



MEASUREMENT AND TEST REPORT

For

Rodann Electronic Mfg. Co.

1819 S.W. Troon Avenue, Bend, OR 97702, USA

FCC ID: U2QTXRX10002000A

Report Type: Original Report	Product Type: Motion Detector Alarm
Test Engineer: <u>Angel Escamilla</u> 	
Report Number: <u>R1110113-231</u>	
Report Date: <u>2012-03-13</u>	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1110113-231	Original Report	2012-03-13

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Rodann Electronic Mfg. Co.* and their product, FCC ID: U2QTXRX10002000A, Model: RXTX20001000A which will be henceforth referred to as the "EUT" (Equipment under Test). The EUT is a Motion Detector Alarm operates at 418 MHz.

1.2 Mechanical Description

The EUT measures approximately 12cm (L) x 8cm (W) x 6cm (H) and weighs 44.5 g.

The test data gathered are from production sample, serial number: R1110113-1 assigned by BACL.

1.3 Objective

This report is prepared on behalf of *Rodann Electronic Mfg. Co.* in accordance with Part 2, Subpart J, and Part 15, Subparts C of the Federal Communication Commissions rules.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

1.5 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurements were performed at BACL.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from ± 2.0 for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11, 1997 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003 & TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-2463 and C-2698. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>.

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was tested in accordance with ANSI C63.4-2003 Standard.

2.2 EUT Exercise Software

There will be no special s/w for the EUT, all working mode of the unit are compliance with ANSI 63.4 standard which was verified by Angel Escamilla from BACL.

2.3 Special Accessories

No special Accessories were used to the EUT.

2.4 Equipment Modifications

No modification of the EUT was necessary to meet testing requirements.

2.5 Power Supply and Line Filters

NA: EUT is battery powered.

2.6 Local Support Equipment

NA

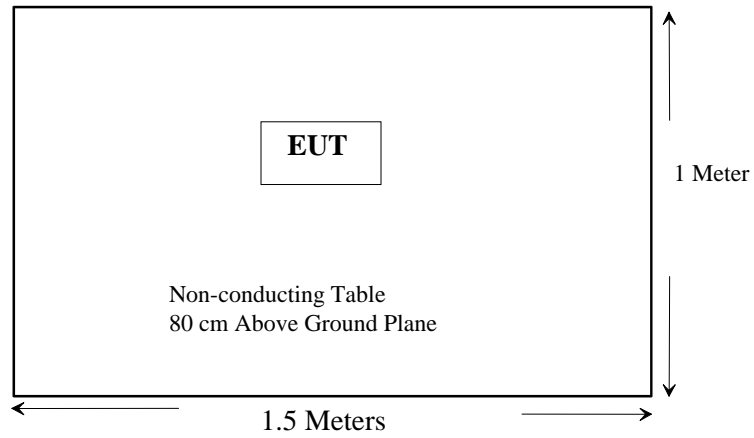
2.7 Interface Ports and Cabling

NA

2.8 EUT Internal Configuration Details

Manufacturers	Description	Model No.	Serial No.
Rodann Electronics	PCB Board	Rev C	-

2.9 Test Setup Block Diagram



3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliant
§15.205, §15.209	Restricted Bands of Operation	Compliant
§15.207	AC Line Conducted Emissions	N/A*
§15.231 (a) (2)	5 Second Automatic Deactivation	Compliant
§15.231 (b)(1)	Field Strength of Fundamental & Spurious Emissions	Compliant
§15.231 (c)	Emission Bandwidth	Compliant

Note: N/A* Battery operation.

4 FCC §15.203 – ANTENNA REQUIREMENT

4.1 Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

4.2 Test Result

This product has an external Omni direction dipole antenna with the cable soldered and skewed on PCB board with less than 2dBi antenna gain which full filled with the FCC 15.203 requirement.

Please refer to the EUT internal photos.

5 FCC §15.231(A) – ECTECTIVE TESTING

5.1 Applicable Standard

As per FCC §15.231

(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

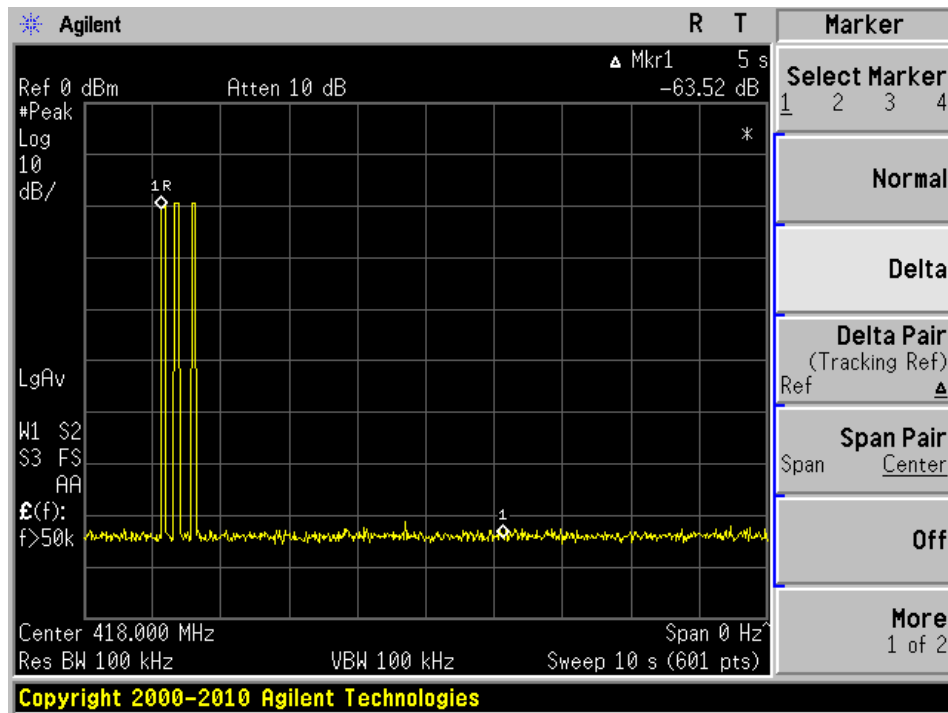
Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

5.3 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	46 %
ATM Pressure:	103.5 kPa

The testing was performed by Angel Escamilla on 2011-11-04.

5.4 Test Result



The transmitter of the device activated automatically, and ceases transmission within 5 seconds after activation.

6 FCC §15.205, §15.209 & §15.231(B) – FIELD STRENGTH OF EMISSIONS

6.1 Applicable Standard

As per FCC §15.205

- (a) Except as shown in 15.205 paragraphs (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
10.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41	/	/	/

(b) Except as provided in 15.205 paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

As per FCC §15.209

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 ¹	3
88 - 216	150 ¹	3
216 - 960	200 ¹	3
Above 960	500	3

Note ¹: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

As per FCC §15.231

(b): In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 ¹	125 to 375 ¹
174-260	3,750	375
260-470	3,750 to 12,500 ¹	375 to 1,250 ¹
Above 470	12,500	1,250

Note ¹: Linear interpolations

(1): The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2): Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

6.2 Test Equipment List and Details

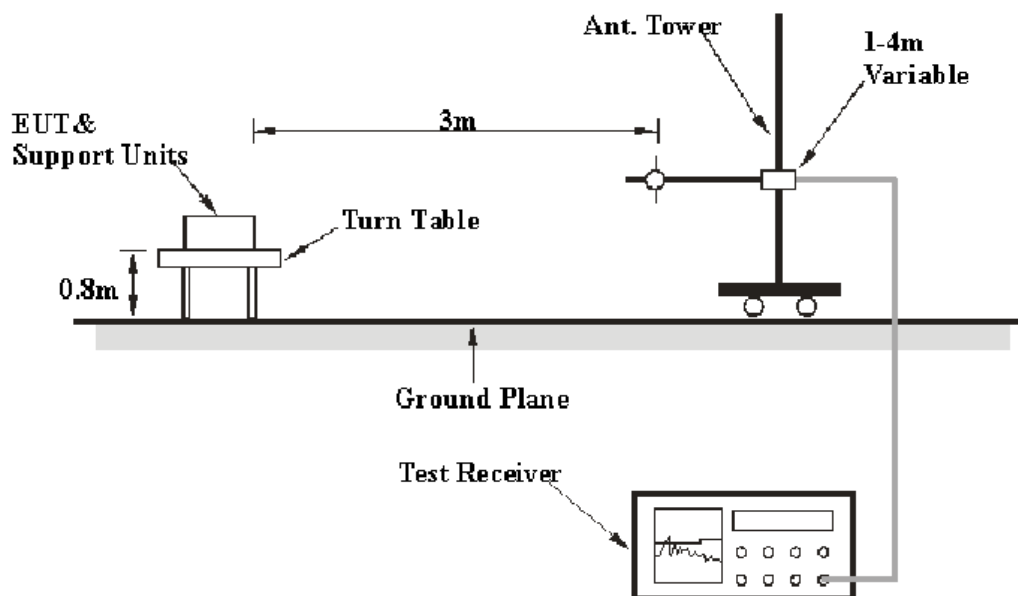
Manufacturer	Description	Model	Serial Number	Calibration Date
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2011-05-08
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2011-06-29
HP	Pre-amplifier	8449B	3147A00400	2011-02-03
A.R.A Inc.	Horn antenna	DRG-1181A	1132	2012-01-04
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

6.3 Radiated Emissions EUT Setup

The radiated emission tests were performed in the closed chamber 3-meter test site, using the setup in accordance with ANSI C63.4 - 2003. The specification used was the FCC Subpart C limits.

The spacing between the peripherals was 10 centimeters.



6.4 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emission, based on the average value of the measured emissions. As an alternative, compliance with the limits may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

6.6 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	45 %
ATM Pressure:	103.5 kPa

The testing was performed by Ning Ma on 2011-11-08.

6.7 Summary of Test Results

According to the data in the following table, the EUT complied with the FCC 15.231(b) standards and had the worst margin reading of:

-8.83 dB at 418 MHz in the Vertical polarization.

6.8 Radiated Emissions Test Plots and Table

Radiated Emissions Test Data, 3 meters from 30 MHz – 5 GHz

Freq. (MHz)	S.A. Reading (dBuV)	Detector (PK/AV)	Turntable Azimuth (Degrees)	Ant. Height (cm)	Ant. Polar (V/H)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp. Gain (dB)	Duty Cycle Factor (dB)	Cord. Reading (dBuV/m)	FCC 15.231/209	
											Limit (dBuV/m)	Margin (dB)
418	92.25	PK	31	100	V	16.6	2.07	25.44	0	85.48	100.28	-14.8
418	90.82	PK	123	100	H	15.8	2.07	25.44	0	83.25	100.28	-17.03
836	55.89	PK	250	100	V	22.2	3.22	25.18	0	56.13	80.28	-24.15
836	46.73	PK	121	100	H	21.6	3.22	25.18	0	46.37	80.28	-33.91
1254	55.54	PK	276	100	V	25.2	2.18	27.37	0	55.55	80.28	-24.73
1254	48.43	PK	212	129	H	24.8	2.18	27.37	0	48.04	80.28	-32.24
1672	47.4	PK	154	100	V	25.6	2.51	27.49	0	48.02	74	-25.98
1672	41.6	PK	41	100	H	25.7	2.51	27.49	0	42.32	74	-31.68
2090	49.94	PK	100	200	V	27.5	2.96	27.54	0	52.86	80.28	-27.42
2090	42.08	PK	167	112	H	27.4	2.96	27.54	0	44.9	80.28	-35.38
2508	55.32	PK	329	150	V	28.6	3.25	27.58	0	59.59	80.28	-20.69
2508	50.37	PK	155	100	H	28.2	3.25	27.58	0	54.24	80.28	-26.04
2926	49.51	PK	13	100	V	28.9	3.4	27.59	0	54.22	80.28	-26.06
2926	41.88	PK	325	167	H	28.9	3.4	27.59	0	46.59	80.28	-33.69
418	92.25	*	31	100	V	16.6	2.07	25.44	-14.03	71.45	80.28	-8.83
418	90.82	*	123	100	H	15.8	2.07	25.44	-14.03	69.22	80.28	-11.06
836	55.89	*	250	100	V	22.2	3.22	25.18	-14.03	42.1	60.28	-18.18
836	46.73	*	121	100	H	21.6	3.22	25.18	-14.03	32.34	60.28	-27.94
1254	55.54	*	276	100	V	25.2	2.18	27.37	-14.03	41.52	60.28	-18.76
1254	48.43	*	212	129	H	24.8	2.18	27.37	-14.03	34.01	60.28	-26.27
1672	47.4	*	154	100	V	25.6	2.51	27.49	-14.03	33.99	54	-20.01
1672	41.6	*	41	100	H	25.7	2.51	27.49	-14.03	28.29	54	-25.71
2090	49.94	*	100	200	V	27.5	2.96	27.54	-14.03	38.83	60.28	-21.45
2090	42.08	*	167	112	H	27.4	2.96	27.54	-14.03	30.87	60.28	-29.41
2508	55.32	*	329	150	V	28.6	3.25	27.58	-14.03	45.56	60.28	-14.72
2508	50.37	*	155	100	H	28.2	3.25	27.58	-14.03	40.21	60.28	-20.07
2926	49.51	*	13	100	V	28.9	3.4	27.59	-14.03	40.19	60.28	-20.09
2926	41.88	*	325	167	H	28.9	3.4	27.59	-14.03	32.56	60.28	-27.72

Note: (1) For Peak, Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain
 (2) For Average, Correction Factor = Duty Cycle (-14.03 dB).
 (3) Below 1 GHz, the cable loss includes the 10 dB attenuator.

Corrected For Pulse Operation

In each TX chain it has 22 T1 = 0.533 ms pulses and 17 T2 = 1 ms pulses.
 Total pulse chain time is 144.5 ms

TX On time = $22 * 0.533 + 17 * 1 = 28.726$ ms

One Pulse Train (Tp) = 144.5 ms

Duty Cycle Factor (dB) = $20 \log [T_{on}/T_p] = 20 \log [28.726 \text{ ms} / 144.5 \text{ ms}] = -14.03$ dB

Please refer to the following plots for test plots details

Figure 1: Total Pulse Chain Time (144.5 ms)

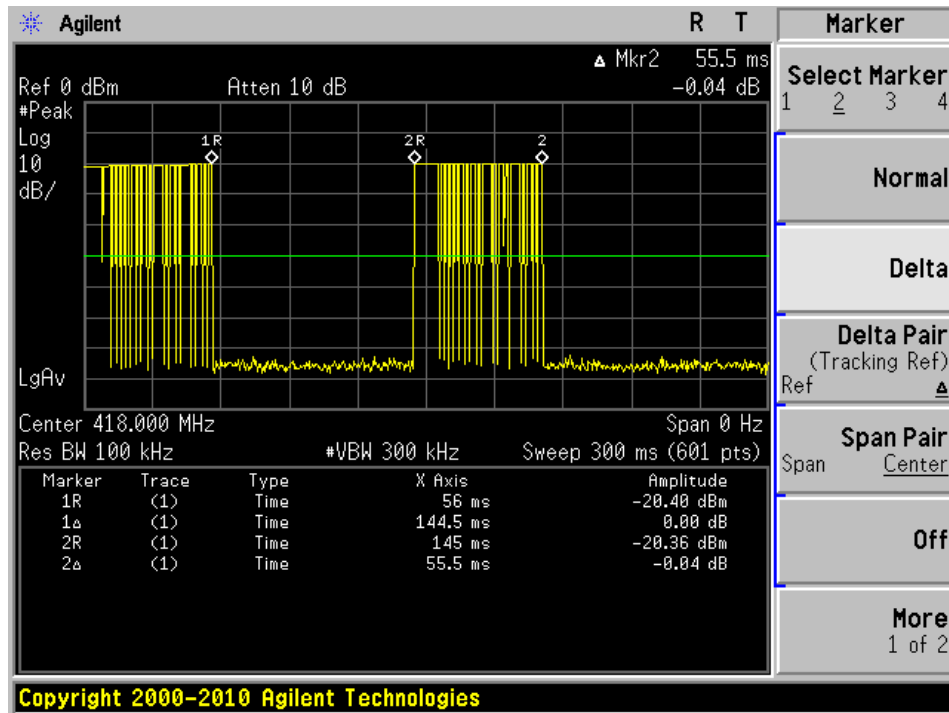


Figure 2: Total 22 T1 pulses & 17 T2 pulses.

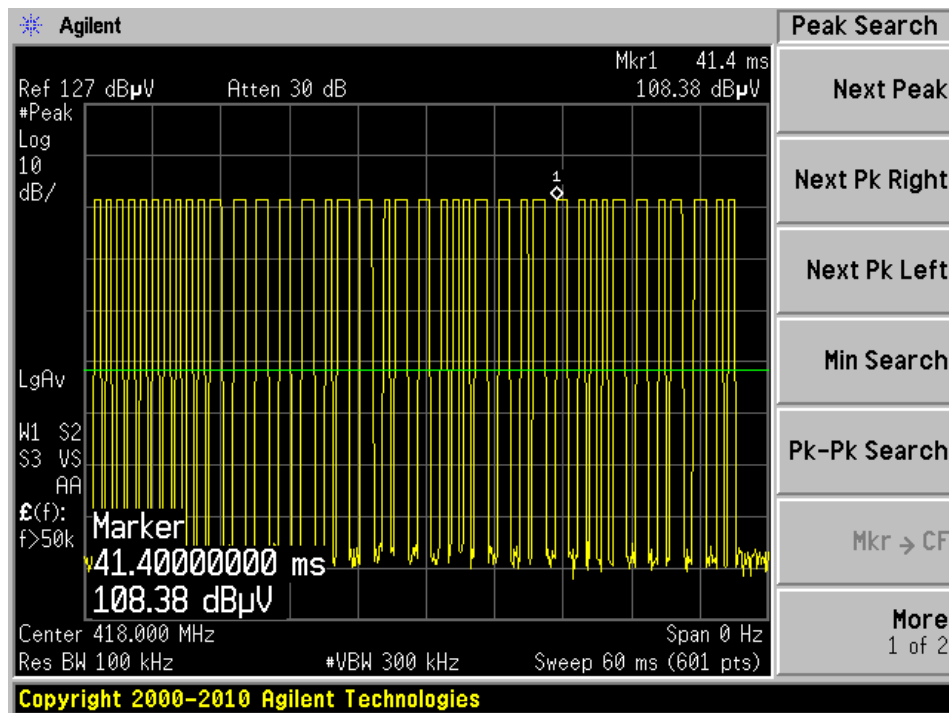
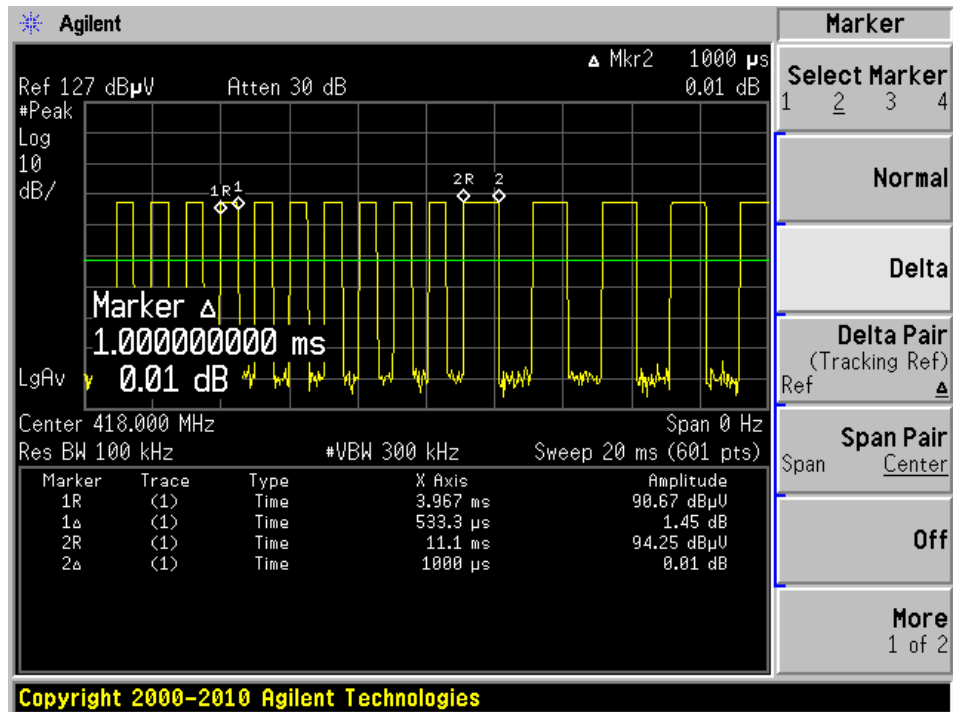


Figure 3: T1 = 0.533 ms, T2 = 1 ms



7 FCC §15.231(C) – EMISSIONS BANDWIDTH

7.1 Applicable Standard

As per FCC §15.231

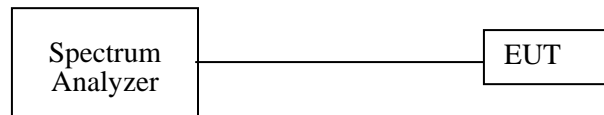
(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

7.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.3 Test Setup Diagram



7.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	45 %
ATM Pressure:	103.5 kPa

The testing was performed by Ning Ma on 2011-11-08.

7.5 Test Result

Frequency (MHz)	20 dB Emission Bandwidth (kHz)	FCC Limit (kHz)	Result
418.012	27.646	1045	Compliant

(Limit = Fundamental Frequency X 0.25% = 418.00 MHz×0.25%= 1045 kHz)

Please refer to the following plot for test result details

20 dB Emission Bandwidth