

EXHIBIT E: REPORT OF MEASUREMENTS [2.1033(B6)]

Test Report for FCC ID: QGH-RZP15

FCC Part 2.1031, Part 15 Subpart C(15.249)

Report #0500786APLF

Issued 06/23/05



908.42MHZ TRANSCEIVER MODEL RZP15

Prepared for: LEVITON MANUFACTURING, Inc.
59-25 Little Neck Pkwy
Little Neck, NY 11362

Test Date(s): April 13, May 5,6,11,19,25, June 8, 2005

data recorded by

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This report prepared by:

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Statements Concerning this Report

NVLAP Accreditation: NVLAP Lab Code 200129-0

The scope of AHD accreditation is the conducted emissions, radiated emissions test methods of:

IEC/CISPR 22: Limits and methods measurement of radio disturbance characteristics of information technology equipment.

FCC Method – 47 CFT Part 15: .

AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.

IEC61000-4-2 and Amend.1: ElectroStatic Discharge Immunity

IEC61000-4-5: Surge Immunity

Test Data:

This test report contains data covered by the NVLAP accreditation.

Subcontracted Testing:

This report contains data recorded at the University of Michigan Radiation Laboratory. The University of Michigan test facility is located at 8501 Beck Road, Belleville, Michigan 48111. This test facility has been fully described and accepted by the FCC and Industry Canada. This facility was utilized to measure emissions occurring at frequencies greater than 6GHz.

Test Traceability:

The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

Limitations on results:

The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

Limitations on copying:

This report shall not be reproduced, except in full, without the written approval of AHD.

Limitations of the report:

This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

Statement of Test Results Uncertainty: Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: ± 1.4 dB

Manufacturer/Applicant [2.1033(b1)]

The manufacturer and applicant:

LEVITON MANUFACTURING, Inc.
59-25 Little Neck Pkwy
Little Neck, NY 11362

Measurement/Test Site Facility & Equipment**Test Site1 [2.948, 2.1033(b6)]****SITE 1.**

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 M-152, Dowagiac, Michigan 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry Canada (file:IC3161).

Measurement Equipment Used [2.947(d), 15.31(b)]**SITE 1.**

Equipment Calibration	Model	S/N	Last Cal Date	Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	26-Aug-04	12 months
RF Receiver Section	HP-85462A	3625A00342	26-Aug-04	12 months
EMCO BiconiLog Antenna	3142	1077	24-Aug-04	12 months
Solar LISN	8012-50-R-24-BNC	962137	24-Aug-04	12 months
Solar LISN	8012-50-R-24-BNC	962138	24-Aug-04	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	29-Nov-04	12 months
(3-M) Type 129FF Ultra Flex LowLoss	RG58/U	9910-12	06-Jun-05	6 months
(3-M) LMR-400 Ultra Flex	LMR400	9812-11	06-Jun-05	6 months
Double Ridged Horn	ONO91202-2	A00329	calibration by design	physical inspection
Wavetek Signal Generator	2500	0010313	Characterized/leveled durng test setup	

Test Site2 [2.948, 2.1033(b6)]**SITE 2.**

The University of Michigan test facility is located at 8501 Beck Road, Belleville, Michigan 48111. This test facility has been fully described and accepted by the FCC and Industry Canada. This facility was utilized to measure emissions occurring at frequencies greater than 6GHz.

Measurement Equipment Used [2.947(d), 15.31(b)]**SITE 2.**

Equipment Calibration	Model	S/N	Last Cal	
			Date	Interval
C-Band Std. Gain Horn	UM NRL design		calibration by design & physical inspection.	
XN-Band Std. Gain Horn	UM NRL design		calibration by design & physical inspection.	
X-Band Std. Gain Horn	SA 12-8.2	730	calibration by design & physical inspection.	
Avantek RF amplifier	AFT-12665		06-Jul-04	12 months
3ft LowLoss coax	RG142	-	with Avantek amp	
Spectrum Analyzer	HP 8593E	3412A01131	06-Jul-04	12 months

Measurement Environment

The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 35%.

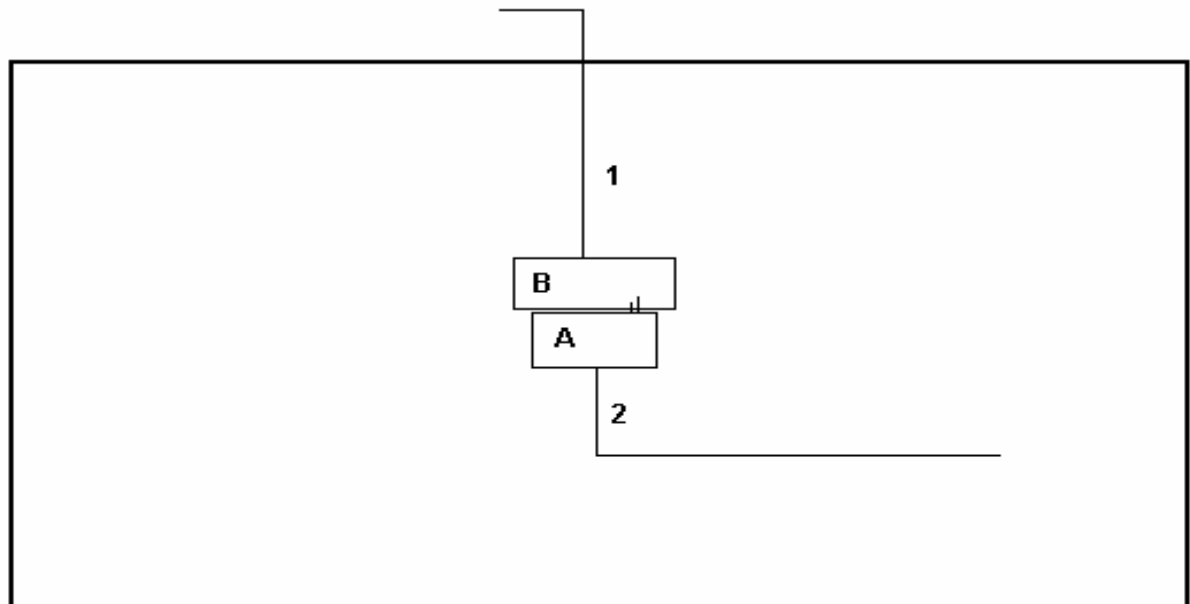
Tested Configuration /Setup: [2.1033(b8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] Appliance On/Off control module	[Leviton] RZP15	preproduction	FCC ID: QGH-RZP15
B	Electrical Box/Socket			
1	AC Mains cable	-		1.5 meter Unterminated
2	AC cable	-		1 meter, Unshielded terminated into power strip

Setup Diagram

Note: Setup photographs are located in Attached Electronic File, Exhibit E.



setup_1a1d2

BASIC EUT SETUP
 (Legend designation is above)

Summary of Results:

1. This test series evaluated the Equipment Under Test to FCC Part 15, SubPart C.
2. The system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart C for operation in the 902-928MHz frequency band, (Part 15.249).
3. The equipment under test was received on April 13, 2005 and this test series commenced on April 13, 2005.
4. The unit operates only at the frequency 908.42MHz.
5. The Occupied Band width of the fundamental, using the 99% method with a 3KHz RBW, measured 116KHz.
6. The field strength level of the fundamental was measured with a Quasi-Peak detection and observed to be 0.15dB below the quasi-peak limit of 94dBuV/m (50,000uV/m). The EUT was positioned on the 'side' and the receive antenna oriented in the horizontal polarization.
7. The evaluation of the field strength levels of the transmitter harmonics showed the emission nearest the limit occurred at 1816.8MHz. This signal was measured to be 1.4dB below the average limit of 54dBuV/m (500uV/m). The EUT was configured in the 'end' position, and the receive antenna oriented in the vertical polarization.
8. The field strength level of the Local Oscillator was measured to be 2.6dB below the quasi-peak limit of 46dBuV/m (200uV/m). The EUT was positioned on the 'end' and the receive antenna oriented in the horizontal polarization.
9. The evaluation of the field strength levels of the Local Oscillator harmonics showed the measurable emission nearest the limit occurred at 1816MHz. This emission was measured to be 10.7dB below the average limit of 54dBuV/m (500uV/m). The EUT was configured in the 'end' position, and the receive antenna oriented in the vertical polarization.
10. Spurious emissions, not harmonics of transmitter or local oscillator, were initially determined in a shielded enclosure. At the open area test site the spurious emission level nearest the limit occurred at 265.6MHz. This emission was measured to be 21.9dBuV/m Quasi-Peak which is 24.1dB below the limit of 46dBuV/m (200uV/m).
11. The line conducted emission level nearest the limit occurred at 14.8MHz. This emission was measured to be 5.84dB below the Average limit of 50.0dBuV.

Changes made to achieve compliance

1. Power output set in firmware to be 'B3_4'.

Standards Applied to Test: [2.1033(b6)]

ANSI C63.4 - 2001

CFR47 FCC Part 2;, Part 15, SubPart C, 15.249 Intentional Radiator; SubPart B, Digital Device

AHD test procedures TP0101-01, TP0102-01

Test Methodology: [2.1033(b6)]

The setup pictures in this report indicate the configuration of testing for this product.

The product was evaluated for emissions in both transmit and receive modes. The transmitted power output is set in firmware and the user does not have access to this location. The receiver uses a local oscillator 200KHz below the received signal.

In transmit mode, the EUT was setup up to transmit continuously with an FSK modulation. The measurements of the fundamental and its harmonics were recorded with Peak detection. The measurements of the fundamental frequencies were compared to the appropriate Quasi-Peak and average limits of section 15.249.

The system was placed at the center of the table 80cm above the ground plane pursuant to ANSI C63.4 for stand-alone equipment.

FORMULAS AND SAMPLE CALCULATIONS:

THE HP8546A EMI Receiver has stored in memory the antenna and coax correction factors used in this test. The resultant Field Strength (FS) in dBuV/m presented by the HP8546A is the summation in decibels (dB) of the Received Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF).

Formula 1:
$$FS(\text{dBuV/m}) = RF(\text{dBuV}) + AF(\text{dB/m}) + CF(\text{dB})$$

With the EUT in transmitting mode only the resultant Field Strength measurement is recorded using the peak hold detector of the HP8546A.

Where it was necessary to move the EUT to 1 meter distance to take measurements a 'dB' factor which adjusts for this distance variance is used before comparing the emission level to the FCC limits. This factor is determined by the following formula.

Formula 3:
$$\text{Distance factor}(\text{dB}) = 20 * \text{Log}(3\text{meter}/1\text{meter}) = 20 * \text{Log}(3) = 9.54\text{dB}.$$

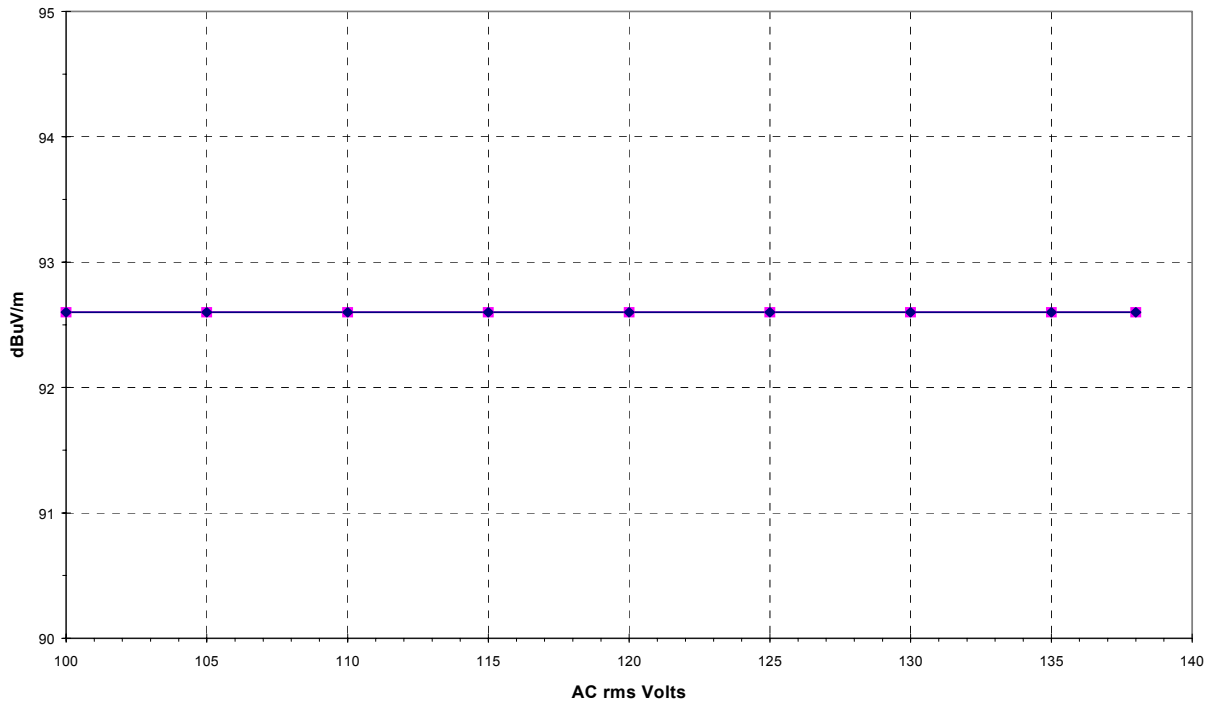
Test Data [2.1033(b6)]

Relative Emission Level vs. Supply Voltage [15.31(e)]

The relative emission level as the supply voltage varied is presented in the charts below. The ac mains level, input to the EUT, was adjusted from 100vac to 138vac.

TX OUTPUT vs Voltage LEVEL 908.42MHz	
Volt In AC rms	TX OutPut Pk dBuV/m
100	92.6
105	92.6
110	92.6
115	92.6
120	92.6
125	92.6
130	92.6
135	92.6
138	92.6

OUTPUT FIELD STRENGTH vs INPUT VOLTAGE
 [908.42MHz; Modulated]

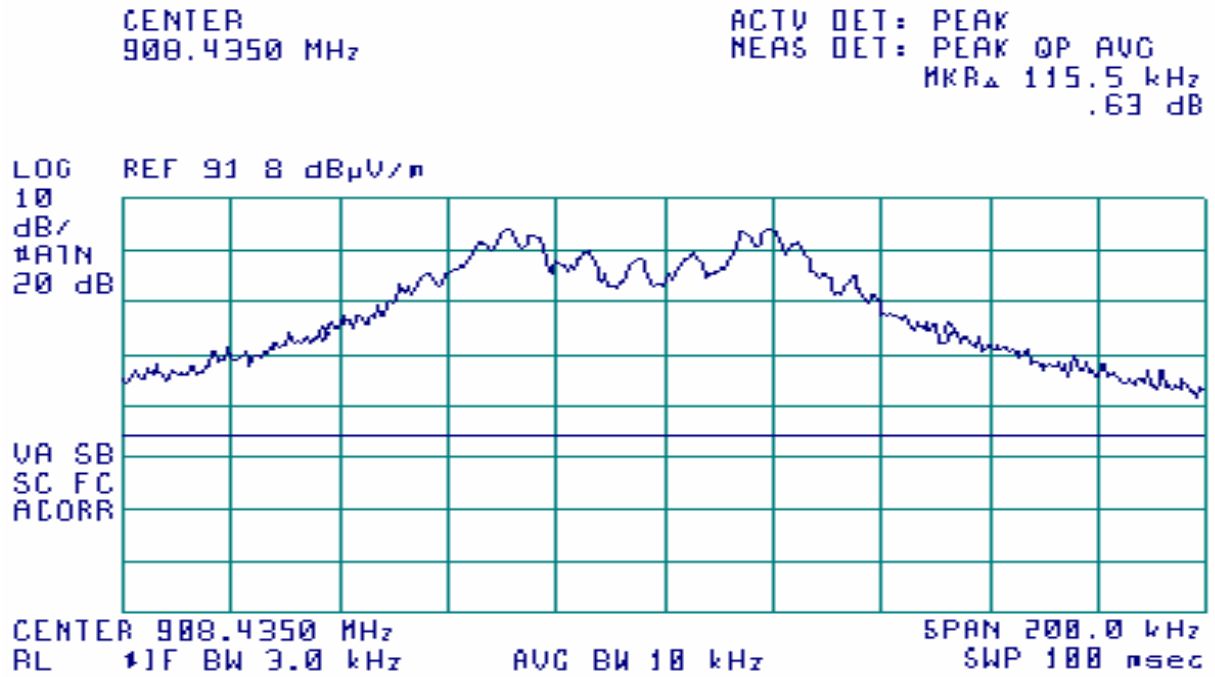


Modulation Characteristics

The transmitter is FSK modulated using $\pm 22\text{KHz}$ frequency shifting.

Occupied Bandwidth

An RBW of 3KHz is selected.



This chart shows a typical measured bandwidth signal.

Fundamental (MHz)	Measured 20dB Bandwidth
908.42	116KHz

Radiated Field Strength Measurements: [15.209, 15.249(a,d)]**Field Strength Measurements of Fundamental & LO: [15.249(a,d), 15.209]**

MEASUREMENT PROCEDURE:

1. The EUT was setup to one of the two positions.
2. The receive antenna is positioned vertical or horizontal polarity.
3. Steps 1-2 were repeated to cover all positions.

The FCC field strength limit of the fundamental is 50milliVolt/m at a measurement distance of 3 meters. This number is equivalent to 94dBuV/m.

Calculation: $50\text{mV/m} = 50,000\text{uV/m}$. $20*\text{Log}(50,000\text{uV/m})=94\text{dBuV/m}$

The FCC field strength limit of the harmonics is 500microVolt/m at a measurement distance of 3 meters. This number is equivalent to 54dBuV/m.

Calculation: $20*\text{Log}(500\text{uV/m})=54\text{dBuV/m}$

Transmit Mode. Fundamental

Frequency	Corrected Quasi Peak Measurement	Included Cable+Antenna Factors	Turntable Azimuth	Antenn a Height	FCC Limit	Margin	EUT postion	Ant. Pol.
MHz	dBuV/m	dB+dB/m	deg	Mtr	dBuV/m	dB		
908.4	93.85	25.38	90	1.0	94	0.15	side	H

Transmit Mode. Harmonics

Frequency MHz	Corrected AVERAGE Measurement dBuV/m	Included Cable+Antenna Factors dB+dB/m	Turntable Azimuth deg	Antenn a Height Mtr	FCC Limit dBuV/m	Margin dB	EUT position	Ant. Pol
1816.75	52.55	34.33	260	1.6	54.00	1.45	end	V
2725.26	51.20	36.79	300	1.4	54.00	2.80	end	H
3633.55	46.61	38.82	330	1.0	54.00	7.39	end	H
4541.34	37.20*	39.55	-	1.0	54.00	16.80	-	-

*These levels are at the noise floor of the measurement systems.

The following transmitter harmonic measurements were taken at the UM Radiation Lab facility. The distance between the EUT and Horn antenna is 3 meter. Spectrum analyzer settings for peak measurements are 1MHz RBW, 3MHz VBW.

The term in the column “calculated average level” is determined by
SA Peak Measurement + Ant Factor – Amp Factor

The peak level emissions are compared to the FCC average limits. Compliance is demonstrated.

Freq MHz	S.A. PEAK Measurement dBuV/m	Antenna Correction Factor dB/m	RF Amp Factor dB	Calculated Peak Level dBuV/m	FCC Avg Limit dBuV/m	Margin dB
5451	50.2	24.7	38.0	36.9	54	17.1
6359.5	50.9	24.4	38.0	37.3	54	16.7
7268	48.0	25.2	36.8	36.4	54	17.6
8176.5	47.4*	27.0	36.8	37.6	54	>16.4
9085	48.4*	27.5	36.8	39.1	54	>14.9

*These levels are at the noise floor of the measurement systems.

Receive Mode. Local Oscillator & harmonics

Frequency MHz	Corrected Quasi-peak Measurement dBuV/m	Included Cable+Antenna Factors dB+dB/m	Turntable Azimuth deg	Antenn a Height Mtr	FCC Limit dBuV/m	Margin dB	EUT postion	Ant. Pol.
908.27	43.4	25.38	300	1.8	46.00	2.6	end	H

Frequency MHz	Corrected AVERAGE Measurement dBuV/m	Included Cable+Antenna Factors dB+dB/m	Turntable Azimuth deg	Antenn a Height Mtr	FCC Class B Limit dBuV/m	Margin dB	EUT postion	Ant. Pol.
1816.55	43.30	34.41	0	1.0	54.00	10.70	end	V
2724.99	34.64*	36.79	-	1.0	54.00	>19.36	-	-
3633.93	36.30*	38.82	-	1.0	54.00	>17.70	-	-
4541.80	37.60*	39.55	-	1.0	54.00	>16.40	-	-

*These levels are at the noise floor of the measurement systems.

The following Local Oscillator harmonic measurements were taken at the UM Radiation Lab facility.

The distance between the EUT and Horn antenna is 3 meter. Spectrum analyzer settings for peak measurements are 1MHz RBW, 3MHz VBW.

The term in the column “calculated average level” is determined by
SA Peak Measurement + Ant Factor – Amp Factor

The peak level emissions are compared to the FCC average limits. Compliance is demonstrated.

Freq MHz	S.A. PEAK Measurement dBuV/m	Antenna Correction Factor dB/m	RF Amp Factor dB	Calculated Peak Level dBuV/m	FCC Avg Limit dBuV/m	Margin dB
5451	48.7	24.7	38.0	35.4	54	18.6
6359.5	48.6	24.4	38.0	35.3	54	19.0
7268	48.3	25.2	36.8	36.7	54	17.3
8176.5	48.6*	27.0	36.8	38.8	54	>15.2
9085	48.4*	27.5	36.8	39.1	54	>14.9

*These levels are at the noise floor of the measurement systems.

Out of Band Emissions [15.249(d)]

The emissions outside the 902-928MHz band are to be either 50dB below the level of the fundamental or the limits of section 15.209.

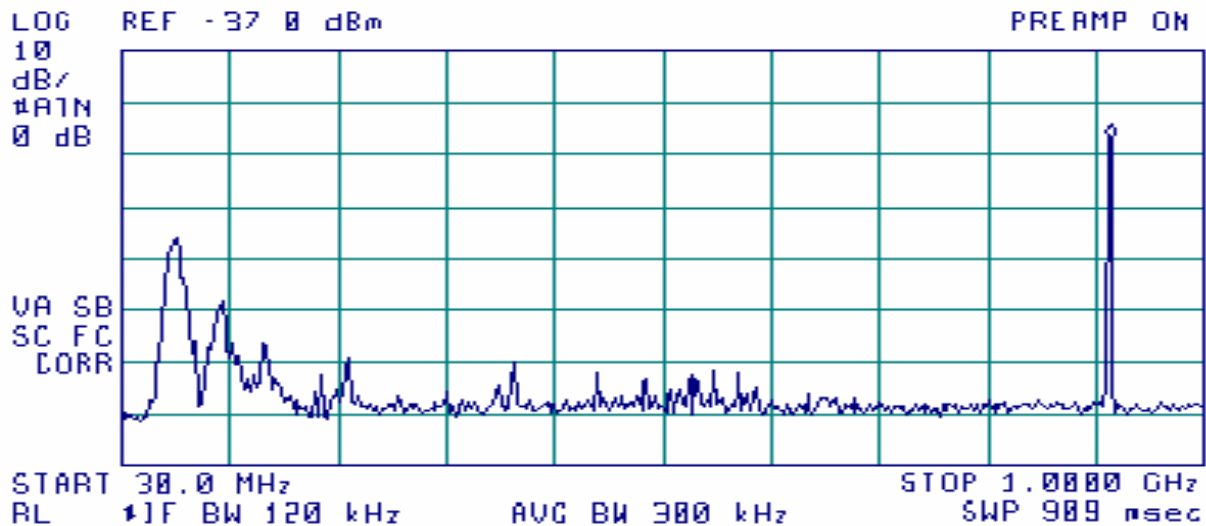
LIMIT @ 3meter: [15.209(a)]

30-88MHz	100uV/m	40dBuV/m
88-216MHz	150uV/m	43.5dBuV/m
216-960MHz	200uV/m	46dBuV/m
above 960MHz	500uV/m	54dBuV/m

A scan of the EUT was made in a shielded room to study the emission profile. These scans indicate there are low level spurious emissions from the unit other than the fundamental and its associated harmonics. These suspect signals were measured at the 3-meter open area test site.

Spurious Emissions: [15.249d]

Graph of scan made in shielded enclosure



Tabulated Quasi-Peak Measurements.

Frequency MHz	Corrected Quasi Peak Measurement dBuV/m	Included Cable+Antenna Factors dB+dB/m	Turntable Azimuth deg	Antenn a Height Mtr	Polarity	FCC Class B Limit dBuV/m	Margin dB
127.62	17.94	8.42	0	1.6	H	43.50	25.56
165.86	14.06	10.29	0	1.6	H	43.50	29.44
168.20	12.87	10.39	0	1.0	H	43.50	30.63
221.32	20.96	12.36	340	1.0	H	46.00	25.04
265.58	21.88	14.31	220	1.0	H	46.00	24.12

The frequencies for measurements were determined by the suspect list generated from the shielded room prescan of 30MHz through 5GHz.

All other spurious emission are greater than 30dB below limits.

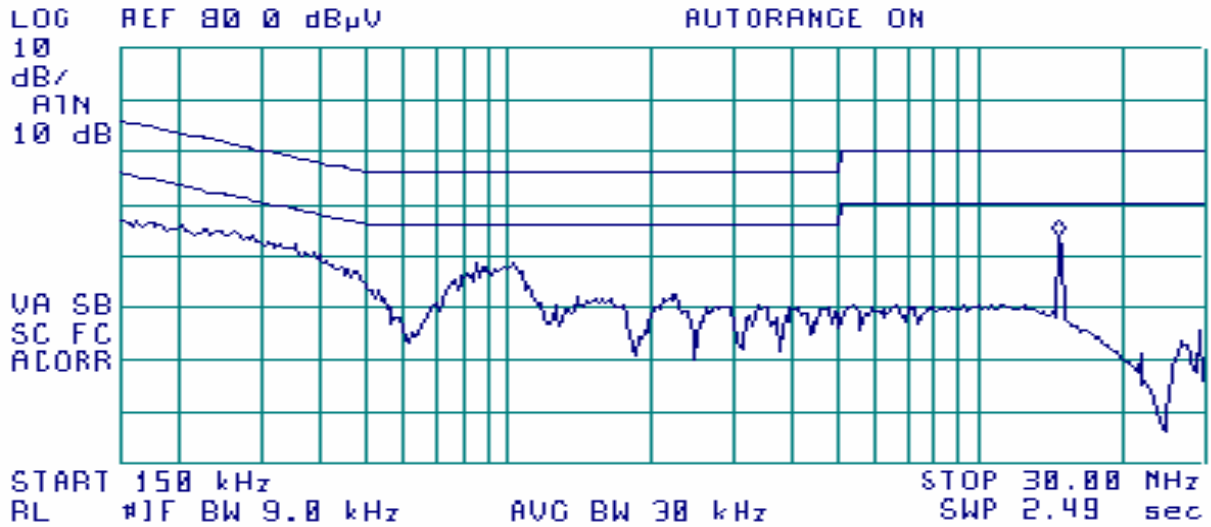
Line Conducted Measurements: [15.207(a)]

Line Conducted

NEUTRAL to Ground Measurement.

Class B

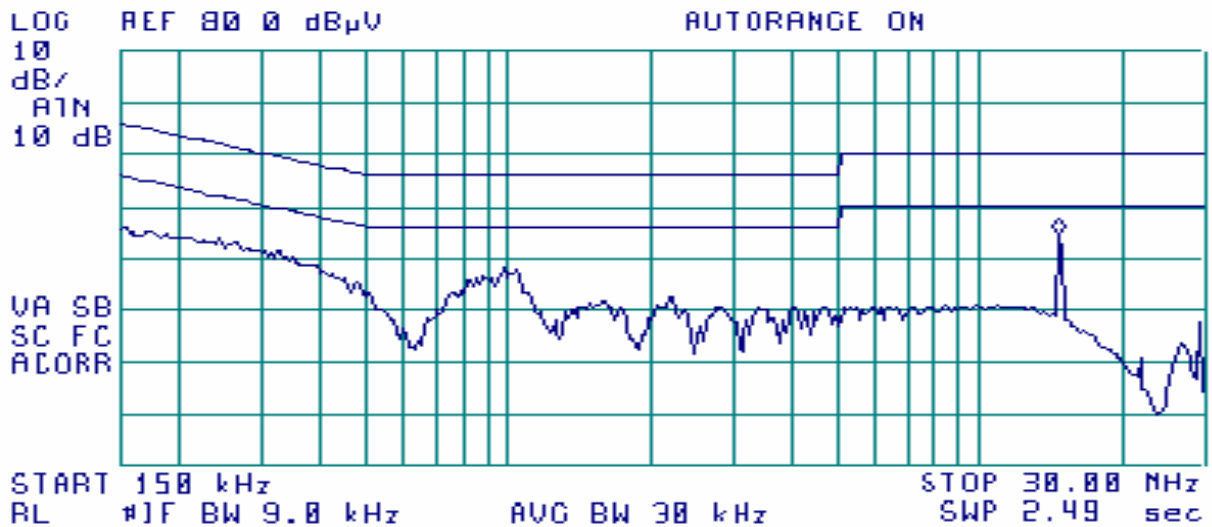
Plot of Peak Values



Tabulated Quasi-Peak/Average Measurements.

Frequency MHz	dBUV Reading		FCC / EN55022 dBUV Class B Limit		dB Margin	
	QP	Avg	QP	Avg	QP	Avg
0.150	44.87	41.94	66.00	56.00	21.13	14.06
0.979	37.48	32.38	56.00	46.00	18.52	13.62
2.188	29.54	26.63	56.00	46.00	26.46	19.37
11.178	27.43	22.30	60.00	50.00	32.57	27.70
14.754	44.48	44.01	60.00	50.00	15.52	5.99
29.508	27.08	25.84	60.00	50.00	32.92	24.16

PHASE to Ground Measurement.
 Class B
 Plot of Peak Values



Tabulated Quasi-Peak/Average Measurements.

Frequency MHz	dBuV Reading		FCC / EN55022 dBuV Class B Limit		dB Margin	
	QP	Avg	QP	Avg	QP	Avg
0.150	44.47	40.87	66.00	56.00	21.53	15.13
0.974	36.16	31.00	56.00	46.00	19.84	15.00
2.185	29.60	26.82	56.00	46.00	26.40	19.18
9.819	28.41	23.06	60.00	50.00	31.59	26.94
14.755	44.66	44.16	60.00	50.00	15.34	5.84
29.508	27.51	26.58	60.00	50.00	32.49	23.42