

APPLICANT: MIDWAY SERVICES, INC.

FCC ID: NTX900

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TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC. The UUT was transmitting a test signal during the testing.

15.247(a)(1) CARRIER FREQUENCY SEPARATION & NUMBER OF CHANNELS: A near field probe was used to sense the signal of the UUT. The UUT was made to hop its full range. The spectrum analyzer was set to view the frequency range from 902 to 928 MHz and placed in the memory mode. A plot (Exhibit #9) was then made of the display showing the number of channels, 63 and the separation of the channels, 115 kHz.

15.247(a)(1)(i) CARRIER FREQUENCY DWELL TIME: A near field probe was used to sense the signal of the UUT. The UUT was made to hop its full range. The spectrum analyzer was set to view the frequency range from 902 to 928 MHz and the center of the HOPPING RANGE was centered on the Spectrum Analyzer. The SPAN was then set to ZERO(0) and the SWEEP TIME was set to 20 seconds. Then by analyzing the plot of the total ON TIME of the UUT during the 20 seconds it was determined the dwell time on any frequency was less than 0.4 seconds, 14.4 mseconds. See exhibit #11.

15.247(b)(2) POWER OUTPUT: The RF power output was measured at the antenna feed point by removing the permanent antenna and connecting the UUT to a peak power meter, HP Model No. 8900C.

15.247(c) ANTENNA CONDUCTED EMISSIONS: The RBW=100 kHz, VBW =1.0 MHz up to 1000 MHz and RBW=1.0MHz & VBW=3.0 MHz above 1.0 GHz. The spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz up to 1.0 GHz and 1.0 MHz with a video BW of 3.0 MHz above 1.0 GHz. The ambient temperature of the UUT was 87°F, with a humidity of 29%. The hopping was stopped at the low end, middle and high end of the band in order to test the radiated emissions.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The ambient temperature of the UUT was 78°F with a humidity of 45%.

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TEST PROCEDURES CONTINUED

FORMULA OF CONVERSION FACTORS: The Field Strength at 3 m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz)	METER READING + ACF = FS
33	20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

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TEST EQUIPMENT LIST

- 1._X_Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/
preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter
HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02,
S/N 3008A00372
- 2._X_Biconnical Antenna: Eaton Model 94455-1, S/N 1057,
- 3.___Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
- 4._X_Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
- 5.___Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409
- 6._X_Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180,
1-18 GHz, S/N 2319
- 7.___18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
- 8.___Horn 40-60GHz: ATM Part #19-443-6R
- 9.___Line Impedance Stabilization Network: Electro-Metrics Model
EM-7820, w/NEMA Adapter S/N 2682
- 10.___Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
- 11.___Frequency Counter: HP Model 5385A, S/N 3242A07460
- 12.___Peak Power Meter: HP Model 8900C, S/N 2131A00545,
- 13._X_Open Area Test Site #1-3 meters
- 14.___Signal Generator: HP 8640B, S/N 2308A21464
- 15.___Signal Generator: HP 8614A, S/N 2015A07428
- 16.___Passive Loop Antenna: EMC0 Model 6512, 9KHz to 30MHz, S/N
9706-1211
- 17.___Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153
- 18.___AC Voltmeter: HP Model 400FL, S/N 2213A14499
- 19.___Digital Multimeter: Fluke Model 8012A, S/N 4810047
- 20.___Digital Multimeter: Fluke Model 77, S/N 43850817
- 21.___Oscilloscope: Tektronix Model 2230, S/N 300572

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INTRODUCTION: GENERAL INFORMATION AND DATA

15.247(a): Definition: This EUT uses a pseudo random algorithm to hop over the frequency range of 902.00 to 928.00 MHz in 63 hops.

15.247(a)(1): The number of hops is 63 hops at a separation of 115 kHz, the requirement in the 902-928 MHz band is a minimum of 50 Hops.

15.247(a)(1)(i) Dwell Time of Hop: The dwell time of any hopping frequency cannot be greater than 0.4 seconds in any 20 second period. The Dwell time in 20 seconds is 14.4 mseconds. See exhibits 11.

15.247 (b)(3) The antenna's gain is a negative number and consists of the case of the battery. This is descibed in the circuit description. See exhibit 14.

15.247(a)(1)(i) The maximum allowed 20 dB bandwidth of a hopping channel is 500 kHz. The 20 dB bandwidth measured was 344 kHz. See exhibit 10.

15.247 (4)(c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. See Exhibit 12.

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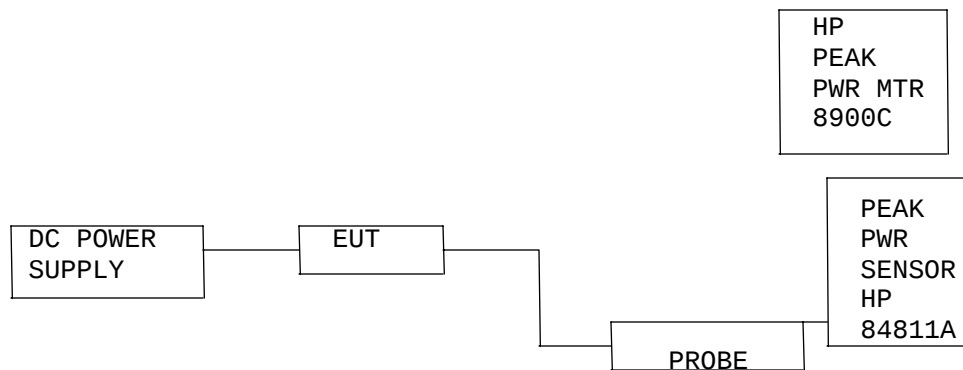
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15.247(b)(2): POWER OUTPUT

The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum power output was less than +30 dBm. Power was measured by disconnecting the antennas and measuring across a 50 ohm load as recommended by the manufacturer using a HP peak power meter Model 8900C. The antenna is non directional and did not exceed 6 dBi gain. The power output was measured at three places in the band highest is reported below.

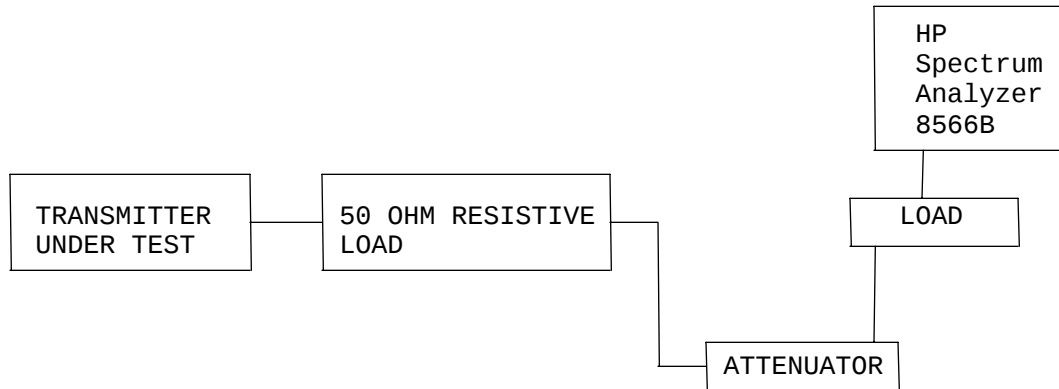
MEASUREMENT: 252 mWATTS



POWER OUPUT: 252mW appears to meet the FCC requirements.

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15.247(c) Method of Measuring RF Conducted Spurious Emissions



NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

NOT REQUIRED; DEVICE HAS AN INTEGRAL ANTENNA.

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NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.247, 15.209

REQUIREMENTS:

FIELD STRENGTH of Fundamental:	FIELD STRENGTH of Harmonics	S15.209	
		30 - 88 MHz	40 dBuV/m @3M
		88 -216 MHz	43.5
902-928MHz		216 -960 MHz	46
127.38dBuV/m @3m	54 dBuV/m @3m	ABOVE 960 MHz	54dBuV/m

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 50 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209, WHICHEVER IS THE LESSER ATTENUATION.

TEST RESULTS: This unit DOES meet the FCC requirements.

TEST DATA:

EMISSION FREQ. MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	PEAK FIELD STRNGTH dBuV/m	AVERAGE FIELD STRNGTH dBuV/m	MARGIN dB	ANT.
906.50	90.10	2.90	24.17	117.17	100.10	27.28	H
1813.00	30.90	1.00	27.25	59.15	42.08	8.02	V
2719.50R	26.40	1.14	29.80	57.34	40.26	13.74	V
3626.00R	17.50	1.27	32.06	50.84	33.76	20.24	V
4532.50R	17.70	1.41	33.60	52.71	35.63	18.37	V
5439.00R	2.40	1.55	34.62	38.57	21.49	32.51	V
6345.50	3.30	1.68	35.64	40.62	23.54	26.56	V
914.00	91.00	2.90	24.14	118.04	100.97	26.41	H
1828.00	33.60	1.00	27.31	61.92	44.84	6.13	H
2742.00R	25.70	1.14	29.85	56.70	39.62	14.38	V
3656.00R	14.30	1.28	32.14	47.72	30.64	23.37	V
4570.00R	18.60	1.42	33.64	53.66	36.58	17.42	V
5484.00	5.80	1.55	34.67	42.02	24.95	26.02	V
6398.00	0.90	1.69	35.70	38.29	21.21	29.76	H
7312.00R	5.50	1.83	36.73	44.05	26.98	27.02	V
8226.00R	3.60	1.96	37.64	43.21	26.13	27.87	V
920.90	91.70	2.90	24.12	118.72	101.64	25.74	H
1841.80	32.70	1.01	27.37	61.07	44.00	7.64	H
2762.70R	21.40	1.14	29.91	52.45	35.37	18.63	V
3683.60R	14.80	1.28	32.21	48.29	31.21	22.79	V
4604.50R	17.70	1.42	33.68	52.80	35.72	18.28	V
5525.40	1.10	1.56	34.72	37.38	20.30	31.34	V
6446.30	3.00	1.70	35.75	40.45	23.37	28.27	V
7367.20R	4.00	1.84	36.79	42.62	25.55	28.45	V
8288.10R	2.10	1.97	37.68	41.76	24.68	29.32	V

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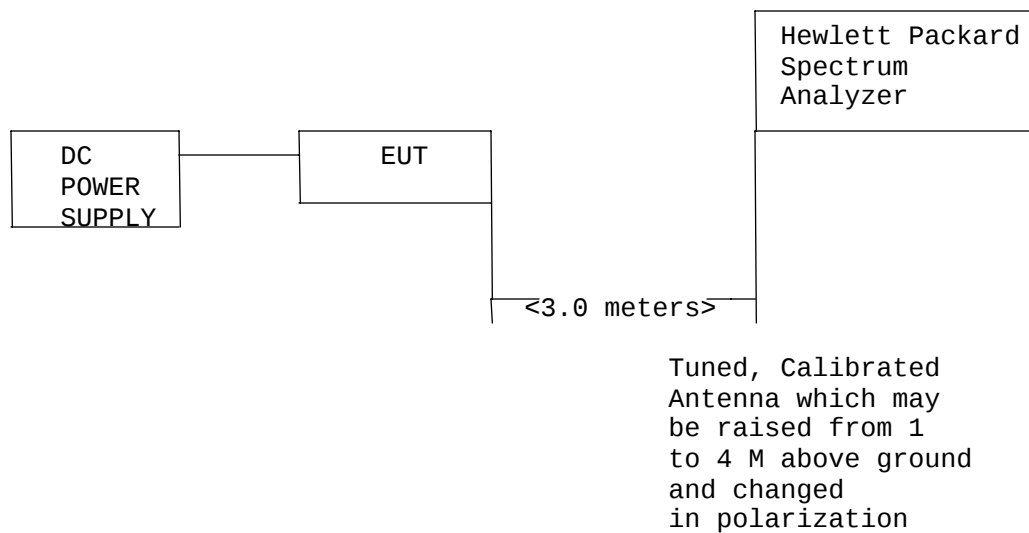
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Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground on a rotatable platform.

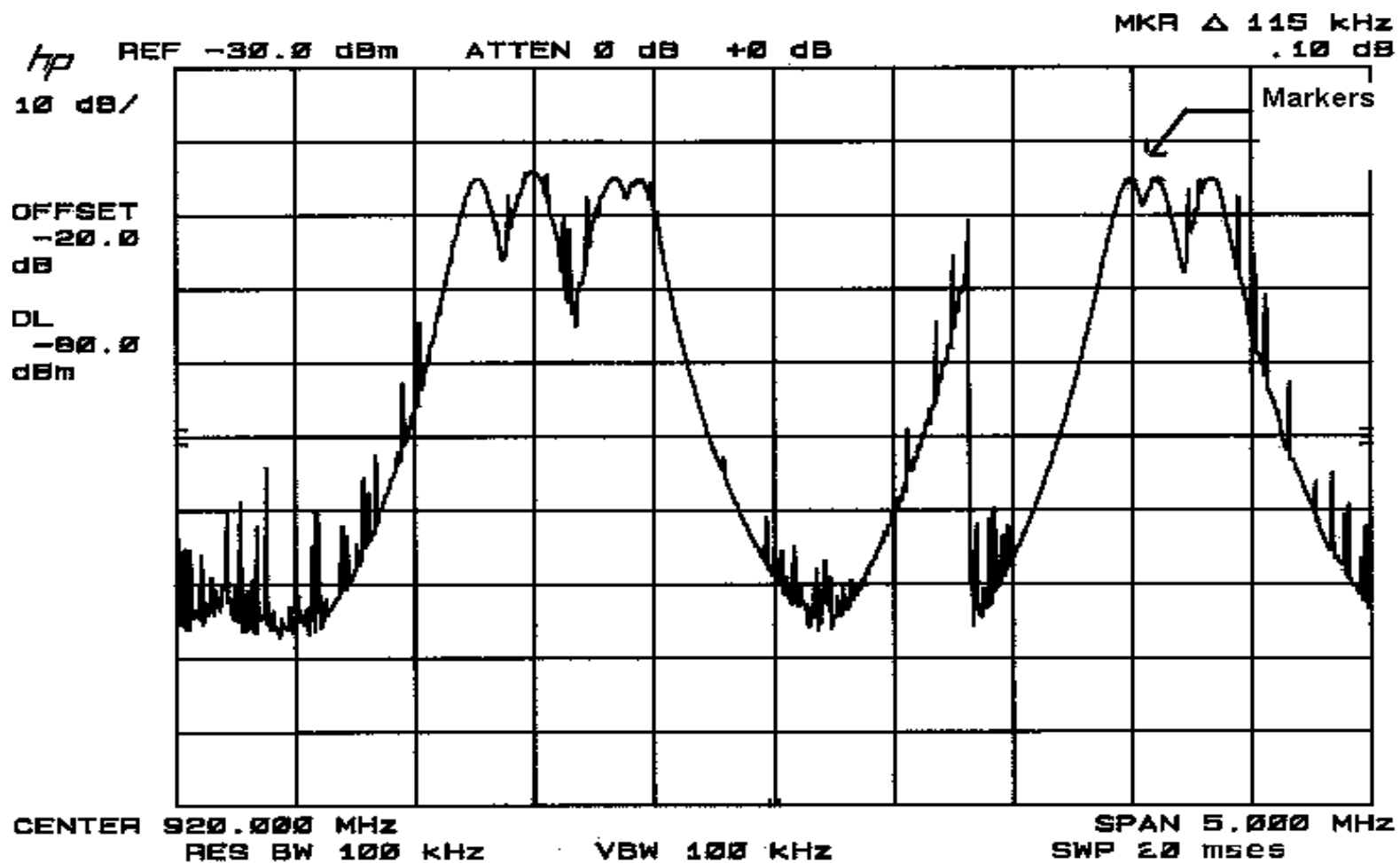


EXHIBIT 9
Channel Spacing

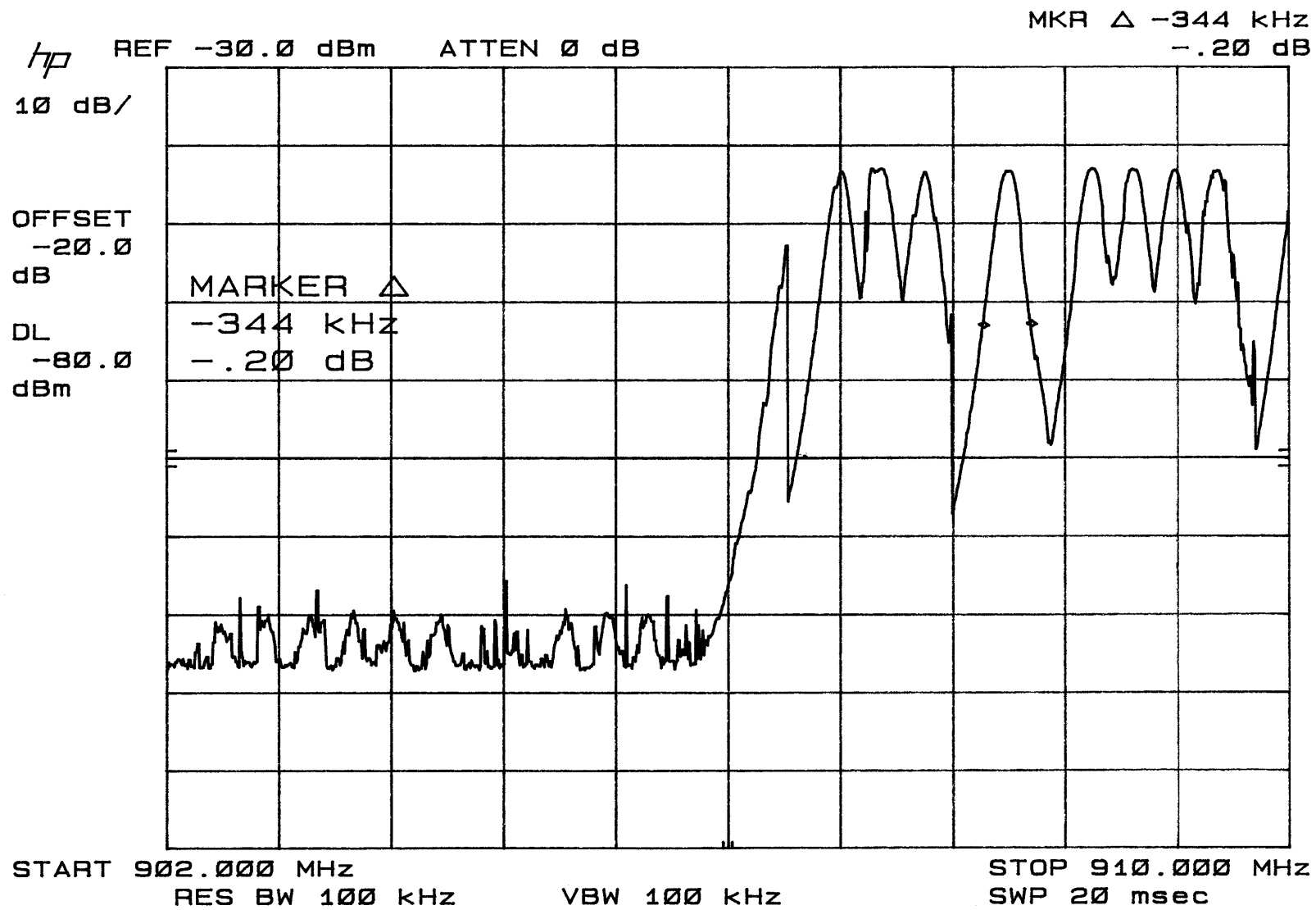


EXHIBIT 10
20 dB Bandwidth of a Hopping Channel

DWELL TIME PLOT

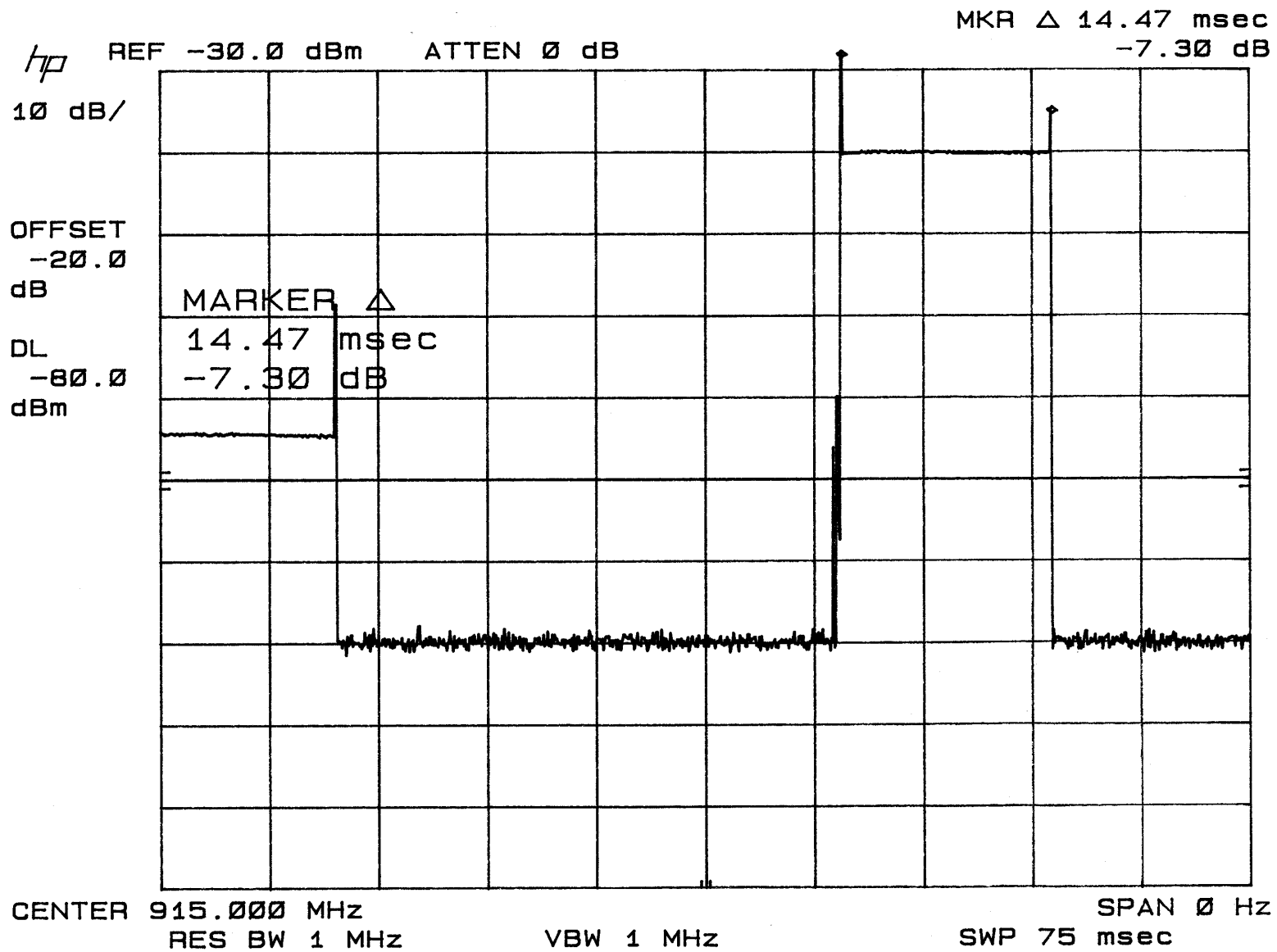


EXHIBIT 11
Dwell Time Plot

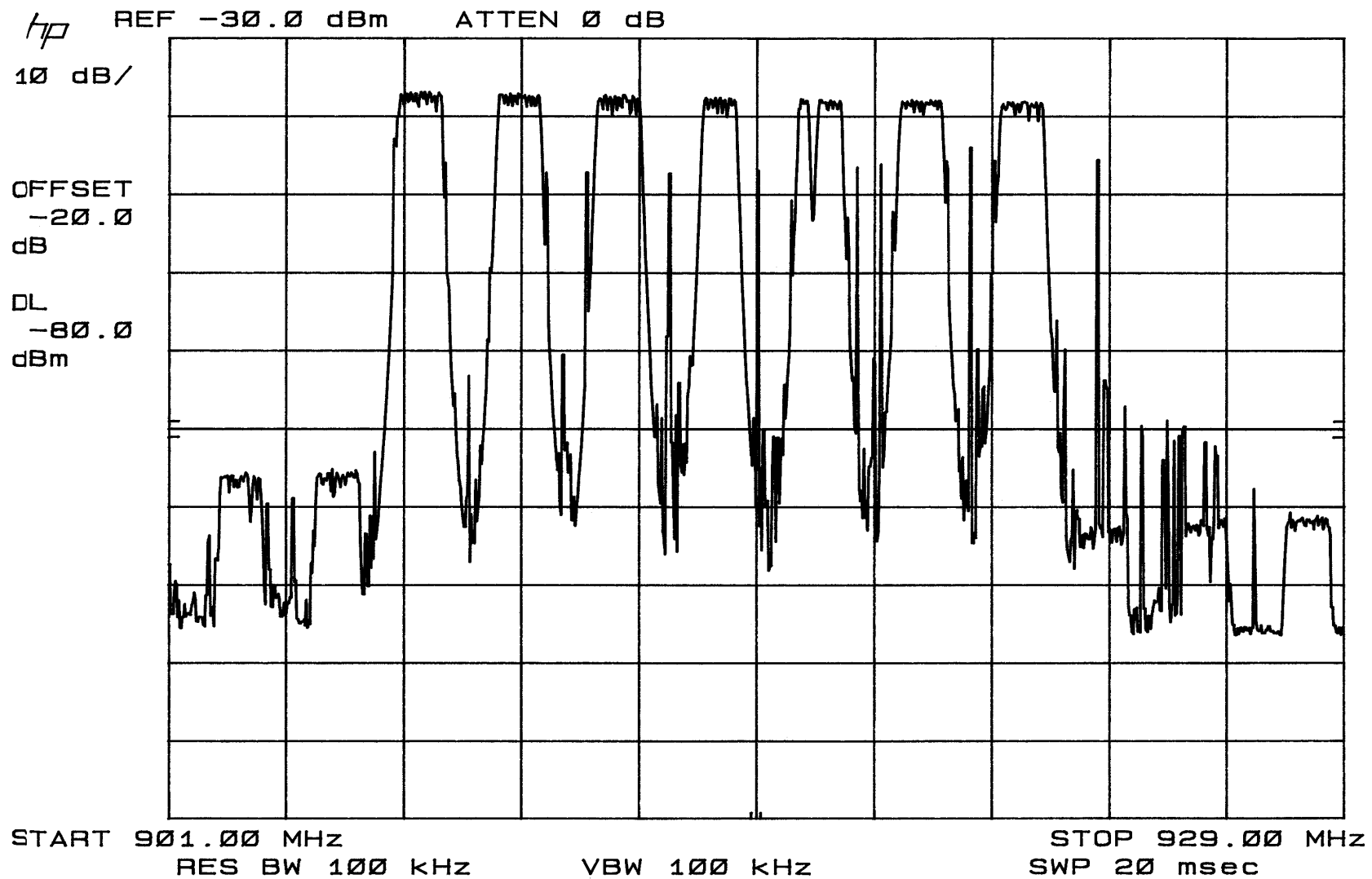
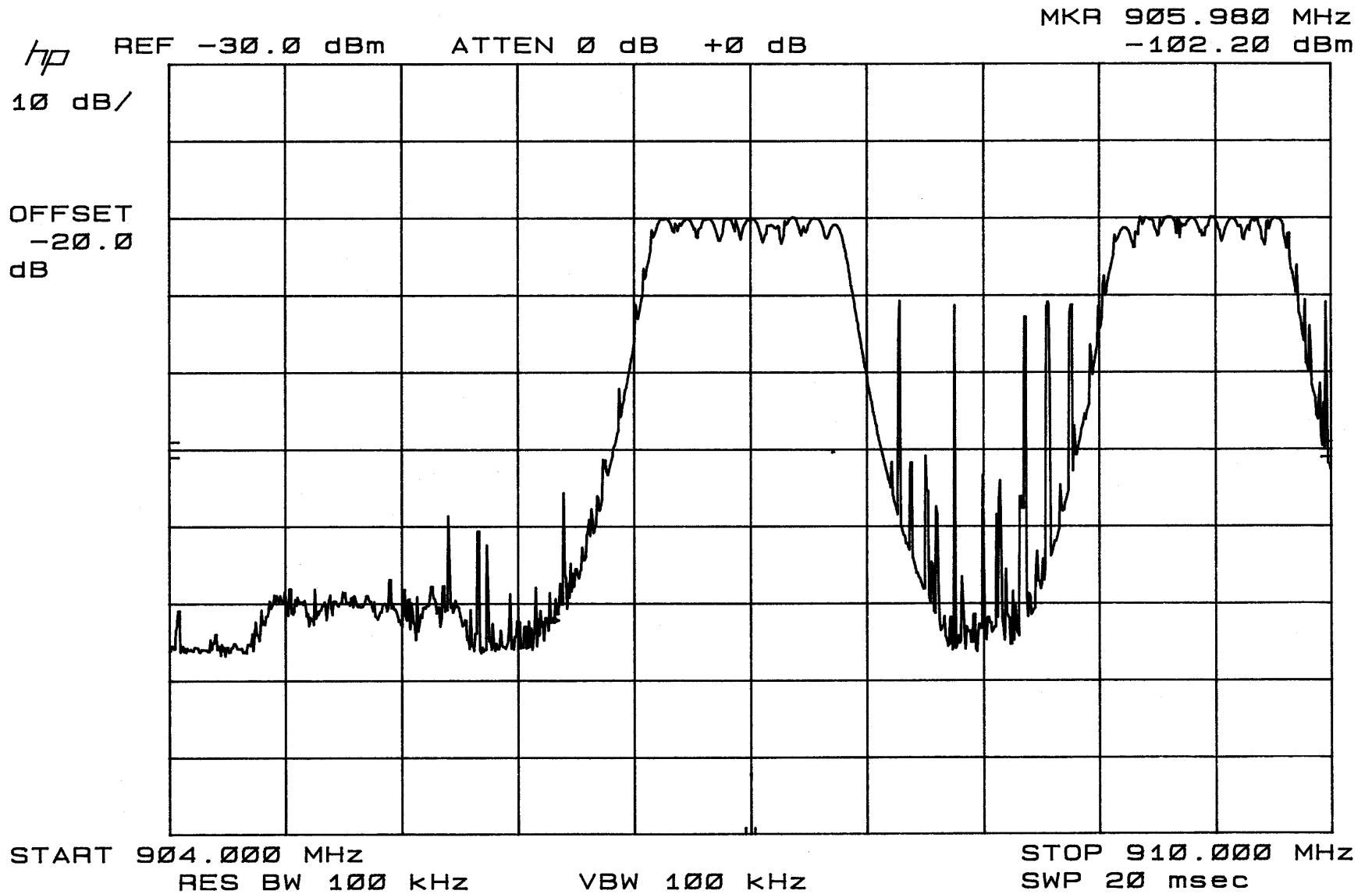
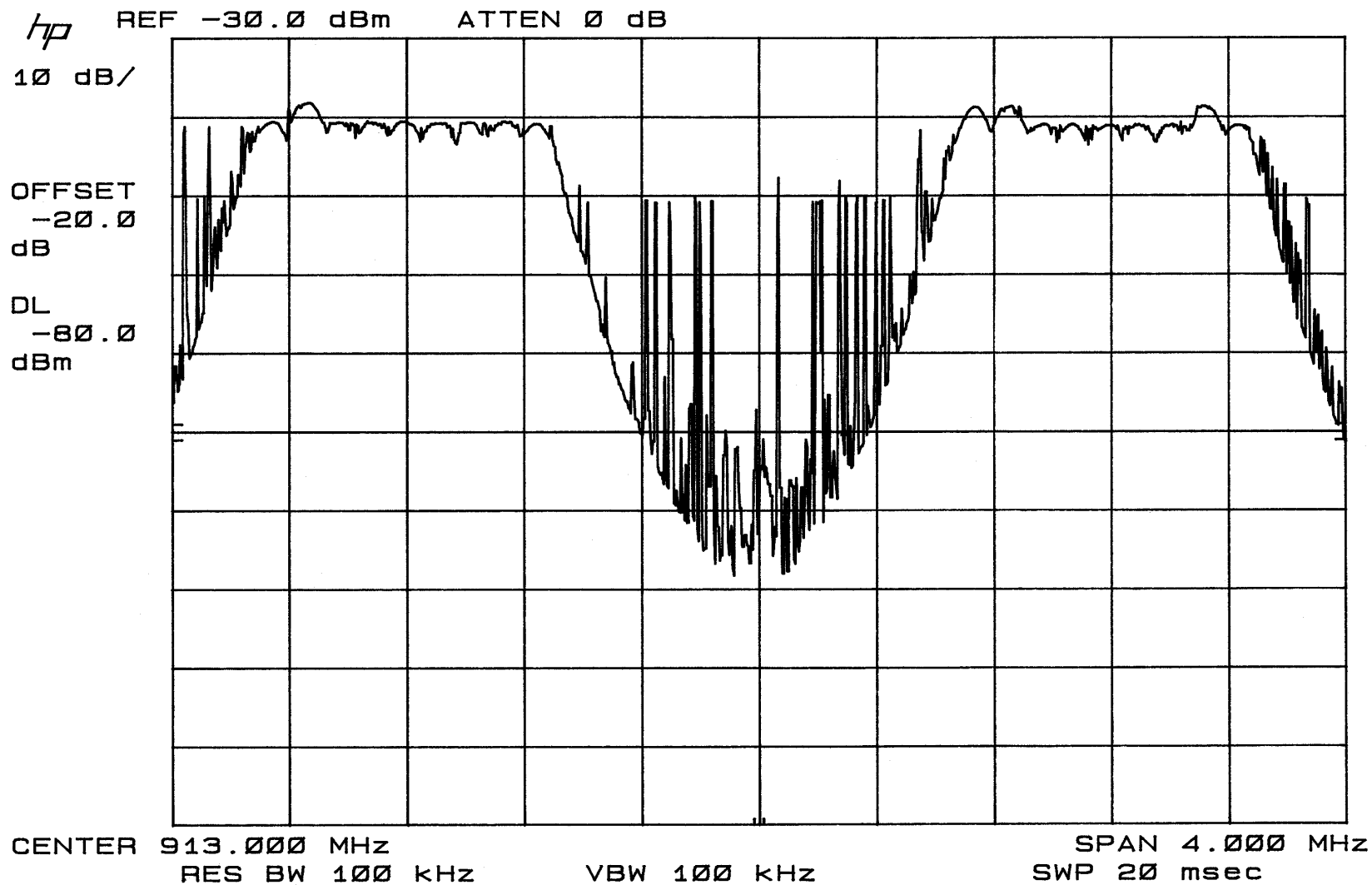


EXHIBIT 12
Bandedge Plot

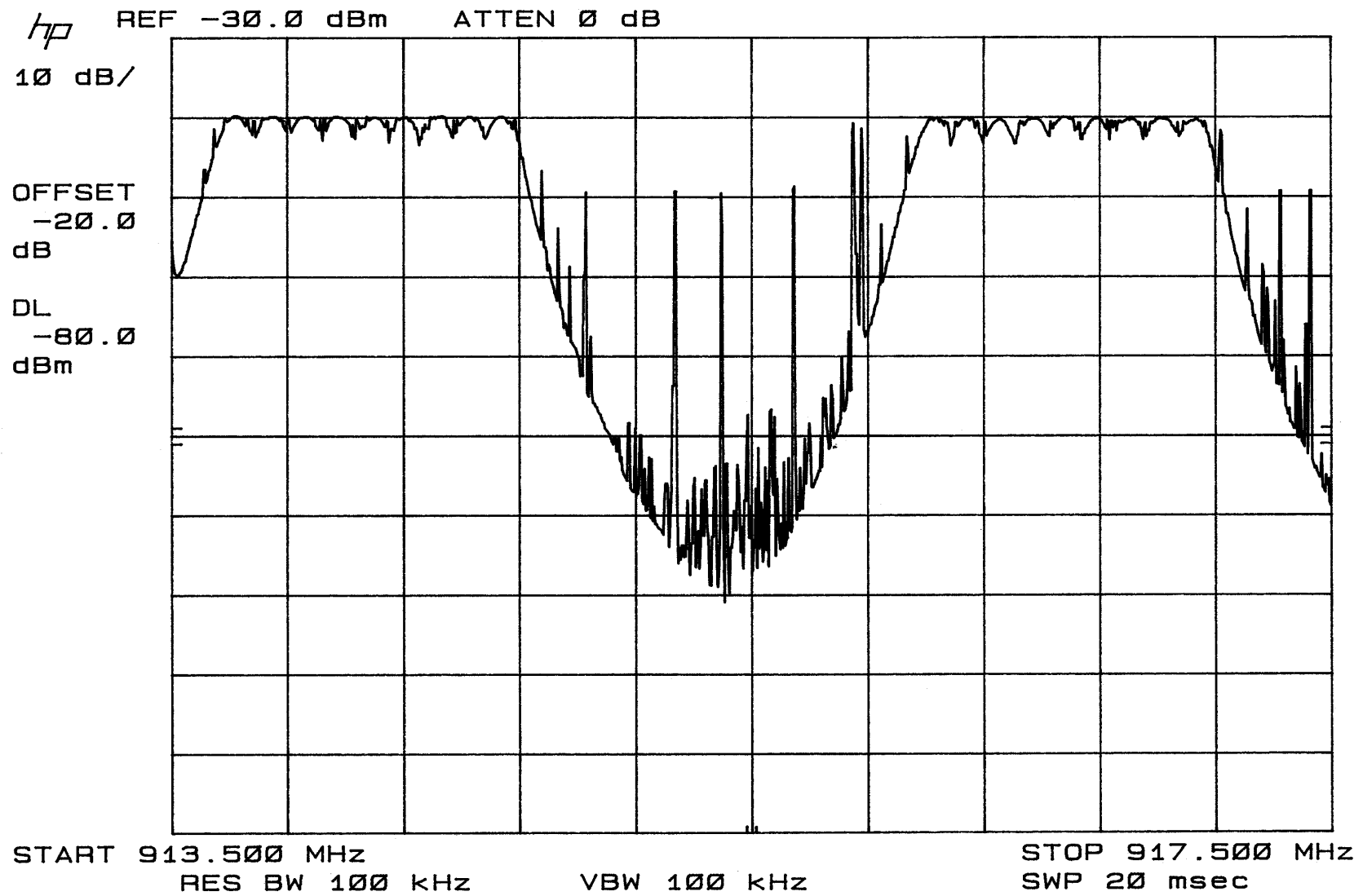
NUMBER OF CHANNELS



NUMBER OF CHANNELS



NUMBER OF CHANNELS



NUMBER OF CHANNELS

