

CERTIFICATE OF COMPLIANCE **FCC PART 24 CERTIFICATION**

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Applicant Information:

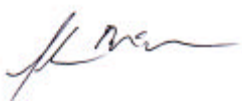
DOWTELECOM INC.
4th Floor, Woosong Bldg.,
361-10, Yatap-Dong,
Buandang-Gu, Seongnam-Si,
Gyunggi-Do, Korea 463-828

FCC Classification:	Licensed Base Station for Part 24 (PCB)
FCC Rule Part(s):	§24(E), §2
FCC ID:	PUNDTP-1900
Model No.:	DTP-1900
Equipment Type:	PCS CDMA Wireless Local Loop Terminal
Tx Frequency Range:	1851.25 - 1908.75 MHz
Rx Frequency Range:	1931.25 - 1988.75 MHz
Max. RF Output Power:	0.839 Watts EIRP
Frequency Tolerance:	2.5 PPM
Emission Designator:	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.

Celltech Research Inc. certifies that no party to this application has been denied FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).



Shawn McMillen
General Manager
Celltech Research Inc.



TABLE OF CONTENTS

1.1 GENERAL INFORMATION	1
2.1 MEASUREMENT PROCEDURES	2
Occupied Bandwidth (2.1049, 24.238)	2
Spurious Emissions at Antenna Terminal (2.1051)	2
Radiated Spurious & Harmonic Emissions (2.1053)	2
Frequency Stability/Temperature Variation (2.1055, 24.135)	3
3.1 TEST DATA	4
Effective Isotropic Radiated Power Output	4
Field Strength of Spurious Radiation	5-7
Frequency Stability	8-9
4.1 LIST OF TEST EQUIPMENT	10
5.1 CONCLUSION	11

ATTACHMENT A:	COVER LETTER(S)
ATTACHMENT B:	ATTESTATION STATEMENT(S)
ATTACHMENT C:	TEST REPORT
ATTACHMENT D:	TEST PLOTS
ATTACHMENT E:	FCC ID LABEL & LOCATION
ATTACHMENT F:	TEST SETUP PHOTOGRAPHS
ATTACHMENT G:	EXTERNAL EUT PHOTOGRAPHS
ATTACHMENT H:	INTERNAL EUT PHOTOGRAPHS
ATTACHMENT I:	BLOCK DIAGRAM(S)
ATTACHMENT J:	CIRCUIT DIAGRAMS
ATTACHMENT K:	CIRCUIT DESCRIPTION
ATTACHMENT L:	PARTS LIST
ATTACHMENT M:	TUNE UP PROCEDURE
ATTACHMENT N:	ANTENNA SPECIFICATIONS
ATTACHMENT O:	OPERATIONAL DESCRIPTION
ATTACHMENT P:	USER'S MANUAL
ATTACHMENT Q:	SAR MEASUREMENT REPORT

MEASUREMENT REPORT - FCC PART 24

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.

§2.1033(a) General Information

APPLICANT:

**DOWTELECOM INC.
4th Floor, Woosong Bldg., 361-10, Yatap-Dong,
Buandang-Gu, Seongnam-Si,
Gyeonggi-Do, Korea 463-828**

FCC ID	PUNDTP-1900
Model No.	DTP-1900
EUT Type	PCS CDMA Wireless Local Loop Terminal
FCC Classification	Licensed Base Station for Part 24 (PCB)
FCC Rule Part(s)	§24(E), §2
Max. RF Output Power	0.839 Watts EIRP
Tx Freq. Range	1851.25 - 1908.75 MHz
Rx Freq. Range	1931.25 - 1988.75 MHz
Emission Designator	1M25F9W
Modulation	PCS CDMA
Antenna Type	Omni-Directional Swivel Antenna
Power Supply	1. 9VDC 1.3A AC/DC Power Adapter (DOWTEL Model: SIH-1309WN) 2. Internal Battery Backup

2.1 MEASUREMENT PROCEDURES

2.2 OCCUPIED BANDWIDTH - §2.1049

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 with and without internal data modulation. 100% of the in-band modulation was below the specified mask per §24.238.

2.3 OCCUPIED BANDWIDTH EMISSION LIMITS - §24.238

1. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB.
2. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
3. When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
4. The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

2.4 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

The level of the carrier and the various conducted spurious and harmonic frequencies was 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. The transmitter was operating at maximum power with internal data modulation.

2.5 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

Radiated and harmonic emissions above 1 GHz were measured at our 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 from 1 to 4 meters and the polarization was varied to determine the worst-case emission level.

2.6 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055, §24.135

Minimum Standard:

The minimum frequency stability shall be $\pm 0.00005\%$ ($\pm 300\text{Hz}$) referenced to a received carrier frequency from a base station. This meets the requirement for operational accuracy of 0.00005% for digital mode.

Measurement Method:

The frequency stability of the transmitter was measured by:

1. Temperature: The temperature was varied from -30°C to $+60^{\circ}\text{C}$ 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 varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied. The EUT was tested down to the battery endpoint.

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.
4. Frequency measurements were made at 10°C intervals up to $+60^{\circ}\text{C}$, 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

Frequency Tuned	EUT Conducted Power	Max. Field Strength of EUT (Horiz. Pol.)	Horn Gain	Horn Forward Conducted Power	EIRP of EUT Horn Gain + Horn Forward Conducted Power	
(MHz)	(dBm)	(dBm)	(dBi)	(dBm)	(dBm)	Watts
1851.25	25.0	- 9.37	6.67	22.57	29.24	0.839
1880.00	25.0	- 10.88	6.68	21.98	28.66	0.735
1908.75	25.0	- 11.99	6.69	21.62	28.31	0.678

Notes:

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, and for both EUT antenna polarizations and modes. 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 forward power and the antenna gain in dB.

3.3 Field Strength of Spurious Radiation – §2.1053

PCS CDMA Mode

Operating Frequency (MHz): 1851.25 (Channel 25)
Measured EIRP: 29.24 dBm
Measured Conducted Power: 25.0 dBm
Modulation: CDMA (Internal)
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	dBc
3702.50	-100.6	-66.71	9.4	H	-57.31	82.11
5553.75	-101.8	-68.70	10.4	H	-58.30	83.10
7405.00	-100.1	-59.25	10.6	H	-48.65	73.45
9256.25	-100.8	-64.44	11.4	H	-53.04	77.84
11107.50	-99.56	-60.74	12.4	H	-48.34	73.14
12958.75	-99.62	-62.12	12.2	H	-49.92	74.72
14810.00	-97.72	-59.83	13.7	H	-46.13	70.93
16661.25	-97.30	-58.84	14.7	H	-44.14	68.94
18512.50	-98.26	-70.94	7.5	H	-63.44	88.24

Radiated 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 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 forward power and the antenna gain in dB.

Field Strength of Spurious Radiation – §2.1053

PCS CDMA Mode

Operating Frequency (MHz): 1880.00 (Channel 600)
Measured EIRP 28.66 dBm
Measured Conducted Power: 25.0 dBm
Modulation: CDMA (Internal)
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	dBc
3760.00	-101.93	-68.04	9.4	H	-58.64	83.44
5640.00	-100.17	-67.07	10.4	H	-56.67	81.47
7520.00	-99.63	-58.78	10.6	H	-48.18	72.98
9400.00	-101.33	-64.97	11.4	H	-53.57	78.37
11280.00	-99.56	-60.74	12.4	H	-48.34	73.14
13160.00	-100.26	-62.76	12.2	H	-50.56	75.36
15040.00	-97.38	-59.49	13.7	H	-45.79	70.59
16920.00	-97.27	-58.81	14.7	H	-44.11	68.91
18800.00	-98.36	-71.04	7.5	H	-63.54	88.34

Radiated 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 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 forward power and the antenna gain in dB.

Field Strength of Spurious Radiation – §2.1053

PCS CDMA Mode

Operating Frequency (MHz): 1908.75 (Channel 1175)
Measured EIRP: 28.31 dBm
Measured Conducted Power: 25.0 dBm
Modulation: CDMA (Internal)
Distance: 3 Meters
Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency (MHz)	Field Strength of Spurious Radiation (dBm)	Horn Forward Cond. Pwr. (dBm)	Standard Gain Horn Antenna Gain (dBi)	POL (H/V)	EIRP (dBm)	dBc
3817.50	-100.49	-66.60	9.4	H	-57.20	82.00
5726.25	-99.15	-66.05	10.4	H	-55.65	80.45
7635.00	-100.35	-59.50	10.6	H	-48.90	73.70
9543.75	-99.38	-63.02	11.4	H	-51.62	76.42
11452.50	-100.03	-61.21	12.4	H	-48.81	73.61
13361.25	-95.71	-58.21	12.2	H	-46.01	70.81
15270.00	-98.06	-60.17	13.7	H	-46.47	71.27
17178.75	-97.02	-58.56	14.7	H	-43.86	68.66
19087.50	-97.21	-69.89	7.5	H	-62.39	87.19

Radiated Measurements by Substitution Method:

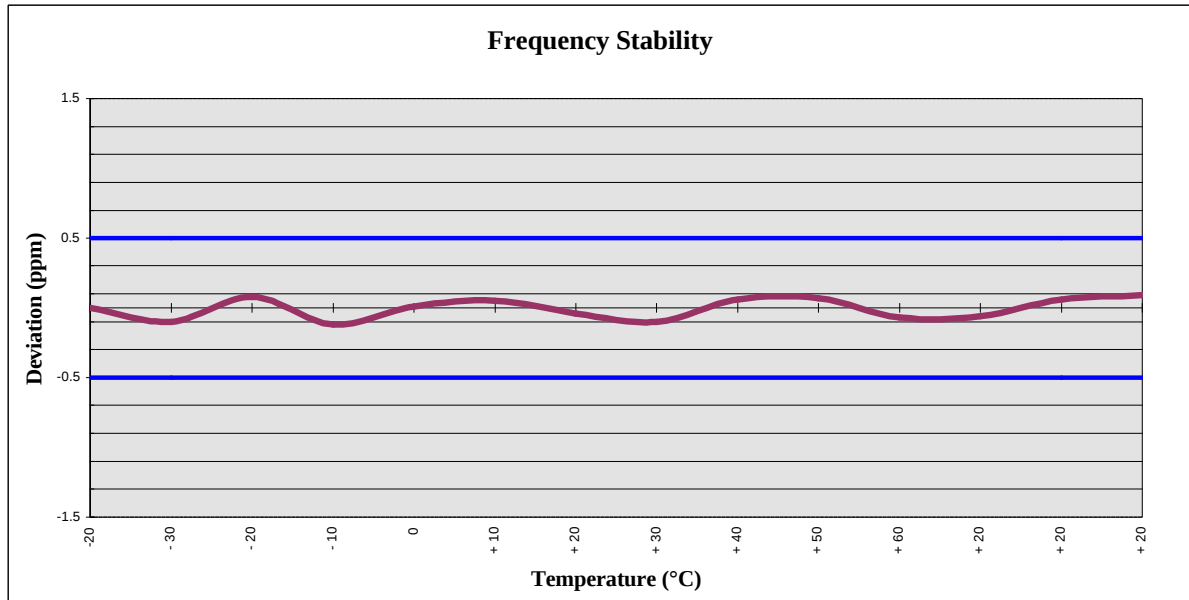
The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A 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 forward power and the antenna gain in dB.

3.4 FREQUENCY STABILITY (PCS CDMA) - § 24.135

Operating Frequency: 1,880,000,000 Hz
Channel: 600
Reference Voltage: 3.8 VDC
Deviation Limit: ± 0.00005 % or 0.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,880,000,000	0.000000
100 %		- 30	1,880,000,188	-0.000010
100 %		- 20	1,879,999,850	0.000008
100 %		- 10	1,880,000,226	-0.000012
100 %		0	1,879,999,981	0.000001
100 %		+ 10	1,879,999,906	0.000005
100 %		+ 20	1,880,000,075	-0.000004
100 %		+ 30	1,880,000,188	-0.000010
100 %		+ 40	1,879,999,887	0.000006
100 %		+ 50	1,879,999,868	0.000007
100 %		+ 60	1,880,000,132	-0.000007
85 %		+ 20	1,880,000,113	-0.000006
115 %		+ 20	1,879,999,887	0.000006
BATT. ENDPOINT	na	+ 20	1,879,999,831	0.000009

FREQUENCY STABILITY (PCS CDMA) - § 24.135



4.1 TEST EQUIPMENT

<u>Type</u>	<u>Model</u>	<u>Calib. Date</u>	<u>Serial No.</u>
HP Signal Generator	8648D (9kHz-4.0GHz)	Nov 1999	3847A00611
Rohde & Schwarz Signal Generator	SMR40 (10MHz-40GHz)	Nov 2000	835537/022
Gigatronics Power Meter	8652A	Oct 1999	1835272
Gigatronics Power Sensor (2)	80701A (0.05-18GHz)	Oct 1999	1833535, 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 1999	US38433013
Audio Analyzer	HP 8903B	March 1999	3729A18691
Modulation Analyzer	HP 8901A	March 1999	3749A07154
Frequency Counter	HP 53181A (3GHz)	May 1999	3736A05175
DC Power Supply	HP E3611A	N/A	KR83015294
CDMA Base Station Test Set	Agilent E8285A	N/A	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. 2000	6267
Double Ridged Horn Antenna	ETS 3115 (1-18GHz)	Oct. 2000	6276
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept 1998	9120A-239
Horn Antenna	Chase BBHA 9120-A (0.7-4.8GHz)	Sept 1998	9120A-240
Roberts Dipoles	Compliance Design (2 sets) 3121C	June 2000	
Spectrum Analyzer	HP 8594E	March 2000	3543A02721
Spectrum Analyzer	HP E4408B	Nov 1999	US39240170
Shielded Screen Room	Lindgren R.F. 18W-2/2-0	N/A	16297
Environmental Chamber	ESPEC ECT-2 (Temperature/Humidity)	Feb 2000	0510154-B

5.1 CONCLUSION

The data in this measurement report shows that the DOWTELECOM INC. Model: DTP-1900 PCS CDMA Wireless Local Loop Terminal FCC ID: PUNDTP-1900 complies with all the requirements of Parts 2 and 24 of the FCC rules.

TEST PLOTS



15:24:41 Sep 10, 2001

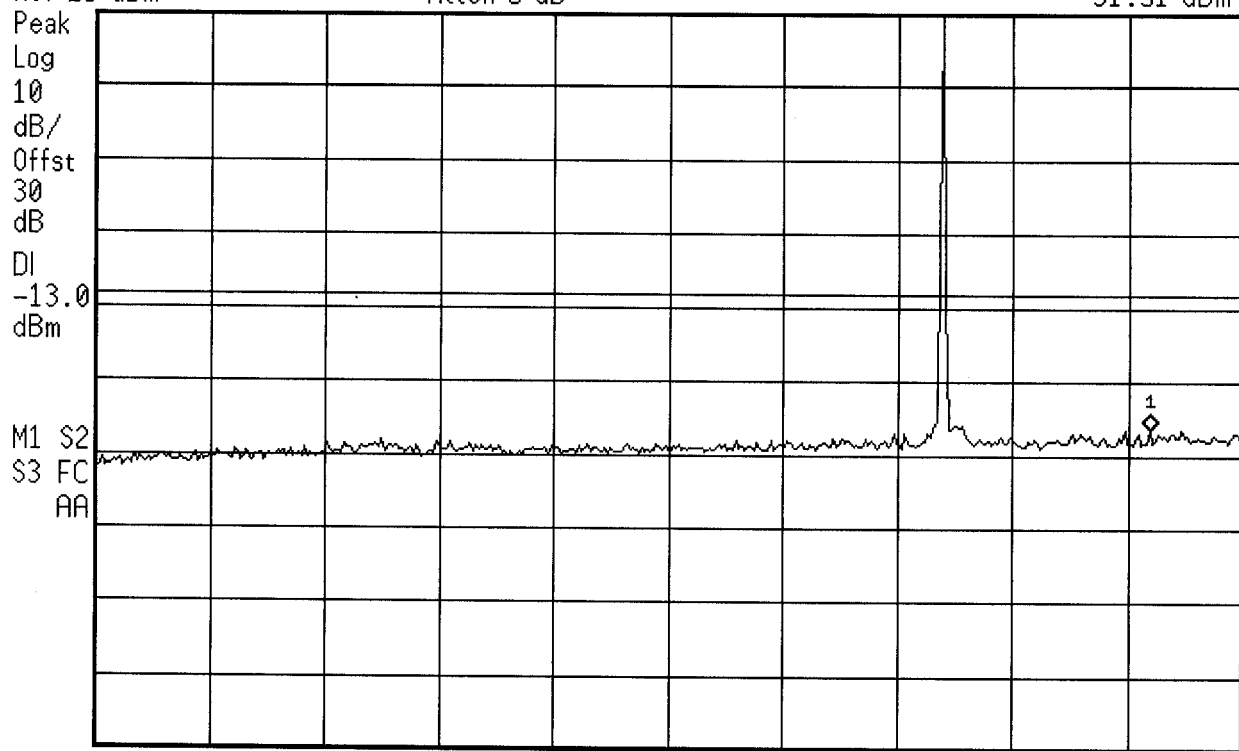
DOW TELECOM COND SPURS CH 25

Ref 25 dBm

Atten 5 dB

Mkr1 2.301 GHz

-31.51 dBm



Start 10 MHz

#Res BW 1 MHz

VBW 1 MHz

Stop 2.5 GHz

Sweep 6.225 ms



15:25:39 Sep 10, 2001

DOW TELECOM COND SPURS CH 25

Ref 25 dBm

Atten 5 dB

Mkr1 2.988 GHz

-33.42 dBm

Peak

Log

10

dB/

Offst

30

dB

DI

-13.0

dBm

M1 S2

S3 FC

AA

1

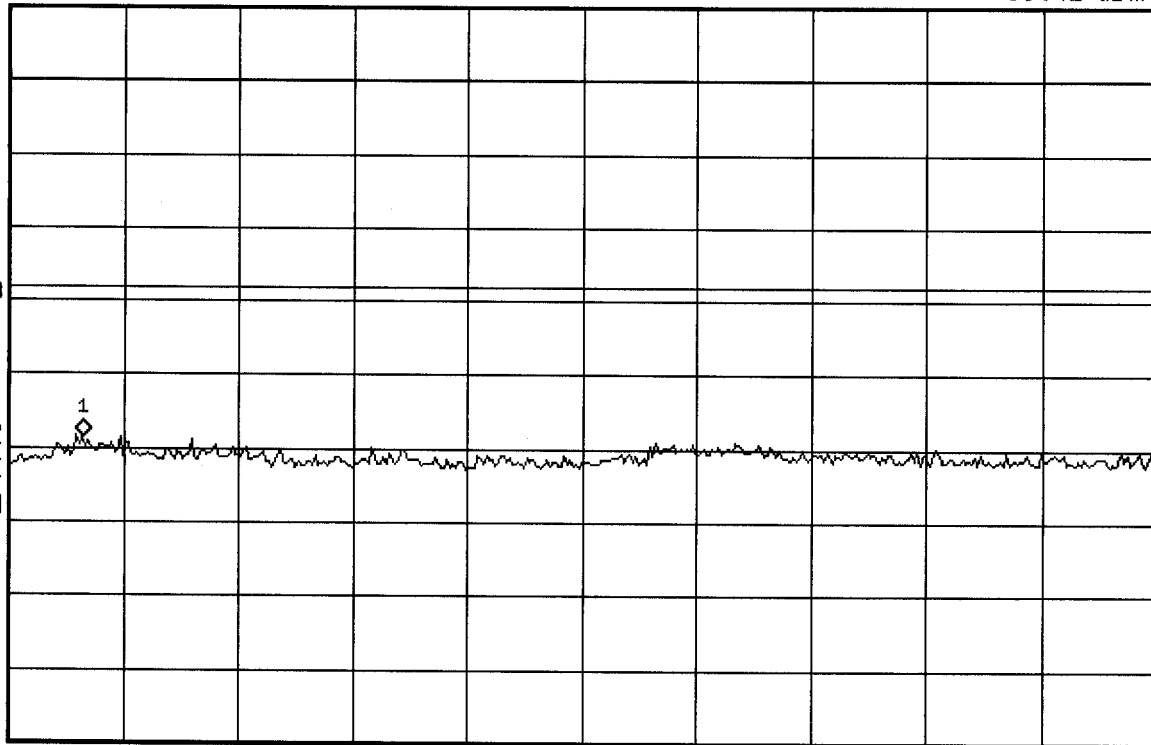
Start 2.5 GHz

*Res BW 1 MHz

VBW 1 MHz

Stop 10 GHz

Sweep 18.75 ms





15:26:13 Sep 10, 2001

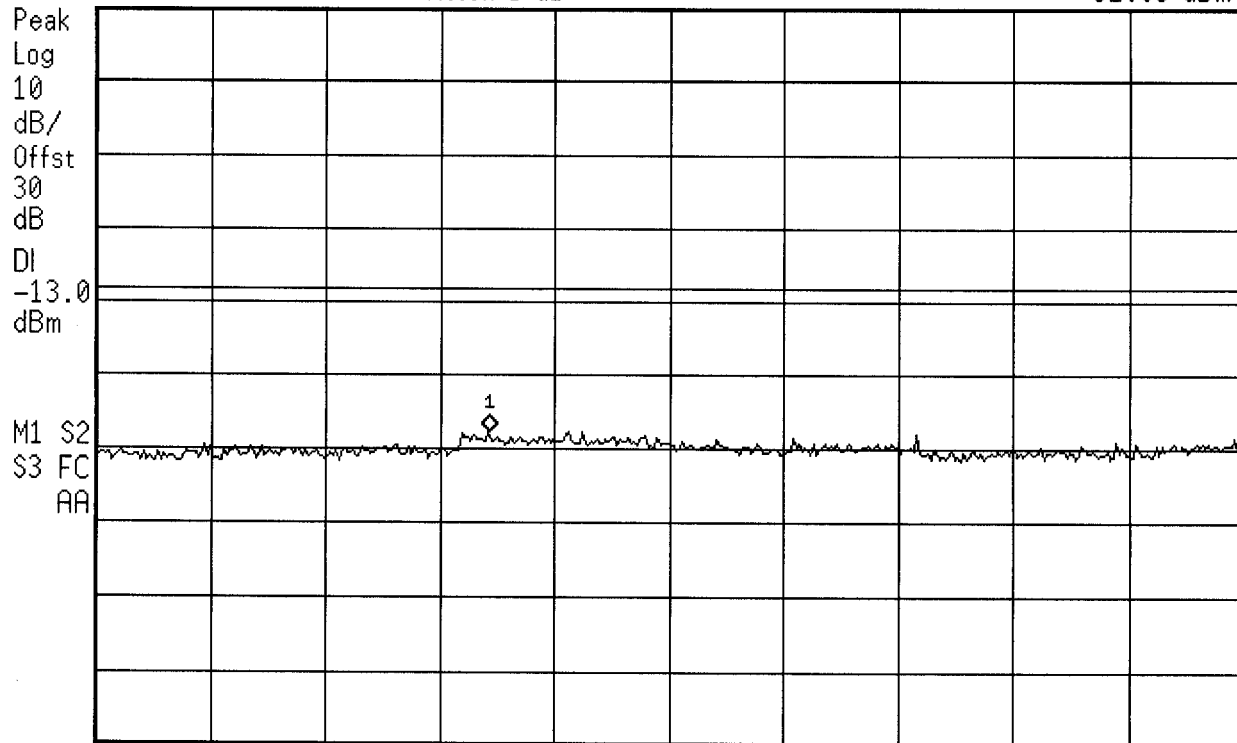
DOW TELECOM COND SPURS CH 25

Ref 25 dBm

Atten 5 dB

Mkr1 13.43 GHz

-32.83 dBm



*Res BW 1 MHz

VBW 1 MHz

Sweep 100 ms



15:29:16 Sep 10, 2001

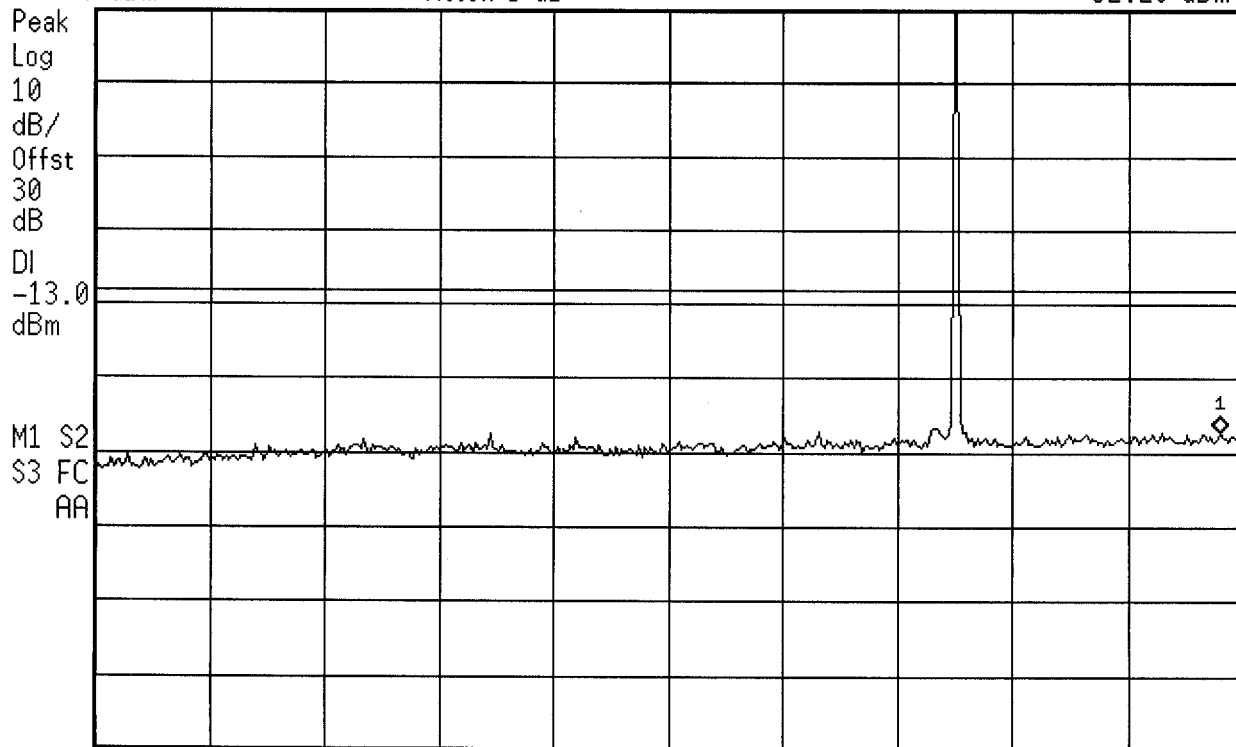
DOW TELECOM COND SPURS CH 600

Ref 25 dBm

Atten 5 dB

Mkr1 2.450 GHz

-32.26 dBm



Start 10 MHz

*Res BW 1 MHz

VBW 1 MHz

Stop 2.5 GHz

Sweep 6.225 ms

hp 15:29:56 Sep 10, 2001

DOW TELECOM COND SPURS CH 600

Ref 25 dBm

Atten 5 dB

Mkr1 2.988 GHz

-33 dBm

Peak

Log

10

dB/

Offst

30

dB

DI

-13.0

dBm

M1 S2

S3 FC

AA

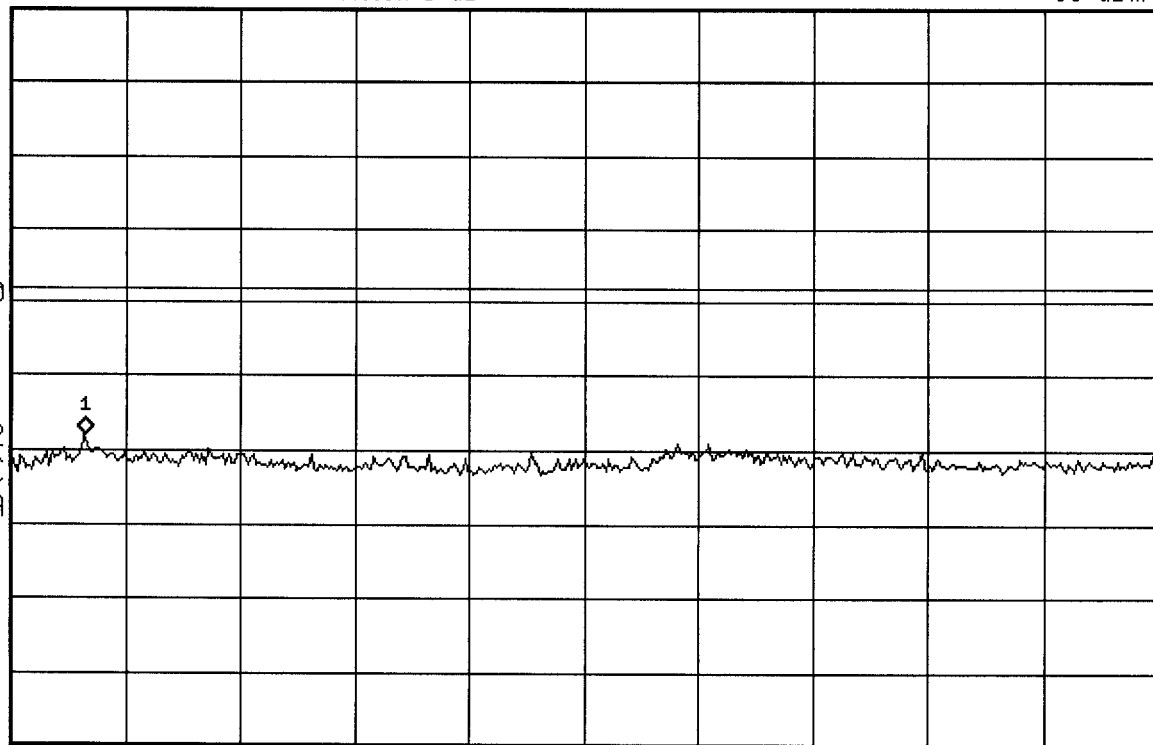
Start 2.5 GHz

#Res BW 1 MHz

VBW 1 MHz

Stop 10 GHz

Sweep 18.75 ms



hp 15:30:27 Sep 10, 2001

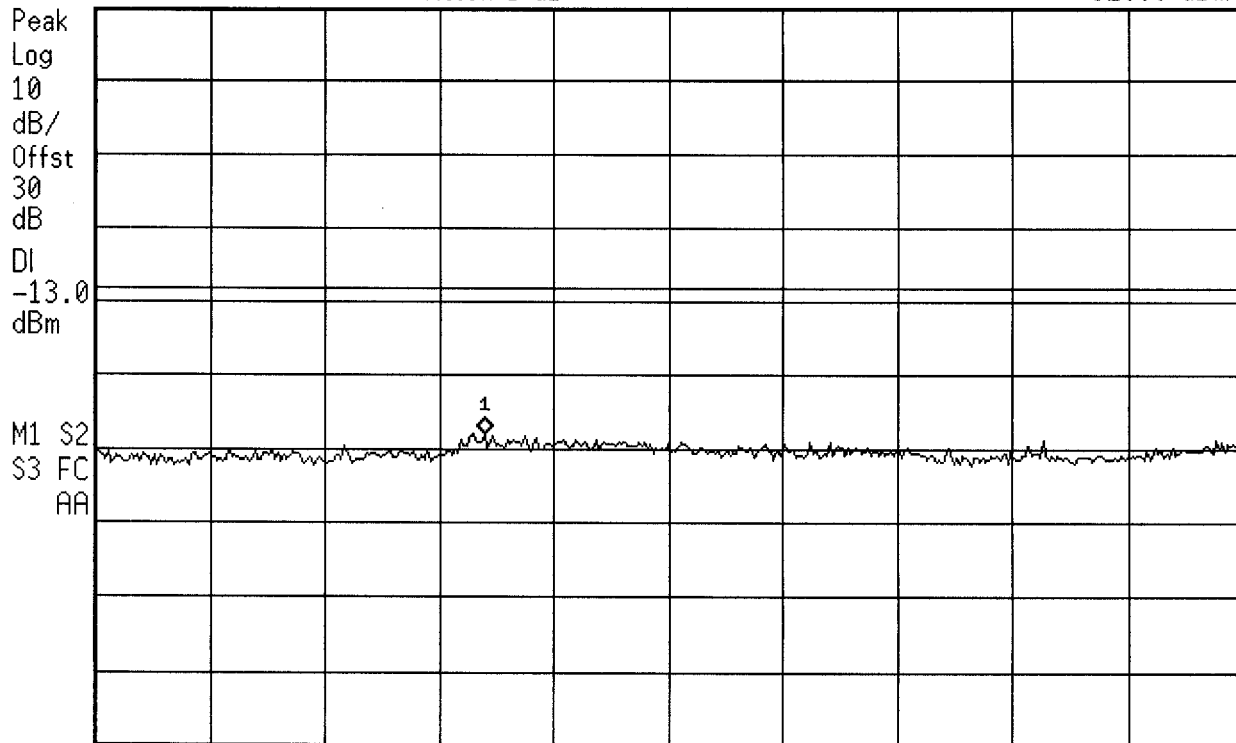
DOW TELECOM COND SPURS CH 600

Ref 25 dBm

Atten 5 dB

Mkr1 13.40 GHz

-32.99 dBm



Start 10 GHz

*Res BW 1 MHz

VBW 1 MHz

Stop 20 GHz

Sweep 100 ms

hp 15:34:04 Sep 10, 2001

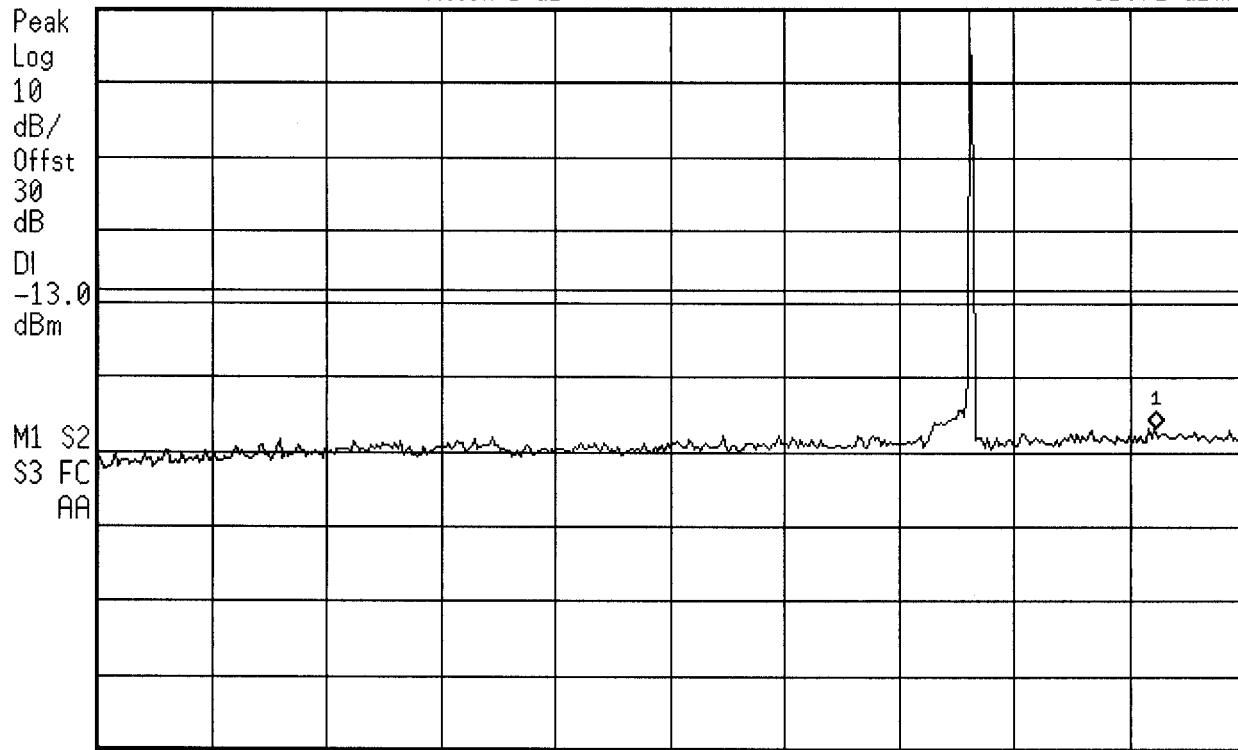
DOW TELECOM COND SPURS CH 1175

Ref 25 dBm

Atten 5 dB

Mkr1 2.307 GHz

-31.71 dBm



Start 10 MHz

#Res BW 1 MHz

VBW 1 MHz

Stop 2.5 GHz

Sweep 6.225 ms

hp 15:34:35 Sep 10, 2001

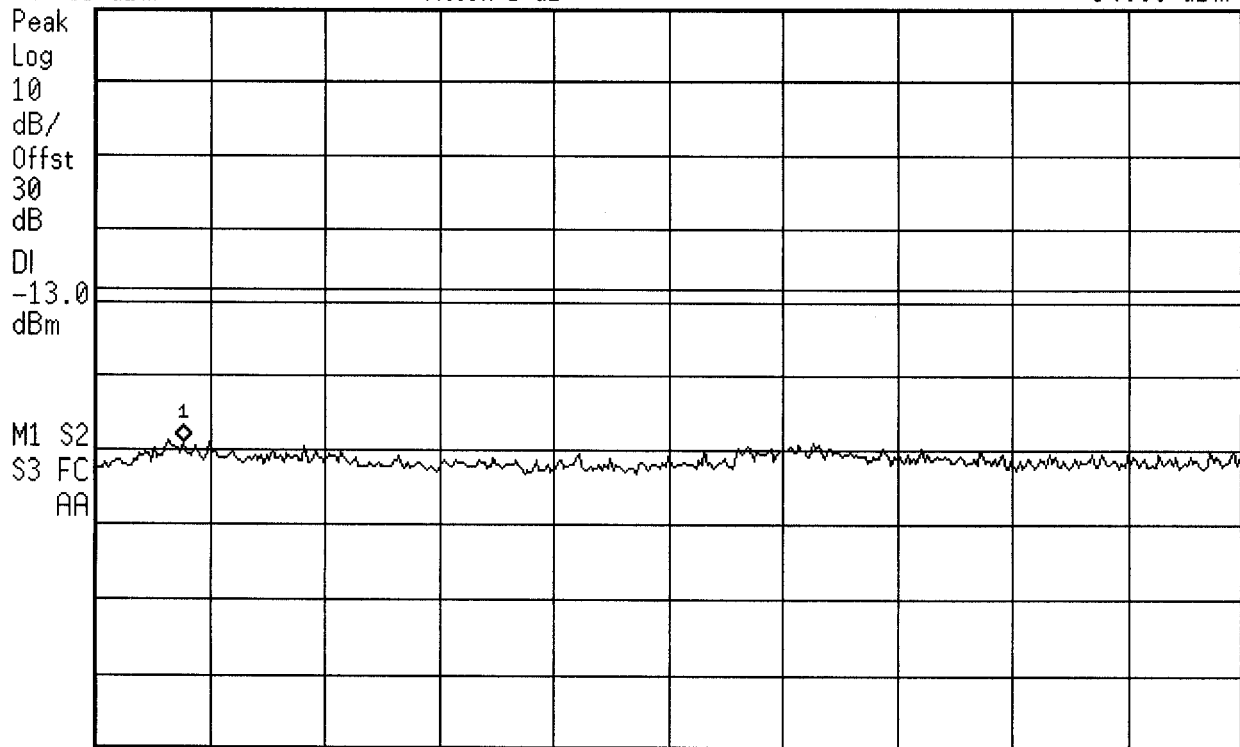
DOW TELECOM COND SPURS CH 1175

Ref 25 dBm

Atten 5 dB

Mkr1 3.081 GHz

-34.09 dBm



Start 2.5 GHz

*Res BW 1 MHz

VBW 1 MHz

Stop 10 GHz

Sweep 18.75 ms



15:35:01 Sep 10, 2001

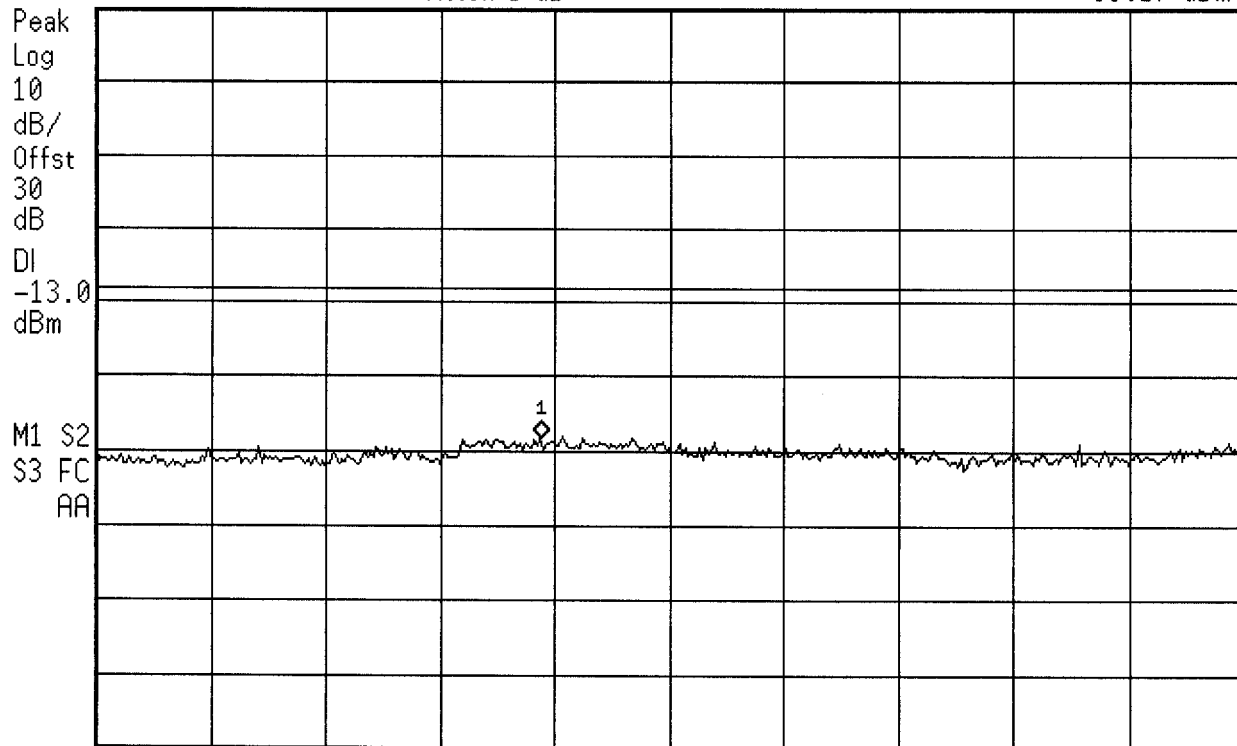
DOW TELECOM COND SPURS CH 1175

Mkr1 13.88 GHz

Ref 25 dBm

Atten 5 dB

-33.17 dBm



Start 10 GHz

Stop 20 GHz

#Res BW 1 MHz

VBW 1 MHz

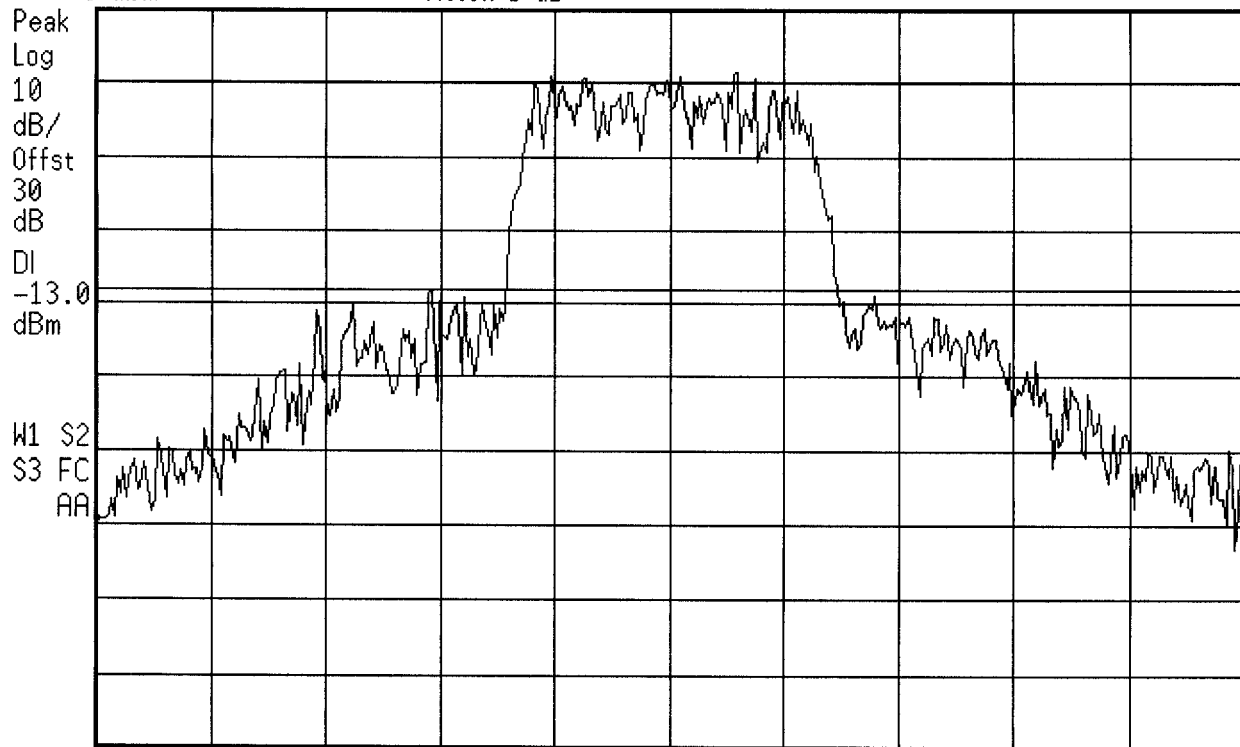
Sweep 100 ms

hp 15:45:01 Sep 10, 2001

DOW TELECOM CH 25

Ref 25 dBm

Atten 5 dB



Center 1.851 GHz

*Res BW 30 kHz

VBW 30 kHz

Span 5 MHz

Sweep 13.89 ms



15:43:50 Sep 10, 2001

DOW TELECOM CH 600

Ref 25 dBm

Atten 5 dB

Peak

Log

10

dB/

Offst

30

dB

DI

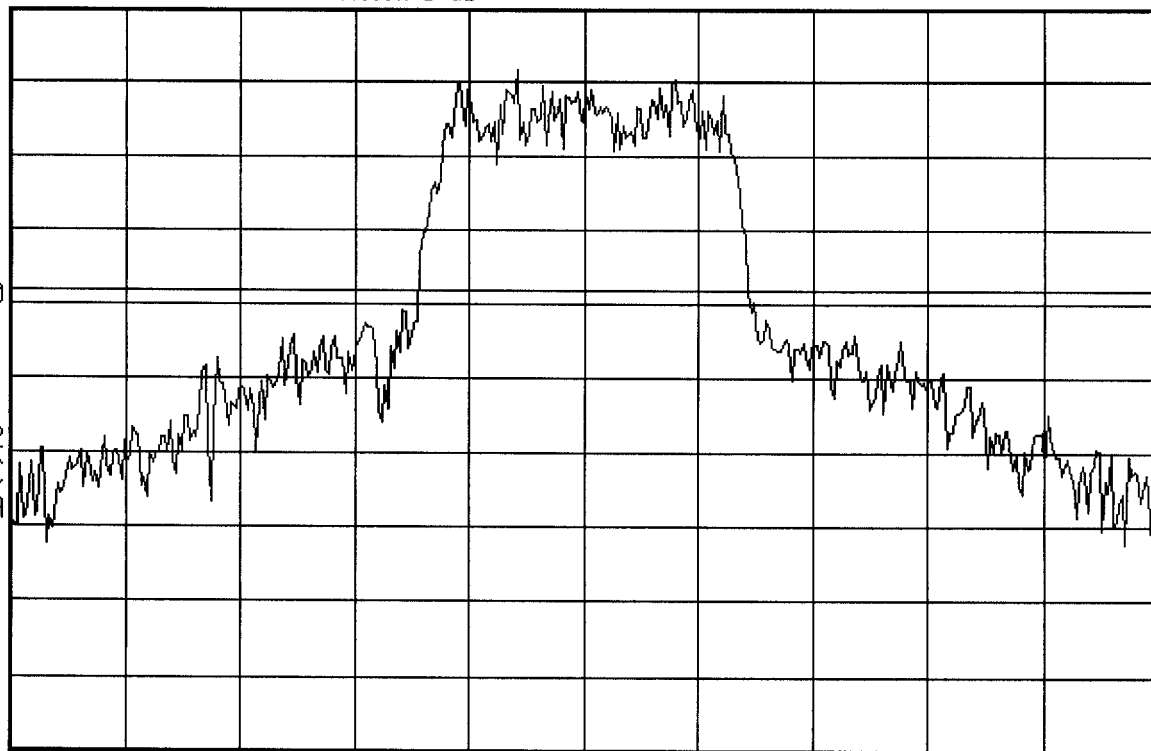
-13.0

dBm

W1 S2

S3 FC

AA



Center 1.88 GHz

*Res BW 30 kHz

VBW 30 kHz

Span 5 MHz

Sweep 13.89 ms



15:38:34 Sep 10, 2001

DOW TELECOM CH 1175

Ref 25 dBm

Atten 5 dB

Peak

Log

10

dB/

Offst

30

dB

DI

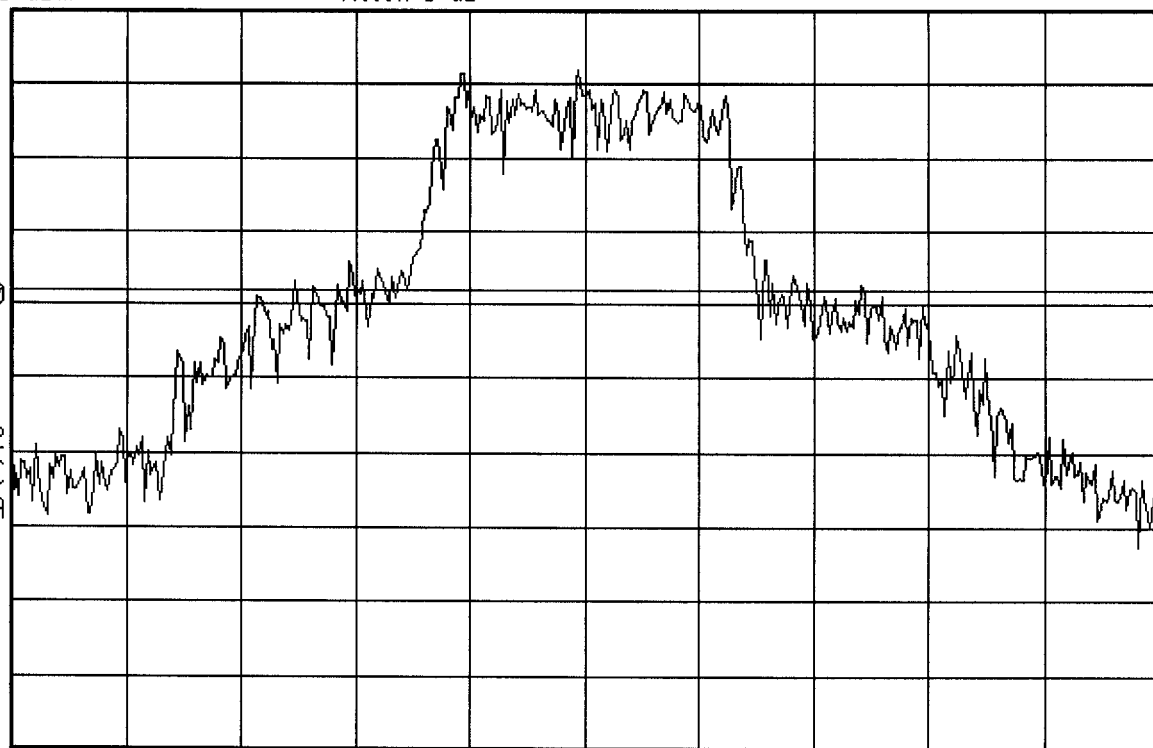
-13.0

dBm

W1 S2

S3 FC

AA



Center 1.909 GHz

*Res BW 30 kHz

VBW 30 kHz

Span 5 MHz

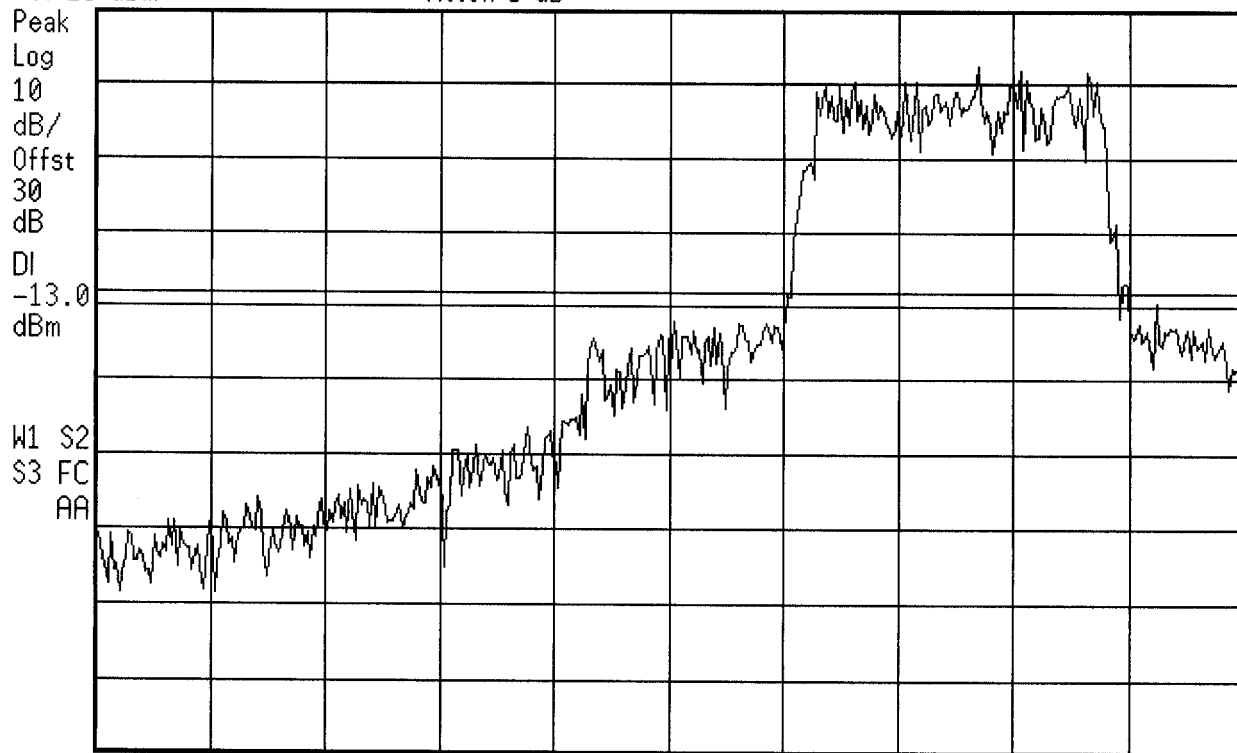
Sweep 13.89 ms

hp 15:48:30 Sep 10, 2001

DOW TELECOM BAND EDGE LOW

Ref 25 dBm

Atten 5 dB



Center 1.85 GHz

*Res BW 30 kHz

VBW 30 kHz

Span 5 MHz

Sweep 13.89 ms



15:51:29 Sep 10, 2001

DOW TELECOM BAND EDGE HIGH

Ref 25 dBm

Atten 5 dB

Peak

Log

10

dB/

Offst

30

dB

DI

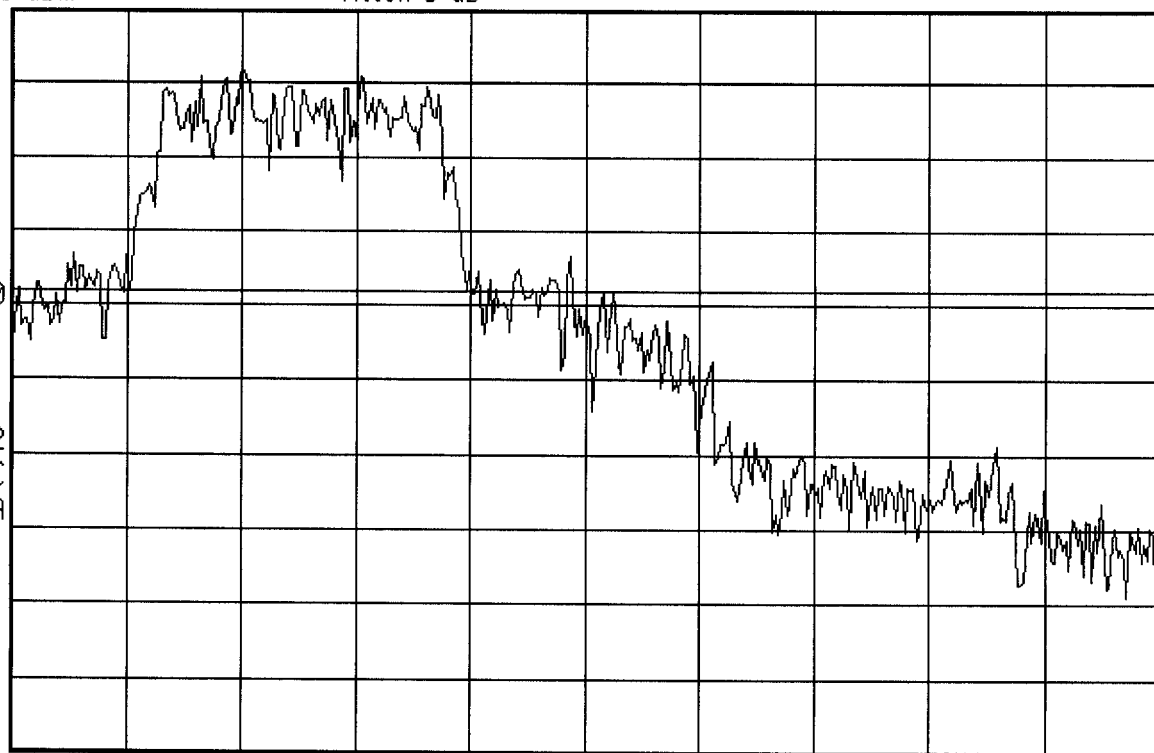
-13.0

dBm

W1 S2

S3 FC

AA



Center 1.91 GHz

*Res BW 30 kHz

VBW 30 kHz

Span 5 MHz

Sweep 13.89 ms

hp 15:56:16 Sep 10, 2001

DOW TELECOM BAND WIDTH

Ref 25 dBm

Atten 5 dB

Samp

Log

10

dB/

Offst

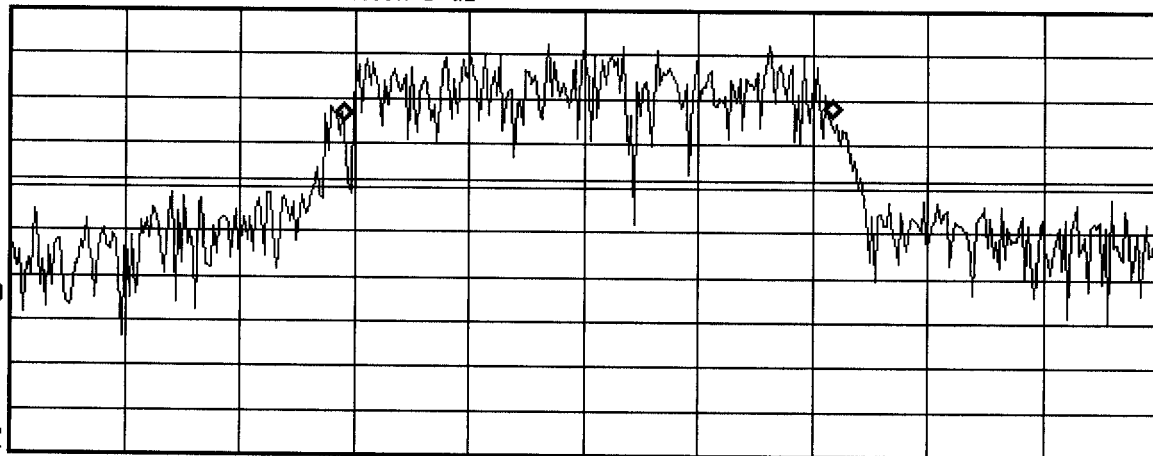
30

dB

DI

-13.0

dBm



W1 S2

Center 1.88 GHz

Span 3 MHz

*Res BW 30 kHz

*VBW 300 kHz

Sweep 9.167 ms

Occupied Bandwidth Results (measuring..)

Occupied Bandwidth
1.281 MHz

Occ BW % Pwr 99.00 %

Transmit Freq Error 8.706 kHz