

EXHIBIT E: REPORT OF MEASUREMENTS [2.1033(B6)]**Test Report for FCC ID: QGH-RZP03**
FCC Part 2.1031, Part 15 Subpart C(15.249)**Report #0500786DIMF**
Issued 06/24/05**908.42MHz TRANSCEIVER MODEL RZP03**

Prepared for:

LEVITON MANUFACTURING CO., Inc.
Little Neck PKWY
Little Neck, NY 11362Test Date(s): April 13, May 5,6,11, 2005

data recorded by



Ted Chaffee, NCE



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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 CO., Inc.
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 during 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%.

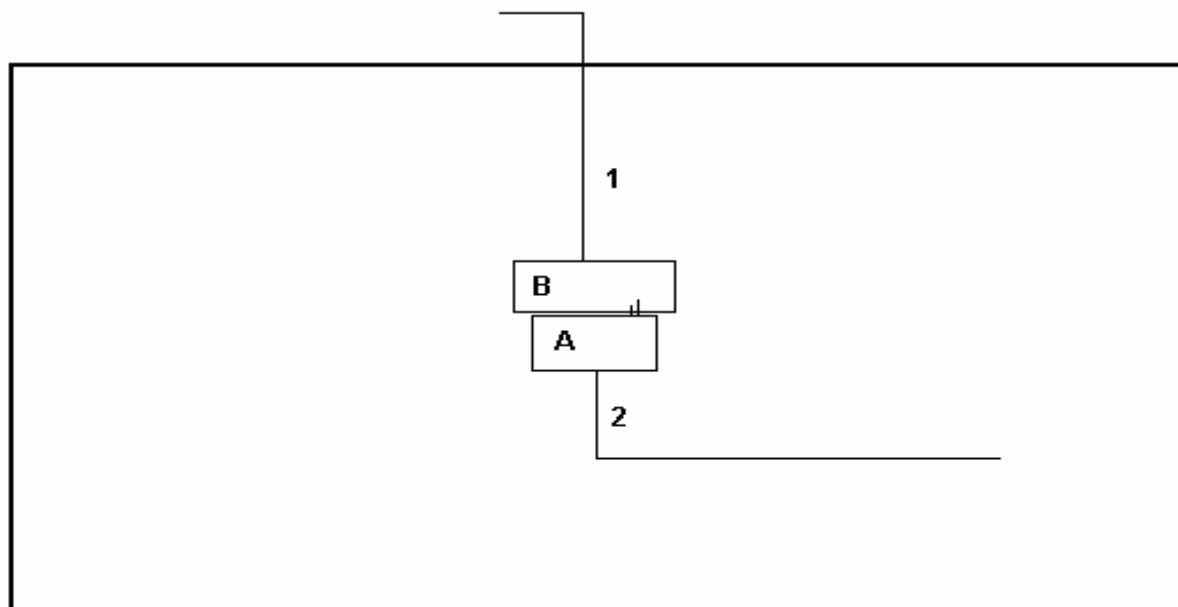
Tested Configuration /Setup: [2.1033(b8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] Dimming control module	[Leviton] RZP03	preproduction	FCC ID: QGH-RZP03
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 109KHz.
6. The field strength level of the fundamental was measured with a Quasi-Peak detection and observed to be 0.99dB 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 2725MHz. This signal was measured to be 0.9dB below the average limit of 54dBuV/m (500uV/m). The EUT was configured in the 'end' position, and the receive antenna oriented in the horizontal polarization.
8. The field strength level of the Local Oscillator was measured to be 4.6dB below the quasi-peak limit of 46dBuV/m (200uV/m). The EUT was positioned on the 'side' and the receive antenna oriented in the vertical 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 9.5dB 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 characterized in a shielded enclosure. At the open area test site the spurious emission level nearest the limit occurred at 167.0MHz. This emission was measured to be 16.9BuV/m Quasi-Peak which is 26.6dB below the limit of 43.5dBuV/m (150uV/m).
11. The line conducted emission level nearest the limit occurred at 1.07MHz. This emission was measured to be 11.8dB below the Average limit of 46.0dBuV.

Changes made to achieve compliance

1. The PCB solder resist at the mounting screw was scraped and a new mounting screw with a larger head installed to make a ground contact to the PCB.

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 was recorded with Quasi-Peak detection. The measurements of the harmonics, above 1000MHz, were recorded with Average detection. The measurements were compared to the appropriate Quasi-Peak and average limits of section 15.249.

In operation, the device uses FSK modulation with a transmission on time of 65.7mSec.

The off time between transmissions is variable with the shortest off time before the onset of another transmission at 30.6mSec.

Therefore, in a 100mSec window the greatest amount of transmission on time available is approximately 70mSec.

For the transmitter harmonics, where detector averaging is permitted, a 70% duty cycle is applicable. 70% duty cycle is equivalent to a 3.1dB duty cycle factor [$20 * \log(.7) = -3.1\text{dB}$].

The duty cycle factor was not applied to the measurements of the field strength of emissions above 1000MHz when comparing those levels to the permissible limits.

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

Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm above the open field site ground plane in the prescribed setup per ANSI C63.4.

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

The principle settings of the EMI Receiver for radiated testing include:

IF Bandwidth: 120KHz for frequencies less than 1GHz.
1 MHz for frequencies greater than 1GHz.
Detector Function: Peak Mode for transmitter fundamental and harmonics.
Quasi-Peak for other emissions less than 1GHz.
Average for other emissions greater than 1GHz.

At frequencies up to 1000MHz a BiconiLog broadband antenna was used for measurements.

At frequencies above 1000MHz a double-ridge Horn broadband antenna was used for measurements.

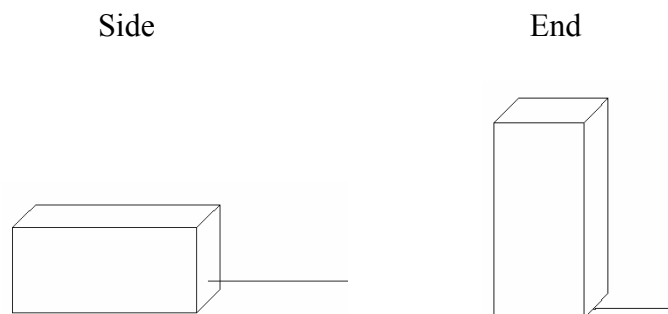
During the transmitter evaluation the EUT was transmitting continuously.

The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions.

The final measurements were made with the EUT placed in one of two positions (designated as side, and end). Measurements were recorded in each of these two positions and with the measuring antenna in vertical and horizontal positions.

The unit was evaluated up to the tenth harmonic of the transmit fundamental, and up to 5000MHz for other spurious signals.

The test positions of EUT are:



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 the resultant Field Strength measurement is recorded using the peak hold detector of the HP8546A.

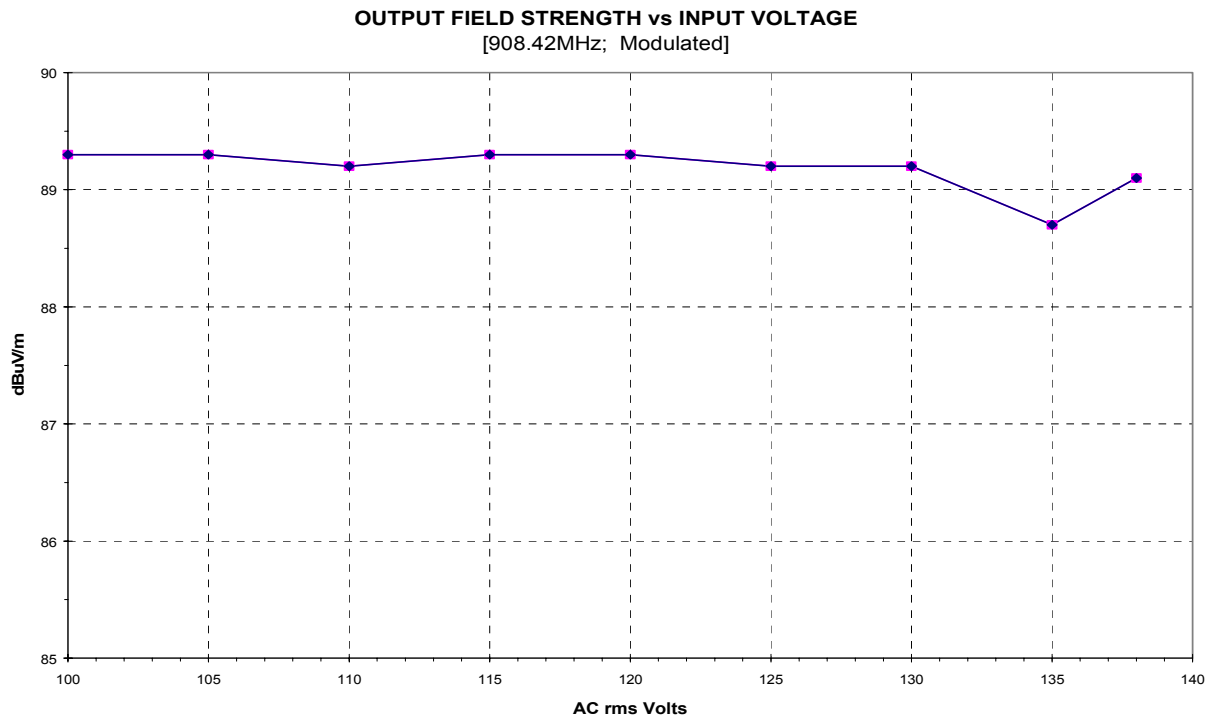
Where it was necessary to move the EUT to 1 meter distance to take measurements a 'dB' factor which adjusts for this distance variance is used before comparing the emission level to the FCC limits. This factor is determined by the following formula.

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	89.3
105	89.3
110	89.2
115	89.3
120	89.3
125	89.2
130	89.2
135	88.7
138	89.1

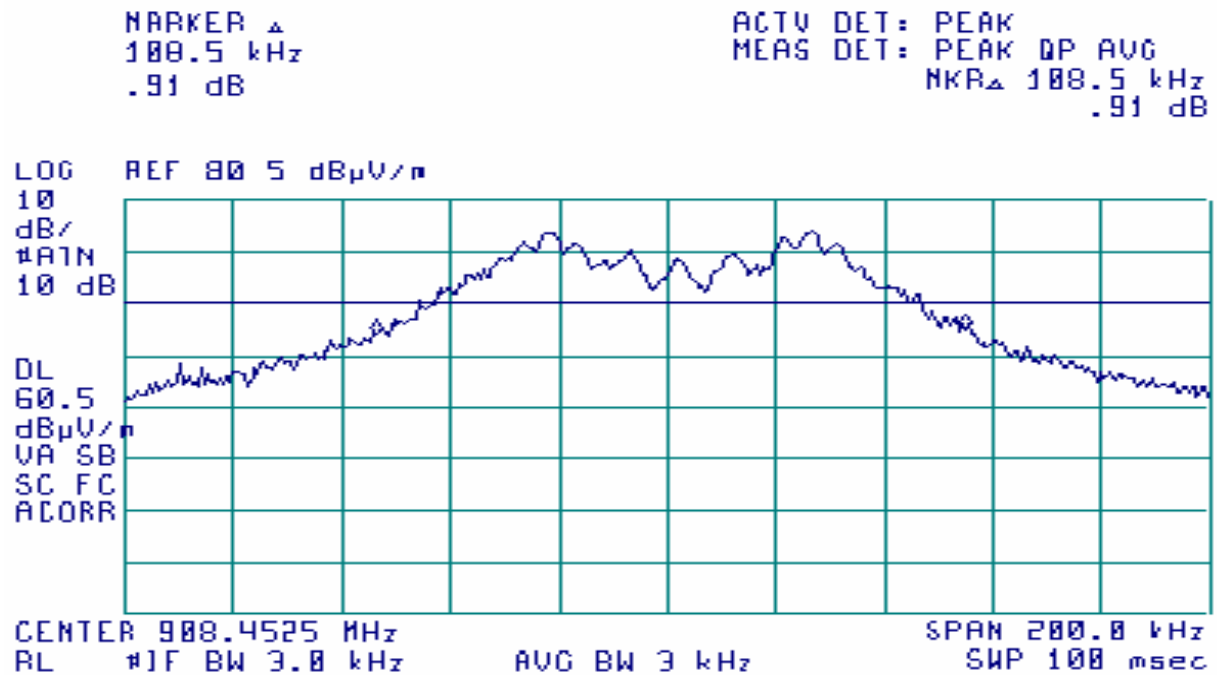


Modulation Characteristics

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

Occupied Bandwidth

An RBW of 3KHz is selected.



This chart shows a typical measured bandwidth signal.

Fundamental (MHz)	Measured 99% Bandwidth
908.42	109KHz

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	93.01	25.31	0	1.4	94	0.99	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
1816.8	50.66	34.41	0	1.2	54.00	3.34	end	V
2725.2	53.12	36.79	10	1.3	54.00	0.88	end	H
3633.8	44.49	38.82	190	1.4	54.00	9.51	end	H
4542.1	40.44	39.55	0	1.0	54.00	13.56	end	H

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

A 3.1dB duty cycle factor is not used in the data tabulated above.

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	50.0	24.7	38.0	36.7	54	17.3
6359.5	50.6	24.4	38.0	37.0	54	17.0
7268	48.1	25.2	36.8	36.5	54	17.6
8176.5	48.1*	27.0	36.8	38.3	54	>15.7
9085	48.9*	27.5	36.8	39.5	54	>14.4

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

A 3.1dB duty cycle factor is not used in the data tabulated above.

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	41.4	25.38	0	1.0	46.00	4.6	side	V

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	44.5	34.41	280	1.0	54.00	9.5	end	V
2724.99	34.6*	36.79	-	1.0	54.00	>19.4	-	-
3633.93	36.0*	38.82	-	1.0	54.00	>18.0	-	-
4541.80	37.6*	39.55	-	1.0	54.00	>16.4	-	-

*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	48.3*	24.7	38.0	35.0	54	>19.0
6359.5	48.0*	24.4	38.0	34.4	54	>19.6
7268	47.3*	25.2	36.8	35.7	54	>18.3
8176.5	47.3*	27.0	36.8	37.5	54	>16.5
9085	48.8*	27.5	36.8	39.5	54	>14.5

*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.

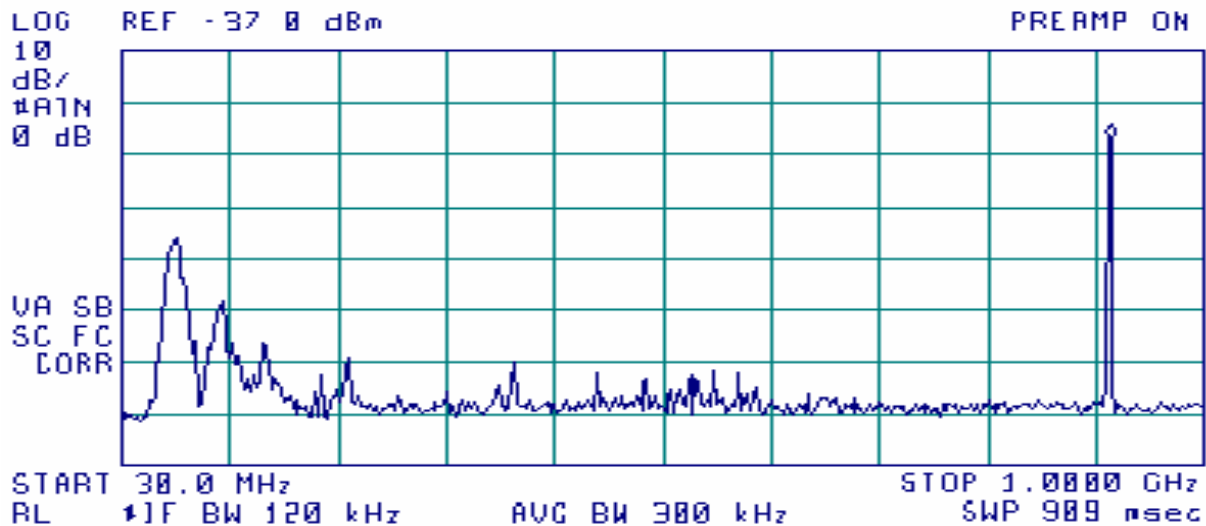
LIMIT @ 3meter: [15.209(a)]

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
119.65	15.28	8.72	180	3.4	H	43.50	28.22
167.02	16.89	10.33	110	2.1	H	43.50	26.61
208.86	15.62	11.75	170	2.1	H	43.50	27.88
383.09	13.2*	17.11	-	1.6	H	46.00	>32.8
455.36	13.9*	18.11	-	1.6	H	46.00	>32.1

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

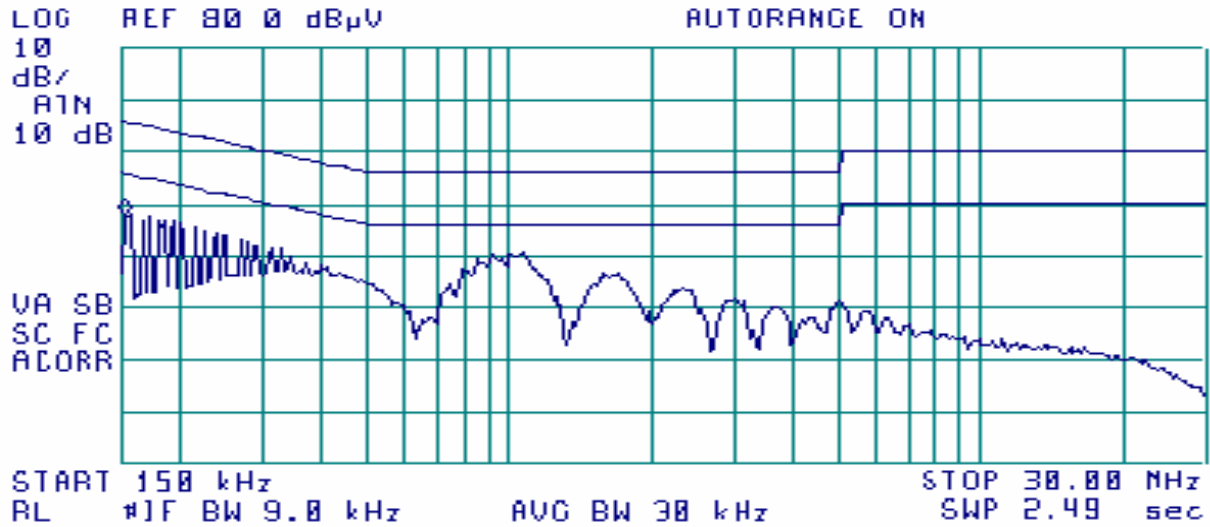
The frequencies for measurements were determined by the suspect list generated from the shielded room prescan of 30MHz through 5GHz.

Line Conducted Measurements: [15.207(a)]**Line Conducted**

NEUTRAL to Ground Measurement.

Class B

Plot of Peak Values



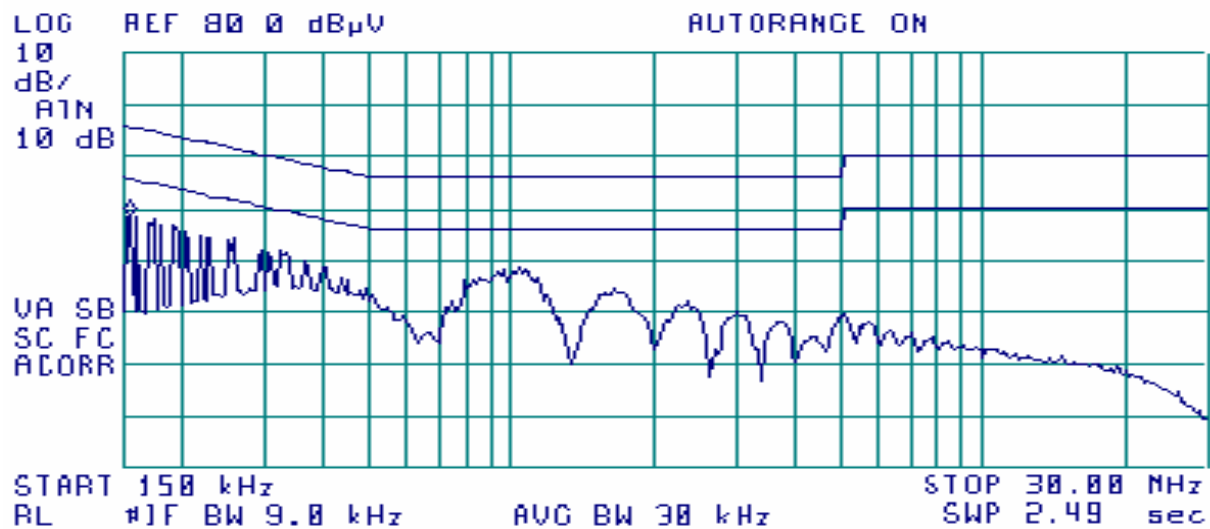
Tabulated Quasi-Peak/Average Measurements.

Frequency MHz	dBuV Reading		FCC / EN55022 dBuV Class B Limit		dB Margin	
	QP	Avg	QP	Avg	QP	Avg
0.150	44.80	27.44	66.00	56.00	21.20	28.56
0.200	41.95	29.32	63.61	53.61	21.66	24.29
0.395	35.68	32.88	57.96	47.96	22.28	15.08
1.066	38.94	34.24	56.00	46.00	17.06	11.76
1.672	34.65	31.52	56.00	46.00	21.35	14.48
2.365	31.94	29.27	56.00	46.00	24.06	16.73

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	45.03	25.95	66.00	56.00	20.97	30.05
0.200	42.43	27.27	63.61	53.61	21.18	26.34
0.400	34.87	30.65	57.86	47.86	22.99	17.21
1.064	36.65	32.19	56.00	46.00	19.35	13.81
1.648	32.26	29.15	56.00	46.00	23.74	16.85
2.343	29.95	27.17	56.00	46.00	26.05	18.83