



Intertek Testing Services ETL SEMKO

FCC Part 90 Test Report
for
Communication Network Interface, Inc.
on the
Radio Packet Modem
Model: CNI-903M
FCC ID: N79CNI-903M

Test Report #: J20007646A
Date of Report: March 29, 2000

Job #: J20007646
Date of Test: March 21, 2000

Total No. of Pages Contained in this Report: 14 + data pages



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Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

1.0 Summary of Tests

FCC ID: N79CNI-903M
Model No.: CNI-903M

FCC RULE	DESCRIPTION OF TEST	RESULTS
2.1046	RF Power Output	Pass
90.205	Effective Radiated Power	Pass
2.1049, 90.209(b)(5), 90.210	Occupied Bandwidth, Bandwidth Limitation, Emission Masks	Pass
2.1051	Spurious Emissions at Antenna Terminals	Pass
2.1053, 15.109	Field Strength of Spurious Radiation	Pass
15.107	Line Conducted Emissions	Pass
2.1055	Frequency Stability vs. Temperature	Pass
2.1055	Frequency Stability vs. Voltage	Pass
2.914	Transient Frequency Behavior	N/A

Test Engineer:

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Date:

3/30/00

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David Chernomordik, Ph.D.
EMC Site Manager

Date:

3/30/00

Table of Contents

1.0	Summary of Tests	1
2.0	General Description	2
2.1	Product Description	2
2.2	Related Submittal(s) Grants	2
2.3	Test Facility.....	2
3.0	RF Power Output, FCC § 2.985(a).....	3
3.1	Test Procedure.....	3
3.2	Test Equipment.....	3
3.3	Test Results.....	3
4.0	Occupied Bandwidth, Bandwidth Limitation, Emission Masks	4
4.1	Test Procedure.....	4
4.2	Test Equipment.....	4
4.3	Test Results.....	4
5.0	Out of Band Emissions at Antenna Terminals, FCC §2.991.....	5
5.1	Test Procedure.....	5
6.0	Field Strength of Spurious Radiation, FCC §2.993, §15.109.....	6
6.1	Test Procedure.....	6
6.2	Test Equipment.....	6
7.0	Line Conducted Emissions, FCC § 15.107	9
7.1	Test Procedure.....	9
7.2	Test Configuration Setup – Line Conducted Emissions	10
7.3	Test Results.....	11
8.0	Frequency Stability vs Temperature, FCC § 2.995(a).....	12
8.1	Test Procedure.....	12
8.2	Test Equipment.....	12
8.3	Test Results.....	12
9.0	Frequency Stability vs Voltage, FCC §2.995(d)(2)	13
9.1	Test Procedure.....	13
9.2	Test Equipment.....	13
9.3	Test Results.....	13
10.0	Transient Frequency Behavior, FCC §90.214.....	14
10.1	Test Procedure.....	14
10.2	Test Results.....	14

Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

2.0 General Description**2.1 Product Description**

The CNI-903M, RPM (Radio Packet Modem) is a digital data communication equipment in accordance with Mobitex specification. The frequency it uses ranges from 896 MHz to 901 MHz for transmission and from 935 MHz to 941 MHz for reception.

A production version of the sample was received on March 21, 2000 in good condition.

Overview of Radio Packet Modem

Applicant	Communication Network Interface, Inc.
Trade Name & Model No.	CNI / CNI-903M
FCC Identifier	N79CNI-903M
Use of Product	Digital Data Communication (Two-Way Pager)
Type of Transmission	Direct Sequence
Bit Rate	8000 bps
Max. Allowed Deviation	2 kHz
Range of RF Output	2W
The dc voltage applied to and current into the several elements of the final RF amplifying device	Voltage: 3V Current: 1A
Frequency Range	896 - 901 MHz
Max. Number of Channels	
Antenna(e) & Gain	0 dBi
Detachable Antenna?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Receiver L.O. Frequency	896 - 901 MHz
External Input	<input type="checkbox"/> Audio <input checked="" type="checkbox"/> Digital Data

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

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

Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

3.0 RF Power Output, FCC § 2.985(a)**3.1 Test Procedure**

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. The resolution bandwidth and the video bandwidth of the spectrum analyzer were set up to 100 kHz and 30 kHz respectively. The attenuator was included in spectrum analyzer OFFSET function.

Transmitter output was read off the spectrum analyzer in dBm.

3.2 Test Equipment

Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782 Spectrum Analyzer, 100 Hz - 40 GHz

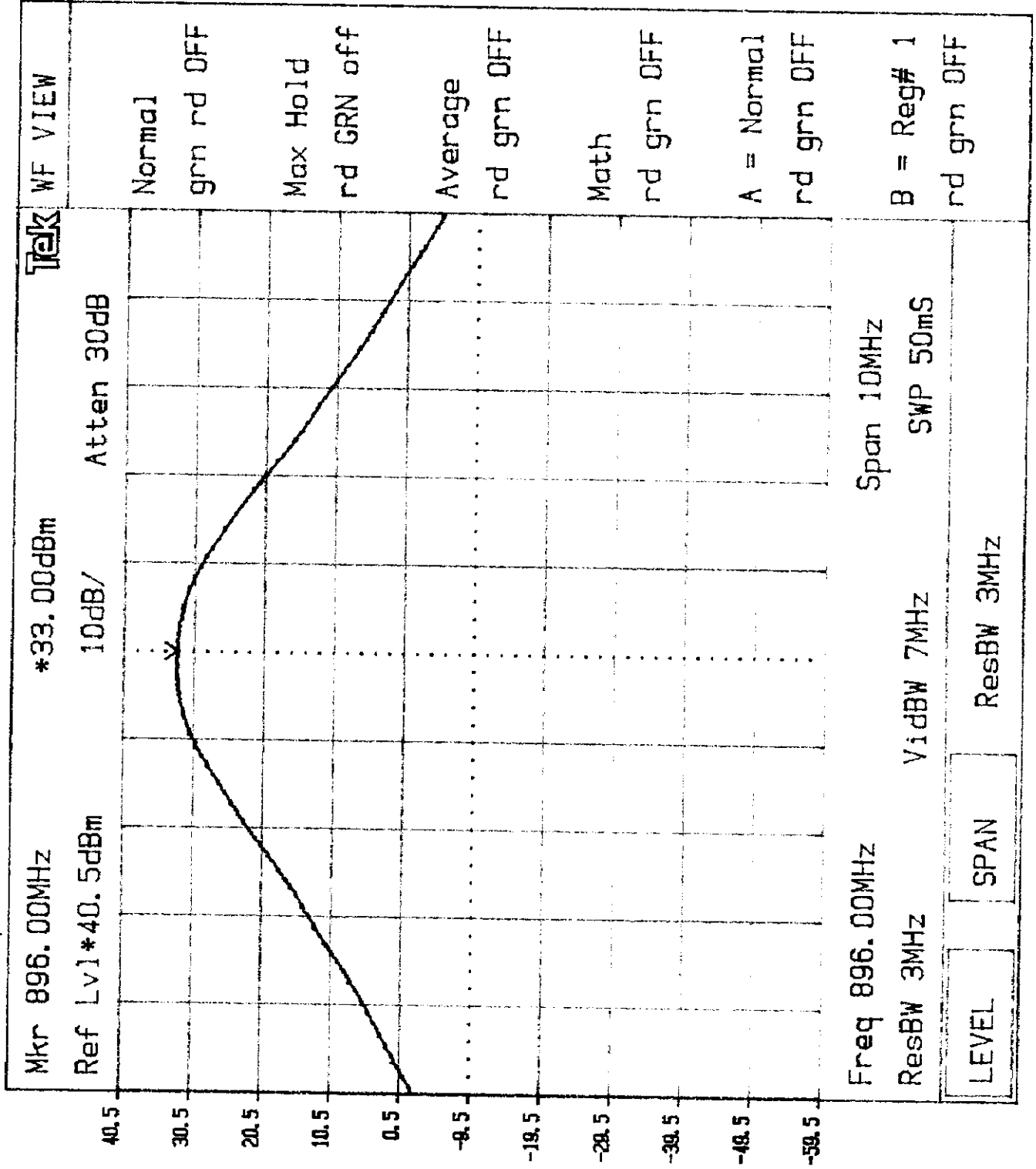
3.3 Test Results

Refer to the attached plot.

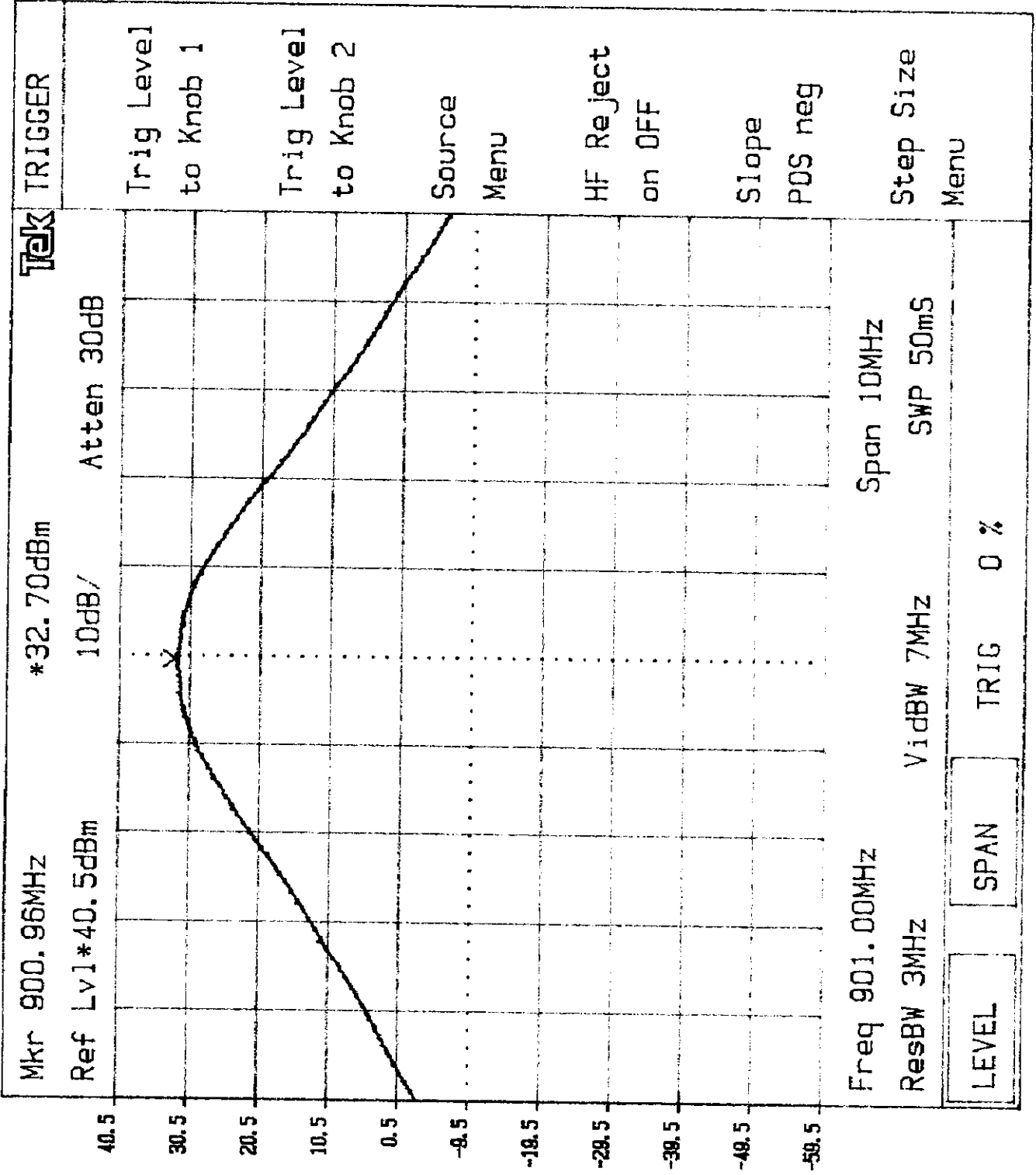
Plot Number	Description
3-1	Low Channel
3-2	High Channel

Results: Passed

Plot 3-1



Plot 3-2



Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

4.0 Occupied Bandwidth, Bandwidth Limitation, Emission Masks
FCC §2.989(D), 90.209(B)(5), 90.210**4.1 Test Procedure**

The antenna was disconnected from the transmitter and the short cable was connected to the transmitter RF output.

The RF output was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set up at least 10 times higher than the authorized bandwidth of the transmitter. The spectrum analyzer reading was recorded and plotted. This reading is used as a reference for emission mask measurements.

The resolution bandwidth of the spectrum analyzer was set up to 100 Hz and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask.

The emission designator was defined as 11K25F1D, where 11.25 kHz is the Authorized Bandwidth.

4.2 Test Equipment

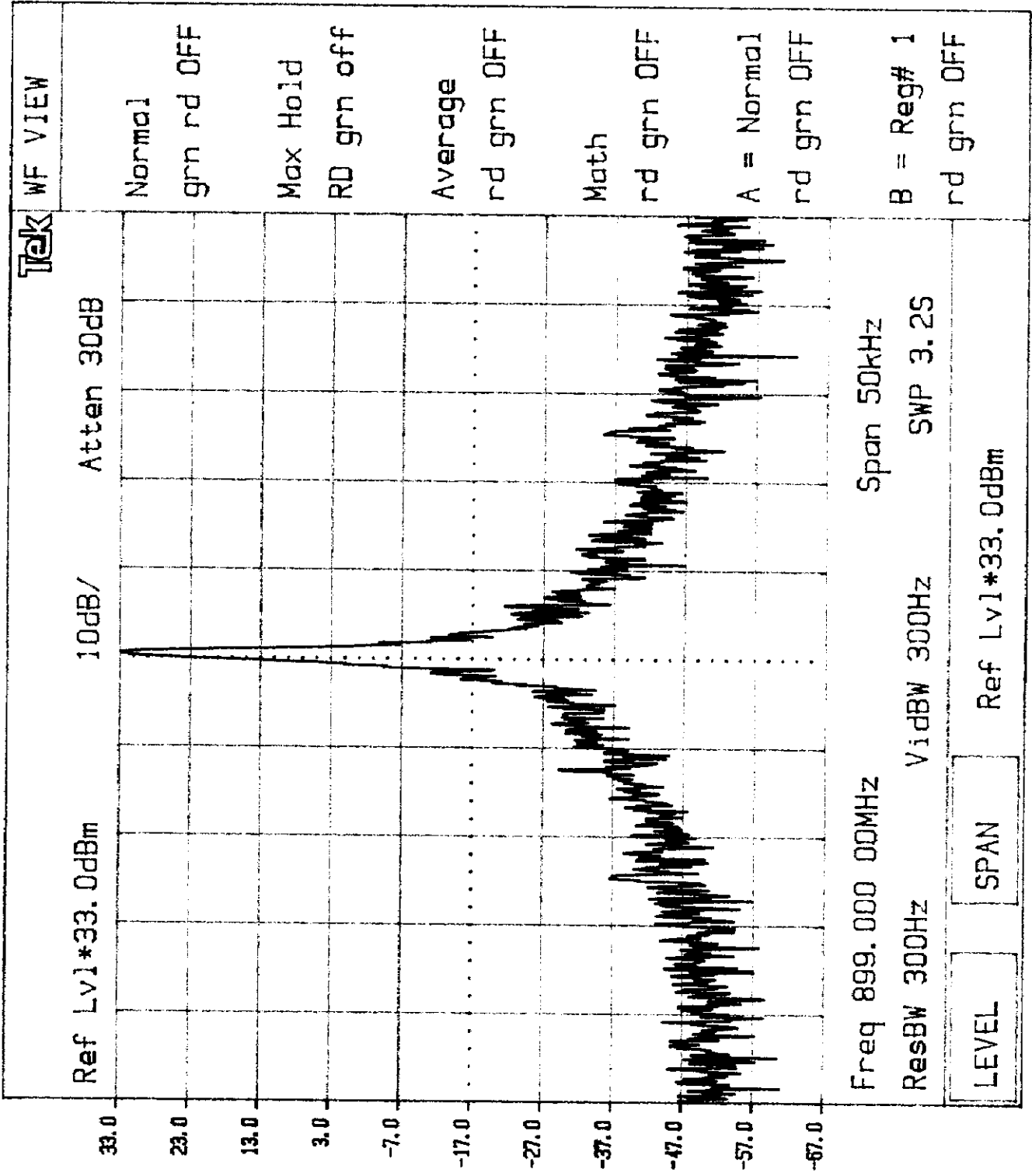
Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782 Spectrum Analyzer, 100 Hz - 40 GHz

4.3 Test Results

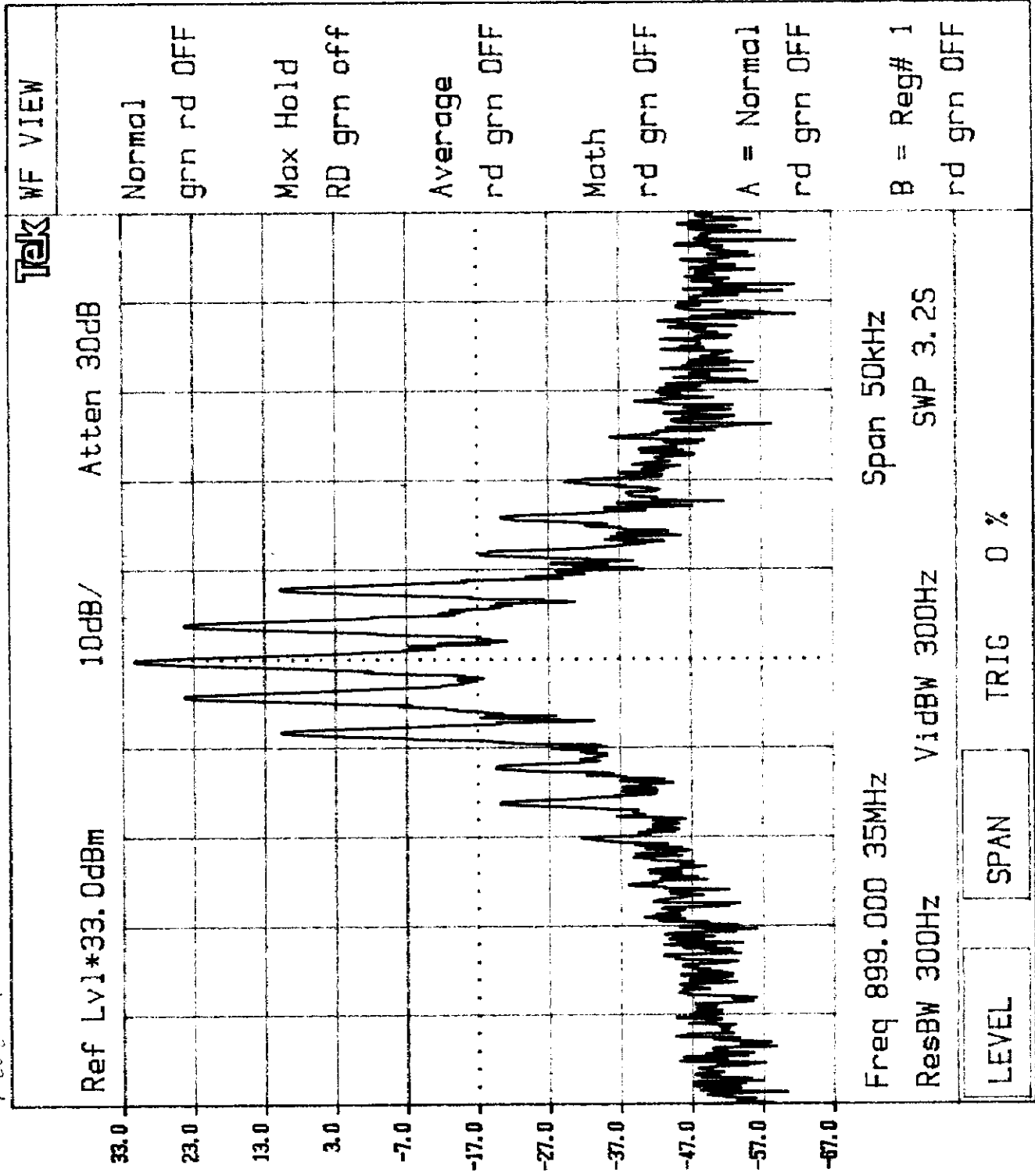
Plot Number	Description
4-1	Unmodulated
4-2	Modulated (00.11.00.11...) 50 kHz Span
4-3	Modulated (00.11.00.11...) 100 kHz Span
4-4	Modulated (00.11.00.11...) 200 kHz Span
4-5	Modulated (00.11.00.11...) 1 MHz Span
4-6	Random Modulated

Results: Passed

Plot 4-1



Plot 4-2



WF VIEW

Normal
grn rd OFF

Max Hold
RD grn off

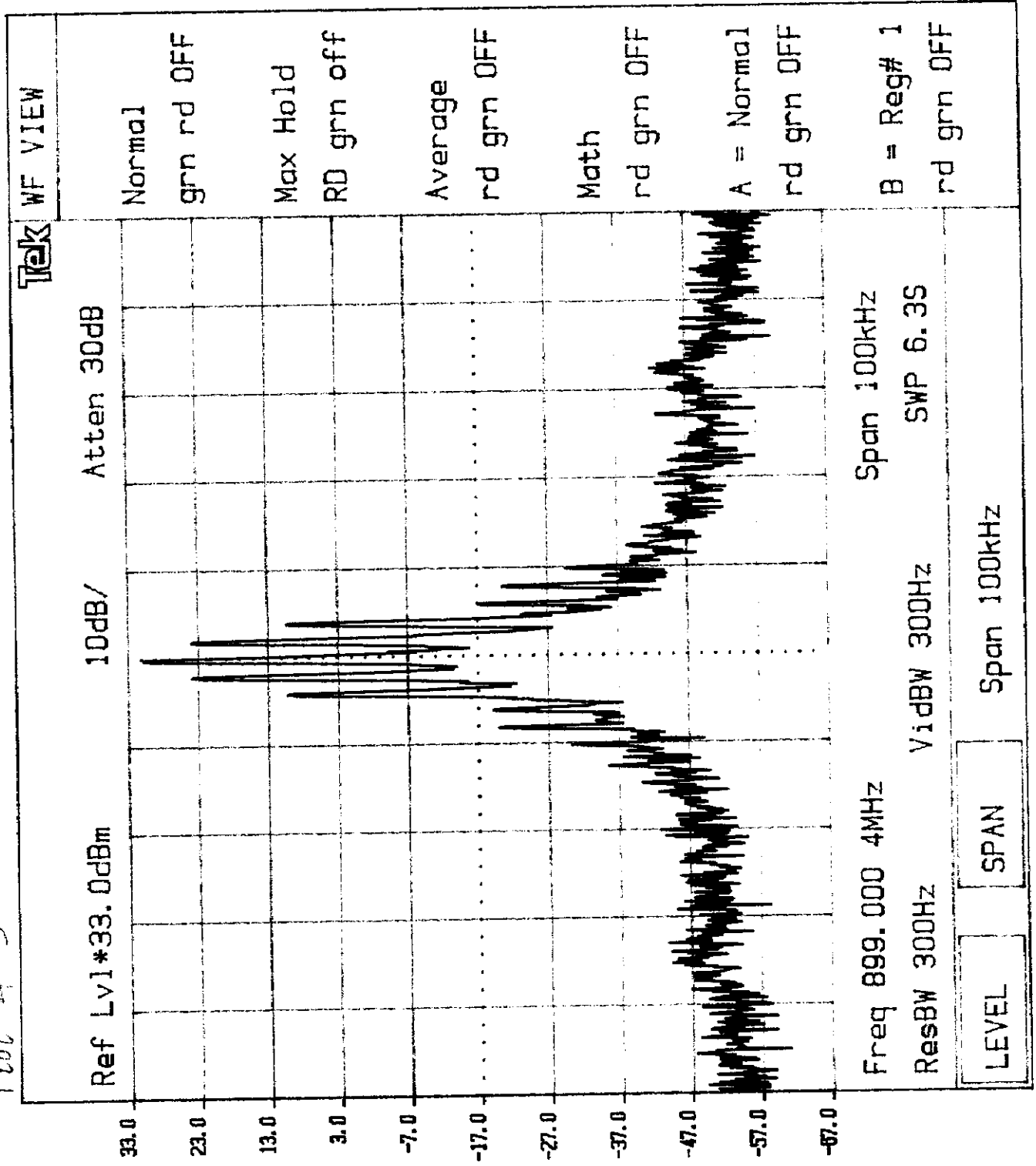
Average
rd grn OFF

Math
rd grn OFF

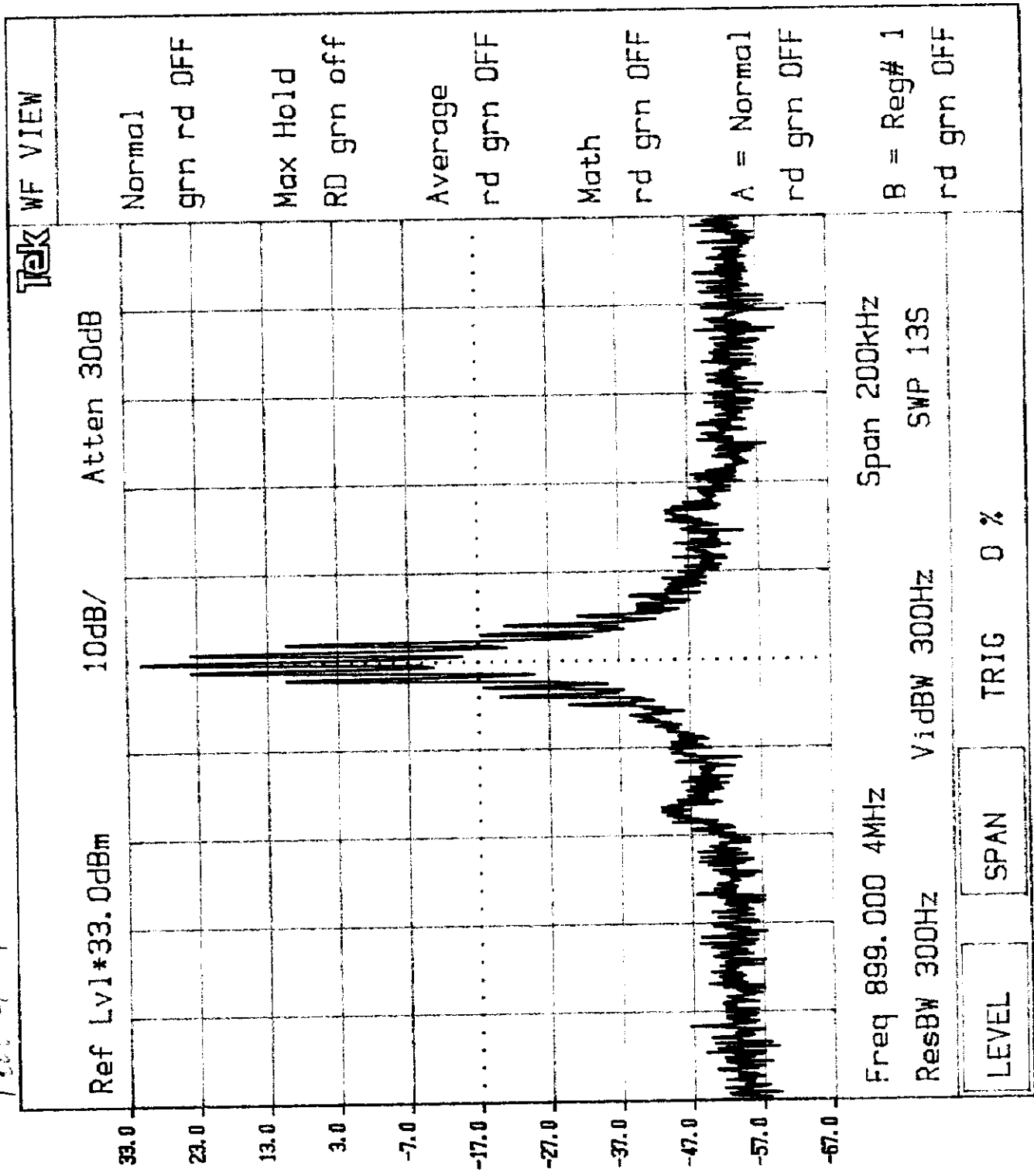
A = Normal
rd grn OFF

B = Reg# 1
rd grn OFF

Plot 4-3

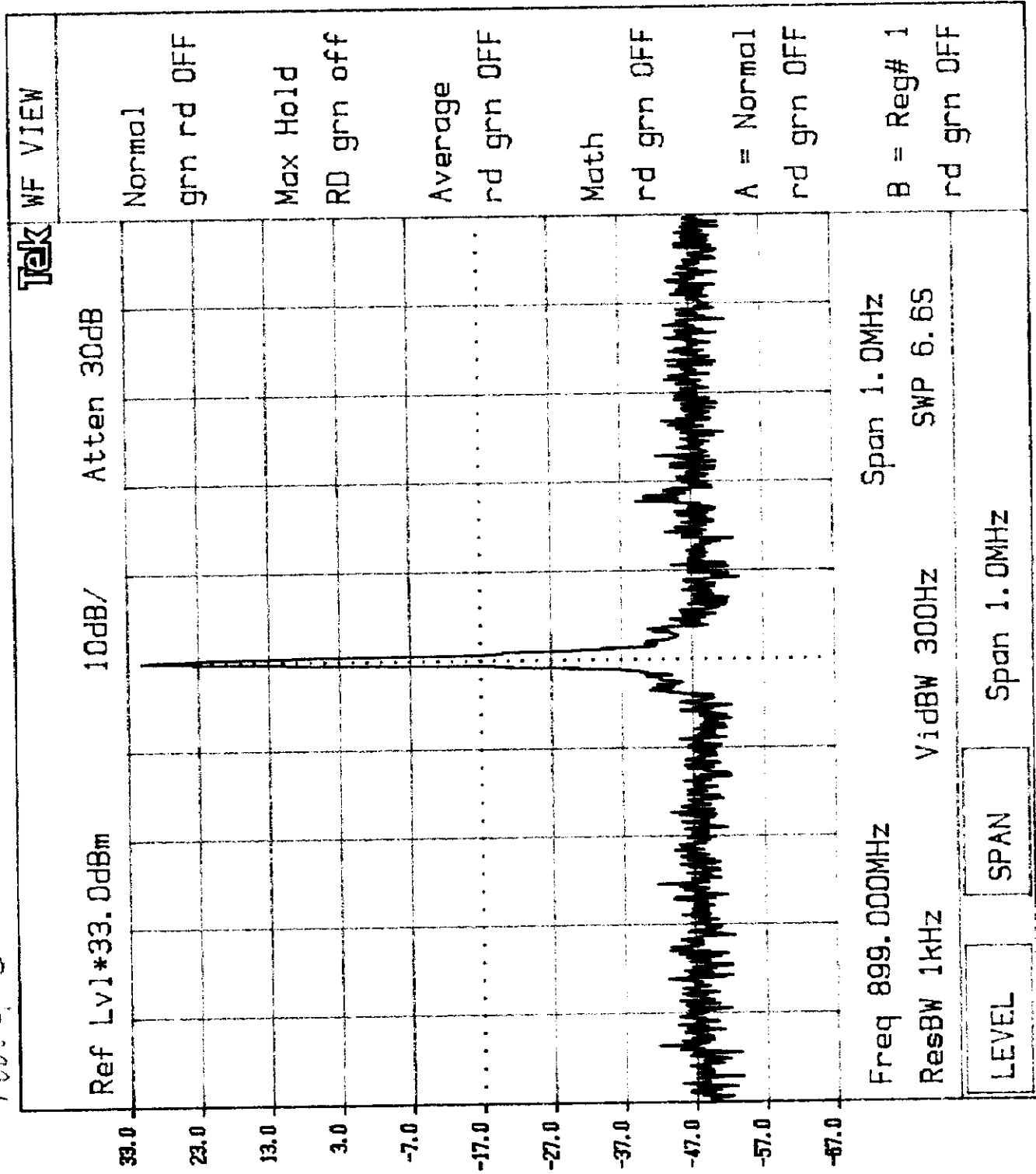


Plot 4-4



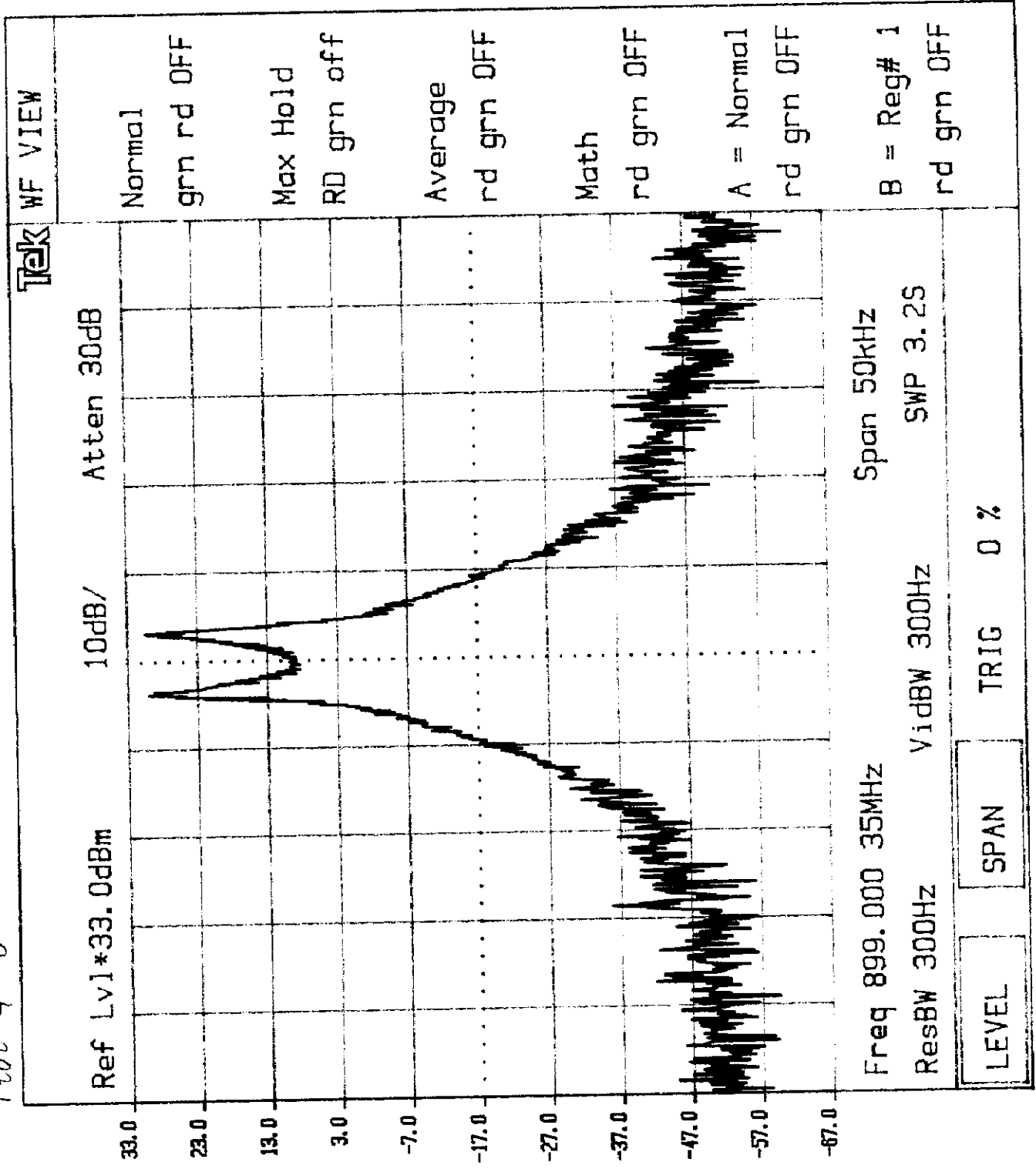
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

Plot 4-5



KNOB 2 KNOB 1 KEYPAD Tektronix 2784

Plot 4-6



5.0 Out of Band Emissions at Antenna Terminals, FCC §2.991

The power of emissions must be attenuated below the power of the unmodulated carrier (P) on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth - at least $43 + 10 \log P$ dB.

5.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show the out-of-band emissions if any up to 10th harmonic.

5.2 Test Equipment

HP 8566B Spectrum Analyzer, 100 Hz - 22 GHz
HP 7470A Plotter

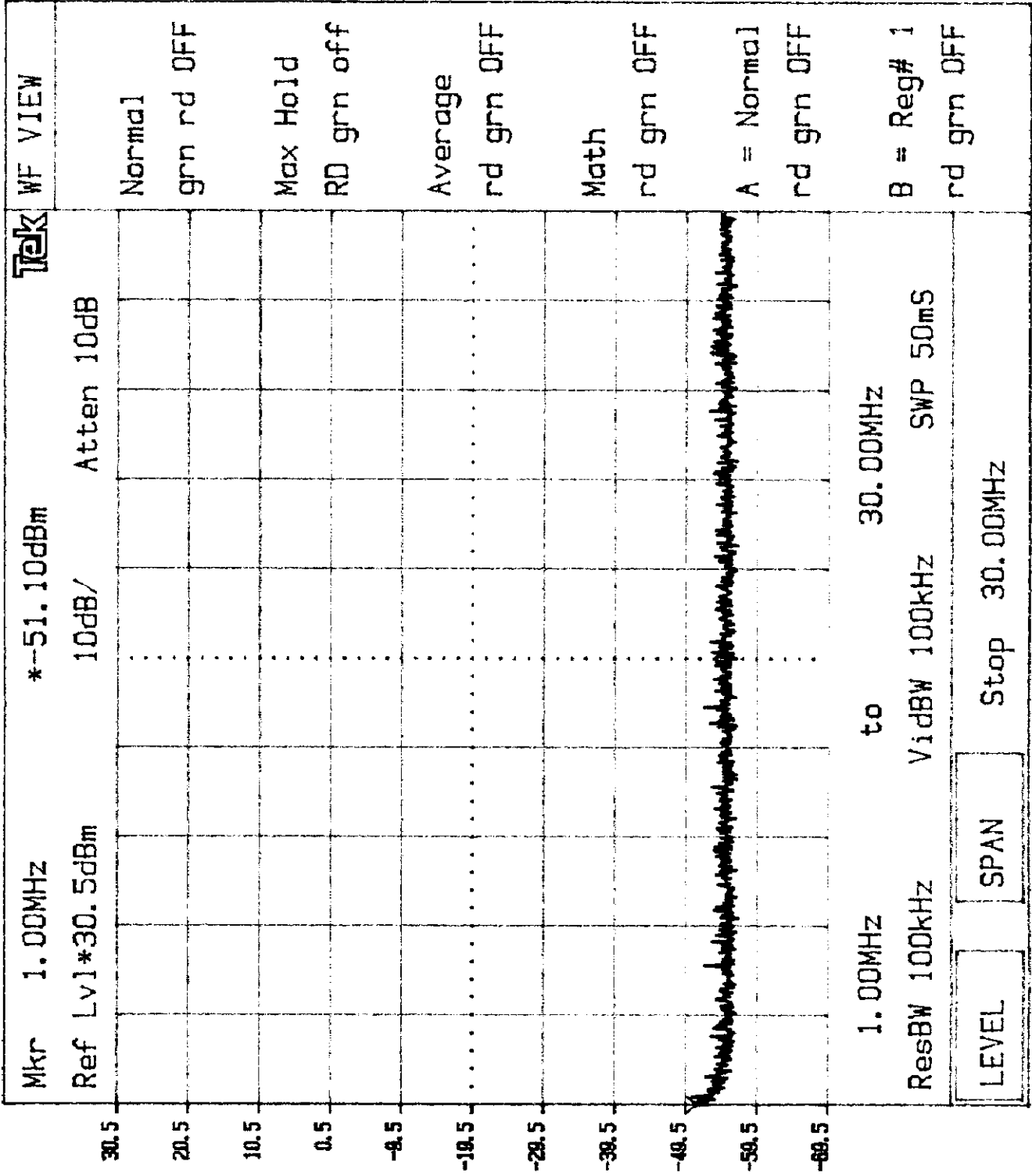
5.3 Test Results

Refer to the attached plots.

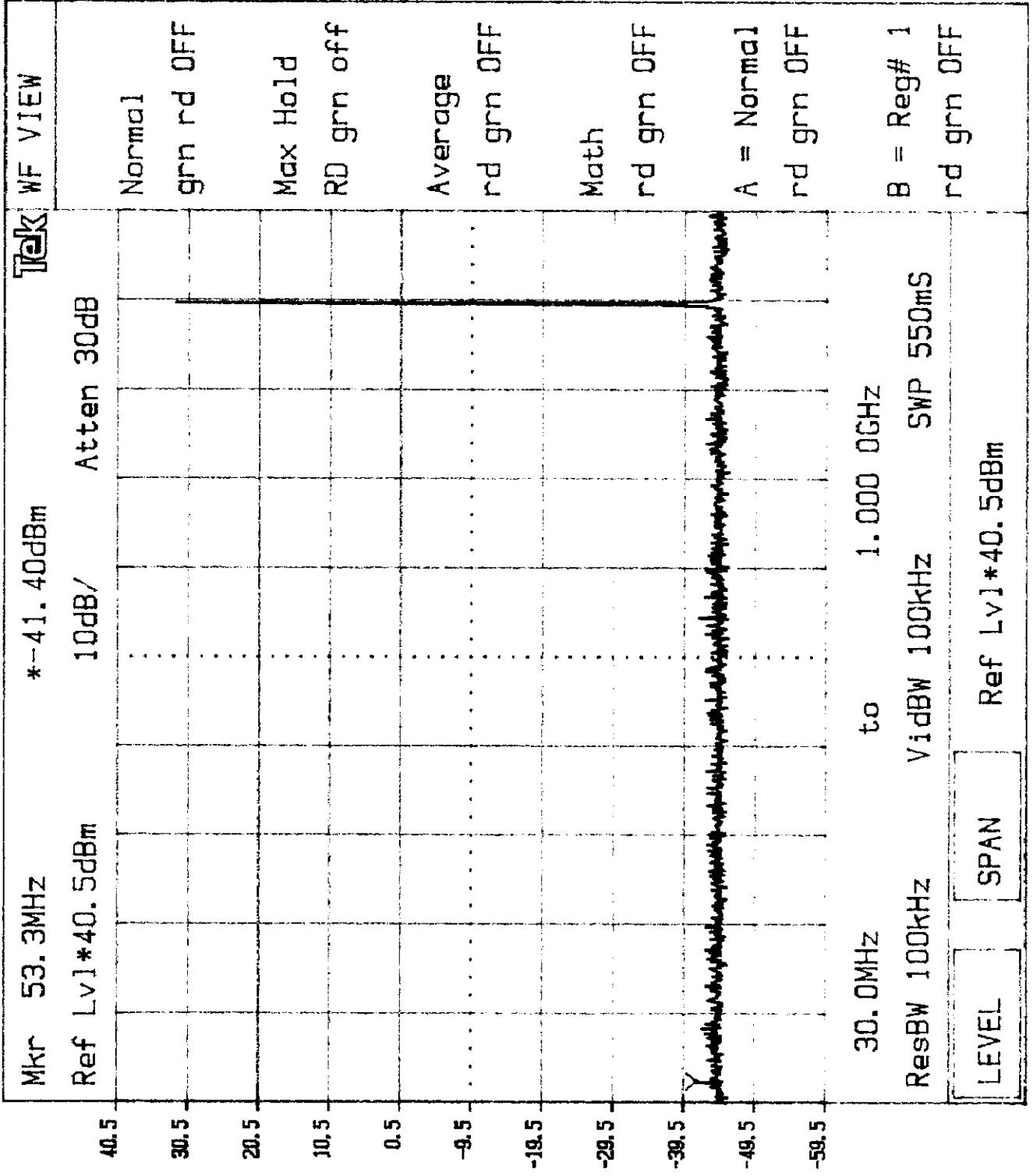
Plot Number	Description
5-1-1	Low Channel, 1 MHz - 30 MHz
5-1-2	Low Channel, 30 MHz - 1 GHz
5-1-3	Low Channel, 1 GHz - 10 GHz
5-b-1	High Channel, 1 MHz - 30 MHz
5-b-2	High Channel, 30 MHz - 1 GHz
5-b-3	High Channel, 1 GHz - 10 GHz

Results: Passed

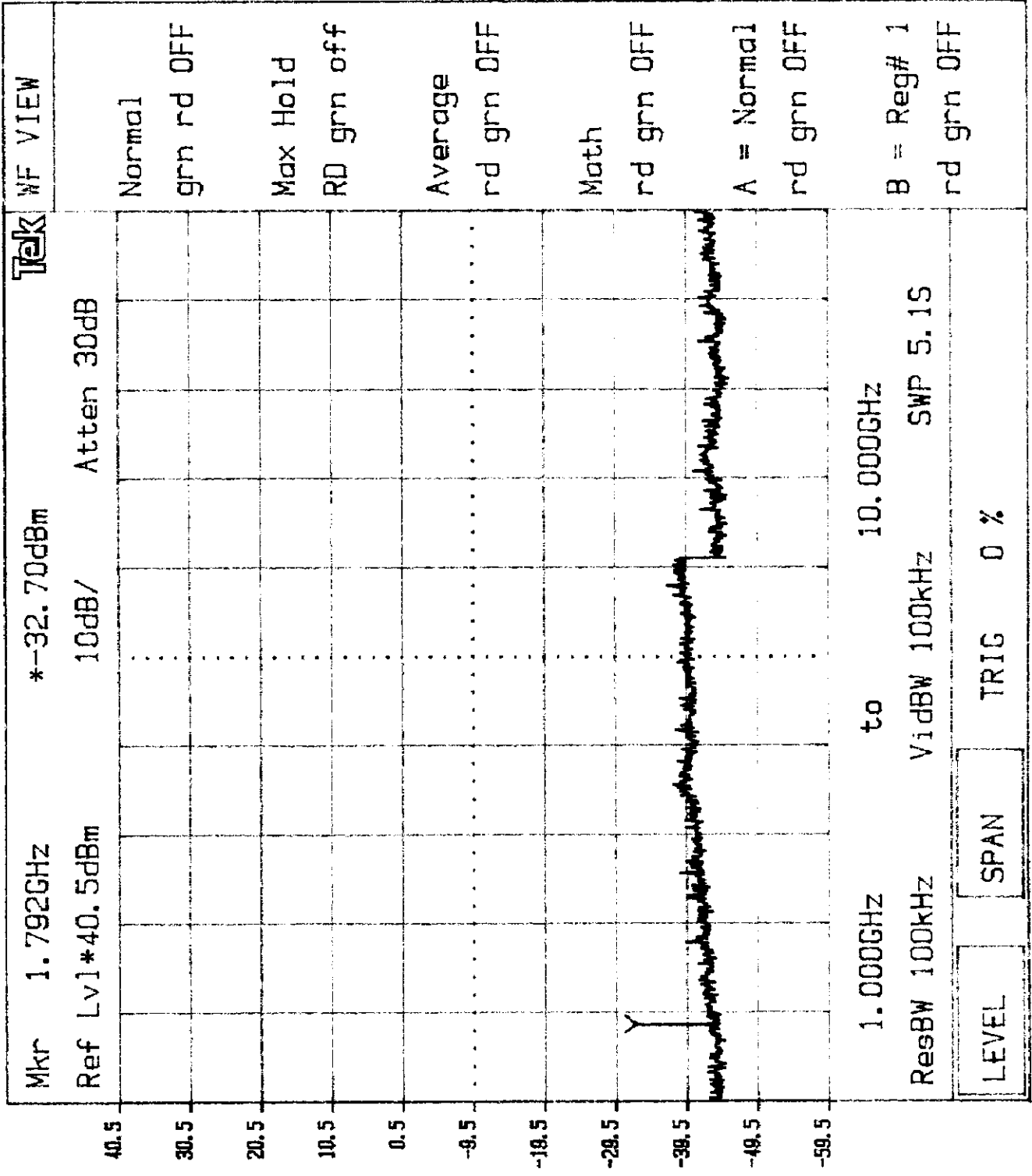
S-a-1



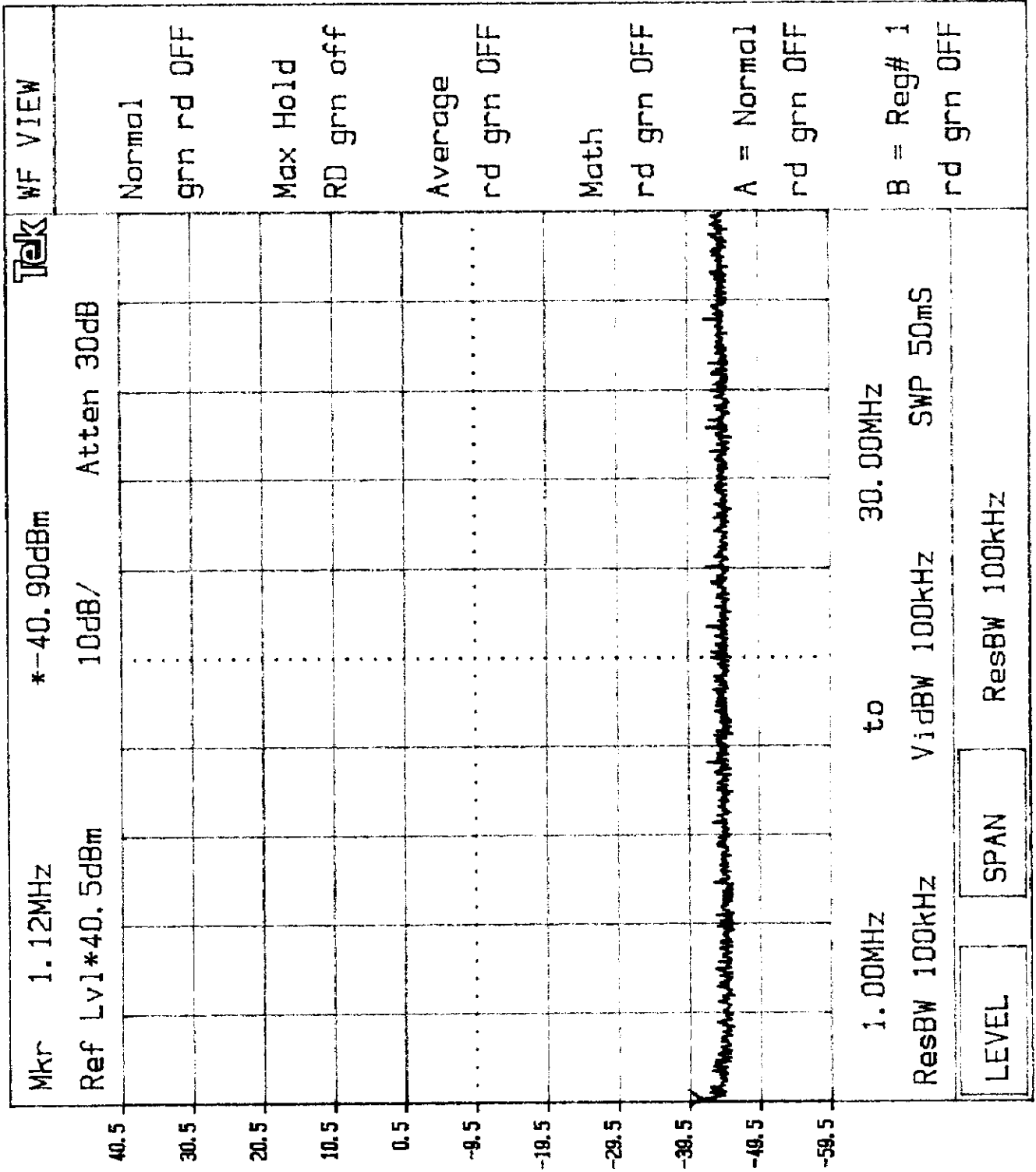
5-a-2



5-a-3



5-b-1



WF VIEW

Normal
grn rd OFF

Max Hold
RD grn off

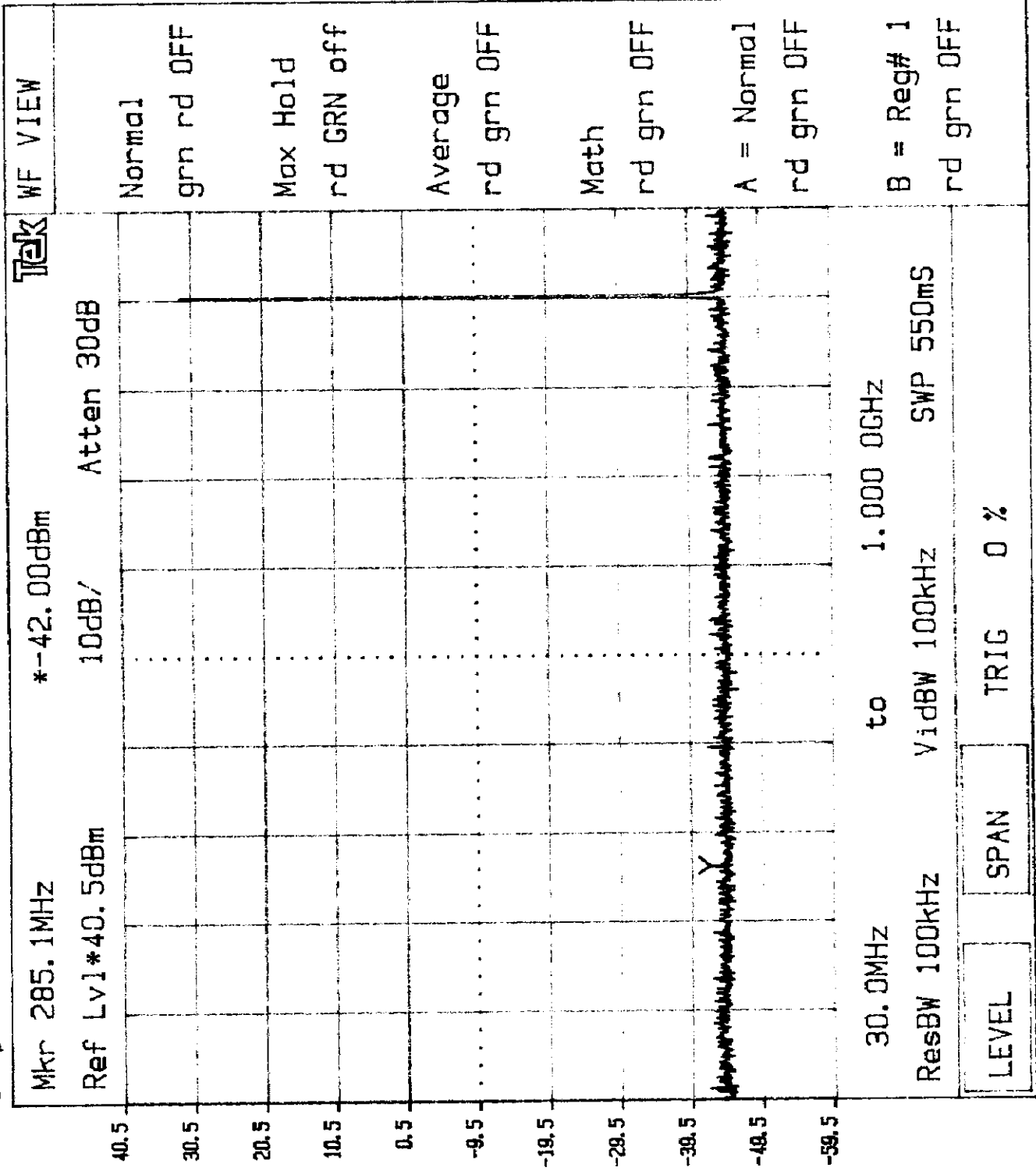
Average
rd grn OFF

Math
rd grn OFF

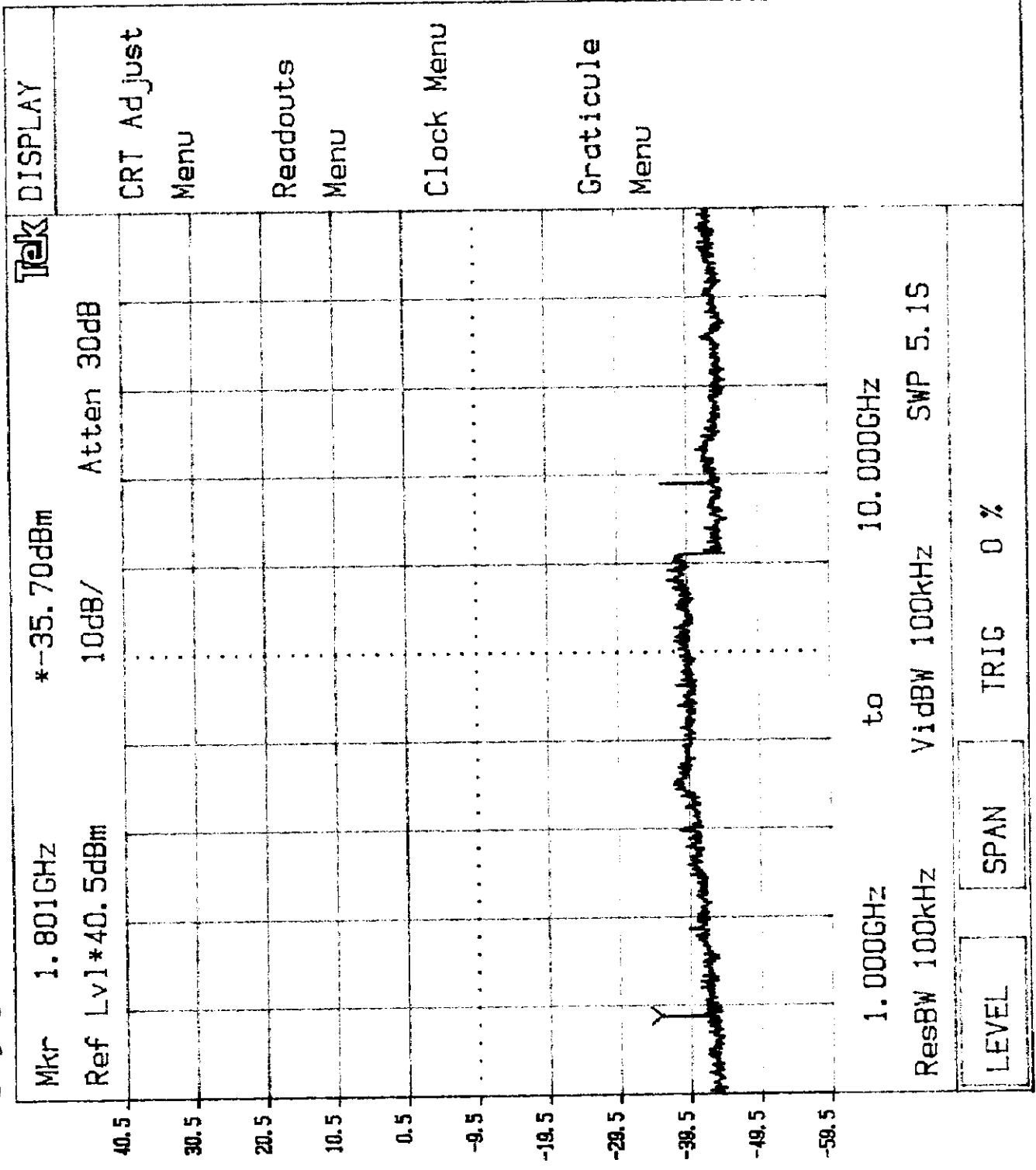
A = Normal
rd grn OFF

B = Reg# 1
rd grn OFF

5-6-2



5-b-3



6.0 Field Strength of Spurious Radiation, FCC §2.993, §15.109**6.1 Test Procedure**

The transmitter was placed on a wooden turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3 orthogonal axis.

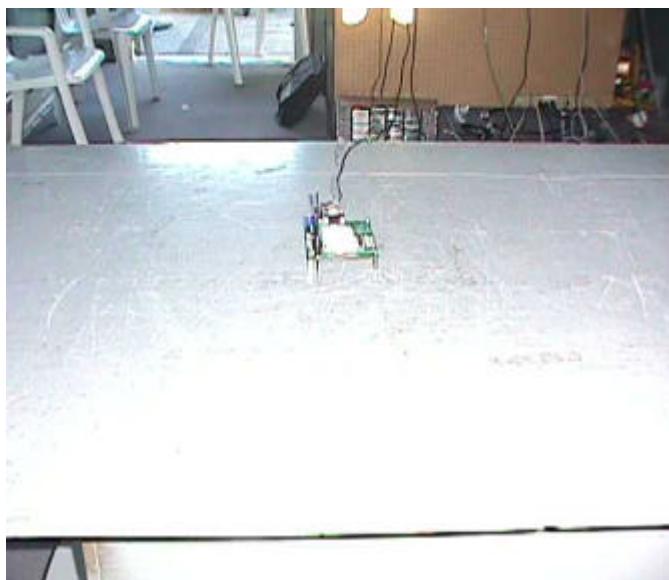
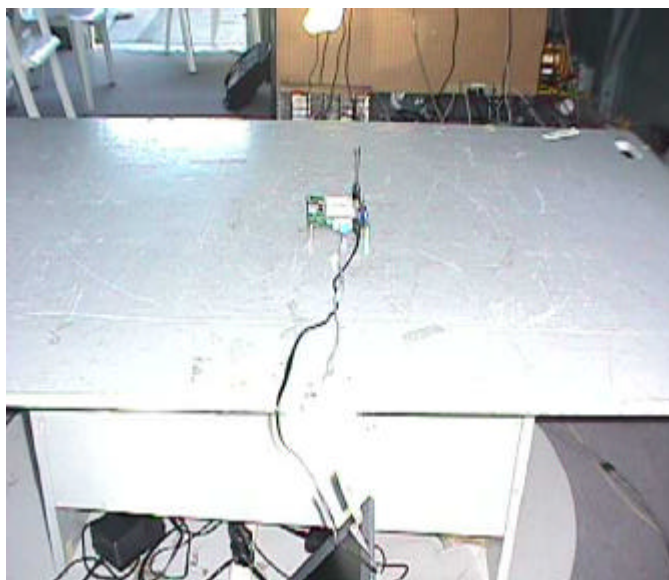
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The spurious harmonic attenuation was calculated as the difference between E in dB(uV/m) at the fundamental frequency and at the spurious emission frequency.

6.2 Test Equipment

CDI B100/200/300 Biconical Antennas
EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Preamplifiers

6.3 Test Configuration Setup - Radiated Emission



Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

6.4 Test Results

See attached.

Results: Passed

Radiated Emissions Test Data

Company:	C.N.I. Inc.	Model #:	CNI-903M	Req:	FCC 2.993
EUT:		S/N or FCC #:		Test Dist:	3 meters
Project #:	J2000764 6	Test Date:	March 21, 2000	TP:	2.00 Watt
Test Mode:	Tx @ Low Ch.	Engineer:	Xi Ming Y.	Min. Attn:	45.01 dBc

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	11	14	0	8	13	0	0	12	0
Model:	EMCO 3143	LPB-2520A	EMCO 3115	None	CDI_P1000	ACO/400	None	None	Gm_M+L	None

Frequency	Reading	Detector	Ant #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	Net	ERP	Attn.	Margin
MHz	dB(µV)	P/A/G	#	#	H/V	dB(1/m)	dB	dB	dB(µV/m)	mVv	dBc	dB
896.00	106.0	Peak	11	0	V	22.2	0.0	2.1	130.3	1.96E+03	0.0	N/A
1792.00	72.0	Peak	14	8	H	26.2	29.4	3.1	71.9	2.81E-03	58.4	-12.4
2688.00	60.1	Peak	14	8	H	32.7	28.4	2.3	66.7	8.56E-04	63.6	-17.6
3584.00	60.6	Peak	14	8	H	32.1	27.8	2.7	67.6	1.04E-03	62.8	-16.7
4480.00	56.0	Peak	14	8	H	34.5	27.9	2.9	65.5	6.42E-04	64.9	-18.8
5376.00	43.0	Peak	14	8	H	34.3	28.3	3.5	52.5	3.25E-05	77.8	-31.8
6272.00	39.0	Peak	14	8	V	36.8	28.0	3.9	51.7	2.73E-05	78.6	-32.6
7168.00	42.4	Peak	14	8	V	38.0	27.9	4.3	56.8	8.80E-05	73.5	-27.5
8064.00	37.0	Peak	14	8	V	37.9	27.2	4.8	52.5	3.24E-05	77.8	-31.8
8960.00	37.7	Peak	14	8	V	40.3	27.0	4.7	55.7	6.84E-05	74.6	-28.6

Notes:

- a) O.C.F.: Other Correction Factor
- b) Insert. Loss = Cable A + Cable B + Cable C + Transducer.
- c) Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss.
- d) Attn = Field Strength (Fundamental) - Field Strength (Harmonics).
- e) Negative signs (-) in Margin column signify levels below the limits.

Radiated Emissions Test Data

Company:	C.N.I. Inc.	Model #:	CNI-903M	Reg:	FCC 2 993
EUT:		S/N or FCC #:		Test Dist:	3 meter
Project #:	J2000764 6	Test Date:	March 21, 2000	TP:	2.00 Watt
Test Mode:	Tx @ Mid Ch.	Engineer:	Xi Ming Y.	Min. Attn:	46.01 dBc

Antenna Used			Pre-Amp Used			Cable Used			Transducer Used	
Number:	2	11	14	0	8	13	0	0	12	0
Model:	EMCO 3143	LPB-2520A	EMCO 3115	None	CDI_P1000	ACO/400	None	None	Gm_M-L	None

Frequency	Reading	Detector	Ant. #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	Net	ERP	Attn.	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB(µV/m)	mW	dBc	dB
899.00	106.5	Peak	11	0	V	22.2	0.0	2.1	130.8	2.20E+03	0.0	N/A
1798.00	71.5	Peak	14	8	H	26.2	29.4	3.1	71.4	2.51E-03	59.4	-13.4
2697.00	67.7	Peak	14	8	V	30.4	28.4	2.3	72.0	2.90E-03	58.8	-12.8
3596.00	56.1	Peak	14	8	V	32.5	27.8	2.7	63.5	4.05E-04	67.4	-21.3
4495.00	50.4	Peak	14	8	V	34.2	27.9	2.9	59.6	1.65E-04	71.3	-25.2
5394.00	35.4	Peak	14	8	V	35.4	28.3	3.5	46.0	7.28E-06	84.8	-38.8
6293.00	39.0	Peak	14	8	V	36.8	28.0	3.9	51.7	2.73E-05	79.1	-33.1
7192.00	42.0	Peak	14	8	V	38.0	27.9	4.3	56.4	8.02E-05	74.4	-28.4
8091.00	37.0	Peak	14	8	V	37.9	27.2	4.8	52.5	3.24E-05	78.3	-32.3
8990.00	36.0	Peak	14	8	V	40.3	27.0	4.7	54.0	4.63E-05	76.8	-30.8

Notes:

- a) O.C.F.:Other Correction Factor
- b) Insert. Loss = Cable A + Cable B + Cable C + Transducer.
- c) Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss.
- d) Attn. = Field Strength (Fundamental) - Field Strength (Harmonics).
- e) Negative signs (-) in Margin column signify levels below the limits.

Radiated Emissions Test Data

Company:	C.N.I. Inc.	Model #:	CNI-903M	Req:	FCC 2 993
EUT:		S/N or FCC #:		Test Dist:	3 meters
Project #:	J2000764 6	Test Date:	March 21, 2000	TP:	2.00 Watt
Test Mode:	Tx @ High Ch.	Engineer:	Xi Ming Y.	Min. Attn:	46.01 dBc

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	11	14	0	8	13	0	0	12	0
Model:	EMCO 3143	LPB-2520A	EMCO 3115	None	CDL PY000	ACO/400	None	None	Gm_M*L	None

Frequency	Reading	Detector	Ant. #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	Net	ERP	Attn.	Margin
MHz	dB(μV)	P/A/C	#	#	H/V	dB(1/m)	dB	dB	dB(μV/m)	mW	dBc	dB
901.00	106.1	Peak	11	0	V	22.1	0.0	2.2	130.4	1.99E+03	0.0	N/A
1802.00	75.4	Peak	14	8	H	26.2	29.3	3.2	75.5	6.49E-03	54.9	-8.9
2703.00	72.6	Peak	14	8	V	30.4	28.4	2.3	76.9	8.96E-03	53.5	-7.5
3604.00	48.1	Peak	14	8	V	32.5	27.8	2.7	55.5	6.42E-05	74.9	-28.9
4505.00	52.5	Peak	14	8	V	33.9	27.9	3.2	61.7	2.71E-04	68.7	-22.7
5406.00	42.3	Peak	14	8	V	35.4	28.3	3.5	52.9	3.57E-05	77.5	-31.5
6307.00	35.9	Peak	14	8	V	36.8	28.0	3.9	48.6	1.34E-05	81.7	-35.7
7208.00	37.8	Peak	14	8	V	38.0	28.0	4.3	52.1	2.98E-05	78.3	-32.2
8109.00	34.8	Peak	14	8	V	37.9	27.2	4.8	50.3	1.95E-05	80.1	-34.1
9010.00	35.0	Peak	14	8	V	40.2	26.8	4.7	53.1	3.76E-05	77.2	-31.2

- Notes:**
- O.C.F.: Other Correction Factor
 - Insert. Loss = Cable A + Cable B + Cable C + Transducer.
 - Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss
 - Attn. = Field Strength (Fundamental) - Field Strength (Harmonics)
 - Negative signs (-) in Margin column signify levels below the limits.

**Radiated Emissions
Test Data**

Company:	C.N.I. Inc.	Model #:	CNI-903M	Standard:	FCC § 15B
EUT:		S/N #:		Limits:	2
Project #:	J20007646	Test Date:	March 21, 2000	Test Distance:	3 meters
Test Mode:	RX@ Low, Mid, High Ch.	Engineer:	Xi-Ming Y.	Duty Relaxation:	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	14	8	8	10	0	0	0	12	0
Model:	EMCO 3143	EMCO 3115	EMCO 3115	CDI P100 0	AFT18855	None	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)	PA/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
159.48	29.2	Peak	2	0	V	9.9	0.0	0.8	0.0	39.9	43.5	-3.6
184.35	27.0	Peak	2	0	V	9.3	0.0	0.9	0.0	37.2	43.5	-6.3
358.80	23.0	Peak	2	0	H	15.3	0.0	1.3	0.0	39.6	46.0	-6.4
600.00	14.0	Peak	2	0	H	19.4	0.0	1.7	0.0	35.1	46.0	-10.9
800.00	12.0	Peak	2	0	H	21.4	0.0	2.0	0.0	35.4	46.0	-10.6
896.00	15.0	Peak	2	0	V	22.6	0.0	2.1	0.0	39.7	46.0	-6.3
899.00	13.7	Peak	2	0	V	22.6	0.0	2.1	0.0	38.4	46.0	-7.6
901.00	13.5	Peak	2	0	V	22.7	0.0	2.2	0.0	38.4	46.0	-7.6
1792.00	35.0	Peak	14	8	H	26.2	29.4	3.1	0.0	34.9	54.0	-19.1
1790.00	34.0	Peak	14	8	H	26.2	29.4	3.1	0.0	33.9	54.0	-20.1
1802.00	32.0	Peak	14	8	H	26.2	29.3	3.2	0.0	32.1	54.0	-21.9

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

Communication Network Interface, Inc., Model No. CNI-903M
FCC ID: N79CNI-903M

Date of Test: March 21, 2000

7.0 Line Conducted Emissions, FCC § 15.107

7.1 Test Procedure

Not applicable, the EUT is battery powered.

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7.2 Test Configuration Setup – Line Conducted Emissions

Not applicable, the EUT is battery powered.

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7.3 Test Results

See attached test data.

Results: Not applicable, the EUT is battery powered.

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8.0 Frequency Stability vs Temperature, FCC § 2.995(a)**8.1 Test Procedure**

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber.

The DC leads, RF output cable, exited the chamber through an opening
After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

8.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Tektronix 2784 Spectrum Analyzer
Goldstar DC Power Supply, GR303

8.3 Test Results

Refer to the test data below.

Temperature, C	Difference (Hz)
+50	5
+40	320
+30	580
+20	629
+10	940
0	980
-10	980
-20	990
-30	935

Results: Passed

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9.0 Frequency Stability vs Voltage, FCC §2.995(d)(2)**9.1 Test Procedure**

An external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115% of the DC nominal value and for 85% of the nominal value.

9.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
Tektronix 2784 Spectrum Analyzer
Goldstar DC Power Supply, GR303

9.3 Test Results

Refer to the test data below.

Voltage, VDC	Difference (Hz)
4.8	641
4.2	629
3.6	665

Results: Passed

Note: Battery end at 3.6 VDC

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10.0 Transient Frequency Behavior, FCC §90.214

10.1 Test Procedure

Test was performed according the TIA/EIA/IS-102.CAAA, Section 2.2.18. The transmitter was continuously transmitting a modulated signal (FSK, 2400 bits/sec.). The generator was generating FM signal (1 kHz tone, 12.5 kHz deviation). Several plots were made on the FM demodulator output with the EUT turned ON and OFF.

10.2 Test Results

Results: Not Applicable
