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SR9223986

Order Number: 10000640
File Number: MC15343
Date: November 8, 2012 Rev.1
Model: 1D7964

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

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Order #: 10000640 SR9223986 Rev.1
Model Number: 1D7964
Client Name: Chamberlain Group Inc.

File #: MC15343 Page 2 of 70

Test Report Details

Tests Performed By: **UL LLC**
333 Pfingsten Rd.
Northbrook, IL 60062

Tests Performed For: **Chamberlain Group Inc.**
845 Larch Av
Elmhurst, IL 60126

Applicant Contact: **Hank Sieradzki**
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Test Report Date: **November 8, 2012 Rev.1**

Product Type: **Universal Periodic Transmitter**

Product standards **FCC Part 15, Subpart C, 15.231 & RSS-210**

Model Number: **1D7964**

EUT Category: **Wireless Device**

Testing Start Date: **November 5, 2012**

Date Testing Complete: **November 8, 2012**

Overall Results: **Compliant**

UL LLC 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. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. 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.

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.

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
Rev.1 2012/12/03	Change to radiated emissions data, added peak limit and margin.	BM	MF

1.0 GENERAL - Product Description

1.1 Equipment Description

The equipment under test is a universal 1D7964 (visor) mount push button transmitter used with various brand garage door operators. The transmitter uses 310MHz, 315MHz, and 390MHz. It is user programmable for use with specific garage door operators.

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.	1D7964	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	3	-	-	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 per specific configuration

1.5 Rational for EUT Configuration

Mode #	Description										
1	Below is a list of possible configurations. Configurations that were not tested (configuration 2) had same power amplifier setting, same frequency and same duty cycle number as the ones above.										
	<table border="1"> <thead> <tr> <th>CONFIG#</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>310MHz, 315MHz, 390MHz</td> </tr> <tr> <td>3</td> <td>315MHz</td> </tr> <tr> <td>4</td> <td>390MHz</td> </tr> <tr> <td>5</td> <td>390MHz</td> </tr> </tbody> </table>	CONFIG#	Frequency	1	310MHz, 315MHz, 390MHz	3	315MHz	4	390MHz	5	390MHz
CONFIG#	Frequency										
1	310MHz, 315MHz, 390MHz										
3	315MHz										
4	390MHz										
5	390MHz										

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL LLC 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	2012
RSS-210	License - exempt Radio Apparatus (All Frequency Bands): Category I Equipment	Issue 8

2.4 Results Summary

Requirement – Test	Result (Compliant / Non-Compliant)*
Line Conducted Emissions	N/A – EUT is battery operated only
Occupied Bandwidth	Compliant
Cease Operation	Compliant
Pulse Train and Duty Cycle	Compliant
Fundamental Frequency & Spurious Radiated Emissions*	Compliant

* Peak limit and margin to peak limit is not shown in the data. In all cases the duty cycle correction factor is less than 20dB thus no emission will be more than 20dB above the average level.

Test Engineer:



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Reviewer:



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WiSE Staff Engineer
UL Verification Services - EMC

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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:

FCC	47 CFR Part 15 – Intentional Radiators
IC	RSS-210 and RSS-Gen License - exempt Radio Apparatus

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
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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 Configuration 1 Test Data

4.1.1 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: 775.00kHz)	
	0.25% of Center Frequency (315MHz: 787.50kHz)	
	0.25% of Center Frequency (390MHz: 975.00kHz)	

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	% PWR
10kHz	-20	99
Supplementary information: None		

Table 3 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
310MHz	57.09	99.905
315MHz	54.87	100.57
390MHz	56.36	119.22

Figure 1 – Bandwidth Graph 310MHz

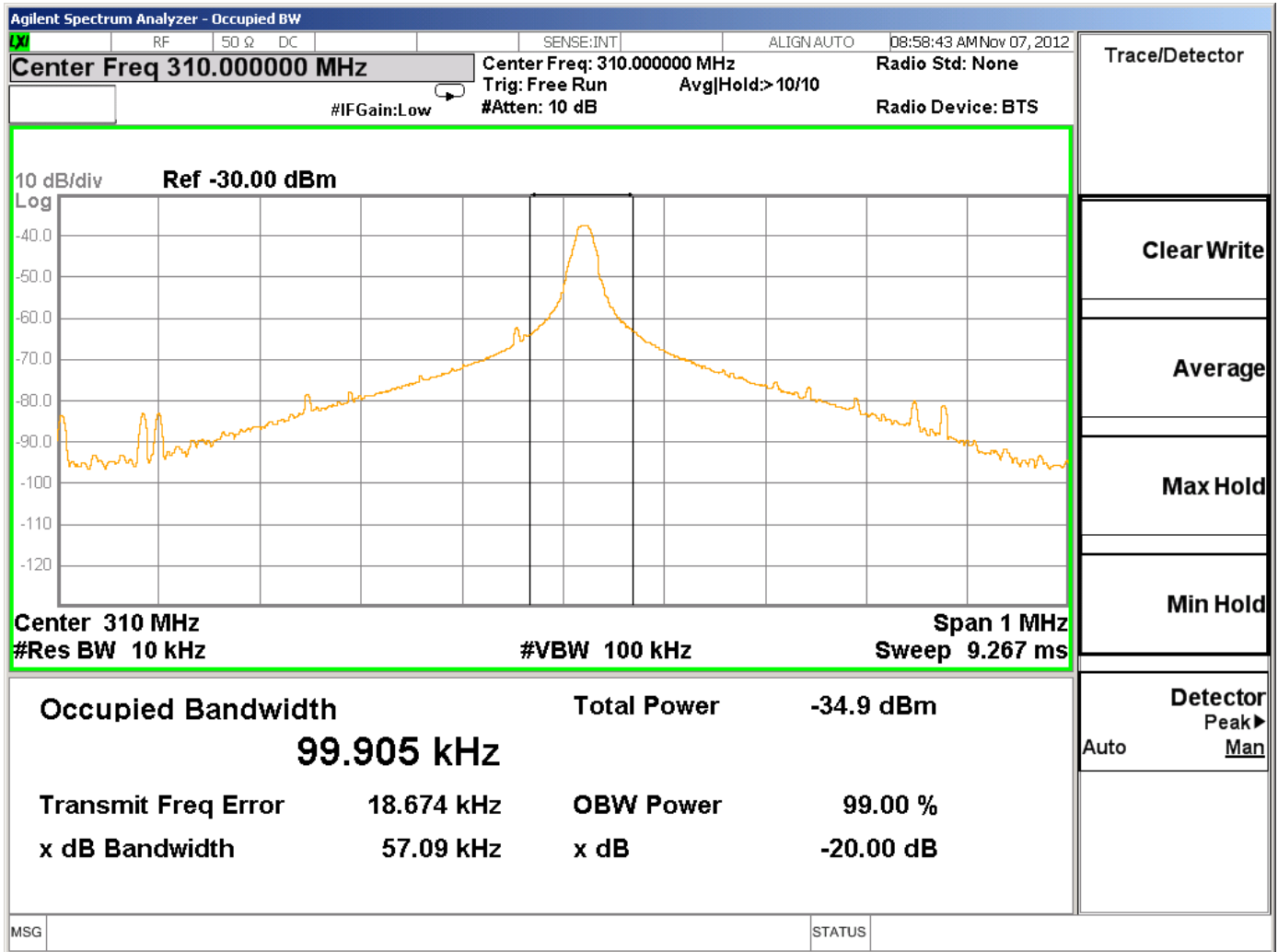


Figure 2 – Bandwidth Graph 315MHz

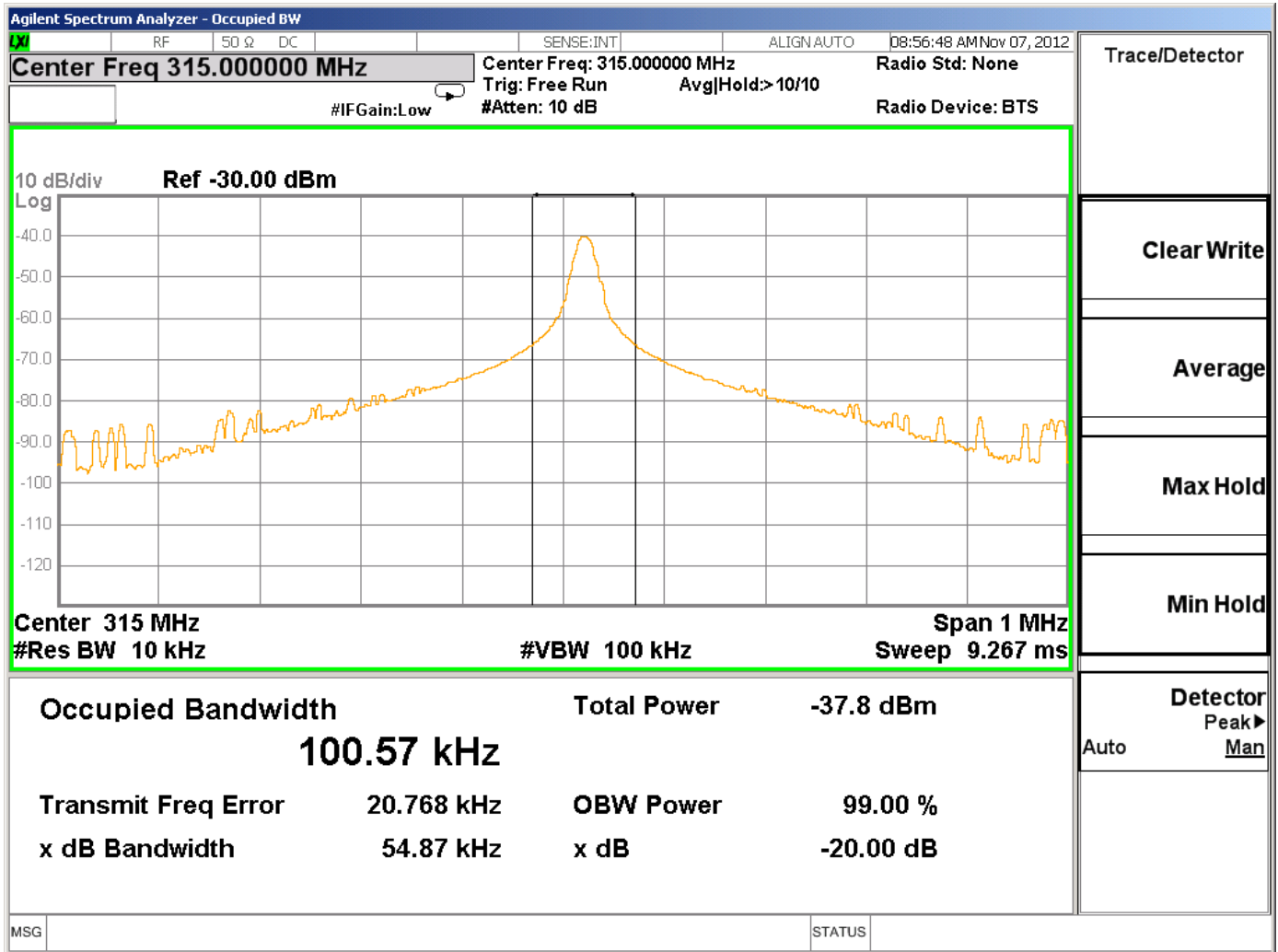
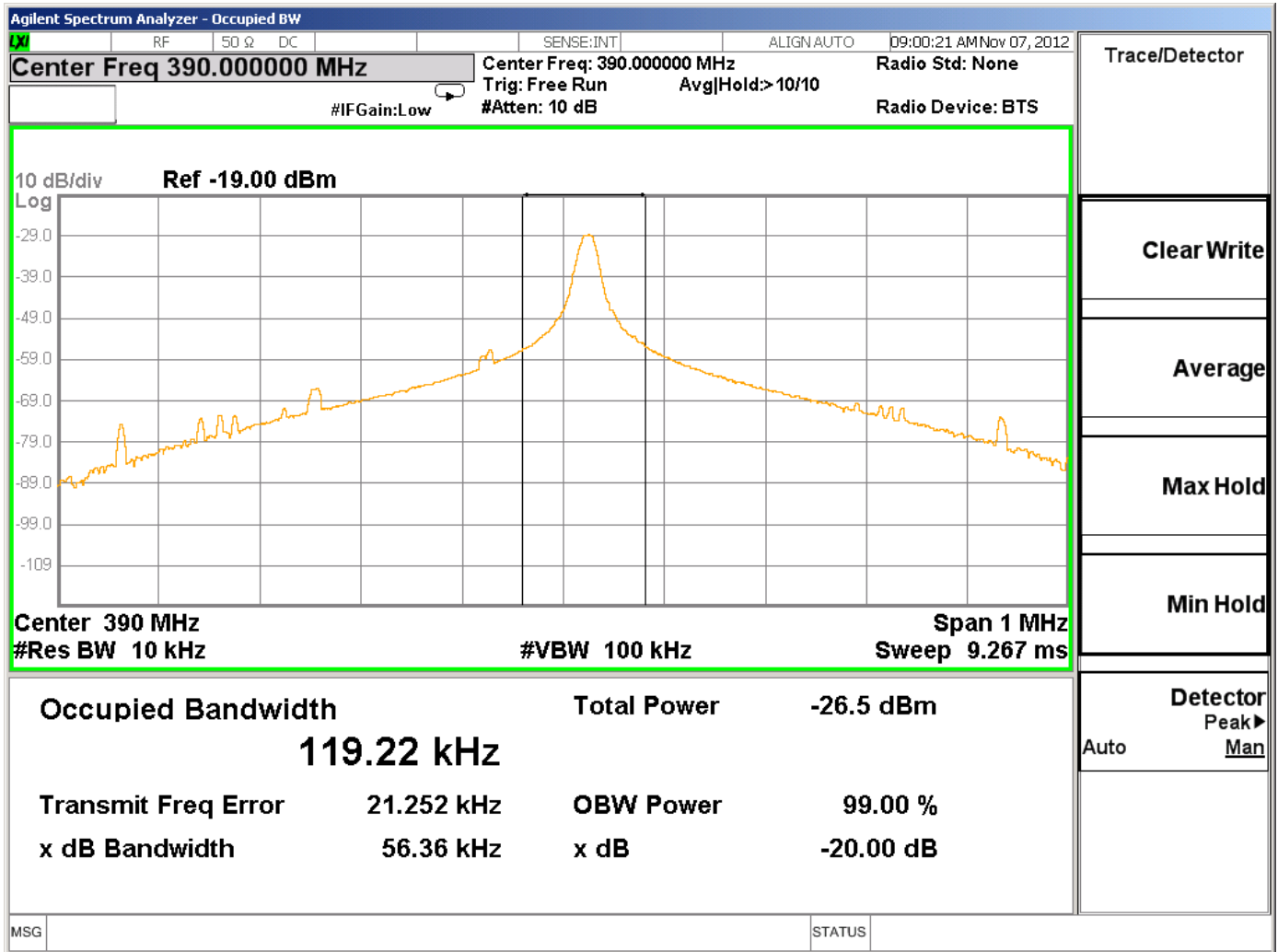


Figure 3 – Bandwidth Graph 390MHz



4.1.2 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	47 CFR Part 15.231(a)
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 4 Cease Operation Configuration Settings

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

Figure 4 Cease Operation Graph 310MHz



4.1.3 Figure 5 Cease Operation Graph 315MHz

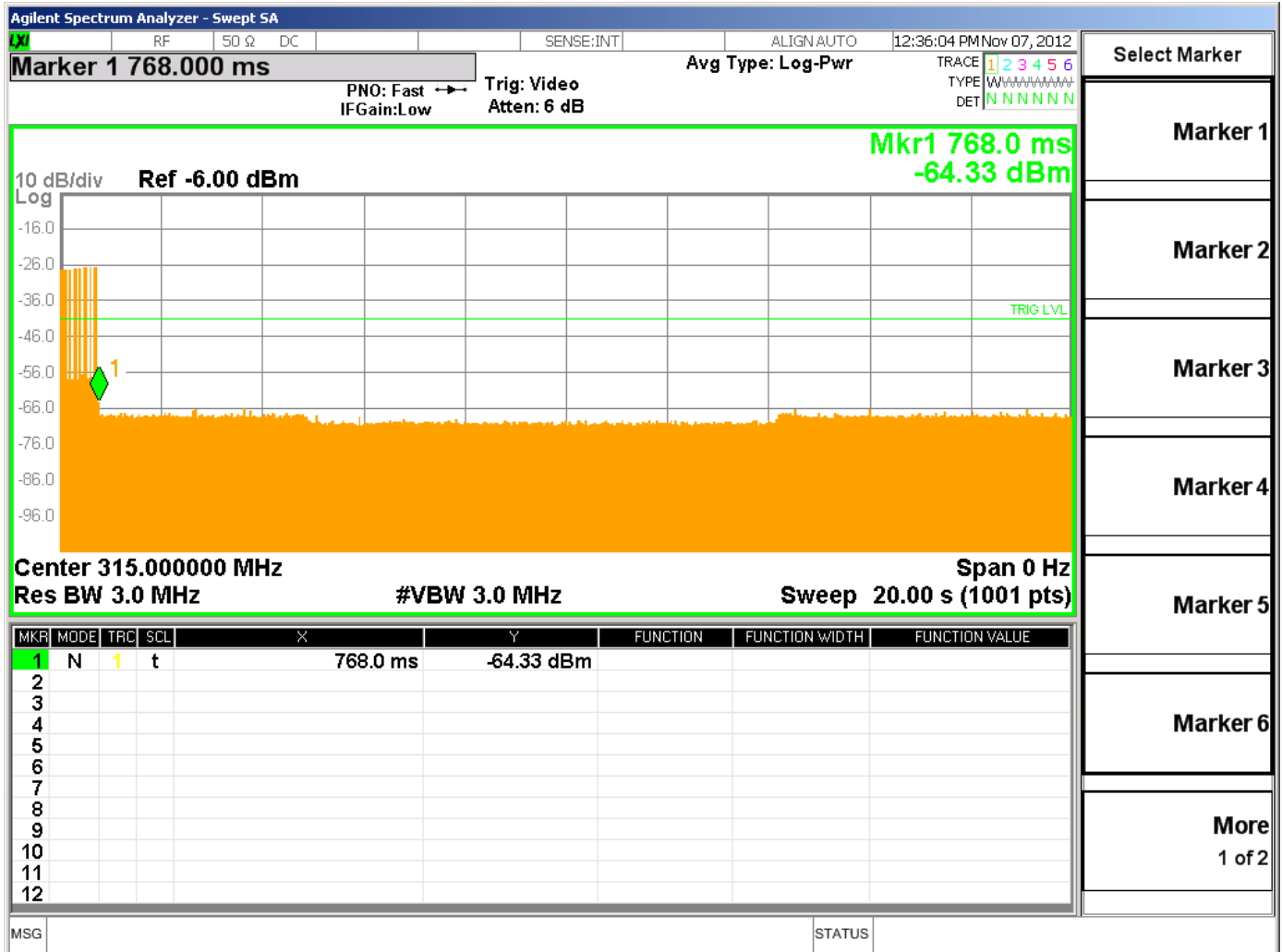
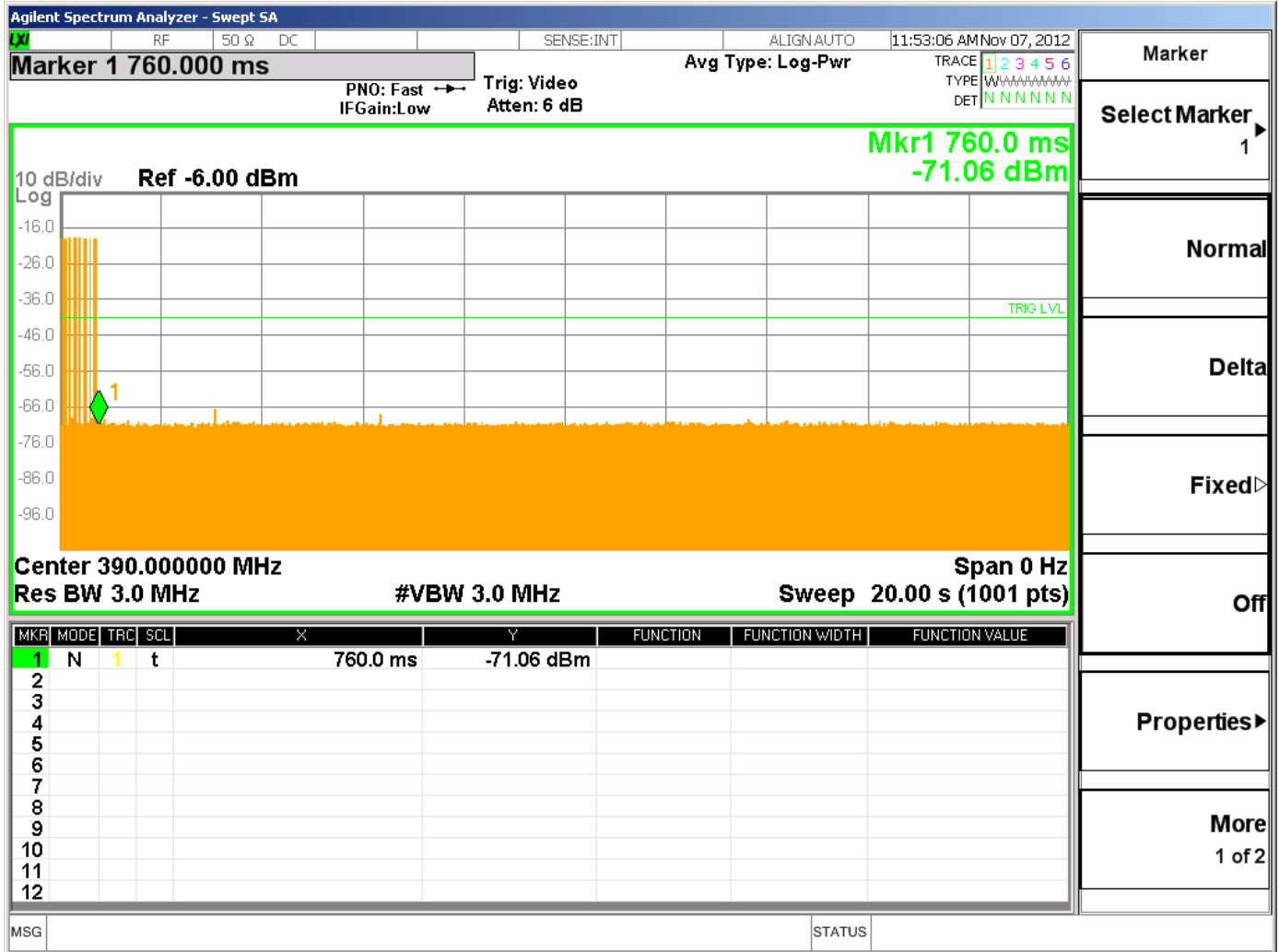


Figure 6 Cease Operation Graph 390MHz



4.1.4 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 5 Pulse Train Configuration Settings

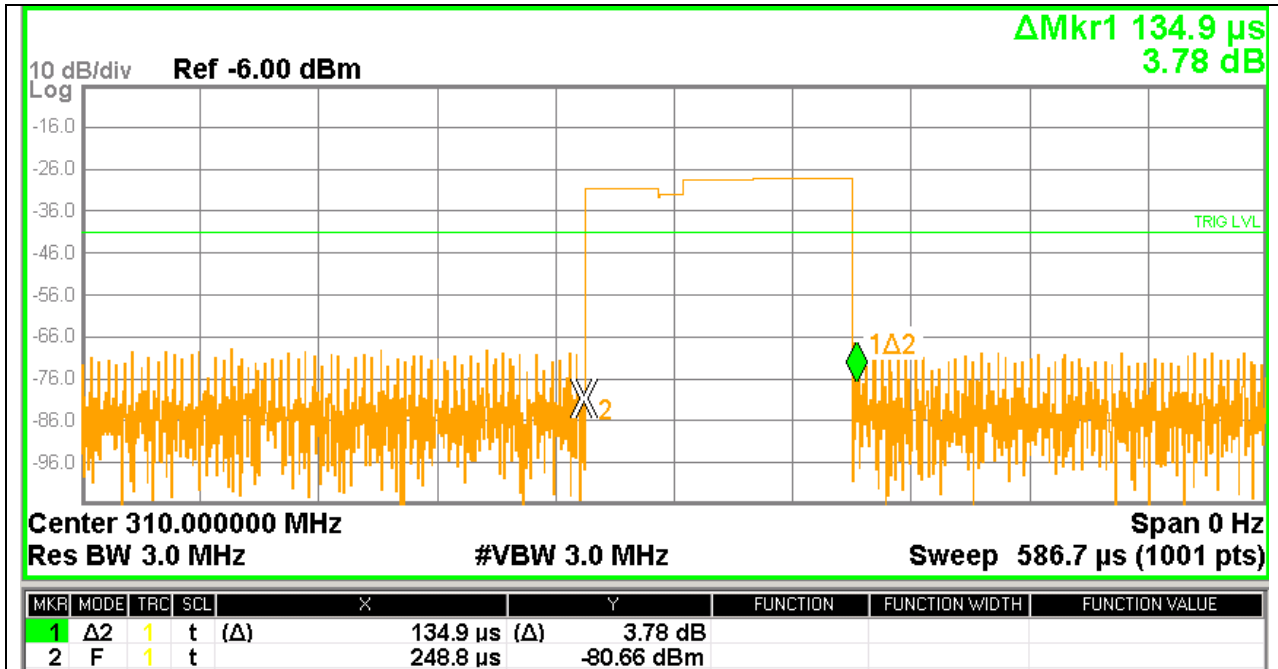
Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 6 Pulse Train Calculation

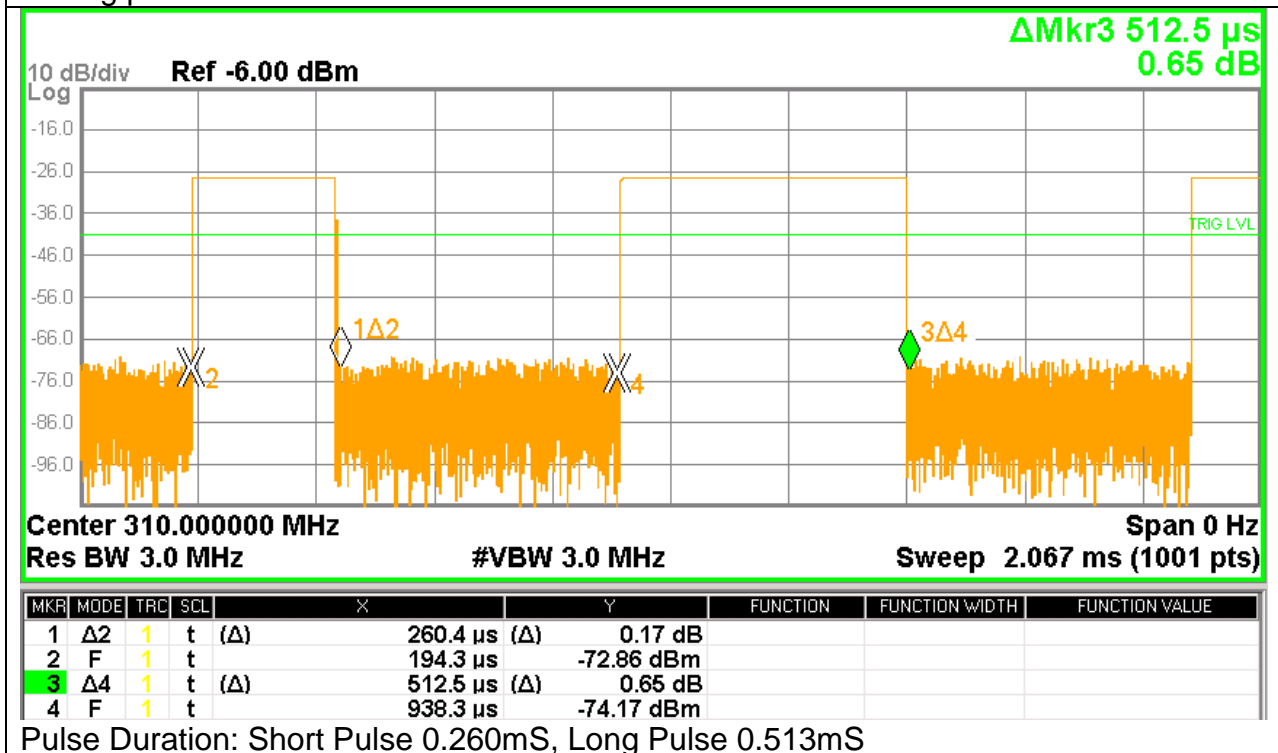
TX Frequency	Total TX time	Total Transmission period or 100ms whichever is lesser	DC Correction Factor (dB)
			$20\log\left(\frac{PulseWidth}{Period}\right)$
310MHz	$(34 \times 0.260) + (14 \times 0.513) = 16.0\text{mS}$	99.66mS	-15.90dB
315MHz	$(38 \times 0.261) + (12 \times 0.509) = 16.0\text{mS}$	99.17mS	-15.85dB
390MHz	$(32 \times 0.264) + (15 \times 0.516) = 16.2\text{mS}$	99.43mS	-15.76dB

Worst Case Duty Cycle: Worst case duty cycle was calculated over normal period not including the tuning pulses. The manufacturer declared duty cycle as -16.19dB, measured duty cycle is used for all radiated emissions data.

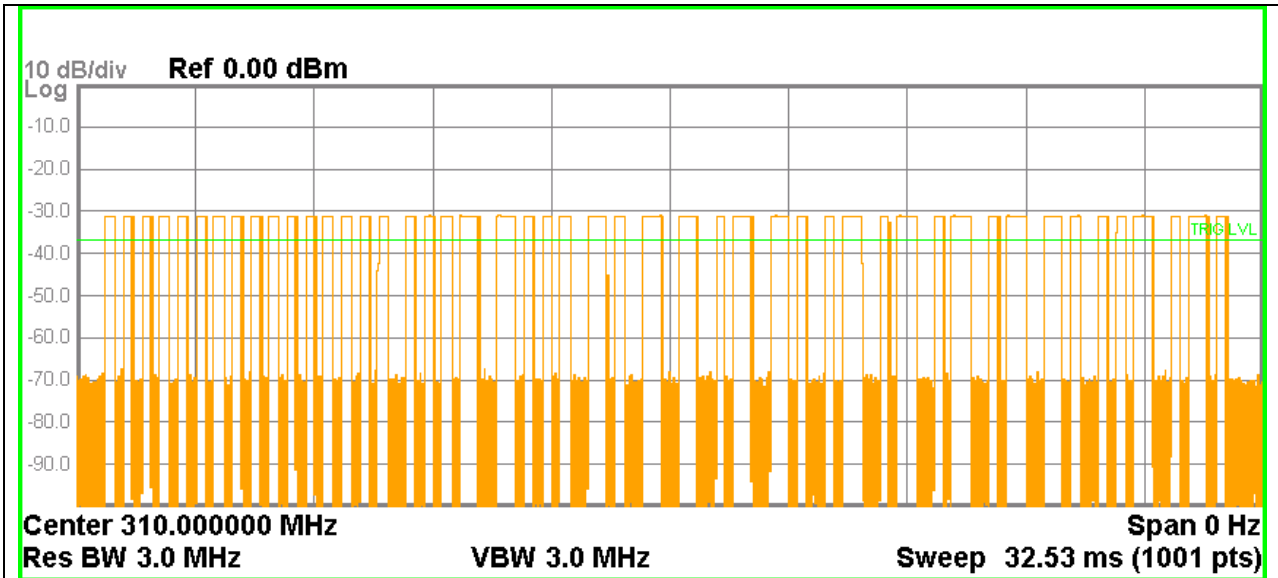
Figure 7 Pulse Train Graphs for 310MHz



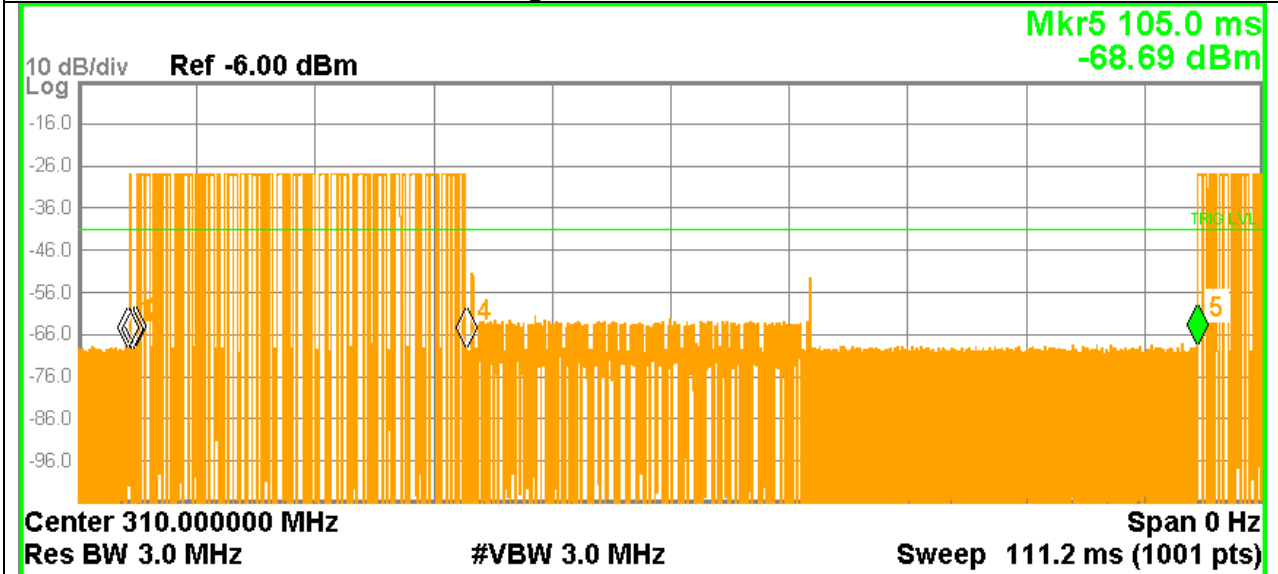
Tuning pulse duration: 0.135mS



Pulse Duration: Short Pulse 0.260mS, Long Pulse 0.513mS



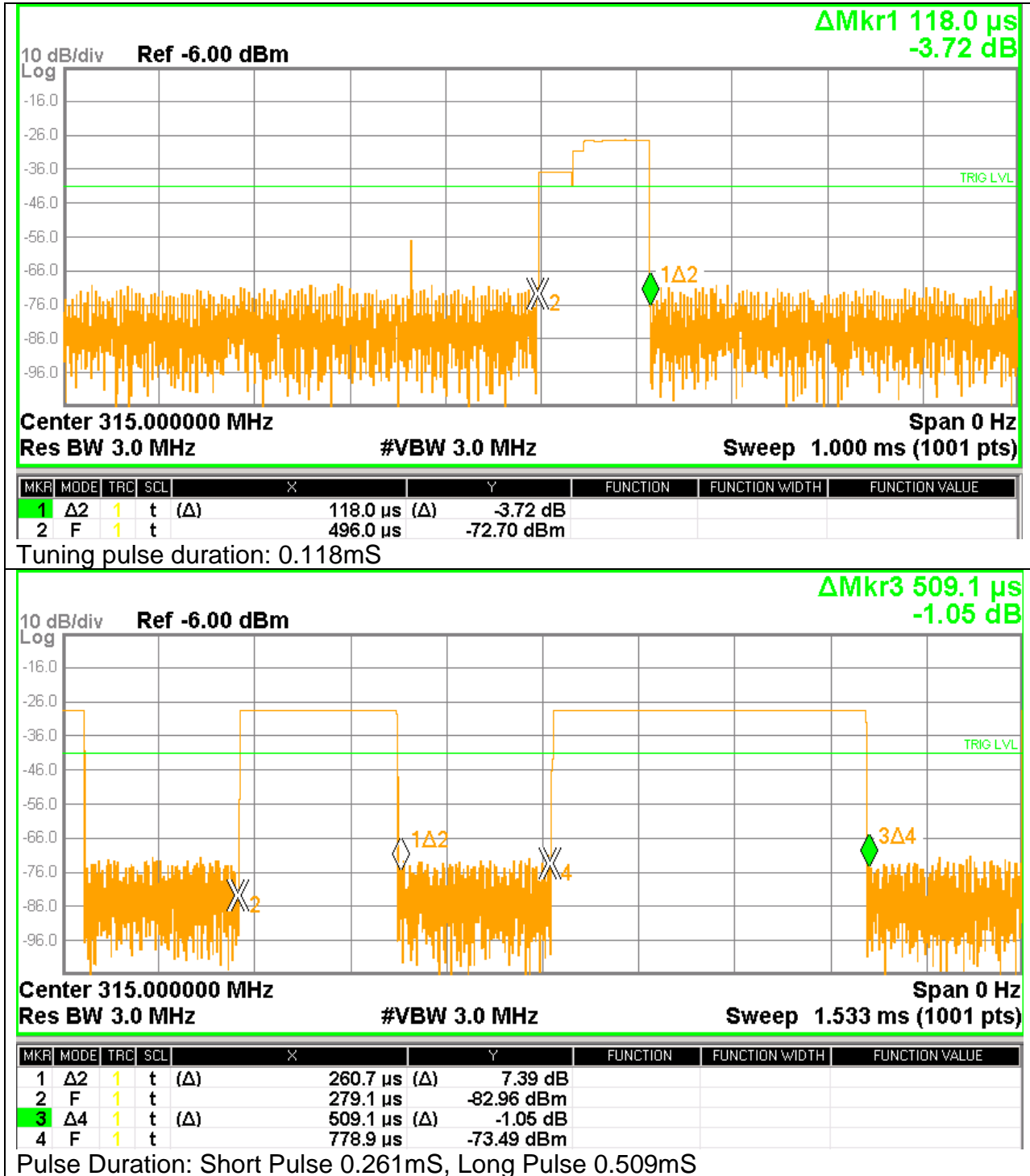
Number of Pulses: 34 Short, 14 Long

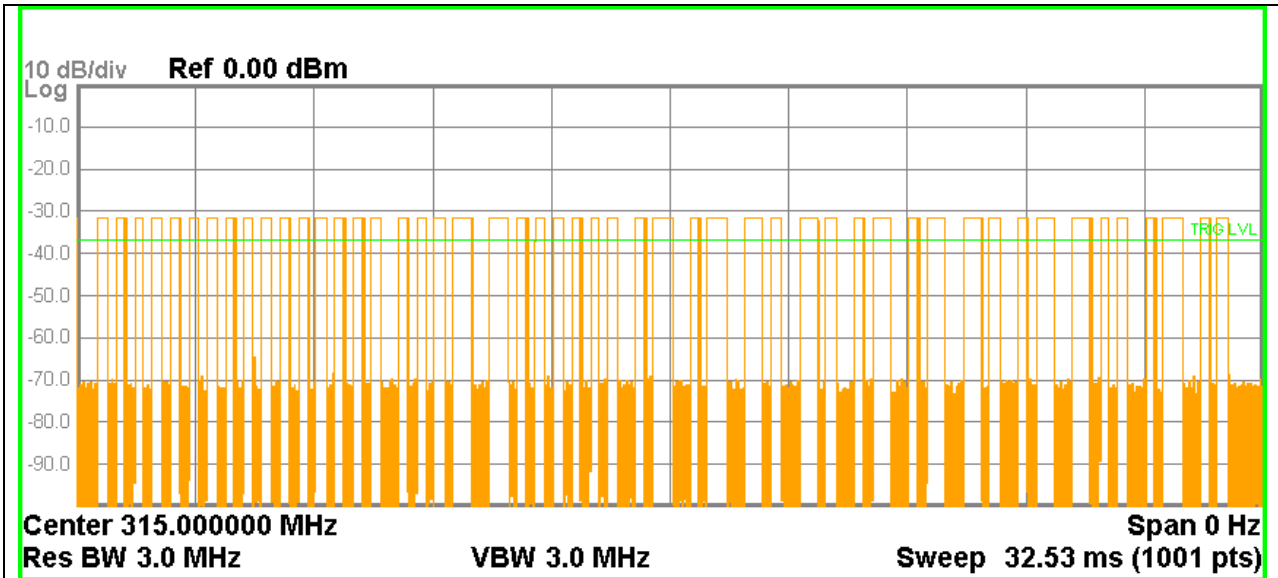


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	4.670 ms	-69.24 dBm			
2	N	1	t	5.115 ms	-69.60 dBm			
3	N	1	t	5.338 ms	-69.12 dBm			
4	N	1	t	36.47 ms	-69.25 dBm			
5	N	1	t	105.0 ms	-68.69 dBm			

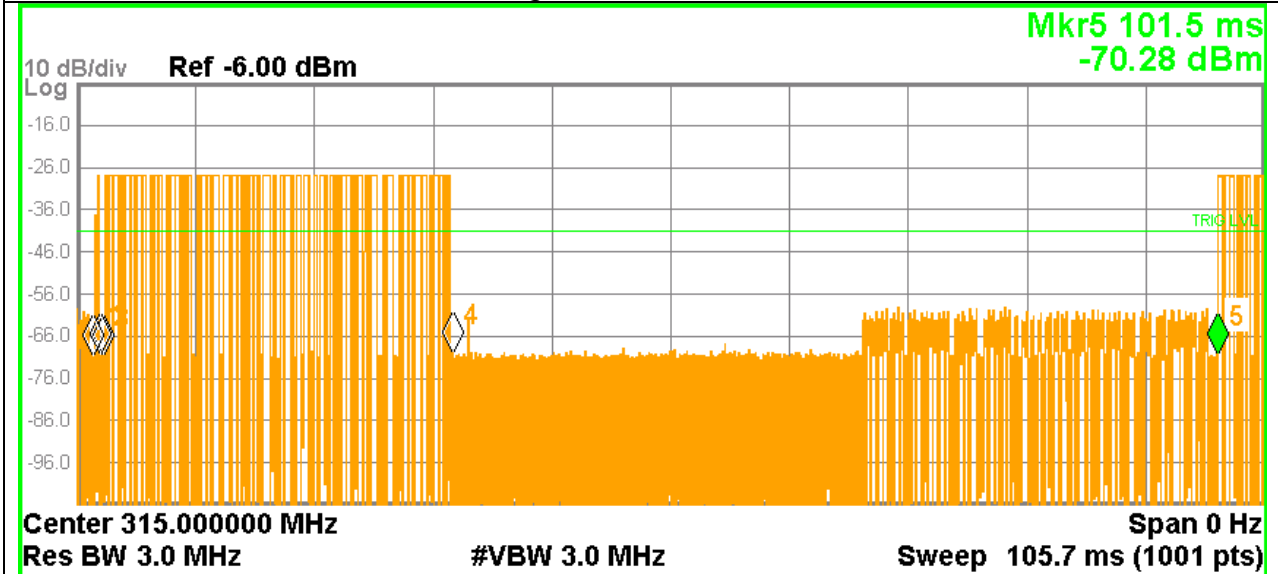
Period scan

Figure 8 Pulse Train Graphs for 315MHz





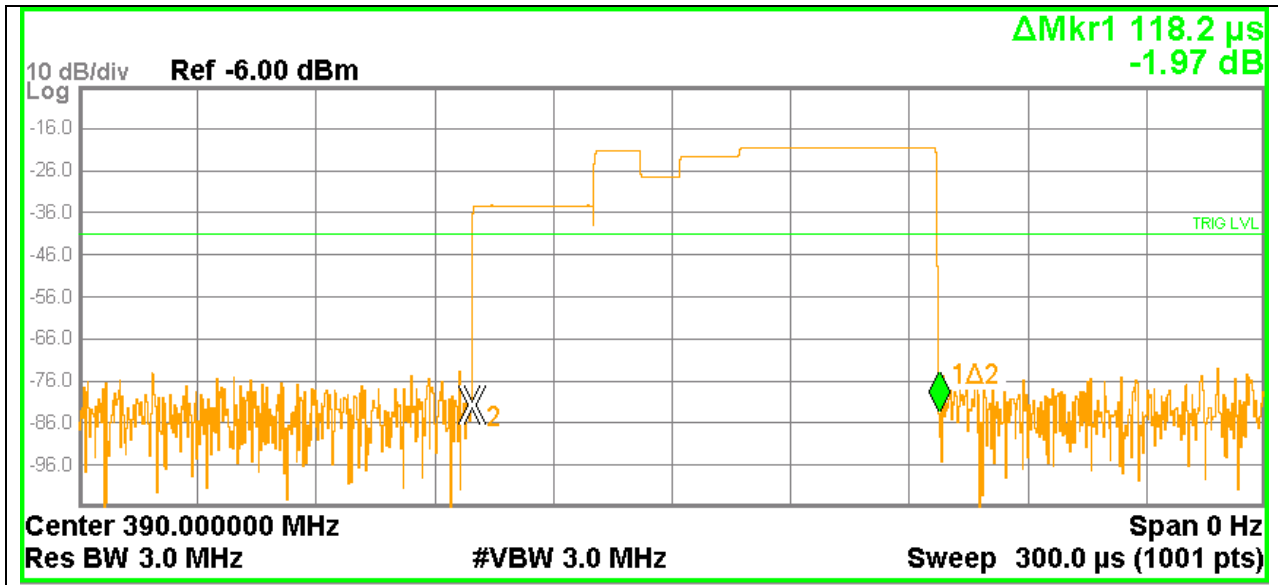
Number of Pulses: 38 Short, 12 Long



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	1.480 ms	-70.77 dBm			
2	N	1	t	2.115 ms	-70.51 dBm			
3	N	1	t	2.326 ms	-70.65 dBm			
4	N	1	t	33.41 ms	-69.92 dBm			
5	N	1	t	101.5 ms	-70.28 dBm			

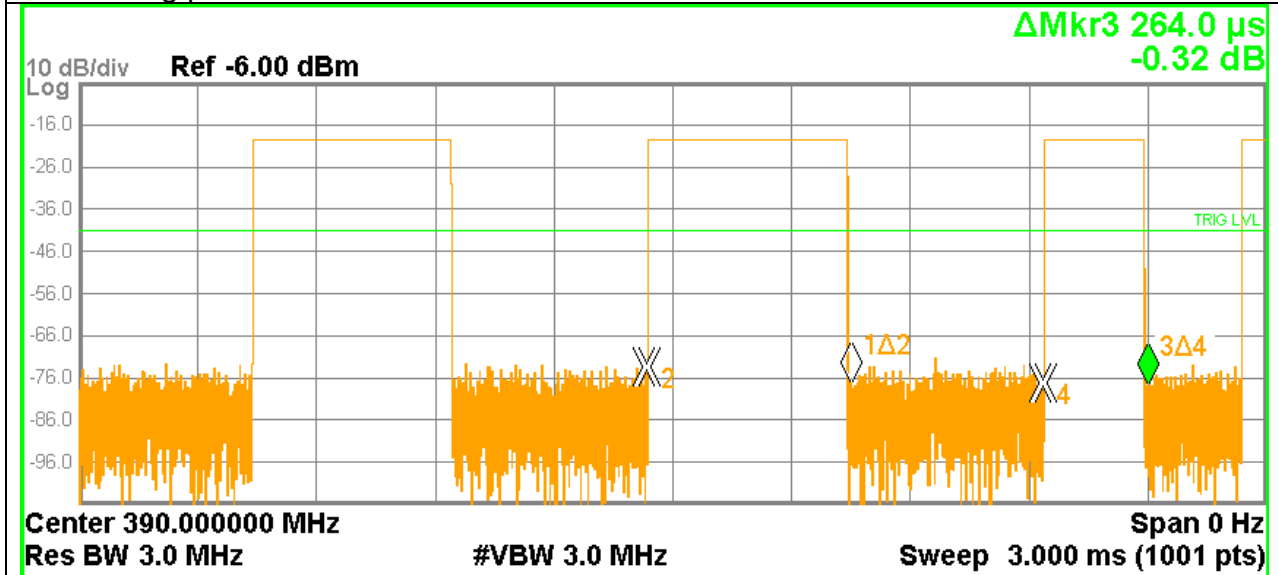
Period scan

Figure 9 Pulse Train Graphs for 390MHz



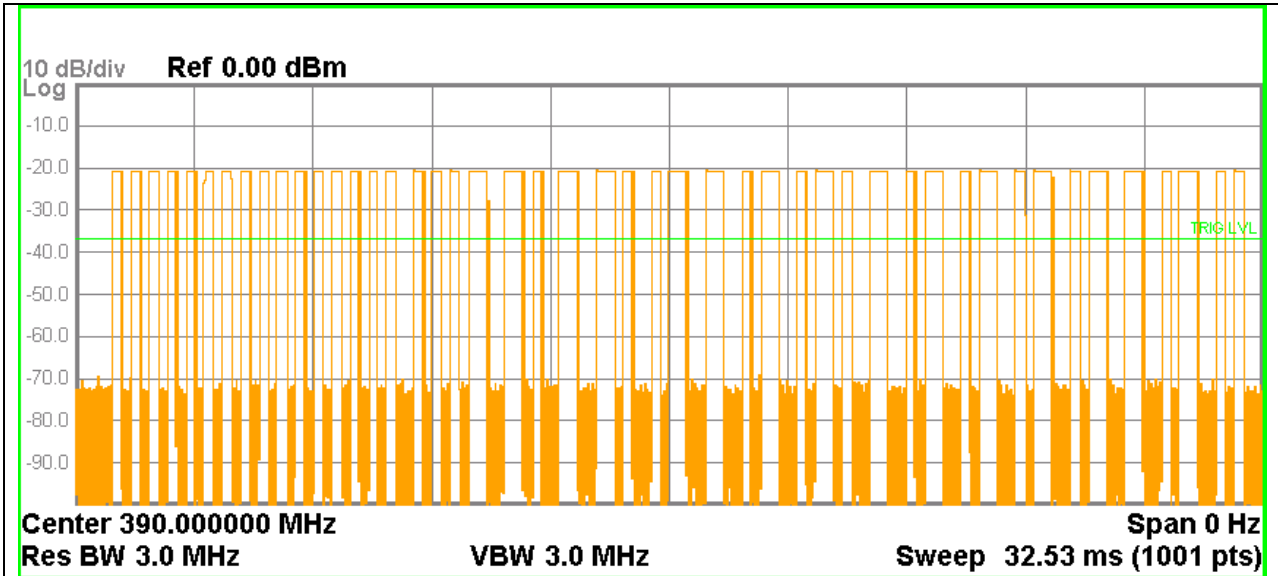
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	118.2 μs (Δ)	-1.97 dB		
2	F	1	t		99.30 μs	-81.77 dBm		

First tuning pulse duration: 0.118mS

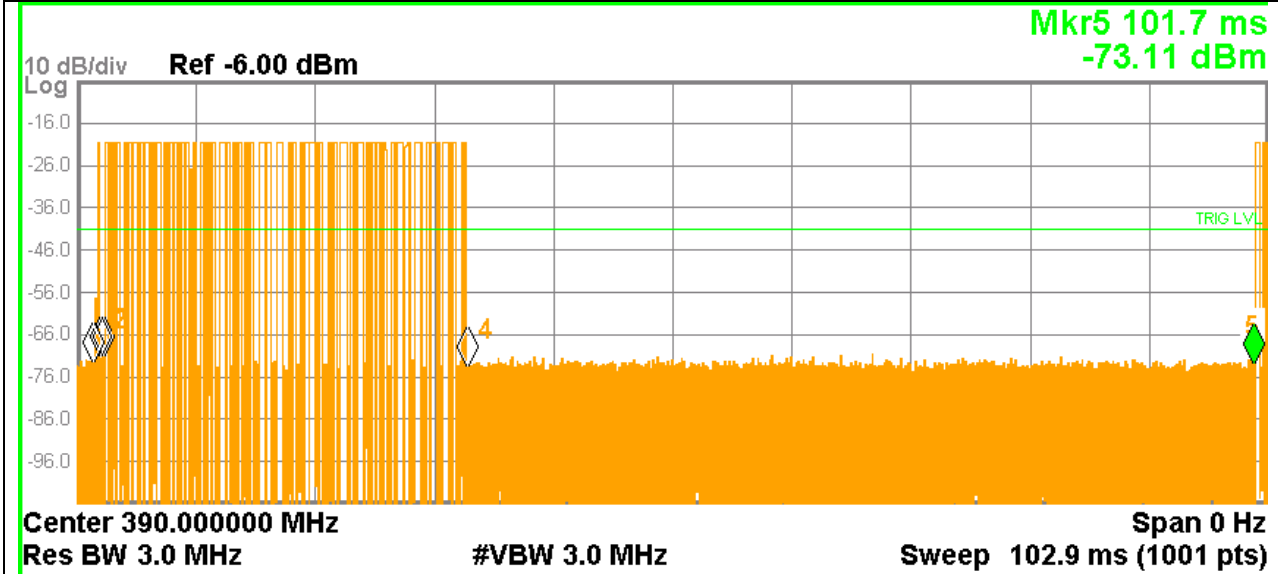


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	516.0 μs (Δ)	-3.85 dB		
2	F	1	t		1.434 ms	-73.45 dBm		
3	Δ4	1	t	(Δ)	264.0 μs (Δ)	-0.32 dB		
4	F	1	t		2.436 ms	-77.41 dBm		

Pulse Duration: Short Pulse 0.264mS, Long Pulse 0.516mS



Number of Pulses: 32 Short, 15 Long



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	1.441 ms	-72.68 dBm			
2	N	1	t	2.059 ms	-71.55 dBm			
3	N	1	t	2.265 ms	-71.32 dBm			
4	N	1	t	33.76 ms	-73.72 dBm			
5	N	1	t	101.7 ms	-73.11 dBm			

Period scan

4.1.5 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 C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 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, and RSS-210	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance
	1GHz – 4GHz	3 meter distance
Out of band spurious emissions limit		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)
Fundamental Frequency Limits and Non-restricted band Harmonic Limits		
Frequency (MHz)	Limit (dBµV/m) @ 3m distance	
	All harmonics except those in restricted bands must be attenuated by 20dB or more	
	Average - Fundamental	Peak - Fundamental
310	75.32	95.32
315	75.62	95.62
390	79.24	99.24
Supplementary information: See section 4.1.3 for duty cycle information.		

Figure 10 Radiated Emissions Graph (Below 1GHz)

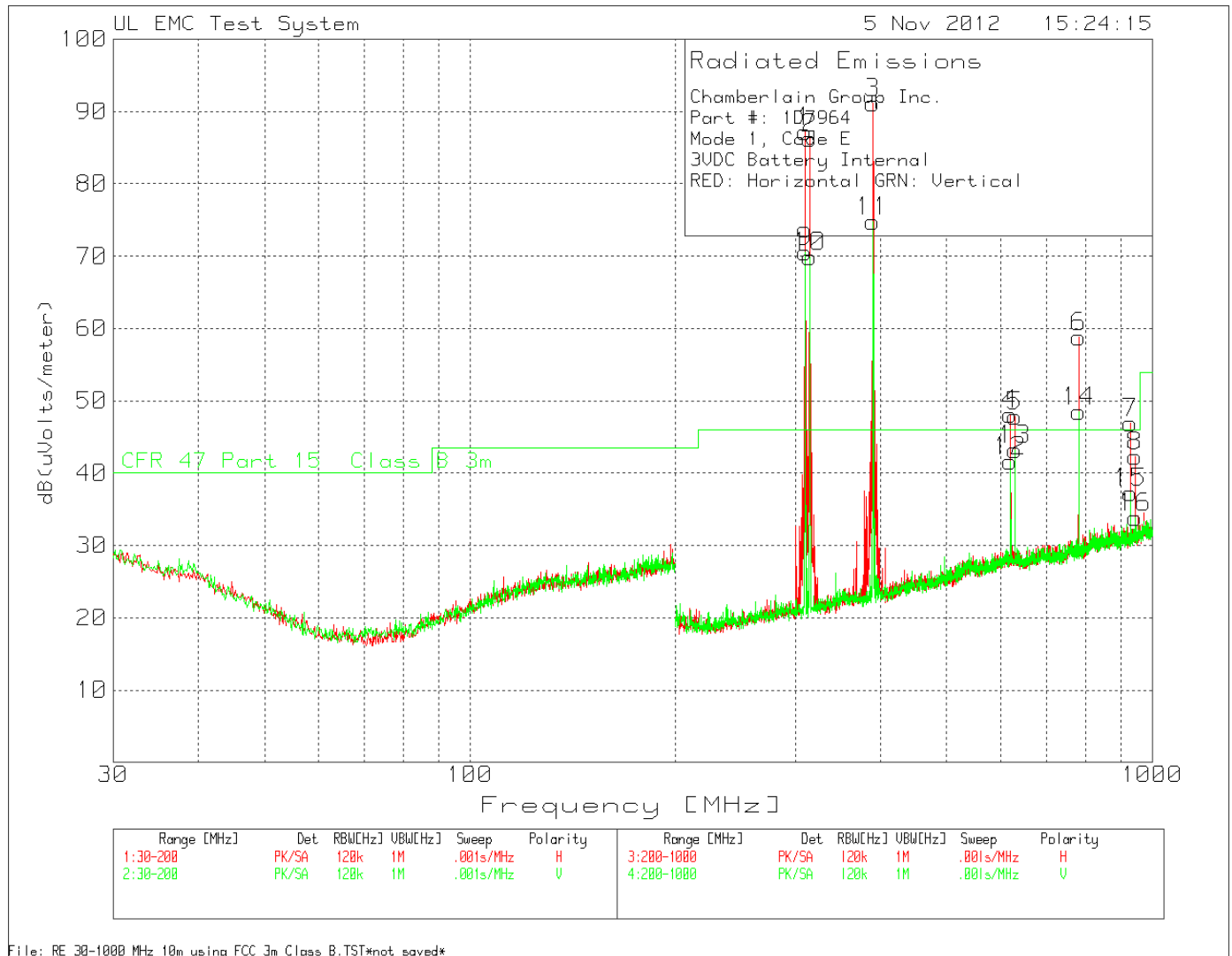


Figure 11 Radiated Emissions Graph (Above 1GHz X Axis)

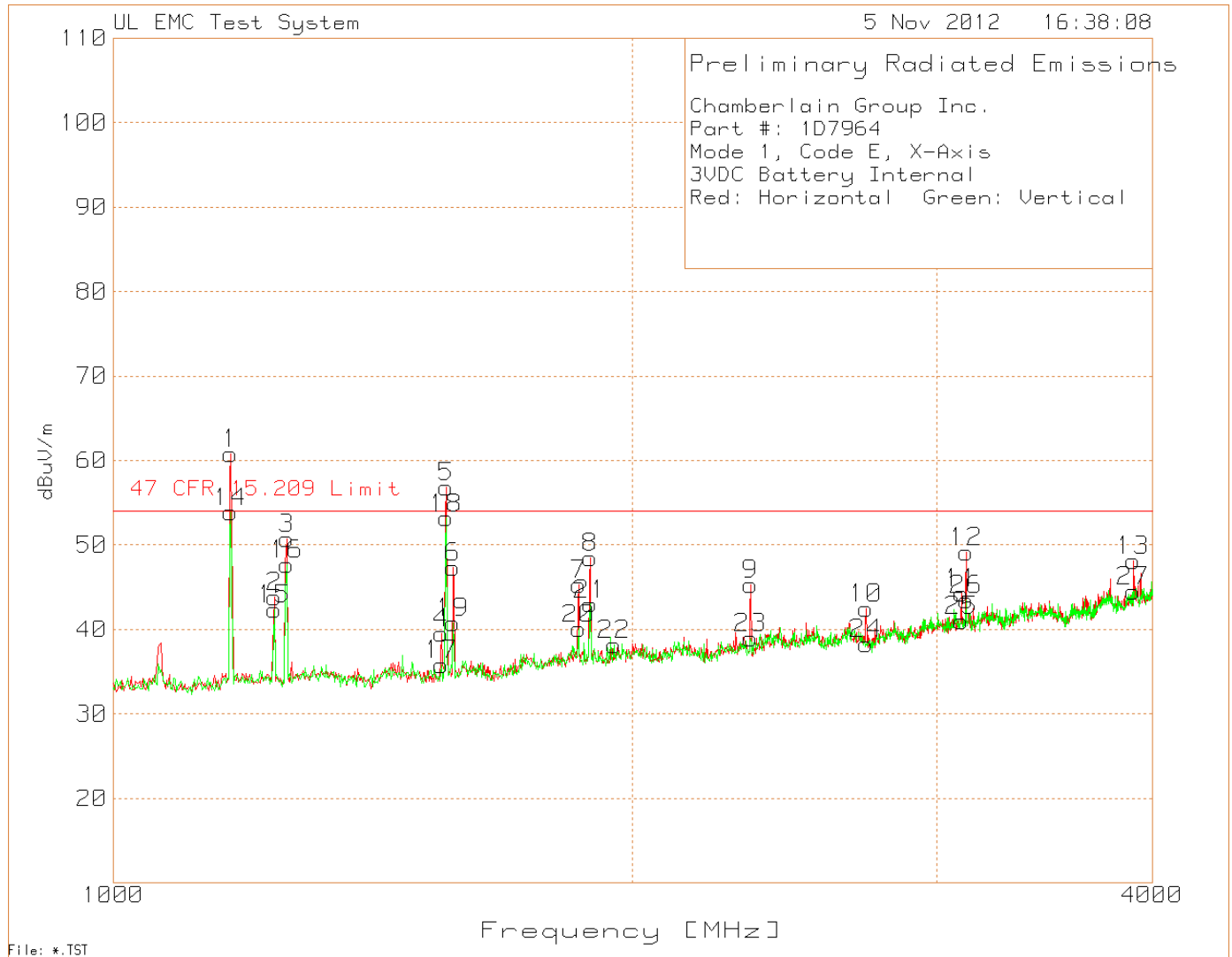


Figure 12 Radiated Emissions Graph (Above 1GHz Z Axis)

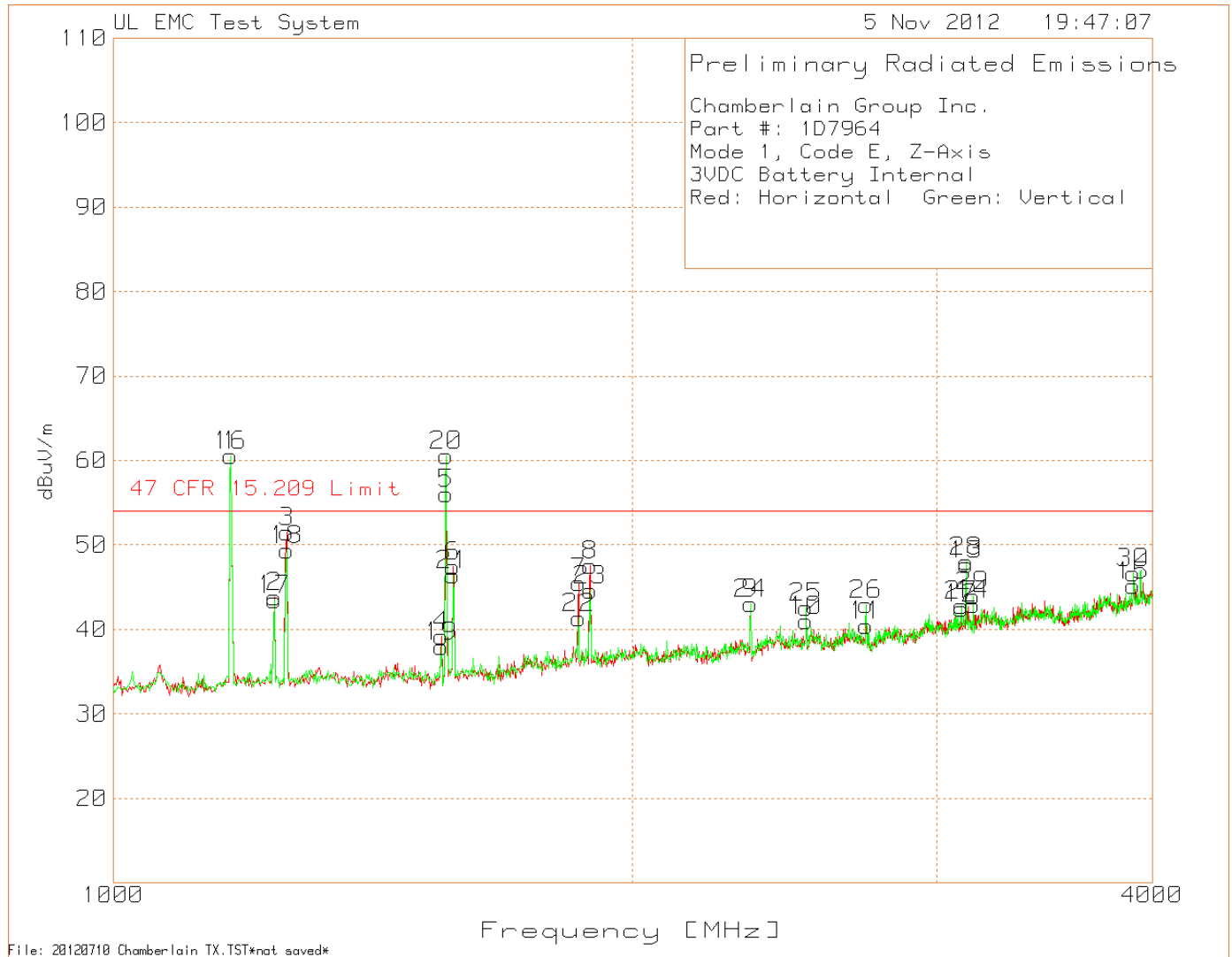


Table 7 - Radiated Emissions Data Points 310MHz

Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit @ 3m dBuV/m	Peak Margin dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Average Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
310.015	70.65	PK	14.1	2.1	86.85	95.32	-8.47	-15.9	70.95	75.32	-4.37	98	101	Horz	1
310.016	53.94	PK	14.1	2.1	70.14	95.32	-25.18	-15.9	54.24	75.32	-21.08	7	115	Vert	1
310.02	63.34	PK	14.1	2.1	79.54	95.32	-15.78	-15.9	63.64	75.32	-11.68	11	227	Horz	2
310.02	67.84	PK	14.1	2.1	84.04	95.32	-11.28	-15.9	68.14	75.32	-7.18	253	191	Vert	2
310.019	66.42	PK	14.1	2.1	82.62	95.32	-12.7	-15.9	66.72	75.32	-8.6	174	141	Horz	3
310.018	68	PK	14.1	2.1	84.2	95.32	-11.12	-15.9	68.3	75.32	-7.02	94	179	Vert	3
620.0359	22.35	PK	20.4	3	45.75	66	-20.25	-15.9	29.85	46	-16.15	195	141	Horz	1
930.069	17.85	PK	23.8	3.8	45.45	66	-20.55	-15.9	29.55	46	-16.45	30	160	Horz	1
620.027	19.68	PK	20.4	3	43.08	66	-22.92	-15.9	27.18	46	-18.82	93	102	Vert	1
930.0576	10.62	PK	23.8	3.8	38.22	66	-27.78	-15.9	22.32	46	-23.68	53	166	Vert	1
1240.16	75.74	PK	25.1	-56.96	43.88	74	-30.12	-15.9	27.98	54	-26.02	*	125	Horz	1
1550.367	70.3	PK	25.2	-56.02	39.48	74	-34.52	-15.9	23.58	54	-30.42	*	100	Horz	1
1860.12	74.06	PK	27.2	-54.43	46.83	74	-27.17	-15.9	30.93	54	-23.07	312	122	Horz	1
3100.102	67.5	PK	30.5	-51.32	46.68	74	-27.32	-15.9	30.78	54	-23.22	271	133	Horz	1
1240.16	74.27	PK	25.1	-56.96	42.41	74	-31.59	-15.9	26.51	54	-27.49	*	125	Vert	1
1550.367	66.65	PK	25.2	-56.02	35.83	74	-38.17	-15.9	19.93	54	-34.07	*	100	Vert	1
1860.574	67.28	PK	27.2	-54.44	40.04	74	-33.96	-15.9	24.14	54	-29.86	*	100	Vert	1
3101.401	61.85	PK	30.5	-51.31	41.04	74	-32.96	-15.9	25.14	54	-28.86	*	100	Vert	1
1240.16	75.72	PK	25.1	-56.96	43.86	74	-30.14	-15.9	27.96	54	-26.04	*	125	Horz	3
1550.367	70.03	PK	25.2	-56.02	39.21	74	-34.79	-15.9	23.31	54	-30.69	*	100	Horz	3
1859.964	74.87	PK	27.2	-54.43	47.64	74	-26.36	-15.9	31.74	54	-22.26	24	117	Horz	3
3101.401	63.27	PK	30.5	-51.31	42.46	74	-31.54	-15.9	26.56	54	-27.44	*	100	Horz	3
1240.006	78.8	PK	25.1	-56.96	46.94	74	-27.06	-15.9	31.04	54	-22.96	19	129	Vert	3
1550.367	68.79	PK	25.2	-56.02	37.97	74	-36.03	-15.9	22.07	54	-31.93	*	100	Vert	3
1860.574	68.62	PK	27.2	-54.44	41.38	74	-32.62	-15.9	25.48	54	-28.52	*	125	Vert	3
3101.401	63.61	PK	30.5	-51.31	42.8	74	-31.2	-15.9	26.9	54	-27.1	*	125	Vert	3
* Prescan Data															

Notes:	
1 - Mode 1, Code E, X-Axis	
2 - Mode 1, Code E, Y-Axis	
3 - Mode 1, Code E, Z-Axis	

Table 8 - Radiated Emissions Data Points 315MHz

Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
315.018	69.61	PK	14.3	2.1	86.01	95.62	-9.61	-15.85	70.16	75.62	-5.46	277	102	Horz	1
315.022	53.54	PK	14.3	2.1	69.94	95.62	-25.68	-15.85	54.09	75.62	-21.53	0	113	Vert	1
315.017	61.98	PK	14.3	2.1	78.38	95.62	-17.24	-15.85	62.53	75.62	-13.09	356	229	Horz	2
315.019	67.12	PK	14.3	2.1	83.52	95.62	-12.1	-15.85	67.67	75.62	-7.95	99	188	Vert	2
315.018	65.07	PK	14.3	2.1	81.47	95.62	-14.15	-15.85	65.62	75.62	-10	183	113	Horz	3
315.021	66.8	PK	14.3	2.1	83.2	95.62	-12.42	-15.85	67.35	75.62	-8.27	103	170	Vert	3
630.033	23.66	PK	20.7	3	47.36	66	-18.64	-15.85	31.51	46	-14.49	190	131	Horz	1
945.058	14.39	PK	23.9	3.8	42.09	66	-23.91	-15.85	26.24	46	-19.76	102	153	Horz	1
630.047	20.61	PK	20.7	3	44.31	66	-21.69	-15.85	28.46	46	-17.54	100	102	Vert	1
945.063	7.68	PK	23.9	3.8	35.38	66	-30.62	-15.85	19.53	46	-26.47	47	163	Vert	1
1260.0541	82.67	PK	25.1	-56.92	50.85	74	-23.15	-15.85	35	54	-19	0	129	Horz	1
1575.1723	77.7	PK	25.3	-55.29	47.71	74	-26.29	-15.85	31.86	54	-22.14	63	103	Horz	1
1890.0842	77.12	PK	27.4	-54.31	50.21	74	-23.79	-15.85	34.36	54	-19.64	306	119	Horz	1
1260.1383	78.26	PK	25.1	-56.92	46.44	74	-27.56	-15.85	30.59	54	-23.41	186	138	Vert	1
1574.383	70.78	PK	25.3	-55.3	40.78	74	-33.22	-15.85	24.93	54	-29.07	*	125	Vert	1
1890.594	69.9	PK	27.4	-54.32	42.98	74	-31.02	-15.85	27.13	54	-26.87	*	100	Vert	1
1260.1142	83.87	PK	25.1	-56.92	52.05	74	-21.95	-15.85	36.2	54	-17.8	357	121	Horz	3
1575.1323	78.37	PK	25.3	-55.29	48.38	74	-25.62	-15.85	32.53	54	-21.47	0	101	Horz	3
1890.1142	78.59	PK	27.4	-54.31	51.68	74	-22.32	-15.85	35.83	54	-18.17	25	116	Horz	3
2521.014	64.34	PK	28.9	-52.19	41.05	74	-32.95	-15.85	25.2	54	-28.8	*	125	Horz	3
3151.434	64.08	PK	30.6	-51.71	42.97	74	-31.03	-15.85	27.12	54	-26.88	*	125	Horz	3
1260.0721	83	PK	25.1	-56.92	51.18	74	-22.82	-15.85	35.33	54	-18.67	35	132	Vert	3
1575.1743	76.28	PK	25.3	-55.29	46.29	74	-27.71	-15.85	30.44	54	-23.56	0	102	Vert	3
1890.2224	75.49	PK	27.4	-54.31	48.58	74	-25.42	-15.85	32.73	54	-21.27	0	108	Vert	3
* Prescan Data															

Notes:	
1 - Mode 1, Code E, X-Axis	
2 - Mode 1, Code E, Y-Axis	
3 - Mode 1, Code E, Z-Axis	

Table 9 - Radiated Emissions Data Points 390MHz

Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
390.03	70.72	PK	16.1	2.3	89.12	99.24	-10.12	-15.76	73.36	79.24	-5.88	126	104	Horz	1
390.029	55.05	PK	16.1	2.3	73.45	99.24	-25.79	-15.76	57.69	79.24	-21.6	155	273	Vert	1
390.024	64.84	PK	16.1	2.3	83.24	99.24	-16	-15.76	67.48	79.24	-11.8	203	172	Horz	2
390.024	71.24	PK	16.1	2.3	89.64	99.24	-9.6	-15.76	73.88	79.24	-5.36	247	145	Vert	2
390.027	66.74	PK	16.1	2.3	85.14	99.24	-14.1	-15.76	69.38	79.24	-9.86	185	102	Horz	3
390.027	71.52	PK	16.1	2.3	89.92	99.24	-9.32	-15.76	74.16	79.24	-5.08	71	142	Vert	3
780.043	21.17	PK	22	3.4	46.57	66	-19.43	-15.76	30.81	46	-15.2	112	102	Horz	3
780.049	29.55	PK	22	3.4	54.95	66	-11.05	-15.76	39.19	46	-6.81	345	155	Vert	3
1170.0872	93.59	PK	24.8	-57.24	61.15	74	-12.85	-15.76	45.39	54	-8.61	181	132	Horz	1
1560.1503	87.31	PK	25.2	-55.66	56.85	74	-17.15	-15.76	41.09	54	-12.9	166	101	Horz	1
2340.2946	71.93	PK	28.3	-52.9	47.33	74	-26.67	-15.76	31.57	54	-22.4	47	100	Horz	1
2731.154	65.65	PK	29	-52.19	42.46	74	-31.54	-15.76	26.7	54	-27.3	*	125	Horz	1
3120.1503	73.42	PK	30.6	-51.39	52.63	74	-21.37	-15.76	36.87	54	-17.1	273	112	Horz	1
3900.3246	70.2	PK	32.7	-52.05	50.85	74	-23.15	-15.76	35.09	54	-18.9	233	106	Horz	1
1170.0671	87.46	PK	24.8	-57.24	55.02	74	-18.98	-15.76	39.26	54	-14.7	200	166	Vert	1
1560.0842	83.89	PK	25.2	-55.66	53.43	74	-20.57	-15.76	37.67	54	-16.3	62	100	Vert	1
1950.634	65.2	PK	27.4	-54.39	38.21	74	-35.79	-15.76	22.45	54	-31.6	*	100	Vert	1
2340.894	63.56	PK	28.3	-52.9	38.96	74	-35.04	-15.76	23.2	54	-30.8	*	125	Vert	1
2731.154	61.51	PK	29	-52.19	38.32	74	-35.68	-15.76	22.56	54	-31.4	*	125	Vert	1
3121.414	64.25	PK	30.6	-51.41	43.44	74	-30.56	-15.76	27.68	54	-26.3	*	100	Vert	1
3901.935	63.78	PK	32.7	-51.99	44.49	74	-29.51	-15.76	28.73	54	-25.3	*	125	Vert	1
1170.0631	92.95	PK	24.8	-57.24	60.51	74	-13.49	-15.76	44.75	54	-9.25	7	126	Horz	3
1560.0782	86.76	PK	25.2	-55.66	56.3	74	-17.7	-15.76	40.54	54	-13.5	0	100	Horz	3
2340.894	67.68	PK	28.3	-52.9	43.08	74	-30.92	-15.76	27.32	54	-26.7	*	100	Horz	3
2731.154	63.66	PK	29	-52.19	40.47	74	-33.53	-15.76	24.71	54	-29.3	*	125	Horz	3
3120.0842	71.27	PK	30.6	-51.39	50.48	74	-23.52	-15.76	34.72	54	-19.3	23	134	Horz	3
3900.2044	68.89	PK	32.7	-52.05	49.54	74	-24.46	-15.76	33.78	54	-20.2	12	104	Horz	3
1170.0311	92.92	PK	24.8	-57.24	60.48	74	-13.52	-15.76	44.72	54	-9.28	108	100	Vert	3
1560.0661	91.26	PK	25.2	-55.66	60.8	74	-13.2	-15.76	45.04	54	-8.96	17	100	Vert	3
2340.894	67.63	PK	28.3	-52.9	43.03	74	-30.97	-15.76	27.27	54	-26.7	*	125	Vert	3
2731.154	66.07	PK	29	-52.19	42.88	74	-31.12	-15.76	27.12	54	-26.9	*	100	Vert	3
3120.1463	71.1	PK	30.6	-51.39	50.31	74	-23.69	-15.76	34.55	54	-19.5	288	104	Vert	3
3900.2164	67.96	PK	32.7	-52.05	48.61	74	-25.39	-15.76	32.85	54	-21.2	98	103	Vert	3

* Prescan Data

Notes:	
1 - Mode 1, Code E, X-Axis	
2 - Mode 1, Code E, Y-Axis	
3 - Mode 1, Code E, Z-Axis	

4.2 Configuration 3 Test Data

4.2.1 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: 787.5kHz)		

Table 10 Occupied Bandwidth Configuration Settings

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

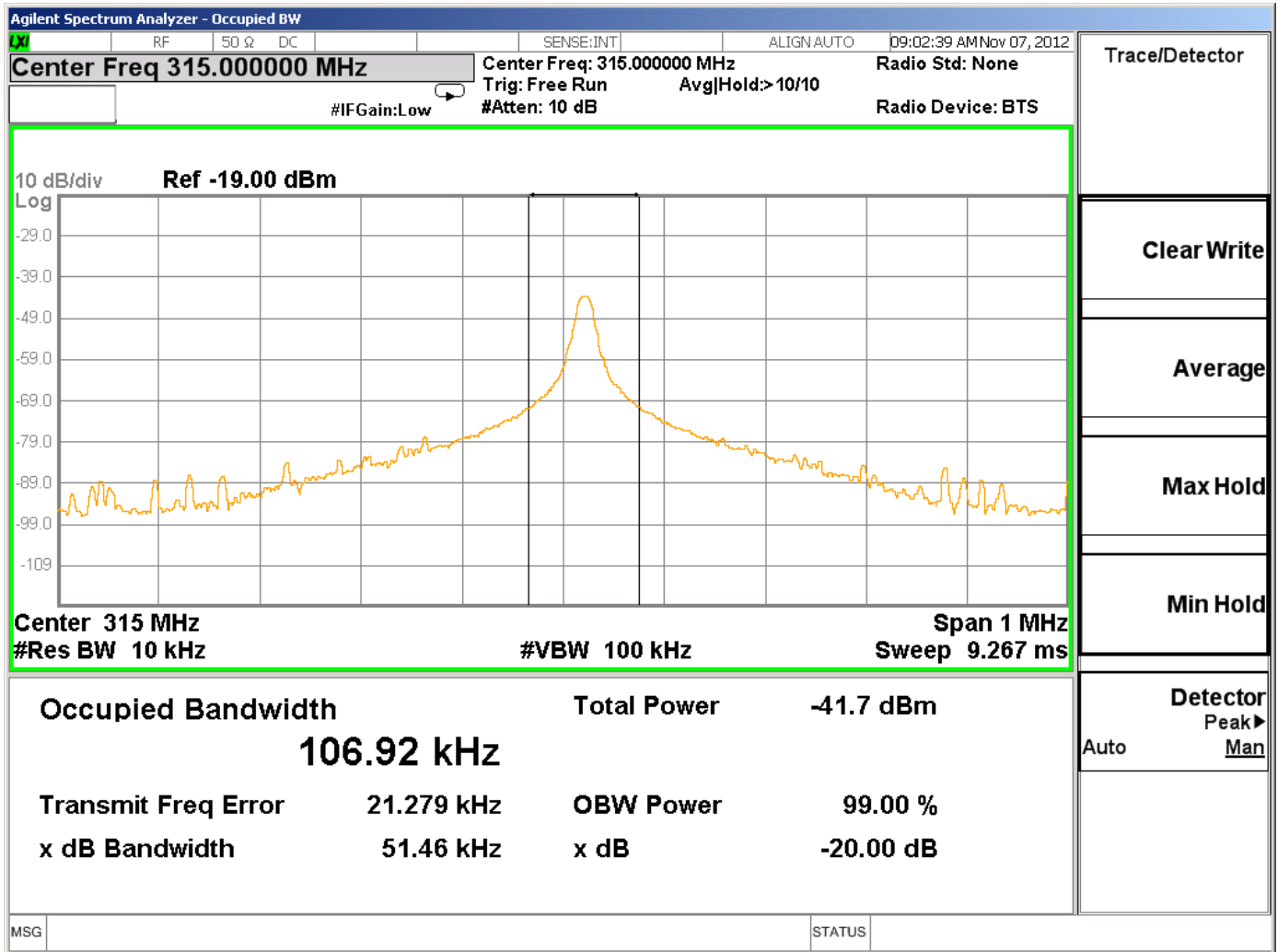
Table 11 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 12 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
315MHz	51.46	106.92

Figure 13 – Bandwidth Graph



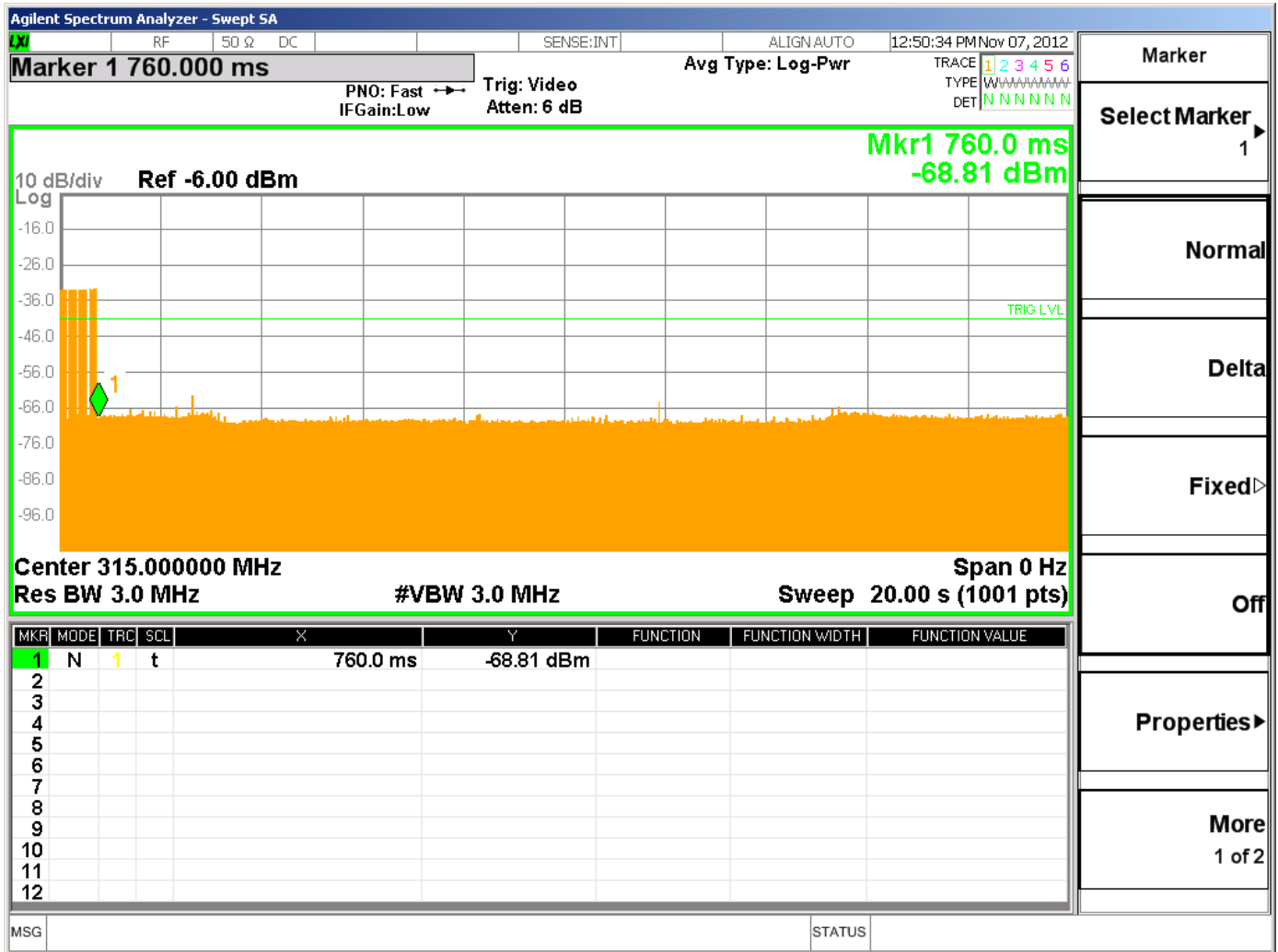
4.2.2 Test Conditions and Results – Cease Operation

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	47 CFR Part 15.231(a)	
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 13 Cease Operation Configuration Settings

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

Figure 14 Cease Operation Graph



4.2.3 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.		

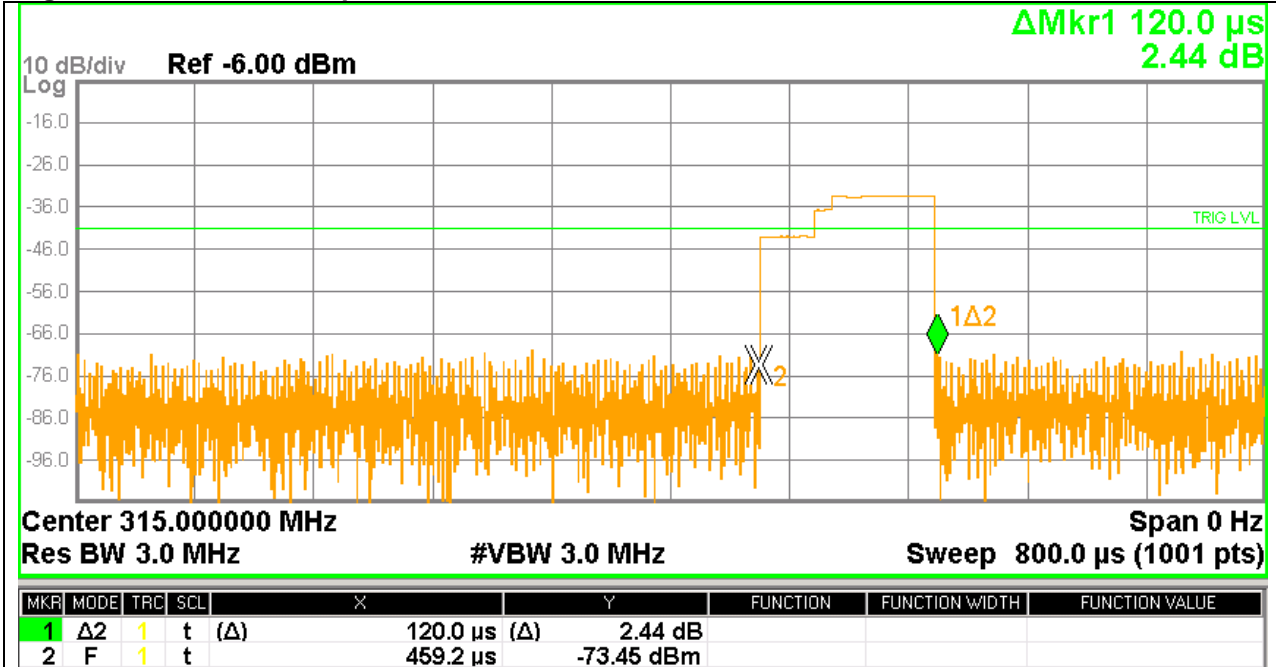
Table 14 Pulse Train Configuration Settings

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

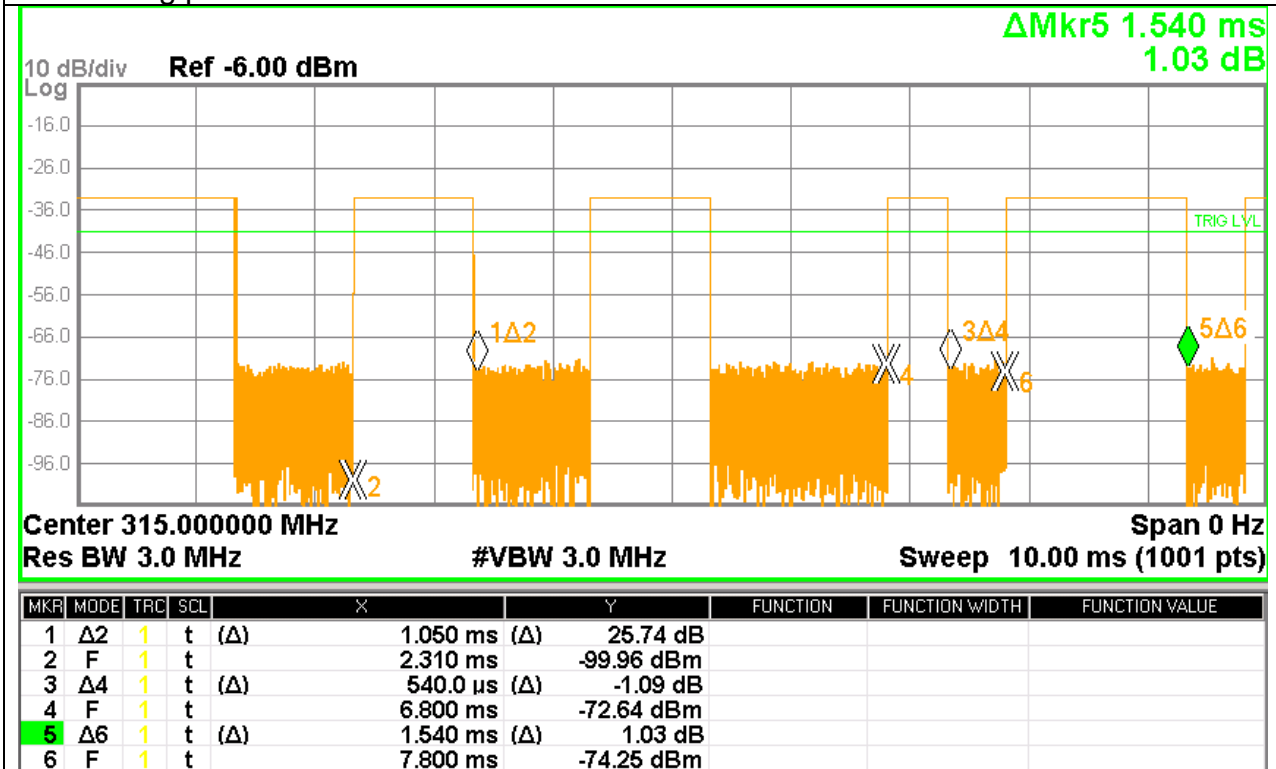
Table 15 Pulse Train Calculation

TX Frequency	Total TX time	Total Transmission period or 100ms whichever is lesser	DC Correction Factor (dB)
			$20\log\left(\frac{PulseWidth}{Period}\right)$
390MHz	$(9 \times 0.540) + (3 \times 1.050) + (9 \times 1.540) = 21.87mS$	97.40mS	-12.97dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over normal period of 97.40mS not including the tuning pulses. The manufacturer declared duty cycle as -10.20dB and it is used for all radiated emissions data.			

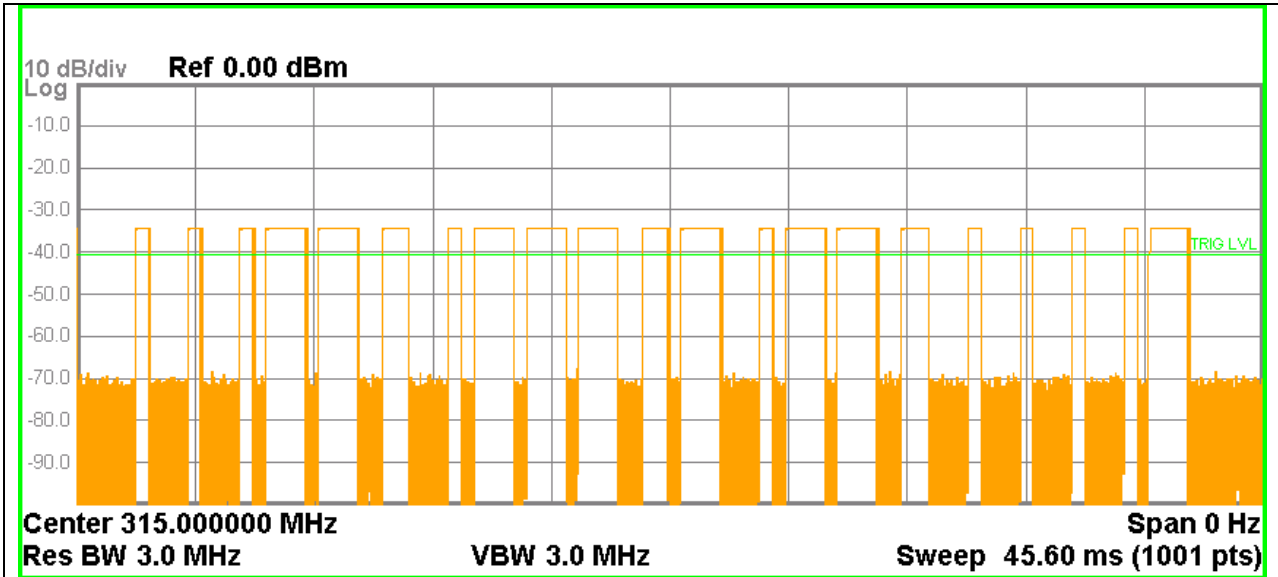
Figure 15 Pulse Train Graphs for 390MHz



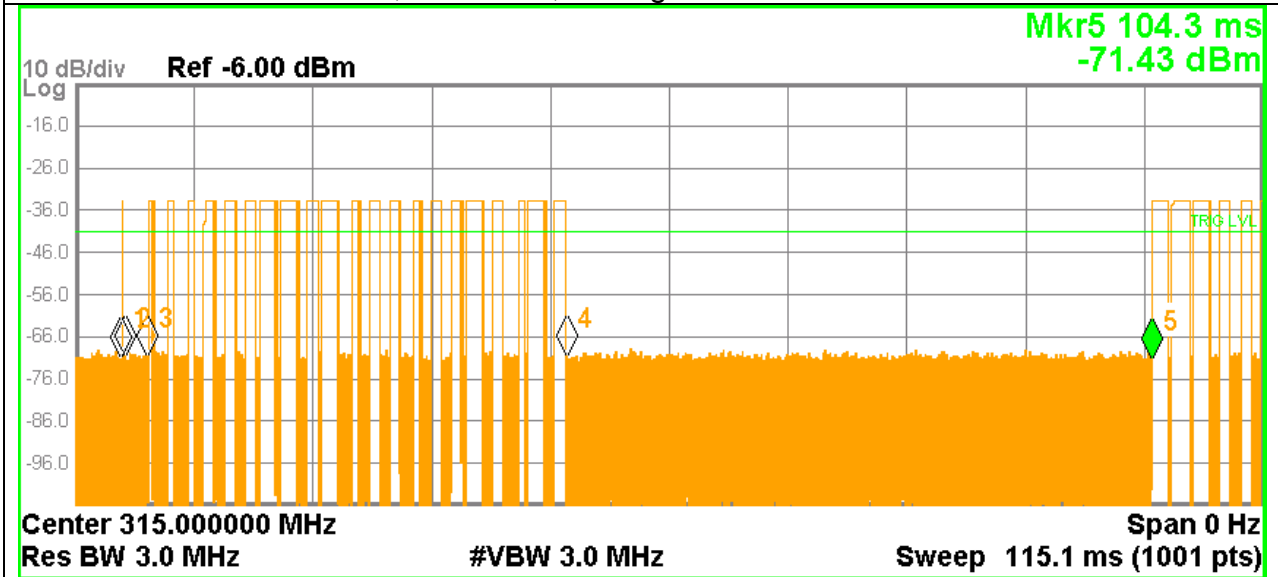
First tuning pulse duration: 0.120mS



Pulse Duration: Short Pulse 0.540mS, Medium Pulse 1.050mS, Long Pulse 1.540mS



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



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	4.376 ms	-71.15 dBm			
2	N	1	t	4.833 ms	-70.68 dBm			
3	N	1	t	6.904 ms	-70.59 dBm			
4	N	1	t	47.64 ms	-70.59 dBm			
5	N	1	t	104.3 ms	-71.43 dBm			

Period scan

4.2.4 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 C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 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, and RSS-210	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance
	1GHz – 4GHz	3 meter distance
Out of band spurious emissions limits		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)
Fundamental Frequency Limits and Non-restricted band Harmonic Limits		
Frequency (MHz)	Limit (dBµV/m) @ 3m distance	
	All harmonics except those in restricted bands must be attenuated by 20dB or more	
	Average - Fundamental	Peak - Fundamental
315	75.62	95.62
Supplementary information: See section 4.2.3 for duty cycle information.		

Figure 16 Radiated Emissions Graph (Below 1GHz)

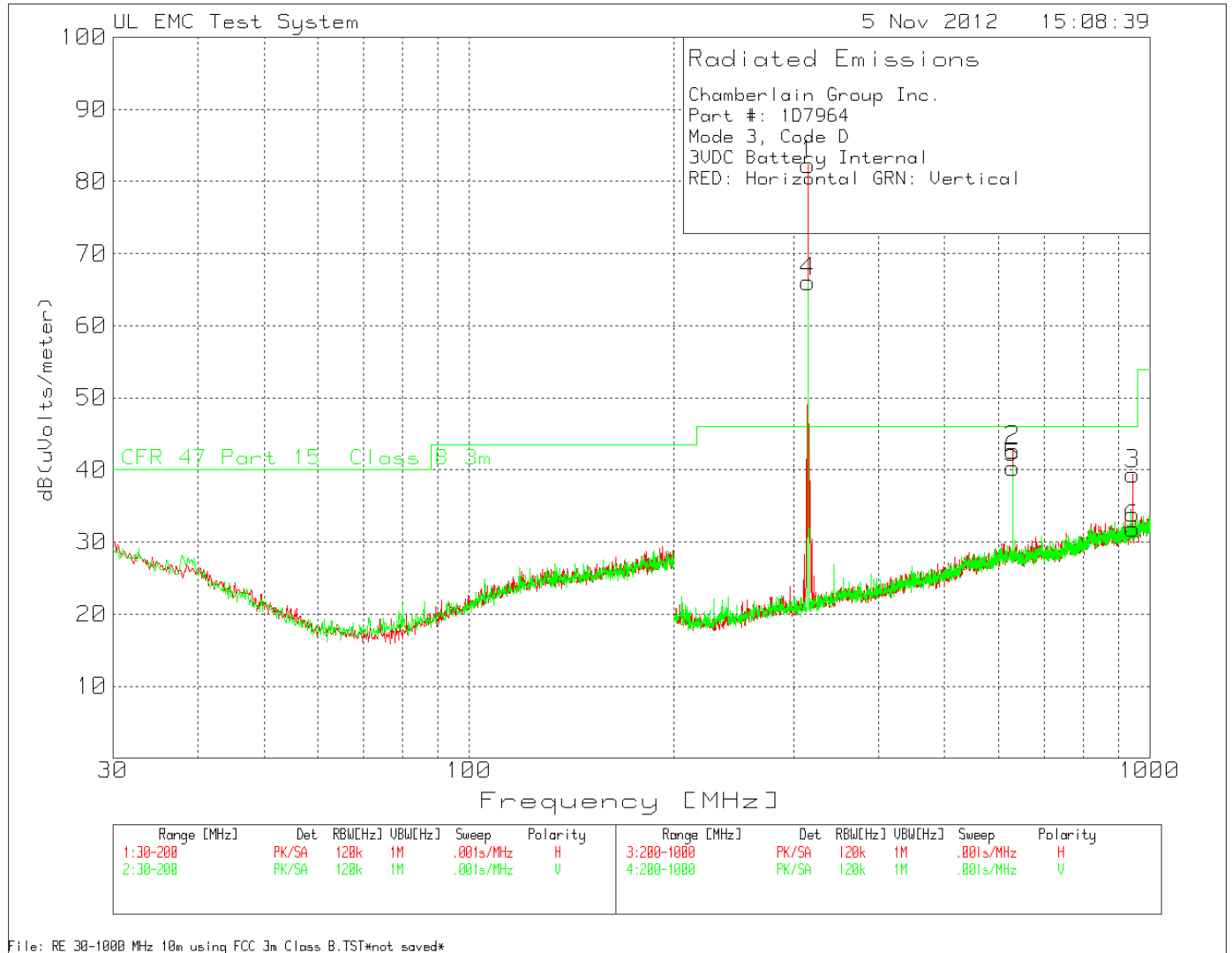


Figure 17 Radiated Emissions Graph (Above 1GHz)

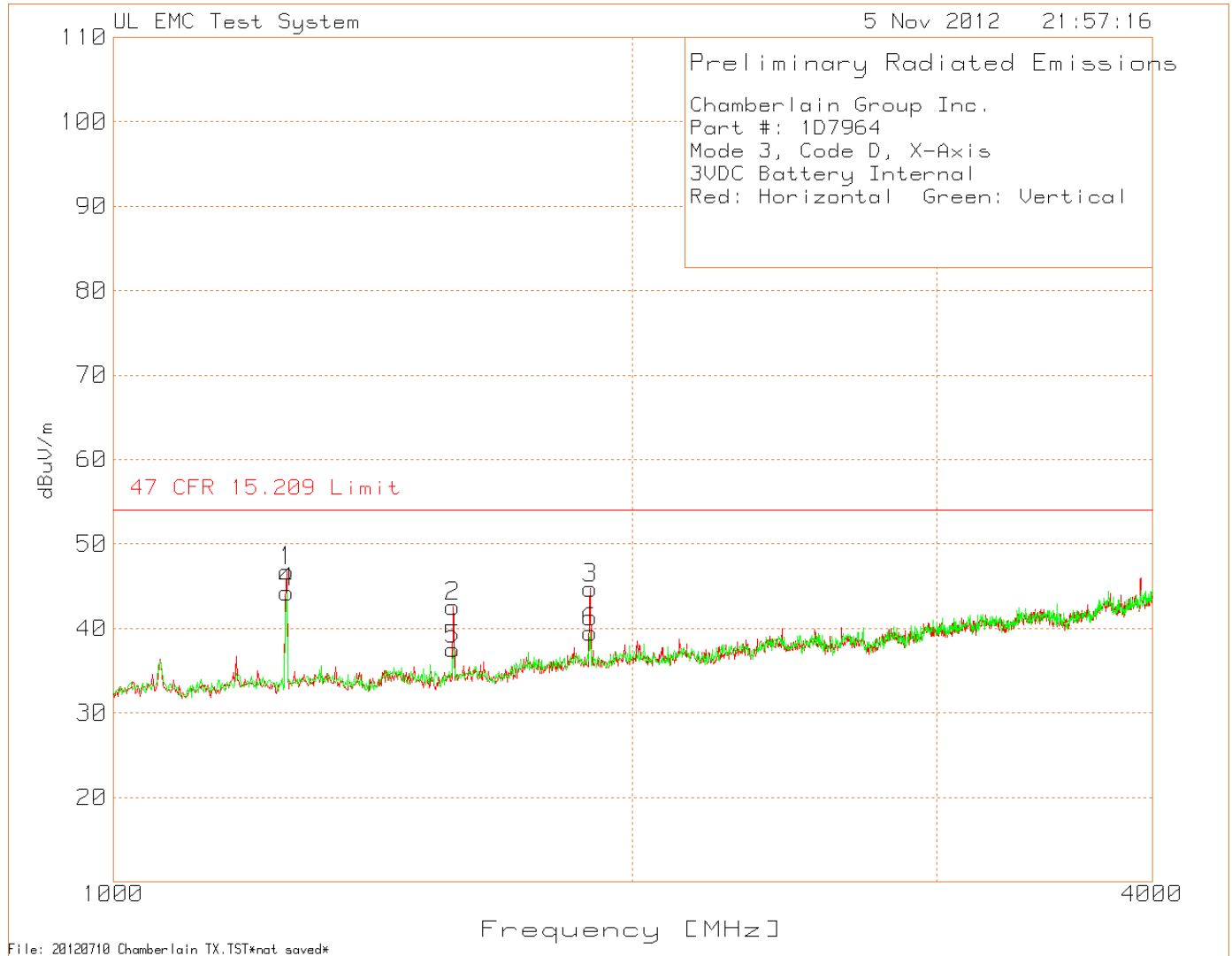


Table 16 - Radiated Emissions Data Points 315MHz

Chamberlain Group Inc.																
Part #: 1D7964																
3VDC Battery Internal																
Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes	
315.023	65.44	PK	14.3	2.1	81.84	95.32	-13.48	-10.2	71.64	75.32	-3.68	275	102	Horz	4	
315.028	49.5	PK	14.3	2.1	65.9	95.32	-29.42	-10.2	55.7	75.32	-19.62	7	114	Vert	4	
630.0526	20.02	PK	20.7	3	43.72	66	-22.28	-10.2	33.52	46	-12.48	26	129	Horz	4	
630.038	17.72	PK	20.7	3	41.42	66	-24.58	-10.2	31.22	46	-14.78	101	103	Vert	4	
945.075	13.63	PK	23.9	3.8	41.33	66	-24.67	-10.2	31.13	46	-14.87	305	159	Horz	4	
945.079	7.33	PK	23.9	3.8	35.03	66	-30.97	-10.2	24.83	46	-21.17	200	153	Vert	4	
1260.0671	79.64	PK	25.1	-56.92	47.82	74	-26.18	-10.2	37.62	54	-16.38	0	128	Horz		
1574.383	72.63	PK	25.3	-55.3	42.63	74	-31.37	-10.2	32.43	54	-21.57	*	100	Horz		
1890.1683	74.48	PK	27.4	-54.31	47.57	74	-26.43	-10.2	37.37	54	-16.63	304	120	Horz		
1260.0671	77.32	PK	25.1	-56.92	45.5	74	-28.5	-10.2	35.3	54	-18.7	121	127	Vert		
1574.383	67.55	PK	25.3	-55.3	37.55	74	-36.45	-10.2	27.35	54	-26.65	*	125	Vert		
1890.594	66.49	PK	27.4	-54.32	39.57	74	-34.43	-10.2	29.37	54	-24.63	*	100	Vert		
* Prescan Data																

4.3 Configuration 4 Test Data

4.3.1 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 (390MHz: 975.0kHz)		

Table 17 Occupied Bandwidth Configuration Settings

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

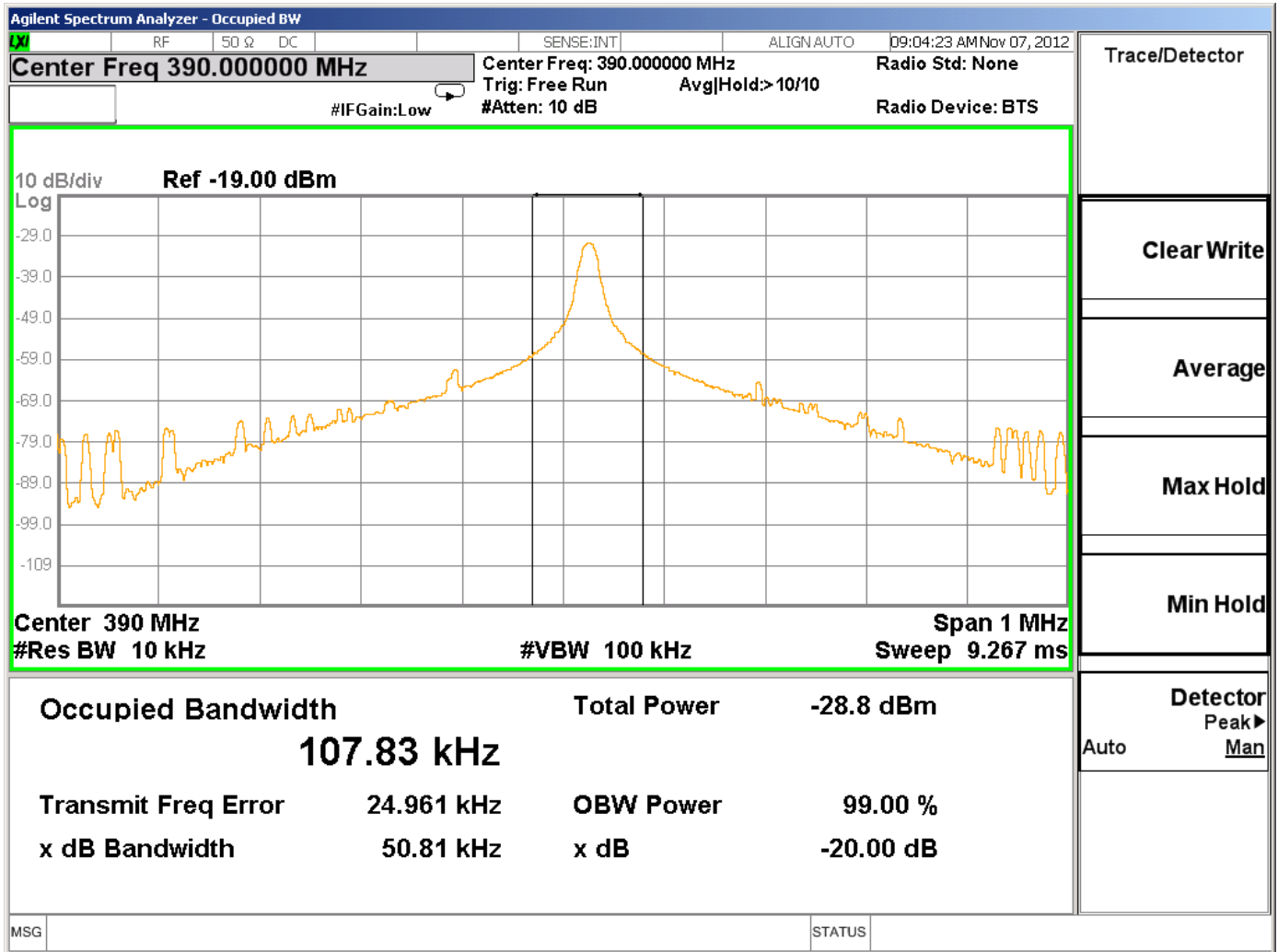
Table 18 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 19 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
390MHz	50.81	107.83

Figure 18 – Bandwidth Graph



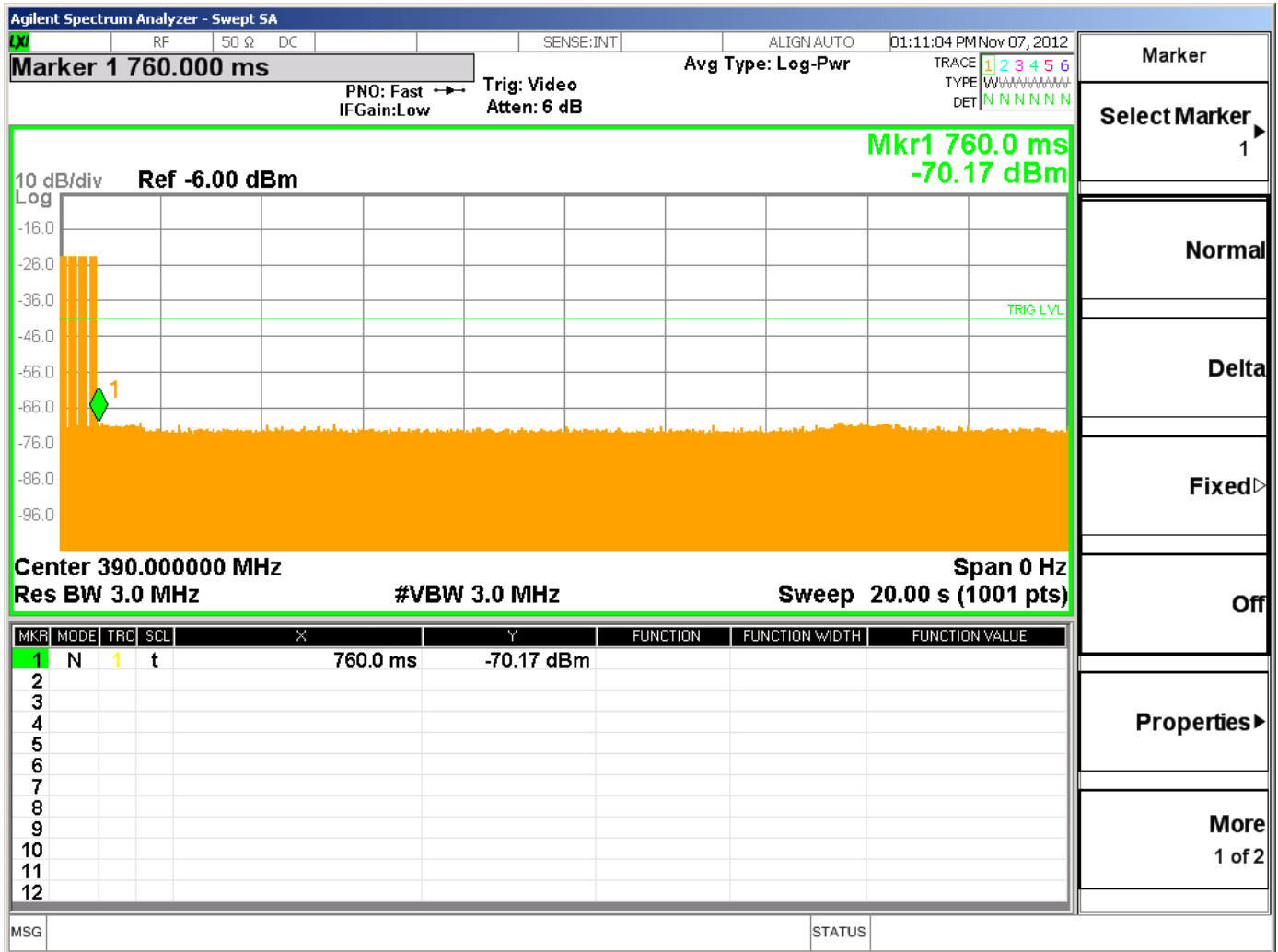
4.3.2 Test Conditions and Results – Cease Operation

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	47 CFR Part 15.231(a)	
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 20 Cease Operation Configuration Settings

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

Figure 19 Cease Operation Graph



4.3.3 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.		

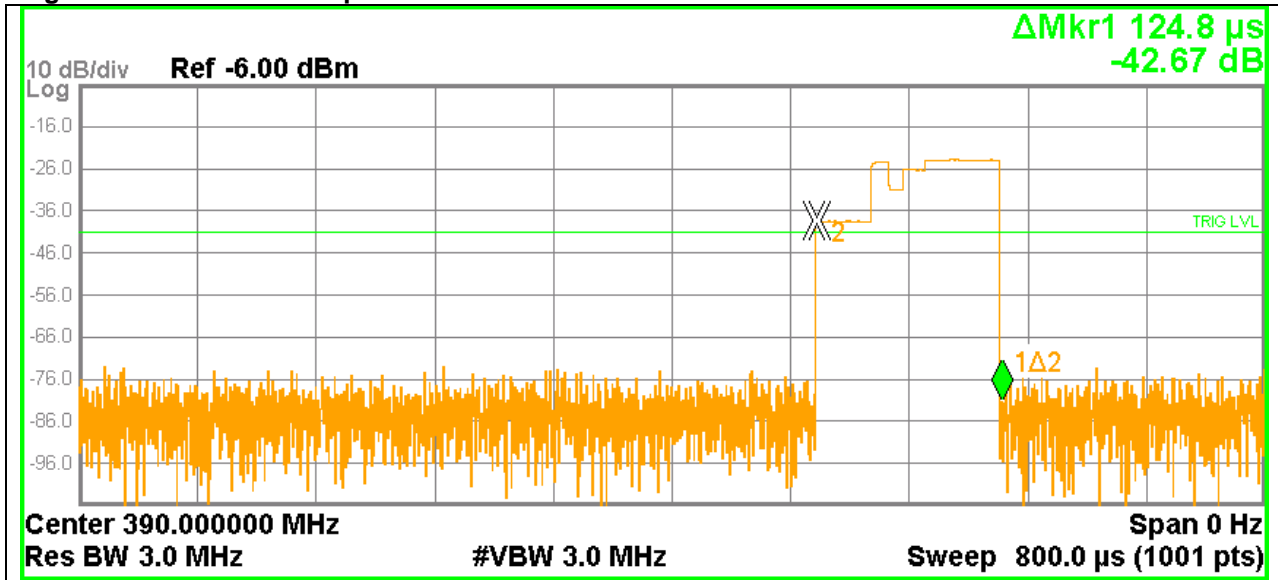
Table 21 Pulse Train Configuration Settings

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

Table 22 Pulse Train Calculation

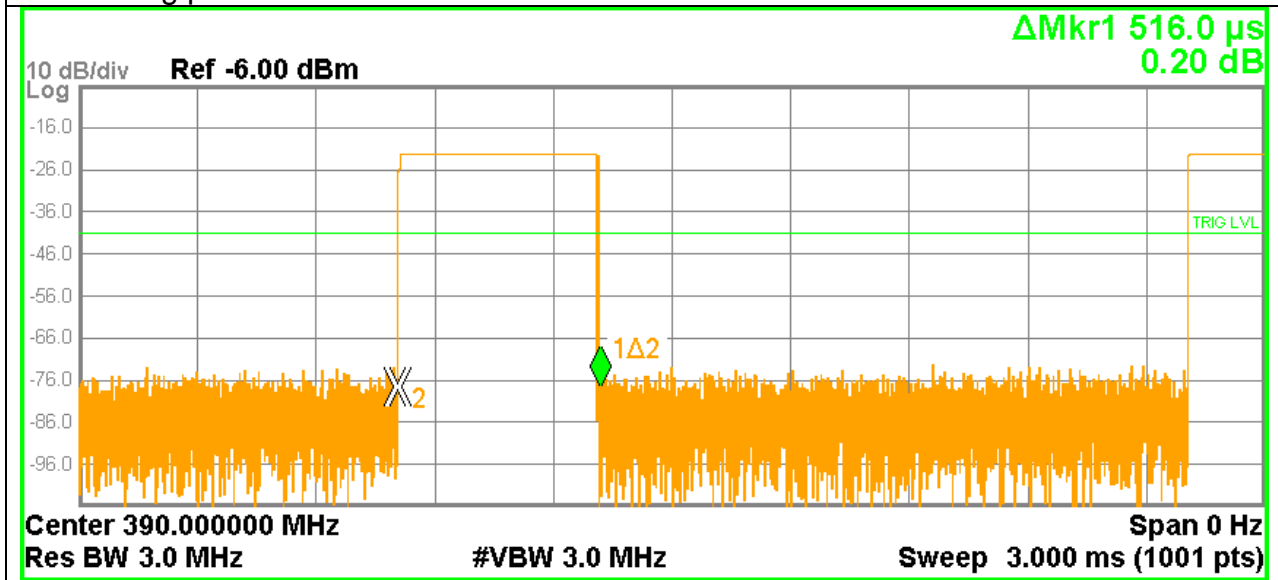
TX Frequency	Total TX time	Total Transmission period or 100ms whichever is lesser	DC Correction Factor (dB)
			$20\log\left(\frac{PulseWidth}{Period}\right)$
390MHz	$(8 \times 0.516) + (6 \times 1.001) + (7 \times 1.520) = 20.77mS$	97.56mS	-13.43dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over normal period of 97.56mS not including the tuning pulses. The manufacturer declared duty cycle as -10.20dB and it is used for all radiated emissions data.			

Figure 20 Pulse Train Graphs for 390MHz



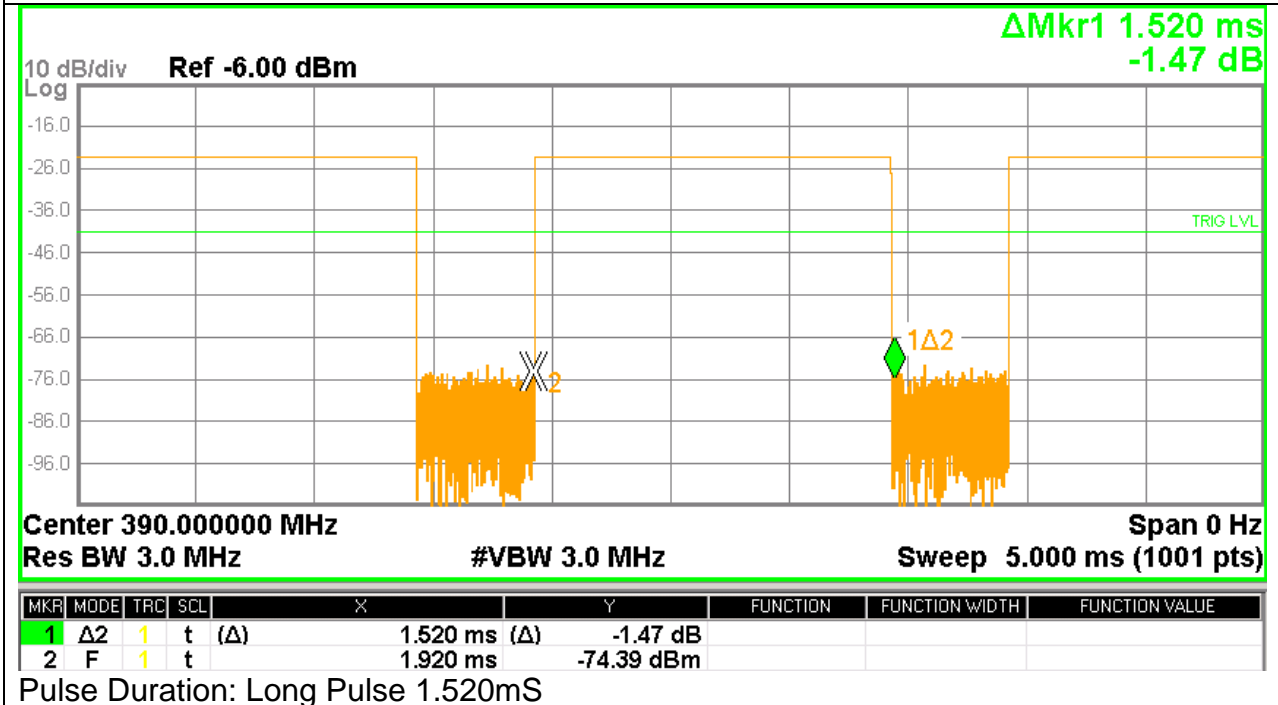
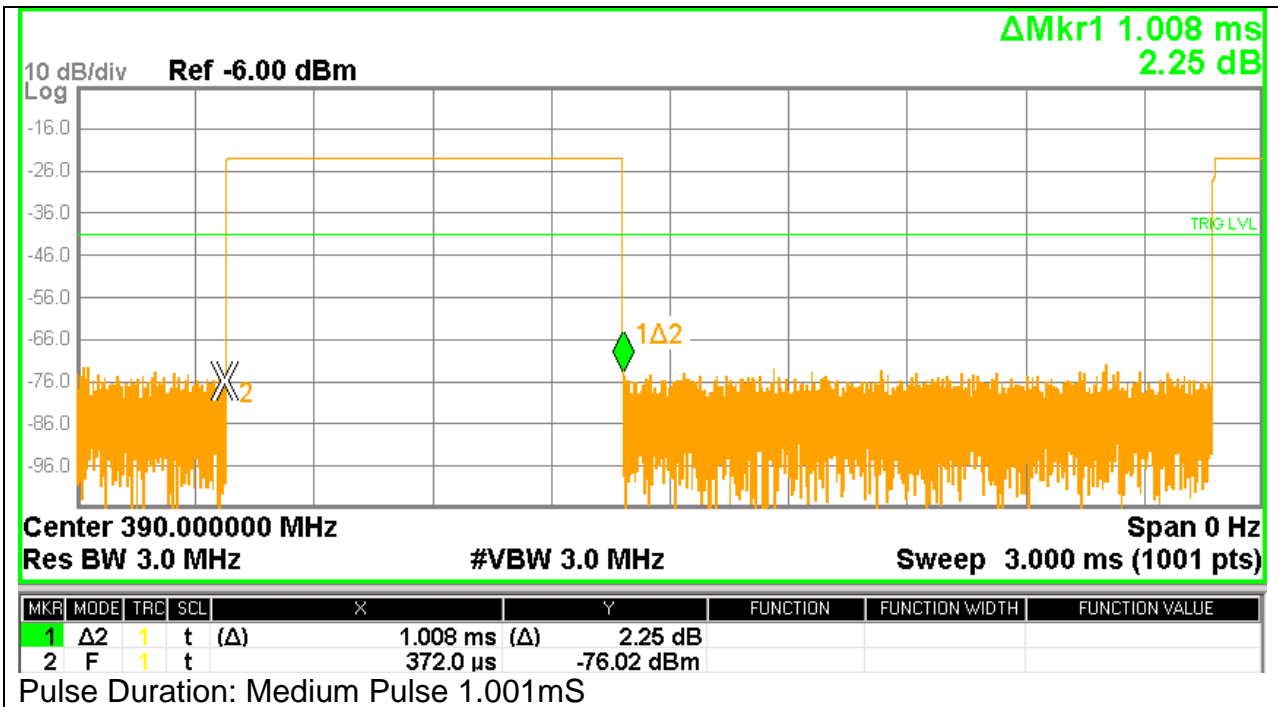
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t (Δ)		124.8 μs (Δ)			-42.67 dB
2	F	1	t		497.6 μs			-38.62 dBm

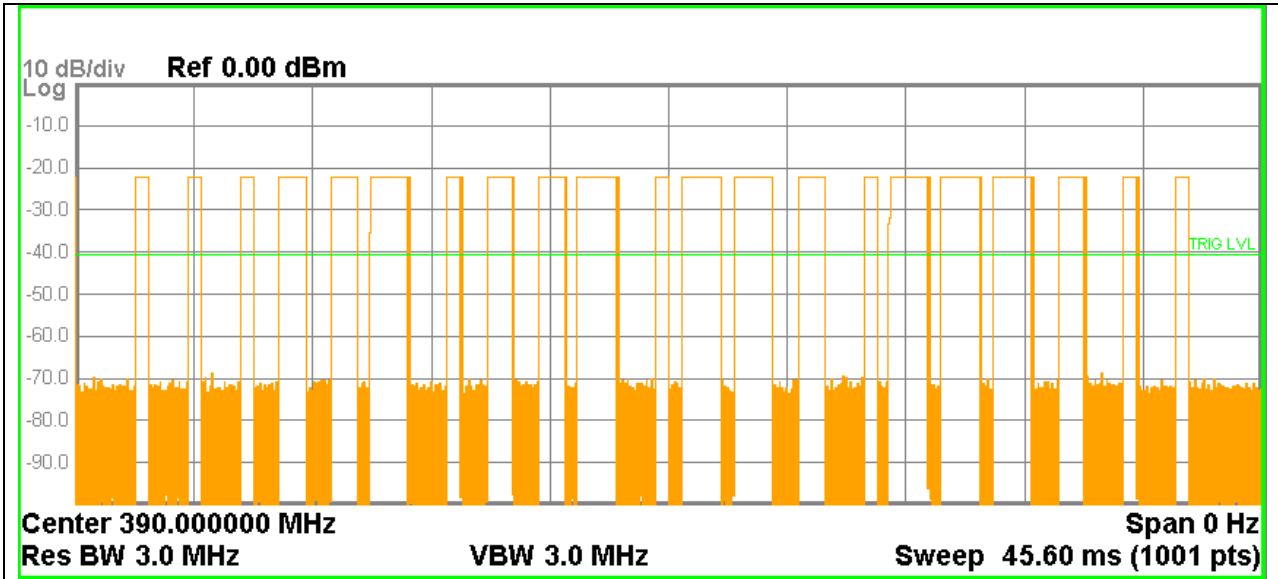
First tuning pulse duration: 0.125mS



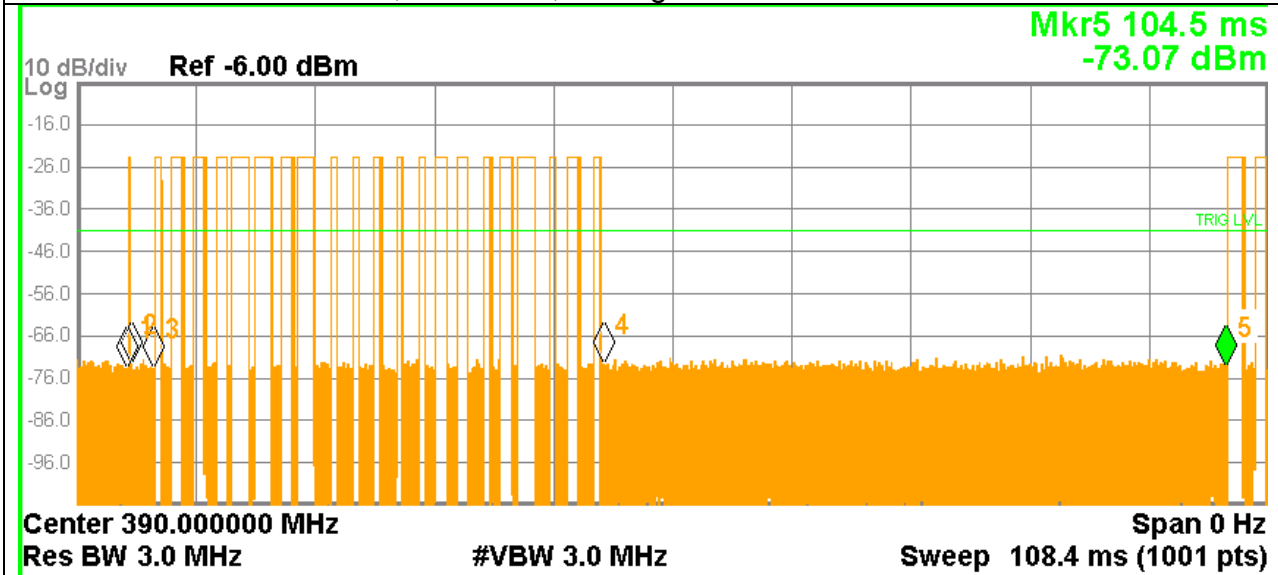
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t (Δ)		516.0 μs (Δ)			0.20 dB
2	F	1	t		804.0 μs			-77.80 dBm

Pulse Duration: Short Pulse 0.516mS





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



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	4.553 ms	-73.57 dBm			
2	N	1	t	4.986 ms	-72.65 dBm			
3	N	1	t	6.938 ms	-73.65 dBm			
4	N	1	t	47.91 ms	-72.63 dBm			
5	N	1	t	104.5 ms	-73.07 dBm			

Period scan

4.3.4 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 C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 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, and RSS-210	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance
	1GHz – 4GHz	3 meter distance
Out of band spurious emissions		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)
Fundamental Frequency Limits and Non-restricted band Harmonic Limits		
Frequency (MHz)	Limit (dBµV/m) @ 3m distance	
	All harmonics except those in restricted bands must be attenuated by 20dB or more	
	Average - Fundamental	Peak - Fundamental
390	79.24	99.24
Supplementary information: See section 4.3.3 for duty cycle information.		

Figure 21 Radiated Emissions Graph (Below 1GHz)

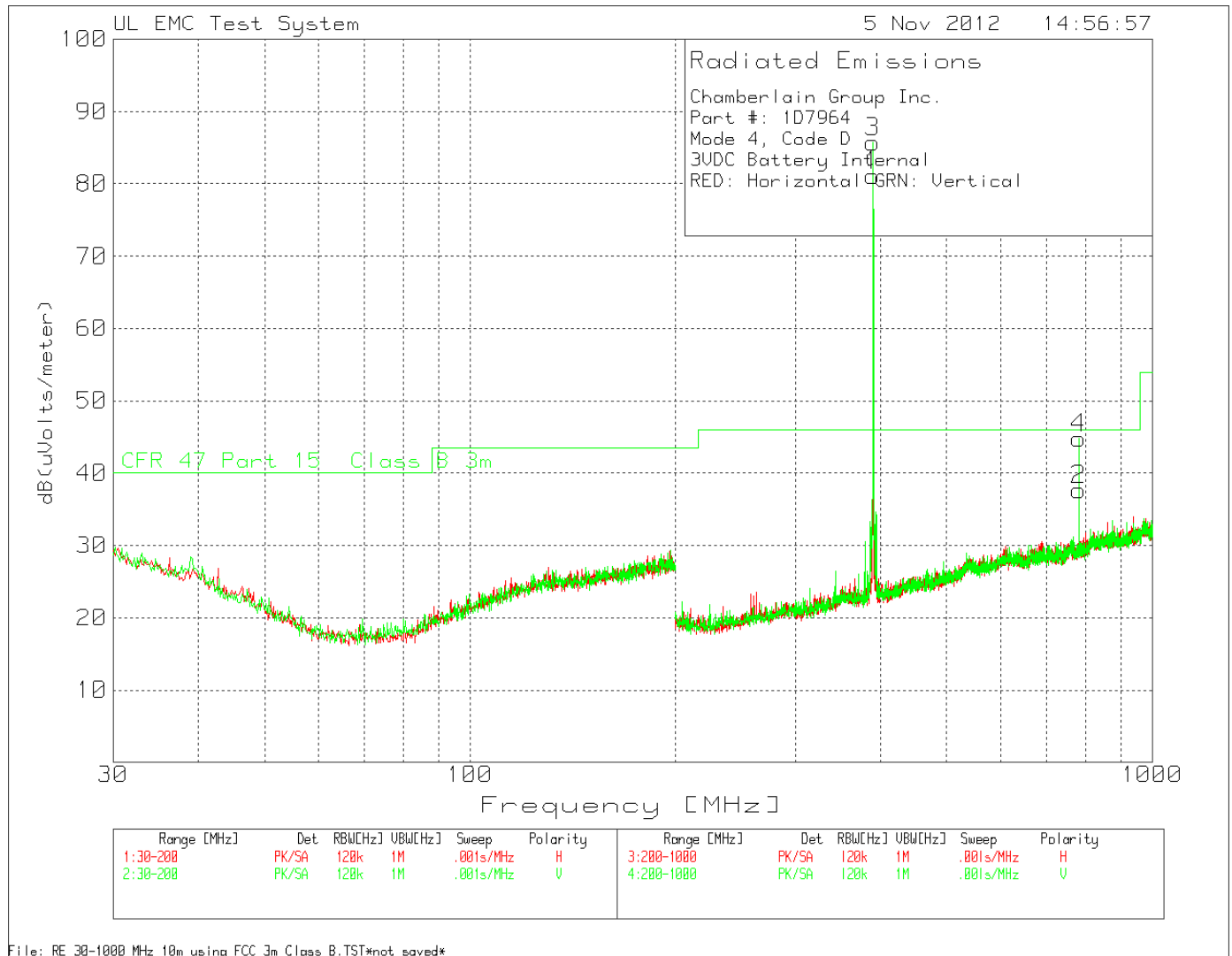


Figure 22 Radiated Emissions Graph (Above 1GHz)

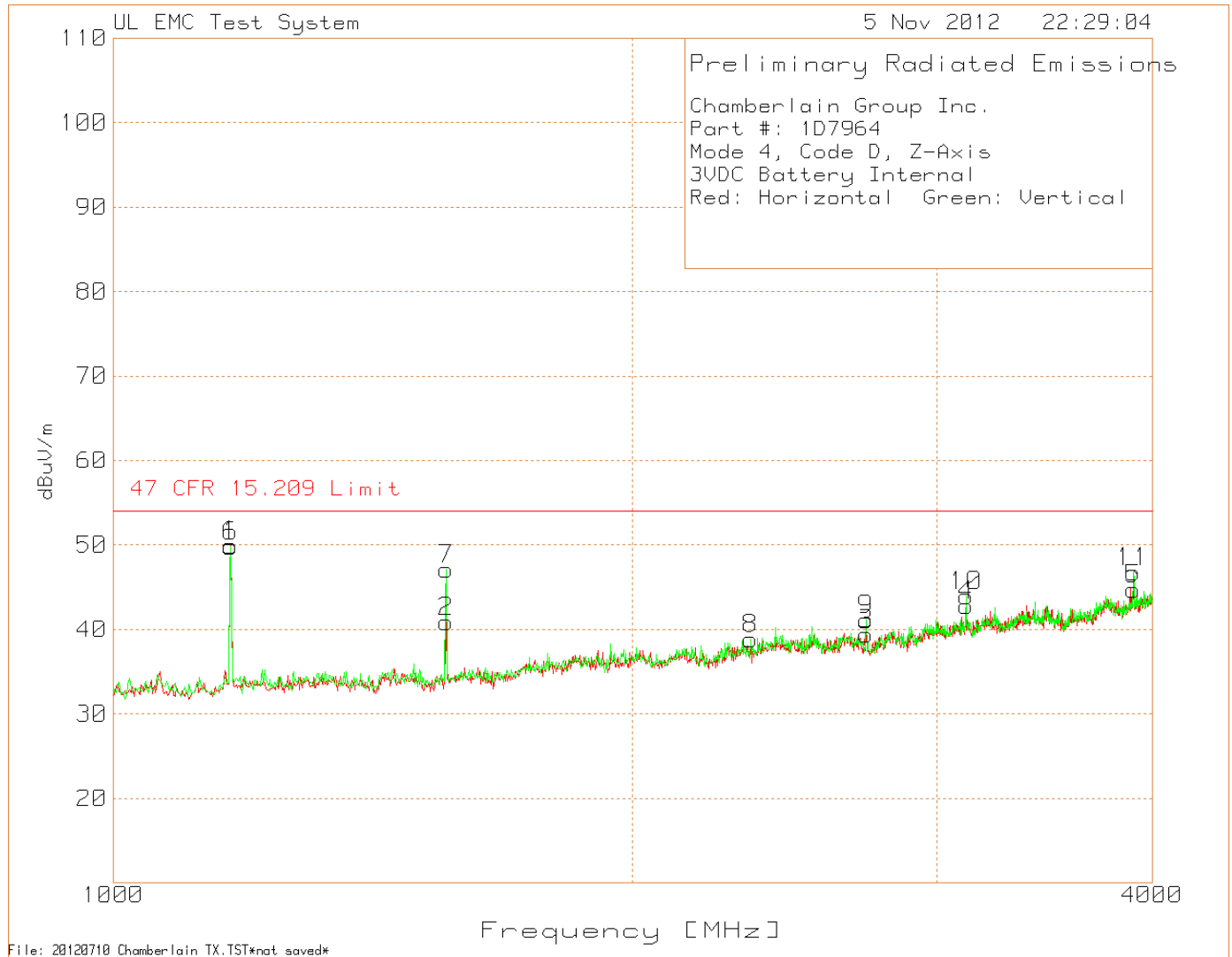


Table 23 - Radiated Emissions Data Points

Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
390.031	63.13	PK	16.1	2.3	81.53	99.24	-17.71	-10.2	71.33	79.24	-7.91	181	107	Horz
390.031	67.98	PK	16.1	2.3	86.38	99.24	-12.86	-10.2	76.18	79.24	-3.06	73	139	Vert
780.083	11.01	PK	22	3.4	36.41	66	-29.59	-10.2	26.21	46	-19.79	110	102	Horz
780.068	17.04	PK	22	3.4	42.44	66	-23.56	-10.2	32.24	46	-13.76	354	154	Vert
1170.0832	82.68	PK	24.8	-57.24	50.24	74	-23.76	-10.2	40.04	54	-13.96	11	128	Horz
1560.374	71.34	PK	25.2	-55.65	40.89	74	-33.11	-10.2	30.69	54	-23.31	*	126	Horz
2731.154	62.6	PK	29	-52.19	39.41	74	-34.59	-10.2	29.21	54	-24.79	*	126	Horz
3121.414	63.67	PK	30.6	-51.41	42.86	74	-31.14	-10.2	32.66	54	-21.34	*	127	Horz
3899.7234	69.77	PK	32.7	-52.05	50.42	74	-23.58	-10.2	40.22	54	-13.78	29	105	Horz
1170.0531	82.88	PK	24.8	-57.24	50.44	74	-23.56	-10.2	40.24	54	-13.76	107	100	Vert
1560.2585	78.77	PK	25.2	-55.66	48.31	74	-25.69	-10.2	38.11	54	-15.89	21	101	Vert
2340.894	63.5	PK	28.3	-52.9	38.9	74	-35.1	-10.2	28.7	54	-25.3	*	100	Vert
2731.154	64.28	PK	29	-52.19	41.09	74	-32.91	-10.2	30.89	54	-23.11	*	100	Vert
3121.414	64.79	PK	30.6	-51.41	43.98	74	-30.02	-10.2	33.78	54	-20.22	*	125	Vert
3899.7535	68.45	PK	32.7	-52.05	49.1	74	-24.9	-10.2	38.9	54	-15.1	53	102	Vert
*Prescan data														

4.4 Configuration 5 Test Data

4.4.1 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 (390MHz: 975.0kHz)		

Table 24 Occupied Bandwidth Configuration Settings

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

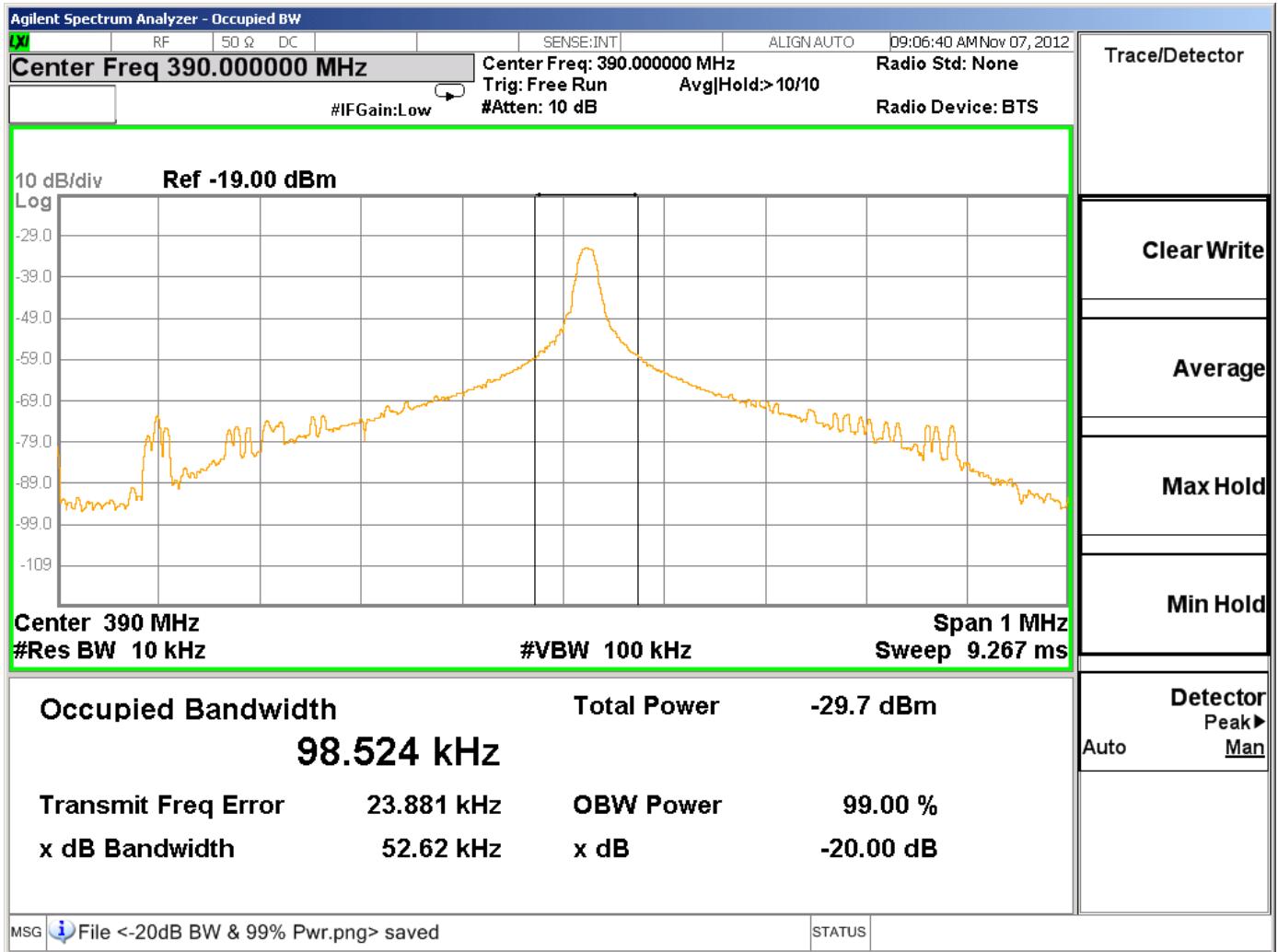
Table 25 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 26 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
390MHz	52.62	98.524

Figure 23 – Bandwidth Graph



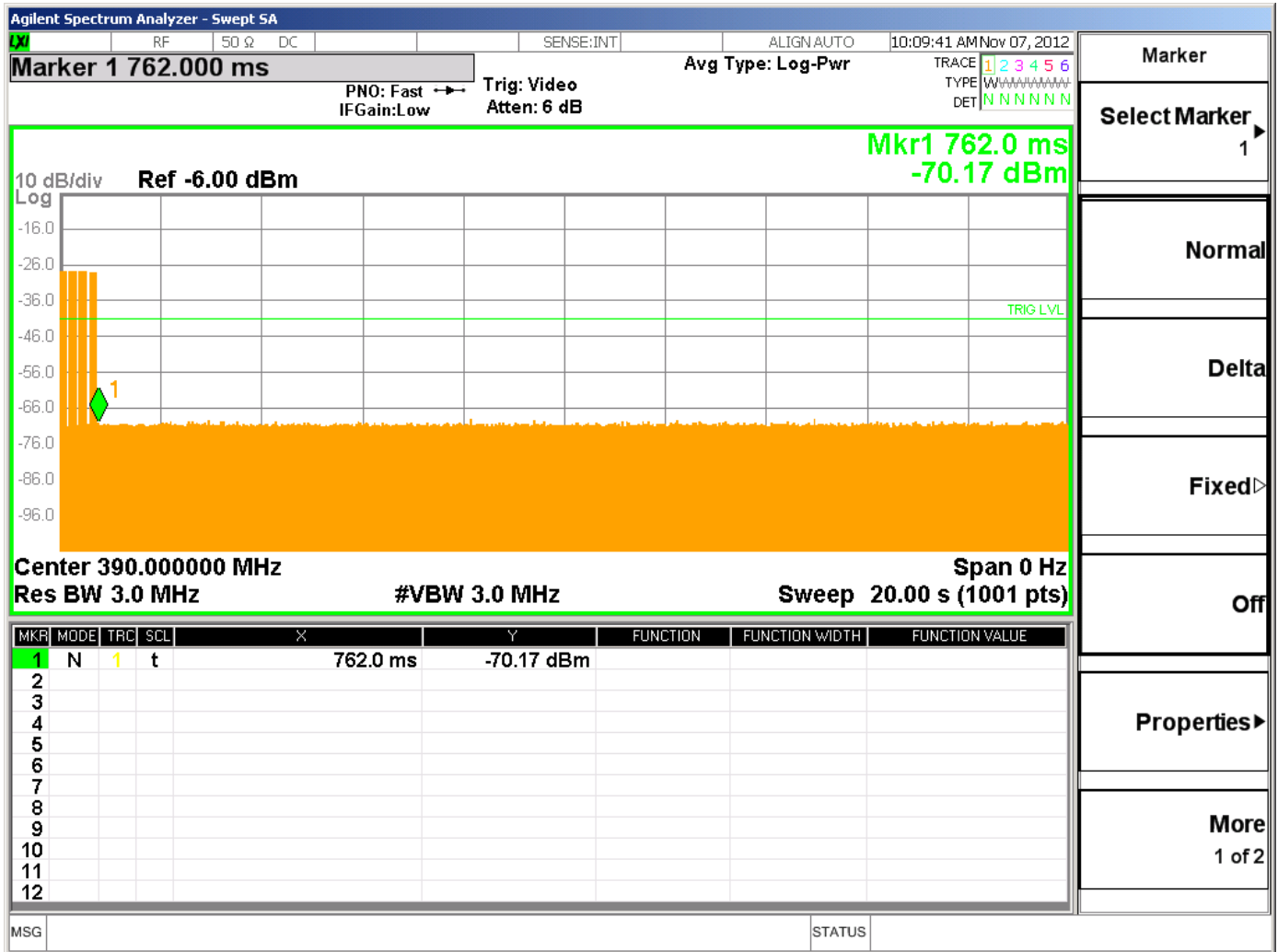
4.4.2 Test Conditions and Results – Cease Operation

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	47 CFR Part 15.231(a)
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 27 Cease Operation Configuration Settings

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

Figure 24 Cease Operation Graph



4.4.3 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.		

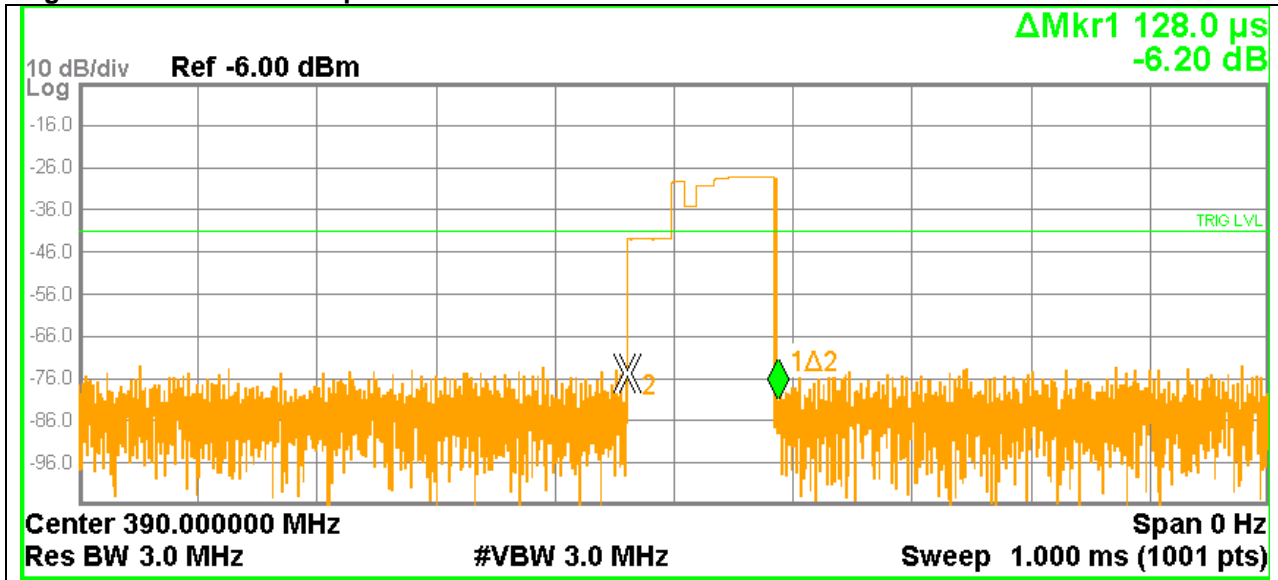
Table 28 Pulse Train Configuration Settings

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

Table 29 Pulse Train Calculation

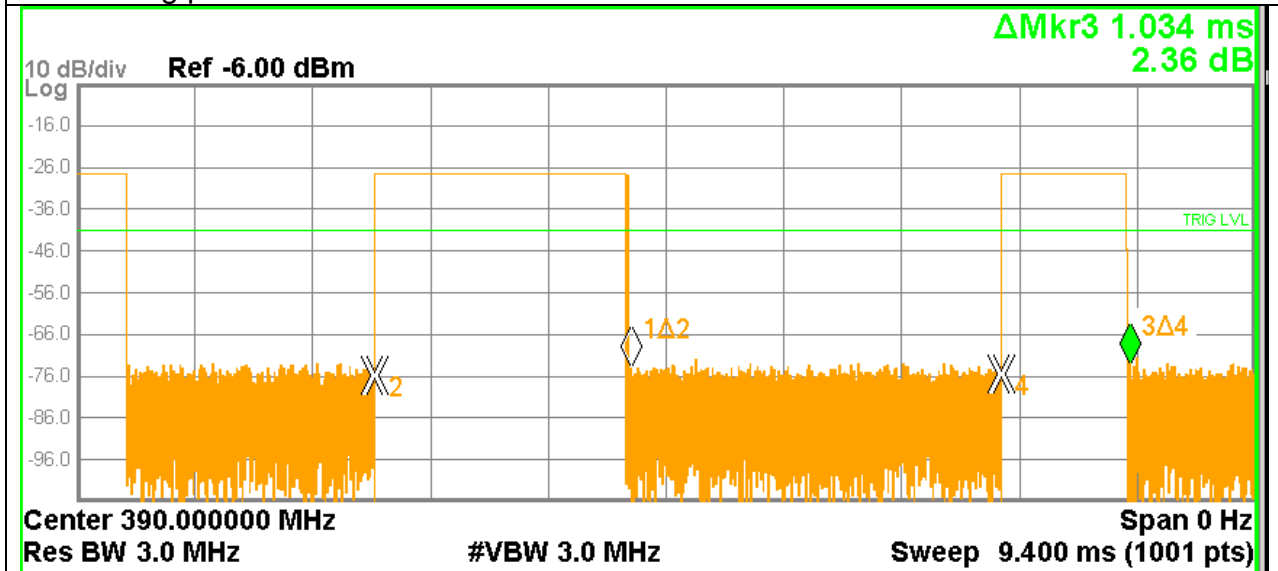
TX Frequency	Total TX time	Total Transmission period or 100ms whichever is lesser	DC Correction Factor (dB)
			$20\log\left(\frac{PulseWidth}{Period}\right)$
390MHz	$(5 \times 1.010) + (3 \times 2.980) + (3 \times 3.058) = 23.16\text{mS}$	96.3mS	-12.38dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over normal period of 96.3mS not including the tuning pulses. The manufacturer declared duty cycle as -6.74dB and it is used for all radiated emissions data.			

Figure 25 Pulse Train Graphs for 390MHz



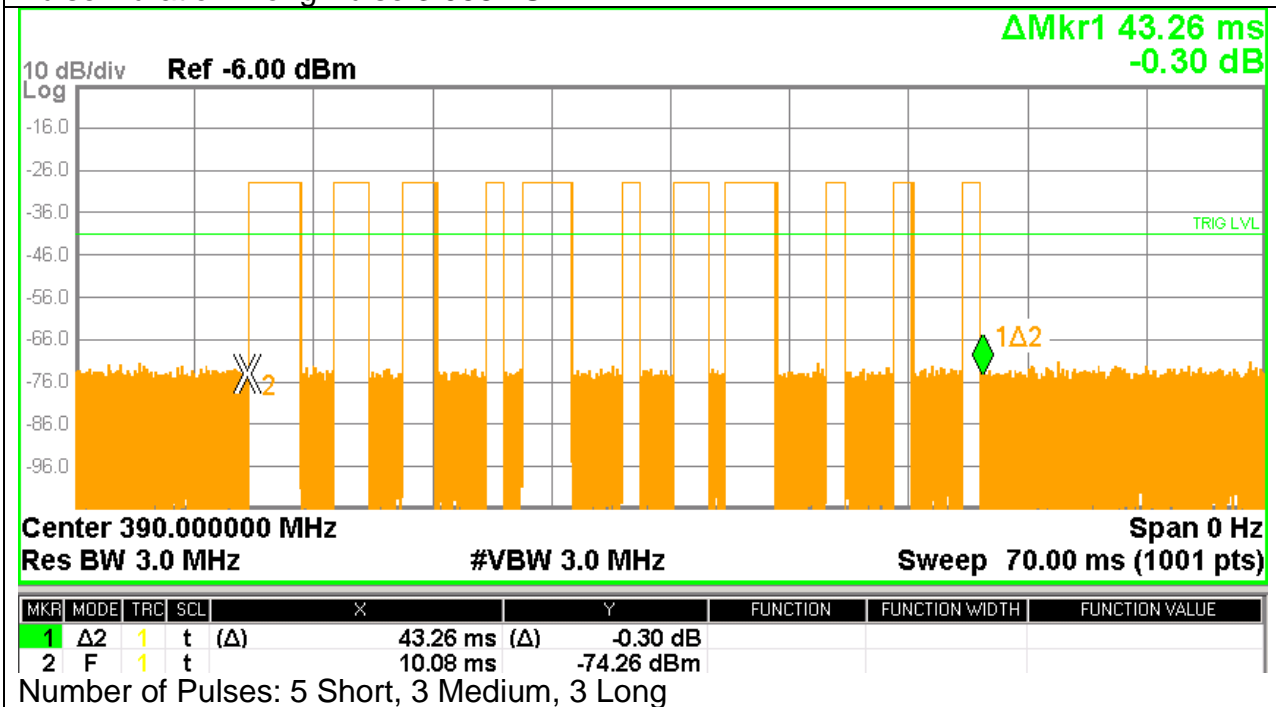
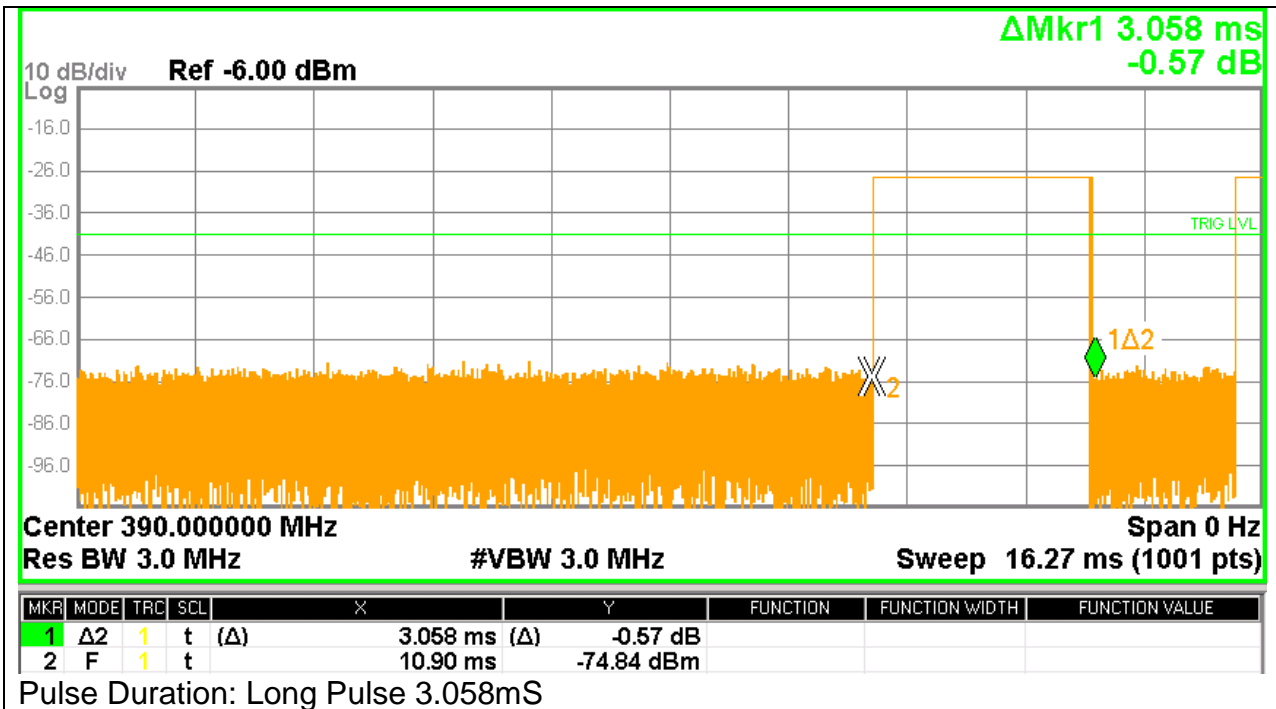
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	128.0 μs (Δ)	-6.20 dB		
2	F	1	t		460.0 μs	-75.04 dBm		

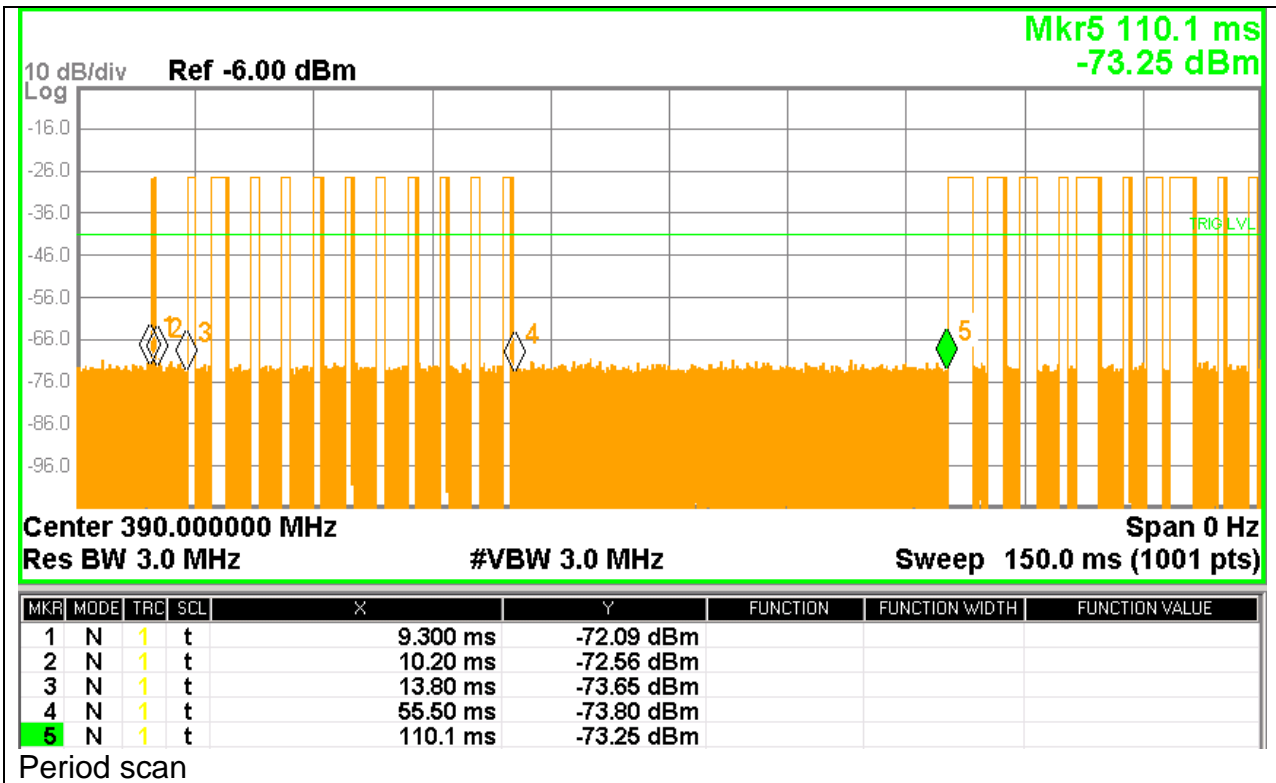
First tuning pulse duration: 0.128mS



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	2.049 ms (Δ)	1.96 dB		
2	F	1	t		2.369 ms	-76.00 dBm		
3	Δ4	1	t	(Δ)	1.034 ms (Δ)	2.36 dB		
4	F	1	t		7.370 ms	-75.47 dBm		

Pulse Duration: Short Pulse 1.010mS, Medium Pulse 2.980mS





4.4.4 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 C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 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, and RSS-210	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance
	1GHz – 4GHz	3 meter distance
Restricted Band Limits		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)
Fundamental Frequency Limits and Non-restricted band Harmonic Limits		
Frequency (MHz)	Limit (dBµV/m) @ 3m distance	
	All harmonics except those in restricted bands must be attenuated by 20dB or more	
	Average - Fundamental	Peak - Fundamental
390	79.24	99.24
Supplementary information: See section 4.4.3 for duty cycle information.		

Figure 26 Radiated Emissions Graph (Below 1GHz)

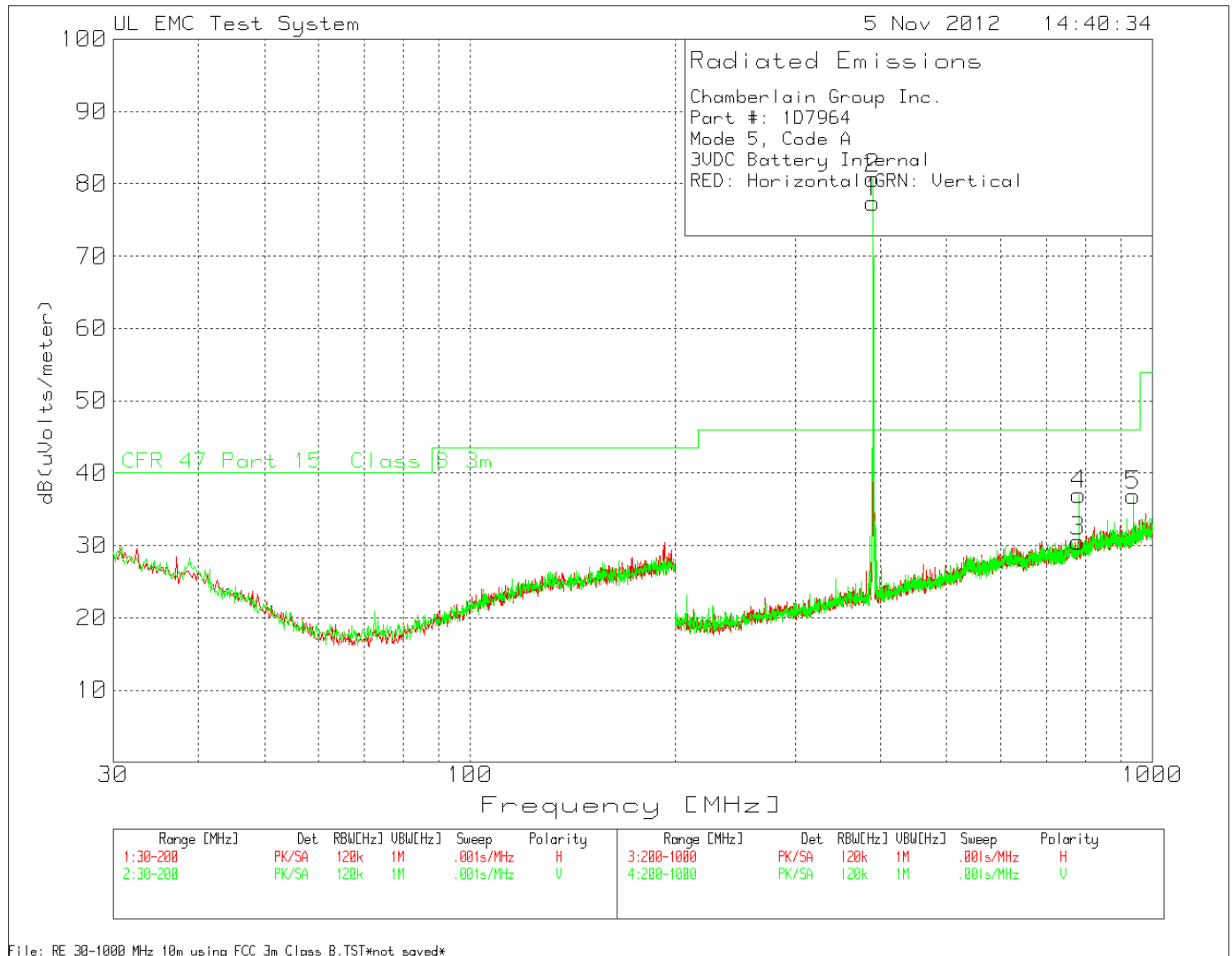


Figure 27 Radiated Emissions Graph (Above 1GHz)

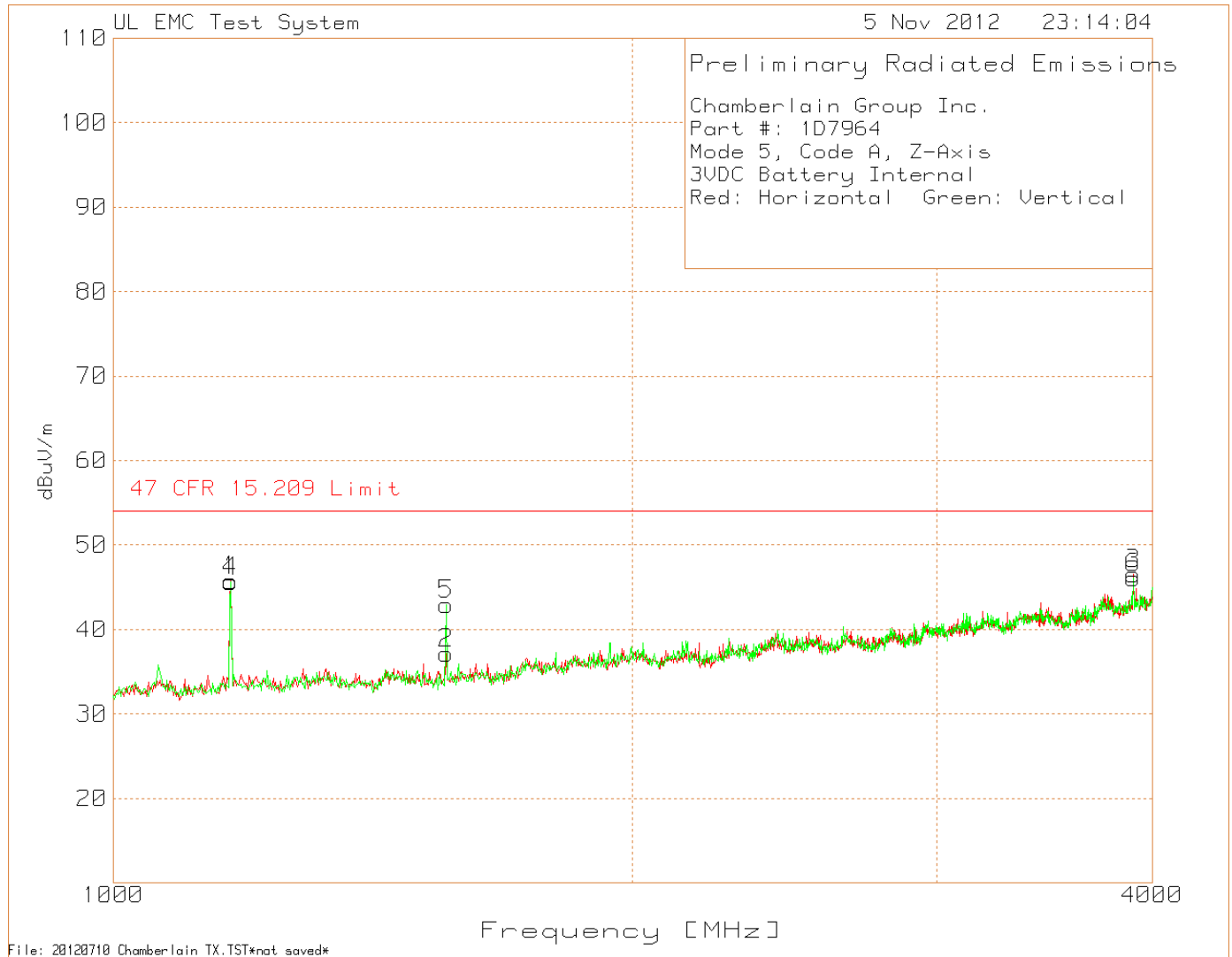


Table 30 - Radiated Emissions Data Points

Chamberlain Group Inc.																
Part #: 1D7964																
3VDC Battery Internal																
Test Frequency MHz	Meter Reading dBuV	Detector	Antenna Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit dBuV/m	Margin Peak dB	Duty Cycle Factor dB	Level with Duty Cycle dBuV/m	Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity		
390.024	59.14	PK	16.1	2.3	77.54	99.24	-21.7	-6.74	70.8	79.24	-8.44	178	102	Horz		
390.024	64.07	PK	16.1	2.3	82.47	99.24	-16.77	-6.74	75.73	79.24	-3.51	80	142	Vert		
780.05	11.85	PK	22	3.4	37.25	66	-28.75	-6.74	30.51	46	-15.49	353	153	Vert		
780.051	7.93	PK	22	3.4	33.33	66	-32.67	-6.74	26.59	46	-19.41	247	104	Horz		
1170.0792	79.72	PK	24.8	-57.24	47.28	74	-26.72	-6.74	40.54	54	-13.46	360	125	Horz		
1560.374	67.63	PK	25.2	-55.65	37.18	74	-36.82	-6.74	30.44	54	-23.56 *		126	Horz		
3900.0962	70.27	PK	32.7	-52.05	50.92	74	-23.08	-6.74	44.18	54	-9.82	42	105	Horz		
1170.1032	78.7	PK	24.8	-57.24	46.26	74	-27.74	-6.74	39.52	54	-14.48	100	102	Vert		
1560.374	73.37	PK	25.2	-55.65	42.92	74	-31.08	-6.74	36.18	54	-17.82 *		100	Vert		
3899.8377	68.44	PK	32.7	-52.05	49.09	74	-24.91	-6.74	42.35	54	-11.65	74	102	Vert		
*Prescan Data Used																

Appendix A

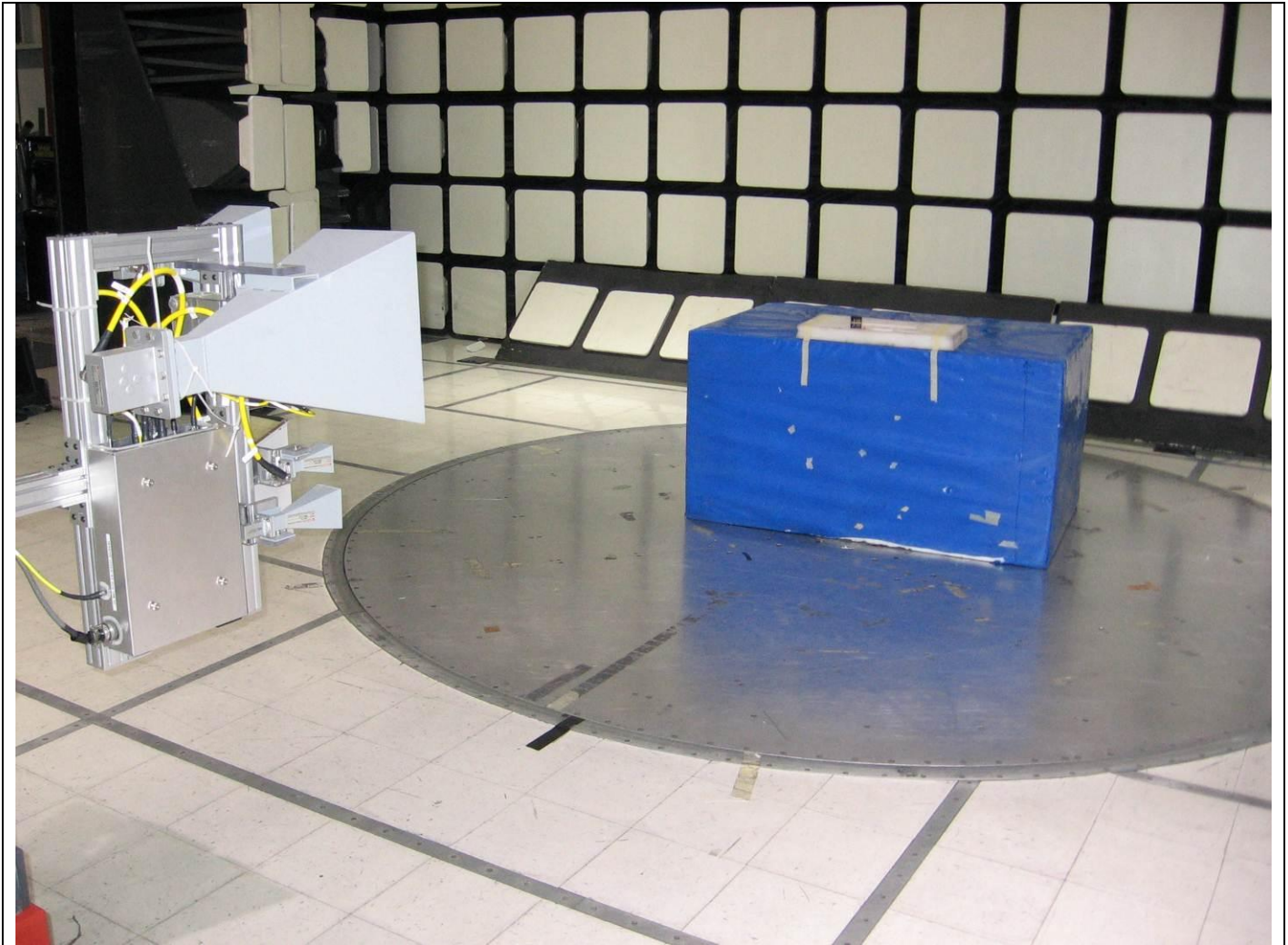
Test Equipment Used

Test Equipment Used for Near Field Measurements					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum analyzer	Agilent	PXA	EMC4360	20120515	20130515
Generic Di-pole Antenna	-	-	-	-	-

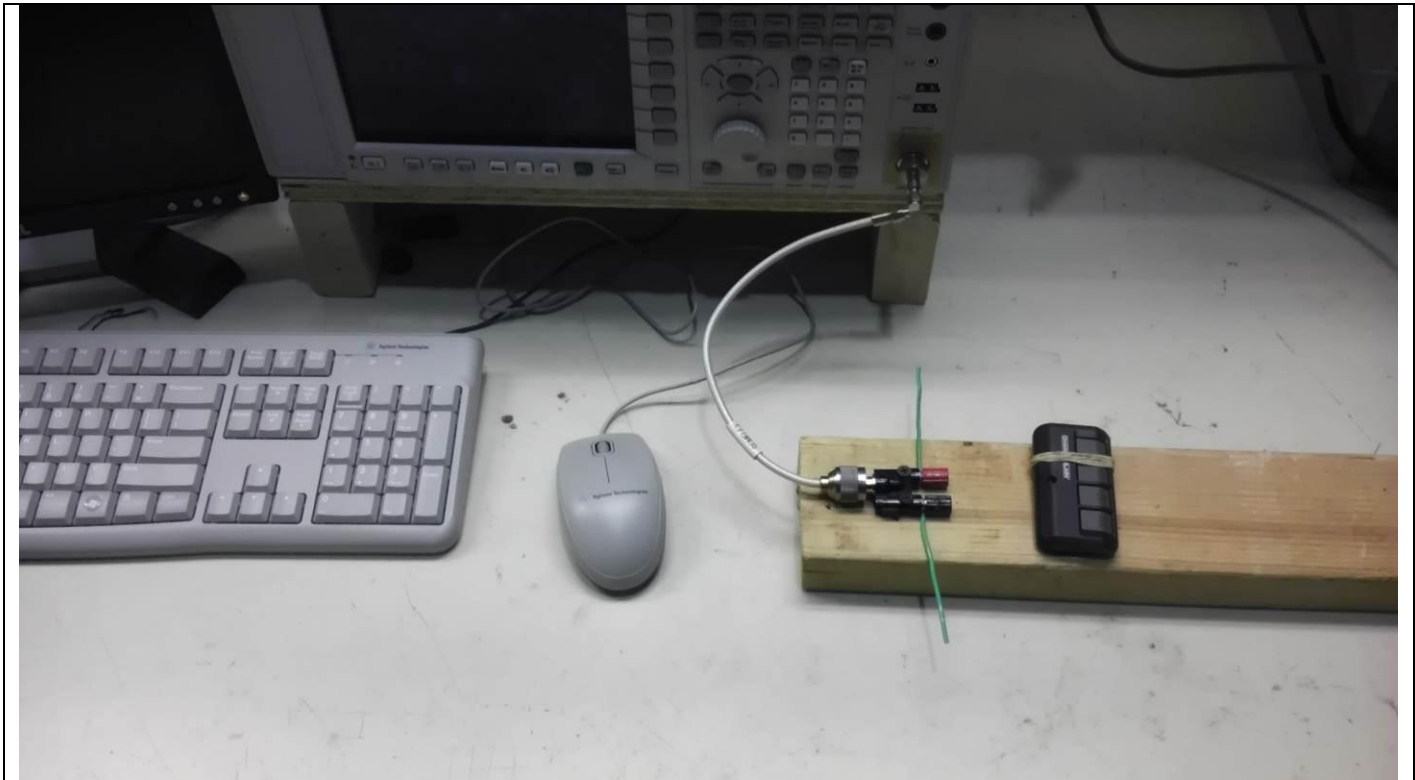
Test Equipment Used for Radiated Emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20111228	20121231
Bicon Antenna	Chase	VBA6106A	EMC4078	20120117	20130131
Log-P Antenna	Chase	UPA6109	EMC4313	20120807	20130831
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20111227	20121231
Antenna Array	UL	BOMS	EMC4276	20111227	20121231

Appendix B

Test Setup Photos



Radiated Emissions Setup



Near Field Measurements

Appendix C

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/standards/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

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