ITS Intertek Testing Services

APPLICATION FOR FCC CERTIFICATION

Sentrol Incorporated

Motion Detector

FCC ID: CGGAA2

Report # J98018757

Number of Pages: 13 pp. + Supporting Data and Documents

Date of Report: July 10, 1998

NVLAP®

Intertek Testing Services NA Inc.

1365 Adams Court, Menlo Park, CA 94025

Telephone 650-463-2900 Fax 650-463-2910 Home Page www.worldlab.com

Table of Contents

1.0 **Summary of Tests**

Sentrol - FCC ID: CGGAA2

TEST	REFERENCE	RESULTS
Radiated Emission	15.245(b)	Pass
Out of Band Radiated Emission	15.245(3)	Not Applicable
AC Conducted Emission	15.207	Not Tested
Radiated Emission from Digital Part	15.109	Not Tested
Antenna Requirement	15.203	Pass

Test Engineer: Xi-Ming Yang Date: 8-17-98

Xi-Ming Yang

Engineering Mgr.: Date: 8-18-98

C.K.Li

2.0 General Description

2.1 Product Description

The Sentrol Incorporated, FCC ID: CGGAA2, is a motion detector.

For more information, see attached users manual.

A pre-production version of the sample was received on July 2, 1998 in good condition.

Overview of the EUT

Applicant	**Sentrol, SLC Technologies Inc.**
Trade Name & Model No.	**Ranger**; RangeGated RADAR
FCC Identifier	CGGAA2
Use of Product	[X] Indoor [ ] Outdoor [ ] Both [ ] Open building doors [ ] In motor vehicle or/and aircraft
Frequency Range (MHz)	5725 - 5875
Antenna Requirement	The EUT uses a permanently connected antenna.
Manufacturer name & address	Sentrol, SLC Technologies Inc. 12345 Leveton Drive Tualatin, Oregon 97062

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

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

2.4 Test Facility

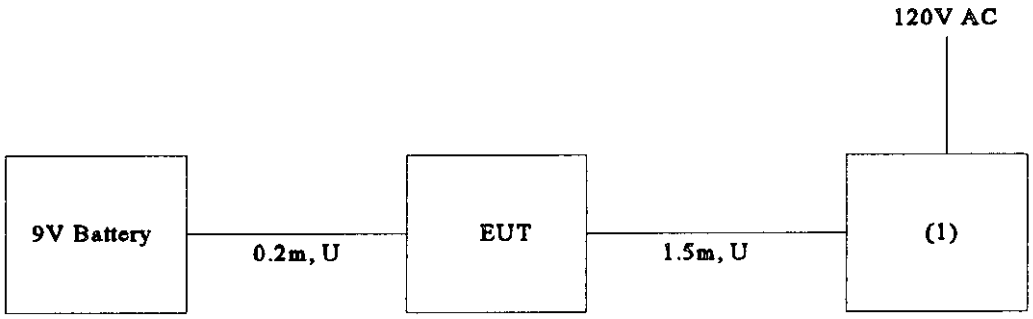
The open area test site and conducted measurement facility used to collect the radiated data is site 1. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.
1	Goldstar DC Power Supply	GP-303	4081023

3.2 Block Diagram of Test Setup



* = EUT	S = Shielded;	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	

3.3 Justification

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

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

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation During Test

Continuous transmission

3.6 Modifications Required for Compliance

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

No modifications were installed by Intertek Testing Services.

4.0 Measurement Results

For radiated emission tests, The analyzer setting was as followings unless otherwise stated:

	RES BW	VID BW	
Frequency < 1 GHz	100 kHz	100 kHz	
Frequency > 1 GHz	1 MHz	1 MHz	(Peak measurements)
	1 MHz	10 Hz	(Average measurements)

4.1 Radiated Emission test results

See attached for details.

ITS Intertek Testing Services

Company: Sentrol
Project #: J98018757
Model: Motion Detector (CW mode)
Engineer: Xi-Ming Yang
Date of test: July 2, 1998

Note: Pulse mode is normal operation for this device.
CW results are not required but are provided FYI.

FCC 15.249 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Duty Cyco	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
5807.8	H	61.2	34.4	3.5	0.0	-20.0	0.0	79.1	114.0	-34.9
11615.5	H	62.3	39.0	5.9	-39.7	-20.0	0.0	47.5	54.0	-6.5
17423.3	H	39.0	44.9	7.5	-37.5	-20.0	0.0	33.9	54.0	-20.1
23225.0	H	32.5*	40.4	9.0	-24.2	-20.0	-9.5	28.2	54.0	-25.8
29038.8	H	41.0*	43.5	10.5	-25.9	-20.0	-9.5	39.6	54.0	-14.4

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Read with * is made at 1 meters**

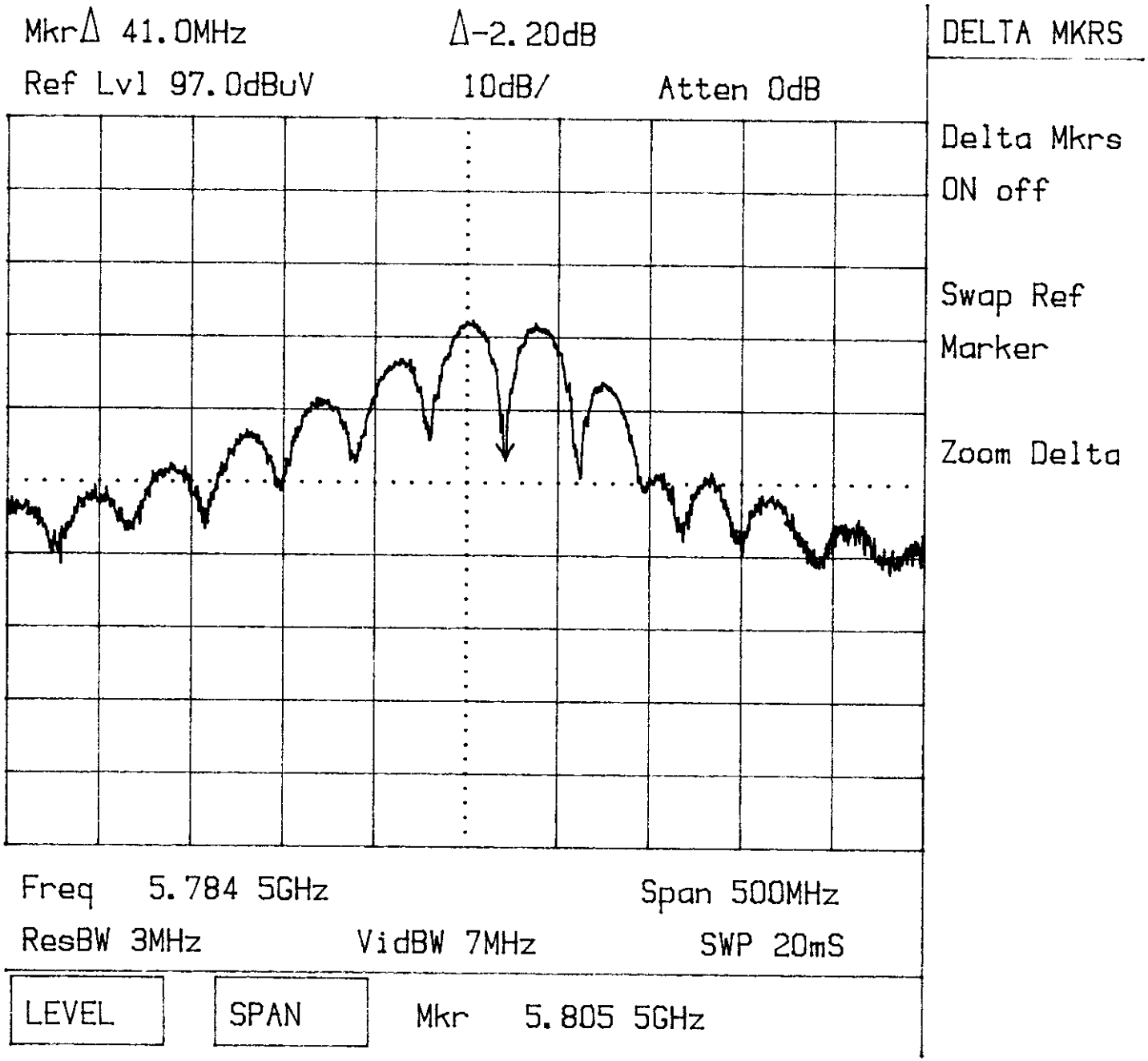
ITS Intertek Testing Services

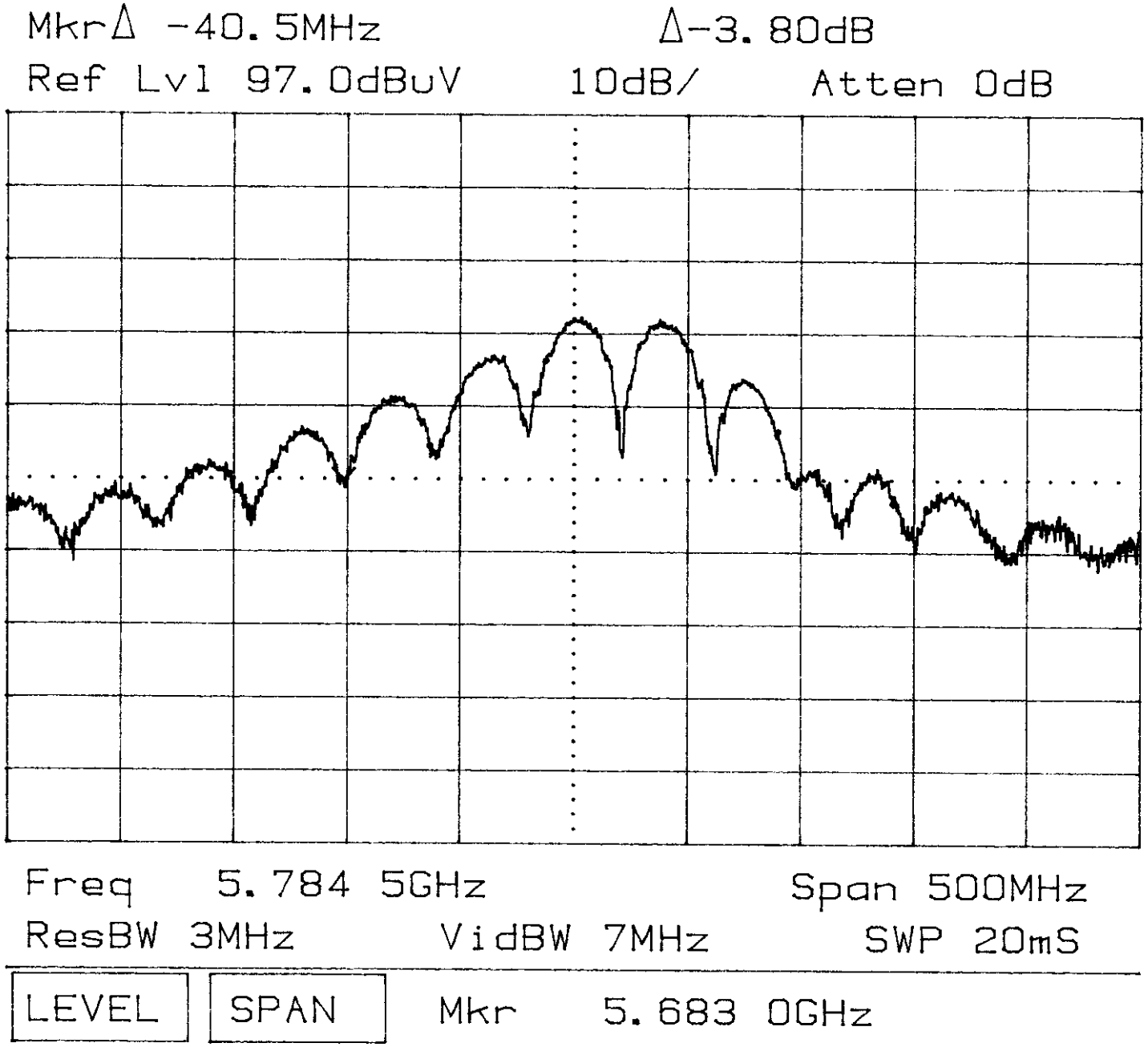
Company: Sentrol
Project #: J98018757
Model: Motion Detector (Modulated mode)
Engineer: Xi-Ming Yang
Date of test: July 2, 1998

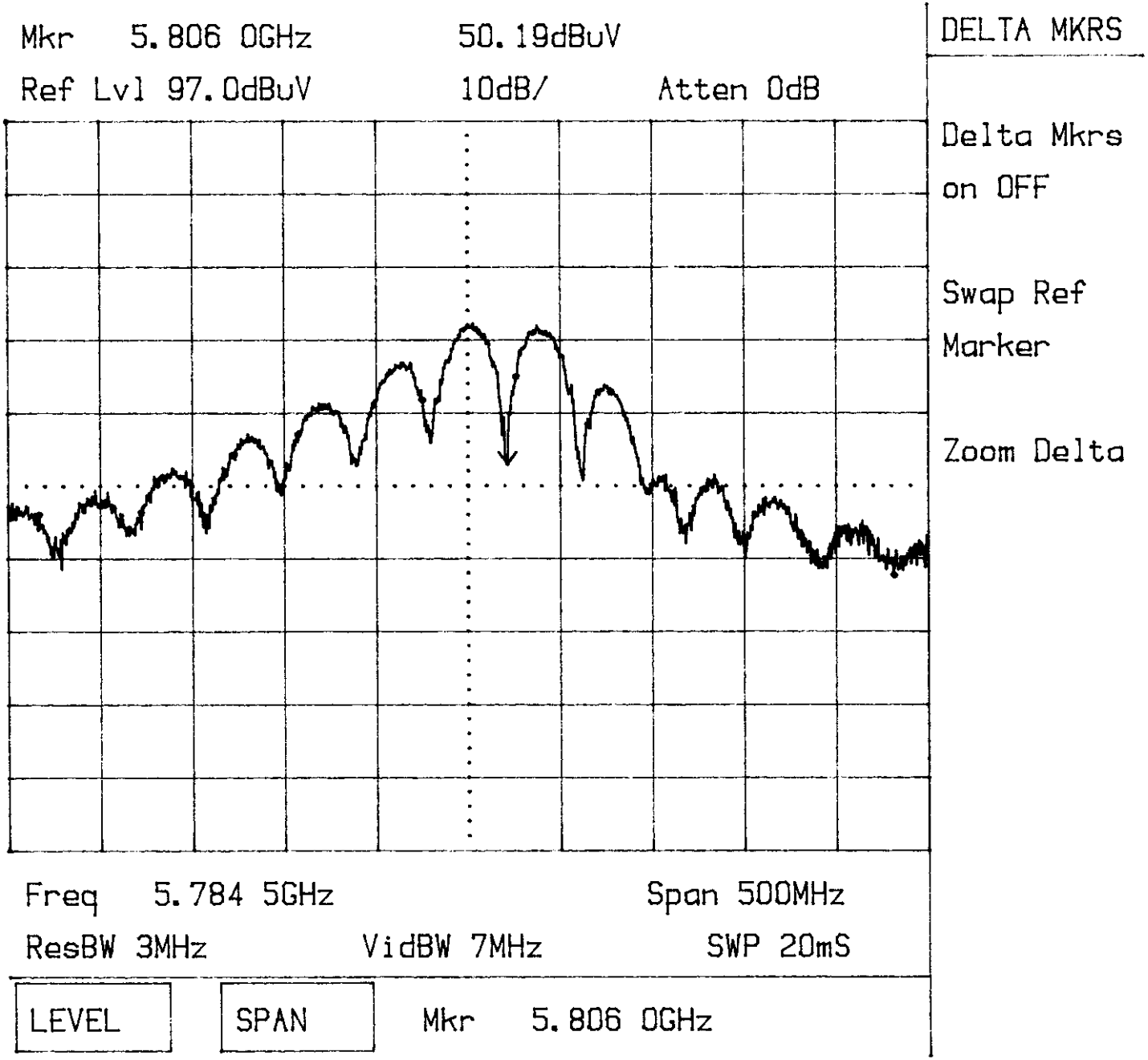
FCC 15.249 Radiated Emissions

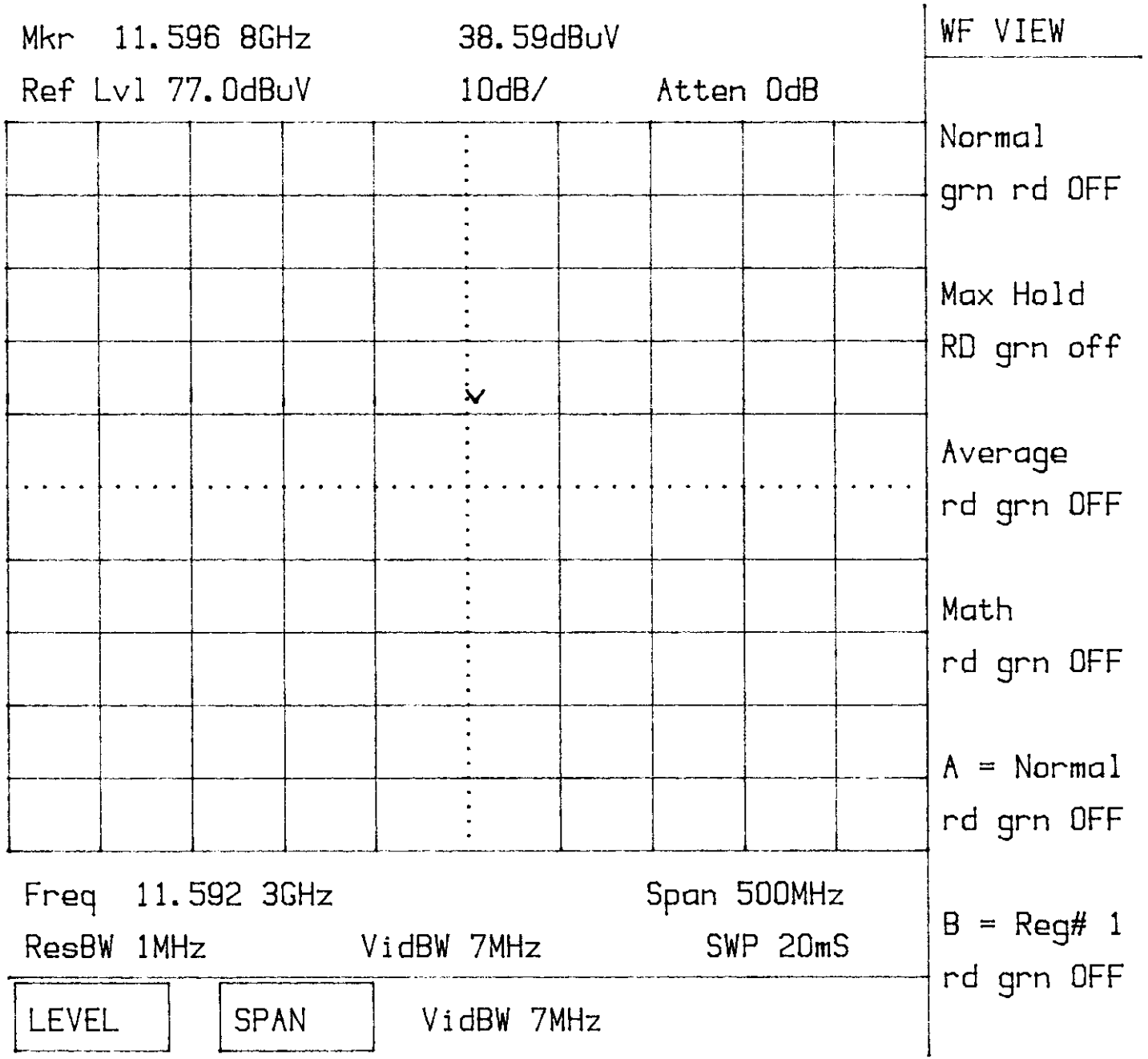
Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Duty Cyco	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
5706.8	V	51.0#	34.4	3.5	-28.3	-20.0	0.0	40.6	54.0	-13.4
5875.0	V	48.6#	34.4	3.5	-28.3	-20.0	0.0	38.2	54.0	-15.8
11596.8	H	38.6	39.0	5.9	-39.7	-20.0	0.0	23.8	54.0	-30.2
17426.0	H	35.5	44.9	7.5	-37.5	-20.0	0.0	30.4	54.0	-23.6
23233.8	H	35.4*	40.4	9.0	-24.2	-20.0	-9.5	31.1	54.0	-22.9
29041.6	H	46.5*	43.5	10.5	-25.9	-20.0	-9.5	45.1	54.0	-8.9
34961.0	H	46.1*	43.6	5.0	-23.8	-20.0	-9.5	41.4	54.0	-12.6
40000.0	H	51.5*	43.7	6.0	-24.4	-20.0	-9.5	47.3	54.0	-6.7

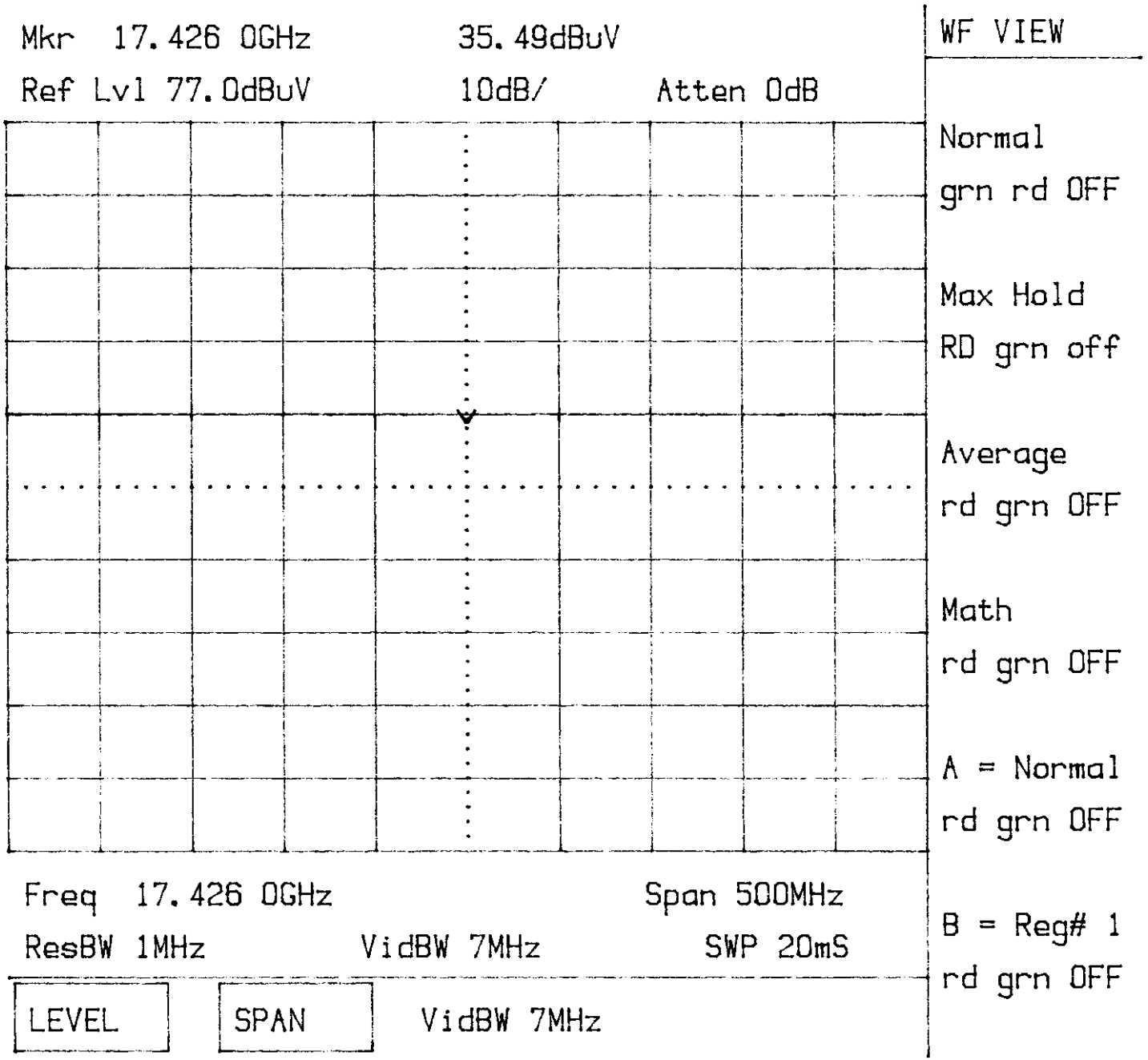
Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Read with * is made at 1 meters**
4. **Read with # is made at band edge**
5. **All readings are made with RBW= 1MHz and VBW=7MHz.**

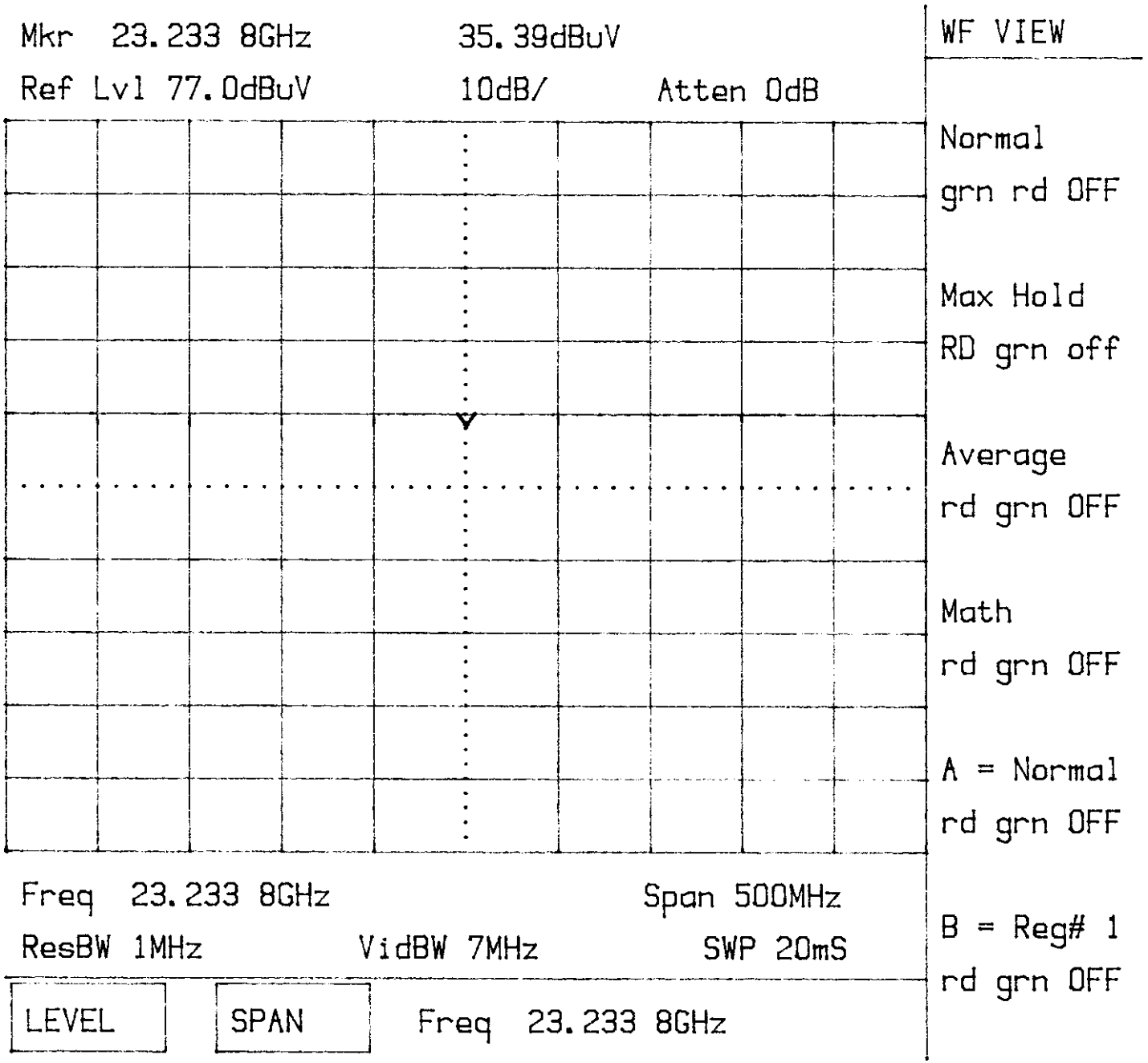

MkrΔ 41.0MHz
Δ-2.20dB
DELTA MKRS
Ref Lvl 97.0dBuV
10dB/
Atten 0dB
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
Freq 5.784 5GHz
Span 500MHz
ResBW 3MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
Mkr 5.805 5GHz

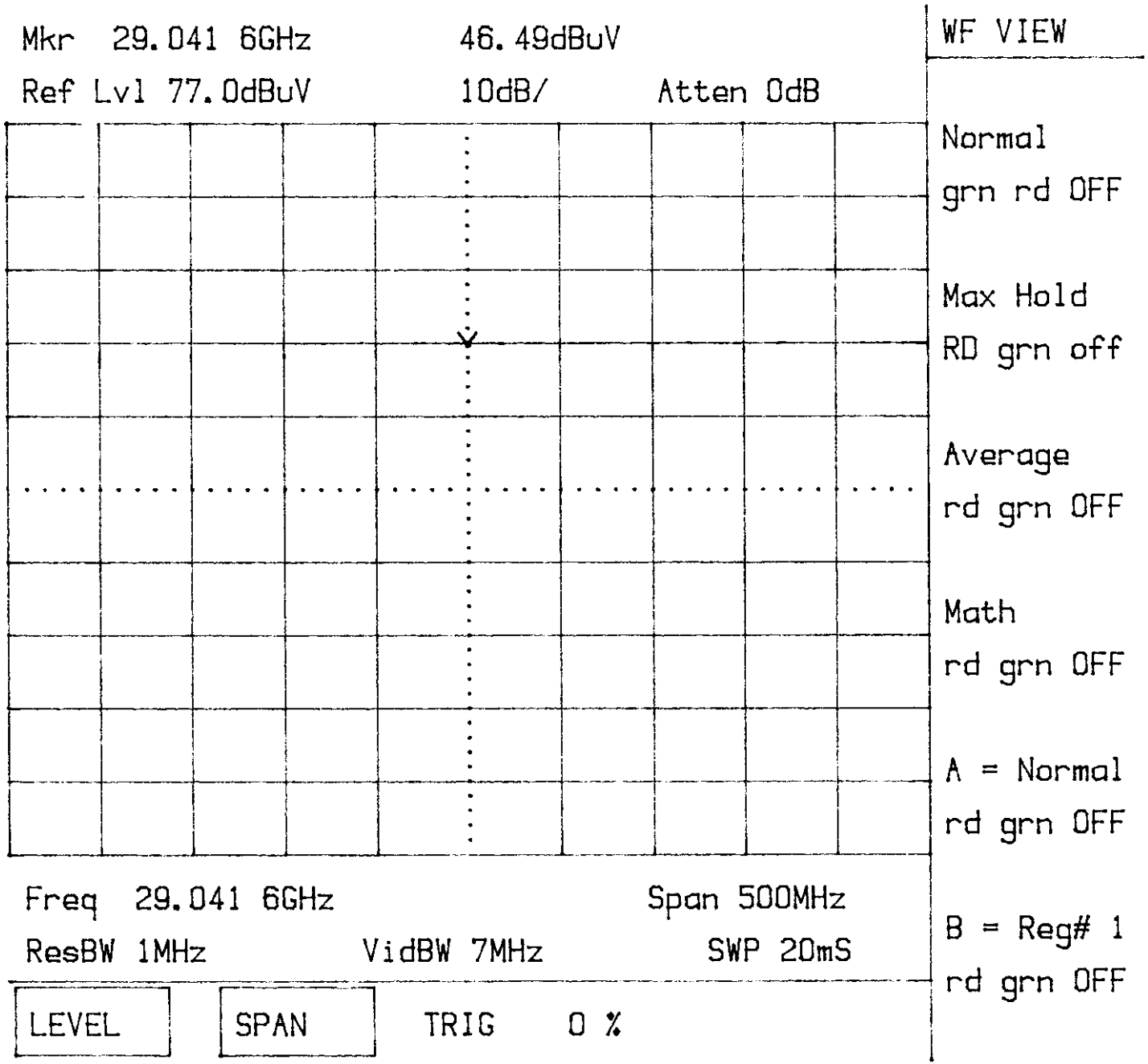

MkrΔ -40.5MHz
Δ-3.80dB
Ref Lvl 97.0dBuV
10dB/
Atten 0dB
Freq 5.784 5GHz
Span 500MHz
ResBW 3MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
Mkr 5.683 0GHz


Mkr 5.806 0GHz
50.19dBuV
Ref Lvl 97.0dBuV
10dB/
Atten 0dB
DELTA MKRS
Delta Mkrs
on OFF
Swap Ref
Marker
Zoom Delta
Freq 5.784 5GHz
Span 500MHz
ResBW 3MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
Mkr 5.806 0GHz


Mkr 11.596 8GHz
38.59dBuV
Ref Lvl 77.0dBuV
10dB/
Atten 0dB
Freq 11.592 3GHz
Span 500MHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
VidBW 7MHz
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


Mkr 17.426 0GHz
35.49dBuV
Ref Lvl 77.0dBuV
10dB/
Atten 0dB
Freq 17.426 0GHz
Span 500MHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
VidBW 7MHz
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


Mkr 23.233 8GHz
35.39dBuV
Ref Lvl 77.0dBuV
10dB/
Atten 0dB
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
Freq 23.233 8GHz
Span 500MHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
Freq 23.233 8GHz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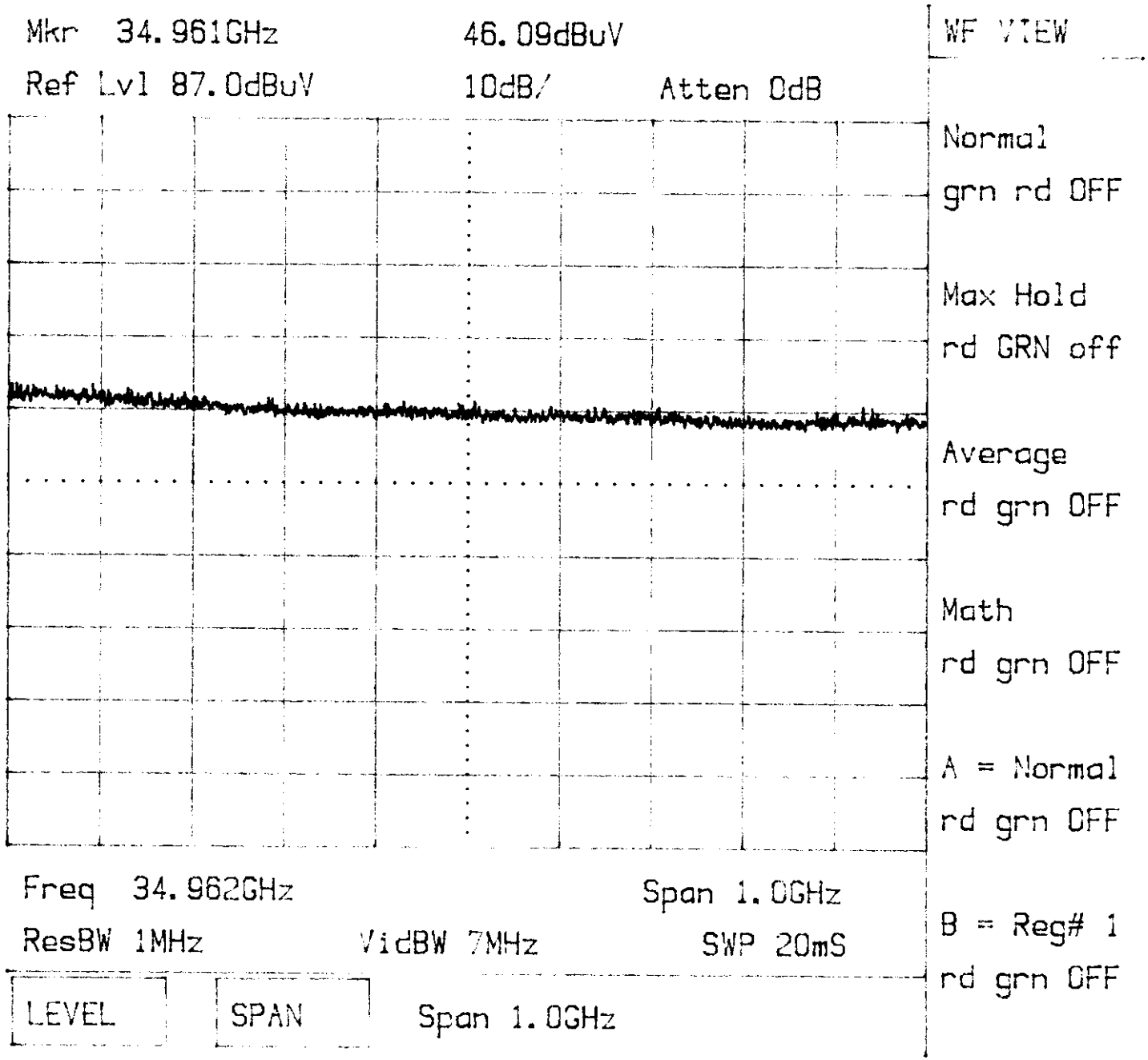
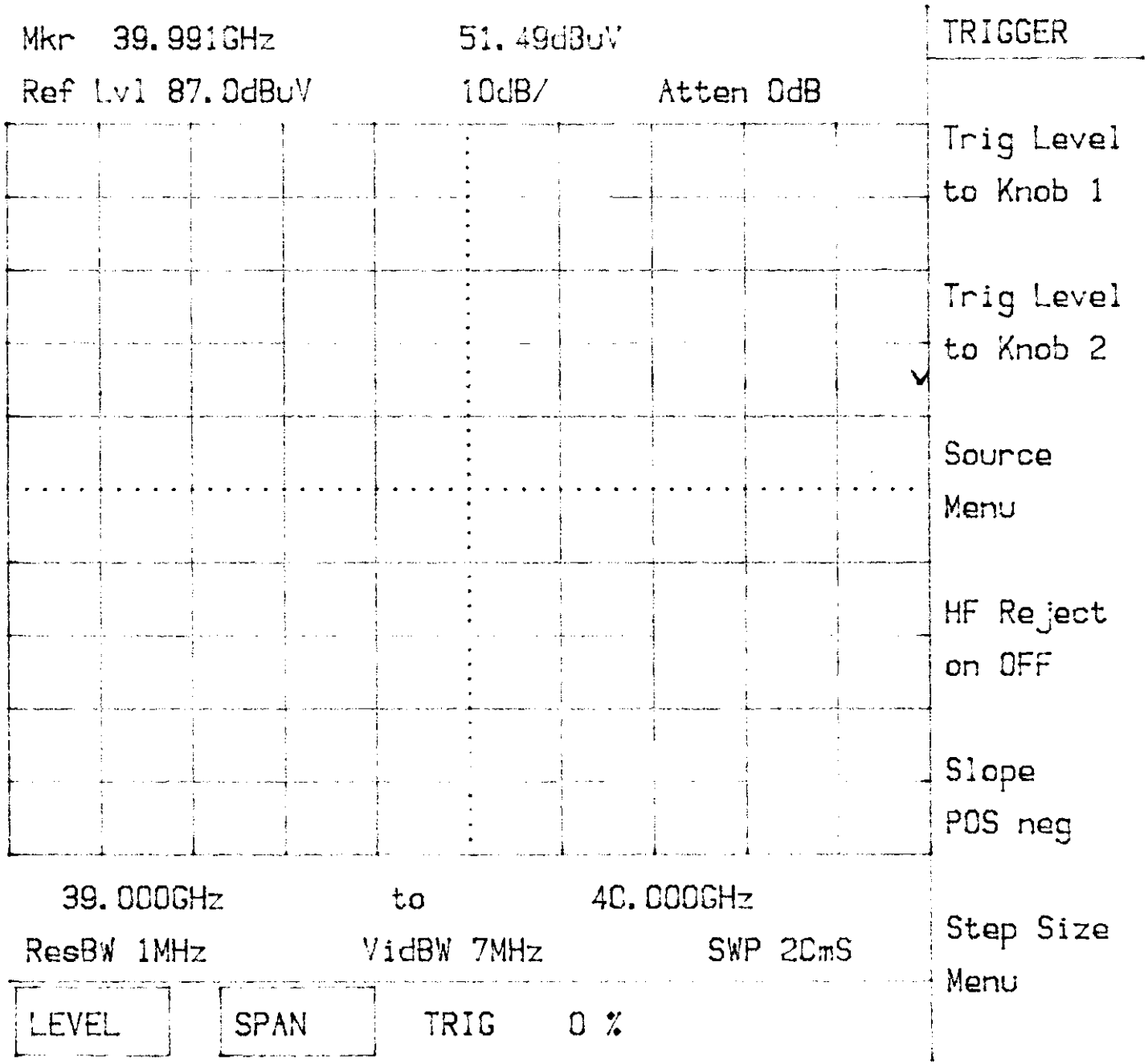
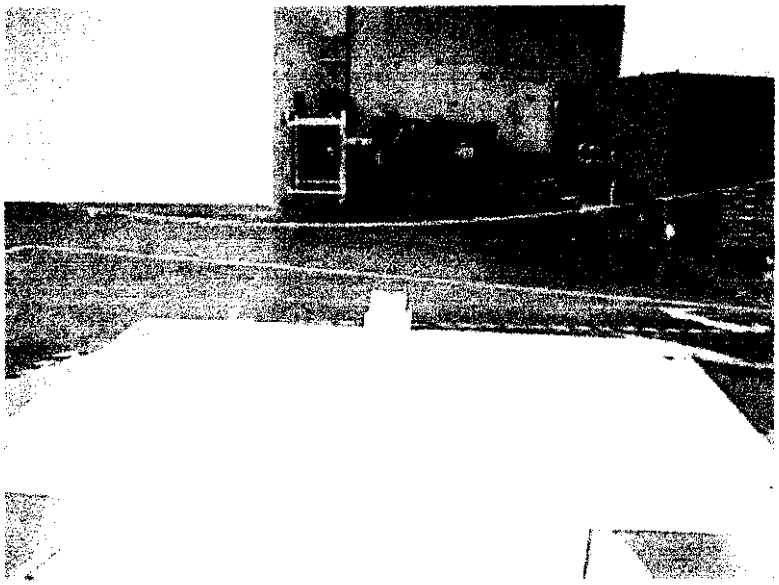
46.49dBuV
Ref Lvl 77.0dBuV
10dB/
Atten 0dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
Freq 29.041 6GHz
Span 500MHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
TRIG
0 %

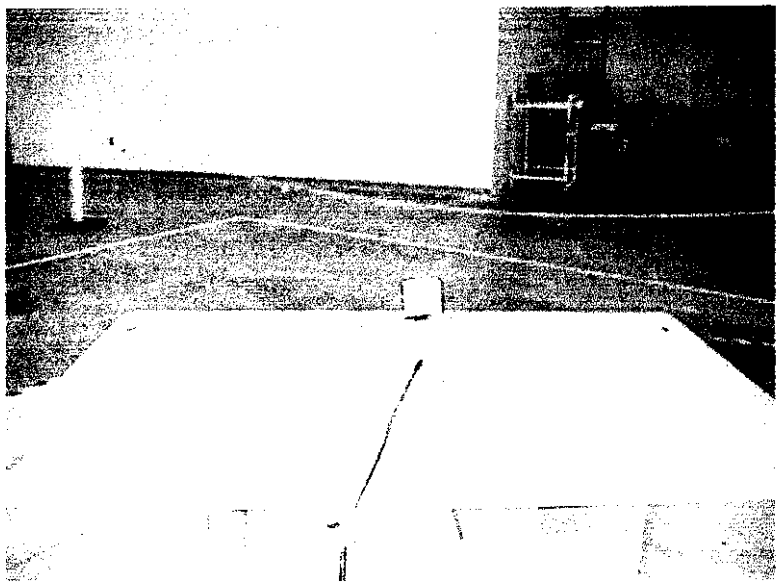

Mkr 34.961GHz
46.09dBuV
Ref Lvl 87.0dBuV
10dB/
Atten 0dB
WF VIEW
Normal
grn rd OFF
Max Hold
rd GRN off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
Freq 34.962GHz
Span 1.0GHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
B = Reg# 1
rd grn OFF
LEVEL
SPAN
Span 1.0GHz


Mkr 39.991GHz
51.49dBuV
Ref Lvl 87.0dBuV
10dB/
Atten 0dB
39.000GHz
to
40.000GHz
ResBW 1MHz
VidBW 7MHz
SWP 20mS
LEVEL
SPAN
TRIG 0 %
TRIGGER
Trig Level to Knob 1
Trig Level to Knob 2
Source Menu
HF Reject on OFF
Slope POS neg
Step Size Menu

4.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission





4.3 AC Line Conducted Emission, FCC Rule 15.207:

Not requested by client.

5.0 Equipment Photographs

Photographs of the EUT are attached. Total 4 Pages.

Sentrol, SLC Technologies, Inc.

Ranger RangeGated Radar
FCC ID: CGGAA2

FCC Part 15, Class B Verification Report

Report Prepared By:

Northwest EMC, Inc.
120 South Elliott Road, Suite 300
Newberg, OR 97132

(503) 537-0728
Fax: 537-0735

July 31, 1998

Report No. SENT0121

Table of Contents

1.0 General Information

1.1 Scope

This Test Report documents the results of the electromagnetic compatibility (EMC) testing performed by Northwest EMC, Inc. Details and results of testing performed on July 30, 1998 through July 31, 1998 are contained within.

1.2 Purpose

Testing was performed to evaluate the electromagnetic compatibility (EMC) performance of the EUT (Equipment Under Test).

1.3 Product Information

Manufactured By ..... Sentrol, SCL Technologies, Inc.
Address ..... 12345 SW Leveton Drive Tualatin, OR 97062
Test Requested By: ..... Steven McCoy
Model ..... Ranger RangeGated Radar
Serial Number ..... Prototype
Date of Test ..... July 30, 1998 through July 31, 1998
Receipt Date of Test Samples ..... July 30, 1998
Job Number SENT0121

1.4 Summary

Description	Specified Requirement	Results
Conducted Emissions	FCC Part 15, Class B	Pass
Radiated Emissions	FCC Part 15, Class B	Pass

Reviewed By:

Donald Facteau, EMC Engineer

Approved By:

Dean Ghizzone, President

1.5 Hardware Description

The EUT (Equipment Under Test) is the Sentrol, SLC Technologies, Inc., Ranger RangeGated Radar four-cell RangeGated field disturbance sensor with the primary function of detecting motion to a 35' distance.

Clocks/Oscillators: 5.8 GHz, 10 MHz Clock

EUT I/O Ports: Input, 12 VDC, Output, Relay, NO (Normally Open), NC (Normally Closed), Tamper and Microcontroller Test and L/F Pins.

CPU Speeds: 10 MHz

1.6 Tested System Details

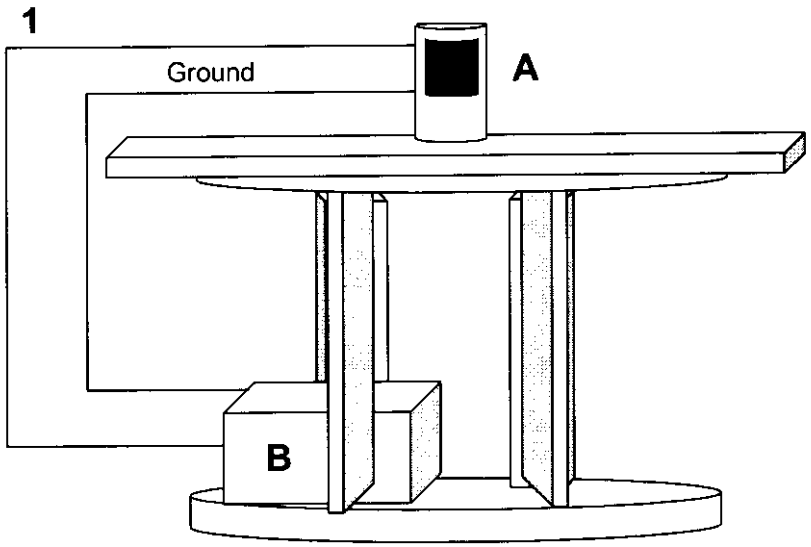
1.6.1 EUT and Peripherals

Diagram No.	Description	Manufacturer	Model/Part Number	Serial Number
A	EUT	Sentrol, SLC Technologies, Inc.	Ranger RangeGated Radar	Prototype
B	DC Power Supply	LG Precision	LG-43030	8011010

1.6.2 Cables

Diagram No.	Cable Type	Shield	Length (meters)	Ferrite	Connector	Connection Point 1	Connection Point 2
1	DC Power	N/A	1 Meter	N/A	Metal	EUT	Power Supply

Figure 1.6 Configuration of Tested System (Block Diagram)



1.7 Test Methodology

Description	Test Method	Year Issued
Conducted Emissions	ANSI C63.4	1992
Radiated Emissions	ANSI C63.4	1992

1.8 Test Facilities

Elliott Facility:
120 South Elliott Road
Suite 300
Newberg, OR 97132
(503) 537-0728
Fax: 537-0735

Trails End Facility:
30475 NE Trails End Lane
Newberg, OR 97132
(503) 648-0275
Fax: 537-5562

Hillsboro Facility:
5289 NE Elam Young Pkwy
Suite G-800
Hillsboro, OR 97124
(503) 648-0275
Fax: 648-3269

Bothell Facility:
19102 North Creek Pkwy
Suite 106
Bothell, WA 98011
(425) 485-0960
Fax: 485-3965

Sultan Facility:
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675
Fax: 793-2536

1.9 Accreditations and Authorizations

NVLAP
Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Lab Code: 200059-0.

FCC
The Open Area Test Sites, and conducted measurement facilities are located in Newberg, OR,. These sites have been fully described in reports filed with the FCC (Federal Communications Commission), and accepted by the FCC in letters maintained in our files.

TÜV Product Service
Northwest EMC, Inc. is included by TÜV Product Service Group in its Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements, (Certificate No. USA9601C).

TÜV Rheinland
Northwest EMC, Inc. has been authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO
Northwest EMC, Inc. has been assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

ITI
Northwest EMC, Inc. has been assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LAC0196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.

AUSTEL
Northwest EMC, Inc., has been accredited by AUSTEL (Australian Telecommunications Authority) as an approved third party test house. This approval is a part of the Technical Approvals Guide No. 3 (TAG3) issue 6.1, Telecommunications Equipment, Standards and Labeling.

New Zealand Ministry of Commerce
Northwest EMC, Inc., is an approved Testing Laboratory for the New Zealand Ministry of Commerce, Communications Division - Radio Operations.

VCCI
Northwest EMC, Inc. has been accepted as an Associate Member to the VCCI, Acceptance No. 564. The conducted and radiated measurement facilities located at 120 S. Elliott Road, Suite 300, Newberg, OR have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration No. R-165 and C-160. The conducted and radiated measurement facilities located at 30475 NE Trails End Lane, Newberg, OR have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration No. R-677 and C-694.

BCIQ
Northwest EMC, Inc., has been accredited by BCIQ (Bureau of Commodity Inspection and Quarantine) in Taiwan. As an accredited EMC Laboratory, our test data will be accepted for commodity EMC type approval in Taiwan. License No. SL2-IN-E-38T.

2.0 System Test Configuration

2.1 Justification

The EUT was configured to simulate typical use. Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O Cables. The mode of operation utilized for testing was selected in order to best simulate typical EUT use.

2.2 EUT Exercise Software

Application-specific software was utilized to exercise the EUT for each of the tests.

2.3 Special Accessories

No special accessories are sold with the EUT.

2.4 Equipment Modifications

The following modifications were made in order achieve EMI compliance:

- Added R151, 100 Ohm, and C152 and 33 pf to clock circuit output
- Added L3; 49 nH and C151; .001 μf to Vcc of U8 (forming pifiller network)
- Added series L1 and L2; .16 μH to 12 VDC Input and C153; .001 μf shunt cap from 12 VDC to ground.

3.0 Conducted Emissions Data

3.1 Test Description

The EUT shall meet the average limit and the quasipeak limit when using, respectively, an average detector and a quasipeak detector. If the average limit is met when using a peak or quasipeak detector, the EUT shall be deemed to meet both limits, making additional measurements unnecessary.

EUT Input Power for Test ..... 115 VAC, 60 Hz
Test Method ..... ANSI C63.4
Specification Limits ..... FCC Part 15, Class B

3.2 Test Procedure

The hot (high) and neutral (low) AC power leads of the EUT were scanned with a spectrum analyzer utilizing a peak detector throughout the specified frequency range. The results were plotted in graphical form with the peak emission levels compared to the average limits. All peak measurements with less than a 2 dB margin when compared to the average limit are re-measured using a quasipeak and/or average detector. Complete graphs and data sheets may be referenced on the following pages.

3.3 Laboratory/Measurement Equipment

Test Location: **EL01**

Instrument	Model	Serial No.	Freq. Range	Last Cal	Cal Due
LISN	Solar 9252-50-R24	971602	10 kHz - 50 MHz	04/09/98	04/09/99
LISN	Solar 9252-50-R24	971603	10 kHz - 50 MHz	04/09/98	04/09/99
Spectrum Analyzer	HP 8568B	2601A02125	100 Hz - 1.5 GHz	07/22/97	07/22/98

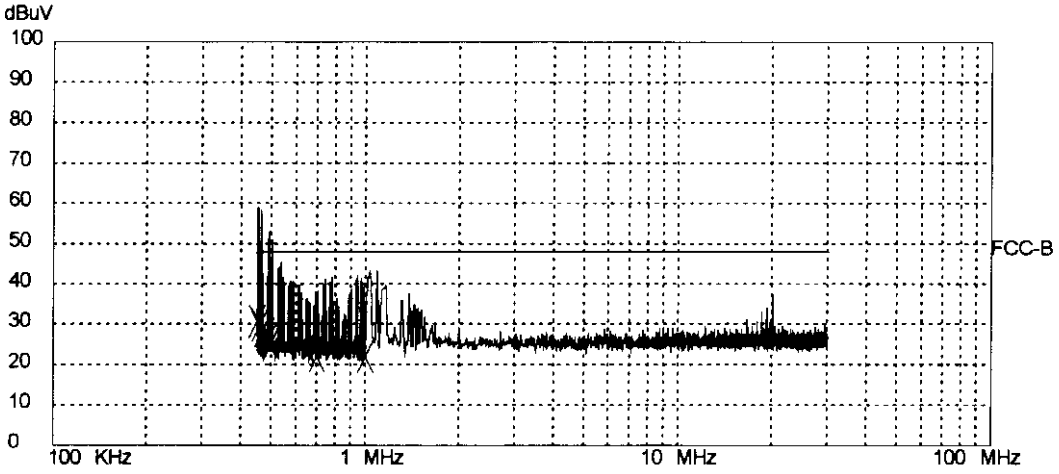
3.4 Test Results

* Positive (+) Margins = measured levels less than specification limit.
* Negative (-) Margins = measured levels greater than specification limit.

Judgment: Passed, minimum margin is 17.7dB.

Equipment Tested: RGR
Serial Number: prototype
Manufacturer: Sentrol, Inc.
Job Number: SENT0121
Date/Time: 07-31-1998 08:12:38
Tested By: Greg Kiemel, EL01
Comments: 33pF shunt C & 100 ohm series resistor on 10MHZ clock output. PI filter on VCC of oscillator. Run #8 120V, 60Hz mains

FCC Part 15 Class B Conducted Emissions Limits High

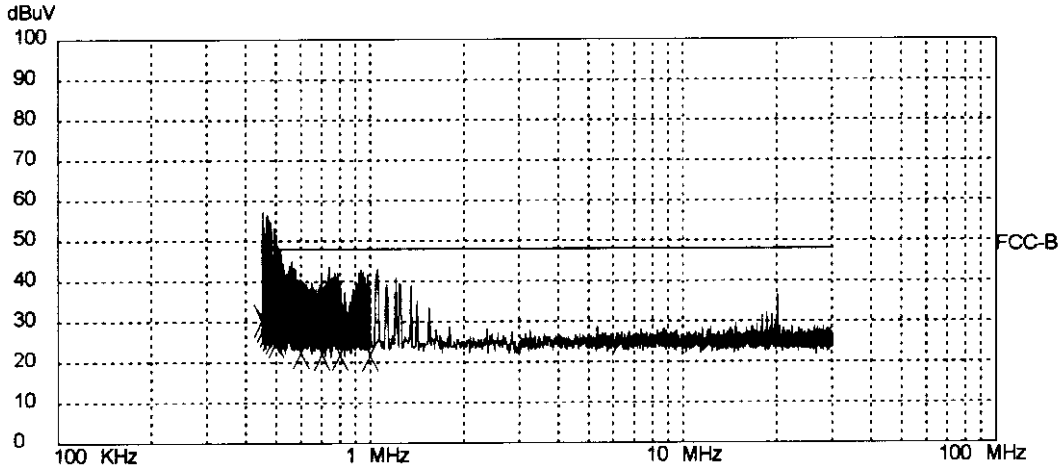


Frequency (MHz)	Meter Reading (dBuV)	Detector Function	Correction Factor (dB)	Line Tested	Adjusted Level (dBuV)	Spec. Limit (dBuV)	Compared To Limit (dB)
0.470	8.5	QP	20.0	High	28.5	56.5	-28.0
0.450	10.7	QP	20.0	High	30.7	56.9	-26.2
0.460	9.8	QP	20.0	High	29.8	56.7	-26.9
0.480	7.5	QP	20.0	High	27.5	56.3	-28.8
0.500	5.5	QP	20.0	High	25.5	56.0	-30.5
0.490	6.0	QP	20.0	High	26.0	56.2	-30.2
0.700	2.1	QP	20.0	High	22.1	56.0	-33.9
1.000	2.0	QP	20.0	High	22.0	56.0	-34.0

Northwest EMC, Inc.

Equipment Tested: RGR
Serial Number: prototype
Manufacturer: Sentrol, Inc.
Job Number: SENT0121
Date/Time: 07-31-1998 08:37
Tested By: Greg Kiemel, EL01
Comments: 33pF shunt C & 100 ohm series resistor on 10MHZ clock output. PI filter on VCC of oscillator. Run #8 120V, 60Hz mains

FCC Part 15 Class B Conducted Emissions Limits Low



Frequency (MHz)	Meter Reading (dBuV)	Detector Function	Correction Factor (dB)	Line Tested	Adjusted Level (dBuV)	Spec. Limit (dBuV)	Compared To Limit (dB)
0.450	10.3	QP	20.0	Low	30.3	56.9	-26.6
0.460	9.3	QP	20.0	Low	29.3	56.7	-27.4
0.470	8.1	QP	20.0	Low	28.1	56.5	-28.4
0.480	7.0	QP	20.0	Low	27.0	56.3	-29.3
0.490	6.1	QP	20.0	Low	26.1	56.2	-30.1
0.500	5.3	QP	20.0	Low	25.3	56.0	-30.7
0.600	2.6	QP	20.0	Low	22.6	56.0	-33.4
0.700	2.1	QP	20.0	Low	22.1	56.0	-33.9
0.800	2.0	QP	20.0	Low	22.0	56.0	-34.0
1.000	1.9	QP	20.0	Low	21.9	56.0	-34.1

4.0 Radiated Emissions Data

4.1 Test Description

Radiated emissions measurements are made in the frequency range of 30 MHz - 1000 MHz, using instrumentation that incorporates a quasipeak detector. Measurement distances are specified by the test specification.

Test Method ..... ANSI C63.4
Specification Limits ..... FCC Part 15, Class B

4.2 Test Procedure

Emission frequencies, total (corrected) levels, specification margins, correction factors, antenna height, table azimuth, etc., are contained in the graphs and tables on the following pages. Explanation of the correction factors is provided in this report.

Test Distance (Antenna to EUT) ..... 3 meters

4.3 Laboratory/Measurement Equipment

Test Location **EL02**

Instrument	Model	Serial No.	Freq. Range	Last Cal	Cal Due
Bicon Antenna	ARA BCD-235/B	1042	30 MHz - 200 MHz	01/31/98	01/31/99
Log Periodic Antenna	EMCO 3146	9006-2809	200 MHz - 1000 MHz	01/31/98	01/31/99
Pre-Amplifier	LN1000AM3	21913	10 kHz - 1000 MHz	10/03/97	10/03/98
Quasi-Peak Adapter	HP 85650A	2043A00214	10 kHz - 1000 MHz	07/22/97	07/22/98
Spectrum Analyzer	HP 8568B	2601A02125	100 Hz - 1.5 GHz	07/22/97	07/22/98

4.4 Test Results

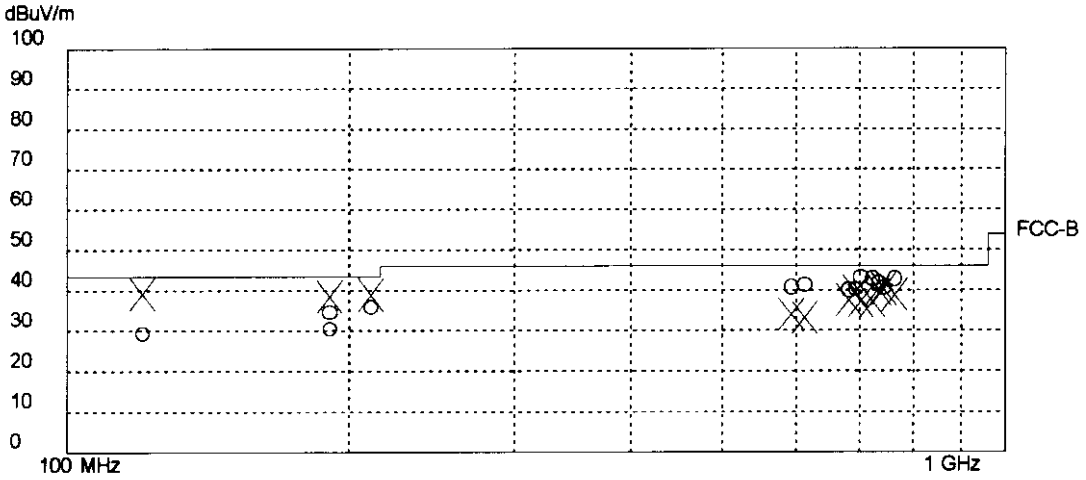
* Positive (+) Margins = measured levels less than specification limit.
* Negative (-) Margins = measured levels greater than specification limit.

Judgment: Passed, minimum margin of 2.7 dB.

EUT Name: RGR
Serial Number: prototype
Manufacturer: Sentrol, Inc.
Job Number: SENT0121
Test Date: 07-30-1998
Tested By: Greg Kiemel, EL01
Test Distance: 3 meters.
Comments: 33pF shunt C & 100 ohm series resistor on 10MHZ clock output. PI filter on VCC of oscillator. Run #8 Added 1000pF on DC input. Series ferrites on short DC cables.

Horizontal= X
Vertical = O

FCC Class B (3 Meter Limit)



Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
702.530	48.3	QP	21.4	VLPA	32.1	5.7	43.3	46.0	80.0	1.5	-2.7
763.003	47.1	QP	21.7	VLPA	32.1	6.1	42.8	46.0	20.0	1.5	-3.2
722.653	47.3	QP	21.8	VLPA	32.1	5.8	42.8	46.0	90.0	1.7	-3.2
120.414	58.0	QP	11.5	HBIC	32.2	2.0	39.3	43.5	0.0	1.5	-4.2
732.884	46.1	QP	21.8	VLPA	32.1	5.9	41.7	46.0	0.0	1.0	-4.3
210.829	56.9	QP	11.5	HLPA	32.0	2.6	39.0	43.5	350.0	1.5	-4.5
612.188	49.0	QP	19.1	VLPA	32.0	5.3	41.4	46.0	75.0	1.0	-4.6
190.657	54.3	QP	13.8	HBIC	32.0	2.5	38.6	43.5	180.0	1.0	-4.9
592.103	48.8	QP	18.8	VLPA	32.0	5.2	40.8	46.0	75.0	1.0	-5.2
742.924	45.1	QP	21.8	VLPA	32.1	6.0	40.8	46.0	170.0	1.0	-5.2
692.726	45.6	QP	21.2	VLPA	32.1	5.7	40.4	46.0	200.0	1.0	-5.6
732.885	44.7	QP	21.8	HLPA	32.1	5.9	40.3	46.0	90.0	1.5	-5.7
742.920	44.6	QP	21.8	HLPA	32.1	6.0	40.3	46.0	100.0	1.4	-5.7
682.405	45.5	QP	21.1	VLPA	32.1	5.6	40.1	46.0	180.0	1.0	-5.9
692.727	44.8	QP	21.2	HLPA	32.1	5.7	39.6	46.0	0.0	1.5	-6.4
763.001	43.2	QP	21.7	HLPA	32.1	6.1	38.9	46.0	20.0	1.4	-7.1
210.835	54.0	QP	11.5	VLPA	32.0	2.6	36.0	43.5	180.0	1.0	-7.4
682.359	43.0	QP	21.1	HLPA	32.1	5.6	37.6	46.0	80.0	1.4	-8.4
702.447	42.3	QP	21.4	HLPA	32.1	5.7	37.3	46.0	200.0	1.4	-8.7
722.524	41.8	QP	21.8	HLPA	32.1	5.8	37.3	46.0	200.0	1.4	-8.7

Temperature 70F 60% Humidity

4.5 Field Strength Calculations

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

FS = RA + AF + CF - AG
where : FS = Field Strength

RA = Measured Level

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/meter.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/meter

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

4.6 Measurement Uncertainty

When a measurement is made the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value.

EL02	Probability Distribution	Uncertainty (dB) Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty U (level of confidence ≈ 95%)	normal (k=2)	+ 3.72 - 3.77	+ 3.82 - 3.73	+ 4.46 -2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: **k**. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then k=3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.

"ISO Guide to the Expression of Uncertainty in Measurements" and "NIS81: The Treatment of Uncertainty in EMC Measurements" were the basis for determining the uncertainty levels of our measurements. Details of those calculations are available upon request.

4.7 Measurement Bandwidths

Peak Data

150 kHz - 30 MHz ..... 10 kHz
30 MHz - 1000 MHz ..... 100 kHz

Quasi-peak Data

150 kHz - 30 MHz ..... 9 kHz
30 MHz - 1000 MHz ..... 120 kHz

Measurements were made using the Bandwidths and detectors specified. No video filter was used.

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT

OF

FCC ID : CGGAA2

PRESENCE SENSOR (6.25 GHz TRANSMITTER)

MODEL NO.:DOLPHIN PRESENCE SENSOR

S/N: N/A

REPORT NO: 97E5794

FEBRUARY 18,1997

Prepared for

SENTROL ,INC.
12345 SW LEVETON DRIVE
TUALATIN, OR 97062

Prepared by

COMPLIANCE ENGINEERING SERVICES, INC.
1366 BORDEAUX DRIVE
SUNNYVALE CA 94089

TABLE OF CONTENTS PAGE

1. VERIFICATION OF COMPLIANCE

COMPANY NAME : SENTROL,INC.
12345 SW LEVETON DRIVE
TUALATIN, OR 97062

CONTACT PERSON : MR. KEVIN McDONALD

TELPHONE NO : (503)692-4052

EUT DESCRIPTION : PRESENCE SENSOR (6.25GHz TRANSMITTER)

MODEM NAME : DOLPHIN PRESENCE SENSOR

DATE TESTED : FEBRUARY 18,1997

LIMIT APPLY TO :FCC PART 15 SECTION 15.205/SECTION 15.209	
TECHNICAL LIMITS	**TEST RESULT**
Restricted Band of Operation	Passed
LIMIT APPLY TO :FCC PART 15 SECTION 15.207	
AC Line Conducted Emission	Passed

The above equipment was tested by Compliance Engineering Services Inc. for compliance with the requirement set forth in the requirements of CFR 47 PART 15 SUBPART C. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

THOMAS N. COKENIAS/ EMC DIRECTOR
COMPLIANCE ENGINEERING SERVICES,INC.

COMPLIANCE CONSULTING SERVICES
1366 BORDEAUX DRIVE SUNNYVALE,CA 94089
DOCUMENT NO:CCSUP4017B
TEL:(408)752-8166 FAX:(408)752-8168

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

CHASSIS TYPE	**METAL**
CentralFrequency	**6.25 GHz**
Local Osc./Location	**Y1:4MHz**
Modulation Technique	**HOMODYNE**
Transmitted Pulse Width	**4 nanoseconds w/ a half-sine envelope shape**
Pulse Repetition Frequency (PRF)	**125kHz**

EUT is designed to detect the presence of moving human sized objects within a certain range. Moving objects beyond the calibrated range are not sensed. Stationary objects are not sensed becasue the system is AC coupled.

3. TEST LOCATION

All emissions tests were performed at:

Compliance Consulting Services
561F Monterey Road
Morgan Hill, CA 95087

CCS has site descriptions on file with the FCC for 10m and 3m site configurations. CCS is a NVLAP accredited facility.

Radiated emissions from the digital portion of the EUT were performed on site B, one of the 10 m sites.

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4. TEST PROCEDURES AND TEST RESULTS

Radiated Emissions (General Requirements)
Test Requirement: 15.205/15.209

Measurement Equipment Used:

HP 8563E Spectrum Analyzer
HP 8449 B Preamplifier, 1-26 GHz
ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 Ghz
ARA MWH 1826/B Horn Antenna, 18-26 GHz
QIM "The Workhorse" low loss cable, 9ft (loss: 0.85 dB/ft@ 26 GHz)
HP 11970A Harmonic Mixer, 26.5 - 40GHz

Test Set-Up

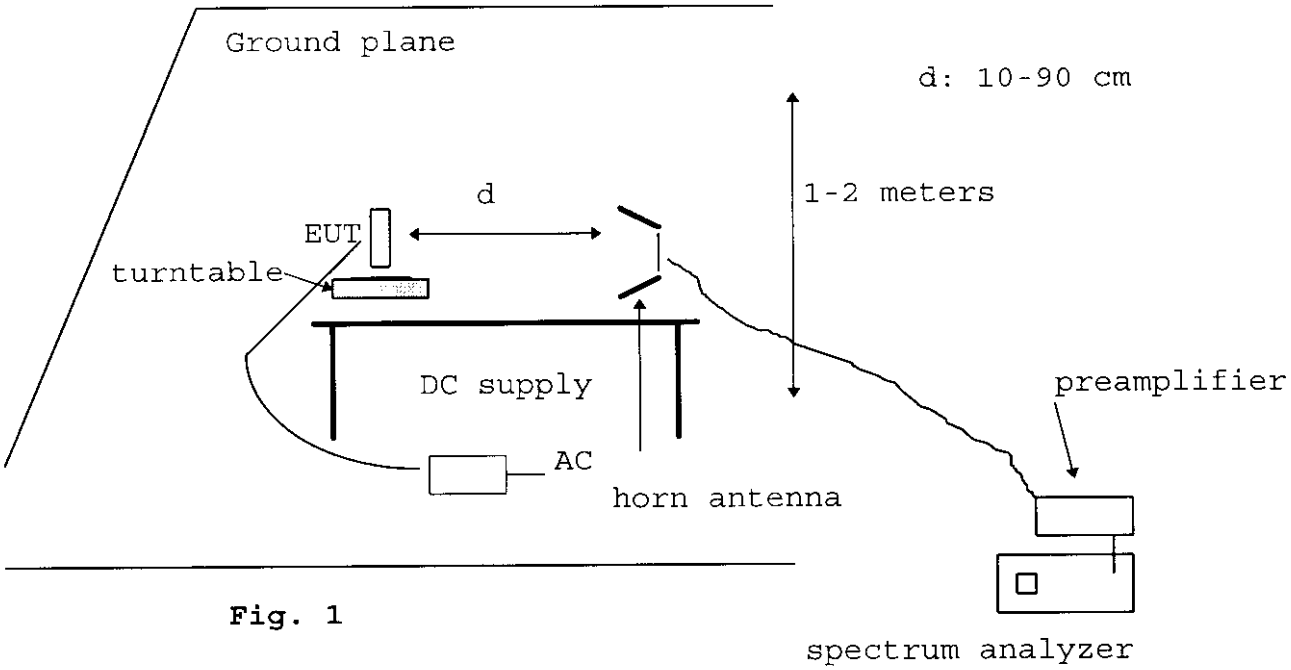

Fig. 1

Test Procedures

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3 ft from the EUT. The EUT antenna was mounted vertically as per normal installation.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the horn antenna.

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In the 26.5 - 40 GHZ range, the horn antenna was replaced by a standard gain horn attached to the HP11970 external harmonic mixer.

3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recored in the data listed below.

Test Results: Refer to attached tabular data sheets

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Radiated Emissions

18-Feb-97

Sentrol, Inc.

T.N. Cokenias

Dolphin Presence Sensor

Site F 1 meter

FCC Rule Part: 15.209

Measurements below 19 GHz:

F(MHz)	Reading dBuV	AF dB	Amplifier dB	CL dB	DIST dB	Other dB	Total dBuV/m	Limit dBuV/m
6305Pk	69.5	37.8	-35.5	3.2	-10.45	0.0	64.55	74.0
6305Av	36.7	37.8	-35.5	3.2	-10.45	0.0	31.75	54.0
12633Pk	45.8	43.3	-35.5	4.7	-20.0	0.0	38.3	74.0
12633Av	27.8	43.3	-35.5	4.7	-20.0	0.0	20.3	54.0
8812PkN	37.3	57.1	-35.5	6.2	-20.0	0.0	45.1	74.0
8812AvN	27.7	57.1	-35.5	6.2	-20.0	0.0	35.5	54.0

Note: Duty cycle = 20 log(50nsec/8000 nsec) = -44.1 dB

Duty cycle correction was **not** added to peak reading to obtain average reading

Measurments Above 19 GHz:

F(MHz)	Reading dBm	Gain dBi	E@10 cm dBuV/m	DIST dB	E@3m dBuV/m	Limit dBuV/m	Margin dB
25149NF	-65.0	24.8	76.9	-29.5	47.0	54.0	-7.0
31250NF	-72.3	15.7	78.8	-29.5	49.3	54.0	-4.7
37750NF	-74.8	17.0	76.9	-29.5	47.0	54.0	-7.0

Duty cycle correction was **not** added to peak reading to obtain average reading

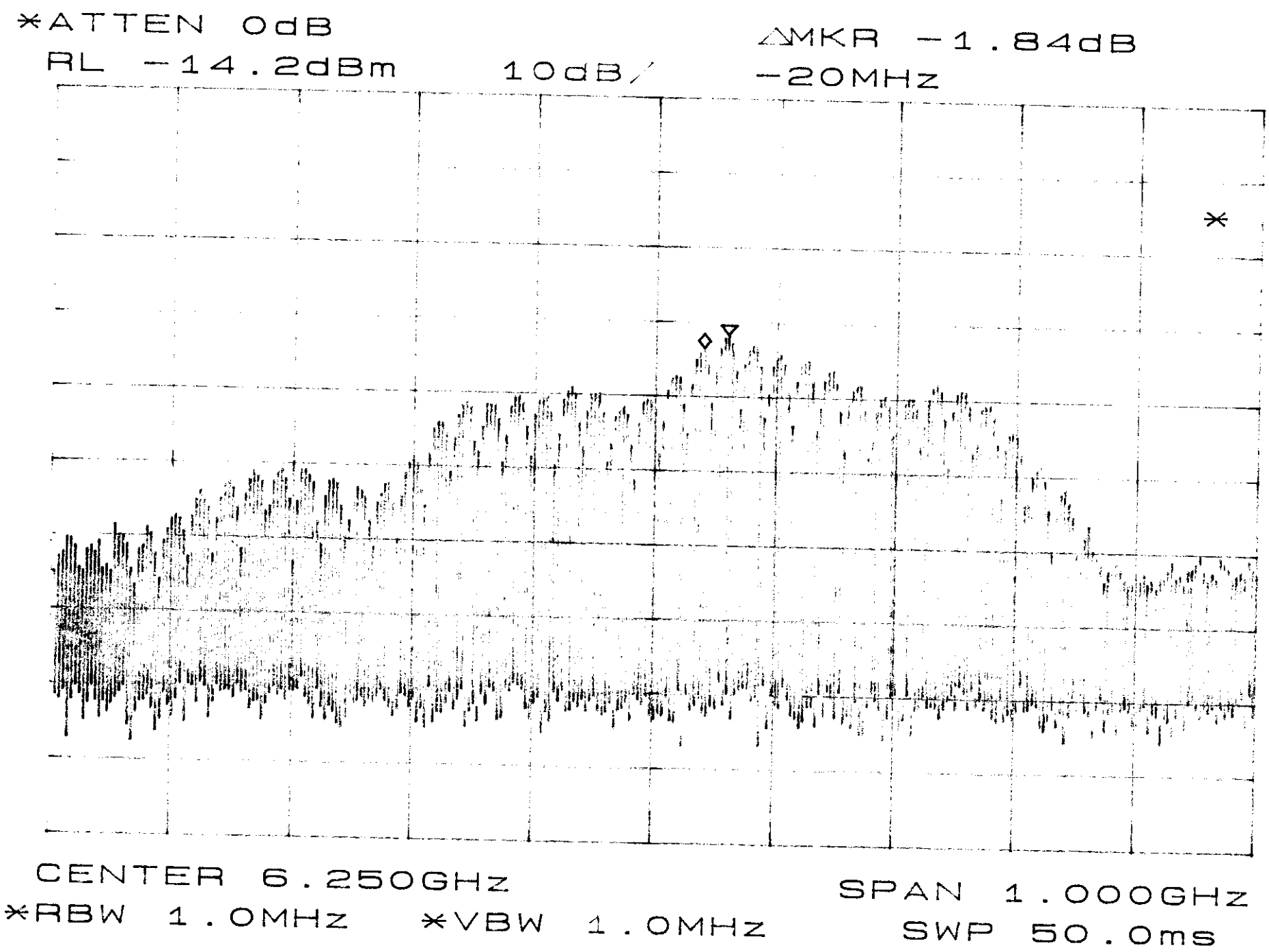
Effective Area of antenna = A = (L)^2*G/4*pi

G = gain isotropic, numeric

Pant = SA=E*H*A = (E)^2/(120*pi)*A, watts/

L= wavelength, meters

E,v/m = (pi/L)*21.9*(P/G)^(0.5)


*ATTEN 0dB
RL -14.2dBm
10dB/
ΔMKR -1.84dB
-20MHz
CENTER 6.250GHz
*RBW 1.0MHz
*VBW 1.0MHz
SPAN 1.000GHz
SWP 50.0ms

AC Line Conducted Emissions
Test Requirement: 15.207

Measurement Equipment Used:

Rohde & Schwarz EMI Receiver ESHS-20
Fischer Custom Communication LISN, FCC-LISN-50/250-25-2

Test Set-up

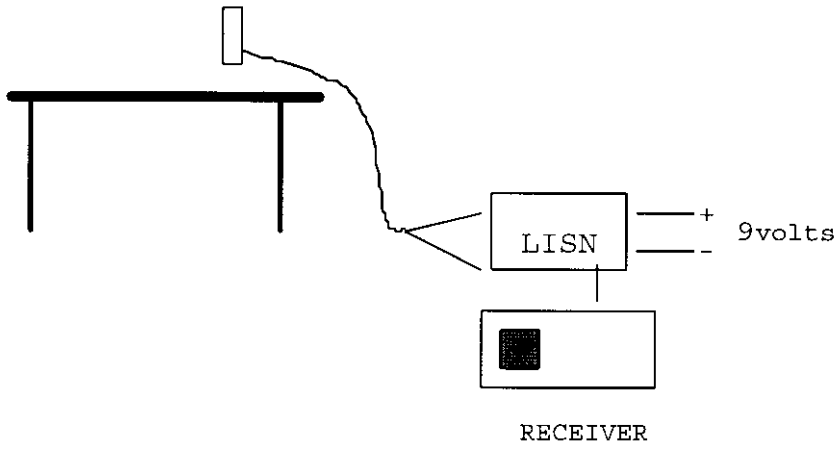


Fig. 2

Test Procedure

The EUT operates on DC power only. The DC is supplied by a non-specific AC to DC converter. The DC supply used for the radiated test was not designed for EMI suppression and introduced noise into the test set-up. To determine the RF noise (if any) coming from the EUT, the equipment was set up as shown in Figure 2, and DC was supplied to the EUT through a LISN. Any emissions produced by the EUT in the .45 - 30 Mhz region could then be measured without ambiguity.

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in a normal hopping mode.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

Test Results

Refer to attached graph.

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1366 BORDEAUX DRIVE SUNNYVALE,CA 94089
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TEL:(408)752-8166 FAX:(408)752-8168

COMPLIANCE ENGINEERING SERVICES INC.

RFI VOLTAGE

EUT: DOLPHIN MOTION SENSOR
Manuf: SENTROL
Op Cond: 6.25GHZ CENTER FREQUENCY
Operator: MIKE ZHU
Test Spec: FCC CLASS B
Comment: Line hot black. nuetral blue
8Vdc

Fast Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	500k	3k	10k	PK	0.05ms	10dBLN	OFF	60dB
500k	30M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB

Final Measurement: x QP
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

Transducer No.	Start	Stop	Name
1	10k	30M	FISCHER