

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155**Date of Test: October 20-29, 2001****4.5 Out-of-Band Conducted Emissions**
FCC Rule 15.407(b)**Requirement:**

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Procedure:

Spectrum Analyzer was connected to the output of the EUT. For measurements above 1 GHz, the Resolution Bandwidth was set to 1 MHz; for measurements below 1 GHz, the Resolution Bandwidth was set 100 kHz, and the Video Bandwidth was set to 100 kHz. Several plots were made in the frequency range from 5715 to 5835 MHz.

In addition, plots were made in the frequency range from 30 MHz to 40 GHz.

Result:

Refer to the following plots and data tables (on the next page) for out-of-band conducted emissions data:

Plot 4.a1 – 4.a10: Low Channel Emissions

Plot 4.b1 – 4.b10: High Channel Emissions

The antenna used for this application has the gain equals 28.4 dBi, therefore the EUT pass the test with a margin of 3.2 dB without reducing the output power.



Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

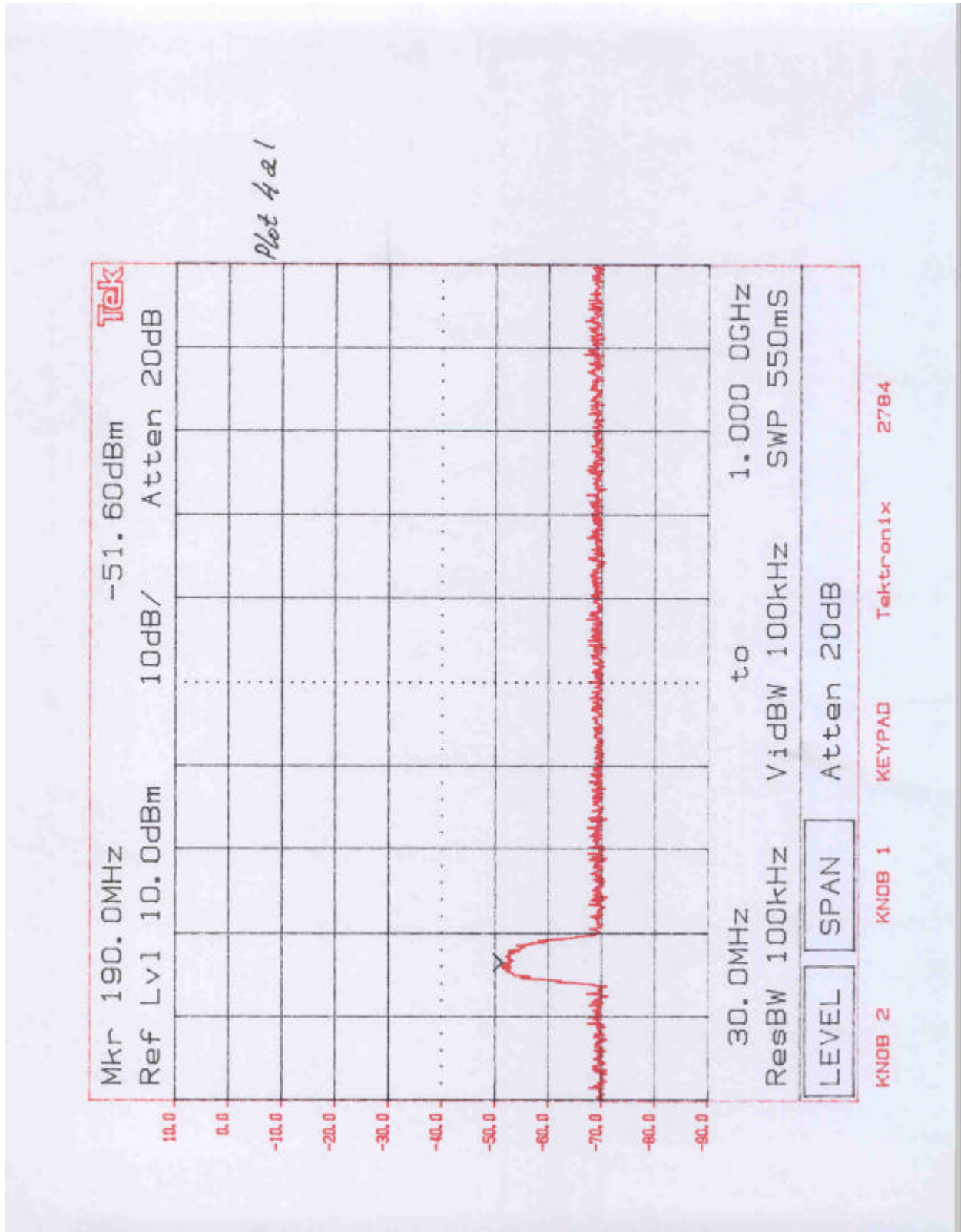
Date of Test: October 20-29, 2001

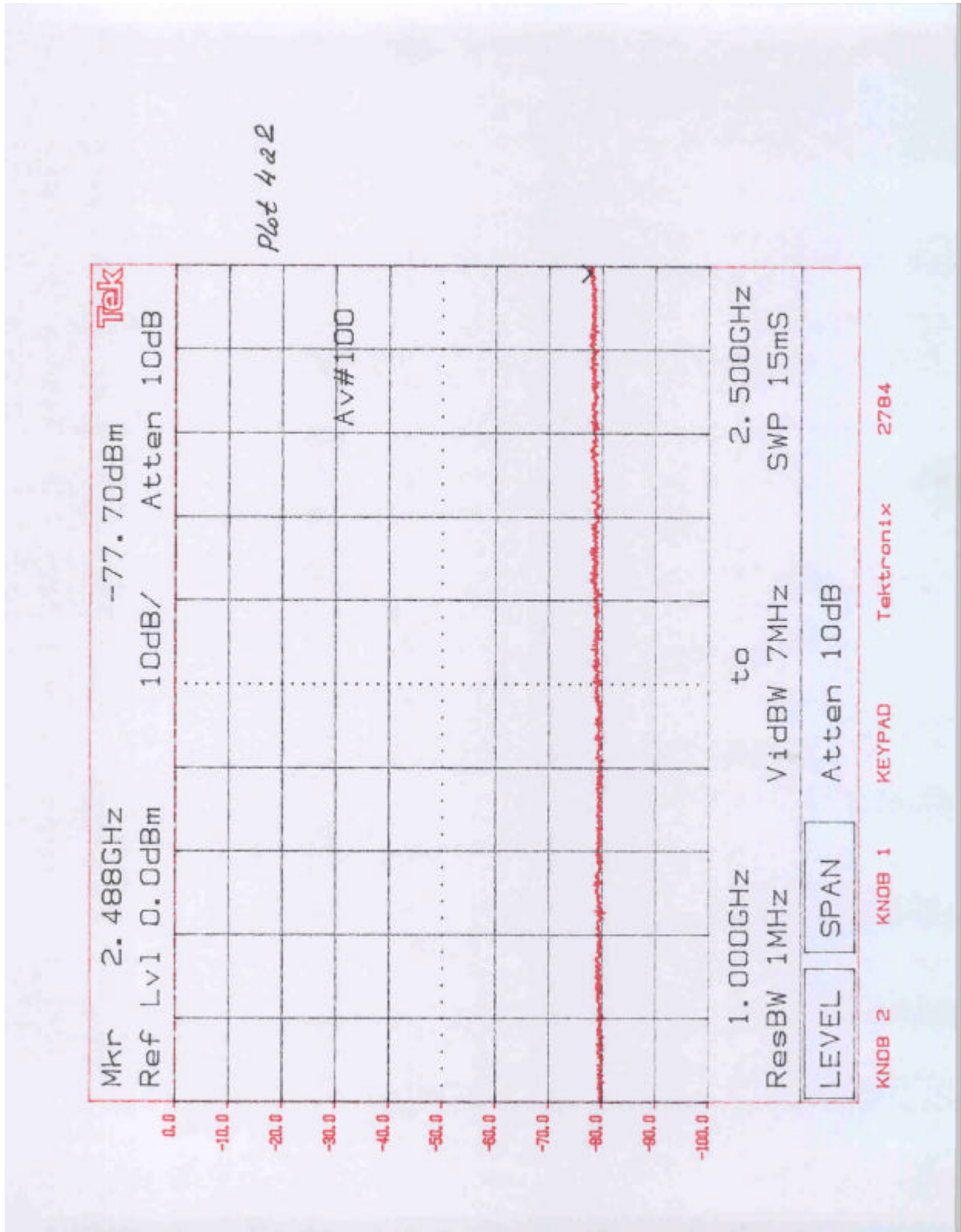
Operating Frequency	Frequency, MHz	Level, dBm	Limit, dBm/MHz	Maximum allowed antenna gain, * dBi
5300 MHz	5150	-76.4 from plot 4.a4	-27.0	49.4
	5350	-69.6 from plot 4.a7	-27.0	42.6

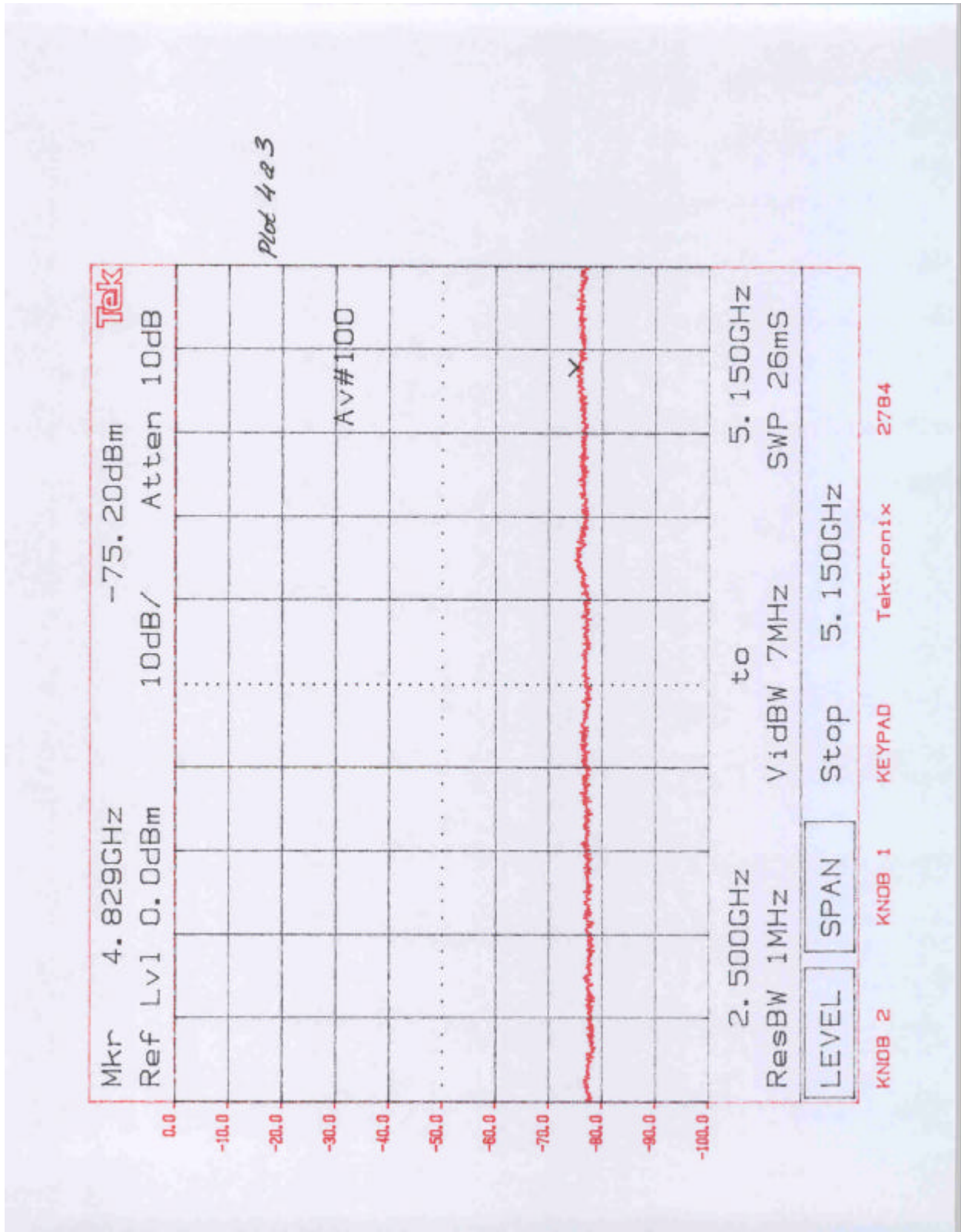
Operating Frequency	Frequency, MHz	Level, dBm	Limit, dBm/MHz	Maximum allowed antenna gain, * dBi
5775 MHz	5715	-65.4 from plot 4.b2	-27.0	38.4
	5725	-58.6 from plot 4.b5	-17.0	41.6
	5825	-60.7 from plot 4.b6	-17.0	43.7
	5835	-65.2 from plot 4.b7	-27.0	38.2

* Maximum antenna gain without reducing the Output Power.

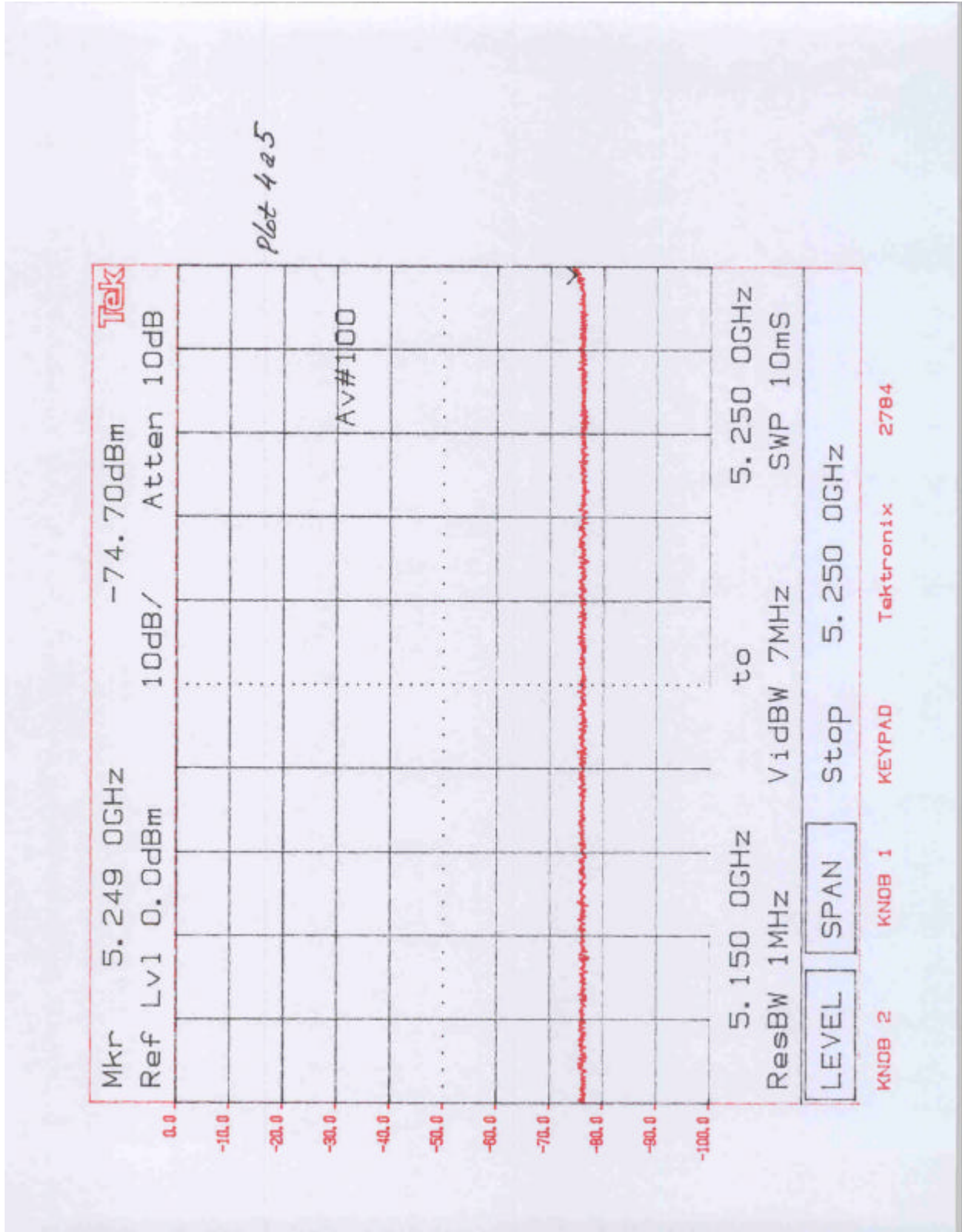
When a higher gain antenna is used, the Output Power should be reduced and, as a result, the Out-of-Band emission is in compliance with EIRP Power Density Limit.

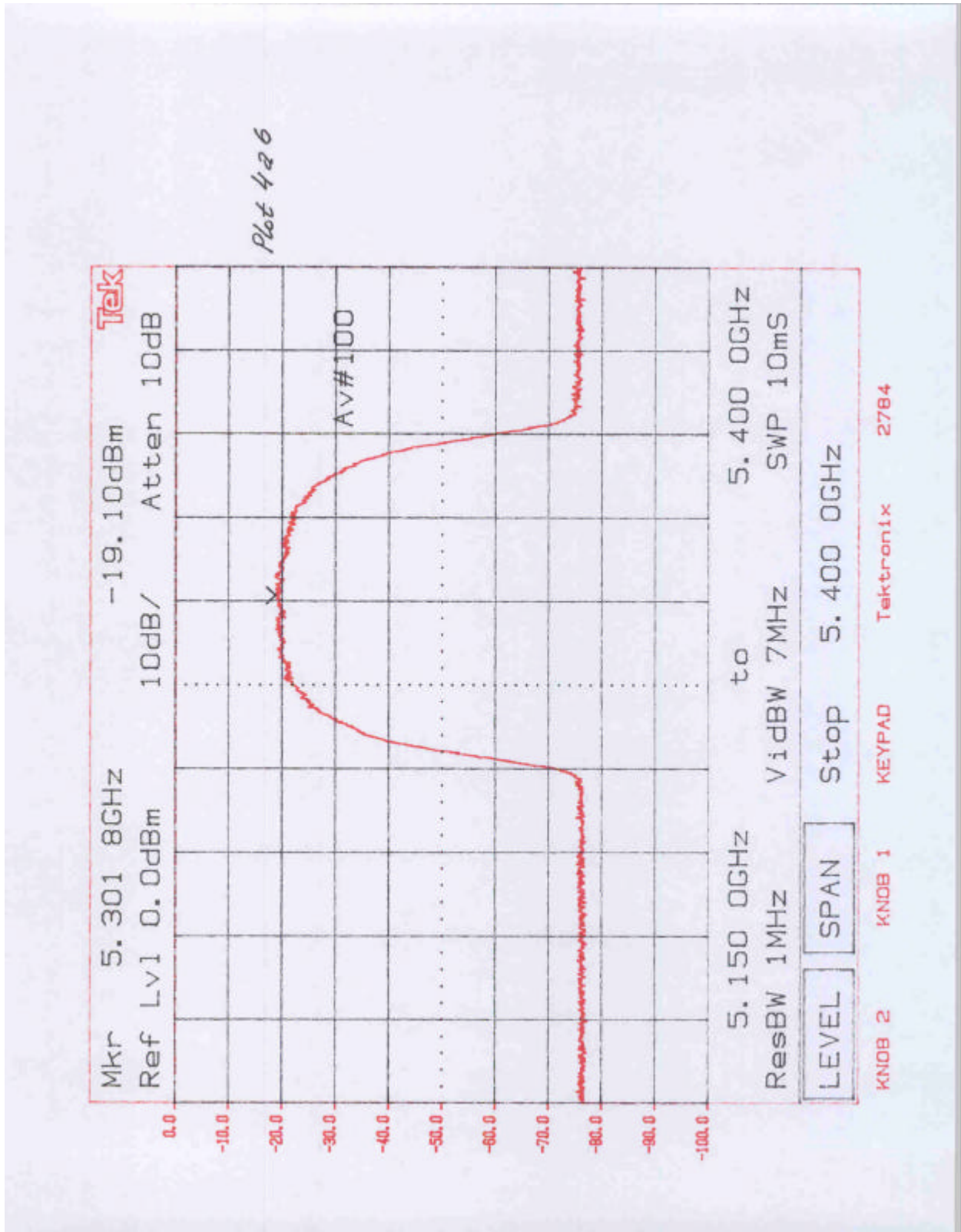


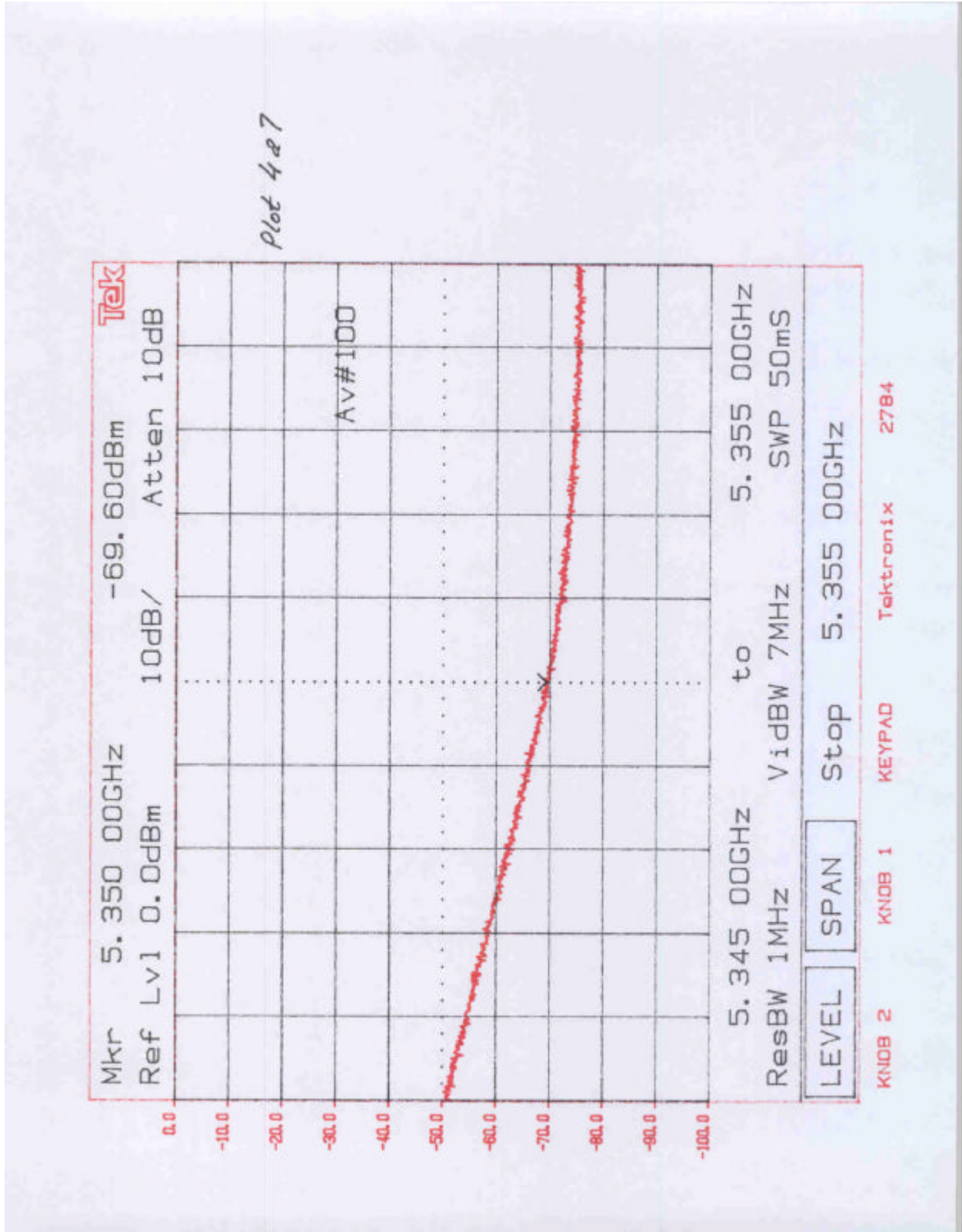


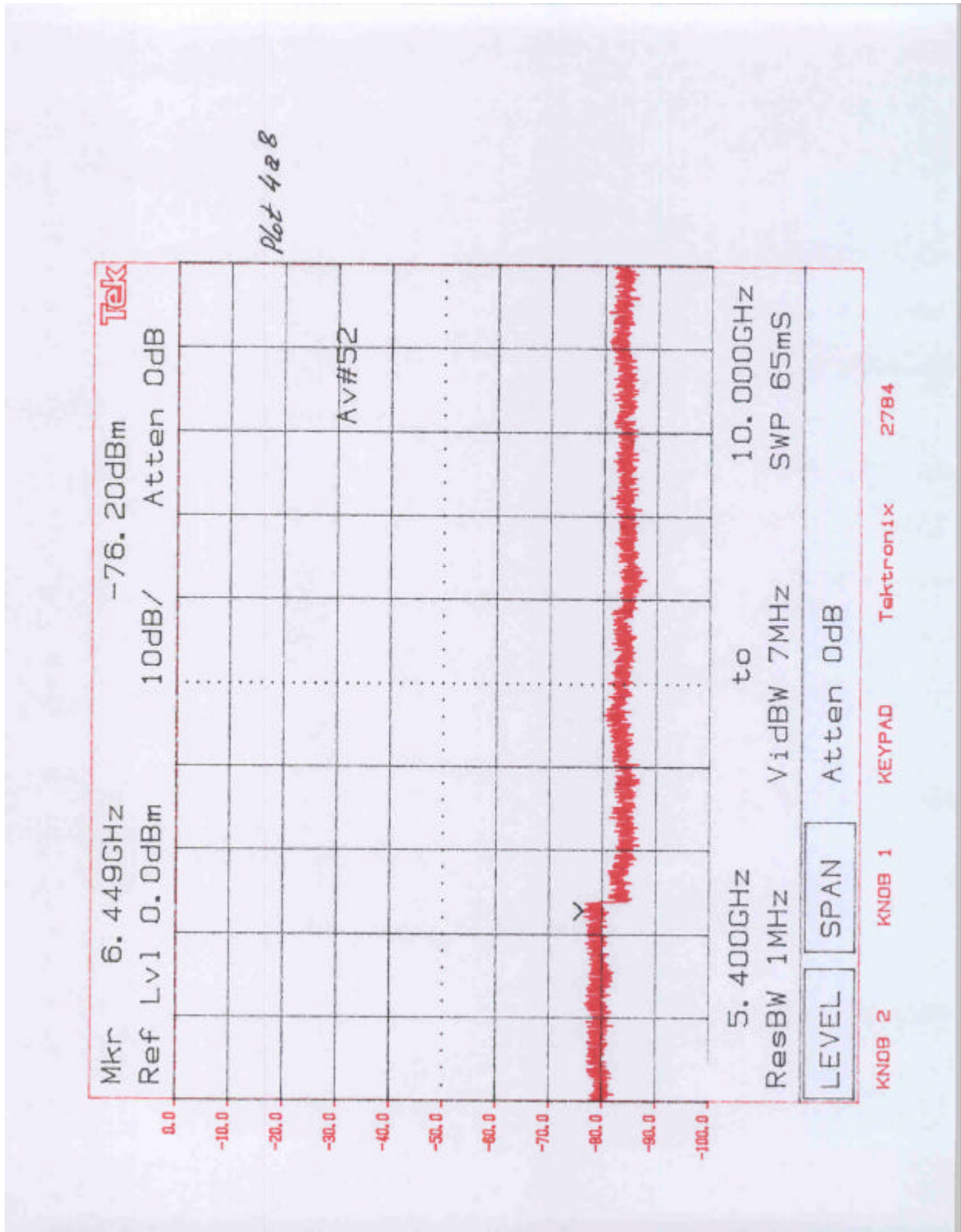


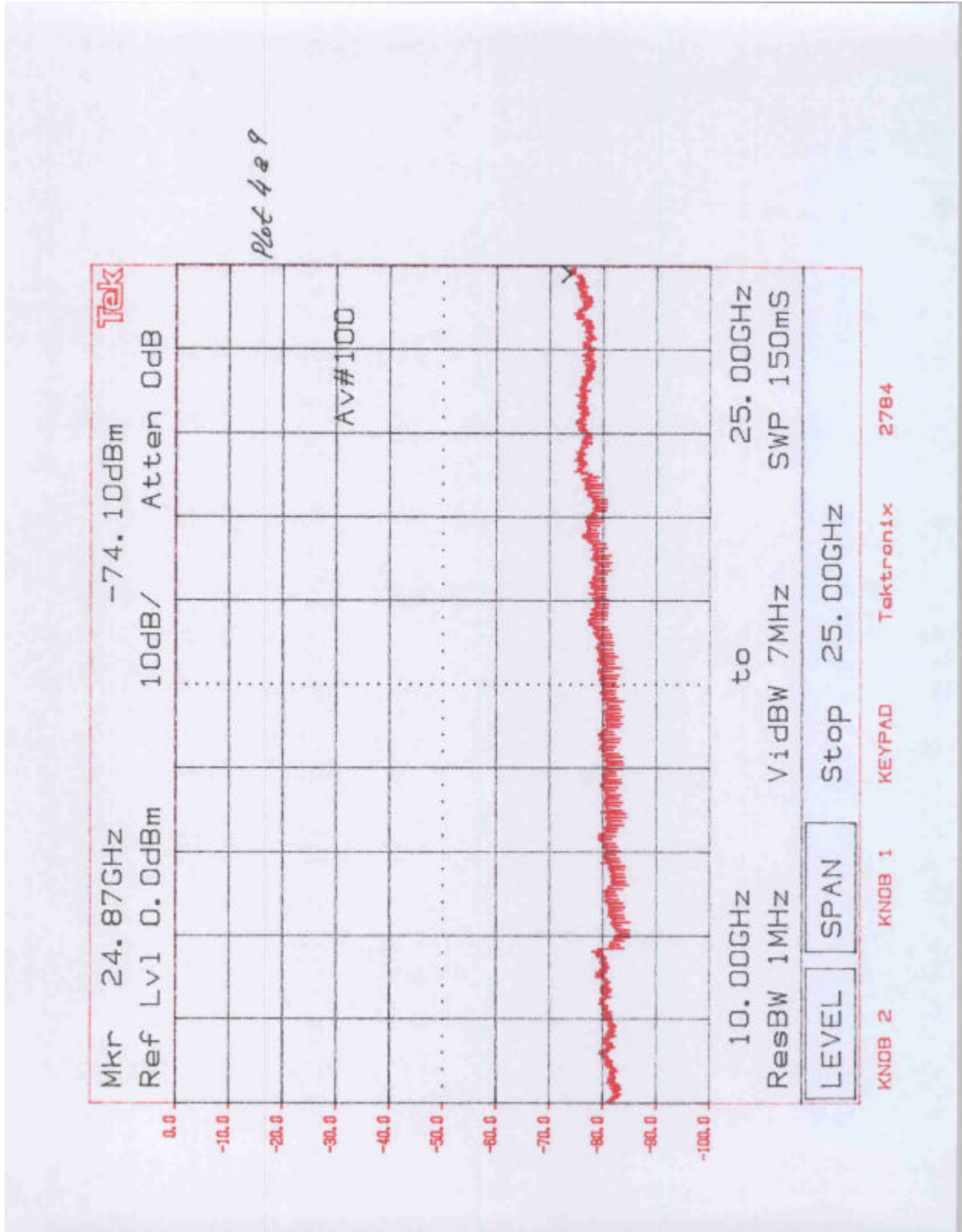


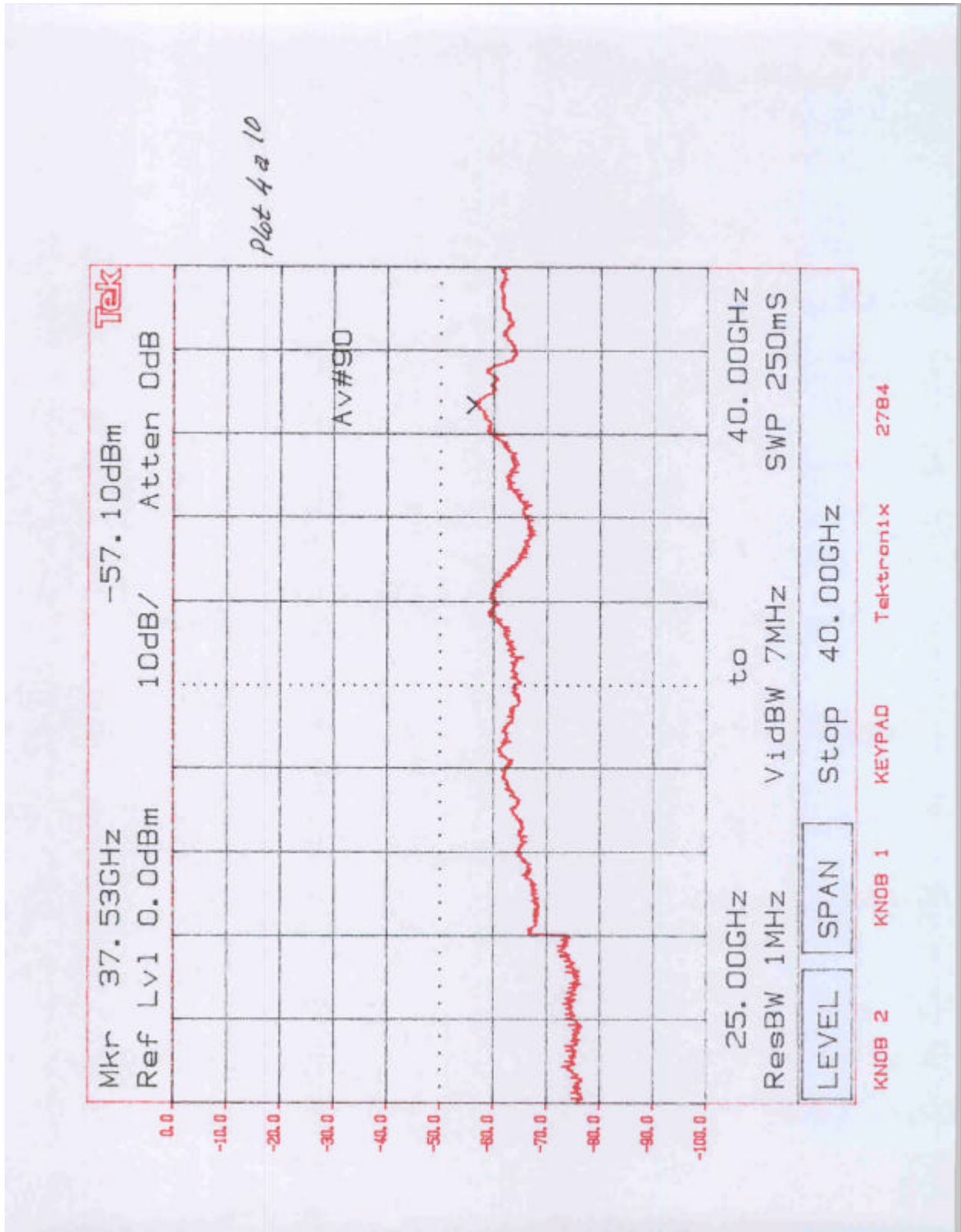


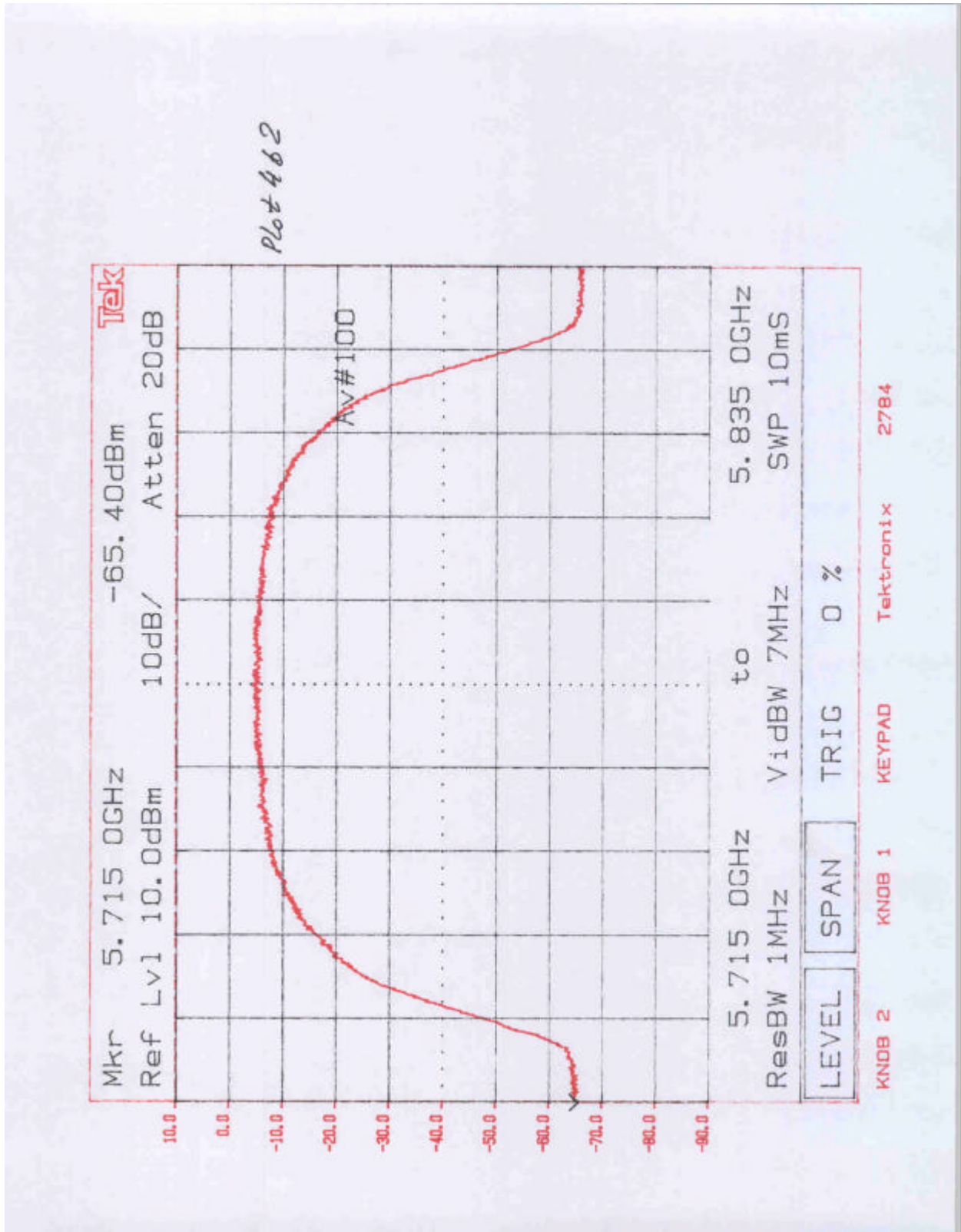


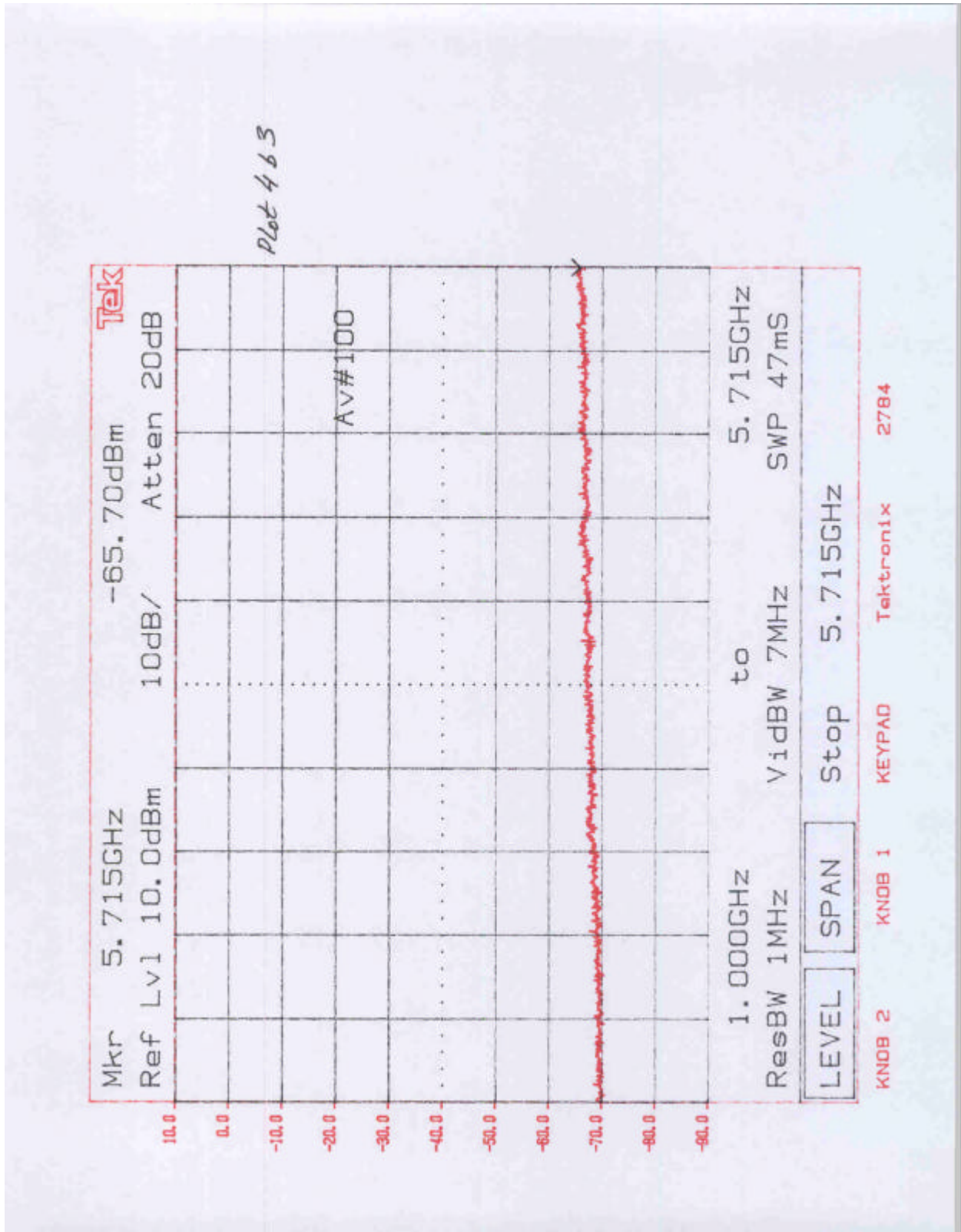


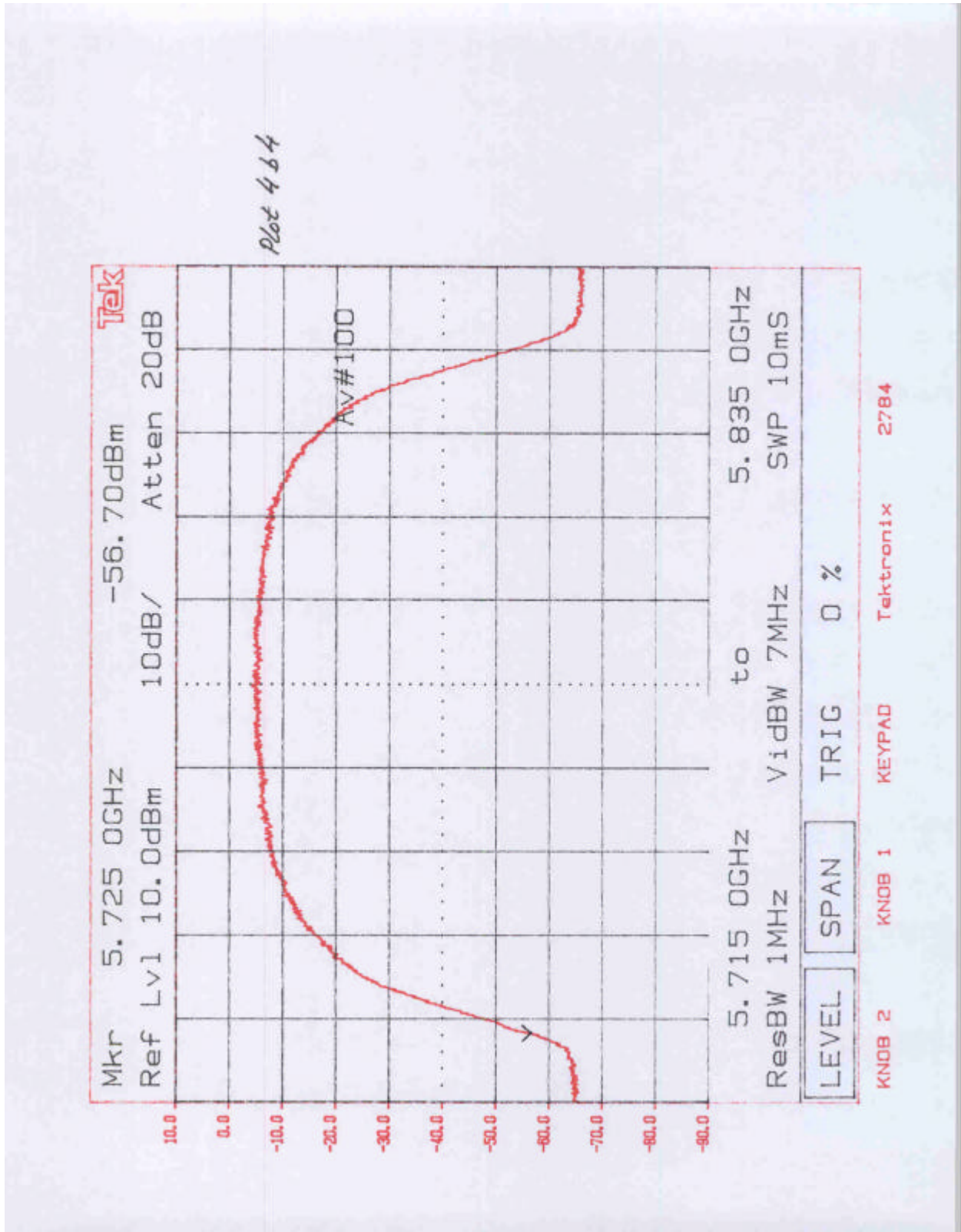


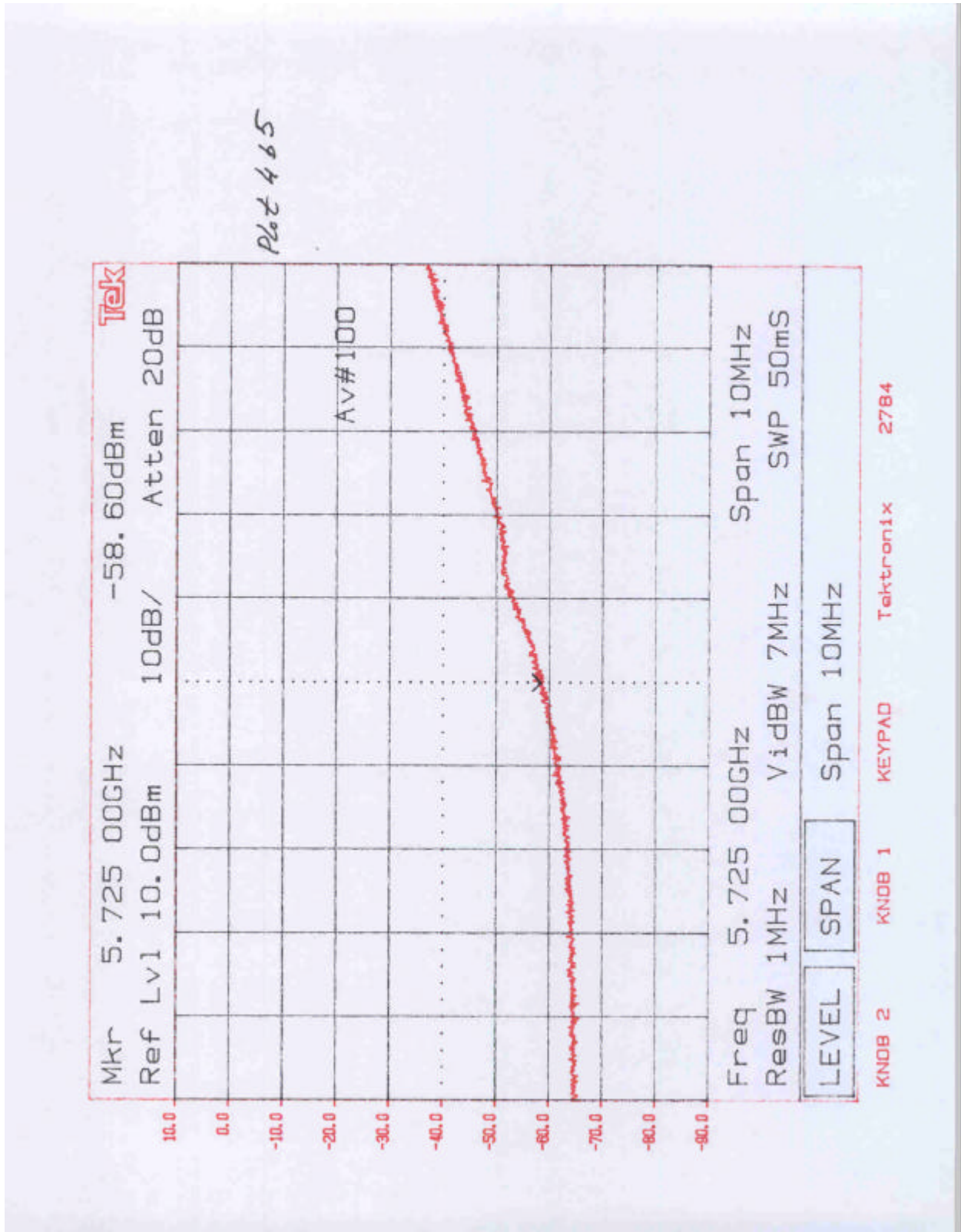


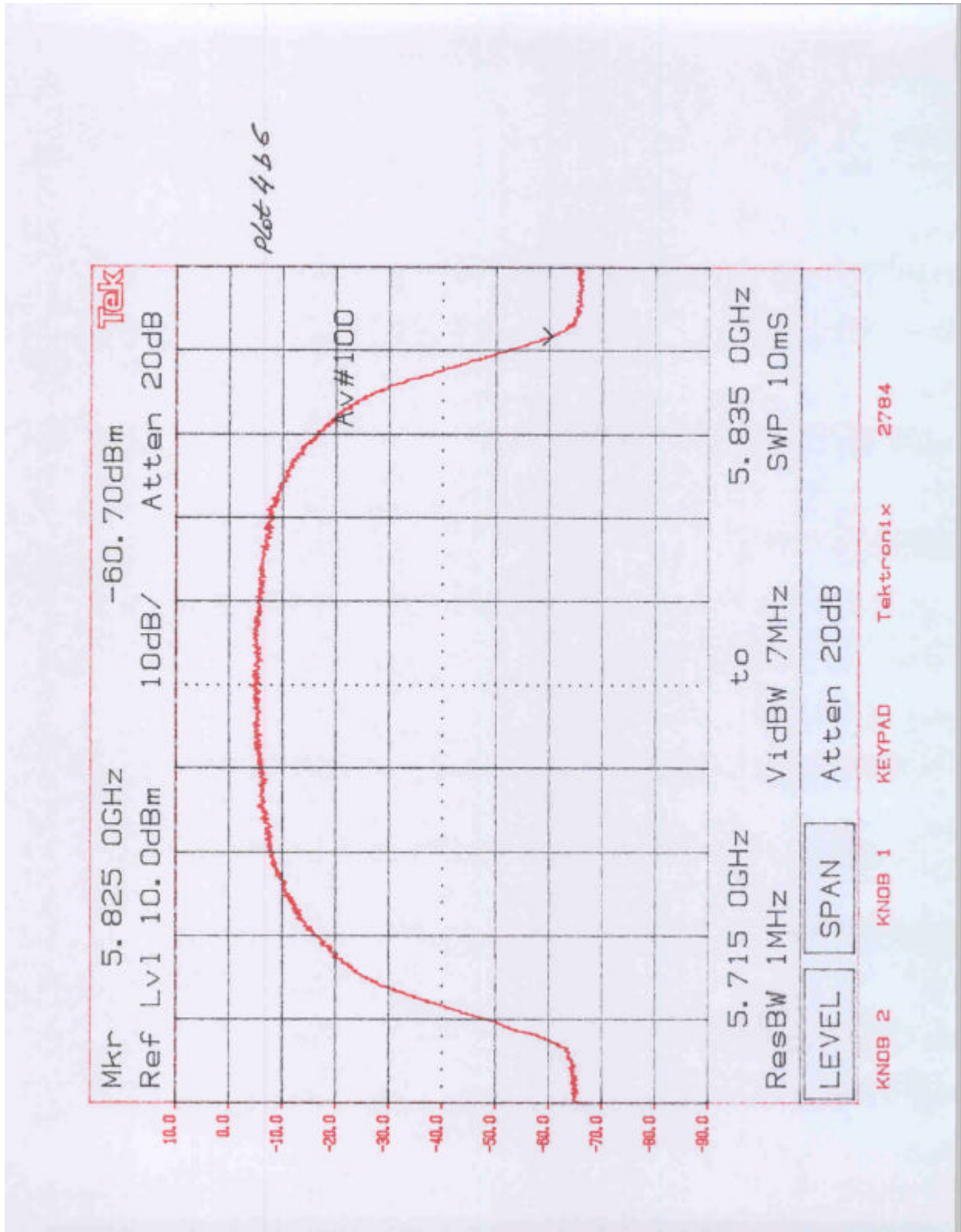


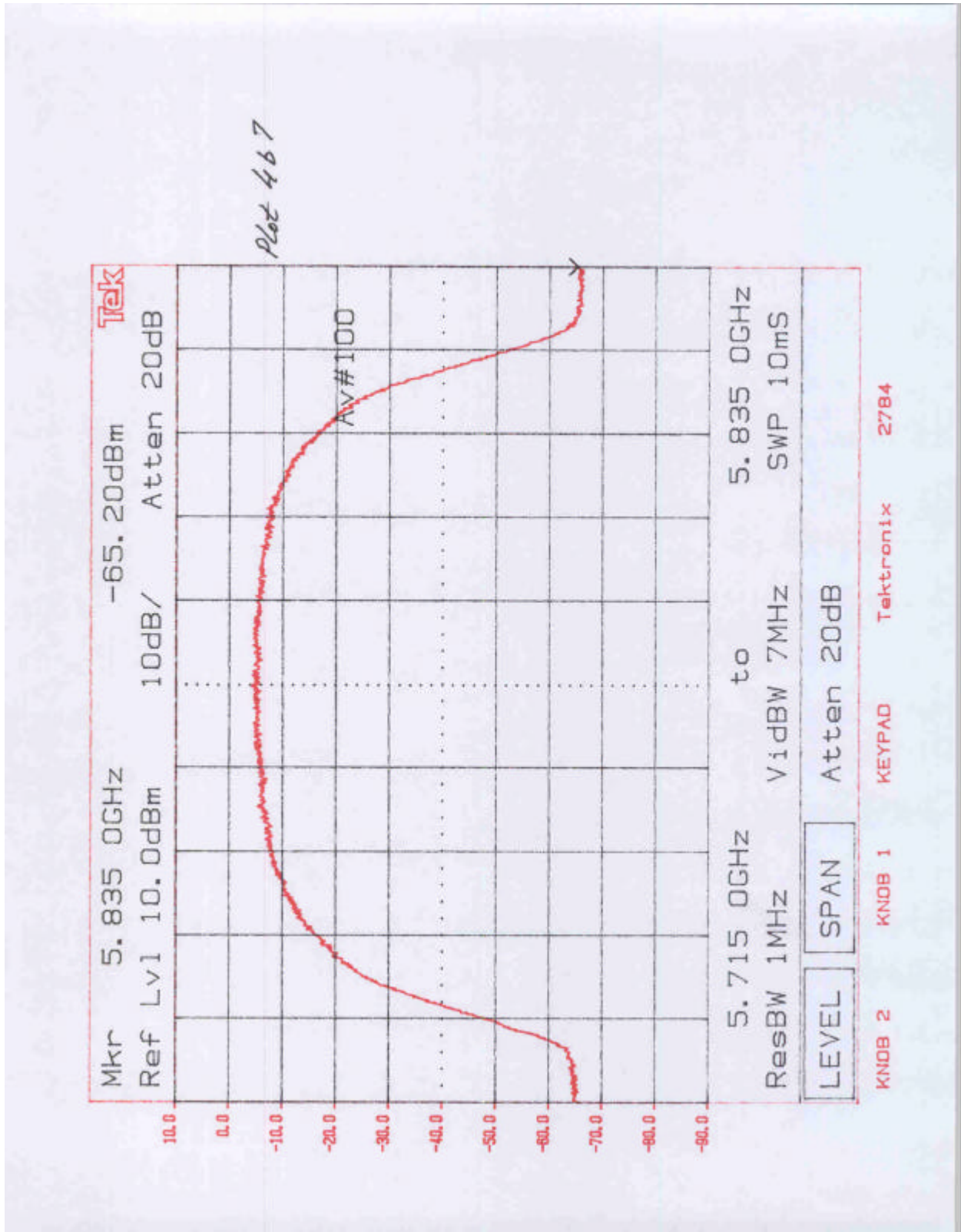


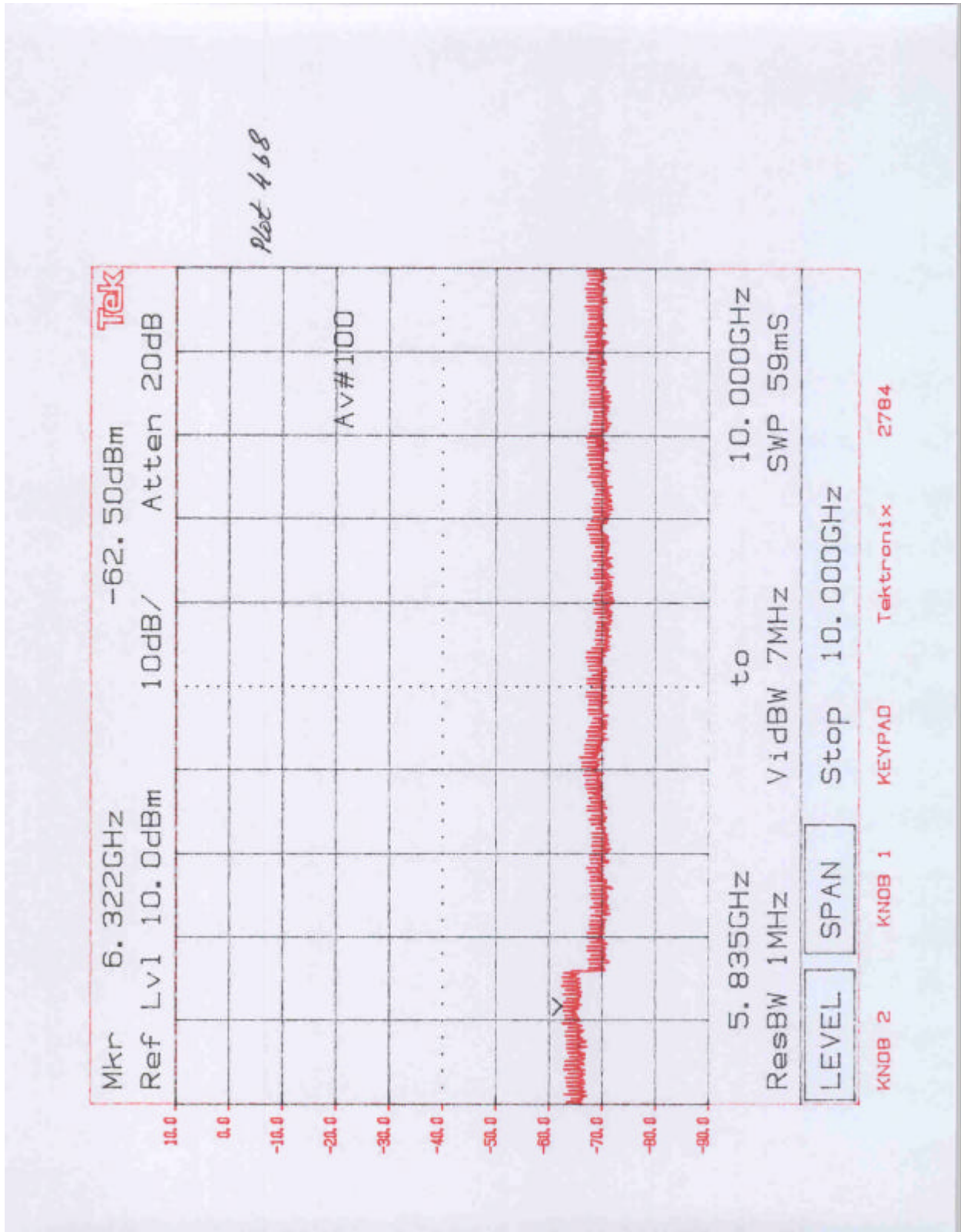


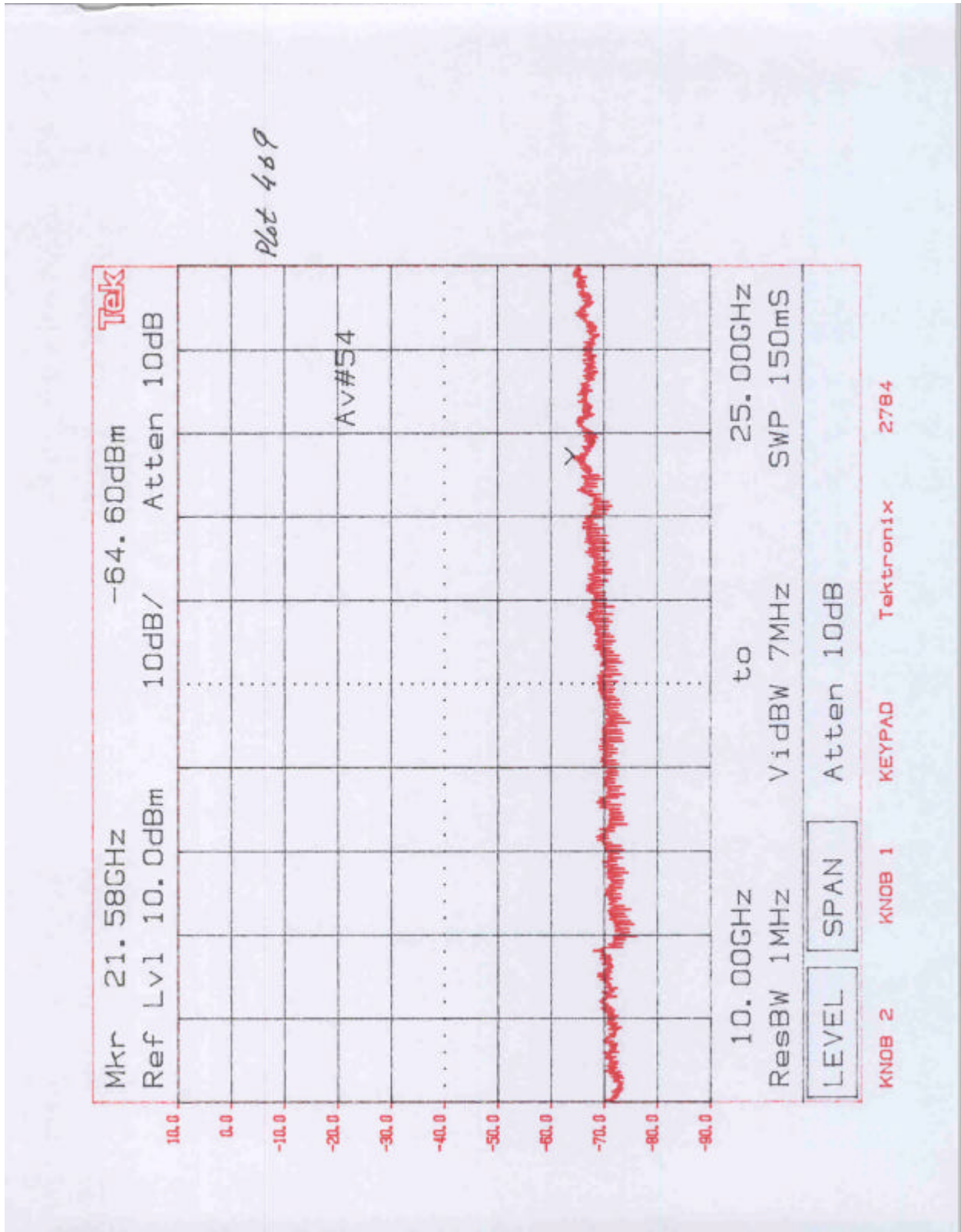


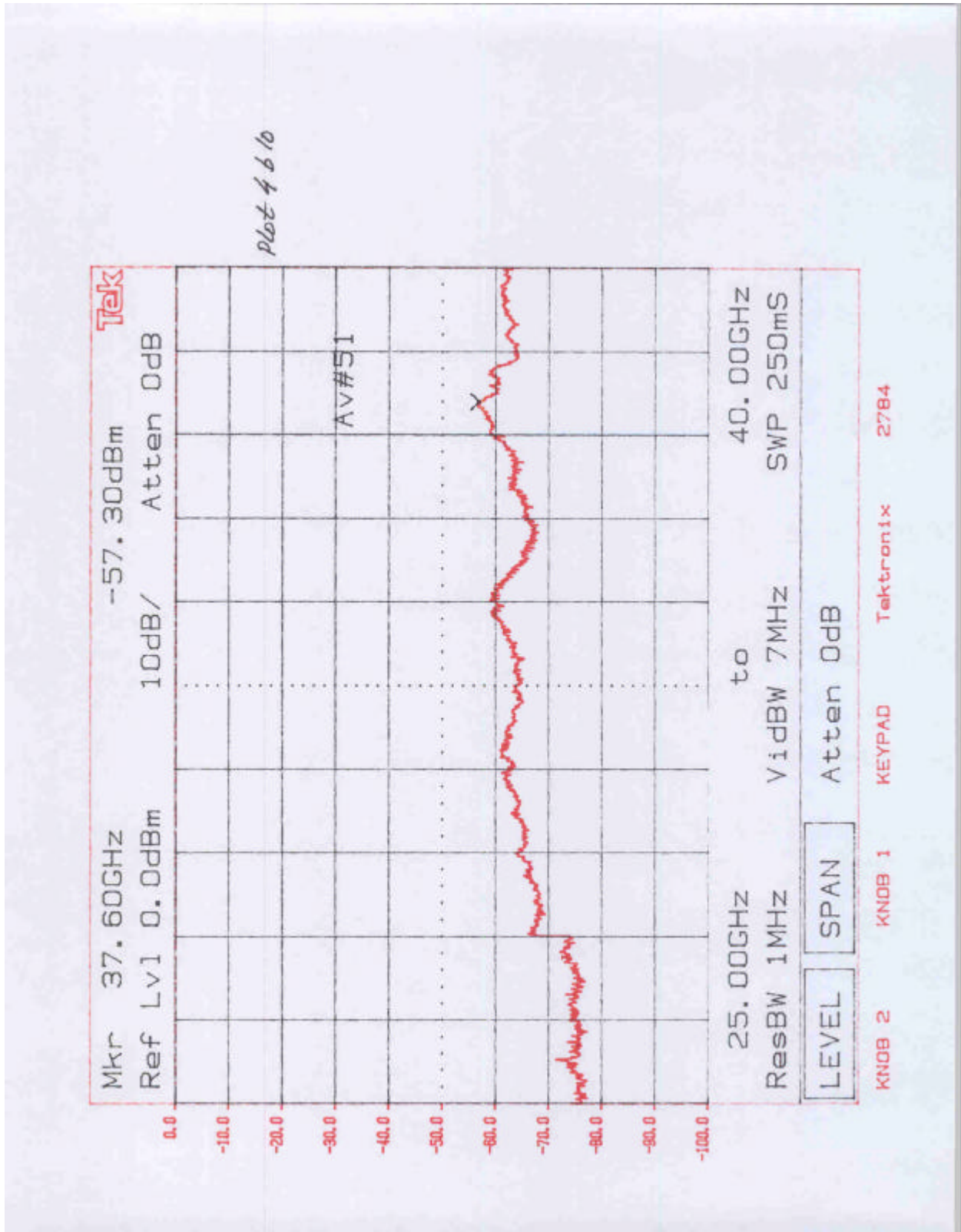












Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

4.6 Transmitter Radiated Emissions
FCC Rule 15.407(b), 15.109, 15.205

Radiated emission measurements were performed from 30 MHz to 40,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

Where FS = Field Strength in dB μ V/m

RR = RA - AG in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antennas factor of 7.4-dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

Test Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance:

Data sheets #1 and #2 - with antenna DFPD1-52

Data sheets #3 and #4 - with antenna DFPD2-52

Data sheets #5 and #6 - with antenna SSP2-52B

Data sheets #7 and #8 - with antenna SSD8-52

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#1
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.247 RB
EUT: U-NII radio w/DFPD1-52 antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.3 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	21	8	22	10	13	12	10	0	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS72-1	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.06E+4	40.0	Peak	8	10	H	39.3	39.5	7.0	0.0	46.8	74.0	-27.2
1.06E+4	31.2	Ave.	8	10	H	39.3	39.5	7.0	0.0	38.0	54.0	-16.0
1.59E+4	38.8	Peak	8	10	H	41.2	38.4	8.7	0.0	50.3	74.0	-23.7
1.59E+4	28.9	Ave.	8	10	H	41.2	38.4	8.7	0.0	40.4	54.0	-13.6
2.12E+4	39.0	Peak	21	12	H	40.3	32.2	2.0	-9.5	39.6	74.0	-34.4
2.12E+4	28.4	Ave.	21	12	H	40.3	32.2	2.0	-9.5	29.0	54.0	-25.0
2.65E+4	40.1	Peak	22	13	V	43.4	24.2	2.4	-9.5	52.1	74.0	-21.9
2.65E+4	30.1	Ave.	22	13	V	43.4	24.2	2.4	-9.5	42.1	54.0	-11.9
3.18E+4	45.3	Peak	22	13	V	43.5	25.9	2.8	-9.5	56.2	74.0	-17.8
3.18E+4	35.1	Ave.	22	13	V	43.5	25.9	2.8	-9.5	46.0	54.0	-8.0
3.71E+4	46.2	Peak	22	13	V	43.7	23.8	3.2	-9.5	59.7	74.0	-14.3
3.71E+4	35.9	Ave.	22	13	V	43.7	23.8	3.2	-9.5	49.4	54.0	-4.6

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#2
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.247 RB
EUT: U-NII radio w/ DFPD1-52 antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.775 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

Number:	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
		21	8	22	10	13	12	12	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.16E+4	40.0	Peak	8	10	H	40.4	39.7	7.3	0.0	48.0	74.0	-26.0
1.16E+4	30.9	Ave.	8	10	H	40.4	39.7	7.3	0.0	38.9	54.0	-15.1
1.73E+4	38.9	Peak	8	10	H	42.2	38.8	9.2	0.0	51.5	74.0	-22.5
1.73E+4	28.9	Ave.	8	10	H	42.2	38.8	9.2	0.0	41.5	54.0	-12.5
2.31E+4	39.0	Peak	21	12	H	40.4	32.2	2.2	-9.5	39.9	74.0	-34.1
2.31E+4	28.4	Ave.	21	12	H	40.4	32.2	2.2	-9.5	29.3	54.0	-24.7
2.89E+4	39.8	Peak	22	13	V	43.4	24.2	2.6	-9.5	52.1	74.0	-21.9
2.89E+4	29.5	Ave.	22	13	V	43.4	24.2	2.6	-9.5	41.8	54.0	-12.2
3.47E+4	45.0	Peak	22	13	V	43.6	23.8	3.0	-9.5	58.2	74.0	-15.8
3.47E+4	35.0	Ave.	22	13	V	43.6	23.8	3.0	-9.5	48.2	54.0	-5.8

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#3
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.205 RB
EUT: U-NII radio w/ DFPD2-52 antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.3 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

Number:	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
		21	8	22	10	13	12	10	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS72-1	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.06E+4	41.0	Peak	8	10	H	39.3	39.5	7.0	0.0	47.8	74.0	-26.2
1.06E+4	31.5	Ave.	8	10	H	39.3	39.5	7.0	0.0	38.3	54.0	-15.7
1.59E+4	38.9	Peak	8	10	H	41.2	38.4	8.7	0.0	50.4	74.0	-23.6
1.59E+4	29.0	Ave.	8	10	H	41.2	38.4	8.7	0.0	40.5	54.0	-13.5
2.12E+4	38.2	Peak	21	12	H	40.3	32.2	2.0	-9.5	38.8	74.0	-35.2
2.12E+4	28.0	Ave.	21	12	H	40.3	32.2	2.0	-9.5	28.6	54.0	-25.4
2.65E+4	40.5	Peak	22	13	V	43.4	24.2	2.4	-9.5	52.5	74.0	-21.5
2.65E+4	30.1	Ave.	22	13	V	43.4	24.2	2.4	-9.5	42.1	54.0	-11.9
3.18E+4	45.0	Peak	22	13	V	43.5	25.9	2.8	-9.5	55.9	74.0	-18.1
3.18E+4	35.0	Ave.	22	13	V	43.5	25.9	2.8	-9.5	45.9	54.0	-8.1
3.71E+4	46.2	Peak	22	13	V	43.7	23.8	3.2	-9.5	59.7	74.0	-14.3
3.71E+4	36.0	Ave.	22	13	V	43.7	23.8	3.2	-9.5	49.5	54.0	-4.5

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#4
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.247 RB
EUT: U-NII radio w/ DFPD2-52 antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.775 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

Number:	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
		21	8	22	10	13	12	12	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.16E+4	40.5	Peak	8	10	H	40.4	39.7	7.3	0.0	48.5	74.0	-25.5
1.16E+4	30.4	Ave.	8	10	H	40.4	39.7	7.3	0.0	38.4	54.0	-15.6
1.73E+4	39.0	Peak	8	10	H	42.2	38.8	9.2	0.0	51.6	74.0	-22.4
1.73E+4	28.9	Ave.	8	10	H	42.2	38.8	9.2	0.0	41.5	54.0	-12.5
2.31E+4	40.0	Peak	21	12	H	40.4	32.2	2.2	-9.5	40.9	74.0	-33.1
2.31E+4	29.0	Ave.	21	12	H	40.4	32.2	2.2	-9.5	29.9	54.0	-24.1
2.89E+4	39.8	Peak	22	13	V	43.4	24.2	2.6	-9.5	52.1	74.0	-21.9
2.89E+4	30.0	Ave.	22	13	V	43.4	24.2	2.6	-9.5	42.3	54.0	-11.7
3.47E+4	45.0	Peak	22	13	V	43.6	23.8	3.0	-9.5	58.2	74.0	-15.8
3.47E+4	35.0	Ave.	22	13	V	43.6	23.8	3.0	-9.5	48.2	54.0	-5.8

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#5
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.205 RB
EUT: U-NII radio w/ SSP2-52B antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.3 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	21	8	22	10	13	12	12	0	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.06E+4	40.1	Peak	8	10	H	39.3	39.5	7.0	0.0	46.9	74.0	-27.1
1.06E+4	31.0	Ave.	8	10	H	39.3	39.5	7.0	0.0	37.8	54.0	-16.2
1.59E+4	39.0	Peak	8	10	H	41.2	38.4	8.7	0.0	50.5	74.0	-23.5
1.59E+4	29.0	Ave.	8	10	H	41.2	38.4	8.7	0.0	40.5	54.0	-13.5
2.12E+4	38.0	Peak	21	12	H	40.3	32.2	2.0	-9.5	38.6	74.0	-35.4
2.12E+4	28.0	Ave.	21	12	H	40.3	32.2	2.0	-9.5	28.6	54.0	-25.4
2.65E+4	40.0	Peak	22	13	V	43.4	24.2	2.4	-9.5	52.0	74.0	-22.0
2.65E+4	30.1	Ave.	22	13	V	43.4	24.2	2.4	-9.5	42.1	54.0	-11.9
3.18E+4	45.0	Peak	22	13	V	43.5	25.9	2.8	-9.5	55.9	74.0	-18.1
3.18E+4	35.0	Ave.	22	13	V	43.5	25.9	2.8	-9.5	45.9	54.0	-8.1
3.71E+4	46.0	Peak	22	13	V	43.7	23.8	3.2	-9.5	59.5	74.0	-14.5
3.71E+4	36.0	Ave.	22	13	V	43.7	23.8	3.2	-9.5	49.5	54.0	-4.5

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#6
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.247 RB
EUT: U-NII radio w/ SSP2-52B antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 20, 2001	Test Distance	3 meters
Test Mode: transmitting @ 5.775 GHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	21	8	22	10	13	12	12	0	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/400	ACO/180	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
1.16E+4	40.2	Peak	8	10	H	40.4	39.7	7.3	0.0	48.2	74.0	-25.8
1.16E+4	31.0	Ave.	8	10	H	40.4	39.7	7.3	0.0	39.0	54.0	-15.0
1.73E+4	39.5	Peak	8	10	H	42.2	38.8	9.2	0.0	52.1	74.0	-21.9
1.73E+4	28.5	Ave.	8	10	H	42.2	38.8	9.2	0.0	41.1	54.0	-12.9
2.31E+4	40.5	Peak	21	12	H	40.4	32.2	2.2	-9.5	41.4	74.0	-32.6
2.31E+4	29.0	Ave.	21	12	H	40.4	32.2	2.2	-9.5	29.9	54.0	-24.1
2.89E+4	39.8	Peak	22	13	V	43.4	24.2	2.6	-9.5	52.1	74.0	-21.9
2.89E+4	30.1	Ave.	22	13	V	43.4	24.2	2.6	-9.5	42.4	54.0	-11.6
3.47E+4	45.0	Peak	22	13	V	43.6	23.8	3.0	-9.5	58.2	74.0	-15.8
3.47E+4	35.2	Ave.	22	13	V	43.6	23.8	3.0	-9.5	48.4	54.0	-5.6

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequency above 19 GHz was made at 1m distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#7
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.205 (RB)
EUT: U-NII radio w/SSD8-52 antenna	FCC ID: HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 24, 2001	Test Distance	3 meters
Test Mode: transmitting at 5.3 GHz	Engineer: Barry Smith	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	21	8	22	10	12	13	12	0	0	0
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/180	ACO/400	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
1.16E+4	40.5	Peak	8	10	V	40.6	39.7	7.3	0.0	48.7	74.0	-25.3
1.16E+4	31.9	Ave.	8	10	V	40.6	39.7	7.3	0.0	40.1	54.0	-13.9
1.73E+4	39.0	Peak	8	10	V	42.0	38.8	9.2	0.0	51.4	74.0	-22.6
1.73E+4	32.1	Ave.	8	10	V	42.0	38.8	9.2	0.0	44.5	54.0	-9.5
2.31E+4	38.0	Peak	21	12	V	40.4	32.2	2.2	-9.5	36.7	74.0	-35.1
2.31E+4	29.2	Ave.	21	12	H	40.4	32.2	2.2	-9.5	27.9	54.0	-23.9
2.89E+4	41.3	Peak	22	13	H	43.4	24.2	2.6	-9.5	51.0	74.0	-20.4
2.89E+4	29.9	Ave.	22	13	H	43.4	24.2	2.6	-9.5	39.6	54.0	-11.8
3.47E+4	41.5	Peak	22	13	H	43.6	23.8	3.0	-9.5	51.7	74.0	-19.3
3.47E+4	32.4	Ave.	22	13	H	43.6	23.8	3.0	-9.5	42.6	54.0	-8.4

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequencies above 19 GHz measured at 1 meter distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

Radiated Emissions Test Data	#8
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Company: Western Multiplex Corporation	Model #: 28020	Standard	FCC § 15.205 (RB)
EUT: U-NII radio w/SSD8-52 antenna	FCC ID HZB-U5358-155	Limits	11
Project #: 3012069	Test Date: October 24, 2001	Test Distance	3 meters
Test Mode: transmitting at 5.775 GHz	Engineer: Barry Smith	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	21	8	22 10	12	13	12	0	0	0	
Model:	EMCO 3160-9	EMCO 3115	EMCO 3160-10	AFT 18855	ACO/180	ACO/400	NPS366	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
1.16E+4	40.5	Peak	8	10	V	40.6	39.7	7.3	0.0	48.7	74.0	-25.3
1.16E+4	31.9	Ave.	8	10	V	40.6	39.7	7.3	0.0	40.1	54.0	-13.9
1.73E+4	39.0	Peak	8	10	V	42.0	38.8	9.2	0.0	51.4	74.0	-22.6
1.73E+4	32.1	Ave.	8	10	V	42.0	38.8	9.2	0.0	44.5	54.0	-9.5
2.31E+4	38.0	Peak	21	12	V	40.4	32.2	2.2	-9.5	36.7	74.0	-35.1
2.31E+4	29.2	Ave.	21	12	H	40.4	32.2	2.2	-9.5	27.9	54.0	-23.9
2.89E+4	41.3	Peak	22	13	H	43.4	24.2	2.6	-9.5	51.0	74.0	-20.4
2.89E+4	29.9	Ave.	22	13	H	43.4	24.2	2.6	-9.5	39.6	54.0	-11.8
3.47E+4	41.5	Peak	22	13	H	43.6	23.8	3.0	-9.5	51.7	74.0	-19.3
3.47E+4	32.4	Ave.	22	13	H	43.6	23.8	3.0	-9.5	42.6	54.0	-8.4

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 3 dB below the limits.
	f) Frequencies above 19 GHz measured at 1 meter distance

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

4.7 Radiated Emissions from Digital Section and Receiver
FCC Rule 15.109, 15.209

The data on the following page list the significant emission frequencies, the limit and the margin of compliance.

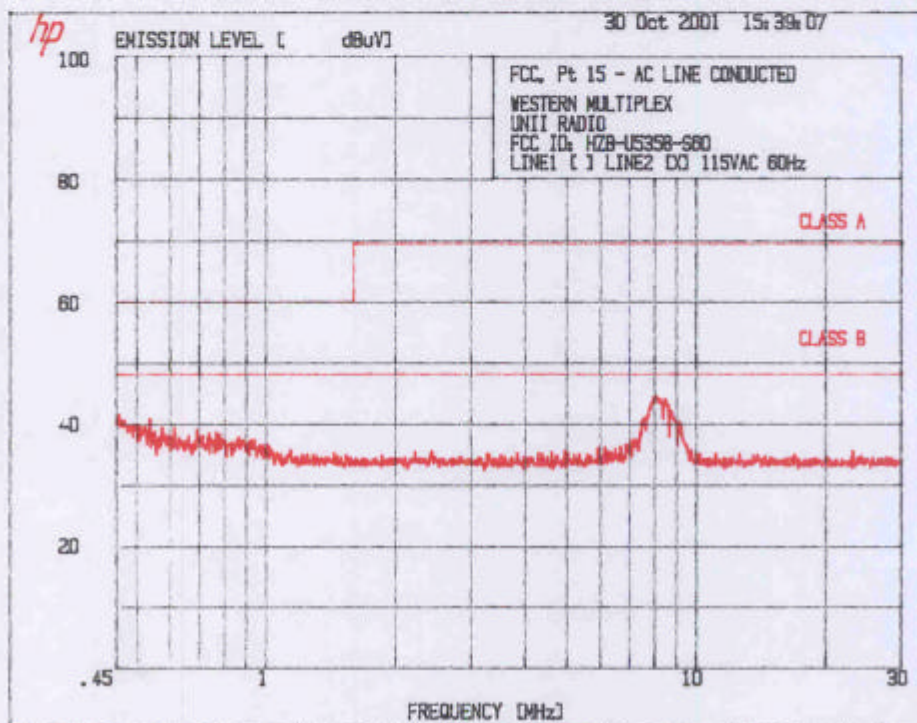
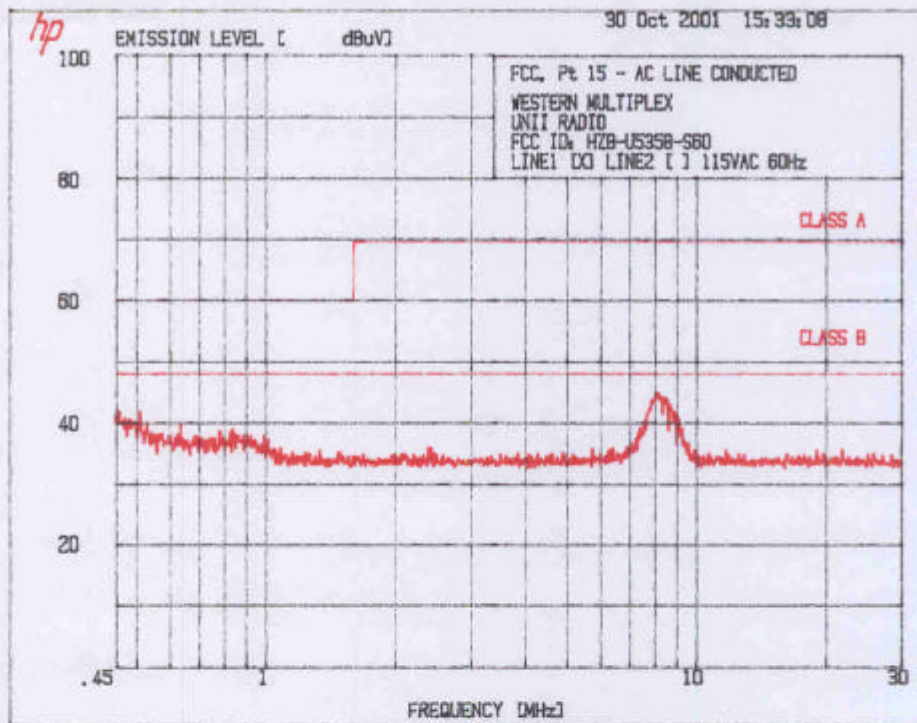
Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

4.8 AC Line Conducted Emission
FCC Rule 15.207

AC line conducted emission test was performed according the ANSI C63.4 standard. The EUT was connected to DC Power Supply which was connected to AC Line through the LISNs.

For the test result, see attached plot.



Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

4.9 Transmitter Duty Cycle Calculation / Measurements
FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time in 100 msec/100

Duty cycle correction, dB = 20 * log (DC)

	See attached spectrum analyzer chart(s) for transmitter timing
	See transmitter timing diagram provided by manufacturer
X	Not applicable.

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

5.0 List of Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. INT.	CAL. DUE
Spectrum Analyzer w/85650 QP Adapter	Hewlett Packard	8566B	2416A00317 2043A00251	12	4/6/02
Spectrum Analyzer w/8650 QP Adapter	Hewlett Packard	8568B	1912A0053 2521A01021	12	2/23/02
Spectrum Analyzer	Tektronix	2784	B3020108	12	8/8/02
Double-ridged Horn Antenna	EMCO	3115	9107-3712	12	3/17/02
Horn Antenna	EMCO	3160-09	Not Labeled	#	#
Horn Antenna	EMCO	3160-10	Not Labeled	#	#
Pre-Amplifier	CDI	P950	ITS009	12	7/2/02
Pre-Amplifier	Sonoma Inst.	310	185634	12	4/25/02
Pre-Amplifier	CDI	P1000	N/A	12	12/06/01
Pre-Amplifier	Avantek	AFT-18855	8723H705	12	12/5/01
Pre-amplifier	CTT	ACO/400	47526	12	12/5/01
Power Meter	Hewlett Packard	8900D	3607U00673	12	8/8/02
LISN	Solar Electronics	8025-50-TS-24-BNC	912434	12	6/11/02
LISN	Solar Electronics	8028-50-TS-24-BNC	941502	12	2/7/02

No Calibration Required

APPENDIX



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November 7, 2001

Subject: Statement of Compliance to FCC 15.407 (C)

To Whom It May Concern:

The HZB-U5358-155 radio was designed with networking capability, which demands the radio to carry networking traffic (polling, reporting) on a constant basis. Therefore, the radio is designed to transmit all the time (when operational). We designed the product in such a way that whenever a radio hardware failure is detected, the system firmware turns off the radio transmitter.

A handwritten signature in black ink, appearing to read "Caroline Yu". The signature is fluid and cursive, with a long horizontal stroke at the end.

Caroline Yu

Homologation Product Manager
Western Multiplex Corporation

FCC ID: HZB-U5358-155

Compliance with 15.407(g) frequency stability

The following table shows the specifications of the determining oscillators and the *total frequency stability of the equipment at both bands over the full operating temperature range*. The data show on the table covers the worst frequency shift situation within the full operating temperature range of -30 to +65C specified for the equipment under application. The oscillators are crystal types.

	5.775 GHz Transmitter	5.3 GHz Transmitter
Fundamental Oscillator (PN: 1900012-414000-000)	140MHz±10ppm or ±1.4 kHz	140MHz±10ppm or ±1.4 kHz
Secondary Oscillator (PN: 1900017-610900-000)	(109MHz±30ppm)x5 or ±16.4kHz	(109MHz±30ppm) x5 or ±16.4kHz
RF reference Oscillator (PN: 1900017-610900-000)	(106.041666MHz±10ppm)x48 or ±50.89kHz	(124.687500MHz±10ppm)x48 or 59.85kHz
Total Frequency Stability	±11.89ppm or ±68.69kHz	±14.65ppm or ±77.65kHz

Justification for the claim of compliance with 15.407(g) is as follows:

- a) The lowest channel center frequency is 5300 MHz, with a 26dBc width of 86.3 MHz. The margin above and below the 26dBc points to the band edges is 6.85 MHz, both above and below the center frequency.
- b) The highest channel center frequency is 5775 MHz with a 26dBc width of 80.4 MHz. The margin above and below the 26dBc points to the band edges is 9.8 MHz, both above and below the center frequency.
- c) Therefore, the frequency stability of the frequency-determining element must be no worse than 0.129% (6.85 MHz/5300 MHz) over the normal operating range to maintain the emissions within the allowed band. From the above table, it can be seen that the frequency-determining components offer much superior stability to ensure the compliance to 15.407(g).