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Job Number:	1001348828
Project Number:	11CA10122
File Number:	MC3181
Date:	March 4, 2011
Model:	1D7382-1

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

Test Report Details

Tests Performed By:	**Underwriters Laboratories Inc.** **333 Pfingsten Rd.** **Northbrook, IL 60062**
Tests Performed For:	**Chamberlain Group Inc.** **845 Larch Av** **Elmhurst, IL 60126**
Applicant Contact: Phone: E-mail:	**Hank Sieradzki** **(630) 993-6564** **Hank.Sieradzki@chamberlaingroup.com**
Test Report Date:	**March 4, 2011**
Product Type:	**Periodic Transmitter**
Product standards	**FCC Part 15, Subpart C, 15.231 & RSS-210**
Model Number:	**1D7382-1**
EUT Category:	**Periodic Low Power 3 channel Transmitter**
Testing Start Date:	**January 24, 2011**
Date Testing Complete:	**February 25, 2011**
Overall Results:	**Compliant**

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the US government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Report Directory

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
none			

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The equipment under test is a multiple channel wall mount keypad periodic transmitter operating at 310MHz, 315MHz and 390MHz.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Periodic Transmitter	Chamberlain Group Inc.	1D7382-1	None

Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

1.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

1.2.3 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	9.0	-	-	DC	-	Battery Operated

1.3 EUT Configurations

Mode #	Description
1	EUT with fresh batteries set to transmit.

1.4 EUT Operation Modes

Mode #	Description
1	EUT transmitting on 310MHz, 315MHz, and 390MHz.

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C, 15.231	Code of Federal Regulations, Part 15, Radio Frequency Devices	2010
RSS-210	License - exempt Radio Apparatus (All Frequency Bands): Category I Equipment	Issue 8

2.4 Results Summary

This product is considered Class B

Requirement – Test	Result (Compliant / Non-Compliant)*
Occupied Bandwidth	Compliant
Cease Operation	Compliant
Pulse Train and Duty Cycle	Compliant
Fundamental Frequency & Spurious Radiated Emissions	Compliant

Test Engineer:

Bartlomiej Mucha (Ext.41216)
Staff Engineer
International EMC Services
Conformity Assessment Services-

Reviewer:

Michael Ferrer(Ext.41312)
Senior Project Engineer
International EMC Services
Conformity Assessment Services

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

---------- United States ----------

Code of Federal Regulations Title 47	Part 15, Subpart C, Radio Frequency Devices

---------- Canada ----------

Radio Standards specifications	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.1 Test Conditions and Results – Occupied Bandwidth

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the spectrum analyzer resolution bandwidth set per the appropriate standard.
Basic Standard	47 CFR Part 15.231(c)
Occupied Bandwidth Limits	
0.25% of Center Frequency (310MHz: 775kHz, 315MHz: 788kHz, 390MHz: 975kHz)	

Table 1 Occupied Bandwidth Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 2 Occupied Bandwidth Spectrum Analyzer Settings

Resolution Bandwidth	Occupied Bandwidth Requirements	
	dBc	%
10kHz	-20	99
Supplementary information: None		

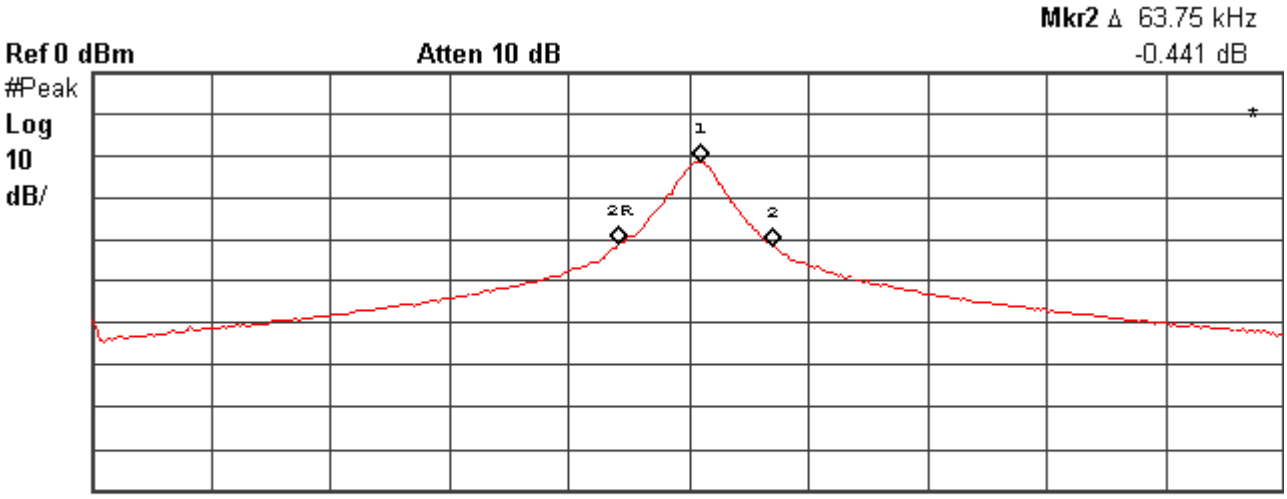
Table 3 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
310MHz	63.75	113.75
315MHz	62.50	127.50
390MHz	63.75	146.25

Table 4 Occupied Bandwidth Test Equipment

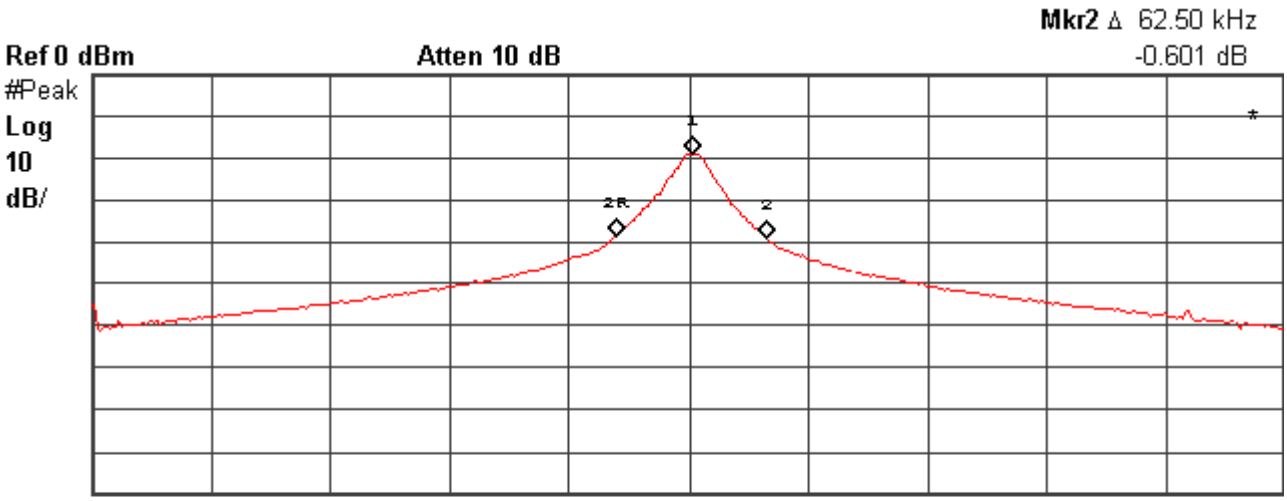
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E7405	EMC4242	Dec 29 2010	Dec 30 2011
Loop Antenna	-	-			

Figure 1 – 20dB Bandwidth Graph for 310MHz



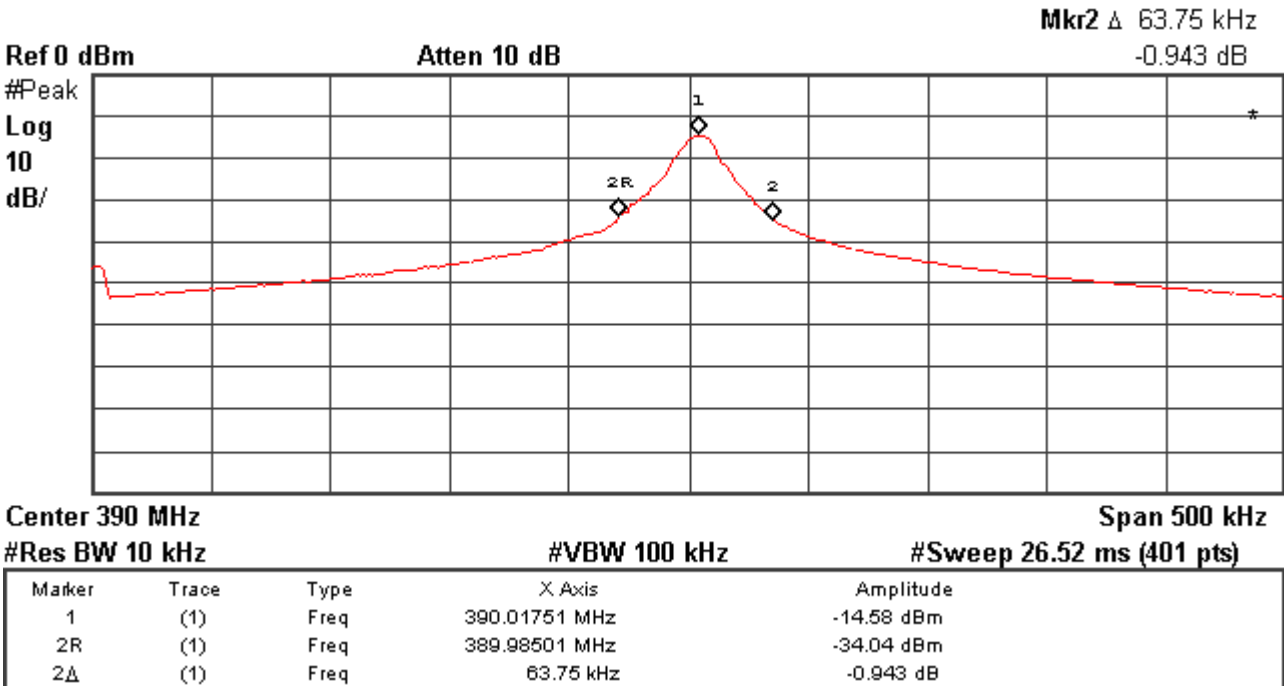
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	310.01250 MHz	-21.39 dBm
2R	(1)	Freq	309.97875 MHz	-41.19 dBm
2Δ	(1)	Freq	63.75 kHz	-0.441 dB

Figure 2 – 20dB Bandwidth Graph for 315MHz



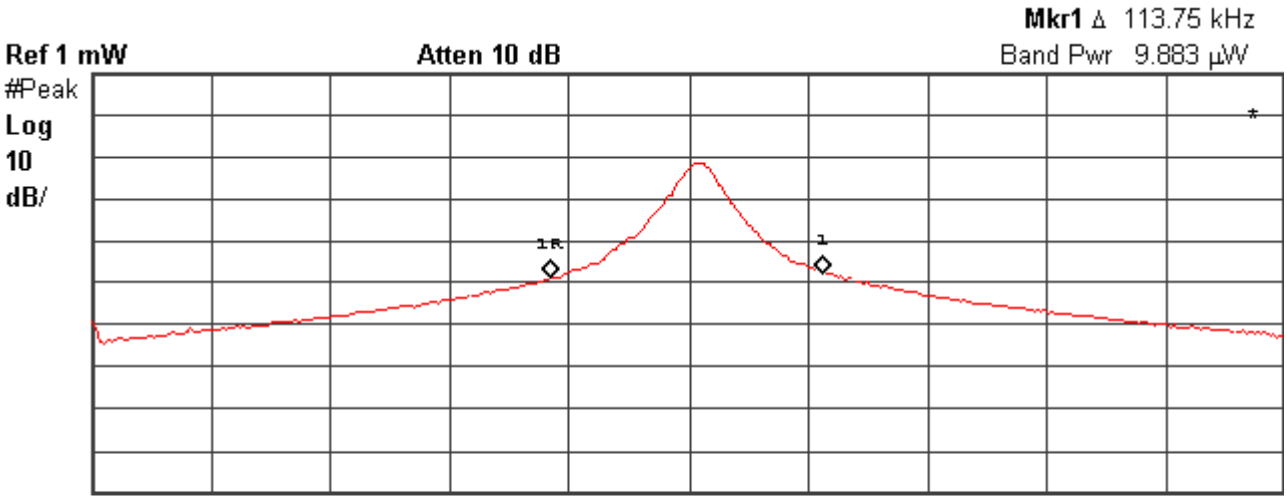
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	315.01501 MHz	-18.94 dBm
2R	(1)	Freq	314.98376 MHz	-38.82 dBm
2Δ	(1)	Freq	62.50 kHz	-0.601 dB

Figure 3 – 20dB Bandwidth Graph for 390MHz



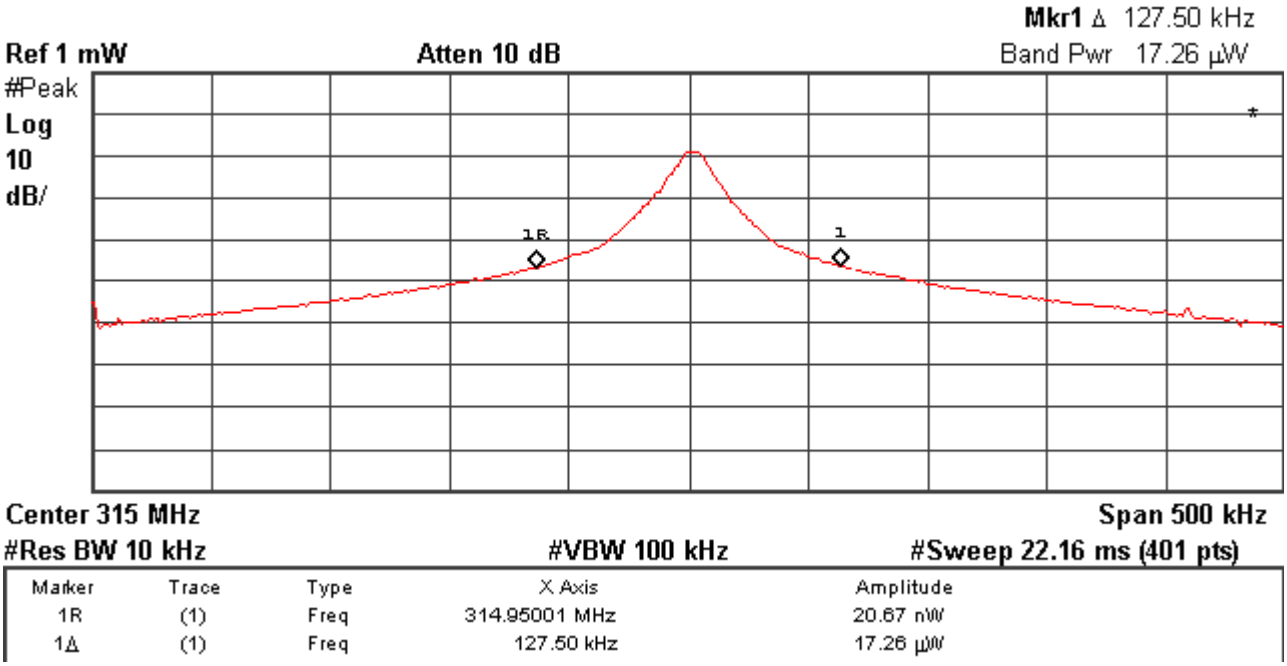
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	390.01751 MHz	-14.58 dBm
2R	(1)	Freq	389.98501 MHz	-34.04 dBm
2Δ	(1)	Freq	63.75 kHz	-0.943 dB

Figure 4 – 99% Bandwidth Graph for 310MHz



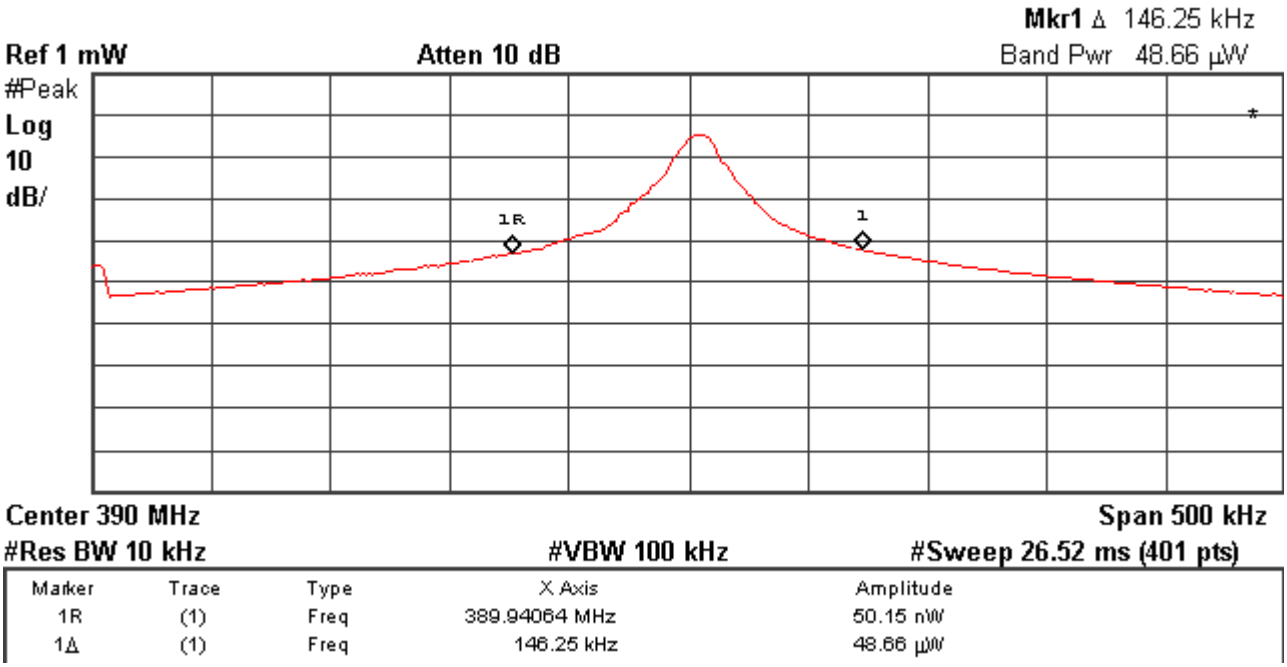
Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	309.95063 MHz	13.24 nW
1Δ	(1)	Freq	113.75 kHz	9.883 µW

Figure 5 – 99% Bandwidth Graph for 315MHz



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	314.95001 MHz	20.67 nW
1Δ	(1)	Freq	127.50 kHz	17.26 µW

Figure 6 – 99% Bandwidth Graph for 390MHz



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	389.94064 MHz	50.15 nW
1Δ	(1)	Freq	146.25 kHz	48.66 µW

4.2 Test Conditions and Results – Cease Operation

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the transmission time measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	
Cease Operation Limits	
The transmissions shall stop within 5 seconds of either a button being released or if automatically controlled transmissions shall be stopped 5 seconds after transmissions begin.	

Table 5 Cease Operation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 6 Cease Operation Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E7405	EMC4242	Dec 29 2010	Dec 30 2011
Loop Antenna	-	-			

Figure 7 Cease Operation Graph for 310MHz

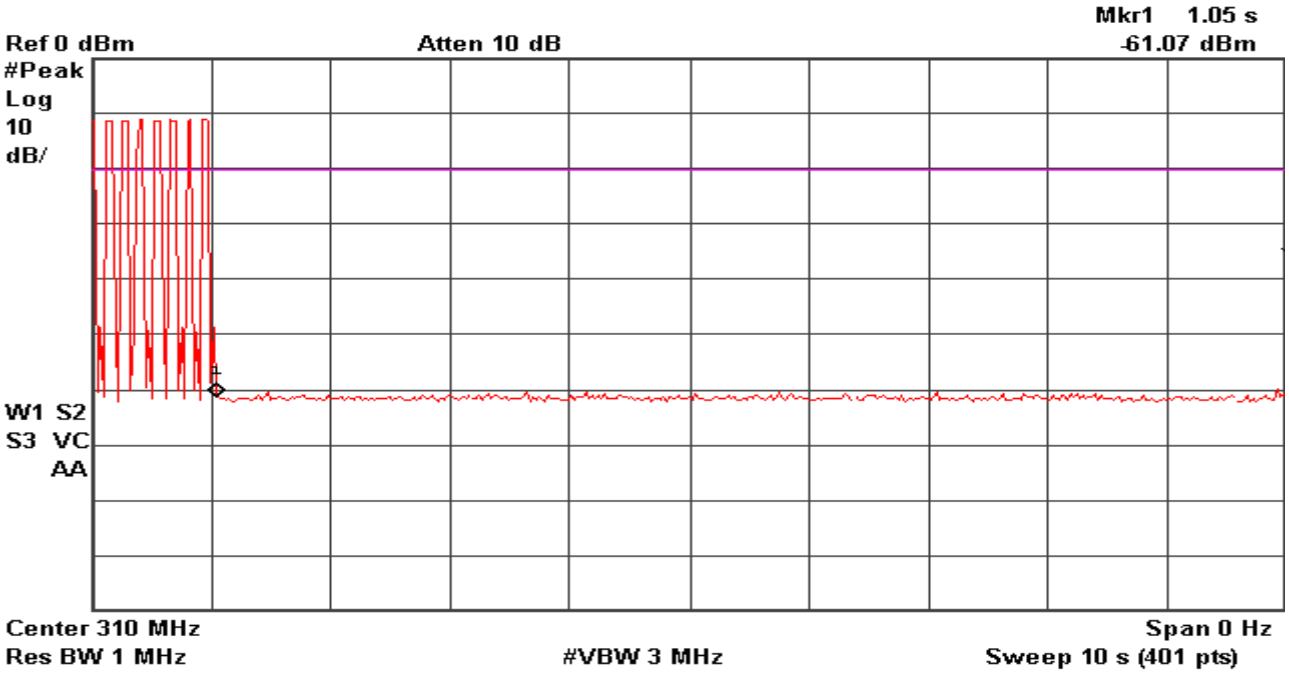


Figure 8 Cease Operation Graph for 315MHz

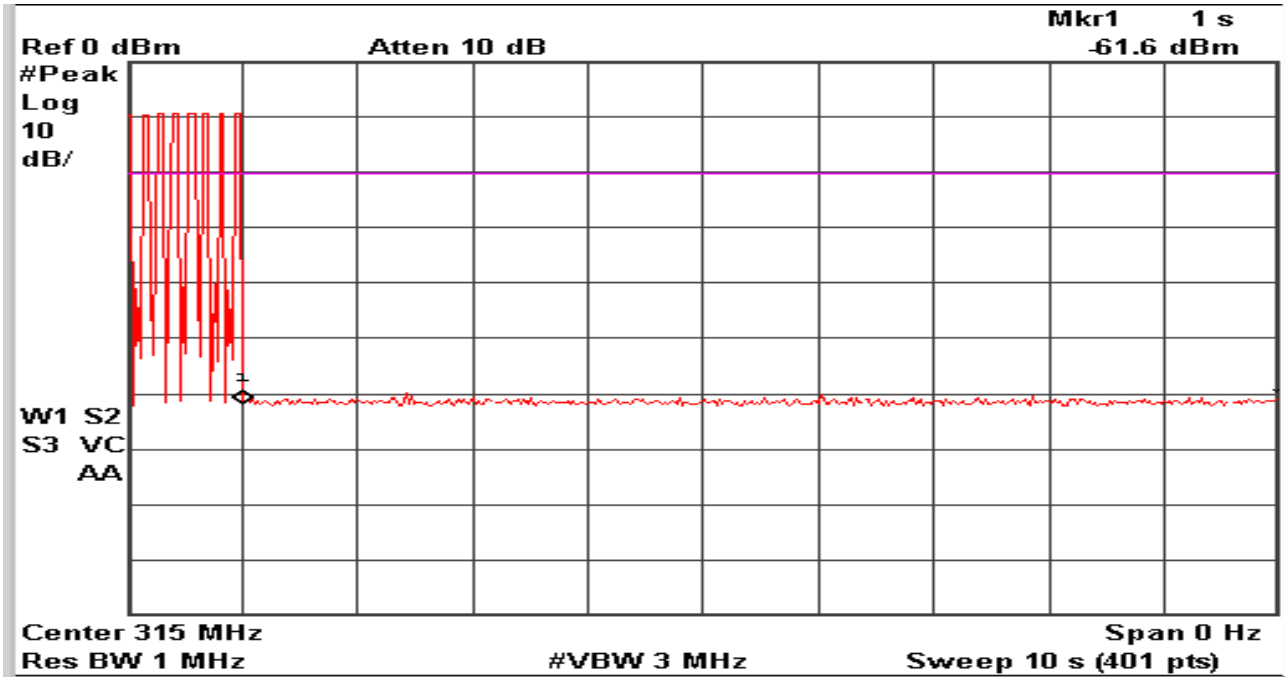
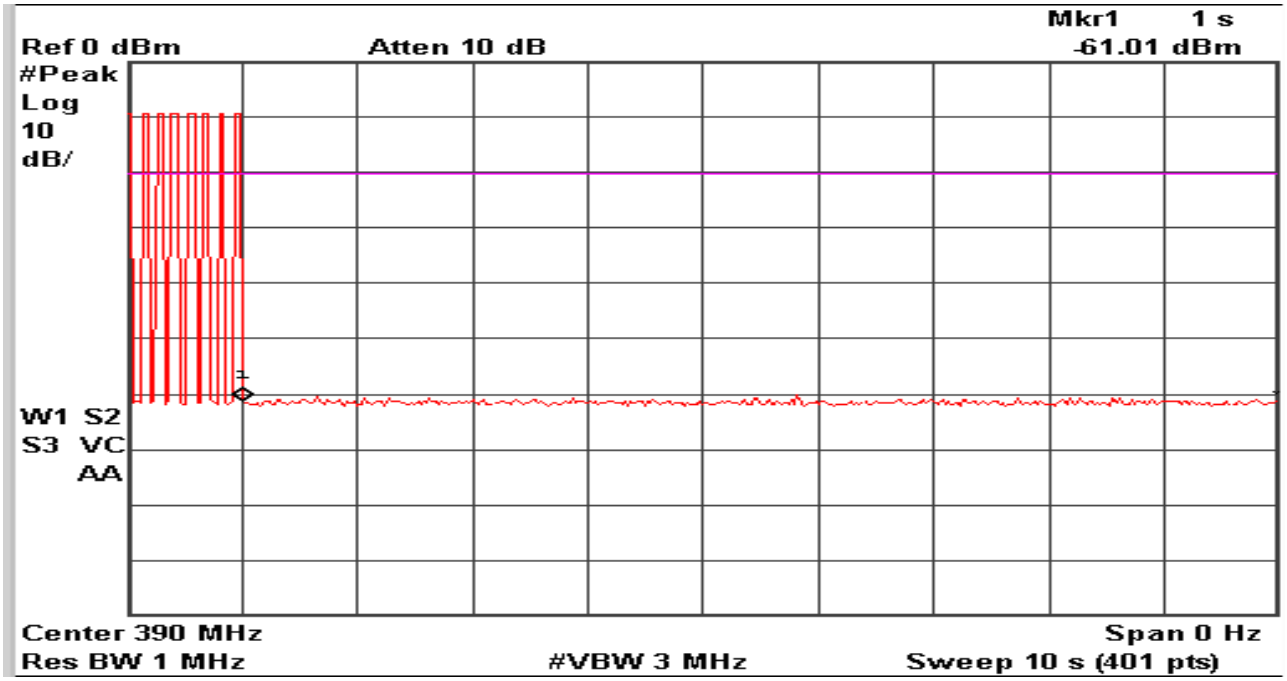


Figure 9 Cease Operation Graph for 390MHz



4.3 Test Conditions and Results – Pulse Train

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The pulse train was measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	FCC Part 15 Subpart A, 15.35
Pulse Train Limits	
There are no limits for this test. This data is used to calculate the averaging correction factor that is applied to the measured peak radiated emissions results.	

Table 7 Pulse Train Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

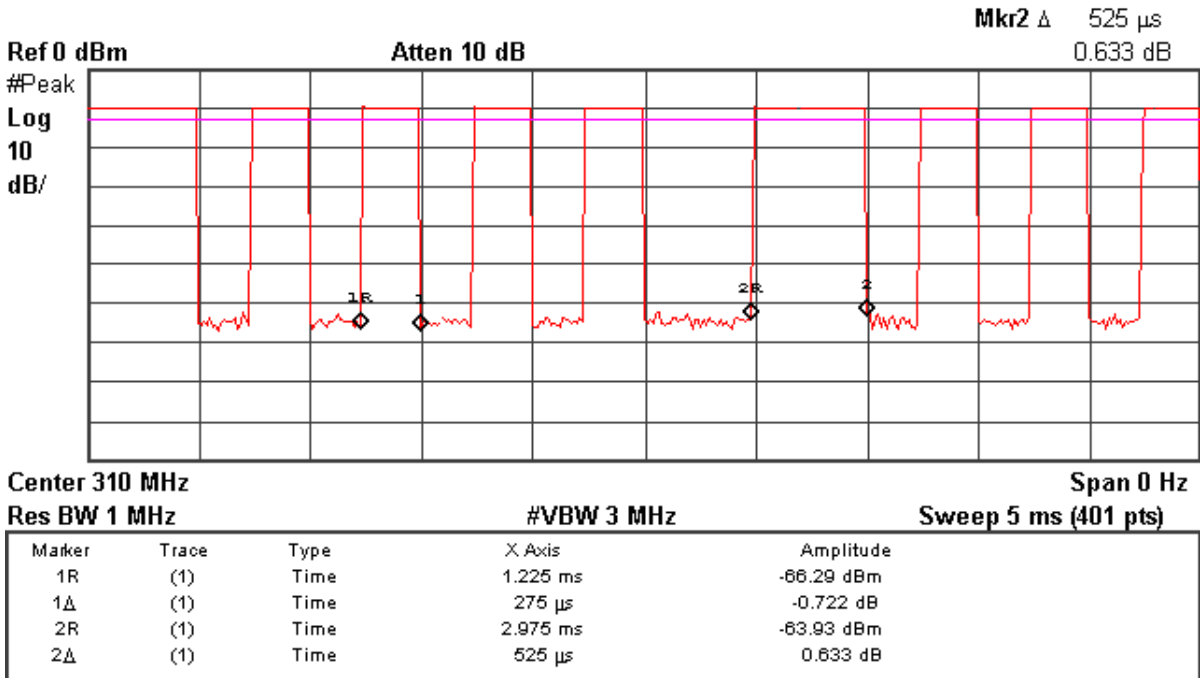
Table 8 Pulse Train Calculation

TX Frequency	Total TX time	Total Transmission time or 100ms whichever is lesser	DC Correction Factor (dB) $20\log\left(\frac{PulseWidth}{Period}\right)$
310MHz	(44x0.275ms)+(25x0.525ms)=25.225ms	100ms	-11.96dB
315MHz	(43x0.2875ms)+(25x0.525ms)=25.49ms	100ms	-11.87dB
390MHz	(39x0.275ms)+(27x0.525ms)=24.9ms	100ms	-12.07dB
Manufacturer declared duty cycle correction -13.35dB. For Radiated Emissions the measured worst case duty cycle was used.			

Table 9 Pulse Train Test Equipment

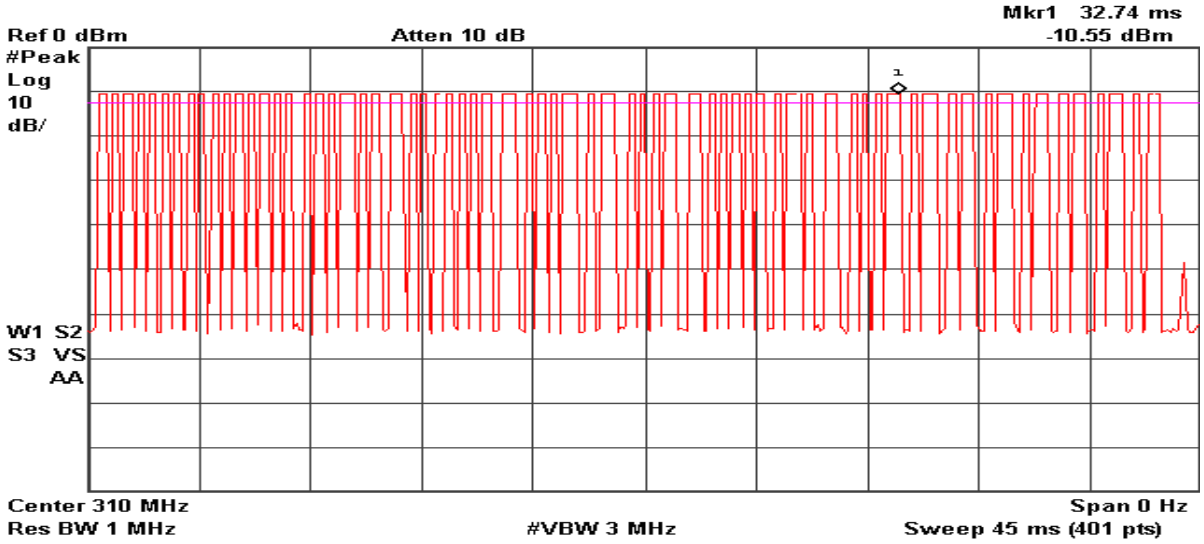
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E7405	EMC4242	Dec 29 2010	Dec 30 2011
Loop Antenna	-	-			

Figure 10 Pulse Train Graphs for 310MHz



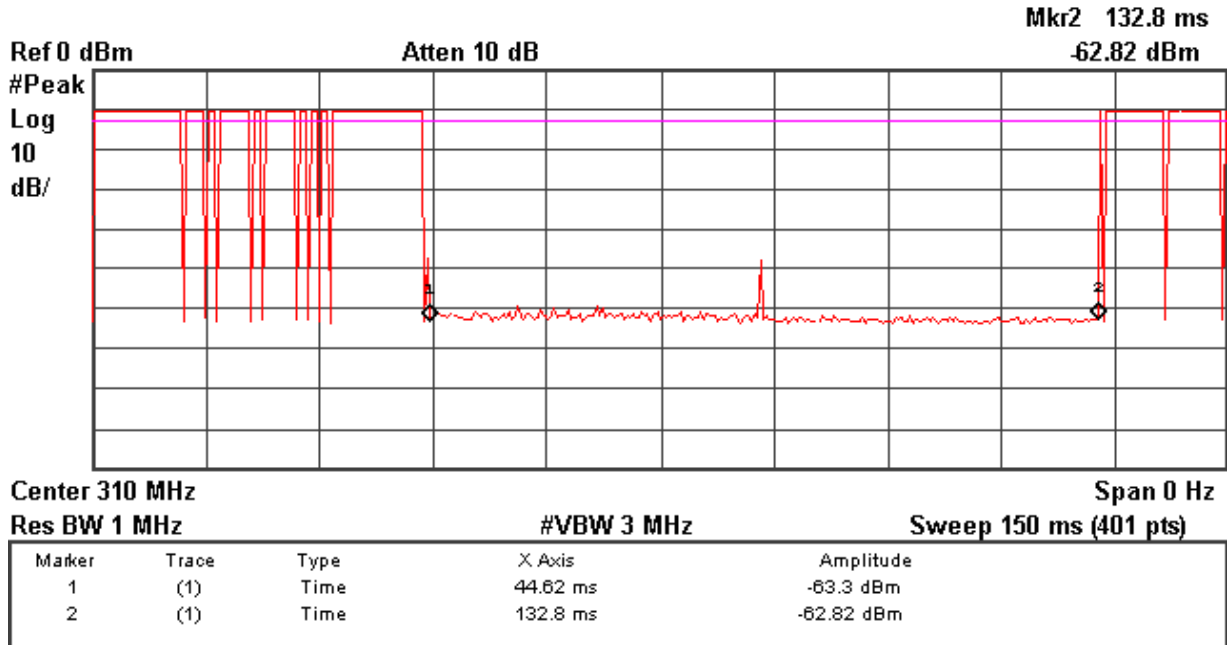
Short Pulse: 0.275ms, Long Pulse: 0.525mS

Pulse Duration mS



# of Short Pulses: 44, # of Long Pulses: 25

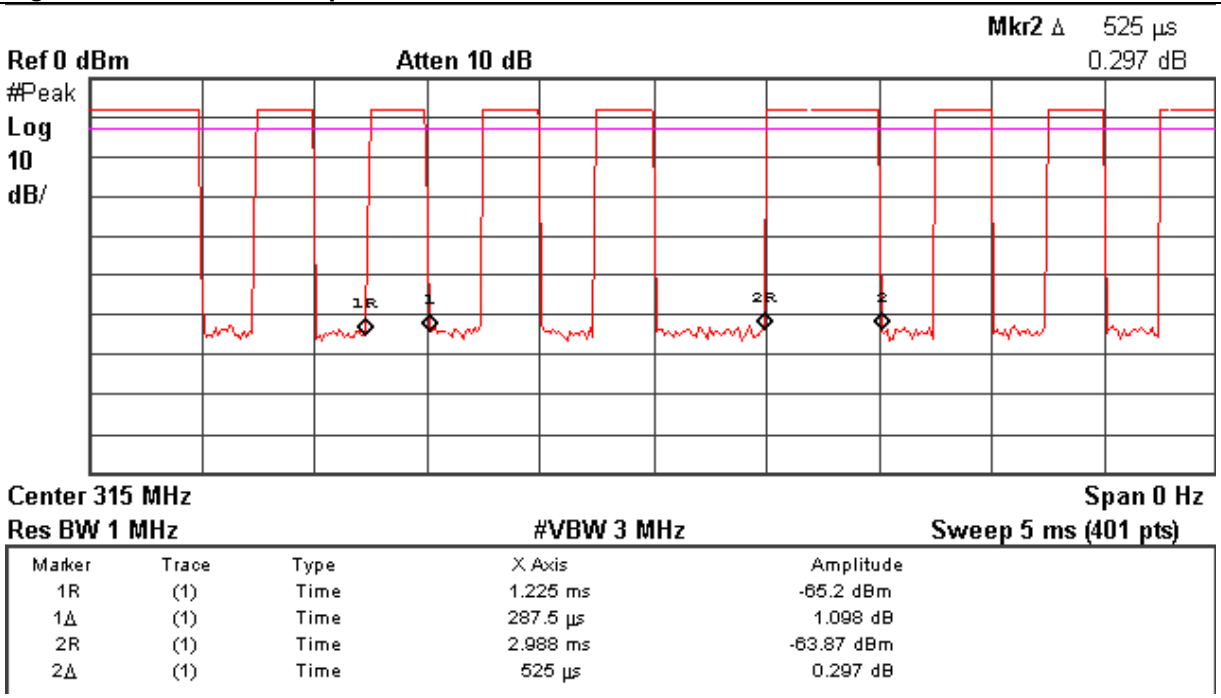
Number of Pulses



Period

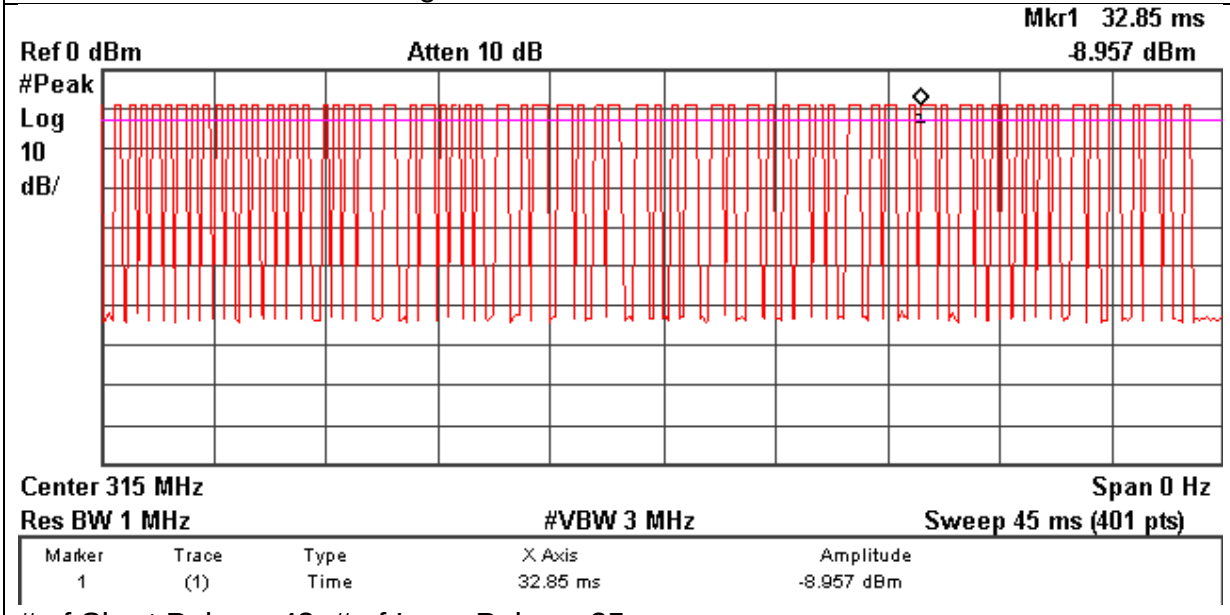
Period: 132.8ms, use 100mS for DC calculation

Figure 11 Pulse Train Graphs for 315MHz



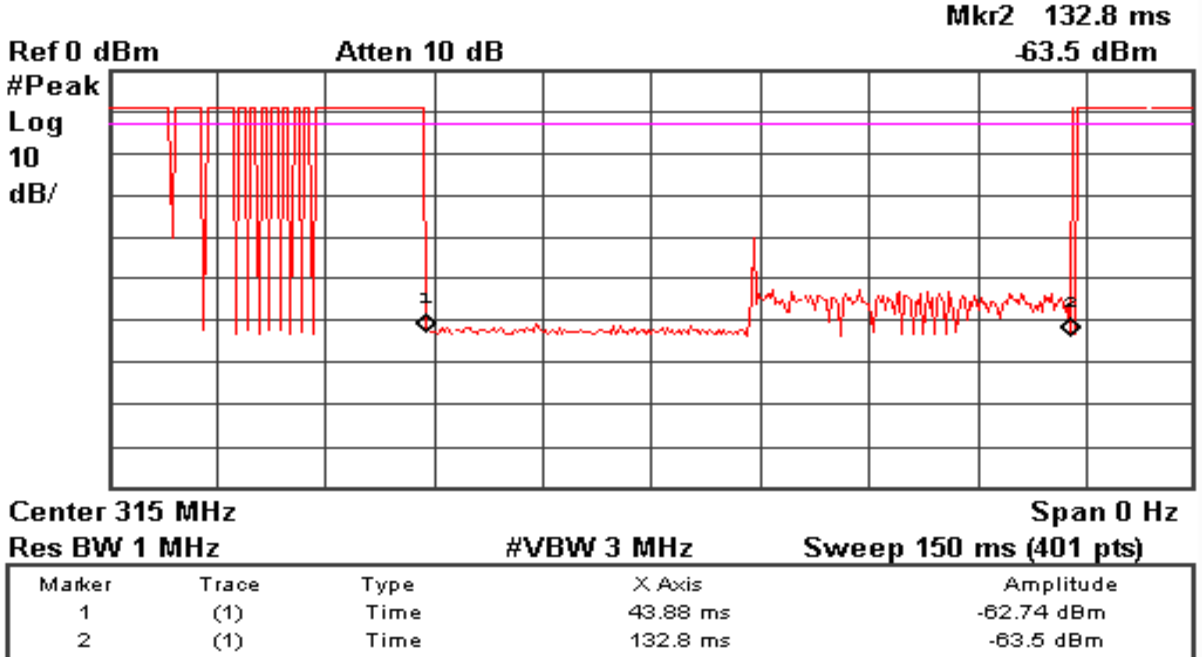
Pulse Duration mS

Short Pulse: 0.2875mS, Long Pulse 0.525mS



Number of Pulses

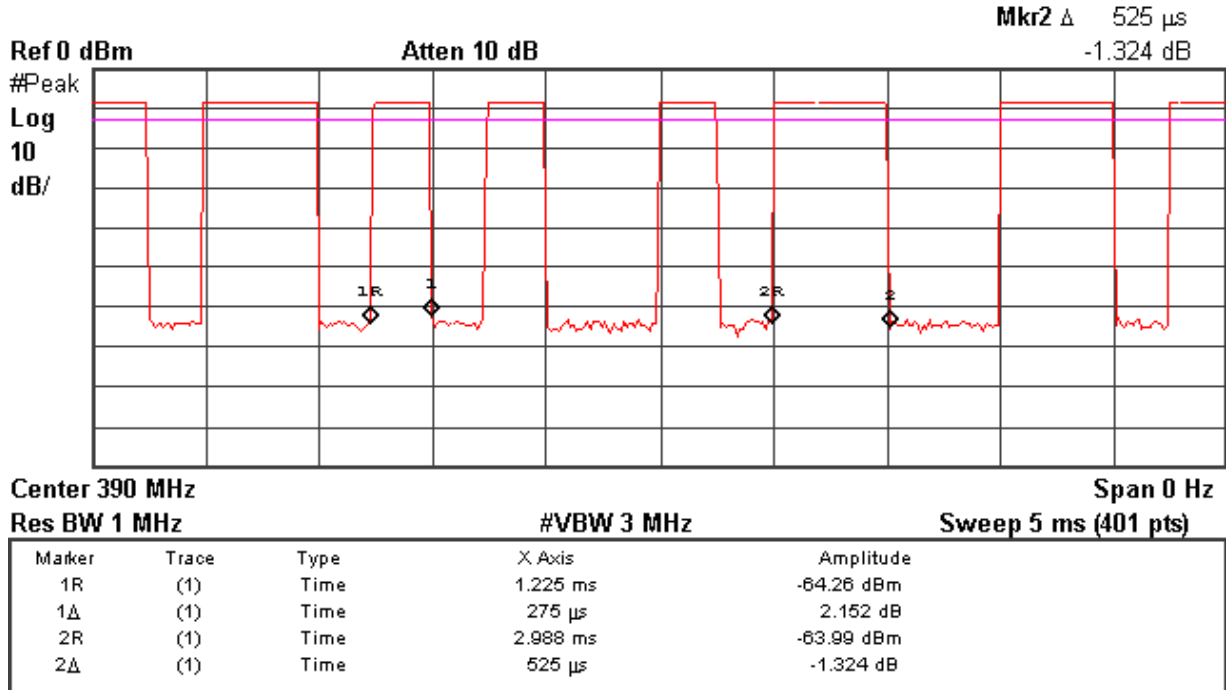
# of Short Pulses: 43, # of Long Pulses: 25



Period: 132.8ms (use 100mS for DC calculation)

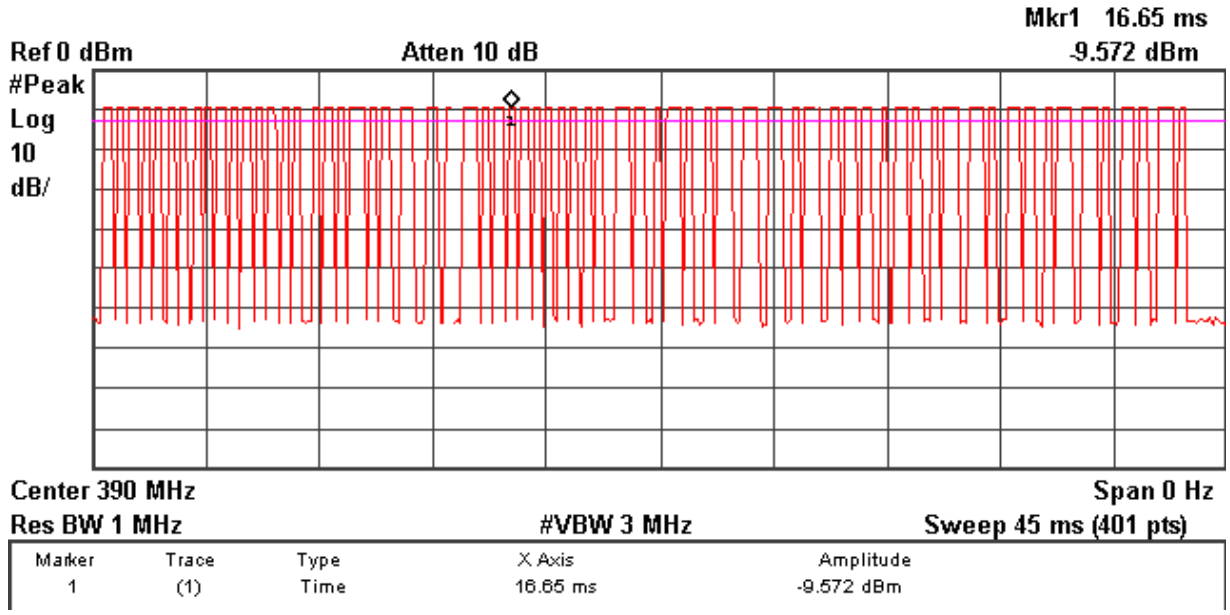
Period

Figure 12 Pulse Train Graphs for 390MHz



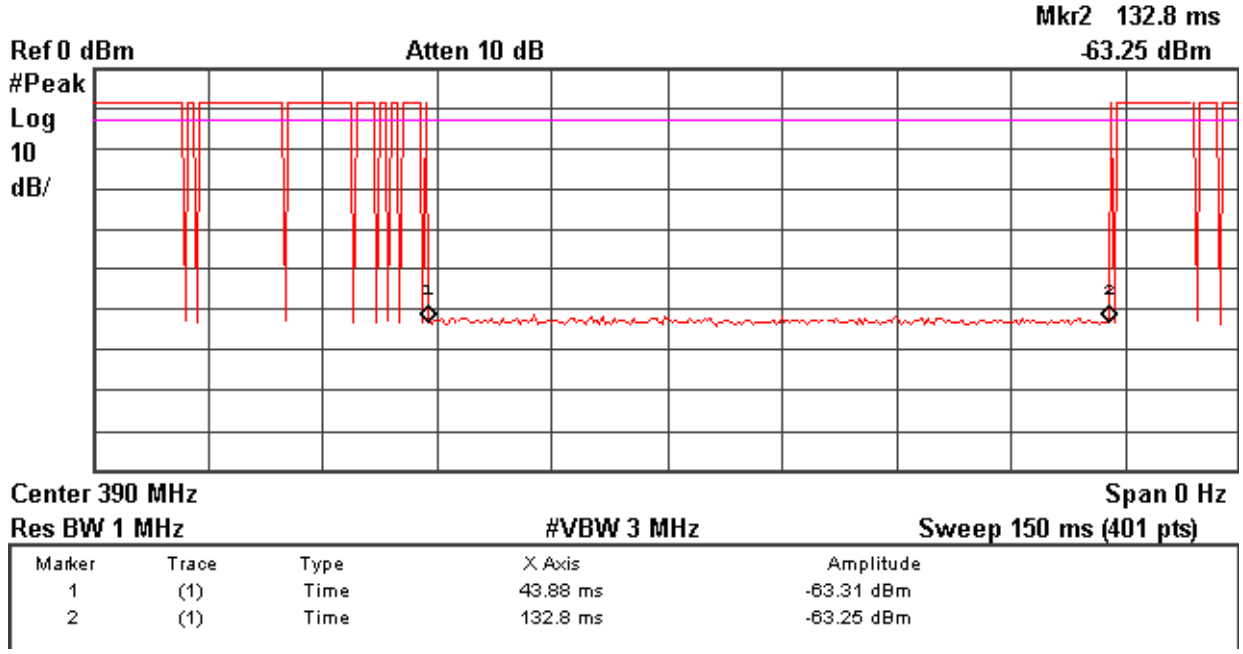
Pulse Duration mS

Short Pulse: 0.275mS, Long Pulse 0.525mS



Number of Pulses

# of Short Pulses: 39, # of Long Pulses: 27



Period

Period: 132.8mS (used 100ms for duty cycle calculation)

4.4 Test Conditions and Results – RADIATED EMISSIONS Fundamental and Spurious

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter or 3-meter as noted. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

Basic Standard		
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	10 meter distance
	1GHz – 4GHz	3 meter distance

General and Restricted Band Limits

Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Average
30 - 88	29.54	NA
88 - 216	33.04	NA
216 - 960	35.54	NA
960 - 1000	43.54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)

Fundamental Frequency Limits

Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Average
310	64.1	NA
315	64.4	NA
390	68.2	NA

Supplementary information: See section 4.3 for duty cycle information.

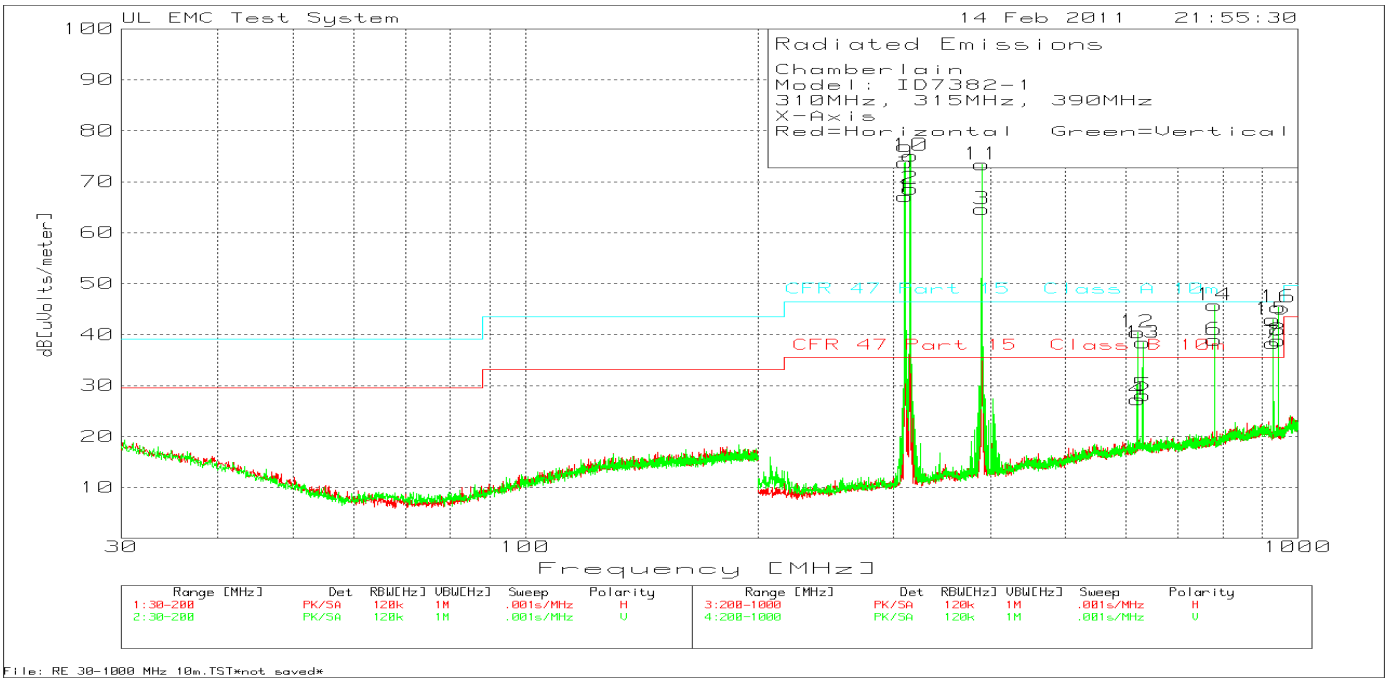
Table 10 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 11 Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	Dec 30 2010	Dec 302011
Bicon Antenna	Chase	VBA6106A	EMC4078	Dec 02 2010	Dec 30 2011
Log-P Antenna	Chase	UPA6109	EMC4313	Jun 01 2010	Jun 01 2011
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	Dec 28 2010	Dec 30 2011
Antenna Array	UL	BOMS	EMC4276	Aug 1 2010	Aug 1 2011

Figure 13 Radiated Emissions Graphs for 310MHz, 315MHz, and 390MHz



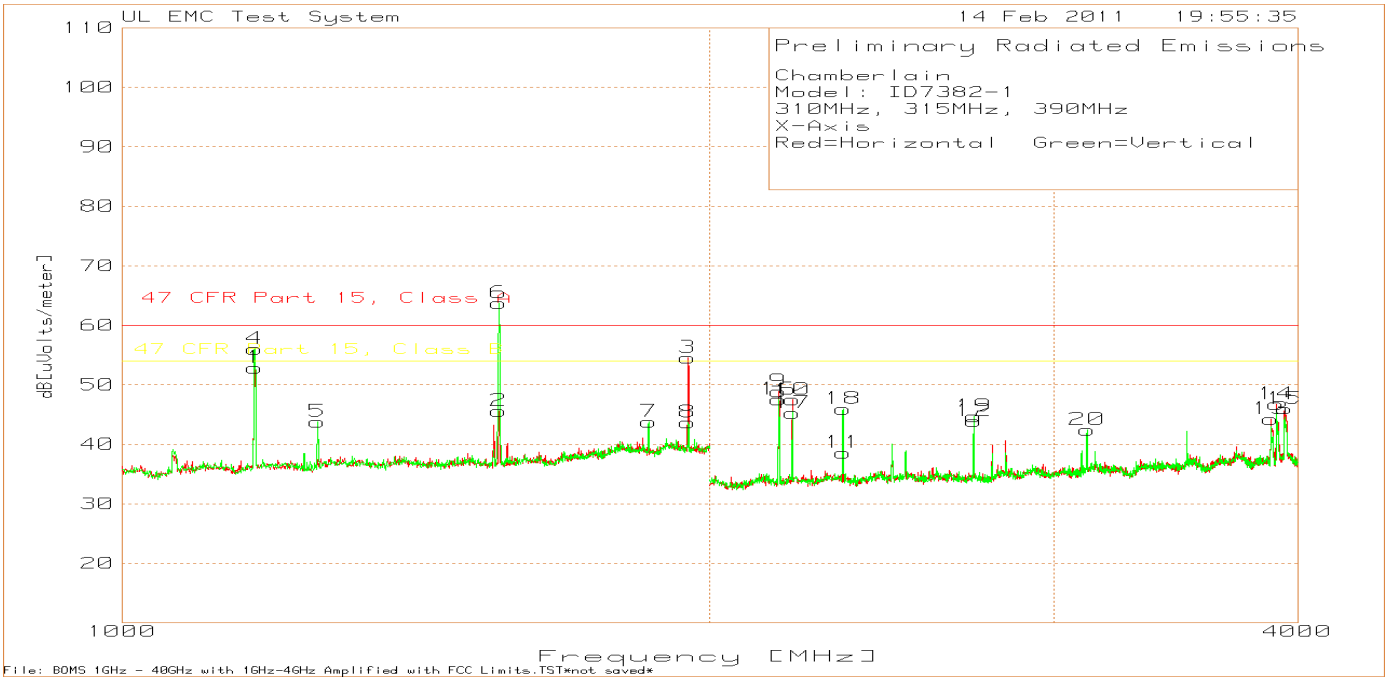


Table 12 Radiated Emissions Data Points for 310MHz, 315MHz, & 390MHz

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	DC Factor dB	Limit 1	Level dB[uV/m] NO DC	Level dB[uV/m] with DC	Margin dB	Polarity
310.018	86.77	PK	-32.7	13.3	-11.87	64.1	67.37	55.5	-8.6	Horz
315.0134	88.37	PK	-32.7	13.4	-11.87	64.4	69.07	57.2	-7.2	Horz
390.0194	83.15	PK	-32.1	15.3	-11.87	68.2	66.35	54.48	-13.72	Horz
620.036	40.98	PK	-31.3	20.4	-11.87	44.1	30.08	18.21	-25.89	Horz
630.0306	39.33	PK	-31.1	20.4	-11.87	44.4	28.63	16.76	-27.64	Horz
780.0388	50.41	PK	-31.5	21.4	-11.87	48.2	40.31	28.44	-19.76	Horz
930.0526	48.31	PK	-31.7	22.7	-11.87	44.1	39.31	27.44	-16.66	Horz
945.0434	50.3	PK	-31.5	22.8	-11.87	44.4	41.6	29.73	-14.67	Horz
310.0178	92.5	PK	-32.7	13.3	-11.87	64.1	73.1	61.23	-2.87	Vert
315.015	94.35	PK	-32.7	13.4	-11.87	64.4	75.05	63.18	-1.22	Vert
390.0194	90.19	PK	-32.1	15.3	-11.87	68.2	73.39	61.52	-6.68	Vert
620.036	51.79	PK	-31.3	20.4	-11.87	44.1	40.89	29.02	-15.08	Vert
630.0298	49.08	PK	-31.1	20.4	-11.87	44.4	38.38	26.51	-17.89	Vert
780.0406	56.6	PK	-31.5	21.4	-11.87	48.2	46.5	34.63	-13.57	Vert
930.054	54.84	PK	-31.7	22.7	-11.87	44.1	45.84	33.97	-10.13	Vert
945.0452	56.48	PK	-31.5	22.8	-11.87	44.4	47.78	35.91	-8.49	Vert
1170.17	84.33	PK	-56.07	24.6	-11.87	54	52.86	40.99	-13.01	Horz
1560.561	75.53	PK	-54.94	25	-11.87	54	45.59	33.72	-20.28	Horz
1949.95	80.55	PK	-53.45	27.5	-11.87	54	54.6	42.73	-11.27	Horz
1949.602	81.7	PK	-53.45	27.5	-11.87	54	55.75	43.88	-10.12	Horz
2169.446	79.37	PK	-52.15	21.7	-11.87	54	48.92	37.05	-16.95	Horz
2204.136	77.31	PK	-51.62	21.8	-11.87	54	47.49	35.62	-18.38	Horz
2340.227	67.93	PK	-51.08	21.7	-11.87	54	38.55	26.68	-27.32	Horz
2729.82	72.28	PK	-50.46	22.1	-11.87	54	43.92	32.05	-21.95	Horz
3875.917	71.4	PK	-51.03	23.9	-11.87	54	44.27	32.4	-21.6	Horz
3901.268	74.06	PK	-51.16	23.8	-11.87	54	46.7	34.83	-19.17	Horz
3938.626	72.22	PK	-50.21	24	-11.87	54	46.01	34.14	-19.86	Horz
1170.069	90.62	PK	-56.08	24.6	-11.87	54	59.14	47.27	-6.73	Vert
1260.26	74.75	PK	-55.8	24.9	-11.87	54	43.85	31.98	-22.02	Vert
1560.1	94.27	PK	-54.95	25	-11.87	54	64.32	52.45	-1.55	Vert
1860.861	70.31	PK	-53.87	27.4	-11.87	54	43.84	31.97	-22.03	Vert
1949.95	69.66	PK	-53.45	27.5	-11.87	54	43.71	31.84	-22.16	Vert
2169.446	78.02	PK	-52.15	21.7	-11.87	54	47.57	35.7	-18.3	Vert
2205.47	75.14	PK	-51.62	21.8	-11.87	54	45.32	33.45	-20.55	Vert
2340.227	75.34	PK	-51.08	21.7	-11.87	54	45.96	34.09	-19.91	Vert
2729.82	73.11	PK	-50.46	22.1	-11.87	54	44.75	32.88	-21.12	Vert
3120.747	69.56	PK	-49.8	22.7	-11.87	54	42.46	30.59	-23.41	Vert

Appendix A - Accreditations and Authorizations

NVLAP Lab code: 100414-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see http://ts.nist.gov/ts/htdocs/210/214/scopes/1004140.htm

FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91044).

Industry Canada Industrie Canada

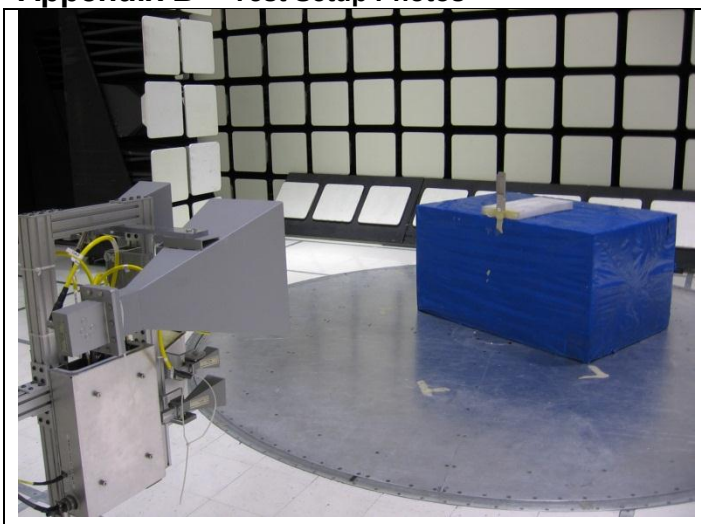
Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: Radiated Emissions R-621, Conducted Emissions C-642.

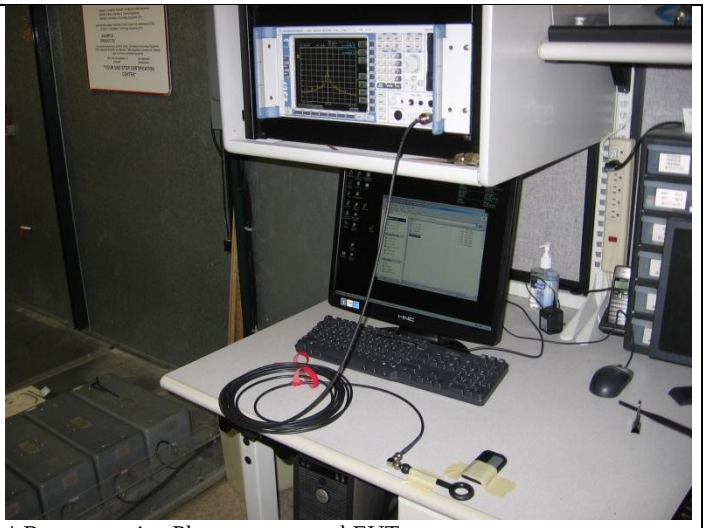
ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).

NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.
NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).
NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6

Appendix B – Test Setup Photos



Radiated X-Axis Setup



* Representative Photo – not actual EUT.

BW & DC Test Setup

All test setup photos are typical configuration and might not reflect actual sample tested.