



Nemko Test Report: 2014_246422_FCC_15249

Applicant: Den-Mat Holdings LLC
2727 Skyway Drive
Santa Maria CA 93455
United States

**Equipment Under Test:
(E.U.T.)** SOL

FCC Identifier: SYS-SOL

Industry Canada Identifier: 11076A-SOL

In Accordance With: **FCC Part 15, Subpart C, 15.249 and
Industry Canada RSS-210, Issue 8**
Operation within the bands 902-928 MHz,
2400-2483.5 MHz, 5725-5875 MHz, and
24.0-24.25 GHz.

Tested By: Nemko USA Inc.
2210 Faraday Ave.
Suite 150
Carlsbad, CA 92008

TESTED BY:


David Light, Wireless Engineer

DATE: 31 January 2014

APPROVED BY:


Bruce Ketterling, EMC Manager

DATE: 18 March 2014

Total Number of Pages: 14

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Section 1. Summary Of Test Results

Manufacturer: Den-Mat Holdings LLC

Model No.: SOL

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47 Part 15.249 and Industry Canada RSS-210 Issue 8. All tests were conducted using measurement procedure ANSI C63.4-2003. Radiated Emissions were made on an open area test site.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE
TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP Lab Code 200116-0

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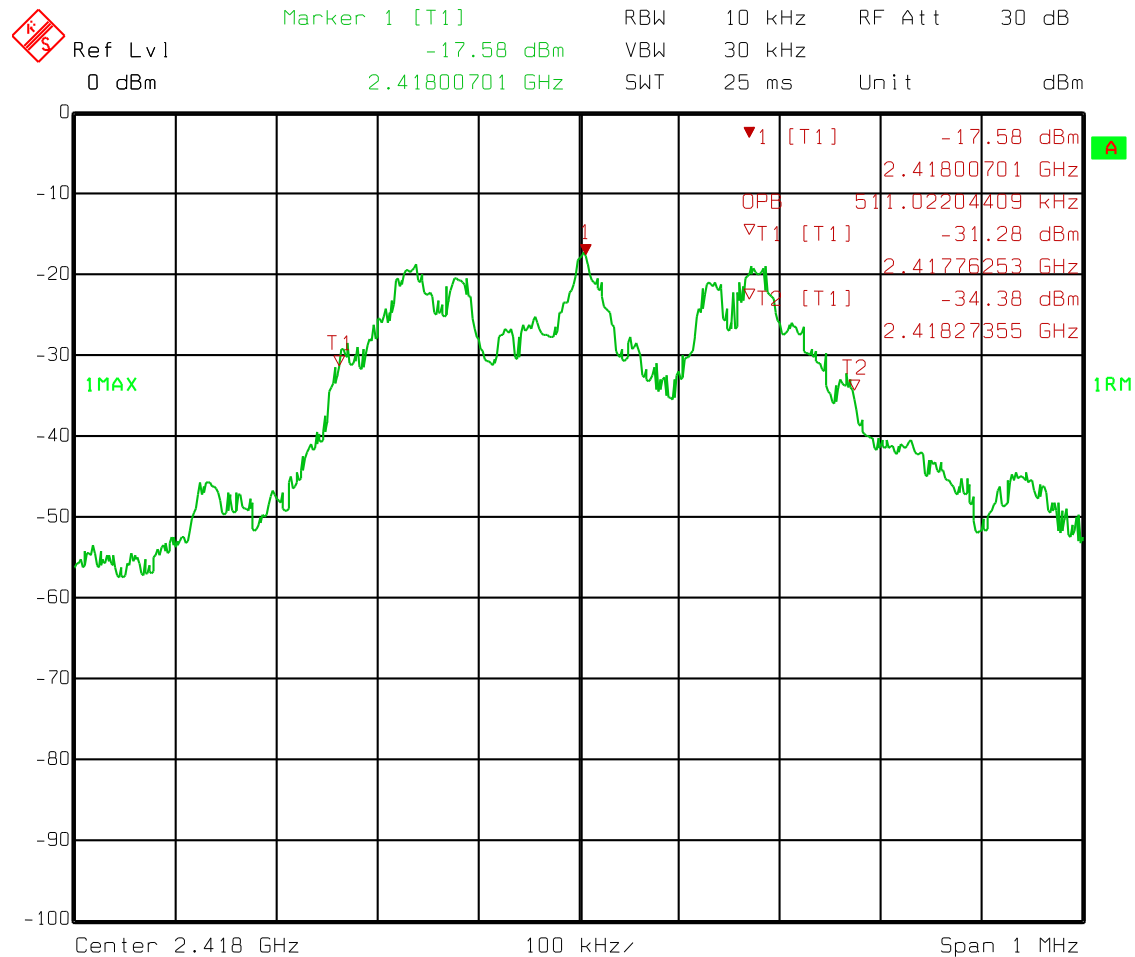
Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	15.207 / RSS-Gen 7.2.4	NA
Radiated Emissions	15.249(a) / RSS-210 A2.9	Complies
Receiver Spurious Emissions	RSS-Gen 7.2.2	NA

Footnotes For N/A's:

The transmitter is battery powered.

The EUT operates above 960 MHz.



Date: 20.NOV.2013 14:40:30

Section 2. General Equipment Specification

Frequency Range:	2400 to 2483.5 MHz				
Operating Frequency(ies) of Sample:	2403 to 2473 MHz				
Number of Channels:	15				
Modulation Type:	GFSK				
Emissions Designator:	511KF1D				
Channel Spacing:	5 MHz				
Power Source:	4.5 Vdc (3 AAA batteries)				
User Frequency Adjustment:	Manual				
Integral Antenna	<table><tbody><tr><td>Yes</td><td>No</td></tr><tr><td>☒</td><td>☐</td></tr></tbody></table>	Yes	No	☒	☐
Yes	No				
☒	☐				

Section 3. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: FCC 15.249(a) RSS-210 A2.9
TESTED BY: David Light	DATE: 25 November2013

Minimum Standard:

(a) The field strengths shall not exceed the following:

Carrier (MHz)	Field Strength (mV/m)	Field Strength (dB μ V)	Harmonic (μ V/m)	Harmonic (dB μ V)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

(b) Field strength limits are specified at a distance of 3 meters.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limits of 15.209 whichever is the less attenuation.

(d) ...for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Results: Complies. The worst case emission was 47.3 dB μ V/m at 2400 MHz. This is 6.7 dB below the specification limit.

Measurement Data: See attached table(s).

This device was tested with a fresh battery.

This device was tested at +/- 15% input power with no variation in output power.

This device was tested from 30 MHz to the tenth harmonic of the carrier.

RBW=VBW=100 kHz < 1000 MHz Peak Detector
RBW= 1 MHz / VBW=3 MHz > 1000 MHz Peak Detector

Operation within the bands 902-928 MHz,
2400-2483.5 MHz, 5725-5875 MHz,
and 24.0-24.25 GHz.

EQUIPMENT: SOL

REPORT NO.:2014_246422_FCC_15249

Test Data - Radiated Emissions (Peak)

Low Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											Low Channel
2403	V	0	87.7	24.5	9.0	41.4	79.8	114.0	-34.2	Pass	Carrier
2403	H	0	97.2	24.5	9.0	41.4	89.3	114.0	-24.7	Pass	Carrier
2400	V	0	62	24.5	9.0	41.4	54.1	74.0	-19.9	Pass	
2400	H	0	75.2	24.5	9.0	41.4	67.3	74.0	-6.7	Pass	
4806	V	0	46	32.9	11.5	42.5	47.9	74.0	-26.1	Pass	
4806	H	0	57.7	32.9	11.5	42.5	59.6	74.0	-14.4	Pass	
7209	V	0	48	36.4	13.3	42.6	55.1	74.0	-18.9	Pass	
7209	H	0	32	36.4	13.3	42.6	39.1	74.0	-34.9	Pass	NF
9612	V	0	31	37.6	15.2	42.7	41.1	74.0	-32.9	Pass	NF
9612	H	0	31	37.6	15.2	42.7	41.1	74.0	-32.9	Pass	NF
12015	V	0	28	39.7	17.3	42.6	42.4	74.0	-31.6	Pass	NF
12015	H	0	28	39.7	17.3	42.6	42.4	74.0	-31.6	Pass	NF
14418	V	0	27	42.4	18.9	40.7	47.6	74.0	-26.4	Pass	NF
14418	H	0	27	42.4	18.9	40.7	47.6	74.0	-26.4	Pass	NF
16821	V	0	25	42	18.0	40.1	44.9	74.0	-29.1	Pass	NF
16821	H	0	25	42	18.0	40.1	44.9	74.0	-29.1	Pass	NF

Test Data - Radiated Emissions (Peak)

Mid Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											SOL
2418	V	0	86.6	24.5	9.0	41.4	78.7	114.0	-35.3	Pass	Peak Carrier
2418	H	0	91	24.5	9.0	41.4	83.1	114.0	-30.9	Pass	Peak Carrier
2400	V	0	32	24.5	9.0	41.4	24.1	74.0	-49.9	Pass	Peak NF
2400	H	0	50.6	24.5	9.0	41.4	42.7	74.0	-31.3	Pass	Peak
2483.5	V	0	32	28.7	9.0	41.4	28.3	74.0	-45.7	Pass	Peak NF
2483.5	H	0	32	28.7	9.0	41.4	28.3	74.0	-45.7	Pass	Peak NF
4836	V	0	35	32.9	11.5	42.5	36.9	74.0	-37.1	Pass	Peak NF
4836	H	0	51	32.9	11.5	42.5	52.9	74.0	-21.1	Pass	Peak
7254	V	0	50.5	36.4	13.3	42.6	57.6	74.0	-16.4	Pass	Peak
7254	H	0	56.2	36.4	13.3	42.6	63.3	74.0	-10.7	Pass	Peak
9672	V	0	33	37.6	15.2	42.7	43.1	74.0	-30.9	Pass	Peak NF
9672	H	0	33	37.6	15.2	42.7	43.1	74.0	-30.9	Pass	Peak NF
12090	V	0	31	39.7	17.3	42.6	45.4	74.0	-28.6	Pass	Peak NF
12090	H	0	31	39.7	17.3	42.6	45.4	74.0	-28.6	Pass	Peak NF
14508	V	0	30	42.4	18.9	40.7	50.6	74.0	-23.4	Pass	Peak NF
14508	H	0	30	42.4	18.9	40.7	50.6	74.0	-23.4	Pass	Peak NF
16926	V	0	30	42	18.0	40.1	49.9	74.0	-24.1	Pass	Peak NF
16926	H	0	30	42	18.0	40.1	49.9	74.0	-24.1	Pass	Peak NF

Test Data - Radiated Emissions (Peak)

Upper Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											High Channel
2473	V	0	95	28.7	9.0	41.4	91.3	114.0	-22.7	Pass	Carrier
2473	H	0	95	28.7	9.0	41.4	91.3	114.0	-22.7	Pass	Carrier
2483.5	V	0	61	28.7	9.0	41.4	57.3	74.0	-16.7	Pass	
2483.5	H	0	61	28.7	9.0	41.4	57.3	74.0	-16.7	Pass	
4946	V	0	56.6	32.9	11.5	42.5	58.5	74.0	-15.5	Pass	
4946	H	0	56.2	32.9	11.5	42.5	58.1	74.0	-15.9	Pass	
7419	V	0	56.6	36.4	13.3	42.6	63.7	74.0	-10.3	Pass	
7419	H	0	33	36.4	13.3	42.6	40.1	74.0	-33.9	Pass	NF
9892	V	0	29	37.6	15.2	42.7	39.1	74.0	-34.9	Pass	NF
9892	H	0	29	37.6	15.2	42.7	39.1	74.0	-34.9	Pass	NF
12365	V	0	26	39.7	17.3	42.6	40.4	74.0	-33.6	Pass	NF
12365	H	0	26	39.7	17.3	42.6	40.4	74.0	-33.6	Pass	NF
14838	V	0	29	42.4	18.9	40.7	49.6	74.0	-24.4	Pass	NF
14838	H	0	29	42.4	18.9	40.7	49.6	74.0	-24.4	Pass	NF
17311	V	0	26	42	18.0	40.1	45.9	74.0	-28.1	Pass	NF
17311	H	0	26	42	18.0	40.1	45.9	74.0	-28.1	Pass	NF

Test Data - Radiated Emissions (Average)

Lower Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
2403	V	-20	87.7	24.5	9.0	41.4	59.8	94.0	-34.2	Pass	Carrier
2403	H	-20	97.2	24.5	9.0	41.4	69.3	94.0	-24.7	Pass	Carrier
2400	V	-20	62	24.5	9.0	41.4	34.1	54.0	-19.9	Pass	
2400	H	-20	75.2	24.5	9.0	41.4	47.3	54.0	-6.7	Pass	
4806	V	-20	46	32.9	11.5	42.5	27.9	54.0	-26.1	Pass	
4806	H	-20	57.7	32.9	11.5	42.5	39.6	54.0	-14.4	Pass	
7209	V	-20	48	36.4	13.3	42.6	35.1	54.0	-18.9	Pass	
7209	H	-20	32	36.4	13.3	42.6	19.1	54.0	-34.9	Pass	NF
9612	V	-20	31	37.6	15.2	42.7	21.1	54.0	-32.9	Pass	NF
9612	H	-20	31	37.6	15.2	42.7	21.1	54.0	-32.9	Pass	NF
12015	V	-20	28	39.7	17.3	42.6	22.4	54.0	-31.6	Pass	NF
12015	H	-20	28	39.7	17.3	42.6	22.4	54.0	-31.6	Pass	NF
14418	V	-20	27	42.4	18.9	40.7	27.6	54.0	-26.4	Pass	NF
14418	H	-20	27	42.4	18.9	40.7	27.6	54.0	-26.4	Pass	NF
16821	V	-20	25	42	18.0	40.1	24.9	54.0	-29.1	Pass	NF
16821	H	-20	25	42	18.0	40.1	24.9	54.0	-29.1	Pass	NF

Test Data - Radiated Emissions (Average)

Mid Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											SOL
2418	V	-20	86.6	24.5	9.0	41.4	58.7	94.0	-35.3	Pass	Average Carrier
2418	H	-20	91	24.5	9.0	41.4	63.1	94.0	-30.9	Pass	Average Carrier
4836	V	-20	35	32.9	11.5	42.5	16.9	54.0	-37.1	Pass	Average NF
4836	H	-20	51	32.9	11.5	42.5	32.9	54.0	-21.1	Pass	Average
7254	V	-20	50.5	36.4	13.3	42.6	37.6	54.0	-16.4	Pass	Average
7254	H	-20	56.2	36.4	13.3	42.6	43.3	54.0	-10.7	Pass	Average
9672	V	-20	33	37.6	15.2	42.7	23.1	54.0	-30.9	Pass	Average NF
9672	H	-20	33	37.6	15.2	42.7	23.1	54.0	-30.9	Pass	Average NF
12090	V	-20	31	39.7	17.3	42.6	25.4	54.0	-28.6	Pass	Average NF
12090	H	-20	31	39.7	17.3	42.6	25.4	54.0	-28.6	Pass	Average NF
14508	V	-20	30	42.4	18.9	40.7	30.6	54.0	-23.4	Pass	Average NF
14508	H	-20	30	42.4	18.9	40.7	30.6	54.0	-23.4	Pass	Average NF
16926	V	-20	30	42	18.0	40.1	29.9	54.0	-24.1	Pass	Average NF
16926	H	-20	30	42	18.0	40.1	29.9	54.0	-24.1	Pass	Average NF

Operation within the bands 902-928 MHz,
2400-2483.5 MHz, 5725-5875 MHz,
and 24.0-24.25 GHz.

EQUIPMENT: SOL

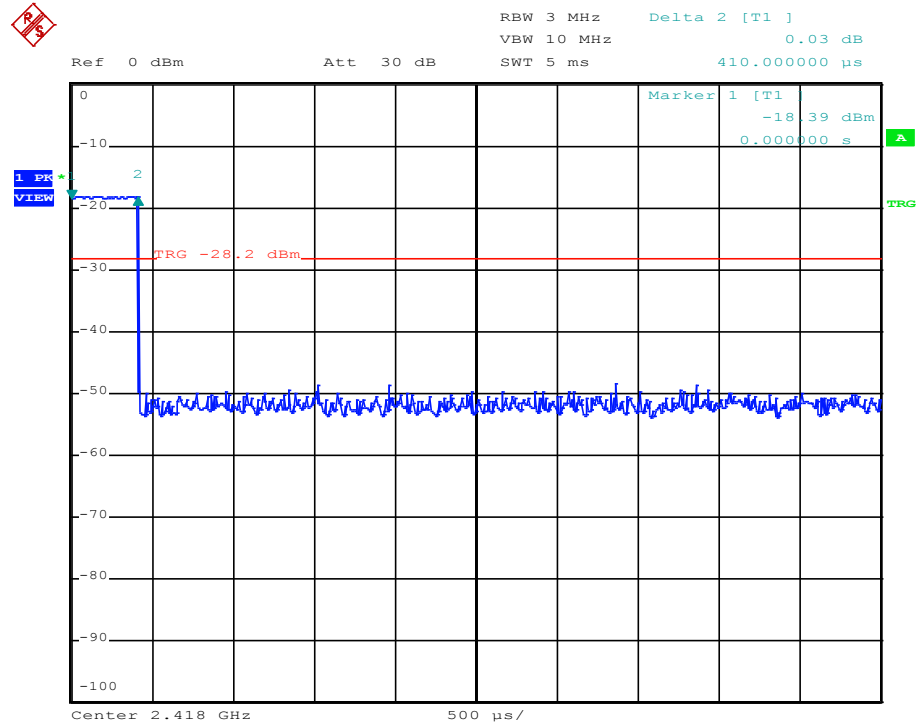
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Test Data - Radiated Emissions (Average)

Upper Channel

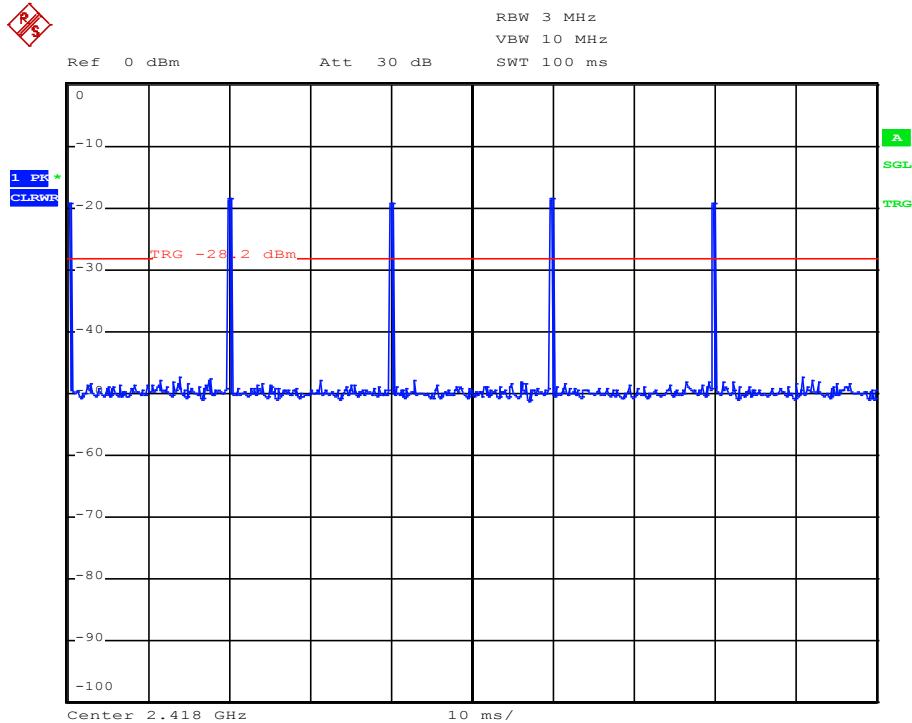
Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
2477	V	-20	95	28.7	9.0	41.4	71.3	94.0	-22.7	Pass	
2477	H	-20	95	28.7	9.0	41.4	71.3	94.0	-22.7	Pass	
2483.5	V	-20	61	28.7	9.0	41.4	37.3	54.0	-16.7	Pass	
2483.5	H	-20	61	28.7	9.0	41.4	37.3	54.0	-16.7	Pass	
4954	V	-20	56.6	32.9	11.5	42.5	38.5	54.0	-15.5	Pass	
4954	H	-20	56.2	32.9	11.5	42.5	38.1	54.0	-15.9	Pass	
7431	V	-20	56.6	36.4	13.3	42.6	43.7	54.0	-10.3	Pass	
7431	H	-20	33	36.4	13.3	42.6	20.1	54.0	-33.9	Pass	NF
9908	V	-20	29	37.6	15.2	42.7	19.1	54.0	-34.9	Pass	NF
9908	H	-20	29	37.6	15.2	42.7	19.1	54.0	-34.9	Pass	NF
12385	V	-20	26	39.7	17.3	42.6	20.4	54.0	-33.6	Pass	NF
12385	H	-20	26	39.7	17.3	42.6	20.4	54.0	-33.6	Pass	NF
14862	V	-20	29	42.4	18.9	40.7	29.6	54.0	-24.4	Pass	NF
14862	H	-20	29	42.4	18.9	40.7	29.6	54.0	-24.4	Pass	NF
17339	V	-20	26	42	18.0	40.1	25.9	54.0	-28.1	Pass	NF
17339	H	-20	26	42	18.0	40.1	25.9	54.0	-28.1	Pass	NF

Test Data – Duty Cycle



Date: 17.AUG.1998 20:02:59

Test Data – Duty Cycle



Date: 17.AUG.1998 20:04:03

$$\text{Duty Cycle Correction} = 20 \log (T_{\text{ON}}/100 \text{ ms}) = 20 \log 0.02 \text{ ms} = -33.8 \text{ dB}$$

Section 4. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
111	Antenna, LPA	EMCO	3146	1382	09-Jan-2013	09-Jan-2014
752	Antenna, DRWG	EMCO	3115	4943	03-Jan-2013	03-Jan-2014
901	Preamplifier	Sonoma	310 N	130607	21-Nov-2013	21-Nov-2014
1036	Spectrum Analyzer	Rohde & Schwarz	FSEK30	830846/006	15-Jul-2013	15-Jul-2015
E1029	Preamplifier (20MHz to 18GHz)	A.H. Systems, Inc.	PAM-0118	343	21-Jan-2013	21-Jan-2014
E1030	10 Meter Low Loss Cable	A.H. Systems, Inc.	SAC-18G-10	1096	03-Dec-2012	03-Dec-2013
E1031	33ft High Frequency Blue Cable				03-Dec-2012	03-Dec-2013
E1046	Biconical Antenna	A.H. Systems Inc.	SAS-540	736	22-Apr-2013	22-Apr-2014

Nemko USA, Inc.

CFR 47, PART 15, SUBPART C, Paragraph 15.249

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and 24.0-24.25 GHz.

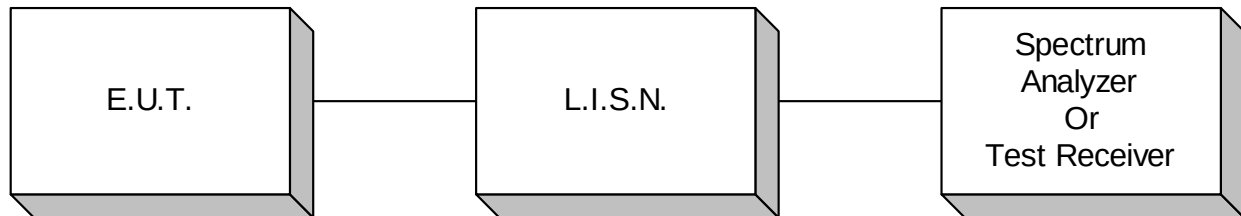
EQUIPMENT: SOL

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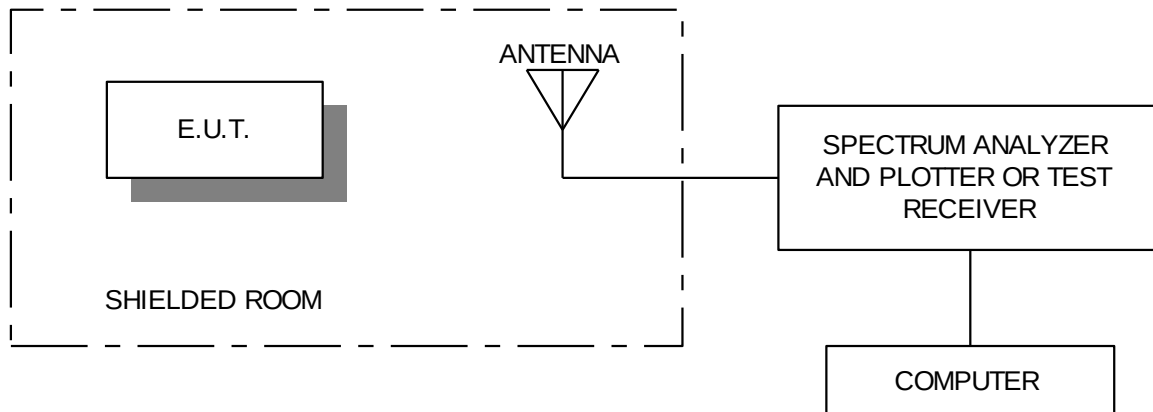
ANNEX A

TEST DIAGRAMS

Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions

