FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

REPEATER

MODEL NUMBER: WRR-MAIN-REP

FCC ID: JPZ0103
IC: 2851A-JPZ0103

REPORT NUMBER: 10087626

ISSUE DATE: 2013-10-25
REVISION DATE: 2014-01-17

Prepared for
LUTRON ELECTRONICS INC.
7200 SUTER RD.
COOPERBURG PA, 18036, USA

Prepared by
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NVLAP LAB CODE 100255-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2013-10-25	Initial Issue	B. DeLisi
1	2014-01-17	Added clarification on repeated signals from Lutron products.	B. DeLisi

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Lutron Electronics Inc.
7200 Suter Rd.
Cooperburg PA, 18036, USA

EUT DESCRIPTION: Repeater

MODEL: WRR-MAIN-REP

SERIAL NUMBER: Non-serialized production unit

DATE TESTED: 2013-10-16 through 2013-10-21

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 Issue 8, Annex 1	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards, using test results reported in the test report documents referenced below and/or documentation furnished by the applicant. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations of these calculations. The results show that the equipment is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation, as described by the referenced documents. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL By:

Michael Antola
WiSE Lead Engineer
UL LLC

Tested By:

Bob DeLisi
WiSE Principal Engineer
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1285 Walt Whitman Rd. Melville, NY 11747, USA.

UL Melville is accredited by NVLAP, Laboratory Code 100255-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/1002550.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.3 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.00 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a repeater for Lutron Electronics Inc. lighting applications.

The radio module is manufactured by Lutron Electronics Inc. All signals that are repeated by the WRR-MAIN-REP are from Lutron 15.231(a)/RSS-210 Annex A1.1 devices so all timing signals will comply with the applicable rules.

After testing was complete the manufacturer changed the model number to WRR-MAIN-REP from RR-MAIN-REP. Throughout this report, the data for the RR-MAIN-REP represents the WRR-MAIN-REP.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral dipole antenna.

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 0795183 which has OS 6.2.108 and Boot 3.0.14.

The test utility software used during testing was 0795182 which has OS 6.2.109 and Boot 3.0.14.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated and conducted emissions testing were performed on the low and high channels. All other tests were conducted on a single channel

The device under test was investigated in the desktop and wall mount configurations with the antenna positioned both horizontally and vertically. The worst case orientation was the desktop configuration with the antenna in the vertical position. All testing was conducted in this orientation.

5.5. MODIFICATIONS

The power to the antenna was lowered to a software setting of 2.1dBm in order to comply with the peak emissions at the fundamental..

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	IBM	T140	R81EHLE	DoC
AC/DC Adapter	Lutron	T120-9DC-3-WH	N/A	N/A

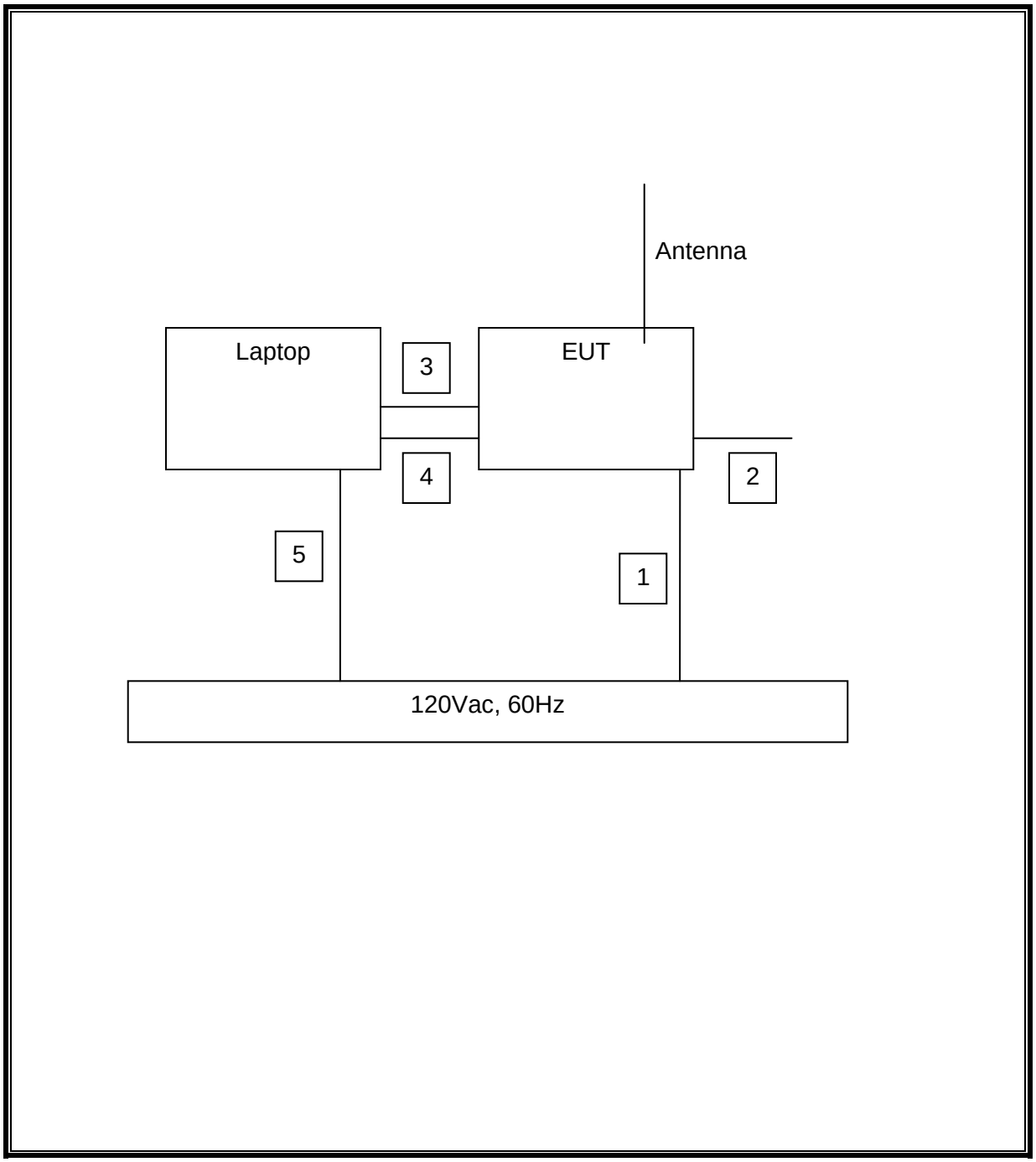
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	Plug	Unshielded	<3m	AC/DC adpater
2	Repeater	1	hardwire	Unshielded	<3m	None
3	LAN	1	RJ-45	Unshielded	>3m	None
4	RS-232	1	DB-9	Shielded	<3m	Used for service only
5	AC	1	Plug	Unshielded	<3m	Laptop Power supply

TEST SETUP

The EUT is a stand-alone device that can connect to RS-232, LAN and Repeater interfaces. The LAN and RS-232 were connected to a laptop and the Repeater interface was connected and left un-terminated.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Radiated Emissions/Antenna Port					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESCI7	75141	2013-01-30	2014-01-31
Bicon Antenna	Schaffner	VBA6106A	54	2013-04-03	2014-04-03
Log-P Antenna	Schaffner	UPA6109	44067	2013-07-09	2014-07-09
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Multimeter	Fluke	83III	ME5B-305	2013-01-30	2014-01-31
Above 1GHz (Band Optimized System)					
Spectrum Analyzer	Agilent	E4446A	72823	2013-01-29	2014-01-31
Horn Antenna (1-2 GHz)	ETS	3161-01 (26°)**	51442	2008-03-28	See * below
Horn Antenna (2-4 GHz)	ETS	3161-02 (22°)**	48107	2007-09-27	See * below
Horn Antenna (4-8 GHz)	ETS	3161-03 (22°)**	48106	2007-09-27	See * below
Signal Path Controller	HP	11713A	50250	N/A	N/A
Gain Controller	HP	11713A	50251	N/A	N/A
RF Switch / Preamp Fixture	UL	BOMS1	50249	N/A	N/A
System Controller	UL	BOMS2	50252	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2012-12-22	2014-12-22
Multimeter	Fluke	83III	ME5B-305	2013-01-30	2014-01-31

* - Note: As allowed by the calibration standard ANSI C63.4 Section 4.4.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.

Gain standard horn antennas (sometimes called standard gain horn antennas) need not be calibrated beyond that which is provided by the manufacturer unless they are damaged or deterioration is suspected, or they are used at a distance closer than $2D^2/\lambda$. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.

** - Number in parentheses denotes antenna beam width.

Conducted Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2013-01-29	2014-01-31
LISN	EMCO	3825/2R	ME5-790	2013-02-01	2014-02-28
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2013-02-01	2014-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.5	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2012-03-13	2014-03-13
Multimeter	Fluke	83III	ME5B-305	2013-01-28	2014-01-31

7. ANTENNA PORT TEST RESULTS

7.1. 20 dB AND 99% BW

LIMITS

FCC §15.231 (c)
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

IC A1.1.3
For the purpose of Section A1.1, the 99% Bandwidth shall be no wider than 0.25% of the center frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

TEST PROCEDURE

ANSI C63.4

The transmitter output is connected to the spectrum analyzer.

20dB Bandwidth: The RBW is set to 10 KHz. The VBW is set to 30 KHz. The sweep time is coupled. Bandwidth is determined at the points 20 dB down from the modulated carrier.

99% Bandwidth: The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

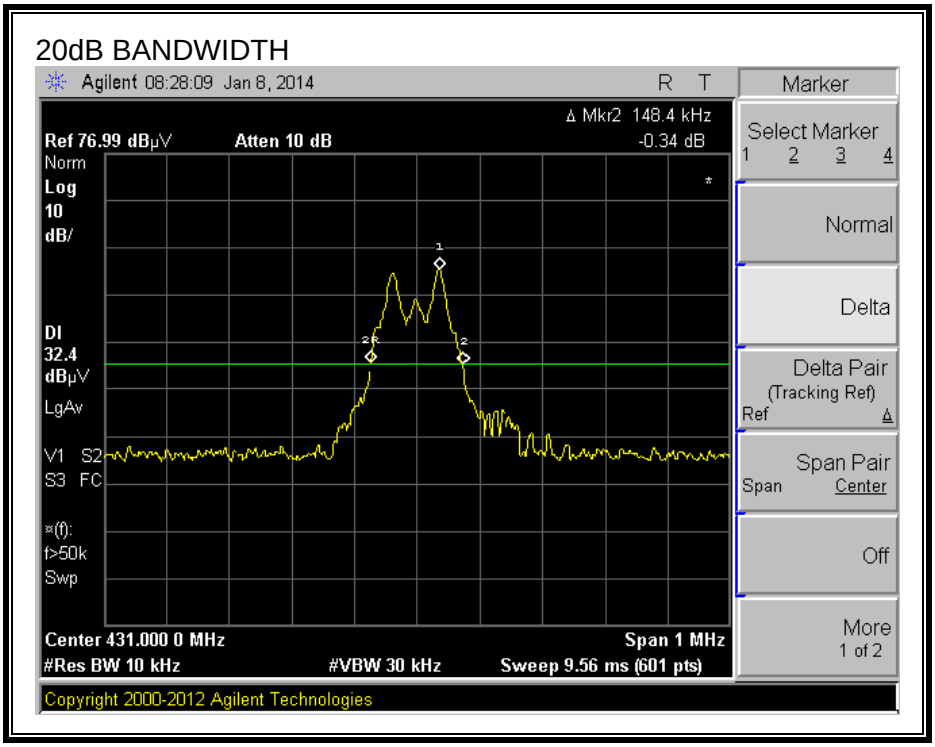
20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431	148.4	1077.5	-929.1

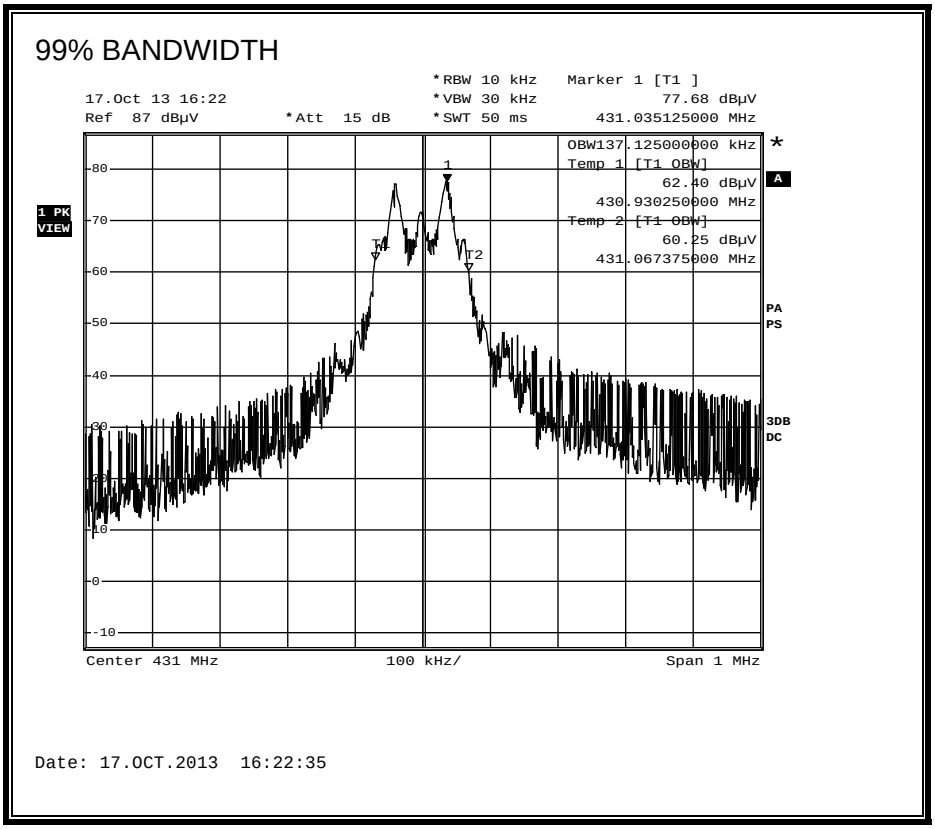
99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431	137.125	1077.5	-940.375

20dB BANDWIDTH



99% BANDWIDTH



7.2. DUTY CYCLE

LIMITS

FCC §15.35 (c)
The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 1 MHz and the VBW is set to 10 MHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

CALCULATION

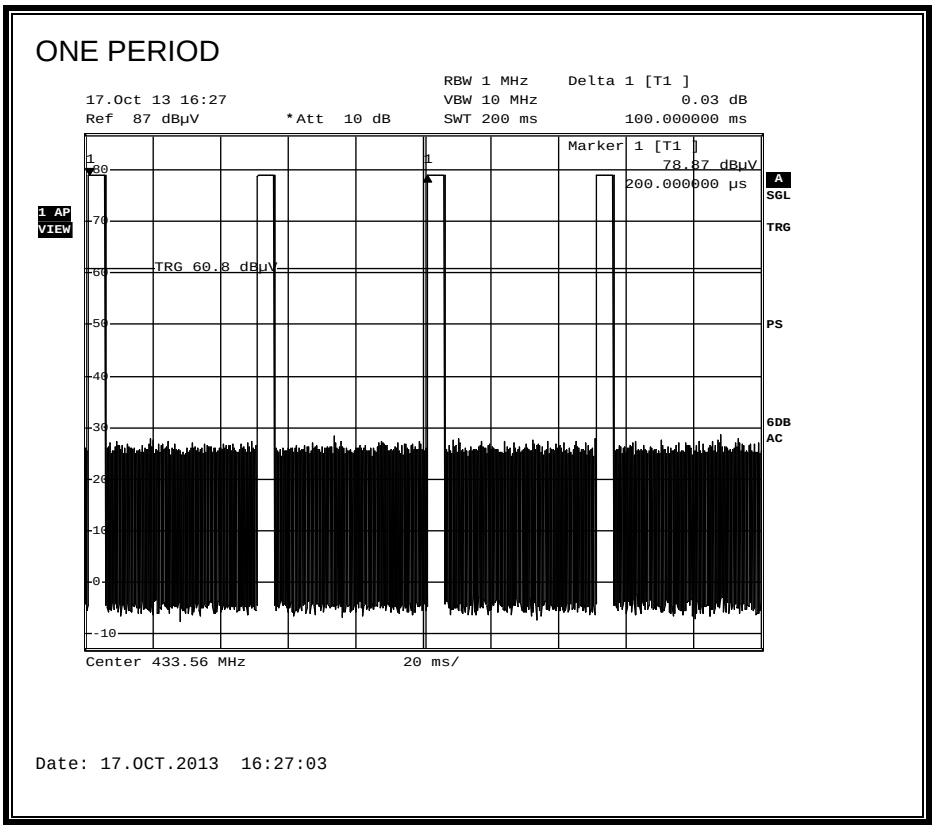
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is
(# of long pulses * long pulse width) + (# of short pulses * short pulse width) / 100 or T

RESULTS

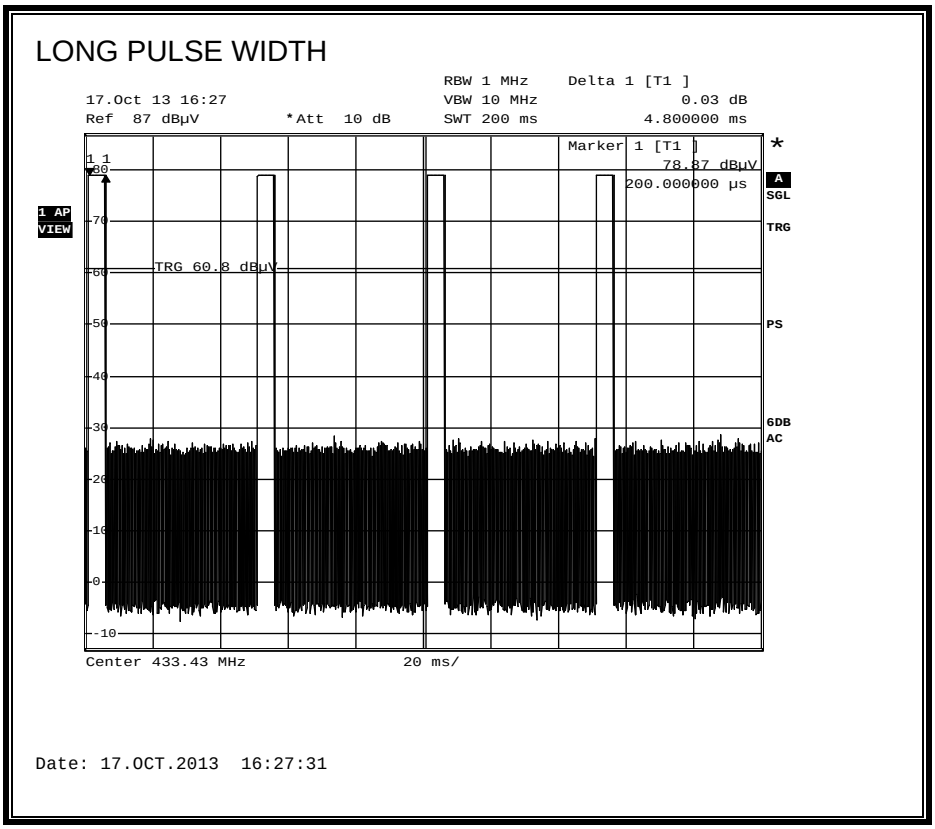
No non-compliance noted:

One Period (ms)	Long Pulse Width (ms)	# of Long Pulses	Short Width (ms)	# of Short Pulses	Duty Cycle	20*Log Duty Cycle (dB)
100	4.8	1	4.60	1	0.094	-20.54

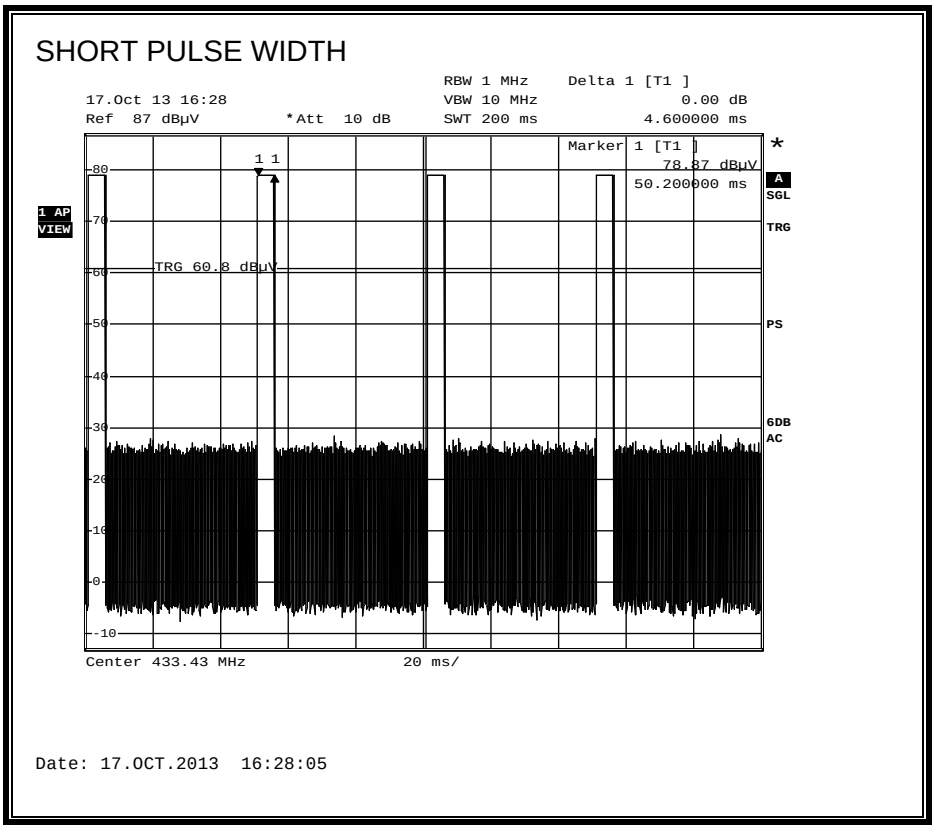
ONE PERIOD



LONG PULSE WIDTH



SHORT PULSE WIDTH



7.3. TRANSMISSION TIME

LIMITS

FCC §15.231 (a) (2)

IC A1.1.1 (b)

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

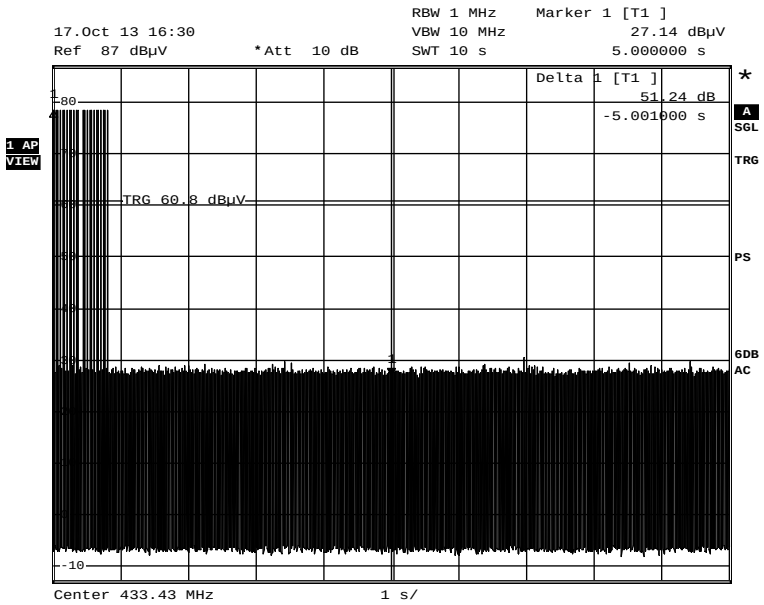
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 1 MHz and the VBW is set to 10 MHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

RESULTS

No non-compliance noted:

LESS THAN 5 SECONDS



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8. RADIATED EMISSION TEST RESULTS

8.1. TX RADIATED SPURIOUS EMISSION

LIMITS

FCC §15.231 (b)
IC A1.1.2
In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Frequency (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750[1]	125 to 375[1]
174 - 260	3,750	375
260 - 470	3,750 to 12,500[1]	375 to 1,250[1]
Above 470	12,500	1,250

1 Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 – 13.41	322 - 335.4		

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2 Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30 88	100 **	3
88 216	150 **	3
216 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

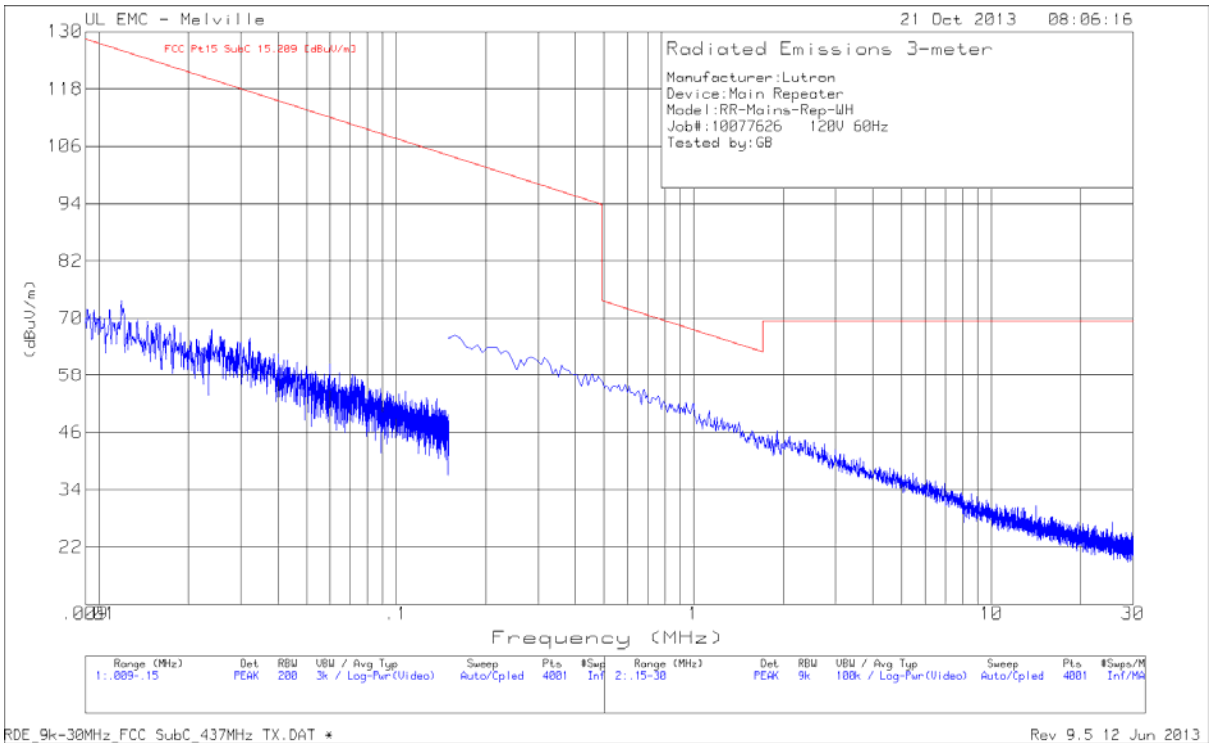
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and duty cycle correction applied for average values.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

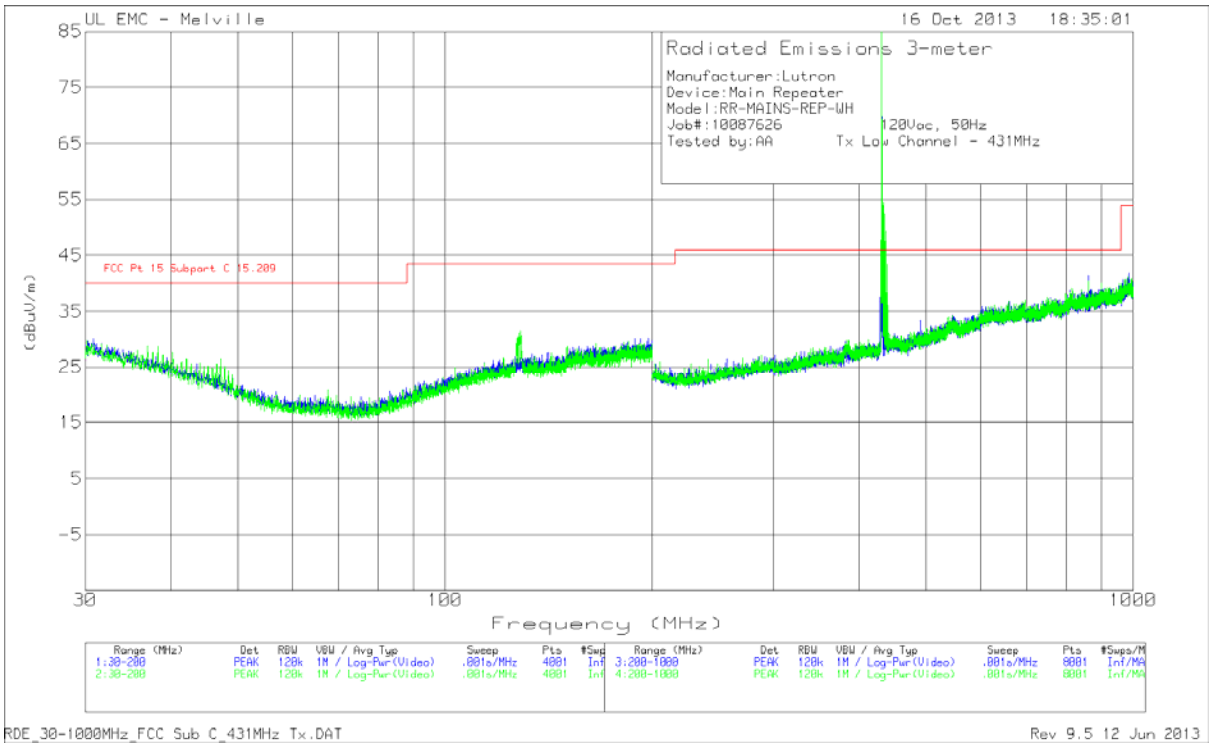
No non-compliance noted:

TX SPURIOUS EMISSION (Below 30MHz)



Frequency (MHz)	Meter Reading (dBuV)	Det	AF-5A288 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	FCC Pt15 SubC 15.209 [dBuV/m]	Margin (dB)	Azimuth (Degs)
.011891	44.76	PK	28.8	.2	73.76	126.08	-52.32	0-360
.01457	42.08	PK	27.3	.2	69.58	124.32	-54.74	0-360
.024017	43.49	PK	23.6	.2	67.29	119.98	-52.69	0-360
.15746	49.79	PK	16.4	.3	66.49	103.66	-37.17	0-360
.28433	45.53	PK	16.2	.3	62.03	98.52	-36.49	0-360
.31418	45.36	PK	16.2	.3	61.86	97.66	-35.8	0-360

FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION (30 – 1000 MHz) – Low Channel

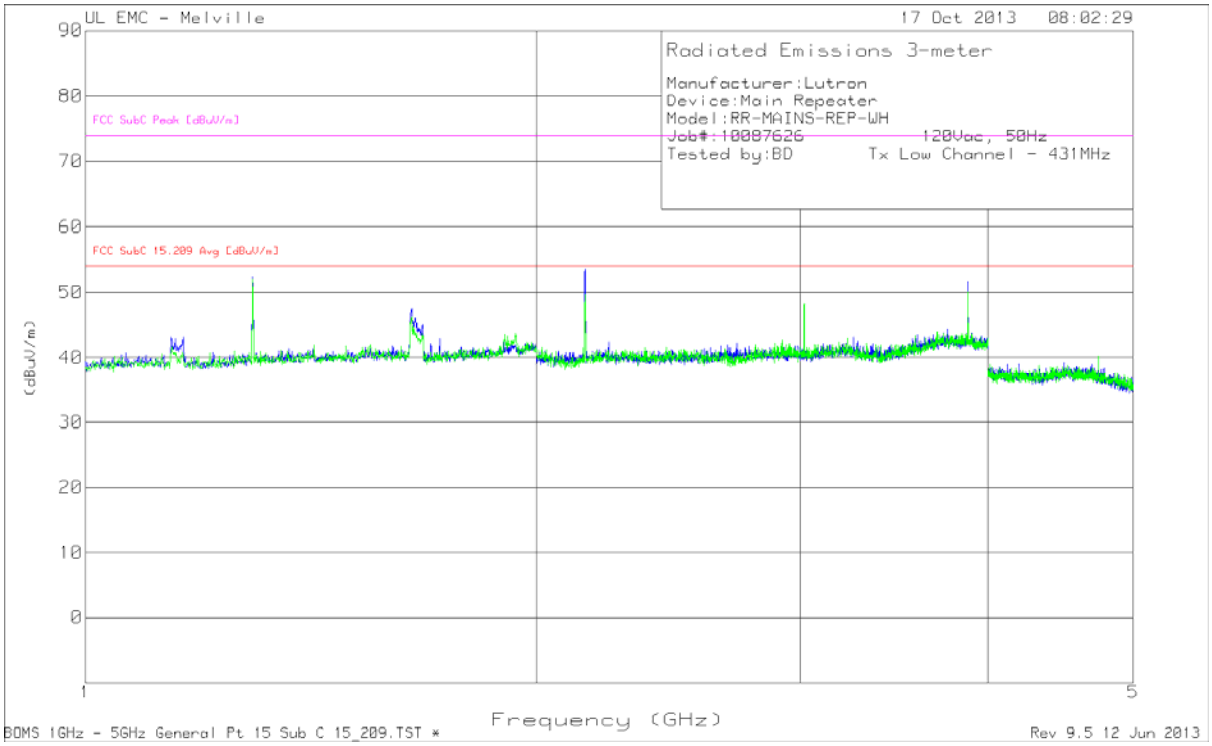


Frequency (MHz)	Meter Reading (dBuV)	Det	AF-67 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC Pt 15 Subpart C 15.231 Limit	Margin (dB)	FCC Pt 15 Peak Limit	Margin (dB)	FCC Pt 15 Subpart C 15.209 Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
431	68.13	PK	16.1	1.4	85.63	-20.54	65.09	80.7	-15.61	100.7	-15.07	-	-	7	258	H
862.0818	16.4	PK	21.9	2.2	40.5	-	-	60.7	-20.2	80.7	-40.2	-	-	141	100	H
431.0372	79.19	PK	16.1	1.4	96.69	-20.54	76.15	80.7	-4.55	100.7	-4.01	-	-	238	223	V
862.0688	19.48	PK	21.9	2.2	43.58	-	-	60.7	-17.12	80.7	-37.12	-	-	217	230	V
433	22.83	QP	16.2	1.5	40.53	-	-	-	-	-	-	46	-5.47	75	238	H
434.7	11.1	QP	16.4	1.4	28.9	-	-	-	-	-	-	46	-17.1	18	240	H
429.6	19.23	QP	16	1.4	36.63	-	-	-	-	-	-	46	-9.37	245	181	V
433.6	24.86	QP	16.3	1.4	42.56	-	-	-	-	-	-	46	-3.44	352	176	V
434.4	12.6	QP	16.4	1.4	30.4	-	-	-	-	-	-	46	-15.6	62	130	V
436.8	14.78	QP	16.5	1.5	32.78	-	-	-	-	-	-	46	-13.22	27	136	V
438.8	22	QP	16.6	1.5	40.1	-	-	-	-	-	-	46	-5.9	22	179	V
439.6	17.68	QP	16.6	1.5	35.78	-	-	-	-	-	-	46	-10.22	277	151	V

PK - Peak detector

QP - Quasi-Peak detector

HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz – Low Channel

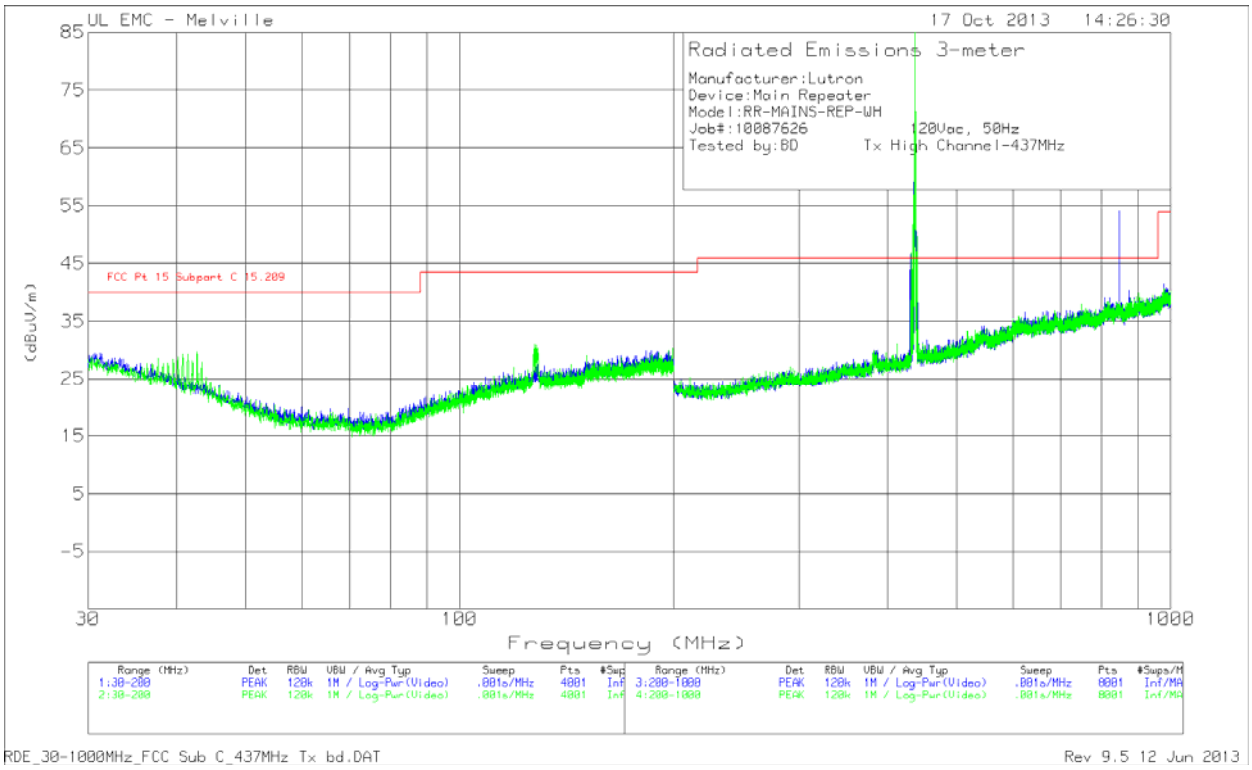


Frequency (GHz)	Meter Reading (dBuV)	Det	AF-51442 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC SubC 15.209 Avg [dBuV/m]	Margin (dB)	FCC SubC Peak (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.293	77.44	PK	20.4	-44.17	53.67	-20.54	33.13	54	-20.87	74	-20.33	77	151	V
1.293	78.58	PK	20.4	-44.17	54.81	-20.54	34.27	54	-19.73	74	-19.19	48	153	H
1.649	69.86	PK	21	-43.84	47.02	-20.54	26.48	54	-27.52	74	-26.98	244	116	V
1.649	71.47	PK	21	-43.84	48.63	-20.54	28.09	54	-25.91	74	-25.37	309	392	H

Frequency (GHz)	Meter Reading (dBuV)	Det	AF-48107 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC SubC 15.209 Avg [dBuV/m]	Margin (dB)	FCC SubC Peak (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.155	75.26	PK	21.4	-43.12	53.54	-20.54	33	54	-21	74	-20.46	9	395	V
2.155	77.44	PK	21.4	-43.12	55.72	-20.54	35.18	54	-18.82	74	-18.28	215	384	H
3.017	72.29	PK	21.5	-41.63	52.16	-20.54	31.62	54	-22.38	74	-21.84	91	150	V
3.017	70.7	PK	21.5	-41.63	50.57	-20.54	30.03	54	-23.97	74	-23.43	30	349	H
3.879	71.24	PK	22.6	-41.56	52.28	-20.54	31.74	54	-22.26	74	-21.72	205	242	V
3.879	72.9	PK	22.6	-41.56	53.94	-20.54	33.4	54	-20.6	74	-20.06	292	210	H

PK - Peak detector

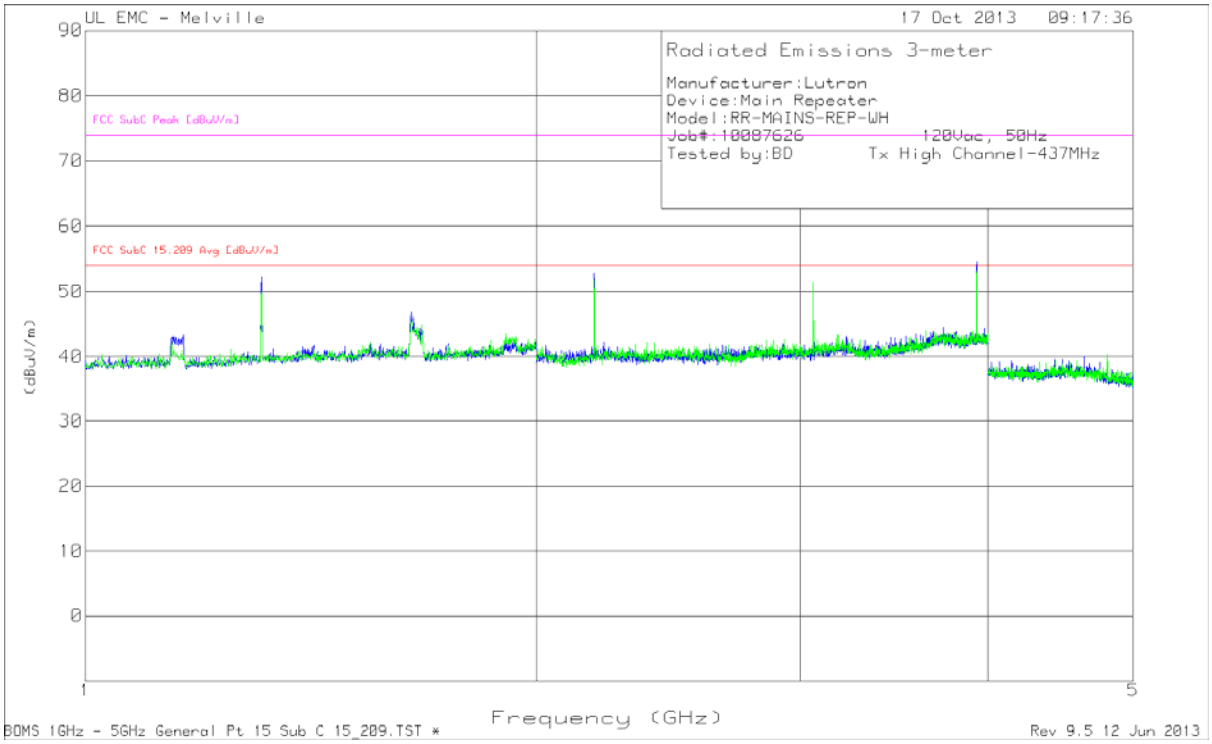
FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION (30 – 1000 MHz) – High Channel



Frequency (MHz)	Meter Reading (dBuV)	Det	AF-67 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC Pt 15 Subpart C 15.231 Limit	Margin (dB)	FCC Pt 15 Peak Limit	Margin (dB)	FCC Pt 15 Subpart C 15.209 Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
437.0357	80.69	PK	16.5	1.5	98.69	-20.54	78.15	80.9	-2.75	100.9	-2.21	-	-	7	258	H
873.886	16.12	PK	22.6	2.1	40.82	-	-	60.9	-20.08	80.9	-40.08	-	-	267	202	H
437.0357	76.72	PK	16.5	1.5	94.72	-20.54	74.18	80.9	-6.72	100.9	-6.18	-	-	238	223	V
873.886	14.53	PK	22.6	2.1	39.23	-	-	60.9	-21.67	80.9	-41.67	-	-	186	248	V
436	26.31	QP	16.4	1.5	44.21	-	-	-	-	-	-	46	-1.79	287	185	V
438	25.37	QP	16.5	1.5	43.37	-	-	-	-	-	-	46	-2.63	106	113	V

PK - Peak detector
QP - Quasi-Peak detector

HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz – High Channel



Frequency (GHz)	Meter Reading (dBuV)	Det	AF-51442 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC SubC 15.209 Avg [dBuV/m]	Margin (dB)	FCC SubC Peak (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.311	78.73	PK	20.5	-44.27	54.96	-20.54	34.42	54	-19.58	74	-19.04	114	380	V
1.311	77.21	PK	20.5	-44.27	53.44	-20.54	32.9	54	-21.1	74	-20.56	42	137	H
1.65	71.07	PK	20.9	-43.81	48.16	-20.54	27.62	54	-26.38	74	-25.84	356	229	V
1.65	72	PK	20.9	-43.81	49.09	-20.54	28.55	54	-25.45	74	-24.91	206	171	H

Frequency (GHz)	Meter Reading (dBuV)	Det	AF-48107 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	DCF (dB)	Corrected Average Reading (dBuV/m)	FCC SubC 15.209 Avg [dBuV/m]	Margin (dB)	FCC SubC Peak (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.185	73.58	PK	21.5	-43.11	51.97	-20.54	31.43	54	-22.57	74	-22.03	357	300	V
2.185	77.04	PK	21.5	-43.11	55.43	-20.54	34.89	54	-19.11	74	-18.57	216	374	H
3.059	73.41	PK	21.6	-41.63	53.38	-20.54	32.84	54	-21.16	74	-20.62	120	204	V
3.059	71.5	PK	21.6	-41.63	51.47	-20.54	30.93	54	-23.07	74	-22.53	22	347	H
3.933	72.98	PK	22.7	-41.37	54.31	-20.54	33.77	54	-20.23	74	-19.69	230	234	V
3.933	72.71	PK	22.7	-41.37	54.04	-20.54	33.5	54	-20.5	74	-19.96	10	323	H

PK - Peak detector

8.2. RX RADIATED SPURIOUS EMISSION

LIMITS

IC RSS-Gen Issue 2, section 7.2.3.2

All spurious emissions shall comply with the limits shown below:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to receive in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

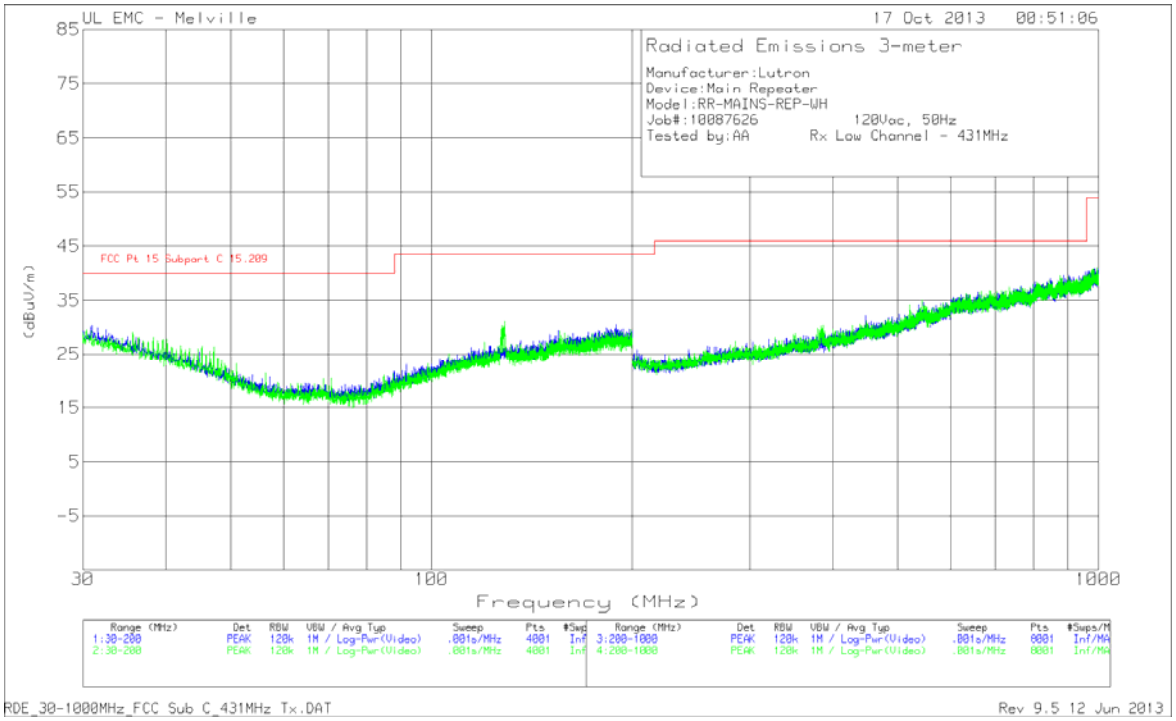
The spectrum from 30 MHz to 5th harmonic is investigated with the transmitter set to the middle channel.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

RECEIVER SPURIOUS EMISSION (30MHz - 1GHz) – Low Channel

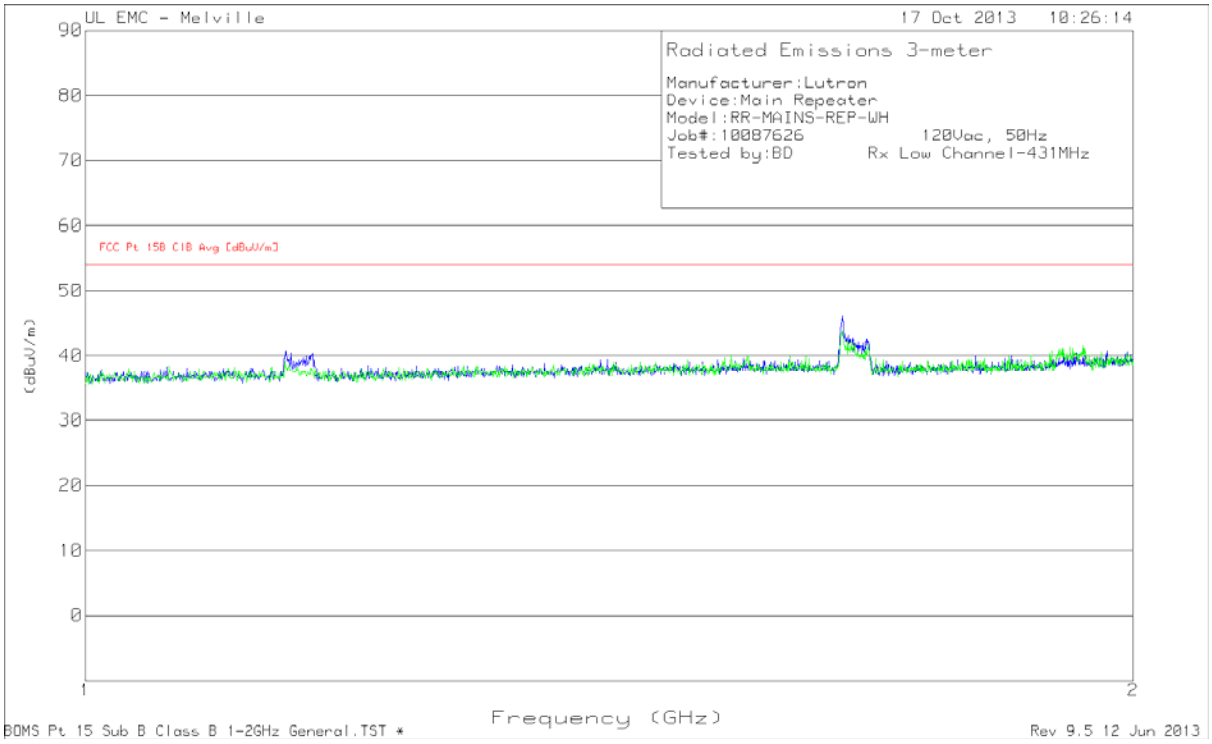


Frequency (MHz)	Meter Reading (dBuV)	Det	AF-54 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart C 15.209	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
38.245	13.54	PK	14.5	.2	28.24	40	-11.76	0-360	100	V
47.17	15.23	PK	11	.1	26.33	40	-13.67	0-360	100	V
128.6	16.59	PK	14.1	.5	31.19	43.5	-12.31	0-360	100	V

Frequency (MHz)	Meter Reading (dBuV)	Det	AF-67 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart C 15.209	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
387	13.91	PK	15.2	1.3	30.41	46	-15.59	0-360	100	V
543.9	13.96	PK	19.4	1.6	34.96	46	-11.04	0-360	100	V
874.9	14.93	PK	22.6	2.1	39.63	46	-6.37	0-360	200	V

PK - Peak detector

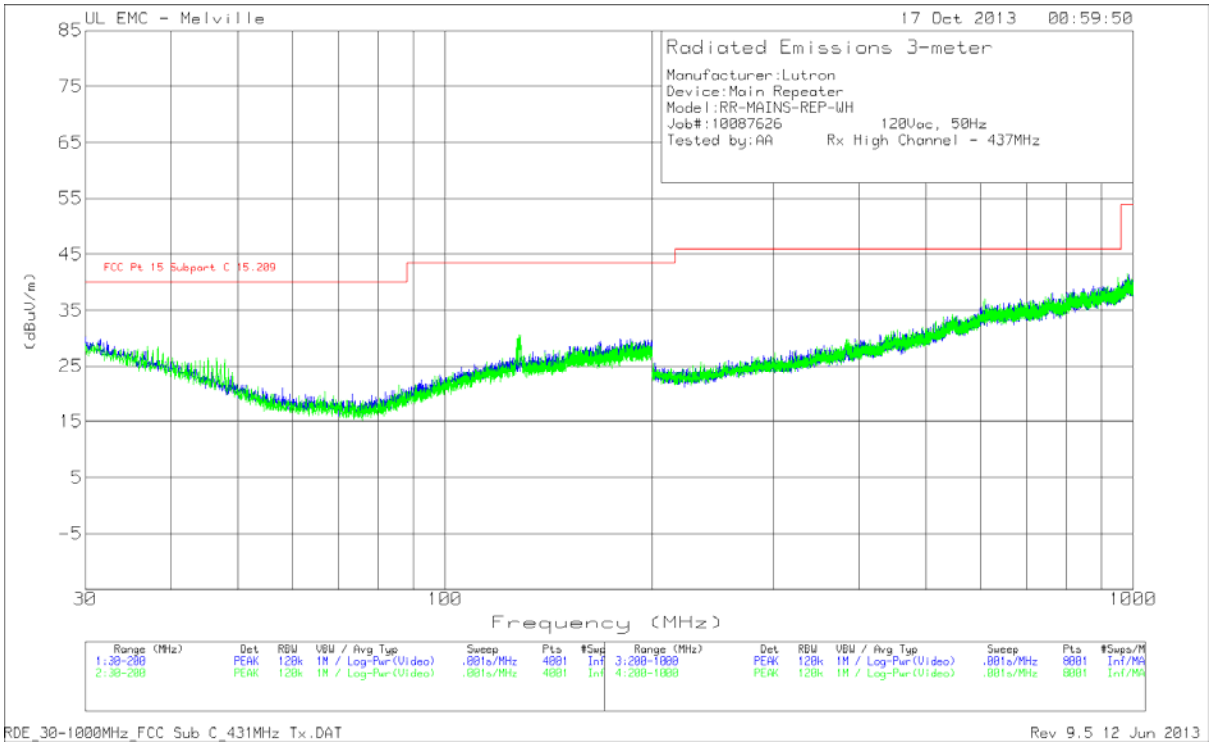
RECEIVER SPURIOUS EMISSION ABOVE 1GHz – Low Channel



Frequency (GHz)	Meter Reading (dBuV)	Det	AF-51442 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	FCC Pt 15B ClB Avg [dBuV/m]	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.141	63.5	PK	19.9	-44.28	39.12	54	-14.88	0-360	100	V
1.142	65.14	PK	19.9	-44.37	40.67	54	-13.33	0-360	200	H
1.163	64.82	PK	19.9	-44.34	40.38	54	-13.62	0-360	200	H
1.65	66.7	PK	21	-43.86	43.84	54	-10.16	0-360	100	V
1.651	68.97	PK	20.9	-43.76	46.11	54	-7.89	0-360	200	H
1.677	65.56	PK	20.8	-43.76	42.6	54	-11.4	0-360	100	H
1.678	64.82	PK	20.8	-43.86	41.76	54	-12.24	0-360	200	V

PK - Peak detector

RECEIVER SPURIOUS EMISSION (30MHz - 1GHz) – High Channel

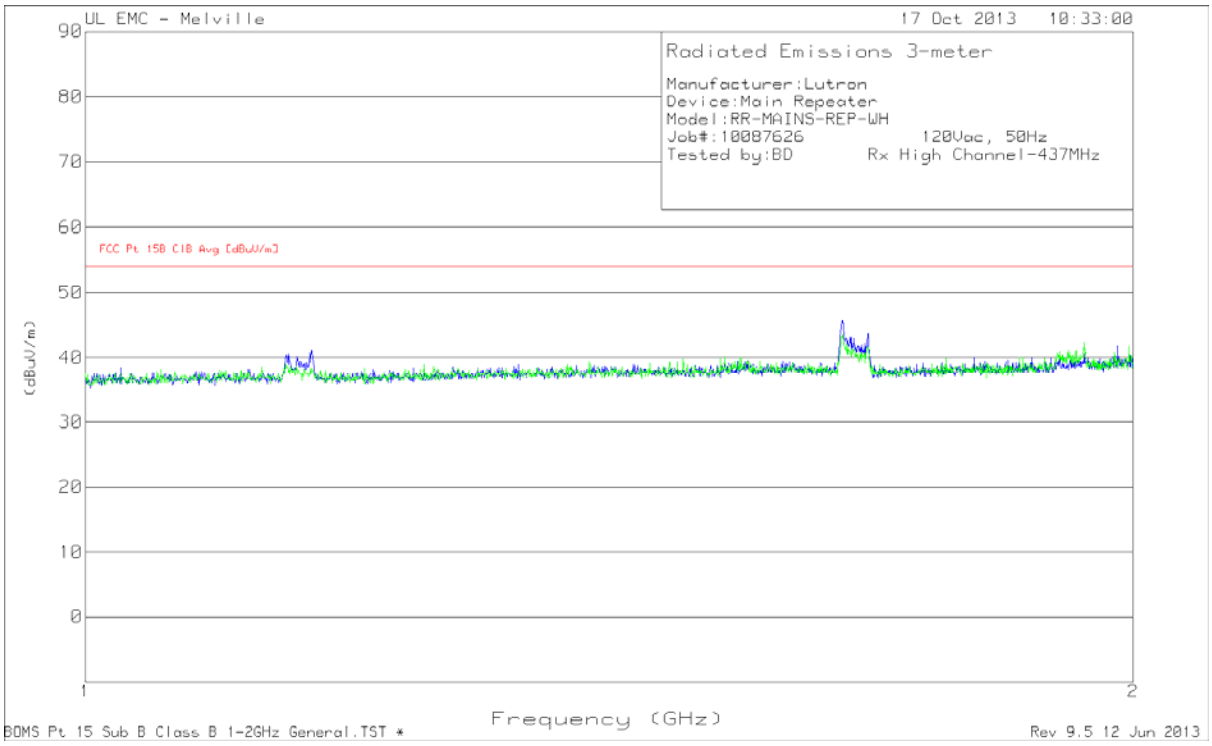


Frequency (MHz)	Meter Reading (dBuV)	Det	AF-54 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart C 15.209	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
38.245	13.8	PK	14.5	.2	28.5	40	-11.5	0-360	100	V
45.2575	14.61	PK	11.7	.2	26.51	40	-13.49	0-360	100	V
128.2175	16.04	PK	14.1	.5	30.64	43.5	-12.86	0-360	100	V

Frequency (MHz)	Meter Reading (dBuV)	Det	AF-67 [dB/m]	GL-3M [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart C 15.209	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
383.4	13.34	PK	15.1	1.4	29.84	46	-16.16	0-360	200	V
609.3	15.71	PK	19.7	1.6	37.01	46	-8.99	0-360	100	V
951.6	15.46	PK	23.1	2.2	40.76	46	-5.24	0-360	100	V

PK - Peak detector

RECEIVER SPURIOUS EMISSION ABOVE 1GHz – High Channel



Frequency (GHz)	Meter Reading (dBuV)	Det	AF-51442 [dB/m]	BOMS Factor (dB)	Corrected Reading (dBuV/m)	FCC Pt 15B CIB Avg [dBuV/m]	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.142	64.94	PK	19.9	-44.37	40.47	54	-13.53	0-360	200	H
1.142	63.45	PK	19.9	-44.31	39.04	54	-14.96	0-360	199	V
1.162	65.46	PK	19.9	-44.2	41.16	54	-12.84	0-360	200	H
1.65	68.66	PK	21	-43.86	45.8	54	-8.2	0-360	200	H
1.65	66.47	PK	21	-43.86	43.61	54	-10.39	0-360	100	V
1.678	64.65	PK	20.8	-43.86	41.59	54	-12.41	0-360	100	V
1.679	66.83	PK	20.8	-43.88	43.75	54	-10.25	0-360	200	H

PK - Peak detector

8.3. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207 (a)
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

TEST PROCEDURE

ANSI C63.4

RESULTS

No non-compliance noted:

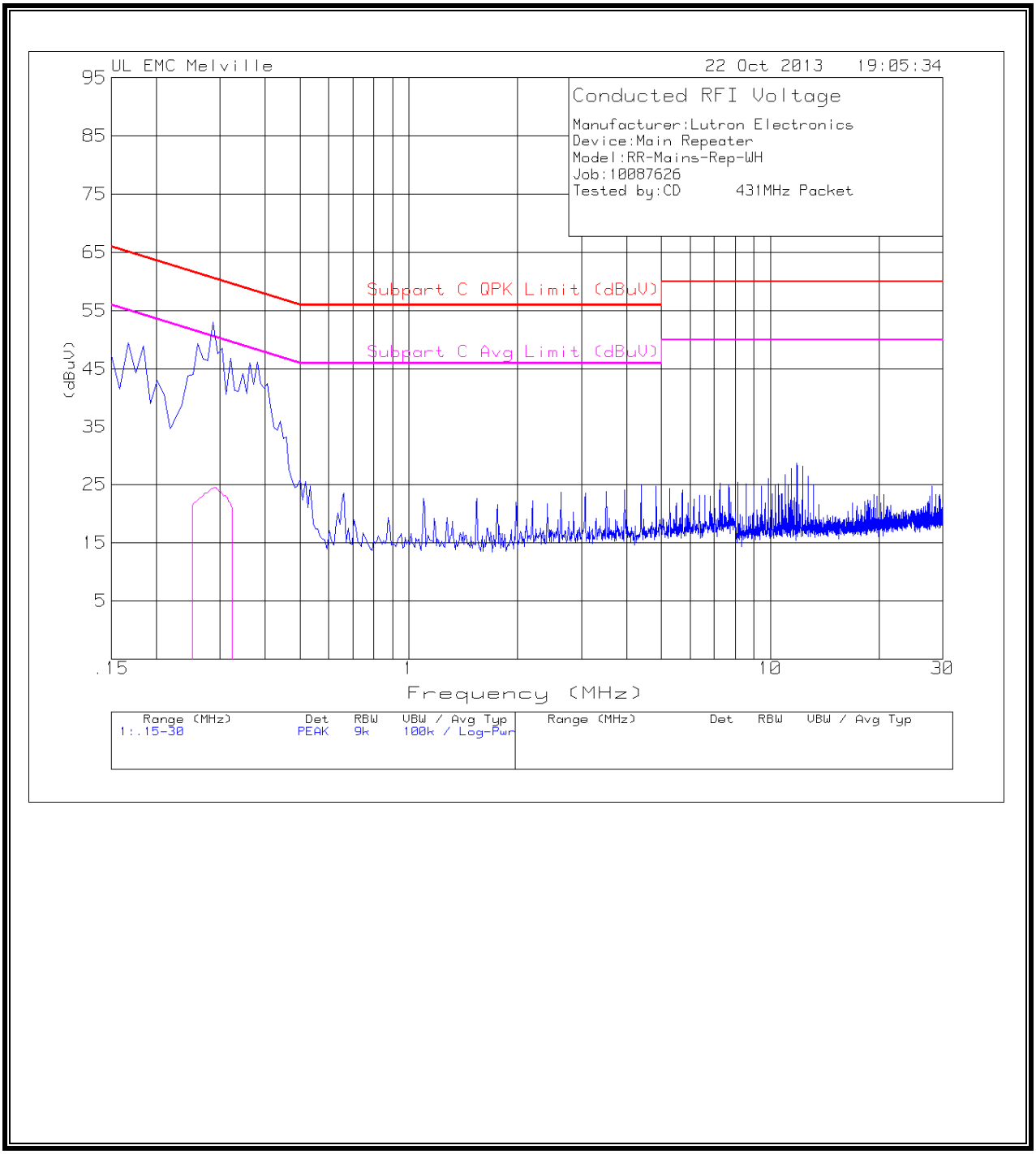
WORST EMISSIONS – Low Channel TX

Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.27183	13.51	Av	10	23.51	-	-	51.06	-27.55
.29208	14.43	Av	10	24.43	-	-	50.47	-26.04
.31458	12.71	Av	10	22.71	59.85	-37.14	49.85	-27.14
.16706	39.53	PK	10	49.53	65.11	-15.58	55.11	-5.58
.2609	39.42	PK	10	49.42	61.4	-11.98	51.4	-1.98
.2865	43.11	PK	10	53.11	60.63	-7.52	-	-
.38034	36.16	PK	10	46.16	58.27	-12.11	48.27	-2.11
.66186	13.52	PK	10	23.52	56	-32.48	46	-22.48
11.85454	17.8	PK	10.9	28.7	60	-31.3	50	-21.3

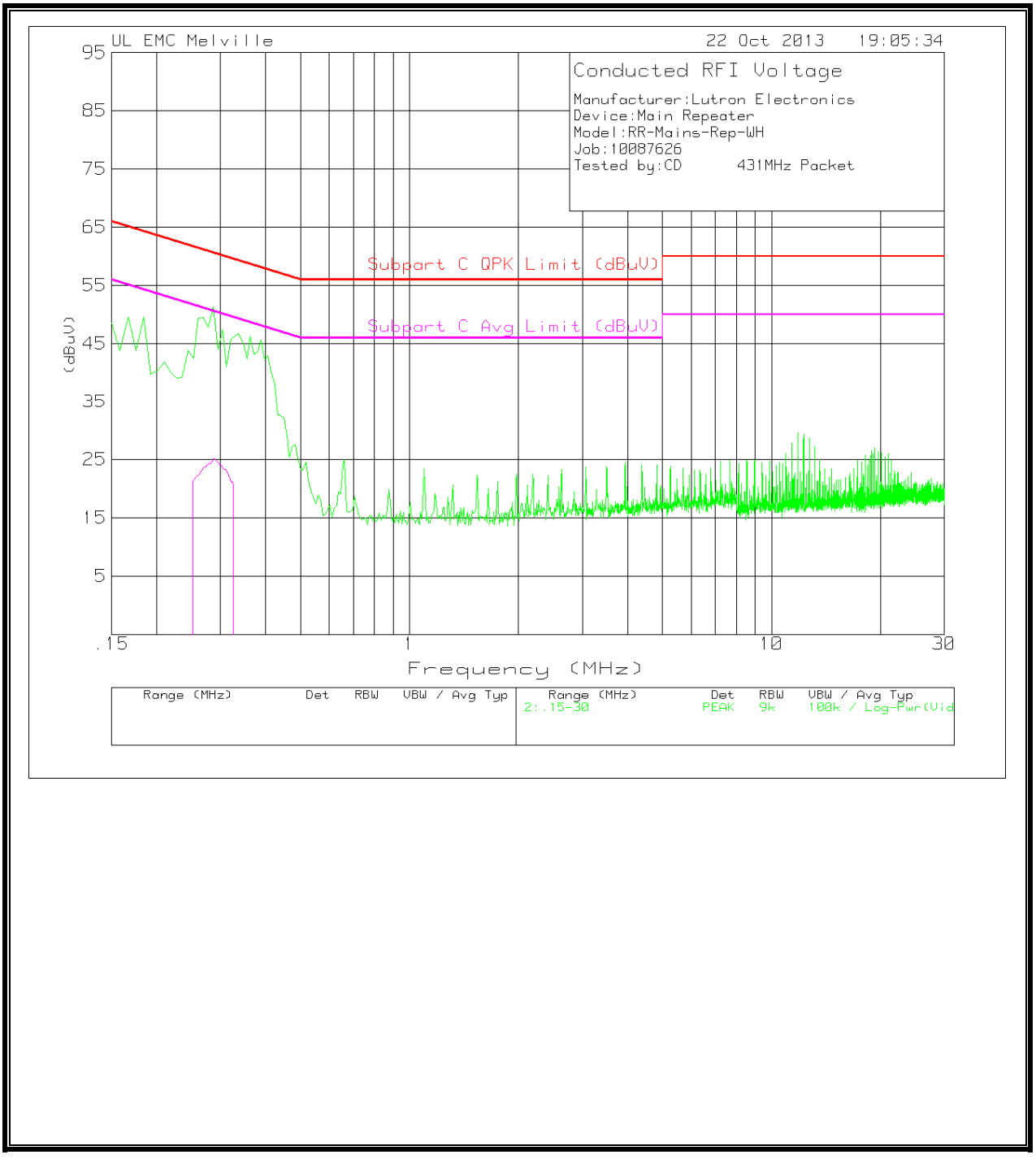
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 2 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.26058	12.31	Av	10	22.31	-	-	51.41	-29.1
.28533	14.73	Av	10	24.73	-	-	50.66	-25.93
.31458	12.64	Av	10	22.64	-	-	49.85	-27.21
.18412	39.68	PK	10	49.68	64.3	-14.62	54.3	-4.62
.2865	41.34	PK	10	51.34	60.63	-9.29	-	-
.36328	36.29	PK	10	46.29	58.65	-12.36	48.65	-2.36
.66186	14.92	PK	10.1	25.02	56	-30.98	46	-20.98
12.70765	17.96	PK	10.8	28.76	60	-31.24	50	-21.24
19.27652	15.92	PK	11.1	27.02	60	-32.98	50	-22.98

PK - Peak detector
Av - average detection

LINE 1 RESULTS – Low Channel TX



LINE 2 RESULTS – Low Channel TX



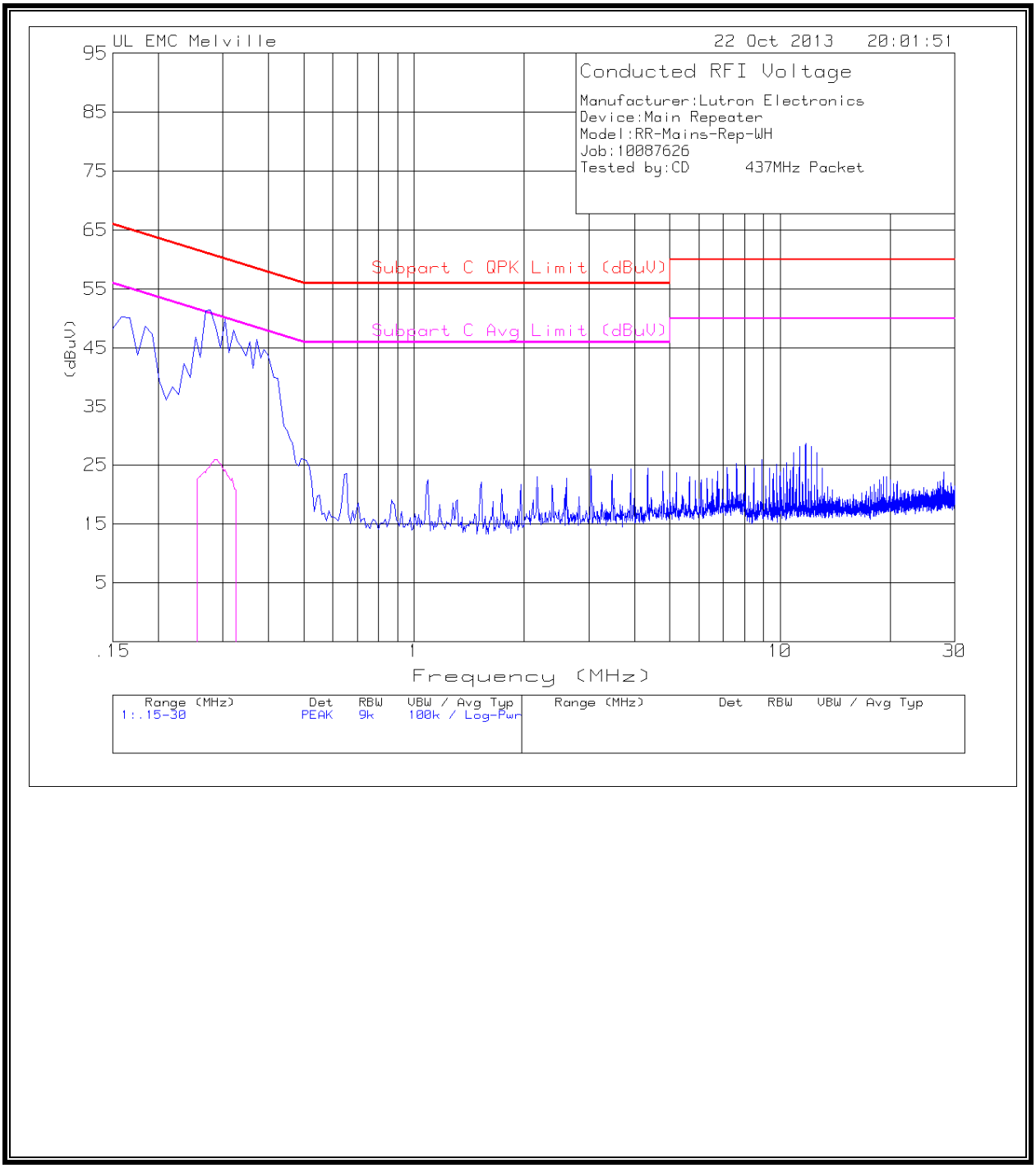
WORST EMISSIONS – High Channel TX

Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.15853	40.27	PK	10	50.27	65.54	-15.27	55.54	-5.27
.27797	41.49	PK	10	51.49	60.88	-9.39	-	-
.37181	36.45	PK	10	46.45	58.46	-12.01	48.46	-2.01
.65333	13.59	PK	10	23.59	56	-32.41	46	-22.41
1.08841	12.48	PK	10	22.48	56	-33.52	46	-23.52
11.30856	17.27	PK	10.9	28.17	60	-31.83	50	-21.83
.25978	13.02	Av	10	23.02	-	-	51.44	-28.42
.28678	15.94	Av	10	25.94	-	-	50.62	-24.68
.31828	12.71	Av	10	22.71	-	-	49.75	-27.04

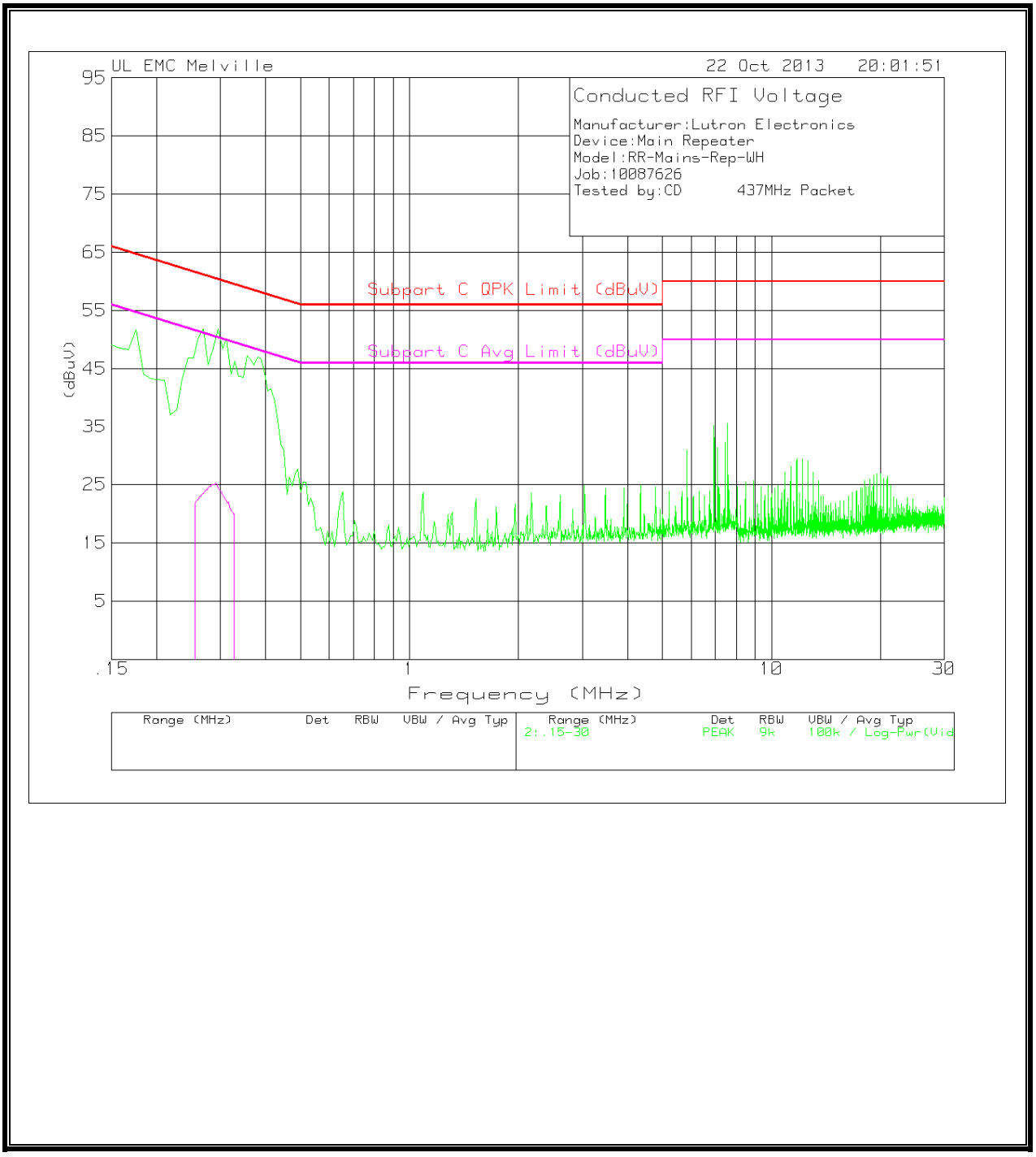
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 2 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.25978	12.42	Av	10	22.42	-	-	51.44	-29.02
.28678	15.06	Av	10	25.06	-	-	50.62	-25.56
.31603	11.98	Av	10	21.98	-	-	49.81	-27.83
.17559	41.78	PK	10	51.78	64.69	-12.91	54.69	-2.91
.29503	41.89	PK	10	51.89	60.38	-8.49	-	-
.35474	37.3	PK	10	47.3	58.85	-11.55	48.85	-1.55
.65333	13.69	PK	10.1	23.79	56	-32.21	46	-22.21
1.08841	13.65	PK	10.1	23.75	56	-32.25	46	-22.25
7.56345	25.3	PK	10.4	35.7	60	-24.3	50	-14.3

PK - Peak detector
Av - average detection

LINE 1 RESULTS – High Channel TX



LINE 2 RESULTS – High Channel TX



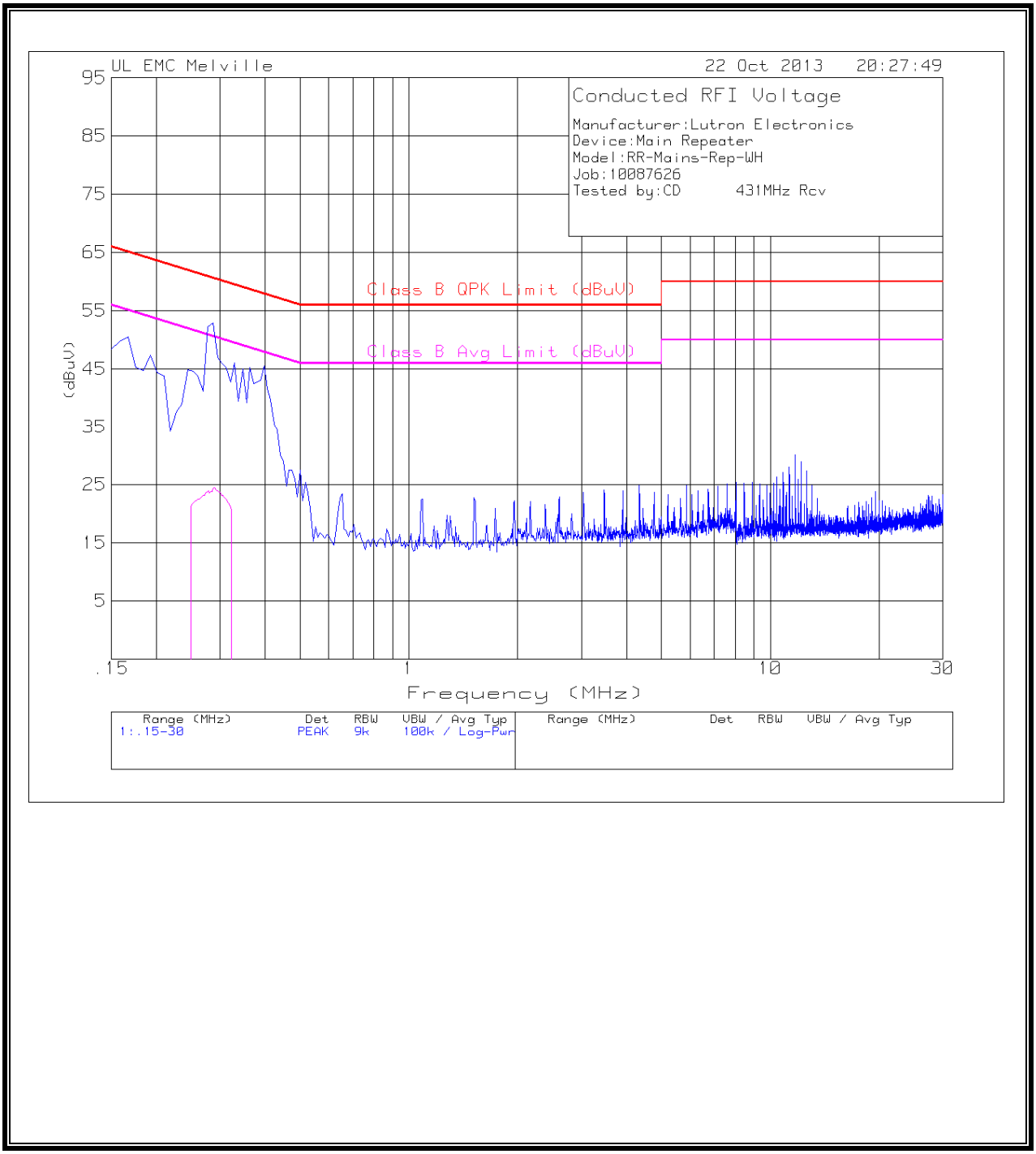
WORST EMISSIONS – Low Channel RX

Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.25589	12.27	Av	10	22.27	-	-	51.56	-29.29
.28964	14.43	Av	10	24.43	-	-	50.53	-26.1
.31439	12.17	Av	10	22.17	-	-	49.85	-27.68
.16706	40.58	PK	10	50.58	65.11	-14.53	55.11	-4.53
.2865	42.86	PK	10	52.86	60.63	-7.77	-	-
.3974	35.58	PK	10	45.58	57.91	-12.33	47.91	-2.33
.65333	13.46	PK	10	23.46	56	-32.54	46	-22.54
1.08841	12.55	PK	10	22.55	56	-33.45	46	-23.45
11.72658	19.19	PK	10.9	30.09	60	-29.91	50	-19.91

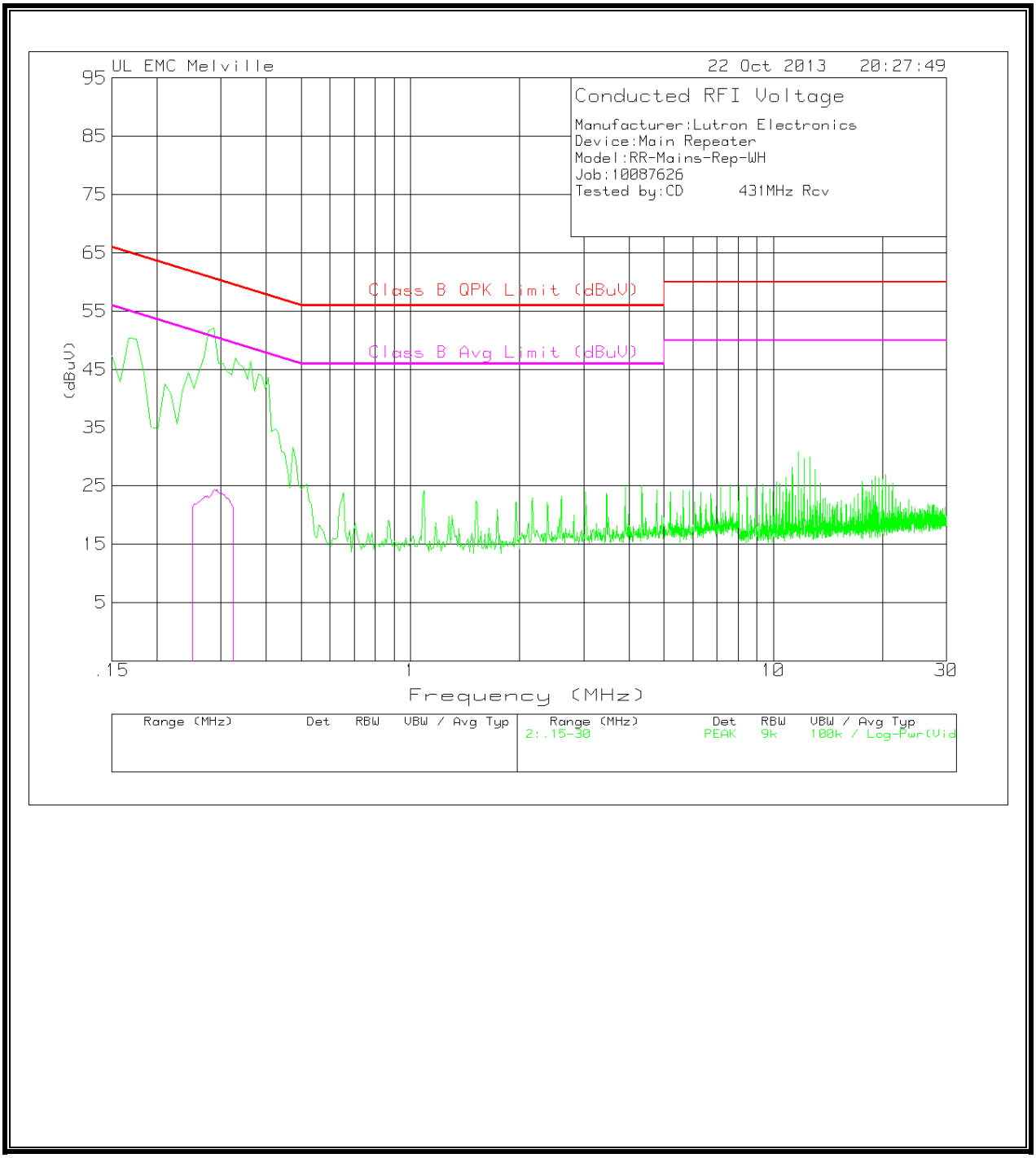
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 2 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.2571	11.85	Av	10	21.85	-	-	51.52	-29.67
.2886	14.38	Av	10	24.38	-	-	50.56	-26.18
.31335	12.96	Av	10	22.96	-	-	49.88	-26.92
.16706	40.42	PK	10	50.42	65.11	-14.69	55.11	-4.69
.2865	42.14	PK	10	52.14	60.63	-8.49	-	-
.38034	34.28	PK	10	44.28	58.27	-13.99	48.27	-3.99
.65333	13.77	PK	10.1	23.87	56	-32.13	46	-22.13
1.08841	14.1	PK	10.1	24.2	56	-31.8	46	-21.8
12.16166	18.78	PK	10.9	29.68	60	-30.32	50	-20.32

PK - Peak detector
Av - average detection

LINE 1 RESULTS – Low Channel RX



LINE 2 RESULTS – Low Channel RX



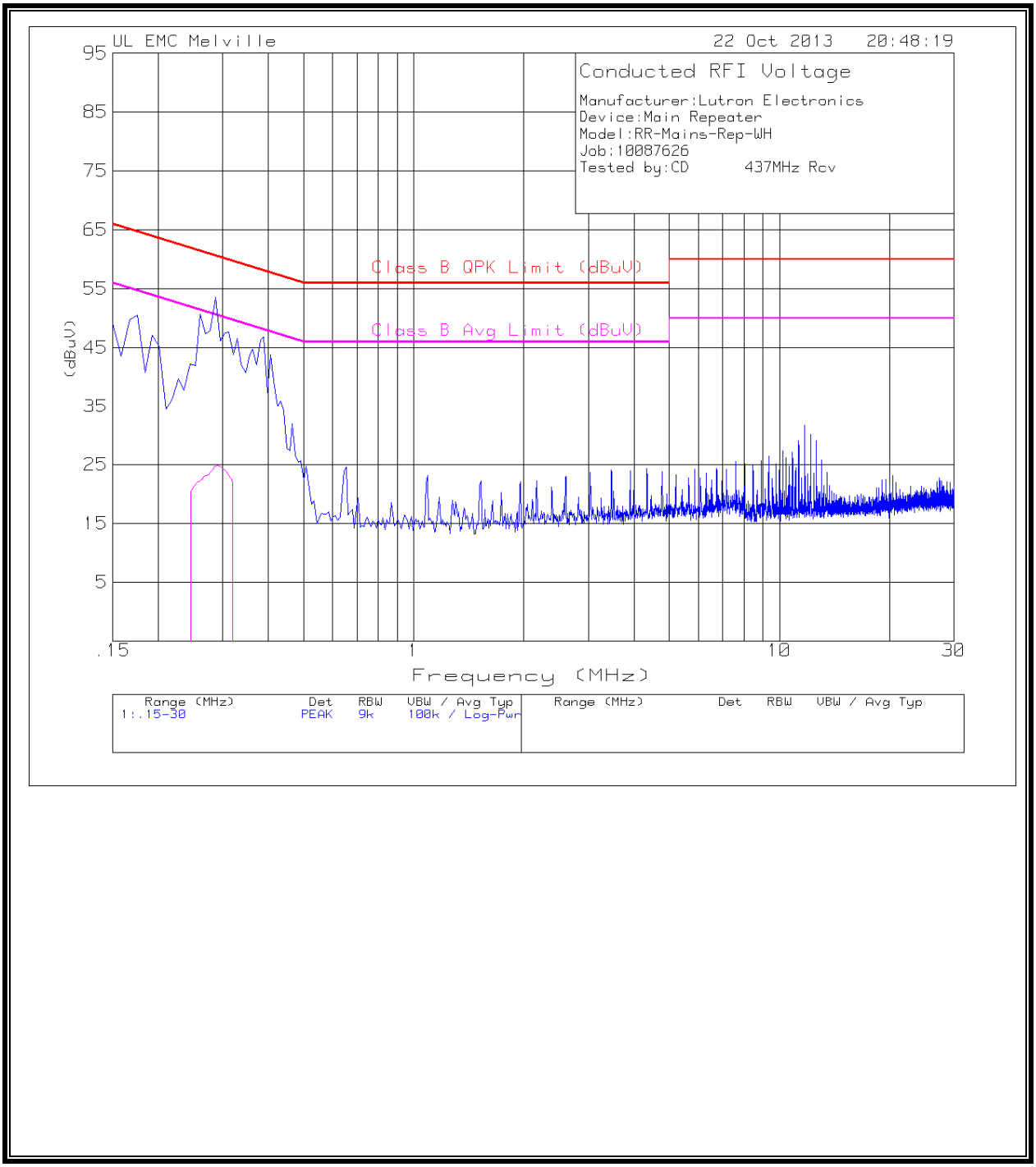
WORST EMISSIONS – High Channel RX

Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.17559	40.61	PK	10	50.61	64.69	-14.08	54.69	-4.08
.2865	43.63	PK	10	53.63	60.63	-7	-	-
.38887	36.81	PK	10	46.81	58.09	-11.28	48.09	-1.28
.65333	14.56	PK	10	24.56	56	-31.44	46	-21.44
1.08841	13.18	PK	10	23.18	56	-32.82	46	-22.82
11.2915	18.15	PK	10.9	29.05	60	-30.95	50	-20.95
.25002	11.33	Av	10	21.33	-	-	51.76	-30.43
.29052	14.86	Av	10	24.86	-	-	50.51	-25.65
.31527	12.71	Av	10	22.71	-	-	49.83	-27.12

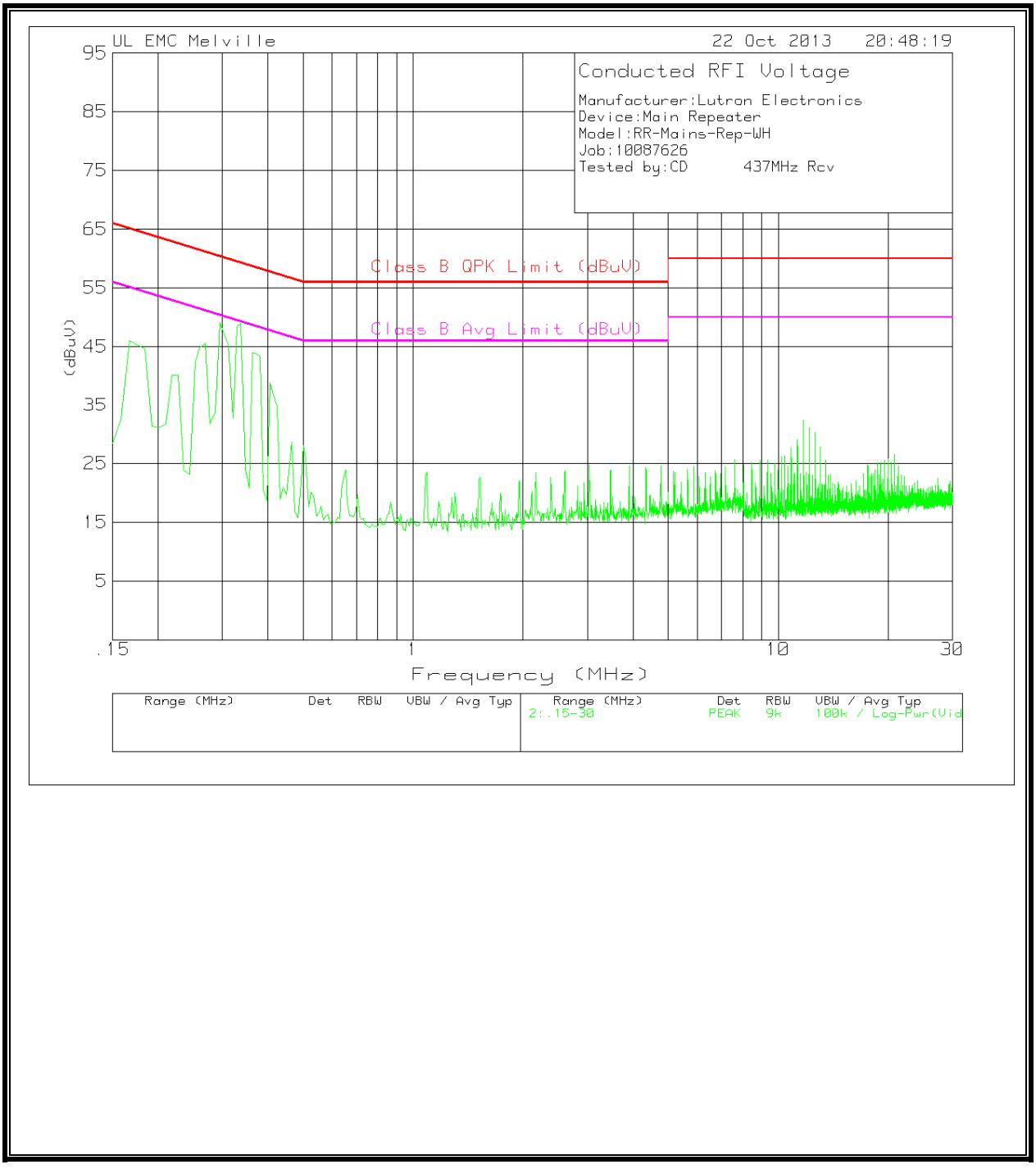
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 2 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.16706	36.12	PK	10	46.12	65.11	-18.99	55.11	-8.99
.29503	39.14	PK	10	49.14	60.38	-11.24	50.38	-1.24
.36328	33.94	PK	10	43.94	58.65	-14.71	48.65	-4.71
.65333	13.86	PK	10.1	23.96	56	-32.04	46	-22.04
11.72658	21.41	PK	11	32.41	60	-27.59	50	-17.59
12.16166	20.15	PK	10.9	31.05	60	-28.95	50	-18.95

PK - Peak detector

LINE 1 RESULTS – High Channel RX



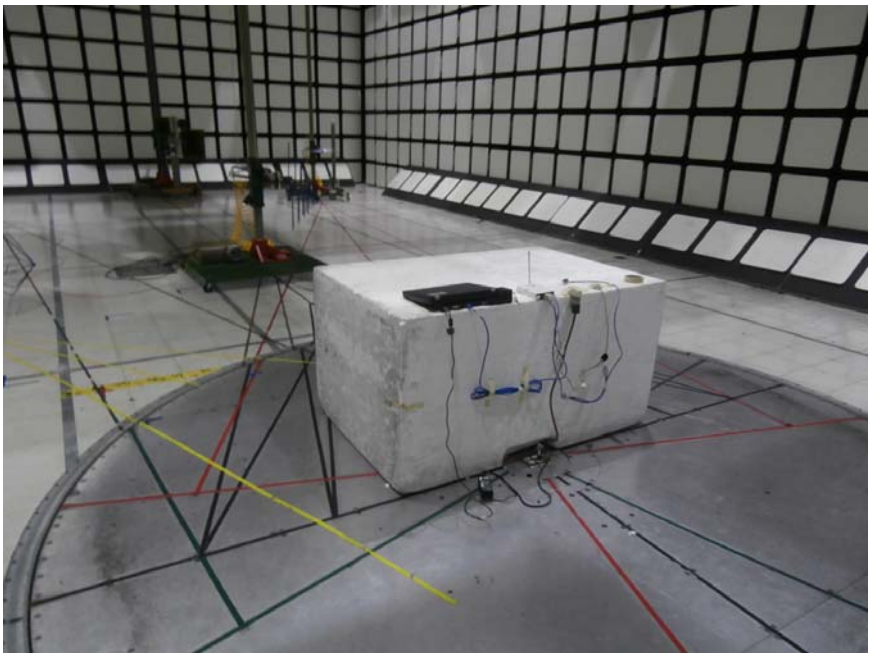
LINE 2 RESULTS – High Channel RX



9. SETUP PHOTOS

ANTENNA PORT

ANTENNA PORT

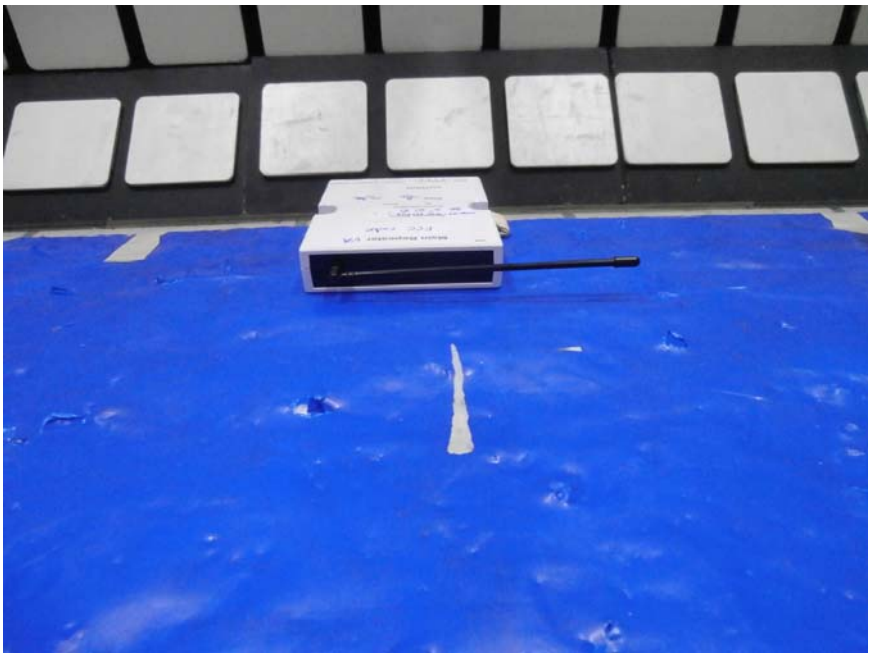


RADIATED EMISSION FOR PORTABLE CONFIGURATION – X ORIENTATION (Table Top)

RADIATED EMISSION FOR PORTABLE CONFIGURATION – X ORIENTATION

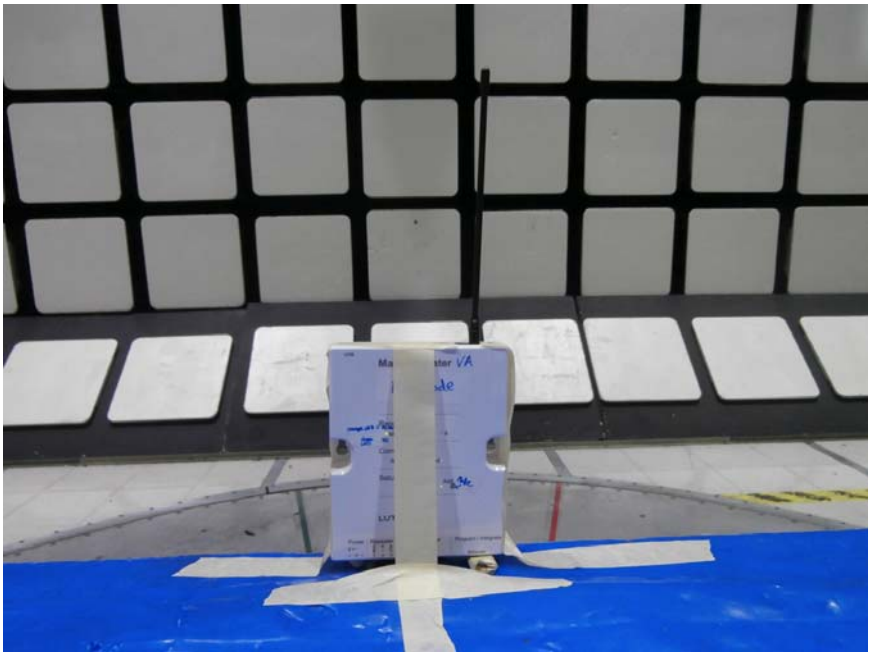
RADIATED EMISSION FOR PORTABLE CONFIGURATION – Y ORIENTATION (Table Top)

RADIATED EMISSION FOR PORTABLE CONFIGURATION – Y ORIENTATION



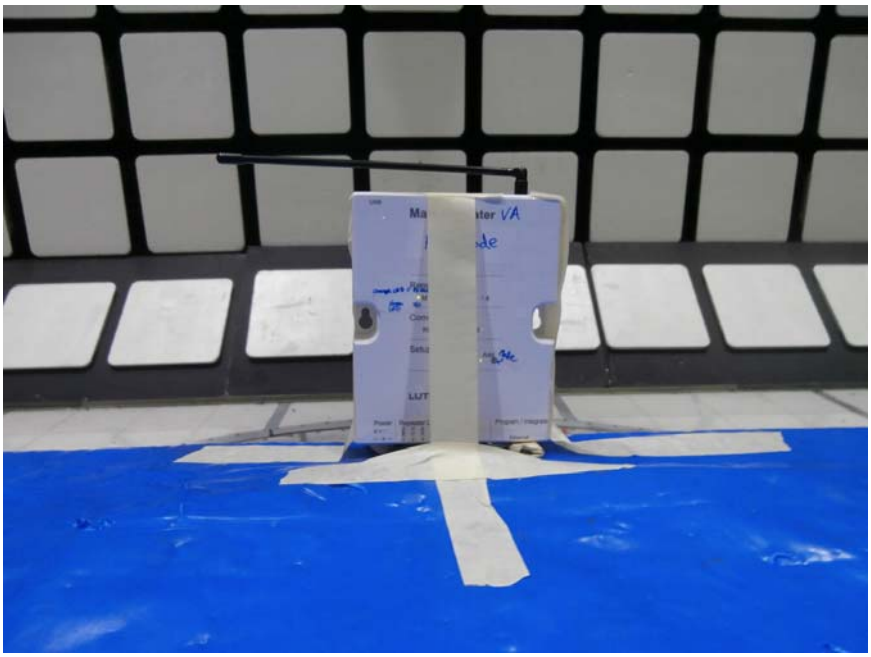
RADIATED EMISSION FOR PORTABLE CONFIGURATION – X ORIENTATION (Wall Mount)

RADIATED EMISSION FOR PORTABLE CONFIGURATION – X ORIENTATION



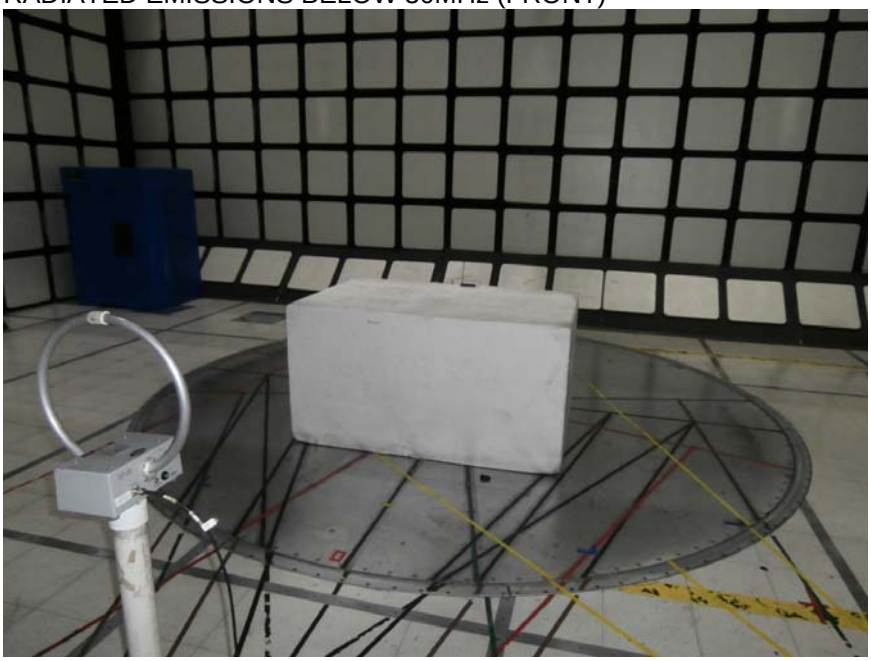
RADIATED EMISSION FOR PORTABLE CONFIGURATION – Y ORIENTATION (Wall Mount)

RADIATED EMISSION FOR PORTABLE CONFIGURATION – Y ORIENTATION

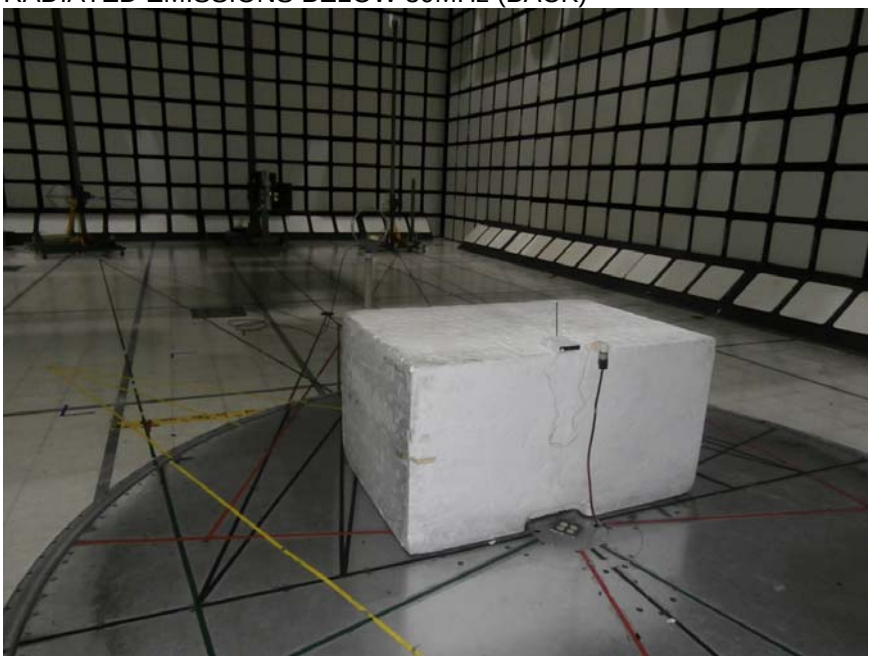


RADIATED EMISSION BELOW 30 MHz

RADIATED EMISSIONS BELOW 30MHz (FRONT)

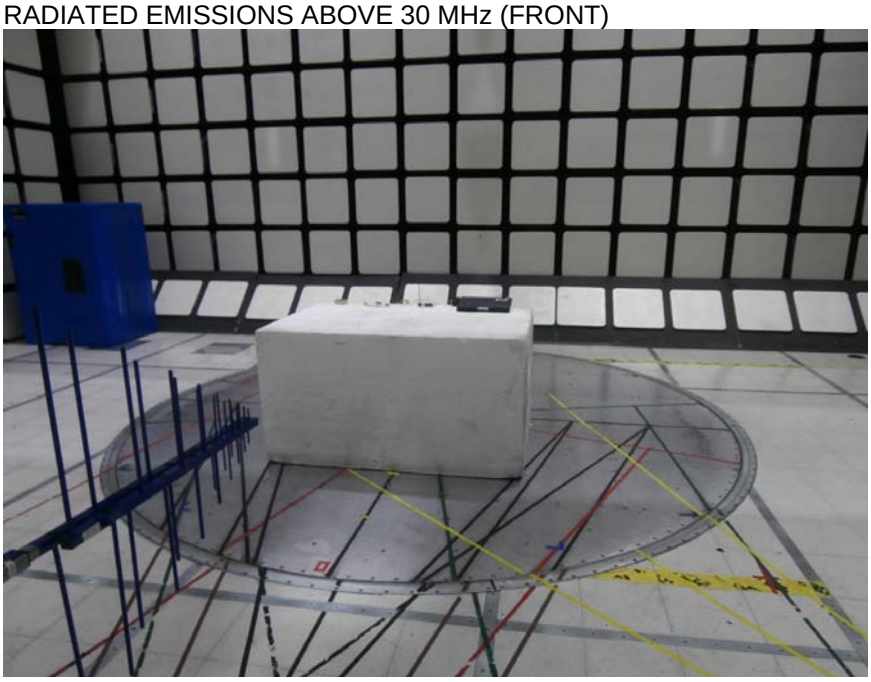


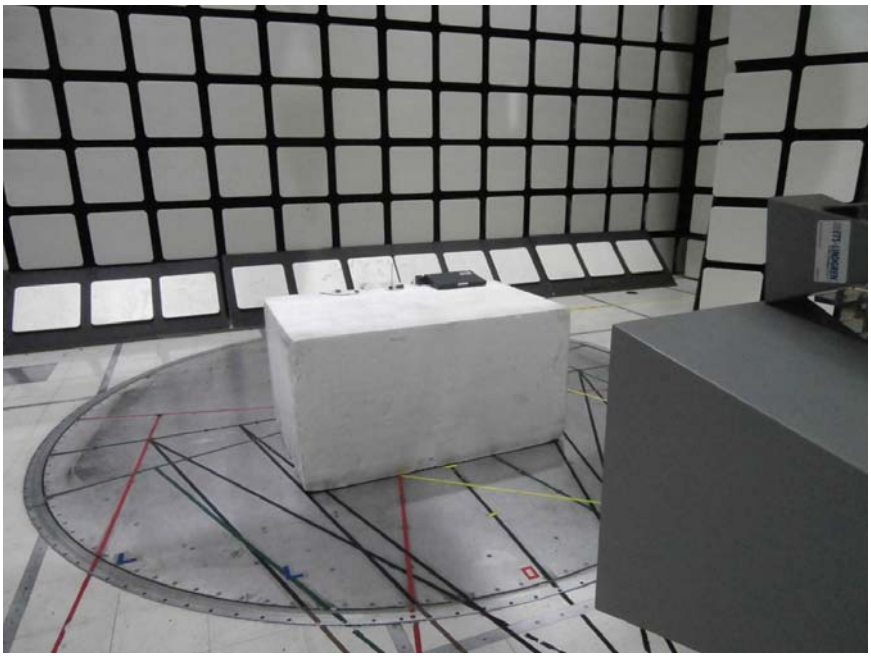
RADIATED EMISSIONS BELOW 30MHz (BACK)



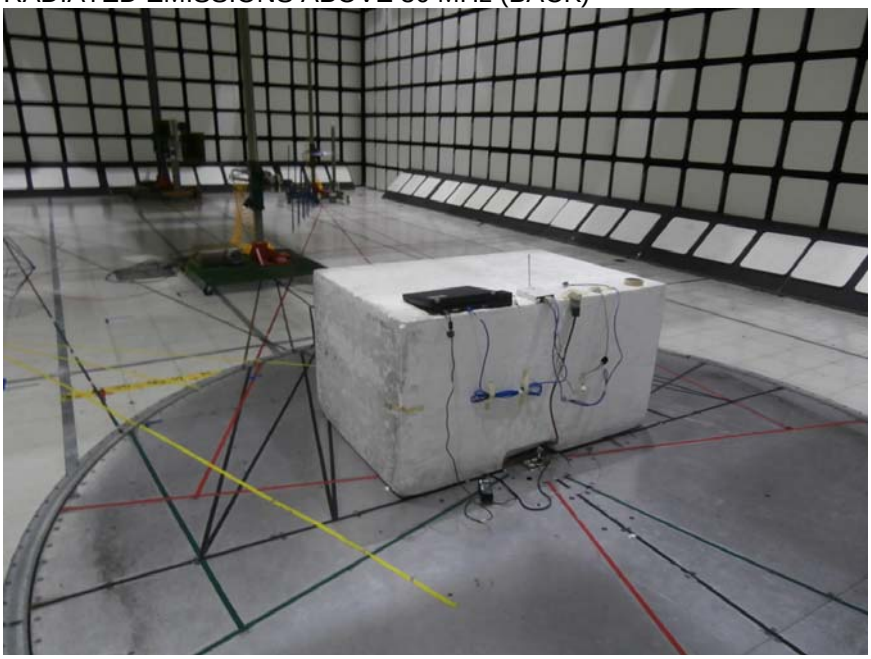
RADIATED EMISSION ABOVE 30 MHz

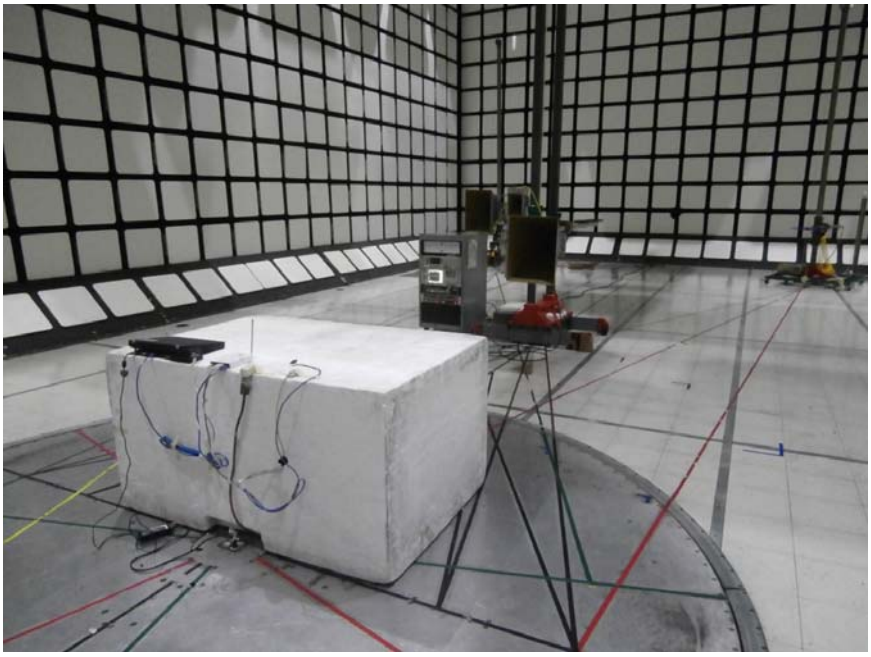
RADIATED EMISSIONS ABOVE 30 MHz (FRONT)





RADIATED EMISSIONS ABOVE 30 MHz (BACK)

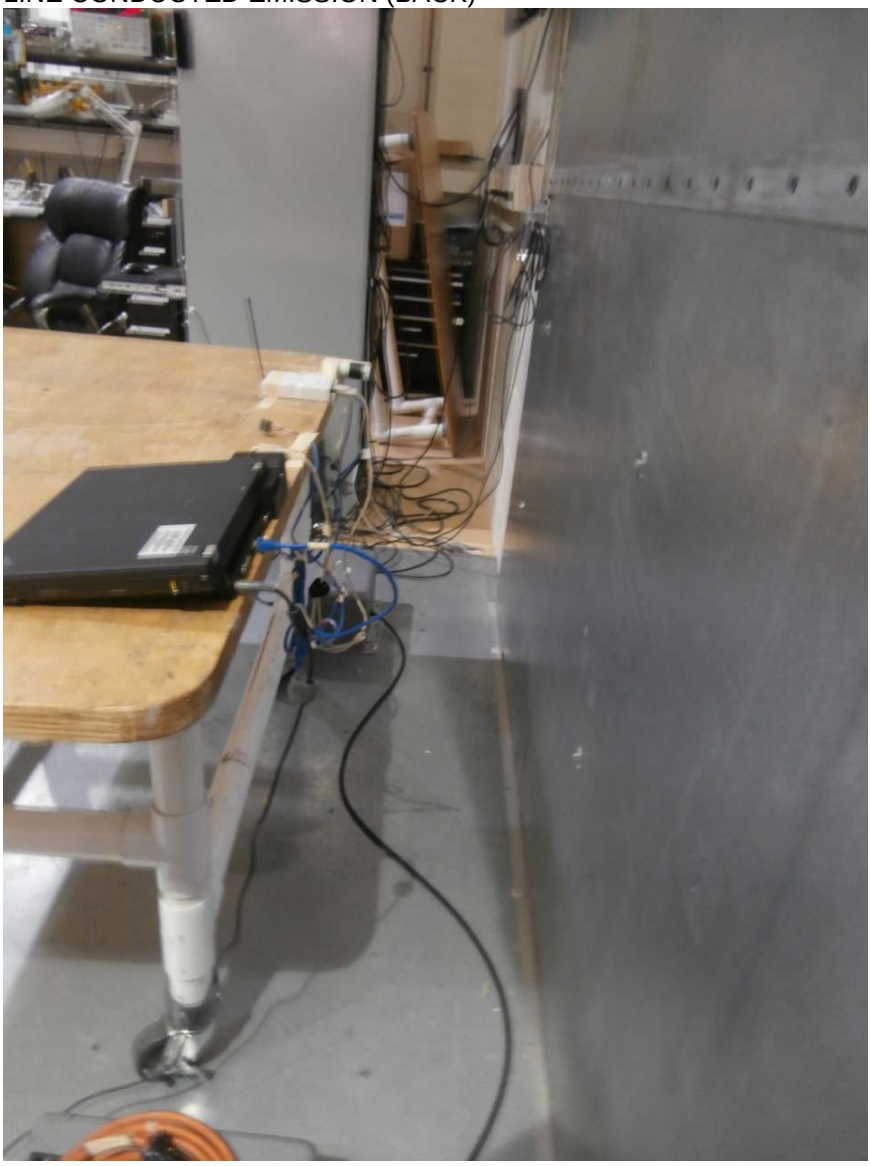




AC MAINS LINE CONDUCTED EMISSION

LINE CONDUCTED EMISSION (FRONT)

LINE CONDUCTED EMISSION (BACK)



END OF REPORT

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