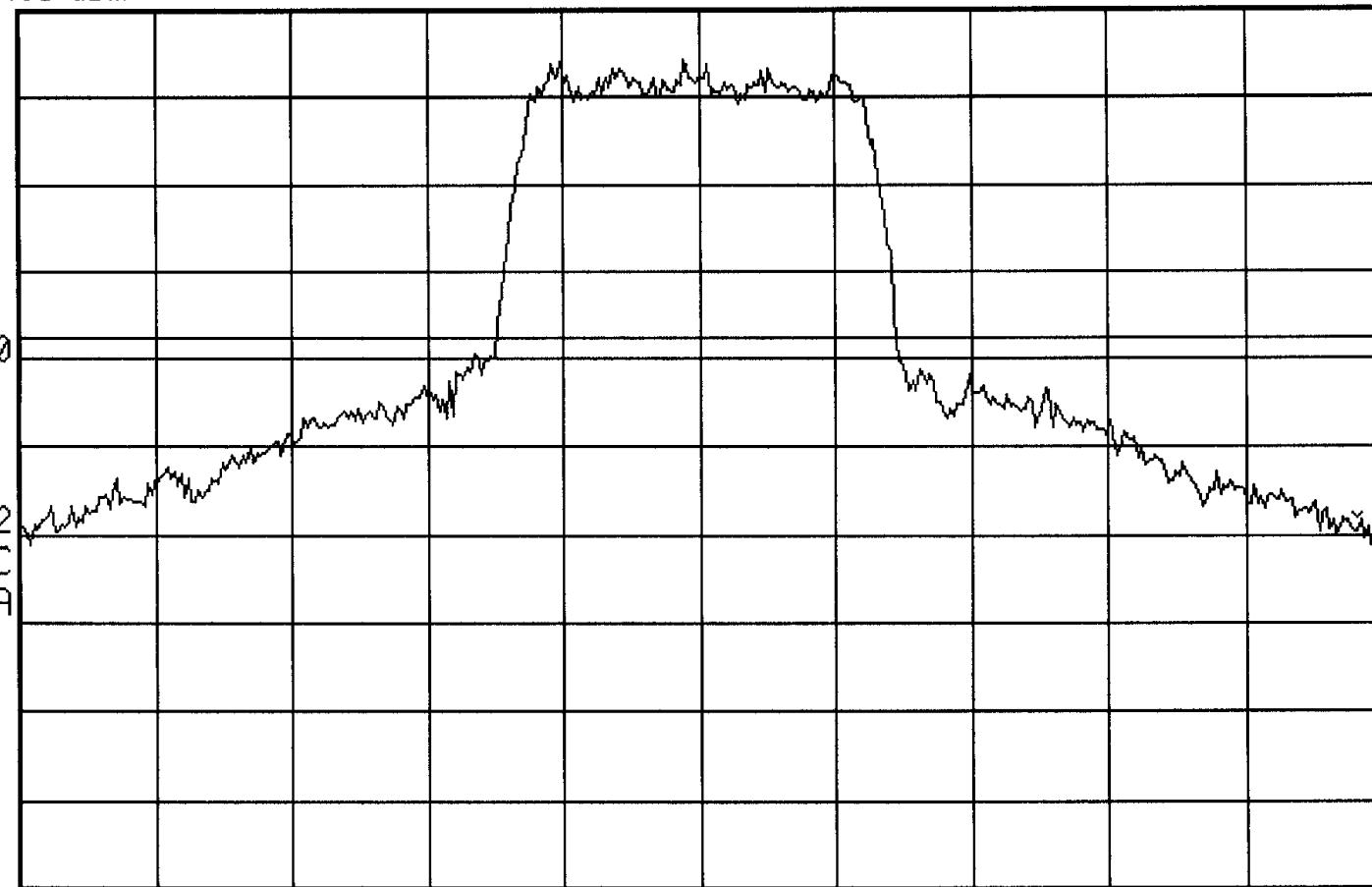
-13.0

dBm

S1 W2

S3 FC

AA



Center 824.7 MHz

#Res BW 30 kHz

Span 5 MHz

#VBW 30 kHz

#Sweep 2.083 s

hp 16:20:37 Jan 29, 2002

WITHUS WPE-2100 CDMA CH 363

Ref 24.5 dBm

*Atten 5 dB

Peak

Log

10

dB/

Offset

30

dB

DI

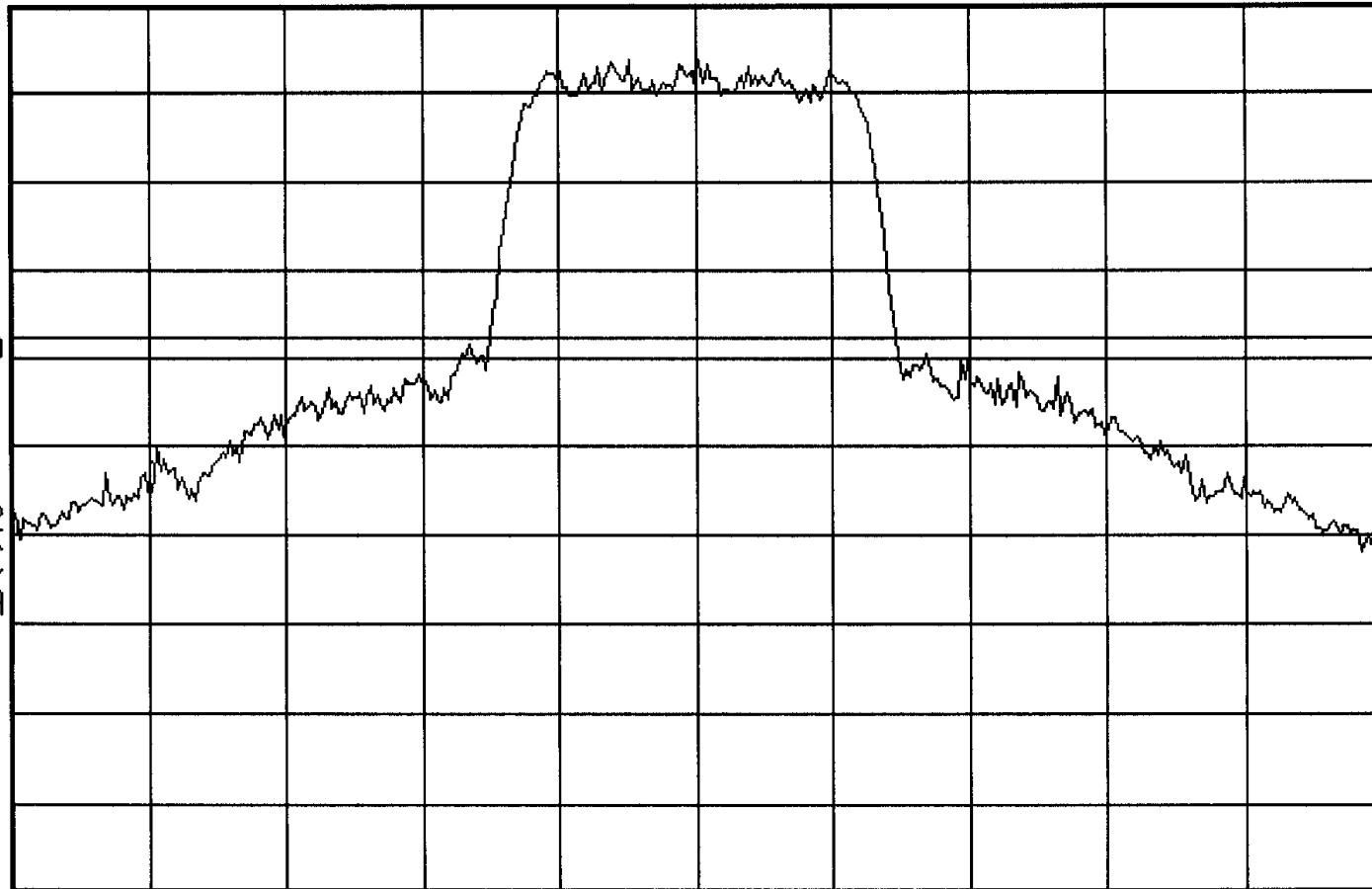
-13.0

dBm

S1 W2

S3 FC

AA



Center 835.9 MHz

#Res BW 30 kHz

Span 5 MHz

#VBW 30 kHz

#Sweep 2.083 s

hp 16:21:53 Jan 29, 2002

WITHUS WPE-2100 CDMA CH 777

Ref 24.5 dBm

*Atten 5 dB

Peak

Log

10

dB/

Offset

30

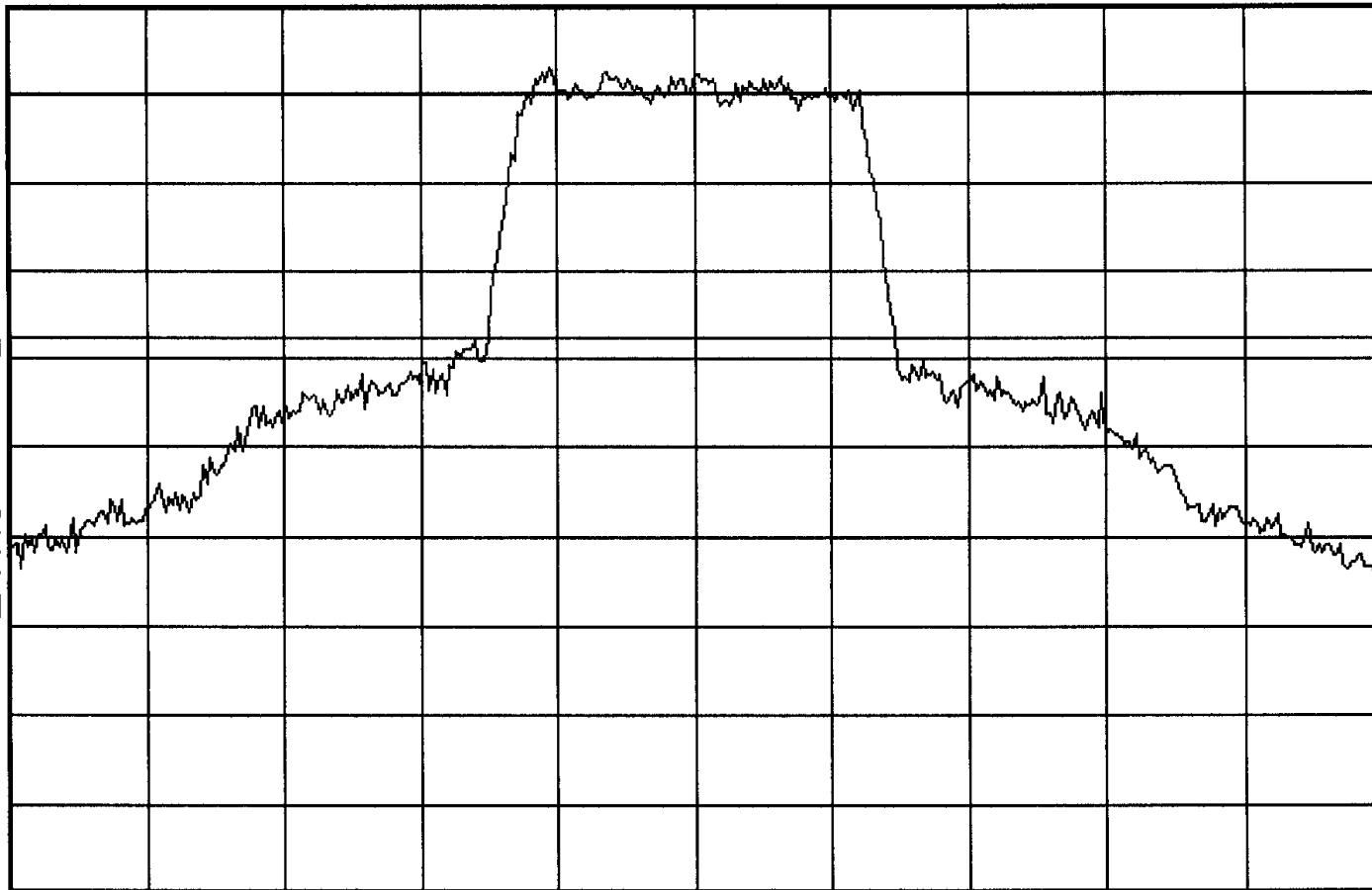
dB

DI

-13.0

dBm

S1 W2
S3 FC
AA



Center 848.3 MHz

*Res BW 30 kHz

*VBW 30 kHz

Span 5 MHz

*Sweep 2.083 s