



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

**CERTIFICATION TEST REPORT**

**FOR**

**CONTROLLER**

**MODEL NUMBER: FC-1 & FC-2**

**FCC ID: JPZ0108  
IC: 2851A-JPZ0108**

**REPORT NUMBER: 10382159**

**ISSUE DATE: 2014-08-15**

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**NVLAP LAB CODE 100255-0**

Revision History

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--	8/15/14	Initial Issue	M. Antola

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LUTRON ELECTRONICS CO., INC.  
7200 SUTER ROAD  
COOPERSBURG, PA, 18036, USA

**EUT DESCRIPTION:** CONTROLLER

**MODEL:** FC-1 & FC-2

**SERIAL NUMBER:** NON-SERIALIZED PRODUCTION UNIT

**DATE TESTED:** 8/6/14 – 8/14/14

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:

Tested By:



Bob DeLisi  
Program Manager  
UL LLC

Mike Antola  
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UL LLC

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8. For receive mode testing, the referenced standard is ANSI C63.4: 2009.

## 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 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 control transceiver for use in lighting applications that operates on a single channel in the 431-437MHz range.

The difference in the two models numbers is the fact that the FC-2 comes packaged with an option sensor and the FC-1 does not. The FC-2 was tested, throughout, as it is deemed to be the worse-case model.

### **5.2. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes an integral trace antenna.

### **5.3. SOFTWARE AND FIRMWARE**

The EUT driver software installed during testing was 079-5609.

### **5.4. WORST-CASE CONFIGURATION AND MODE**

All three orthogonal axes were investigated on order to determine the worse-case orientation for radiated testing. All radiated testing was performed in this axis (x-axis). All testing was performed on the lowest and highest channels for all tests with the exception of duty cycle and transmission time, which were performed on the center channel.

### **5.5. MODIFICATIONS**

No modifications were made during testing.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Sensor	Lutron	NA	NA	NA
Restive Load	NA	NA	NA	NA

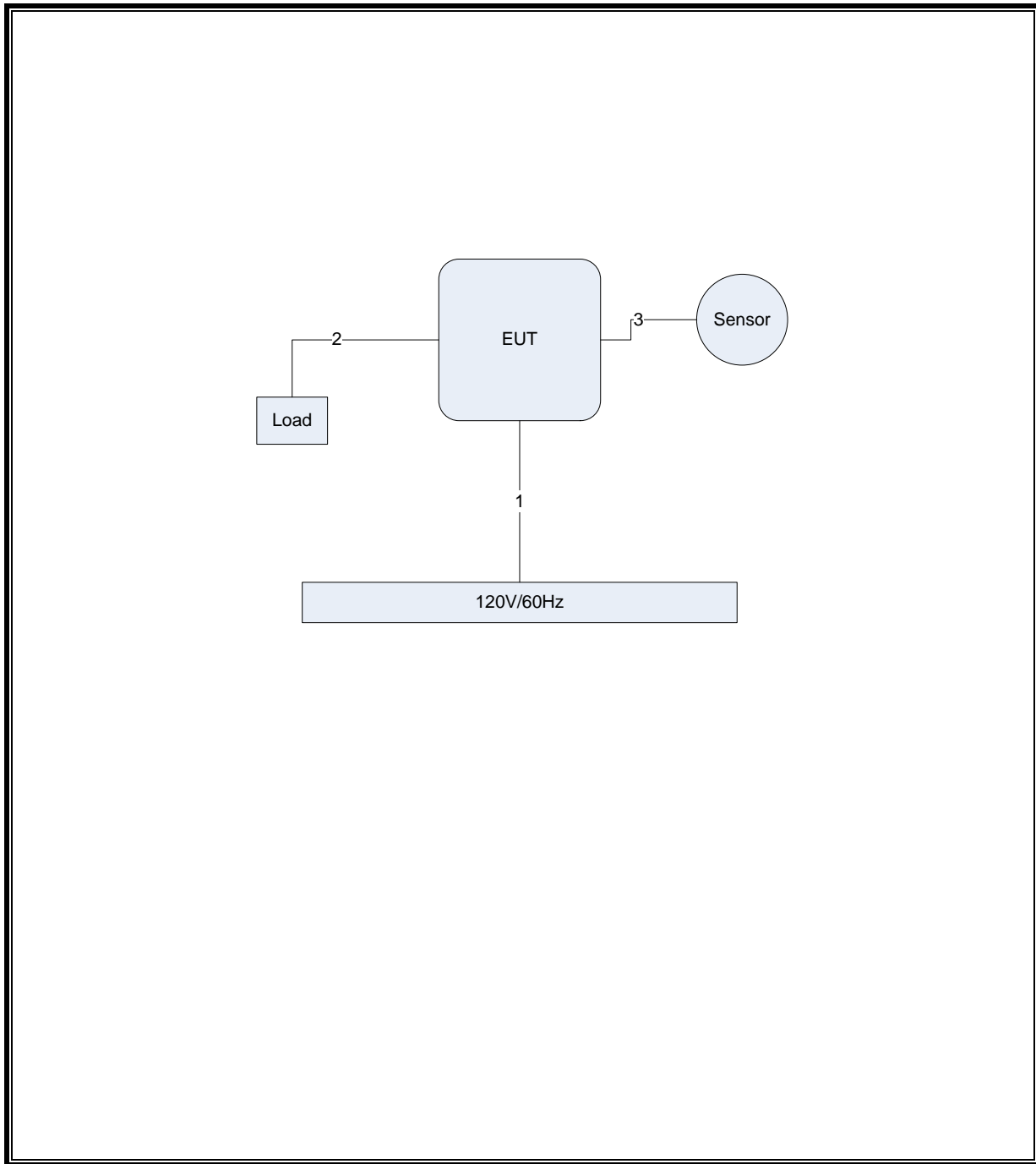
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks
1	Mains	1	Terminals	Stranded Wire	<3M	None
2	10Vdc Out	1	Terminals	Stranded Wire	<3M	Terminated with resistive load
3	12 Vdc	1	Terminals	Stranded Wire	<3M	Terminated to sensor

### TEST SETUP

The EUT is connected to typical equipment in order to load the analog portion of the device. The RF portion of the EUT acts as a stand-alone device.

**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					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
9kHz-1000MHz					
EMI Receiver	Rohde & Schwarz	ESCI7	75141	2014-01-29	2015-01-31
Hybrid Antenna	Sunol	JB-1	84106	2014-02-19	2015-02-19
Loop Antenna	EMCO	6507	5A-288	2013-12-02	2014-12-02
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol	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
Above 1GHz (Band Optimized System)					
Spectrum Analyzer	Agilent	E4446A	72822	2014-06-13	2015-06-13
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
Horn Antenna	EMCO	3115	ME5A-766	2013-12-03	2014-12-03
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	87V	79649	2014-02-05	2015-02-28
<p>* - Note: As allowed by the calibration standard ANSI C63.10 Section 4.6.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.</p> <p>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 <math>2D^2/\lambda</math>. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.</p> <p>** - Number in parentheses denotes antenna beam width.</p>					

<b>Conducted Emissions</b>					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2014-04-09	2015-04-09
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2014-01-28	2015-01-28
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	2014-03-24	2016-03-24
Multimeter	Fluke	83III	ME5B-305	2014-01-28	2015-01-28

<b>Bench Tests</b>					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
RF Room 1					
Spectrum Analyzer	Agilent	N9030A	85671	2014-06-27	2015-06-27
Dipole Antenna	EMCO	3121C	3359	2014-01-10	2015-01-10
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43733	2014-03-24	2016-03-24

## 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 C63.10

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 10 KHz. 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:

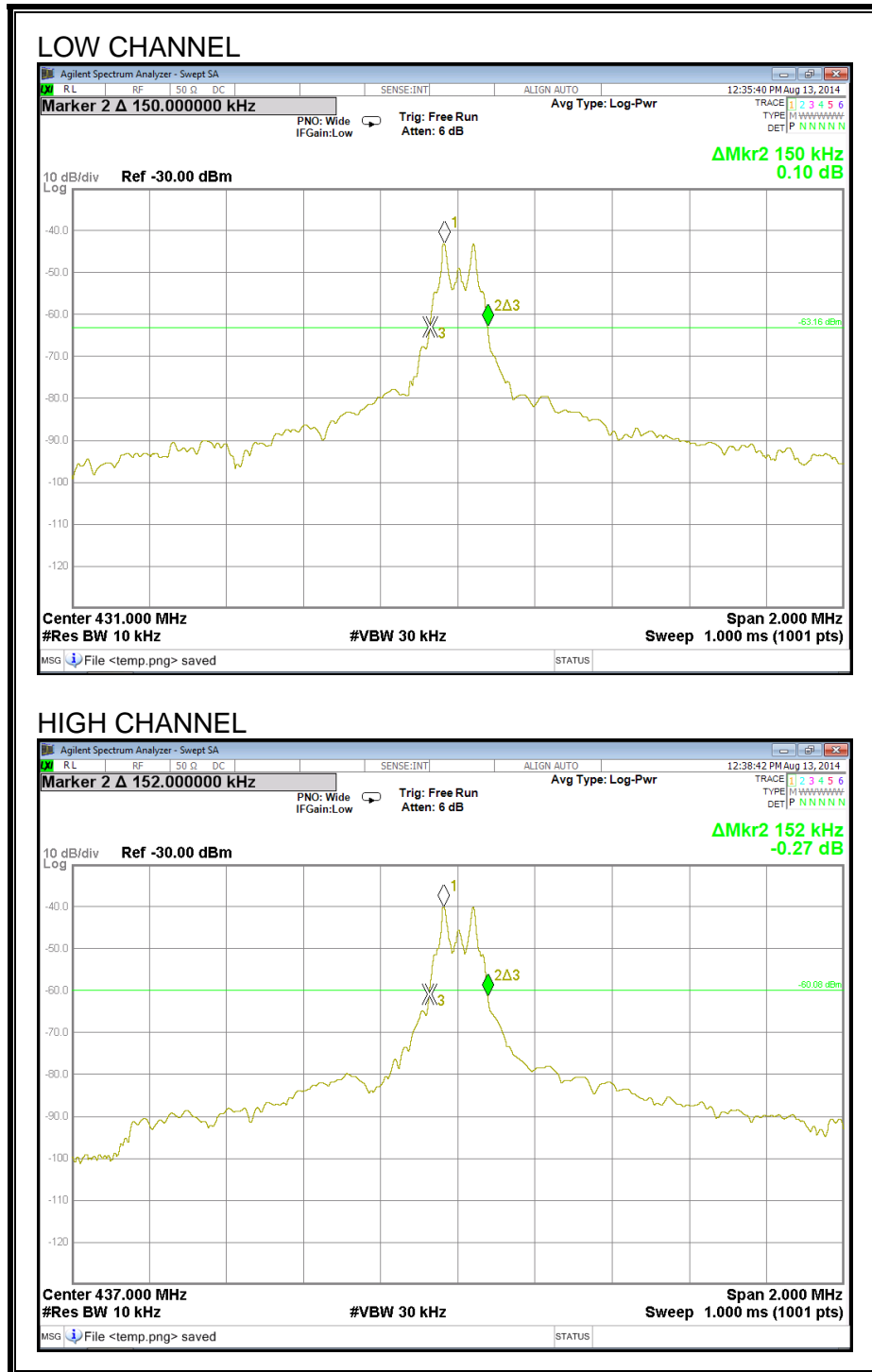
20dB Bandwidth

<b>Frequency (MHz)</b>	<b>20dB Bandwidth (kHz)</b>	<b>Limit (kHz)</b>	<b>Margin (kHz)</b>
431	150	1077.5	-927.5
437	152	1092.5	-940.5

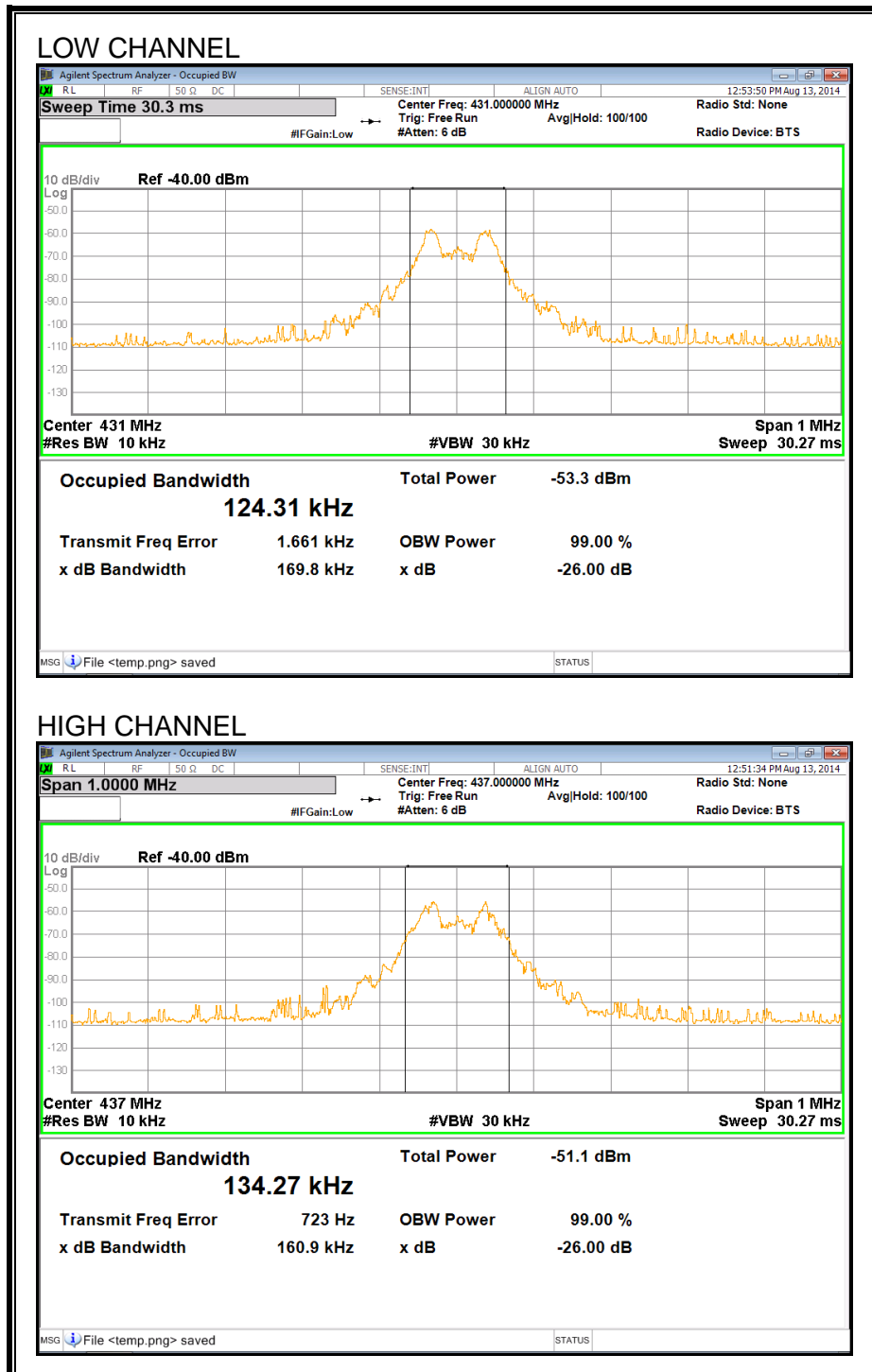
99% Bandwidth

<b>Frequency (MHz)</b>	<b>99% Bandwidth (kHz)</b>	<b>Limit (kHz)</b>	<b>Margin (kHz)</b>
431	124.31	1077.5	-953.19
437	134.27	1092.5	-958.23

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 1 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

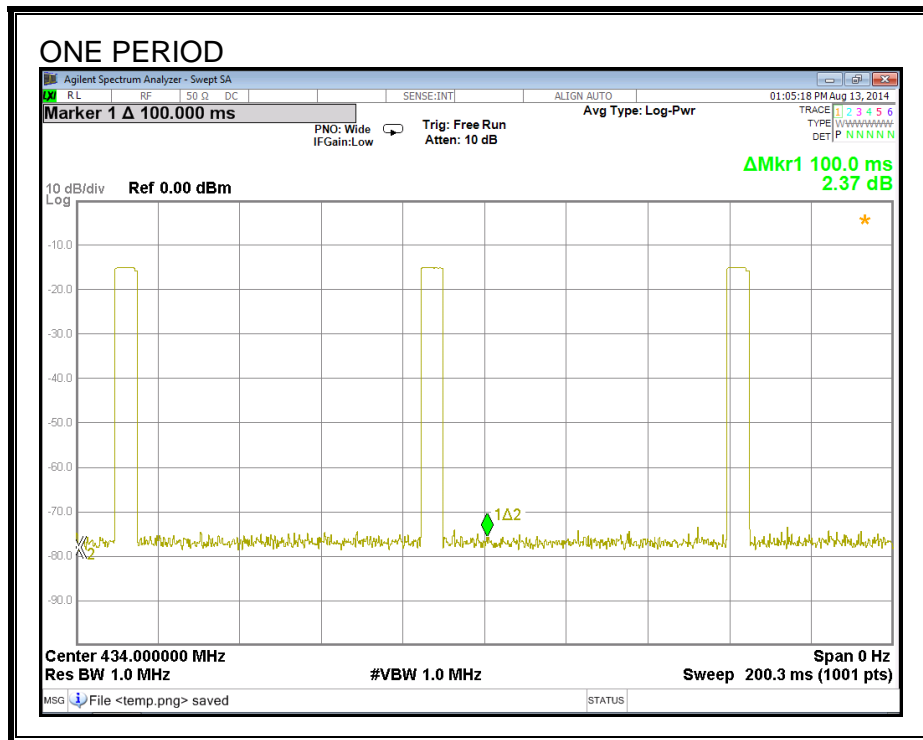
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is (# of long pulses \* long pulse width) + (# of short pulses \* short pulse width) / 100 or T

### RESULTS

No non-compliance noted:

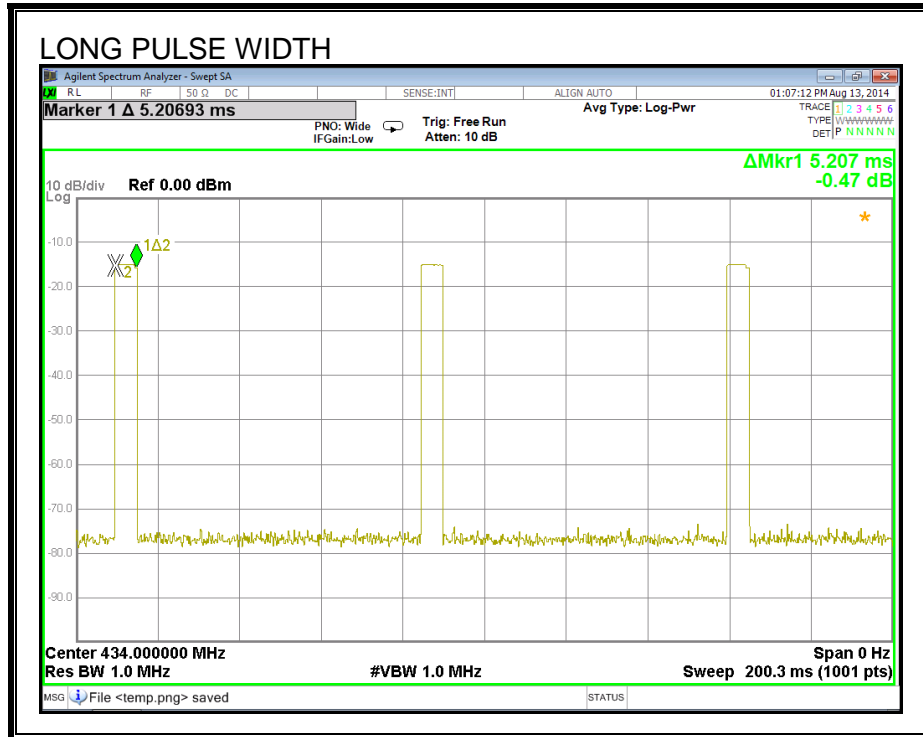
One Period (ms)	Long Pulse Width (ms)	# of Long Pulses	Short Width (ms)	# of Short Pulses	Duty Cycle	20*Log Duty Cycle (dB)
100	5.2069	1	5.01	1	0.102	-19.82

**ONE PERIOD**

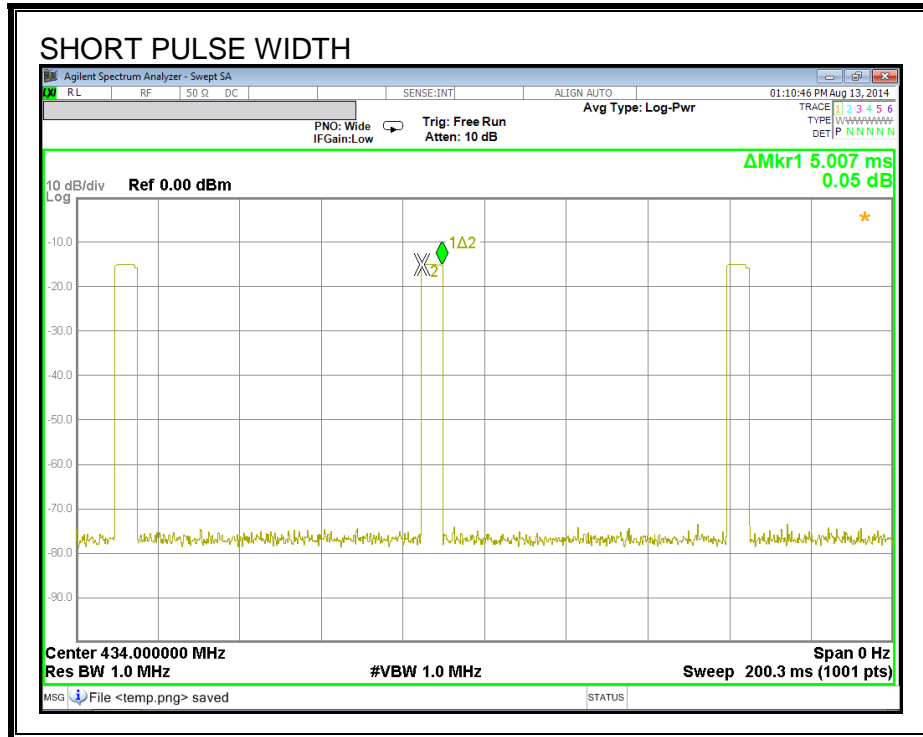




**LONG PULSE WIDTH**



**SHORT PULSE WIDTH**



### 7.3. TRANSMISSION TIME

#### LIMITS

FCC §15.231 (a) (2)

IC A1.1.1 (b)

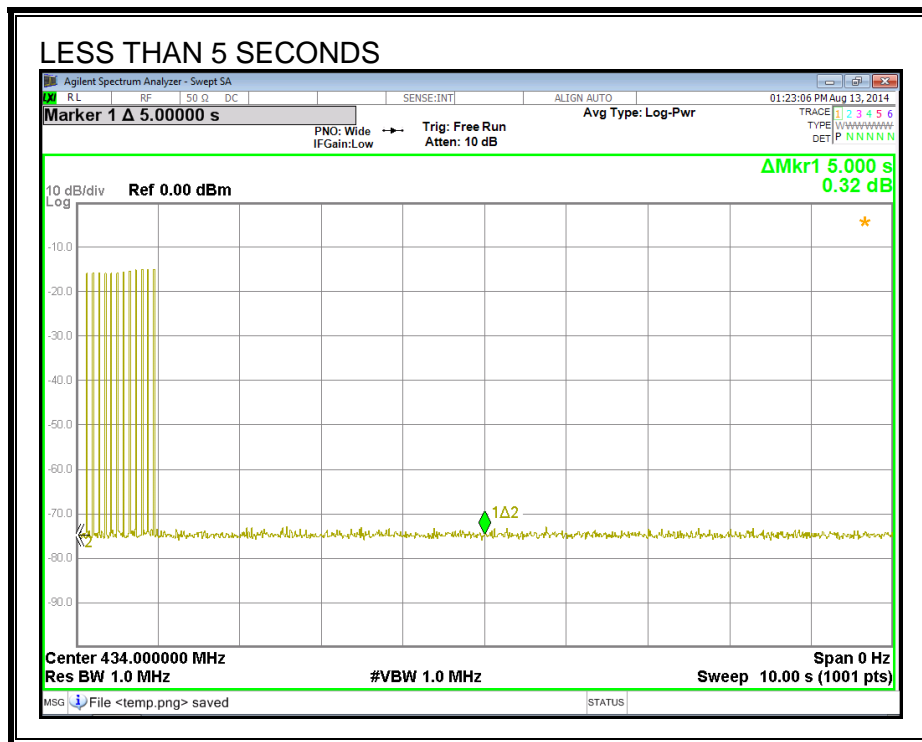
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

#### 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 1 MHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

#### RESULTS

No non-compliance noted:



## 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 <sup>1</sup>	125 to 375 <sup>1</sup>
174 - 260	3,750	375
260 - 470	3,750 to 12,500 <sup>1</sup>	375 to 1,250 <sup>1</sup>
Above 470	12,500	1,250

<sup>1</sup> 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
<sup>1</sup> 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	( <sup>2</sup> )
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
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.

\*\* 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 C63.10. 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.

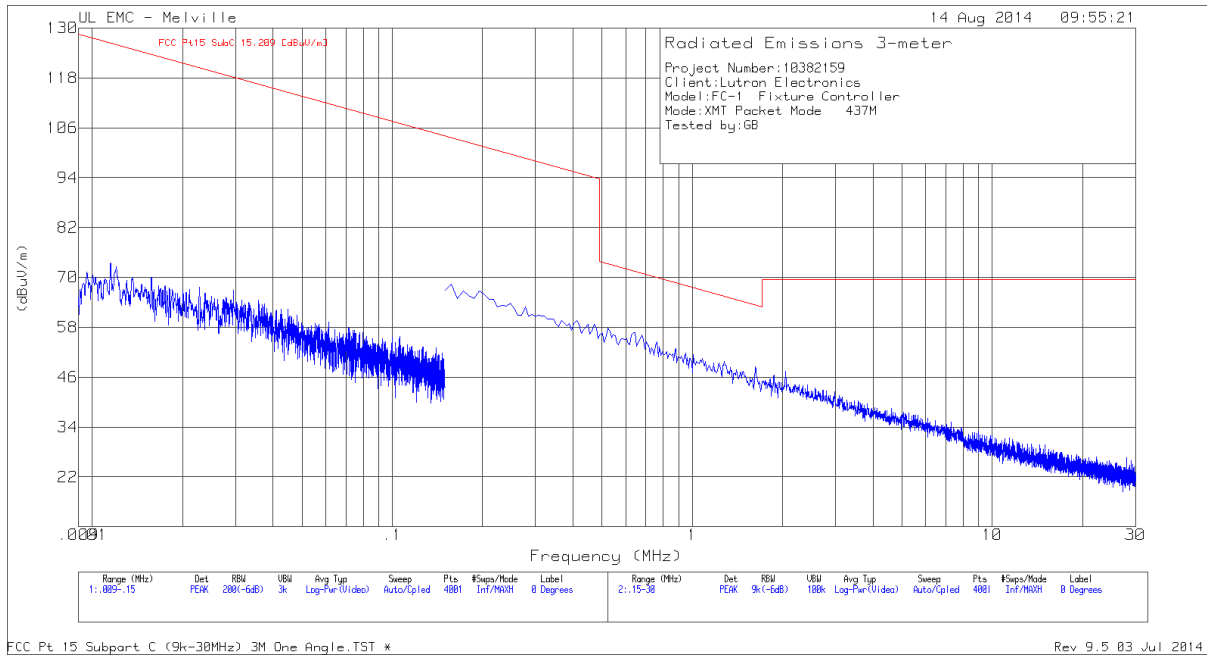
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz

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**

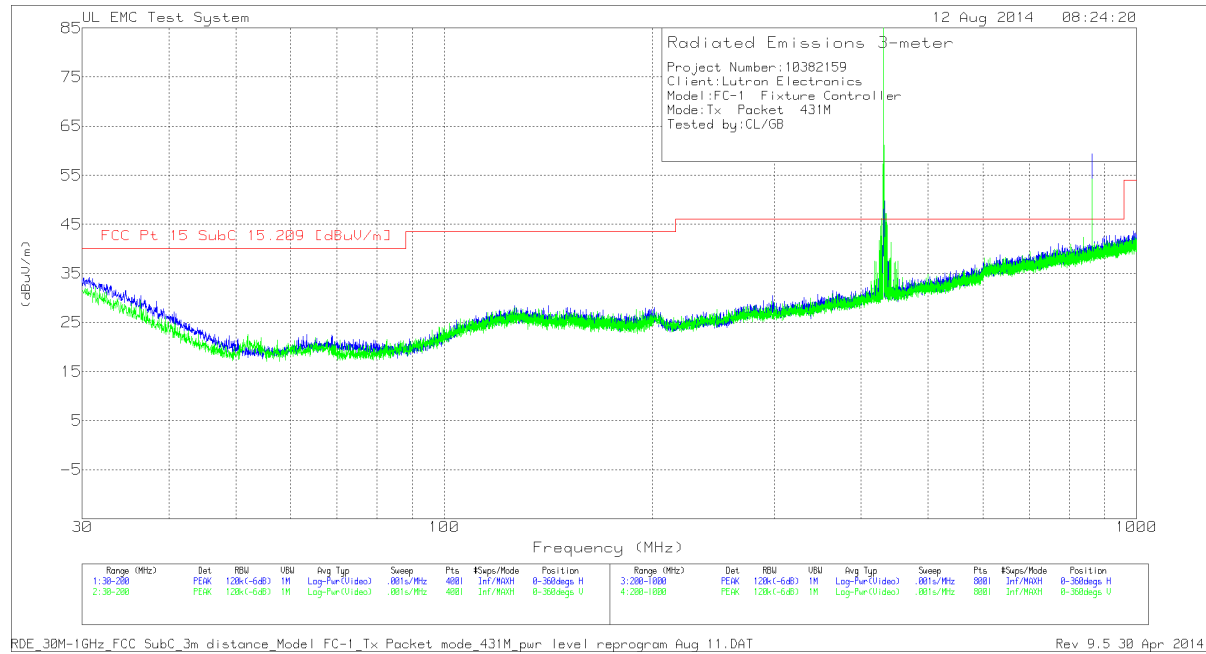
No non-compliance noted:

**SPURIOUS EMISSION BELOW 30 MHz**



No emissions detected above the system noise floor

**FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION (30 – 1000 MHz) – LOW CHANNEL**



RDE\_30M-1GHz\_FCC\_SubC\_3m\_distance\_Model\_FC-1\_Tx\_Packet\_mode\_431M\_pwr\_level\_reprogram\_Aug\_11.DAT

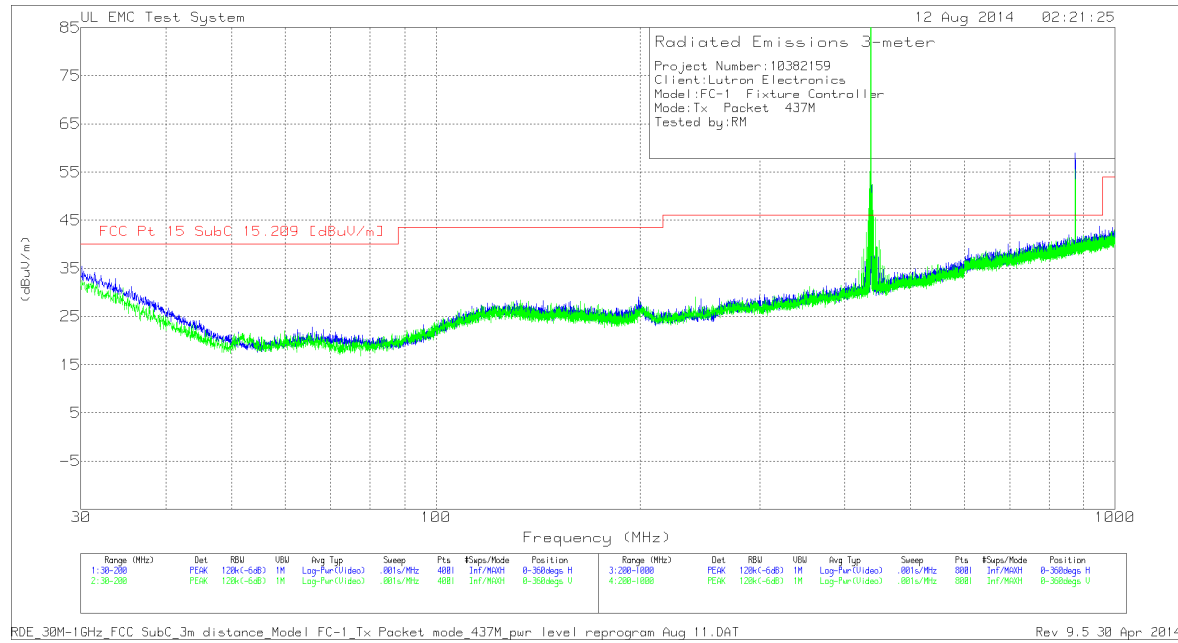
Rev 9.5 30 Apr 2014

Frequency [MHz]	Meter Reading [dBuV]	Det	AF [dB/m]	GL [dB]	Corrected Reading [dBuV/m]	DCF [dB]	Corrected Avg Reading [dBuV/m]	FCC Pt 15 SubC 15.209 [dBuV/m]	Margin [dB]	FCC Pt 15 SubC 15.231 [dBuV/m]	Margin [dB]	FCC Pt 15 SubC 15.209 Pk [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
430.9628	73.7	PK	16.8	3.1	93.6	-19.8	73.78	-	-	80.7	-6.32	100.7	-7.1	0	240	H
430.9628	74.13	PK	16.8	3.1	94.03	-19.8	74.21	-	-	80.7	-6.49	100.7	-6.67	111	142	V
861.9357	25.05	PK	22.3	4.8	52.15	-19.8	32.33	-	-	60.7	-28.37	80.7	-28.55	258	135	V
861.9357	27.03	PK	22.3	4.8	54.13	-19.8	34.31	-	-	60.7	-26.39	80.7	-26.57	38	162	H
428.7368	5.42	QP	16.8	3.1	25.32	-	-	46	-20.68	-	-	-	-	100	221	H
432.6619	12.47	QP	16.9	3.2	32.57	-	-	46	-13.43	-	-	-	-	139	249	H
433.2915	10.66	QP	16.5	3.2	30.36	-	-	46	-15.64	-	-	-	-	57	104	V
435.397	8.68	QP	16.6	3.2	28.46	-	-	46	-17.52	-	-	-	-	349	125	V
436.2742	7.12	QP	16.7	3.2	27.02	-	-	46	-18.98	-	-	-	-	11	135	V
442.0782	1.52	QP	16.8	3.2	21.52	-	-	46	-24.48	-	-	-	-	2	133	V

PK - Peak detector  
 QP - Quasi-Peak detector



**FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION (30 – 1000 MHz) – HIGH CHANNEL**



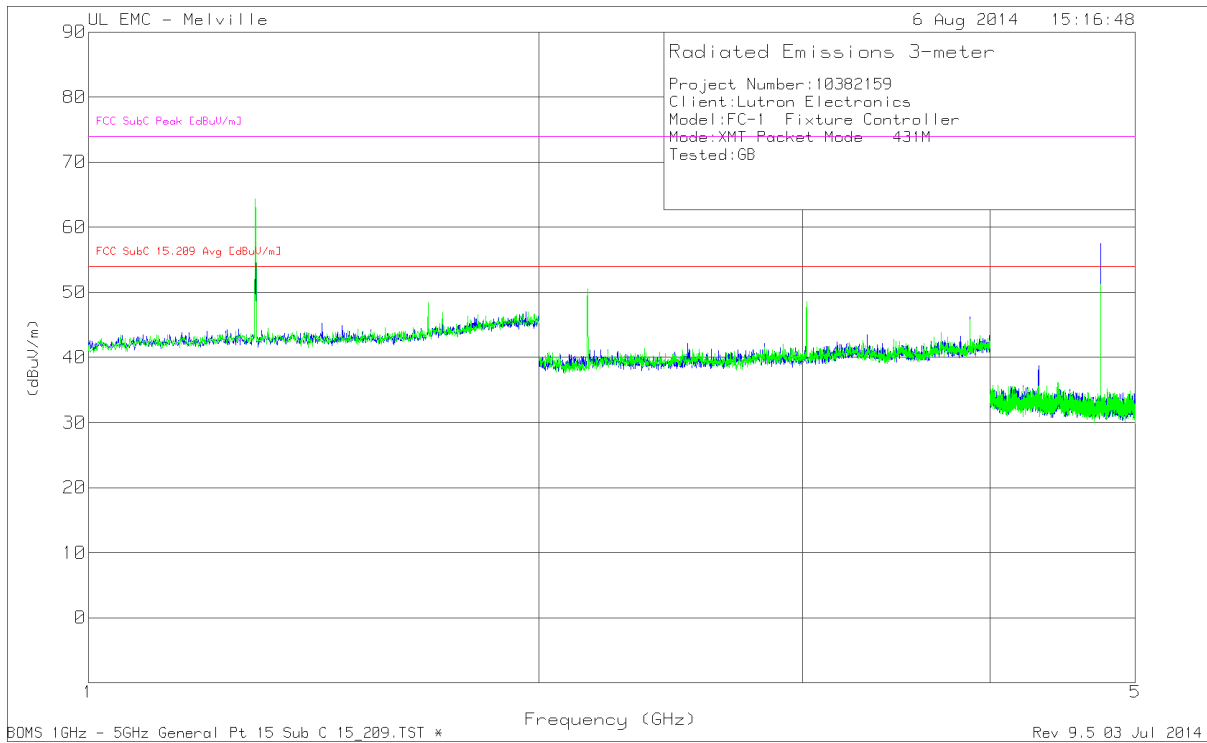
RDE\_30M-1GHz\_FCC\_SubC\_3m\_distance\_Mode1\_FC-1\_Tx\_Packet\_mode\_437M\_pur\_level\_reprogram\_Aug\_11.DAT

Rev 9.5 30 Apr 2014

Frequency (MHz)	Meter Reading [dBuV]	Det	AF-84106 [dB/m]	GL [dB]	Corrected Reading [dBuV/m]	DCF [dB]	Corrected Average Reading [dBuV/m]	FCC Pt 15 SubC 15.209 [dBuV/m]	Margin [dB]	FCC Pt 15 SubC 15.231 [dBuV/m]	Margin [dB]	FCC Pt 15 SubC 15.209 Pk [dBuV/m]	Margin [dB]	Azimuth (Degs)	Height (cm)	Polarity
437.0391	71.56	PK	17	3.2	91.76	-19.82	71.94	-	-	80.9	-8.96	100.9	-9.14	171	100	H
437.0415	77.63	PK	16.7	3.2	97.53	-19.82	77.71	-	-	80.9	-3.19	100.9	-3.37	2	135	V
874.082	36.17	PK	22.5	4.8	63.47	-19.82	43.65	-	-	60.9	-17.25	80.9	-17.43	168	106	H
874.078	34.51	PK	21.9	4.8	61.21	-19.82	41.39	-	-	60.9	-19.51	80.9	-19.69	275	128	V
432.7	2.2	QP	16.9	3.2	22.3	-	-	46	-23.7	-	-	-	-	157	100	H
433.5	4.38	QP	16.9	3.2	24.48	-	-	46	-21.52	-	-	-	-	176	101	H
435.8	14.78	QP	17	3.2	34.98	-	-	46	-11.02	-	-	-	-	177	100	H
438.2	18.36	QP	17.1	3.2	38.66	-	-	46	-7.34	-	-	-	-	178	101	H
438.4	16.69	QP	17.1	3.2	36.99	-	-	46	-9.01	-	-	-	-	176	101	H
439.4	10.28	QP	17.1	3.2	30.58	-	-	46	-15.42	-	-	-	-	182	101	H
439.9	7.99	QP	17.1	3.2	28.29	-	-	46	-17.71	-	-	-	-	170	101	H
432.7	8.01	QP	16.5	3.2	27.71	-	-	46	-18.29	-	-	-	-	338	126	V
433.6	10.94	QP	16.5	3.2	30.64	-	-	46	-15.36	-	-	-	-	359	145	V
434.8	14.79	QP	16.6	3.2	34.59	-	-	46	-11.41	-	-	-	-	358	147	V
435.8	21.14	QP	16.6	3.2	40.34	-	-	46	-5.06	-	-	-	-	359	140	V
438.2	24.81	QP	16.7	3.2	44.71	-	-	46	-1.29	-	-	-	-	359	142	V
438.9	19.72	QP	16.8	3.2	39.72	-	-	46	-6.28	-	-	-	-	359	140	V
440.2	13.13	QP	16.8	3.2	33.13	-	-	46	-12.87	-	-	-	-	359	141	V
441.1	10.59	QP	16.8	3.2	30.59	-	-	46	-15.41	-	-	-	-	358	144	V
444	6.55	QP	16.8	3.2	26.55	-	-	46	-19.45	-	-	-	-	1	139	V

PK - Peak detector  
 QP - Quasi-Peak detector

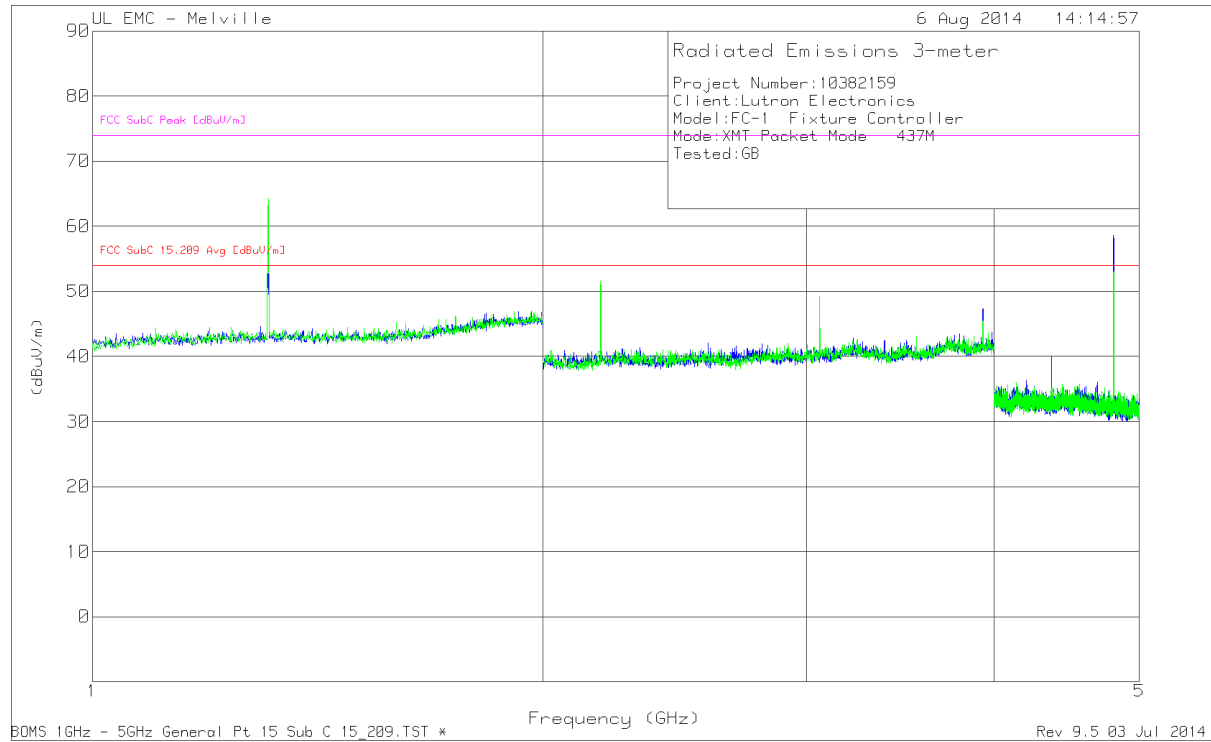
**HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz – LOW CHANNEL**



Frequency [GHz]	Meter Reading [dBuV]	Det	AF [dB/m]	Gain/Loss [dB]	Corrected Peak Reading [dBuV/m]	DCF [dB]	Corrected Avg 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	79.81	PK	25.1	-44.55	60.36	-19.8	40.54	54	-13.46	74	-13.64	190	192	H
1.293	82.16	PK	25.1	-44.55	62.71	-19.8	42.89	54	-11.11	74	-11.29	307	101	V
2.155	71.52	PK	21.4	-42.76	50.16	-19.8	30.34	54	-23.66	74	-23.84	47	180	H
2.155	75.36	PK	21.4	-42.76	54	-19.8	34.18	54	-19.82	74	-20	324	150	V
3.017	70.89	PK	21.5	-40.75	51.64	-19.8	31.82	54	-22.18	74	-22.36	247	216	H
3.017	69.82	PK	21.5	-40.75	50.57	-19.8	30.75	54	-23.25	74	-23.43	175	254	V
3.879	68.79	PK	22.6	-40.9	50.49	-19.8	30.67	54	-23.33	74	-23.51	60	232	H
3.879	69.61	PK	22.6	-40.9	51.31	-19.8	31.49	54	-22.51	74	-22.69	288	260	V
4.31	67.14	PK	27.7	-52.78	42.06	-19.8	22.24	54	-31.76	74	-31.94	42	195	H
4.31	64.55	PK	27.7	-52.78	39.47	-19.8	19.65	54	-34.35	74	-34.53	172	209	V
4.741	85.26	PK	27.2	-53.39	59.07	-19.8	39.25	54	-14.75	74	-14.93	47	167	H
4.741	81.18	PK	27.2	-53.39	54.99	-19.8	35.17	54	-18.83	74	-19.01	109	146	V

PK - Peak detector

**HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz – HIGH CHANNEL**



Frequency (GHz)	Meter Reading [dBuV]	Det	AF [dB/m]	Gain/Loss [dB]	Corrected Peak Reading [dBuV/m]	DCF [dB]	Corrected Avg 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	79.47	PK	25.1	-44.44	60.13	-19.82	40.31	54	-13.69	74	-13.87	160	112	H
1.311	81.43	PK	25.1	-44.44	62.09	-19.82	42.27	54	-11.73	74	-11.91	349	140	V
2.185	71.52	PK	21.5	-42.22	50.8	-19.82	30.98	54	-23.02	74	-23.2	43	136	H
2.185	76.07	PK	21.5	-42.22	55.35	-19.82	35.53	54	-18.47	74	-18.65	326	144	V
3.059	62.23	PK	21.6	-41.03	42.8	-19.82	22.98	54	-31.02	74	-18.65	6	282	V
3.059	63.78	PK	21.6	-41.03	44.35	-19.82	24.53	54	-29.47	74	-18.65	46	157	H
3.932	66.57	PK	22.7	-40.84	48.43	-19.82	28.61	54	-25.39	74	-25.57	326	144	H
3.932	69.98	PK	22.7	-40.84	51.84	-19.82	32.02	54	-21.98	74	-22.16	301	216	V
4.37	68.16	PK	27.6	-52.98	42.78	-19.82	22.96	54	-31.04	74	-31.22	44	129	H
4.37	64.34	PK	27.6	-52.98	38.96	-19.82	19.14	54	-34.86	74	-35.04	99	162	V
4.807	87.07	PK	27.1	-53.81	60.36	-19.82	40.54	54	-13.46	74	-13.64	52	165	H
4.807	83.37	PK	27.1	-53.81	56.66	-19.82	36.84	54	-17.16	74	-17.34	355	210	V

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 (dB $\mu$ V/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.

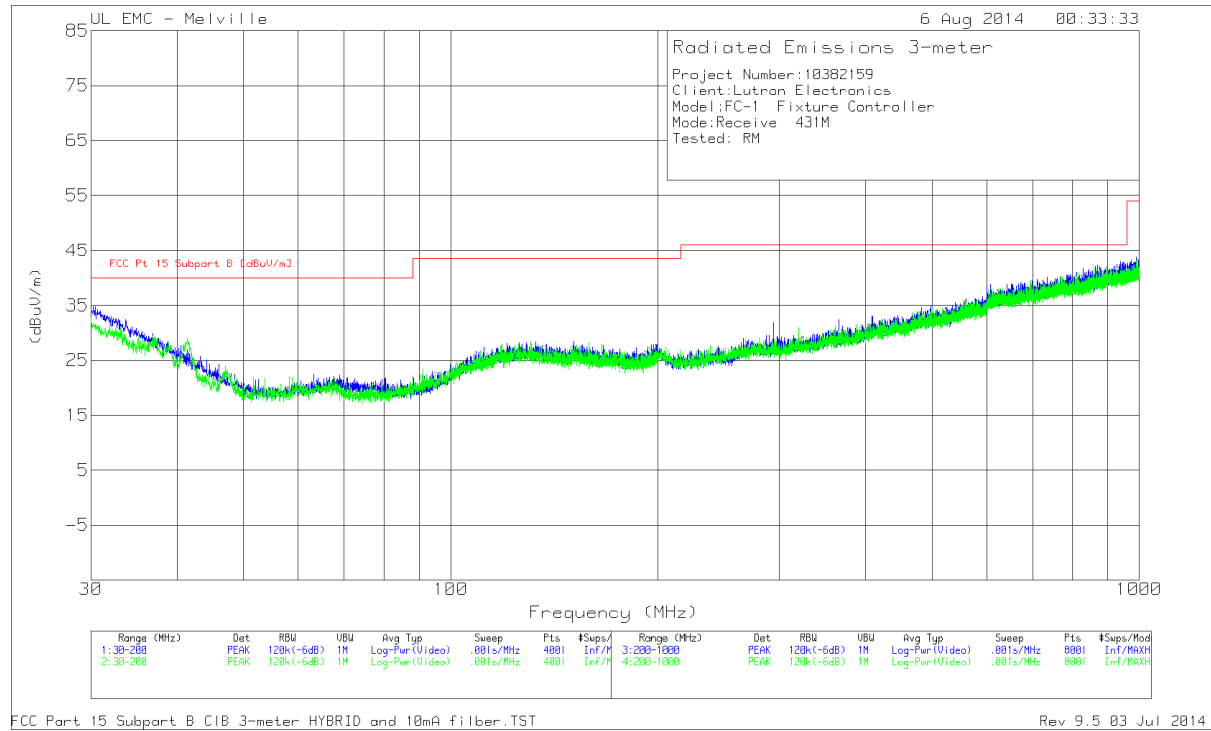
The spectrum from 30 MHz to 5th harmonic is investigated with the transmitter set to the middle channel.

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

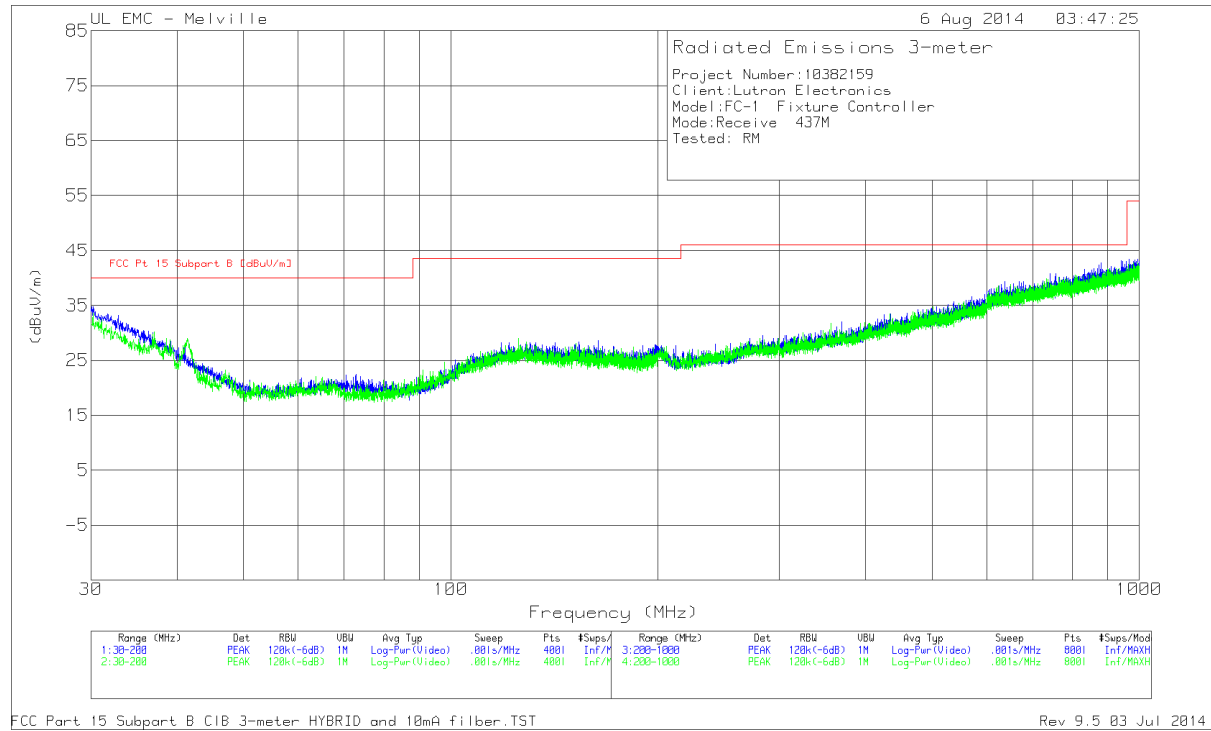
No non-compliance noted:

**RECEIVER SPURIOUS EMISSION (30MHz - 1GHz) – LOW CHANNEL**



Frequency (MHz)	Meter Reading (dBuV)	Det	AF-84106 [dB/m]	GL [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart B [dBuV/m]	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
33.6975	12.3	PK	19.3	.8	32.4	40	-7.6	0-360	100	H
41.4325	16.34	PK	11.7	.9	28.94	40	-11.06	0-360	100	V
118.5275	12.46	PK	13.9	1.6	27.96	43.5	-15.54	0-360	100	V
294.1	15.54	PK	13.9	2.5	31.94	46	-14.06	0-360	200	H
608.6	15.37	PK	19.3	4.1	38.77	46	-7.23	0-360	300	H
205.1	13.19	PK	12.1	2.1	27.39	43.5	-16.11	0-360	99	V

**RECEIVER SPURIOUS EMISSION (30MHz - 1GHz) – HIGH CHANNEL**



Frequency (MHz)	Meter Reading (dBuV)	Det	AF-84106 [dB/m]	GL [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 Subpart B [dBuV/m]	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
32.8475	12.37	PK	20	.8	33.17	40	-6.83	0-360	400	H
198.045	13.07	PK	12.8	2	27.87	43.5	-15.63	0-360	400	H
37.055	14.32	PK	15.1	.8	30.22	40	-9.78	0-360	100	V
41.39	16.37	PK	11.7	.9	28.97	40	-11.03	0-360	100	V
125.455	12.95	PK	14.4	1.6	28.95	43.5	-14.55	0-360	100	V
370	13.46	PK	15.6	2.9	31.96	46	-14.04	0-360	200	H
202.9	12.8	PK	12.4	2.1	27.3	43.5	-16.2	0-360	400	V
356.4	13.89	PK	15	2.8	31.69	46	-14.31	0-360	200	V

**RECEIVER SPURIOUS EMISSION ABOVE 1GHz – LOW CHANNEL**



Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	Gain/Loss (dB)	Corrected 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
1.021	63.27	PK	24.1	-44.52	42.85	54	-11.15	74	-31.15	0-360	100	H
1.497	64.49	PK	25.1	-44.33	45.26	54	-8.74	74	-28.74	0-360	100	H
1.969	62.39	PK	27.6	-43.78	46.21	54	-7.79	74	-27.79	0-360	100	H
1.03	64.55	PK	23.9	-44.59	43.86	54	-10.14	74	-30.14	0-360	100	V
1.126	64.53	PK	24.7	-44.52	44.71	54	-9.29	74	-29.29	0-360	100	V
1.914	63.48	PK	27.8	-44.14	47.14	54	-6.86	74	-26.86	0-360	100	V

**RECEIVER SPURIOUS EMISSION ABOVE 1GHz – HIGH CHANNEL**



Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	Gain/Loss (dB)	Corrected 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
1.06	63.7	PK	24.3	-44.67	43.33	54	-10.67	74	-30.67	0-360	100	H
1.214	64.02	PK	25	-44.66	44.36	54	-9.64	74	-29.64	0-360	100	H
1.99	63.09	PK	27.6	-43.83	46.86	54	-7.14	74	-27.14	0-360	100	H
1.095	63.77	PK	24.4	-44.52	43.65	54	-10.35	74	-30.35	0-360	100	V
1.309	64.04	PK	25.3	-44.44	44.9	54	-9.1	74	-29.1	0-360	100	V
1.979	63.56	PK	27.8	-43.74	47.62	54	-6.38	74	-26.38	0-360	100	V



## 9. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207 (a)  
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dB $\mu$ V)	
	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 (Receive Mode); ANSI C63.10 (Transmit Mode)

### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS – LOW CHANNEL, TRANSMIT MODE**

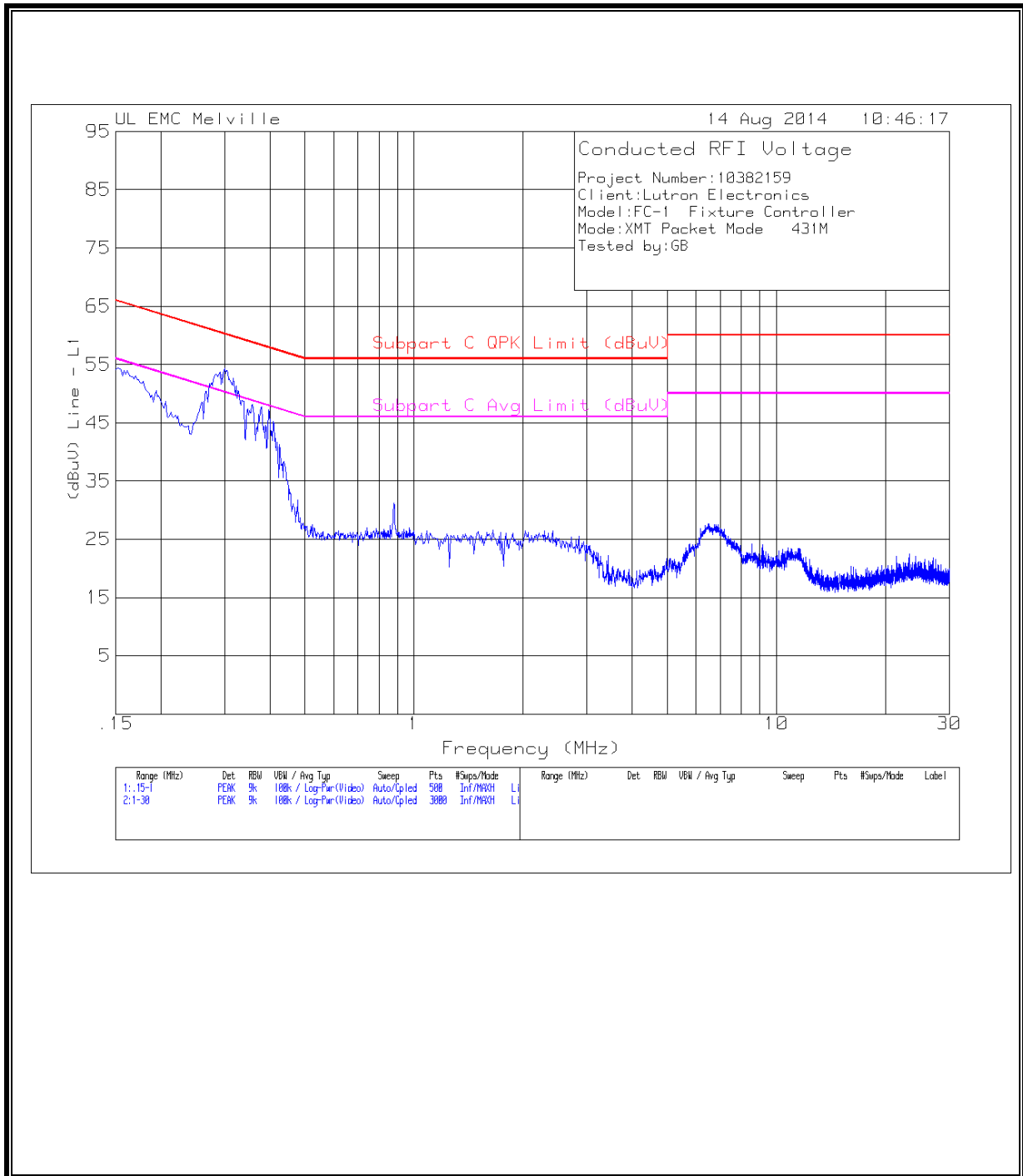
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.15341	44.38	PK	10	54.38	65.81	-11.43	-	-
.27605	41.8	PK	10	51.8	60.93	-9.13	-	-
.2999	44.32	PK	10	54.32	60.25	-5.93	-	-
.35952	37.45	PK	10	47.45	58.74	-11.29	-	-
.3987	36.98	PK	10	46.98	57.88	-10.9	-	-
.88247	20.76	PK	10	30.76	56	-25.24	-	-
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)
.15341	44.28	PK	10.1	54.38	65.81	-11.43	-	-
.27435	42.1	PK	10	52.1	60.99	-8.89	-	-
.30501	43.44	PK	10	53.44	60.11	-6.67	-	-
.31523	42.09	PK	10	52.09	59.83	-7.74	-	-
.35952	38.96	PK	10	48.96	58.74	-9.78	-	-
.38507	38.29	PK	10	48.29	58.17	-9.88	-	-

PK - Peak detector

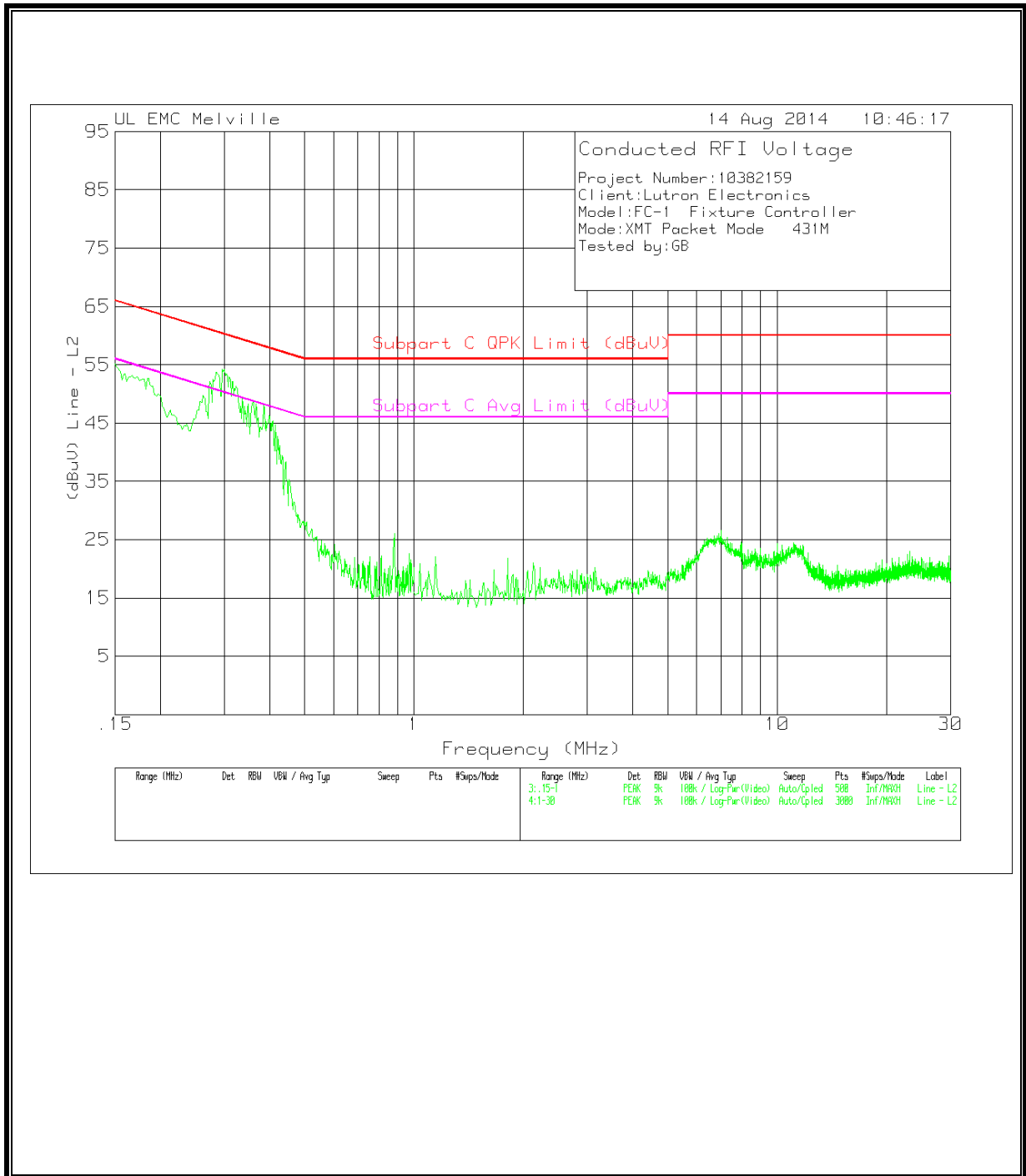
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.15408	20.01	CAV	10	30.01	-	-	55.78	-25.77
.27841	19.3	CAV	10	29.3	-	-	50.86	-21.56
.30036	15.5	CAV	10	25.5	-	-	50.23	-24.73
.35849	14.78	CAV	10	24.78	-	-	48.76	-23.98
.39892	9.24	CAV	10	19.24	-	-	47.88	-28.64
.87831	15.26	CAV	10	25.26	-	-	46	-20.74
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)
.15319	19.82	CAV	10.1	29.92	-	-	55.83	-25.91
.27473	18.62	CAV	10	28.62	-	-	50.97	-22.35
.30495	15.02	CAV	10	25.02	-	-	50.11	-25.09
.31428	15.02	CAV	10	25.02	-	-	49.86	-24.84
.35992	13.02	CAV	10	23.02	-	-	48.73	-25.71
.38518	9.4	CAV	10	19.4	-	-	48.17	-28.77

CAV - CISPR average detection

**LINE 1 RESULTS – LOW CHANNEL, TRANSMIT MODE**



**LINE 2 RESULTS – LOW CHANNEL, TRANSMIT MODE**



**6 WORST EMISSIONS – HIGH CHANNEL, TRANSMIT MODE**

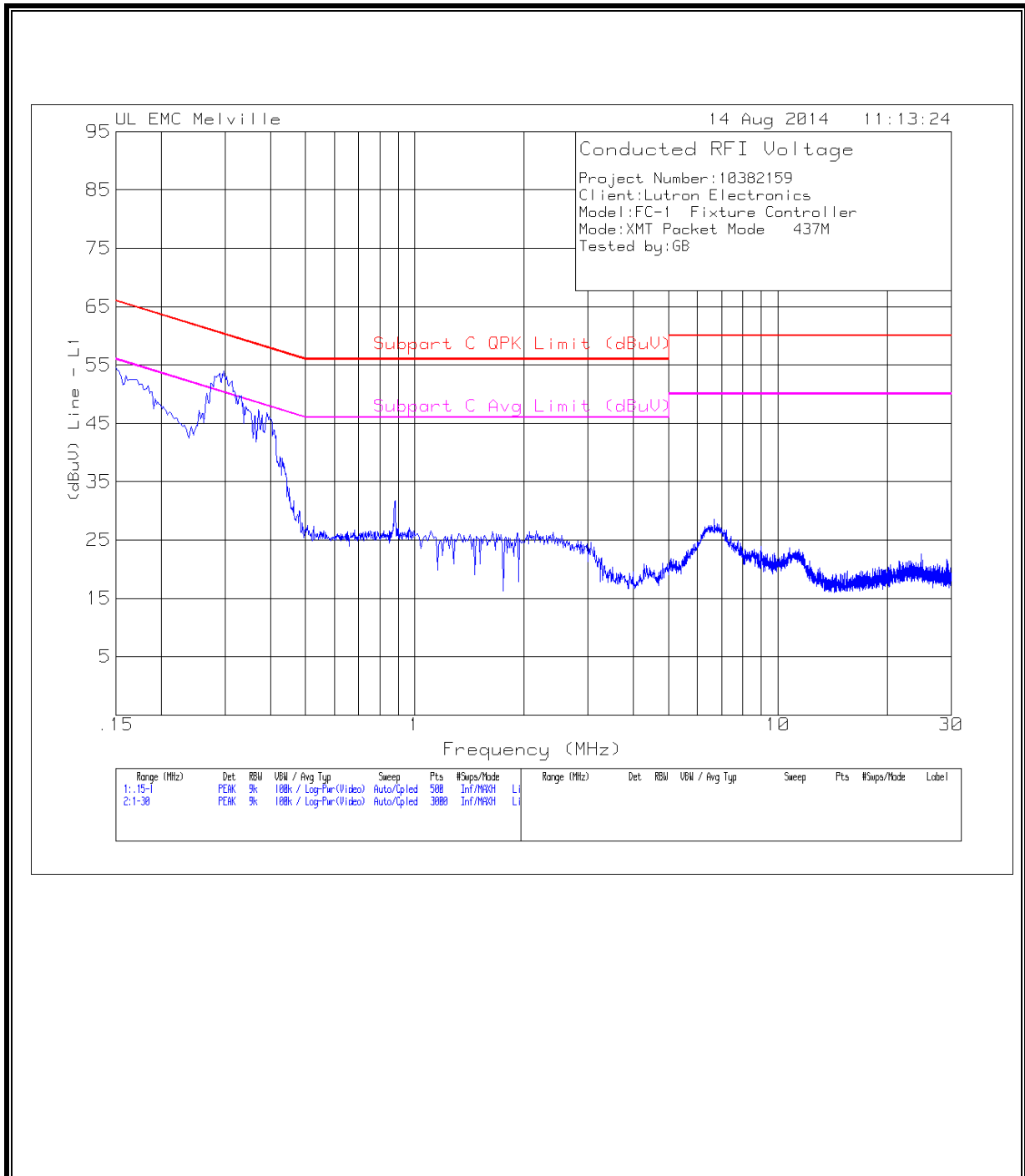
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.1517	44.08	PK	10	54.08	65.91	-11.83	-	-
.27435	41.83	PK	10	51.83	60.99	-9.16	-	-
.30331	43.02	PK	10	53.02	60.15	-7.13	-	-
.33227	39.72	PK	10	49.72	59.39	-9.67	-	-
.37826	35.4	PK	10	45.4	58.32	-12.92	-	-
.39359	36.58	PK	10	46.58	57.99	-11.41	-	-
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)
.15511	43.71	PK	10.1	53.81	65.72	-11.91	-	-
.26754	40.32	PK	10	50.32	61.19	-10.87	-	-
.29309	43.95	PK	10	53.95	60.44	-6.49	-	-
.31012	43.05	PK	10	53.05	59.97	-6.92	-	-
.37485	37.68	PK	10	47.68	58.39	-10.71	-	-
.39699	36.43	PK	10.1	46.53	57.92	-11.39	-	-

PK - Peak detector

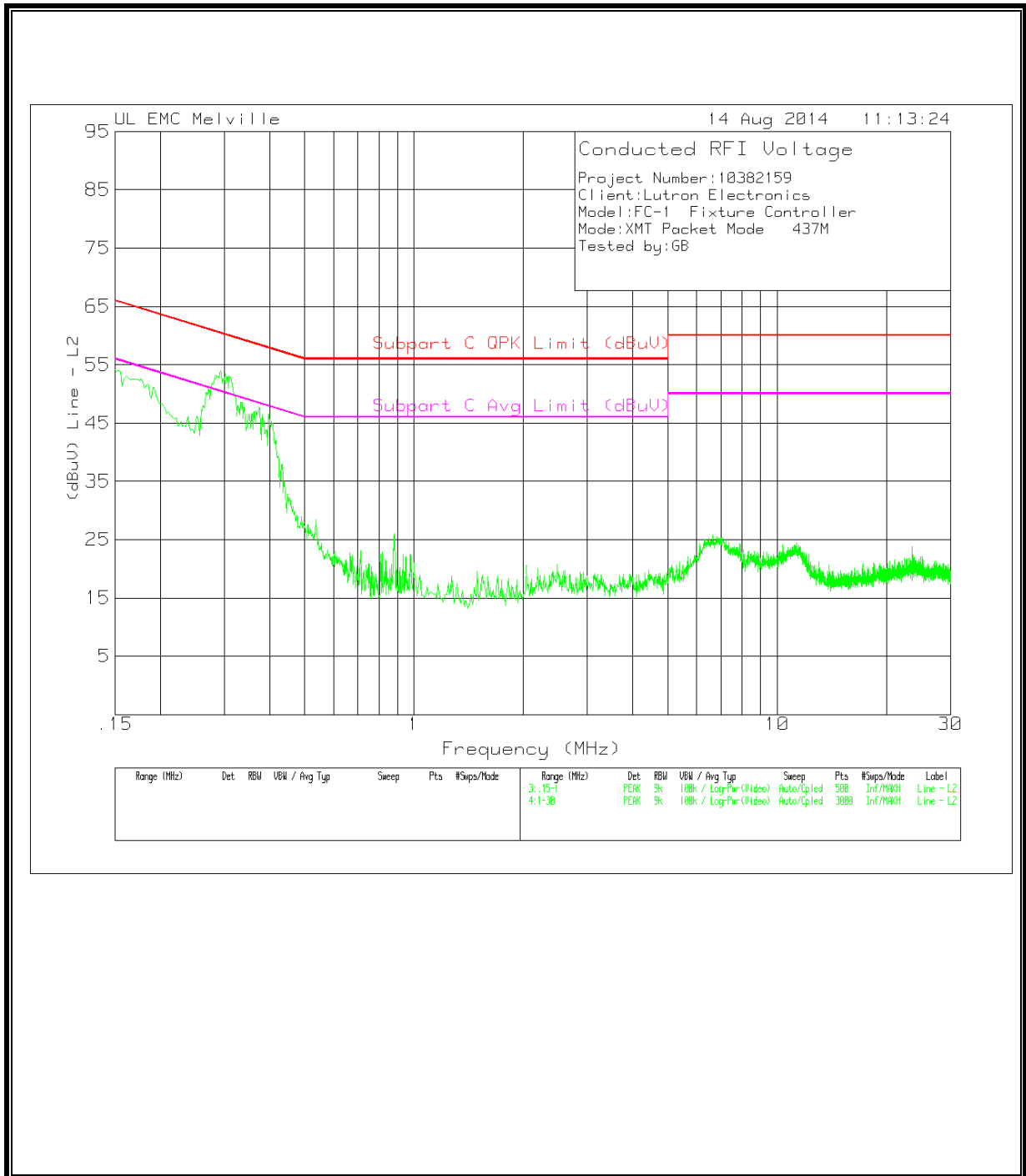
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Subpart C QPK Limit (dBuV)	Margin (dB)	Subpart C Avg Limit (dBuV)	Margin (dB)
.15549	19.64	CAV	10	29.64	-	-	55.7	-26.06
.27578	18.46	CAV	10	28.46	-	-	50.94	-22.48
.30209	15.5	CAV	10	25.5	-	-	50.19	-24.69
.33218	14.78	CAV	10	24.78	-	-	49.4	-24.62
.38128	11.34	CAV	10	21.34	-	-	48.25	-26.91
.39551	9.55	CAV	10	19.55	-	-	47.95	-28.4
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)
.15823	20.1	CAV	10.1	30.2	-	-	55.56	-25.36
.26454	19.15	CAV	10	29.15	-	-	51.29	-22.14
.2924	15.42	CAV	10	25.42	-	-	50.46	-25.04
.30857	15.26	CAV	10	25.26	-	-	50.01	-24.75
.37355	13.71	CAV	10	23.71	-	-	48.42	-24.71
.39928	8.75	CAV	10	18.75	-	-	47.87	-29.12

CAV - CISPR average detection

**LINE 1 RESULTS – HIGH CHANNEL, TRANSMIT MODE**



**LINE 2 RESULTS – HIGH CHANNEL, TRANSMIT MODE**



**6 WORST EMISSIONS – LOW CHANNEL, RECEIVE MODE**

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)
.16192	47.01	PK	10	57.01	65.36	-8.35	-	-
.19855	43.64	PK	10	53.64	63.67	-10.03	-	-
.27094	40.68	PK	10	50.68	61.09	-10.41	-	-
.29649	42.72	PK	10	52.72	60.34	-7.62	-	-
.30331	41.88	PK	10	51.88	60.15	-8.27	-	-
.31523	40.71	PK	10	50.71	59.83	-9.12	-	-
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)
.16363	47.85	PK	10	57.85	65.28	-7.43	-	-
.1977	44.23	PK	10	54.23	63.71	-9.48	-	-
.28116	41.91	PK	10	51.91	60.78	-8.87	-	-
.29479	42.19	PK	10	52.19	60.39	-8.2	-	-
.31012	41.81	PK	10	51.81	59.97	-8.16	-	-
.31012	41.81	PK	10	51.81	59.97	-8.16	-	-

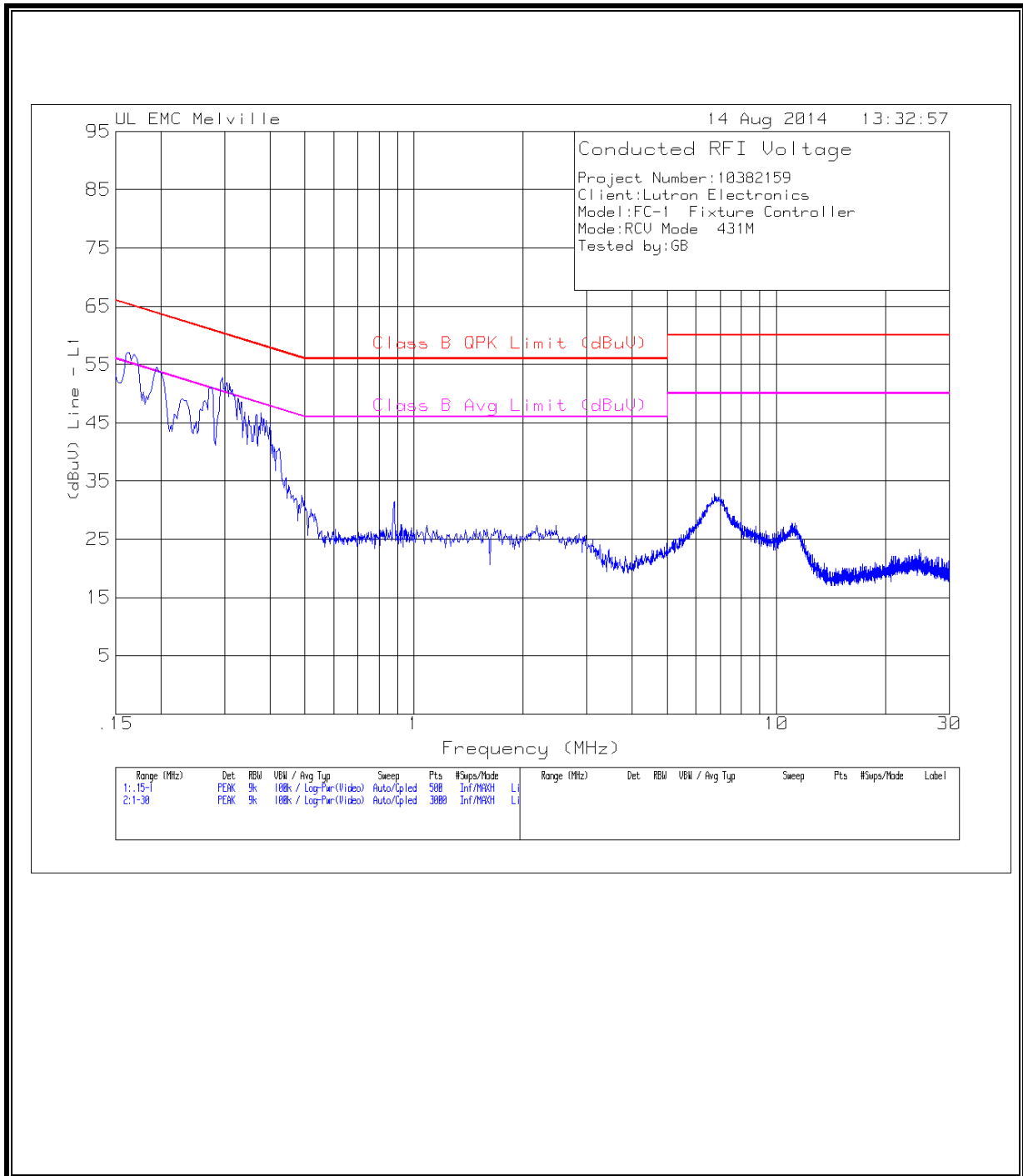
PK - Peak detector

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)
.16501	25.12	CAV	10	35.12	-	-	55.21	-20.09
.19809	24.43	CAV	10	34.43	-	-	53.69	-19.26
.2674	20.63	CAV	10	30.63	-	-	51.2	-20.57
.29508	16.98	CAV	10	26.98	-	-	50.38	-23.4
.29962	16.78	CAV	10	26.78	-	-	50.25	-23.47
.31838	16.09	CAV	10	26.09	-	-	49.75	-23.66
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)
.16546	24.4	CAV	10	34.4	-	-	55.19	-20.79
.19821	23.77	CAV	10	33.77	-	-	53.69	-19.92
.28497	20.01	CAV	10	30.01	-	-	50.67	-20.66
.29341	16.37	CAV	10	26.37	-	-	50.43	-24.06
.30641	15.95	CAV	10	25.95	-	-	50.07	-24.12

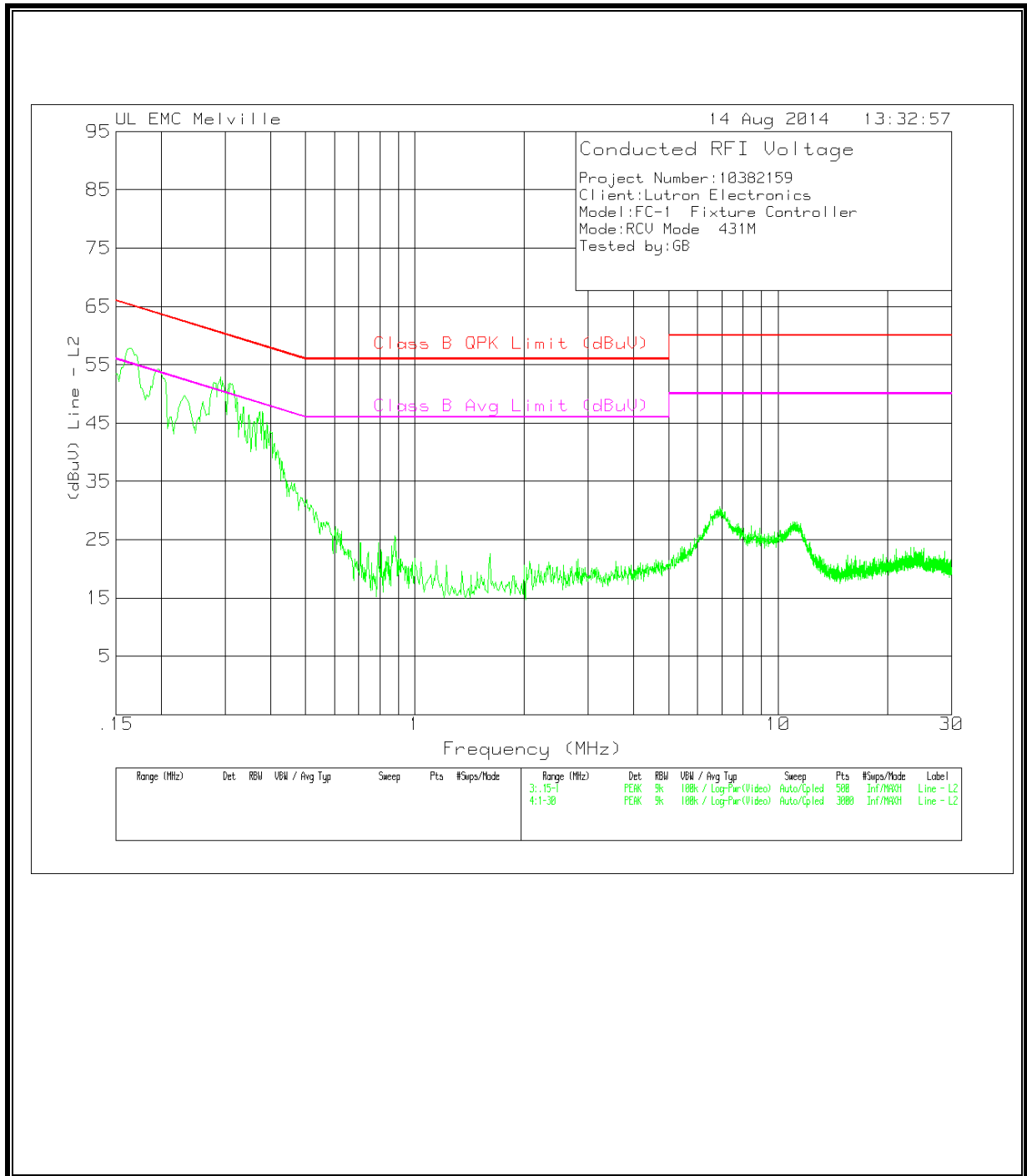
CAV - CISPR average detection



**LINE 1 RESULTS – LOW CHANNEL, RECEIVE MODE**



**LINE 2 RESULTS – LOW CHANNEL, RECEIVE MODE**



**6 WORST EMISSIONS – HIGH CHANNEL, RECEIVE MODE**

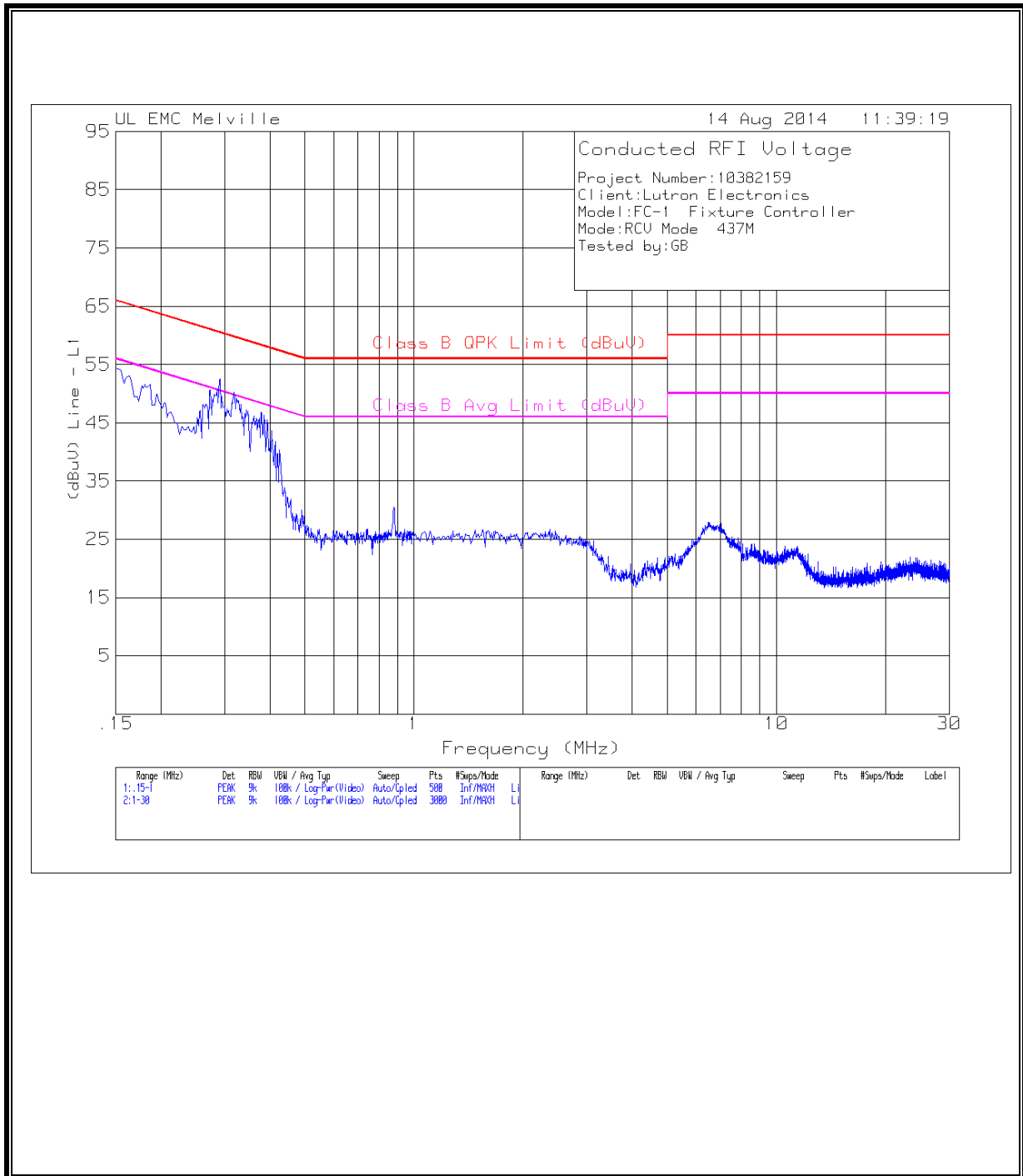
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.15681	42.67	PK	10	52.67	65.63	-12.96	-	-
.18748	41.57	PK	10	51.57	64.15	-12.58	-	-
.28627	40.68	PK	10	50.68	60.63	-9.95	-	-
.29138	42.48	PK	10	52.48	60.48	-8	-	-
.31864	40.26	PK	10	50.26	59.74	-9.48	-	-
.37826	36.82	PK	10	46.82	58.32	-11.5	-	-
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)
.15341	43.87	PK	10.1	53.97	65.81	-11.84	-	-
.27265	41.04	PK	10	51.04	61.04	-10	-	-
.28287	42.63	PK	10	52.63	60.73	-8.1	-	-
.2999	43.18	PK	10	53.18	60.25	-7.07	-	-
.31353	42.1	PK	10	52.1	59.88	-7.78	-	-
.32886	39.18	PK	10	49.18	59.48	-10.3	-	-

PK - Peak detector

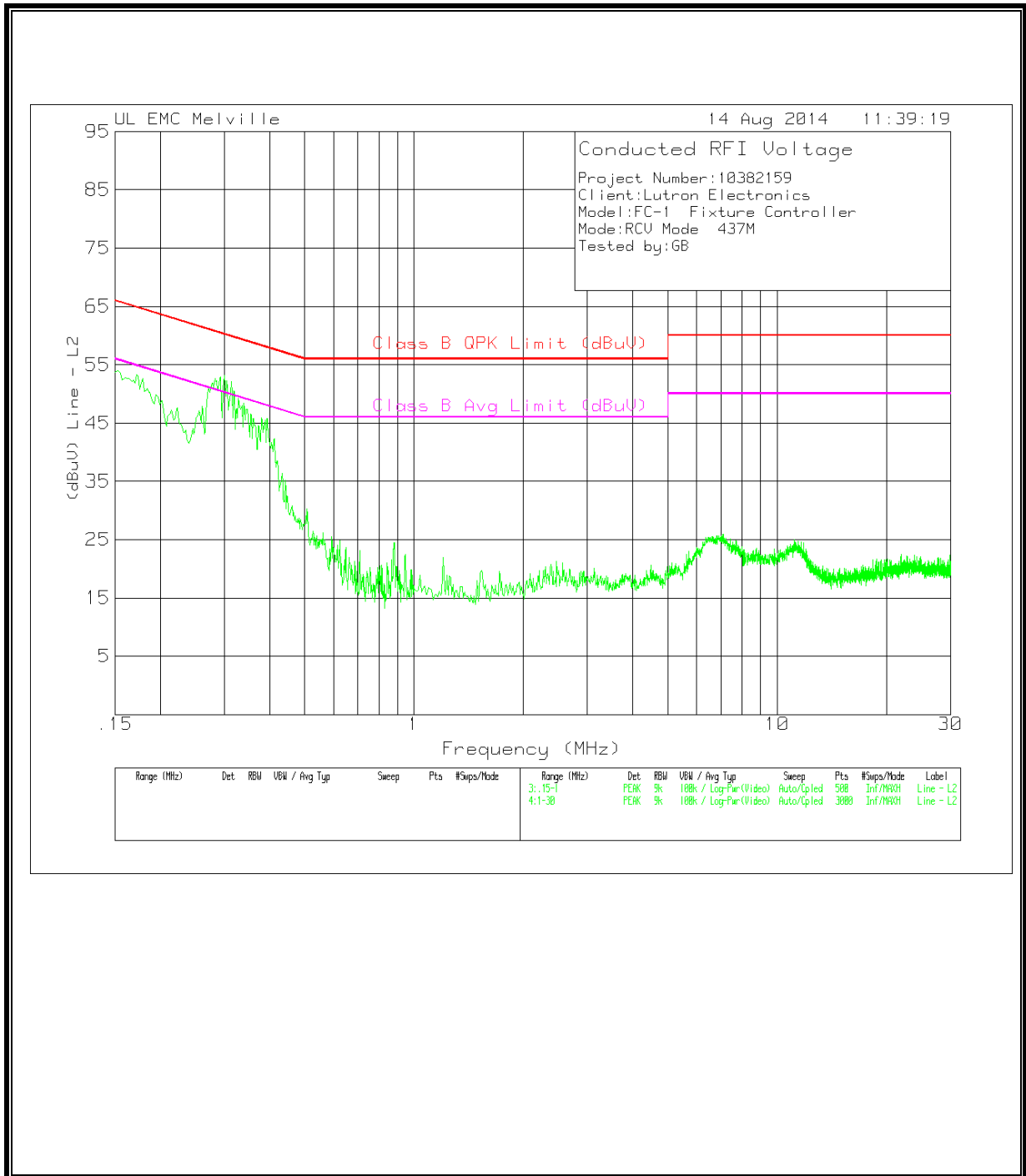
Frequency (MHz)	Meter Reading (dBuV)	Det	Line 1 G/L (dB)	Corrected Reading (dBuV)	Class B QPK Limit (dBuV)	Margin (dB)	Class B Avg Limit (dBuV)	Margin (dB)
.15936	20.63	CAV	10	30.63	-	-	55.5	-24.87
.18374	20.01	CAV	10	30.01	-	-	54.31	-24.3
.28434	17.78	CAV	10	27.78	-	-	50.69	-22.91
.29076	15.42	CAV	10	25.42	-	-	50.5	-25.08
.31819	14.52	CAV	10	24.52	-	-	49.75	-25.23
.37894	12.39	CAV	10	22.39	-	-	48.3	-25.91
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)
.15488	19.04	CAV	10.1	29.14	-	-	55.73	-26.59
.27303	18.07	CAV	10	28.07	-	-	51.03	-22.96
.28474	14.94	CAV	10	24.94	-	-	50.68	-25.74
.29797	14.86	CAV	10	24.86	-	-	50.3	-25.44
.31061	14.69	CAV	10	24.69	-	-	49.95	-25.26
.33047	13.23	CAV	10	23.23	-	-	49.44	-26.21

CAV - CISPR average detection

**LINE 1 RESULTS – HIGH CHANNEL, RECEIVE MODE**

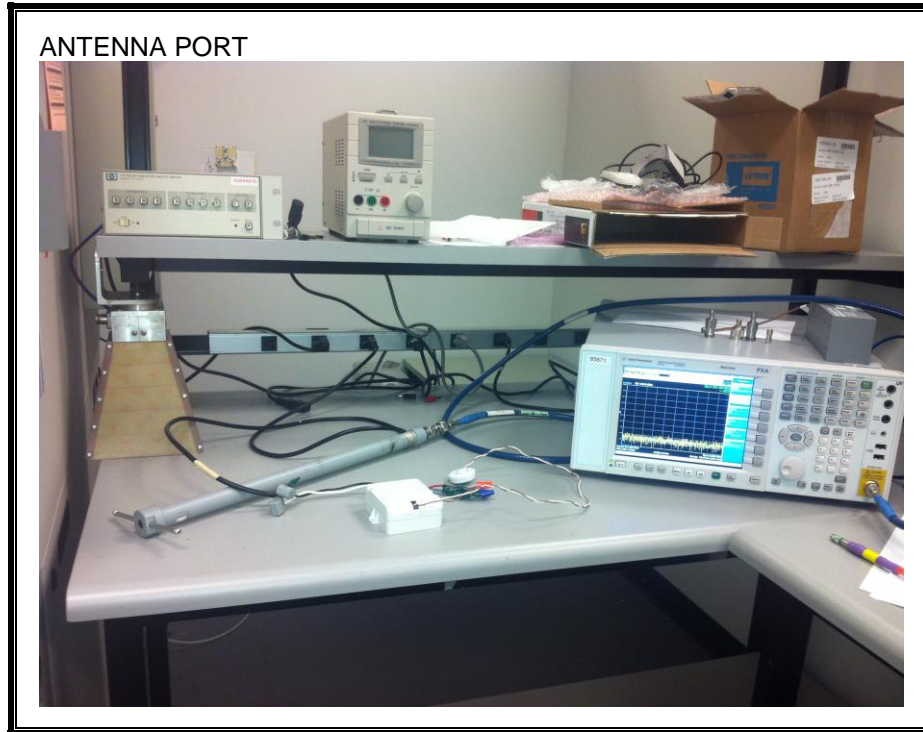


**LINE 2 RESULTS – HIGH CHANNEL, RECEIVE MODE**

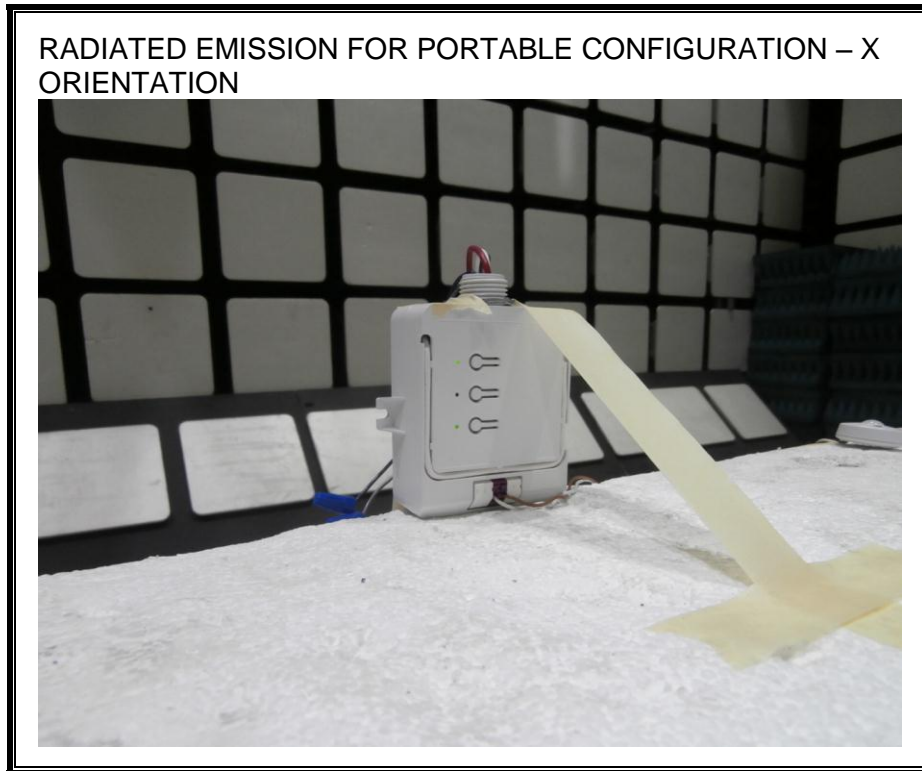


## 10. SETUP PHOTOS

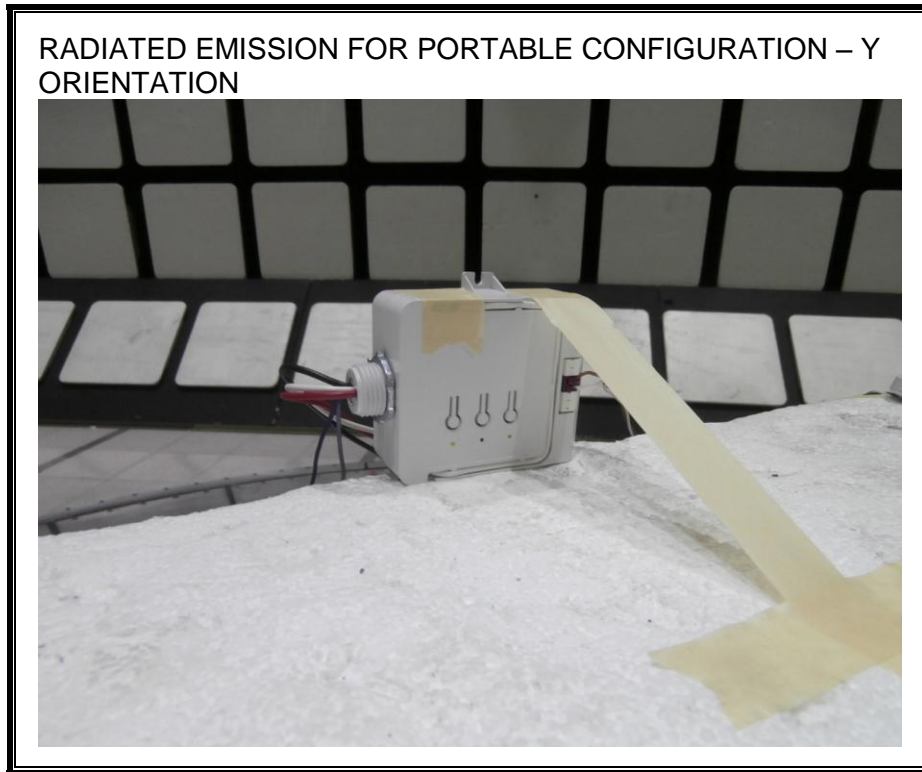
### ANTENNA PORT



**RADIATED EMISSION FOR PORTABLE CONFIGURATION – X ORIENTATION**



**RADIATED EMISSION FOR PORTABLE CONFIGURATION – Y ORIENTATION**

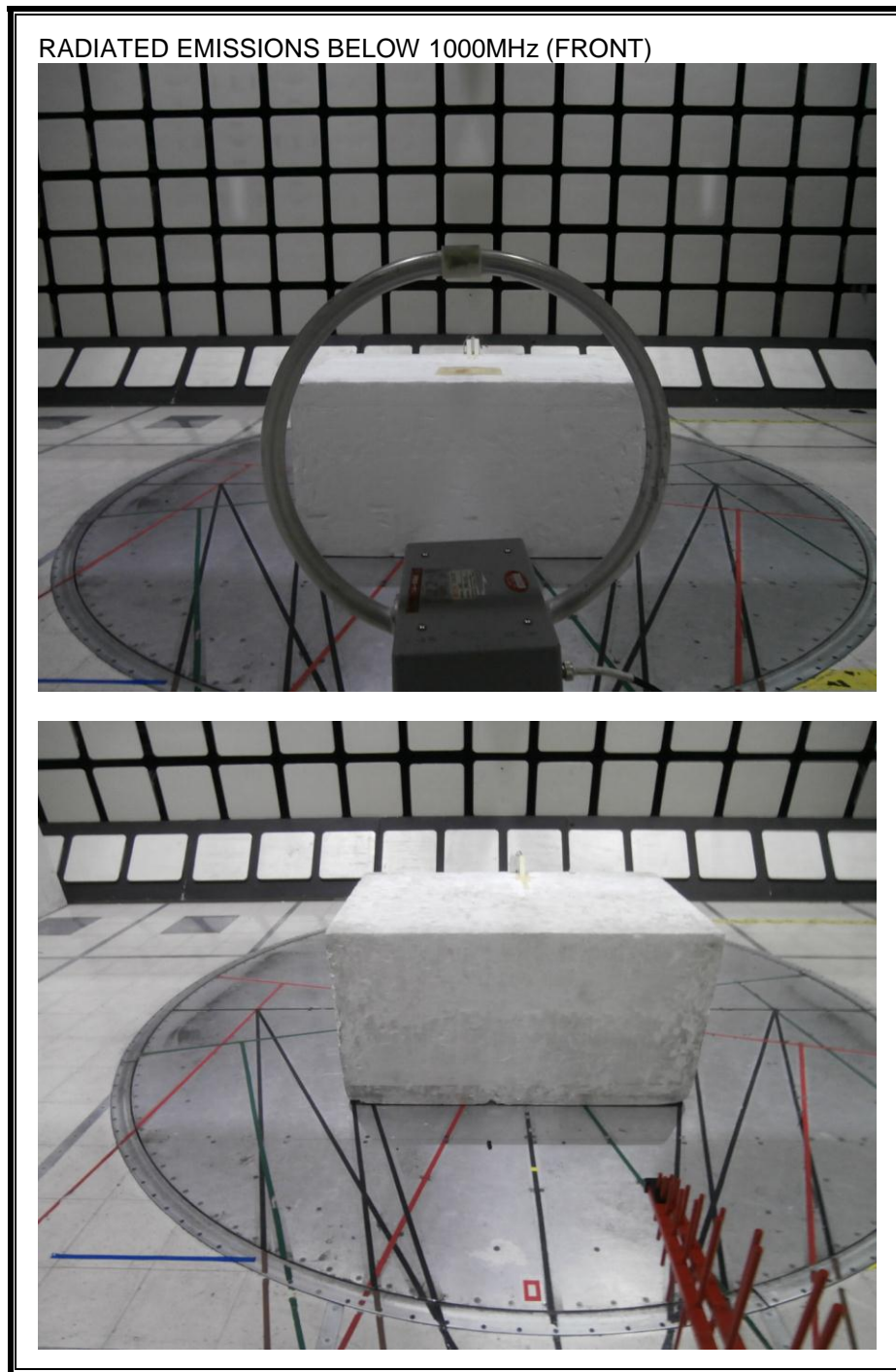




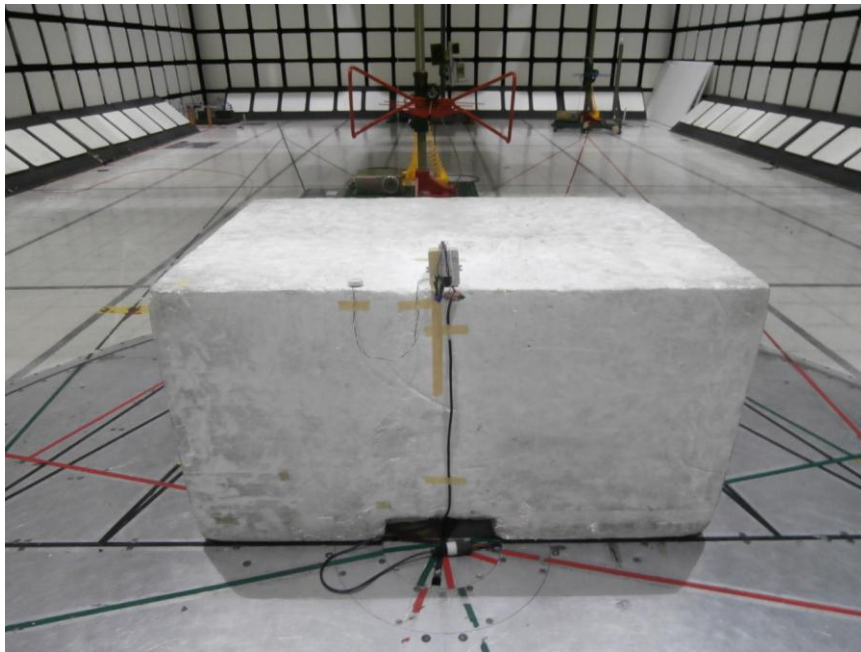
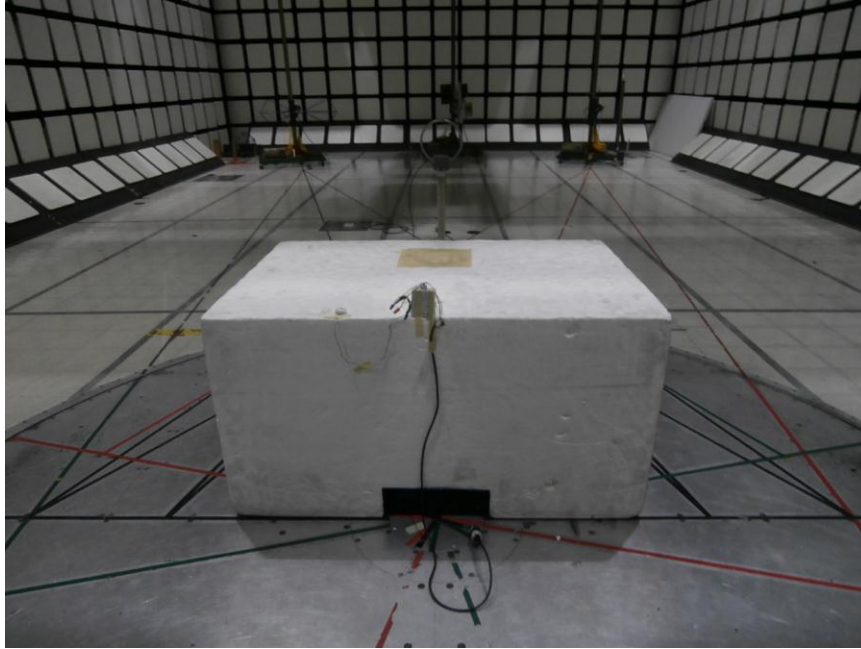
**RADIATED EMISSION FOR PORTABLE CONFIGURATION – Z ORIENTATION**



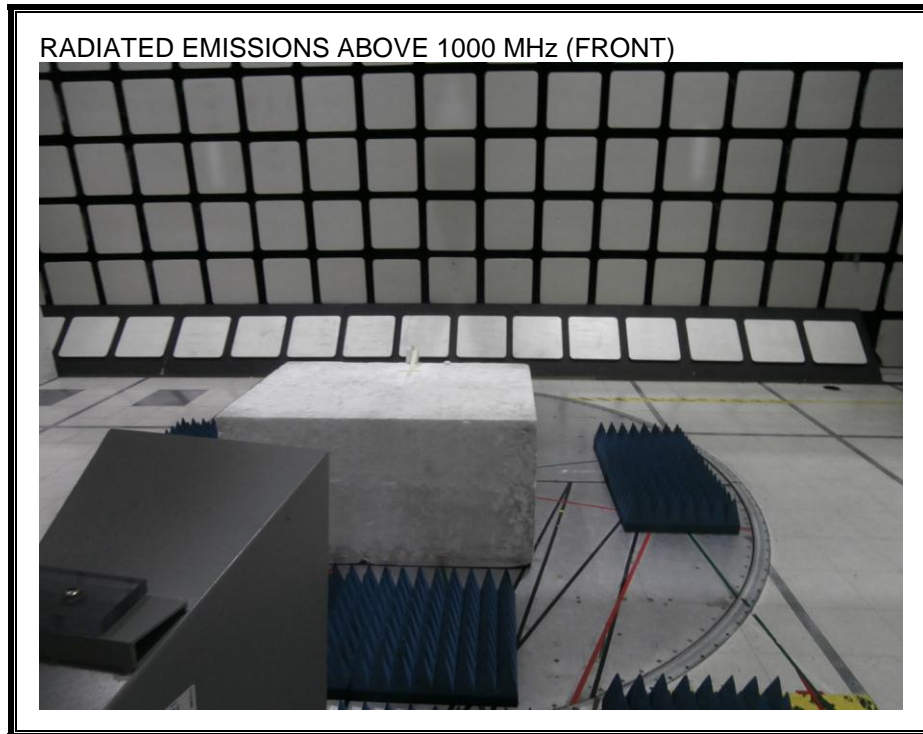
**RADIATED EMISSION BELOW 1000 MHz**

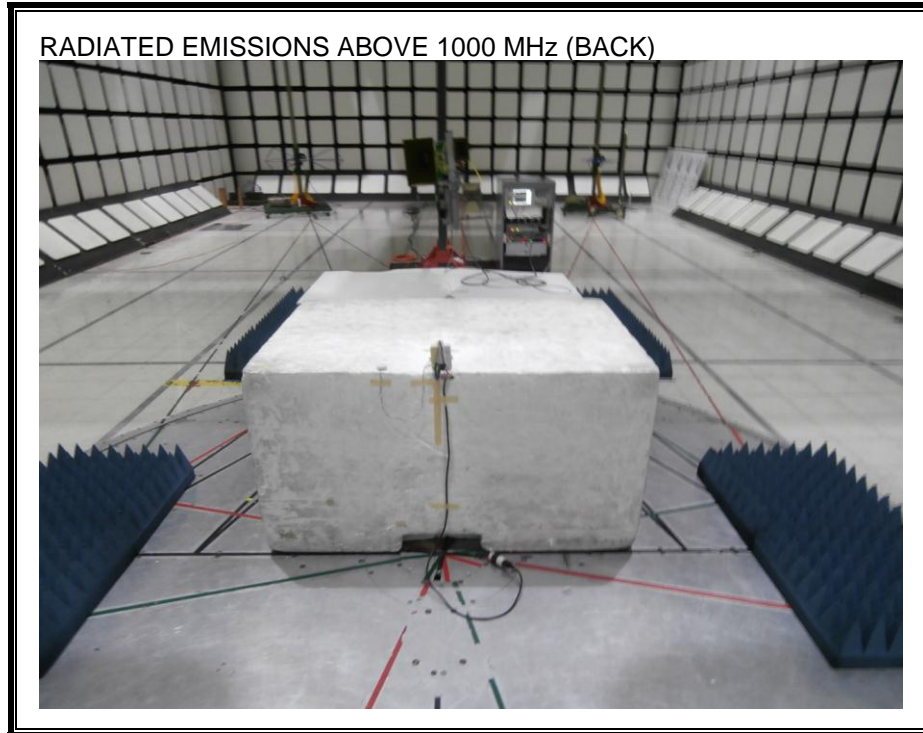


RADIATED EMISSIONS BELOW 1000MHz (BACK)

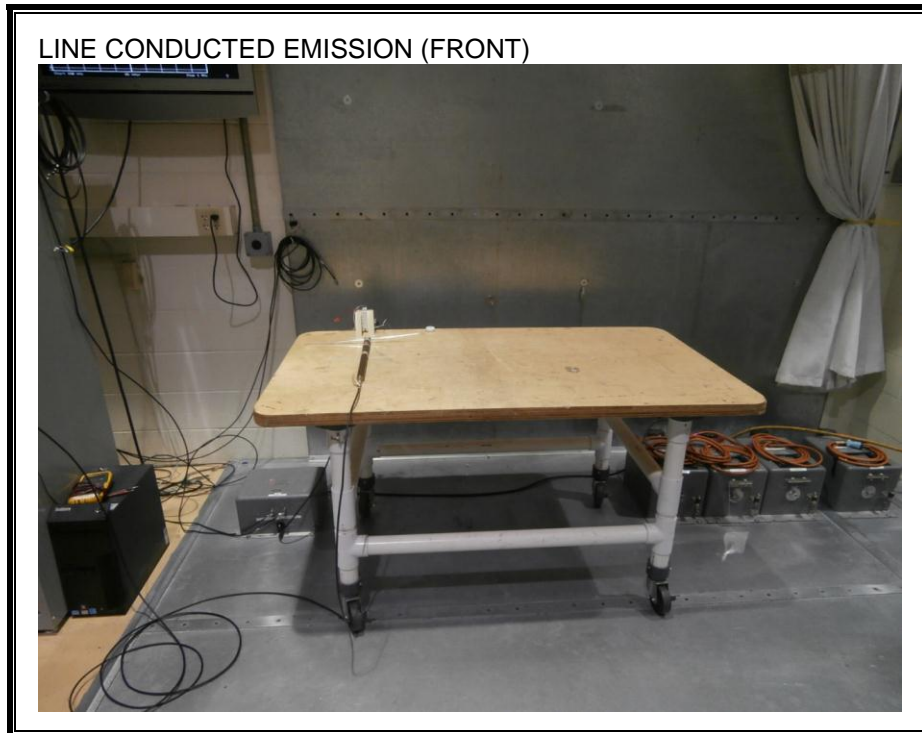


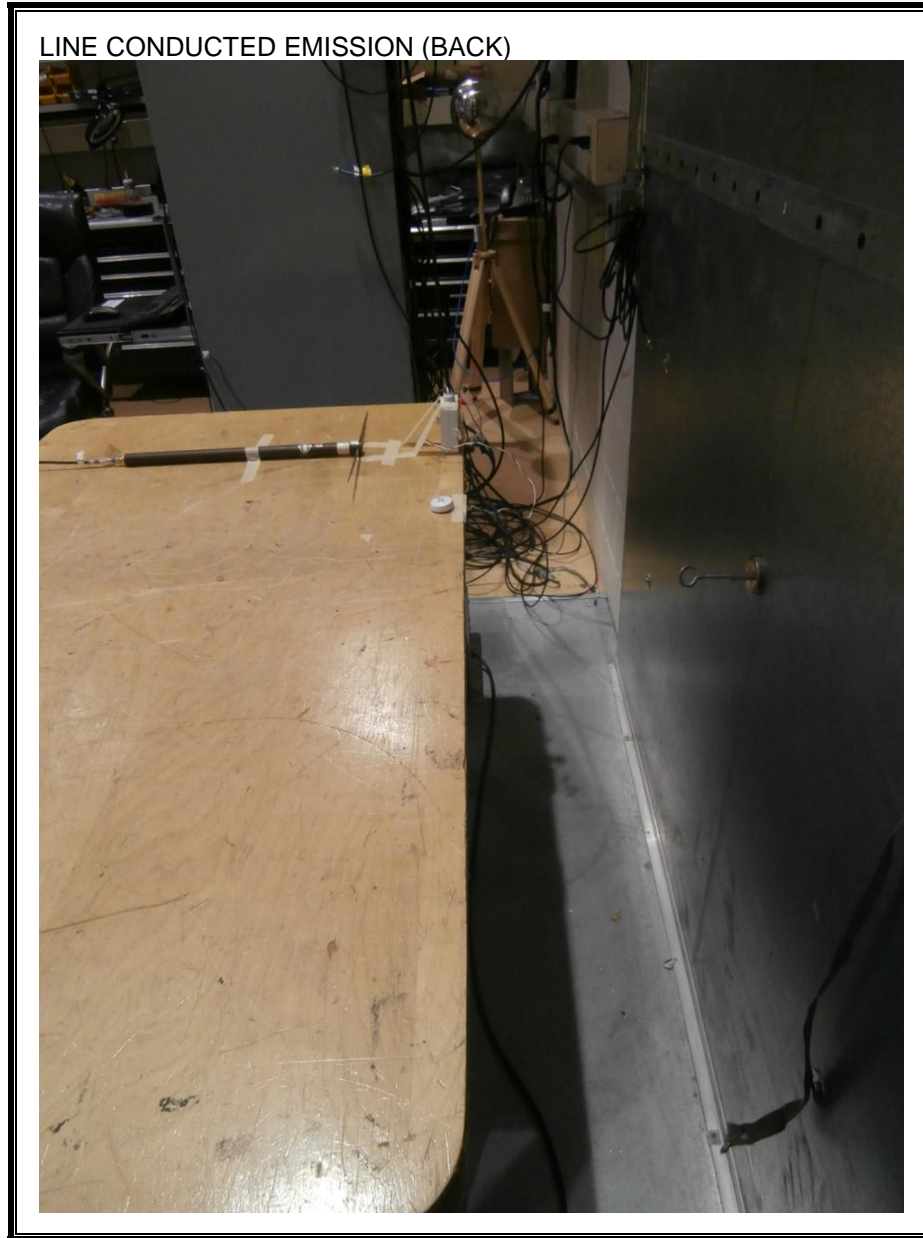
**RADIATED EMISSION ABOVE 1000 MHz**





**AC MAINS LINE CONDUCTED EMISSION**





**END OF REPORT**