

Intertek Testing Services

APPLICATION FOR FCC CERTIFICATION

Western Multiplex

U-NII Radio

Model: 27720

FCC ID: HZB-U5358-100

Job # J20008318

Number of Pages: 16 pp. + Supporting Data and Documents

Date of Report: April 27, 2000

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Western Multiplex
FCC ID: HZB-U5358-100

Date of Test: March 29 – April 12, 2000

1.0 Summary of Tests

Western Multiplex, MODEL: 27720
FCC ID: HZB-U5358-100

TEST	REFERENCE	RESULTS
Max. Output power	15.407 (a)	Pass
26 dB Bandwidth	15.407 (a)	For calculation only
Max. Power Density	15.407 (a) (5)	Pass
Out of Band Antenna Conducted Emission	15.407 (b)	Pass
Radiated Emission in Restricted Bands	15.205	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.209	Pass
Radiated Emission from Receiver L.O.	15.209	Not Applicable
Radiation Exposure Requirement	1.1310	Pass (see section 4.10)
Antenna Requirement	15.203	Not Applicable

Test Engineer: *Li Ming Yang for*
Ollie Moyfong

Date: *4/5/00*

EMC Site Manager: *David Chernomordik*
David Chernomordik

Date: *4/5/00*

2.0 General Description

2.1 Product Description

The EUT Model No.: 27720 is an intentional transmitter used for wireless point-to-point communications operating in the frequency ranges: 5.25 - 5.35 GHz and 5.725 - 5.825 GHz.

A pre-production version of the sample was received on March 28, 2000 in good condition.

Overview of Spread Spectrum Radio

Applicant	Western Multiplex Corporation
Trade Name & Model No.	27720
FCC Identifier	HZB-U5358-100
Use of Product	Point-to-point fixed wireless interconnect
Manufacturer & Model of Spread Spectrum Module	Western Multiplex Corporation
Type of Transmission	QPSK
Rated RF Output (mW)	200 mW (5.3 GHz), 159 mW (5.775 GHz)
Frequency Range (MHz)	5.25-5.35 GHz, 5.725-5.825 GHz
Number of Channel(s)	2
Antenna(s) & Gain, dBi	5 dBi, 23 dBi, 29 dBi
Antenna Requirement	<input type="checkbox"/> The EUT uses a permanently connected antenna. <input type="checkbox"/> The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. <input checked="" type="checkbox"/> The EUT requires professional installation (attach supporting documentation if using this option).
Manufacturer name & address	Western Multiplex Corporation 1196 Borregas Avenue Sunnyvale, California 94089

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

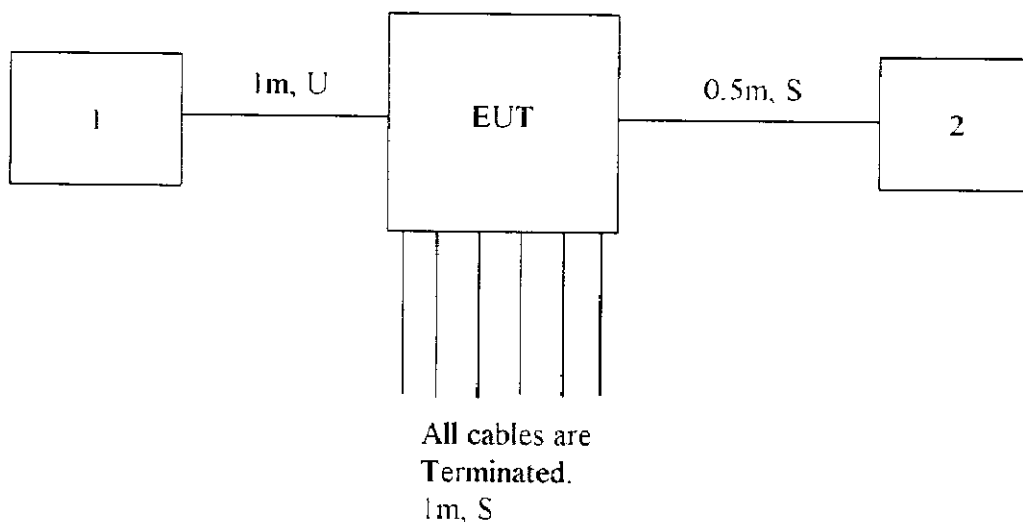
The open area test site and conducted measurement facility used to collect the radiated data is site 2. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

3.0 System Test Configuration

3.1 Support Equipment and description

Item #	Description	Model No.	Serial No.
1	GW DC Power Supply	GPR-6030	8690196
2	Various Antennas	OMNH-5.8, DFPS1-52(M1), SSP2-52B, 57C24N-1	N/A

3.2 Block Diagram of Test Setup



m: Length
S: Shielded
U: Unshielded

3.3 Justification

For emission testing, the **Equipment Under Test (EUT)** was configured for testing in a typical fashion (as a customer would normally use it). During testing, **all cables were manipulated to produce worst case emissions.**

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. 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.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of operation during test

Transmitting signal on low and high channels.

3.6 Modifications required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Western Multiplex prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminal, FCC Rule 15.407(a)

Requirement:

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band, the peak transmit power shall not exceed the lesser of 1 Watt (30 dBm) or $17 \text{ dBm} + 10\text{Log}(B)$, where B is the 26dB emission bandwidth in MHz (for antenna gain up to 23 dBi). For devices operating in 5.25-5.35 GHz band, the peak transmit power shall not exceed the lesser of 250 mW (24 dBm) or $11 \text{ dBm} + 10\text{Log}(B)$, where B is the 26 dB emission bandwidth in MHz.

Procedure:

The antenna port of the EUT was connected to the input of a power meter. Power was read directly from the meter and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

Result:

Frequency, MHz	Output Power, dBm	Output Power, mW	Maximum allowed antenna gain, dBi*
Low Channel: 5300	23.0	199.5	7.0
High Channel: 5775	22.0	158.5	31.0

*Note: Maximum antenna gain without reducing the output power and without taking into account antenna cable loss.

4.2 26 dB Bandwidth, FCC Rule 15.407(a): (for calculation only)

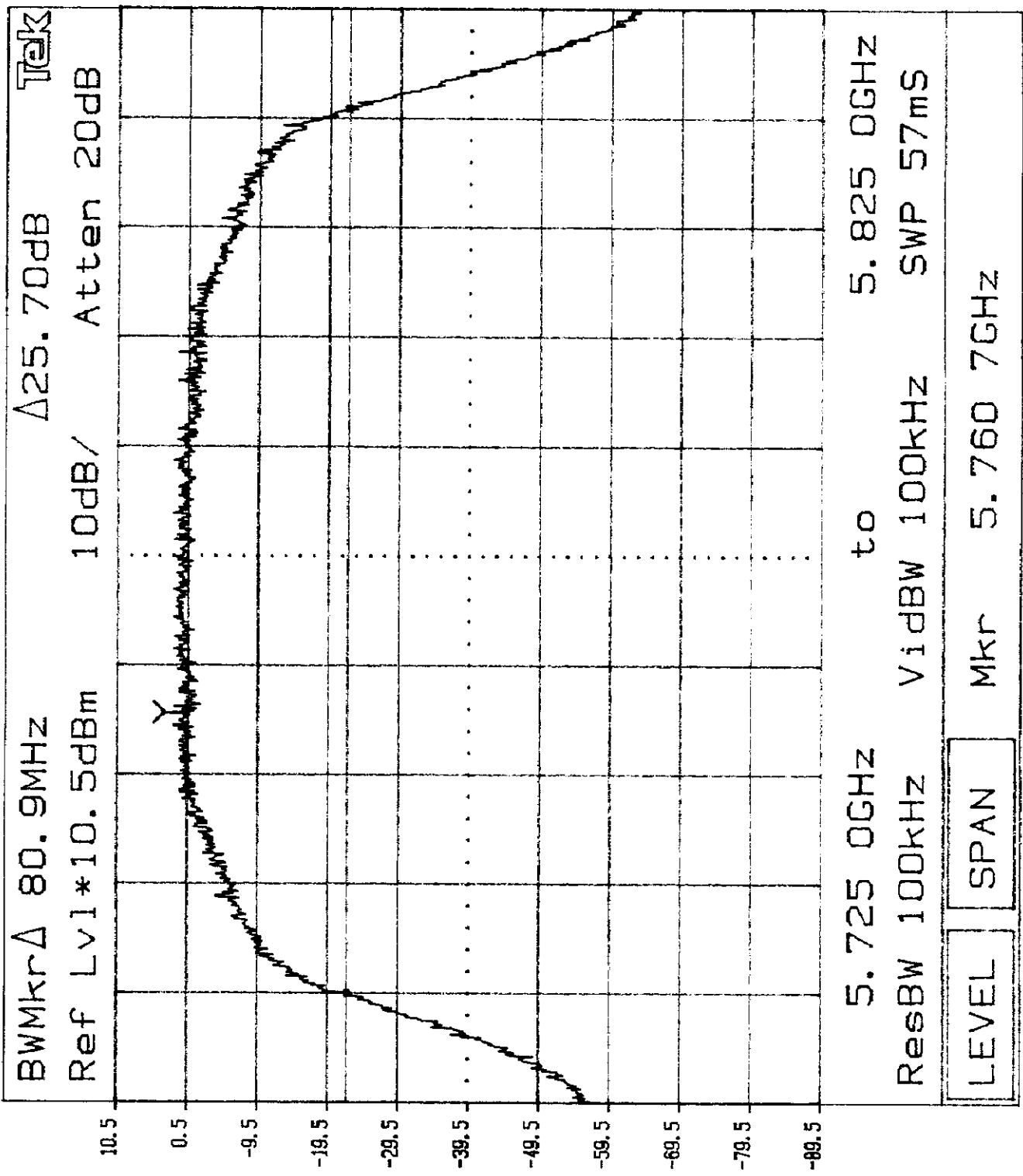
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer Res BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 26 dB lower than PEAK level. The 26 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency, MHz	26 dB Bandwidth, MHz
5300	84.4
5775	80.9

Refer to the following plots for 26 dB bandwidth:

Plot 1a: Low Channel 26 dB Bandwidth

Plot 1b: High Channel 26 dB Bandwidth

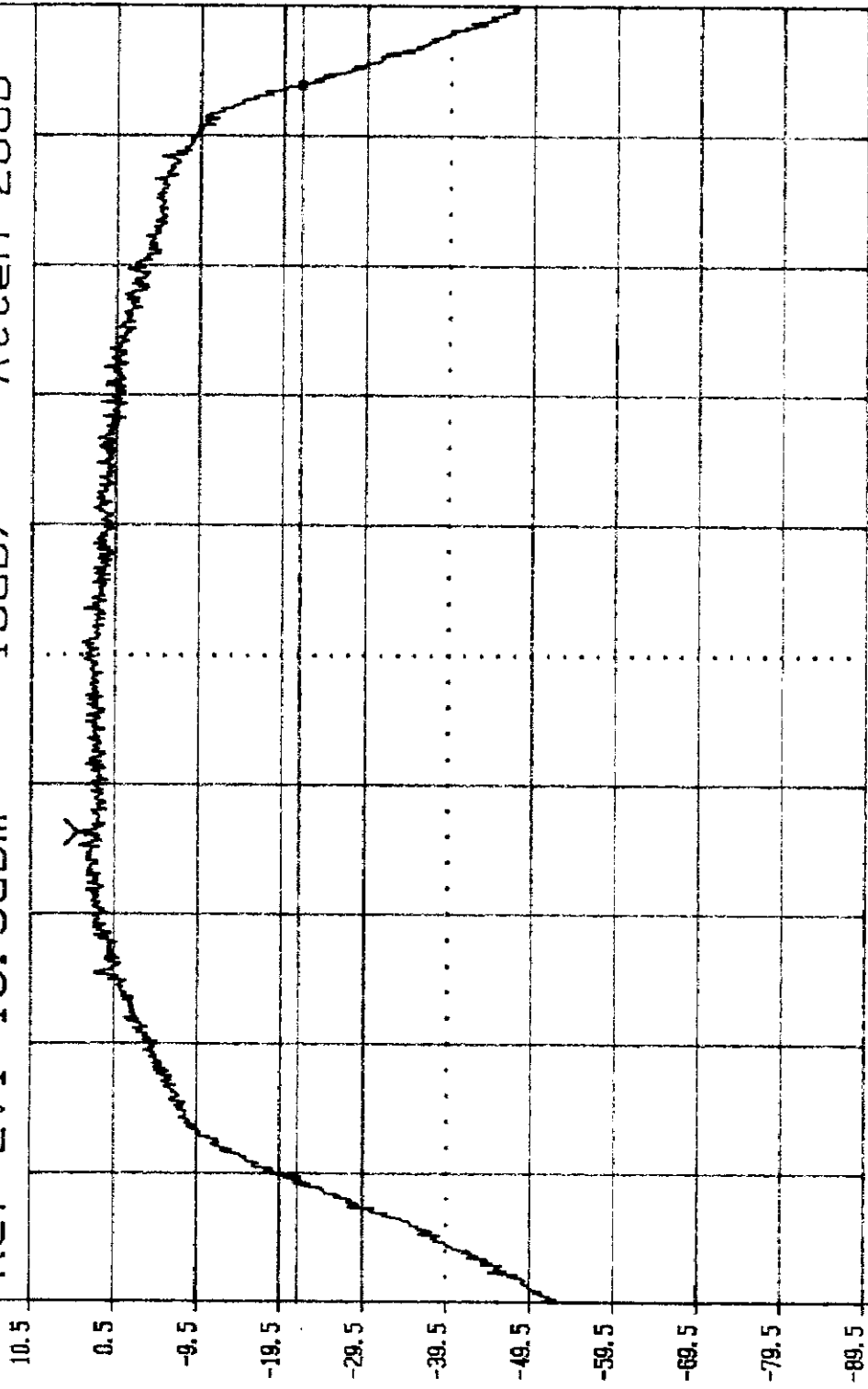


KNOB 2 KNOB 1 KEYPAD Tektronix 2784

Plot 1/2

BWMkrΔ 84.4MHz Δ26.20dB Tek

Ref Lv1*10.5dBm 10dB/ Atten 20dB



5.250 0GHZ to 5.350 0GHZ
ResBW 100kHz VidBW 100kHz SWP 57mS

LEVEL SPAN

Strt 5.250 0GHZ

KNOB 2 KNOB 1 KEYPAD Tektronix 2784

Plot 1a

4.3 Maximum Power Density, FCC Rule 15.407(a)(3):

Requirement:

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band the peak power spectral density shall not exceed 17 dBm in any 1 MHz band (for antenna gain up to 23 dBi).

For devices operating in 5.25-5.35 GHz band peak power spectral density shall not exceed 11 dBm in any 1 MHz band (for antenna gain up to 6 dBi).

Procedure:

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

The spectrum analyzer Resolution Bandwidth was set to 1 MHz and Video Bandwidth was set to 7 MHz. The START and STOP frequencies were set to the band edges of the maximum output passband. The spectrum analyzer was set to video average, 100 sweeps were used. Maximum peak-power spectral density reading was recorded.

Result:

Frequency, MHz	Power Density, dBm	Limit, dBm
5300	9.6	11.0
5775	9.1	17.0

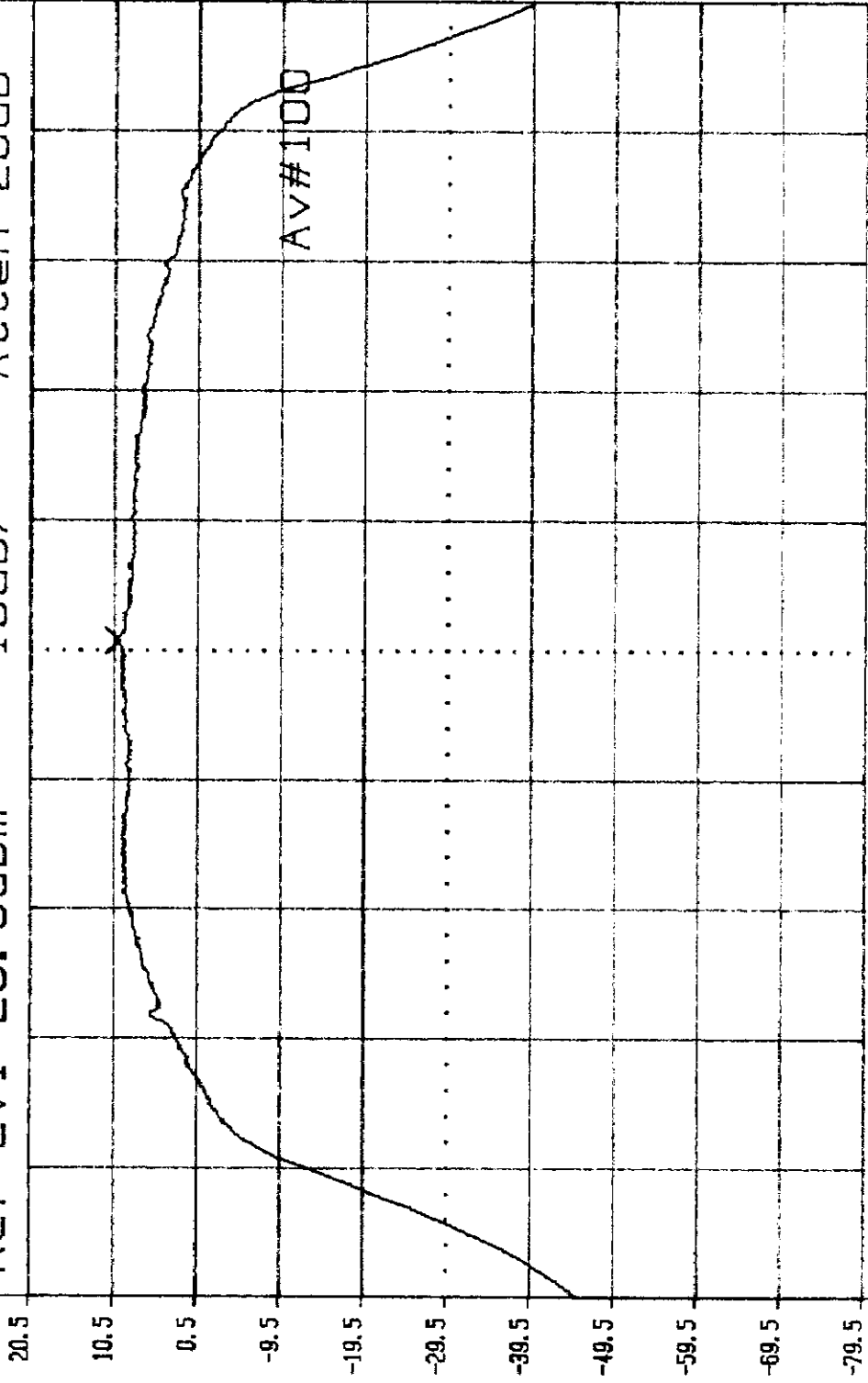
Refer to the following plots for power density data:

Plot 2a: Low Channel Power Density

Plot 2b: High Channel Power Density

Mkr 5.300 8GHz *9.60dBm Tek

Ref Lv1*20.5dBm 10dB/ Atten 20dB



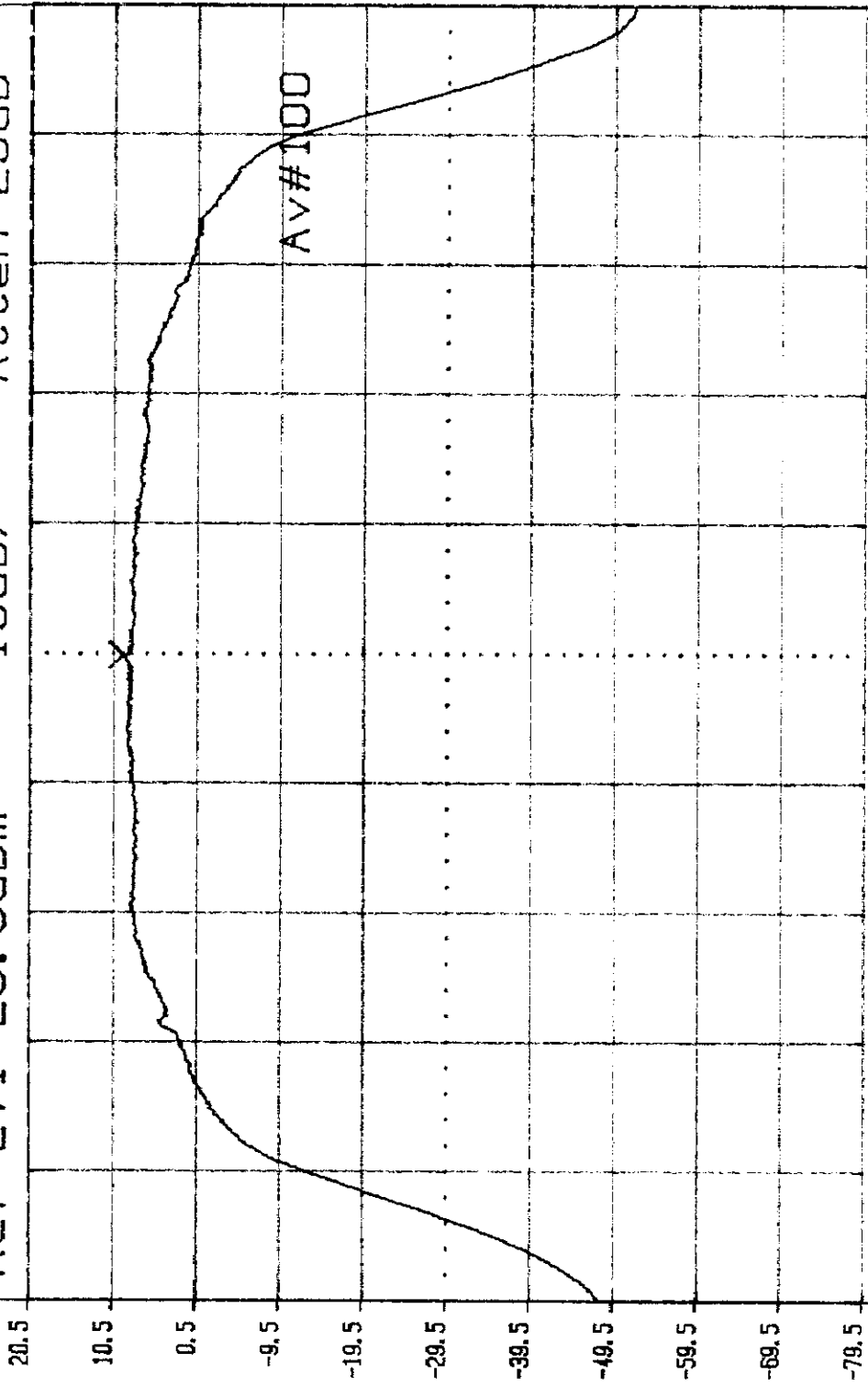
5.250 0GHz to 5.350 0GHz
ResBW 1MHz VidBW 7MHz SWP 20ms

LEVEL SPAN

Strt 5.250 0GHz

Mkr 5.774 9GHz *9.10dBm Tek

Ref Lv1*20.5dBm 10dB/ Atten 20dB



5.725 0GHz to 5.825 0GHz
ResBW 1MHz VidBW 7MHz SWP 20mS

LEVEL SPAN

Ref Lv1*20.5dBm

4.4 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 equal or greater than Resolution Bandwidth. Several plots were made in the frequency range from 5715 to 5835 MHz with sample averaging (100 samples).

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

Result:

Refer to the following plots for out-of-band conducted emissions data:

Plot 3a1 – 3a9: Low Channel Emissions

Plot 3b1 – 3b13: High Channel Emissions

The results of the emissions at band-edge frequencies are on the following tables. In the frequency range from 5.725 GHz to 5.825 GHz maximum allowed antenna gain is 29.9 dBi (without reducing the output power and without taking into account antenna cable loss)

Operating frequency	Frequency, MHz	Level, dBm	Noise floor *, dBm	Corrected Signal, dBm	Limit, dBm/MHz	Maximum allowed antenna gain, dBi **
5775 MHz	5715	-52.2 from plot 3.b5	-54.0 from plot 3.b9	-56.9	-27.0	29.9
	5725	-48.9 from plot 3.b6	-54.0 from plot 3.b9	-50.5	-17.0	33.5
	5825	-52.7 from plot 3.b7	-54.0 from plot 3.b9	-58.6	-17.0	41.6
	5835	-53.3 from plot 3.b8	-54.0 from plot 3.b9	-61.6	-27.0	34.6

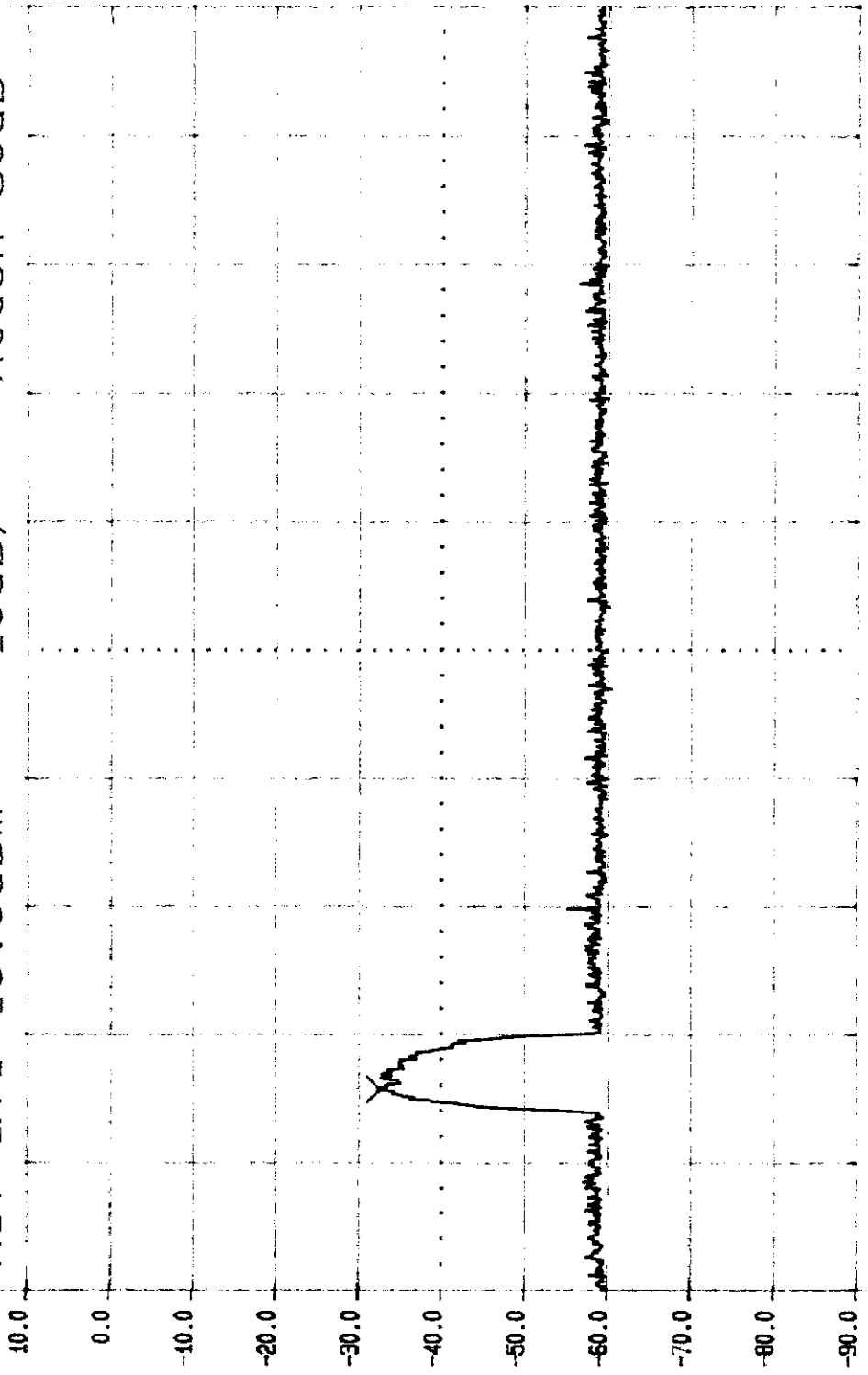
* EUT OFF

Operating frequency	Frequency, MHz	Level, dBm	Limit, dBm/MHz	Maximum allowed antenna gain, dBi **
5300 MHz	5150	-54.5 from plot 3.a5	-27.0	27.5
	5350	-46.3 from plot 3.a6.1	-27.0	19.3

** Note: maximum antenna gain without reducing the output power and without taking into account antenna cable loss.

Mkr 182.3MHz %ot 3.a/ -33.40dBm Tek

Ref LVI 10.0dBm 10dB/ Atten 30dB

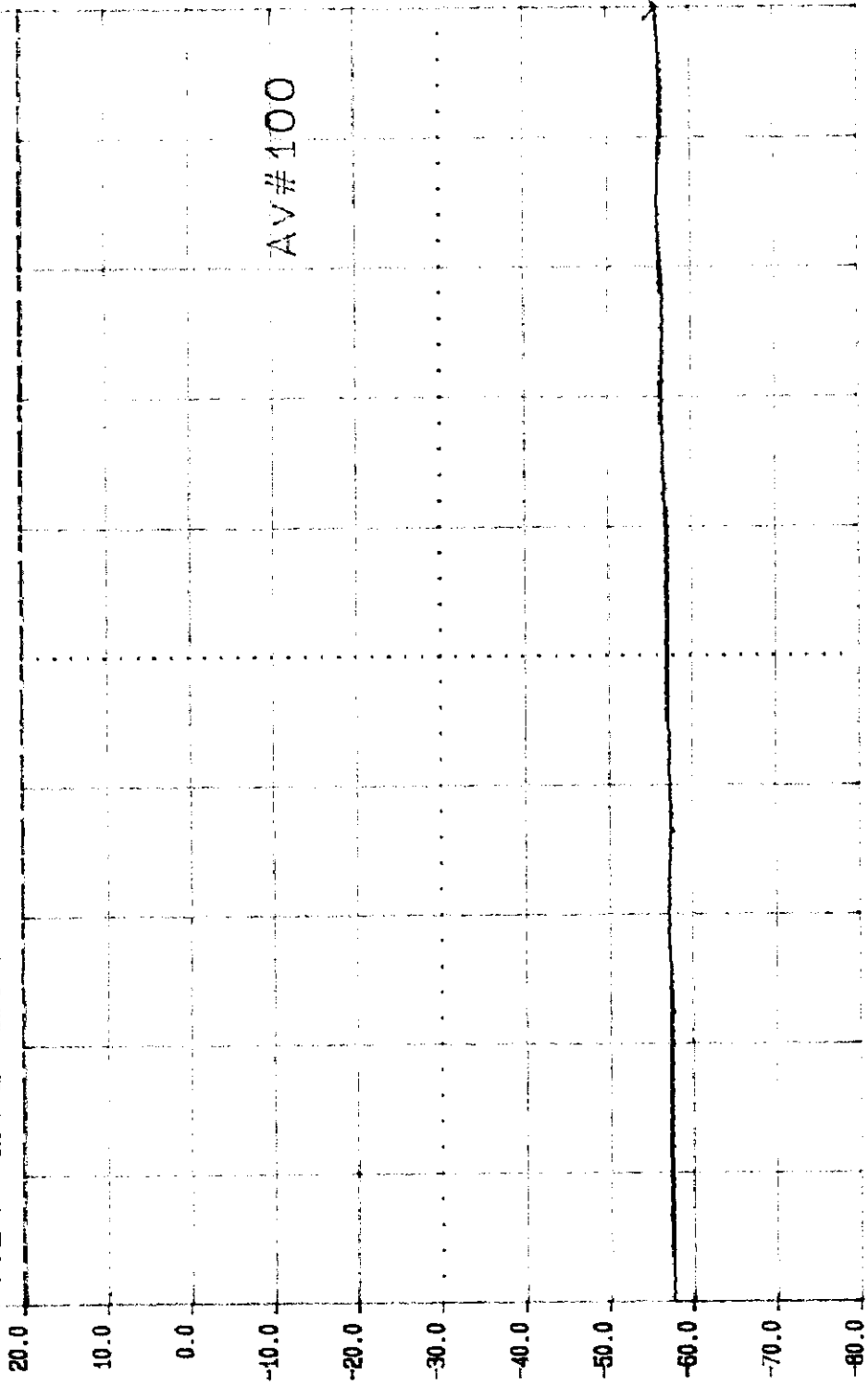


30.0MHz to 1.000 0GHz
 ResBW 100kHz VidBW 100kHz SWP 550ms

LEVEL SPAN Strt 30.0MHz

Mkr 2.500GHZ Plot 3.2.2 -56.40dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



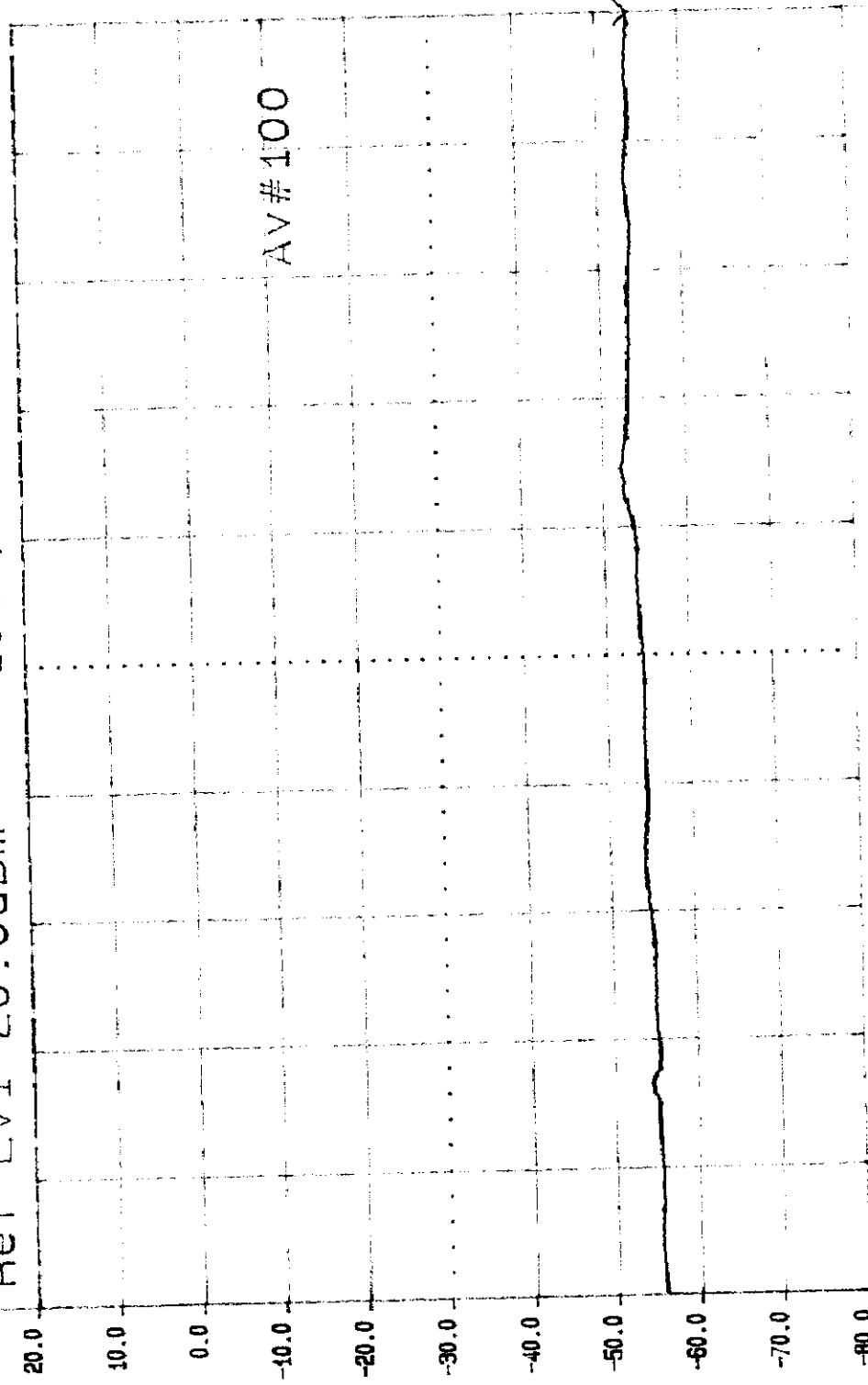
1.000GHZ to 2.500GHZ

ResBW 1MHZ VidBW 7MHZ SWP 20ms

LEVEL SPAN Stop 2.500GHZ

TEK

Mkr 5.150GHZ Plot 3.e3 -54.20dBm
Ref Lvl 20.0dBm 10dB/ Atten 20dB



2.500GHZ to 5.150GHZ
ResBW 1MHz VidBW 7MHz SWP 26ms

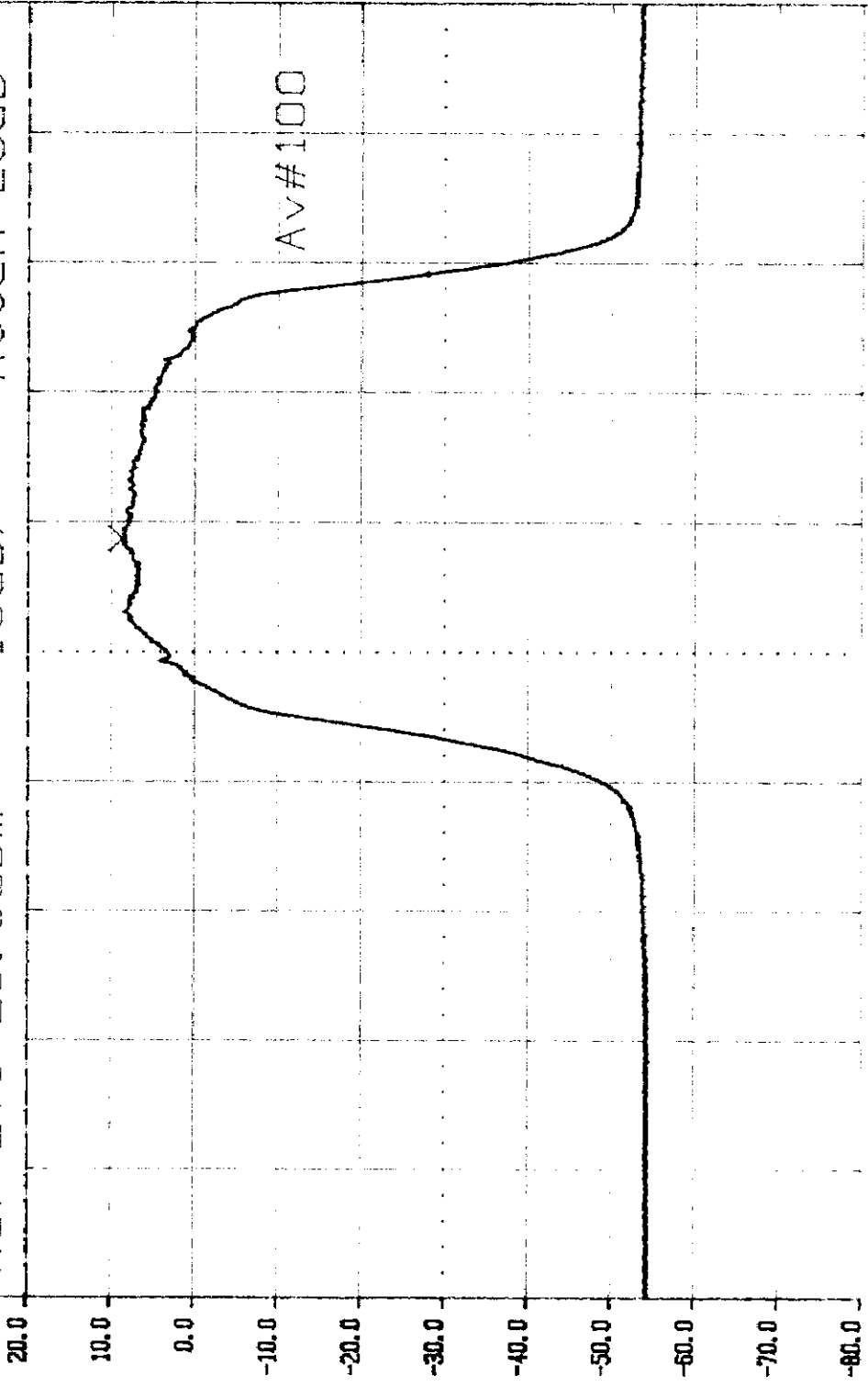
LEVEL SPAN

Stop 5.150GHZ

Knob 2 Knob 1 KEYPAD Tektronix 2784

Tek

Mkr 5.296 8GHz Plot 3.24 8.30dBm
Ref Lvl 20.0dBm 10dB/ Atten 20dB

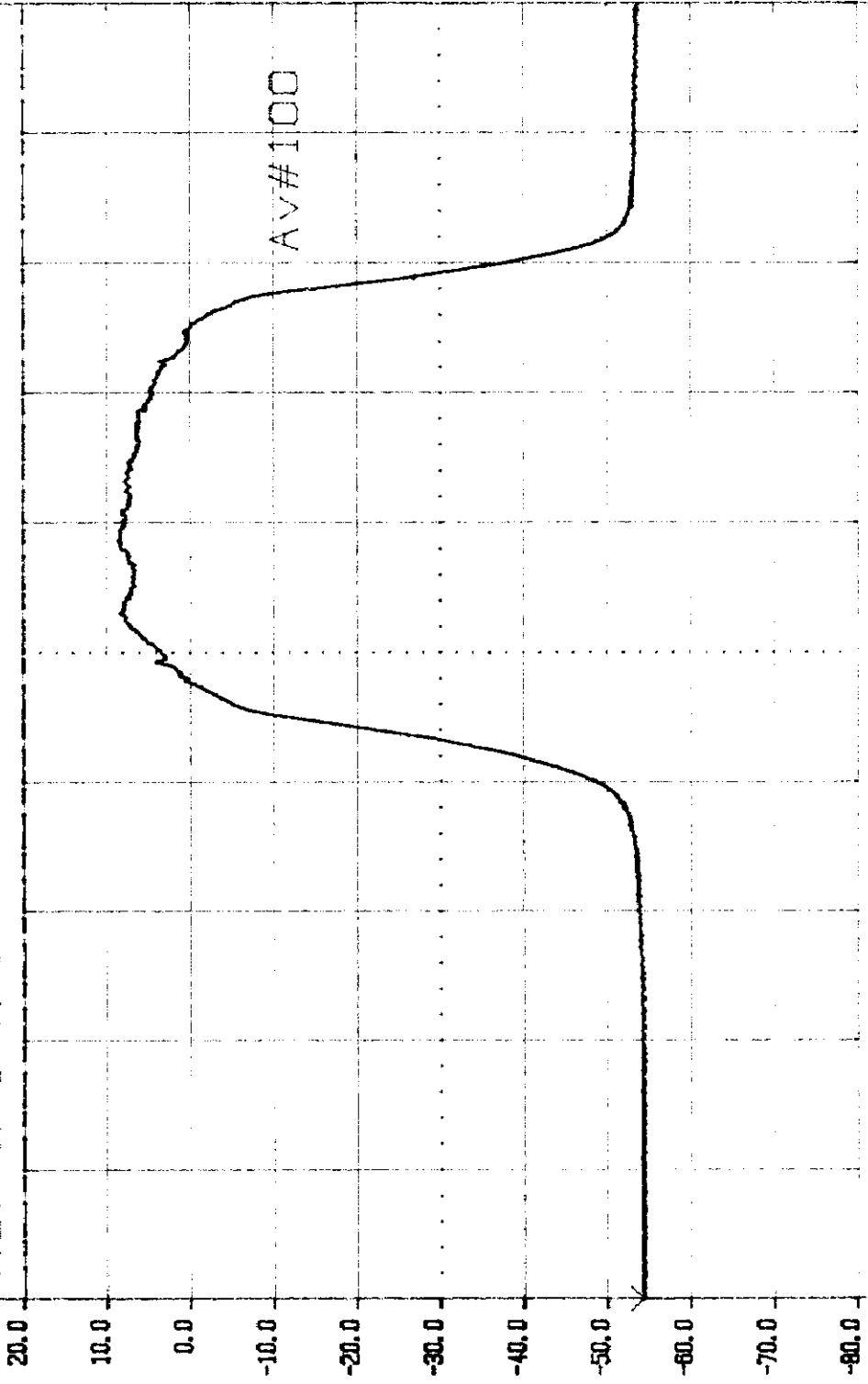


5.150 0GHz to 5.400 0GHz
ResBW 1MHz VidBW 7MHz SWP 20ms

LEVEL SPAN

Mkr 5.150 0GHz Plot 3.25 -54.50dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB

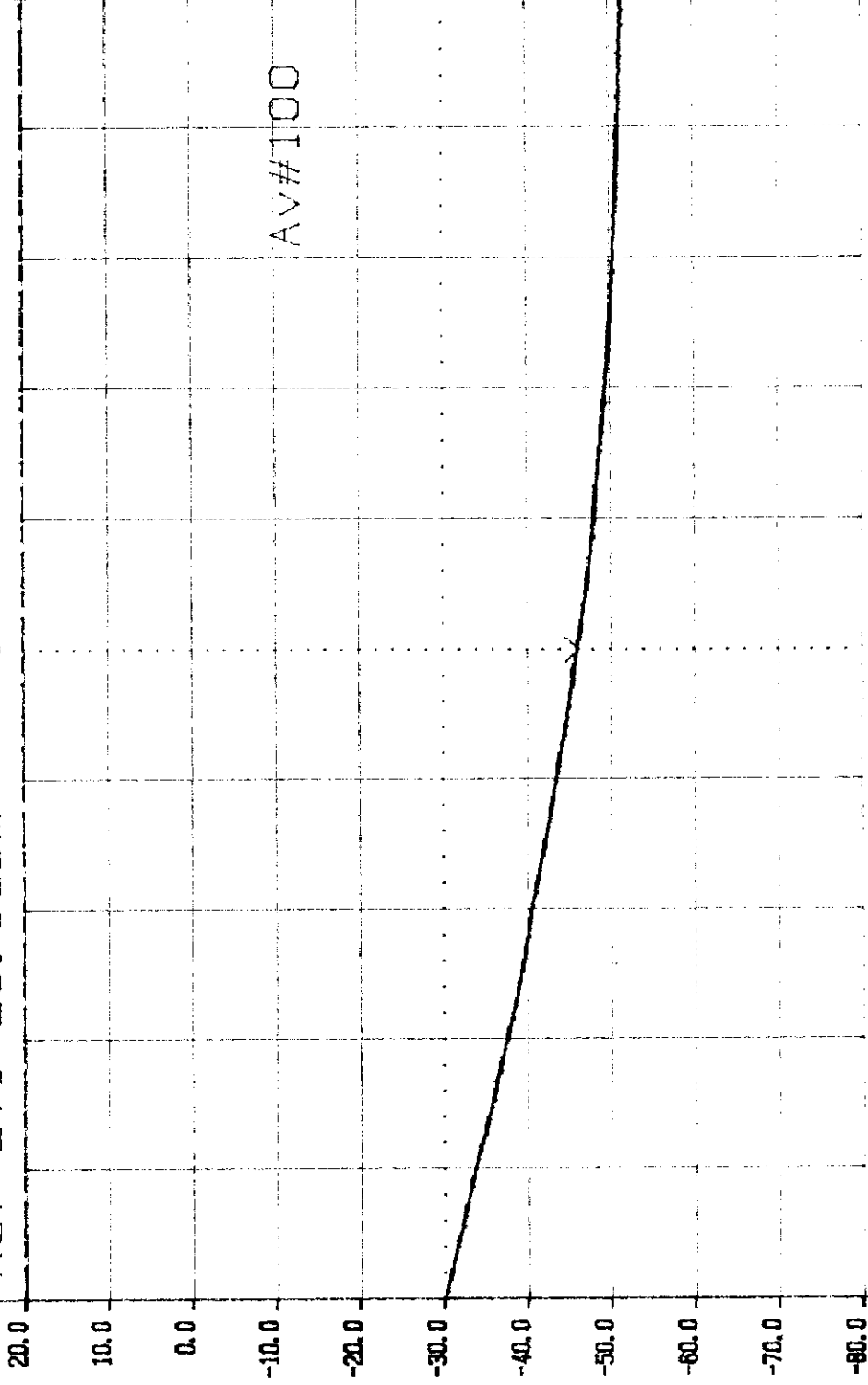


5.150 0GHz to 5.400 0GHz
ResBW 1MHz VidBW 7MHz SWP 20ms

LEVEL SPAN

Mkr 5.350 00GHz Plot 3.26.1-46.30dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



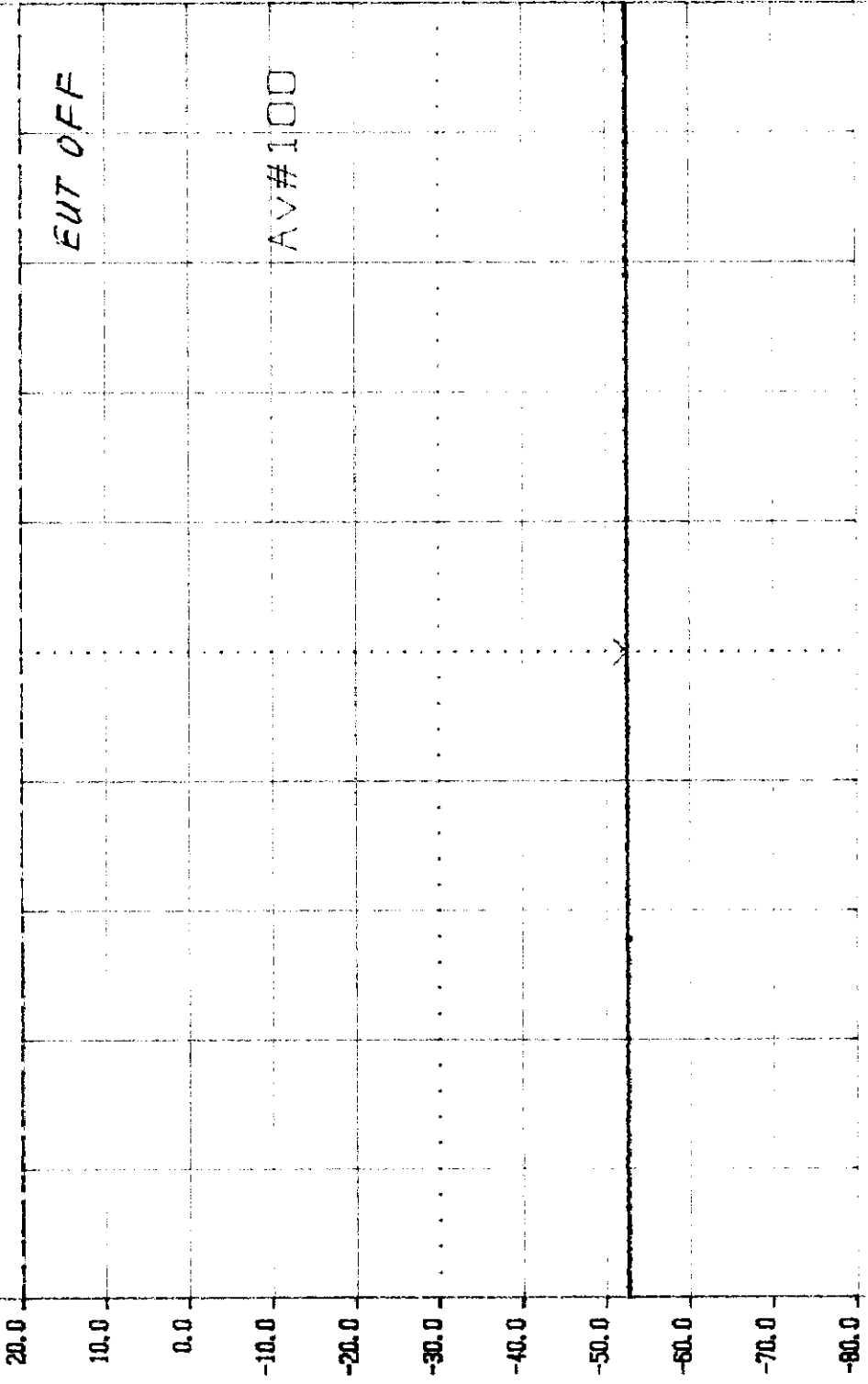
5.345 00GHz to 5.355 00GHz
ResBW 1MHz VidBW 7MHz SWP 50ms

LEVEL SPAN

TRIG 0 %

Mkr 5.350 00GHz Plot 3, 2 6.2 53.00dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.345 00GHz to 5.355 00GHz

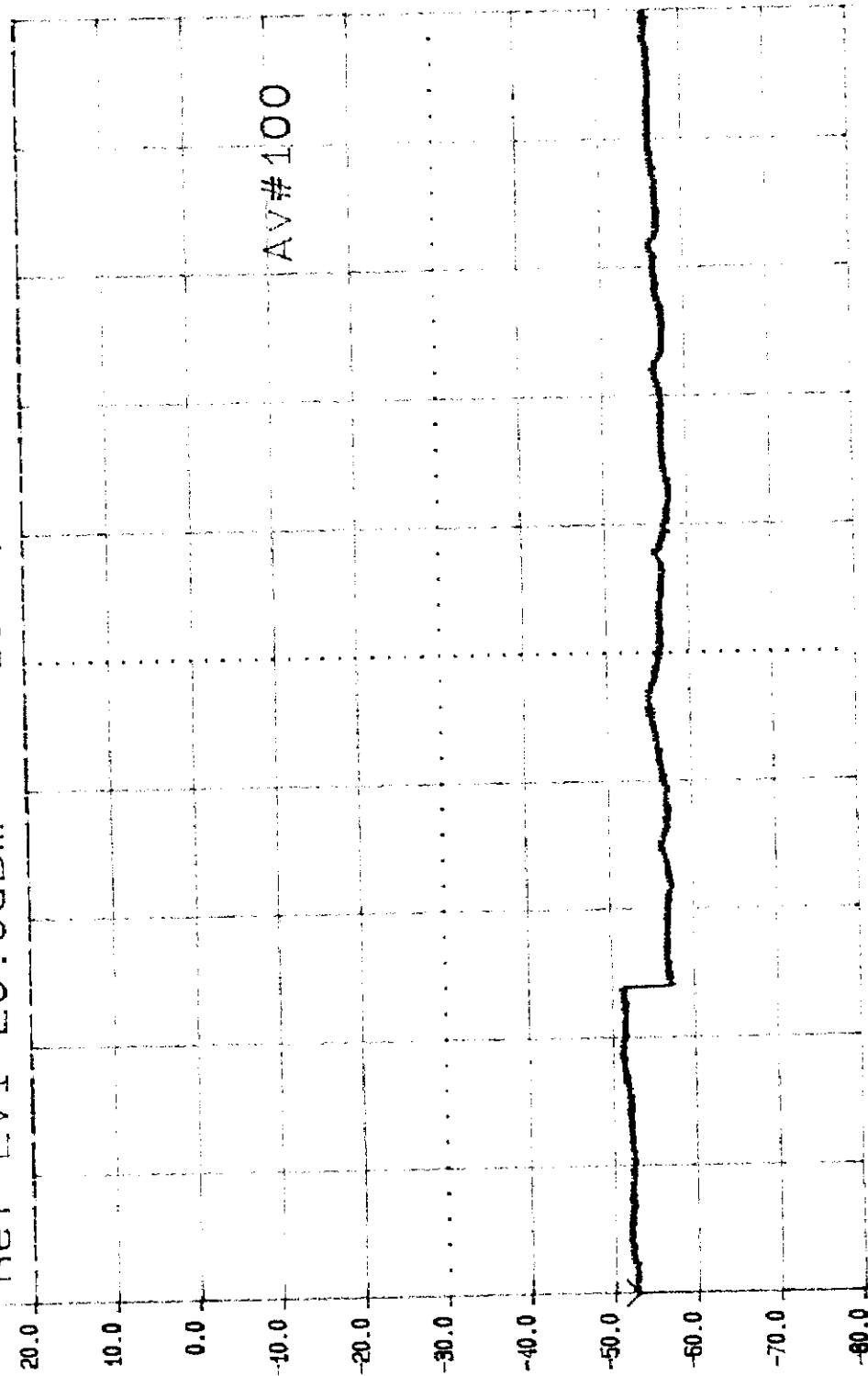
ResBW 1MHz VidBW 7MHz SWP 50ms

LEVEL SPAN

Mkr 5.350 0GHz

MKP 5.400GHZ Plot 3.27 --53.10dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.400GHZ to 10.000GHZ
ResBW 1MHz VidBW 7MHz SWP 65ms

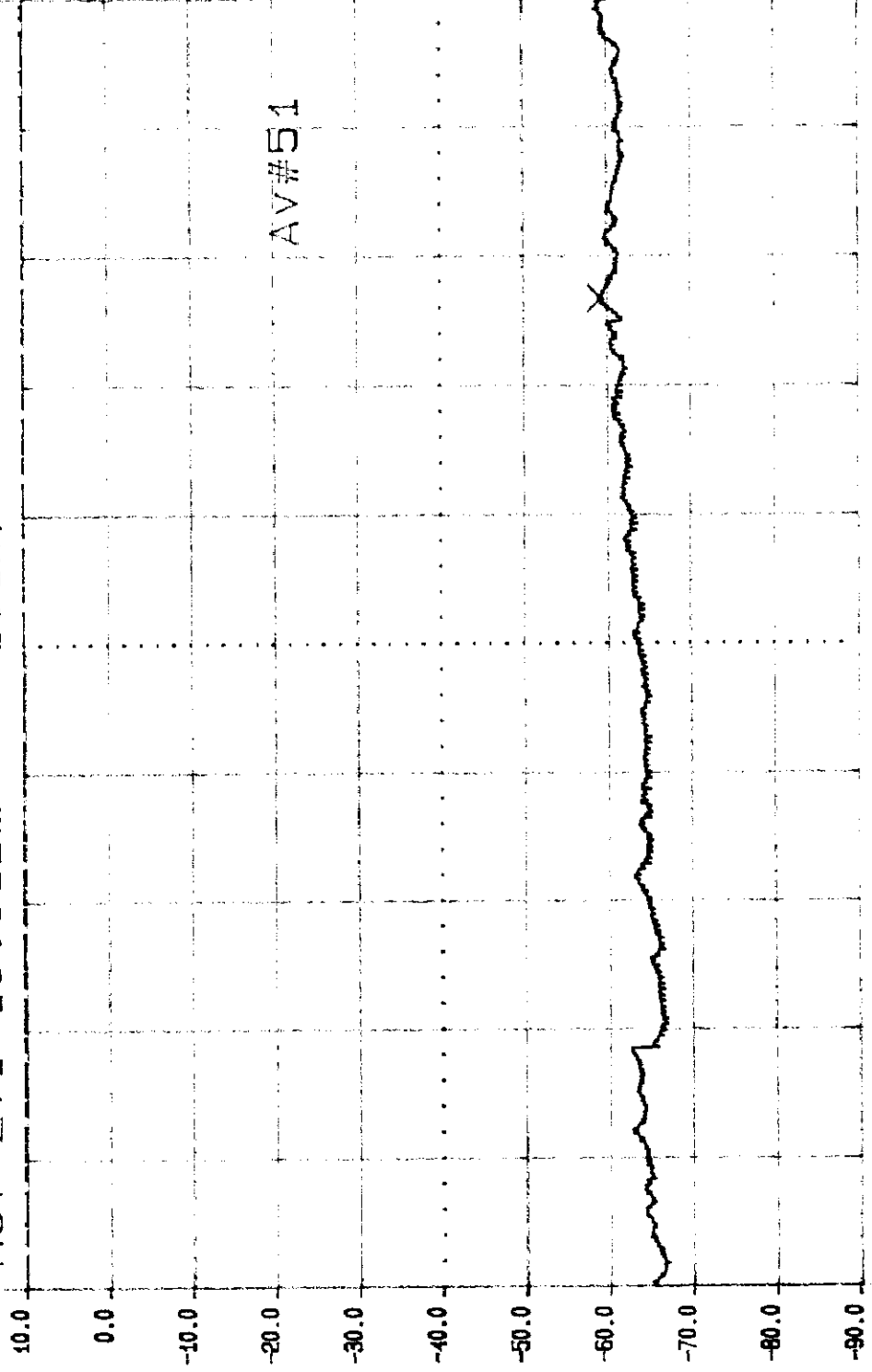
LEVEL SPAN

TRIG 0%

Knob 2 Knob 1 Keypad Tektronix 2784

Mkr 21.51GHZ Plot 3.e8 -59.60dBm Tek

Ref Lvl 10.0dBm 10dB/ Atten 10dB



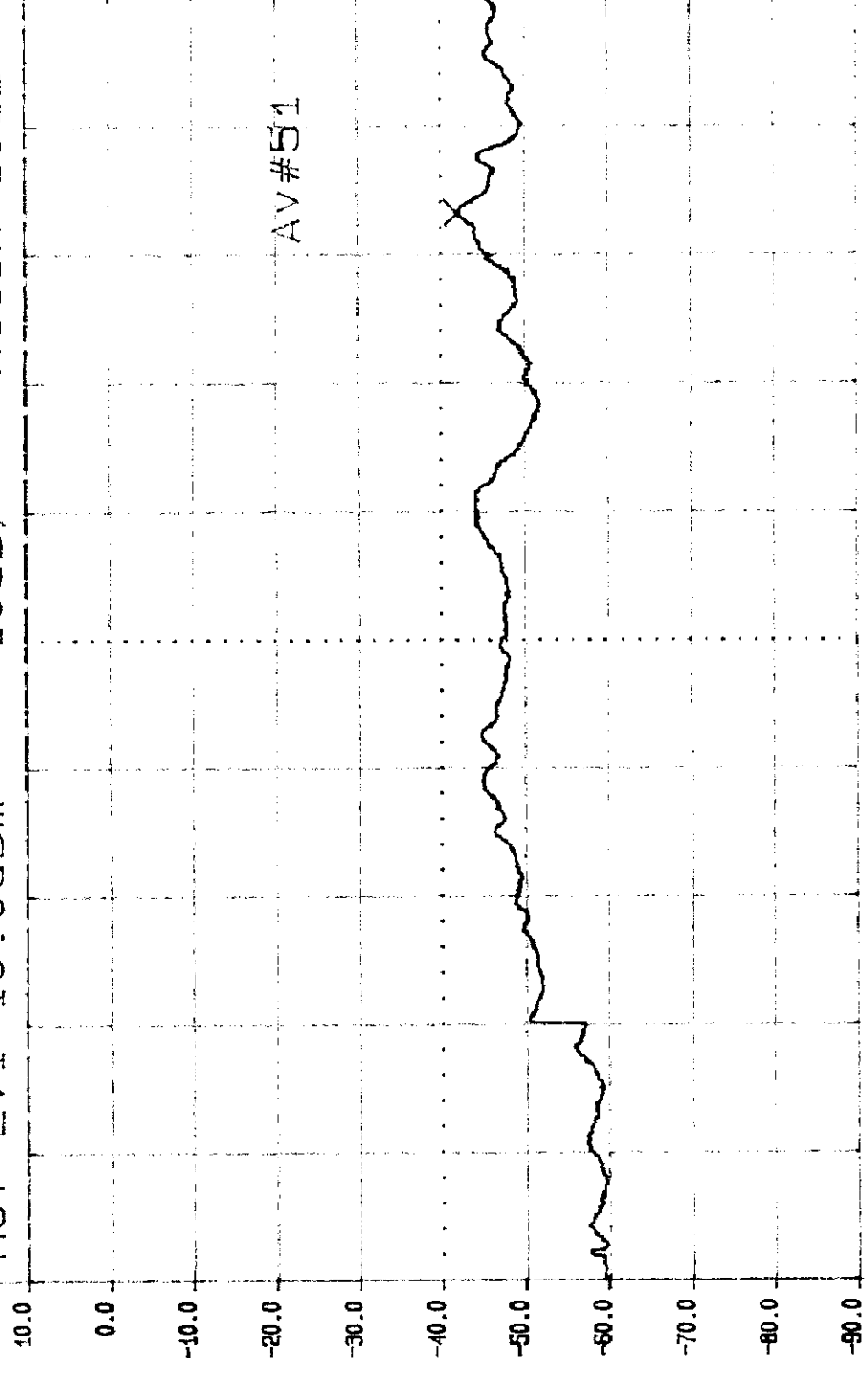
10.00GHZ to 25.00GHZ
ResBW 1MHZ VidBW 7MHZ SWP 150ms

LEVEL SPAN

Atten 10dB

Mkr 37.48GHz Plot 3.29 -42.40dBm Tek

Ref Lvl 10.0dBm 10dB/ Atten 10dB

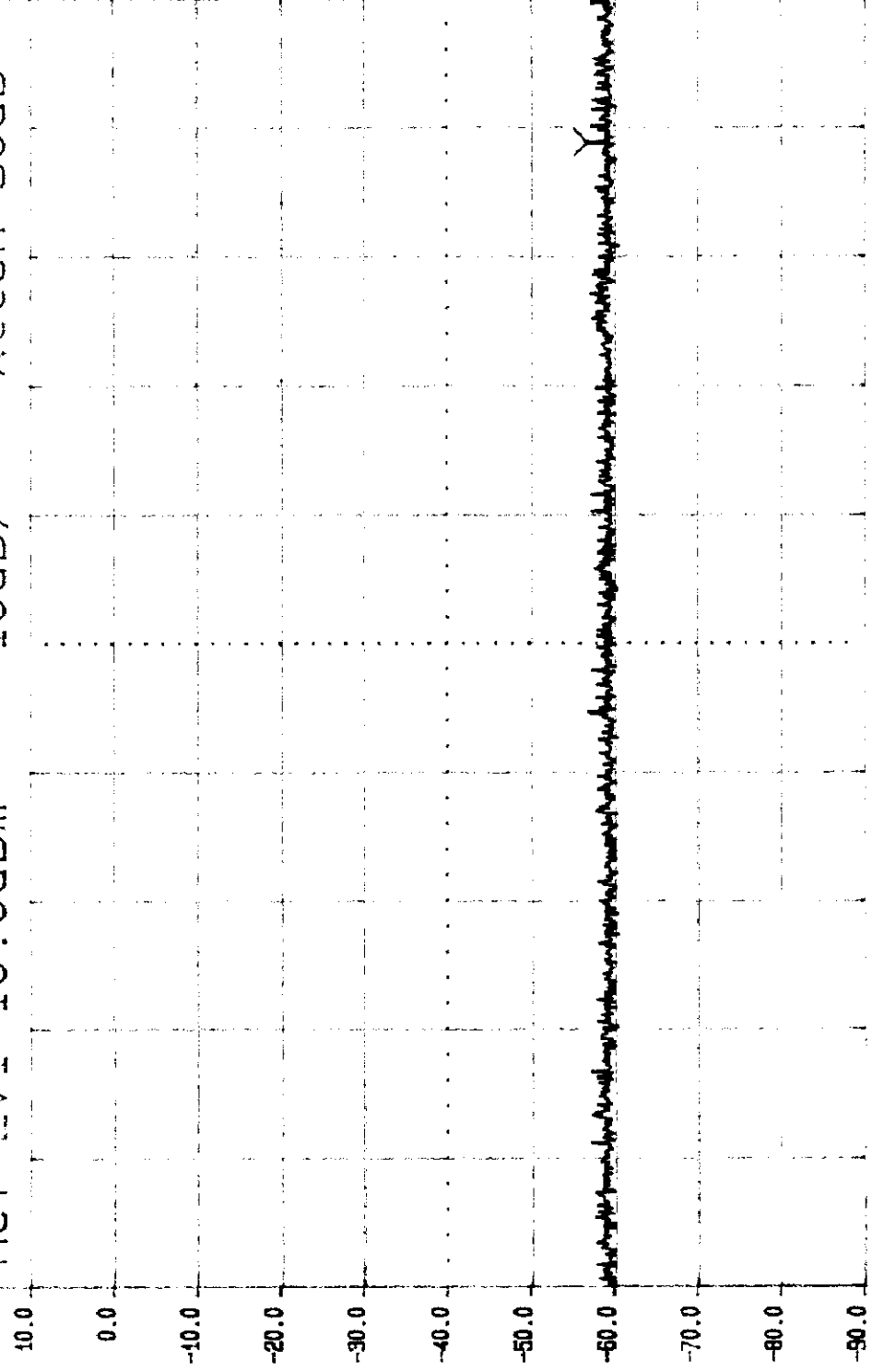


25.00GHz to 40.00GHz
ResBW 1MHz VidBW 7MHz SWP 250ms

LEVEL SPAN

Mkr 891.4MHz Plot 3.6.1 -57.40dBm Tek

Ref Lvl 10.0dBm 10dB/ Atten 30dB

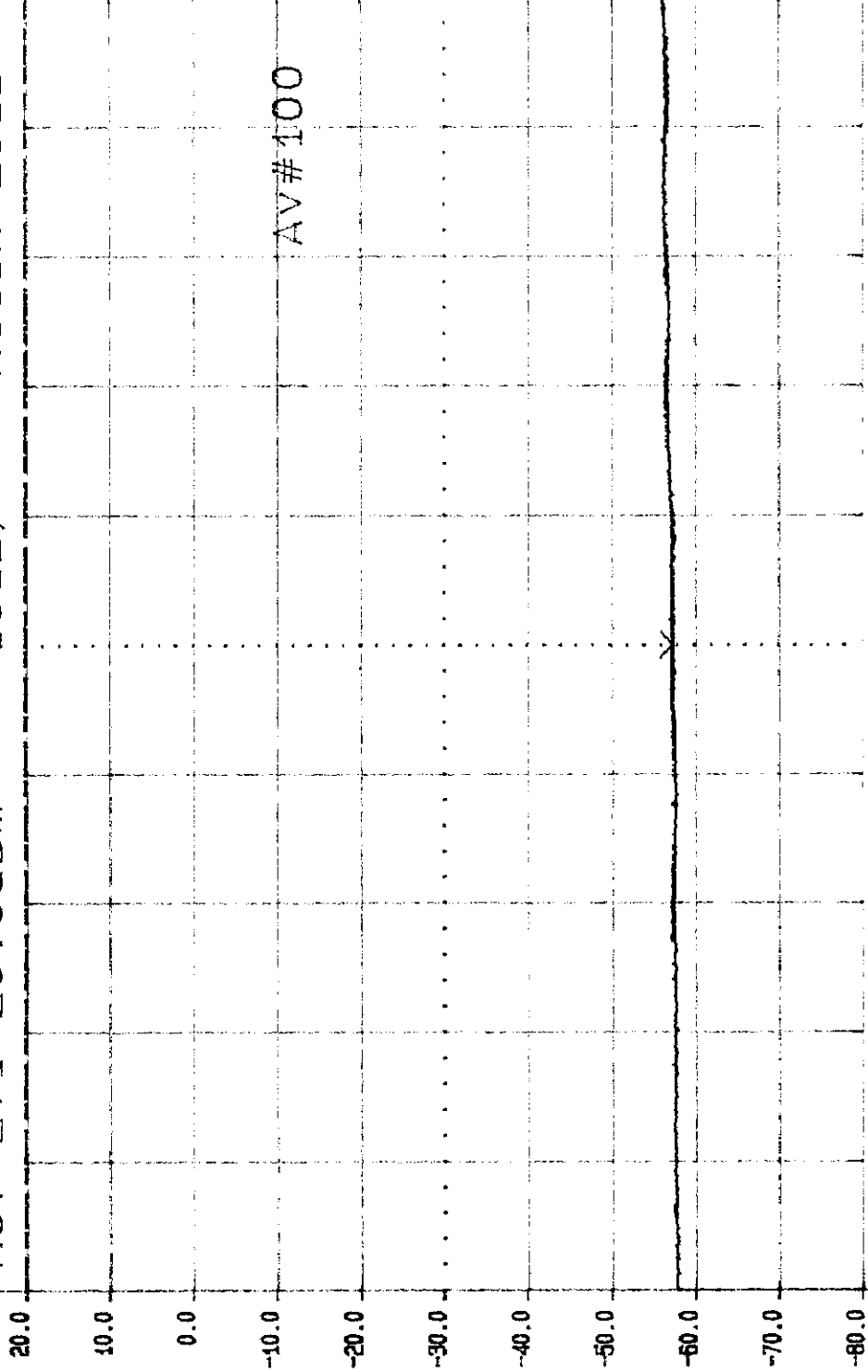


30.0MHZ to 1.000 0GHZ
ResBW 100kHz VidBW 100kHz SWP 550ms

LEVEL SPAN

MKR 1.750GHZ Plot 3 b2 -57.60dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



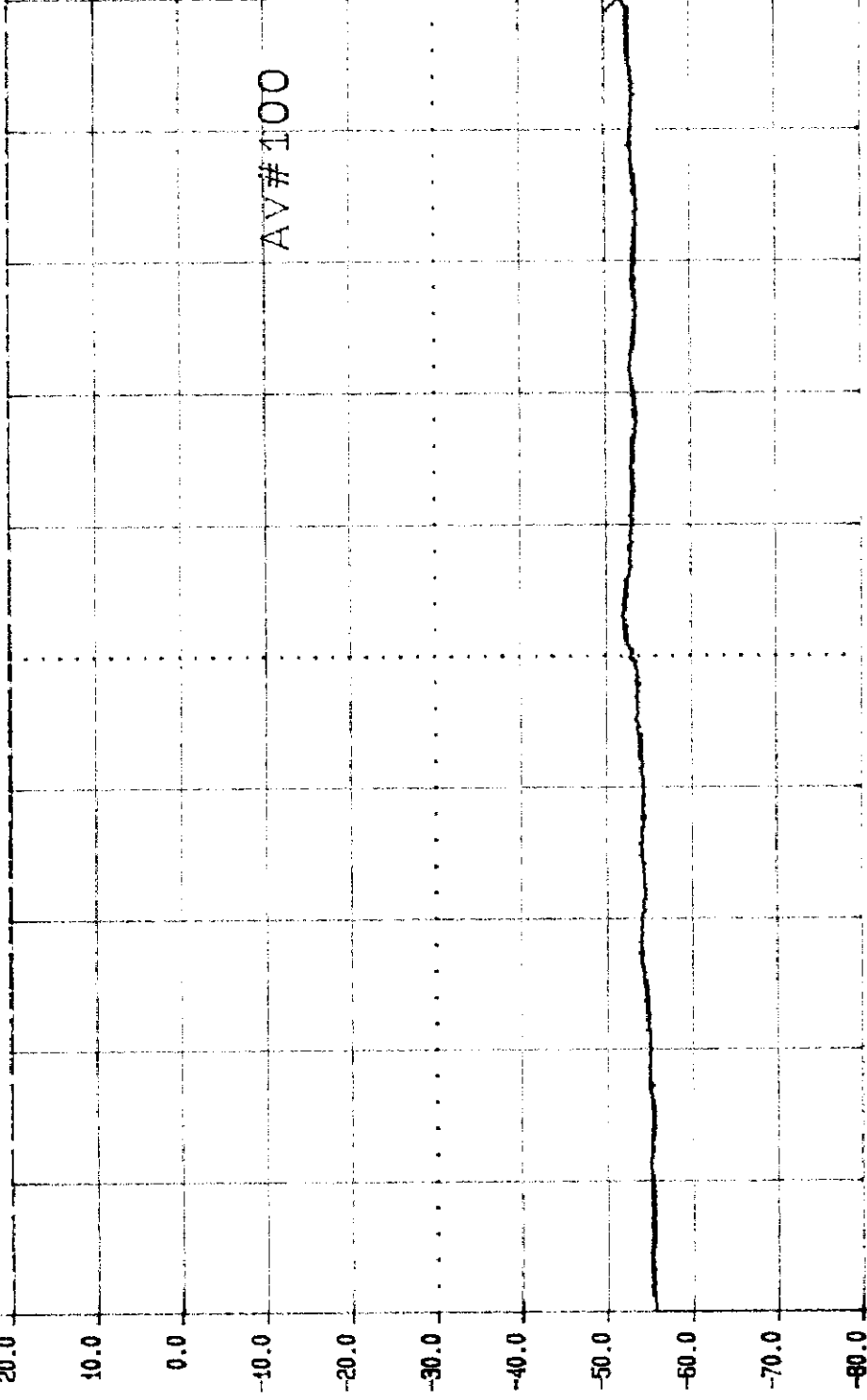
1.000GHZ to 2.500GHZ

ResBW 1MHZ VidBW 7MHZ SWP 20MS

LEVEL SPAN Stop 2.500GHZ

MKR 5.715GHZ Plot 363 -52.20dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



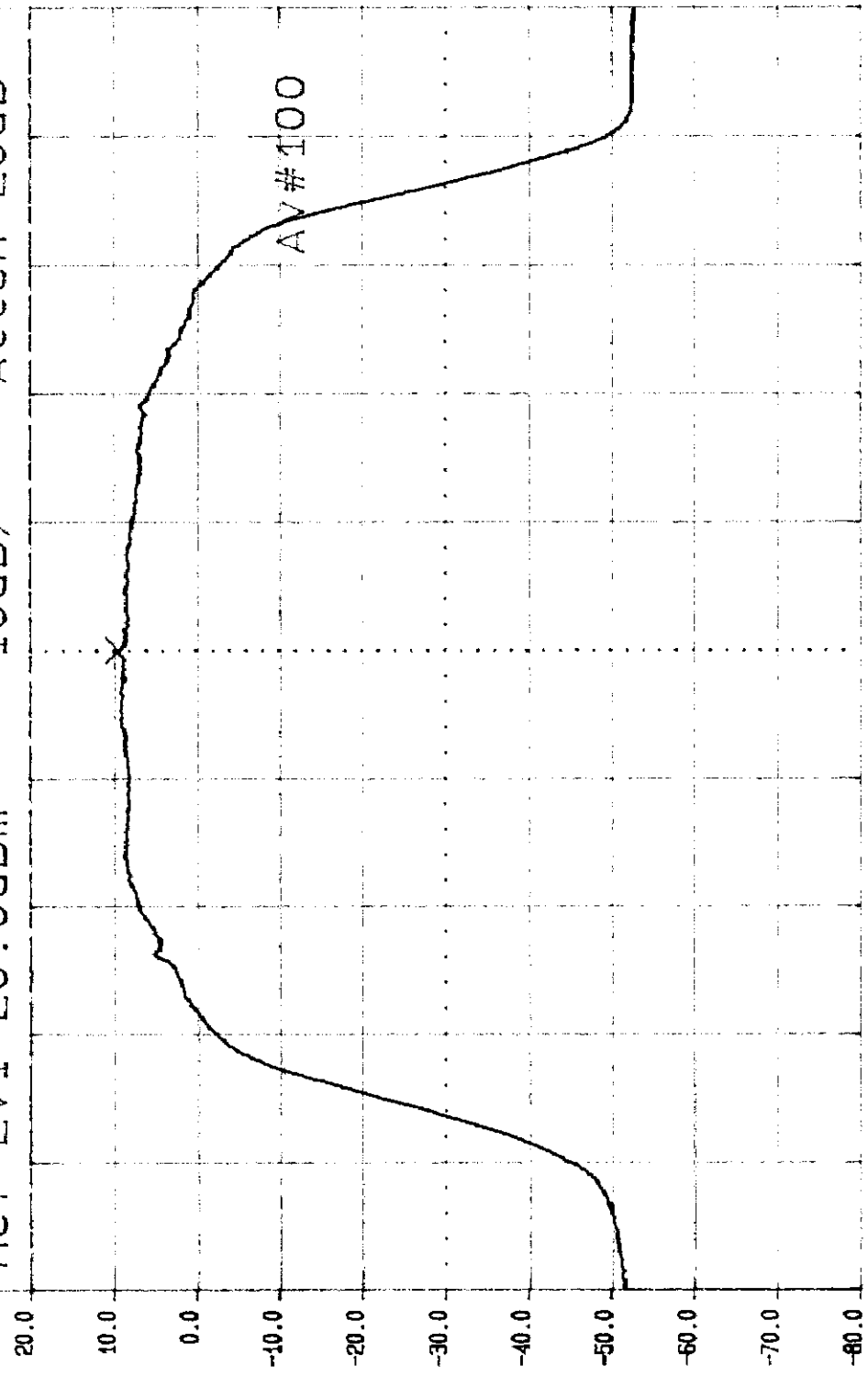
2.500GHZ to 5.715GHZ
ResBW 1MHZ VidBW 7MHZ SWP 32mS

LEVEL SPAN

Knob 2 Knob 1 KEYPAD Tektronix 2784

MKR 5.775 0GHZ Plot 3.64 9.00dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.715 0GHZ to 5.835 0GHZ

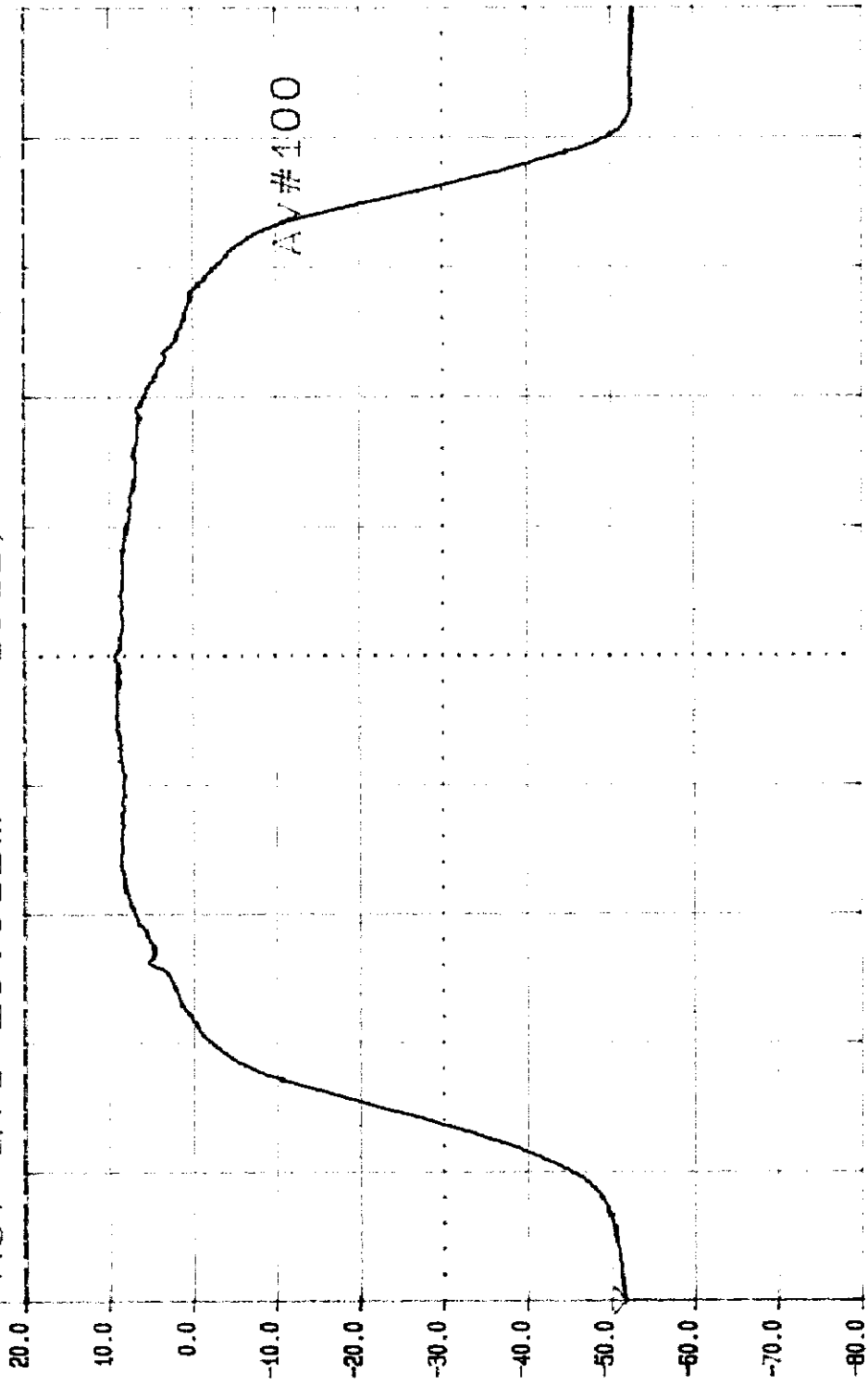
ResBW 1MHz VidBW 7MHz SWP 20ms

LEVEL SPAN

Knob 2 Knob 1 KEYPAD Tektronix 2784

MKR 5.715 0GHZ Plot 3.65 -52.20dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.715 0GHZ to 5.835 0GHZ
ResBW 1MHZ VidBW 7MHZ SWP 20MS

LEVEL SPAN

KnOB 2 KnOB 1 KEYPAD Tektronix 2784

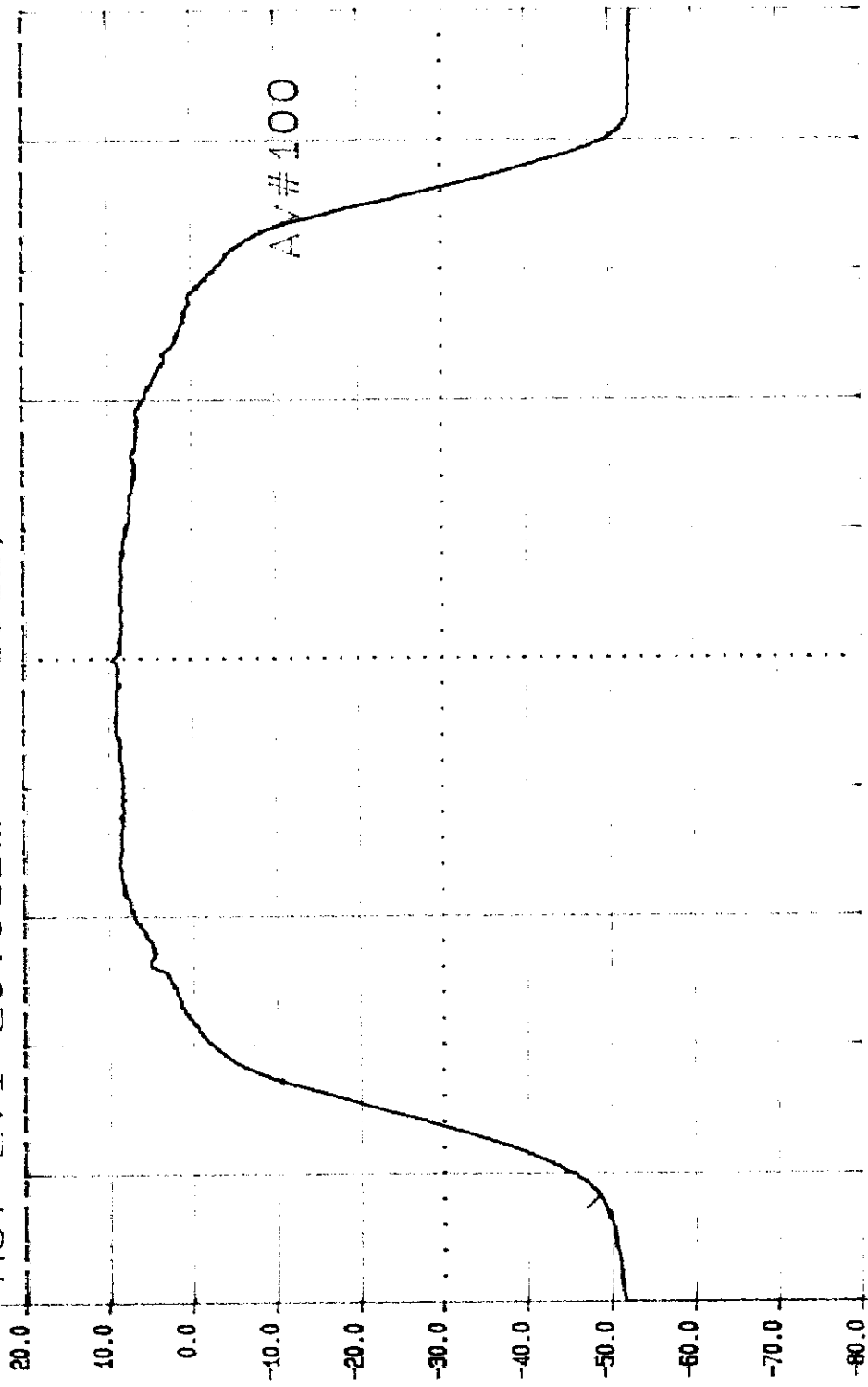
Tek

Mkr 5.725 0GHz

Plot 366

48.90dBm

Ref Lvl 20.0dBm 10dB, Atten 20dB



5.715 0GHz to 5.835 0GHz

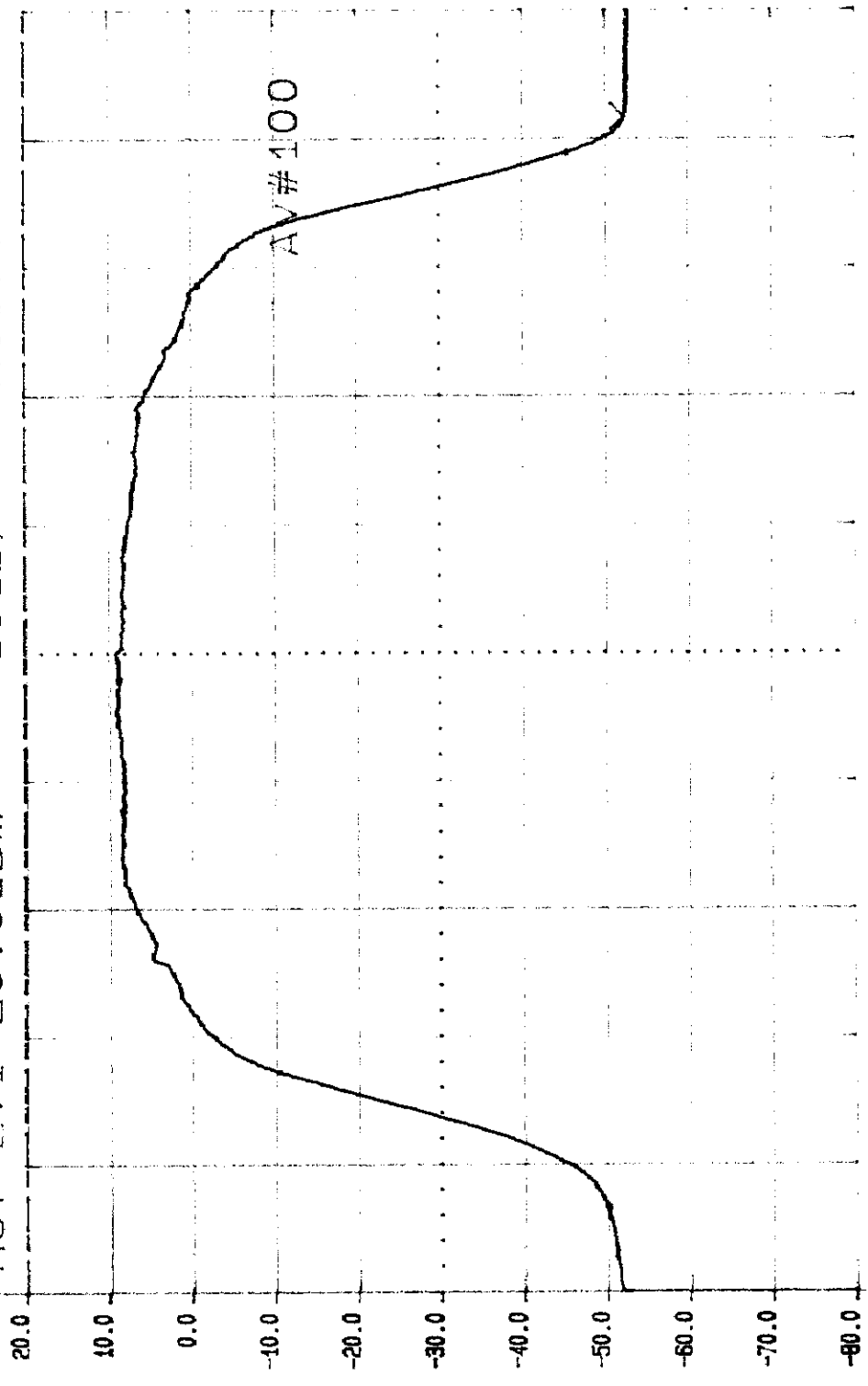
ResBW 1MHz VidBW 7MHz SWP 20ms

LEVEL SPAN

Knob 2 Knob 1 Keypad Tektronix 2784

MKR 5.825 0GHZ Plot 3.67 -52.70dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.715 0GHZ to 5.835 0GHZ

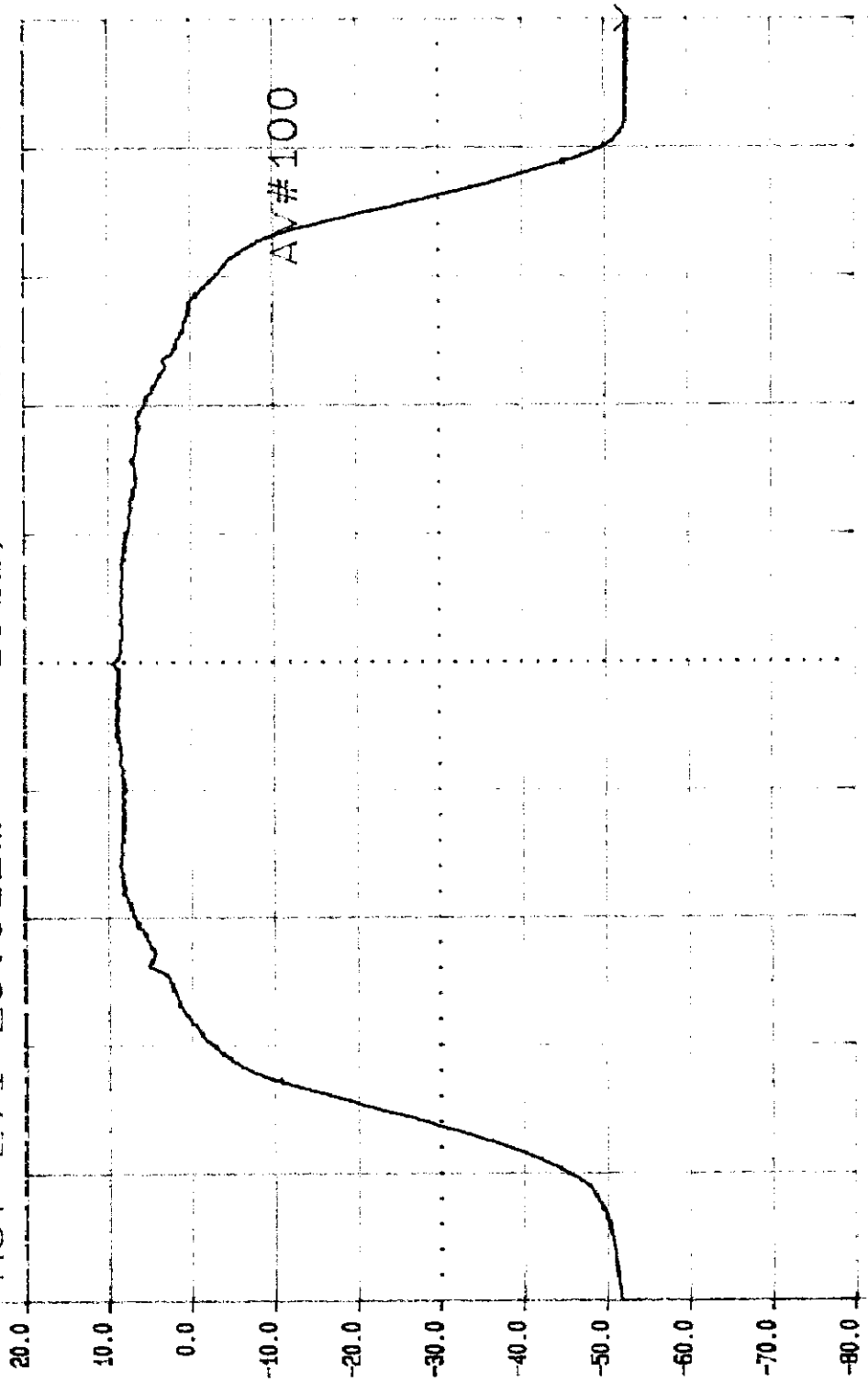
ResBW 1MHz VidBW 7MHz SWP 20ms

[LEVEL] [SPAN]

Knob 2 Knob 1 KEYPAD Tektronix 2784

Mkr 5.835 0GHZ Plot 3.62 -53.30dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



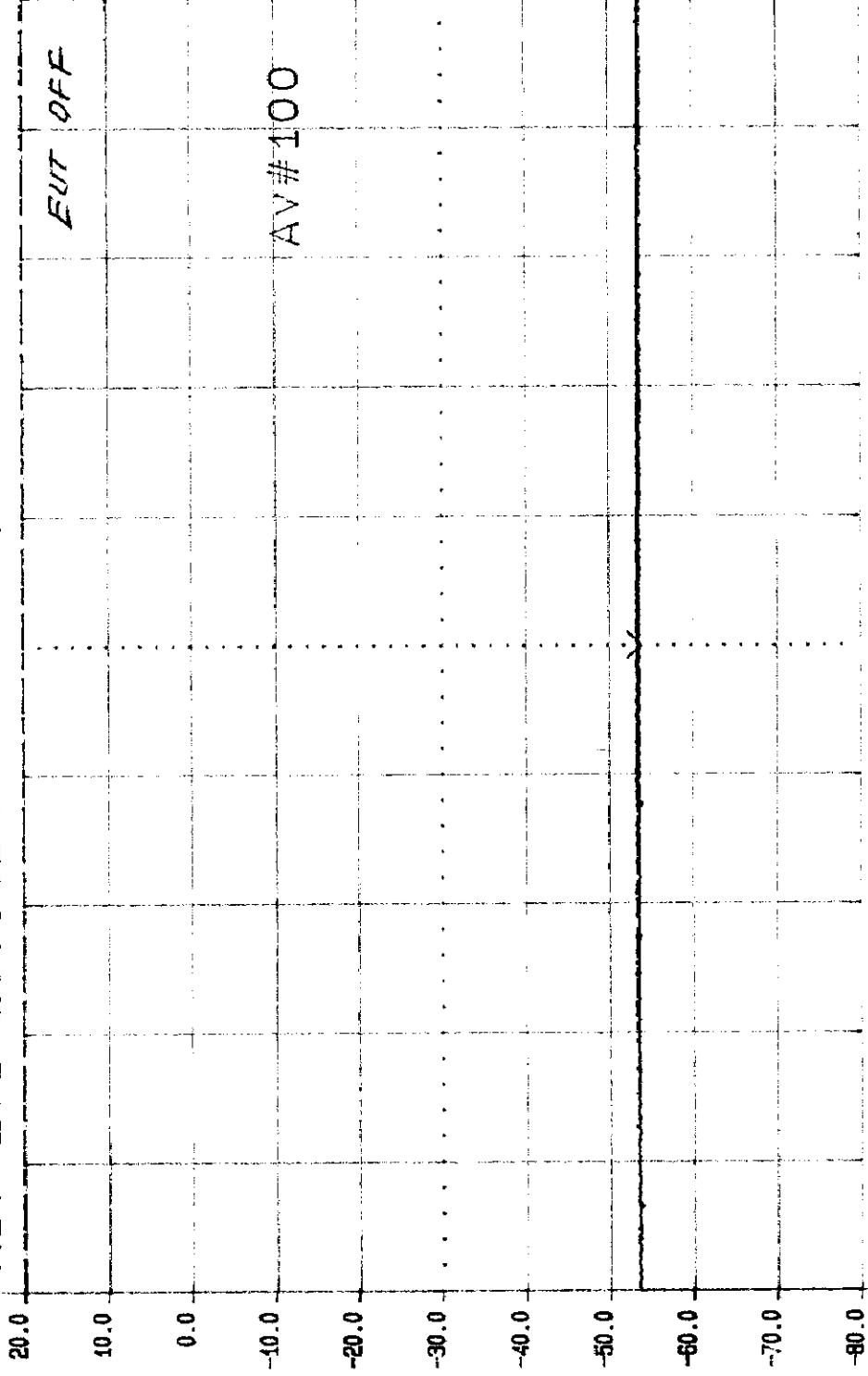
5.715 0GHZ to 5.835 0GHZ
ResBW 1MHZ VidBW 7MHZ SWP 20MS

LEVEL SPAN

Tek

Mkr 5.775 0GHZ Plot 3.09 -54.00dBm

Ref Lvl 20.0dBm 10dB/ Atten 20dB

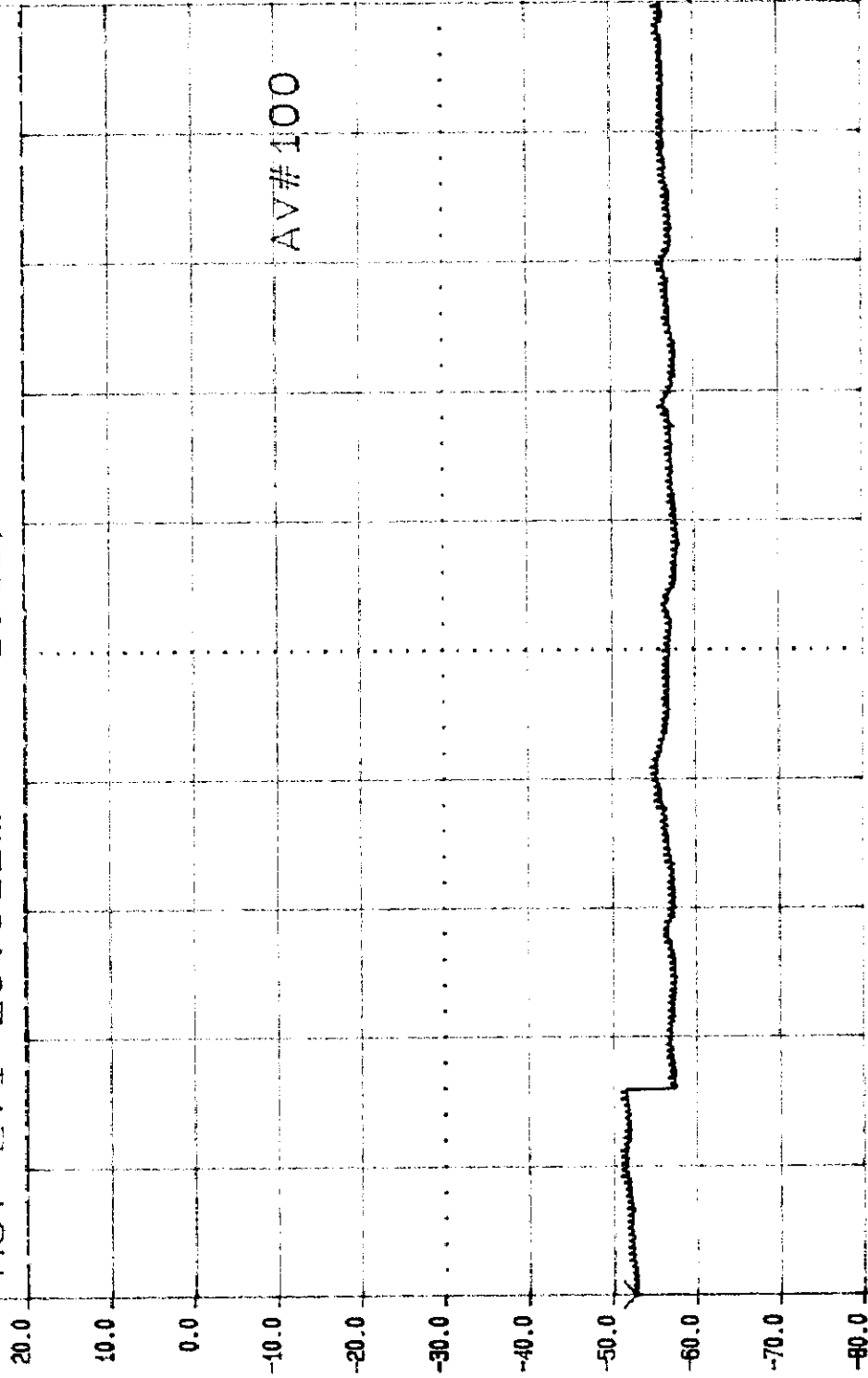


5.715 0GHZ to 5.835 0GHZ
ResBW 1MHZ VidBW 7MHZ SWP 20MS

LEVEL. SPAN MKR 5.775 0GHZ

MKR 5.835GHZ Plot 3.610 -53.10dBm Tek

Ref Lvl 20.0dBm 10dB/ Atten 20dB



5.835GHZ to 10.000GHZ

ResBW 1MHZ VidBW 7MHZ SWP 59MS

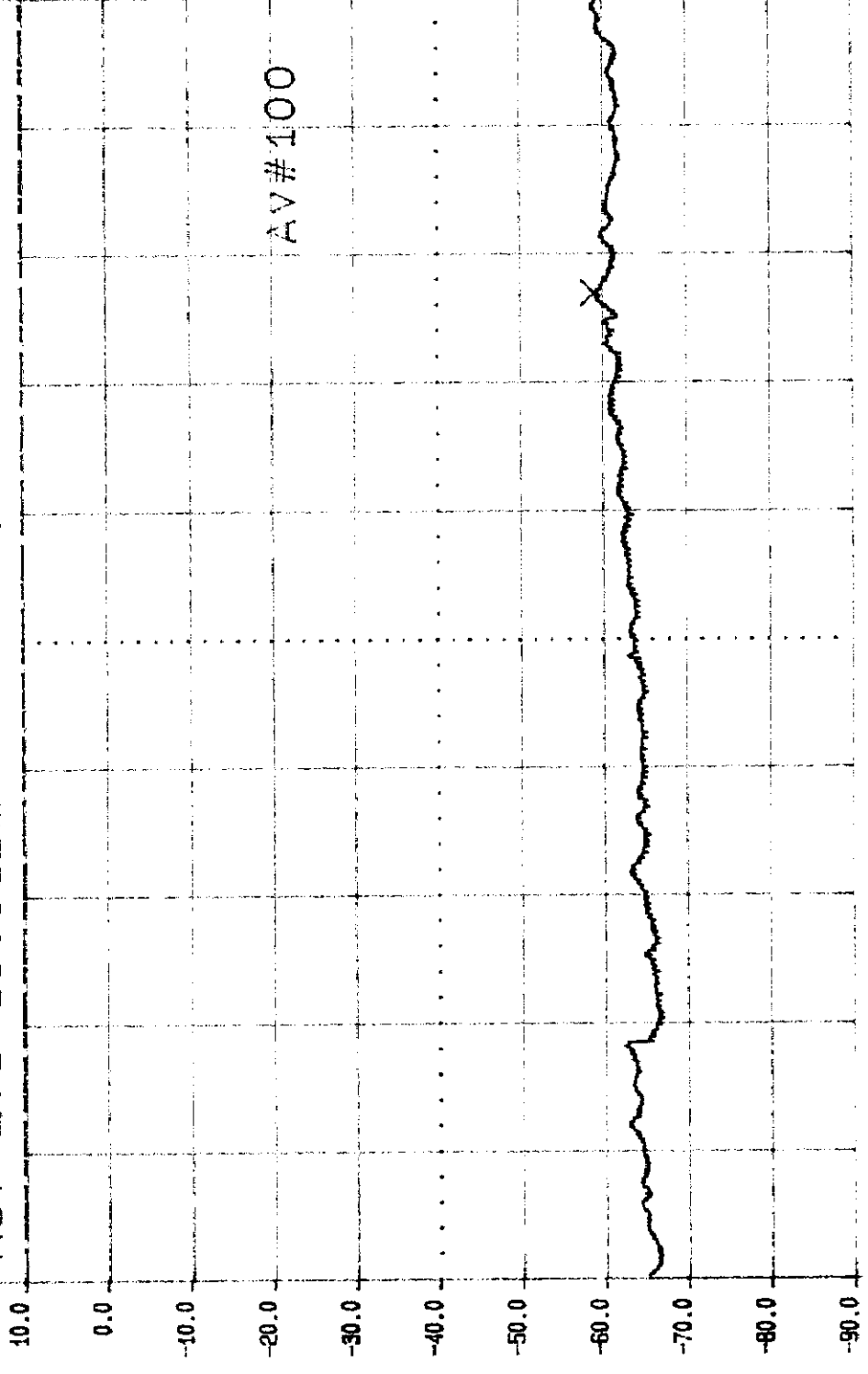
LEVEL SPAN

MKR 5.835GHZ

Tek

Mkr 21.54GHz P_{tot} 3.611 -59.30dBm

Ref Lvl 10.0dBm 10dB/ Atten 10dB



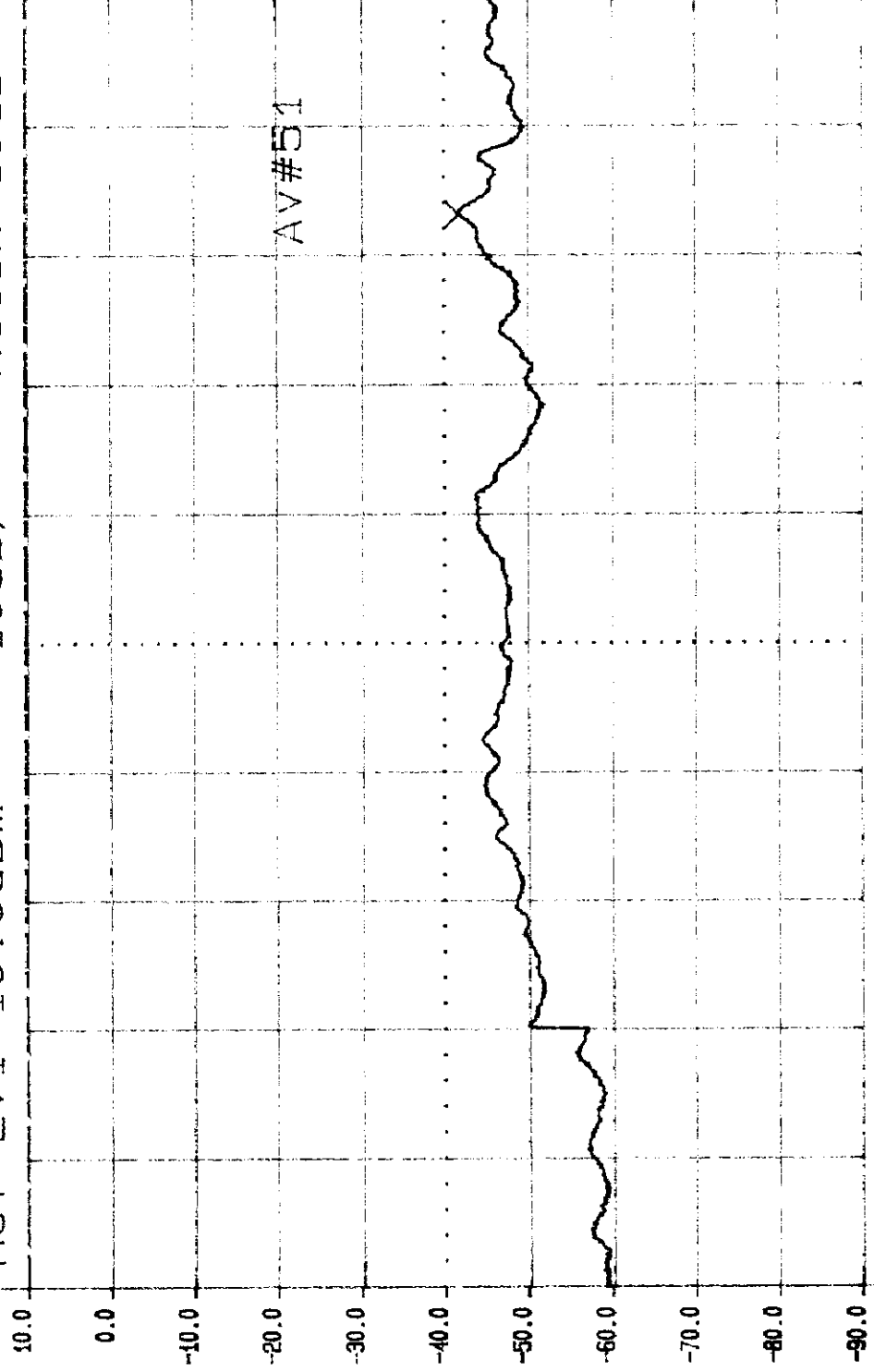
10.00GHz to 25.00GHz

ResBW 1MHz VidBW 7MHz SWP 150ms

LEVEL SPAN

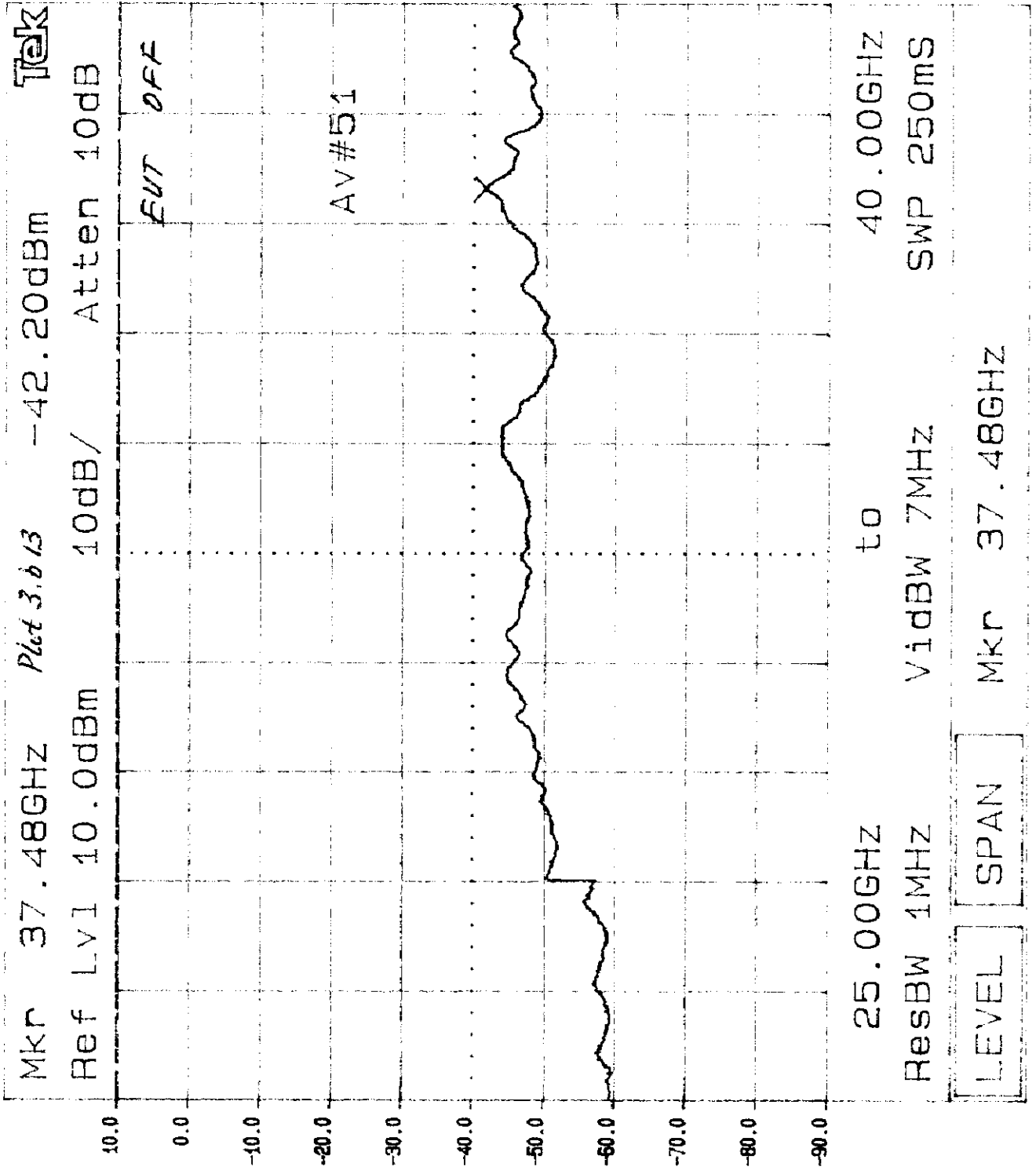
MKR 37.47GHZ P_{tot} 3.612 -42.20dBm Tek

Ref Lvl 10.0dBm 10dB/ Atten 10dB



25.000GHZ to 40.000GHZ
ResBW 1MHZ VidBW 7MHZ SWP 250ms

LEVEL SPAN Ref Lvl 10.0dBm



4.5 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 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.

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.

Result:

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

Radiated Emissions Test Data

Company:	Western Multiplex	Model #:	27720	Standard:	FCC § 15.247 (R.E.)
EUT:	With antenna model: OMNH-5.3	S/N #:		Limits	11
Project #:	J20008318	Test Date:	May 15, 2000	Test Distance	3 meters
Test Mode:	Tx @5.3 GHz	Engineer:	Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3180-9	3180-10	AFT18855	CDI_P1000	ACO/400	None	None	Gm_M+L	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
10600.00	42.0	Peak	8	10	H	36.3	39.5	5.3	0.0	44.1	74.0	-29.9
10600.00	32.0	Ave.	8	10	H	36.3	39.5	5.3	0.0	34.1	54.0	-19.9
15900.00	44.6	Peak	8	10	H	41.2	38.4	6.9	0.0	54.3	74.0	-19.7
15900.00	34.8	Ave.	8	10	H	41.2	38.4	6.9	0.0	44.5	54.0	-9.5
21200.00	35.7	Peak	21	13	H	40.3	23.3	2.4	-9.5	45.6	74.0	-28.4
21200.00	25.7	Ave.	21	13	H	40.3	23.3	2.4	-9.5	35.6	54.0	-18.4
31800.00	41.0	Peak	22	13	V	43.5	25.9	4.0	-9.5	53.1	74.0	-20.9
31800.00	36.1	Ave.	22	13	V	43.5	25.9	4.0	-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 20 dB below the limits.
- f) Frequency above 19GHz was made at 1m distance

**Radiated Emissions
Test Data**

Company:	Western Multiplex	Model #:	27720	Standard:	FCC § 15.247 (R.B.)
EUT:	With antenna model: DFPS1-52(M1))	S/N #:		Limits	11
Project #:	J20008318	Test Date:	March 29, 2000	Test Distance	3 meters
Test Mode:	Tx @5.3 GHz	Engineer:	Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3160-9	3160-10	AFT18855	CDI_P1000	ACC400	None	None	Gm_M+ L	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
10600.00	41.2	Peak	8	10	H	36.3	39.5	5.3	0.0	43.3	74.0	-30.7
10600.00	31.7	Ave.	8	10	H	36.3	39.5	5.3	0.0	33.8	54.0	-20.2
15900.00	44.6	Peak	8	10	H	41.2	38.4	6.9	0.0	54.3	74.0	-19.7
15900.00	34.8	Ave.	8	10	H	41.2	38.4	6.9	0.0	44.5	54.0	-9.5
21200.00	35.7	Peak	21	13	H	40.3	23.3	2.4	-9.5	45.6	74.0	-28.4
21200.00	25.7	Ave.	21	13	H	40.3	23.3	2.4	-9.5	35.6	54.0	-18.4
31800.00	45.5	Peak	22	13	V	43.5	25.9	4.0	-9.5	57.6	74.0	-16.4
31800.00	36.2	Ave.	22	13	V	43.5	25.9	4.0	-9.5	48.3	54.0	-5.7

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 20 dB below the limits.
- f) Frequency above 19GHz was made at 1m distance

**Radiated Emissions
Test Data**

Company:	Western Multiplex	Model #:	27720	Standard	FCC § 15.247 (R.B.)
EUT:	With antenna model: SSP2-52B	S/N #:		Limits	11
Project #:	J20008318	Test Date:	April 21, 2000	Test Distance	3 meters
Test Mode:	Tx @5.3 GHz	Engineer:	Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3160-9	3160-10	AFT18855	CDI_P1000	ACC/400	None	None	Gm_M+ L	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
10600.00	43.0	Peak	8	10	H	36.3	39.5	5.3	0.0	45.1	74.0	-28.9
10600.00	33.1	Ave.	8	10	H	36.3	39.5	5.3	0.0	35.2	54.0	-18.8
15900.00	44.0	Peak	8	10	H	41.2	38.4	6.9	0.0	53.7	74.0	-20.3
15900.00	34.5	Ave.	8	10	H	41.2	38.4	6.9	0.0	44.2	54.0	-9.8
21200.00	36.1	Peak	21	13	H	40.3	23.3	2.4	-9.5	46.0	74.0	-28.0
21200.00	26.6	Ave.	21	13	H	40.3	23.3	2.4	-9.5	36.5	54.0	-17.5
31800.00	45.9	Peak	22	13	V	43.5	25.9	4.0	-9.5	58.0	74.0	-16.0
31800.00	35.6	Ave.	22	13	V	43.5	25.9	4.0	-9.5	47.7	54.0	-6.3

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 20 dB below the limits.

f) Frequency above 19GHz was made at 1m distance

**Radiated Emissions
Test Data**

Company:	Western Multiplex	Model #:	27720	Standard	FCC § 15.247 (R.B.)
EUT:	With antenna model: DFPS1-52(M1)	S/N #:		Limits	11
Project #:	J20008318	Test Date:	May 15, 2000	Test Distance	3 meters
Test Mode:	Tx @5.8 GHz	Engineer:	Xi-Ming Y.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3100-9	3100-10	AFT18855	CDI_P1000	ACD/400	None	None	Gm_M+ L	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
11550.00	43.0	Peak	8	10	H	42.4	39.7	5.8	0.0	51.5	74.0	-22.6
11550.00	33.1	Ave.	8	10	H	42.4	39.7	5.8	0.0	41.6	54.0	-12.5
23100.00	34.7	Peak	21	13	H	40.4	23.3	2.8	-9.5	45.1	74.0	-28.9
23100.00	25.9	Ave.	21	13	H	40.4	23.3	2.8	-9.5	36.3	54.0	-17.7

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 20 dB below the limits.
- f) Frequency above 19GHz was made at 1m distance

Radiated Emissions Test Data

Company: Western Multiplex	Model #: 27720	Standard: FCC § 15.247 (R.B.)
EUT: With antenna model: 57C24N-1	S/N #:	Limits: 11
Project #: J20008318	Test Date: April 12, 2000	Test Distance: 3 meters
Test Mode: Tx @5.8 GHz	Engineer: Xi-Ming Y	Duty Relaxation: 0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3160-9	3160-10	AFT16855	CDI_P1000	ACO/400	None	None	Gm_M+ L	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/C	#	#	H/V	dB(1m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
11550.00	42.9	Peak	8	10	H	42.4	39.7	5.8	0.0	51.4	74.0	-22.7
11550.00	33.5	Ave.	8	10	H	42.4	39.7	5.8	0.0	42.0	54.0	-12.1
23100.00	34.8	Peak	21	13	H	40.4	23.3	2.8	-9.5	45.2	74.0	-28.8
23100.00	25.4	Ave.	21	13	H	40.4	23.3	2.8	-9.5	35.8	54.0	-18.2

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 20 dB below the limits.

f) Frequency above 19GHz was made at 1m distance

**Radiated Emissions
Test Data**

Company:	Western Multiplex	Model #:	27720	Standard	FCC § 15.247 (R.E.)
EUT:	With antenna model: SSP2-52B	S/N #:		Limits	11
Project #:	J20008318	Test Date:	May 15, 2000	Test Distance	3 meters
Test Mode:	Tx @5.8 GHz	Engineer:	Xi-Ming Y	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	21	22	10	8	13	0	0	12	0
Model:	EMCO 3115	3150-9	3150-10	AFT16855	CDI_P1000	ACD/400	None	None	Gm_M+ L	None

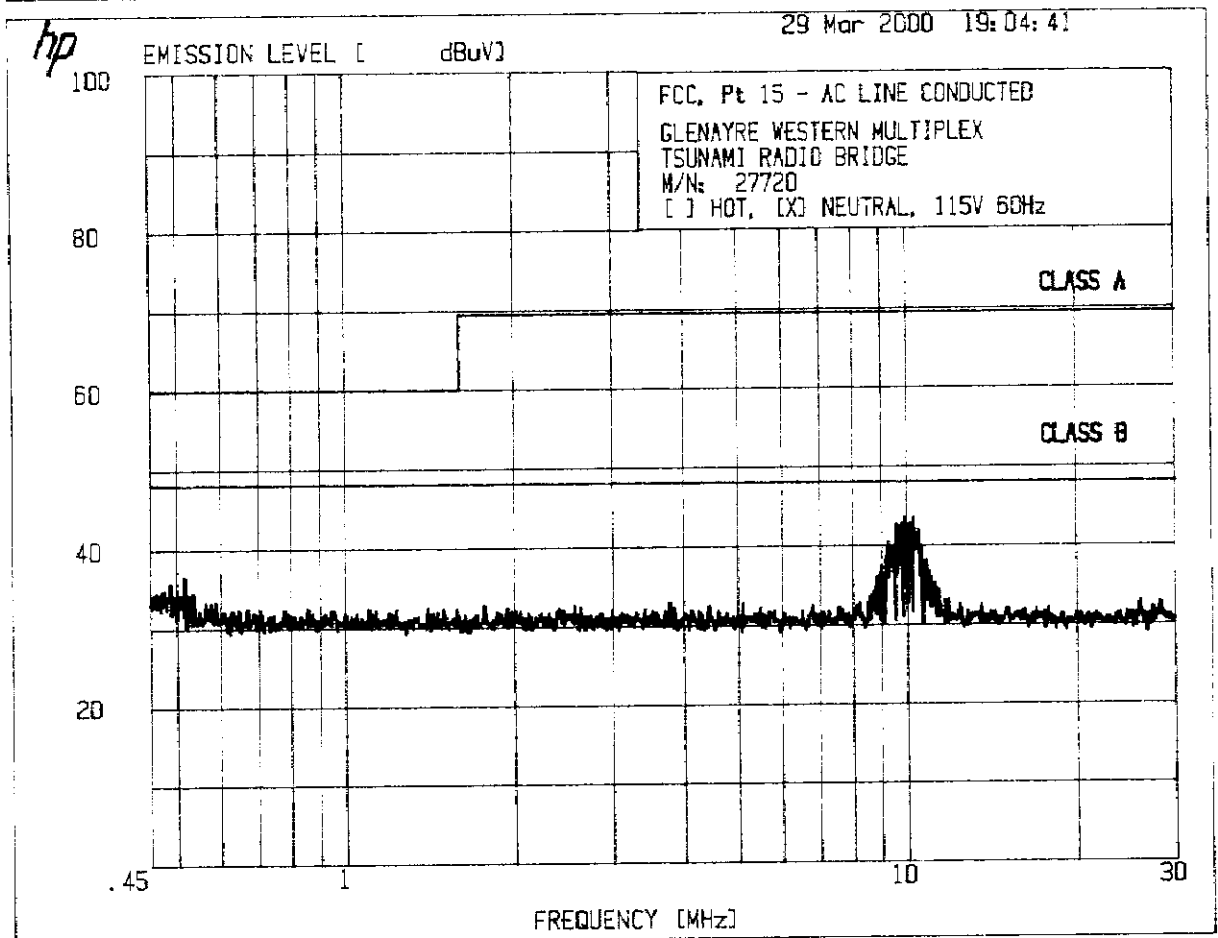
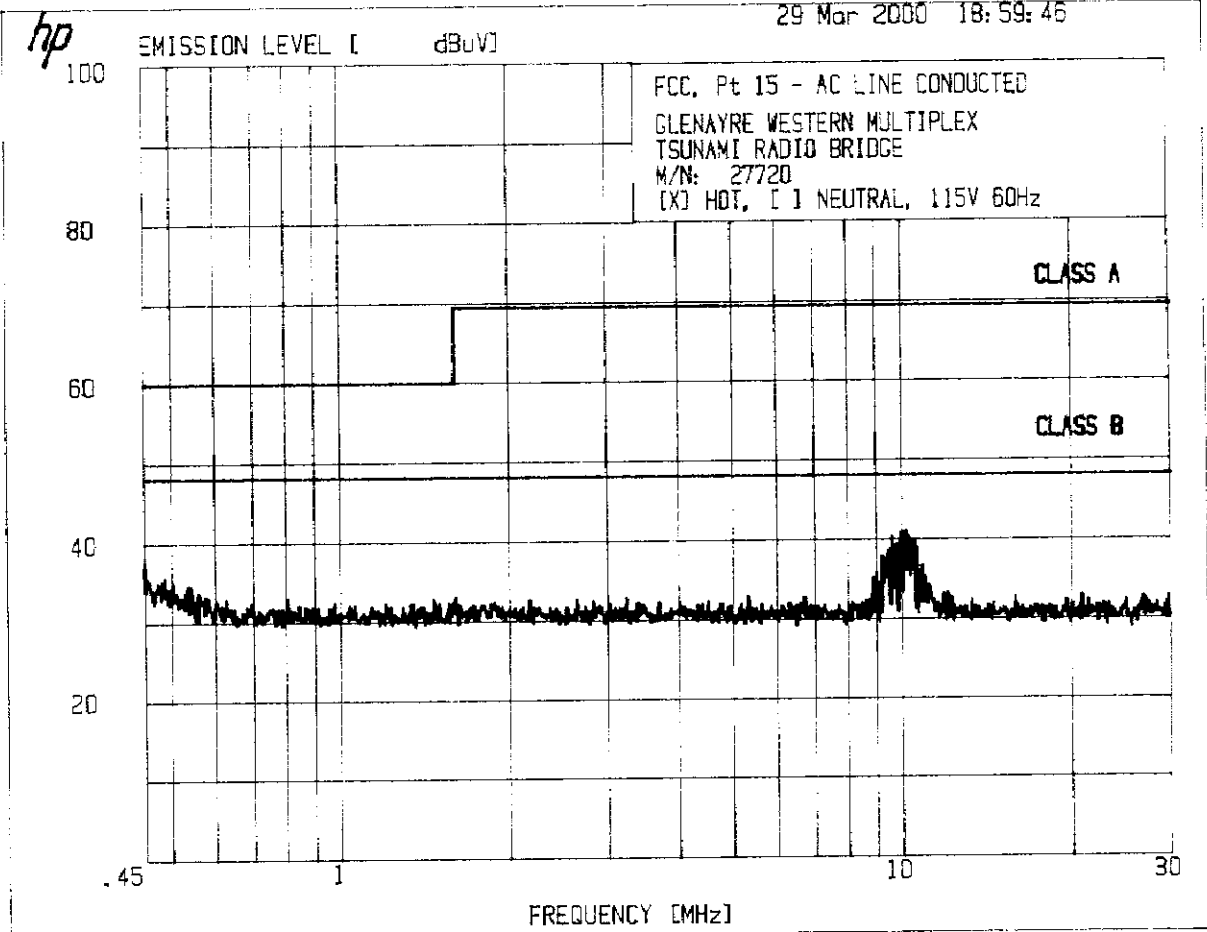
Frequency	Reading	Defector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHZ	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
11550.00	43.8	Peak	8	10	H	42.4	39.7	5.8	0.0	52.3	74.0	-21.8
11550.00	34.1	Ave.	8	10	H	42.4	39.7	5.8	0.0	42.6	54.0	-11.5
23100.00	35.4	Peak	21	13	H	40.4	23.3	2.8	-9.5	45.8	74.0	-28.2
23100.00	25.0	Ave.	21	13	H	40.4	23.3	2.8	-9.5	35.4	54.0	-18.6

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 20 dB below the limits.
- f) Frequency above 19GHz was made at 1m distance

4.6 AC Line Conducted Emission, FCC Rule 15.207

Test data attached.



29 Mar 2000 18:59:46

3. FCC OFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

GLENAYRE WESTERN MULTIPLEX
TSUNAMI RADIO BRIDGE
M/N: 27720
[X] HOT, [] NEUTRAL, 115V 60Hz

PEAKS FOUND ABOVE 35 uBuV

PEAK#	FREQ (MHz)	AMPL (uBuV)
1	4.914	35.7
2	8.824	35.1
3	9.037	35.6
4	9.267	37.3
5	9.503	38.5
6	9.624	40.4
7	9.625	39.4
8	9.594	40.6
9	10.21	41.1
10	10.34	40.4
11	10.55	39.9
12	10.69	39.0
13	10.78	36.0
14	10.91	35.7
15	11.05	35.4

29 Mar 2006 19:04:41

3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

GLENAYRE WESTERN MULTIPLEX
TSUNAMI RADIO BRIDGE
K/N: 27720
[] HOT, [X] NEUTRAL, 115V 60Hz

PEAKS FOUND ABOVE 35 dBuV

PEAK#	FREQ (MHz)	AMPL (dBuV)
1	4.939	35.6
2	5.234	36.6
3	9.524	36.1
4	9.837	37.5
5	9.113	36.5
6	9.386	40.4
7	9.463	38.9
8	9.624	42.7
9	9.828	42.8
10	9.952	43.6
11	10.21	42.8
12	10.34	43.6
13	10.69	43.0
14	10.82	37.9
15	10.91	38.2
16	11.05	36.8
17	11.29	35.2

4.7 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Rule 15.209

Test results are attached.

Job No.: J20008318
 Company: Glenayre Western Multiplex
 Model: 27720
 Test Mode: Tx @ 5775 MHz
 Engineer: Ollie Moyrong
 Date: March_29_2000

FCC Part 15.407 Radiated Emissions

Frequency (MHz)	Antenna Location (m)	Antenna Polariz (H/V)	Reading (dBuV)	Antenna Factor (dB/m)	Preamplifier (dB)	Correction Factor (dB)	Cable Loss (dB)	Corrected Reading (dBuV/m)	Limit At 3 m (dBuV/m)	Margin (dB)
40.0	3.0	V	26.5	7.1	0.0	0.0	1.0	34.6	40.0	-5.4 *
50.0	3.0	V	17.1	6.3	0.0	0.0	1.0	24.4	40.0	-15.6
60.0	3.0	V	23.6	5.4	0.0	0.0	1.1	30.1	40.0	-9.9
75.0	3.0	V	21.2	6.4	0.0	0.0	1.2	28.8	40.0	-11.2
80.0	3.0	V	17.8	6.9	0.0	0.0	1.2	25.9	40.0	-14.1
120.0	3.0	V	16.1	6.9	0.0	0.0	1.4	24.4	43.5	-19.1
125.0	3.0	V	24.3	7.6	0.0	0.0	1.4	33.3	43.5	-10.2
140.0	3.0	V	17.2	10.0	0.0	0.0	1.5	28.7	43.5	-14.8
150.0	3.0	V	24.2	11.7	0.0	0.0	1.5	37.4	43.5	-6.1
160.0	3.0	V	27.9	9.6	0.0	0.0	1.7	39.2	43.5	-4.3 *
165.1	3.0	V	24.6	9.2	0.0	0.0	1.7	35.5	43.5	-8.0
175.0	3.0	V	27.4	9.2	0.0	0.0	1.7	38.3	43.5	-5.2
180.0	3.0	V	21.6	9.3	0.0	0.0	1.7	32.6	43.5	-10.9
200.0	3.0	V	29.3	10.1	0.0	0.0	1.8	41.2	43.5	-2.3 *
240.0	3.0	V	20.4	11.2	0.0	0.0	2.0	33.6	46.0	-12.4
320.0	19.0	V	20.7	14.9	0.0	0.0	2.3	37.9	46.0	-8.1
325.0	3.0	V	18.8	15.2	0.0	0.0	2.3	36.3	46.0	-9.7

Notes: Negative signs (-) in the Margin column signify levels below the limit.
 Readings followed by a "*" are Quasi-peak measurements. All other readings are peak measurements.
 All other emissions not reported are at least 10 dB below the applicable limits.
 Frequency range of investigation is 30 MHz - 1 GHz.

4.8 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation), FCC Ref. 15.209, 15.111

Not required - EUT operation above 960 MHz only

4.9 Transmitter Duty Cycle Calculation and 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.

4.10 Radiation Exposure

See attached letter for MPE calculation



Federal Communications Commission
 Authorization and Evaluation Division
 7435 Oakland Mills Road
 Columbia, MD 21046

1196 Borregas Avenue
 Sunnyvale, CA 94089 USA
 tel: 408 542 5200
 fax: 408 542 5300

www.Wirelessinterconnect.com

Attention: Reviewing Engineer

The HZB-U5358-100 radio is a full duty-cycle product exclusively designed for fixed-mount point-to-point applications. Each radio's inputs are connected to external equipment through the radio's interfaces. The RF output port is connected to a RF cable or a waveguide, which connects on the other side to an antenna usually installed on top of a building or a tower. It is impossible to use the radio in any mobile applications.

The HZB-U5358-100 radios need to be professionally installed outdoor either on top of a tower or a tall building. The installation sites are inaccessible to the general public. Only installation engineers may get close to the radio antenna during system installation. For the safety concern of the professional installers, we put a warning message on Page 3-18 of the product manual recommending installers stay at least 5 meters away from the antenna during system operation.

The maximum output power tested for the HZB-U5358-100 is below 209 mW (+23.2 dBm), and the biggest antenna to be used with our 5.8 GHz radios is of 8' in diameter (41dB gain). To comply with the U-NII EIRP limits, when a higher gain antenna is used, the output power will be reduced to make the overall EIRP less than +30dBm at the 5.25-5.35dBm band, and +53dBm at the 5.725-5.825 band. For the worst case EIRP of +53dBm, the power density at 5 meters from an antenna is:

$$S = \text{EIRP}/4\pi R^2 = 0.64 \text{ W/m}^2 < 1 \text{ mW/cm}^2$$

Where: S = Power density
 R = distance to the center of radiation of the antenna

In the cases of using 2', 4', 6' and 8' parabolic antennas,

The near field power density is : $S_{nr} = 16\eta P/\pi D^2$. The worst case of near-field power density is when the radio output at the certified power, $\eta=1$, and the antenna diameter $D=2 \text{ ft}$.

$$S_{nr \text{ max}} = 16 \times 0.21/\pi (2 \times 0.3048)^2 = 3.0 \text{ W/m}^2 = 0.3 \text{ mW/cm}^2 < 1 \text{ mW/cm}^2$$

Where: S_{nr} = maximum near -field power density
 P = power fed to the antenna
 η = aperture efficiency
 D = antenna diameter

So in all the above-mentioned situations, the power density is compliant with the limit for General Population/ Uncontrolled Exposure as specified in rule 1.1310.

If you should have any questions regarding this submission, please feel free to contact the undersigned.

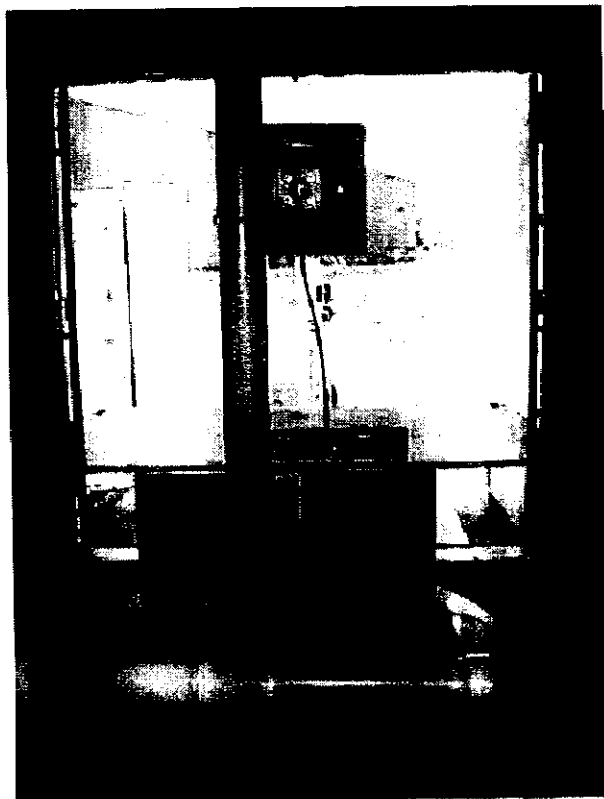
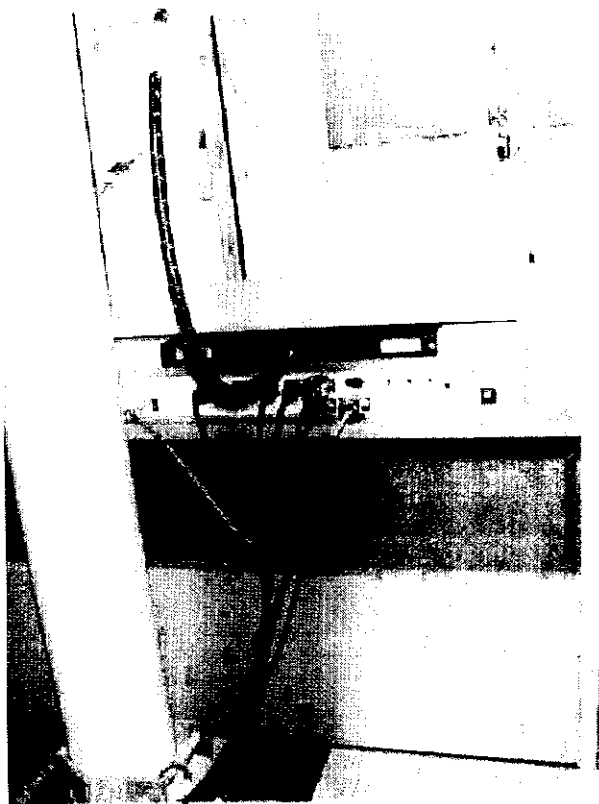
Yours truly,

Caroline Yu
 International Product Manager
 Western Multiplex Corporation

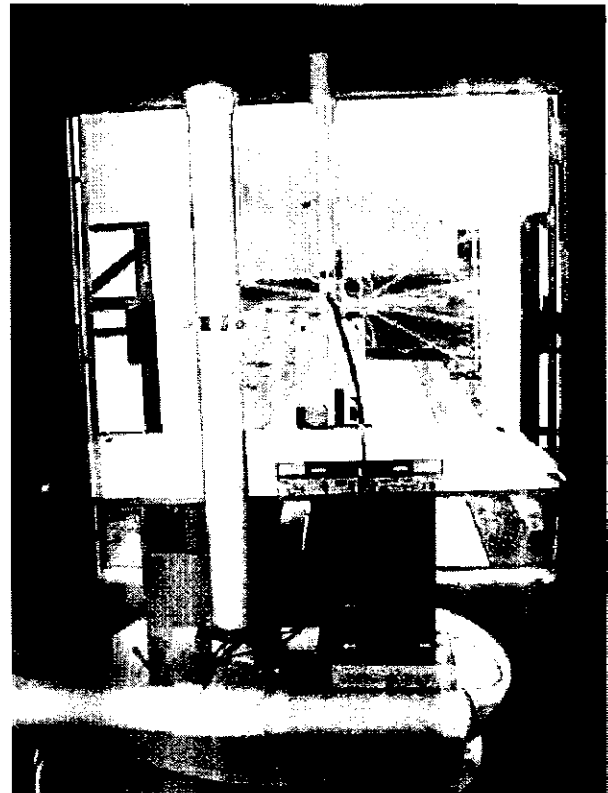
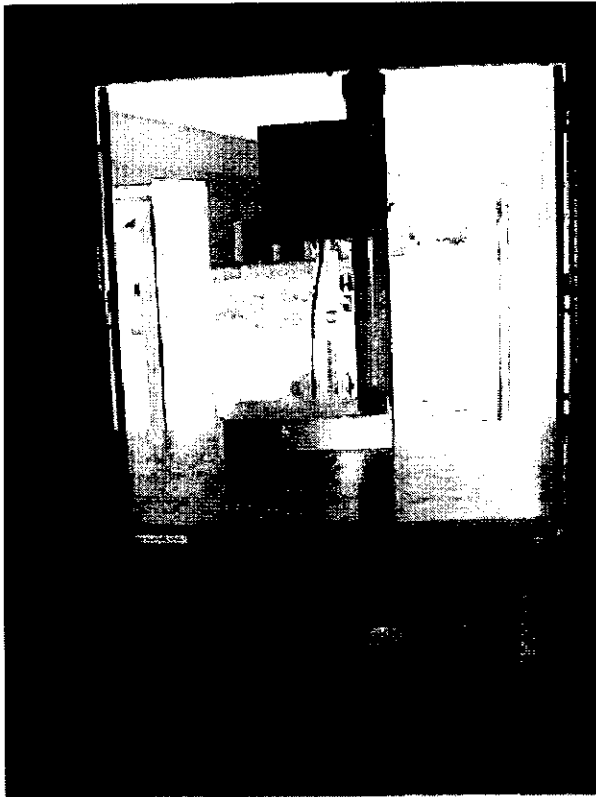
5.0 Test Setup Photos

See attached for test setup photos.

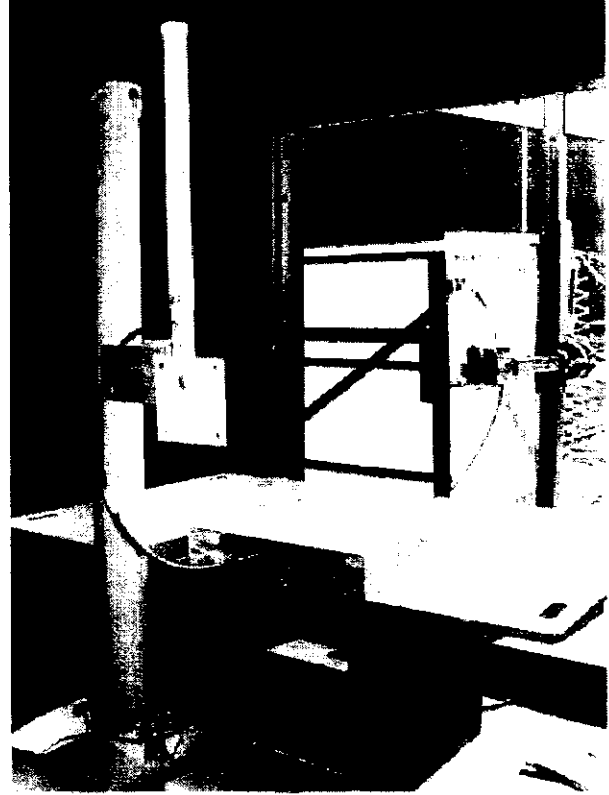
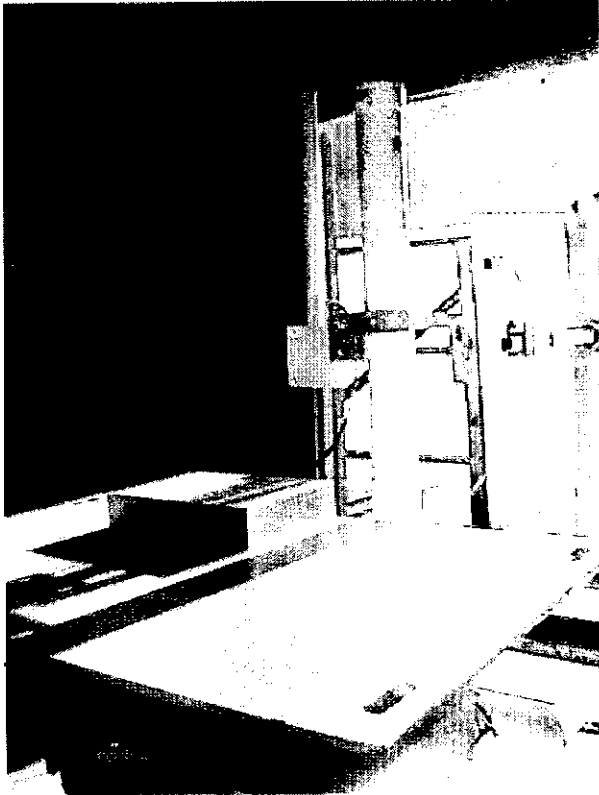
Test Setup Photos – Radiated Emissions



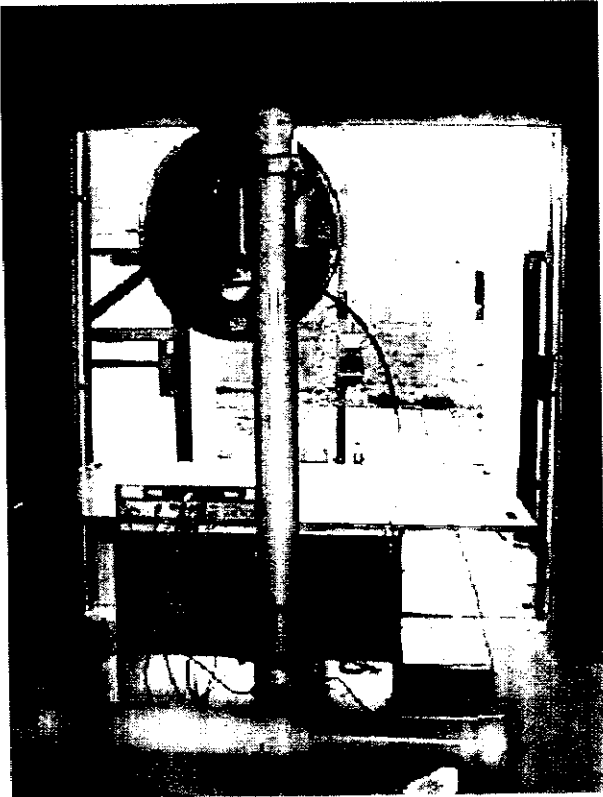
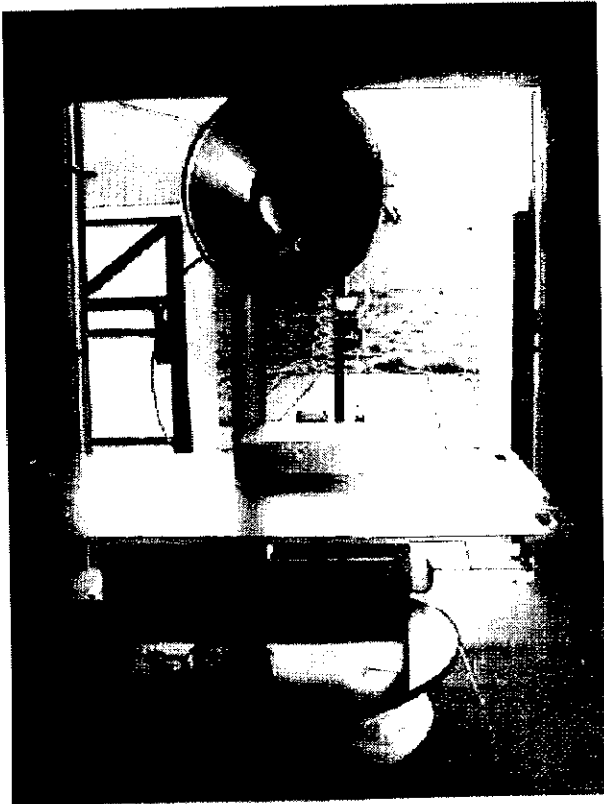
Test Setup Photos – Radiated Emissions



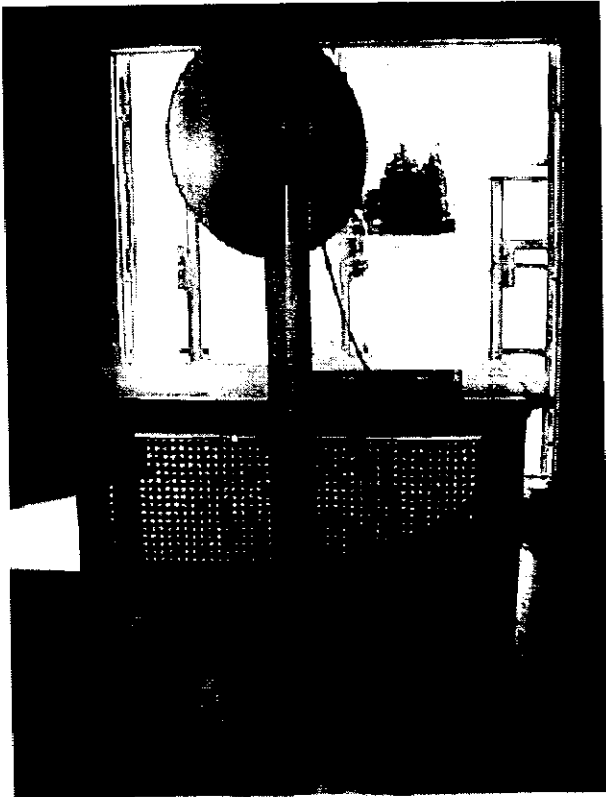
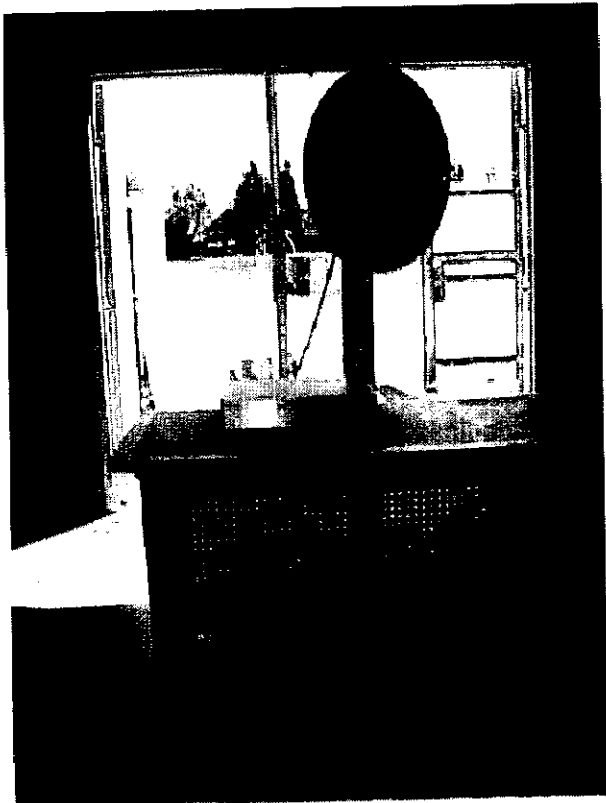
Test Setup Photos – Radiated Emissions



Test Setup Photos – Radiated Emissions



Test Setup Photos – Radiated Emissions



Test Setup Photos – Line Conducted Emissions

