



EXHIBIT D

CKC TEST REPORT



TYPE ACCEPTANCE TEST REPORT
FOR THE
INTERROGATION TRANSMITTER, P/N: 870-00004
FCC PART 87
COMPLIANCE

DATE OF ISSUE: APRIL 21, 1998

PREPARED FOR:

EM Research, Inc.
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Verdi, NV 89439

P.O. No: American Express

W.O. No: 67,225

Report No: **FCTA97-006A**

Revision 1

Date of test: November 4 & 7, 1997
March 25, 1998

DOCUMENTATION CONTROL:


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ADMINISTRATIVE INFORMATION

DATE OF ADDITIONAL TESTS: November 4 & 7, 1997 & March 25, 1998

PURPOSE OF TEST: To demonstrate the compliance of the Interrogation Transmitter, P/N: 870-00004, with the requirements FCC Part 2 & 87 devices.

MANUFACTURER: EM Research, Inc.
2465 Highway 40, Suite 200
Verdi, NV 89439

REPRESENTATIVE: Matt Eiting

TEST LOCATION: CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

TEST PERSONNEL: Dustin Oaks

TEST METHOD: FCC Part 2 & 87

FREQUENCY RANGE TESTED: 450kHz – 10.3GHz

EQUIPMENT UNDER TEST:
Interrogation Transmitter
Manuf: EM Research
Model: P/N: 870-00004
Serial: 1845
FCC ID: (Pending)

SUMMARY OF RESULTS

The EM Research, Inc. Interrogation Transmitter, P/N: 870-00004 was tested in accordance with FCC Part 2 & 87 for compliance with the requirements of the FCC Rules.

As received, the above equipment was found to be fully compliant with the FCC Part 2 & 87 limits of the FCC rules for all emission tests performed.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The system Interrogation Transmitter (ANPC P/N: 870-00004) is used to transmit all of the pulse modulation Interrogation signals used within the landing system. These signals and their purposes are summarized as follows:

- 1030 MHz interrogation pulse pair is transmitted to the tracked aircraft and initiates transponder 1090 MHz response.
- 1030 MHz suppression pulse is transmitted a fixed time after the first 1030 interrogation pulse is received by the airborne transponder and suppresses the 1090 MHz response if receive strength criteria are met.

Both of the above pulses are very low duty cycle as the system interrogation rate is typically set to 10 Hz. The transmitter contains all components required to generate these signal, receiving timing control via a digital control from the Interrogator Control PCBA (ANPC P/N: 690-00100) within the system Base CPU.

EMISSION DESIGNATOR

6M00M1D

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

PERIPHERAL DEVICES

The EUT was tested with the following peripheral devices:

Oscilloscope

Manuf: Tektronix
Model: 2445A
Serial: N/A

Pulse Generator

Manuf: HP
Model: 8111A
Serial: 2519G05082

REPORT OF MEASUREMENTS

The following tables report the highest emissions levels recorded during the tests performed on the Interrogation Transmitter, P/N: 870-00004. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Six Highest Radiated Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
45.290	43.9	10.8	-27.4	1.2		28.5	40.0	-11.5	H
45.912	47.2	10.7	-27.4	1.2		31.7	40.0	-8.3	V
60.066	42.2	9.2	-27.4	1.4		25.4	40.0	-14.6	V
322.288	32.2	21.2	-26.9	3.5		30.0	46.0	-16.0	H
5149.687	21.8	35.1	-33.6	15.8		39.1	54.0	-14.9	HA
6179.585	25.4	36.4	-33.0	18.7		47.5	54.0	-6.5	VA

Test Method: FCC B Part 87.139
Spec Limit : FCC B Part 87.139
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Table 2: Six Highest Antenna Conducted Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Cable dB	dB	dB	dB				
764.110000	85.3	0.0				85.3	94.0	-8.7	N
861.090000	71.1	0.0				71.1	94.0	-22.9	N
2972.97000	73.9	1.8				75.7	94.0	-18.3	N
2974.40000	73.6	1.8				75.4	94.0	-18.6	N
3089.80100	81.4	2.0				83.4	94.0	-10.6	N
6179.68700	75.8	2.6				78.4	94.0	-15.6	NA

Test Method: FCC Part 2 & 87
Spec Limit : FCC Part 87.133
Test Distance: No Distance

NOTES: Q = Quasi Peak Reading
A = Average Reading
B = Black Lead
W = White Lead
N = No Polarity

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Table 3: Power Output Level

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
				Cable dB					
1030.000	161.6			0.2		161.8	163.0	-1.2	N

Test Method: FCC Part 2 & 87
Spec Limit : FCC Part 87.131
Test Distance: No Distance

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Table 4: Six Highest Conducted Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Lisn dB							
0.500047	34.0	0.0				34.0	48.0	-14.0	B
5.220820	34.9	0.0				34.9	48.0	-13.1	W
5.595956	35.6	0.0				35.6	48.0	-12.4	W
5.831507	36.5	0.0				36.5	48.0	-11.5	W
11.800360	34.4	0.0				34.4	48.0	-13.6	W
17.784600	34.4	0.0				34.4	48.0	-13.6	W

Test Method: FCC Part 2 & 87
Spec Limit : FCC Class B/Part 87.139

NOTES: Q = Quasi Peak Reading
A = Average Reading
B = Black Lead
W = White Lead

COMMENTS: EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and amplitude of 1.5V. Interrogation RF output is terminated with a Dummy load.

Table 5: Frequency Stability

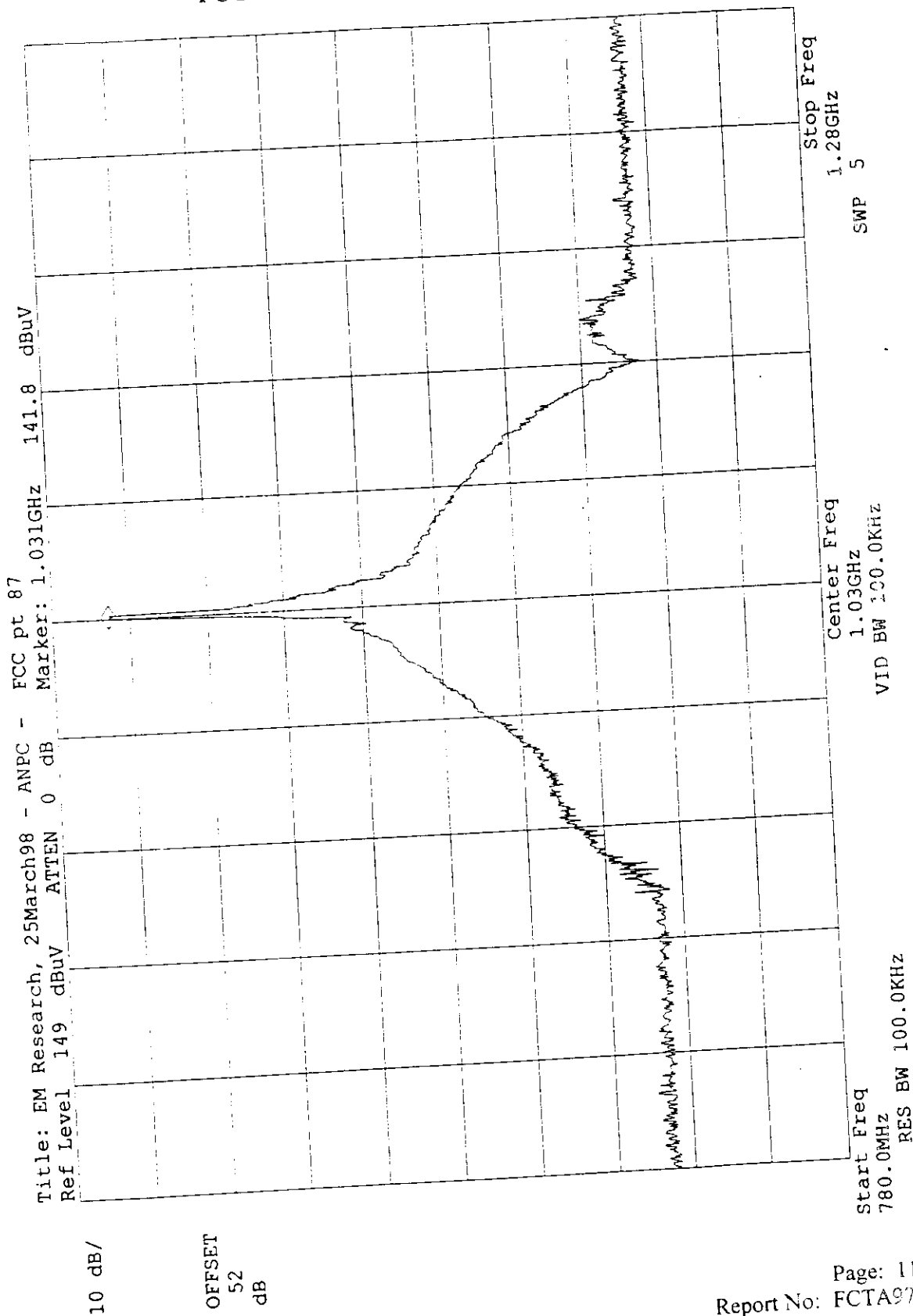
Temp	-10% Voltage	Nominal Voltage	+10% Voltage	Lower Limit (Hz)	Upper Limit (Hz)	Pass/Fail
-30°C	1.299964	1.0299964	1.0299964	1,029,982,200	1,030,023,400	Pass
-20°C	1.0300010	1.0300010	1.0300010	1,029,982,200	1,030,023,400	Pass
-10°C	1.0300034	1.0300035	1.0300034	1,029,982,200	1,030,023,400	Pass
0	1.0300039	1.0300040	1.0300040	1,029,982,200	1,030,023,400	Pass
10°C	1.0300032	1.0300032	1.0300032	1,029,982,200	1,030,023,400	Pass
20°C	1.0300017	1.0300017	1.0300017	1,029,982,200	1,030,023,400	Pass
30°C	1.0300002	1.0300001	1.0300002	1,029,982,200	1,030,023,400	Pass
40°C	1.0299992	1.0299992	1.0299991	1,029,982,200	1,030,023,400	Pass
50°C	1.0299989	1.0299989	1.0299989	1,029,982,200	1,030,023,400	Pass
Test Method:			FCC Part 2 & 87			
Spec Limit :			FCC Part 87.133			



Testing the Future

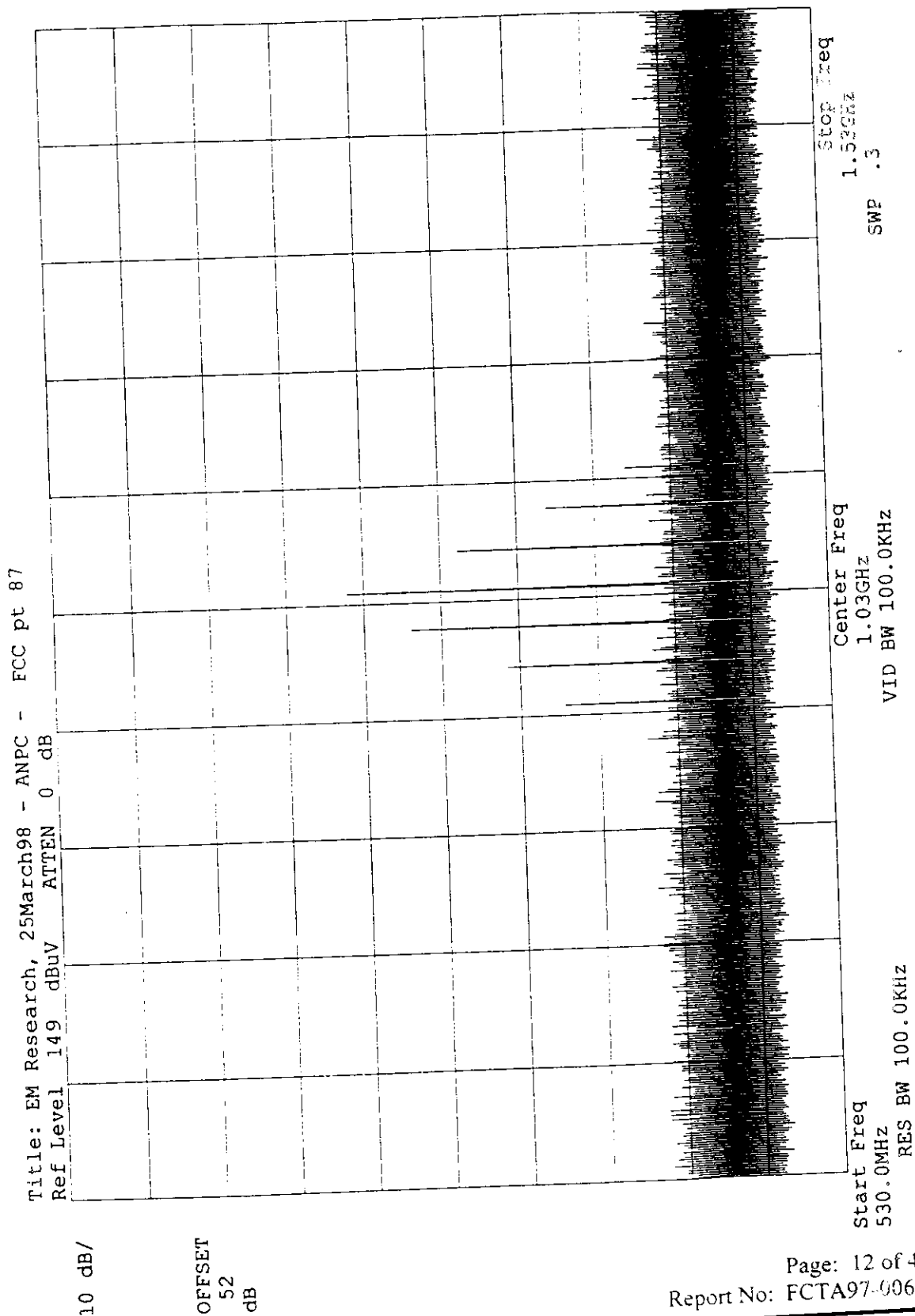
LABORATORIES, INC.

FCC Part 87.135 Occupied Bandwidth Plot



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FCC Part 87.135 Occupied Bandwidth Plot





Testing the Future
LABORATORIES, INC.

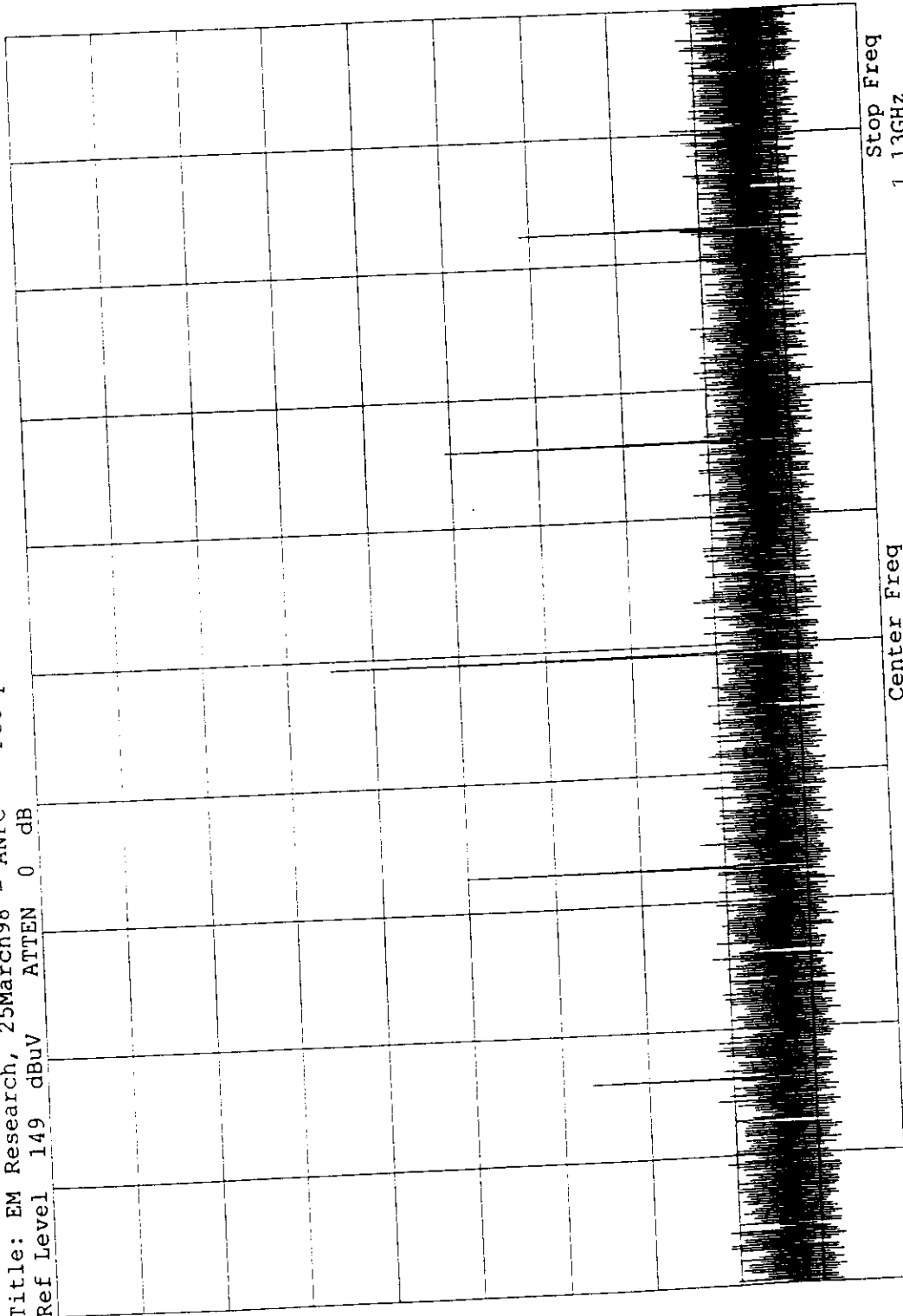
FCC Part 87.135 Occupied Bandwidth Plot

Title: EM Research, 25March98 - ANPC - FCC pt 87

Ref Level 149 dBuV ATTN 0 dB

10 dB/

OFFSET
52
dB



Stop Freq

1.13GHz

SWP .06

Center Freq

1.03GHz

VID BW 100.0KHz

Start Freq

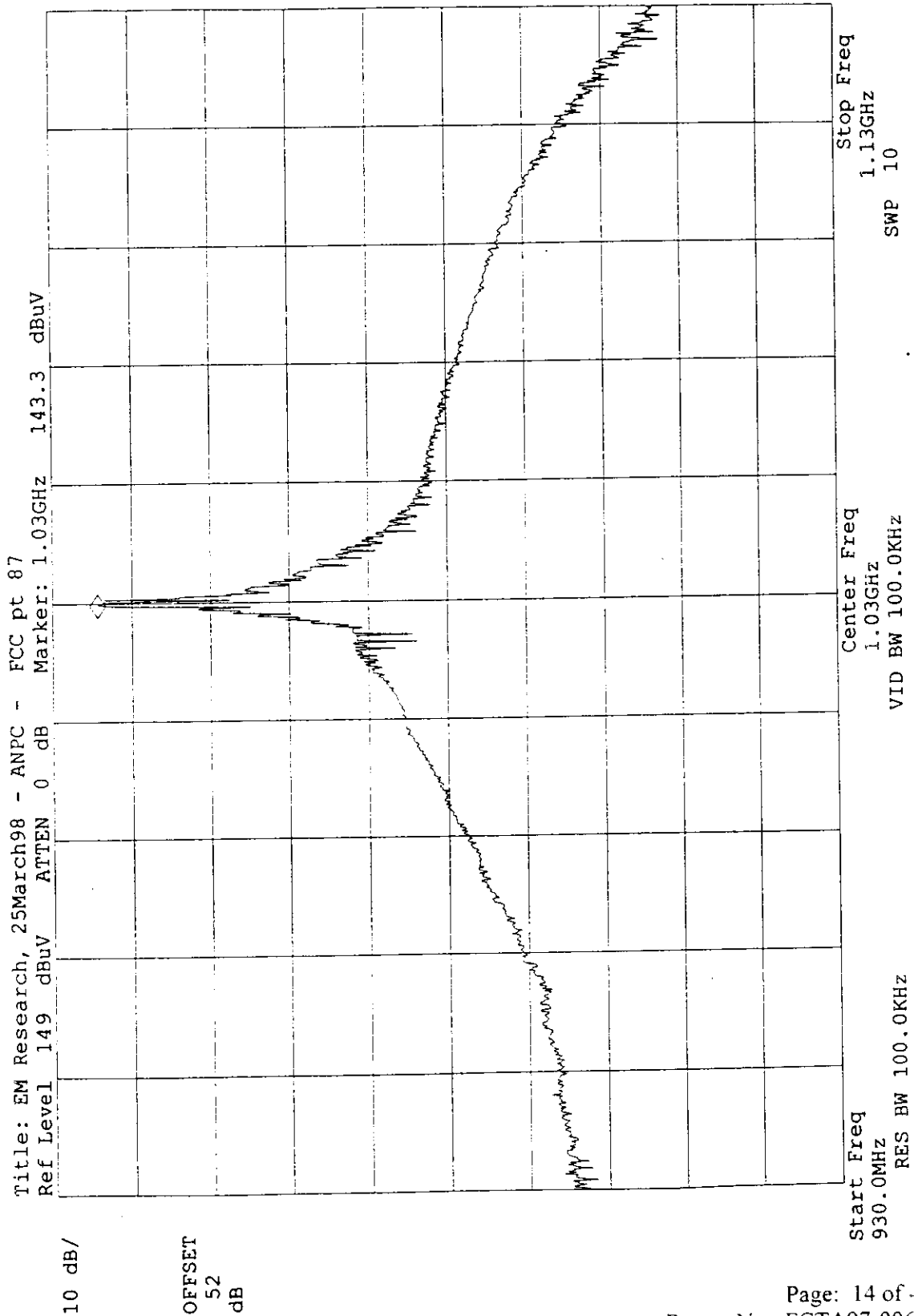
930.0MHz

RES BW 100.0KHz

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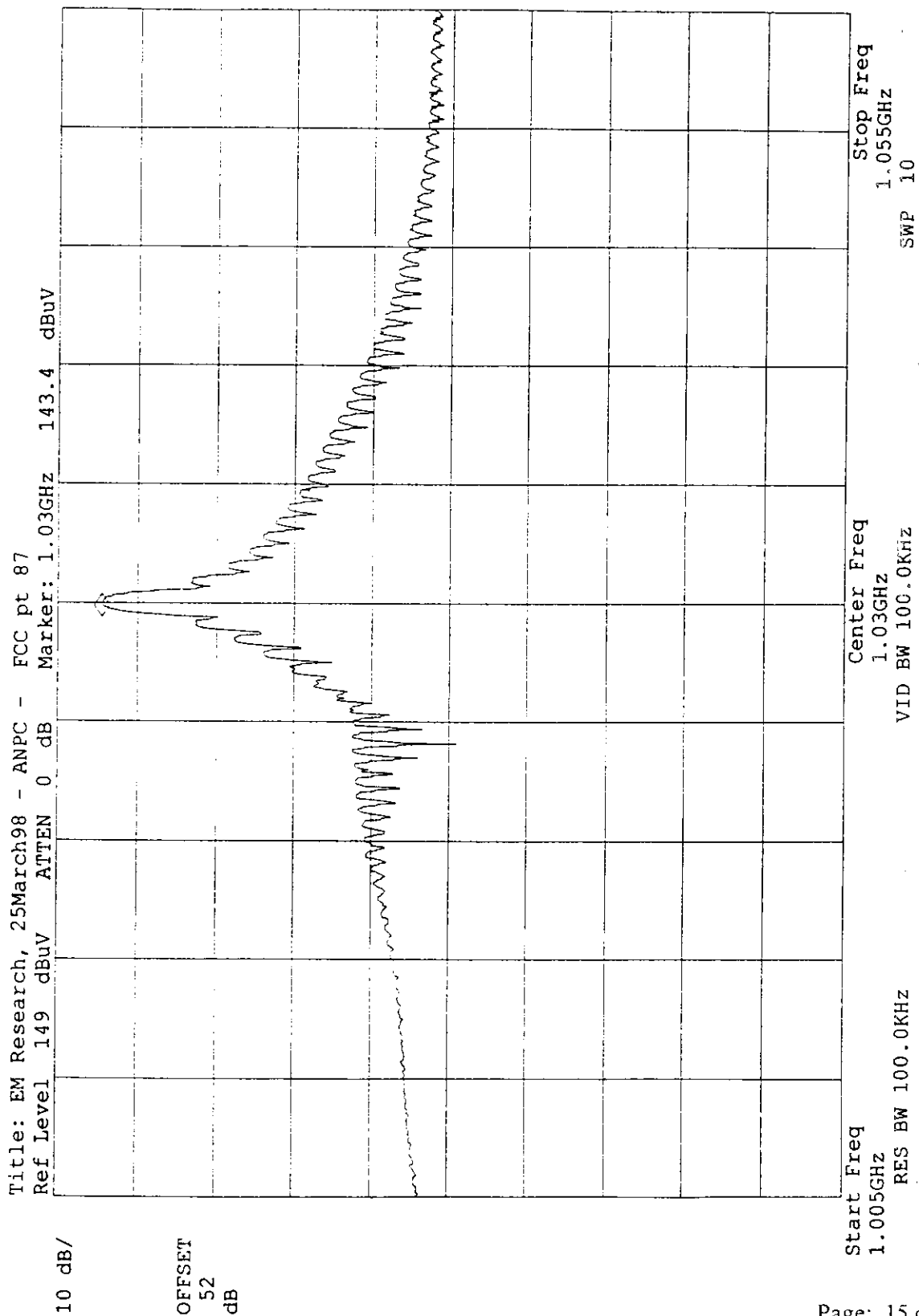
FCC Part 87.135 Occupied Bandwidth Plot





Testing the Future
LABORATORIES, INC.

FCC Part 87.135 Occupied Bandwidth Plot



FCC Part 87.135 Occupied Bandwidth Plot

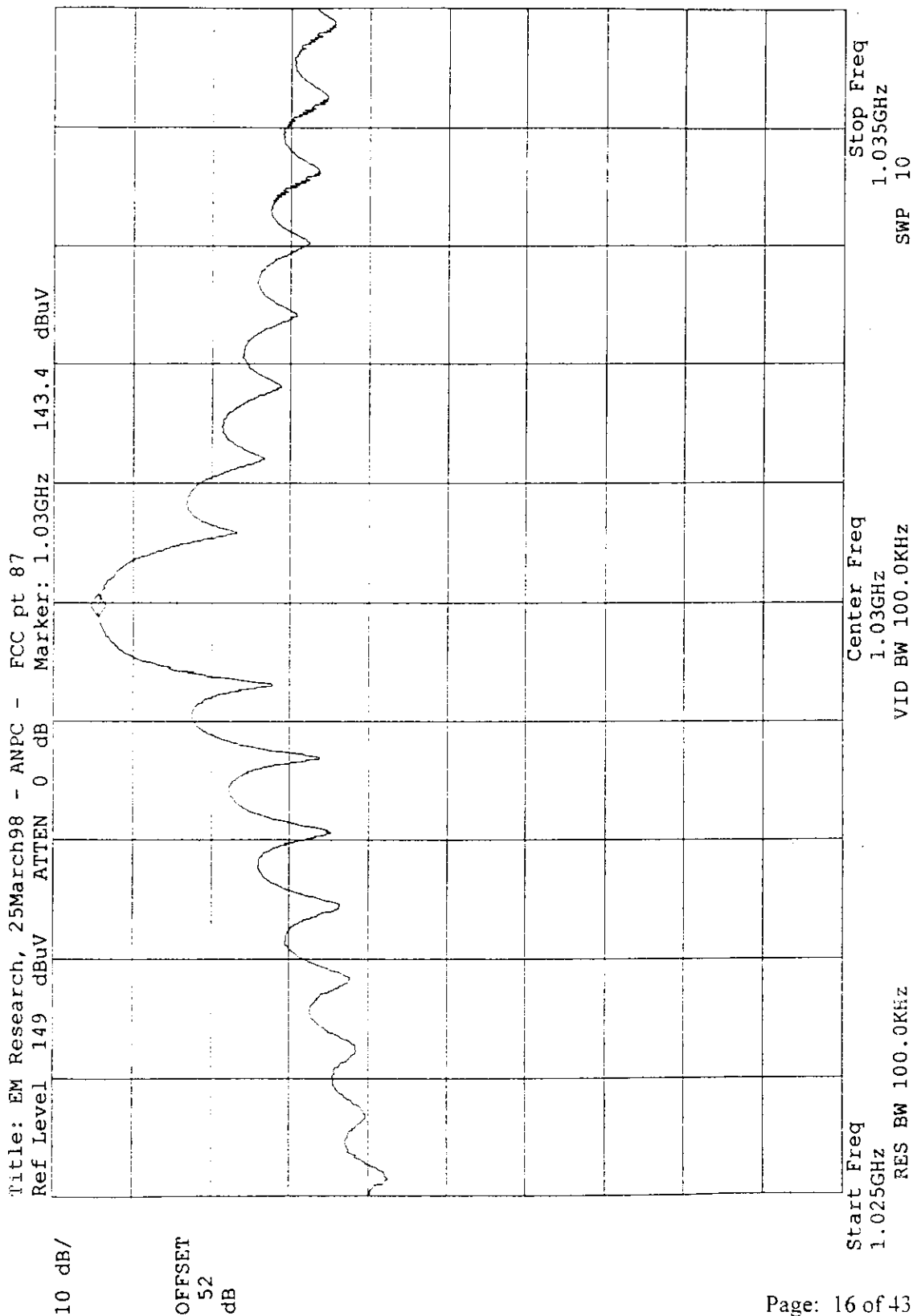


TABLE A**LIST OF TEST EQUIPMENT**

The following list of test equipment used is calibrated regularly.

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2403A08241 (Display Unit), S/N 2209A01404 (rf Unit).
2. Preamp, Hewlett Packard, Model No. 8447D, S/N -1937A02604, (range 2 -1300 MHz noise figure 3.5 - 4.0 dB, flatness of 1.5 - 2.0 dB, and an average gain of 28 dB).
3. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267.
4. Biconical Antenna, A & H Systems, Model No. SAS-200/542, S/N 156.
5. Log Periodic Antenna, A & H Systems, Model No. SAS-200/512, S/N 154.
6. Magnetic Loop Antenna, EMCO, Model No. 6502, S/N 1074.
7. Horn Antenna, EMCO, Model No. 3115, S/N 4683.
8. LISN's (FCC), Solar Electronics, S/N 855996, 992.
9. LISN's, Solar Electronics, S/N 8144793, 474.
10. Test software, EMI Test 2.86.

EUT SETUP

The equipment under test (EUT) and the peripherals listed were setup in a manner that represented their normal use, as shown in the setup photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for radiated emissions, Table 2 for antenna conducted, Table 3 for power output Table 4 for conducted emissions and Table 5 for frequency stability.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 1 meter above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

I/O cables were connected to the EUT and peripherals in the manner required for normal operation of the system.

During conducted emissions testing, the EUT was located 80 centimeters above the conducting ground plane on the same nonconducting table as was used for radiated testing. The metal plane was grounded to the earth through the green wire safety ground. Power to the EUT was provided via 3 meters of shielded power cable from a filter grounded to the metal plane to a LISN. The LISN was also grounded to the plane and attached to the LISN was a 4 ganged grounded outlet whose source was also shielded and 60 cm in length. All other objects were kept a minimum of 1 meter away from the EUT during the conducted test.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect both the radiated and conducted emissions data for the Interrogation Transmitter, P/N: 870-00004. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. For frequencies above 1000 MHz the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT. Conducted emissions tests required the use of the FCC type LISN's.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, reference level of 100 dB μ V and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE

TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	10.3 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 through 4 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in Tables 1 through 4. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Interrogation Transmitter, P/N: 870-00004.

Peak

In this mode, the spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP 85650A Quasi-Peak Adapter for the HP 8568B spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

TEST METHODS

The emissions data of the Interrogation Transmitter, P/N: 870-00004, was taken with the EUT spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the applicable FCC Part 2 & 87 emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode with the I/O cables and line cords facing the antenna. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned in the same manner, using the biconical antenna, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. The horn antenna was used to scan for frequencies above 1000 MHz. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned with its I/O and power cables facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation, antenna height and configuration of the peripheral and cables. Maximizing of the cables was achieved by monitoring the spectrum analyzer on a closed circuit television monitor while the EUT cables were being moved and rearranged on the EUT table for maximum emissions. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

Conducted Emissions Testing

For conducted emissions testing, a 30 to 50 second sweep time was used for automatic measurements in the frequency bands of 150 kHz to 1.705 MHz, 1.705 MHz to 3 MHz, and 3 MHz to 30 MHz. All readings within 20 dB of the limit were recorded. At frequencies where the recorded emissions were close to the limit, further investigation was performed manually at a slower sweep rate.

Antenna Conducted Emissions Testing

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2 & 87 and is compliant with the requirements for FCC Part 2 & 87. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 2.

Occupied Bandwidth

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance FCC Part 2 & 87 and is compliant with the requirements for FCC Part 2 & 87. The data obtained for this test is contained in the occupied bandwidth plots 1-6.

Power Output

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2 & 87 and is compliant with the requirements for FCC Part 2 & 87. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 3.

Frequency Stability

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2 & 87 and is compliant with the requirements for FCC Part 2 & 87. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 5.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in Tables 1-5. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula:

$$\begin{aligned} &\text{Meter reading (dB}\mu\text{V)} \\ &+ \text{Antenna Factor (dB)} \\ &+ \text{Cable Loss (dB)} \\ &- \text{Distance Correction (dB)} \\ &- \text{Pre-amplifier Gain (dB)} \\ &= \text{Corrected Reading (dB}\mu\text{V/m)} \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance. For conducted emissions, no correction factors were needed when 50 μ H LISN's were used.

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

Test Software/Firmware: CRT was displaying: Power Supply Manufacturer: Power Supply Part Number: AC Line Filter Manufacturer: AC Line Filter Part Number:	Not provided by customer at this time.
The AC power cord is removable and is NOT shielded	
Line voltage used during testing: 120V 60Hz	

I/O PORTS

Type	#
Not provided by customer at this time.	

CRYSTAL OSCILLATORS

Type	Freq In MHz
Not provided by customer at this time.	

PRINTED CIRCUIT BOARDS

Function	Model & Rev	Clocks, MHz	Layers	Location

REQUIRED EUT CHANGES TO COMPLY:

None.

CABLE INFORMATION

Cable #: 1	Cable(s) of this type:
Cable Type: Construction: Connected To End (1): Connector At End (1): Shield Grounded At (1): Part Number:	Shield Type: Length In Meters: Connected To End (2): Connector At End (2): Shield Grounded At (2): Number of Conductors:
Notes: Not provided by customer at this time.	

Cable Routing For Worst Case Emissions:
Cable length only allows routing as shown in photograph.

PHOTOGRAPH SHOWING CONDUCTED EMISSIONS

Applicant: EM Research, Inc.
Equipment: Interrogation Transmitter
Model Number: P/N: 870-00004



Conducted Emissions - Front View

NOTES:

APPENDIX B
MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-566-4EMC

Customer: **EM Research**
Specification: **FCC B RADIATED**
Test Type: **Maximized Emissions**
Equipment: **Interrogation Transmitter**
Manufacturer: **EM Research**
Model: **P/N: EMPA-870-00004**
S/N: **1845**

Date: Mar-25-98
Time: 11:54
Sequence#: 3
Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Measurement Data:

Sorted by Margin

Test Distance: 3 Meters

#	Freq MHz	Rdng dBuV	Pream Horn dB	Bicon Horn dB	Log S Barn dB	Barn dB	Dist dB	Corr dBuV/m	Spec dBuV/m	Margin dB	Polar
1	6179.585	25.4	+0.0	+0.0	+0.0	+0.0	+0.0	47.5	54.0	-6.5	Vert
	Average		-33.0	+36.4	+18.7						
^	6179.557	39.8	+0.0	+0.0	+0.0	+0.0	+0.0	61.9	54.0	+7.9	Vert
			-33.0	+36.4	+18.7						
3	6179.744	24.4	-0.0	+0.0	+0.0	+0.0	+0.0	46.5	54.0	-7.5	Horiz
	Average		-33.0	+36.4	+18.7						
^	6179.757	46.3	+0.0	+0.0	+0.0	+0.0	+0.0	68.4	54.0	+14.4	Horiz
			-33.0	+36.4	+18.7						
5	45.912	47.2	-27.4	+10.7	+0.0	+1.2	+0.0	31.7	40.0	-8.3	Vert
			-0.0	+0.0	+0.0						
6	45.290	43.9	-27.4	+10.8	+0.0	+1.2	+0.0	28.5	40.0	-11.5	Horiz
			-0.0	+0.0	+0.0						
7	60.066	42.2	-27.4	+9.2	+0.0	+1.4	+0.0	25.4	40.0	-14.6	Vert
			+0.0	+0.0	+0.0						
8	5149.687	21.8	+0.0	+0.0	+0.0	+0.0	+0.0	39.1	54.0	-14.9	Horiz
	Average		-33.6	+35.1	+15.8						
^	5149.645	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	64.4	54.0	+10.4	Horiz
			-33.6	+35.1	+15.8						
10	5149.706	21.1	+0.0	+0.0	+0.0	+0.0	+0.0	38.4	54.0	-15.6	Vert
	Average		-33.6	+35.1	+15.8						

^	5149.730	41.3	+0.0	+0.0	+0.0	+0.0	+0.0	58.6	54.0	+4.6	Vert
			-33.6	+35.1	+15.8						
12	322.288	32.2	-26.9	+0.0	+21.2	+3.5	+0.0	30.0	46.0	-16.0	Horiz
			+0.0	+0.0	+0.0						
13	4119.782	22.7	+0.0	+0.0	+0.0	+0.0	+0.0	36.2	54.0	-17.8	Vert
	Average		-33.3	+33.8	+13.0						
^	4119.820	57.5	+0.0	+0.0	+0.0	+0.0	+0.0	71.0	54.0	+17.0	Vert
			-33.3	+33.8	+13.0						
15	330.182	29.5	-26.9	+0.0	+20.7	+3.6	+0.0	26.9	46.0	-19.1	Vert
			+0.0	+0.0	+0.0						
16	4119.609	21.2	+0.0	+0.0	+0.0	+0.0	+0.0	34.7	54.0	-19.3	Horiz
	Average		-33.3	+33.8	+13.0						
^	4119.630	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	60.6	54.0	+6.6	Horiz
			-33.3	+33.8	+13.0						
18	3089.868	22.6	+0.0	+0.0	+0.0	+0.0	+0.0	32.9	54.0	-21.1	Horiz
	Average		-35.0	+32.0	+13.3						
^	3089.870	52.4	+0.0	+0.0	+0.0	+0.0	+0.0	62.7	54.0	+8.7	Horiz
			-35.0	+32.0	+13.3						
20	3089.980	19.7	+0.0	+0.0	+0.0	+0.0	+0.0	30.0	54.0	-24.0	Vert
	Average		-35.0	+32.0	+13.3						
^	3089.980	49.4	+0.0	+0.0	+0.0	+0.0	+0.0	59.7	54.0	+5.7	Vert
			-35.0	+32.0	+13.3						
22	2059.792	25.2	+0.0	+0.0	+0.0	+0.0	+0.0	25.3	54.0	-28.7	Vert
	Average		-35.7	+28.1	+7.7						
^	2059.800	64.6	+0.0	+0.0	+0.0	+0.0	+0.0	64.7	54.0	+10.7	Vert
			-35.7	+28.1	+7.7						
24	2059.868	24.9	+0.0	+0.0	+0.0	+0.0	+0.0	25.0	54.0	-29.0	Horiz
	Average		-35.7	+28.1	+7.7						
^	2059.865	68.4	+0.0	+0.0	+0.0	+0.0	+0.0	68.5	54.0	+14.5	Horiz
			-35.7	+28.1	+7.7						
26	1090.205	25.8	+0.0	+0.0	+0.0	+0.0	+0.0	19.9	54.0	-34.1	Horiz
	Average		-36.1	+24.7	+5.5						
^	1090.222	73.0	+0.0	+0.0	+0.0	+0.0	+0.0	67.1	54.0	+13.1	Horiz
			-36.1	+24.7	+5.5						
28	1090.503	22.6	+0.0	+0.0	+0.0	+0.0	+0.0	16.8	54.0	-37.2	Vert
	Average		-36.0	+24.7	+5.5						
^	1090.540	64.6	+0.0	+0.0	+0.0	+0.0	+0.0	58.8	54.0	+4.8	Vert
			-36.0	+24.7	+5.5						
30	1029.880	85.3	+0.0	+0.0	+0.0	+0.0	+0.0	79.2	163.0	-83.8	Horiz
			-36.1	+24.7	+5.3						
31	1029.947	80.8	+0.0	+0.0	+0.0	+0.0	+0.0	74.7	163.0	-88.3	Vert
			-36.1	+24.7	+5.3						
Fundamental											

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-566-4EMC

Customer: **EM Research**
Specification: **FCC antenna terminal**
Test Type: **Antenna Terminal**
Equipment: **Interrogation Transmitter**
Manufacturer: **EM Research**
Model: **P/N: EMPA-870-00004**
S/N: **1845**

Date: Mar-25-98
Time: 09:59
Sequence#: 2
Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBμV	Barn		Barn		Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
			dB	dB	dB	dB					
1	764.110	85.3	+0.0	+0.0			+0.0	85.3	94.0	-8.7	None
2	3089.801	81.4	+1.0	+1.0			+0.0	83.4	94.0	-10.6	None
3	6179.687	75.8	+1.3	+1.3			+0.0	78.4	94.0	-15.6	None
Average											
^	6179.761	96.2	+1.3	+1.3			+0.0	98.8	94.0	+4.8	None
5	2972.970	73.9	+0.9	+0.9			+0.0	75.7	94.0	-18.3	None
6	2974.400	73.6	+0.9	+0.9			+0.0	75.4	94.0	-18.6	None
7	861.090	71.1	+0.0	+0.0			+0.0	71.1	94.0	-22.9	None
8	993.700	52.4	+0.0	+0.0			+0.0	52.4	94.0	-41.6	None
Average											
^	993.700	100.1	+0.0	+0.0			+0.0	100.1	94.0	+6.1	None
10	5149.621	47.2	+1.0	+1.0			+0.0	49.2	94.0	-44.8	None
Average											

^	5149.700	105.1	+1.0	+1.0	+0.0	107.1	94.0	+13.1	None
12	2059.804	0.0	+0.2	+0.2	+0.0	0.4	94.0	-93.6	None
Average									
^	2059.800	97.4	+0.2	+0.2	+0.0	97.8	94.0	+3.8	None

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research**

Date: Mar-25-98

Specification: **Power Output**

Time: 09:15

Test Type: **Power output**

Sequence#: 1

Equipment: **Interrogation Transmitter**

Manufacturer: EM Research

Tested By: Dustin Oaks

Model: P/N: EMPA-870-00004

S/N: 1845

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBμV	Barn				Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
			Barn	Barn							
1	1030.000	161.6	+0.1	+0.1			+0.0	161.8	163.0	-1.2	None

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research**
Specification: **FCC B COND**
Test Type: **Conducted Emissions**
Equipment: **Interrogation Transmitter**
Manufacturer: **EM Research**
Model: **P/N: 870-00004**
S/N: **1845**

Date: Nov-07-97
Time: 13:18
Sequence#: 3
Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: 870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Oscilloscope	Tektronix	2445A	N/A
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and an amplitude of 1.5V. Interrogation RF output is terminated with a Dummy load.

Measurement Data:

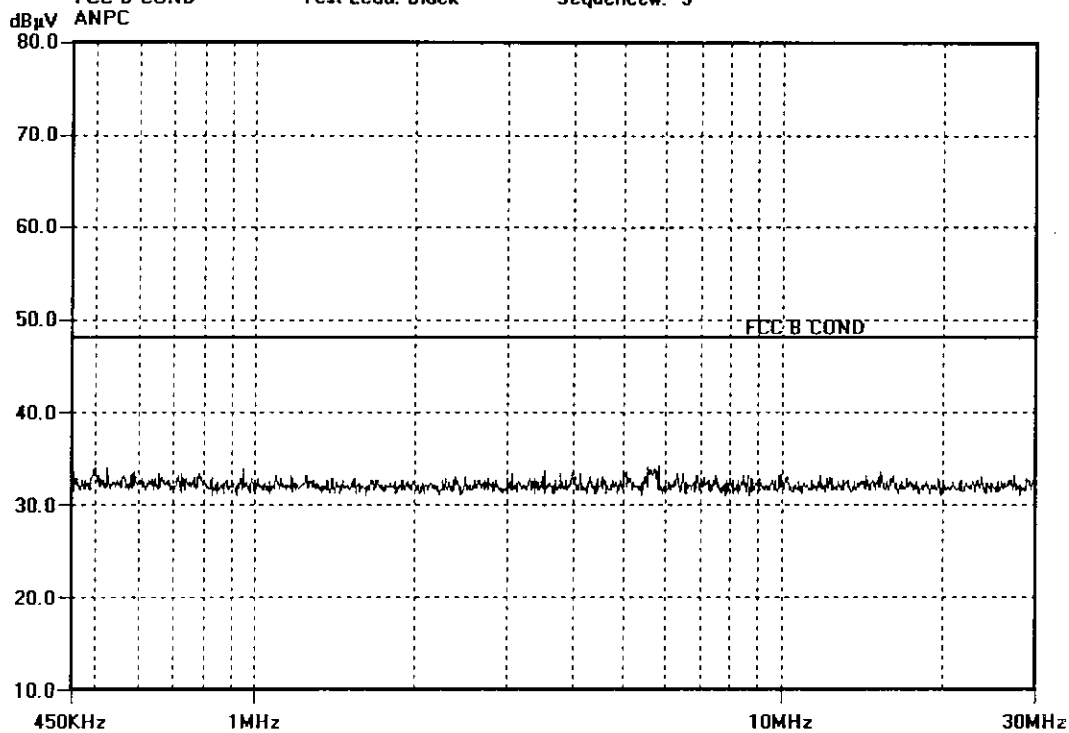
Sorted by Margin

Test Lead: Black

#	Freq	Rdng dBμV	dB	dB	dB	dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	5.832M	34.2					+0.0	34.2	48.0	-13.8	Black
2	5.579M	34.0					+0.0	34.0	48.0	-14.0	Black
3	528.863k	34.0					+0.0	34.0	48.0	-14.0	Black
4	500.047k	34.0					+0.0	34.0	48.0	-14.0	Black
5	5.727M	33.8					+0.0	33.8	48.0	-14.2	Black
6	946.079k	33.8					+0.0	33.8	48.0	-14.2	Black
7	5.626M	33.7					+0.0	33.7	48.0	-14.3	Black
8	3.526M	33.7					+0.0	33.7	48.0	-14.3	Black
9	15.303M	33.6					+0.0	33.6	48.0	-14.4	Black
10	5.047M	33.6					+0.0	33.6	48.0	-14.4	Black

11	590.285k	33.6	+0.0	33.6	48.0	-14.4	Black
12	456.825k	33.5	+0.0	33.5	48.0	-14.5	Black
13	3.796M	33.4	+0.0	33.4	48.0	-14.6	Black
14	3.053M	33.4	+0.0	33.4	48.0	-14.6	Black
15	585.735k	33.4	+0.0	33.4	48.0	-14.6	Black
16	4.128M	33.3	+0.0	33.3	48.0	-14.7	Black
17	3.981M	33.3	+0.0	33.3	48.0	-14.7	Black
18	783.650k	33.3	+0.0	33.3	48.0	-14.7	Black
19	725.261k	33.3	+0.0	33.3	48.0	-14.7	Black
20	657.014k	33.3	+0.0	33.3	48.0	-14.7	Black

CKC Laboratories, Inc. Date: Fri Nov-07-1997 Time: 13:12:02 WO#: 67225
 FCC B COND Test Lead: Black Sequence#: 3



Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research**
Specification: **FCC B COND**
Test Type: **Conducted Emissions**
Equipment: **Interrogation Transmitter**
Manufacturer: **EM Research**
Model: **P/N: 870-00004**
S/N: **1845**

Date: Nov-07-97
Time: 13:21
Sequence#: 4
Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: 870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Oscilloscope	Tektronix	2445A	N/A
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and an amplitude of 1.5V. Interrogation RF output is terminated with a Dummy load.

Measurement Data:

Sorted by Margin

Test Lead: White

#	Freq	Rdng dBμV	dB	dB	dB	dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	5.832M	36.5					+0.0	36.5	48.0	-11.5	White
2	5.596M	35.6					+0.0	35.6	48.0	-12.4	White
3	5.531M	35.2					+0.0	35.2	48.0	-12.8	White
4	5.221M	34.9					+0.0	34.9	48.0	-13.1	White
5	5.683M	34.7					+0.0	34.7	48.0	-13.3	White
6	17.785M	34.4					+0.0	34.4	48.0	-13.6	White
7	11.800M	34.4					+0.0	34.4	48.0	-13.6	White
8	5.875M	34.3					+0.0	34.3	48.0	-13.7	White
9	15.191M	33.9					+0.0	33.9	48.0	-14.1	White
10	12.266M	33.9					+0.0	33.9	48.0	-14.1	White

11	5.343M	33.8	+0.0	33.8	48.0	-14.2	White
12	773.034k	33.8	+0.0	33.8	48.0	-14.2	White
13	12.780M	33.7	+0.0	33.7	48.0	-14.3	White
14	683.176k	33.7	+0.0	33.7	48.0	-14.3	White
15	881.837k	33.6	+0.0	33.6	48.0	-14.4	White
16	9.647M	33.5	+0.0	33.5	48.0	-14.5	White
17	795.782k	33.5	+0.0	33.5	48.0	-14.5	White
18	14.259M	33.4	+0.0	33.4	48.0	-14.6	White
19	2.784M	33.4	+0.0	33.4	48.0	-14.6	White
20	7.254M	33.3	+0.0	33.3	48.0	-14.7	White

CKC Laboratories, Inc. Date: Fri Nov-07-1997 Time: 13:18:24 WO#: 67225
FCC B COND Test Lead: White Sequence#: 4
ANPC

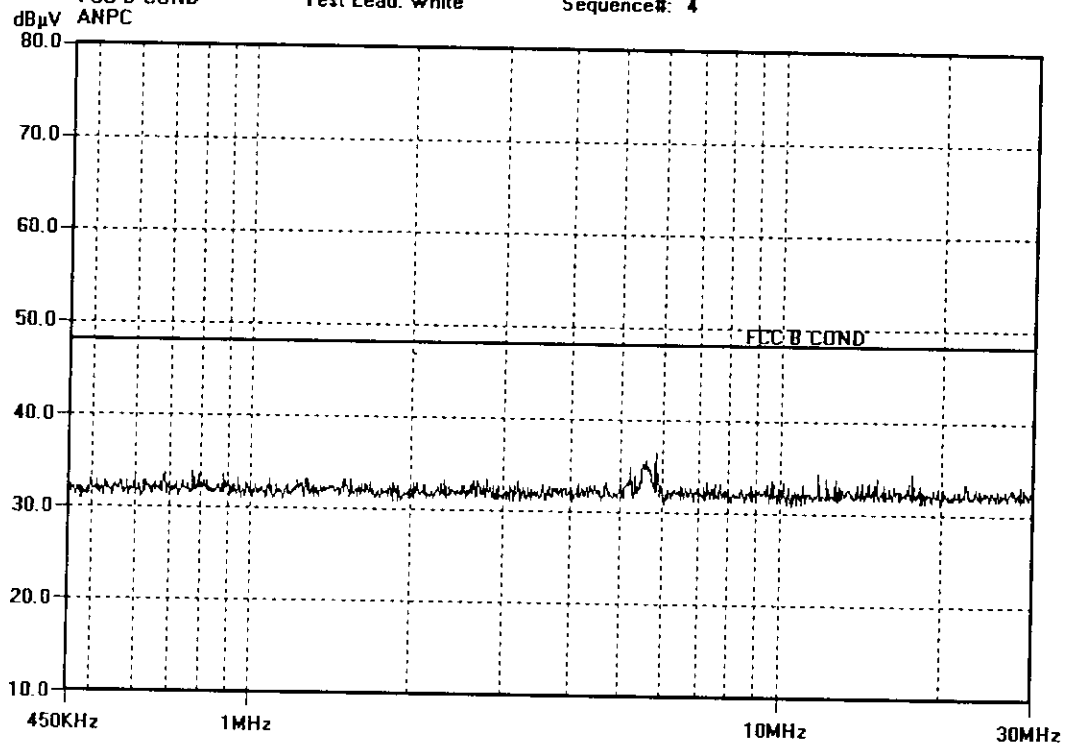


EXHIBIT F
CKC TEST REPORT
2.983(e)

previously sent

REPORT OF MEASUR

Corrected
Pages for
CKC Test Report

The following tables report the highest emissions levels performed on the Interrogation Transmitter, P/N: 870-00004. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Six Highest Spurious Radiated Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
45.290	43.9	10.8	-27.4	1.2	-73	28.5	40.0	-11.5	H
45.912	47.2	10.7	-27.4	1.2	-75	31.7	40.0	-8.3	V
60.066	42.2	9.2	-27.4	1.4	-73	25.4	40.0	-14.6	V
322.288	32.2	21.2	-26.9	3.5	-77	30.0	46.0	-16.0	H
5149.687	21.8	35.1	-33.6	15.8	-67	39.1	54.0	-14.9	HA
6179.585	25.4	36.4	-33.0	18.7	-66	47.5	54.0	-6.5	VA

Test Method:
Spec Limit :
Test Distance:

FCC Part 2.993/Part 87.139
FCC Part 2.993/Part 87.139
3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

$$135.149 = 73 + 26$$

26
61

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Table 2: Six Highest Spurious at Antenna Terminal Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Cable dB							
764.110000	85.3	0.0				85.3	94.0	-8.7	N
861.090000	71.1	0.0				71.1	94.0	-22.9	N
2972.97000	73.9	1.8				75.7	94.0	-18.3	N
2974.40000	73.6	1.8				75.4	94.0	-18.6	N
3089.80100	81.4	2.0				83.4	94.0	-10.6	N
6179.68700	75.8	2.6				78.4	94.0	-15.6	NA

Test Method: FCC 2.991/Part 87.133
Spec Limit : FCC 2.991/Part 87.133
Test Distance: No Distance

NOTES: Q = Quasi Peak Reading
A = Average Reading
B = Black Lead
W = White Lead
N = No Polarity

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Table 3: RF Power Output Level

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
				Cable dB					
1030.000	161.6			0.2		161.8	163.0	-1.2	N

Test Method:

Spec Limit :

Test Distance:

FCC Part 2.985/FCC Part 87.131

FCC Part 2.985/FCC Part 87.131

No Distance

NOTES:

H = Horizontal Polarization

V = Vertical Polarization

N = No Polarization

D = Dipole Reading

Q = Quasi Peak Reading

A = Average Reading

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

V. 140g reading for output

Table 5: Frequency Stability

Temp	-10% Voltage	Nominal Voltage	+10% Voltage	Lower Limit (Hz)	Upper Limit (Hz)	Pass/Fail
-30°C	1.299964	1.0299964	1.0299964	1,029,982,200	1,030,023,400	Pass
-20°C	1.0300010	1.0300010	1.0300010	1,029,982,200	1,030,023,400	Pass
-10°C	1.0300034	1.0300035	1.0300034	1,029,982,200	1,030,023,400	Pass
0	1.0300039	1.0300040	1.0300040	1,029,982,200	1,030,023,400	Pass
10°C	1.0300032	1.0300032	1.0300032	1,029,982,200	1,030,023,400	Pass
20°C	1.0300017	1.0300017	1.0300017	1,029,982,200	1,030,023,400	Pass
30°C	1.0300002	1.0300001	1.0300002	1,029,982,200	1,030,023,400	Pass
40°C	1.0299992	1.0299992	1.0299991	1,029,982,200	1,030,023,400	Pass
50°C	1.0299989	1.0299989	1.0299989	1,029,982,200	1,030,023,400	Pass
Test Method:			FCC Part 2.995/87.133			
Spec Limit :			FCC Part 87.133			

Conducted Emissions Testing

For conducted emissions testing, a 30 to 50 second sweep time was used for automated measurements in the frequency bands of 150 kHz to 1.705 MHz, 1.705 MHz to 3 MHz, and 3 MHz to 30 MHz. All readings within 20 dB of the limit were recorded. At frequencies where the recorded emissions were close to the limit, further investigation was performed manually at a slower sweep rate.

Antenna Conducted Emissions Testing

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.991 & 87.133 and is compliant with the requirements for FCC Part 2.991 & 87.133. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 2.

Occupied Bandwidth

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance FCC Part 2.989 & 87.135 and is compliant with the requirements for FCC Part 2.989 & 87.135. The data obtained for this test is contained in the occupied bandwidth plots 1-6.

Power Output

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.985 & 87.131 and is compliant with the requirements for FCC Part 2.985 & 87.131. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 3.

Frequency Stability

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.995 & 87.133 and is compliant with the requirements for FCC Part 2.995 & 87.133. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 5.

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: EM Research
Specification: FCC Part 2.993/87.139
Test Type: Maximized Emissions
Equipment: Interrogation Transmitter
Manufacturer: EM Research
Model: P/N: EMPA-870-00004
S/N: 1845

Date: Mar-25-98
Time: 11:54
Sequence#: 3
Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Measurement Data:

Sorted by Margin

Test Distance: 3 Meters

#	Freq MHz	Rdng dBuV	Pream Horn dB	Bicon Horn dB	Log S Barn dB	Barn dB	Dist dB	Corr dBuV/m	Spec dBuV/m	Margin dB	Polar
1	6179.585	25.4	+0.0	+0.0	+0.0	+0.0	+0.0	47.5	54.0	-6.5	Vert
	Average		-33.0	+36.4	+18.7						
^	6179.557	39.8	+0.0	+0.0	+0.0	+0.0	+0.0	61.9	54.0	+7.9	Vert
			-33.0	+36.4	+18.7						
3	6179.744	24.4	+0.0	+0.0	+0.0	+0.0	+0.0	46.5	54.0	-7.5	Horiz
	Average		-33.0	+36.4	+18.7						
^	6179.757	46.3	+0.0	+0.0	+0.0	+0.0	+0.0	68.4	54.0	+14.4	Horiz
			-33.0	+36.4	+18.7						
5	45.912	47.2	-27.4	+10.7	+0.0	+1.2	+0.0	31.7	40.0	-8.3	Vert
			+0.0	+0.0	+0.0						
6	45.290	43.9	-27.4	+10.8	+0.0	+1.2	+0.0	28.5	40.0	-11.5	Horiz
			+0.0	+0.0	+0.0						
7	60.066	42.2	-27.4	+9.2	+0.0	+1.4	+0.0	25.4	40.0	-14.6	Vert
			+0.0	+0.0	+0.0						
8	5149.687	21.8	+0.0	+0.0	+0.0	+0.0	+0.0	39.1	54.0	-14.9	Horiz
	Average		-33.6	+35.1	+15.8						
^	5149.645	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	64.4	54.0	+10.4	Horiz
			-33.6	+35.1	+15.8						
10	5149.706	21.1	+0.0	+0.0	+0.0	+0.0	+0.0	38.4	54.0	-15.6	Vert
	Average		-33.6	+35.1	+15.8						

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: EM Research
 Specification: FCC Part 2.991/87.133
 Test Type: Antenna Terminal
 Equipment: Interrogation Transmitter
 Manufacturer: EM Research
 Model: P/N: EMPA-870-00004
 S/N: 1845

Date: Mar-25-98
 Time: 09:59
 Sequence#: 2
 Tested By: Dustin Oaks

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBuV	Barn dB	Barn dB		Dist dB	Corr dBuV/m	Spec dBuV/m	Margin dB	Polar
1	764.110	85.3	+0.0	+0.0		+0.0	85.3	94.0	-8.7	None
2	3089.801	81.4	+1.0	+1.0		+0.0	83.4	94.0	-10.6	None
3	6179.687	75.8	+1.3	+1.3		+0.0	78.4	94.0	-15.6	None
Average										
^	6179.761	96.2	+1.3	+1.3		+0.0	98.8	94.0	+4.8	None
5	2972.970	73.9	+0.9	+0.9		+0.0	75.7	94.0	-18.3	None
6	2974.400	73.6	+0.9	+0.9		+0.0	75.4	94.0	-18.6	None
7	861.090	71.1	+0.0	+0.0		+0.0	71.1	94.0	-22.9	None
8	993.700	52.4	+0.0	+0.0		+0.0	52.4	94.0	-41.6	None
Average										
^	993.700	100.1	+0.0	+0.0		+0.0	100.1	94.0	+6.1	None
10	5149.621	47.2	+1.0	+1.0		+0.0	49.2	94.0	-44.8	None
Average										

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: EM Research Date: Mar-25-98
 Specification: FCC Part 2.985/87.131 Time: 09:15
 Test Type: Power output Sequence#: 1
 Equipment: Interrogation Transmitter
 Manufacturer: EM Research Tested By: Dustin Oaks
 Model: P/N: EMPA-870-00004
 S/N: 1845

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBuV	Barn		dB	dB	Dist dB	Corr dBuV/m	Spec dBuV/m	Margin dB	Polar
			dB	dB							
1	1030.000	161.6	-0.1	+0.1			+0.0	161.8	163.0	-1.2	None

RF POWER OUTPUT

2.985

Table 3: RF Power Output Level									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
				Cable dB					
1030.000	161.6			0.2		161.8	163.0	-1.2	N

Test Method: FCC Part 2.985/FCC Part 87.131
 Spec Limit : FCC Part 2.985/FCC Part 87.131
 Test Distance: No Distance

NOTES: H = Horizontal Polarization
 V = Vertical Polarization
 N = No Polarization
 D = Dipole Reading
 Q = Quasi Peak Reading
 A = Average Reading

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research** Date: Mar-25-98
Specification: **FCC Part 2.985/87.131** Time: 09:15
Test Type: **Power output** Sequence#: 1
Equipment: **Interrogation Transmitter**
Manufacturer: EM Research Tested By: Dustin Oaks
Model: P/N: EMPA-870-00004
S/N: 1845

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBμV	Barn		Barn		Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
			dB	dB	dB	dB					
1	1030.000	161.6	+0.1	+0.1			+0.0	161.8	163.0	-1.2	None

MODULATION CHARACTERISTICS

2.987

Not Applicable

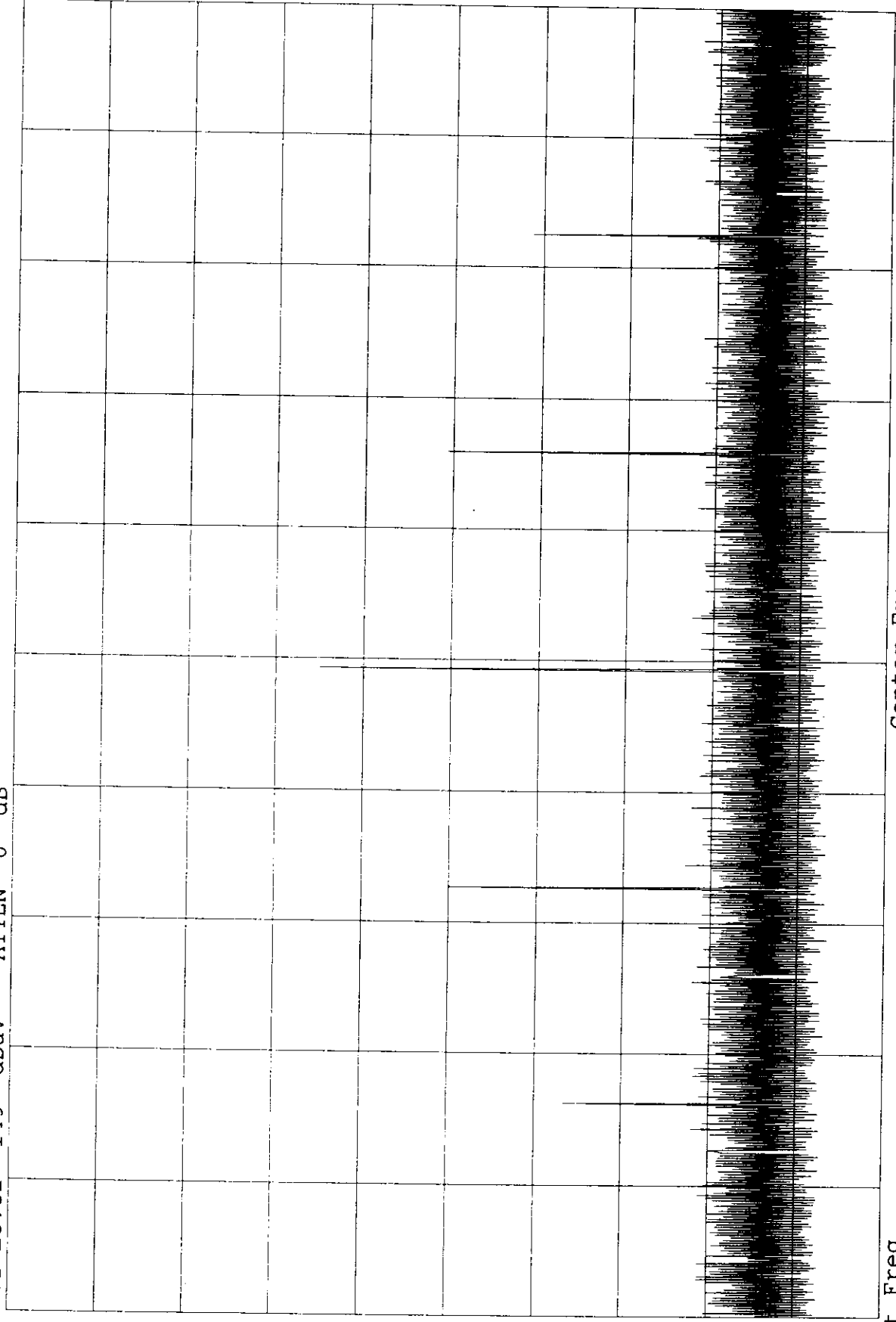
OCCUPIED BANDWIDTH

2.989

Title: EM Research, 25March98 - ANPC - FCC pt 87.135/2.989
Ref Level 149 dBuV ATTN 0 dB

10 dB/

OFFSET
52
dB



Start Freq
930.0MHz

RES BW 100.0KHz

Center Freq
1.03GHz
VID BW 100.0KHz

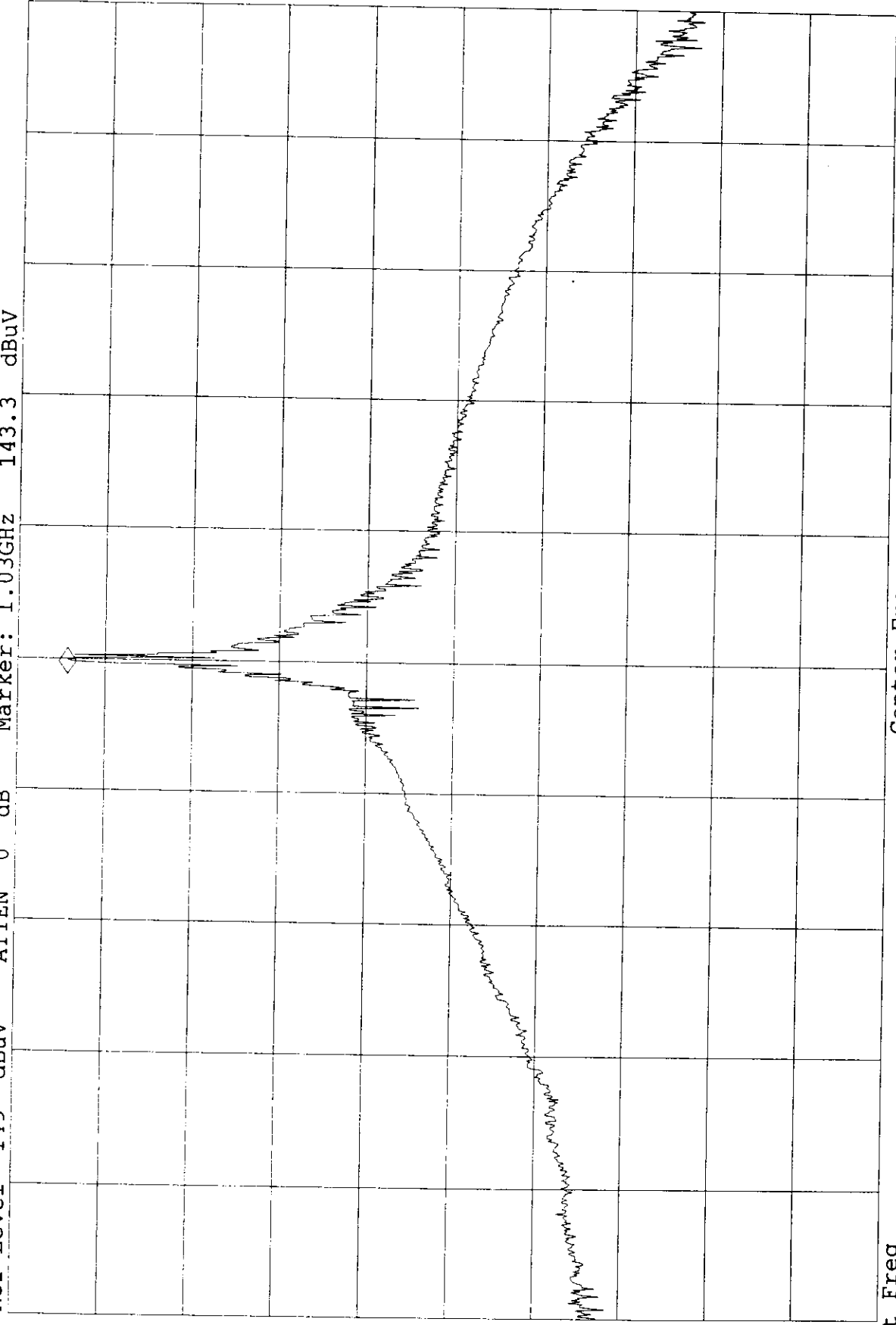
Stop Freq
1.13GHz
SWP .06

Title: EM Research, 25March98 - ANPC - FCC pt 87.135/2.989

Ref Level 149 dBuV ATTN 0 dB Marker: 1.03GHz 143.3 dBuV

10 dB/

OFFSET
52
dB



Start Freq
930.0MHz

RES BW 100.0KHz

Center Freq
1.03GHz

VID BW 100.0KHz

Stop Freq

1.13GHz

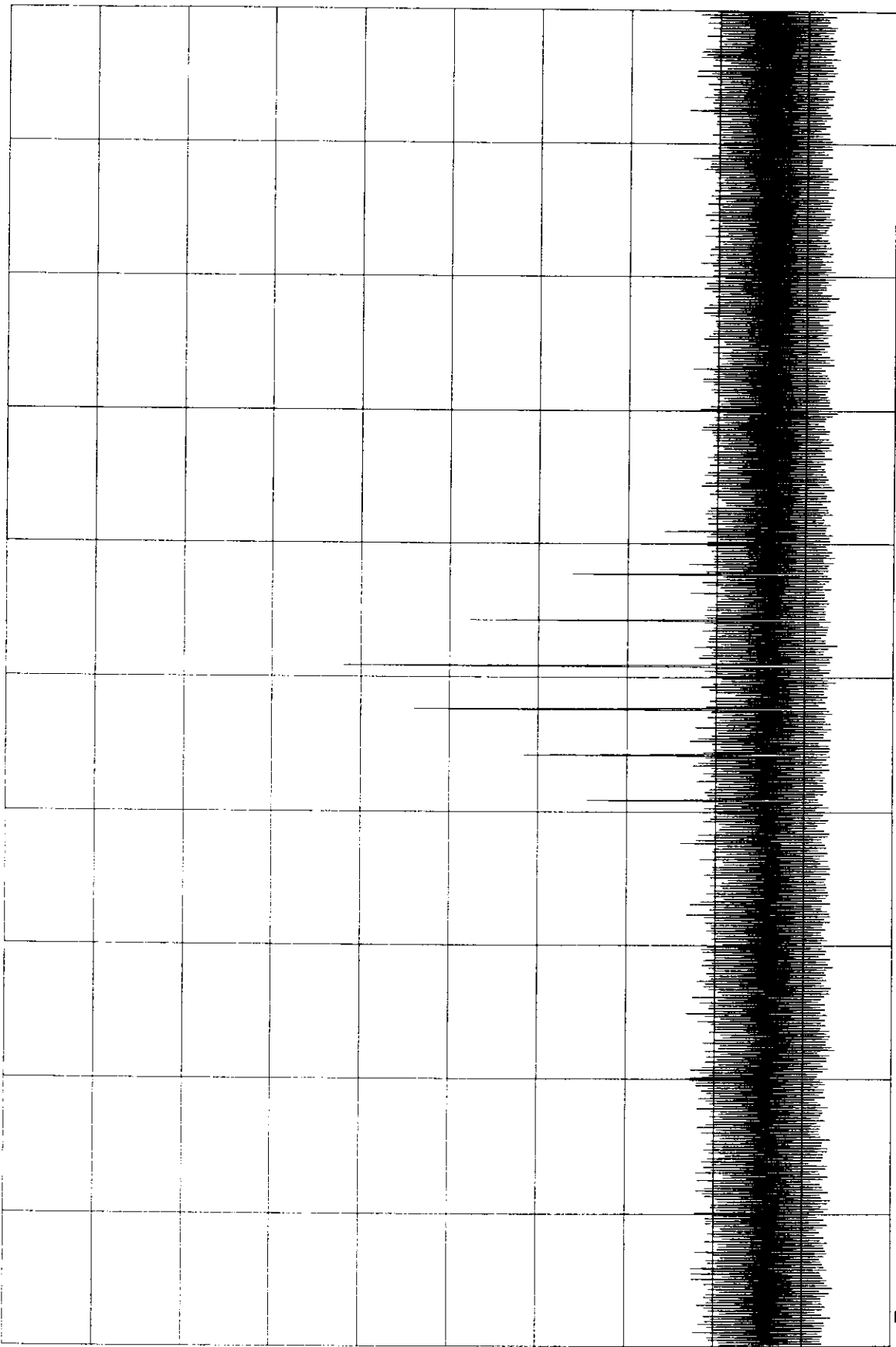
SWP 10

Title: EM Research, 25March98 - ANPC - FCC pt 87.135/2.989

Ref Level 149 dBuV ATTN 0 dB

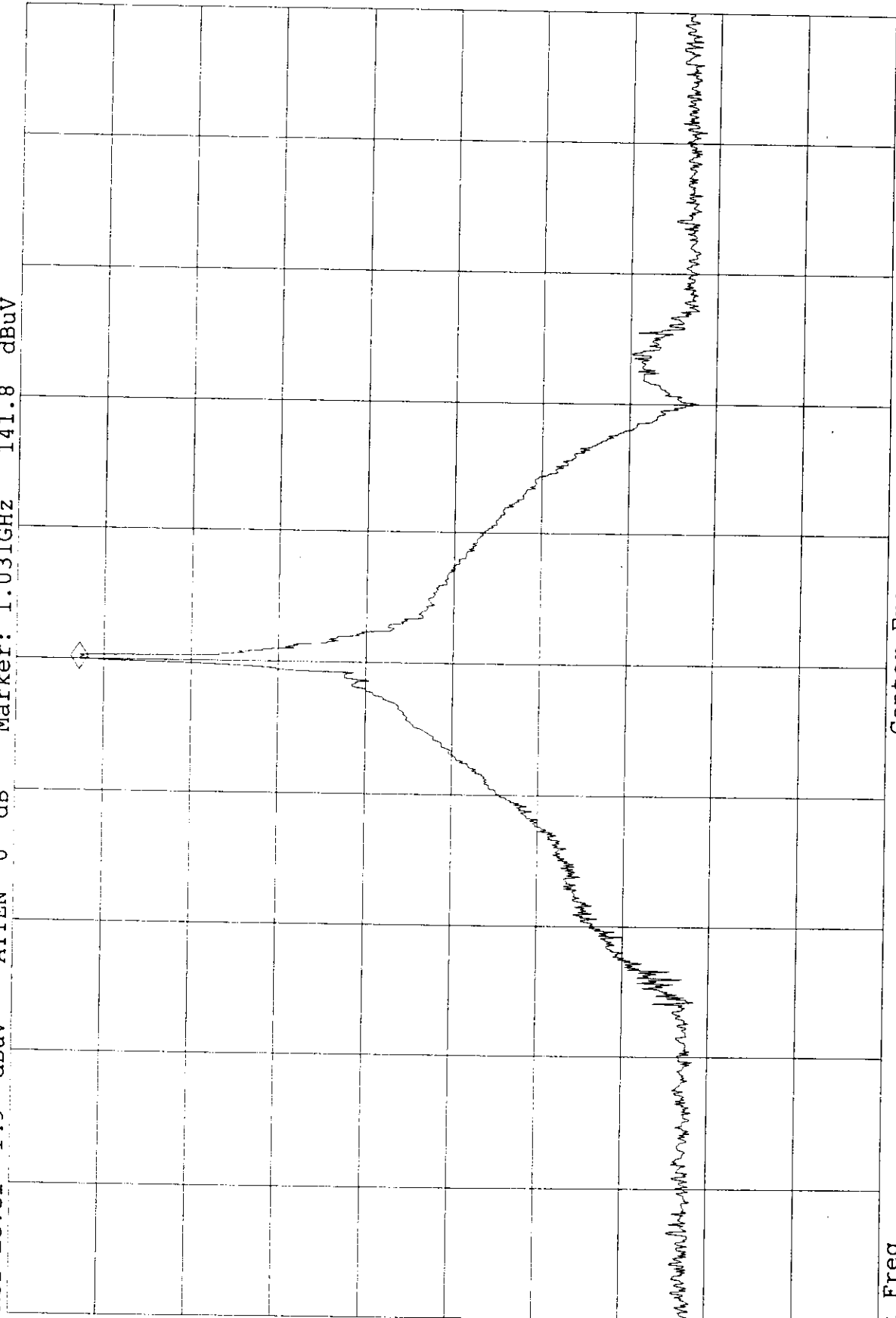
10 dB/

OFFSET
52
dB



Start Freq 530.0MHz RES BW 100.0KHz
Center Freq 1.03GHz VID BW 100.0KHz
Stop Freq 1.53GHz SWP .3

Title: EM Research, 25March98 - ANPC - FCC pt 87.135/2.989
Ref Level 149 dBuV ATTN 0 dB Marker: 1.031GHz 141.8 dBuV



10 dB/

OFFSET
52
dB

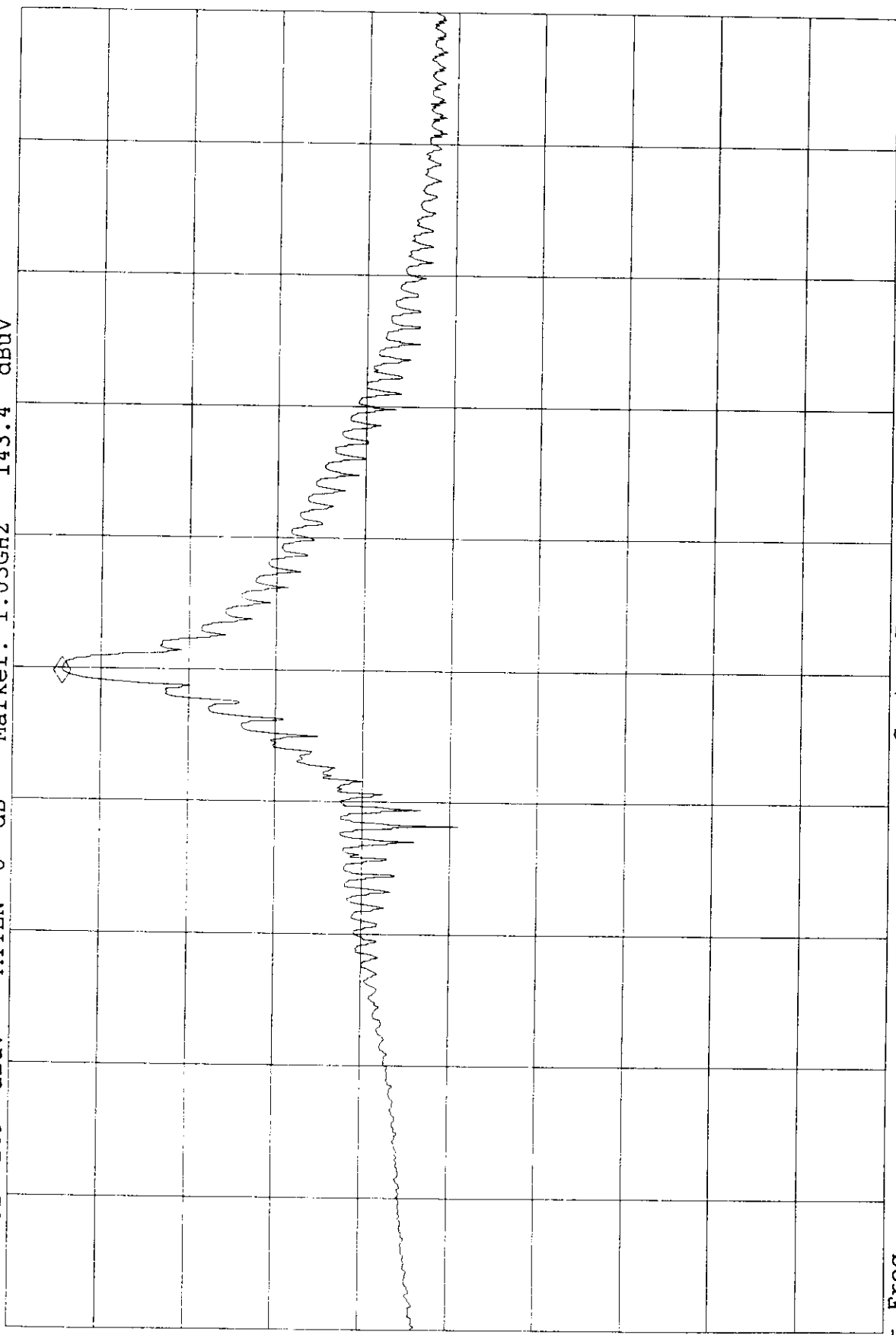
Start Freq
780.0MHz

RES BW 100.0KHz

Center Freq
1.03GHz
VID BW 100.0KHz

Stop Freq
1.28GHz
SWP 5

Title: EM Research, 25March98 - ANPC - FCC pt 87.135/2.989
Ref Level 149 dBuV ATTN 0 dB Marker: 1.03GHz 143.4 dBuV



10 dB/

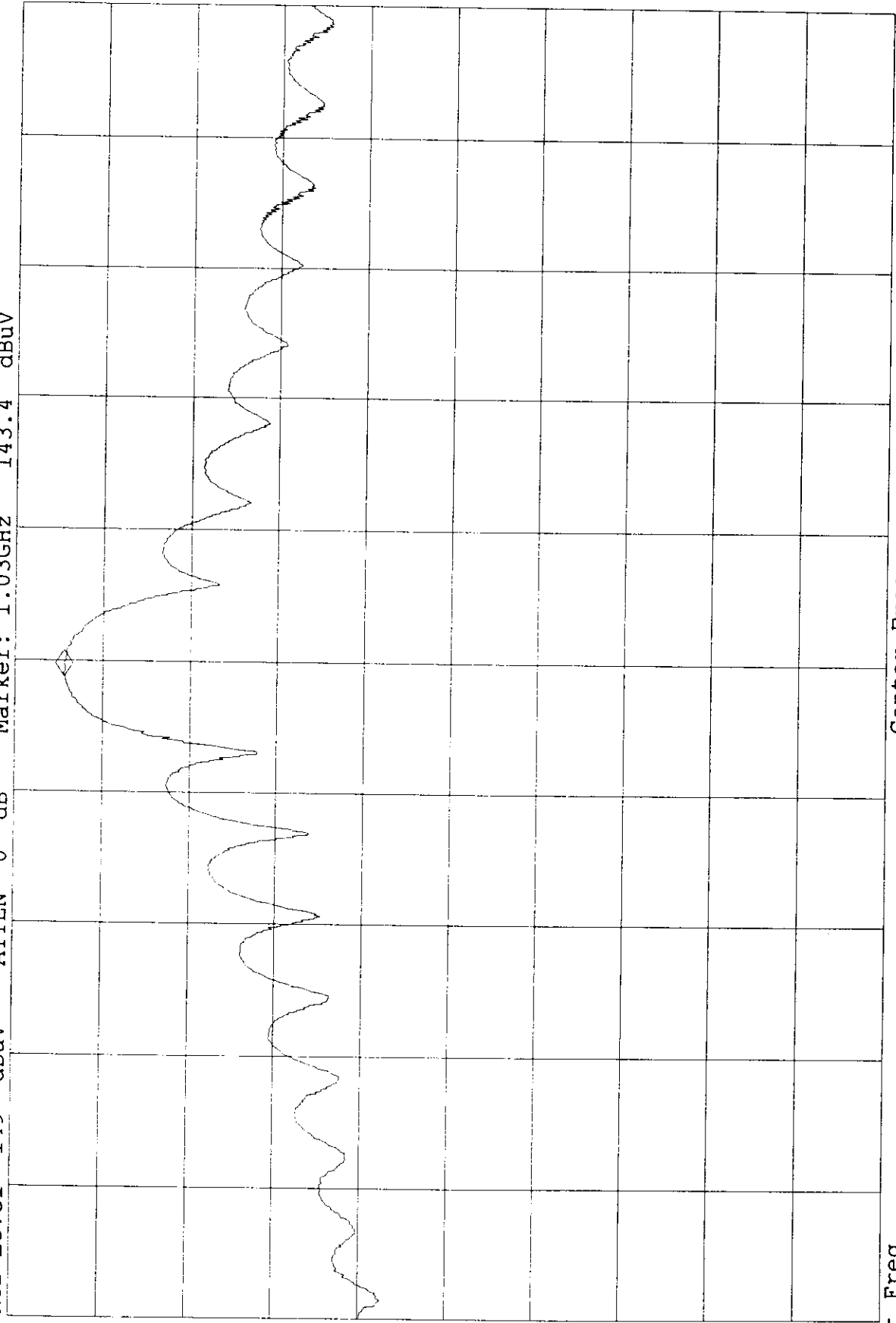
OFFSET
52
dB

Start Freq 1.005GHz
Center Freq 1.03GHz
Stop Freq 1.055GHz
RES BW 100.0KHz
VID BW 100.0KHz
SWP 10

Title: EM Research, 25March98 - ANPC - FCC pt 87.135 / 2.989
Ref Level 149 dBuV ATTN 0 dB Marker: 1.03GHz 143.4 dBuV

10 dB/

OFFSET
52
dB



Start Freq 1.025GHz RES BW 100.0KHz
Center Freq 1.03GHz VID BW 100.0KHz
Stop Freq 1.035GHz SWP 10

SPURIOUS EMISSIONS AT ANTENNA TERMINAL

2.991

FCC LABORATORY
OET

Monika Lopez

From: Bill Inglis (Katie Hawkins) [KHAWKINS@fcc.gov]
Sent: Friday, July 31, 1998 2:28 PM
To: mlopez@ckc.com
Subject: FCC ID: NYKEMPA101

AUG 27 7 58 AM '98

The items in the letter to Dennis Ward were as follows;

1. Letter to FAA per Section 87.147(d). We must wait 21 days after receipt of cc of letter unless FAA sends us a notification of concurrence.
2. Clearly identify the items you wish kept confidential.
3. Redo the test report so that it is a type acceptance report keyed to Section 2.981, et. al instead of a hybrid certification/type acceptance report. Section 2.983 (a) through (g) should be addressed as well as 2.985 thru 2.997. We have no line conducted requirements for dc powered type accepted transmitters. Nothing in Part 15 or C63.4 applies to this application. We expect to see the relative level of emissions referenced to the transmitter carrier, not absolute levels compared to limits. I will be available to help you make these changes in

REC'D

Held for
Sept 7

Sept 7 ear

REPORT OF MEASUREMENTS

The following tables report the highest emissions levels recorded during the tests performed on the Interrogation Transmitter, P/N: 870-00004. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Six Highest Spurious Radiated Emission Levels									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
45.290	43.9	10.8	-27.4	1.2		28.5	40.0	-11.5	H
45.912	47.2	10.7	-27.4	1.2		31.7	40.0	-8.3	V
60.066	42.2	9.2	-27.4	1.4		25.4	40.0	-14.6	V
322.288	32.2	21.2	-26.9	3.5		30.0	46.0	-16.0	H
5149.687	21.8	35.1	-33.6	15.8		39.1	54.0	-14.9	HA
6179.585	25.4	36.4	-33.0	18.7		47.5	54.0	-6.5	VA

Test Method: FCC Part 2.993/Part 87.139
 Spec Limit : FCC Part 2.993/Part 87.139
 Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
 V = Vertical Polarization
 N = No Polarization
 D = Dipole Reading
 Q = Quasi Peak Reading
 A = Average Reading

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Table 2: Six Highest Spurious at Antenna Terminal Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Cable dB							
764.110000	85.3	0.0				85.3	94.0	-8.7	N
861.090000	71.1	0.0				71.1	94.0	-22.9	N
2972.97000	73.9	1.8				75.7	94.0	-18.3	N
2974.40000	73.6	1.8				75.4	94.0	-18.6	N
3089.80100	81.4	2.0				83.4	94.0	-10.6	N
6179.68700	75.8	2.6				78.4	94.0	-15.6	NA

Test Method:
Spec Limit :
Test Distance:

FCC 2.991/Part 87.133
FCC 2.991/Part 87.133
No Distance

NOTES:

Q = Quasi Peak Reading
A = Average Reading
B = Black Lead
W = White Lead
N = No Polarity

COMMENTS: Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

FREQUENCY STABILITY

2.995

Table 5: Frequency Stability

Temp	-10% Voltage	Nominal Voltage	+10% Voltage	Lower Limit (Hz)	Upper Limit (Hz)	Pass/ Fail
-30°C	1.299964	1.0299964	1.0299964	1,029,982,200	1,030,023,400	Pass
-20°C	1.0300010	1.0300010	1.0300010	1,029,982,200	1,030,023,400	Pass
-10°C	1.0300034	1.0300035	1.0300034	1,029,982,200	1,030,023,400	Pass
0	1.0300039	1.0300040	1.0300040	1,029,982,200	1,030,023,400	Pass
10°C	1.0300032	1.0300032	1.0300032	1,029,982,200	1,030,023,400	Pass
20°C	1.0300017	1.0300017	1.0300017	1,029,982,200	1,030,023,400	Pass
30°C	1.0300002	1.0300001	1.0300002	1,029,982,200	1,030,023,400	Pass
40°C	1.0299992	1.0299992	1.0299991	1,029,982,200	1,030,023,400	Pass
50°C	1.0299989	1.0299989	1.0299989	1,029,982,200	1,030,023,400	Pass
Test Method:			FCC Part 2.995/87.133			
Spec Limit :			FCC Part 87.133			

TEST METHODS

The emissions data of the Interrogation Transmitter, P/N: 870-00004, was taken with the HP spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the applicable FCC Part 2 & 87 emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing (30 MHz - 10.3 GHz)

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode with the I/O cables and line cords facing the antenna. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned in the same manner, using the biconical antenna, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. The horn antenna was used to scan for frequencies above 1000 MHz. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned with its I/O and power cables facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation, antenna height and configuration of the peripherals and cables. Maximizing of the cables was achieved by monitoring the spectrum analyzer on a closed circuit television monitor while the EUT cables were being moved and rearranged on the EUT table for maximum emissions. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

Conducted Emissions Testing

For conducted emissions testing, a 30 to 50 second sweep time was used for automated measurements in the frequency bands of 150 kHz to 1.705 MHz, 1.705 MHz to 3 MHz, and 3 MHz to 30 MHz. All readings within 20 dB of the limit were recorded. At frequencies where the recorded emissions were close to the limit, further investigation was performed manually at a slower sweep rate.

Antenna Conducted Emissions Testing

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.991 & 87.133 and is compliant with the requirements for FCC Part 2.991 & 87.133. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 2.

Occupied Bandwidth

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance FCC Part 2.989 & 87.135 and is compliant with the requirements for FCC Part 2.989 & 87.135. The data obtained for this test is contained in the occupied bandwidth plots 1-6.

Power Output

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.985 & 87.131 and is compliant with the requirements for FCC Part 2.985 & 87.131. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 3.

Frequency Stability

The Interrogation Transmitter, P/N: 870-00004, was tested in accordance to FCC Part 2.995 & 87.133 and is compliant with the requirements for FCC Part 2.995 & 87.133. The data obtained for this test is contained in Appendix B and the six highest readings are contained in Table 5.

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research** Date: Mar-25-98
 Specification: **FCC Part 2.993/87.139** Time: 11:54
 Test Type: **Maximized Emissions** Sequence#: 3
 Equipment: **Interrogation Transmitter**
 Manufacturer: EM Research Tested By: Dustin Oaks
 Model: P/N: EMPA-870-00004
 S/N: 1845

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to a Dummy load.

Measurement Data:

Sorted by Margin

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Pream Horn dB	Bicon Horn dB	Log S Barn dB	Barn dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	6179.585	25.4	+0.0	+0.0	+0.0	+0.0	+0.0	47.5	54.0	-6.5	Vert
Average			-33.0	+36.4	+18.7						
^	6179.557	39.8	+0.0	+0.0	+0.0	+0.0	+0.0	61.9	54.0	+7.9	Vert
			-33.0	+36.4	+18.7						
3	6179.744	24.4	+0.0	+0.0	+0.0	+0.0	+0.0	46.5	54.0	-7.5	Horiz
Average			-33.0	+36.4	+18.7						
^	6179.757	46.3	+0.0	+0.0	+0.0	+0.0	+0.0	68.4	54.0	+14.4	Horiz
			-33.0	+36.4	+18.7						
5	45.912	47.2	-27.4	+10.7	+0.0	+1.2	+0.0	31.7	40.0	-8.3	Vert
			+0.0	+0.0	+0.0						
6	45.290	43.9	-27.4	+10.8	+0.0	+1.2	+0.0	28.5	40.0	-11.5	Horiz
			+0.0	+0.0	+0.0						
7	60.066	42.2	-27.4	+9.2	+0.0	+1.4	+0.0	25.4	40.0	-14.6	Vert
			+0.0	+0.0	+0.0						
8	5149.687	21.8	+0.0	+0.0	+0.0	+0.0	+0.0	39.1	54.0	-14.9	Horiz
Average			-33.6	+35.1	+15.8						
^	5149.645	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	64.4	54.0	+10.4	Horiz
			-33.6	+35.1	+15.8						
10	5149.706	21.1	+0.0	+0.0	+0.0	+0.0	+0.0	38.4	54.0	-15.6	Vert
Average			-33.6	+35.1	+15.8						

^	5149.730	41.3	+0.0 -33.6	+0.0 +35.1	+0.0 +15.8	+0.0	+0.0	58.6	54.0	+4.6	Vert
12	322.288	32.2	-26.9 +0.0	+0.0 +0.0	+21.2 +0.0	+3.5	+0.0	30.0	46.0	-16.0	Horiz
13	4119.782	22.7	+0.0	+0.0	+0.0	+0.0	+0.0	36.2	54.0	-17.8	Vert
	Average		-33.3	+33.8	+13.0						
^	4119.820	57.5	+0.0 -33.3	+0.0 +33.8	+0.0 +13.0	+0.0	+0.0	71.0	54.0	+17.0	Vert
15	330.182	29.5	-26.9 +0.0	+0.0 +0.0	+20.7 +0.0	+3.6	+0.0	26.9	46.0	-19.1	Vert
16	4119.609	21.2	+0.0	+0.0	+0.0	+0.0	+0.0	34.7	54.0	-19.3	Horiz
	Average		-33.3	+33.8	+13.0						
^	4119.630	47.1	+0.0 -33.3	+0.0 +33.8	+0.0 +13.0	+0.0	+0.0	60.6	54.0	+6.6	Horiz
18	3089.868	22.6	+0.0	+0.0	+0.0	+0.0	+0.0	32.9	54.0	-21.1	Horiz
	Average		-35.0	+32.0	+13.3						
^	3089.870	52.4	+0.0 -35.0	+0.0 +32.0	+0.0 +13.3	+0.0	+0.0	62.7	54.0	+8.7	Horiz
20	3089.980	19.7	+0.0	+0.0	+0.0	+0.0	+0.0	30.0	54.0	-24.0	Vert
	Average		-35.0	+32.0	+13.3						
^	3089.980	49.4	+0.0 -35.0	+0.0 +32.0	+0.0 +13.3	+0.0	+0.0	59.7	54.0	+5.7	Vert
22	2059.792	25.2	+0.0	+0.0	+0.0	+0.0	+0.0	25.3	54.0	-28.7	Vert
	Average		-35.7	+28.1	+7.7						
^	2059.800	64.6	+0.0 -35.7	+0.0 +28.1	+0.0 +7.7	+0.0	+0.0	64.7	54.0	+10.7	Vert
24	2059.868	24.9	+0.0	+0.0	+0.0	+0.0	+0.0	25.0	54.0	-29.0	Horiz
	Average		-35.7	+28.1	+7.7						
^	2059.865	68.4	+0.0 -35.7	+0.0 +28.1	+0.0 +7.7	+0.0	+0.0	68.5	54.0	+14.5	Horiz
26	1090.205	25.8	+0.0	+0.0	+0.0	+0.0	+0.0	19.9	54.0	-34.1	Horiz
	Average		-36.1	+24.7	+5.5						
^	1090.222	73.0	+0.0 -36.1	+0.0 +24.7	+0.0 +5.5	+0.0	+0.0	67.1	54.0	+13.1	Horiz
28	1090.503	22.6	+0.0	+0.0	+0.0	+0.0	+0.0	16.8	54.0	-37.2	Vert
	Average		-36.0	+24.7	+5.5						
^	1090.540	64.6	+0.0 -36.0	+0.0 +24.7	+0.0 +5.5	+0.0	+0.0	58.8	54.0	+4.8	Vert
30	1029.880	85.3	+0.0 -36.1	+0.0 +24.7	+0.0 +5.3	+0.0	+0.0	79.2	163.0	-83.8	Horiz
31	1029.947	80.8	+0.0 -36.1	+0.0 +24.7	+0.0 +5.3	+0.0	+0.0	74.7	163.0	-88.3	Vert
Fundamental											

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **EM Research** Date: Mar-25-98
 Specification: **FCC Part 2.991/87.133** Time: 09:59
 Test Type: **Antenna Terminal** Sequence#: 2
 Equipment: **Interrogation Transmitter**
 Manufacturer: EM Research Tested By: Dustin Oaks
 Model: P/N: EMPA-870-00004
 S/N: 1845

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Interrogation Transmitter*	EM Research	P/N: EMPA-870-00004	1845

Support Devices:

Function	Manufacturer	Model #	S/N
Pulse Generator	HP	8111A	2519G05082

Test Conditions / Notes:

Spec Limit for EUT is 400W, which = 56dBm = 163dBuV. EUT operation IAW customers setup procedure. Function generator is producing a pulse @ 100Hz, 1.6uS width, and amplitude of 1.5V. Oscilloscope is connected to the transmitter. Sample port is used to verify operation. Interrogation RF output is connected to Spectrum analyzer via 40dB Coupler and Pads.

Measurement Data:

Sorted by Margin

Test Distance: None

#	Freq MHz	Rdng dBμV	Barn		Barn		Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
			dB	dB	dB	dB					
1	764.110	85.3	+0.0	+0.0			+0.0	85.3	94.0	-8.7	None
2	3089.801	81.4	+1.0	+1.0			+0.0	83.4	94.0	-10.6	None
3	6179.687	75.8	+1.3	+1.3			+0.0	78.4	94.0	-15.6	None
Average											
^	6179.761	96.2	+1.3	+1.3			+0.0	98.8	94.0	+4.8	None
5	2972.970	73.9	+0.9	+0.9			+0.0	75.7	94.0	-18.3	None
6	2974.400	73.6	+0.9	+0.9			+0.0	75.4	94.0	-18.6	None
7	861.090	71.1	+0.0	+0.0			+0.0	71.1	94.0	-22.9	None
8	993.700	52.4	+0.0	+0.0			+0.0	52.4	94.0	-41.6	None
Average											
^	993.700	100.1	+0.0	+0.0			+0.0	100.1	94.0	+6.1	None
10	5149.621	47.2	+1.0	+1.0			+0.0	49.2	94.0	-44.8	None
Average											

^	5149.700	105.1	+1.0	+1.0	+0.0	107.1	94.0	+13.1	None
12	2059.804	0.0	+0.2	+0.2	+0.0	0.4	94.0	-93.6	None
Average									
^	2059.800	97.4	+0.2	+0.2	+0.0	97.8	94.0	+3.8	None

FIELD STRENGTH OF SPURIOUS RADIATION

2.993

FREQUENCY SPECTRUM TO BE INVESTIGATED

2.997

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect both the radiated and conducted emissions data for the Interrogation Transmitter, P/N: 870-00004. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. For frequencies above 1000 MHz the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT. Conducted emissions tests required the use of the FCC type LISN's.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, a reference level of 100 dB μ V and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	450 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	10.3 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 through 4 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in Tables 1 through 4. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Interrogation Transmitter, P/N: 870-00004.

Peak

In this mode, the spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP 85650A Quasi-Peak Adapter for the HP 8568B spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

2.981 APPLICATION FOR TYPE ACCEPTANCE

Exhibit	Applicable Section	Description
(A) Cover Letter	2.983(a)-(c)	
(A) Cover Letter	2.983(a)	Name of Applicant
(A) Cover Letter	2.983(b)	Identification of equipment
(A) Cover Letter	2.983(c)	Quantity Production
(B) Operational Description	2.983(d)(1)-(6)	
(B) Operational Description	2.983(d)(1)	Type(s) of Emission
(B) Operational Description	2.983(d)(2)	Frequency Range
(B) Operational Description	2.983(d)(3)	Operating Power Levels
(B) Operational Description	2.983(d)(4)	Maximum Power Rating
(B) Operational Description	2.983(d)(5)	DC Voltages
(B) Operational Description	2.983(d)(6)	Function of Active Circuit Device
(C) Schematics	2.983(d)(7)	Circuit Diagrams
(D) Users Manual	2.983(d)(8)	Instruction Book(s)
(E) Parts List/Tune Up Info	2.983(d)(9)	Tune-up Procedure
(B) Operational Description	2.983(d)(10)-(d)(12)	
(B) Operational Description	2.983(d)(10)	Circuit Description
(B) Operational Description	2.983(d)(11)	Suppression Circuits/Devices
(B) Operational Description	2.983(d)(12)	Modulation System
(F) Test Report	2.983(e)	Required Measurements
(F) Test Report	2.983(e)/2.985/87.131	RF Power Output (page # 8 & 37 of CKC test report)
(F) Test Report	2.983(e)/2.987 (not applicable)	Modulation Characteristics
(F) Test Report	2.983(e)/2.989/87.135	Occupied Bandwidth (page #11-16 of CKC test report)
(F)Test Report	2.983(e)/2.991/87.133	Spurious Emissions At Antenna Terminal (page # 7,35,36 of CKC test report)
(F)Test Report	2.983(e)/2.993/87.139	Field Strength of Spurious Radiation (page # 6,33,34 of CKC test report)
(F)Test Report	2.983(e)/2.995/87.135	Frequency Stability (page # 10 of CKC test report)
(F)Test Report	2.983(e)/2.997	Frequency Spectrum To Be Investigated (page # 19 –21 of CKC test report)
(G) ID Label/Location Info	2.983(f)	Label/Label Location
(H) Internal/External Photos	2.983(g)	Internal/External Photos

EXHIBIT B

OPERATIONAL DESCRIPTION

2.983(d)(1)-(6) and 2.983(d)(10)-(12)

2.983(d)(1)-(6) and 2.983(d)(10)-(12)

2.983 (d) Technical description of the equipment sufficiently complete to develop all the factors concerning compliance with the technical standards of the applicable rule part(s). The description shall include the following items:

2.983 (d)(1) Question: Type or types of emission.
Answer: 6M00M1D

2.983(d)(2) Question: Frequency range
Answer: 1030 MHz
The transmitted frequency is 1030 MHz. The timing for the rf pulses, pulse repetition frequency and pulse duration are supplied by the master computer located in another subsystem. The rf pulses are of a very low duty cycle typically 10 Hz.

2.983(d)(3) Question: Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.
Answer: The output of the power amplifier goes through an attenuator where it's power can be reduced in 3dB steps by 21 dB, after the attenuator's inherent loss, the peak output power is reduced to 400 watts.

2.983(d)(4) Question: Maximum power rating as defined in the applicable part(s) of the rules.
Answer: 400 watts

2.983(d)(5) Question: The DC voltages applied to and DC currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.
Answer: AC power is supplied to the unit through the back panel via a CORCOM 6EDL4 power entry filter. This filter module is internally fused to 10 Amps. A circuit breaker is also installed on the front panel to provide for additional safety, it is rated at 5 Amps. All internal cables and wires are bundled and secured in order to prevent damage due to vibration or impact. DC power each rf module is supplied with linear power supply. See attached "Top Level A/C wiring diagram".

↑
Customer will provide a diagram, this will be sent in by the end of this week

2.983(d)(6) Question: Function of each electron tube or semiconductor or other active circuit device.

Answer: Description of Internal Modules

1030 MHz Signal Source, EM P/N SLFS-1030-IR-01

The 1030 MHz source is a phase locked loop oscillator. This source contains a lumped element LC oscillator which is locked to an internal 10 MHz crystal. The stability of the output oscillator is determined by the stability of the crystal reference. This stability of the output oscillator is determined by the stability of the crystal reference. This stability is better than +/-20ppm over the temperature range -30 to +70C. The output rf power at 1030 MHz is 10 milli-watts.

The data sheet with block diagram and schematics are attached.

1030 MHz Switch/Driver/Overduty module. EM P/N EMPA-1030-5-02

The switch/driver/overduty module receives the rf tone from the 1030 MHz source, then gates the signal depending on the information it receives using it's data link with the controlling computer. The module has an internal chip to receive incoming differential logic for this transmit command.

This module gates the rf on and off according to the received data. The resulting rf pulses are amplified to a peak output power of 5 watts. Internal circuitry monitors the command pulses, shutting down the driver amplifier if the pulses are too fast in frequency or too long in duration. This overduty shutdown feature protects the subsequent power amplifier from destruction.

The data sheet with block diagram and schematics are attached.

1030 MHz Power Amplifier 500 watt. EM P/N EMPA-1030-500-02

The power amplifier module consists of a chain of silicon transistors which are designed to amplify pulsed rf signals. The module amplifies the 5 watt input to 500 watts out. An internal isolator on the output protects the module if an infinite VSWR were placed at its output. An internal lowpass filter at the output suppresses the harmonics by 50 dB. An internal diode detects the output rf pulse and sends this signal out of the transmitter enclosure.

The data sheet with block diagram and schematics are attached.

1030 MHz Step Attenuator. Lorch P/N DA-3-PX-HP

The step attenuator adjusts the rf output power according to data received by the switch/driver/overduty module. It has nominal loss of about .5dB. It has 3 dB steps over a 21 dB range. The control is via three wires. This part is manufactured by LORCH Microwave.

The data sheet with block diagram and schematics are attached.

2.983(d)(10) Question: A description of all circuitry and devices provided for determining and stabilizing frequency.

1030 MHz Source

5. Data sheet with block diagram, miniature phase locked oscillator, SLFS-1030-IR-01
6. RF schematic, SLFS-1030-IR-01
7. VCO schematic, SLFS-1030-IR-01
8. Digital schematic, SLFS-1030-IR-01

2.983(d)(11) Question: A description of any circuits or devices employed for suppression of spurious radiation, for limiting modulation, and for limiting power.

2.983(d)(12) Question: For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wave-train, shall be submitted for the maximum rated conditions under which the equipment will be operated.