Test Report S/N: 082001-155PUN Dates of Tests: October 22-24, 2001 FCC Part 22 Certification

CERTIFICATE OF COMPLIANCE FCC PART 22.901(d) 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 Non-Broadcast Station Transmitter (TNB)

FCC Rule Part(s): \$22.901(d), \$2 FCC ID: PUNDTT-800 Model(s): DTT-800

Equipment Type: Cellular CDMA Wireless Local Loop Terminal

Tx Frequency Range: 824.70 - 848.31 MHz
Rx Frequency Range: 869.70 - 893.31 MHz
Max. RF Output Power: 0.307 Watts (ERP)

Frequency Tolerance: 0.5 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)	2
	Spurious Emissions at Antenna Terminal (2.1051)	2
	Radiated Spurious & Harmonic Emissions (2.1053)	2
	Frequency Stability/Temperature Variation (2.1055)	3
3.1	TEST DATA	4
	Effective 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

MEASUREMENT REPORT - FCC PART 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.

§2.1033(a) General Information

APPLICANT:

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

FCC ID	PUNDTT-800
Model(s)	DTT-800
EUT Type	Cellular CDMA Wireless Local Loop Terminal
FCC Classification	Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part(s)	§22.901(d), §2
Max. RF Output Power	0.307 Watts (ERP)
Tx Freq. Range	824.70 - 848.31 MHz
Rx Freq. Range	869.70 - 893.31 MHz
Emission Designator	1M25F9W
Modulation	CDMA
Power Supply	1.9VDC 1.3A AC/DC Power Adapter (DOWTEL Model: SIH-1309WN) 2. Internal Battery Backup

1

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 §22.917.

Specified Limits:

- (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 $40 + \log_{10}$ (mean power output in Watts) dB, whichever was the smaller attenuation.

2.3 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

The level of the carrier and the various conducted spurious frequencies was measured by means of a calibrated spectrum analyzer. 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.

2.4 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.

2.5 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055

Minimum Standard:

The minimum frequency stability shall be \pm 0.00005% (\pm 300Hz) 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 $+60^{\circ}$ 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°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 RADIATED POWER OUTPUT - §2.1046

800MHz CDMA MODE

Frequency Tuned	EUT Conducted Power	Max. Field Strength of EUT (Vert. Pol.)	Dipole Gain	Dipole Forward Conducted Power	ERP o Dipole H Dipole F Conducte	e Gain - Forward
(MHz)	(dBm)	(dBm)	(dBd)	(dBm)	(dBm)	Watts
824.70	25.0	- 18.39	- 1.44	26.19	24.75	0.299
835.89	25.0	- 18.17	- 1.34	26.21	24.87	0.307
848.31	25.0	- 18.87	- 1.24	25.97	24.73	0.297

Notes:

ERP Measurements by Substitution Method:

3.3 FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053

Operating Frequency (MHz): 824.70

Channel: 1013 (Low)

Measured Cond. Pwr. (dBm): 25.0 Measured ERP (dBm): 24.75

Modulation: CDMA (Internal)

Distance: 3 Meters

Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1649.40	-80.60	-52.14	6.6	٧	-45.54	-47.68	72.43
2474.10	-80.46	-54.17	7.8	٧	-46.37	-48.51	73.26
3298.80	-82.22	-63.71	7.75	>	-55.96	-58.10	82.85
4123.50	-82.75	-66.23	7.6	٧	-58.63	-60.77	85.52
4948.20	-82.30	-60.88	8.5	٧	-52.38	-54.52	79.27
5772.90	-81.31	-65.74	8.8	٧	-56.94	-59.08	83.83
6597.60	-81.04	-68.97	9.6	٧	-59.37	-61.51	86.26
7422.30	-79.37	-71.20	9.0	V	-62.20	-64.34	89.09
8247.00	-80.37	-73.59	9.3	٧	-64.29	-66.43	91.18

The spectrum analyzer was set to the following settings:

- 1. Resolution Bandwidth ≤3 kHz
- 2. Video Bandwidth ≥10 kHz
- 3. Sweep Speed ≤2000 Hz/Second
- 4. Detector Mode = Positive Peak

Notes:

ERP Measurements by Substitution Method:

Operating Frequency (MHz): 835.89

Channel: 363 (Mid)

Measured Cond. Pwr. (dBm): 25.0

Measured ERP (dBm): 24.87

Modulation: CDMA (Internal)

Distance: 3 Meters

Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1671.78	-80.59	-50.48	6.6	V	-43.88	-46.02	70.89
2507.67	-80.73	-52.83	7.8	٧	-45.03	-47.17	72.04
3343.56	-82.00	-55.97	7.75	V	-48.22	-50.36	75.23
4179.45	-82.81	-63.91	7.6	V	-56.31	-58.45	83.32
5015.34	-82.24	-61.88	8.5	٧	-53.38	-55.52	80.39
5851.23	-81.43	-68.21	8.8	V	-59.41	-61.55	86.42
6687.12	-81.74	-75.67	9.6	V	-66.07	-68.21	93.08
7523.01	-79.58	-72.13	9.0	V	-63.13	-65.27	90.14
8358.90	-80.40	-76.50	9.3	V	-67.20	-69.34	94.21

The spectrum analyzer was set to the following settings:

- 1. Resolution Bandwidth ≤3 kHz
- 2. Video Bandwidth ≥10 kHz
- 3. Sweep Speed ≤2000 Hz/Second
- 4. Detector Mode = Positive Peak

Notes:

ERP Measurements by Substitution Method:

Operating Frequency (MHz): 848.31

Channel: 777 (High)

Measured Cond. Pwr. (dBm): 25.0

Measured ERP (dBm): 24.73

Modulation: CDMA (Internal)

Distance: 3 Meters

Limit: $43 + 10 \log (W) = 38.13 \text{ dBc}$

Frequency	Field Strength of Spurious Radiation	Horn Forward Cond. Pwr.	Standard Gain Horn Antenna Gain	POL (H/V)	EIRP (dBm)	ERP	dBc
(MHz)	(dBm)	(dBm)	(dBi)				
1696.62	-80.98	-50.26	6.6	V	-43.66	-45.80	70.53
2544.93	-80.65	-53.61	7.8	٧	-45.81	-47.95	72.68
3393.24	-81.72	-56.43	7.75	V	-48.68	-50.82	75.55
4241.55	-82.71	-61.20	7.6	V	-53.60	-55.74	80.47
5089.86	-81.95	-58.29	8.5	V	-49.79	-51.93	76.66
5938.17	-82.30	-63.85	8.8	V	-55.05	-57.19	81.92
6786.48	-78.71	-68.46	9.6	V	-58.86	-61.00	85.73
7634.79	-79.84	-71.97	9.0	V	-62.97	-65.11	89.84
8483.10	-83.22	-73.98	9.3	V	-64.68	-66.82	91.55

The spectrum analyzer was set to the following settings:

- 1. Resolution Bandwidth ≤3 kHz
- 2. Video Bandwidth ≥10 kHz
- 3. Sweep Speed ≤2000 Hz/Second
- 4. Detector Mode = Positive Peak

Notes:

ERP Measurements by Substitution Method:

3.4 FREQUENCY STABILITY - § 2.1055

Operating Frequency: 835,890,000 Hz

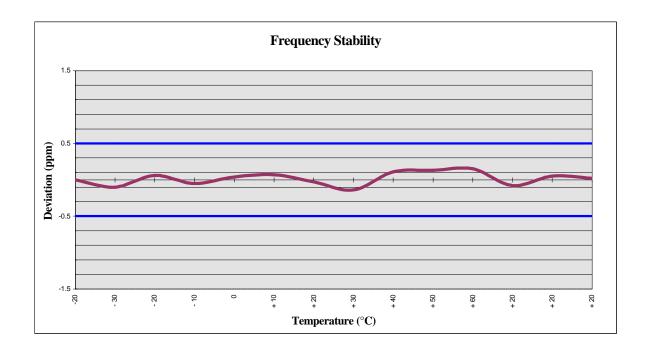
Channel: 363

Reference Voltage: 3.8 VDC

Deviation Limit: ± 0.00005 % or 0.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Deviation (%)
(70)	(VDC)	(C)	(IIZ)	(70)
100 %	3.80	+ 20 (Ref)	835,890,000	0.000000
100 %		- 30	835,890,084	-0.000010
100 %		- 20	835,889,950	0.000006
100 %		- 10	835,890,042	-0.000005
100 %		0	835,889,967	0.000004
100 %		+ 10	835,889,941	0.000007
100 %		+ 20	835,890,025	-0.000003
100 %		+ 30	835,890,117	-0.000014
100 %		+ 40	835,889,908	0.000011
100 %		+ 50	835,889,891	0.000013
100 %		+ 60	835,889,875	0.000015
85 %	3.23	+ 20	835,890,067	-0.000008
115 %	4.37	+ 20	835,889,958	0.000005
BATT. ENDPOINT	3.00	+ 20	835,889,983	0.000002

FREQUENCY STABILITY - § 2.1055



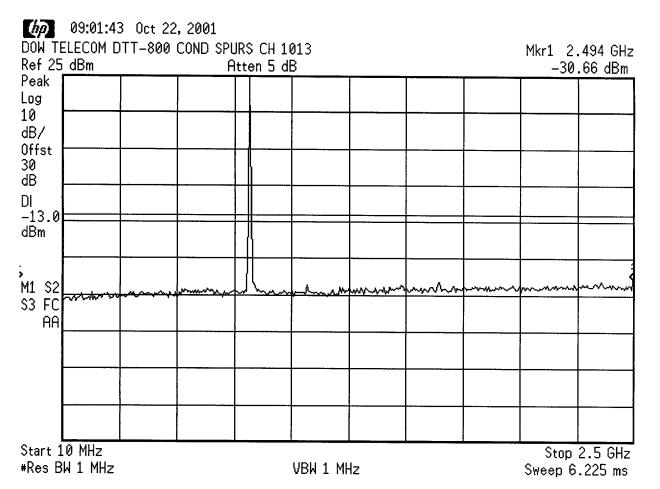
4.1 TEST EQUIPMENT

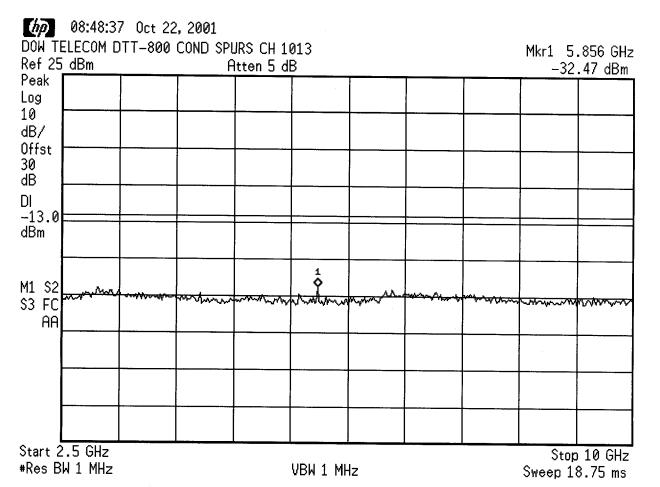
Type	Model	Calib. Date	Serial No.
HP Signal Generator	8648D (9kHz-4.0GHz)	Nov 1999	3847A00611
Rohde & Schwarz Signal Generato	r SMR40 (10MHz-40GHz)	Nov 2000	835537/022
Gigatronics Power Meter	8652A	Oct 1999	1835272
Gigatronics Power Sensor (2)	80701A (0.05-18GHz)	Jan 2001	1833535, 1833542
Amplifier Research 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: DTT-800 FCC ID: PUNDTT-800 Cellular CDMA Wireless Local Loop Terminal complies with all the requirements of Parts 2 and 22.901(d) of the FCC rules.

TEST PLOTS



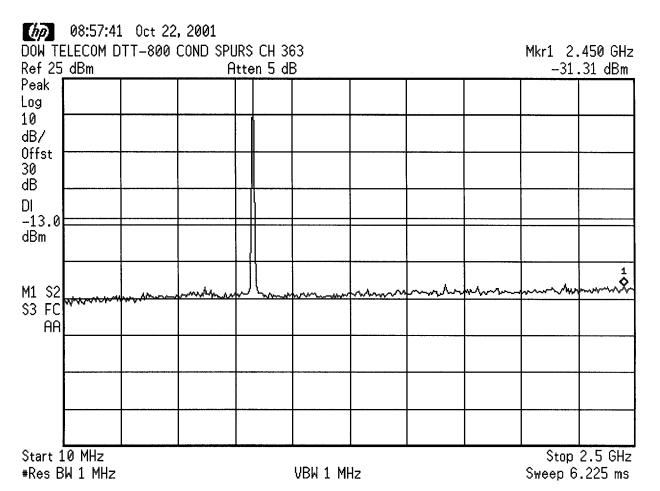


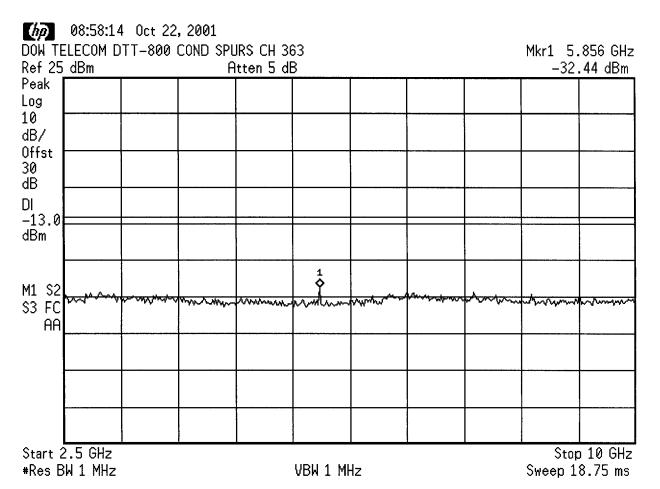
hρ		8 Oct 22							
		008-TT(COND SPL	JRS CH 1	013			Mkr1 13	3.58 GHz
Ref 25	dBm		A	itten 5 di	В			-32	.04 dBm
Peak Log 10 dB/ Offst 30 dB DI -13.0 dBm									
M1 S2 S3 FC AA	dayley and property and the	material document		min.		~~~~~	 <u>~~₩~_~~~</u>	·····	A CONTRACTOR OF THE PARTY OF TH
	0.00								
Start I	.0 GHz							Stop	20 GHz

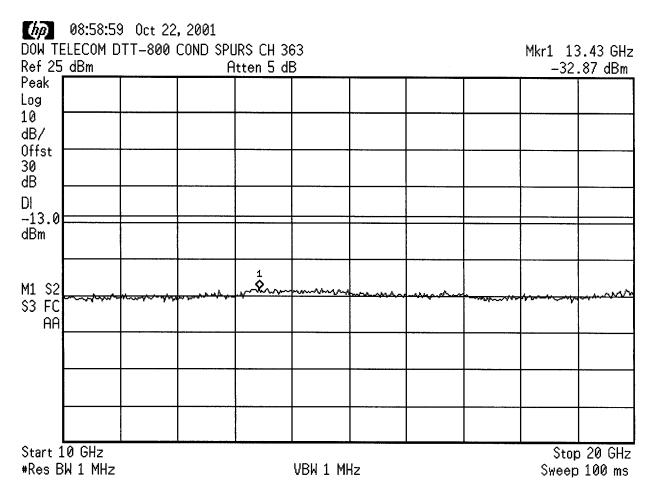
#Res BW 1 MHz

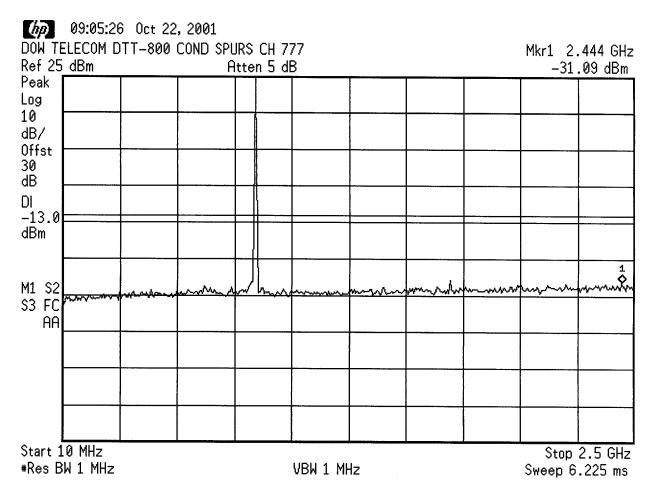
VBW 1 MHz

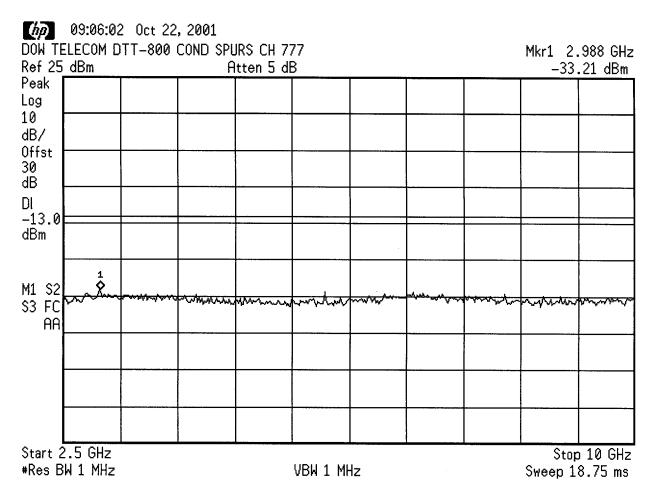
Sweep 100 ms

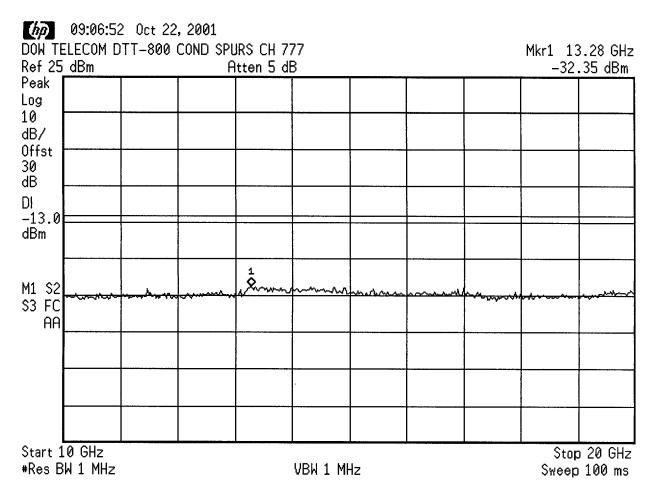


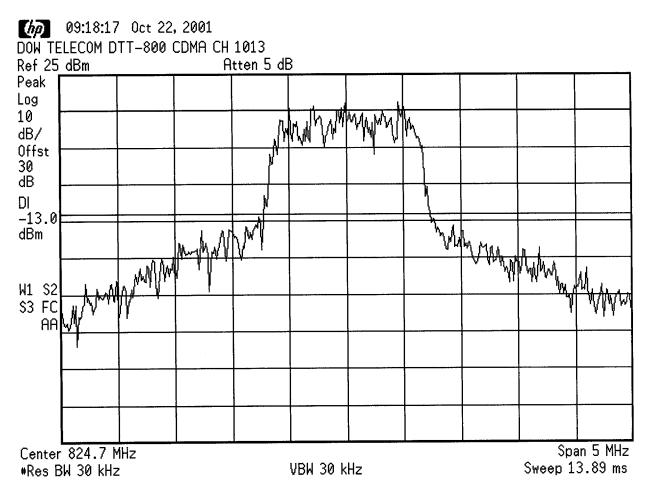


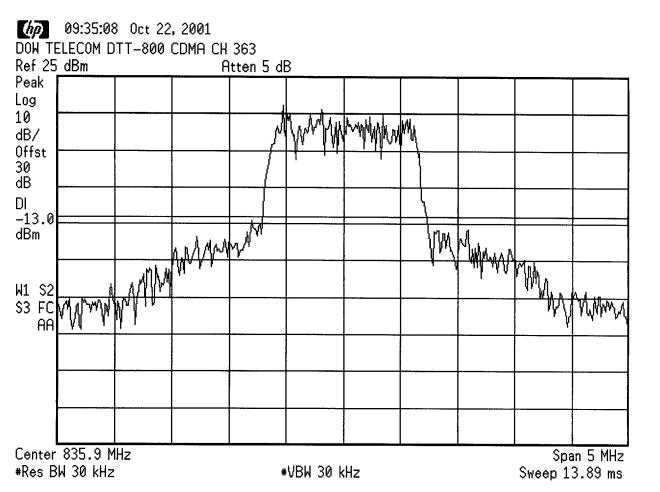


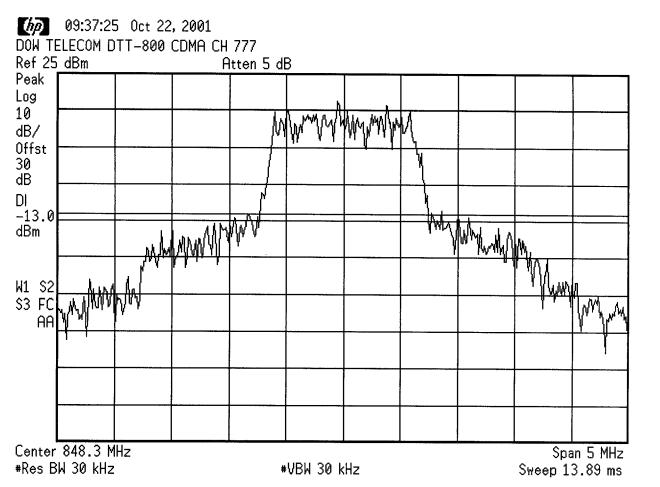


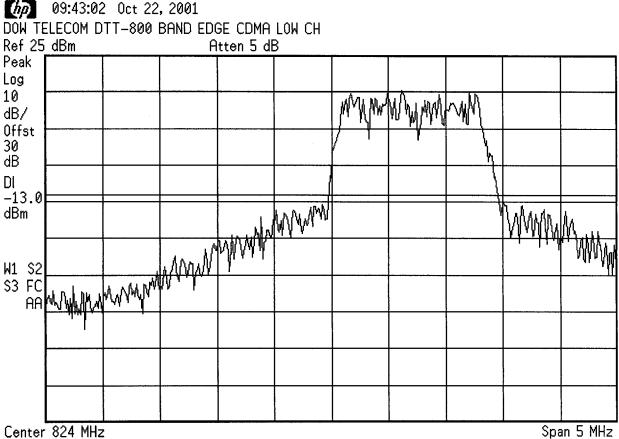












*Res BW 30 kHz

*VBW 30 kHz

Sweep 13.89 ms

