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Job Number:	1001339652
Project Number:	11CA06144
File Number:	MC3181
Date:	March 3, 2011
Model:	1D7510

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 3, 2011**
Product Type:	**Periodic Transmitter**
Product standards	**FCC Part 15, Subpart C, 15.231 & RSS-210**
Model Number:	**1D7510**
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 periodic transmitter capable of operating at 315MHz and 390MHz. The sample tested was set to operate at 315MHz D code, 390MHz D code, and 390MHz A code. The transmitter uses internal trace antenna.

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.	1D7510	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	6.0	-	-	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 either at 315MHz D code or 390MHz D & A code.

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 (315MHz: 787kHz, 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		

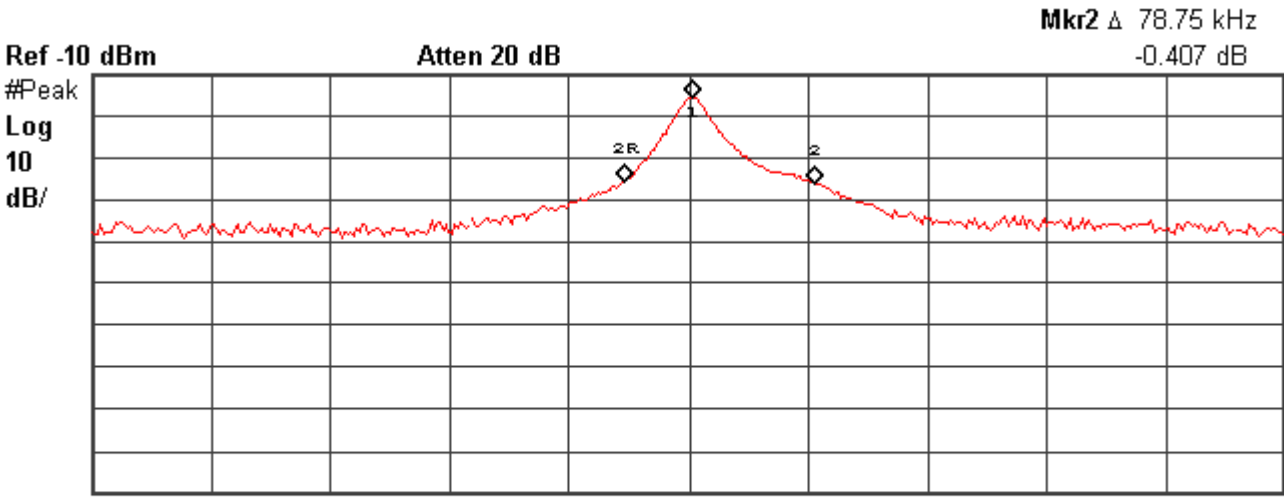
Table 3 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
315MHz D code	78.75	650.0
390MHz D code	88.75	635.0
390MHz A code	85.00	665.0

Table 4 Occupied Bandwidth Test Equipment

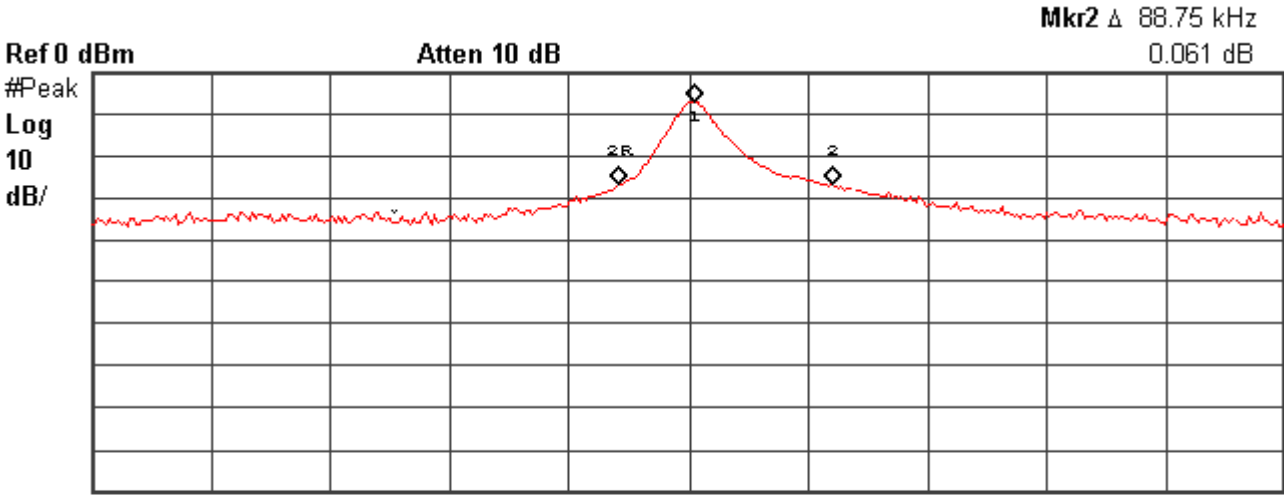
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E7405	EMC4242	Dec 29 2010	Dec 30 2011
Loop Antenna	-	-	-	N/A	N/A

Figure 1 – 20dB Bandwidth Graph for 315MHz D code



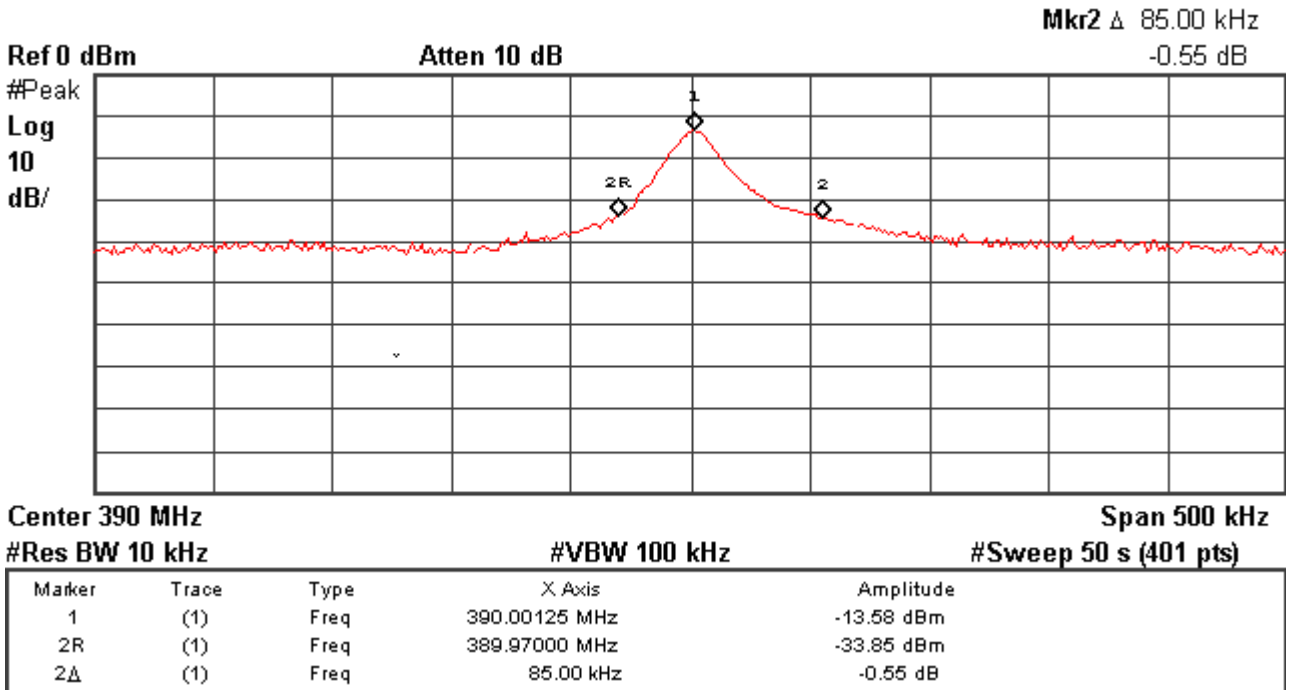
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	315.00125 MHz	-15.86 dBm
2R	(1)	Freq	314.97375 MHz	-35.91 dBm
2Δ	(1)	Freq	78.75 kHz	-0.407 dB

Figure 2 – 20dB Bandwidth Graph for 390MHz D code



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	390.00250 MHz	-6.939 dBm
2R	(1)	Freq	389.97125 MHz	-26.97 dBm
2Δ	(1)	Freq	88.75 kHz	0.061 dB

Figure 3 – 20dB Bandwidth Graph for 390MHz A code



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	390.00125 MHz	-13.58 dBm
2R	(1)	Freq	389.97000 MHz	-33.85 dBm
2Δ	(1)	Freq	85.00 kHz	-0.55 dB

Figure 4 – 99% Bandwidth Graph for 315MHz D code

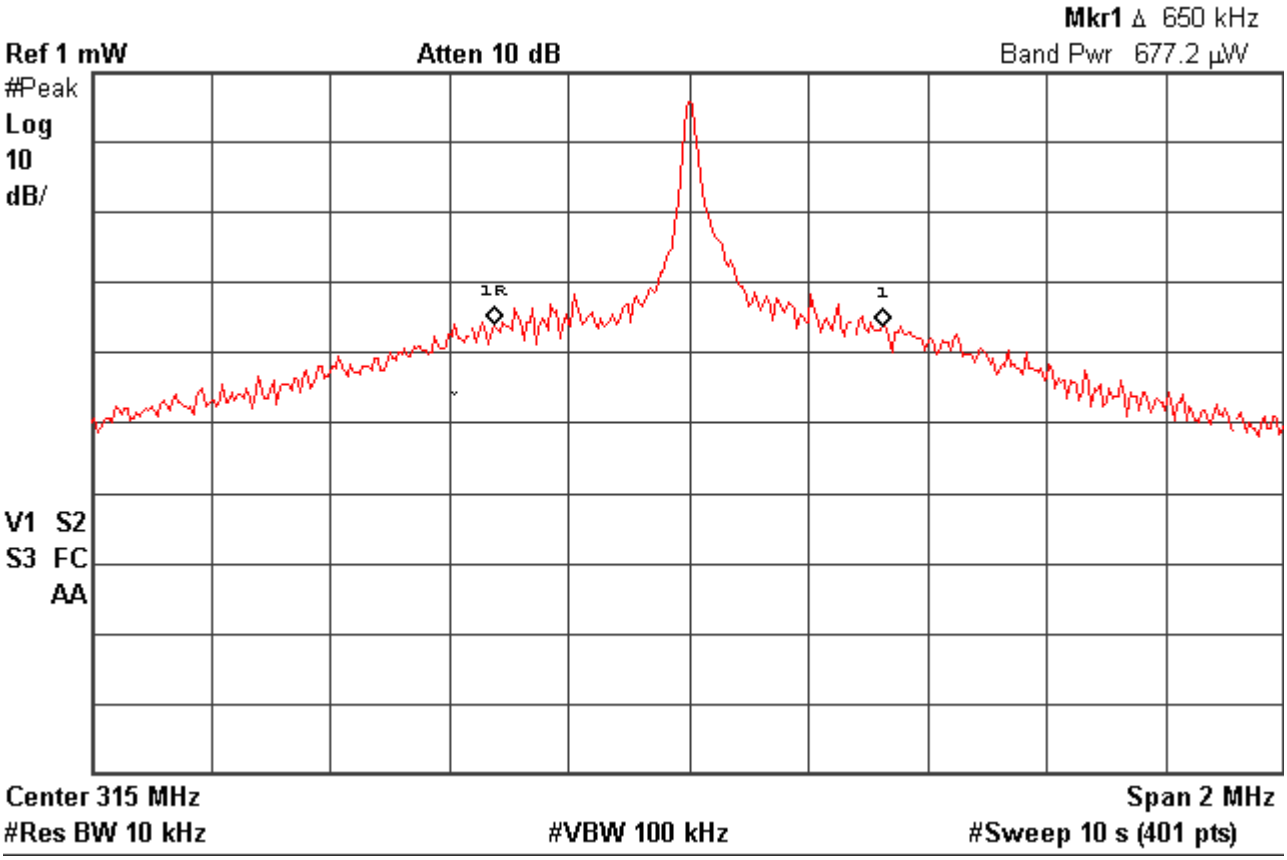


Figure 5 – 99% Bandwidth Graph for 390MHz D code

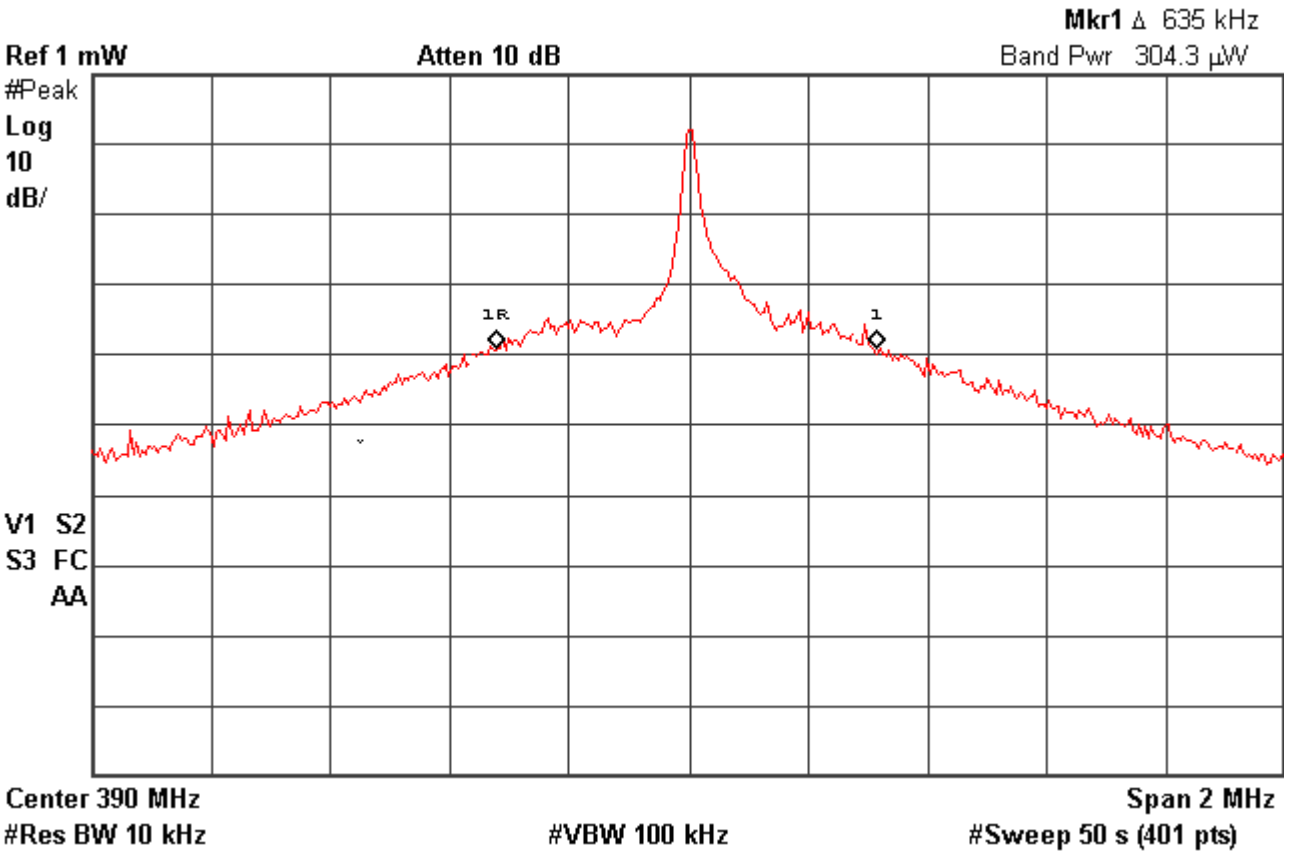
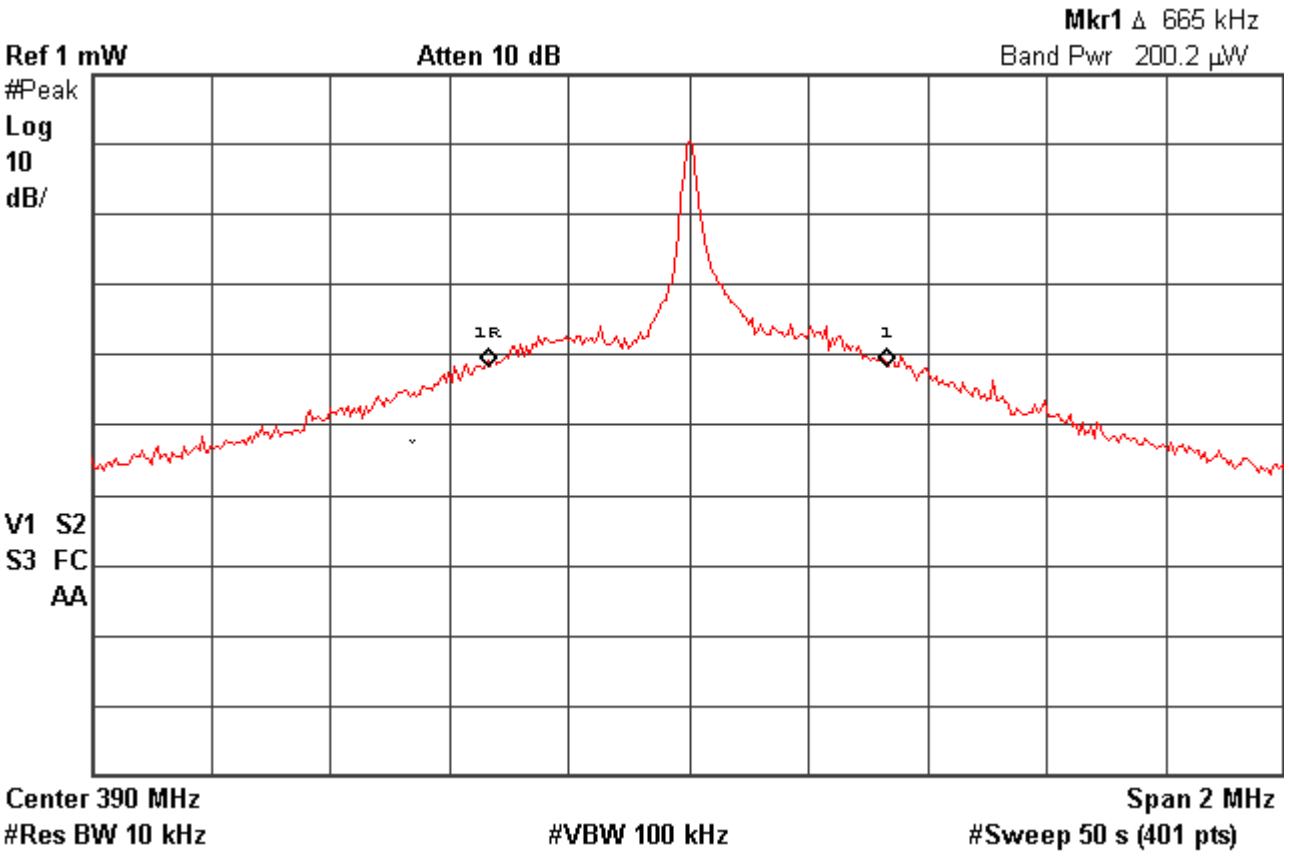


Figure 6 – 99% Bandwidth Graph for 390MHz A code



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	-	-	N/A	N/A	N/A

Figure 7 Cease Operation Graph for 315MHz D code

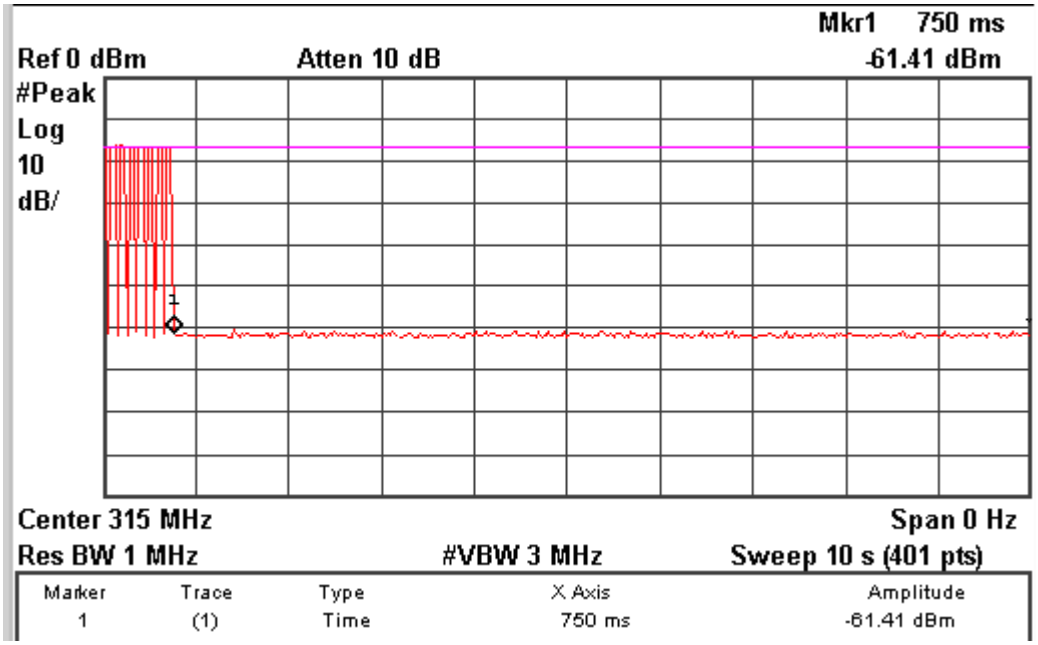


Figure 8 Cease Operation Graph for 390MHz D code

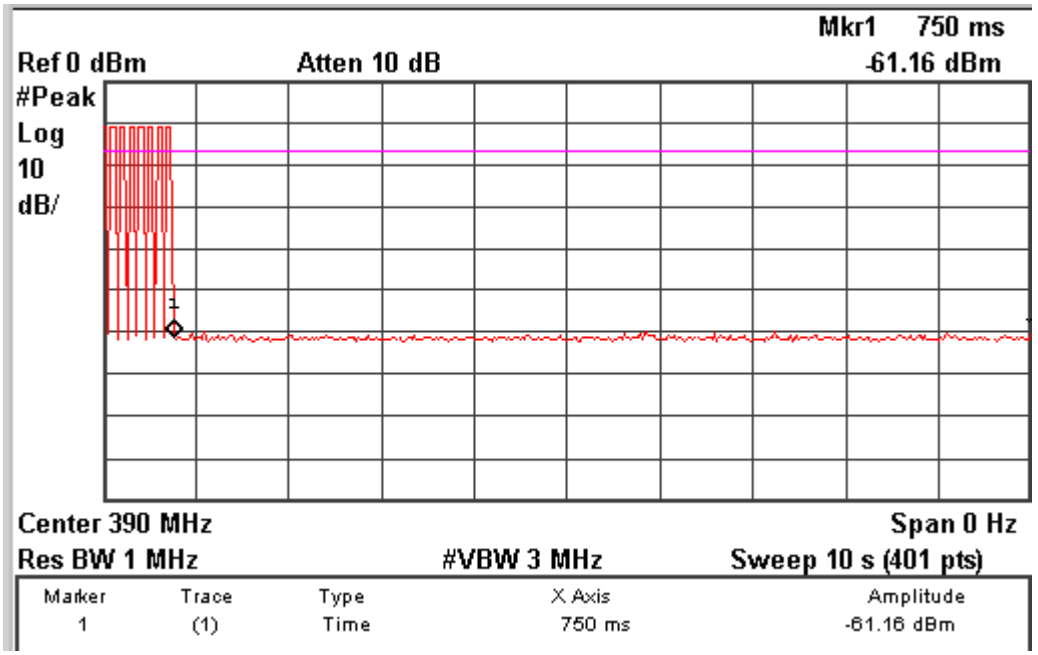
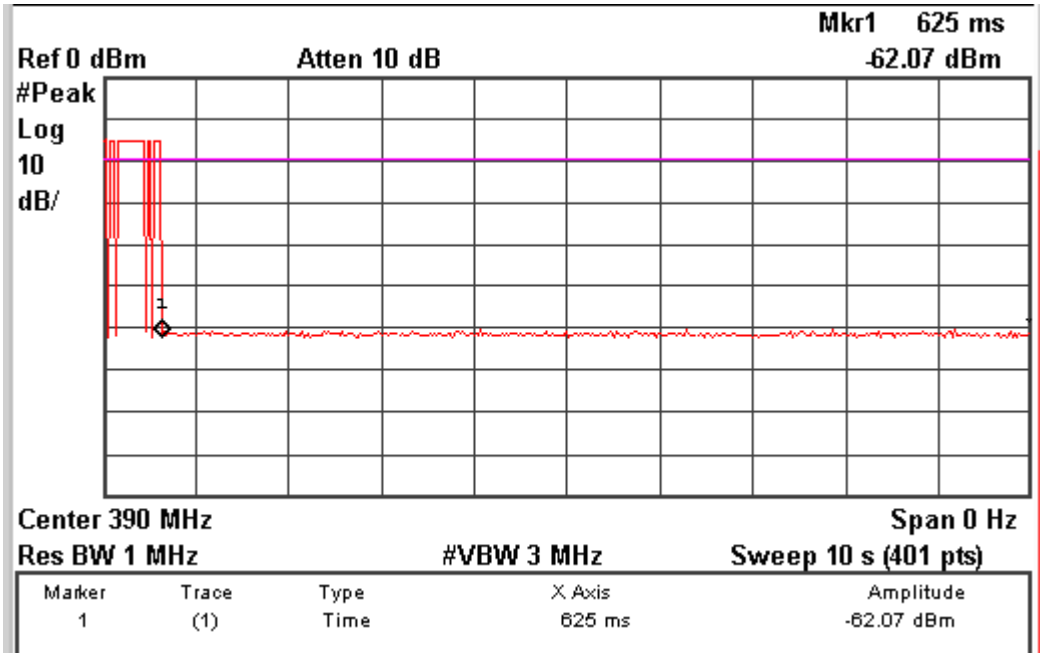


Figure 9 Cease Operation Graph for 390MHz A code



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		

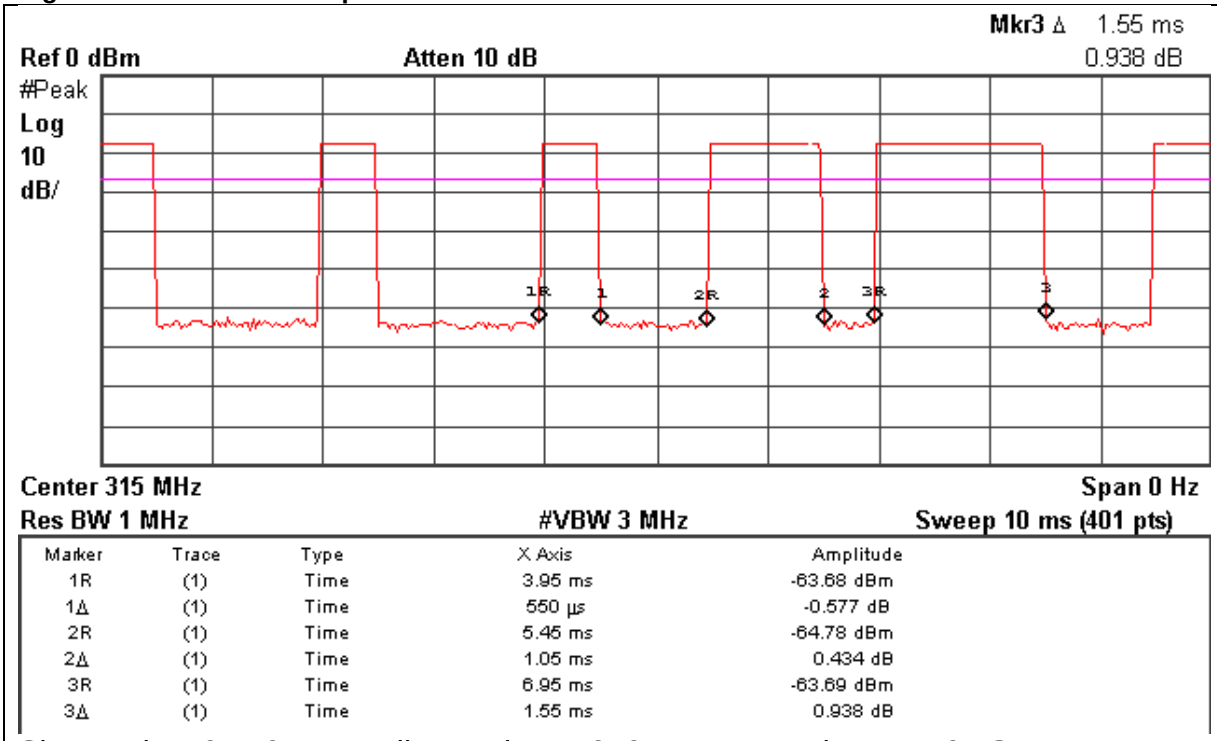
Table 8 Pulse Train Calculation

TX Frequency	Total TX time	Total Transmission time or 100ms whichever is lesser	DC Correction Factor (dB) $20\log\left(\frac{PulseWidth}{Period}\right)$
315MHz D	(9x0.55ms)+(9x1.05ms)+(3x1.55ms)=19.05ms	97.62ms	-14.19dB (*mfg. declared -10.17dB)
390MHz D	(6x0.55ms)+(7x1.05ms)+(8x1.55ms)=23.05ms	97.35mS	-12.51dB (*mfg. declared -10.17dB)
390MHz A	(5x1.125ms)+(3x2.1ms)+(3x3.112ms)=21.261mS	77.27mS	-11.2 (*mfg. declared -6.74dB)
* These values are declared as worst case possible. Because of constantly changing code it's not possible to capture the worst case during testing.			

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	-	-	N/A	N/A	N/A

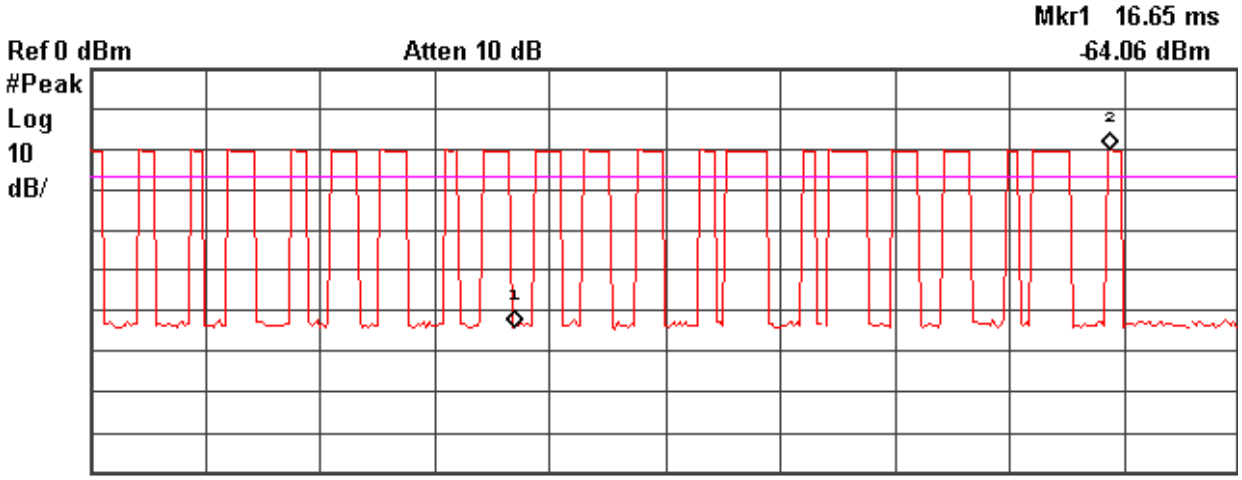
Figure 10 Pulse Train Graphs for 315MHz D code



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	3.95 ms	-63.68 dBm
1Δ	(1)	Time	550 µs	-0.577 dB
2R	(1)	Time	5.45 ms	-64.78 dBm
2Δ	(1)	Time	1.05 ms	0.434 dB
3R	(1)	Time	6.95 ms	-63.69 dBm
3Δ	(1)	Time	1.55 ms	0.938 dB

Pulse Duration mS

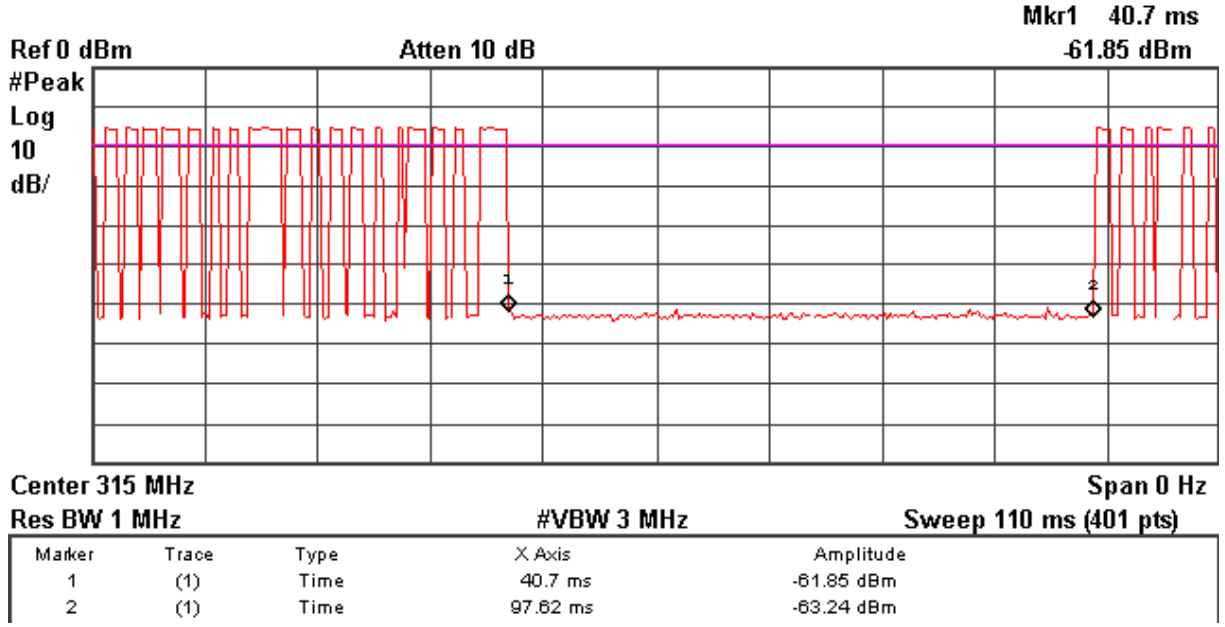
Short Pulse: 0.550ms, Medium Pulse: 1.050ms, Long Pulse: 1.550mS



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Time	16.65 ms	-64.06 dBm
2	(1)	Time	39.94 ms	-20.3 dBm

Number of Pulses

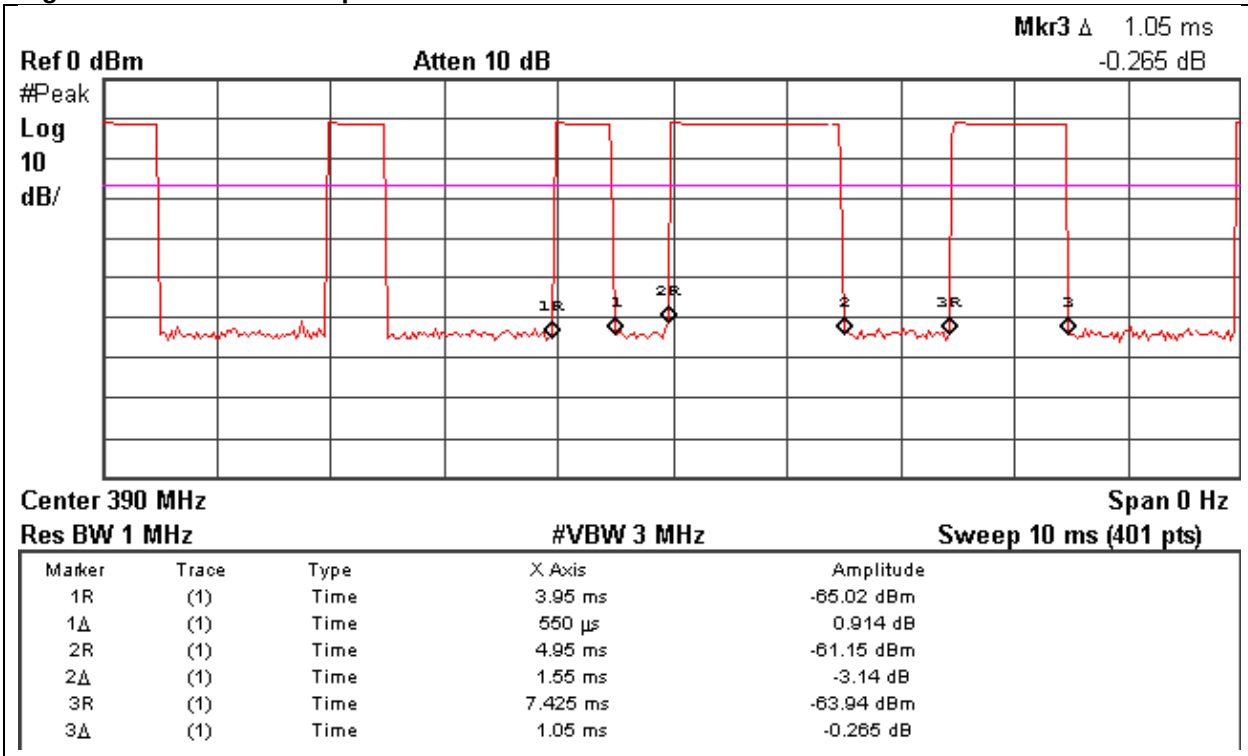
# of Short Pulses: 9, # of Medium Pulses: 9, # of Long Pulses: 3



Period

Period: 97.62ms

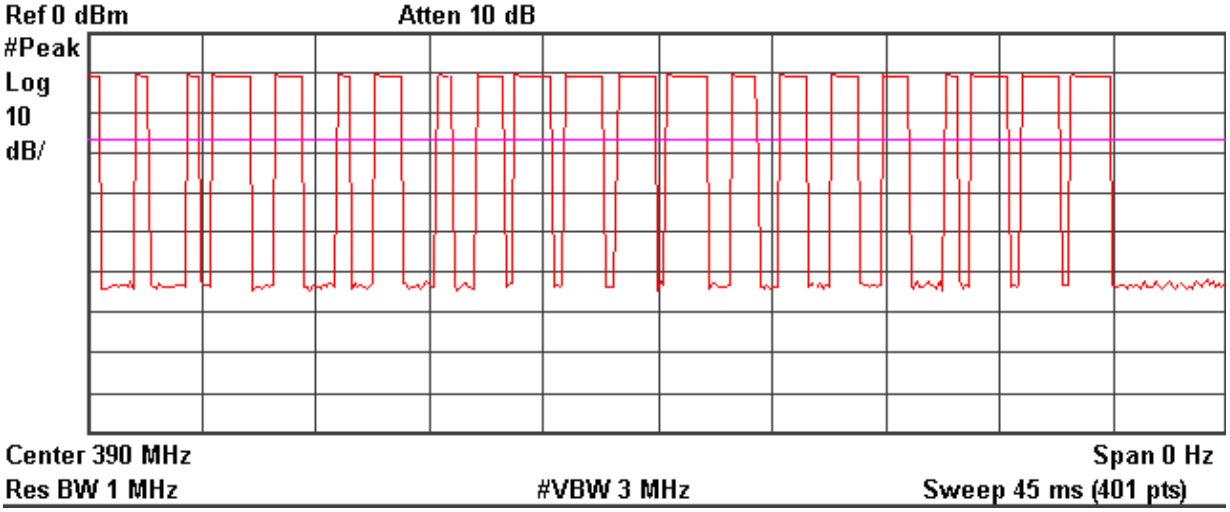
Figure 11 Pulse Train Graphs for 390MHz D code



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	3.95 ms	-65.02 dBm
1Δ	(1)	Time	550 µs	0.914 dB
2R	(1)	Time	4.95 ms	-61.15 dBm
2Δ	(1)	Time	1.55 ms	-3.14 dB
3R	(1)	Time	7.425 ms	-63.94 dBm
3Δ	(1)	Time	1.05 ms	-0.265 dB

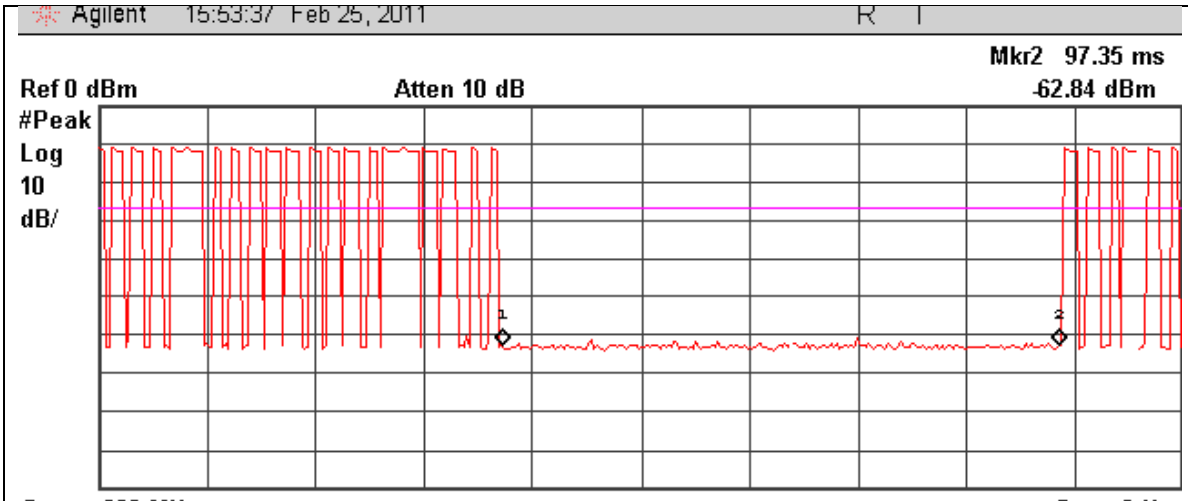
Short Pulse: 0.550mS, Medium Pulse: 1.05mS, Long Pulse 1.55mS

Pulse Duration mS



# of Short Pulses: 6, # of Medium Pulses: 7, # of Long Pulses: 8

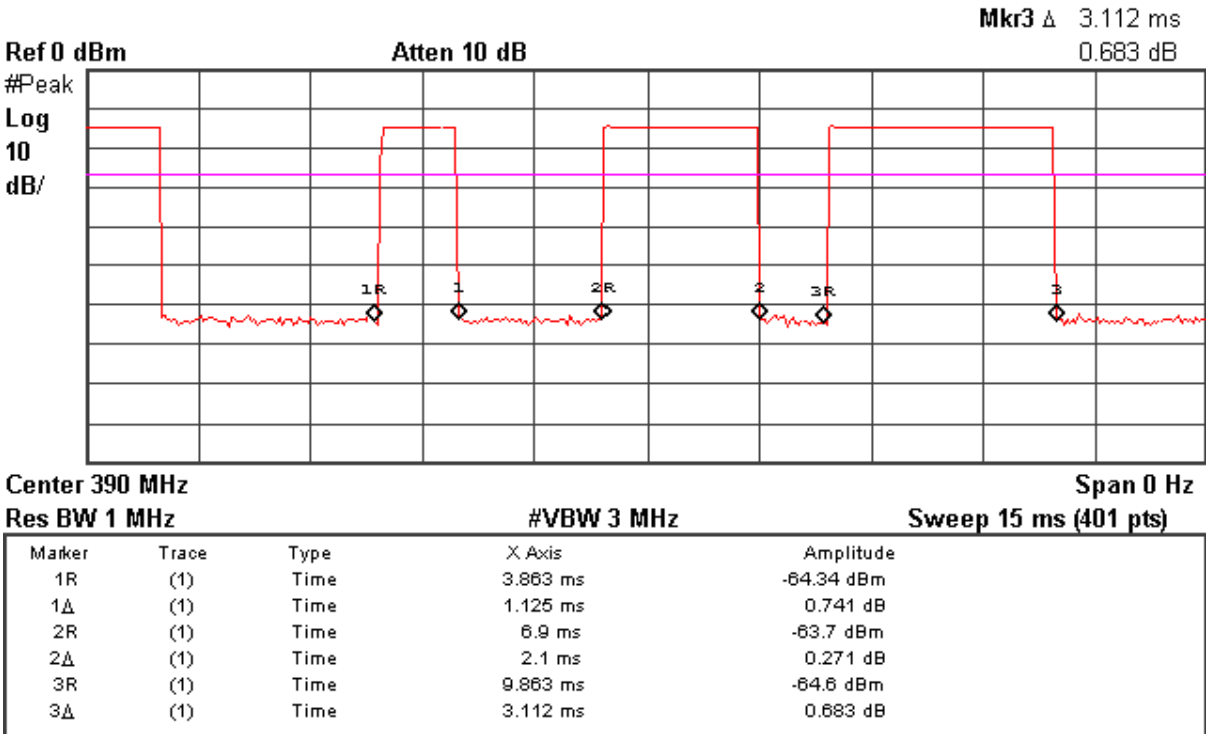
Number of Pulses



Period: 97.35mS

Period

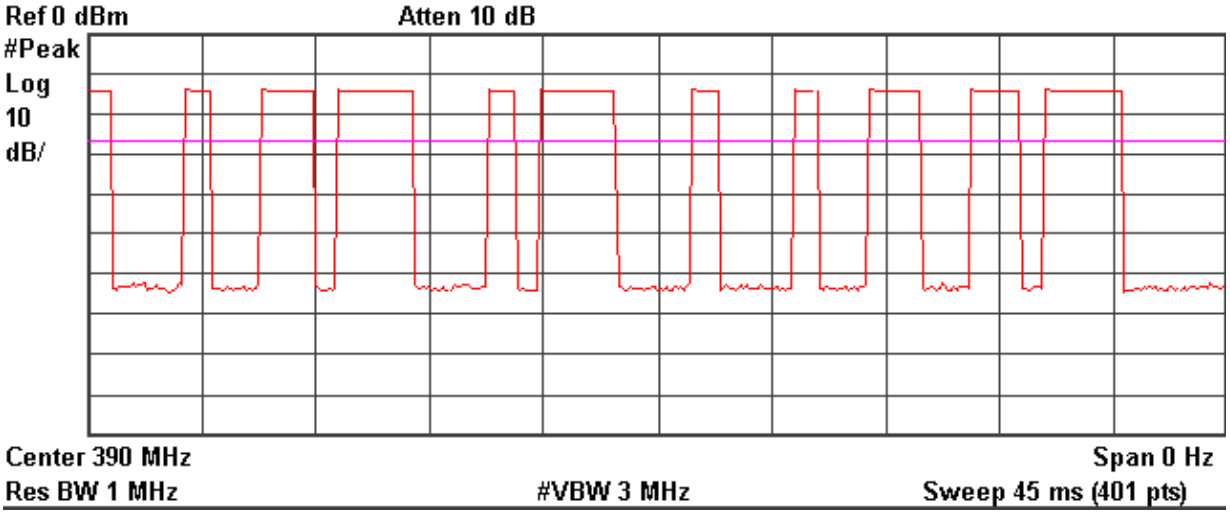
Figure 12 Pulse Train Graphs for 390MHz A code



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Time	3.863 ms	-64.34 dBm
1Δ	(1)	Time	1.125 ms	0.741 dB
2R	(1)	Time	6.9 ms	-63.7 dBm
2Δ	(1)	Time	2.1 ms	0.271 dB
3R	(1)	Time	9.863 ms	-64.6 dBm
3Δ	(1)	Time	3.112 ms	0.683 dB

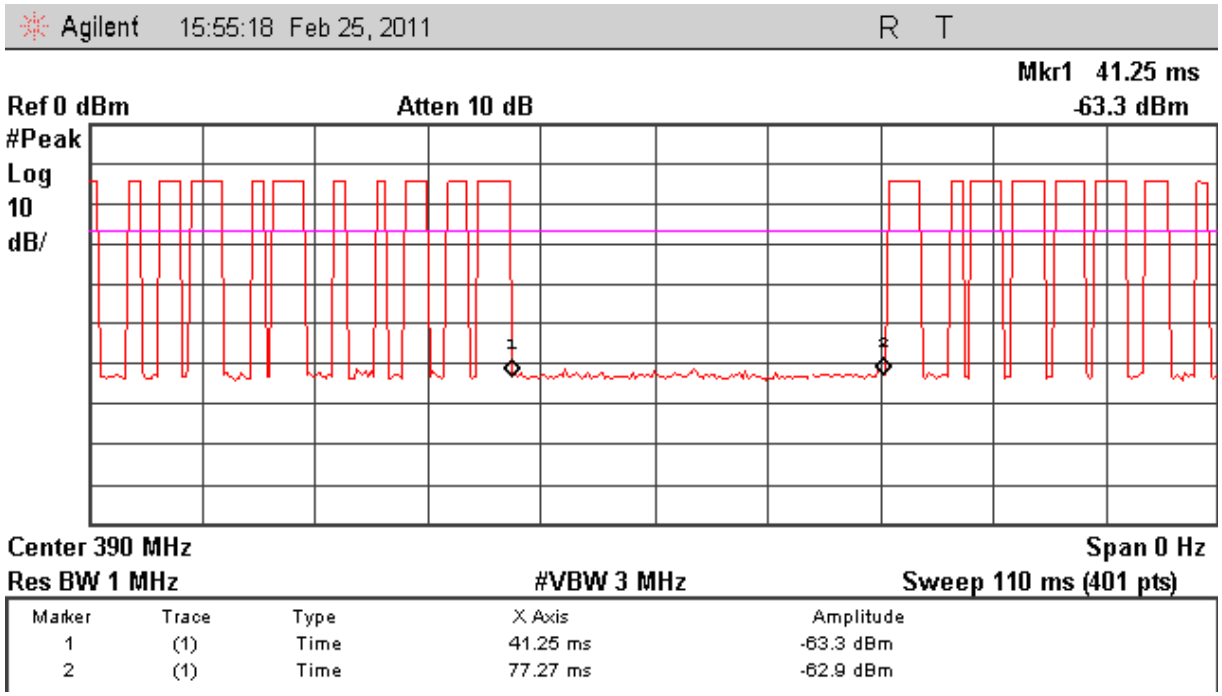
Short Pulse: 1.125mS, Medium Pulse: 2.100mS, Long Pulse 3.112mS

Pulse Duration mS



# of Short Pulses: 5, # of Medium Pulses: 3, # of Long Pulses: 3

Number of Pulses



Period

Period: 97.35mS

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	47 CFR Part 15, Subpart C	
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: No emissions were recorded below 30MHz. See section 4.3 for duty cycle information. Duty cycle used was one declared by the manufacturer (worst case possible).

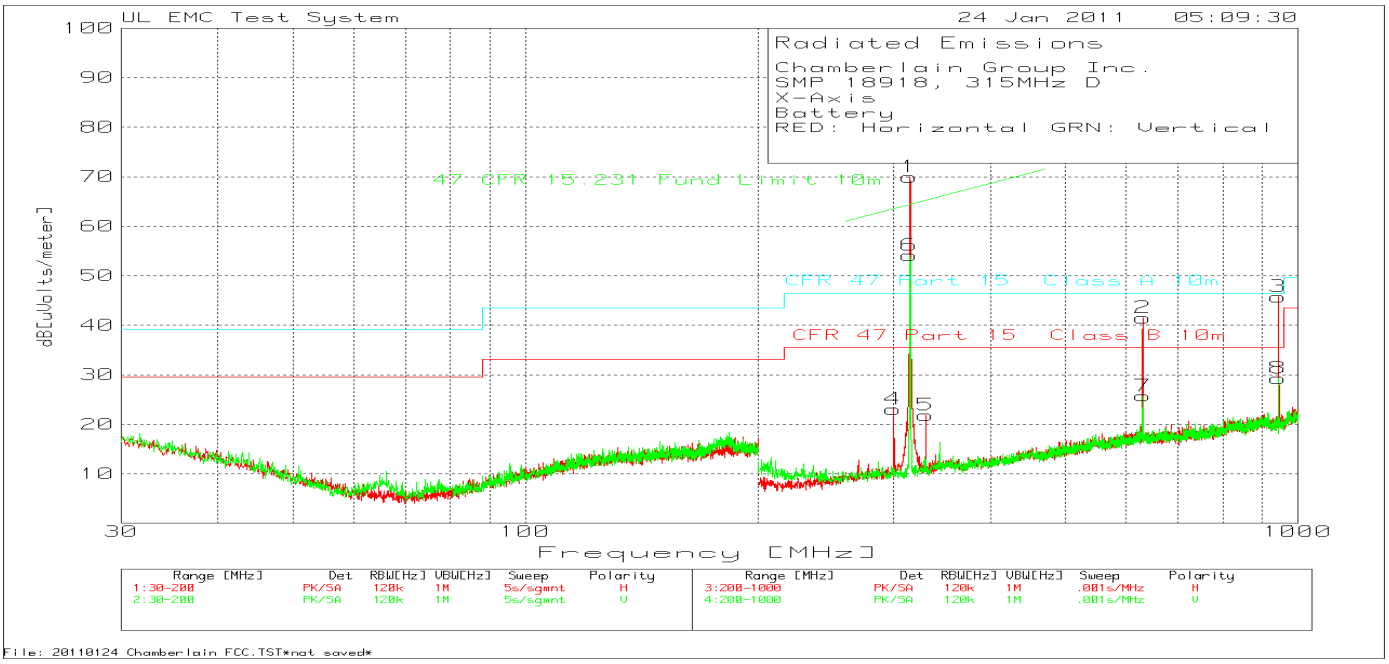
Table 10 Radiated Emissions EUT Configuration Settings

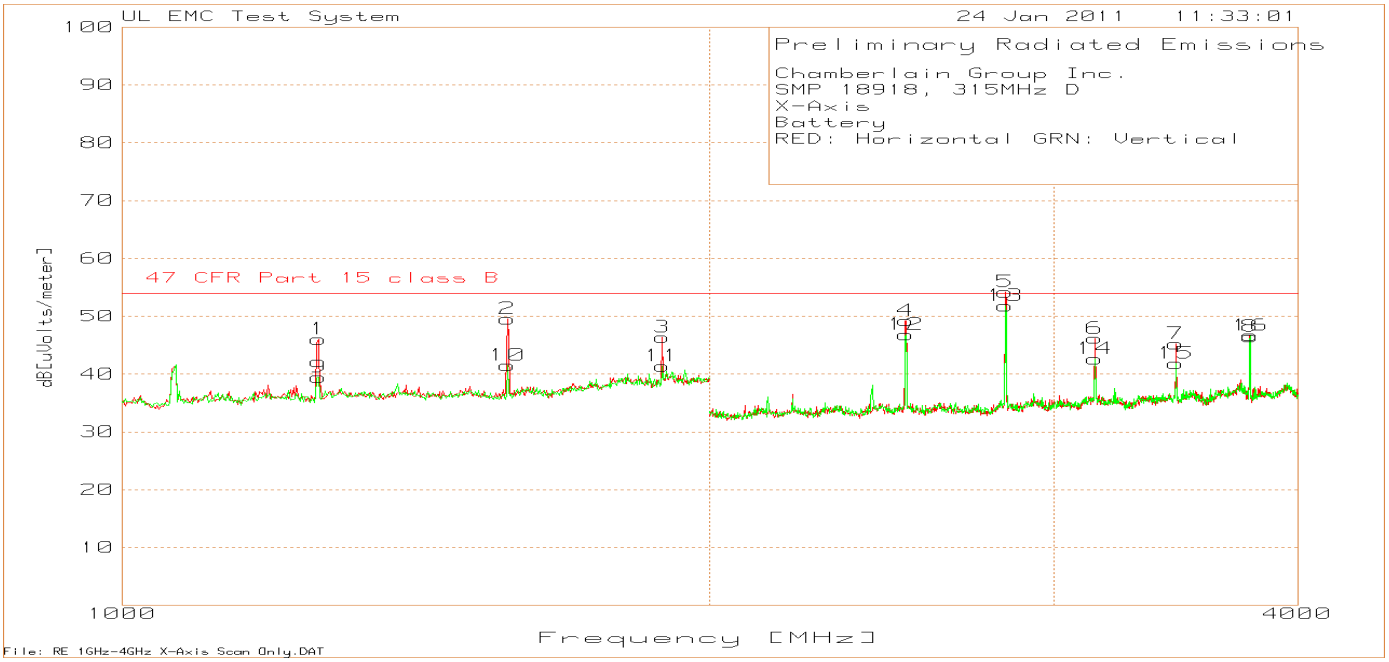
Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

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
Loop Antenna	EMCO	6502/1	EMC4026	Jan 24 2011	Jan 24 2012
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 315MHz D code





* Above plots show data for X-Axis only. All measurements were conducted at three axis. See data below

Table 12 Radiated Emissions Data Points for 315MHz D code

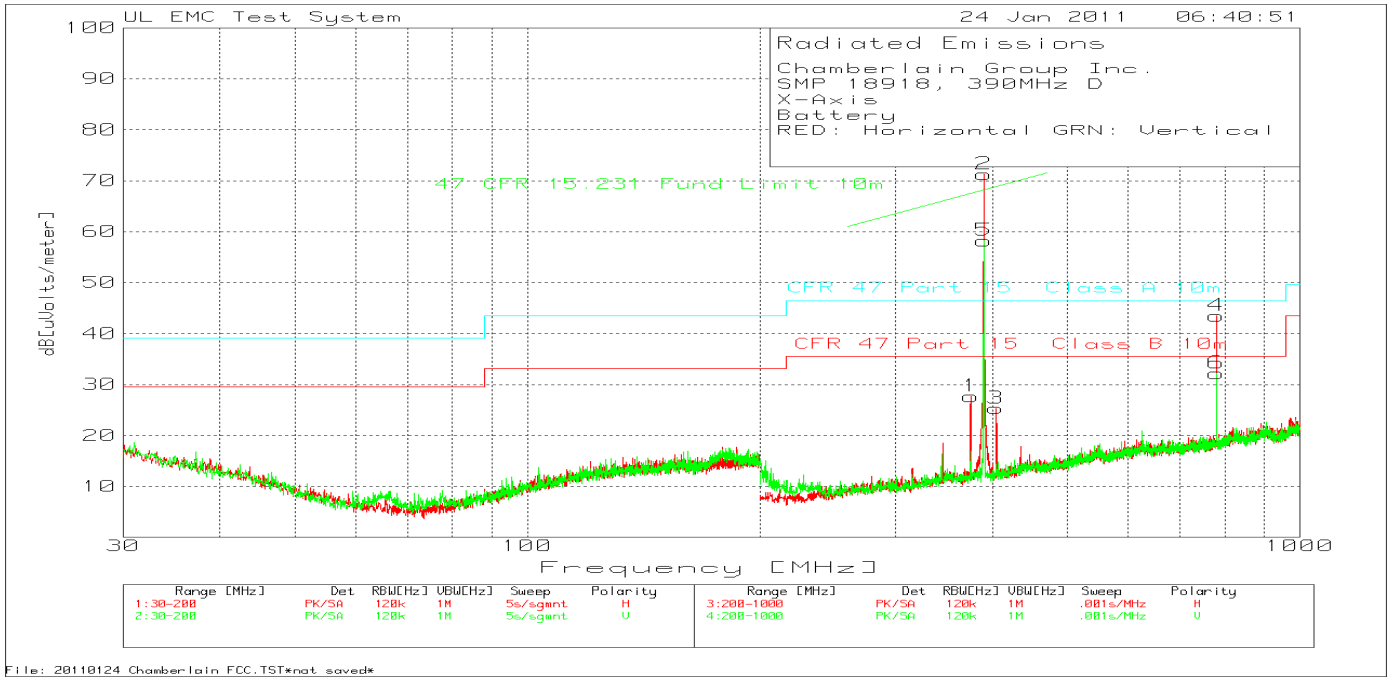
Below 1GHz Data

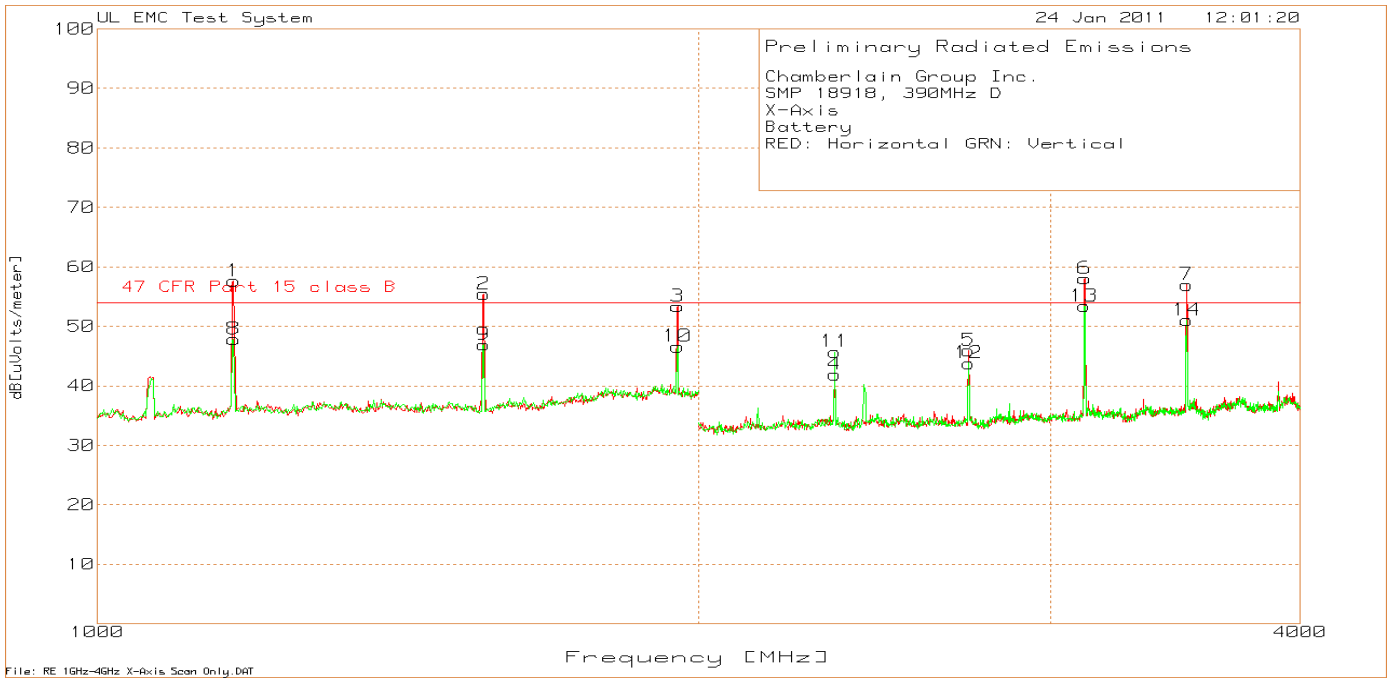
	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Los Factor [dB]	Transduce Factor [dB]	Level dB[uV/m]	Azimuth	Height	Polari	Limit dBuV/m 10m	Margin dB No Duty	Duty dB	Margin dB with Duty
X-Axis	314.9989	93.59	QP	-32.7	13.4	74.29	200	282	Horz	64.4	9.89	-10.17	-0.28
	314.9989	76.79	QP	-32.7	13.4	57.49	132	339	Vert	64.4	-6.91	-10.17	-17.08
Y-Axis	315.0013	86.28	QP	-32.7	13.4	66.98	197	264	Horz	64.4	2.58	-10.17	-7.59
	315.0013	91.88	QP	-32.7	13.4	72.58	282	100	Vert	64.4	8.18	-10.17	-1.99
Z-Axis	315.0028	83.99	QP	-32.7	13.4	64.69	20	391	Vert	64.4	0.29	-10.17	-9.88
	315.0028	92.25	QP	-32.7	13.4	72.95	275	102	Horz	64.4	8.55	-10.17	-1.62
X-Axis	630.0018	52.45	QP	-31.1	20.4	41.75	4	144	Horz	44.4	-2.65	-10.17	-12.82
	630.0018	43.63	QP	-31.1	20.4	32.93	90	397	Vert	44.4	-11.47	-10.17	-21.64
Y-Axis	630.0083	52.06	QP	-31.1	20.4	41.36	8	145	Vert	44.4	-3.04	-10.17	-13.21
	630.0083	44.54	QP	-31.1	20.4	33.84	107	105	Horz	44.4	-10.56	-10.17	-20.73
Z-Axis	630.0011	39.93	QP	-31.1	20.4	29.23	329	100	Vert	44.4	-15.17	-10.17	-25.34
	630.0011	51.37	QP	-31.1	20.4	40.67	89	275	Horz	44.4	-3.73	-10.17	-13.9
X-Axis	945.0025	54.11	QP	-31.5	22.8	45.41	174	102	Horz	44.4	1.01	-10.17	-9.16
	945.0025	42.6	QP	-31.5	22.8	33.9	285	288	Vert	44.4	-10.5	-10.17	-20.67
Y-Axis	945.0034	45.58	QP	-31.5	22.8	36.88	297	100	Horz	44.4	-7.52	-10.17	-17.69
	945.0034	45.58	QP	-31.5	22.8	36.88	297	349	Vert	44.4	-7.52	-10.17	-17.69
Z-Axis	944.999	44.29	QP	-31.5	22.8	35.59	211	116	Horz	44.4	-8.81	-10.17	-18.98
	944.999	54.45	QP	-31.5	22.8	45.75	243	172	Vert	44.4	1.35	-10.17	-8.82

Above 1GHz Data

X-Axis	Test Frequency [MHz]	Meter Reading [dBuV]	Detector Type	Gain/Los Factor [dB]	Transducer Factor [dB]	Level dB[uV/m]	Height[cm]	Polarity	Limit dBuV/m	Margin dB No Duty Cycle	DC Factor dB	Margin dB with Duty Cycle
	1260.521	76.95	PK	-55.8	24.9	46.05	149	Horz	54	-7.95	-10.17	-18.12
	1575.15	79.22	PK	-54.64	25	49.58	149	Horz	54	-4.42	-10.17	-14.59
	1891.784	72.03	PK	-53.17	27.5	46.36	100	Horz	54	-7.64	-10.17	-17.81
	2520.521	78.14	PK	-50.97	22.1	49.27	149	Horz	54	-4.73	-10.17	-14.9
	2834.835	81.82	PK	-49.95	22.3	54.17	149	Horz	54	0.17	-10.17	-10
	3151.151	73.42	PK	-50.11	22.9	46.21	149	Horz	54	-7.79	-10.17	-17.96
	3465.465	71.99	PK	-50.29	23.5	45.2	100	Horz	54	-8.8	-10.17	-18.97
	3781.782	73.62	PK	-51.15	24	46.47	149	Horz	54	-7.53	-10.17	-17.7
	1260.521	70.32	PK	-55.8	24.9	39.42	100	Vert	54	-14.58	-10.17	-24.75
	1575.15	71.2	PK	-54.64	25	41.56	150	Vert	54	-12.44	-10.17	-22.61
	1891.784	67.05	PK	-53.17	27.5	41.38	100	Vert	54	-12.62	-10.17	-22.79
	2520.521	75.7	PK	-50.97	22.1	46.83	100	Vert	54	-7.17	-10.17	-17.34
	2834.835	79.44	PK	-49.95	22.3	51.79	149	Vert	54	-2.21	-10.17	-12.38
	3151.151	69.85	PK	-50.11	22.9	42.64	149	Vert	54	-11.36	-10.17	-21.53
	3465.465	68.65	PK	-50.29	23.5	41.86	149	Vert	54	-12.14	-10.17	-22.31
	3781.782	73.82	PK	-51.15	24	46.67	149	Vert	54	-7.33	-10.17	-17.5
Y-Axis												
	1260.521	70.02	PK	-55.8	24.9	39.12	100	Horz	54	-14.88	-10.17	-25.05
	1575.15	75.78	PK	-54.64	25	46.14	150	Horz	54	-7.86	-10.17	-18.03
	1891.784	67.7	PK	-53.17	27.5	42.03	100	Horz	54	-11.97	-10.17	-22.14
	2520.521	72.06	PK	-50.97	22.1	43.19	100	Horz	54	-10.81	-10.17	-20.98
	2834.835	78.09	PK	-49.95	22.3	50.44	150	Horz	54	-3.56	-10.17	-13.73
	3151.151	70.08	PK	-50.11	22.9	42.87	100	Horz	54	-11.13	-10.17	-21.3
	3465.465	68.18	PK	-50.29	23.5	41.39	100	Horz	54	-12.61	-10.17	-22.78
	3781.782	71.94	PK	-51.15	24	44.79	150	Horz	54	-9.21	-10.17	-19.38
	1258.517	70.79	PK	-55.82	24.9	39.87	150	Vert	54	-14.13	-10.17	-24.3
	1575.15	69.94	PK	-54.64	25	40.3	100	Vert	54	-13.7	-10.17	-23.87
	1889.78	66.13	PK	-53.26	27.5	40.37	150	Vert	54	-13.63	-10.17	-23.8
	2518.519	67.16	PK	-51	22.1	38.26	100	Vert	54	-15.74	-10.17	-25.91
	2834.835	74.62	PK	-49.95	22.3	46.97	150	Vert	54	-7.03	-10.17	-17.2
	3149.149	66.36	PK	-50.07	22.9	39.19	150	Vert	54	-14.81	-10.17	-24.98
	3465.465	63.15	PK	-50.29	23.5	36.36	100	Vert	54	-17.64	-10.17	-27.81
	3781.782	66.09	PK	-51.15	24	38.94	150	Vert	54	-15.06	-10.17	-25.23
Z-Axis												
	1260.521	67.78	PK	-55.8	24.9	36.88	150	Horz	54	-17.12	-10.17	-27.29
	1575.15	68.3	PK	-54.64	25	38.66	100	Horz	54	-15.34	-10.17	-25.51
	1891.784	66.51	PK	-53.17	27.5	40.84	150	Horz	54	-13.16	-10.17	-23.33
	2518.519	67.78	PK	-51	22.1	38.88	150	Horz	54	-15.12	-10.17	-25.29
	2834.835	75.26	PK	-49.95	22.3	47.61	150	Horz	54	-6.39	-10.17	-16.56
	3151.151	64.68	PK	-50.11	22.9	37.47	150	Horz	54	-16.53	-10.17	-26.7
	3465.465	63.95	PK	-50.29	23.5	37.16	150	Horz	54	-16.84	-10.17	-27.01
	3781.782	65.96	PK	-51.15	24	38.81	100	Horz	54	-15.19	-10.17	-25.36
	1260.521	73.83	PK	-55.8	24.9	42.93	149	Vert	54	-11.07	-10.17	-21.24
	1575.15	75.1	PK	-54.64	25	45.46	100	Vert	54	-8.54	-10.17	-18.71
	1891.784	68.27	PK	-53.17	27.5	42.6	149	Vert	54	-11.4	-10.17	-21.57
	2520.521	71.21	PK	-50.97	22.1	42.34	100	Vert	54	-11.66	-10.17	-21.83
	2834.835	77.05	PK	-49.95	22.3	49.4	150	Vert	54	-4.6	-10.17	-14.77
	3151.151	69.46	PK	-50.11	22.9	42.25	100	Vert	54	-11.75	-10.17	-21.92
	3465.465	67.56	PK	-50.29	23.5	40.77	100	Vert	54	-13.23	-10.17	-23.4
	3779.78	66.39	PK	-51.13	24	39.26	150	Vert	54	-14.74	-10.17	-24.91

Figure 14 Radiated Emissions Graphs for 390MHz D code





* Above plots show data for X-Axis only. All measurements were conducted at three axis. See data below

Table 13 Radiated Emissions Data Points for 390MHz D code

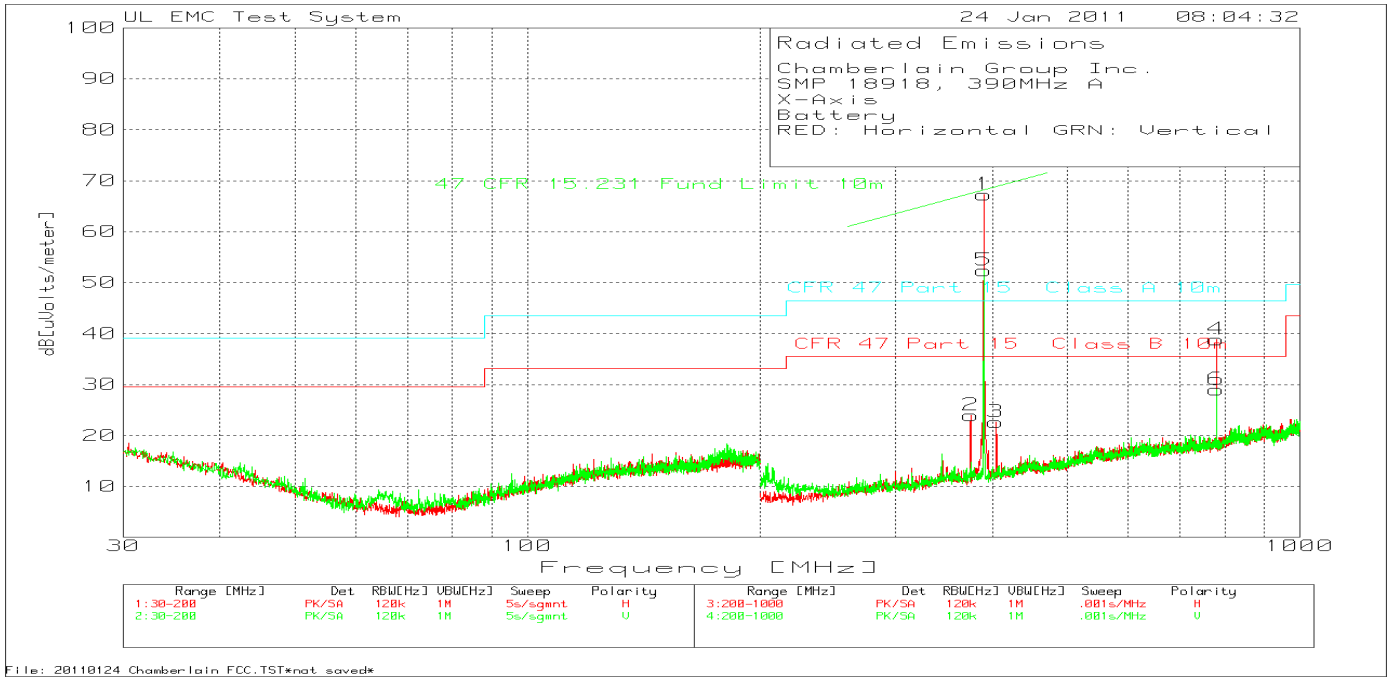
Below 1GHz

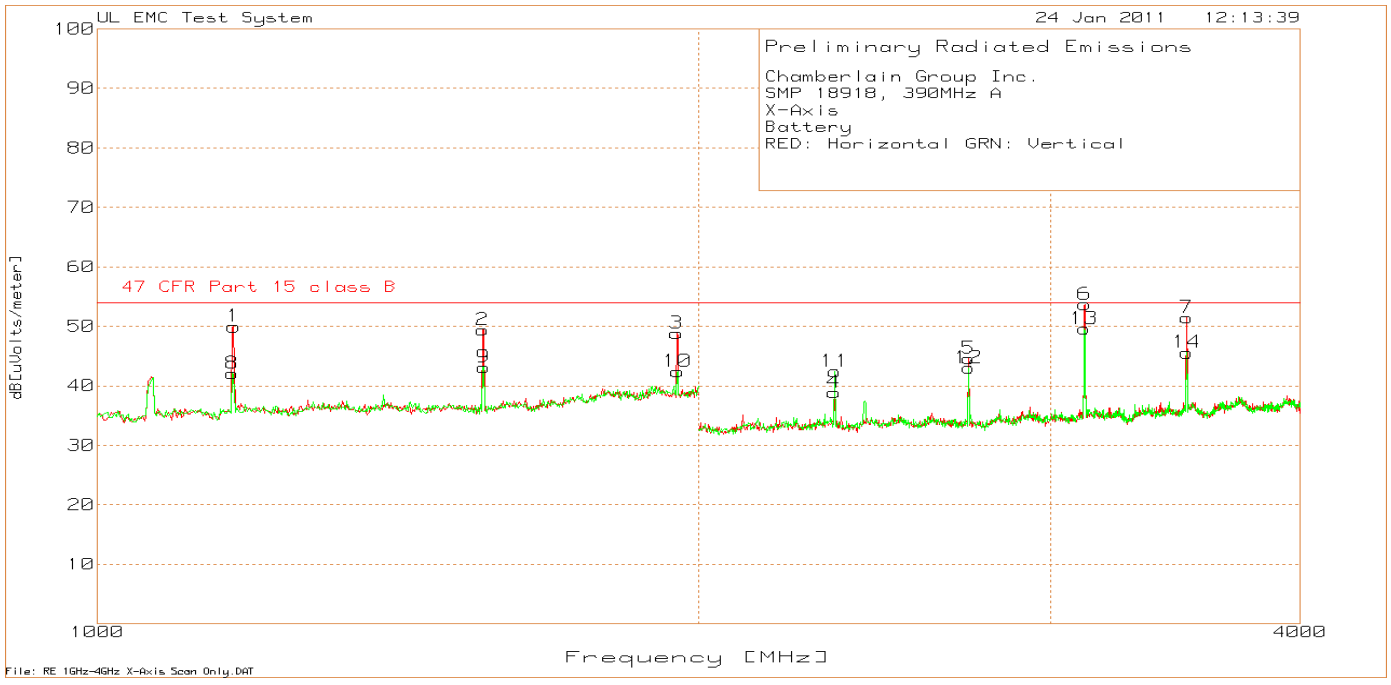
	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBuV/m	Azimuth [deg]	Height [cm]	Polarity	Limit dBuV/m	Margin dB No Duty Cycle	Duty Cycle dB	Margin dB with Duty Cycle
X-Axis	390.001	91.16	QP	-32.1	15.3	74.36	191	221	Horz	68.2	6.16	-10.17	-4.01
	390.001	78.18	QP	-32.1	15.3	61.38	302	339	Vert	68.2	-6.82	-10.17	-16.99
Y-Axis	389.999	83.96	QP	-32.1	15.3	67.16	182	195	Horz	68.2	-1.04	-10.17	-11.21
	389.999	87.69	QP	-32.1	15.3	70.89	106	104	Vert	68.2	2.69	-10.17	-7.48
Z-Axis	390.0028	81.79	QP	-32.1	15.3	64.99	191	185	Horz	68.2	-3.21	-10.17	-13.38
	390.0028	88.12	QP	-32.1	15.3	71.32	109	105	Vert	68.2	3.12	-10.17	-7.05
X-Axis	780	52.94	QP	-31.5	21.4	42.84	257	319	Horz	48.2	-5.36	-10.17	-15.53
	780	51.83	QP	-31.5	21.4	41.73	8	260	Vert	48.2	-6.47	-10.17	-16.64
Y-Axis	780.0035	56.48	QP	-31.5	21.4	46.38	52	106	Horz	48.2	-1.82	-10.17	-11.99
	780.0035	47.93	QP	-31.5	21.4	37.83	104	151	Vert	48.2	-10.37	-10.17	-20.54
Z-Axis	780.0065	55.3	QP	-31.5	21.4	45.2	206	105	Horz	48.2	-3	-10.17	-13.17
	780.0065	54.63	QP	-31.5	21.4	44.53	351	219	Vert	48.2	-3.67	-10.17	-13.84

Above 1GHz

	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin	DC Correction	Margin with DC	Height	Polarity
	Frequency	Reading	Type	Factor	Factor	dBuV/m		dB	dB	dB	cm	
	[MHz]	[dB(uV)]		[dB]	[dB]							
X-Axis	1170.341	89.13	PK	-56.07	24.6	57.66	54	3.66	-10.17	-6.51	150	Horz
	1561.122	85.35	PK	-54.92	25	55.43	54	1.43	-10.17	-8.74	150	Horz
	1951.904	79.33	PK	-53.49	27.5	53.34	54	-0.66	-10.17	-10.83	150	Horz
	2340.34	71.29	PK	-51.08	21.7	41.91	54	-12.09	-10.17	-22.26	150	Horz
	2728.729	74.32	PK	-50.46	22.1	45.96	54	-8.04	-10.17	-18.21	100	Horz
	3121.121	85.12	PK	-49.8	22.7	58.02	54	4.02	-10.17	-6.15	150	Horz
	3511.512	82.82	PK	-49.34	23.5	56.98	54	2.98	-10.17	-7.19	150	Horz
	1170.341	79.3	PK	-56.07	24.6	47.83	54	-6.17	-10.17	-16.34	149	Vert
	1561.122	76.85	PK	-54.92	25	46.93	54	-7.07	-10.17	-17.24	100	Vert
	1951.904	72.59	PK	-53.49	27.5	46.6	54	-7.4	-10.17	-17.57	149	Vert
	2340.34	75.08	PK	-51.08	21.7	45.7	54	-8.3	-10.17	-18.47	100	Vert
	2730.731	72.15	PK	-50.45	22.1	43.8	54	-10.2	-10.17	-20.37	150	Vert
	3119.119	80.5	PK	-49.79	22.7	53.41	54	-0.59	-10.17	-10.76	150	Vert
	3511.512	76.88	PK	-49.34	23.5	51.04	54	-2.96	-10.17	-13.13	150	Vert
Y-Axis												
	1170.341	86.08	PK	-56.07	24.6	54.61	54	0.61	-10.17	-9.56	150	Horz
	1561.122	84.44	PK	-54.92	25	54.52	54	0.52	-10.17	-9.65	150	Horz
	1949.9	77.69	PK	-53.45	27.5	51.74	54	-2.26	-10.17	-12.43	150	Horz
	2340.34	71.11	PK	-51.08	21.7	41.73	54	-12.27	-10.17	-22.44	100	Horz
	2730.731	75.44	PK	-50.45	22.1	47.09	54	-6.91	-10.17	-17.08	150	Horz
	3121.121	85.41	PK	-49.8	22.7	58.31	54	4.31	-10.17	-5.86	150	Horz
	3511.512	82.41	PK	-49.34	23.5	56.57	54	2.57	-10.17	-7.6	150	Horz
	1170.341	79.15	PK	-56.07	24.6	47.68	54	-6.32	-10.17	-16.49	100	Vert
	1561.122	77.34	PK	-54.92	25	47.42	54	-6.58	-10.17	-16.75	100	Vert
	1949.9	73.82	PK	-53.45	27.5	47.87	54	-6.13	-10.17	-16.3	149	Vert
	2340.34	73.25	PK	-51.08	21.7	43.87	54	-10.13	-10.17	-20.3	100	Vert
	2728.729	74.22	PK	-50.46	22.1	45.86	54	-8.14	-10.17	-18.31	100	Vert
	3121.121	78.48	PK	-49.8	22.7	51.38	54	-2.62	-10.17	-12.79	100	Vert
	3511.512	73.81	PK	-49.34	23.5	47.97	54	-6.03	-10.17	-16.2	100	Vert
Z-Axis												
	1170.341	75.35	PK	-56.07	24.6	43.88	54	-10.12	-10.17	-20.29	150	Horz
	1561.122	76.59	PK	-54.92	25	46.67	54	-7.33	-10.17	-17.5	150	Horz
	1951.904	73.45	PK	-53.49	27.5	47.46	54	-6.54	-10.17	-16.71	150	Horz
	2340.34	71.31	PK	-51.08	21.7	41.93	54	-12.07	-10.17	-22.24	100	Horz
	2728.729	70.57	PK	-50.46	22.1	42.21	54	-11.79	-10.17	-21.96	100	Horz
	3121.121	79.69	PK	-49.8	22.7	52.59	54	-1.41	-10.17	-11.58	150	Horz
	3509.51	72.48	PK	-49.41	23.5	46.57	54	-7.43	-10.17	-17.6	150	Horz
	1170.341	85.62	PK	-56.07	24.6	54.15	54	0.15	-10.17	-10.02	100	Vert
	1561.122	82.47	PK	-54.92	25	52.55	54	-1.45	-10.17	-11.62	150	Vert
	1951.904	77.12	PK	-53.49	27.5	51.13	54	-2.87	-10.17	-13.04	150	Vert
	2340.34	70.72	PK	-51.08	21.7	41.34	54	-12.66	-10.17	-22.83	100	Vert
	2728.729	71.23	PK	-50.46	22.1	42.87	54	-11.13	-10.17	-21.3	100	Vert
	3121.121	82.71	PK	-49.8	22.7	55.61	54	1.61	-10.17	-8.56	150	Vert
	3511.512	78.92	PK	-49.34	23.5	53.08	54	-0.92	-10.17	-11.09	150	Vert

Figure 15 Radiated Emissions Graphs for 390MHz A code





* Above plots show data for X-Axis only. All measurements were conducted at three axis. See data below

Table 14 Radiated Emissions Data Points for 390MHz A code

Below 1GHz Data

	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBuV/m	Azimuth deg	Height cm	Polarity	Limit dBuV/m	Margin dB No Duty Cycle	Duty Cycle dB	Margin dB with Duty Cycle
X-Axis	390.0028	86.76	QP	-32.1	15.3	69.96	186	221	Horz	68.2	1.76	-6.74	-4.98
	390.0028	72.24	QP	-32.1	15.3	55.44	309	332	Vert	68.2	-12.76	-6.74	-19.5
Y-Axis	390.0026	79.15	QP	-32.1	15.3	62.35	4	191	Horz	68.2	-5.85	-6.74	-12.59
	390.0026	80.07	QP	-32.1	15.3	63.27	116	109	Vert	68.2	-4.93	-6.74	-11.67
Z-Axis	390.0013	78.51	QP	-32.1	15.3	61.71	19	353	Horz	68.2	-6.49	-6.74	-13.23
	390.0013	83.72	QP	-32.1	15.3	66.92	101	400	Vert	68.2	-1.28	-6.74	-8.02
X-Axis	780.004	48.52	QP	-31.5	21.4	38.42	272	324	Horz	48.2	-9.78	-6.74	-16.52
	780.004	50.68	QP	-31.5	21.4	40.58	329	209	Vert	48.2	-7.62	-6.74	-14.36
Y-Axis	779.9998	50.72	QP	-31.5	21.4	40.62	186	112	Horz	48.2	-7.58	-6.74	-14.32
	889.9998	41.86	QP	-31.5	21.4	31.76	293	191	Vert	48.2	-16.44	-6.74	-23.18
Z-Axis	780.0028	41.88	QP	-31.5	21.4	31.78	97	100	Horz	48.2	-16.42	-6.74	-23.16
	780.0028	50.28	QP	-31.5	21.4	40.18	50	208	Vert	48.2	-8.02	-6.74	-14.76

Above 1GHz Data

	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uV/m]	Limit 1	Margin dB	DutyCycle Factor dB	Margin with DC dB	Height cm	Polarity
X-Axis	1170.341	81.42	PK	-56.07	24.6	49.95	54	-4.05	-6.74	-10.79	150	Horz
	1559.118	79.37	PK	-54.98	25	49.39	54	-4.61	-6.74	-11.35	150	Horz
	1949.9	74.78	PK	-53.45	27.5	48.83	54	-5.17	-6.74	-11.91	150	Horz
	2338.338	68.22	PK	-51.04	21.7	38.88	54	-15.12	-6.74	-21.86	100	Horz
	2730.731	72.93	PK	-50.45	22.1	44.58	54	-9.42	-6.74	-16.16	150	Horz
	3121.121	80.8	PK	-49.8	22.7	53.7	54	-0.3	-6.74	-7.04	150	Horz
	3511.512	77.29	PK	-49.34	23.5	51.45	54	-2.55	-6.74	-9.29	150	Horz
	1168.337	73.68	PK	-56.1	24.5	42.08	54	-11.92	-6.74	-18.66	150	Vert
	1561.122	73.05	PK	-54.92	25	43.13	54	-10.87	-6.74	-17.61	100	Vert
	1951.904	68.38	PK	-53.49	27.5	42.39	54	-11.61	-6.74	-18.35	150	Vert
	2340.34	71.81	PK	-51.08	21.7	42.43	54	-11.57	-6.74	-18.31	102	Vert
	2730.731	71.39	PK	-50.45	22.1	43.04	54	-10.96	-6.74	-17.7	102	Vert
	3119.119	76.71	PK	-49.79	22.7	49.62	54	-4.38	-6.74	-11.12	149	Vert
	3511.512	71.4	PK	-49.34	23.5	45.56	54	-8.44	-6.74	-15.18	149	Vert
Y-Axis												
	1168.337	76.93	PK	-56.1	24.5	45.33	54	-8.67	-6.74	-15.41	150	Horz
	1561.122	78.96	PK	-54.92	25	49.04	54	-4.96	-6.74	-11.7	150	Horz
	1951.904	73.07	PK	-53.49	27.5	47.08	54	-6.92	-6.74	-13.66	150	Horz
	2140.14	64.73	PK	-51.99	21.6	34.34	54	-19.66	-6.74	-26.4	100	Horz
	2430.43	62.8	PK	-50.44	21.9	34.26	54	-19.74	-6.74	-26.48	150	Horz
	2730.731	68.21	PK	-50.45	22.1	39.86	54	-14.14	-6.74	-20.88	100	Horz
	3117.117	78.74	PK	-49.77	22.7	51.67	54	-2.33	-6.74	-9.07	100	Horz
	3511.512	77.18	PK	-49.34	23.5	51.34	54	-2.66	-6.74	-9.4	100	Horz
	1170.341	67.41	PK	-56.07	24.6	35.94	54	-18.06	-6.74	-24.8	100	Vert
	1561.122	73.1	PK	-54.92	25	43.18	54	-10.82	-6.74	-17.56	150	Vert
	1951.904	67.37	PK	-53.49	27.5	41.38	54	-12.62	-6.74	-19.36	150	Vert
	2140.14	66.82	PK	-51.99	21.6	36.43	54	-17.57	-6.74	-24.31	150	Vert
	2422.422	66.5	PK	-50.49	21.9	37.91	54	-16.09	-6.74	-22.83	150	Vert
	2730.731	65.65	PK	-50.45	22.1	37.3	54	-16.7	-6.74	-23.44	150	Vert
	3121.121	71.57	PK	-49.8	22.7	44.47	54	-9.53	-6.74	-16.27	100	Vert
	3511.512	65.46	PK	-49.34	23.5	39.62	54	-14.38	-6.74	-21.12	100	Vert
Z-Axis												
	1168.337	67.78	PK	-56.1	24.5	36.18	54	-17.82	-6.74	-24.56	100	Horz
	1559.118	72.33	PK	-54.98	25	42.35	54	-11.65	-6.74	-18.39	100	Horz
	1951.904	70.36	PK	-53.49	27.5	44.37	54	-9.63	-6.74	-16.37	150	Horz
	2340.34	68.92	PK	-51.08	21.7	39.54	54	-14.46	-6.74	-21.2	150	Horz
	2728.729	71.76	PK	-50.46	22.1	43.4	54	-10.6	-6.74	-17.34	150	Horz
	3121.121	70.72	PK	-49.8	22.7	43.62	54	-10.38	-6.74	-17.12	150	Horz
	3509.51	66.9	PK	-49.41	23.5	40.99	54	-13.01	-6.74	-19.75	150	Horz
	1170.341	79.52	PK	-56.07	24.6	48.05	54	-5.95	-6.74	-12.69	100	Vert
	1561.122	77.14	PK	-54.92	25	47.22	54	-6.78	-6.74	-13.52	150	Vert
	1949.9	73.05	PK	-53.45	27.5	47.1	54	-6.9	-6.74	-13.64	150	Vert
	2338.338	65.77	PK	-51.04	21.7	36.43	54	-17.57	-6.74	-24.31	149	Vert
	2728.729	70.66	PK	-50.46	22.1	42.3	54	-11.7	-6.74	-18.44	149	Vert
	3119.119	75.22	PK	-49.79	22.7	48.13	54	-5.87	-6.74	-12.61	100	Vert
	3511.512	74.56	PK	-49.34	23.5	48.72	54	-5.28	-6.74	-12.02	100	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

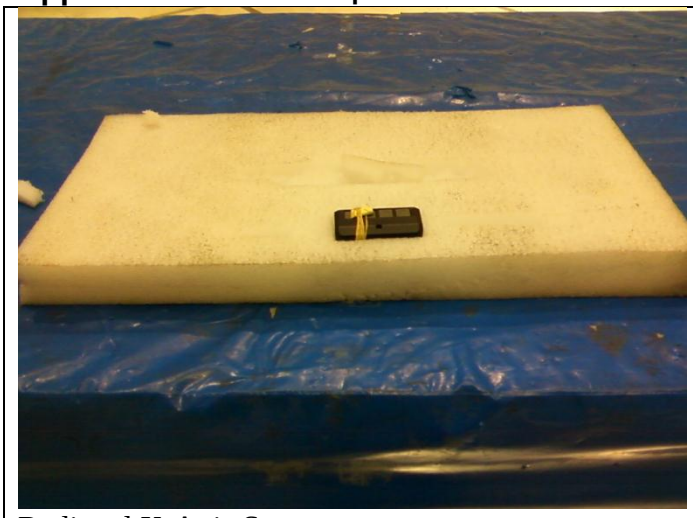
Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180

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).

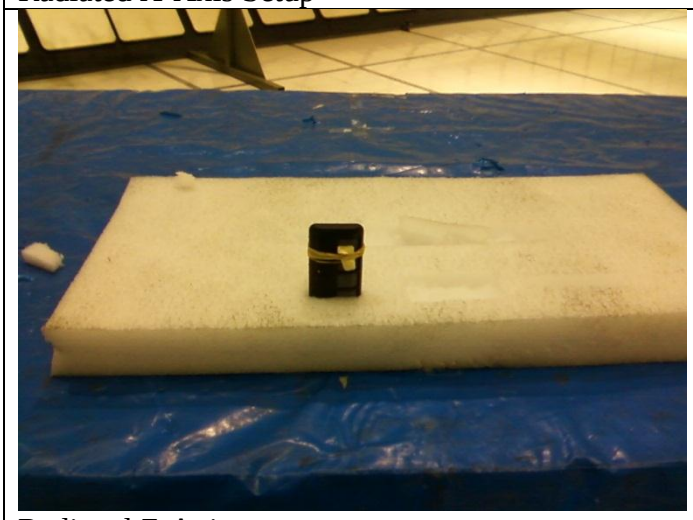
NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, 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

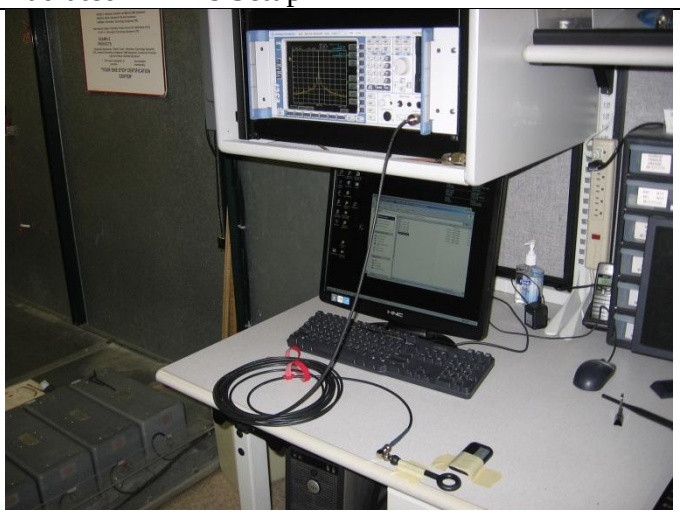


Radiated X-Axis Setup

Radiated Y-Axis Setup



Radiated Z-Axis



BW & DC Test Setup

All test setup photos are typical configuration and migh notreflect actual sample tested.