

EMC Testing Laboratories, Inc.

RF Emissions Test Report To Determine Compliance With: FCC, Part 15, Subpart B and C Rules and Regulations

Model number: PowerLine Guardian. **FCC ID:** QPS01002

Date: October 29, 2014

Manufacturer: Smart Wire Grid, Inc.
1300 Clay Street, Suite 840
Oakland, CA 94612

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Section 1

GENERAL INFORMATION

Manufacturer: Smart Wire Grid, Inc.
1300 Clay Street, Suite 840
Oakland, CA 94612

Manufacturer representative: **Ms. Julie Couillard**

Equipment covered by this report: Model no. PowerLine
Guardian

Options covered by this report: None

Equipment serial no. Prototype

Test specifications: To determine compliance with:
FCC, Part 15, Subpart B and C,
Rules and Regulations, Class A.

Test report number: 14-193A

Test commenced: October 9, 2014

Test completed: October 29, 2014

Test engineer: **Jeff Hamilton**

Test Facility: The test facility used to perform these tests is on
file with the FCC under registration number 637500
and IC no. 3519A and located at:

EMC Testing Laboratories, Inc.
2100 Brandon Trail
Suite 101
Alpharetta, GA 30004
770-475-8819

Section 2

PRODUCT DESCRIPTION AND TEST SUMMARY

Product description:

The PowerLine Guardian turns on automatically when the power line is powered on. Once powered on, the PLG communicates to a base station using the RF link which utilized 915MHz band or 868MHz band depending on the local regulations. The RF link is then used to turn the control system of the PLG on and off to allow for smart power flow control for the grid. In addition to enabling and disabling the features of the PLG, the radio link communicates the current status of the PLG to the base station. The PowerLine Guardian is equipped with an optional cellular modem that may utilize the cellular service available in the area.

The integral antennas are manufactured as follows: ISM band: Taoglas, part no. IS.05.B.301111, Gain: 1.15dBi max, GSM band: Taoglas, part no. G21.B.301111 Gain: 2.2dBi max

The connector is a reverse threaded SMA.

The product, model no. PowerLine Guardian encloses the following component judged as critical:

- 1- Radio, 915/868MHz:** Manufactured by Texas Instruments CC1101 transceiver and CC1190 power amplifier. GSM (cellular): TELIT HE910D
- 2- Main board:** Manufacturer by New Potato, part no. P100544 Rev A.
- 3- Integral antenna:** Manufactured by TAOGLAS model number IS.05.B.301111. ISM band: omnidirectional, dome and model no. G21.B.301111. GSM band: omnidirectional, dome.
- 4- Enclosure:** Formed of metal. Overall dimensions of 56 in. long by 11 in. high by 8.5 in. wide.

The test results apply only to the products identified on the test report.

Test configuration:

The equipment under test (EUT) was set-up and configured as specified by the manufacturer as follows:

- 1-** The product was connected to the following support peripherals:

Product Description and Test Summary ...

A. A laptop.

2- The EUT utilized the following cables and were connected as indicated below:

A- An Ethernet cable between the product and laptop.

Modifications:

The following modifications were required to comply with the radiated emission limits:

1- None

Engineering Statement:

All measurement data of this test report was taken in accordance with the FCC, Subpart C, Part 15.247, Class A Rules and Regulations and ANSI C63.4-(03) by EMC Testing Laboratories, Inc. located in Alpharetta, Georgia. Although this data is taken under stringent laboratory conditions and to the best of our knowledge, represents accurate data, it must be recognized that emissions from or immunity to this type equipment may be greatly affected by the final installation of the equipment. Therefore, EMC Testing Laboratories, Inc., while supporting the accuracy of the data in this report, takes no responsibility for use of equipment based on these tests. The manufacturer of this equipment must take full responsibility for any field problems which may arise, and agrees that EMC Testing Laboratories, Inc., in performing its functions in accordance with its objectives and purposes, does not assume or undertake to discharge any responsibility of the manufacturer to any other party or parties.

Conclusion:

With the above-indicated modifications, the product covered by this report has been tested and found to comply with the above-indicated standards.

Tested by: **Jeff Hamilton, RF Technician**

Approved by: _____
Gene Bailey, Engineering Manager,
EMC Testing Laboratories, Inc.

Section 3

STANDARD REFERENCE

The following primary standards were used for this test:

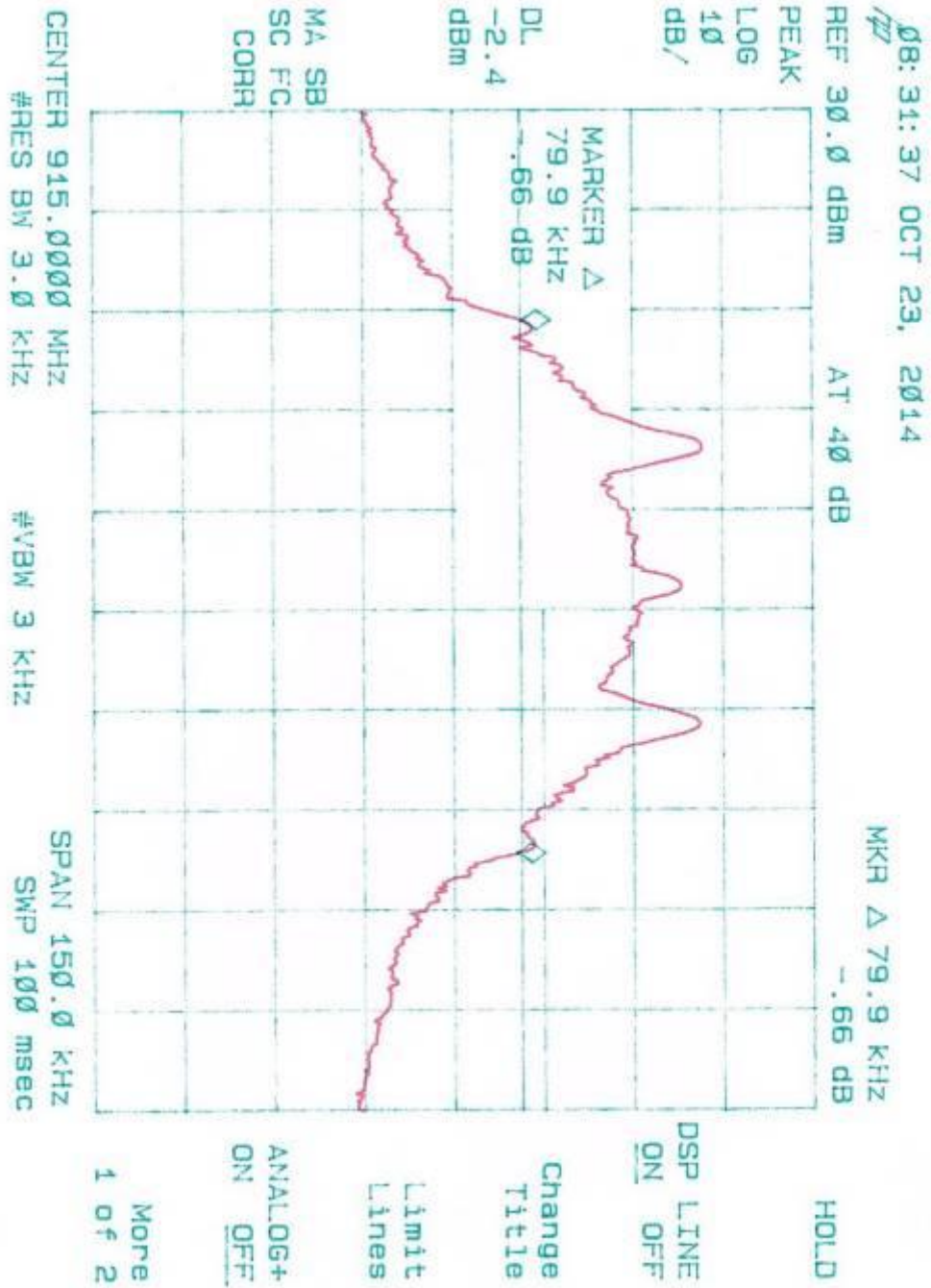
- 1- **ANSI C63.4-2011:** Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 KHz to 40 GHz.
- 2- **US Code of Federal Regulations (CFR) (12):** Title 47, Part 15, Radio Frequency Devices, Subpart C, Intentional Radiators.

Note: Applicable amendments were applied to all standards.

Section 4

20dB Bandwidth
15.247(a)

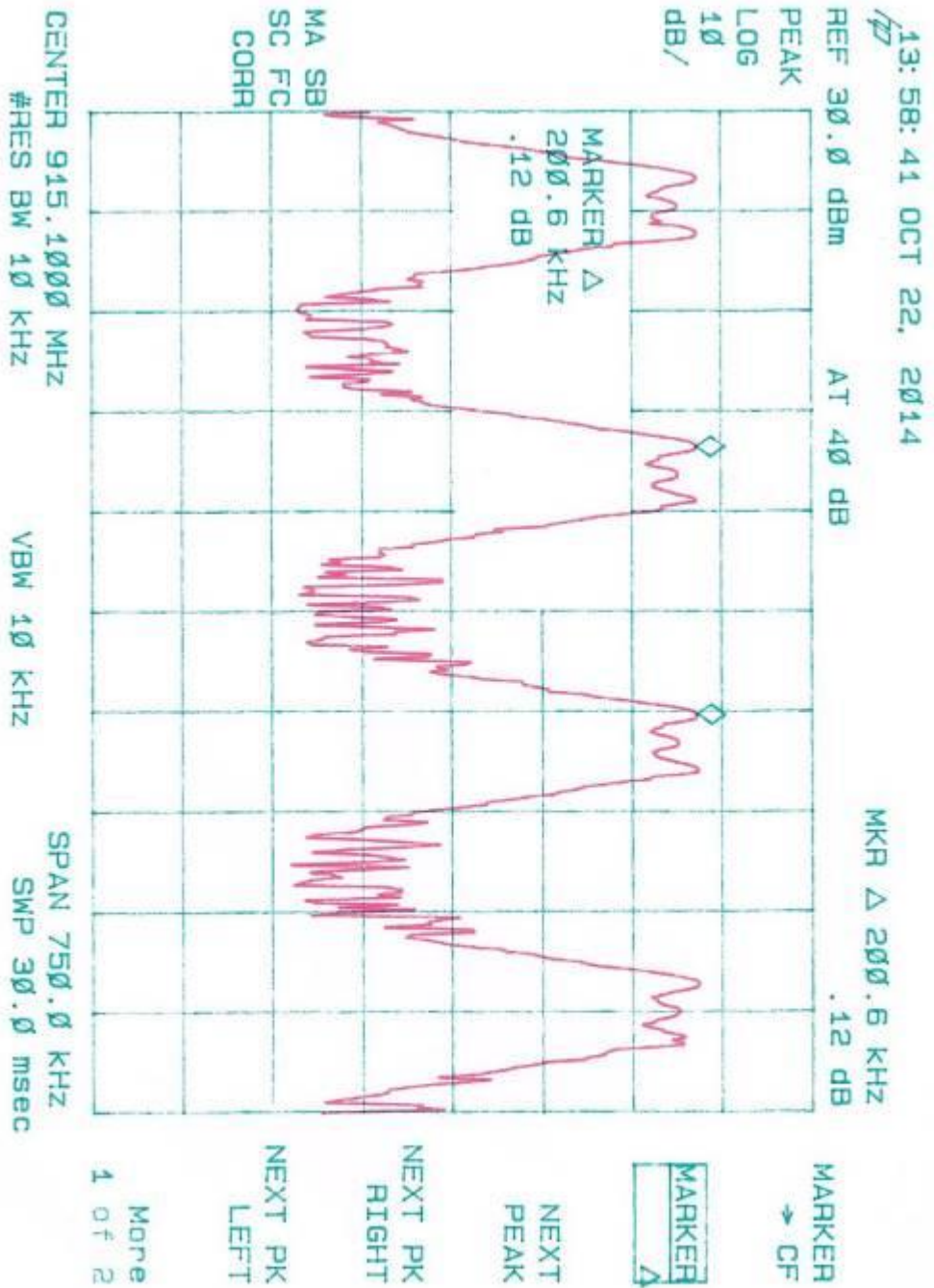
FCC 4.1.1. LOGS BANDWIDTH



Section 5

Carrier Frequency Separation
15.247(a)

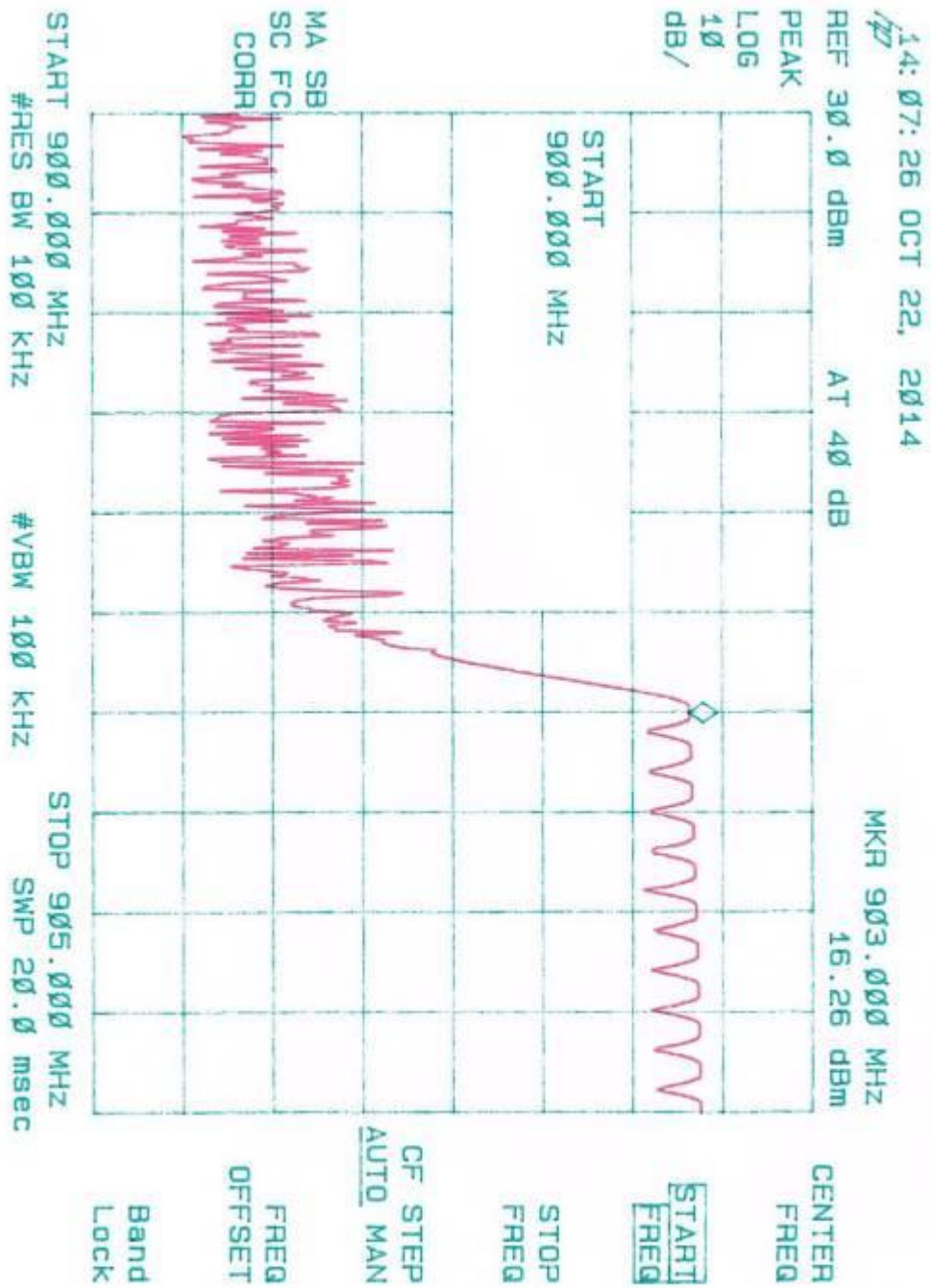
4.1.1 FCC MARKING REQ. SETBACK 1100V



Section 6

Number of Hopping Frequencies
15.247(a)

4.1.3 FCC # 44-16702 CHANNELS
 8.1 dB

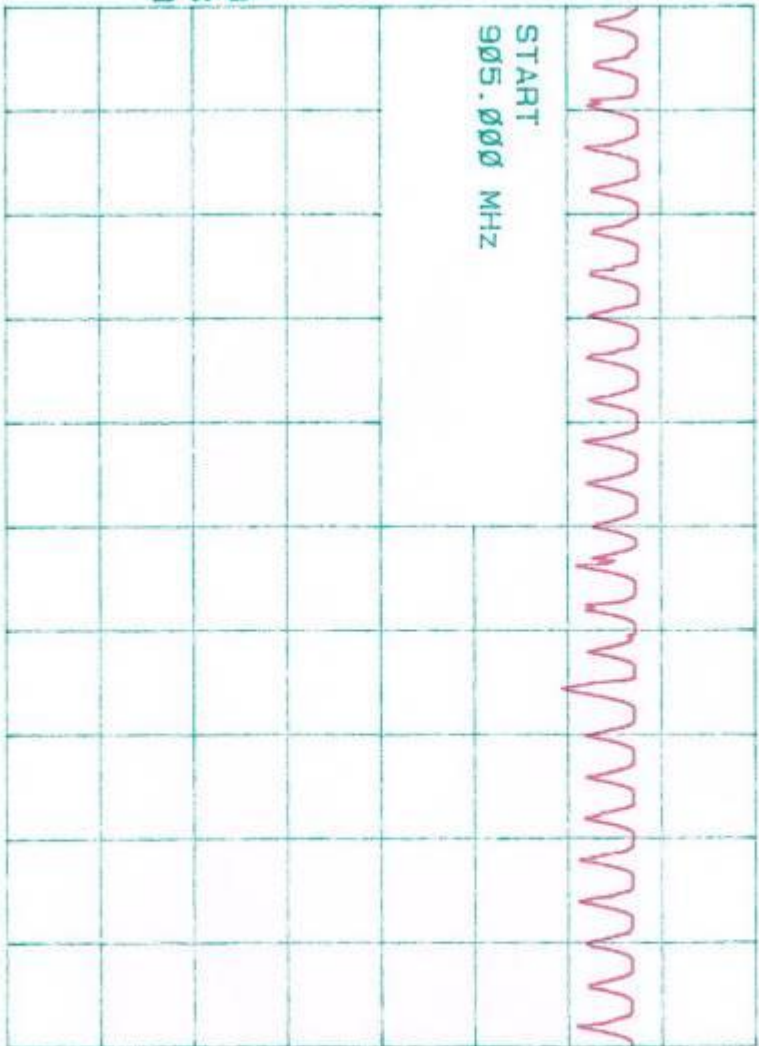


14:13:28 OCT 22, 2014

REF 30.0 dBm AT 40 dB

PEAK
 LOG
 10
 dB/

START
 905.000 MHz



START 905.000 MHz
 #RES BW 100 KHz

#VBW 100 KHz

STOP 910.000 MHz
 SWP 20.0 msec

File: # of Hopping Channels
 2 of 6

CENTER
 FREQ

START
 FREQ

STOP
 FREQ

CF STEP
 AUTO MAN

FREQ
 OFFSET

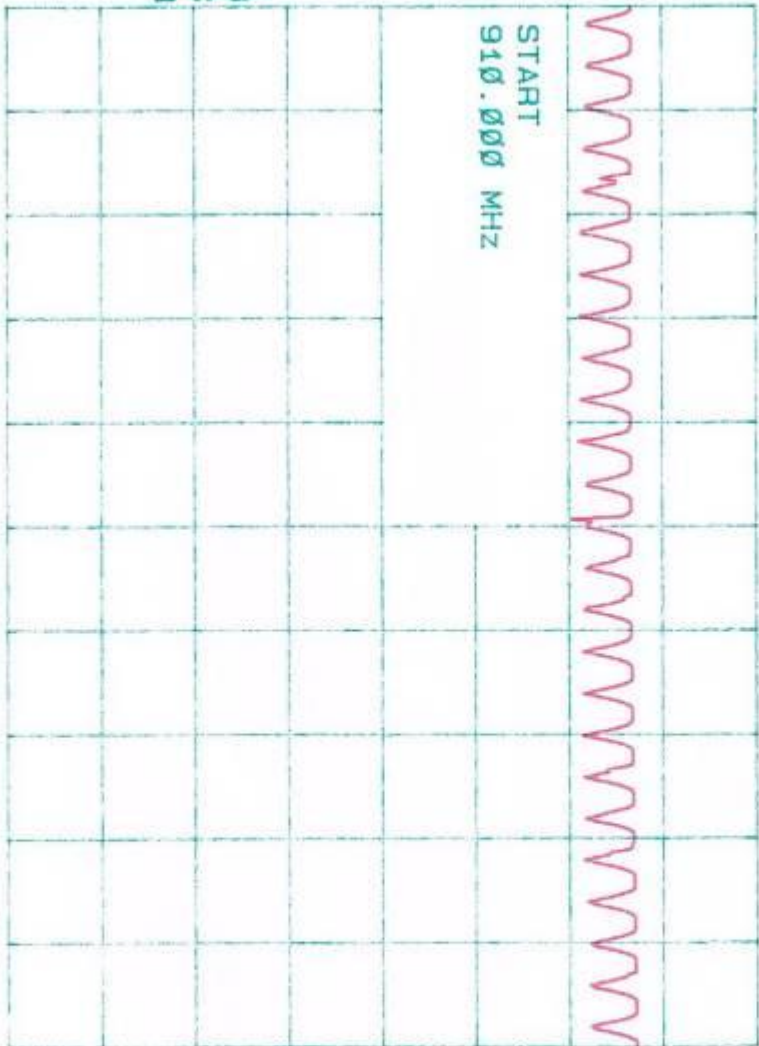
Band
 Lock

FCC: # of HARMFUL CHANNELS
 3 of 6

14:21:40 OCT 22, 2014

REF 30.0 dBm AT 40 dB

PEAK
 LOG
 10
 dB/



START
 910.000 MHz

START 910.000 MHz STOP 915.000 MHz
 #RES BW 100 KHZ #VBW 100 KHZ SWP 20.0 msec

MA SB
 SC FC
 CORR

CENTER
 FREQ

START
 FREQ

STOP
 FREQ

CF STEP
 AUTO MAN

FREQ
 OFFSET

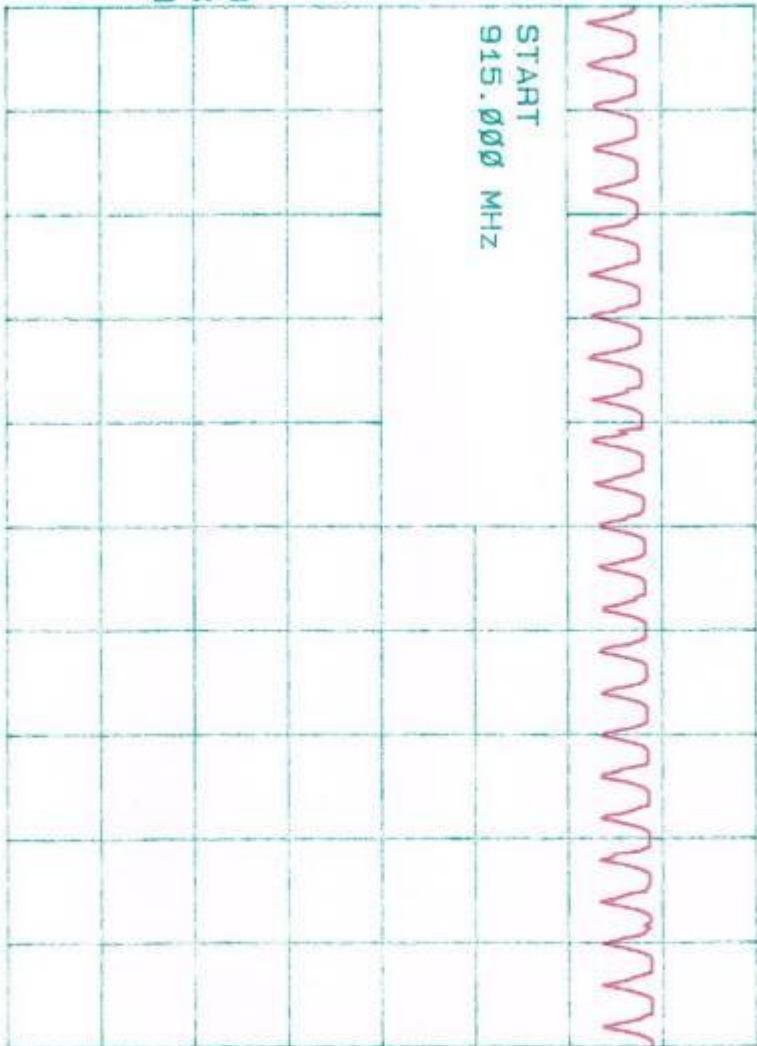
Band
 Lock

FCC: # of HOPPING CHANNELS
 4 of 6

14:27:24 OCT 22, 2014

REF 30.0 dBm AT 40 dB

PEAK
 LOG
 10
 dB/



START 915.000 MHz
 #RES BW 100 KHz

#VBW 100 KHz

STOP 920.000 MHz
 SWP 20.0 msec

CENTER
 FREQ

START
 FREQ

STOP
 FREQ

CF STEP
 AUTO MAN

FREQ
 OFFSET

Band
 Lock

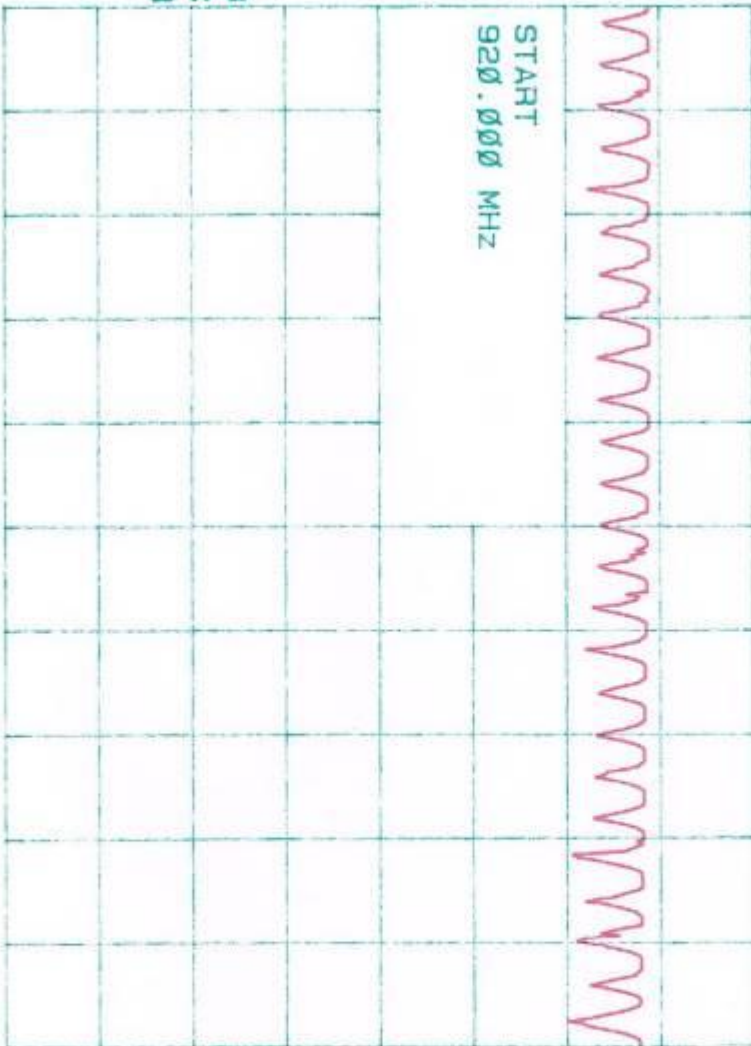
MA SB
 SC FC
 CORR

FCC # of HARPING CHANNELS
 5 of 60

14:32:30 OCT 22, 2014

REF 30.0 dBm AT 40 dB

PEAK
 LOG
 10
 dB/



MA SB
 SC FC
 CORR

START 920.000 MHz
 #RES BW 100 KHz

#VBW 100 KHz

STOP 925.000 MHz
 SWP 20.0 msec

CENTER
 FREQ

START
 FREQ

STOP
 FREQ

CF STEP
 AUTO MAN

FREQ
 OFFSET

Band
 Lock

14:42:57 OCT 22, 2014

REF 30.0 dBm AT 40 dB

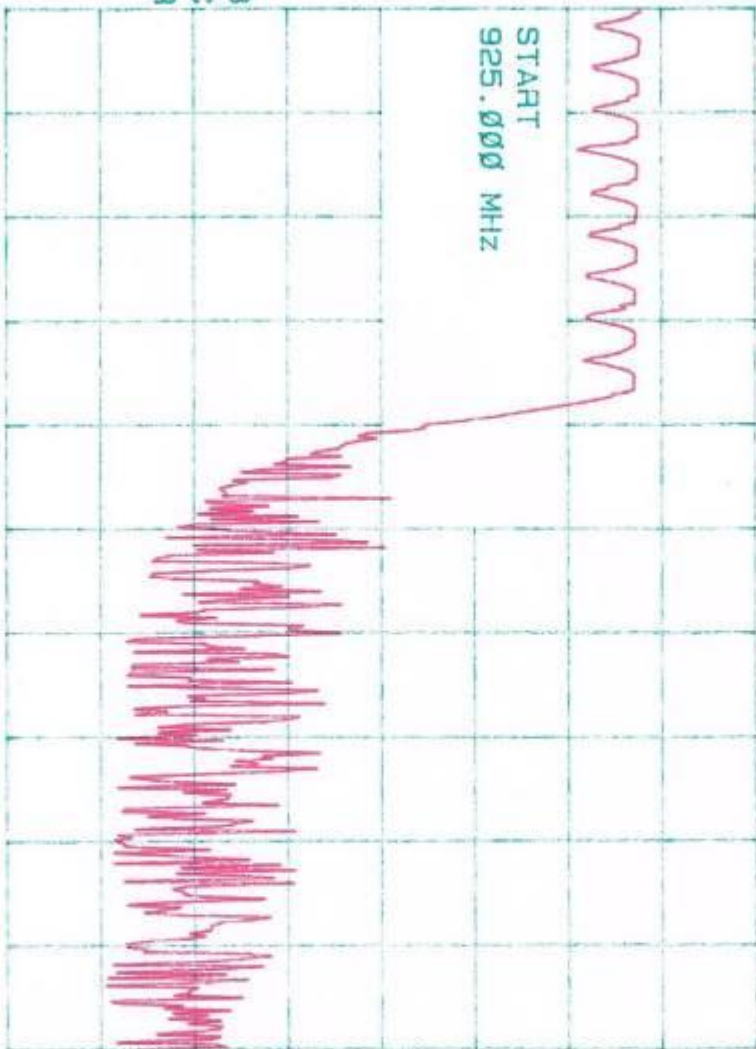
PEAK

LOG

10

dB/

START
925.000 MHz



START 925.000 MHz
#RES BW 100 KHz

#VBW 100 KHz

STOP 930.000 MHz
SWP 20.0 msec

FCC: # of HOPPING CHANNELS

6 of 10

CENTER
FREQ

START
FREQ

STOP
FREQ

CF STEP
AUTO MAN

FREQ
OFFSET

Band
Lock

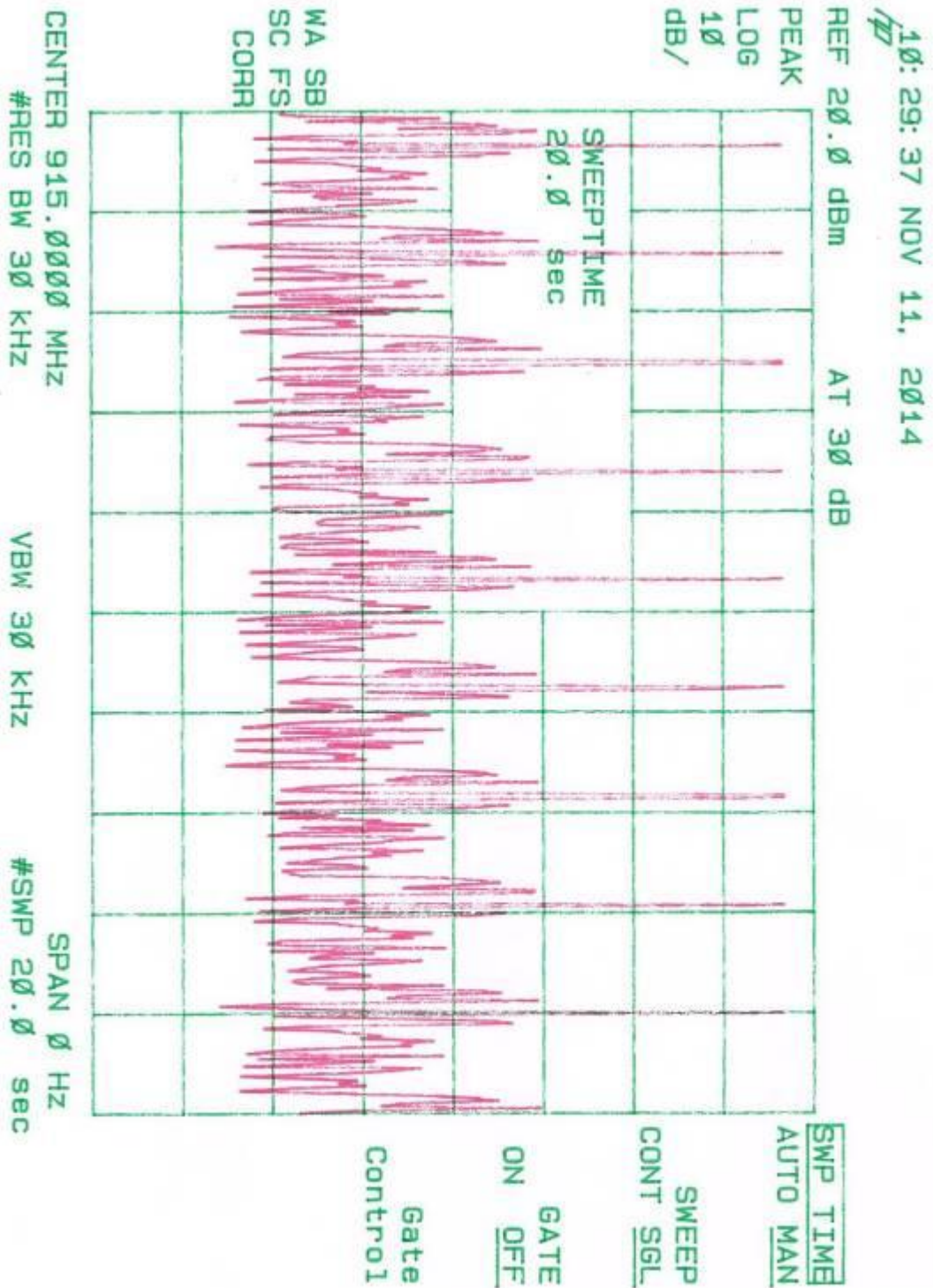
Section 7

Time of Occupancy
15.247(a)

Test Results

Hops in 20 second period	Dwell Time	Time of occupancy
10	13.75mS	0.1375 Seconds

Please see the following 2 plots.



fcc 4.1.4: Dwell Time

11: 15: 34 OCT 07, 2014

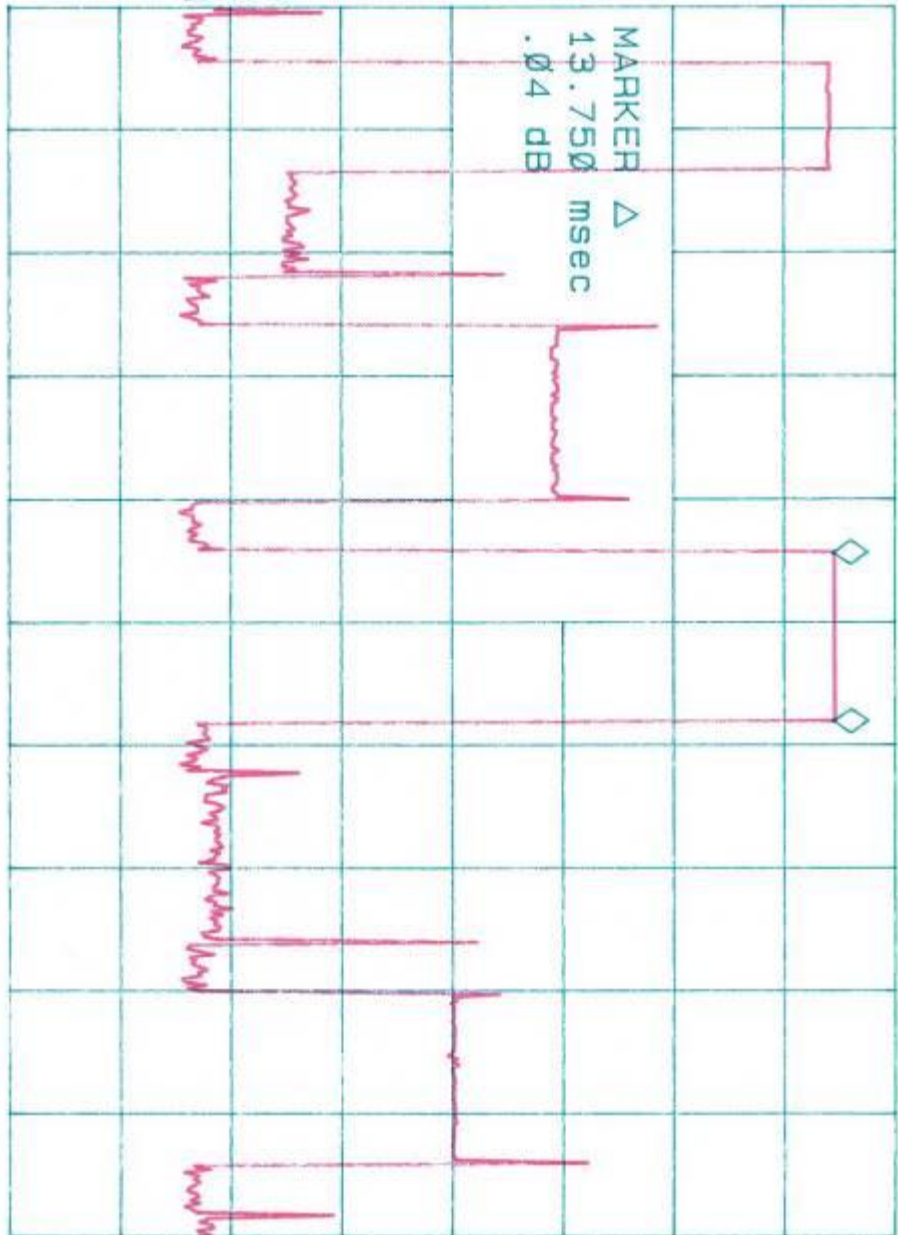
REF 30.0 dBm AT 40 dB

MKR Δ 13.750 msec .04 dB

PEAK

LOG

10
dB/



CENTER 915.000 MHz
 #RES BW 1.0 MHz

#VBW 1 MHz

SPAN 0 Hz
 #SWP 100 msec

MARKER
 NORMAL

MARKER
 Δ

MARKER
 AMPTD

SELECT
 1 2 3 4

MARKER 1
 ON OFF

More
 1 of 2

Section 8

PEAK OUTPUT POWER

Test Results

Frequency (MHz)	Output in dBm	Corrected Output	Corrected Output in Watts	FCC Limits
903.01	16.97	19.38 dBm	0.09	30 dBm (1W)
915.01	17.62	21.72 dBm	0.15	30 dBm (1W)
926.97	17.32	21.42 dBm	0.14	30 dBm (1W)
Peak Output		0.150W		

Please see the following 3 plots.

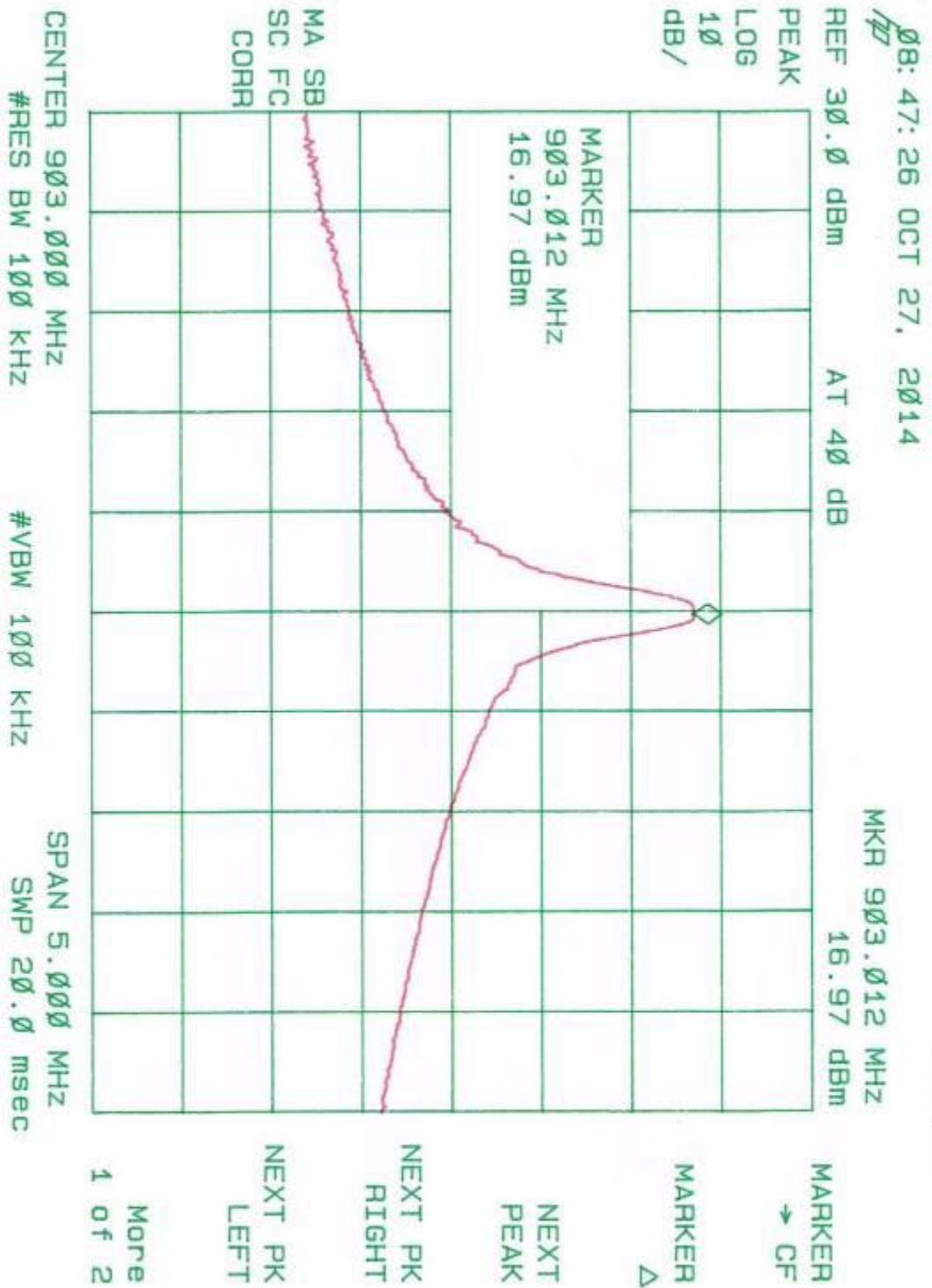
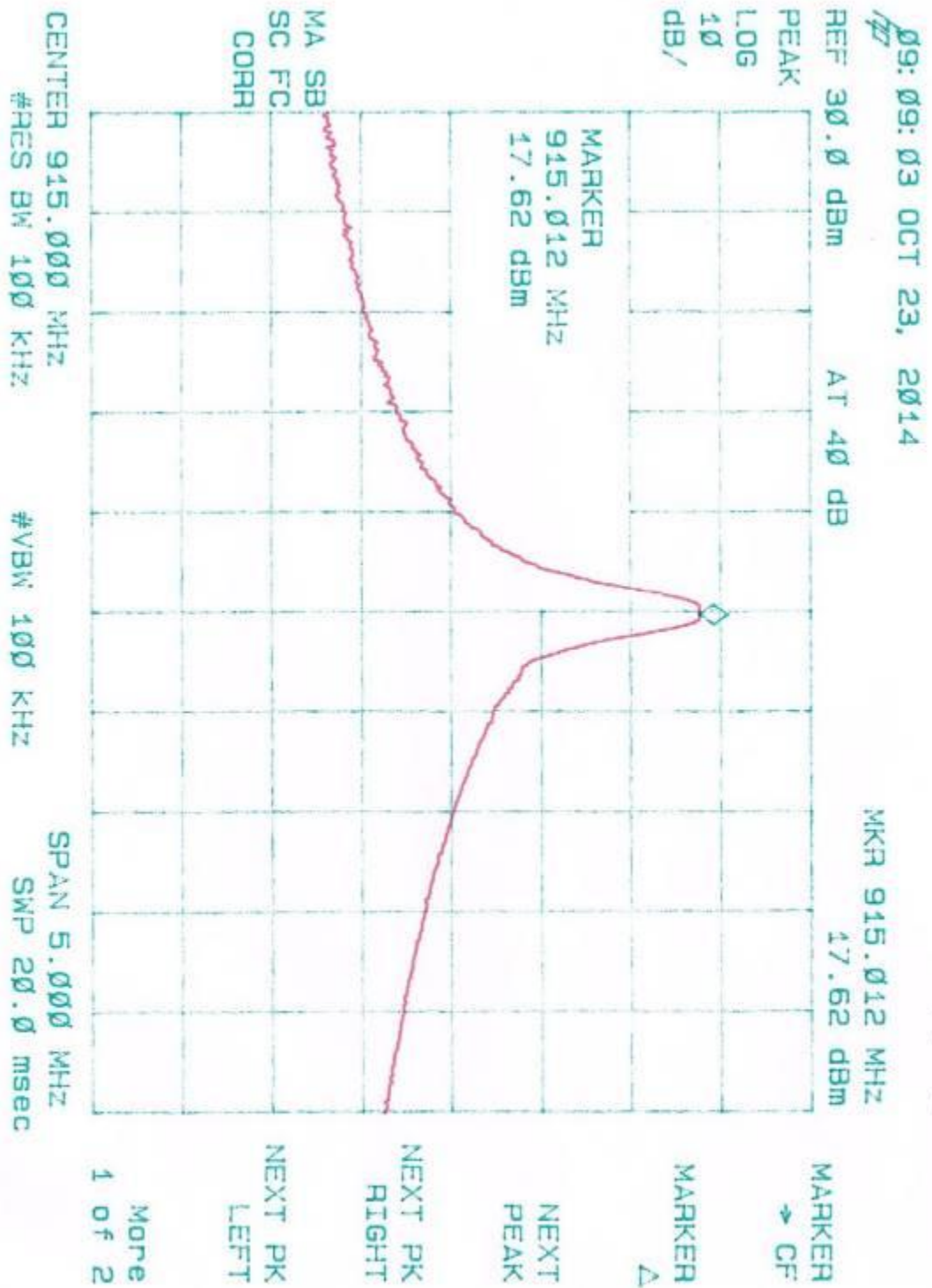
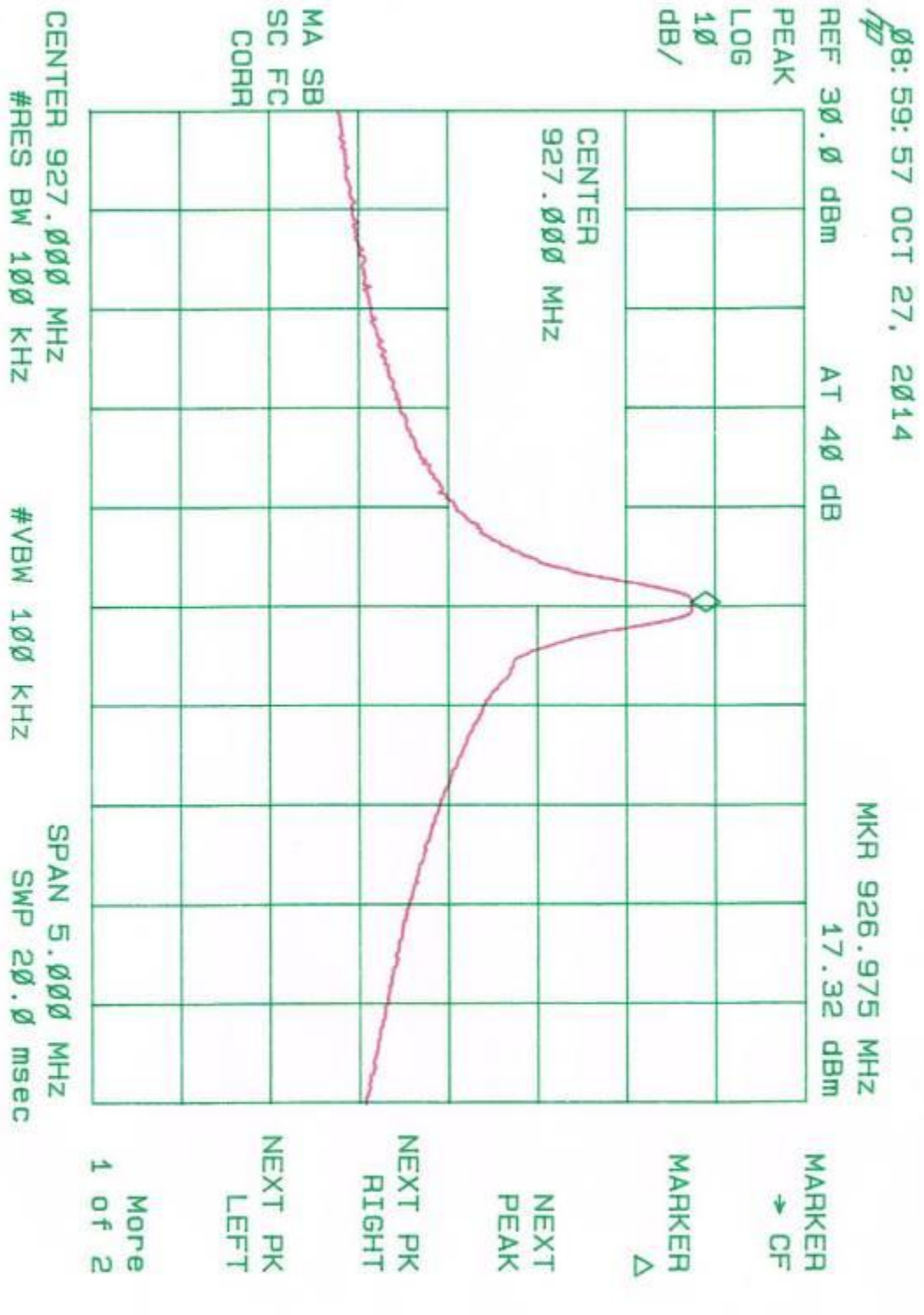


FIG 4.1.5: Peak output power
 903 MHz





fcc 4.1.5 - TEST SUITE
 927 MHz

Section 9

Band Edge Conducted Emissions

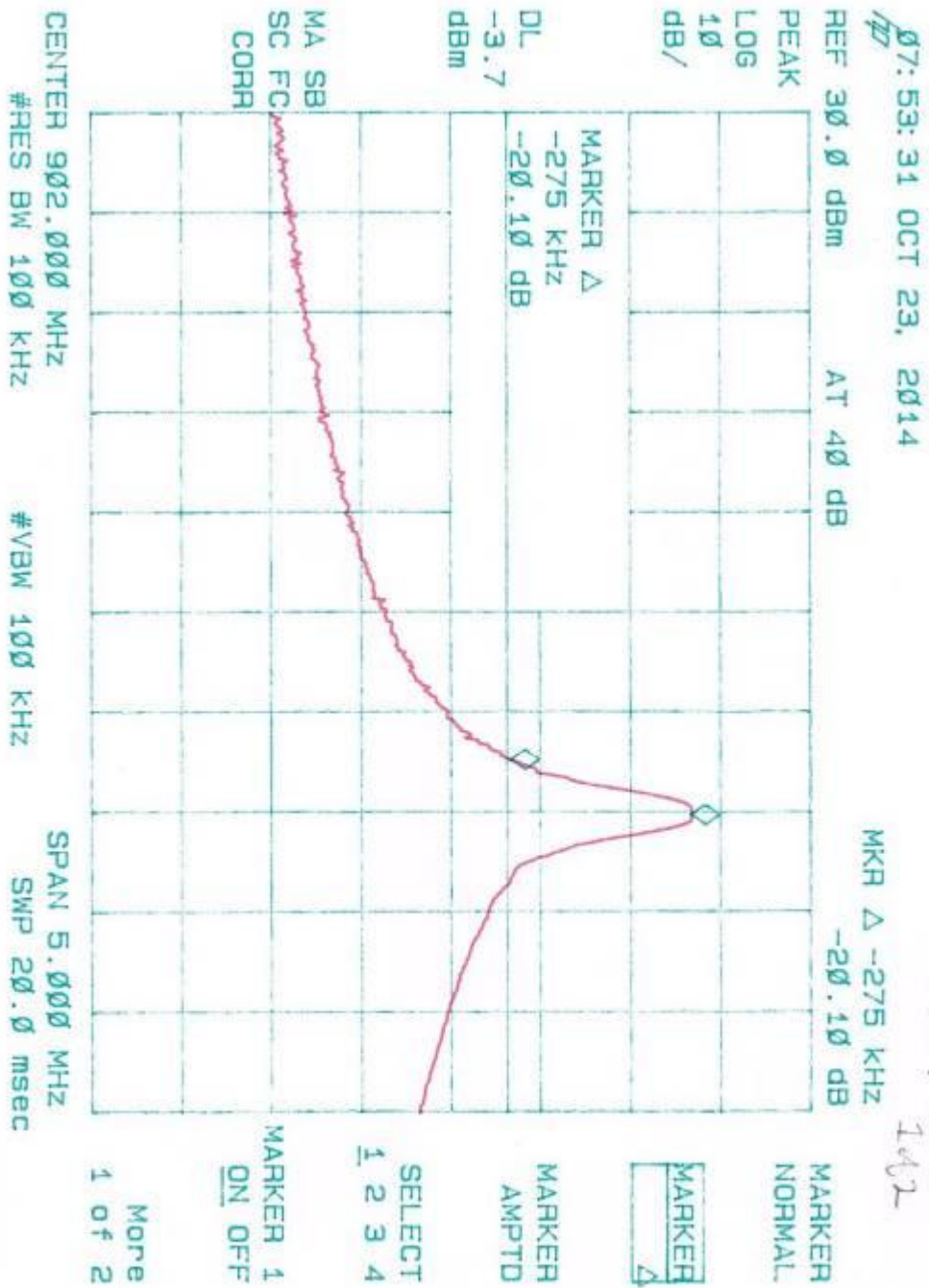


FIG 4.1.6. BAND EDGE EMISSIONS
 -HARMONIC DISABLED
 142

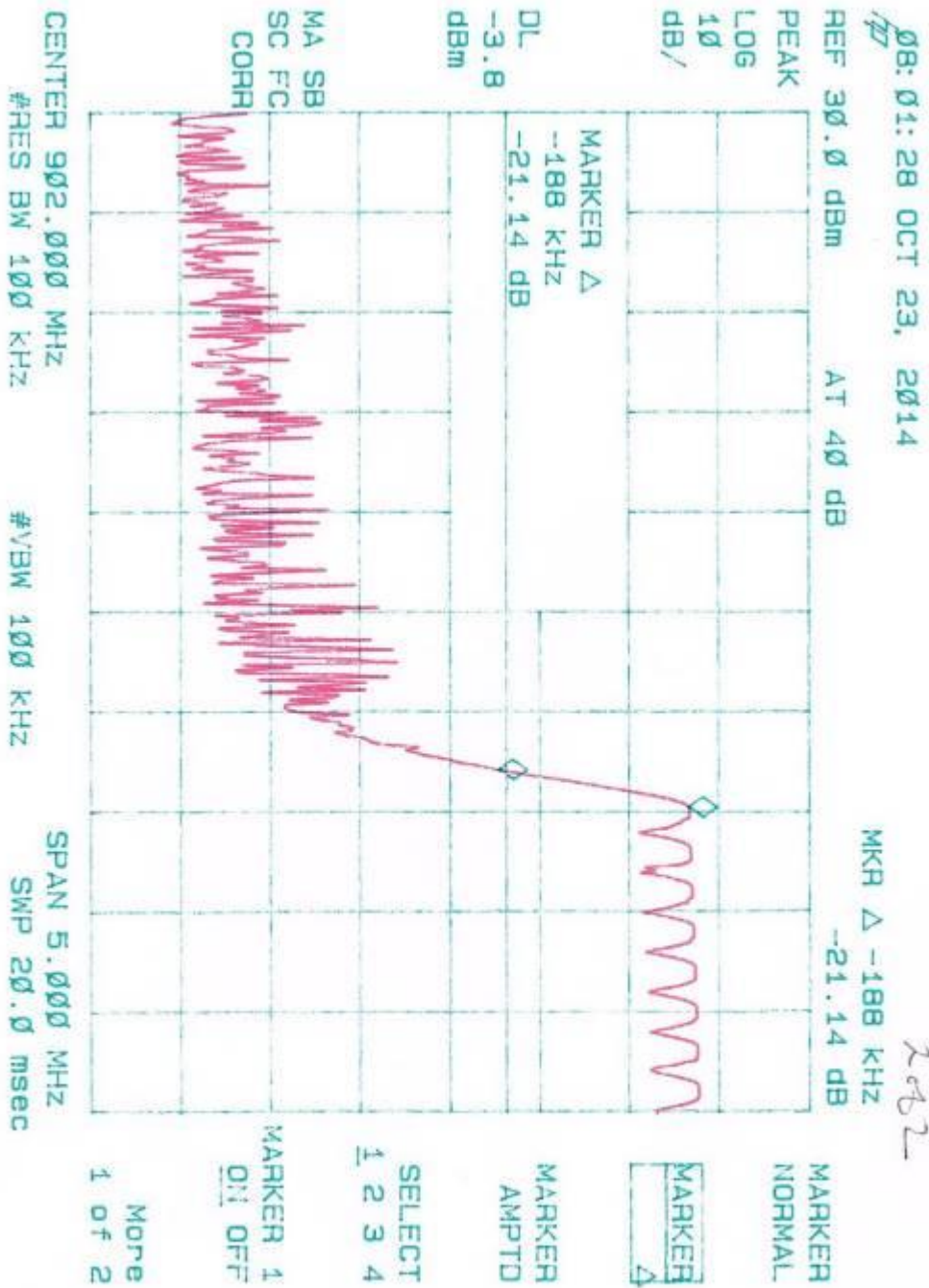
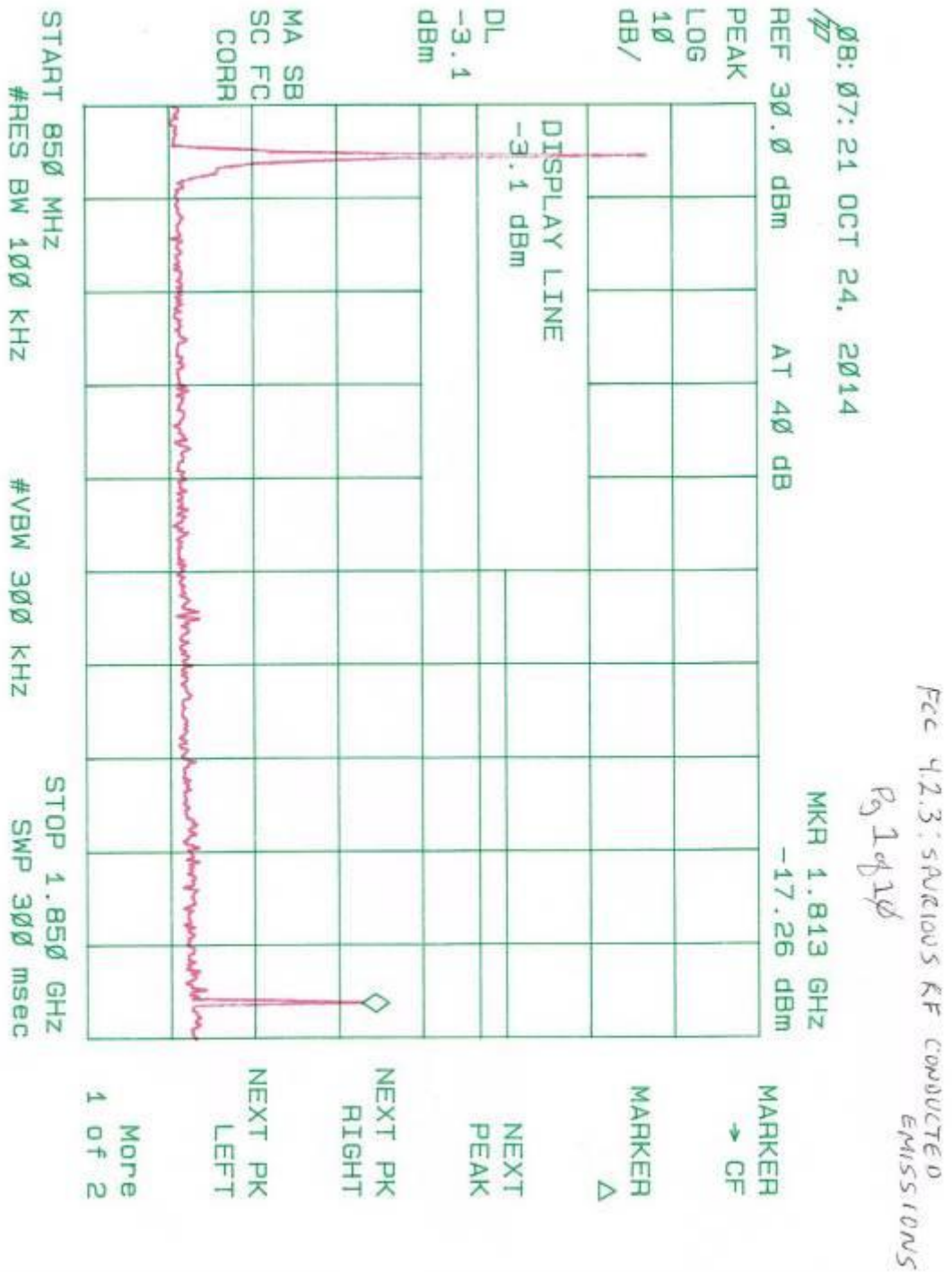


FIG 4.1.10: BAND EDGE COND. EMISSIONS
 -HOPPING ENABLED
 2 of 2

Section 10

SPURIOUS RF CONDUCTED EMISSIONS



08:11:01 OCT 24, 2014

FCC 4.2.3

Pg 2 of 10

REF	30.0	dBm	AT	40	dB				
PEAK									
LOG									
10									
dB/									
STOP									
2.850 GHz									
DL									
-3.1									
dBm									
WA	SB								
SC	FC								
CORR									
START	1.850	GHz	#RES	BW	100	KHz	#VBW	300	KHz
STOP	2.850	GHz	SWP		300	msec			

CENTER FREQ

START FREQ

STOP FREQ

CF STEP
AUTO MAN

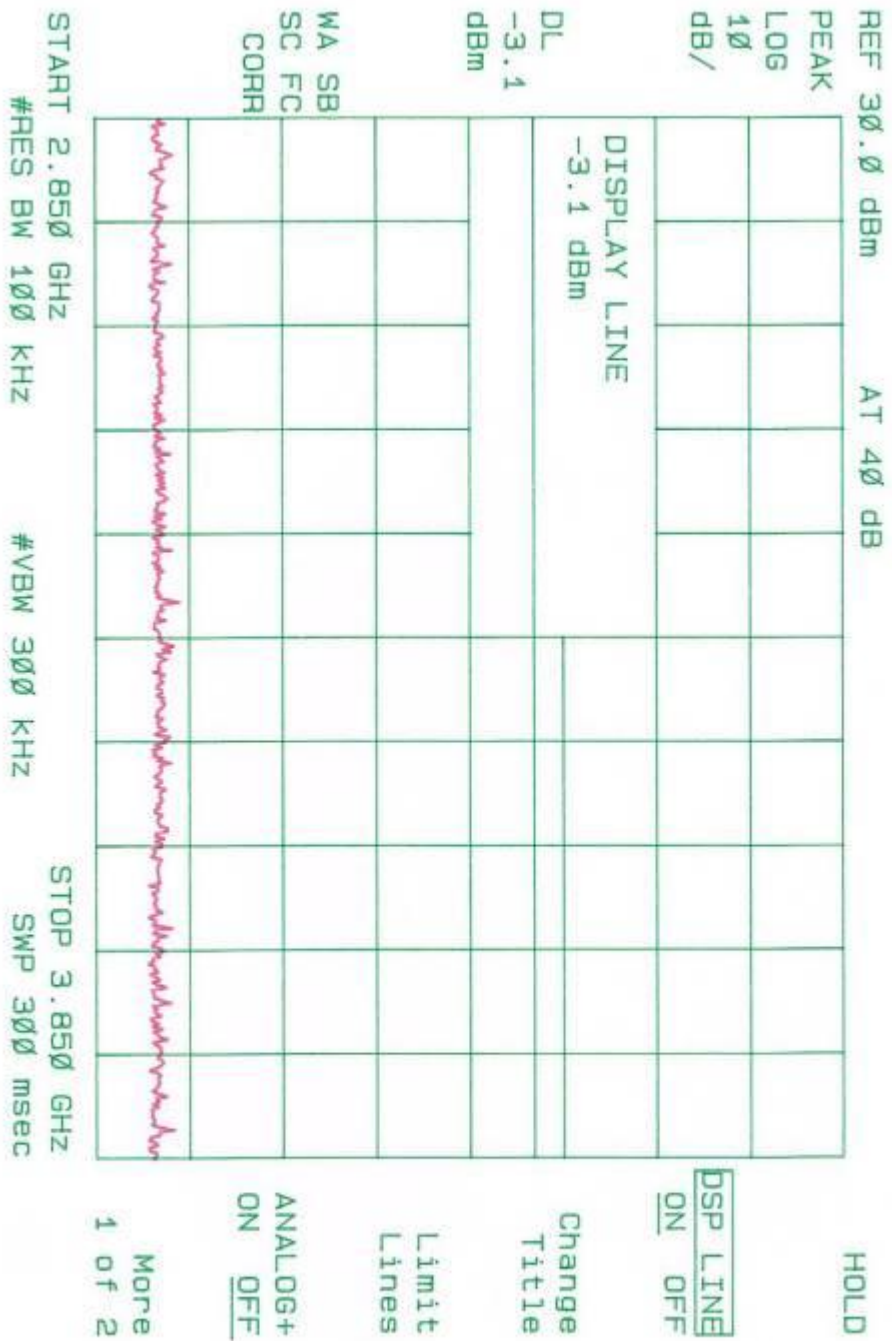
FREQ OFFSET

Band Lock

STOP FREQ

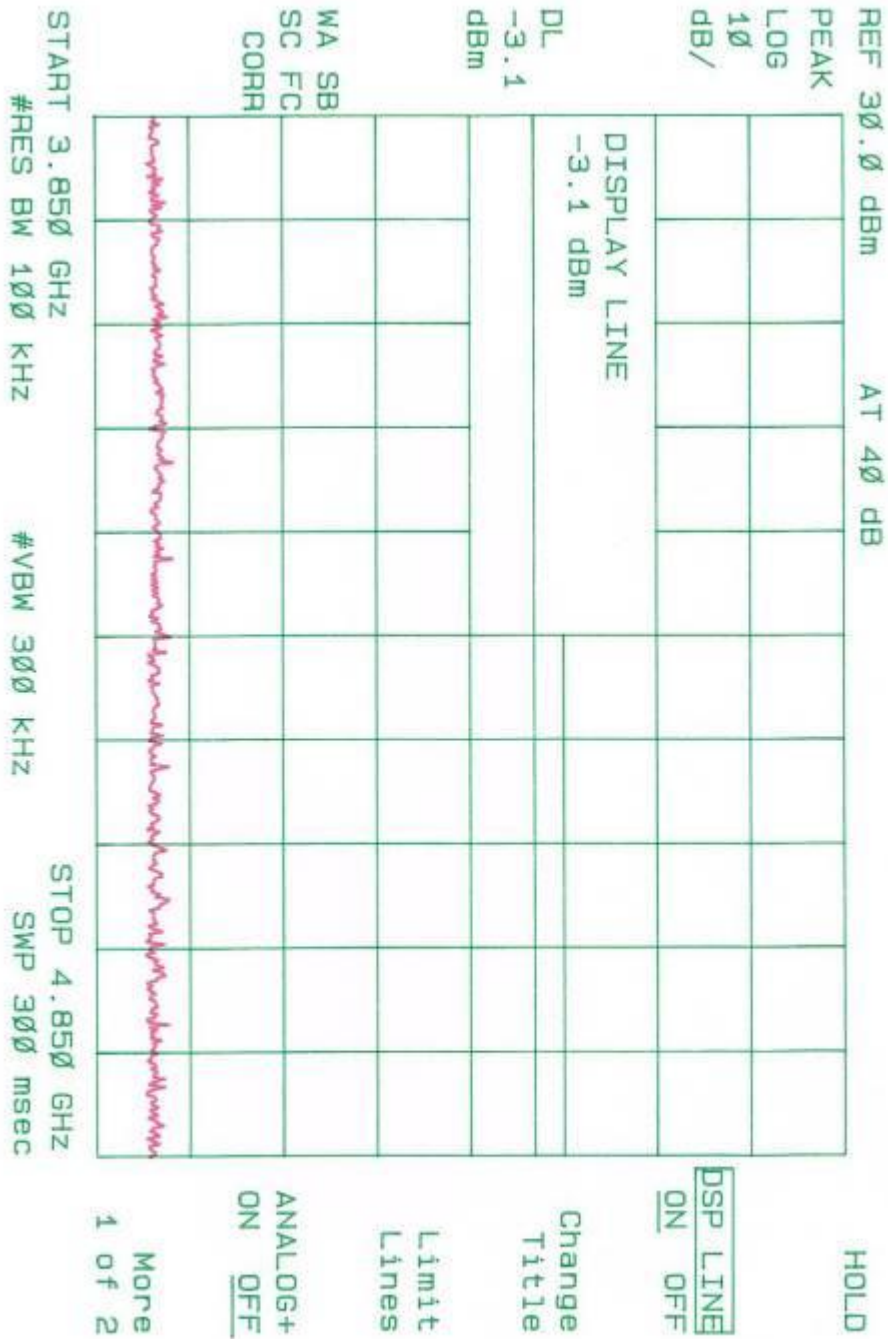
08:14:33 OCT 24, 2014

REC 4.2.5
Pg 3 of 10



08:18:00 OCT 24, 2014

File 4.2.3
 Pg 4 of 10



08:21:13 OCT 24, 2014

FCC 4.2.3
 Pg 5 of 10

REF 30.0 dBm AT 40 dB

HOLD

PEAK
 LOG
 10
 dB/

DSP LINE
 ON OFF

DISPLAY LINE
 -3.1 dBm

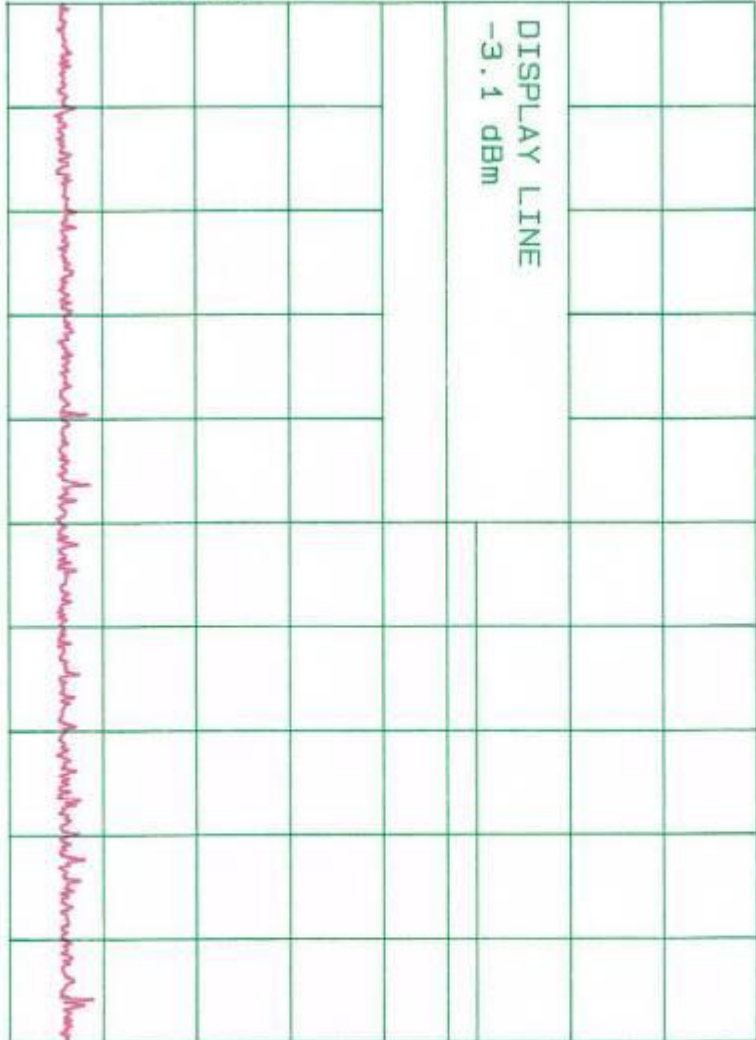
Change
 Title

DL
 -3.1
 dBm

Limit
 Lines

WA SB
 SC FC
 CORR

ANALOG+
 ON OFF



More
 1 of 2

START 4.850 GHz STOP 5.850 GHz
 #RES BW 100 KHz #VBW 300 KHz SWP 300 msec

08:24:35 OCT 24, 2014

fcc 4.2.3
Pg 6 of 14

REF 30.0 dBm AT 40 dB

HOLD

PEAK
LOG
10
dB/

DSP LINE
ON OFF

DISPLAY LINE
-3.1 dBm

DL
-3.1
dBm

Change
Title

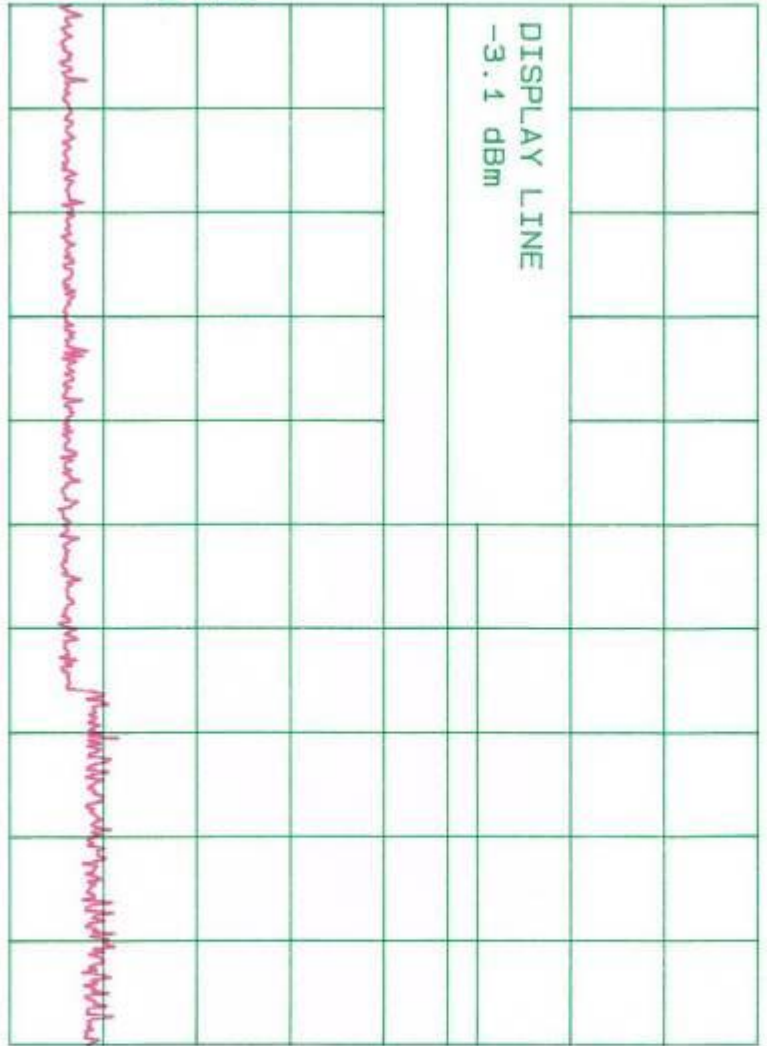
Limit
Lines

WA SB
SC FC
CORR

ANALOG+
ON OFF

More
1 of 2

START 5.850 GHz
#RES BW 100 KHZ
#VBW 300 KHZ
STOP 6.850 GHz
SWP 300 msec



Fe 4.2.3
Pg 7 of 10

HOLD

PEAK

LOG

dB/

DSP LINE
ON OFF

DISPLAY LINE
-3.1 dBm

Change
T4+7aDL
-3.1

dBm

Limit
Lines

WA SB
SC FC
CORR

ANALOG+
ON OFF

More
1 of 2

START 6.850 GHz

#RES BW 100 KHZ

#VBW 300 KHZ

STOP 7. 850 GHz

SWP 300 msec

08:31:52 OCT 24, 2014

fec 4.2.3
 Pg. 8 of 14

REF 30.0 dBm AT 40 dB

HOLD

PEAK
 LOG
 10
 dB/

DSP LINE
 ON OFF

DISPLAY LINE
 -3.1 dBm

Change
 Title

DL
 -3.1
 dBm

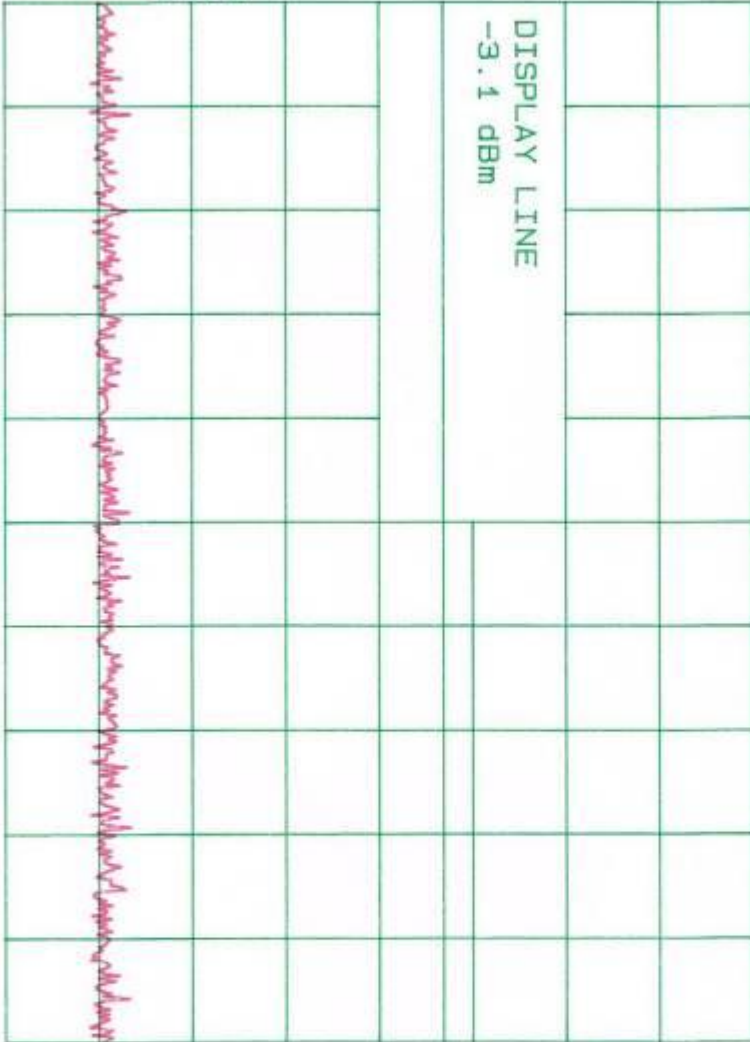
Limit
 Lines

WA SB
 SC FC
 CORR

ANALOG+
 ON OFF

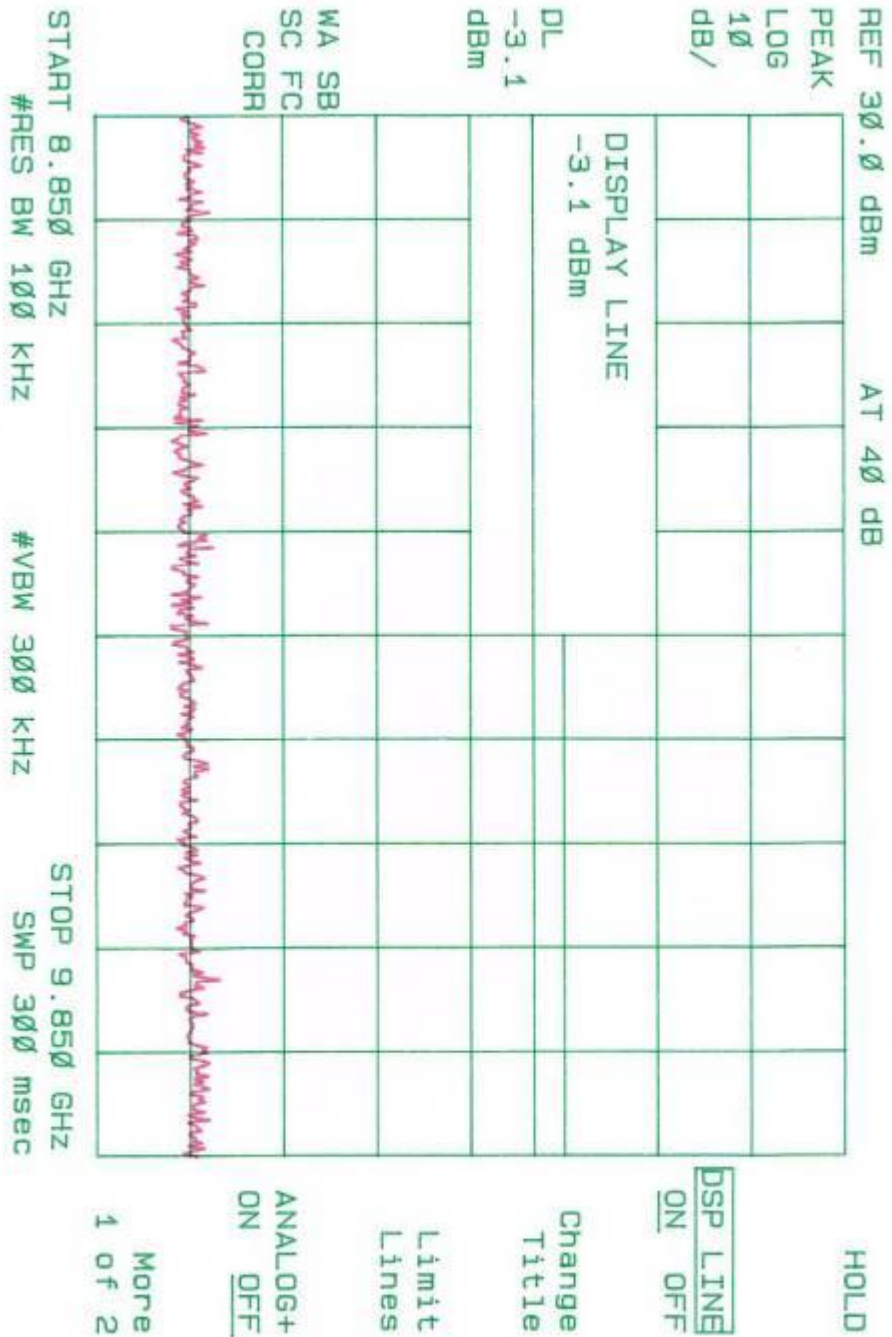
More
 1 of 2

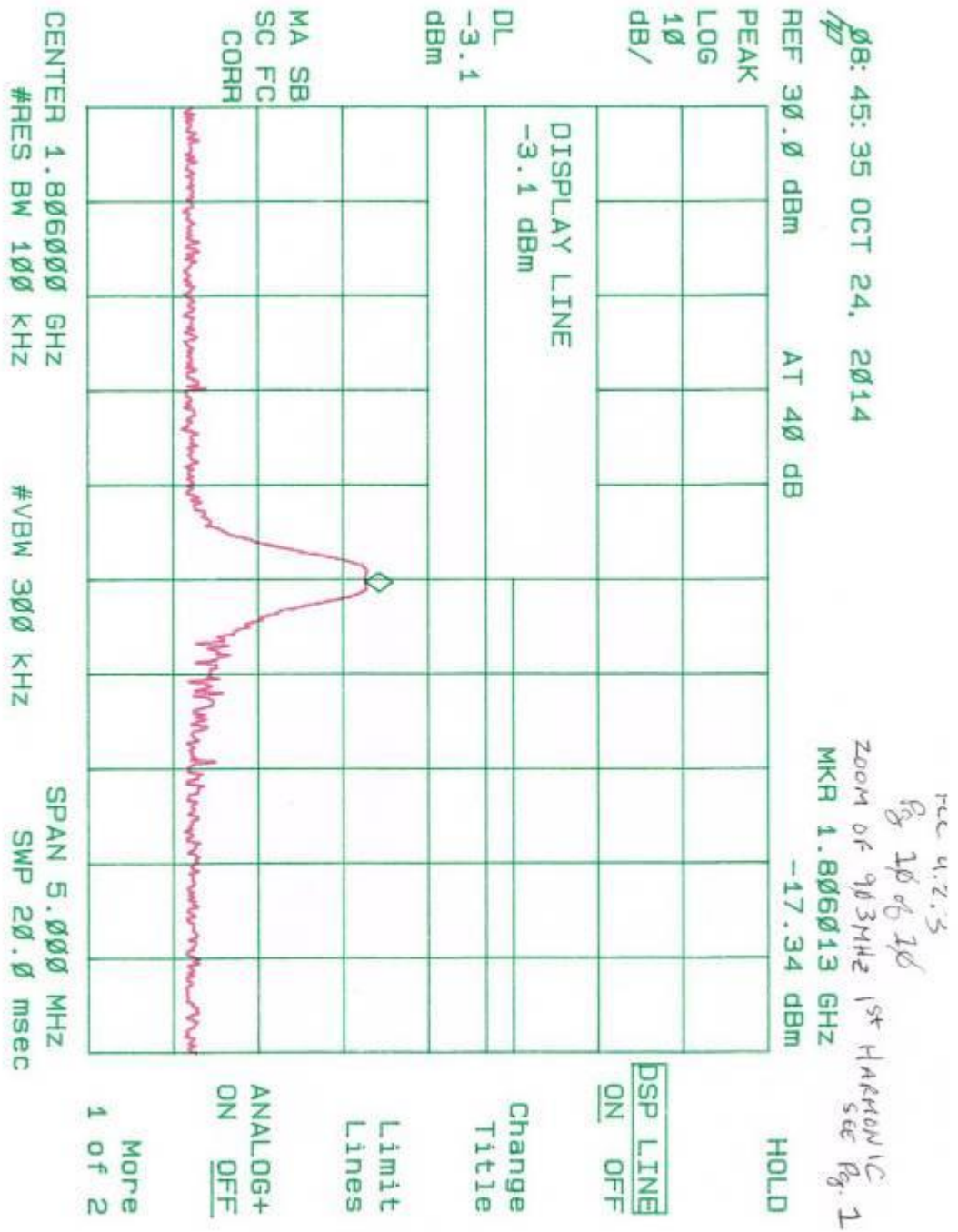
START 7.850 GHz
 #RES BW 100 KHZ
 #VBW 300 KHZ
 STOP 8.850 GHz
 SWP 300 msec



08:35:16 OCT 24, 2014

FCC 4.2.3
 Pg. 9 of 10





Section 11

RADIATED EMISSIONS MEASUREMENTS

Paragraphs: 15.209 (a)

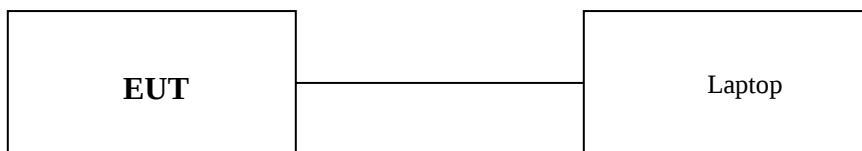
Model number: PowerLine Guardian

Test date: October 24, 2014

Frequency MHz	Measurement Reading, dBμV/m	Corrected Reading, dBμV/m	FCC Limit	Minimum Margin, dBμV/m
Horizontal - Horizontal				
There were no measurable radiated emissions from the EUT Within 12 dB from the limits in either the Vertical or Horizontal Antenna Polarization				

Section 12

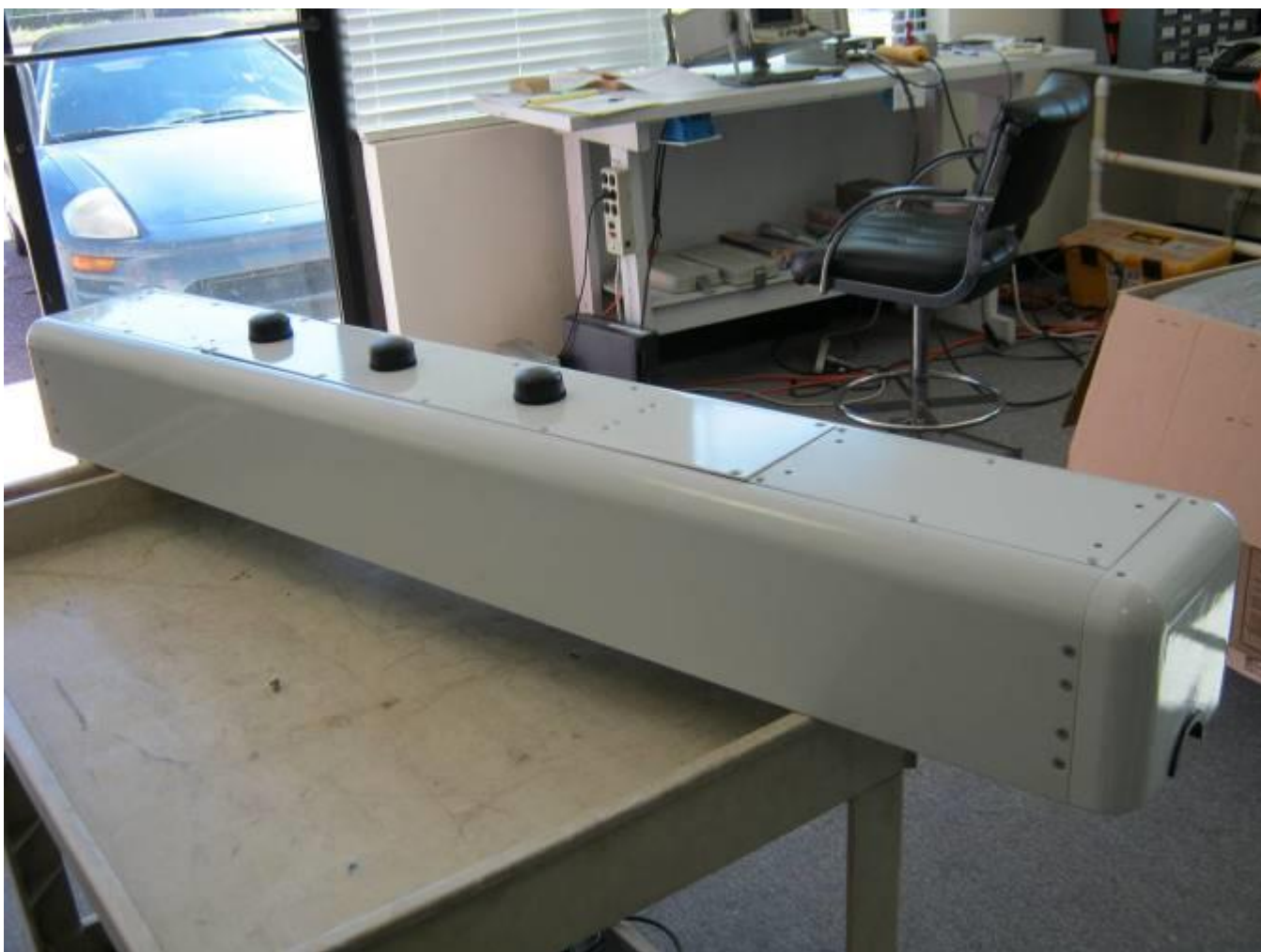
CONFIGURATION



Section 13

PHOTOGRAPHS

Illustrates Complete Product



Photographs cont...

Output Power Measurements



Photographs cont...

Output Power Measurements



Photographs cont...

Output Power Measurements



Photographs cont...

Output Power Measurements



Photographs cont...

Output Power Measurements



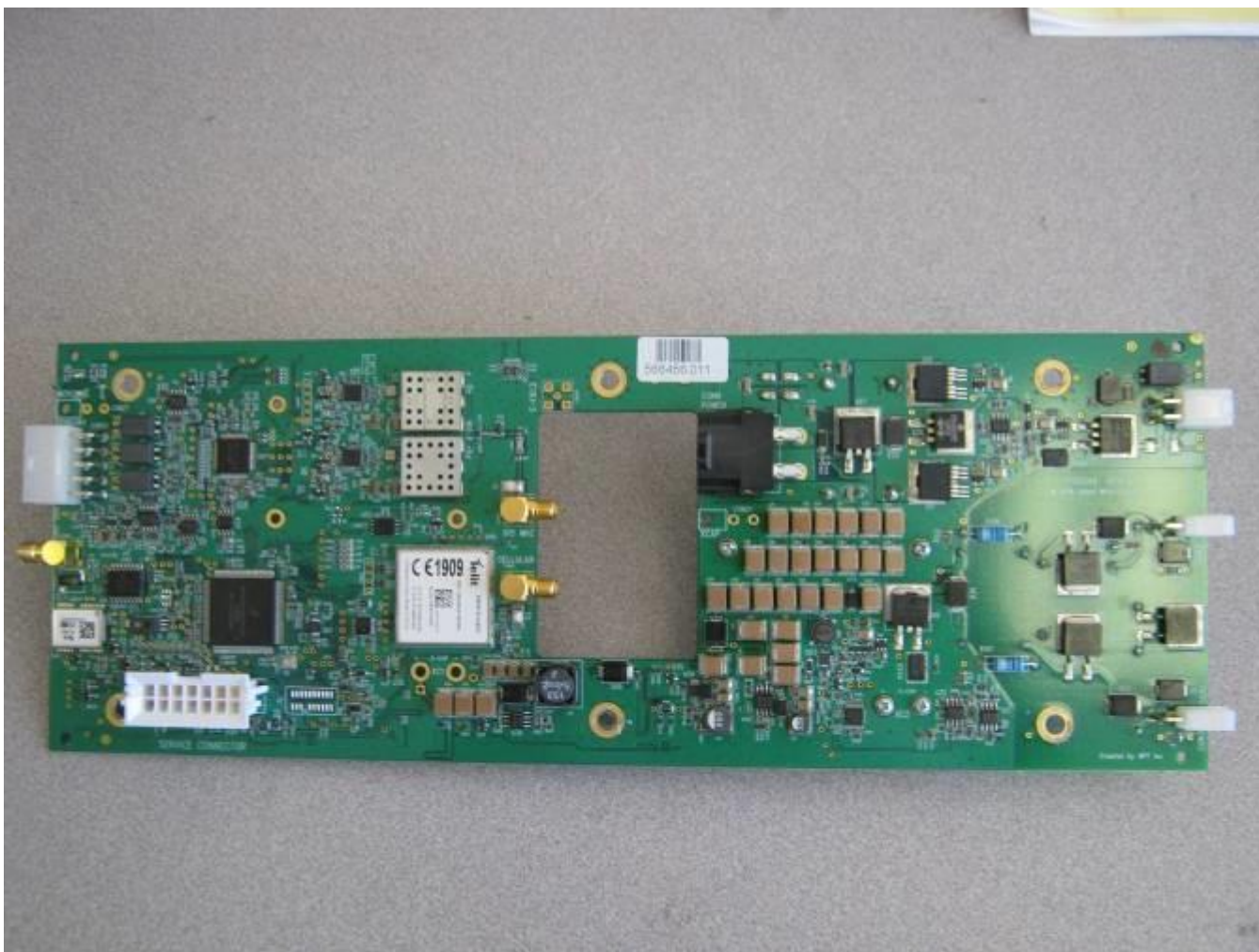
Photographs cont...

Radiated Emissions Measurements



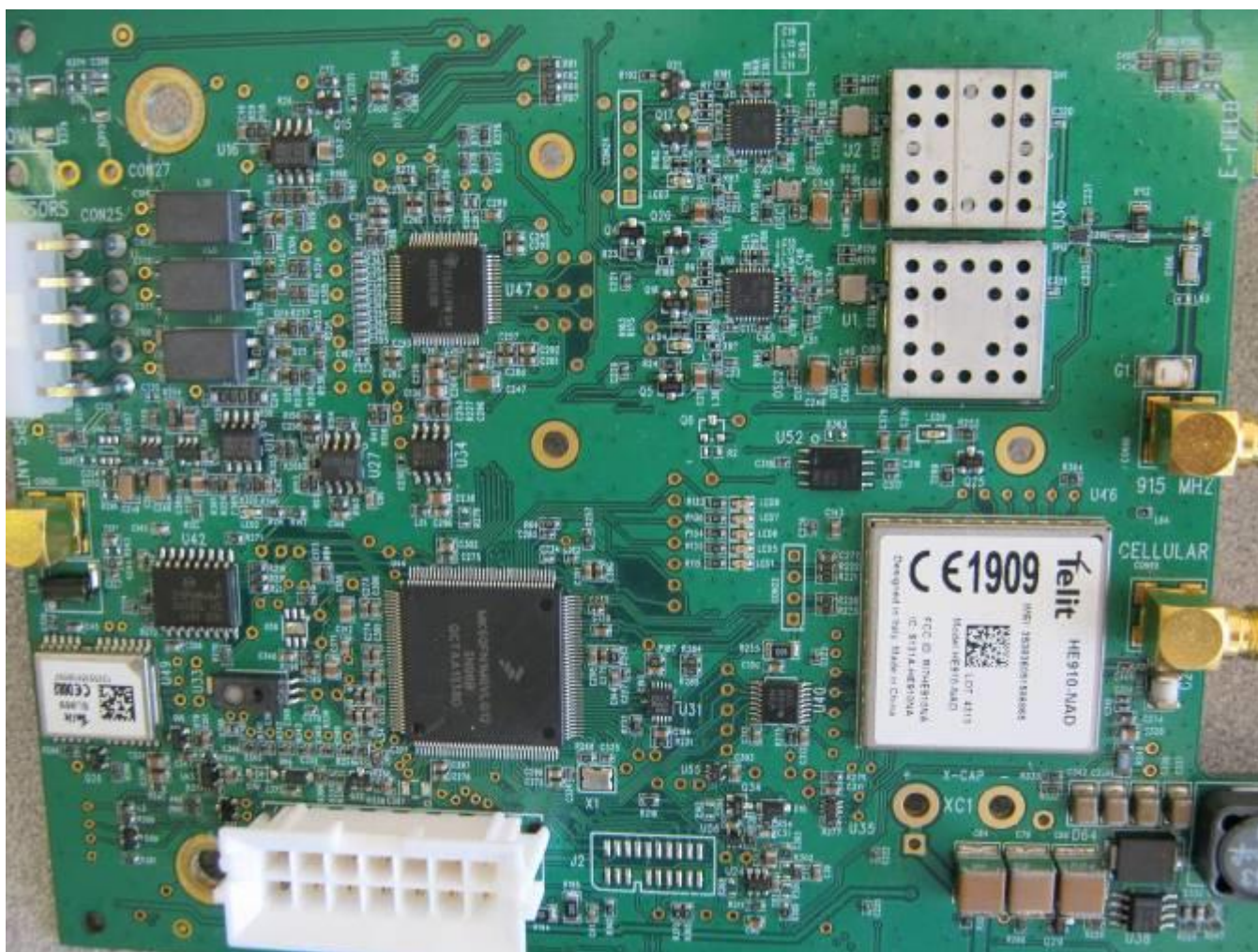
Photographs cont...

Main Board with Radio Board



Photographs cont...

Other View of Main Board



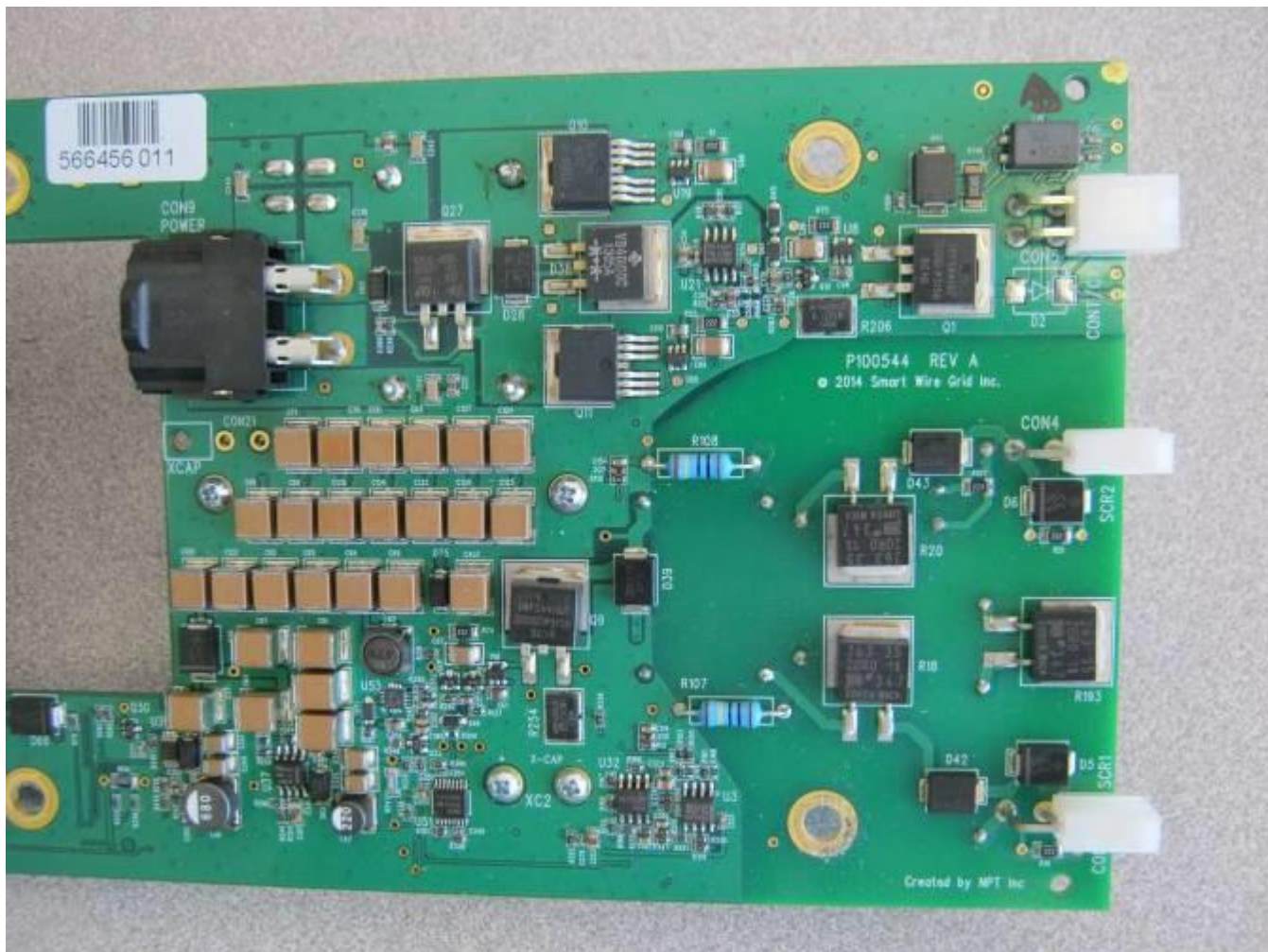
Photographs cont...

Main Board with Shields Removed



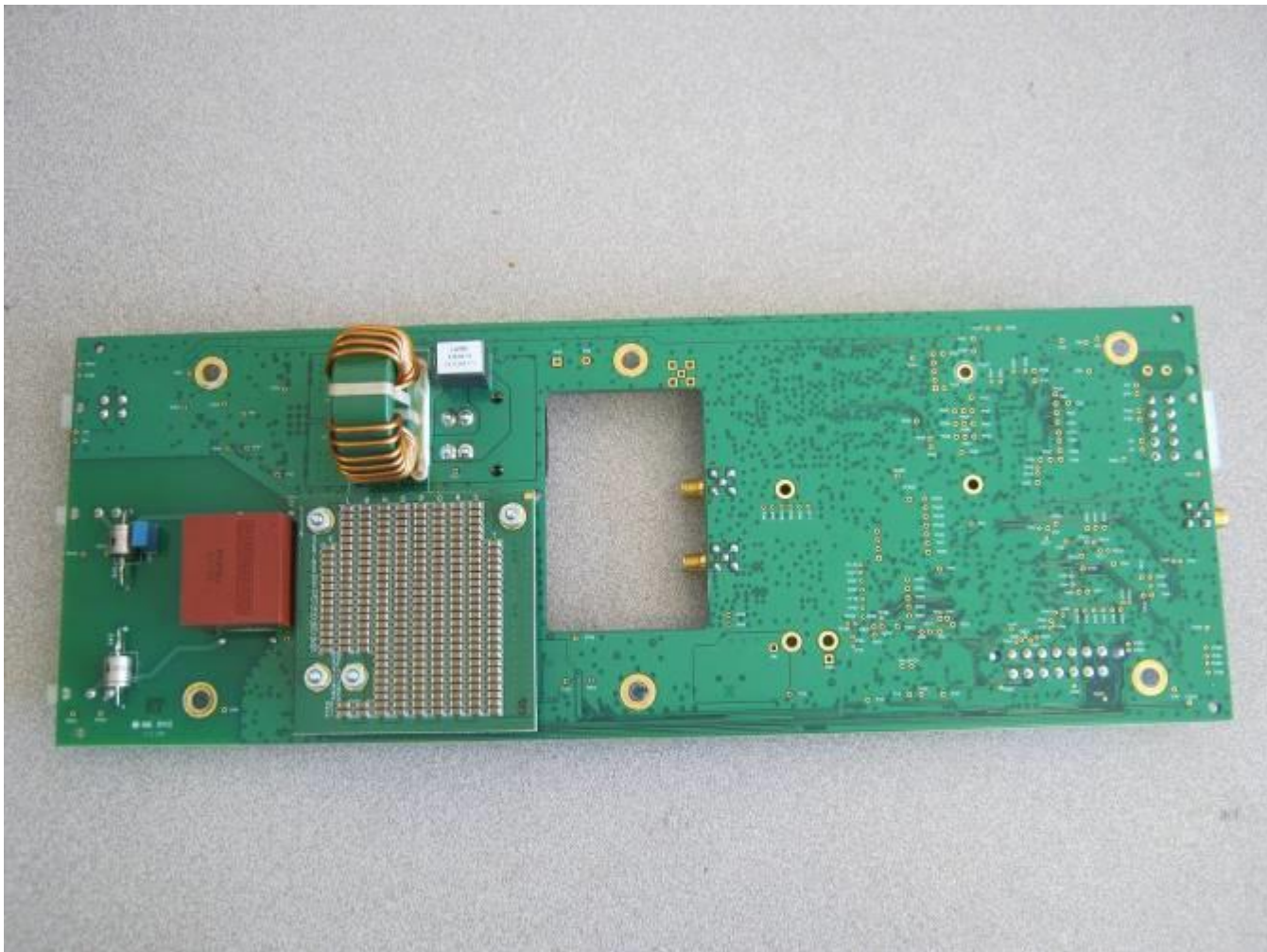
Photographs cont...

Radio Board



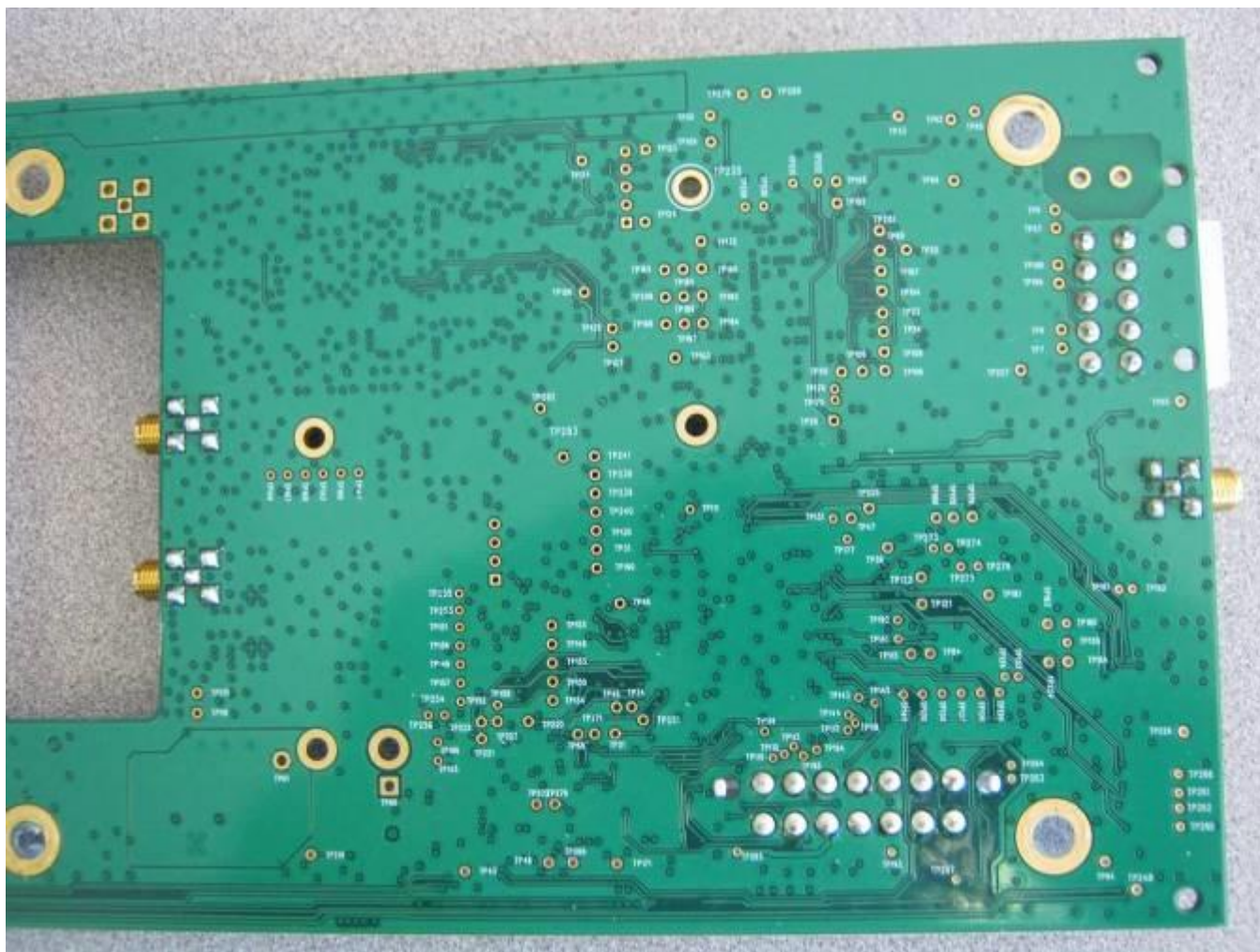
Photographs cont...

Radio Board with Cover Removed



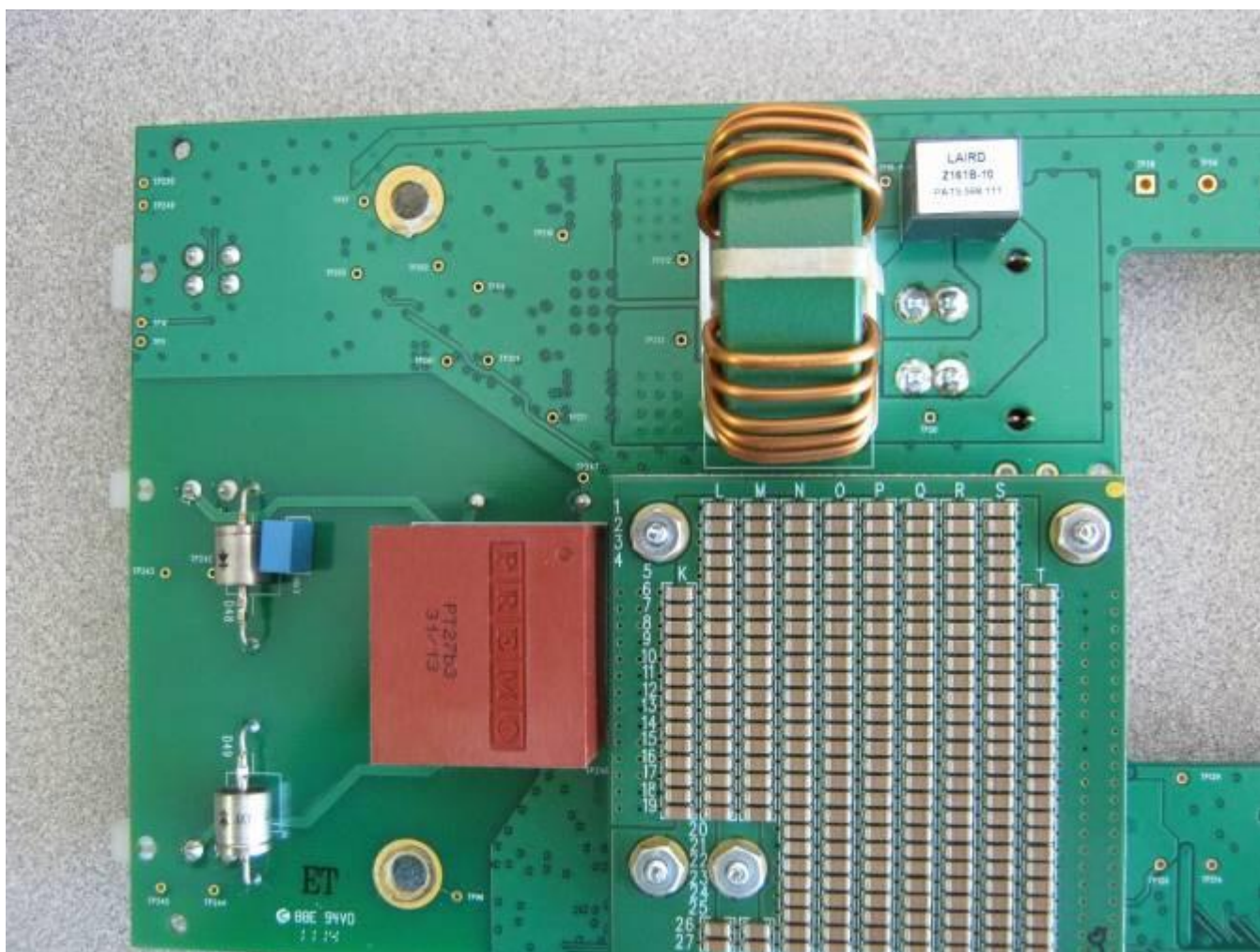
Photographs cont...

Radio Board with Cover Removed



Photographs cont...

Radio Board with Cover Removed



Photographs cont...

Antenna



Photographs cont...

Section 19

FCC LABEL
Product

REVISIONS			
REVISION	DESCRIPTION	DATE	APPROVED
1	RELEASED	02/19/08	CENE

SPECIFICATION CONTROL

1. MATERIAL: .002" THICK POLYESTER WITH 3M #400 OR #7921 ACRYLIC ADHESIVE
 - a. BACKING: SILICONE RELEASE LINER
 - b. FACE COLOR: WHITE WITH BLACK INK
2. ENVIRONMENTAL:
 - a. TEMPERATURE RANGE: -40°C TO +85°C
 - b. ADHESIVE, MATERIAL AND INK SHALL BE RESISTANCE TO UV DEGRADATION
 - c. LIGHT AND HUMIDITY AS SPECIFIED IN UL 969 – OUTDOOR EXPOSURE TEST
3. FONT: MODEL ID AND FCC ID ARIAL 9 BOLD AND TEXT ARIAL 8
4. LABEL SIZE: 1.50" WIDE X 1.10" HIGH


FCC ID: SQB-NIVISAN0100 IC: 6546A-NIVISAN0100
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS. (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

EXAMPLE

DRAWN BY: C.ENE	DATE: 02/19/08	NIVIS LLC.			
APPROVALS		ATLANTA , GEORGIA			
DOC CONTROL:	DATE:	TITLE: Product Label, FCC EDGE ROUTER			
PURCH'G:	DATE:				
DEV ENG:	DATE:				
QUAL ASSR:	DATE:				
MFG ENG:	DATE:	SIZE A	FCSM NO.	DWG. NO. 90000545	REV. 1
PRODUCT MGR:	DATE:	SCALE: NONE		SHEET: 1	

FCC LABEL
Radio

REVISIONS			
REVISION	DESCRIPTION	DATE	APPROVED
1	RELEASED	2/19/08	CENE

SPECIFICATION

CONTROL

1. MATERIAL: .002" THICK POLYESTER WITH 3M #400 OR #7921 ACRYLIC ADHESIVE
 - a. BACKING: SILICONE RELEASE LINER
 - b. FACE COLOR: WHITE WITH BLACK INK
2. ENVIRONMENTAL:
 - a. TEMPERATURE RANGE: -40°C TO +85°C
 - b. ADHESIVE, MATERIAL AND INK SHALL BE RESISTANCE TO UV DEGRADATION
 - c. LIGHT AND HUMIDITY AS SPECIFIED IN UL 969 – OUTDOOR EXPOSURE TEST
3. FONT: ARIAL APPROXIMATELY AS SHOWN
 - a. HEIGHT: .050" BOLD, .035 REGULAR
4. LABEL SIZE: 0.75" WIDE X .40" HIGH

FCC ID: SQB-NIVISAN0100
 IC: 6546A-NIVISAN0100

EXAMPLE

DRAWN BY: C.ENE	DATE: 02/19/08	NIVIS LLC.			
APPROVALS		ATLANTA , GEORGIA			
DOC CONTROL:	DATE:	TITLE: Shield LABEL, FCC Edge Router			
PURCH'G:	DATE:				
DEV ENG:	DATE:				
QUAL ASSR:	DATE:				
MFG ENG:	DATE:	SIZE A	FCSM NO.	DWG. NO. 90000546	REV. 1
PRODUCT MGR:	DATE:	SCALE: NONE		SHEET: 1	

Section 20

TEST EQUIPMENT

<u>Test Equipment</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Serial no.</u>	<u>Cal. Due Date</u>
Spectrum Analyzer	HP	8591A	2919A00171	5/15
Spectrum Analyzer	HP	8592L	3649A00744	7/15
Signal Generator	HP	8648C	3847A0928	5/15
LISN	Emco	3825/2	9305-2088	5/15
Preamplifier	HP	8449B	3808A00914	5/15

<u>Antennas</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Serial no.</u>	<u>Cal. Due Date</u>
Biconical	Electro-Metrics	BIA-25	2451	3/15
Log Periodic	Emco	3146	9306-3643	3/15
Biconilog	Emco	3142	9607-1053	3/15
Active Loop Antenna	Emco	6502	9809-4032	5/15
Horn	Emco	3115	9405-4264	5/15
Horn	Emco	3116	9505-2255	5/15

LAST PAGE ...