4.6 Mode#6 Test Data

4.6.1 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: 975.00kHz)	

Table 41 Occupied Bandwidth Configuration Settings

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

Table 42 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 43 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
390MHz	12.35	23.654

Figure 31 – 20dB Bandwidth Graph

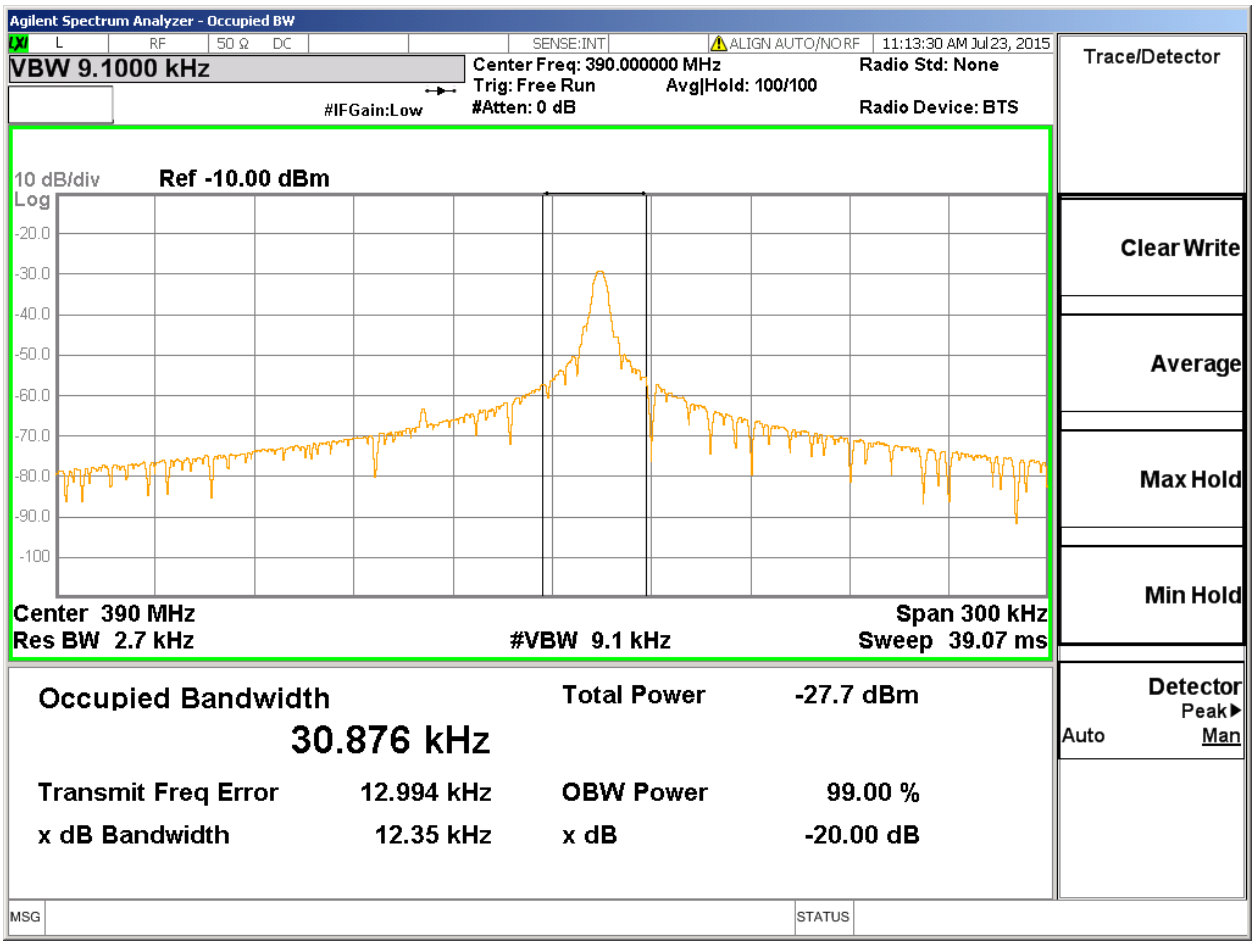
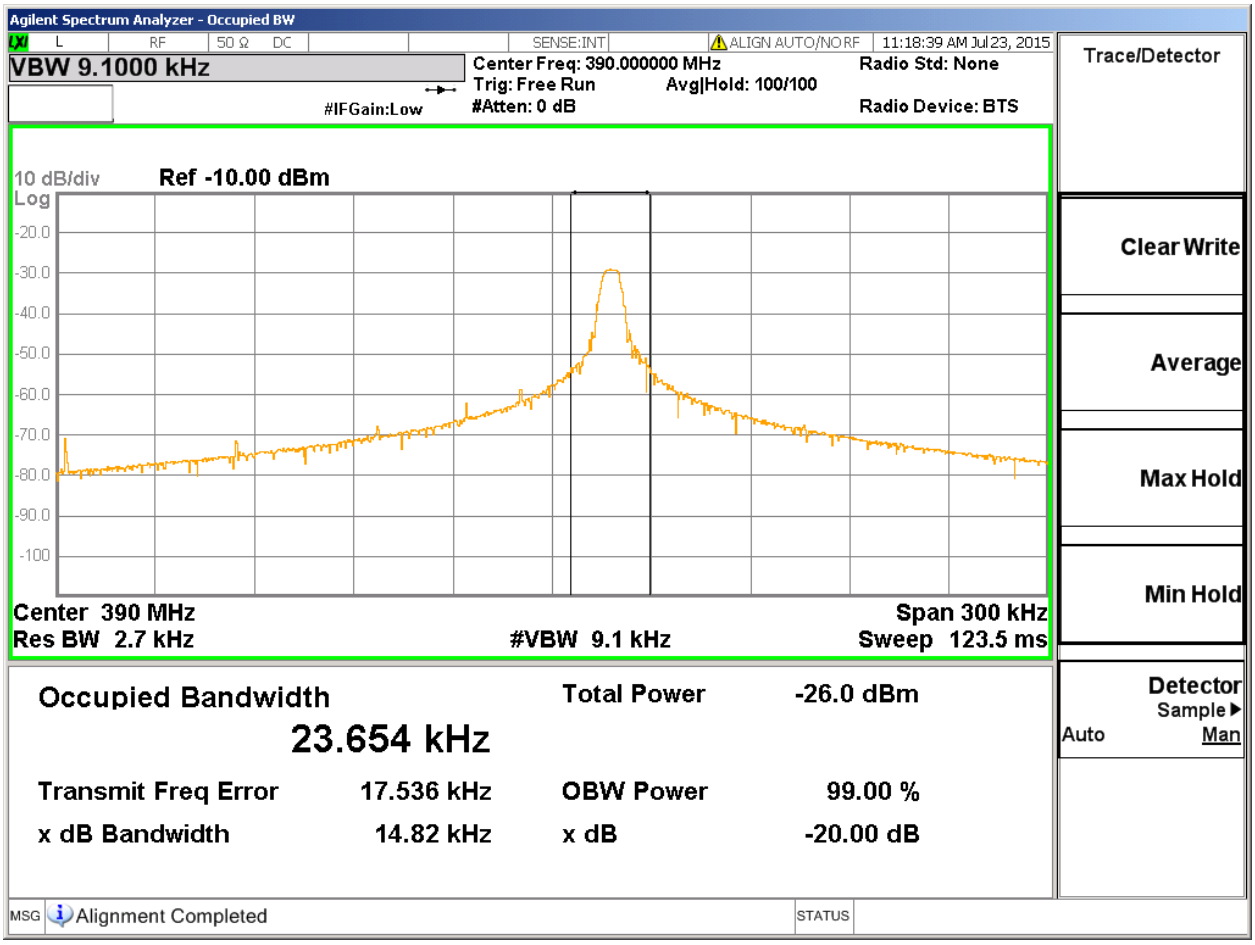


Figure 32 – 99% Bandwidth Graph



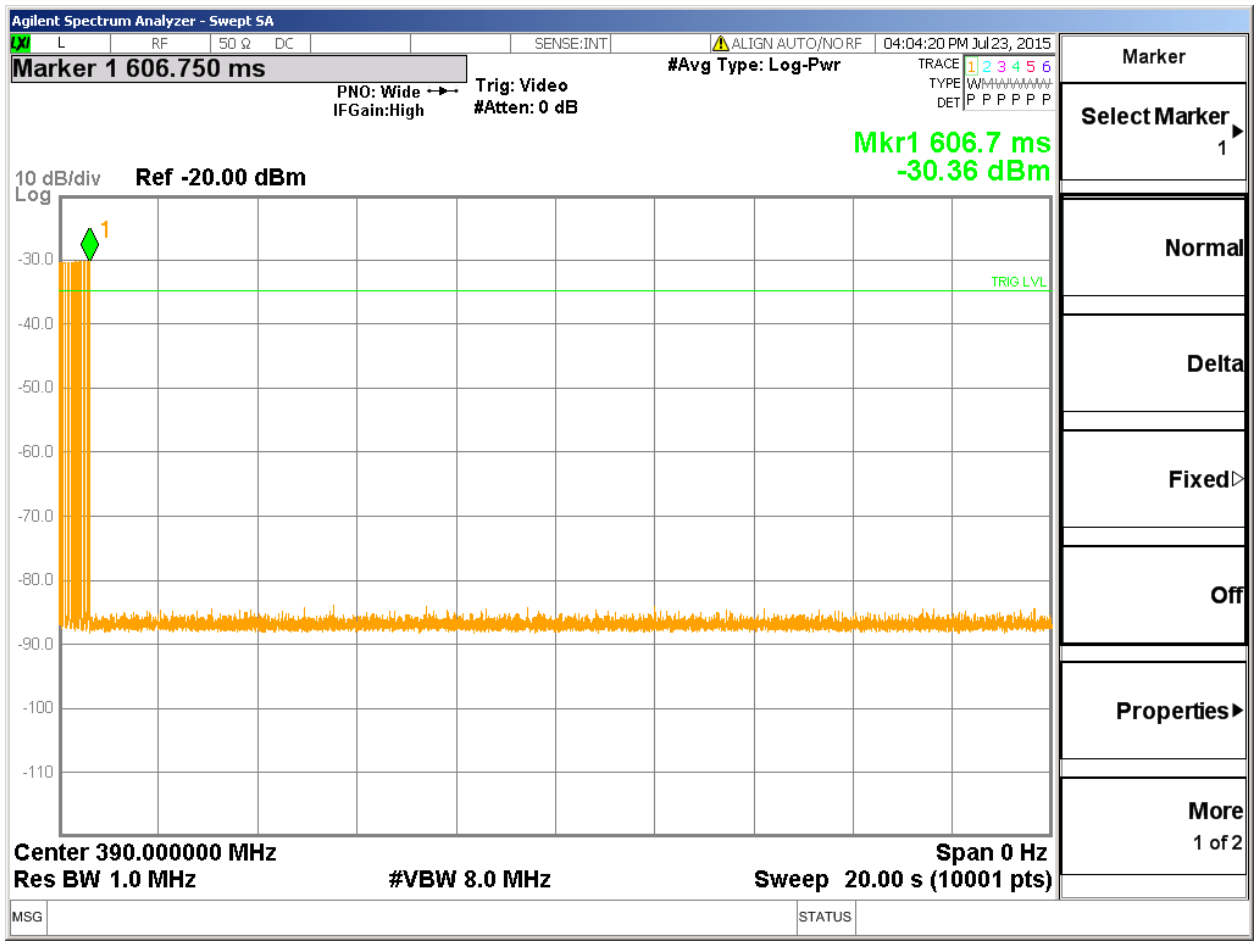
4.6.2 Test Conditions and Results – Cease Operation

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 44 Cease Operation Configuration Settings

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

Figure 33 Cease Operation Graph



4.6.3 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.	

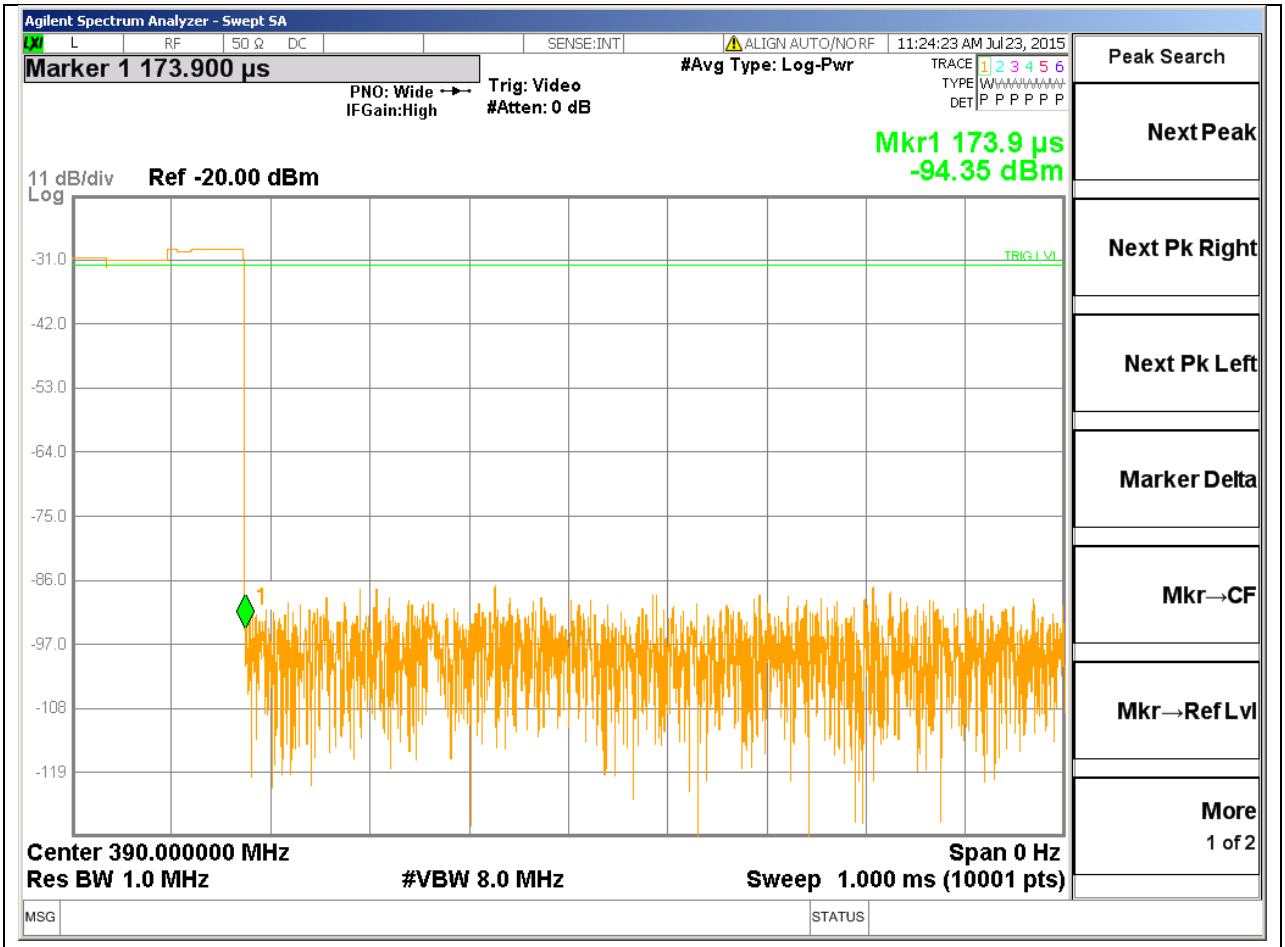
Table 45 Pulse Train Configuration Settings

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

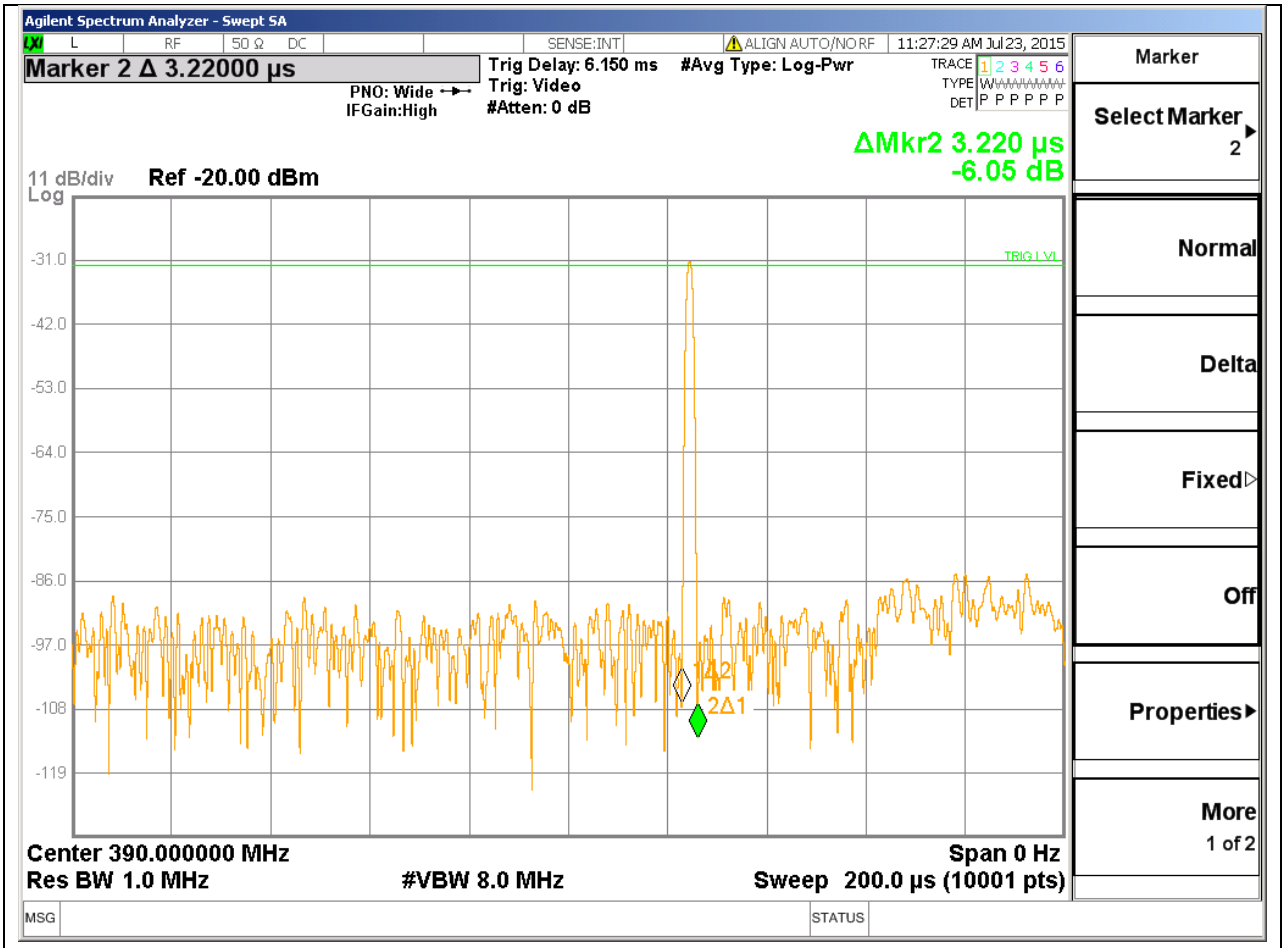
Table 46 Pulse Train Calculation

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	(7x1.0)+(8x3.0)+(1x7.0)=37.989mS	100mS	-8.4dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over 100mS not including the tuning pulses. The manufacturer declared duty cycle as -6.74dB, declared duty cycle is used for all radiated emissions data.			

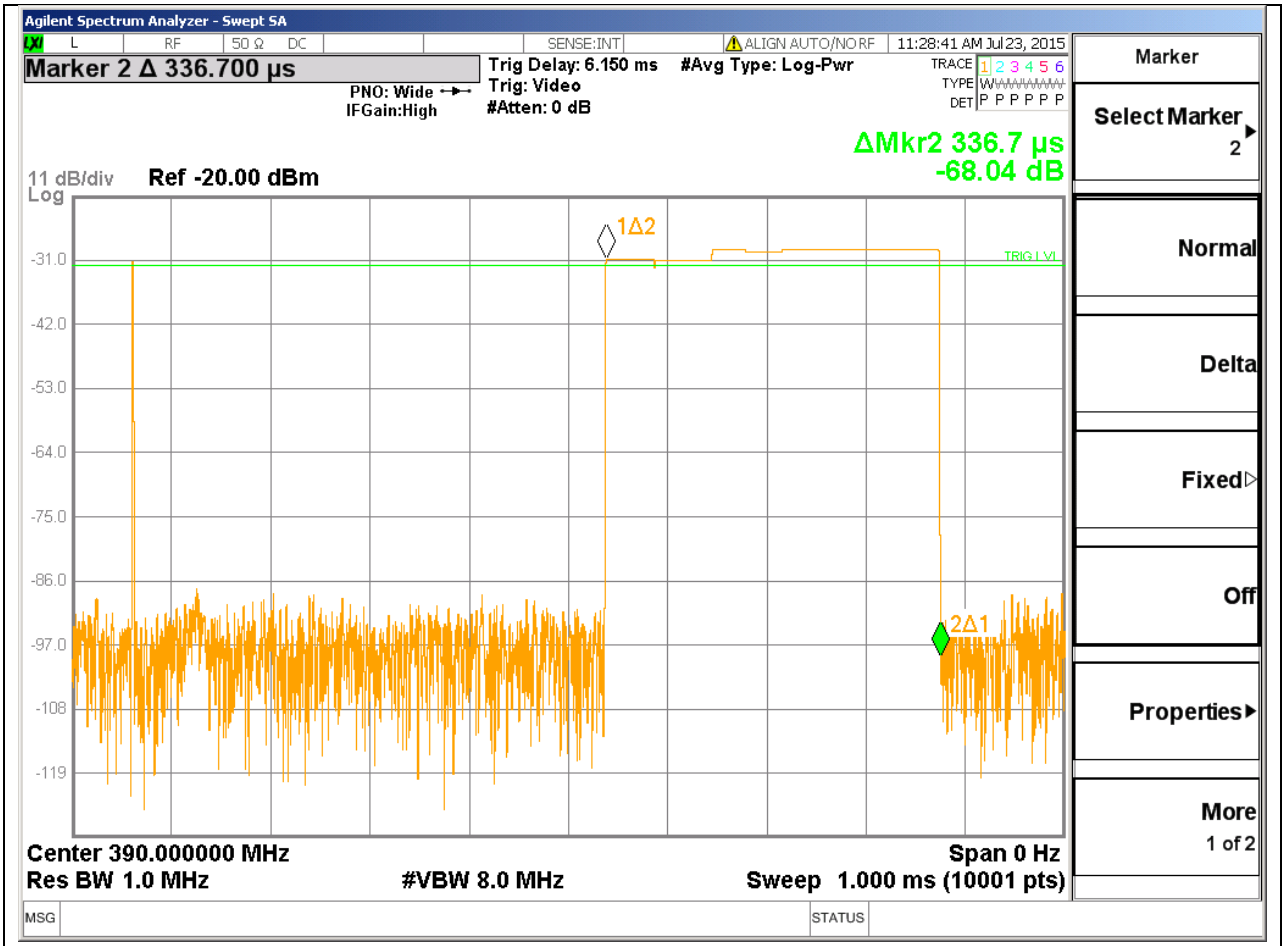
Figure 34 Pulse Train Graphs for 390MHz



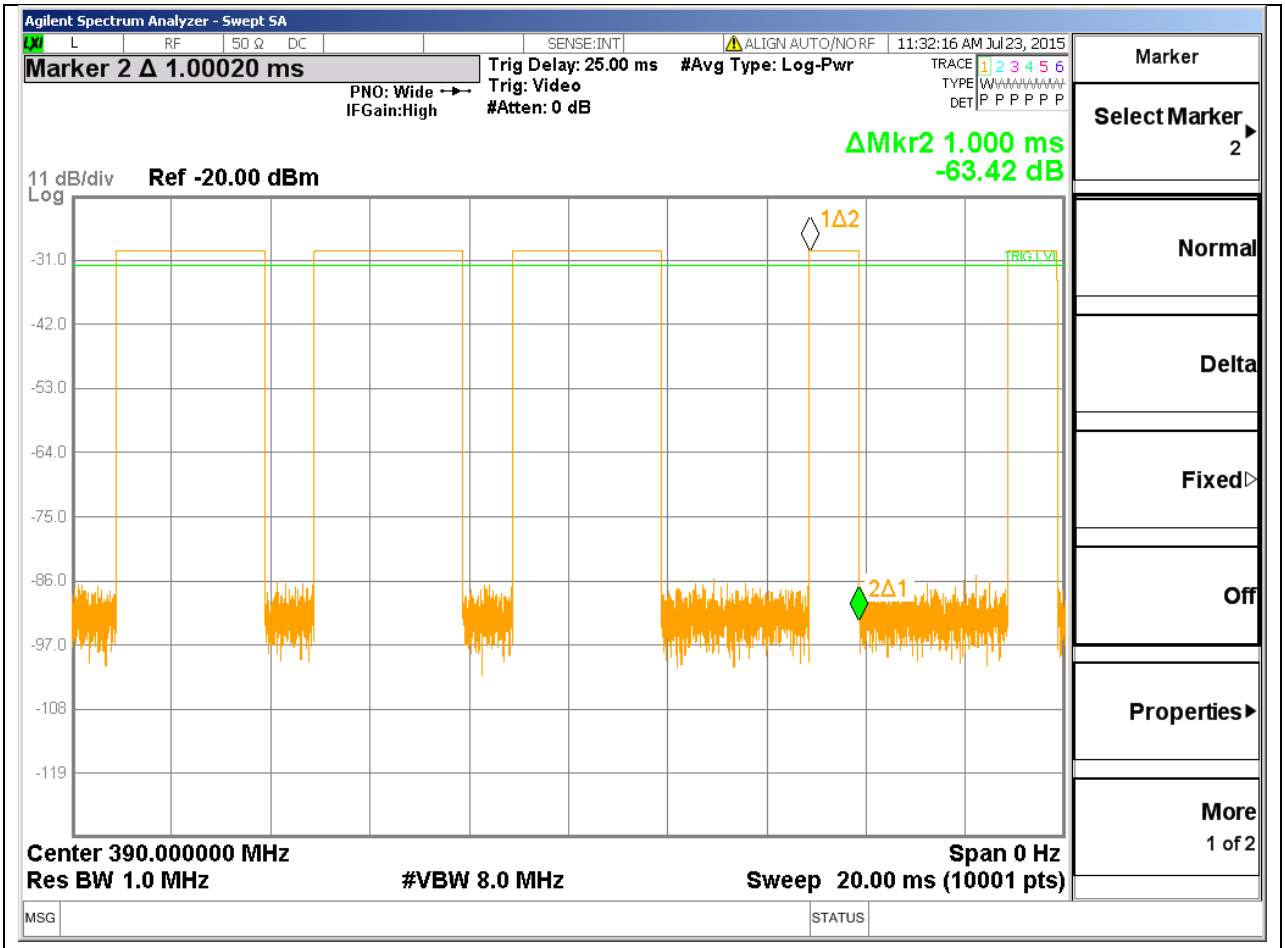
Tuning pulse duration: 0.1739mS



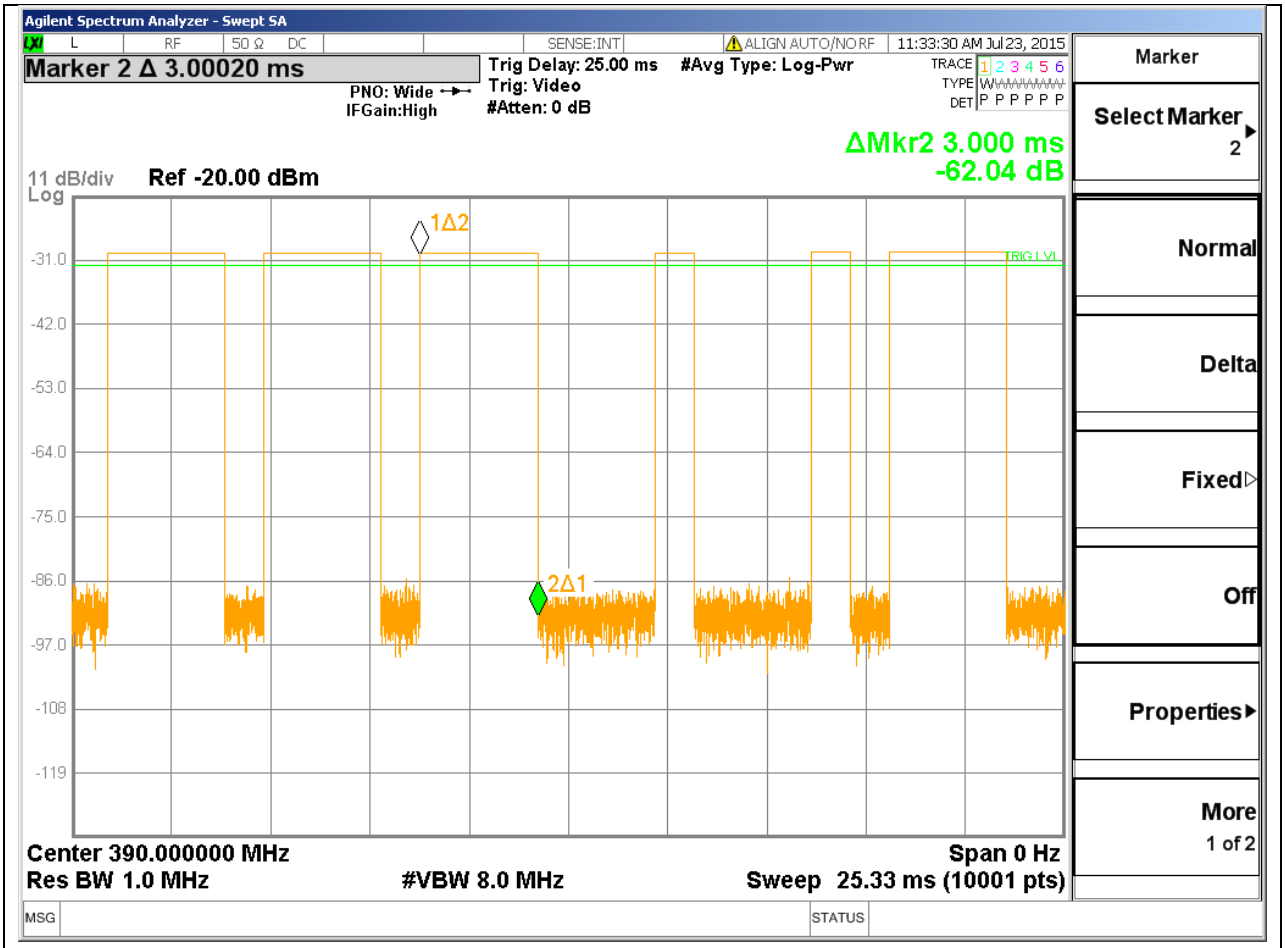
Tuning pulse duration: 0.00322mS



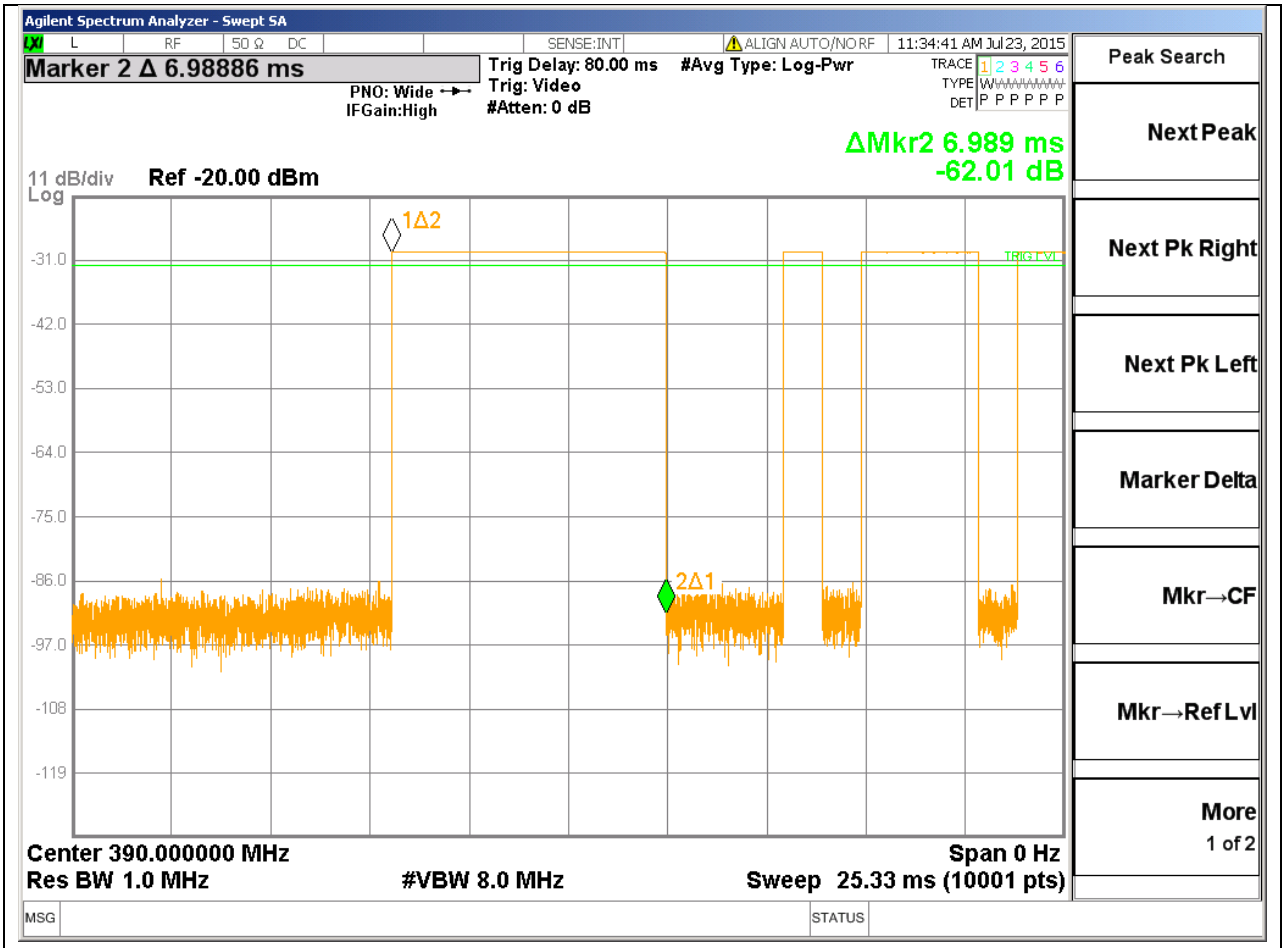
Tuning pulse duration: 0.3367mS



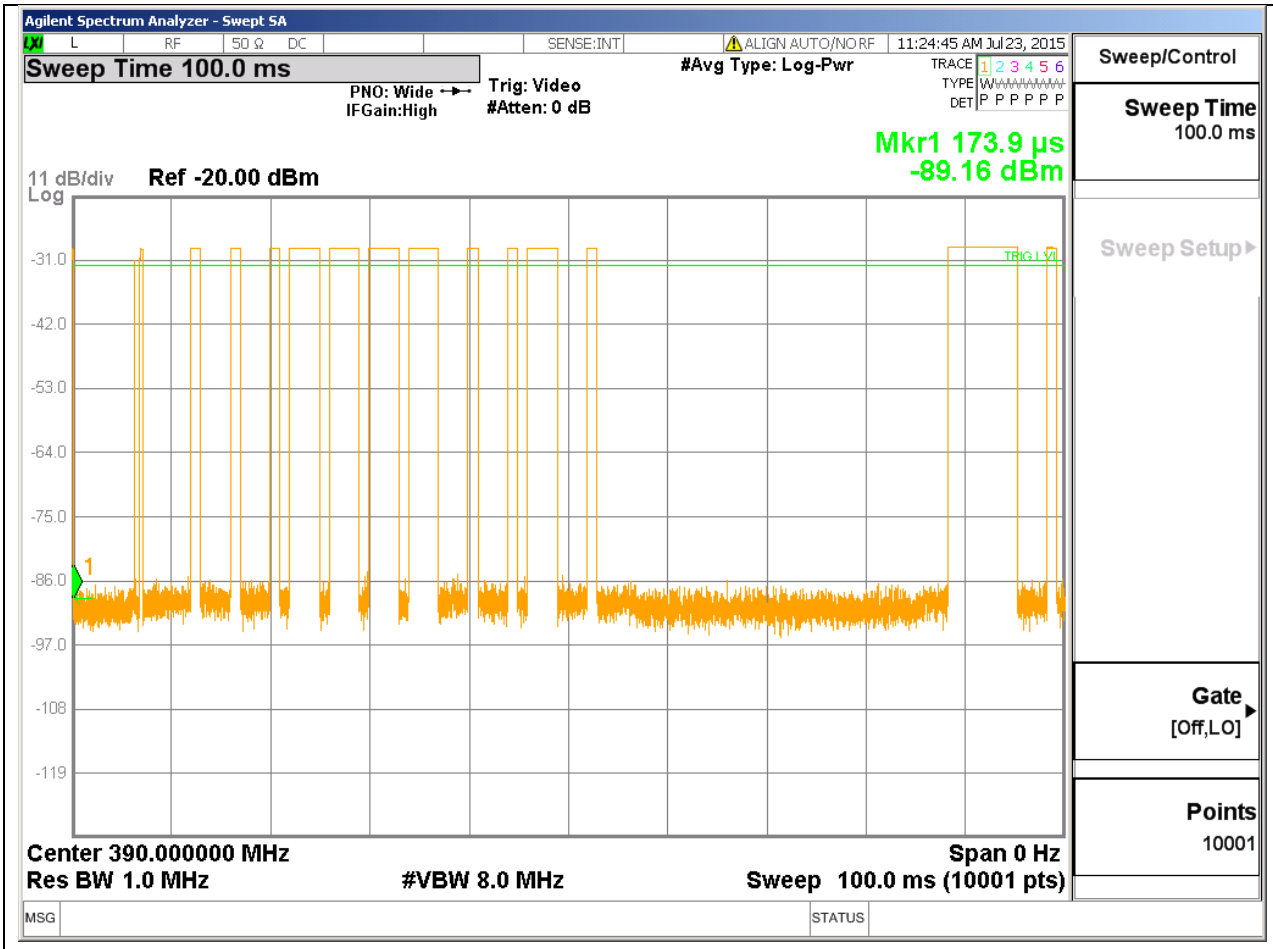
Pulse Duration: Short Pulse 1.000mS



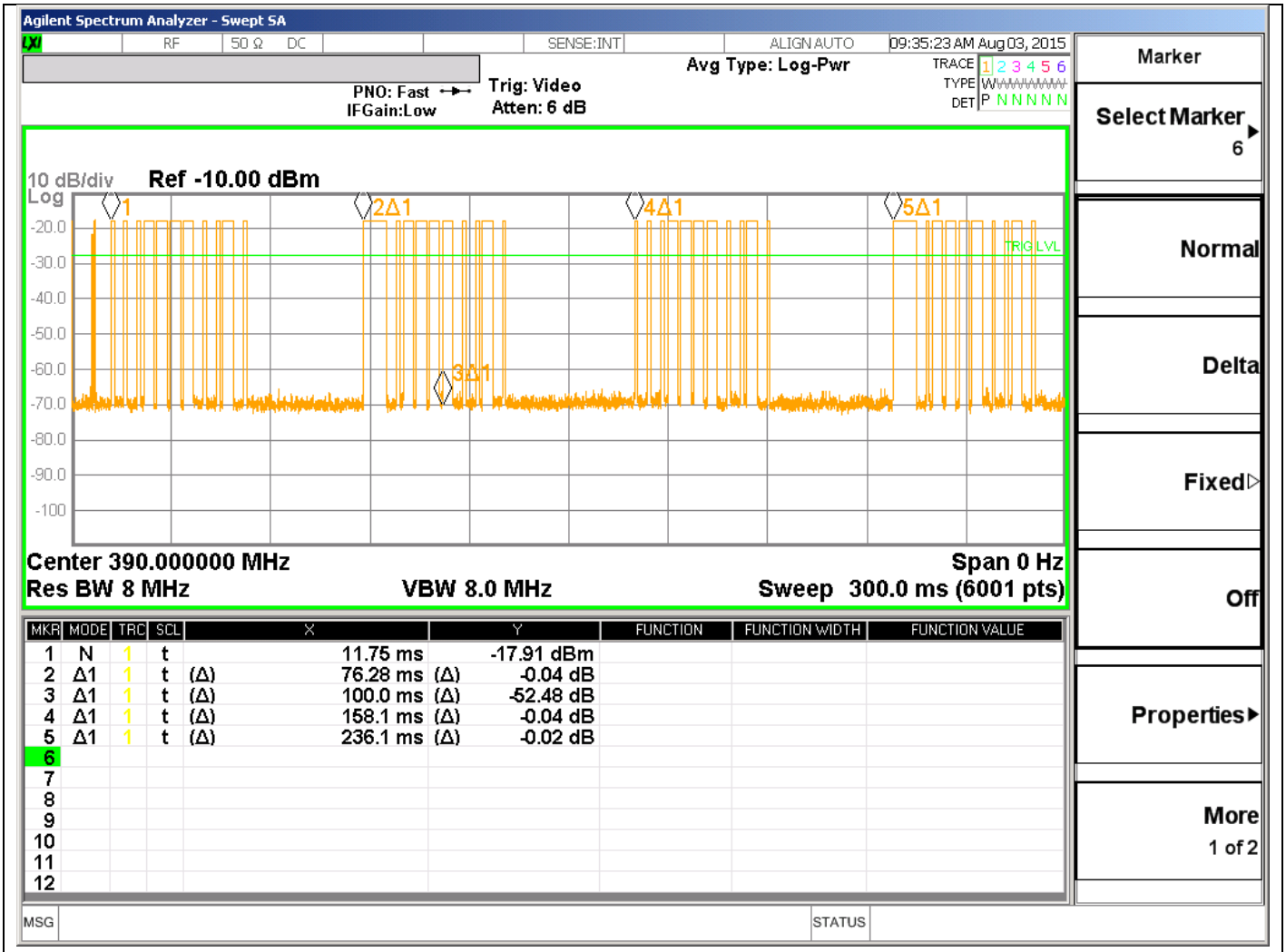
Pulse Duration: Medium Pulse 3.000mS



Pulse Duration: Long Pulse 6.989mS



Number of Pulses: 7 Short,5 Medium, 1 Long


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
09:35:23 AM Aug 03, 2015
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET P N N N N N
PNO: Fast
IFGain:Low
Trig: Video
Atten: 6 dB
10 dB/div
Log
Ref -10.00 dBm
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
1
2Δ1
3Δ1
4Δ1
5Δ1
TRG LVL
Center 390.000000 MHz
Res BW 8 MHz
VBW 8.0 MHz
Span 0 Hz
Sweep 300.0 ms (6001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 t 11.75 ms -17.91 dBm
2 Δ1 1 t (Δ) 76.28 ms (Δ) -0.04 dB
3 Δ1 1 t (Δ) 100.0 ms (Δ) -52.48 dB
4 Δ1 1 t (Δ) 158.1 ms (Δ) -0.04 dB
5 Δ1 1 t (Δ) 236.1 ms (Δ) -0.02 dB
6
7
8
9
10
11
12
MSG
STATUS
Marker
Select Marker
6
Normal
Delta
Fixed
Off
Properties
More
1 of 2

Period Scan

4.6.4 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 C63.10:2009. 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

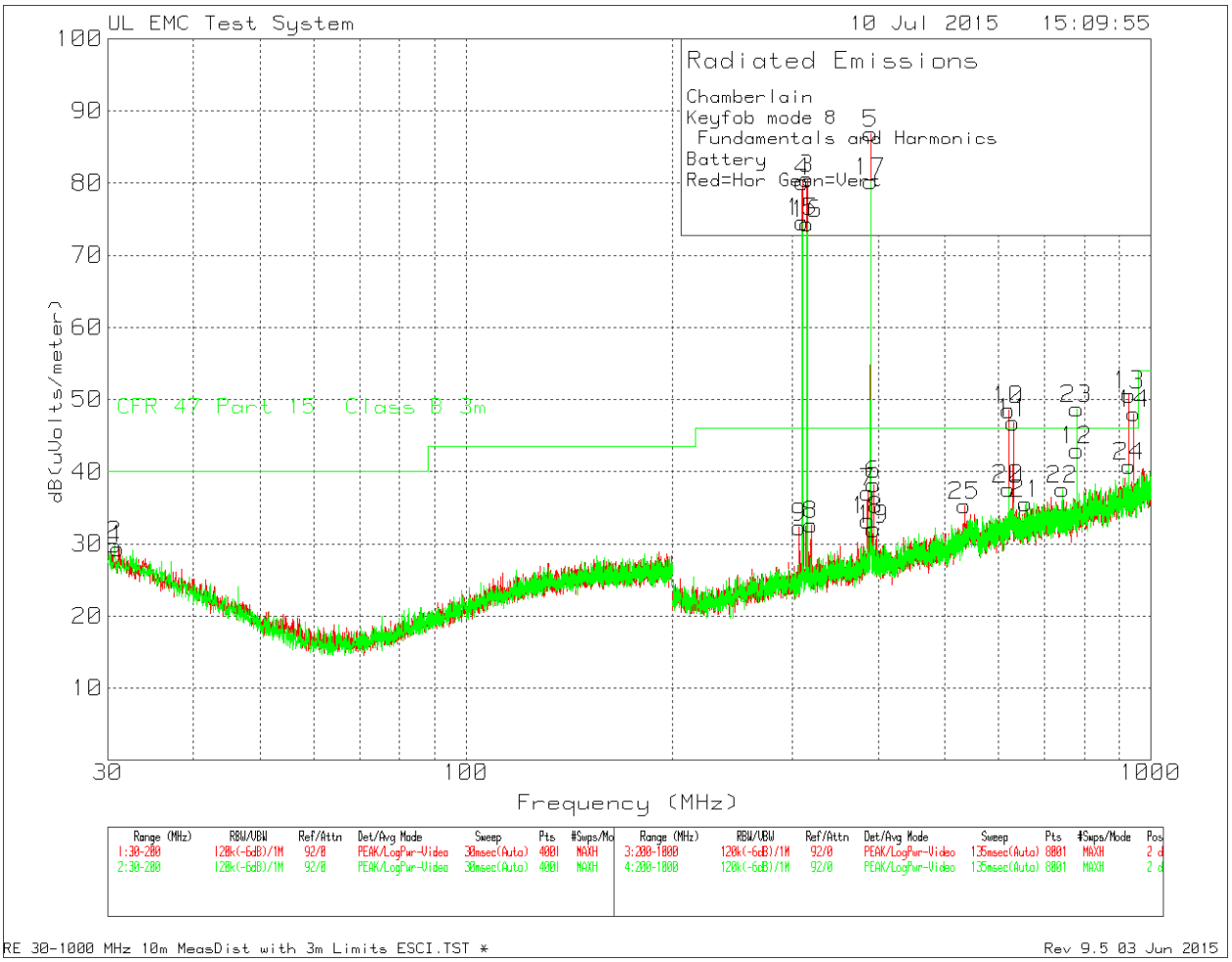
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)

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
390	79.24	99.24

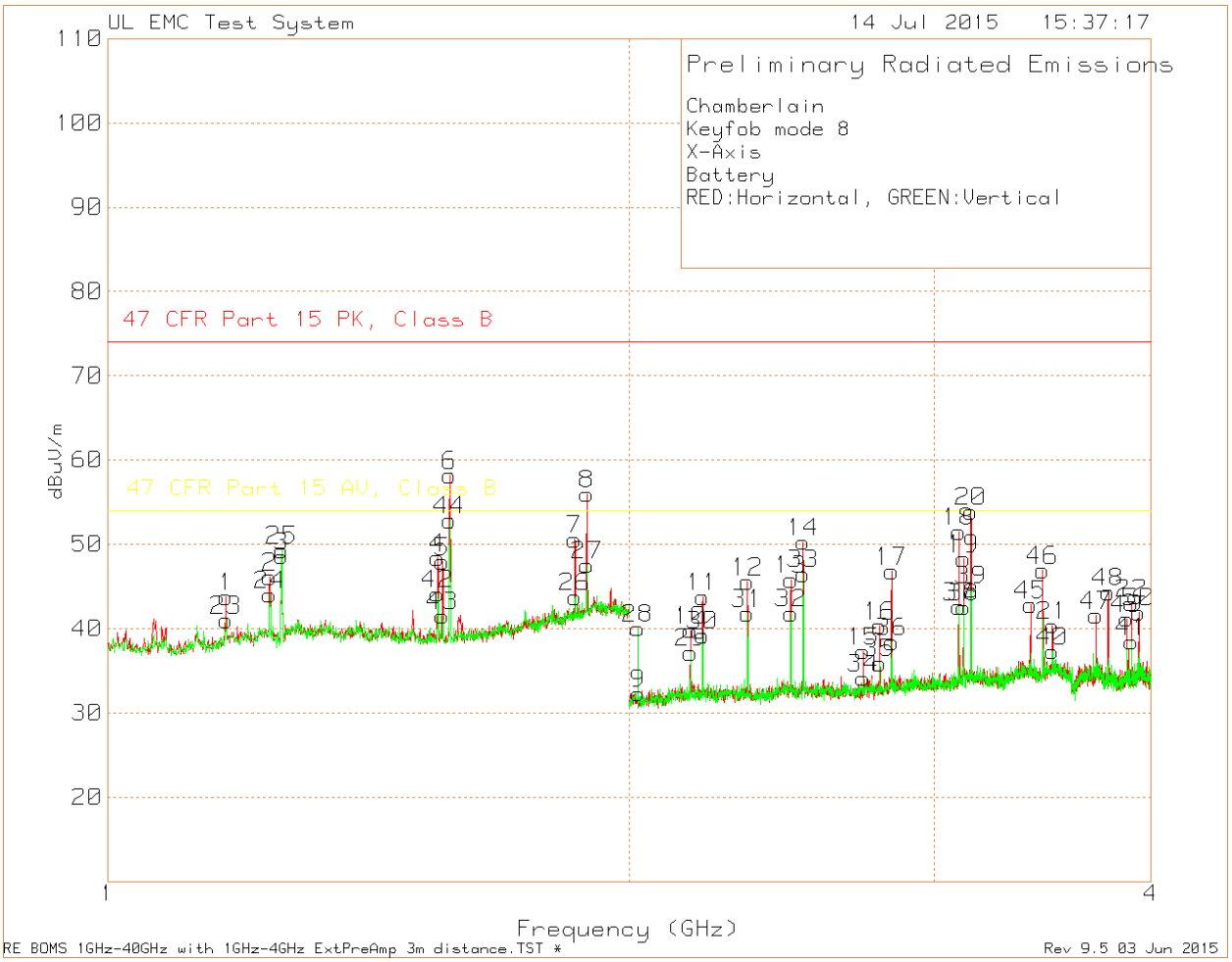
Supplementary information: See section 4.6.44.6.3 for duty cycle information.

Figure 35 Radiated Emissions Graph (Below 1GHz)



Above scan is for mode #8. Mode #8 uses the same frequencies as mode #6 with few additional ones. The drive level for mode #8 is higher then drive for mode #6 therefore conducting a scan with mode #8 was considered as worst case.

Figure 36 Radiated Emissions Graph (Above 1GHz)



Above scan is for mode #8. Mode #8 uses the same frequencies as mode #6 with few additional ones. The drive level for mode #8 is higher then drive for mode #6 therefore conducting a scan with mode #8 was considered as worst case.

Table 47 - Radiated Emissions Data Points Below 1GHz

Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
390.014	60.46	Pk	16.2	8.4	85.06	-6.74	78.32	99.24	-14.18	79.24	-0.92	312	101	H	1
390.0125	40.73	Pk	16.2	8.4	65.33	-6.74	58.59	99.24	-33.91	79.24	-20.65	268	108	V	1
390.019	55.34	Pk	16.2	8.4	79.94	-6.74	73.2	99.24	-19.3	79.24	-6.04	38	183	H	2
390.0185	60.85	Pk	16.2	8.4	85.45	-6.74	78.71	99.24	-13.79	79.24	-0.53	147	155	V	2
390.021	54.66	Pk	16.2	8.4	79.26	-6.74	72.52	99.24	-19.98	79.24	-6.72	34	181	H	3
390.016	54.38	Pk	16.2	8.4	78.98	-6.74	72.24	99.24	-20.26	79.24	-7	41	180	H	3
780.0345	9.18	Pk	21.8	9.9	40.88	-6.74	34.14	66.02	-25.14	46.02	-11.88	3	248	V	1
780.0065	13.71	Pk	21.8	9.9	45.41	-6.74	38.67	66.02	-20.61	46.02	-7.35	308	114	H	1
780.048	9.34	Pk	21.8	9.9	41.04	-6.74	34.3	66.02	-24.98	46.02	-11.72	309	101	H	2
780.0185	9.96	Pk	21.8	9.9	41.66	-6.74	34.92	66.02	-24.36	46.02	-11.1	226	157	V	2
780.056	8.6	Pk	21.8	9.9	40.3	-6.74	33.56	66.02	-25.72	46.02	-12.46	262	208	V	3
780.0285	16.09	Pk	21.8	9.9	47.79	-6.74	41.05	66.02	-18.23	46.02	-4.97	198	108	H	3
Notes:															
1 - X- Axis (Laying Flat) 315MHz															
2 - Z- Axis (Straight Up) 315MHz															
3 - Y- Axis (Sideways) 315MHz															
Pk - Peak detector															

Table 48 - Radiated Emissions Data Points Above 1GHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DB dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity
1	1.17	71.9	Pk	28.2	-56.34	43.76	-6.74	37.02	74	-30.24	54	-16.98	0-360	100	H
23	1.17	69.11	Pk	28.2	-56.34	40.97	-6.74	34.23	74	-33.03	54	-19.77	0-360	150	V
5	1.56	74.56	Pk	28.2	-54.85	47.91	-6.74	41.17	74	-26.09	54	-12.83	0-360	150	H
43	1.56	68.17	Pk	28.2	-54.85	41.52	-6.74	34.78	74	-32.48	54	-19.22	0-360	150	V
12	2.34	75.69	Pk	21.7	-51.87	45.52	-6.74	38.78	74	-28.48	54	-15.22	0-360	99	H
31	2.34	71.95	Pk	21.7	-51.87	41.78	-6.74	35.04	74	-32.22	54	-18.96	0-360	100	V
15	2.73	66.52	Pk	22.1	-51.31	37.31	-6.74	30.57	74	-36.69	54	-23.43	0-360	99	H
34	2.73	63.34	Pk	22.1	-51.31	34.13	-6.74	27.39	74	-39.87	54	-26.61	0-360	150	V
19	3.12	76.16	Pk	22.7	-50.61	48.25	-6.74	41.51	74	-25.75	54	-12.49	0-360	99	H
38	3.12	70.44	Pk	22.7	-50.61	42.53	-6.74	35.79	74	-31.47	54	-18.21	0-360	100	V
21	3.51	66.84	Pk	23.5	-49.96	40.38	-6.74	33.64	74	-33.62	54	-20.36	0-360	99	H
40	3.51	63.76	Pk	23.5	-49.96	37.3	-6.74	30.56	74	-36.7	54	-23.44	0-360	100	V
22	3.901	70.59	Pk	23.8	-51.38	43.01	-6.74	36.27	74	-30.99	54	-17.73	0-360	150	H
41	3.901	66.02	Pk	23.8	-51.38	38.44	-6.74	31.7	74	-35.56	54	-22.3	0-360	100	V
9	2.024	64.39	Pk	21.2	-53.29	32.3	0	-	74	-41.7	54	-21.7	0-360	150	H
45	3.41	69.97	Pk	23.5	-50.66	42.81	0	-	74	-31.19	54	-11.19	0-360	99	H
46	3.465	74.39	Pk	23.5	-50.99	46.9	0	-	74	-27.1	54	-7.1	0-360	99	H
47	3.721	67.86	Pk	23.6	-49.9	41.56	0	-	74	-32.44	54	-12.44	0-360	150	H
48	3.781	71.77	Pk	24	-51.46	44.31	0	-	74	-29.69	54	-9.69	0-360	150	H
49	3.876	68.41	Pk	23.9	-51.15	41.16	0	-	74	-32.84	54	-12.84	0-360	150	H
50	3.938	68.86	Pk	24	-50.95	41.91	0	-	74	-32.09	54	-12.09	0-360	99	H
28	2.023	72.09	Pk	21.2	-53.27	40.02	0	-	74	-33.98	54	-13.98	0-360	150	V
Pk - Peak detector															

For above 1GHz all measurement data was collected with transmitter set to mode #8 (higher output power) and duty cycle from mode #6. Because all emission levels are under the limit it was considered worst case and it was considered not necessary to re-do measurement with transmitter set to mode #6

4.7 Mode#7 Test Data

4.7.1 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)	

Table 49 Occupied Bandwidth Configuration Settings

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

Table 50 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 51 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
310MHz	17.91	43.798

Figure 37 – 20dB Bandwidth Graph

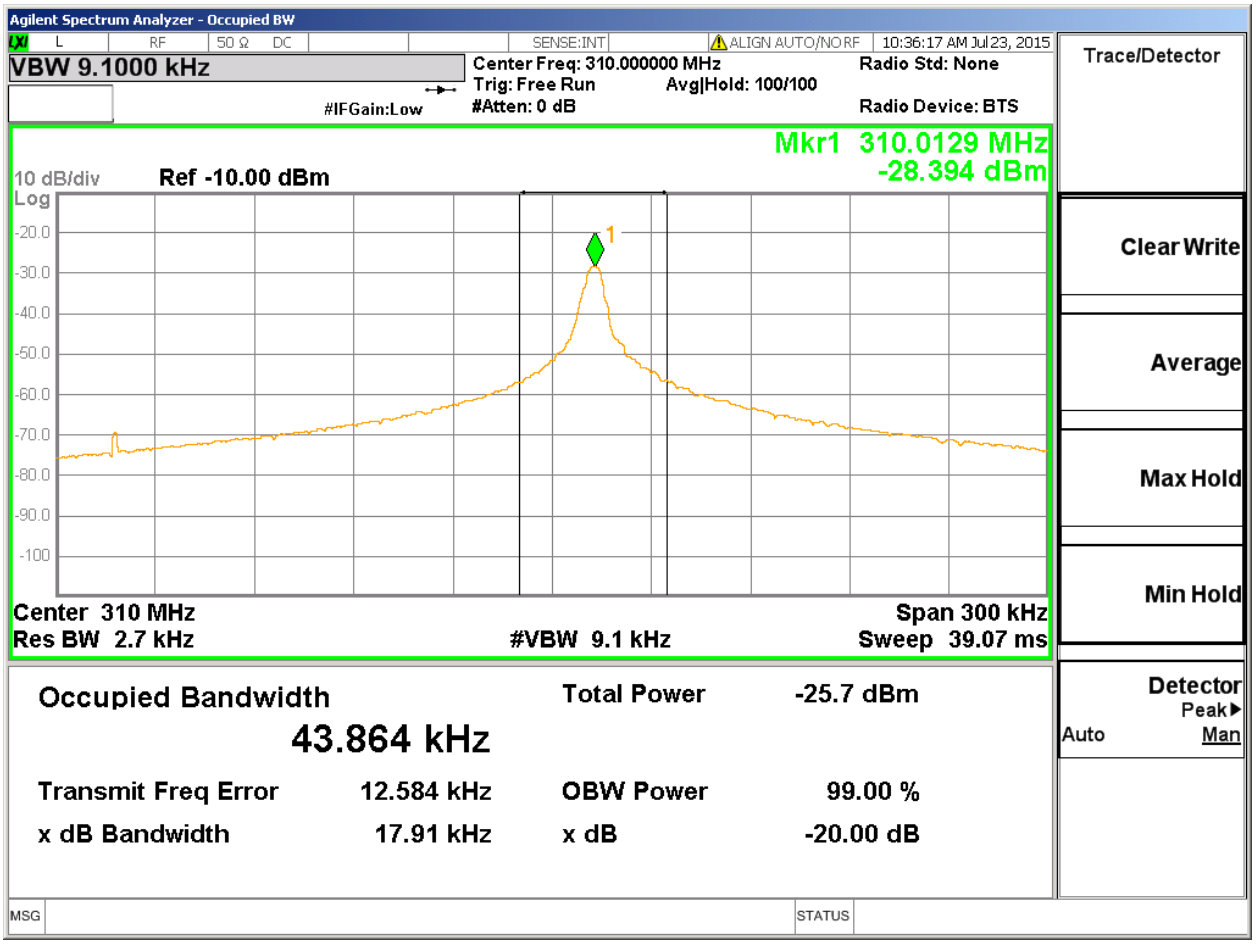
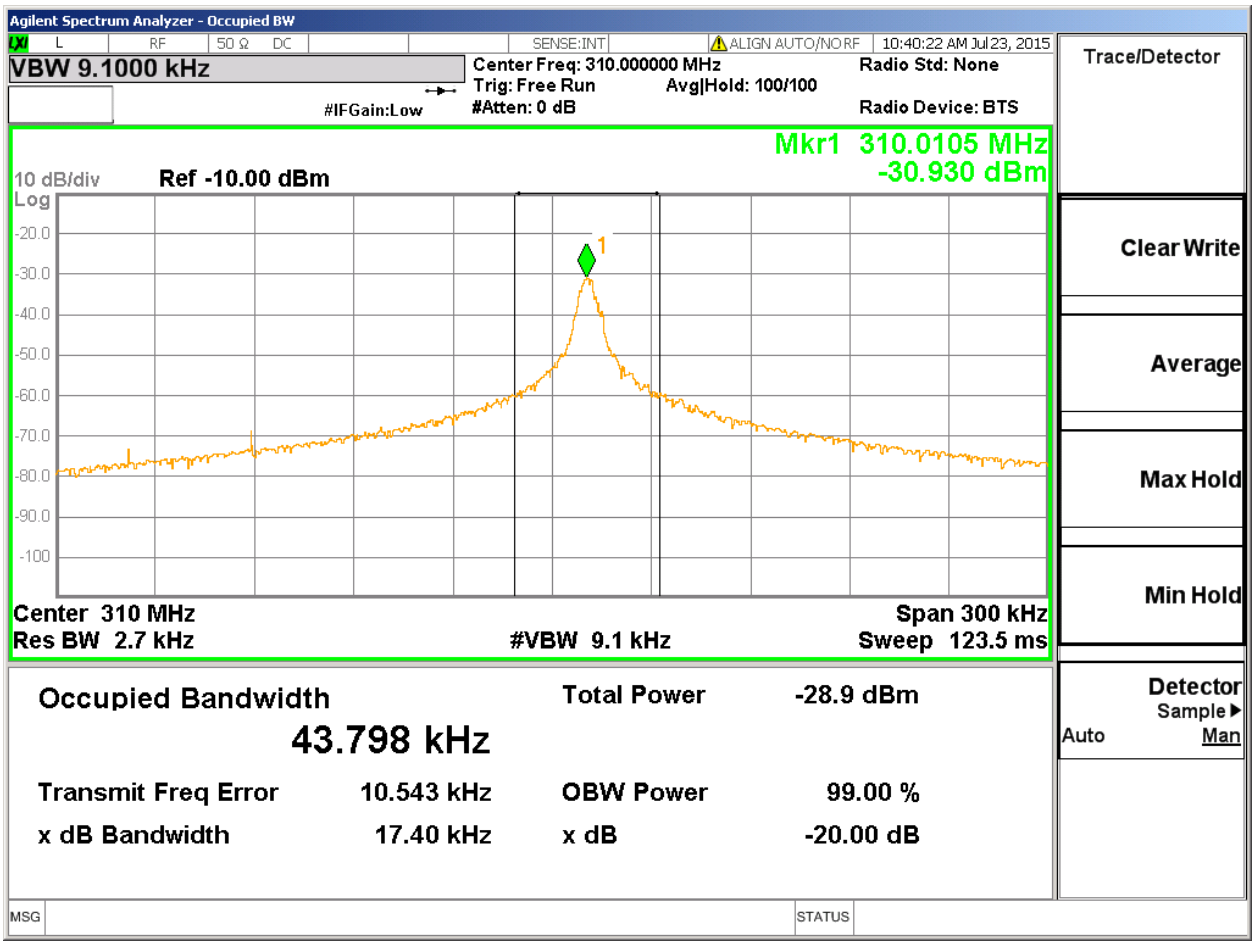


Figure 38 – 99% Bandwidth Graph



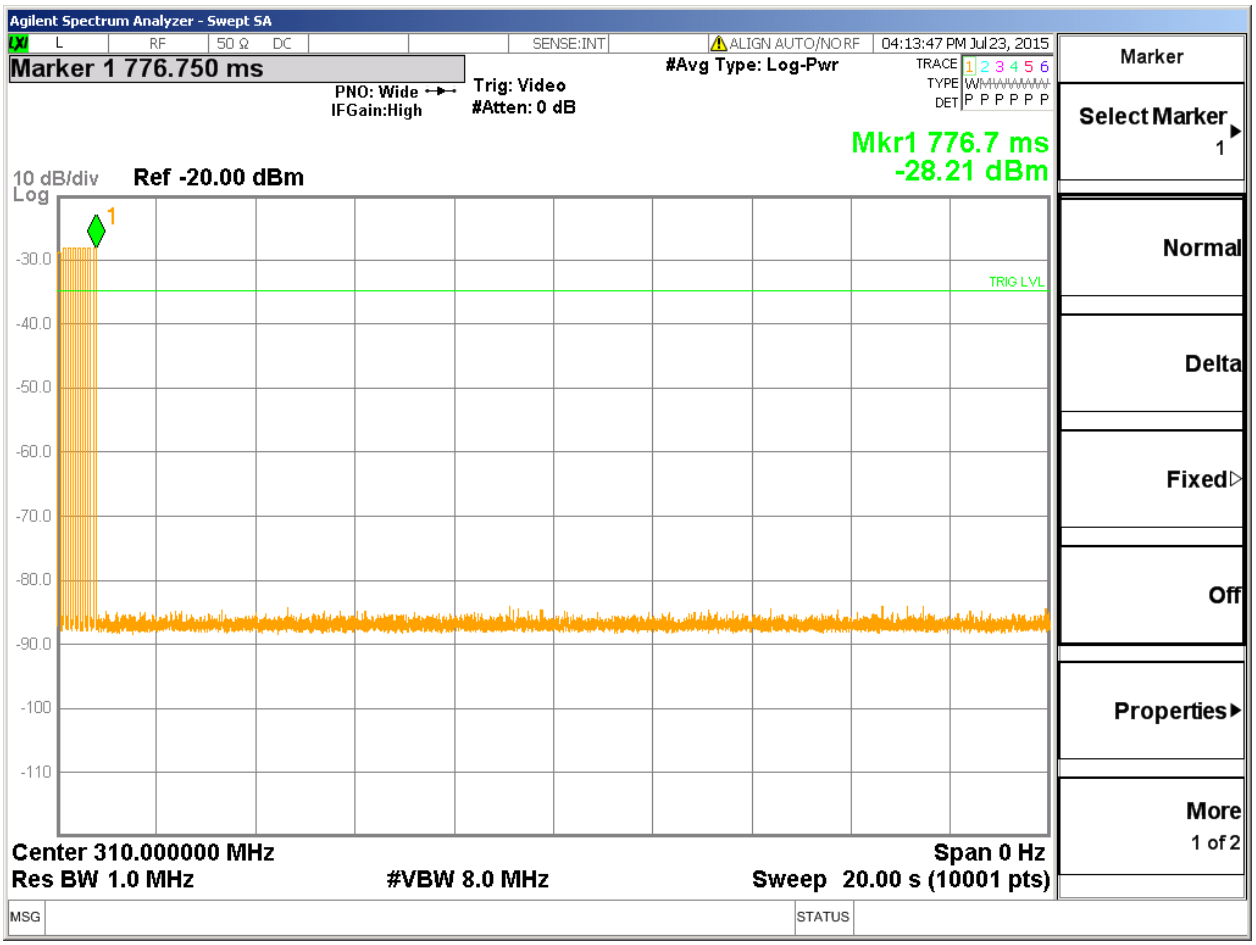
4.7.2 Test Conditions and Results – Cease Operation

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 52 Cease Operation Configuration Settings

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

Figure 39 Cease Operation Graph



4.7.3 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.	

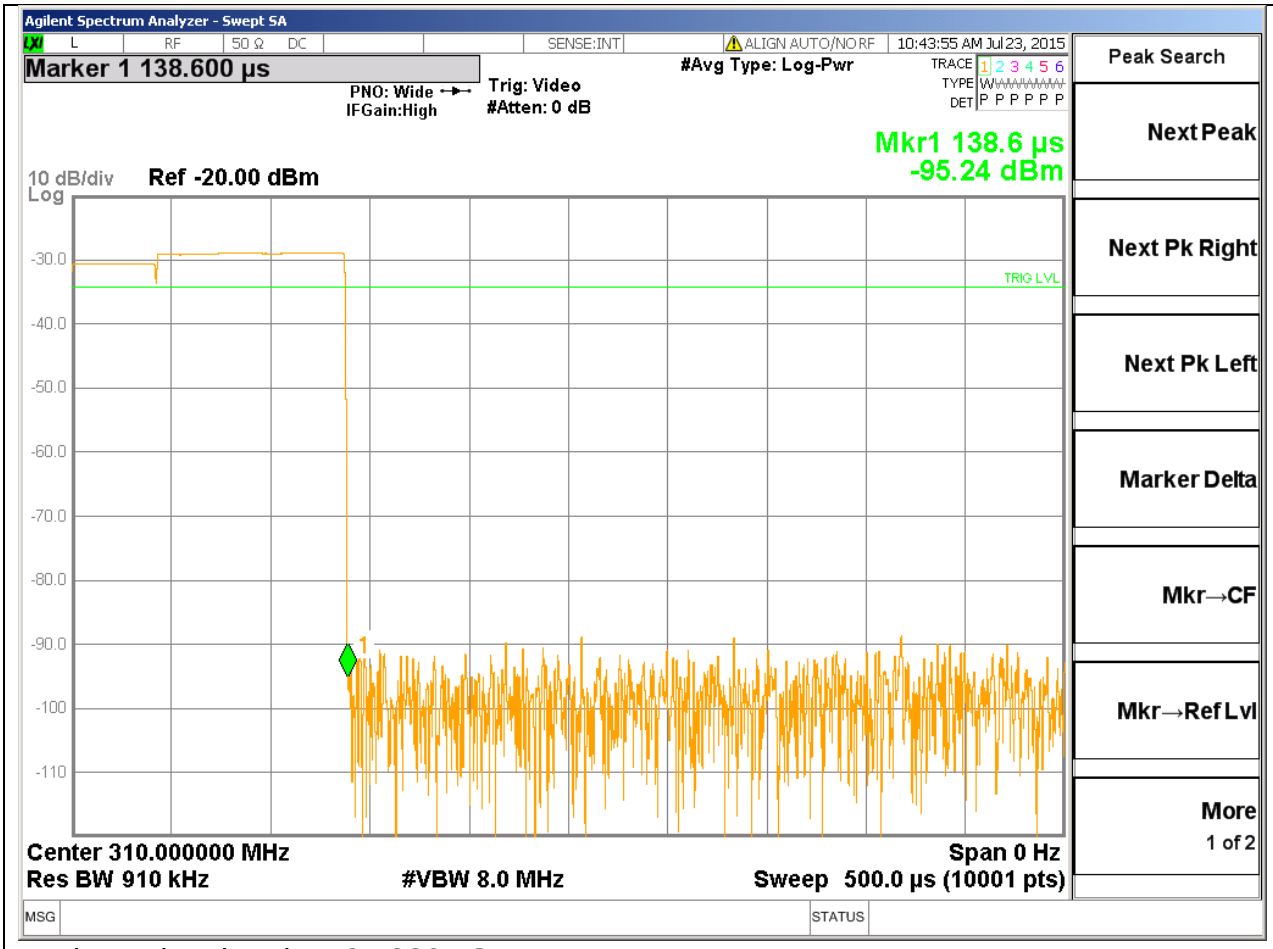
Table 53 Pulse Train Configuration Settings

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

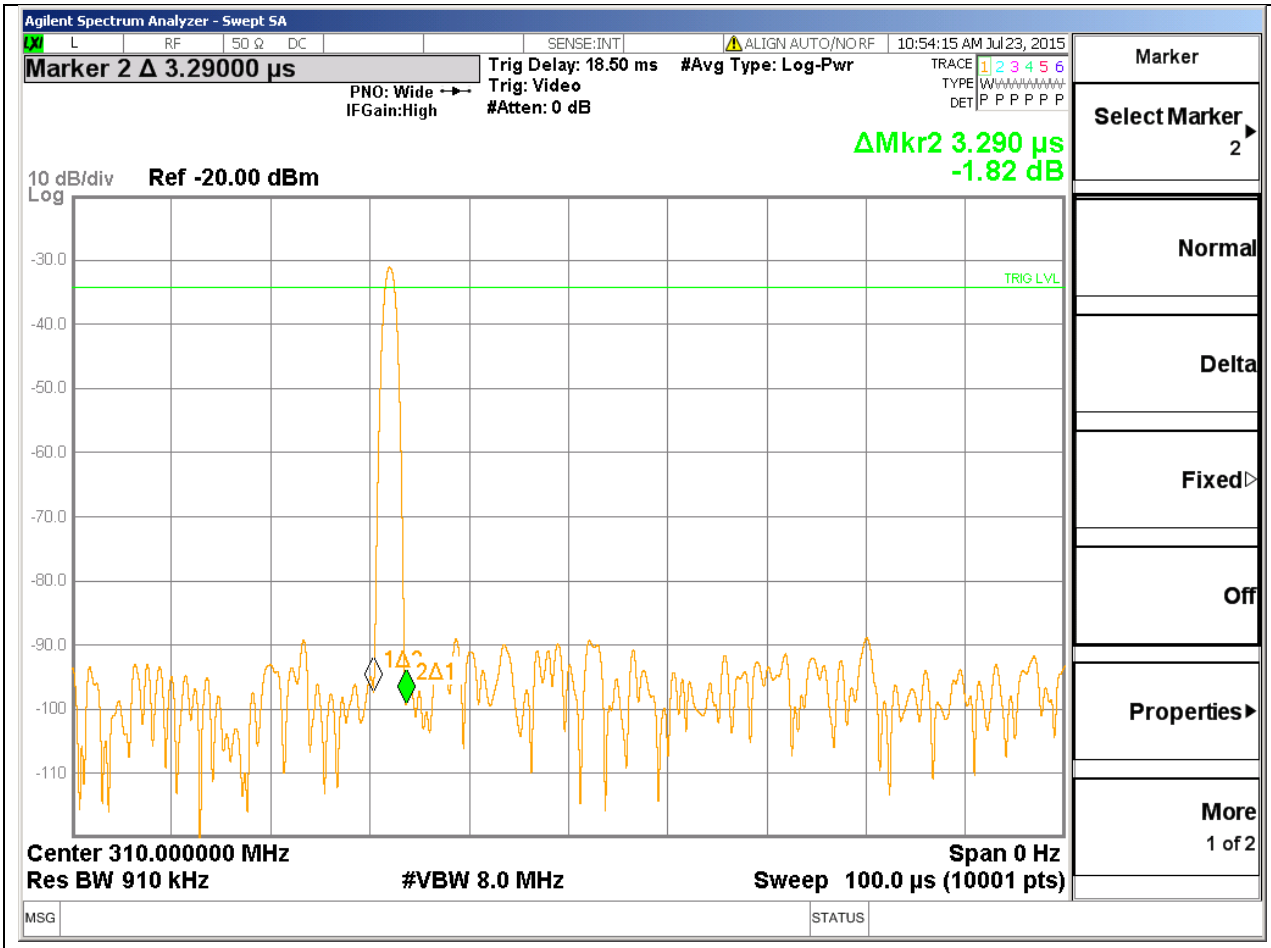
Table 54 Pulse Train Calculation

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	0.1386+0.00329+0.3264+(38x0.2007)+(38x0.4003) = =23.31mS	100mS	-12.65dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over 100mS including the tuning pulses. The manufacturer declared duty cycle as -12.36dB. Declared duty cycle is used for all measurements..			

Figure 40 Pulse Train Graphs for 310MHz

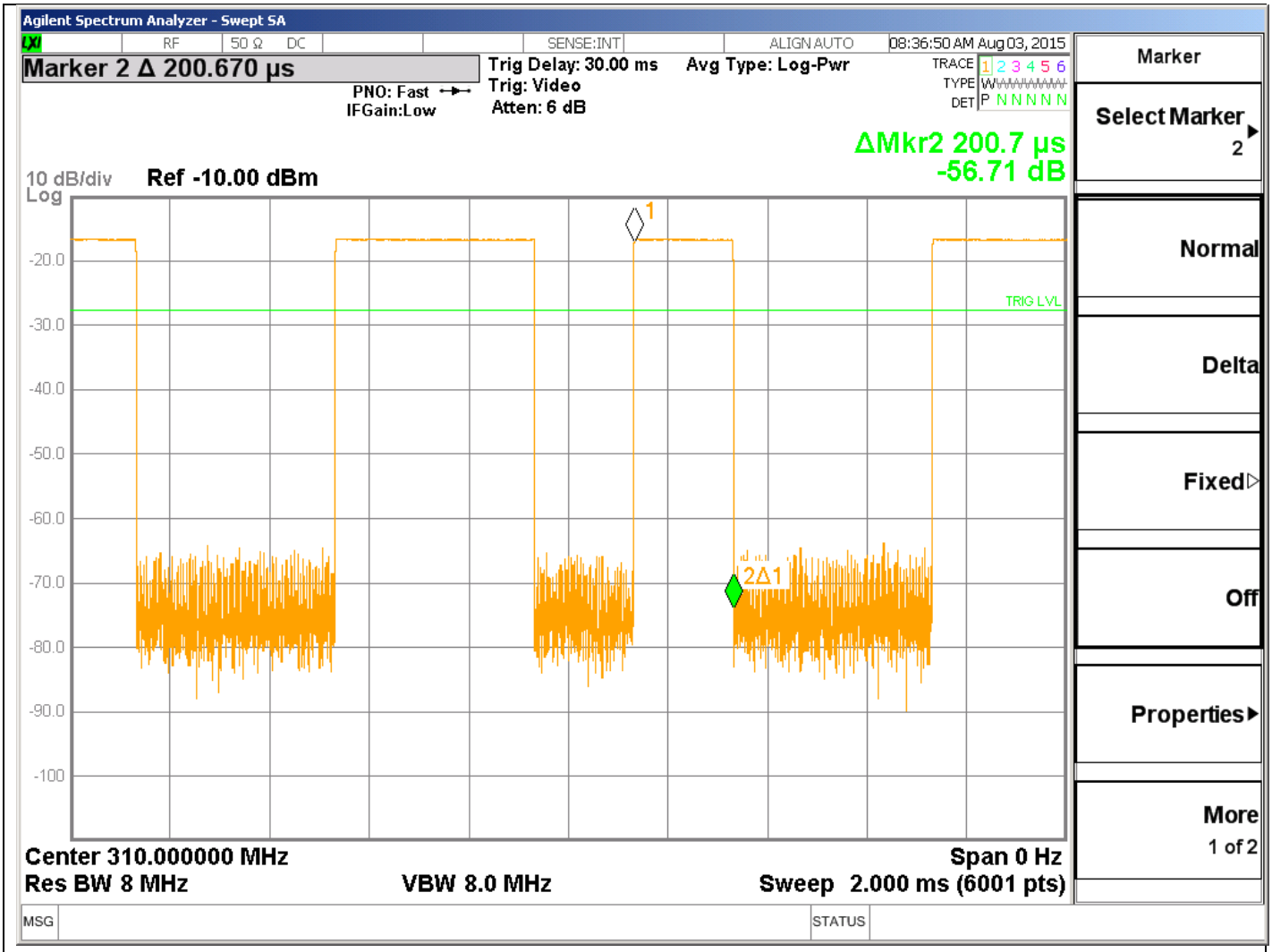


Tuning pulse duration: 0.1386mS

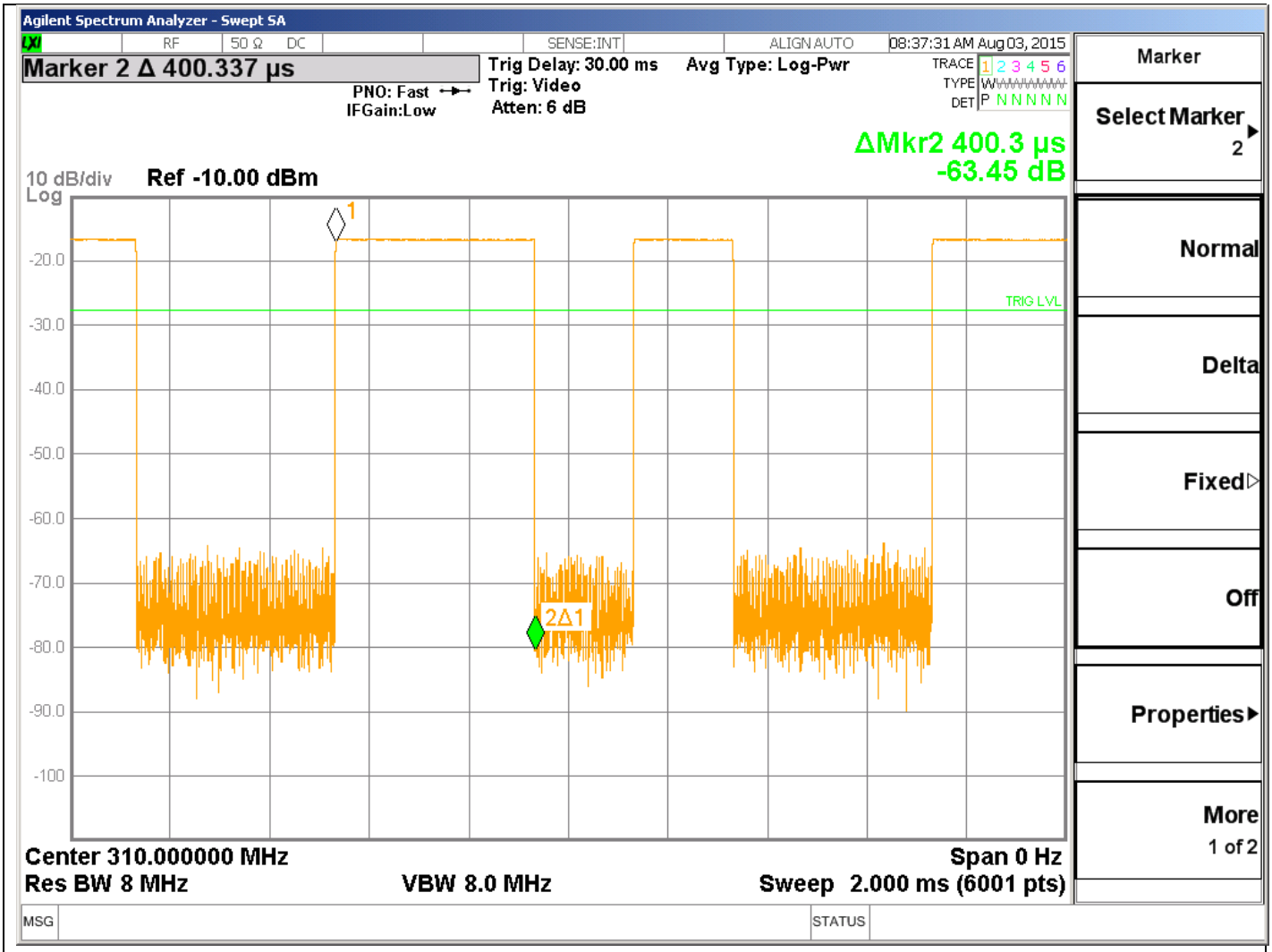


Tuning Pulse 0.00329mS

Tuning Pulse 0.3264mS



Pulse Duration: Short Pulse 0.2007mS



Pulse Duration: Long Pulse 0.4003mS

Number of Pulses: 39 Short, 39 Long


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
08:33:37 AM Aug 03, 2015
Marker 2 Δ 100.433 ms
PNO: Fast
IFGain:Low
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET P N N N N N
ΔMkr2 100.4 ms
-0.21 dB
10 dB/div
Log
Ref -10.00 dBm
1
2Δ1
TRIG LVL
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
Center 310.000000 MHz
Res BW 8 MHz
VBW 8.0 MHz
Span 0 Hz
Sweep 200.0 ms (6001 pts)
MSG
STATUS
Marker
Select Marker
2
Normal
Delta
Fixed
Off
Properties
More
1 of 2

Period scan

4.7.4 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 C63.10:2009. 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

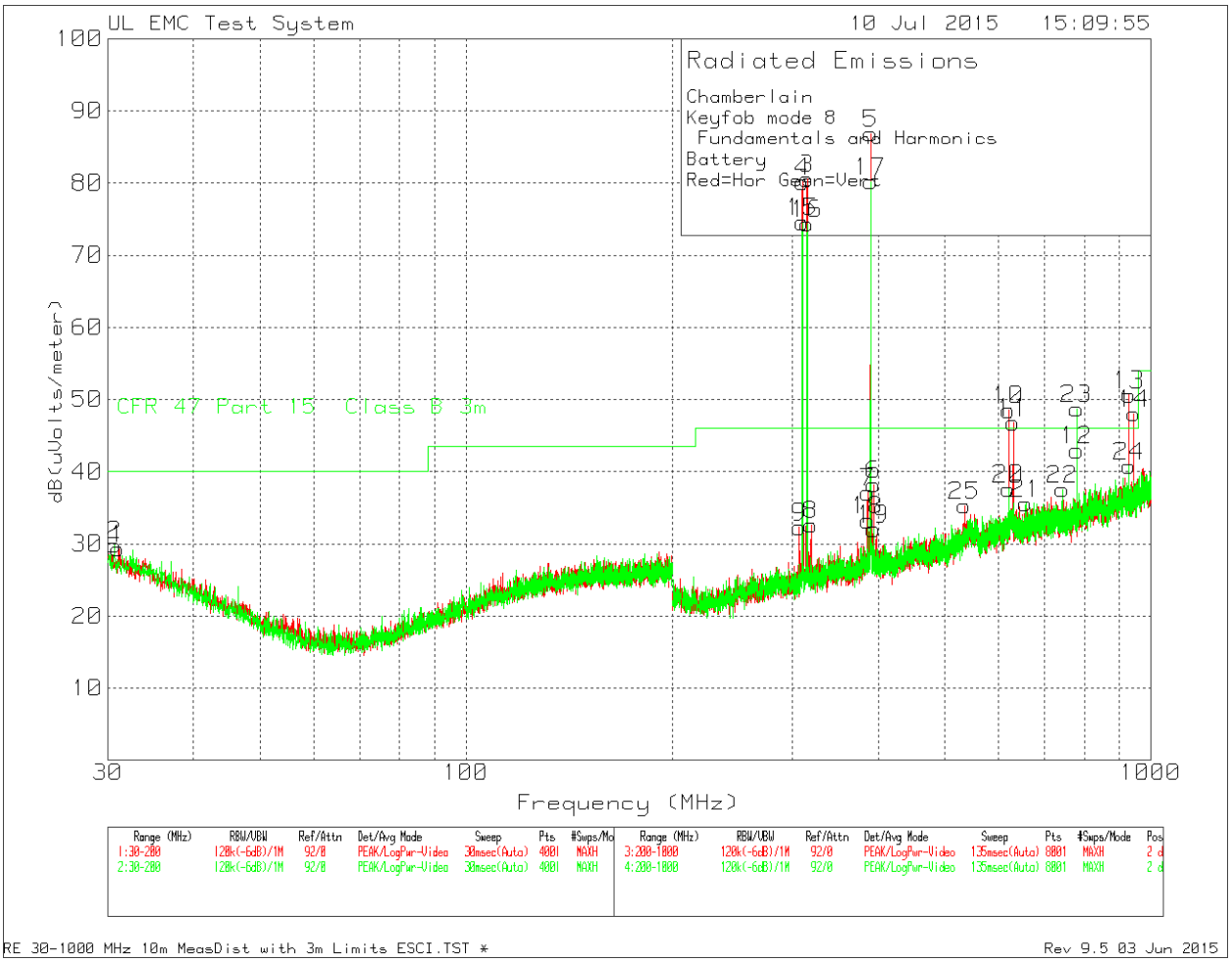
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
30 - 88	40.00	NA
88 - 216	43.52	NA
216 - 960	46.02	NA
960 - 1000	54	NA
Above 1000 (FCC)	NA	54 (at 3-meter)

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

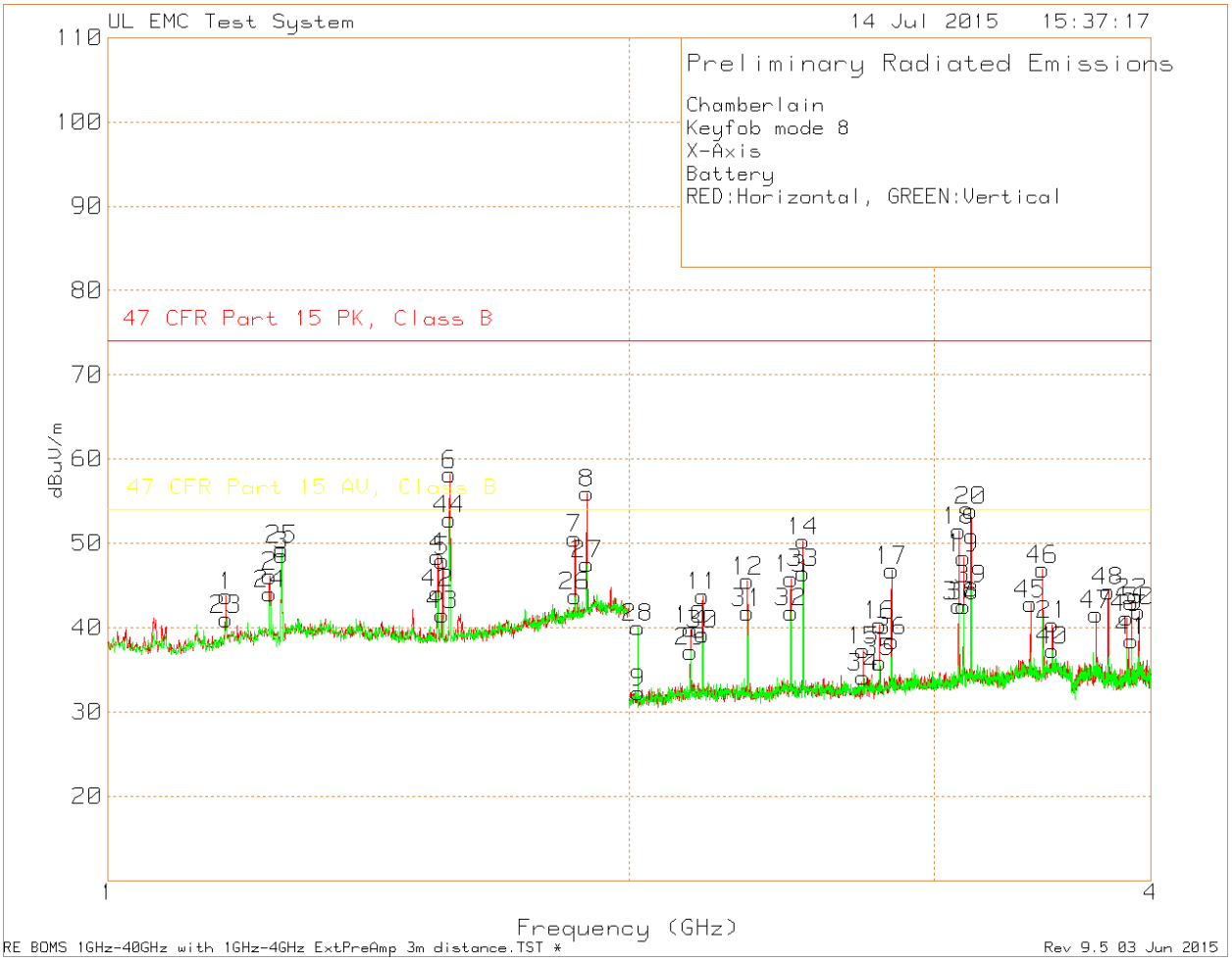
Supplementary information: See section 4.7.3 for duty cycle information.

Figure 41 Radiated Emissions Graph (Below 1GHz)



Above scan is for mode #8. Mode #8 uses the same frequencies as mode #7 with few additional ones. The drive level for mode #8 is higher then drive for mode #7 therefore conducting a scan with mode #8 was considered as worst case.

Figure 42 Radiated Emissions Graph (Above 1GHz)



Above scan is for mode #8. Mode #8 uses the same frequencies as mode #7 with few additional ones. The drive level for mode #8 is higher then drive for mode #7 therefore conducting a scan with mode #8 was considered as worst case.

Table 55 - Radiated Emissions Data Points below 1GHz

Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
310.0174	62.74	Pk	14.1	8	84.84	-12.36	72.48	95.31	-10.47	75.31	-2.83	124	101	H	1
310.0178	46.54	Pk	14.1	8	68.64	-12.36	56.28	95.31	-26.67	75.31	-19.03	191	193	V	1
310.0155	57.7	Pk	14.1	8	79.8	-12.36	67.44	95.31	-15.51	75.31	-7.87	3	229	H	2
310.016	60.71	Pk	14.1	8	82.81	-12.36	70.45	95.31	-12.5	75.31	-4.86	108	200	V	2
310.0175	57.82	Pk	14.1	8	79.92	-12.36	67.56	95.31	-15.39	75.31	-7.75	349	247	H	3
310.0195	60.74	Pk	14.1	8	82.84	-12.36	70.48	95.31	-12.47	75.31	-4.83	262	201	V	3
620.0218	18.94	Pk	20.4	9.1	48.44	-12.36	36.08	66.02	-17.58	46.02	-9.94	85	135	H	1
620.0447	12.93	Pk	20.4	9.1	42.43	-12.36	30.07	66.02	-23.59	46.02	-15.95	164	109	V	1
620.0365	18.57	Pk	20.4	9.1	48.07	-12.36	35.71	66.02	-17.95	46.02	-10.31	16	164	H	2
620.0245	18.35	Pk	20.4	9.1	47.85	-12.36	35.49	66.02	-18.17	46.02	-10.53	92	102	V	2
620.024	14.92	Pk	20.4	9.1	44.42	-12.36	32.06	66.02	-21.6	46.02	-13.96	207	202	H	3
620.0365	20.2	Pk	20.4	9.1	49.7	-12.36	37.34	66.02	-16.32	46.02	-8.68	295	101	V	3
930.063	18.48	Pk	23.7	10.5	52.68	-12.36	40.32	66.02	-13.34	46.02	-5.7	72	164	H	1
930.057	13.1	Pk	23.7	10.5	47.3	-12.36	34.94	66.02	-18.72	46.02	-11.08	252	134	V	1
930.0385	19.29	Pk	23.7	10.5	53.49	-12.36	41.13	66.02	-12.53	46.02	-4.89	184	158	H	2
930.041	19.84	Pk	23.7	10.5	54.04	-12.36	41.68	66.02	-11.98	46.02	-4.34	311	138	V	2
930.062	16.89	Pk	23.7	10.5	51.09	-12.36	38.73	66.02	-14.93	46.02	-7.29	207	180	H	3
930.06	20.07	Pk	23.7	10.5	54.27	-12.36	41.91	66.02	-11.75	46.02	-4.11	109	123	V	3
Notes:															
1 - X- Axis (Laying Flat) 315MHz															
2 - Z- Axis (Straight Up) 315MHz															
3 - Y- Axis (Sideways) 315MHz															
Pk - Peak detector															

Below 1GHz all measurement data was collected with transmitter set to mode #8 and duty cycle for mode #7. The drive level for mode #8 is higher then drive for mode #7 therefore this is considered worst case.

Table 56 - Radiated Emissions Data Points above 1GHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DB dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity
2	1.24	73.33	Pk	28.9	-56.13	46.1	-12.36	33.74	74	-27.9	54	-20.26	0-360	100	H
24	1.24	71.25	Pk	28.9	-56.13	44.02	-12.36	31.66	74	-29.98	54	-22.34	0-360	150	V
4	1.55	75.07	Pk	28.2	-54.9	48.37	-12.36	36.01	74	-25.63	54	-17.99	0-360	150	H
42	1.55	70.81	Pk	28.2	-54.9	44.11	-12.36	31.75	74	-29.89	54	-22.25	0-360	150	V
7	1.86	73.48	Pk	30.9	-53.81	50.57	-12.36	38.21	74	-23.43	54	-15.79	0-360	100	H
26	1.861	66.63	Pk	30.9	-53.8	43.73	-12.36	31.37	74	-30.27	54	-22.63	0-360	100	V
10	2.17	70.5	Pk	21.7	-52.41	39.79	-12.36	27.43	74	-34.21	54	-26.57	0-360	99	H
29	2.17	67.84	Pk	21.7	-52.41	37.13	-12.36	24.77	74	-36.87	54	-29.23	0-360	100	V
13	2.48	75.45	Pk	22	-51.67	45.78	-12.36	33.42	74	-28.22	54	-20.58	0-360	150	H
32	2.48	71.5	Pk	22	-51.67	41.83	-12.36	29.47	74	-32.17	54	-24.53	0-360	150	V
16	2.79	69.17	Pk	22.2	-51.08	40.29	-12.36	27.93	74	-33.71	54	-26.07	0-360	150	H
35	2.79	64.78	Pk	22.2	-51.08	35.9	-12.36	23.54	74	-38.1	54	-30.46	0-360	100	V
18	3.1001	79.6	Pk	22.6	-50.46	51.74	-12.36	39.38	74	-22.26	54	-14.62	63	100	H
37	3.1	70.43	Pk	22.6	-50.46	42.57	-12.36	30.21	74	-31.43	54	-23.79	0-360	100	V
9	2.024	64.39	Pk	21.2	-53.29	32.3	0	-	74	-41.7	54	-21.7	0-360	150	H
45	3.41	69.97	Pk	23.5	-50.66	42.81	0	-	74	-31.19	54	-11.19	0-360	99	H
46	3.465	74.39	Pk	23.5	-50.99	46.9	0	-	74	-27.1	54	-7.1	0-360	99	H
47	3.721	67.86	Pk	23.6	-49.9	41.56	0	-	74	-32.44	54	-12.44	0-360	150	H
48	3.781	71.77	Pk	24	-51.46	44.31	0	-	74	-29.69	54	-9.69	0-360	150	H
49	3.876	68.41	Pk	23.9	-51.15	41.16	0	-	74	-32.84	54	-12.84	0-360	150	H
50	3.938	68.86	Pk	24	-50.95	41.91	0	-	74	-32.09	54	-12.09	0-360	99	H
28	2.023	72.09	Pk	21.2	-53.27	40.02	0	-	74	-33.98	54	-13.98	0-360	150	V
Pk - Peak detector															

Below 1GHz all measurement data was collected with transmitter set to mode #8 and duty cycle for mode #7. The drive level for mode #8 is higher then drive for mode #7 therefore this is considered worst case.

4.8 Mode#8 Test Data

4.8.1 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 57 Occupied Bandwidth Configuration Settings

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

Table 58 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 59 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
310MHz	25.45	50.180
315MHz	25.08	51.629
390MHz	24.92	50.173

Figure 43 – 20dB Bandwidth Graph 310MHz

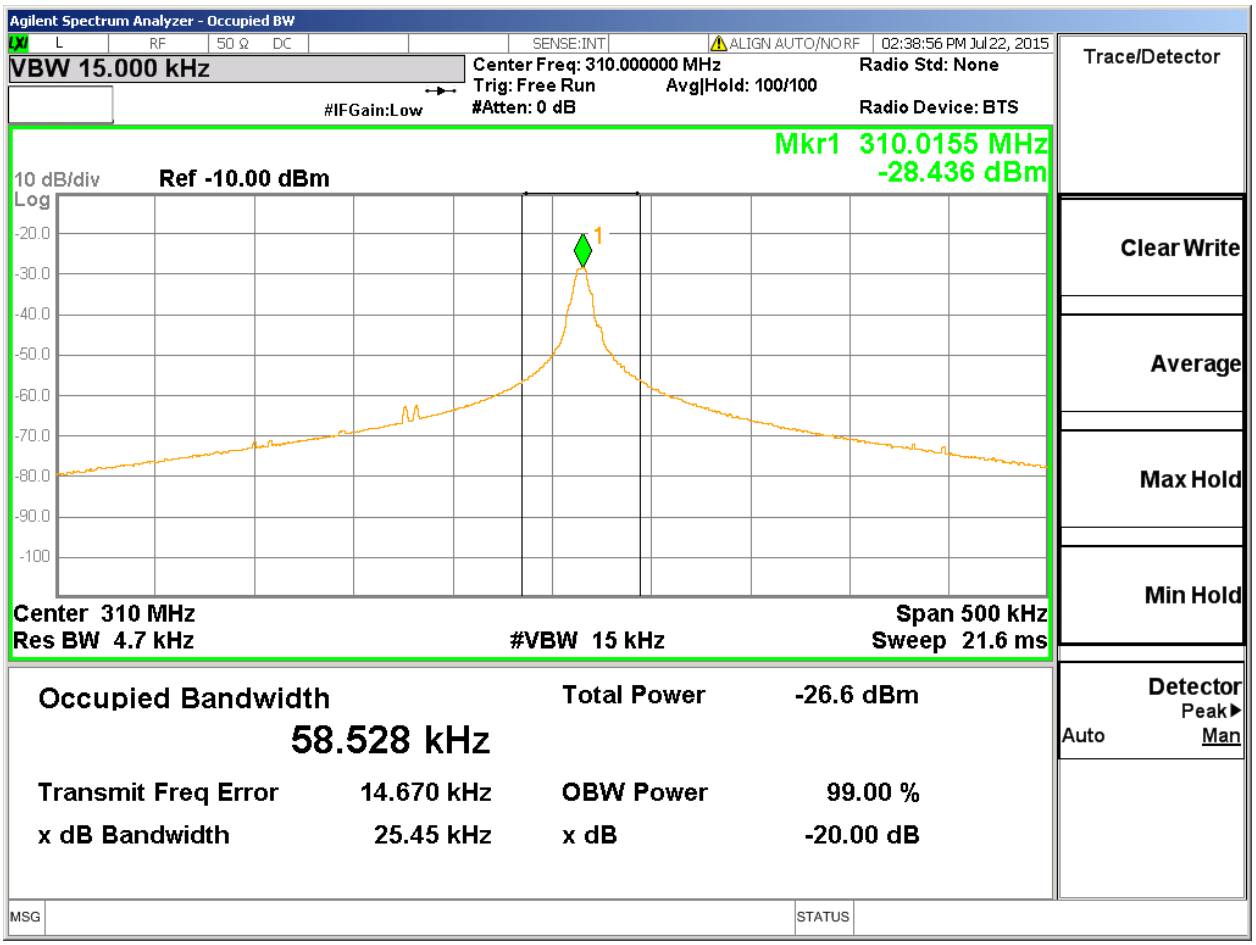


Figure 44 – 20dB Bandwidth Graph 315MHz

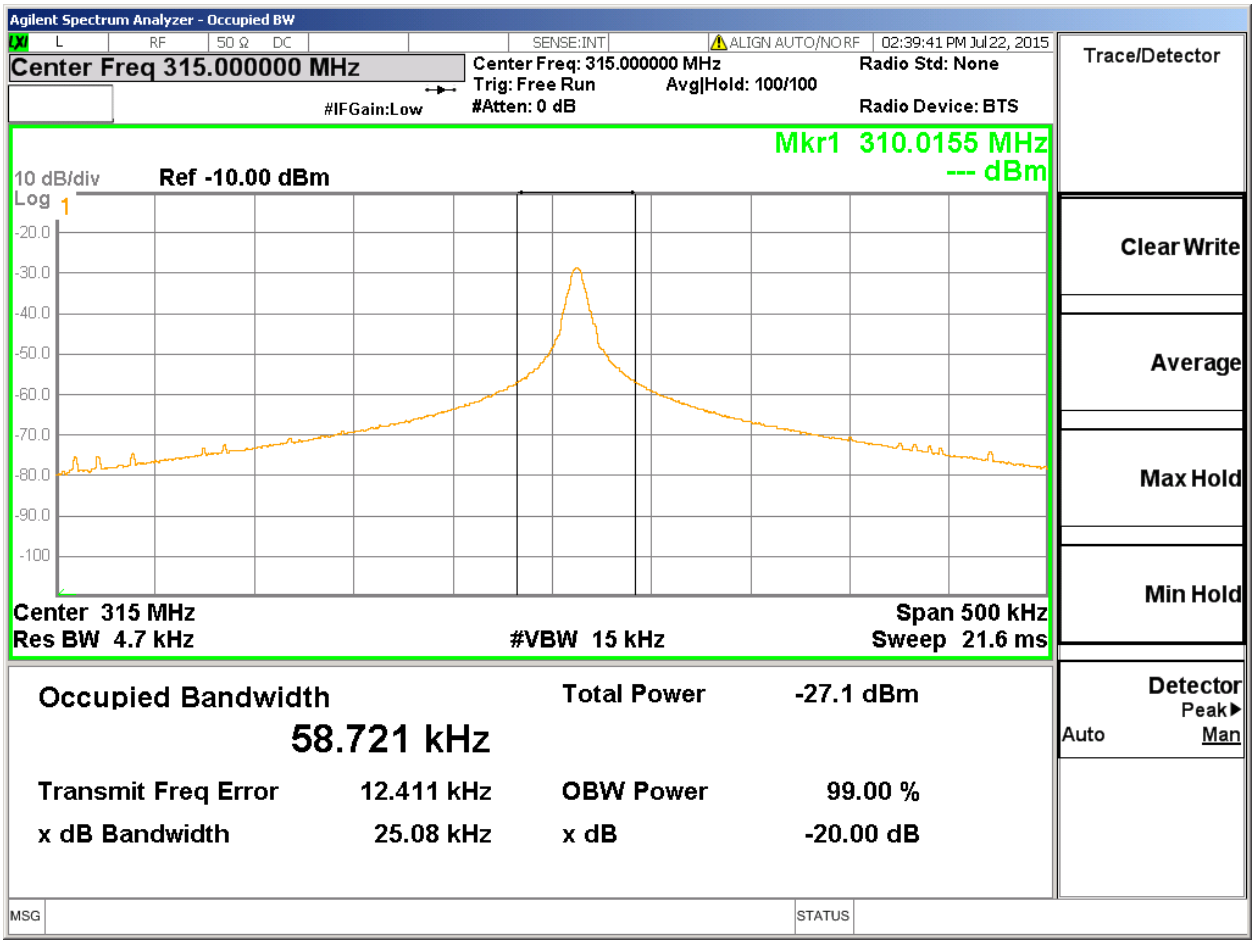


Figure 45 –20dB Bandwidth Graph 390MHz

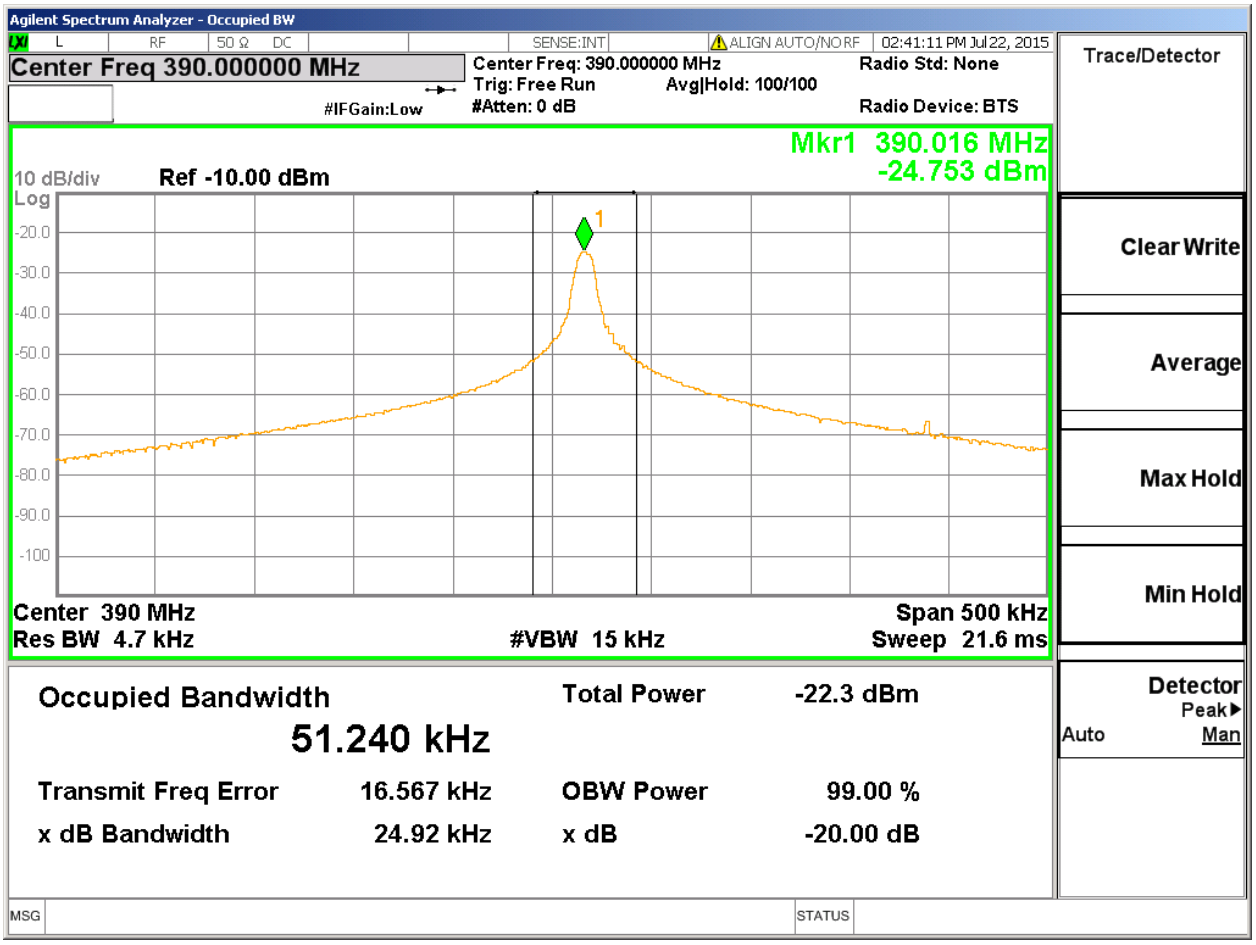


Figure 46 – 99% Bandwidth Graph 310MHz

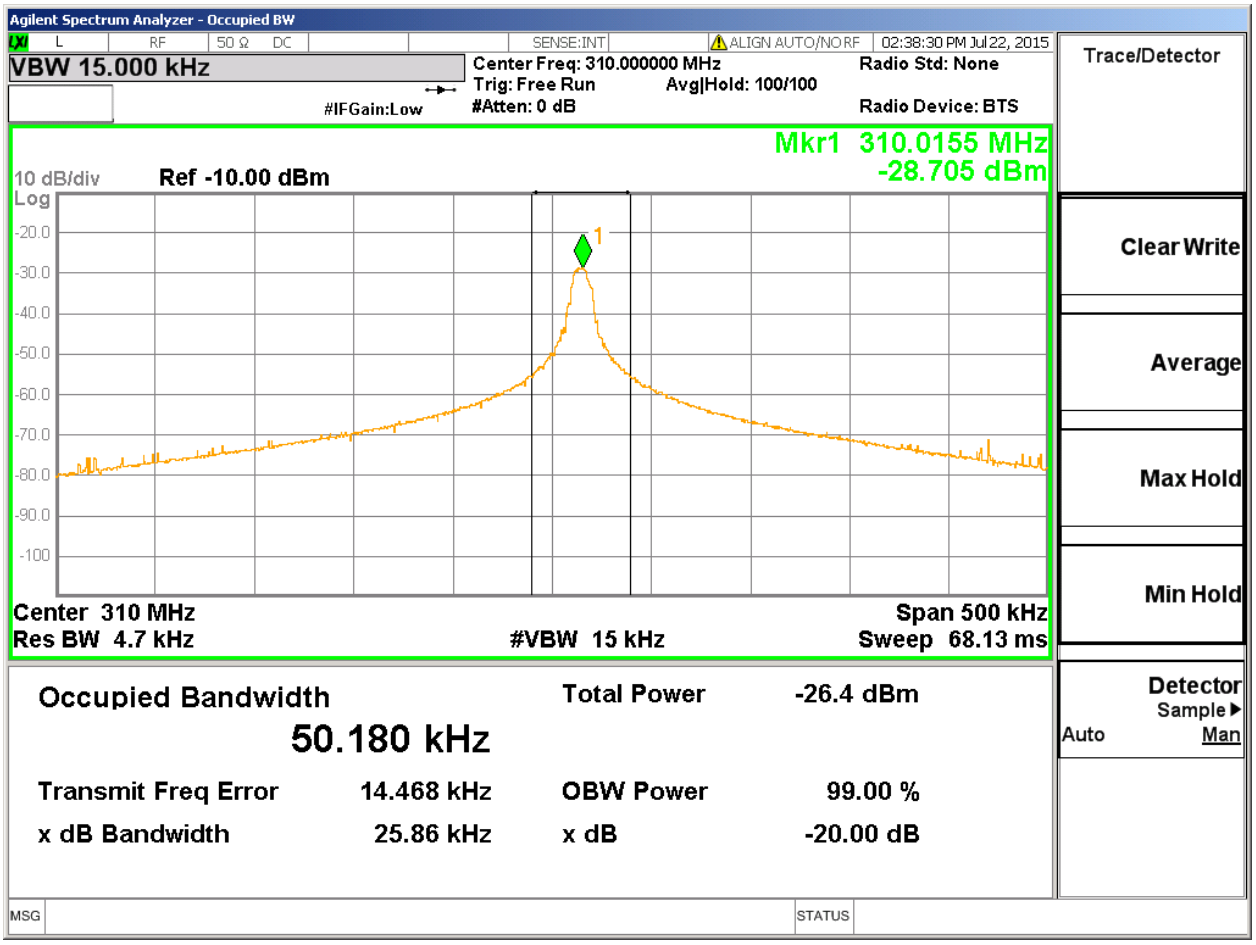


Figure 47 – 99% Bandwidth Graph 315MHz

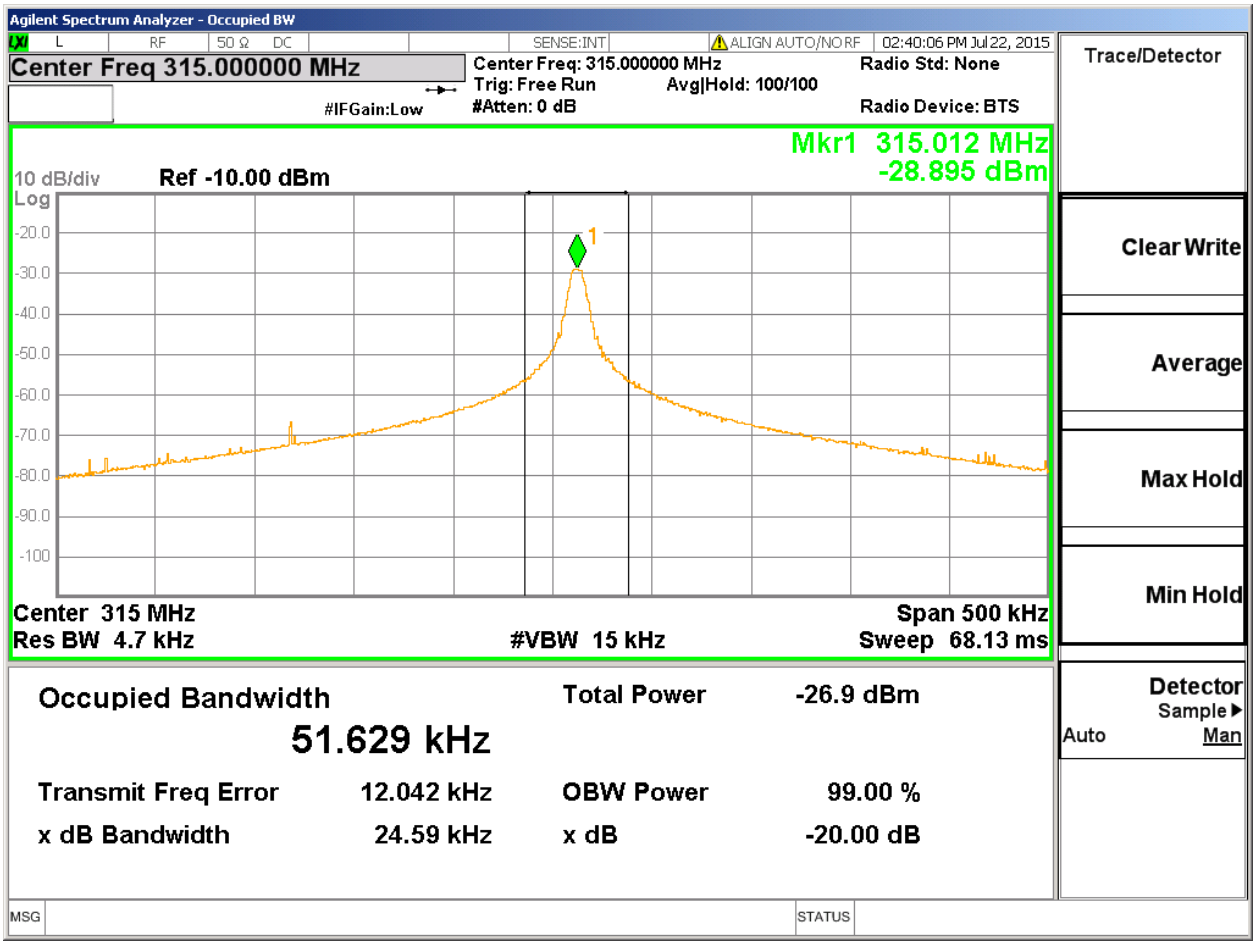
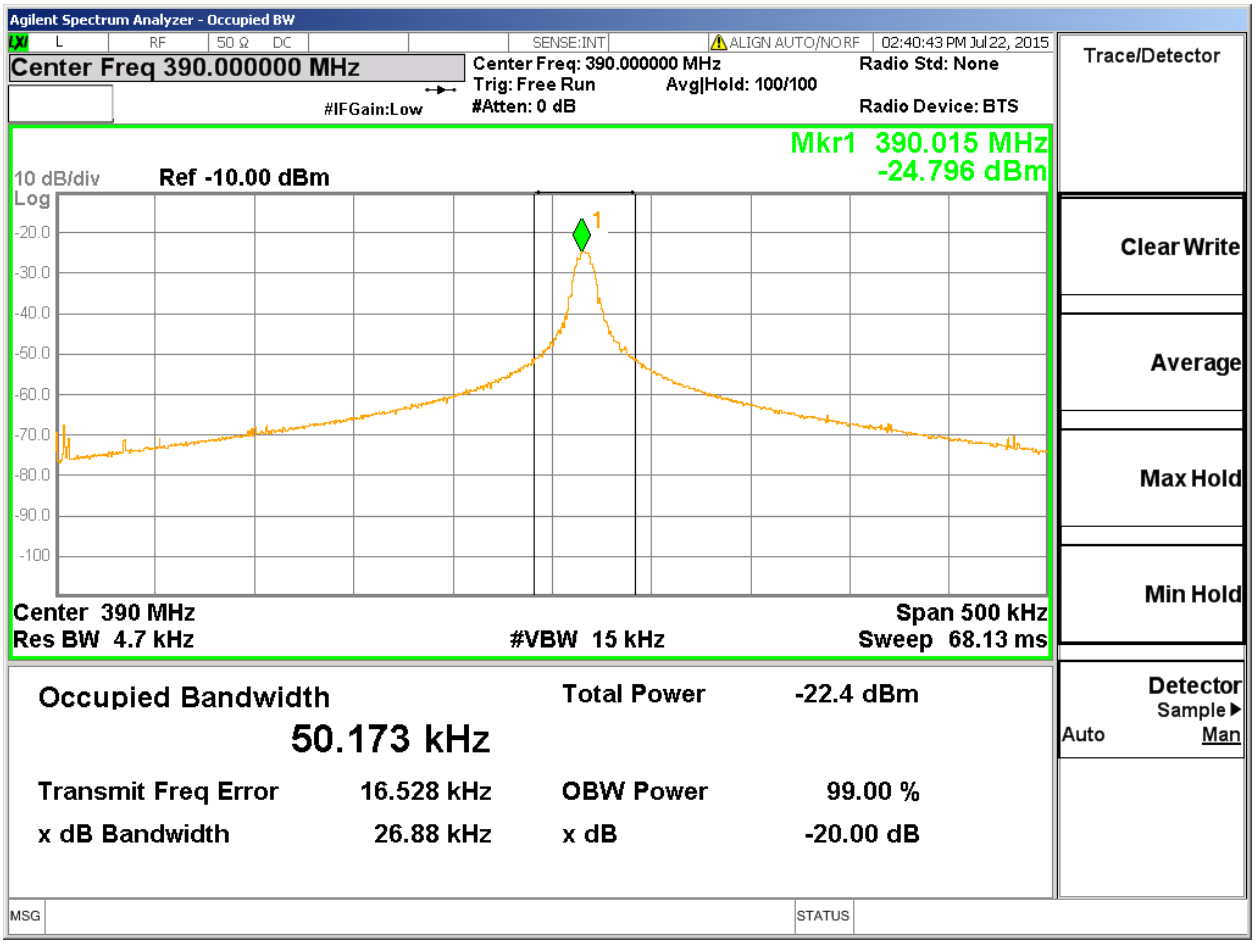


Figure 48 – 99% Bandwidth Graph 390MHz



4.8.2 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 60 Cease Operation Configuration Settings

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

Figure 49 Cease Operation Graph 310MHz

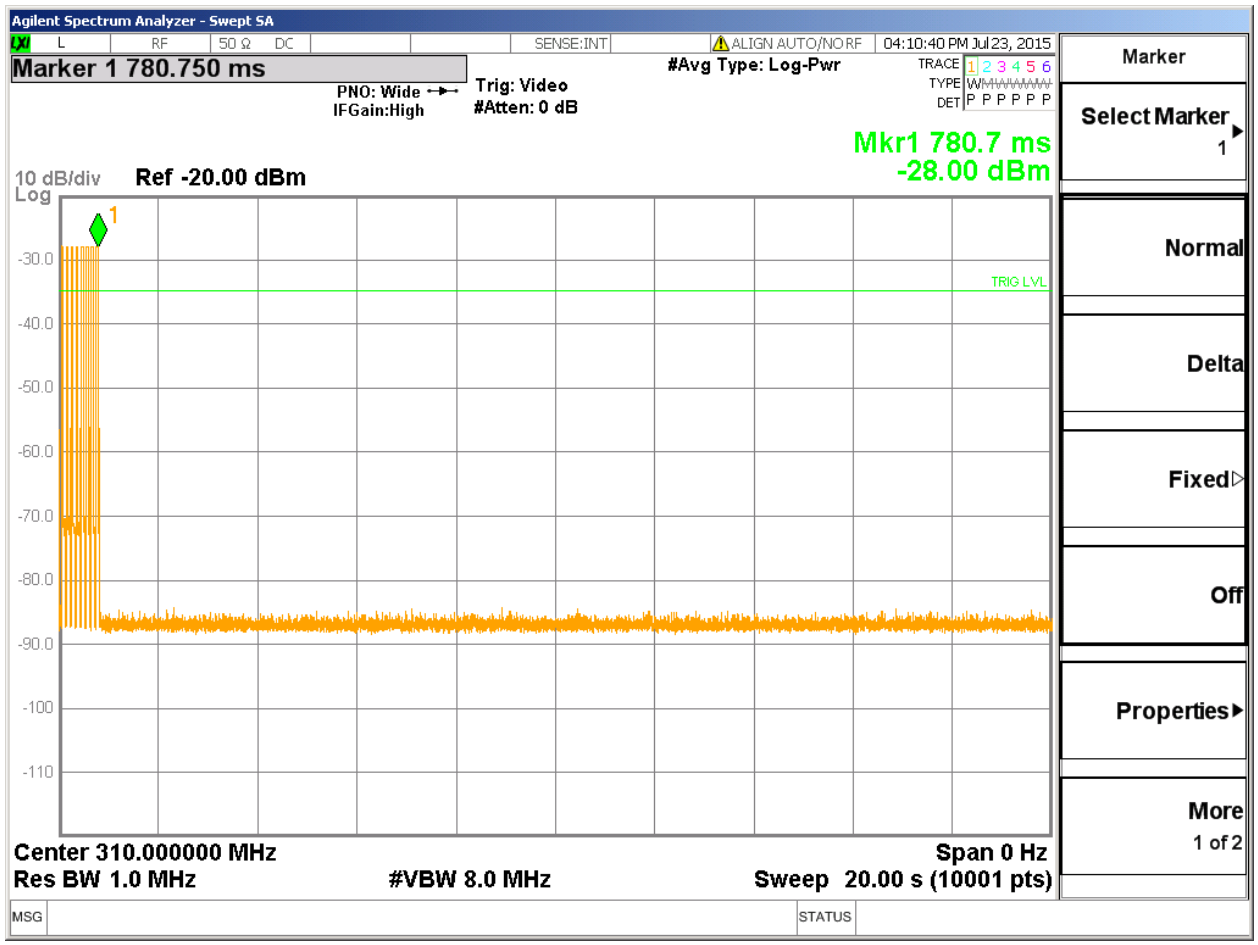


Figure 50 Cease Operation Graph 315MHz

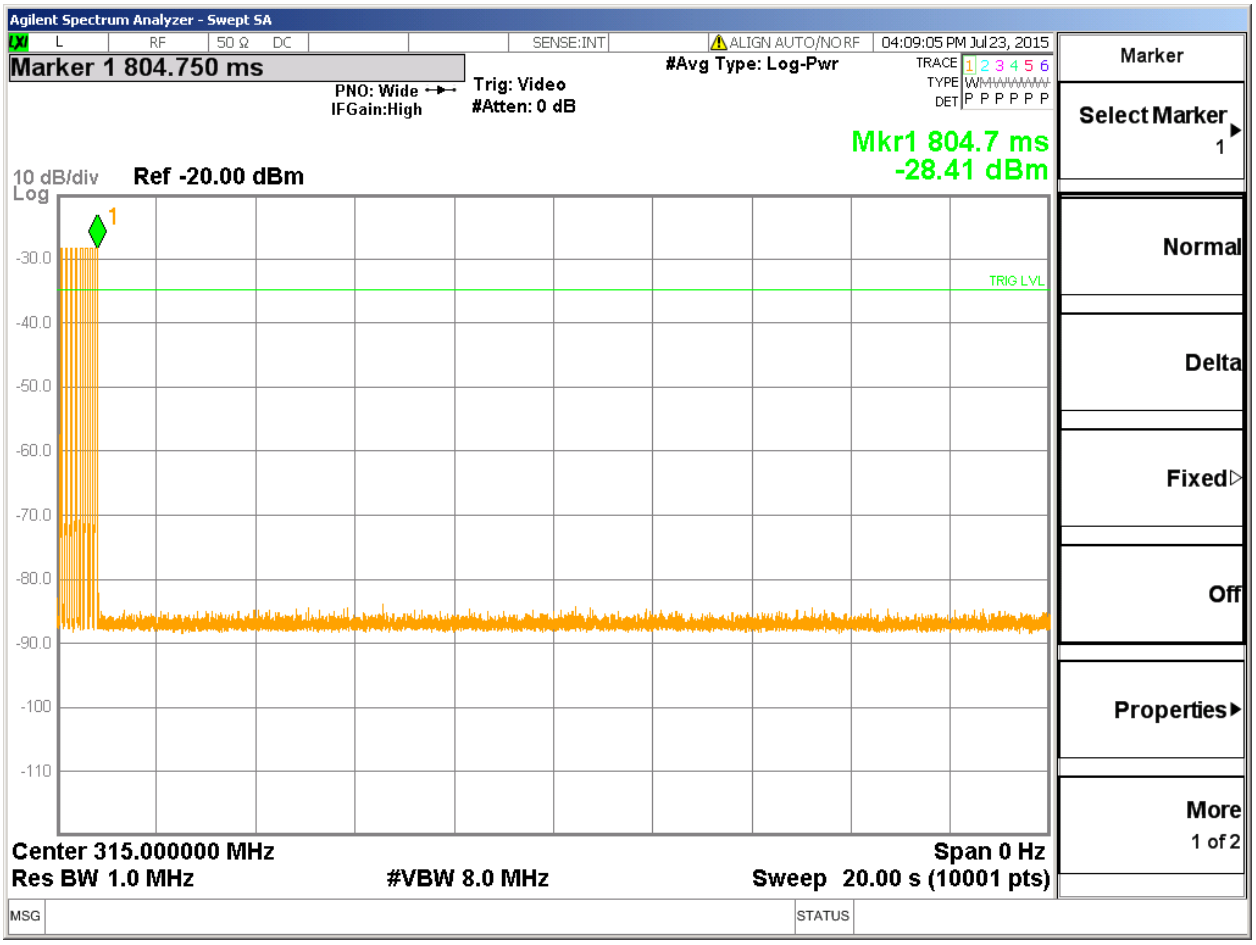
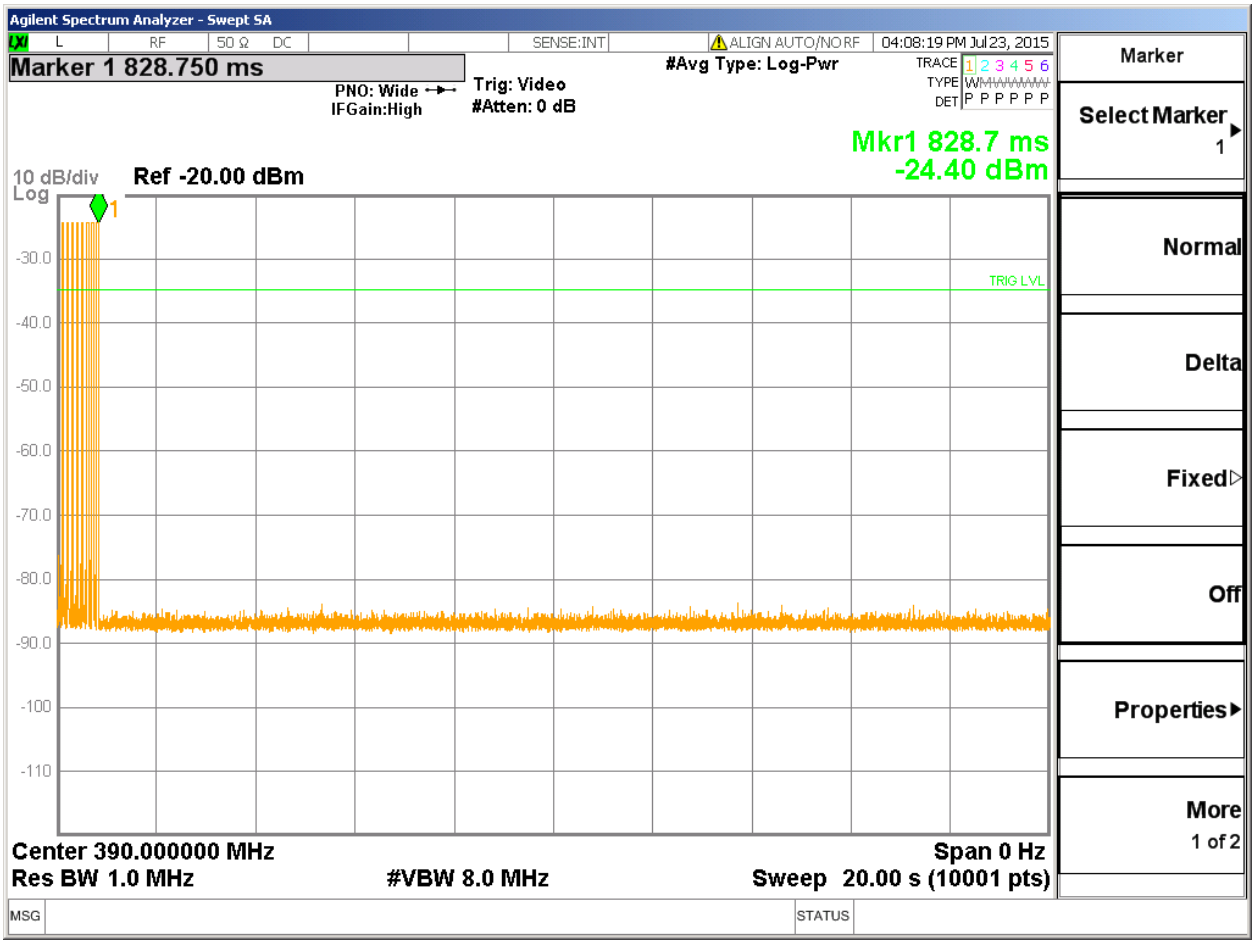


Figure 51 Cease Operation Graph 390MHz



4.8.3 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.	

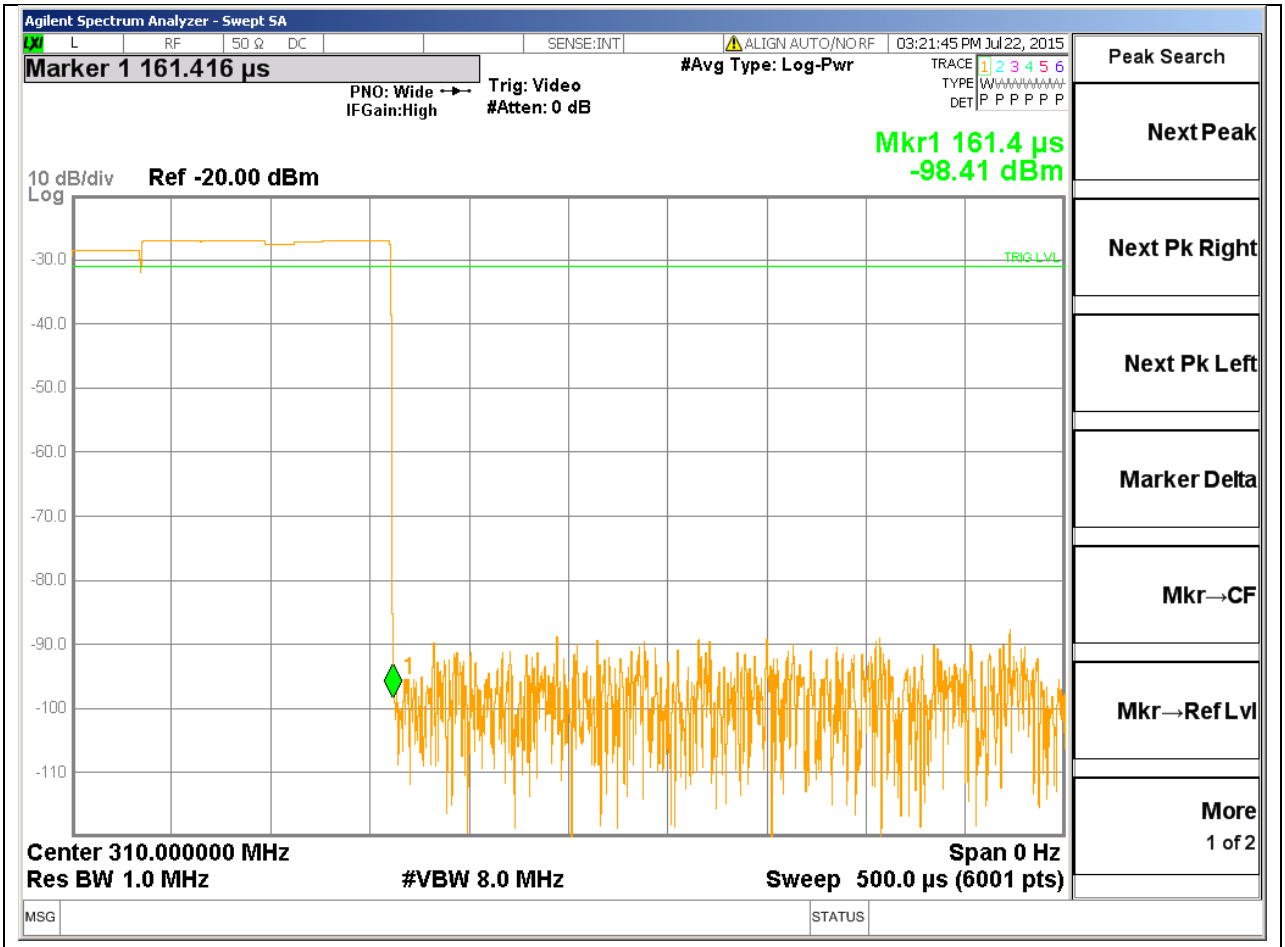
Table 61 Pulse Train Configuration Settings

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

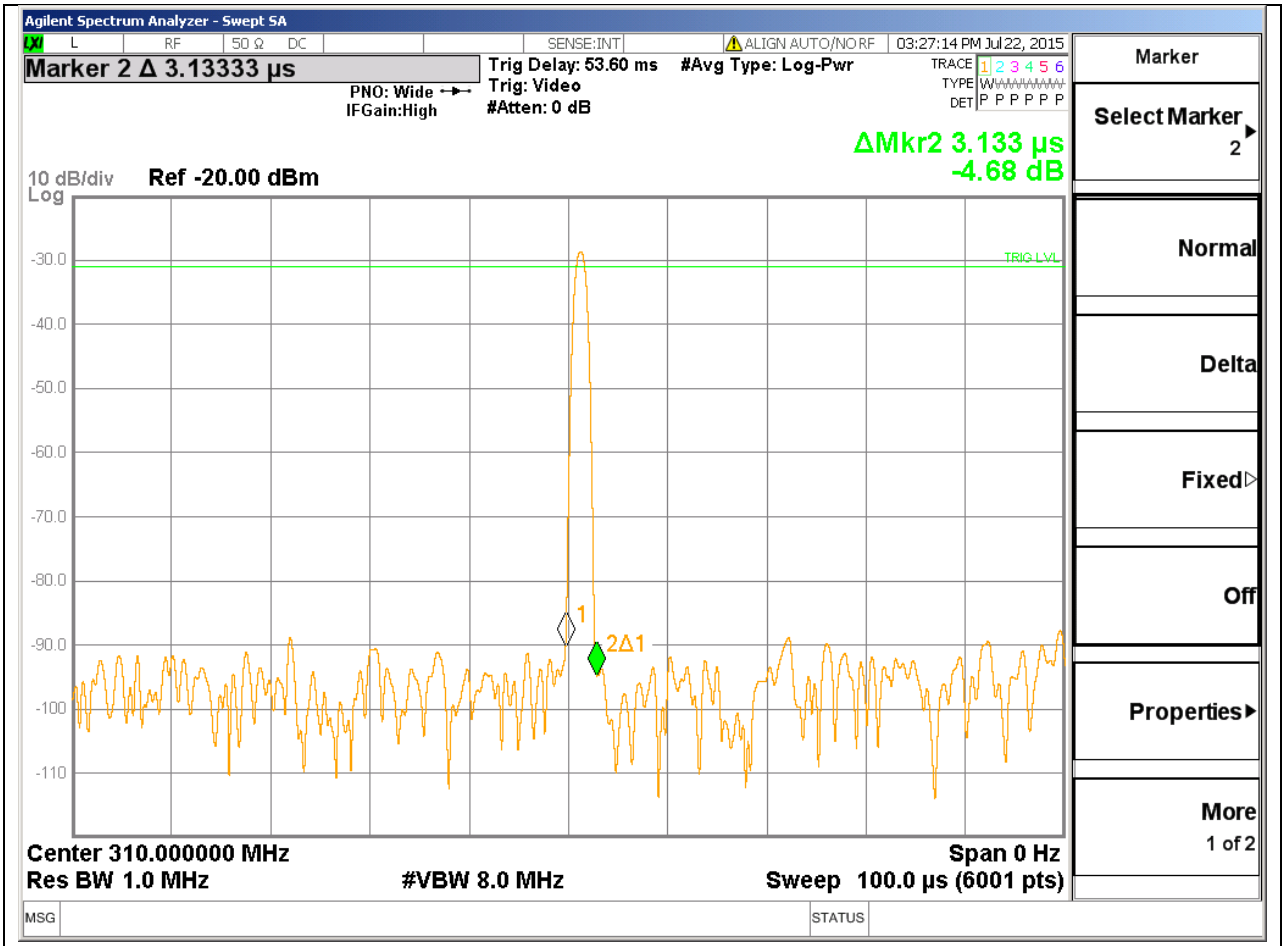
Table 62 Pulse Train Calculation

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	0.1614+0.003133+0.3208+(40x0.2503)+(11x0.5003) = 16.0mS	100mS	-15.19dB
315MHz	0.0923+0.00335+0.3166+(38x0.2504)+(12x0.500) = 15.92mS	100mS	-15.95dB
390MHz	0.1723+0.00326+0.3263+(40x0.2505)+(11x0.516) = 16.2mS	100mS	-15.90dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over 100mS including the tuning pulses. The manufacturer declared duty cycle as -16.19dB, measured duty cycle is used for all radiated emissions data.			

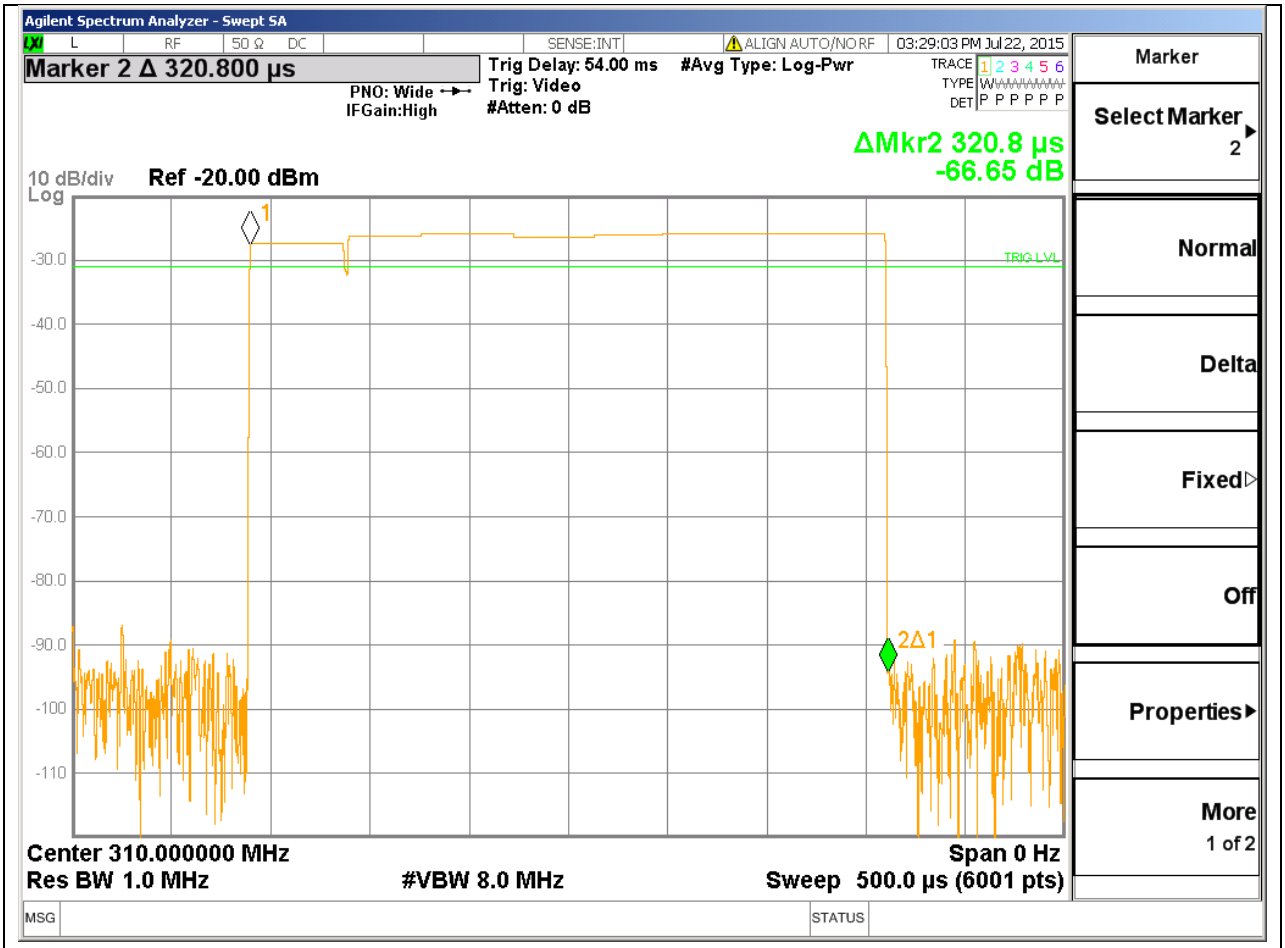
Figure 52 Pulse Train Graphs for 310MHz



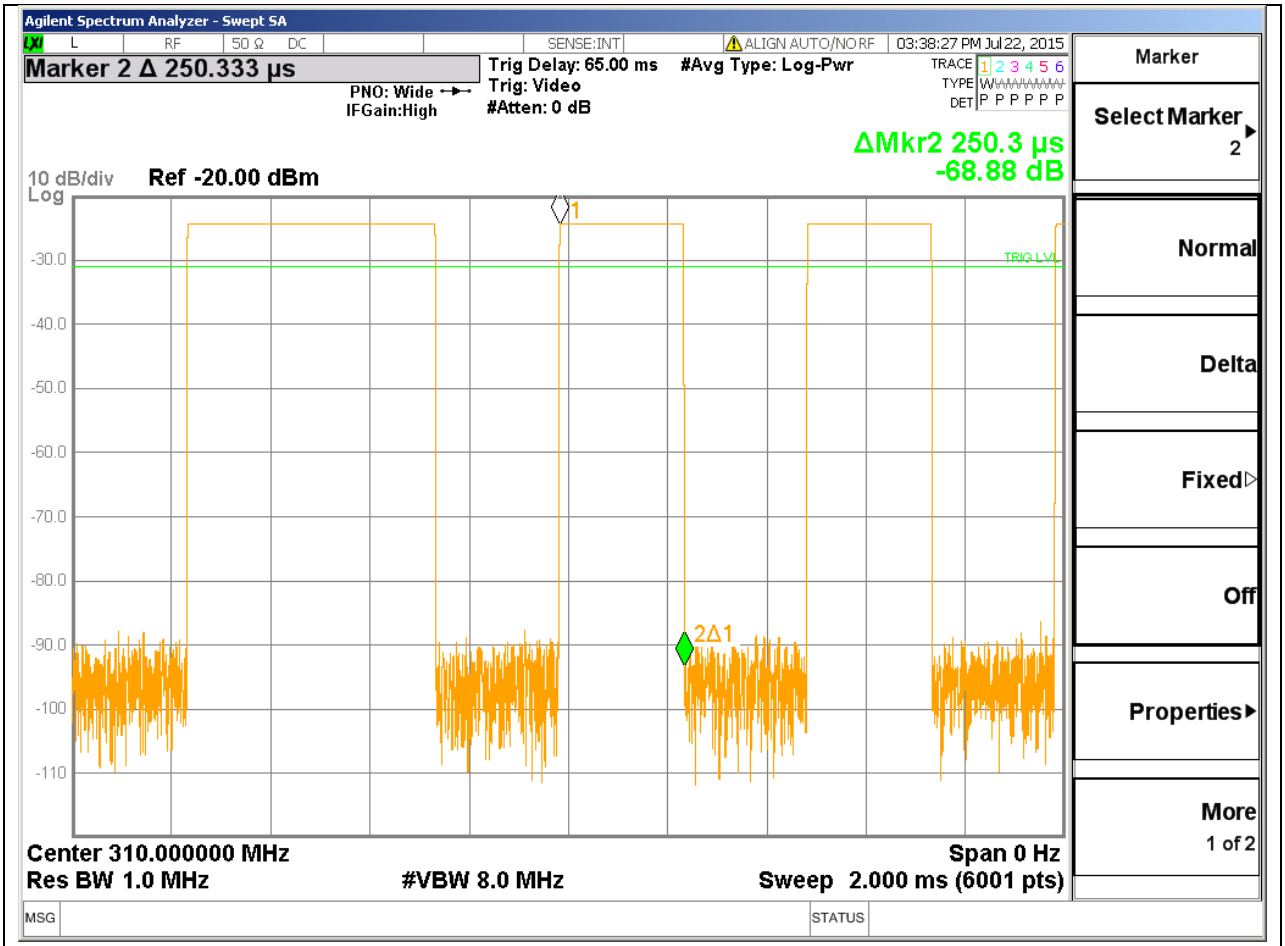
Tuning pulse duration: 0.1614mS



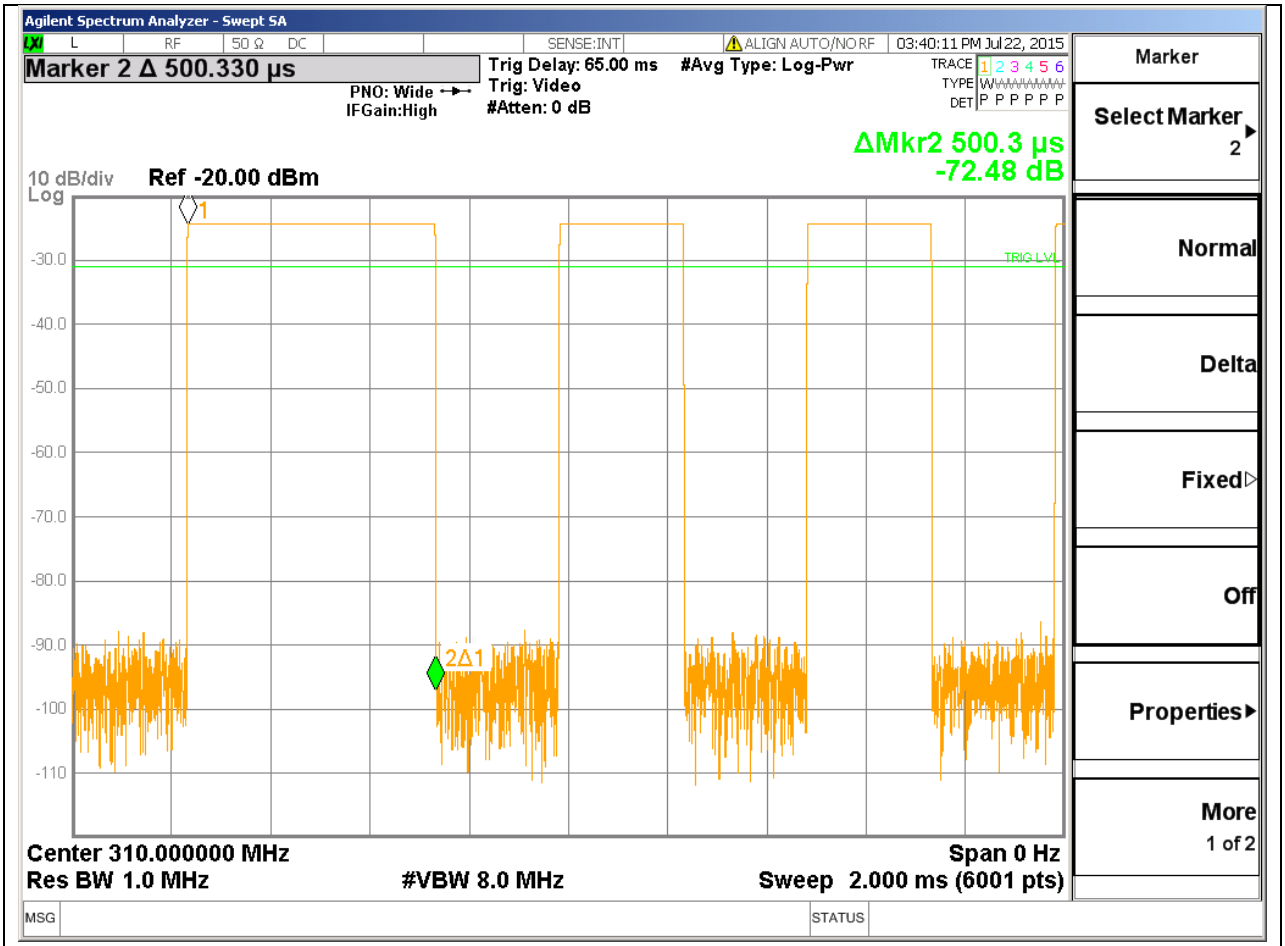
Tuning pulse duration: 0.003133mS



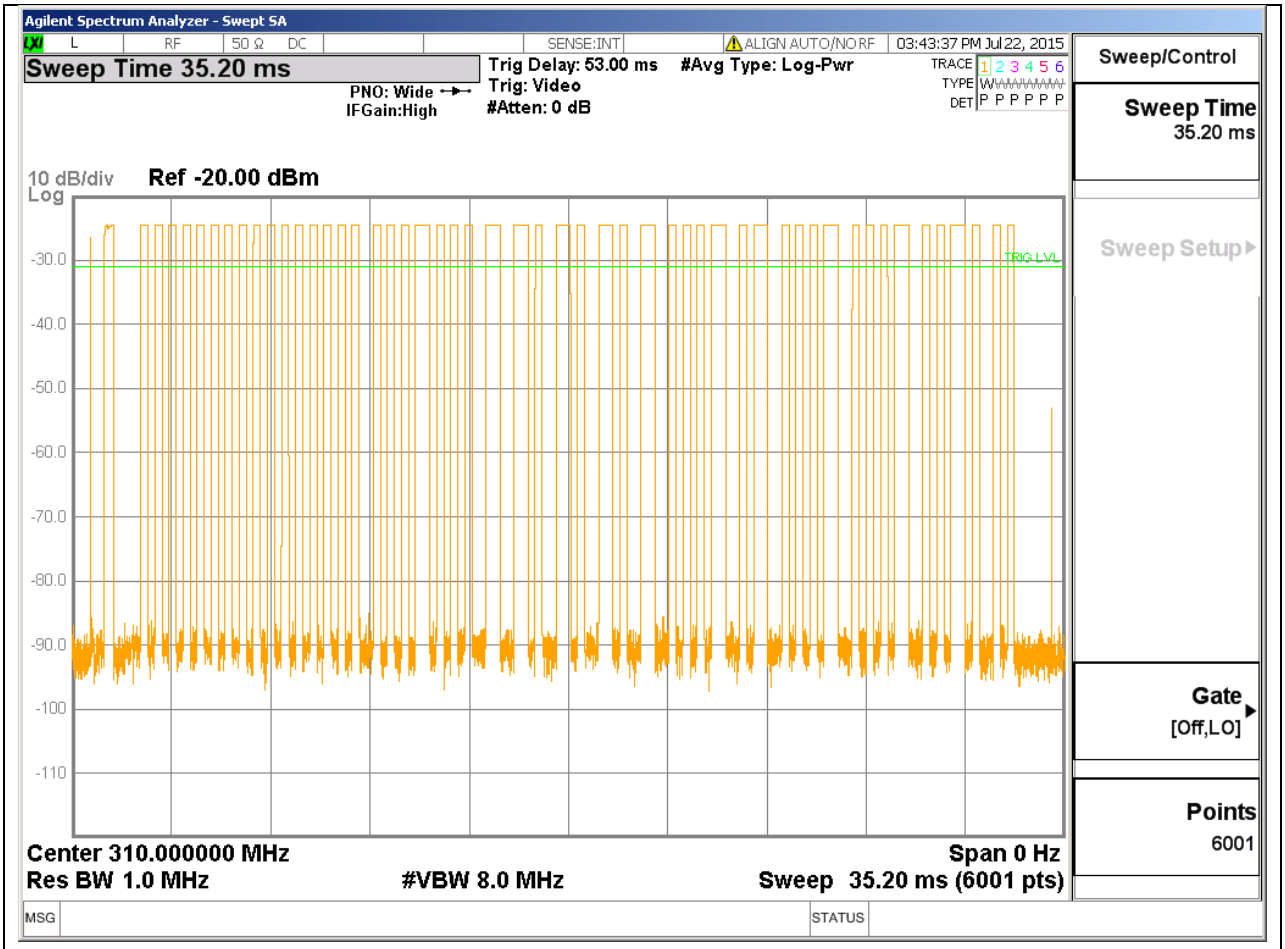
Tuning pulse duration: 0.3208mS



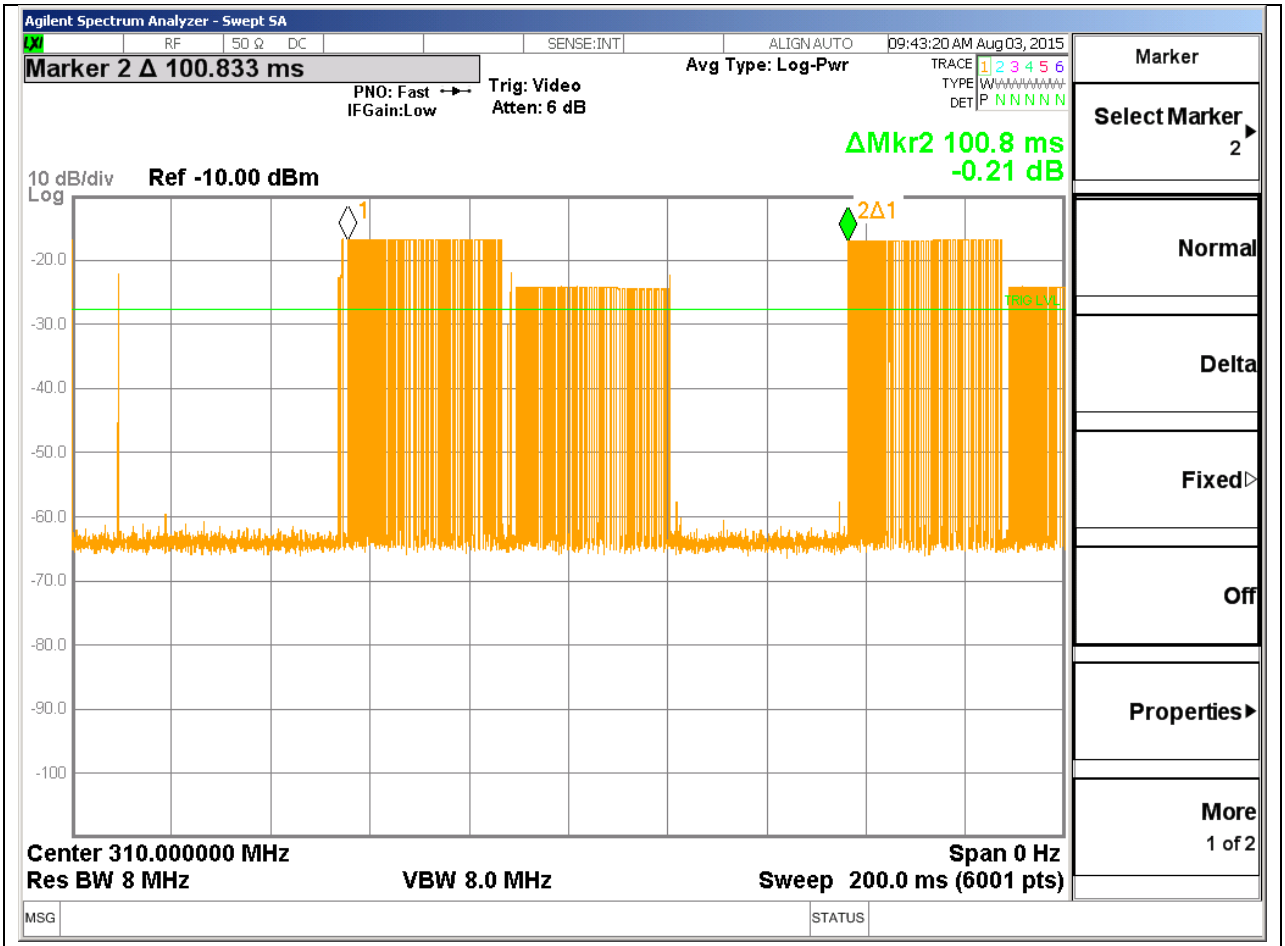
Pulse Duration: Short Pulse 0.2503



Pulse Duration: Long Pulse 0.5003mS

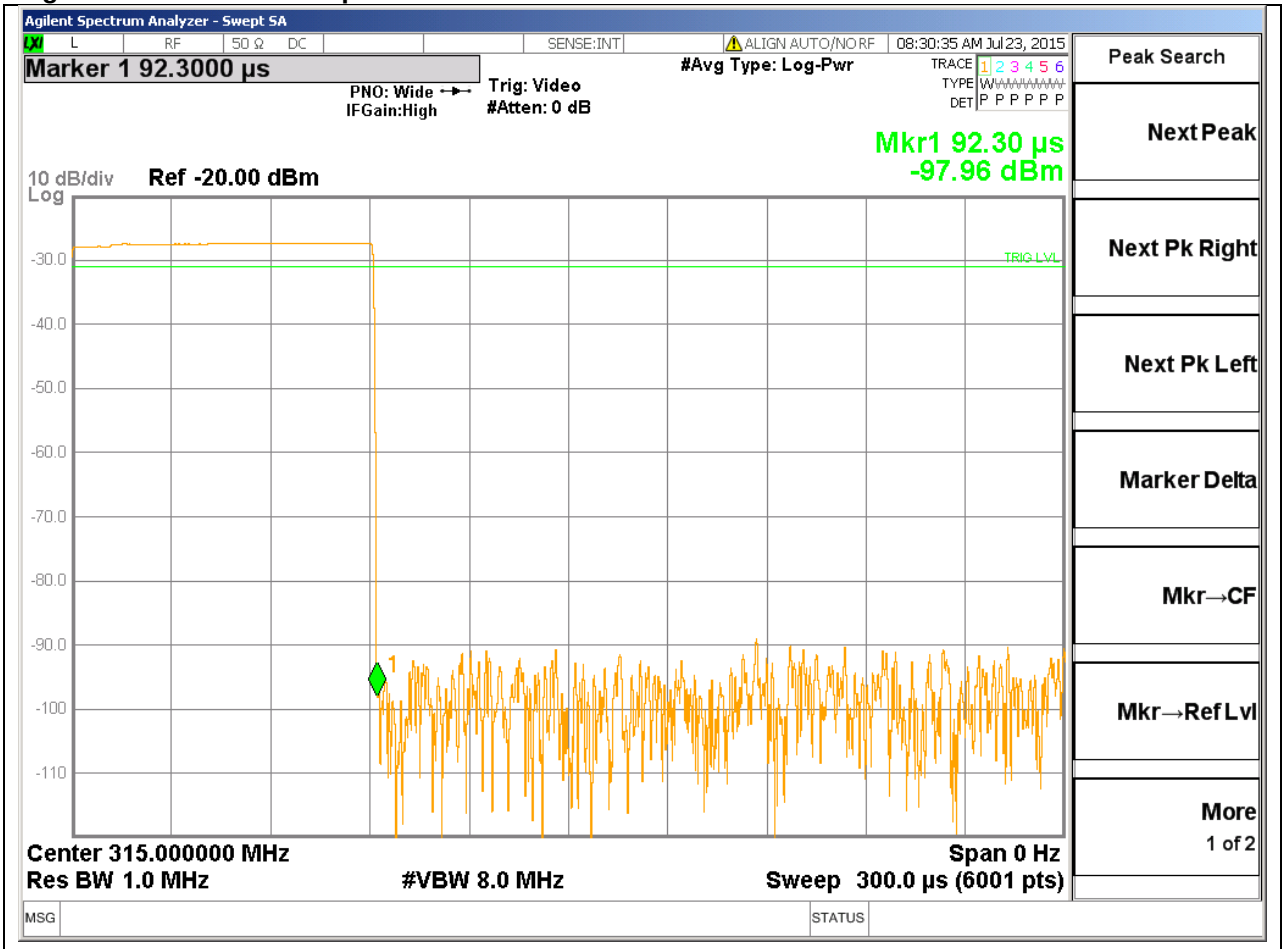


Number of Pulses: Short 40, Long 11

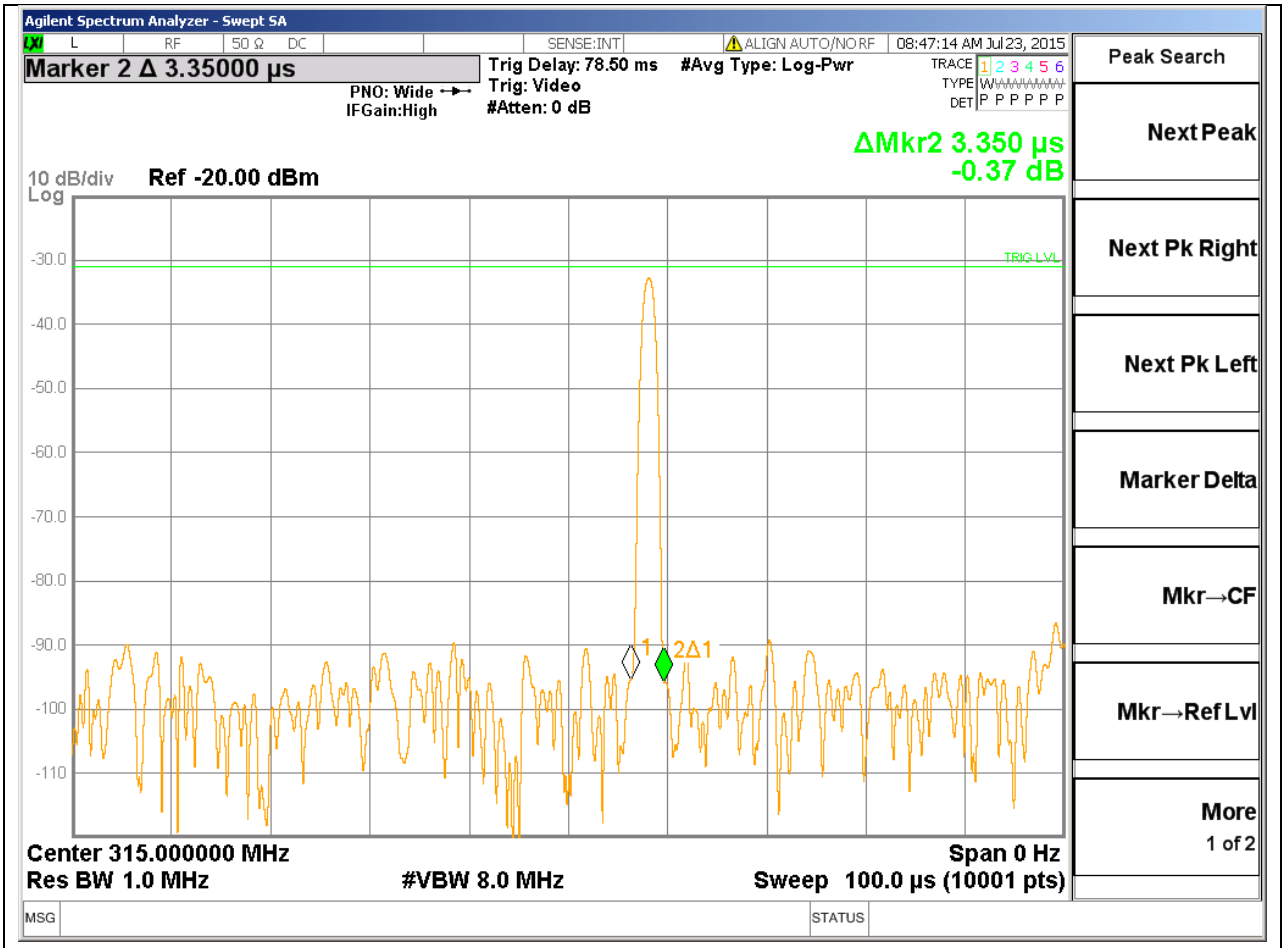


Period scan 100.8mS

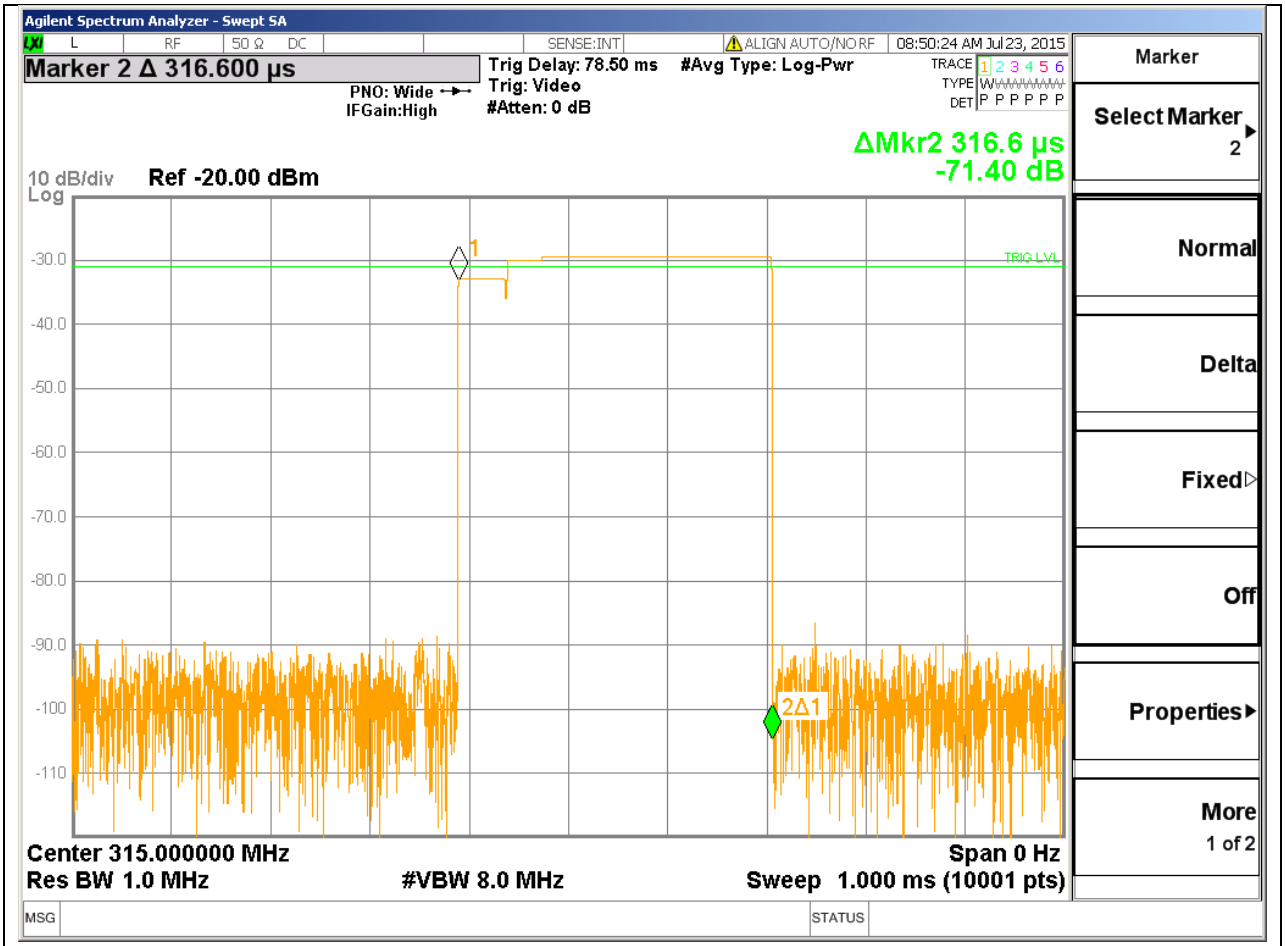
Figure 53 Pulse Train Graphs for 315MHz



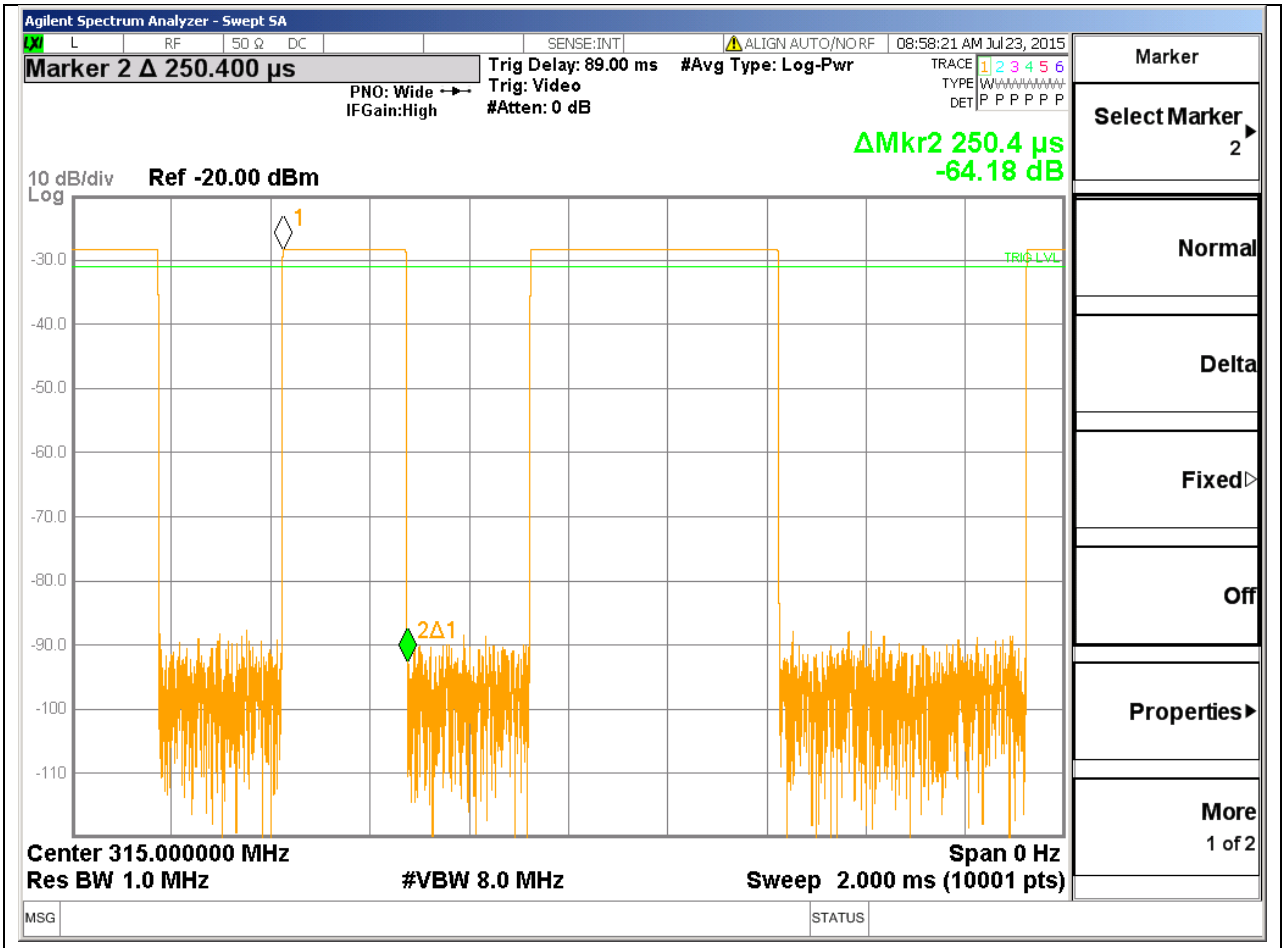
Tuning pulse duration: 0.0923



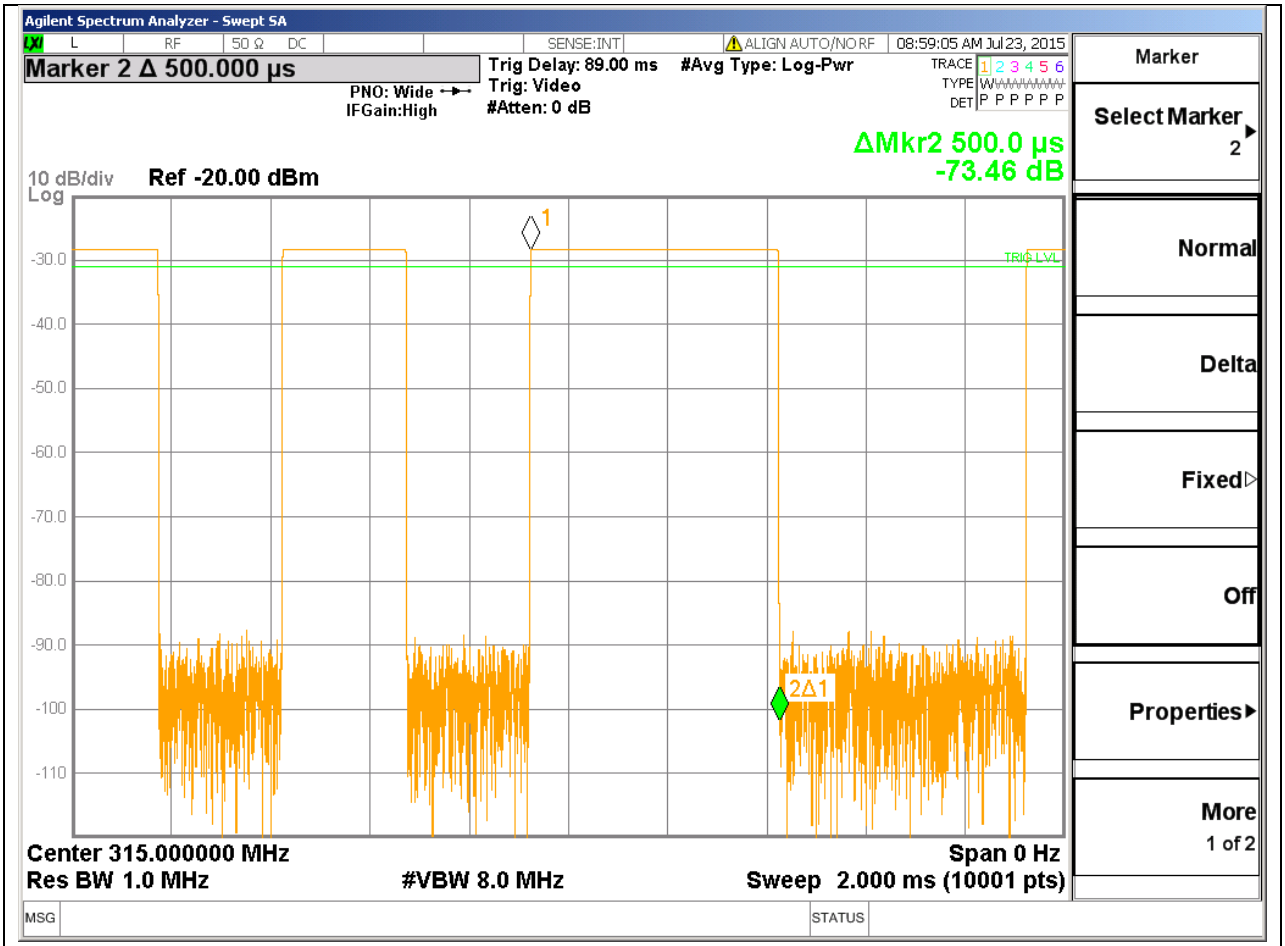
Tuning pulse duration: 0.0035mS



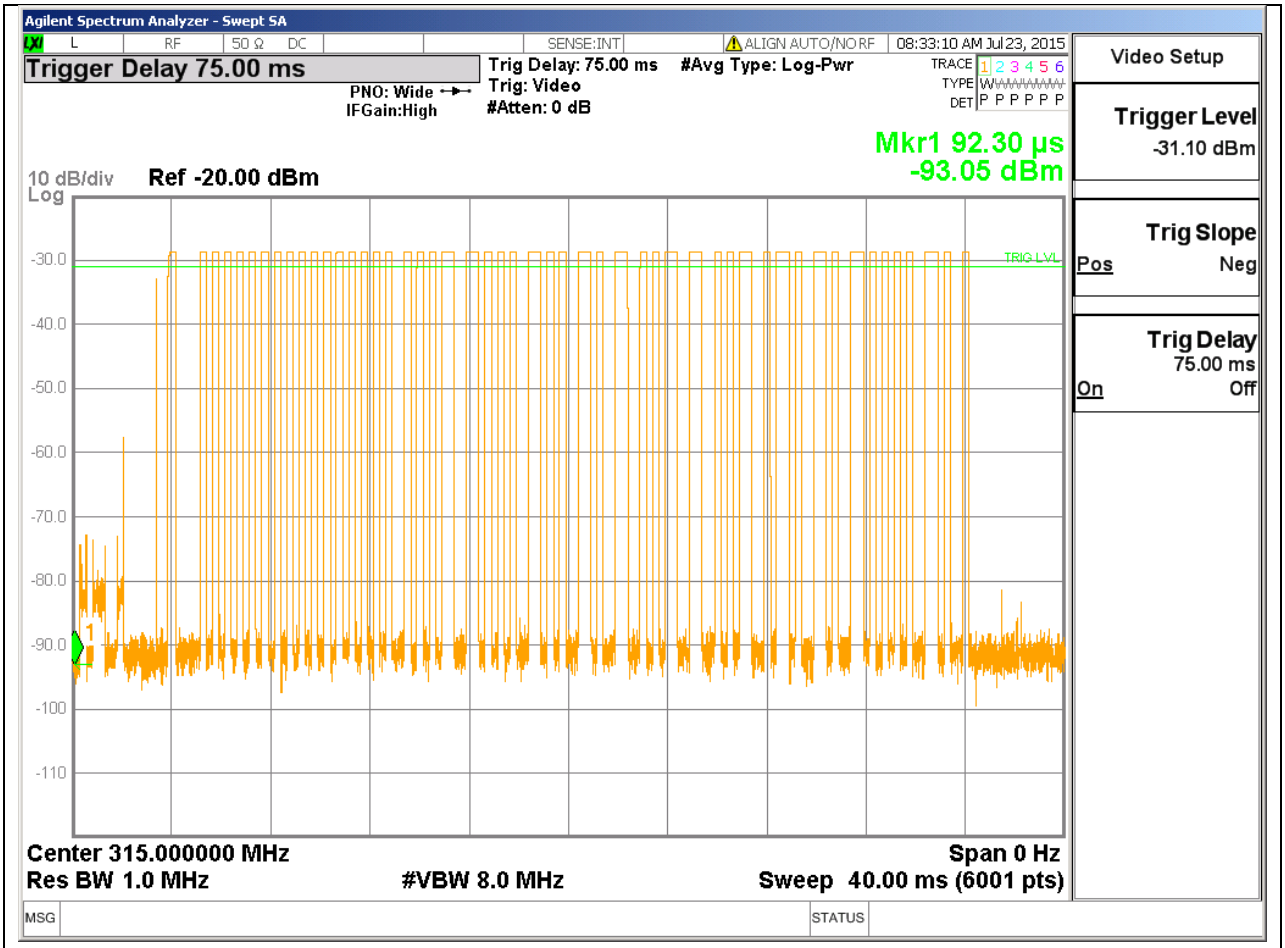
Tuning pulse duration: 0.3166mS



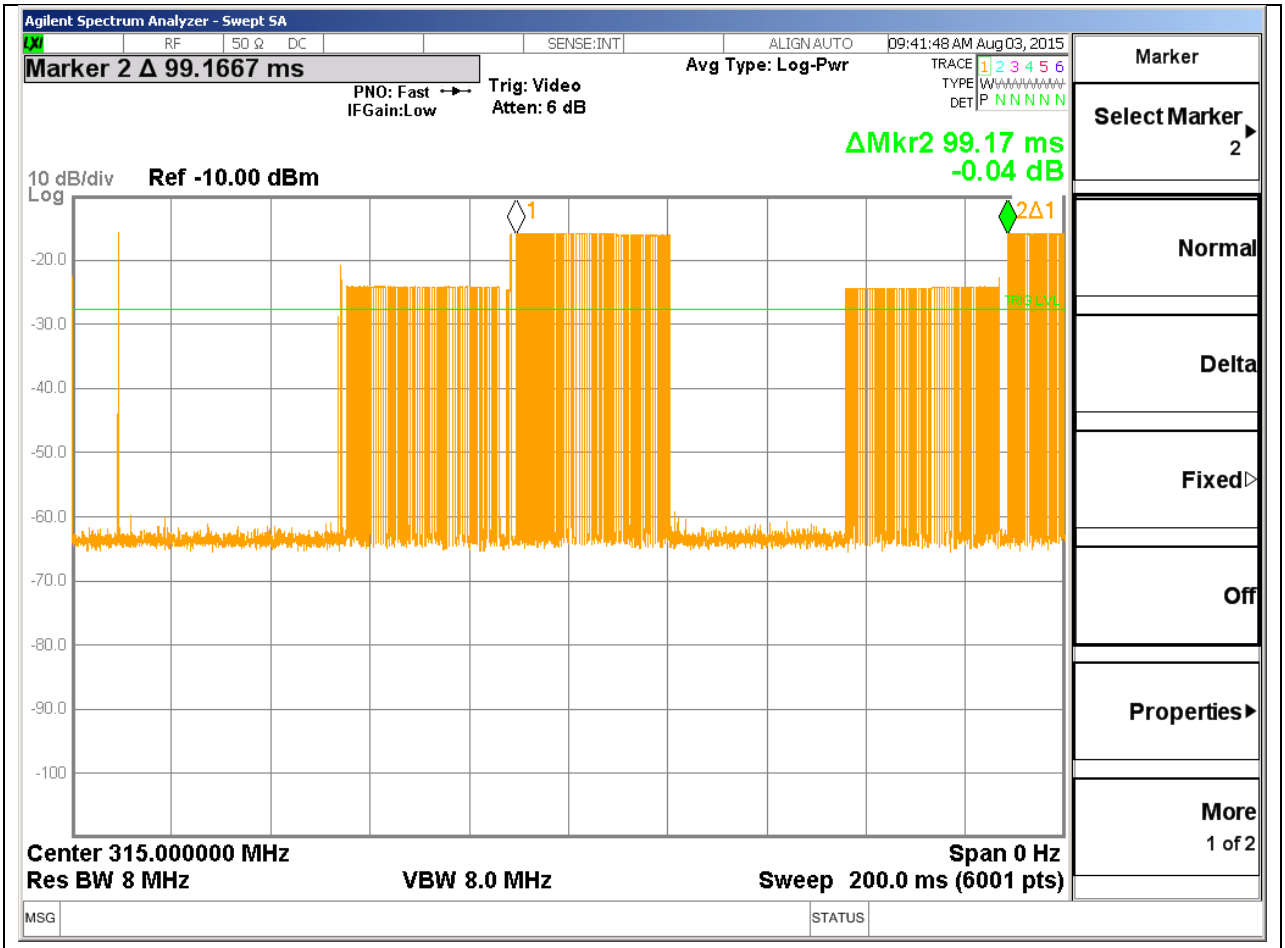
Pulse Duration: Short Pulse 0.2504



Pulse Duration: Long Pulse 0.500

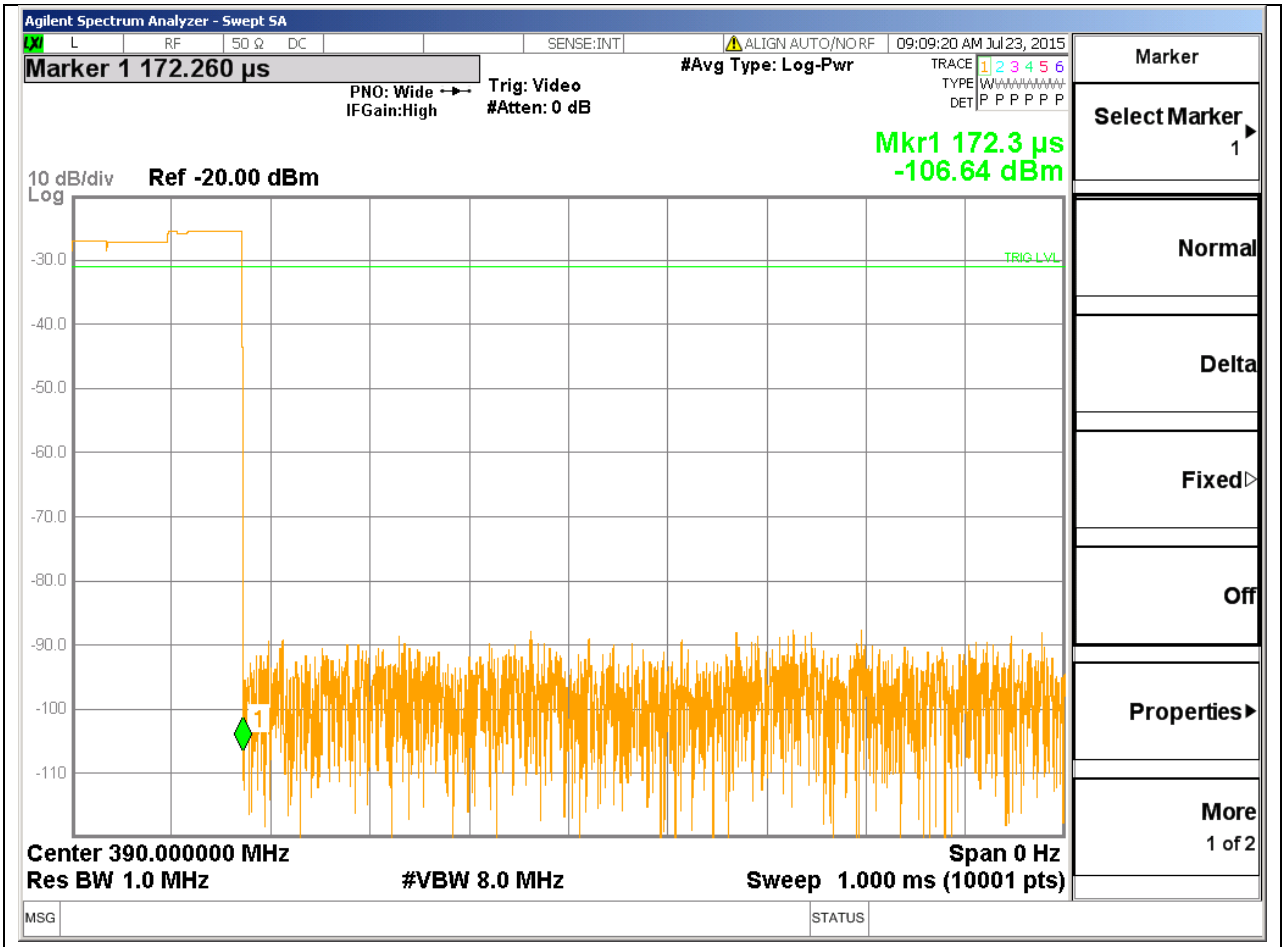


Number of Pulses: 38 Short, 12 Long

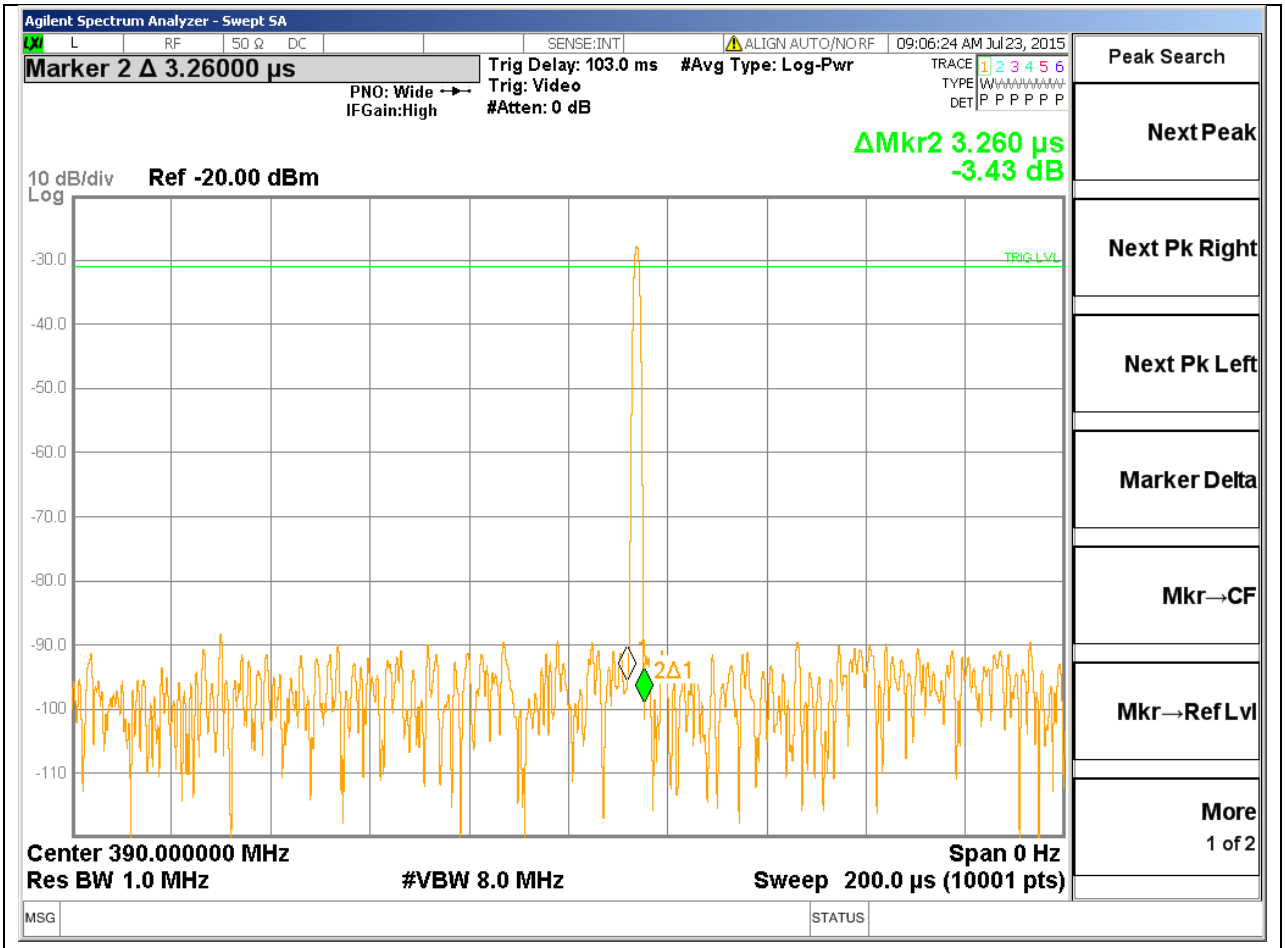


Period scan 99.17 (100mS used for duty cycle calculation as worst case combined with tuning pulses).

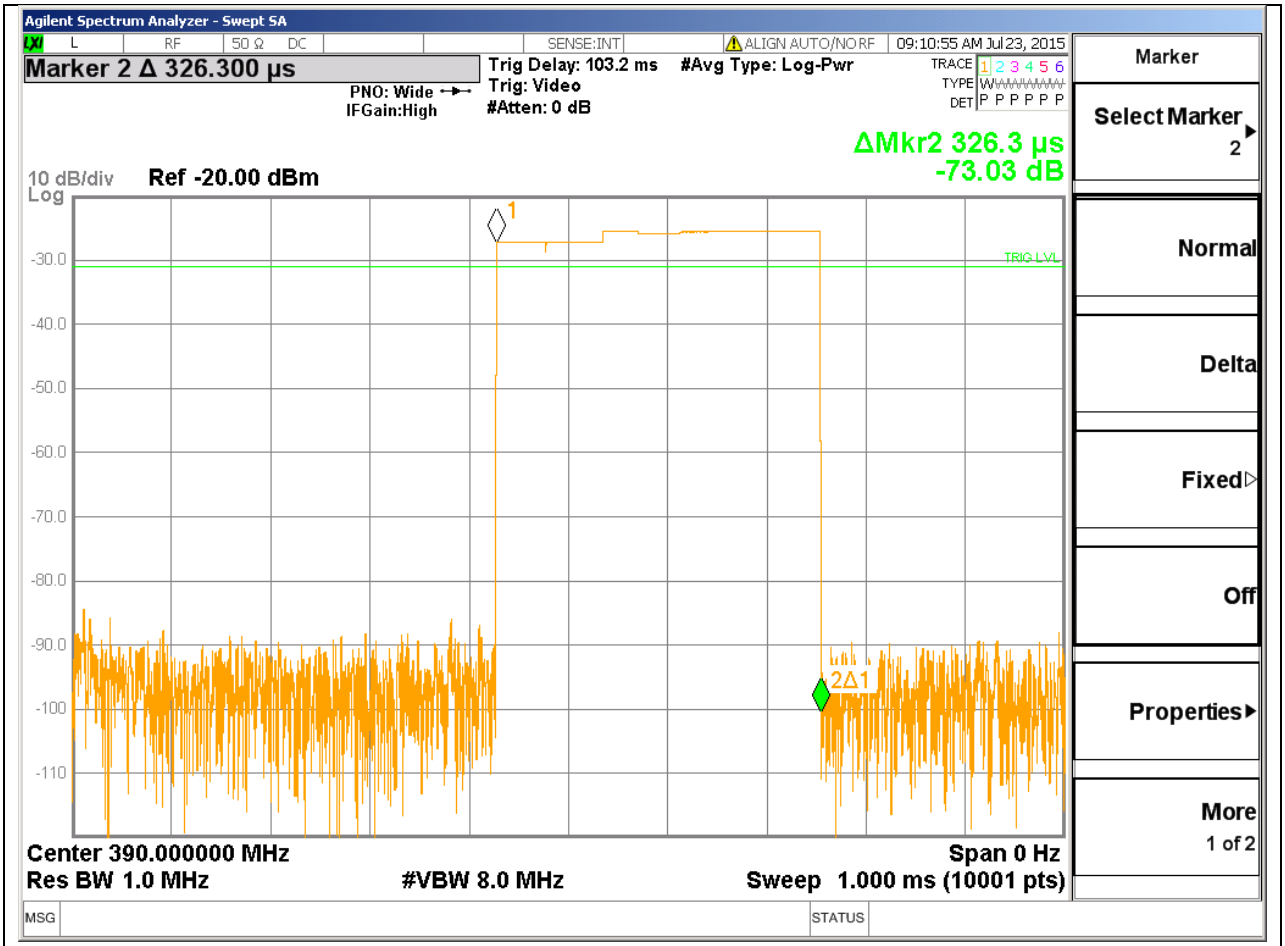
Figure 54 Pulse Train Graphs for 390MHz



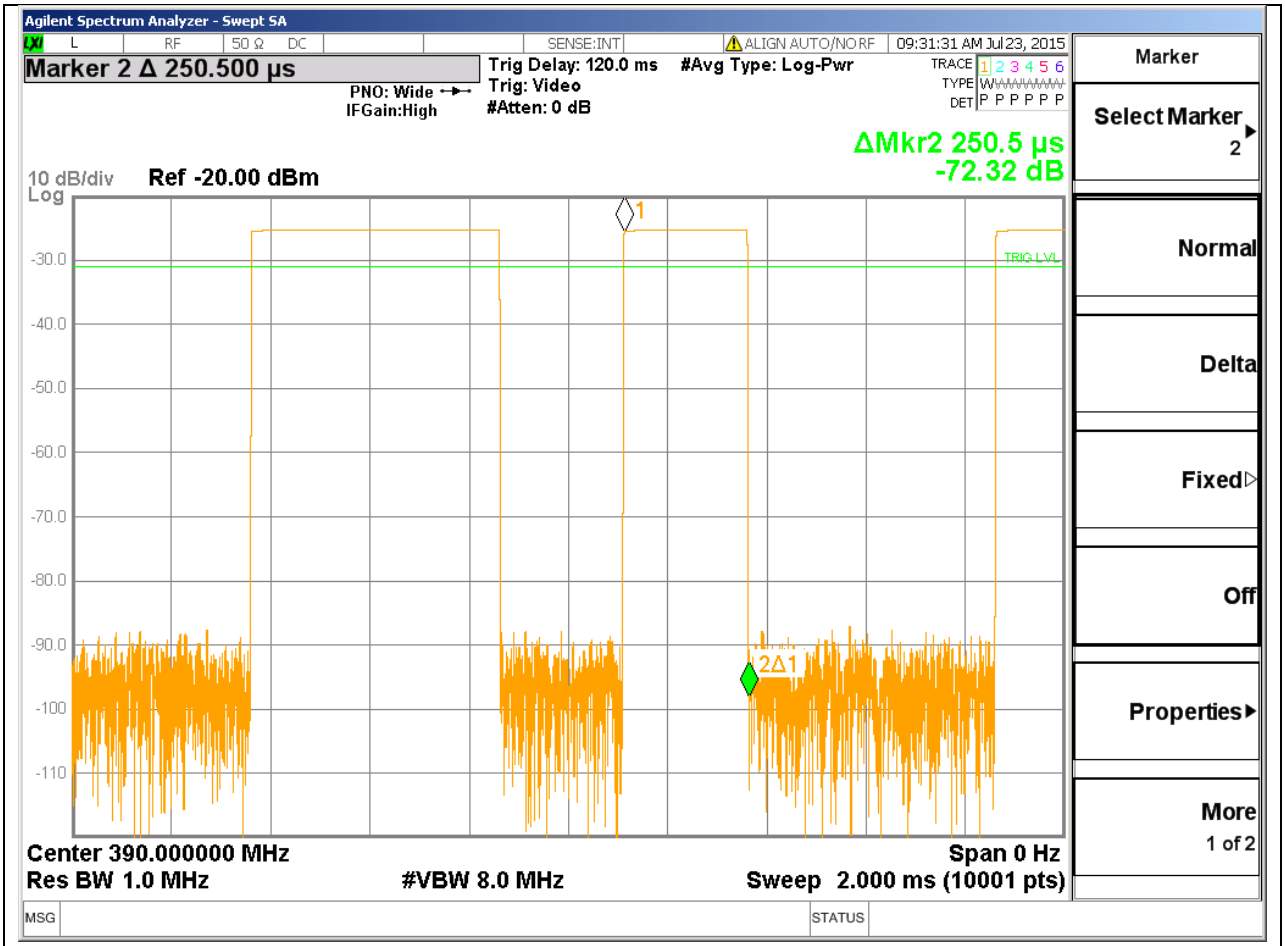
Tuning pulse duration: 0.1723mS



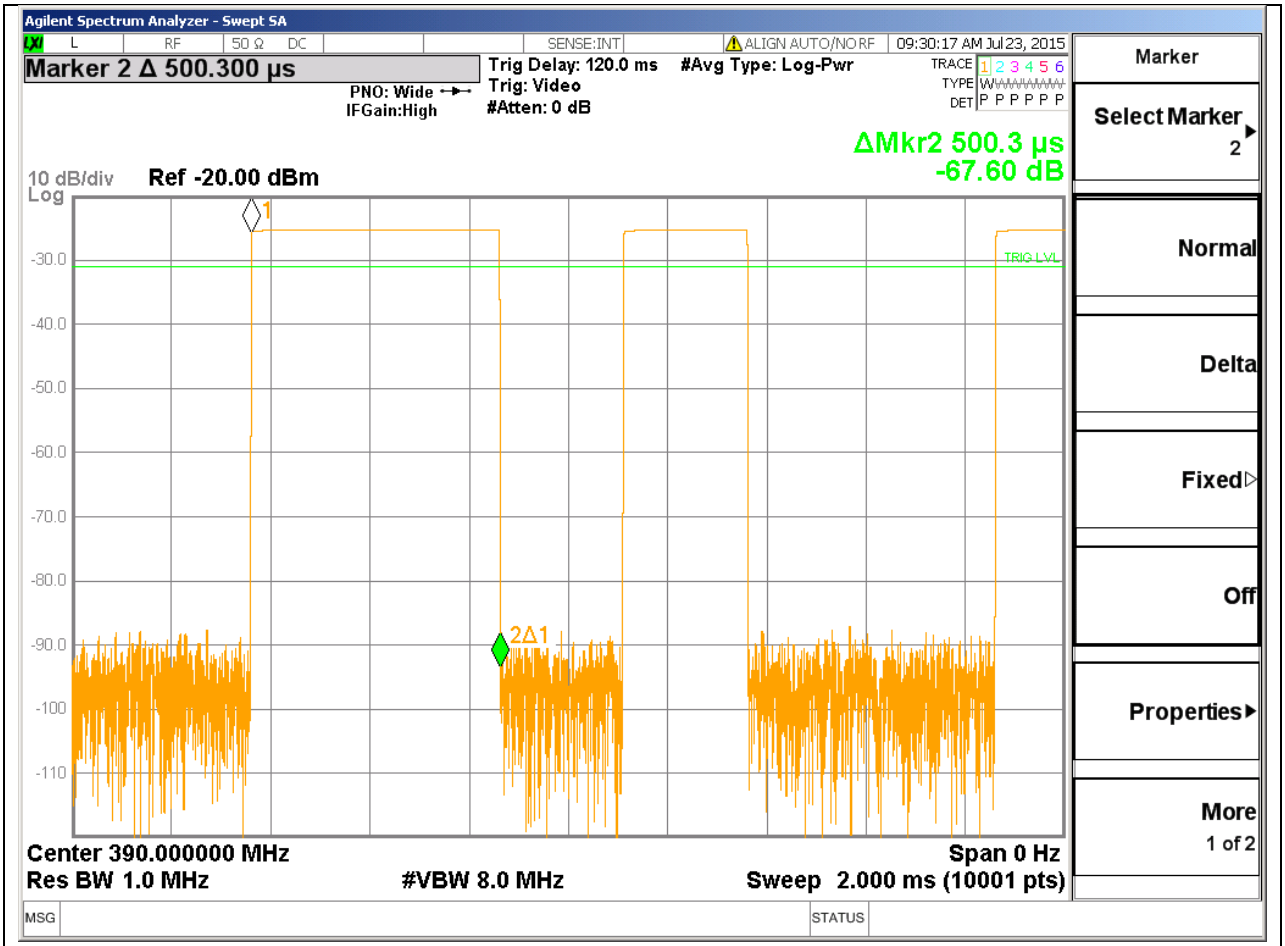
Tuning pulse duration: 0.00326mS



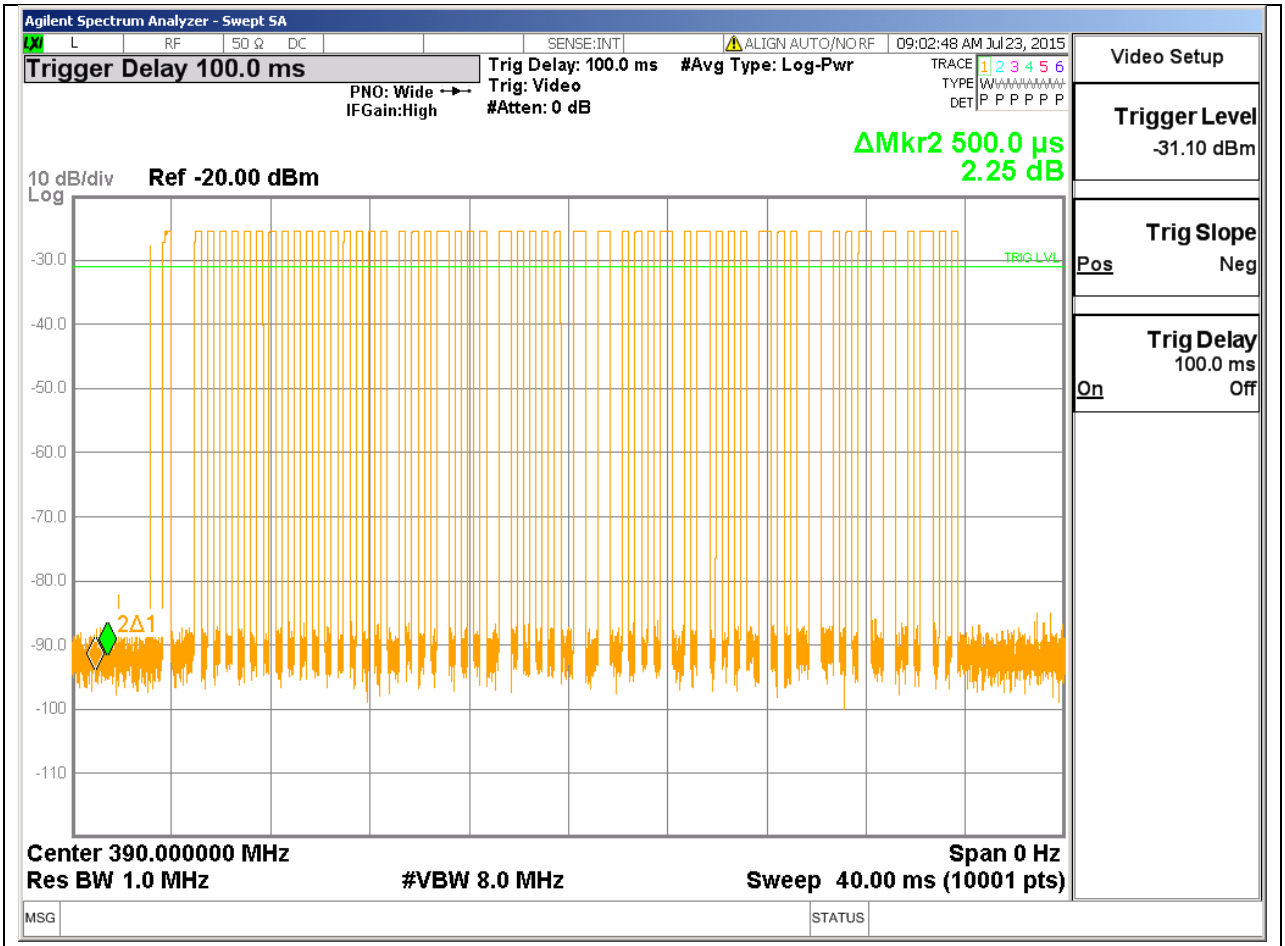
Tuning pulse duration: 0.3263mS



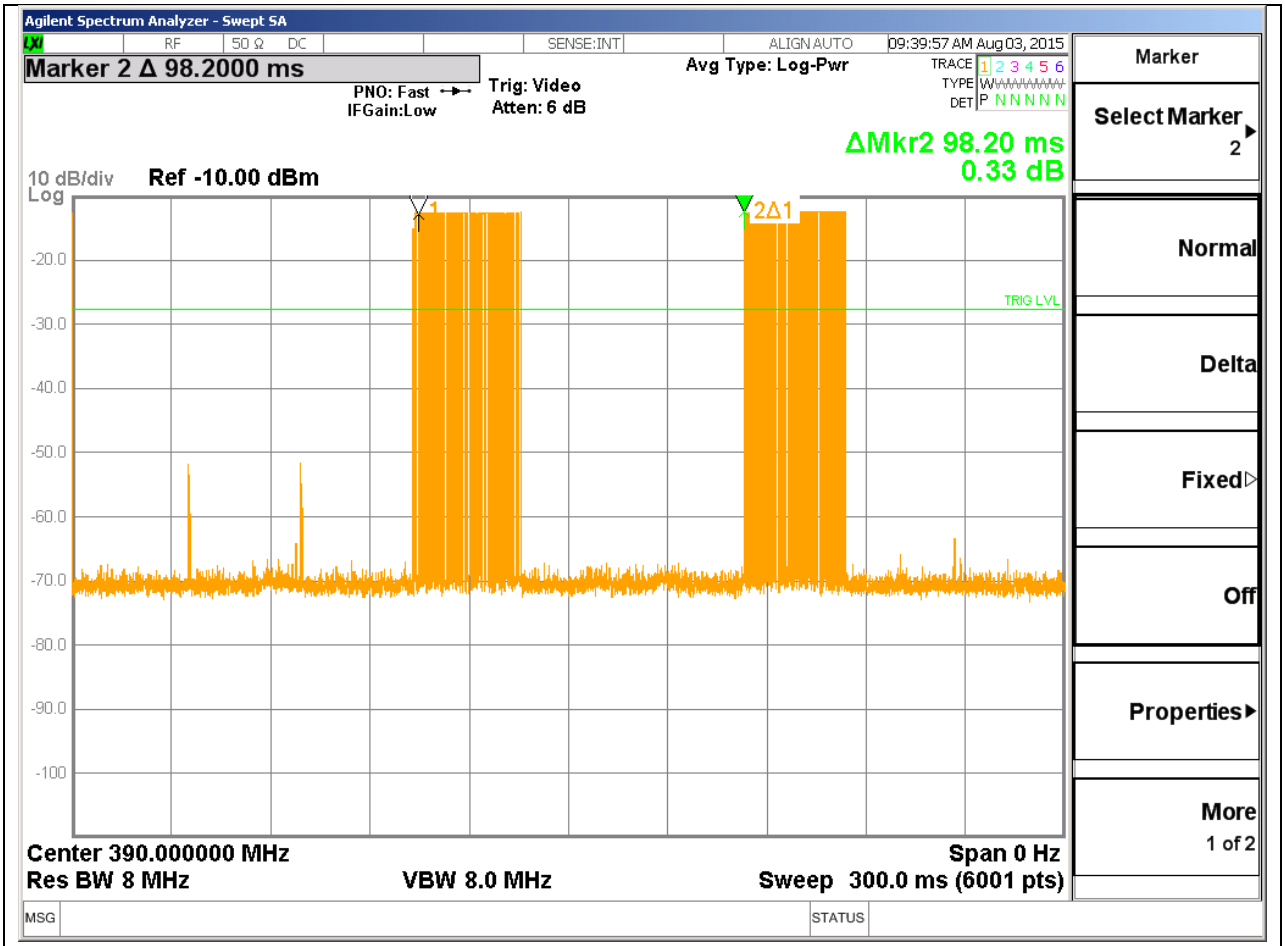
Pulse Duration: Short Pulse 0.2505mS



Pulse Duration: Long Pulse: 0.5003mS



Number of Pulses: Short 39, Long 10



Period scan 98.20mS

4.8.4 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 C63.10:2009. 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 4.8.3 for duty cycle information.

Figure 55 Radiated Emissions Graph (Below 1GHz)

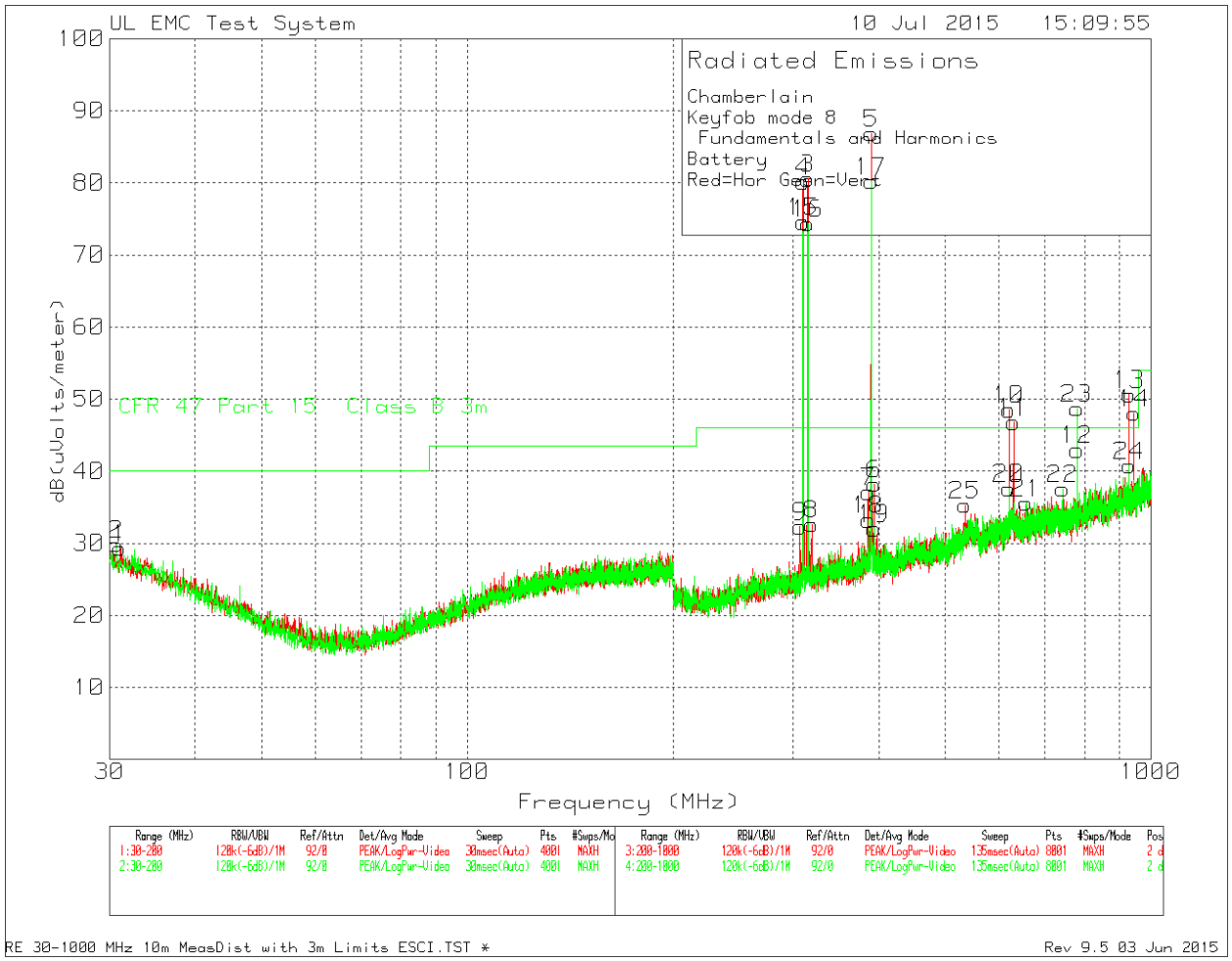


Figure 56 Radiated Emissions Graph (Above 1GHz)

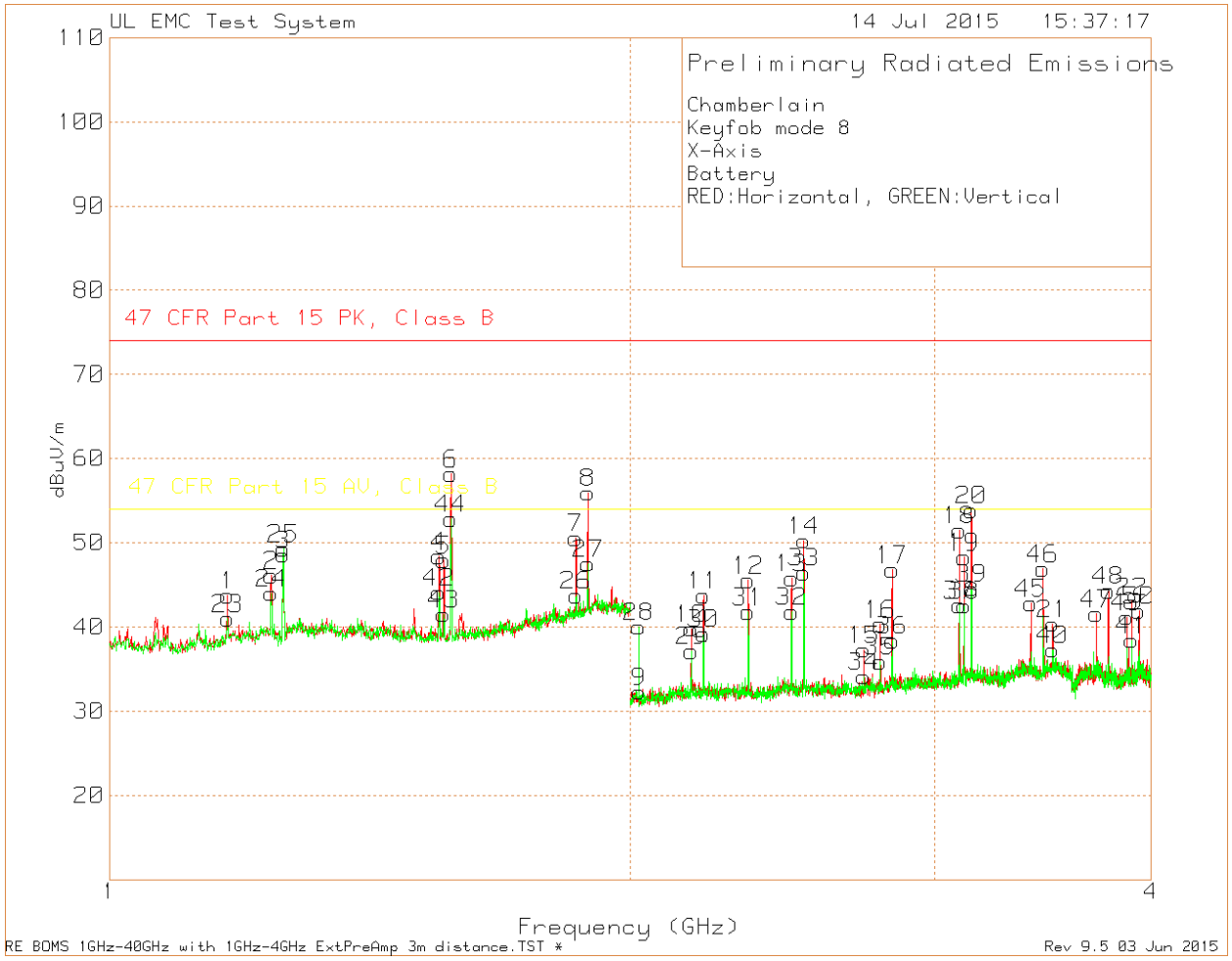


Table 63 - Radiated Emissions Data Points below 1GHz

Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
310.0174	62.74	Pk	14.1	8	84.84	-15.19	69.65	95.31	-10.47	75.31	-5.66	124	101	H	1
310.0178	46.54	Pk	14.1	8	68.64	-15.19	53.45	95.31	-26.67	75.31	-21.86	191	193	V	1
310.0155	57.7	Pk	14.1	8	79.8	-15.19	64.61	95.31	-15.51	75.31	-10.7	3	229	H	2
310.016	60.71	Pk	14.1	8	82.81	-15.19	67.62	95.31	-12.5	75.31	-7.69	108	200	V	2
310.0175	57.82	Pk	14.1	8	79.92	-15.19	64.73	95.31	-15.39	75.31	-10.58	349	247	H	3
310.0195	60.74	Pk	14.1	8	82.84	-15.19	67.65	95.31	-12.47	75.31	-7.66	262	201	V	3
620.0218	18.94	Pk	20.4	9.1	48.44	-15.19	33.25	66.02	-17.58	46.02	-12.77	85	135	H	1
620.0447	12.93	Pk	20.4	9.1	42.43	-15.19	27.24	66.02	-23.59	46.02	-18.78	164	109	V	1
620.0365	18.57	Pk	20.4	9.1	48.07	-15.19	32.88	66.02	-17.95	46.02	-13.14	16	164	H	2
620.0245	18.35	Pk	20.4	9.1	47.85	-15.19	32.66	66.02	-18.17	46.02	-13.36	92	102	V	2
620.024	14.92	Pk	20.4	9.1	44.42	-15.19	29.23	66.02	-21.6	46.02	-16.79	207	202	H	3
620.0365	20.2	Pk	20.4	9.1	49.7	-15.19	34.51	66.02	-16.32	46.02	-11.51	295	101	V	3
930.063	18.48	Pk	23.7	10.5	52.68	-15.19	37.49	66.02	-13.34	46.02	-8.53	72	164	H	1
930.057	13.1	Pk	23.7	10.5	47.3	-15.19	32.11	66.02	-18.72	46.02	-13.91	252	134	V	1
930.0385	19.29	Pk	23.7	10.5	53.49	-15.19	38.3	66.02	-12.53	46.02	-7.72	184	158	H	2
930.041	19.84	Pk	23.7	10.5	54.04	-15.19	38.85	66.02	-11.98	46.02	-7.17	311	138	V	2
930.062	16.89	Pk	23.7	10.5	51.09	-15.19	35.9	66.02	-14.93	46.02	-10.12	207	180	H	3
930.06	20.07	Pk	23.7	10.5	54.27	-15.19	39.08	66.02	-11.75	46.02	-6.94	109	123	V	3
315.0175	63.63	Pk	14.3	8	85.93	-15.95	69.98	95.62	-9.69	75.62	-5.64	326	103	H	1
315.0158	47.14	Pk	14.3	8	69.44	-15.95	53.49	95.62	-26.18	75.62	-22.13	226	146	V	1
315.015	57.52	Pk	14.3	8	79.82	-15.95	63.87	95.62	-15.8	75.62	-11.75	354	234	H	2
315.014	61.06	Pk	14.3	8	83.36	-15.95	67.41	95.62	-12.26	75.62	-8.21	80	192	V	2
315.0165	57.68	Pk	14.3	8	79.98	-15.95	64.03	95.62	-15.64	75.62	-11.59	351	244	H	3
315.019	60.48	Pk	14.3	8	82.78	-15.95	66.83	95.62	-12.84	75.62	-8.79	264	208	V	3
630.0405	15.94	Pk	20.7	9.2	45.84	-15.95	29.89	66.02	-20.18	46.02	-16.13	97	135	H	1
630.04	13.23	Pk	20.7	9.2	43.13	-15.95	27.18	66.02	-22.89	46.02	-18.84	176	109	V	1
630.0315	17.63	Pk	20.7	9.2	47.53	-15.95	31.58	66.02	-18.49	46.02	-14.44	275	101	V	2
630.029	15.48	Pk	20.7	9.2	45.38	-15.95	29.43	66.02	-20.64	46.02	-16.59	240	150	H	2
630.031	19.6	Pk	20.7	9.2	49.5	-15.95	33.55	66.02	-16.52	46.02	-12.47	108	102	V	3
630.039	13.33	Pk	20.7	9.2	43.23	-15.95	27.28	66.02	-22.79	46.02	-18.74	182	208	H	3
945.0475	18.82	Pk	23.9	10.5	53.22	-15.95	37.27	66.02	-12.8	46.02	-8.75	84	158	H	1
945.0565	11.32	Pk	23.9	10.5	45.72	-15.95	29.77	66.02	-20.3	46.02	-16.25	155	188	V	1
945.05	16.84	Pk	23.9	10.5	51.24	-15.95	35.29	66.02	-14.78	46.02	-10.73	184	159	H	2
945.036	15.02	Pk	23.9	10.5	49.42	-15.95	33.47	66.02	-16.6	46.02	-12.55	277	138	V	2
945.0665	18.35	Pk	23.9	10.5	52.75	-15.95	36.8	66.02	-13.27	46.02	-9.22	128	127	V	3
945.064	11.81	Pk	23.9	10.5	46.21	-15.95	30.26	66.02	-19.81	46.02	-15.76	235	189	H	3
390.0164	50.53	Pk	16.2	8.4	75.13	-15.9	59.23	99.24	-24.11	79.24	-20.01	15	142	V	1
390.0196	63.89	Pk	16.2	8.4	88.49	-15.9	72.59	99.24	-10.75	79.24	-6.65	98	101	H	1
390.026	65.41	Pk	16.2	8.4	90.01	-15.9	74.11	99.24	-9.23	79.24	-5.13	96	154	V	2
390.0235	58.89	Pk	16.2	8.4	83.49	-15.9	67.59	99.24	-15.75	79.24	-11.65	4	182	H	2
390.0205	64.02	Pk	16.2	8.4	88.62	-15.9	72.72	99.24	-10.62	79.24	-6.52	83	154	V	3
390.02	58.79	Pk	16.2	8.4	83.39	-15.9	67.49	99.24	-15.85	79.24	-11.75	181	178	H	3
780.051	21.06	Pk	21.8	9.9	52.76	-15.9	36.86	66.02	-13.26	46.02	-9.16	137	224	V	1
780.045	28.03	Pk	21.8	9.9	59.73	-15.9	43.83	66.02	-6.29	46.02	-2.19	83	110	H	1
780.0385	28.97	Pk	21.8	9.9	60.67	-15.9	44.77	66.02	-5.35	46.02	-1.25	197	116	H	2
780.0335	18.71	Pk	21.8	9.9	50.41	-15.9	34.51	66.02	-15.61	46.02	-11.51	263	228	V	2
780.044	27.85	Pk	21.8	9.9	59.55	-15.9	43.65	66.02	-6.47	46.02	-2.37	10	157	V	3
780.0395	20.08	Pk	21.8	9.9	51.78	-15.9	35.88	66.02	-14.24	46.02	-10.14	98	187	H	3

Notes:
1 - X-Axis Program 8,
2 - Y-Axis Program 8
3 - Z-Axis Program 8
Pk - Peak detector

Table 64 - Radiated Emissions Data Points Above 1GHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Harmonic of Freq:
2	1.24	73.33	Pk	28.9	-56.13	46.1	-15.19	30.91	74	-27.9	54	-23.09	0-360	100	H	310
24	1.24	71.25	Pk	28.9	-56.13	44.02	-15.19	28.83	74	-30	54	-25.17	0-360	150	V	310
4	1.55	75.07	Pk	28.2	-54.9	48.37	-15.19	33.18	74	-25.6	54	-20.82	0-360	150	H	310
42	1.55	70.81	Pk	28.2	-54.9	44.11	-15.19	28.92	74	-29.9	54	-25.08	0-360	150	V	310
7	1.86	73.48	Pk	30.9	-53.81	50.57	-15.19	35.38	74	-23.4	54	-18.62	0-360	100	H	310
26	1.861	66.63	Pk	30.9	-53.8	43.73	-15.19	28.54	74	-30.3	54	-25.46	0-360	100	V	310
10	2.17	70.5	Pk	21.7	-52.41	39.79	-15.19	24.6	74	-34.2	54	-29.4	0-360	99	H	310
29	2.17	67.84	Pk	21.7	-52.41	37.13	-15.19	21.94	74	-36.9	54	-32.06	0-360	100	V	310
13	2.48	75.45	Pk	22	-51.67	45.78	-15.19	30.59	74	-28.2	54	-23.41	0-360	150	H	310
32	2.48	71.5	Pk	22	-51.67	41.83	-15.19	26.64	74	-32.2	54	-27.36	0-360	150	V	310
16	2.79	69.17	Pk	22.2	-51.08	40.29	-15.19	25.1	74	-33.7	54	-28.9	0-360	150	H	310
35	2.79	64.78	Pk	22.2	-51.08	35.9	-15.19	20.71	74	-38.1	54	-33.29	0-360	100	V	310
18	3.1001	79.6	Pk	22.6	-50.46	51.74	-15.19	36.55	74	-22.3	54	-17.45	63	100	H	310
37	3.1	70.43	Pk	22.6	-50.46	42.57	-15.19	27.38	74	-31.4	54	-26.62	0-360	100	V	310
3	1.26	75.88	Pk	28.9	-56.21	48.57	-15.95	32.62	74	-25.4	54	-21.38	0-360	100	H	315
25	1.26	76.59	Pk	28.9	-56.21	49.28	-15.95	33.33	74	-24.7	54	-20.67	0-360	100	V	315
6	1.575	85.09	Pk	28.2	-54.64	58.65	-15.95	42.7	74	-15.4	54	-11.3	350	179	H	315
44	1.575	78.46	Pk	28.2	-54.64	52.02	-15.95	36.07	74	-22	54	-17.93	77	254	V	315
8	1.89	78.94	Pk	31.3	-53.57	56.67	-15.95	40.72	74	-17.3	54	-13.28	49	123	H	315
27	1.891	69.81	Pk	31.3	-53.58	47.53	-15.95	31.58	74	-26.5	54	-22.42	0-360	150	V	315
11	2.205	74.4	Pk	21.8	-52.46	43.74	-15.95	27.79	74	-30.3	54	-26.21	0-360	150	H	315
30	2.205	69.86	Pk	21.8	-52.46	39.2	-15.95	23.25	74	-34.8	54	-30.75	0-360	100	V	315
14	2.5202	81.07	Pk	22.1	-51.82	51.35	-15.95	35.4	74	-22.7	54	-18.6	33	209	H	315
33	2.52	76.21	Pk	22.1	-51.82	46.49	-15.95	30.54	74	-27.5	54	-23.46	0-360	150	V	315
17	2.835	75.11	Pk	22.3	-50.62	46.79	-15.95	30.84	74	-27.2	54	-23.16	0-360	99	H	315
36	2.835	66.71	Pk	22.3	-50.62	38.39	-15.95	22.44	74	-35.6	54	-31.56	0-360	100	V	315
20	3.1502	81.97	Pk	22.9	-50.81	54.06	-15.95	38.11	74	-19.9	54	-15.89	65	127	H	315
39	3.151	72.5	Pk	22.9	-50.83	44.57	-15.95	28.62	74	-29.4	54	-25.38	0-360	100	V	315
1	1.17	71.9	Pk	28.2	-56.34	43.76	-15.9	27.86	74	-30.2	54	-26.14	0-360	100	H	390
23	1.17	69.11	Pk	28.2	-56.34	40.97	-15.9	25.07	74	-33	54	-28.93	0-360	150	V	390
5	1.56	74.56	Pk	28.2	-54.85	47.91	-15.9	32.01	74	-26.1	54	-21.99	0-360	150	H	390
43	1.56	68.17	Pk	28.2	-54.85	41.52	-15.9	25.62	74	-32.5	54	-28.38	0-360	150	V	390
12	2.34	75.69	Pk	21.7	-51.87	45.52	-15.9	29.62	74	-28.5	54	-24.38	0-360	99	H	390
31	2.34	71.95	Pk	21.7	-51.87	41.78	-15.9	25.88	74	-32.2	54	-28.12	0-360	100	V	390
15	2.73	66.52	Pk	22.1	-51.31	37.31	-15.9	21.41	74	-36.7	54	-32.59	0-360	99	H	390
34	2.73	63.34	Pk	22.1	-51.31	34.13	-15.9	18.23	74	-39.9	54	-35.77	0-360	150	V	390
19	3.12	76.16	Pk	22.7	-50.61	48.25	-15.9	32.35	74	-25.8	54	-21.65	0-360	99	H	390
38	3.12	70.44	Pk	22.7	-50.61	42.53	-15.9	26.63	74	-31.5	54	-27.37	0-360	100	V	390
21	3.51	66.84	Pk	23.5	-49.96	40.38	-15.9	24.48	74	-33.6	54	-29.52	0-360	99	H	390
40	3.51	63.76	Pk	23.5	-49.96	37.3	-15.9	21.4	74	-36.7	54	-32.6	0-360	100	V	390
22	3.901	70.59	Pk	23.8	-51.38	43.01	-15.9	27.11	74	-31	54	-26.89	0-360	150	H	390
41	3.901	66.02	Pk	23.8	-51.38	38.44	-15.9	22.54	74	-35.6	54	-31.46	0-360	100	V	390
9	2.024	64.39	Pk	21.2	-53.29	32.3	-	-	74	-41.7	54	-21.7	0-360	150	H	-
45	3.41	69.97	Pk	23.5	-50.66	42.81	-	-	74	-31.2	54	-11.19	0-360	99	H	-
46	3.465	74.39	Pk	23.5	-50.99	46.9	-	-	74	-27.1	54	-7.1	0-360	99	H	-
47	3.721	67.86	Pk	23.6	-49.9	41.56	-	-	74	-32.4	54	-12.44	0-360	150	H	-
48	3.781	71.77	Pk	24	-51.46	44.31	-	-	74	-29.7	54	-9.69	0-360	150	H	-
49	3.876	68.41	Pk	23.9	-51.15	41.16	-	-	74	-32.8	54	-12.84	0-360	150	H	-
50	3.938	68.86	Pk	24	-50.95	41.91	-	-	74	-32.1	54	-12.09	0-360	99	H	-
28	2.023	72.09	Pk	21.2	-53.27	40.02	-	-	74	-34	54	-13.98	0-360	150	V	-

4.9 Mode#9 Test Data

4.9.1 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 (372.5MHz: 931.25kHz)	

Table 65 Occupied Bandwidth Configuration Settings

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

Table 66 Occupied Bandwidth Spectrum Analyzer Settings

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

Table 67 Occupied Bandwidth Test Result Summary

Center Frequency	20dB BW Measured (kHz)	99% BW Measured (kHz)
372.5MHz	18.67	39.756

Figure 57 – 20dB Bandwidth Graph

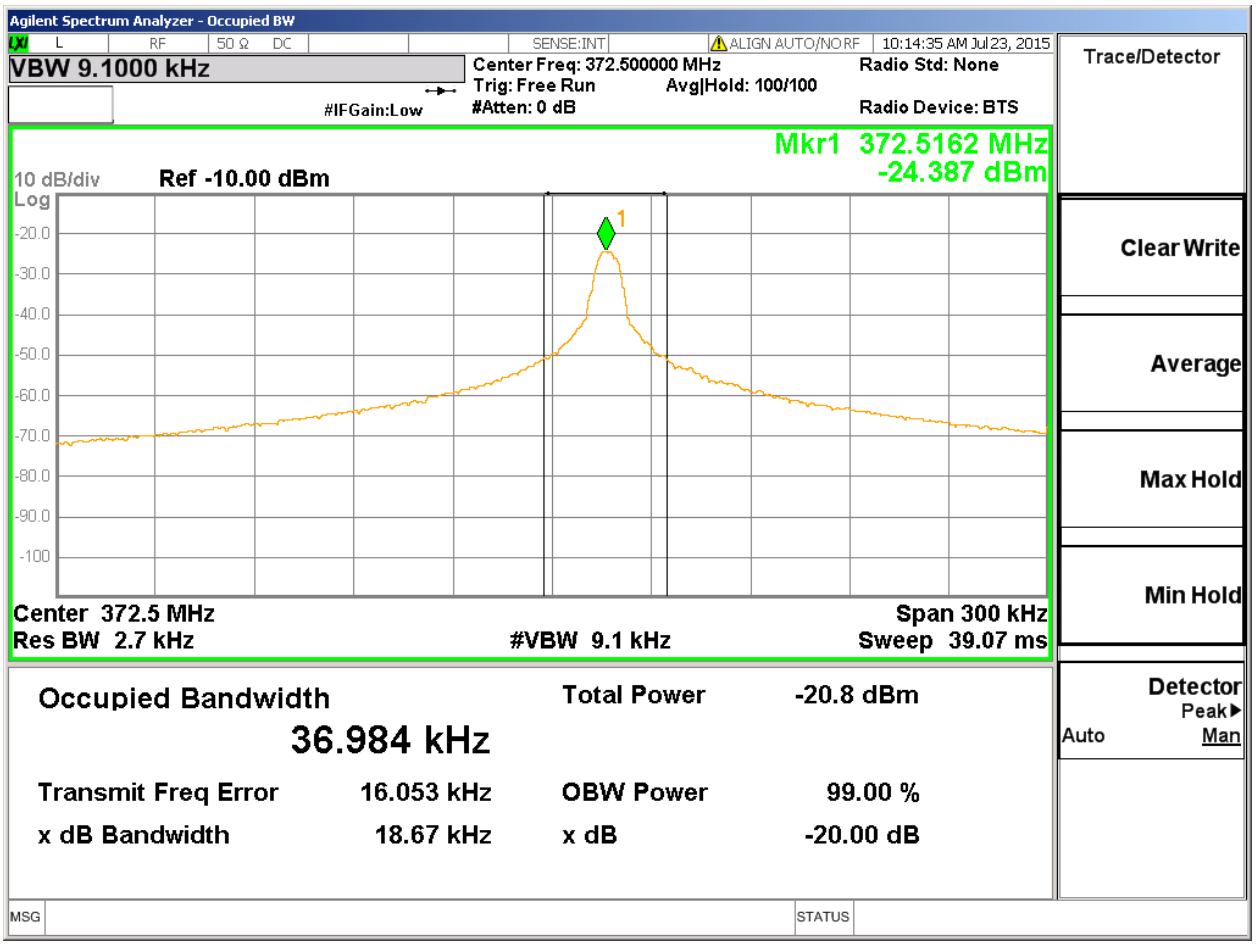
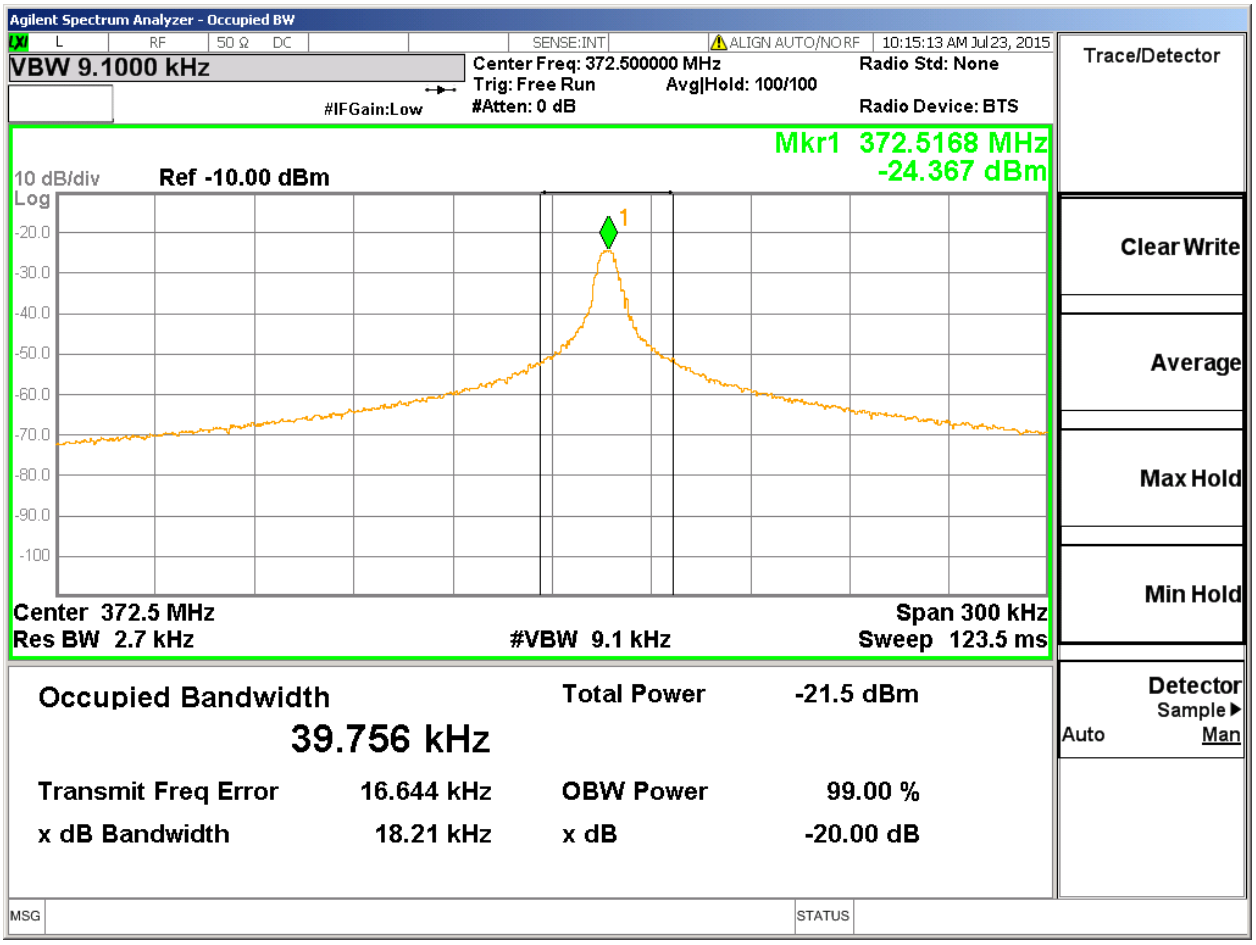


Figure 58 – 99% Bandwidth Graph



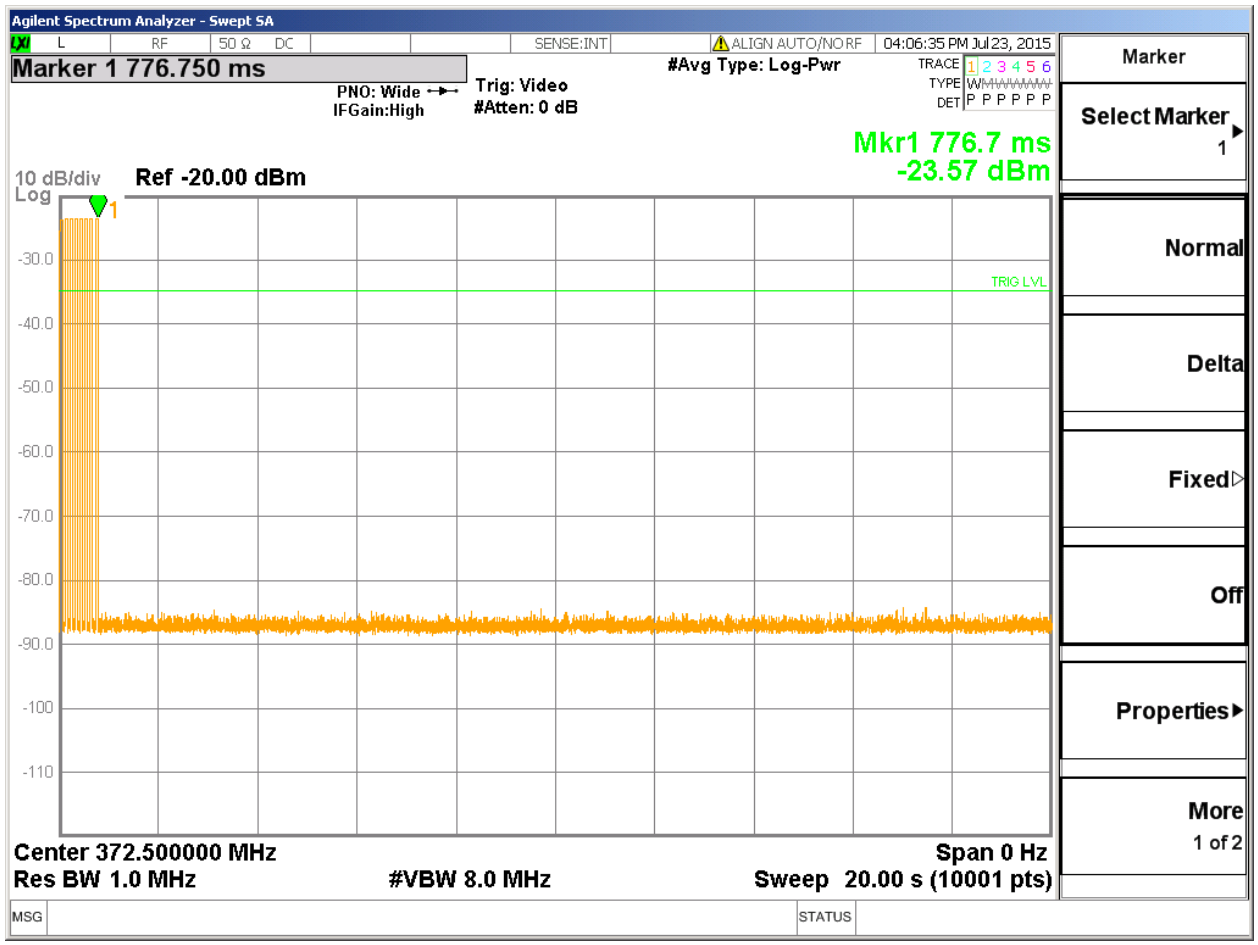
4.9.2 Test Conditions and Results – Cease Operation

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 68 Cease Operation Configuration Settings

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

Figure 59 Cease Operation Graph



4.9.3 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.	

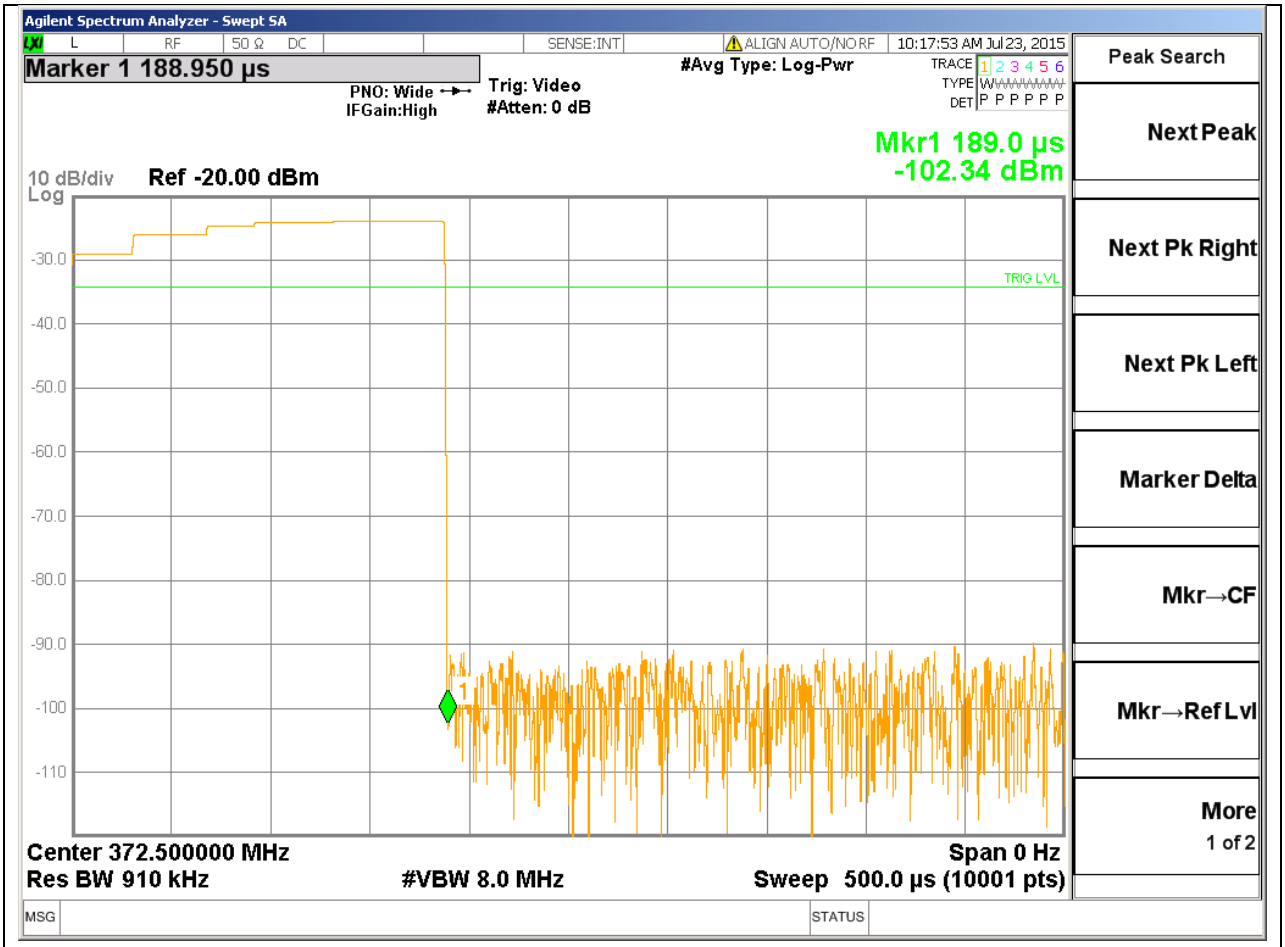
Table 69 Pulse Train Configuration Settings

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

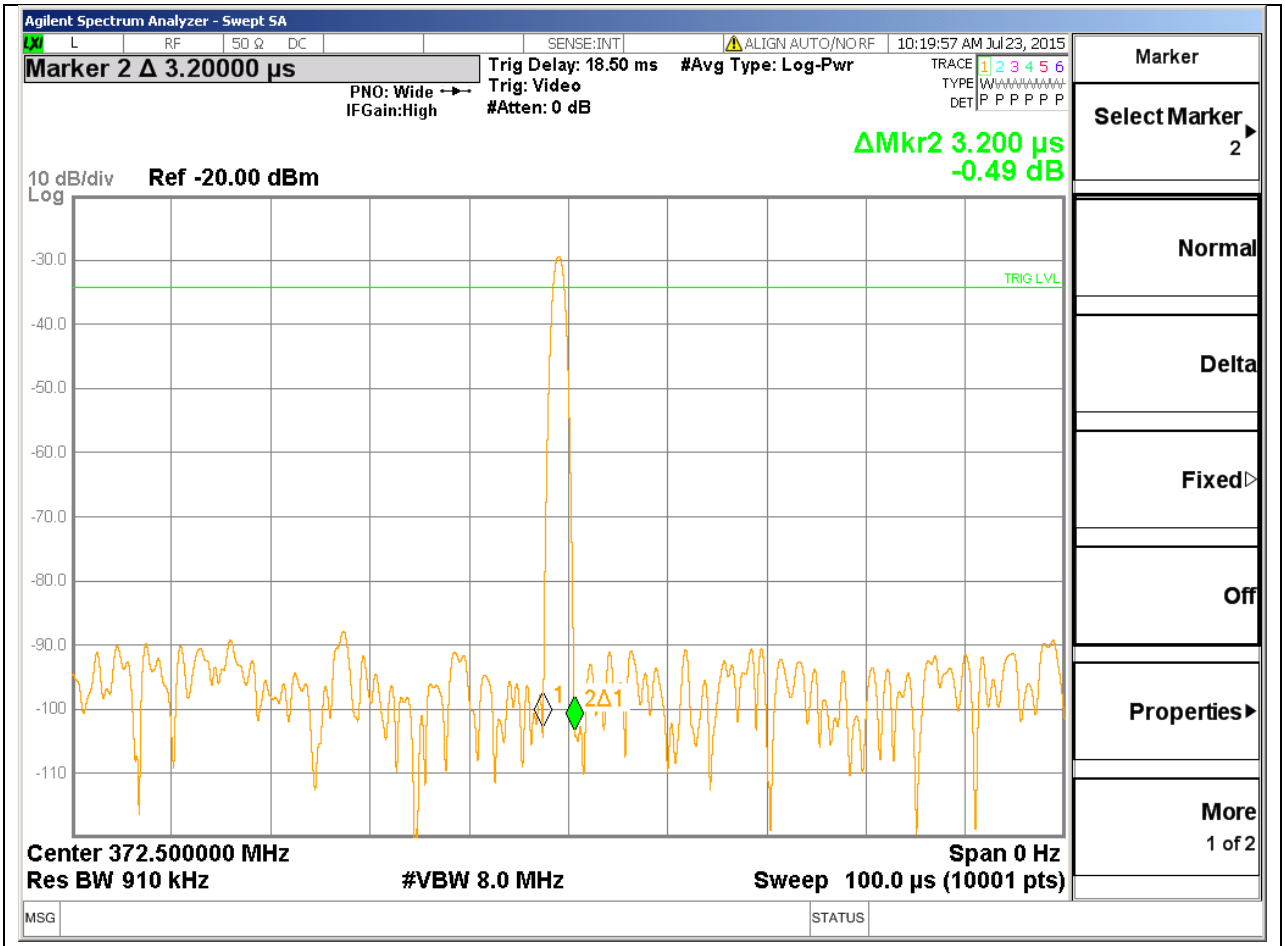
Table 70 Pulse Train Calculation

TX Frequency	Total TX time	Total Transmission period or 100ms whichever is lesser	DC Correction Factor (dB) $20\log\left(\frac{PulseWidth}{Period}\right)$
372.5MHz	0.189+0.0032+0.3642+(37x0.2)+(41x0.4) = 16.2mS = =24.3564	100mS	-12.26dB
Worst Case Duty Cycle: Worst case duty cycle was calculated over 100mS including the tuning pulses. The manufacturer declared duty cycle as -12.36dB, measured duty cycle is used for all radiated emissions data.			

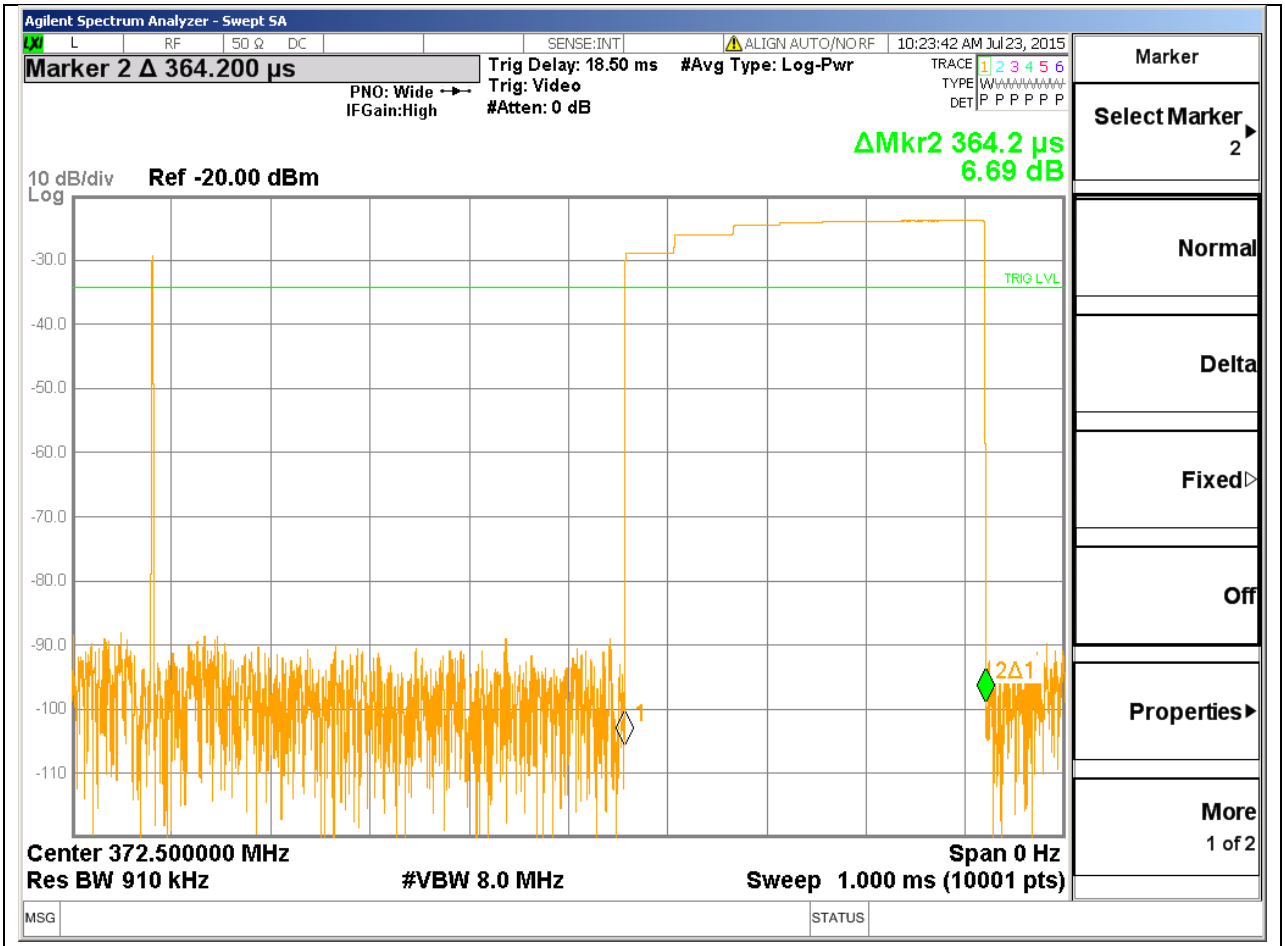
Figure 60 Pulse Train Graphs for 310MHz



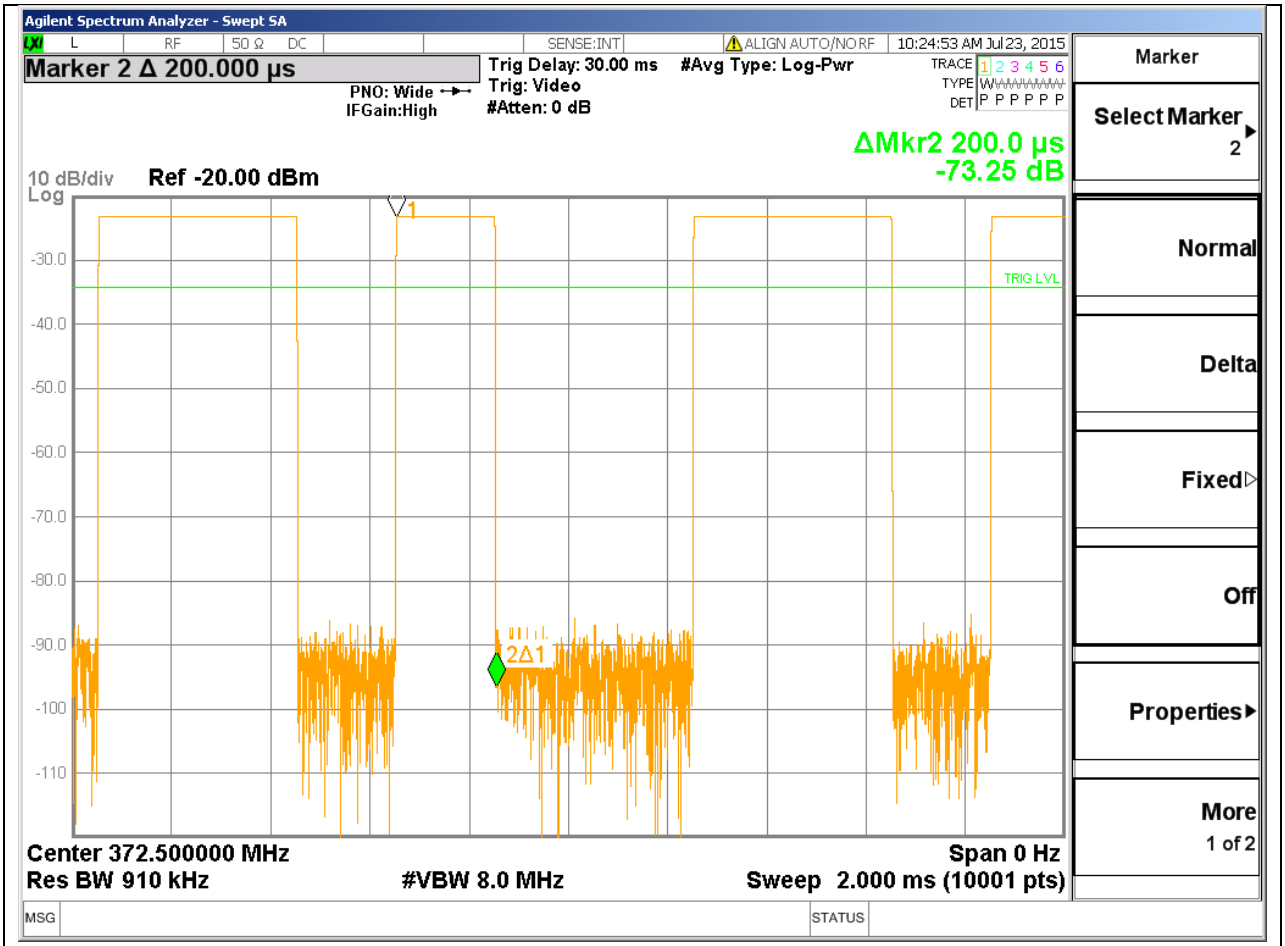
Tuning pulse duration: 0.189mS



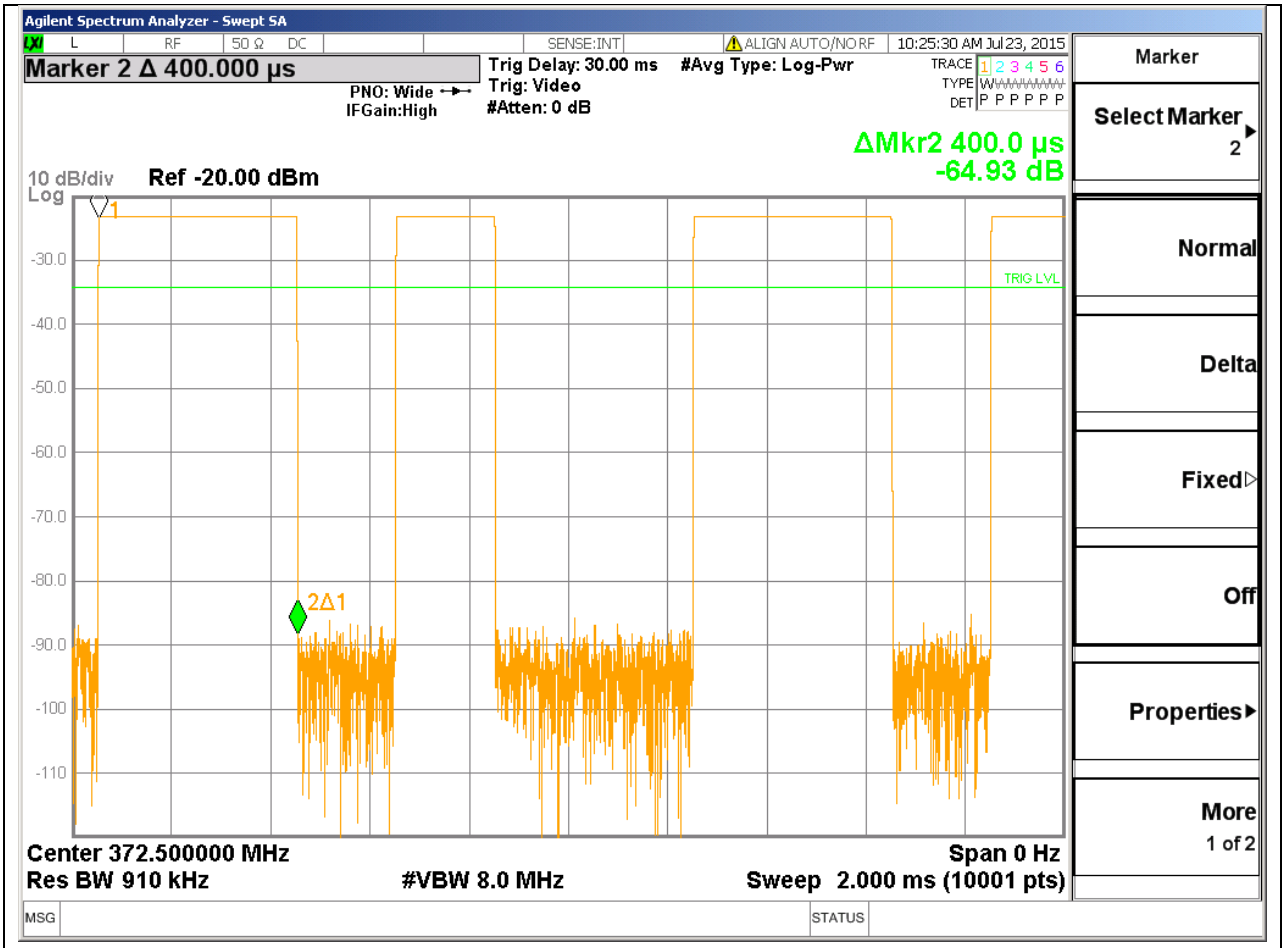
Tuning pulse duration: 0.0032mS



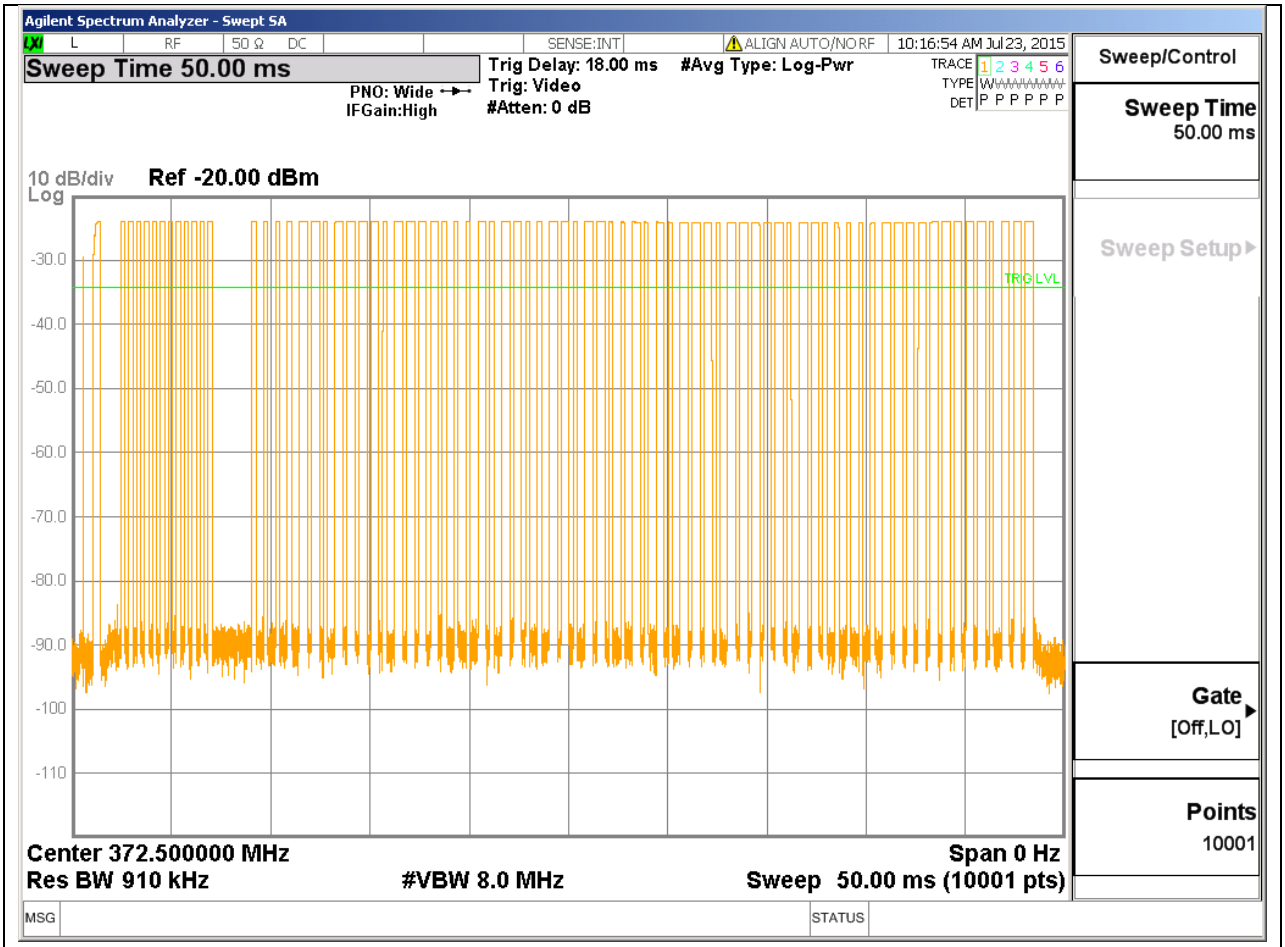
Tuning pulse duration: 0.3642mS



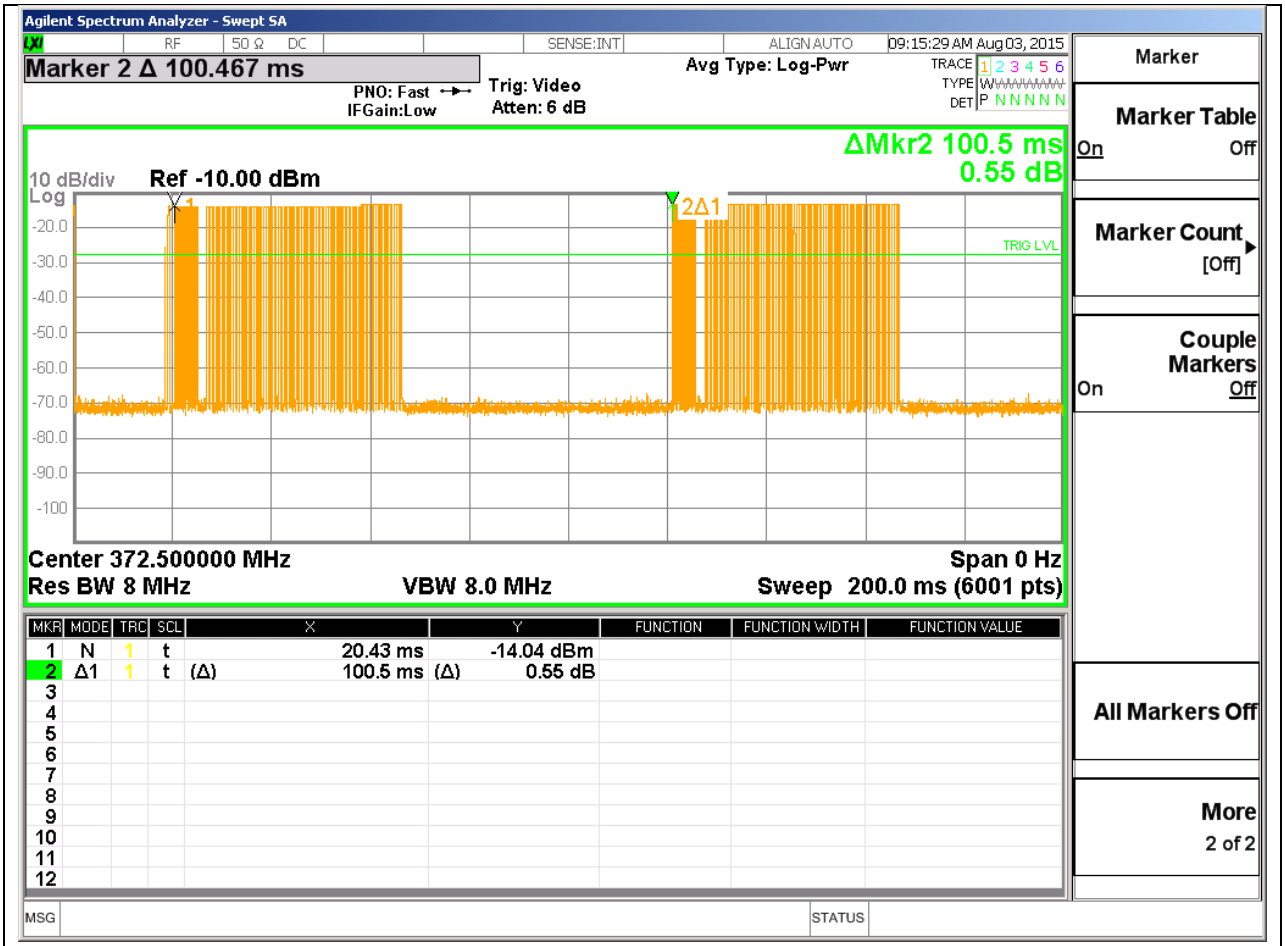
Pulse Duration: Short Pulse 0.200mS



Pulse Duration: Long Pulse 0.400mS



Number of Pulses: 37 Short, 41 Long


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
09:15:29 AM Aug 03, 2015
Marker 2 Δ 100.467 ms
PNO: Fast
IFGain:Low
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE WWWWW
DET P N N N N N
ΔMkr2 100.5 ms
0.55 dB
10 dB/div
Log
Ref -10.00 dBm
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
TRIG LVL
Center 372.500000 MHz
Res BW 8 MHz
VBW 8.0 MHz
Span 0 Hz
Sweep 200.0 ms (6001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 t 20.43 ms -14.04 dBm
2 Δ1 1 t (Δ) 100.5 ms (Δ) 0.55 dB
3
4
5
6
7
8
9
10
11
12
MSG
STATUS
Marker
Marker Table
On Off
Marker Count
[Off]
Couple Markers
On Off
All Markers Off
More
2 of 2

Period scan

4.9.4 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 C63.10:2009. 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
372.5	78.52	98.52

Supplementary information: See section 4.9.3 for duty cycle information.

Figure 61 Radiated Emissions Graph (Below 1GHz)

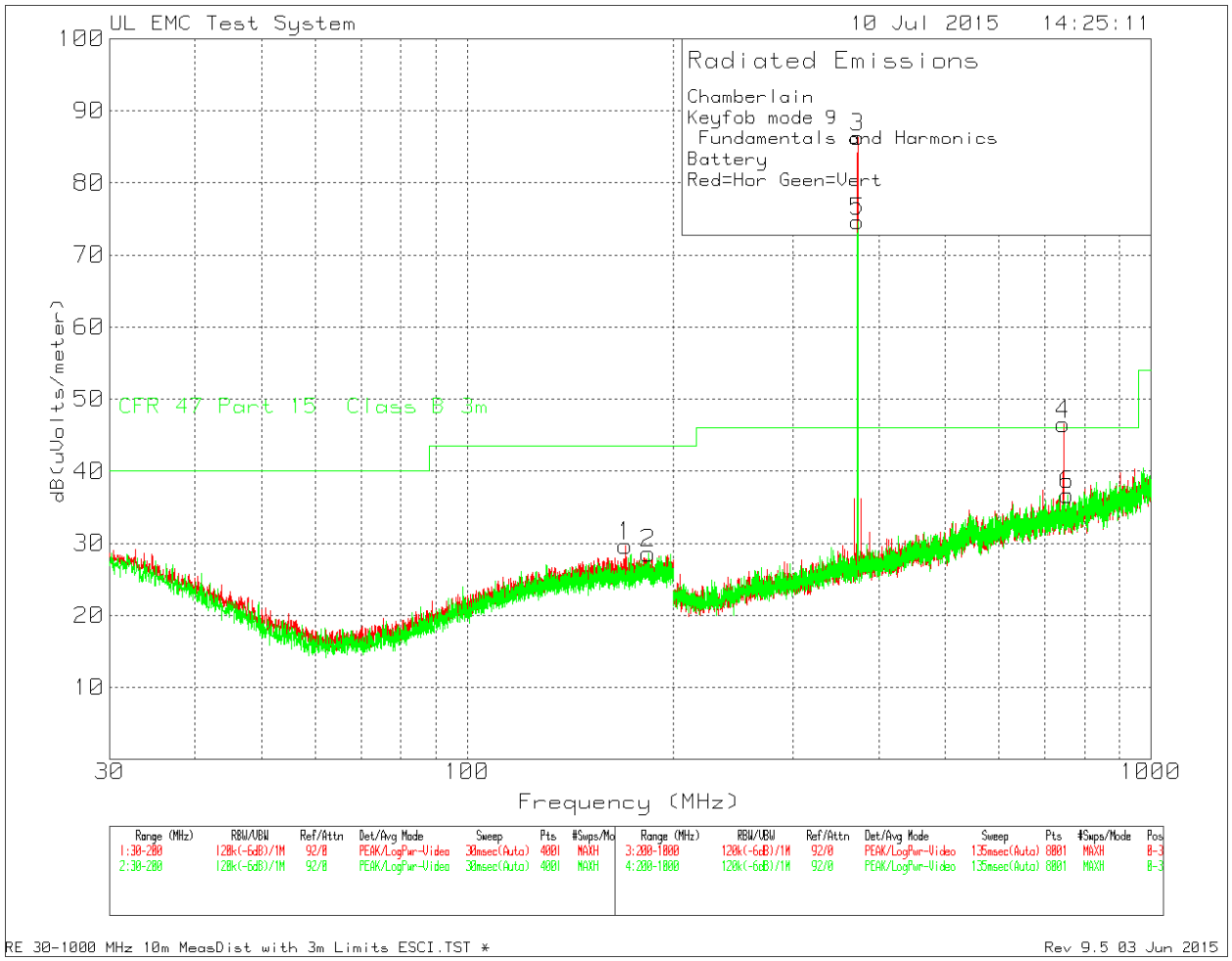


Figure 62 Radiated Emissions Graph (Above 1GHz)

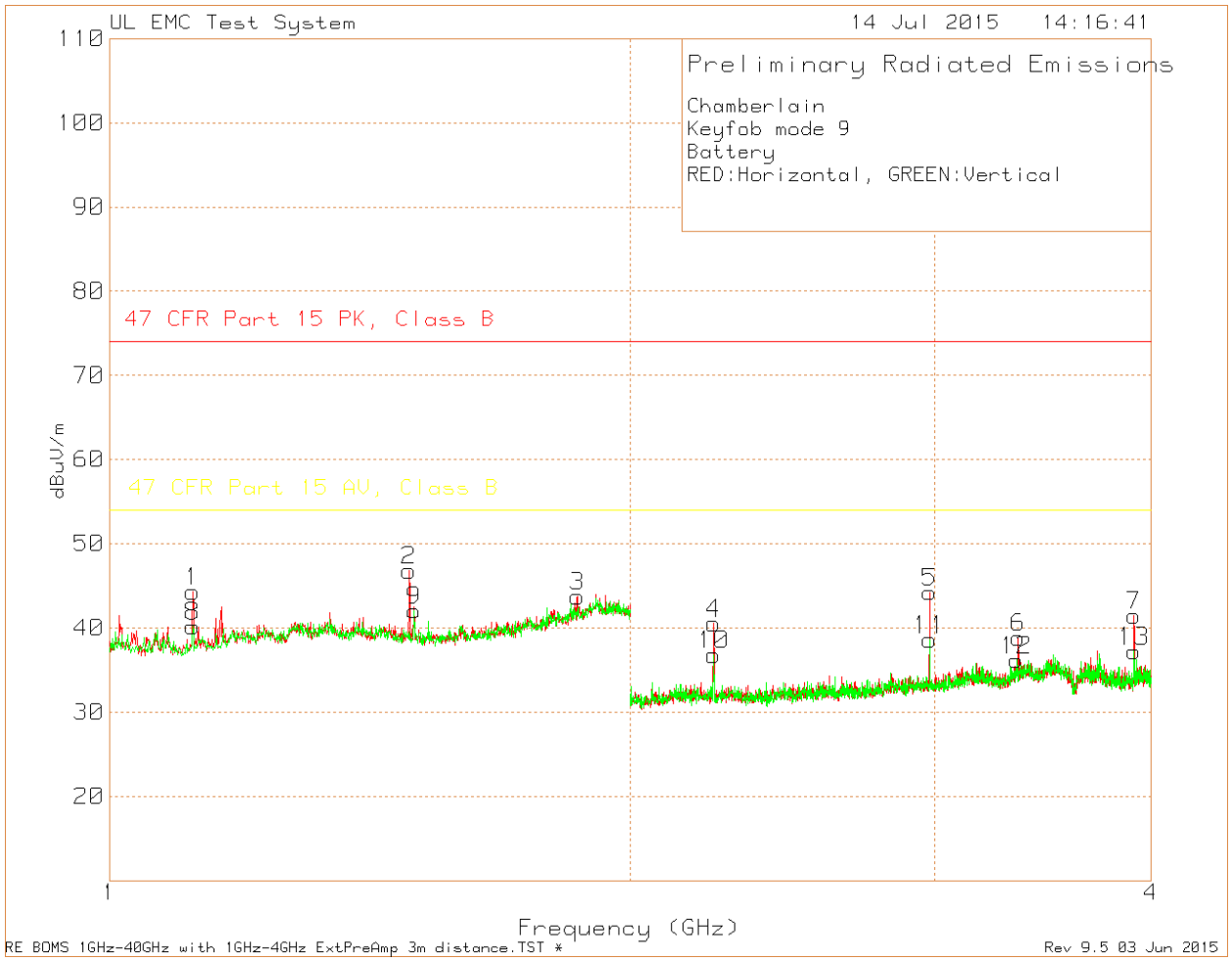


Table 71 - Radiated Emissions Data Points below 1GHz

Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity	Notes
372.5187	65.36	Pk	15.8	8.3	89.46	-12.26	77.2	98.52	-9.06	78.52	-1.32	36	102	H	1
372.5147	53.92	Pk	15.8	8.3	78.02	-12.26	65.76	98.52	-20.5	78.52	-12.76	144	146	V	1
372.514	59.22	Pk	15.8	8.3	83.32	-12.26	71.06	98.52	-15.2	78.52	-7.46	15	194	H	2
372.511	62.22	Pk	15.8	8.3	86.32	-12.26	74.06	98.52	-12.2	78.52	-4.46	51	165	V	2
372.51	60.05	Pk	15.8	8.3	84.15	-12.26	71.89	98.52	-14.37	78.52	-6.63	184	197	H	3
372.512	64.24	Pk	15.8	8.3	88.34	-12.26	76.08	98.52	-10.18	78.52	-2.44	87	169	V	3
745.027	17.62	Pk	21.6	9.5	48.72	-12.26	36.46	66.02	-17.3	46.02	-9.56	248	124	H	1
745.009	12.42	Pk	21.6	9.5	43.52	-12.26	31.26	66.02	-22.5	46.02	-14.76	341	153	V	1
745.016	18.53	Pk	21.6	9.5	49.63	-12.26	37.37	66.02	-16.39	46.02	-8.65	24	118	H	2
745.019	10.56	Pk	21.6	9.5	41.66	-12.26	29.4	66.02	-24.36	46.02	-16.62	260	171	V	2
745.034	11.05	Pk	21.6	9.5	42.15	-12.26	29.89	66.02	-23.87	46.02	-16.13	265	189	H	3
745.012	15.87	Pk	21.6	9.5	46.97	-12.26	34.71	66.02	-19.05	46.02	-11.31	330	168	V	3
Notes:															
1 - X-Axis Program															
2 - y-Axis Program															
3 - Z-Axis Program															
Pk - Peak detector															

Table 72 - Radiated Emissions Data Points above 1GHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	DC Factor dB	Average Level with DC dBuV/m	Peak Limit dBuV/m	Peak Margin dB	Average Limit dBuV/m	Average Margin dB	Azimuth [Degs]	Height [cm]	Polarity
1	1.117	73.29	Pk	27.4	-56.36	44.33	-12.26	32.07	74	-29.67	54	-21.93	0-360	99	H
2	1.49	73.58	Pk	28.3	-55.05	46.83	-12.26	34.57	74	-27.17	54	-19.43	0-360	99	H
3	1.864	66.51	Pk	31	-53.76	43.75	-12.26	31.49	74	-30.25	54	-22.51	0-360	150	H
4	2.235	71.15	Pk	21.8	-52.43	40.52	-12.26	28.26	74	-33.48	54	-25.74	0-360	150	H
5	2.98	72.29	Pk	22.5	-50.55	44.24	-12.26	31.98	74	-29.76	54	-22.02	0-360	99	H
6	3.353	66.07	Pk	23.1	-50.3	38.87	-12.26	26.61	74	-35.13	54	-27.39	0-360	99	H
7	3.912	69	Pk	23.9	-51.42	41.48	-12.26	29.22	74	-32.52	54	-24.78	0-360	99	H
8	1.117	69.13	Pk	27.4	-56.36	40.17	-12.26	27.91	74	-33.83	54	-26.09	0-360	150	V
9	1.5	68.98	Pk	28.2	-55.12	42.06	-12.26	29.8	74	-31.94	54	-24.2	0-360	99	V
10	2.235	67.44	Pk	21.8	-52.43	36.81	-12.26	24.55	74	-37.19	54	-29.45	0-360	150	V
11	2.98	66.63	Pk	22.5	-50.55	38.58	-12.26	26.32	74	-35.42	54	-27.68	0-360	99	V
12	3.345	63.48	Pk	23.1	-50.4	36.18	-12.26	23.92	74	-37.82	54	-30.08	0-360	99	V
13	3.912	64.73	Pk	23.9	-51.42	37.21	-12.26	24.95	74	-36.79	54	-29.05	0-360	99	V
Pk - Peak detector															

Appendix A

Test Equipment Used

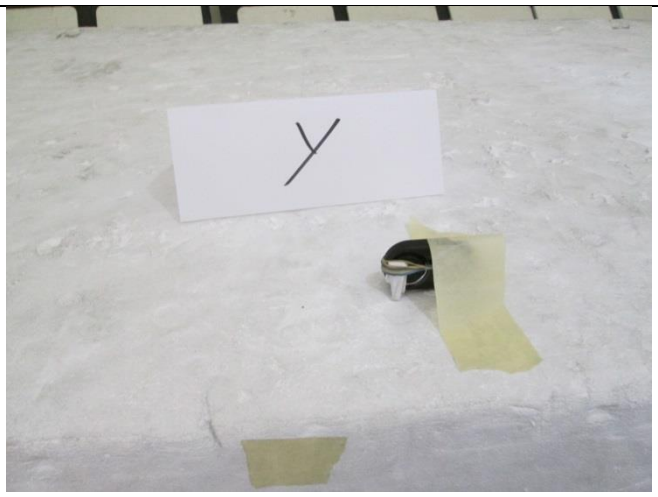
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20141830	20151231
Bicon Antenna	Electro-Metrics	EM6912A	EMC4070	20141014	20151031
Log-P Antenna	Chase	UPA6109	EMC4313	20141119	20151130
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20141216	20151231
Antenna Array	UL	BOMS	EMC4276	20141201	20151231
Spectrum Analyzer	Agilent	N9030A (PXA)	EMC4360	20141219	20151219

Appendix B

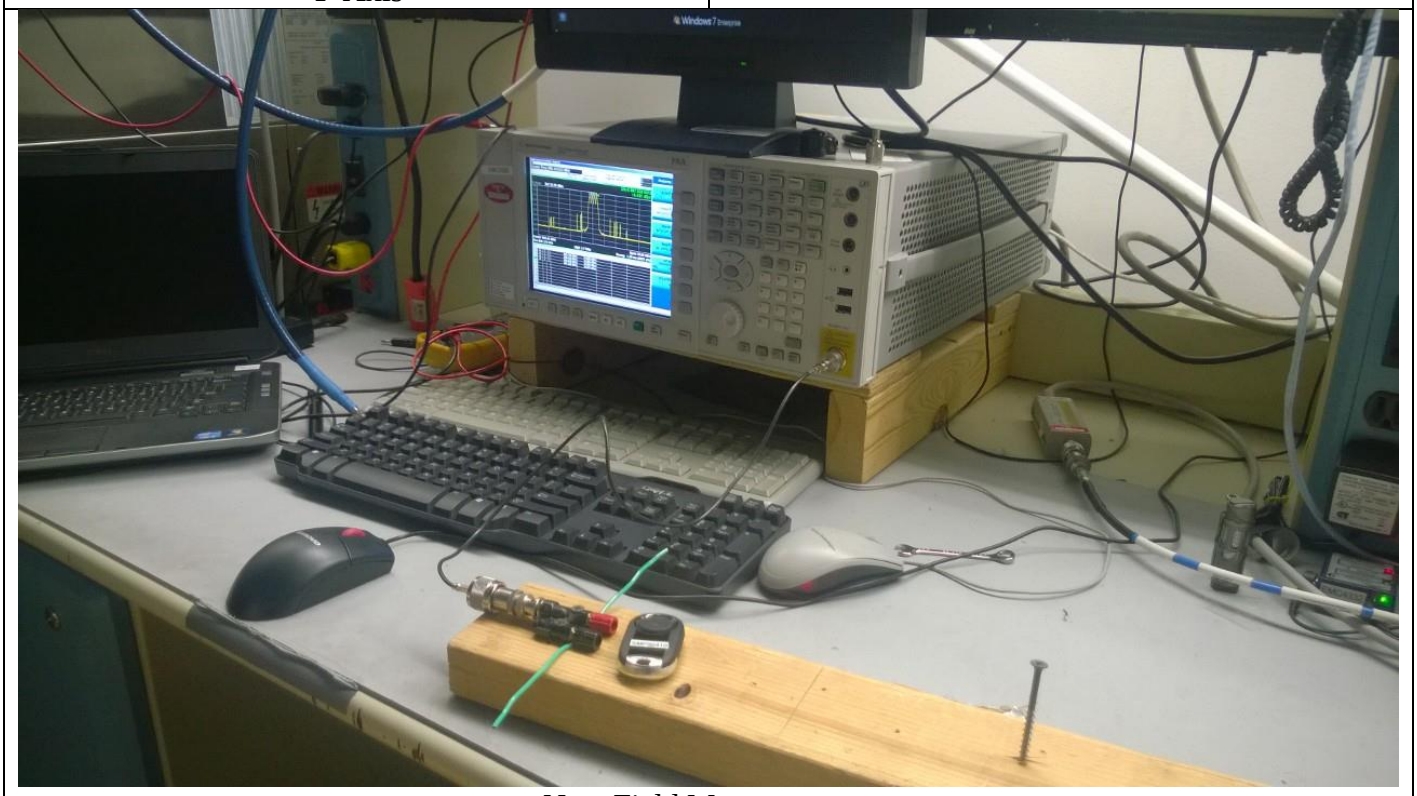
Test Setup Photos

X-Axis

Z-Axis



Y-Axis



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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