SmartLabs, Inc.

ADDENDUM TEST REPORT TO 93082-32

Micro Module Dimmer, 24422
Micro Module Relay, 24432
Micro Module Shutter, 24442

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)
15.249

Report No.: 93082-32A

Date of issue: September 26, 2014

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

SmartLabs, Inc.
16542 Millikan Ave.
Irvine, CA 92606

REPRESENTATIVE: John Lockyer
Customer Reference Number: 14-3JL0715-01

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 93082

DATE OF EQUIPMENT RECEIPT: July 31, 2014
DATE(S) OF TESTING: July 31 - August 27, 2014

Revision History

Original: Testing of the Micro Module Dimmer, 24422, Micro Module Relay, 24432 and Micro Module Shutter, 24442 to FCC Part 15 Subpart C Section 15.249.
Addendum A: To correct duplicate data sheets in the fundamental section of the report.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A	US0060	SL2-IN-E-1146R	3082D-1	90473	A-0147

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure/Method	Description	Modifications*	Results
15.249(a)	Field Strength of Fundamental	NA	Pass
15.249(a)	Field Strength of Harmonics	NA	Pass

Modifications*/Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
This report is for a FCC Permissive Change II. The manufacturer states that there were no changes to the RF board but there were some changes to the main PCB. The RF board is a separate daughter board which sits on the main PCB. Due to the changes made in the units, testing consisted of measuring the fundamental emission and the harmonic emissions.

***Modifications listed above must be incorporated into all production units.**

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Micro Module Dimmer
Manuf: SmartLabs, Inc.
Model: 24422
Serial: 20.24.ED

Micro Module Relay
Manuf: SmartLabs, Inc.
Model: 24432
Serial: 20.1F.FA

Micro Module Shutter
Manuf: SmartLabs, Inc.
Model: 24442
Serial: 20.10.A5

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Light Bulb and Fixture
Manuf: Sylvania
Model: SYL7.5W120V
Serial: None

FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) CFR 47 Section 15 Subpart C requirements for Intentional Radiators.

15.249(a) Field Strength of Fundamental

Test Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 09:24:43
Equipment: **Micro Module Dimmer** Sequence#: 1
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24422
S/N: 20.26.18

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T2	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
T3	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T4	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Dimmer*	SmartLabs, Inc.	24422	20.26.18

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

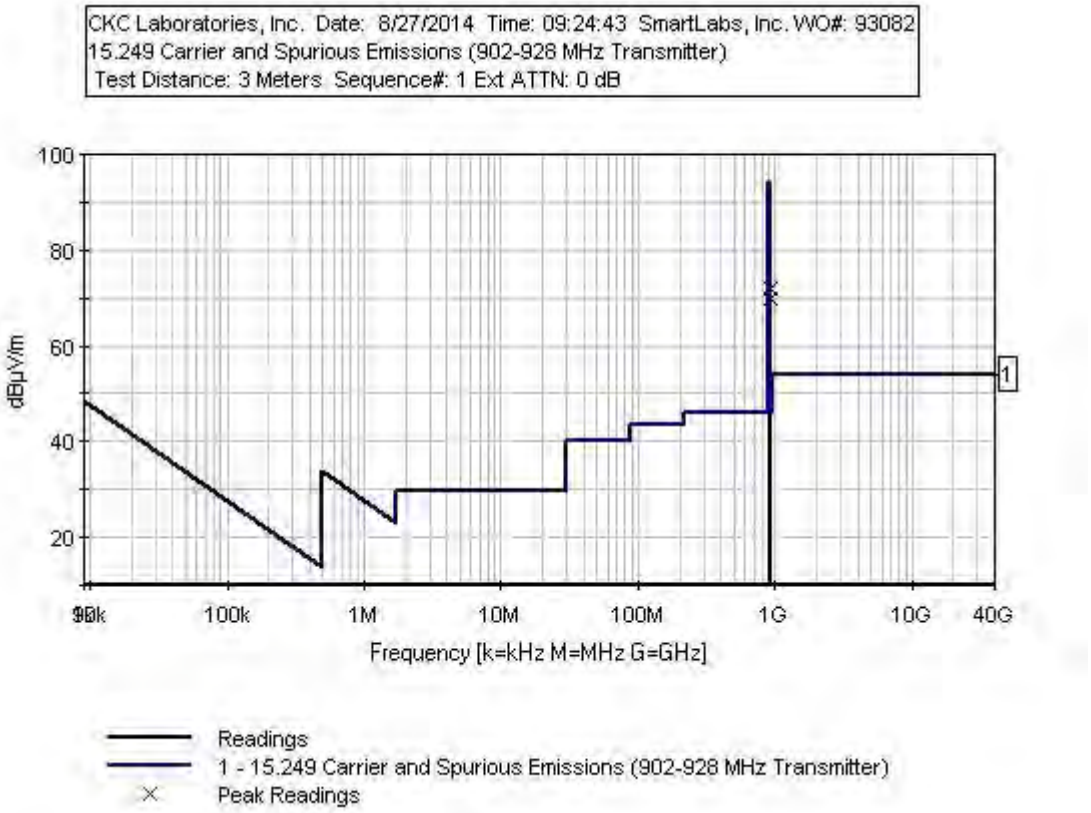
Test Conditions / Notes:

The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 914.5MHz to 915.5MHz. RBW=120 kHz,VBW=120 kHz. Test environment conditions: 26°C, 41%, 100kPa. Site A

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	914.920M	69.2	+0.6	+5.9	-27.3	+23.7	+0.0	72.1	94.0	-21.9	Horiz
2	915.068M	66.9	+0.6	+5.9	-27.3	+23.7	+0.0	69.8	94.0	-24.2	Vert



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 10:05:08
Equipment: **Micro Module Relay** Sequence#: 2
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24432
S/N: 20.20.35

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T2	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
T3	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T4	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Relay*	SmartLabs, Inc.	24432	20.20.35

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

Test Conditions / Notes:

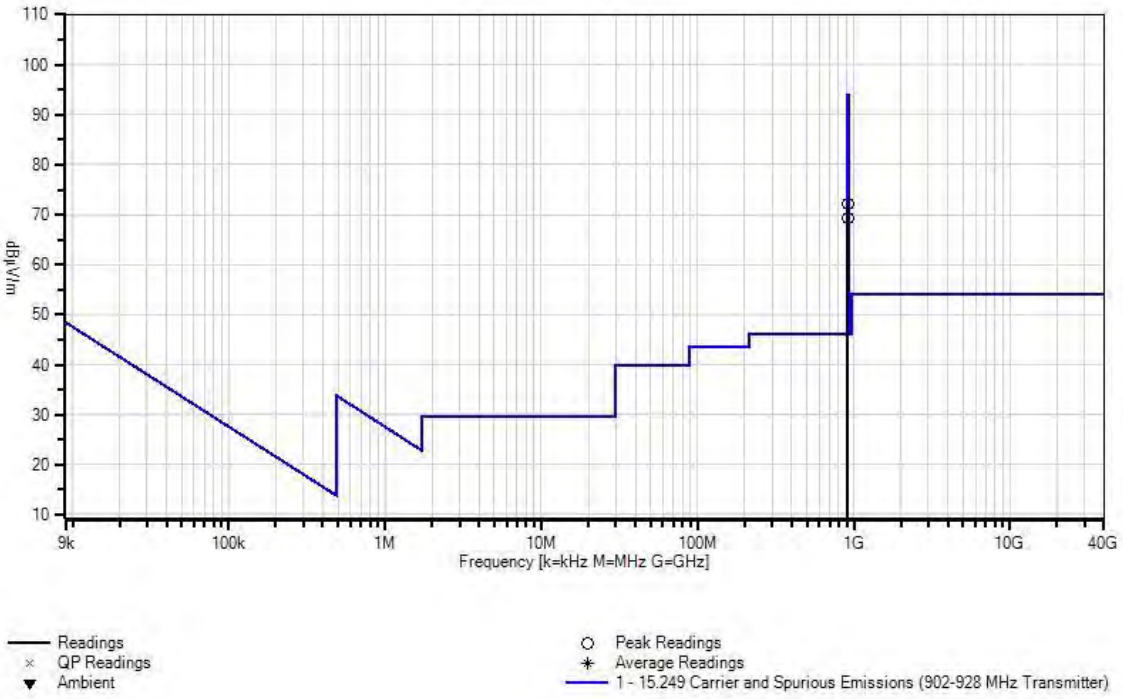
The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 914.5MHz to 915.5MHz. RBW=120 kHz,VBW=120 kHz. Test environment conditions: Temperature: 26°C, Relative Humidity: 41%, Atmospheric Pressure: 100kPa. Site A

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	914.915M	69.2	+0.6	+5.9	-27.3	+23.7	+0.0	72.1	94.0	-21.9	Horiz
2	914.915M	66.4	+0.6	+5.9	-27.3	+23.7	+0.0	69.3	94.0	-24.7	Vert

CKC Laboratories, Inc. Date: 8/27/2014 Time: 10:05:08 SmartLabs, Inc. WO#: 93082
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 2 Ext
ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 10:57:08
Equipment: **Micro Module Shutter** Sequence#: 3
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24442
S/N: 20.0F.E5

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
T2	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
T3	AN00309	Preamp	8447D	3/12/2014	3/12/2016
T4	AN01995	Biconilog Antenna	CBL6111C	4/30/2014	4/30/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Shutter*	SmartLabs, Inc.	24442	20.0F.E5

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

Test Conditions / Notes:

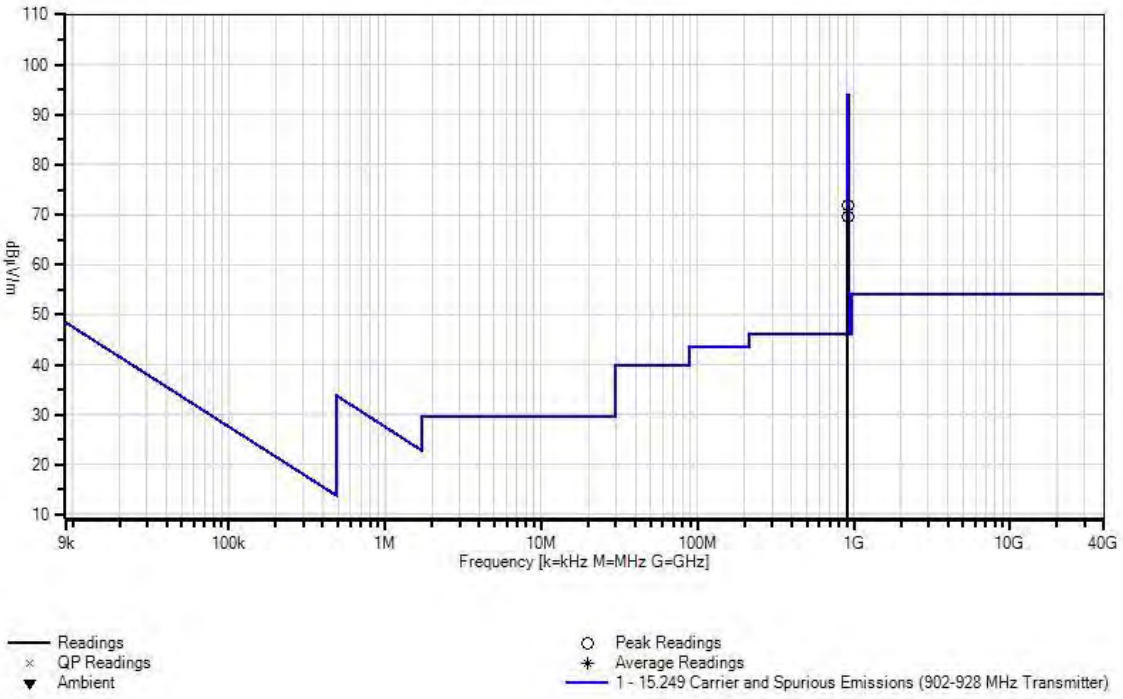
The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 914.5MHz to 915.5MHz. RBW=120 kHz,VBW=120 kHz. Test environment conditions: Temperature: 26°C, Relative Humidity: 41%, Atmospheric Pressure: 100kPa. Site A

Ext Attn: 0 dB

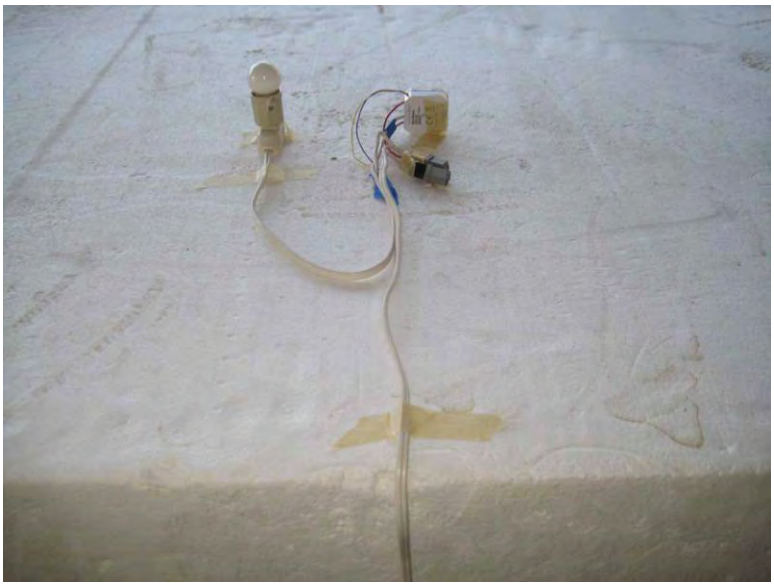
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	915.060M	68.9	+0.6	+5.9	-27.3	+23.7	+0.0	71.8	94.0	-22.2	Horiz
2	914.910M	66.8	+0.6	+5.9	-27.3	+23.7	+0.0	69.7	94.0	-24.3	Vert

CKC Laboratories, Inc. Date: 8/27/2014 Time: 10:57:08 SmartLabs, Inc. WO#: 93082
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 3 Ext
ATTN: 0 dB



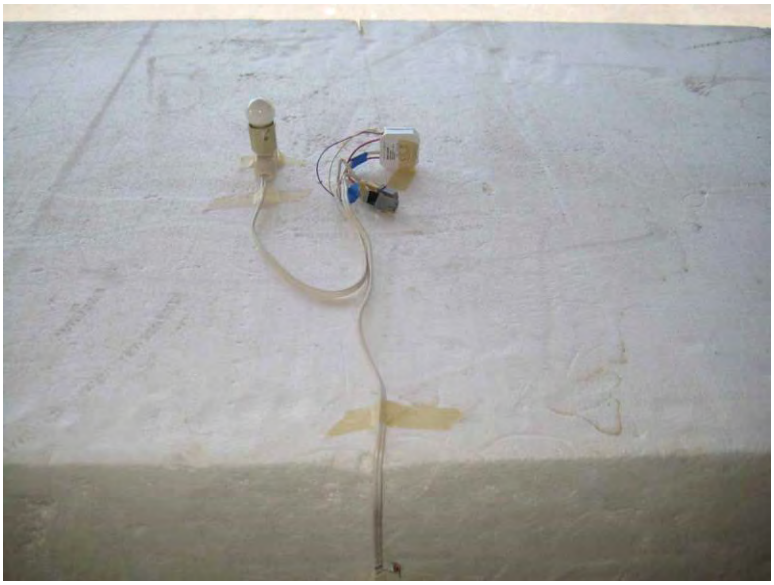
Test Setup Photo(s)



Micro Module Dimmer, 24422

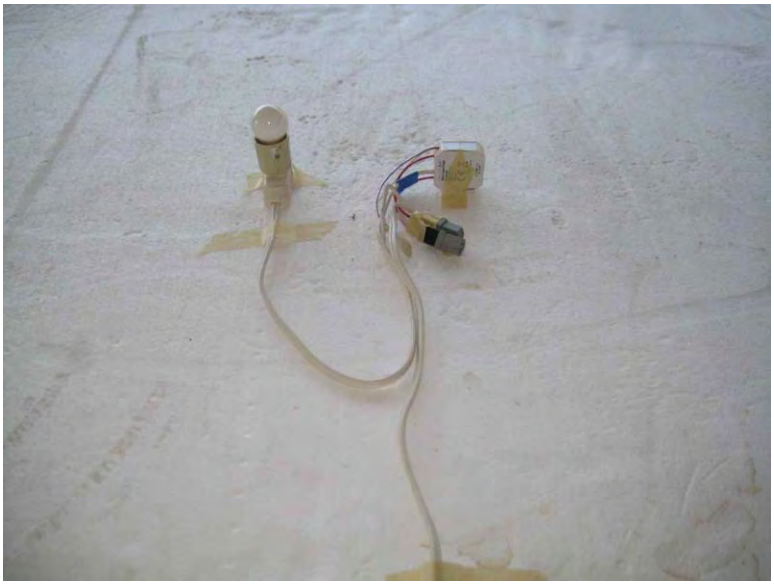
Micro Module Dimmer, 24422

Micro Module Relay, 24432



Micro Module Relay, 24432

Micro Module Shutter, 24442



Micro Module Shutter, 24442

15.249(a) Field Strength of Harmonics

Test Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 13:14:49
Equipment: **Micro Module Dimmer** Sequence#: 4
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24422
S/N: 20.24.ED

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	ANP05421	Cable	Sucoflex 104A	1/8/2014	1/8/2016
T2	AN00786	Preamp	83017A	4/25/2014	4/25/2016
T3	AN00849	Horn Antenna	3115	3/18/2014	3/18/2016
T4	AN02945	Cable	32022-2-2909K-36TC	10/30/2013	10/30/2015
T5	AN03169	High Pass Filter	HM1155-11SS	7/30/2013	7/30/2015
T6	ANP06661	Cable	LDF1-50	4/15/2014	4/15/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Dimmer*	SmartLabs, Inc.	24422	20.24.ED

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

Test Conditions / Notes:

The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 1GHz to 10GHz. RBW=1MHz,VBW=1MHz. Test environment conditions: Temperature: 27°C, Relative Humidity: 41%, Atmospheric Pressure: 100kPa. Site A

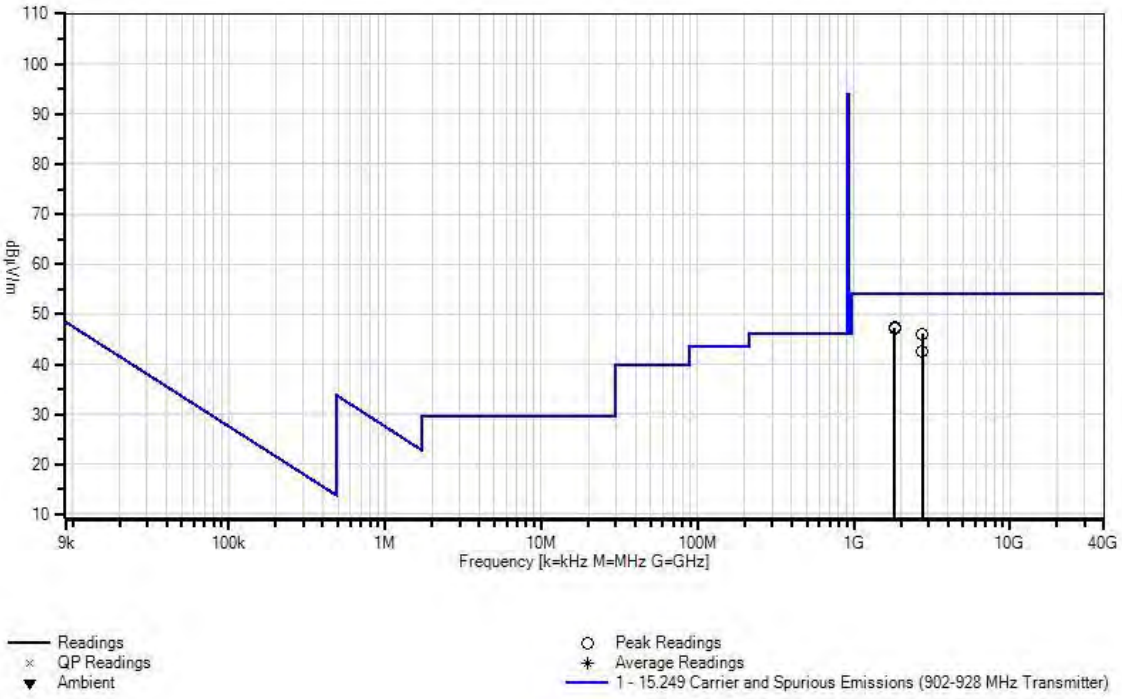
Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1830.153M	56.0	+0.8 +0.3	-38.3 +3.5	+24.4	+0.7	+0.0	47.4	54.0	-6.6	Vert
2	1830.106M	55.7	+0.8 +0.3	-38.3 +3.5	+24.4	+0.7	+0.0	47.1	54.0	-6.9	Horiz

3	2745.208M	51.9	+1.4 +0.2	-38.9 +4.4	+26.4	+0.7	+0.0	46.1	54.0	-7.9	Horiz
4	2745.049M	48.3	+1.4 +0.2	-38.9 +4.4	+26.4	+0.7	+0.0	42.5	54.0	-11.5	Vert

CKC Laboratories, Inc. Date: 8/27/2014 Time: 13:14:49 SmartLabs, Inc. WO#: 93082
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 4 Ext
ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 12:31:11
Equipment: **Micro Module Relay** Sequence#: 5
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24432
S/N: 20.1F.FA

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	AN00786	Preamp	83017A	4/25/2014	4/25/2016
T2	AN00849	Horn Antenna	3115	3/18/2014	3/18/2016
T3	AN02945	Cable	32022-2-2909K-36TC	10/30/2013	10/30/2015
T4	ANP05421	Cable	Sucoflex 104A	1/8/2014	1/8/2016
T5	AN03169	High Pass Filter	HM1155-11SS	7/30/2013	7/30/2015
T6	ANP06661	Cable	LDF1-50	4/15/2014	4/15/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Relay*	SmartLabs, Inc.	24432	20.1F.FA

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

Test Conditions / Notes:

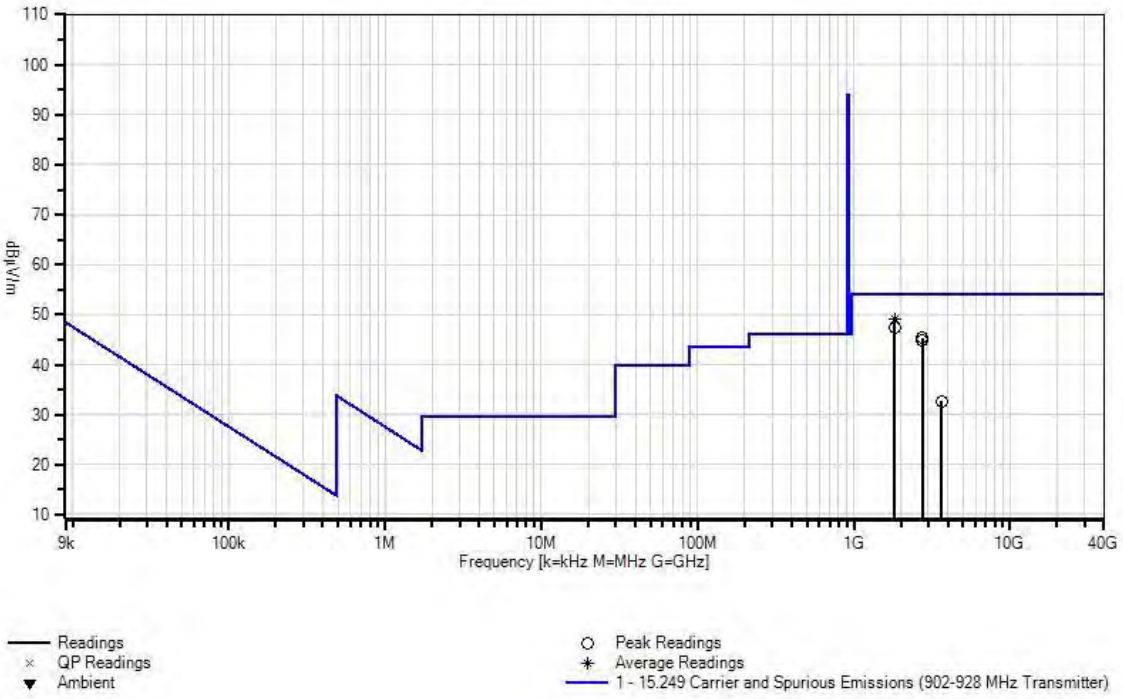
The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 1GHz to 10GHz. RBW=1MHz,VBW=1MHz. Test environment conditions: Temperature: 27°C, Relative Humidity: 41%, Atmospheric Pressure: 100kPa. Site A

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1830.103M	57.8	-38.3	+24.4	+0.7	+0.8	+0.0	49.2	54.0	-4.8	Horiz
	Ave		+0.3	+3.5							
^	1830.103M	60.1	-38.3	+24.4	+0.7	+0.8	+0.0	51.5	54.0	-2.5	Horiz
			+0.3	+3.5							
3	1829.798M	56.0	-38.3	+24.4	+0.7	+0.8	+0.0	47.4	54.0	-6.6	Vert
			+0.3	+3.5							
4	2745.205M	51.2	-38.9	+26.4	+0.7	+1.4	+0.0	45.4	54.0	-8.6	Vert
			+0.2	+4.4							
5	2744.818M	50.6	-38.9	+26.4	+0.7	+1.4	+0.0	44.8	54.0	-9.2	Horiz
			+0.2	+4.4							
6	3659.533M	34.3	-38.1	+28.6	+0.8	+1.6	+0.0	32.7	54.0	-21.3	Horiz
			+0.3	+5.2							

CKC Laboratories, Inc. Date: 8/27/2014 Time: 12:31:11 SmartLabs, Inc. WO#: 93082
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 5 Ext
ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **SmartLabs, Inc.**
Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
Work Order #: **93082** Date: 8/27/2014
Test Type: **Maximized Emissions** Time: 11:58:21
Equipment: **Micro Module Shutter** Sequence#: 6
Manufacturer: SmartLabs, Inc. Tested By: S. Yamamoto
Model: 24442
S/N: 20.10.A5

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T1	ANP05421	Cable	Sucoflex 104A	1/8/2014	1/8/2016
T2	AN00786	Preamp	83017A	4/25/2014	4/25/2016
T3	AN00849	Horn Antenna	3115	3/18/2014	3/18/2016
T4	AN02945	Cable	32022-2-2909K-36TC	10/30/2013	10/30/2015
T5	AN03169	High Pass Filter	HM1155-11SS	7/30/2013	7/30/2015
T6	ANP06661	Cable	LDF1-50	4/15/2014	4/15/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Micro Module Shutter*	SmartLabs, Inc.	24442	20.10.A5

Support Devices:

Function	Manufacturer	Model #	S/N
Light bulb and fixture	Sylvania	SYL7.5W120V	

Test Conditions / Notes:

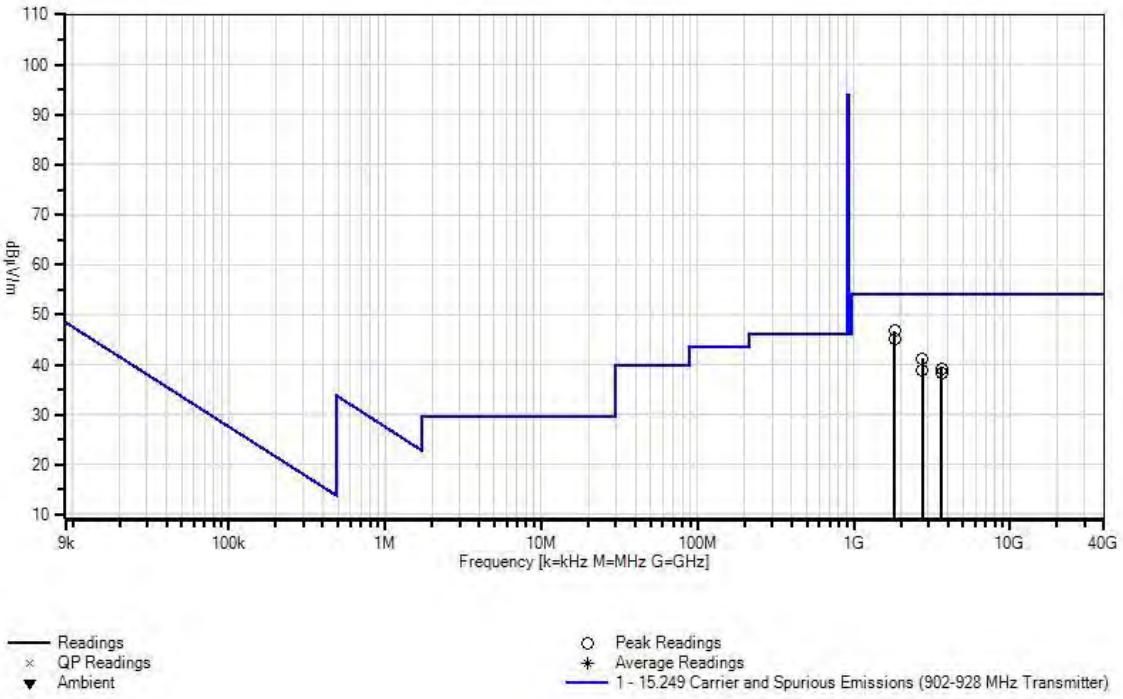
The equipment under test (EUT) is placed on the Styrofoam table top. The EUT is connected to a light bulb load which is turned on constantly. The EUT is transmitting continuously. Emission levels reported in this data are representative of worst case emissions. Voltage to the EUT is 120Vac 60Hz. Operating frequency range of wireless device = 914.5MHz to 915.5MHz. Frequency range of measurement and data sheet = 1GHz to 10GHz. RBW=1MHz,VBW=1MHz. Test environment conditions: Temperature: 27°C, Relative Humidity: 41%, Atmospheric Pressure: 100kPa. Site A

Ext Attn: 0 dB

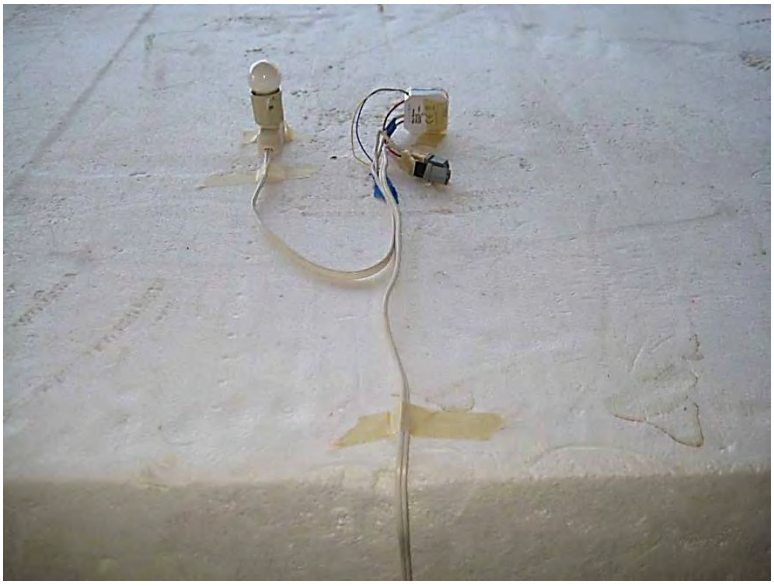
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1830.105M	55.3	+0.8 +0.3	-38.3 +3.5	+24.4	+0.7	+0.0	46.7	54.0	-7.3	Horiz
2	1829.845M	53.6	+0.8 +0.3	-38.3 +3.5	+24.4	+0.7	+0.0	45.0	54.0	-9.0	Vert
3	2745.300M	47.0	+1.4 +0.2	-38.9 +4.4	+26.4	+0.7	+0.0	41.2	54.0	-12.8	Horiz
4	3659.978M	40.8	+1.6 +0.3	-38.1 +5.2	+28.6	+0.8	+0.0	39.2	54.0	-14.8	Horiz
5	2745.395M	44.7	+1.4 +0.2	-38.9 +4.4	+26.4	+0.7	+0.0	38.9	54.0	-15.1	Vert
6	3660.123M	39.9	+1.6 +0.3	-38.1 +5.2	+28.6	+0.8	+0.0	38.3	54.0	-15.7	Vert

CKC Laboratories, Inc. Date: 8/27/2014 Time: 11:58:21 SmartLabs, Inc. WO#: 93082
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 6 Ext
ATTN: 0 dB



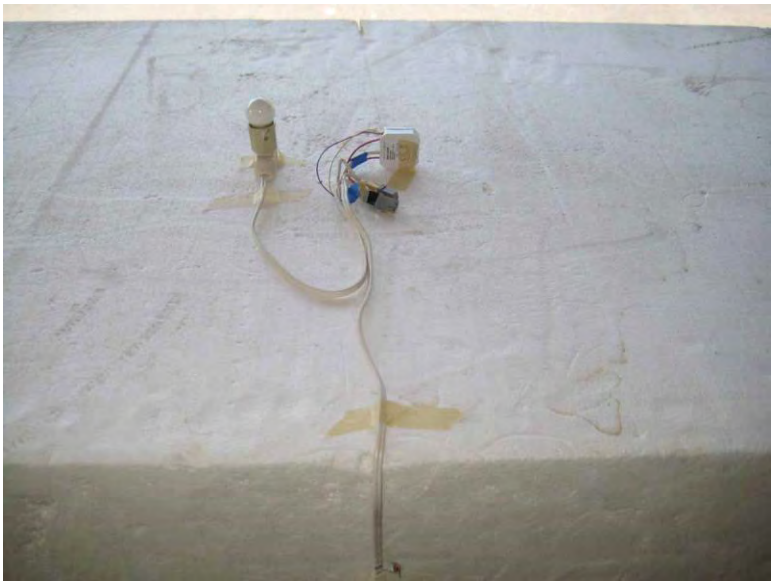
Test Setup Photo(s)



Micro Module Dimmer, 24422

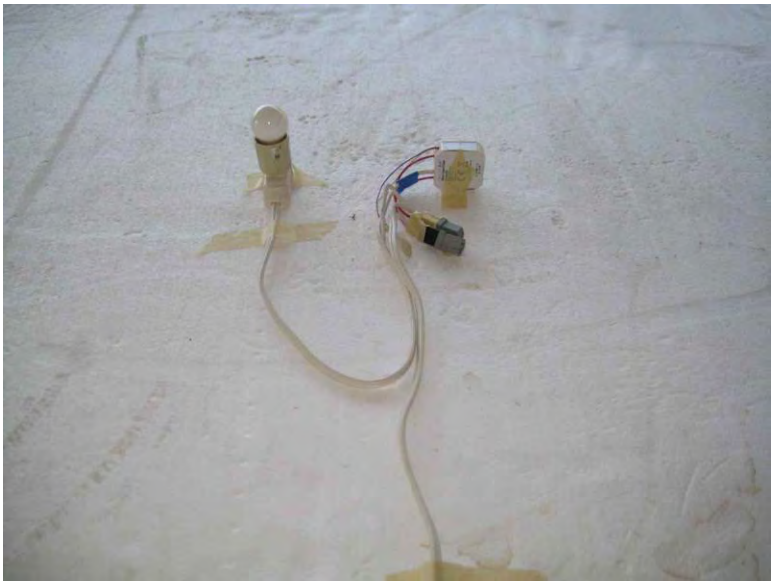
Micro Module Dimmer, 24422

Micro Module Relay, 24432



Micro Module Relay, 24432

Micro Module Shutter, 24442



Micro Module Shutter, 24442

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

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

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.