WALSHIRE LABS

Walshire Labs, LLC
8545 126th Avenue North
Largo, FL 33773
USA
Telephone: (727) 530-8637

47 C.F.R. Part 15 FCC Rules
Subpart B, Class B & Subpart C
Certification Test Record for a
Periodic Operational Transmitter in the 260 - 470 MHz Band

PJNF Technologies' DryLanai™ Model 100-HR

Automatic Storm Shutter Hand-held Remote

Equipment:	**DryLanai™ Model 100-HR**
Client:	**PJNF Technologies, Inc**
Address:	**805 Bentwater Circle #104** **Naples, FL 34108**

Test Report Number: FCCIR2-PJNF-08-17-09
Date: August 19, 2009
Total Number of Pages: 50

NVLAP LAP Code: 200125-0

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1 IDENTIFICATION SUMMARY

1.1 Test Report

Test Report Number: FCCIR2-PJNF-08-17-09
Test Report Date: August 19, 2009

Report written and approved by:

Date	Name	Signature
August 19, 2009	Peter J. Walsh, NCE	

1.2 Testing Laboratory

Walshire Labs, LLC
8545 126th Avenue North
Largo, FL 33773
USA

Telephone: (727) 530-8637
Internet: www.walshirelabs.com
Email: Peter_Walsh@walshirelabs.com

1.3 Limits and Reservations

The test results in this report apply only to the particular Device Under Test (DUT) and component Implementations Under Test (IUTs) declared in this test report. The results and associated conclusions apply only to the DUT while operating in the configuration and modes described herein.

The test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

1.4 Client Information

Name:	PJNF Technologies, Inc.
Street:	805 Bentwater Circle #104
City:	Naples
State:	FL
Zip Code	34108
Country:	USA
Phone:	(239) 594-2603
Contact Person:	Paul Johansen
Phone:	(239) 594-2603
Email:	prjohansen@comcast.net

1.5 Dates

Date of commission:	August 11, 2009
Date of receipt of DUT:	August 17, 2009
Date of test completion:	August 19, 2009

1.6 Device Under Test (DUT)

Name:	DryLanai™ Hand-held Remote
Version:	Model 100-HR
Serial Number:	None, Engineering Prototype
FCC ID:	FCC ID: XDX-100-R
Antenna Type:	Circuit Board Trace
Frequency:	433.92 MHz

2 GENERAL INFORMATION

2.1 Product Description

The Model 100-HR is a component of the DryLanai™ Automatic Storm Shutter Control. It is a battery operated device that allows the user to wirelessly send a command to a wall mounted control unit to open or close storm shutters. The device is considered as a periodic transmitter operating within the constraints of Part 15, § 15.231 FCC Rules. It operates on a Frequency of 433.92 MHz. The modulation type is ASK. The digital data format is a 10 Byte sequence transmitted at a baud rate of 2400.

The Model 100-HR transmits when the user presses any of its three buttons, up, stop, or down. Refer to the operational description exhibit for more detailed information.

2.2 Interface Cable Details

There were no interface cables used in the system.

2.3 Peripheral Devices

There were no peripheral devices used in the system as the transmission was one-way, towards the receiver.

2.4 Test Methodology

A radiated emission test was performed according to ANSI C63.4-2003, the procedure referenced by Part 15, FCC Rules. Radiated emissions tests were performed at an antenna to DUT distance of 3 meters. As the DUT was battery powered, a conducted emissions test was not performed. The DUT was placed in the center of the turntable and orientated in a manner that produced the highest emissions by rotating the DUT along each of its orthogonal axis. The position that produced the highest level of emissions was with the DUT orientated vertically as shown in Photo 5.5-1.

2.5 Test Facility

The 3-meter semi-anechoic test chamber and measurement facility used to collect the radiated and conducted data is located at 8545 126th Avenue N., Largo FL 33773. This laboratory is NVLAP Accredited (NVLAP Lab Code 200125-0).

2.6 Deviations

No deviations were exercised during the course of the testing.

3 SYSTEM TEST CONFIGURATION

3.1 Justification

For the test of the DUT's digital circuitry, the unit was tested in the standby mode.

For field strength tests of the DUT's radio transmitter, a test mode was employed by means of a special firmware version that allowed the radio to transmit its modulated signal continuously whilst any button was held down.

ANSI C63.4 2003 section 12.1.4.1 requires that hand-held or body-worn devices shall include rotation of the EUT through three orthogonal axes to determine the attitude that maximizes the emissions. The DUT is a hand-held device. As such, preliminary tests were performed to determine the orientation that produced the highest level of emissions. This was with the DUT orientated vertically as shown in Photo 5.5-1.

All measurements were performed with the DUT powered by a new battery type CR2032.

3.2 Special Accessories

None

3.3 Equipment Modifications

The following modification was made not to achieve compliance but rather increase the DUT's transmit power. Resistor R3 was changed from 1 kΩ to 420 Ω. This optimized the output of the transmitter to produce a field strength closer to the permissible limit.

Signature:		Date:	August 19, 2009
Typed/Printed Name:	Peter J. Walsh		
Position:	Regulatory Lab Manager		

If modifications were needed to achieve compliance, the client shall acknowledge these by signing below.

Signature:		Date:	August 19, 2009
Typed/Printed Name:	Paul R. Johansen		
Position:	President		

4 CONDUCTED EMISSIONS DATA

References:

47 C.F.R. § 15.107 (a)

Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

47 C.F.R. § 15.207 (a)

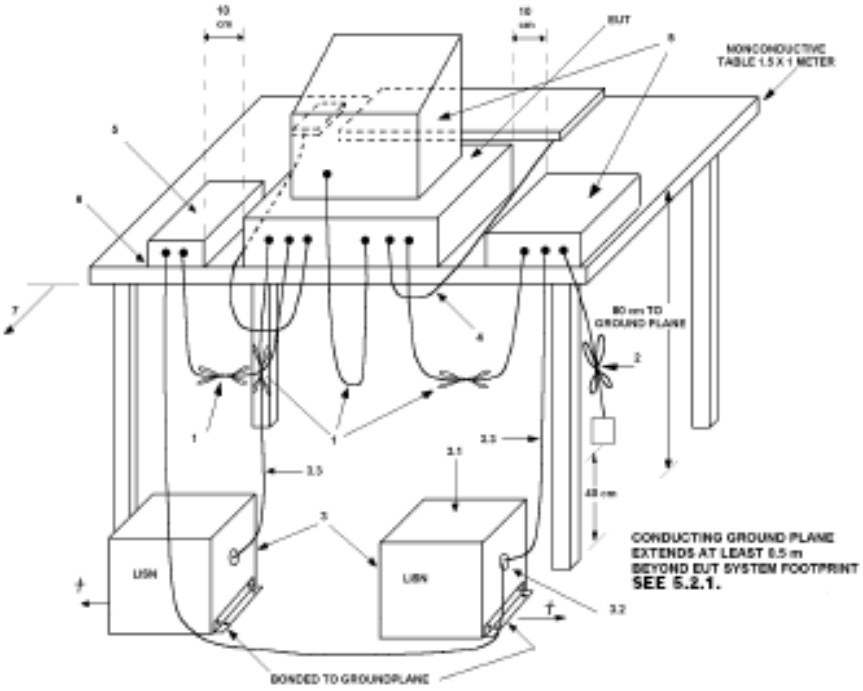
(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.1 Test Procedure

The test would be performed in accordance with ANSI C63.4-2003 § 7. The test setup was consistent with ANSI C63.4-2003 Figure 10a below. The test would be performed in a semi-anechoic chamber. As such, the optional vertical conducting plane would not be used.



LEGEND:

1) Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center forming a bundle 30 to 40 cm long (see 6.1.4 and 11.2.4).
2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m (see 6.1.4).
3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference groundplane (see 5.2.3 and 7.2.1).
   3.1) All other equipment powered from additional LISN(s).
   3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
   3.3) LISN at least 80 cm from nearest part of EUT chassis.
4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use (See 6.2.1.3 and 11.2.4).
5) Non-EUT components of EUT system being tested (see also Figure 13).
6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (see 6.2.1.1 and 6.2.1.2).
7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the groundplane (see 5.2.2 for options).

Figure 10a—Test arrangement for conducted emissions

Conducted emissions measurements are first made using a peak detector and average detector simultaneously. The receiver then performs the final measurements using a quasi-peak detector for comparison with the quasi-peak limit and an average detector for comparison with the average limit.

4.2 Measured Data

Compliance Verdict: None

As the DUT is battery powered, ac mains conducted emissions are not applicable.

Measurement Uncertainty: +/- 3.59 dB

Test Personnel:

August 17, 2009	Peter J. Walsh, NCE	
Date	Name	Signature

4.3 Conducted Emissions Test Instrumentation

Type	Manufacturer/ Model No.	Serial Number	Calibration Due Date
EMI Receiver	Rohde & Schwarz ESCS 30	825788/002	11-17-2009
LISN	Rohde & Schwarz ESH3-Z5	840730/005	8-26-2010

Calibration and Traceability: All measuring and test equipment are calibrated and are traceable to the National Institute for Standards and Technology (NIST) and Methods.

4.4 Conducted Emissions Photographs

No photos were taken as the test was not performed.

5 SUBPART B RADIATED EMISSIONS DATA

Reference: 47 C.F.R. § 15.109 (a)

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Table 5-1

Frequency of Emission (MHz)	Field Strength (3 m) (microvolts/meter)	Field Strength (3 m) (dBµV/m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Reference: 47 C.F.R. § 15.109 (g)

As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement" (incorporated by reference, see § 15.38).

The CISPR 22 Class B radiated emissions limits are given in Table 4-2.[1]

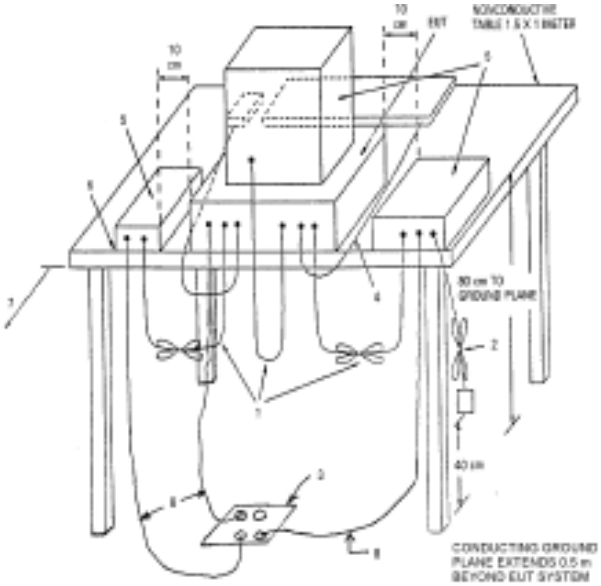
Table 4-2

Frequency of Emission (MHz)	Field Strength (10 m) (dBµV/m)	Field Strength (3 m) (dBµV/m)
30 - 230	30	40
230 - 1000	37	47

[1] *The 3 m limit has been round down to the nearest dBµV/m.*

5.1 Test Procedure

The test was performed in accordance with ANSI C63.4-2003 § 8. The test setup was consistent with ANSI C63.4-2003 Figure 11a below except that the DUT was positioned in the center of the table. The test was performed in a semi-anechoic chamber.



LEGEND:

1) Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long (see 6.1.4 and 11.2.4).
2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m (see 6.1.4).
3) If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the groundplane with the receptacle flush with the groundplane (see 6.1.4).
4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use (see 6.2.1.3 and 11.2.4).
5) Non-EUT components of EUT system being tested (see also Figure 13).
6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (see 6.2.1.1 and 6.2.1.2).
7) No vertical conducting plane used (see 5.2.2).
8) Power cords drape to the floor and are routed over to receptacle (see 6.1.4).

Figure 11a—Test arrangement for radiated emissions tabletop equipment

The following data lists the significant emission frequencies, amplitude levels (including cable correction and antenna factors), plus the limit. The frequency range investigated was 30 MHz to 1 GHz. The highest frequency to which the DUT must be measured for its digital circuitry is 1 GHz because the highest frequency of its digital circuitry is less than 108 MHz. Note that Section 6 contains test data associated with the DUT's radio including radiated emissions data up to the ten harmonic of the fundamental.

5.2 Test Data

Compliance Verdict: PASS

Figure 5.2-1 below shows a composite graph of the radiated emissions levels from 30 to 1000 MHz measured with a peak detector in both vertical (red trace) and horizontal (blue trace) antenna polarity at turntable angles from 0 to 360 degrees and an antenna height of 1, 2.5, and 4 meters.

There were no emissions as measured with the quasipeak detector that were within 20 dB of the limit.

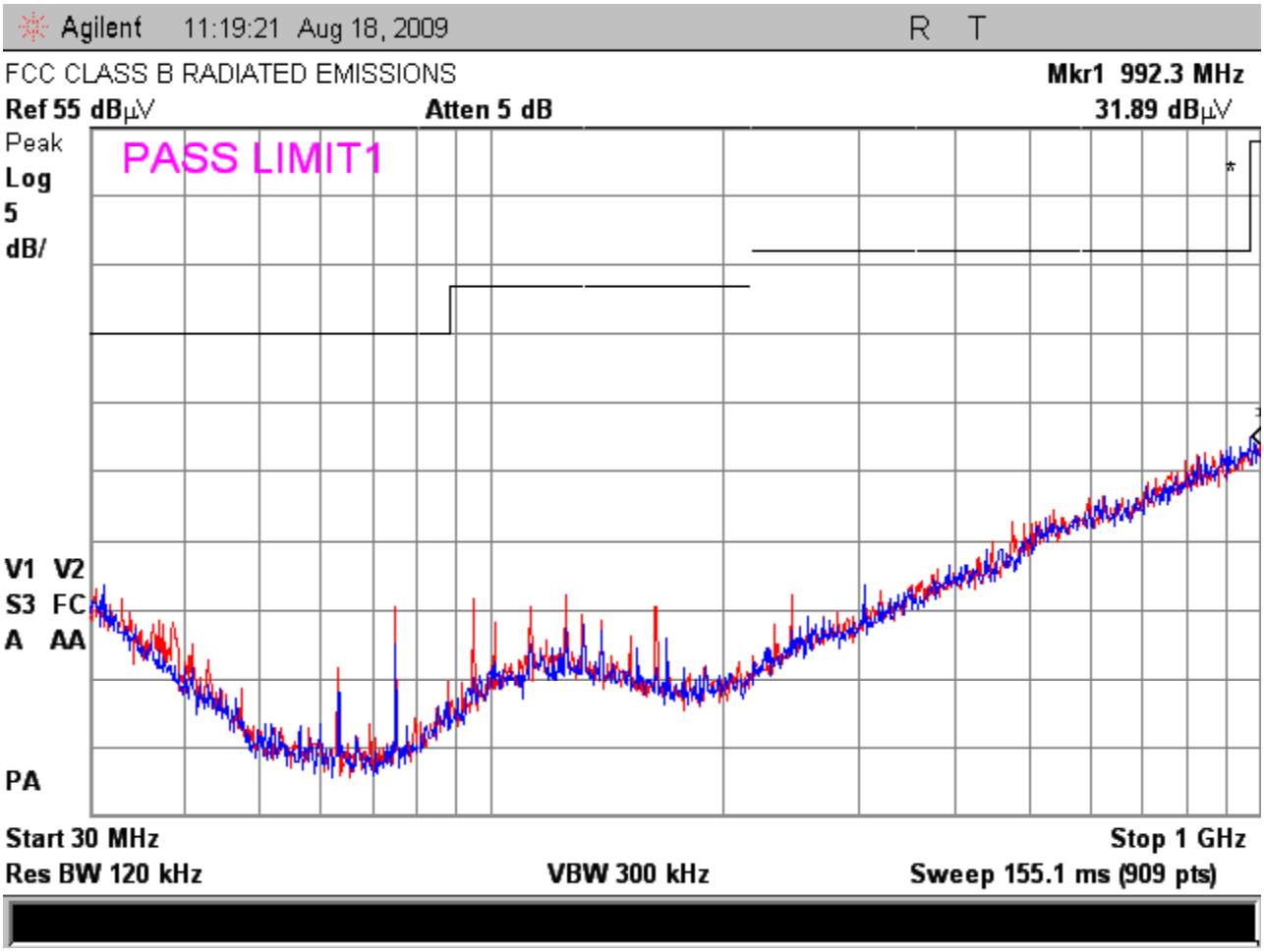


Figure 5.2-1 – FCC Part 15 Subpart B Radiated Emissions Plot

Minimum Margin: **> 20 dBµV/m**

Measurement Uncertainty: +/- 4.26 dB

Test Personnel:

August 18, 2009	Peter J. Walsh, NCE	
Date	Name	Signature

5.3 Test Instrumentation Used, Radiated Measurement

Type	Manufacturer/ Model No.	Serial Number	Calibration Due Date
EMI Receiver	Rohde & Schwarz ESCS 30	825788/002	11-17-2009
Spectrum Analyzer	Agilent E7405A	MY42000055	3-16-2011
Preamplifier	Com-Power PA-122	181925	3-23-2010
Antenna	Chase EMCCBL6112B	2579	10-29-2009
Antenna	EMCO Horn Model 3115	9002-3393	3-27-2011

Calibration and Traceability: All measuring and test equipment are calibrated and are traceable to the National Institute for Standards and Technology (NIST) and Methods.

5.4 Field Strength Calculation

The field strength is calculated by adding the antenna correction factor and cable loss and subtracting the amplifier gain (if any) from the measured reading.

The Rohde & Schwarz Model ESCS30 receiver and Agilent E7405A spectrum analyzer have the capability of automatically performing the field strength calculations. The amplitude level displayed on the receiver or analyzer represents the total measured field strength. This level is directly compared to the appropriate FCC limit to determine the actual margin of the DUT.

5.5 Radiated Emissions Photographs

Photo 5.5-1 - Front View of the Radiated Emissions Test Set-up

Photo 5.5-2 - Rear View of the Radiated Emissions Test Set-up

6 SUBPART C RADIATED EMISSIONS DATA

Reference: 47 C.F.R. § 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:

Table 6-1

Frequency of Emission (MHz)	Field Strength (3 m) (microvolts/meter)	Field Strength (3 m) (dBµV/m)
0.009 – 0.490	2400/F (kHz) @ 300 m	300
0.490 – 1.705	24000/F (kHz) @ 30 m	30
1.705 – 30.0	30 @ 30 m	30
30 - 88	100**	40.0
88 - 216	150**	43.5
216 - 960	200**	46.0
Above 960	500	54.0

*** 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.*

Reference: 47 C.F.R. § 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 6-2

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 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 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.

Reference: 47 C.F.R. § 15.231

Section 15.231 Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

(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.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

(b) In addition to the provisions of Section 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 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(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 Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

(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.

(d) For devices operating within the frequency band 40.66 - 40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ± 0.01%. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) and may be employed for any type of operation, including operation prohibited in paragraph (a), provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this Section, except the field strength table in paragraph (b) is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emission (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500 **	50 to 150 **
174 - 260	1,500	150
260 - 470	1,500 to 5,000 **	150 to 500 **
Above 470	5,000	500

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 22.72727(F) - 2454.545; for the band 260-470 MHz, μV/m at 3 meters = 16.6667(F) - 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Reference: 47 C.F.R. § 15.35

Measurement detector functions and bandwidths.

The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:

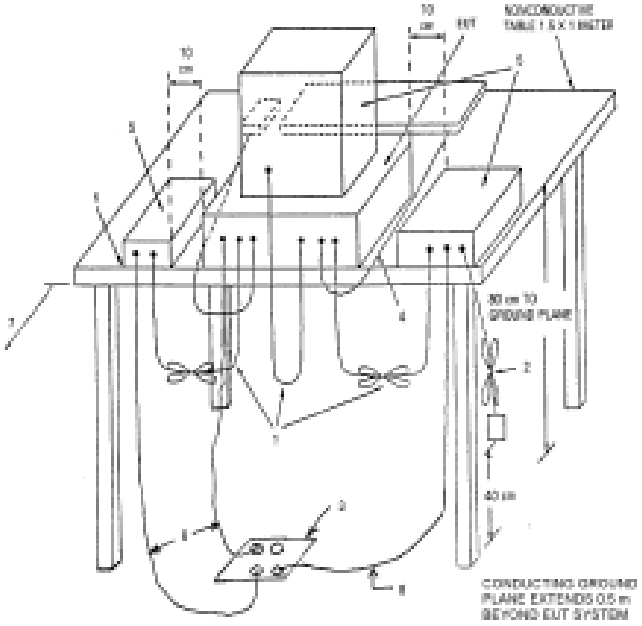
(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

6.1 Test Procedure

The test was performed in accordance with ANSI C63.4-2003 § 8. The test setup was consistent with ANSI C63.4-2003 Figure 11a below except that the DUT was located in the center of the table. The test was performed in a semi-anechoic chamber.



LEGEND:

1) Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long (see 6.1.4 and 11.2.4).

2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m (see 6.1.4).

3) If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the groundplane with the receptacle flush with the groundplane (see 6.1.4).

4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use (see 6.2.1.3 and 11.2.4).

5) Non-EUT components of EUT system being tested (see also Figure 13).

6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (see 6.2.1.1 and 6.2.1.2).

7) No vertical conducting plane used (see 5.2.2).

8) Power cords drape to the floor and are routed over to receptacle (see 6.1.4).

Figure 11a—Test arrangement for radiated emissions tabletop equipment

The following data lists the significant emission frequencies, amplitude levels, limits and margins. The highest frequency to which the radiated emissions had to be measured was 4.339 GHz, ten times the fundamental frequency.

6.2 Test Data

Compliance Verdict: PASS

Figure 6.2-1 shows a composite graph of the radiated emissions levels from 30 to 1000 MHz measured with a peak detector in both vertical (red trace) and horizontal (blue trace) antenna polarities at turntable angles from 0 to 360 degrees and antenna heights of 1, 2.5, and 4 meters. The resolution bandwidth was 120 kHz. Note that the fundamental frequency of 433.92 MHz exceeds the Class B radiated emissions limit but this frequency does not lie in a restricted band. Figure 6.2-2 shows the peak amplitude of the fundamental emission maximized by adjusting the following: DUT orientation, antenna height, polarity, and turntable position.

Figure 6.2-3 shows the highest emissions between 1 and 5 GHz as measured with an average detector. There were no emissions within 20 dB of the limit set out for harmonics and spurious emissions or the tighter, general radiated emissions limit for the restricted bands. Likewise, there were no emissions within 20 dB of the prescribed peak limits.

Tables 6.2-1 and 6.2-2 show the highest measured results within 20 dB of the peak and average limits respectively as set out in 15.231. Measurements were taken out to the tenth harmonic of the fundamental frequency. These final measurements were maximized by adjustment of the receiving antenna height, polarity, DUT orientation and turntable position. The detector used to show compliance with the average limit of the fundamental and second harmonic was the average detector set for a measurement time of 100 msec.

The radiated emissions limits set out in 15.231 are based on the average value of the measured emissions. The peak level is derived from the average limit by adding 20 dB. The limit at the fundamental frequency is calculated from the below formula:

Limit = 41.6667(F) – 7083.333 dBµV/m @ 3 m (eq. 1)

Limit = 41.6667(F) – 7083.333 dBµV/m = 80.8 dBµV/m @ 3 m

Therefore the peak limit was 100.8 dBµV/m @ 3 m.

The limit for the harmonics is 20 dB down from the fundamental or 60.8 dBµV/m @ 3 m.

When determining the permissible average value of the radiated emissions, a duty cycle correction factor may be applied. This correction factor may be calculated using the following formula:

$DC_{CORR} = 20LOG(T_{on} / T_{period})$ (eq. 2)

Refer to Section 7 in this report for the DUT's time domain characteristics including the calculation of its duty cycle correction factor.

Alternatively, the measurement may be performed using the QuasiPeak detector in which case duty cycle correction factor is not applied. This option was not exercised.

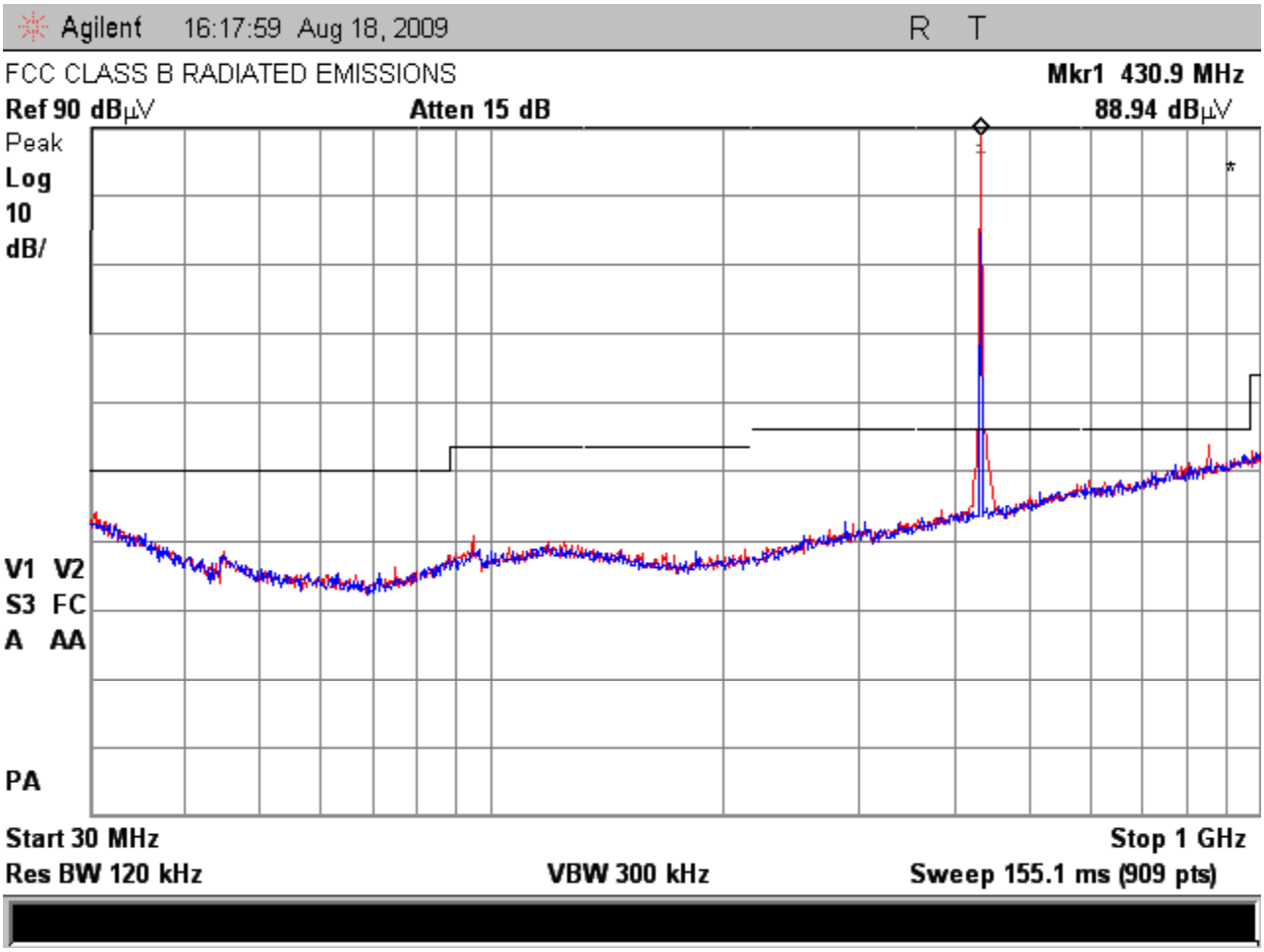


Figure 6.2-1 – Peak Detector Radiated Emissions 30 MHz to 1000 MHz

NOTES:

In the above figure, the red trace was with vertical polarity and the blue trace was with horizontal polarity.

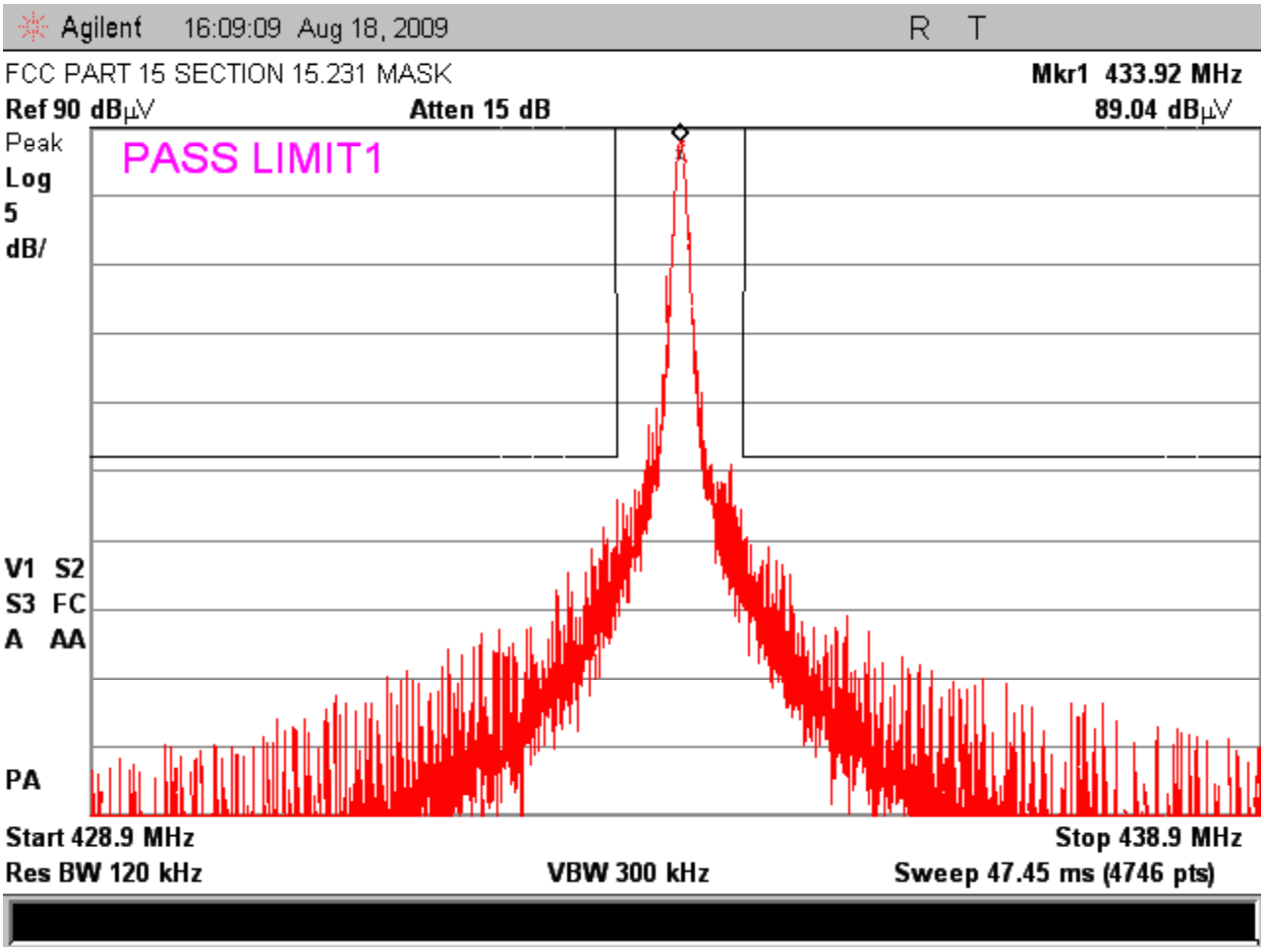


Figure 6.2-2 – Peak Detector Radiated Emissions of the Fundamental Signal

NOTES:

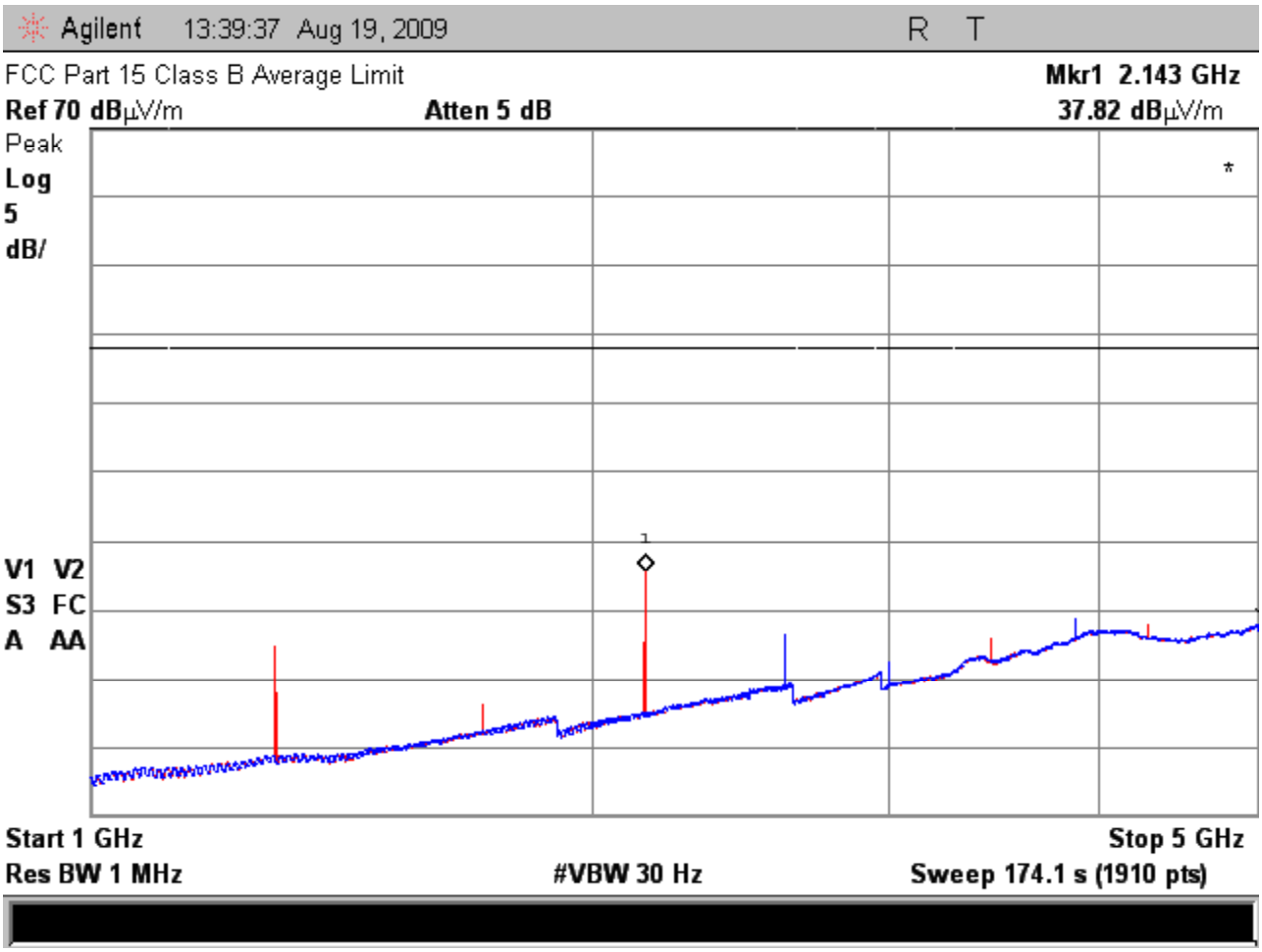


Figure 6.2-3 – Average Detector Radiated Emissions 1 – 5 GHz

NOTES:

In the above figure, the red trace shows vertical polarity; the blue trace shows horizontal polarity. A scan from 1 to 5 GHz with the peak detector showed no emissions within 20 dB of the peak limit. The only emission of concern was the fifth harmonic and this did not lie in a restricted band. This emission at 2170 MHz was further maximized with the resulting level shown in Table 6.2-2.

Table 6.2-1 – Worst Case Radiated Emissions Relative to the Peak Limit

Frequency (MHz)	Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)	Notes
433.92	88.8*	108	V	56	100.8	12.0	Fundamental
867.83	54.6*	128	V	183	80.8	26.2	2nd harmonic

Table 6.2-2 – Worst Case Radiated Emissions Relative to the Average Limit

Frequency (MHz)	Average (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)	Notes
433.92	77.7*	108	V	56	80.8	3.1	Fundamental
867.83	42.0*	128	V	183	60.8	18.8	2nd harmonic
2170.0	41.6	139	V	331	60.8	19.2	5th harmonic

* Denote readings taken with the Rohde & Schwarz ESCS30 receiver using peak or average detector with 100 msec averaging.

Minimum Margin: **3.1 dBµV/m**

Measurement Uncertainty: +4.8 dB, -5.2 dB

Test Personnel:

August 18, 2009	Peter J. Walsh, NCE	
Date	Name	Signature

6.3 Test Instrumentation Used, Radiated Measurement

Type	Manufacturer/ Model No.	Serial Number	Calibration Due Date
EMI Receiver	Rohde & Schwarz ESCS 30	825788/002	11-17-2009
Spectrum Analyzer	Agilent E7405A	MY42000055	3-16-2011
Preamplifier	Com-Power PA-122	181925	3-23-2010
Antenna	Chase EMCCBL6112B	2579	10-29-2009
Antenna	EMCO Horn Model 3115	9002-3393	3-27-2011
Antenna	Schwarzbeck Mess - Electronik Model BBHA 9170 Horn Antenna	BBHA9170398	11-28-2009

Calibration and Traceability: All measuring and test equipment are calibrated and are traceable to the National Institute for Standards and Technology (NIST) and Methods.

6.4 Field Strength Calculation

The field strength is calculated by adding the antenna correction factor and cable loss and subtracting the amplifier gain (if any) from the measured reading.

The Rohde & Schwarz Model ESCS30 receiver and Agilent E7405A spectrum analyzer have the capability of automatically performing the field strength calculations. The amplitude level displayed on the receiver or analyzer represents the total measured field strength. This level is directly compared to the appropriate FCC limit to determine the actual margin of the DUT.

6.5 Radiated Emissions Photographs

Refer to Section 5.5 in this report for photographs of the radiated emissions test set-up as they were the same for both Subpart B and Subpart C radiated emissions tests.

7 TIME DOMAIN CHARACTERISTICS

Reference: 47 C.F.R. § 15.231

Section 15.231 Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

(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.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

7.1 Test Procedure

The test procedure was as follows: A near field probe was placed next to the DUT. The probe was connected to the spectrum analyzer with its center frequency set to the transmitter's fundamental frequency and its span set to 0 Hz to make time domain measurements. The DUT's transmitter was activated manually by pressing the up button.

7.2 Test Data

Compliance Verdict: PASS

Figure 7.2-1 below shows the response of the DUT, as a function of time, whilst transmitting the shutter up command signal sequence by momentarily pressing the up button. This transmission time is by design the same as used for the DUT's shutter stop and shutter down command signal sequences. The DUT ceases transmission within 48 msec, well within the 15.231 (a) (1) requirement of 5 seconds.

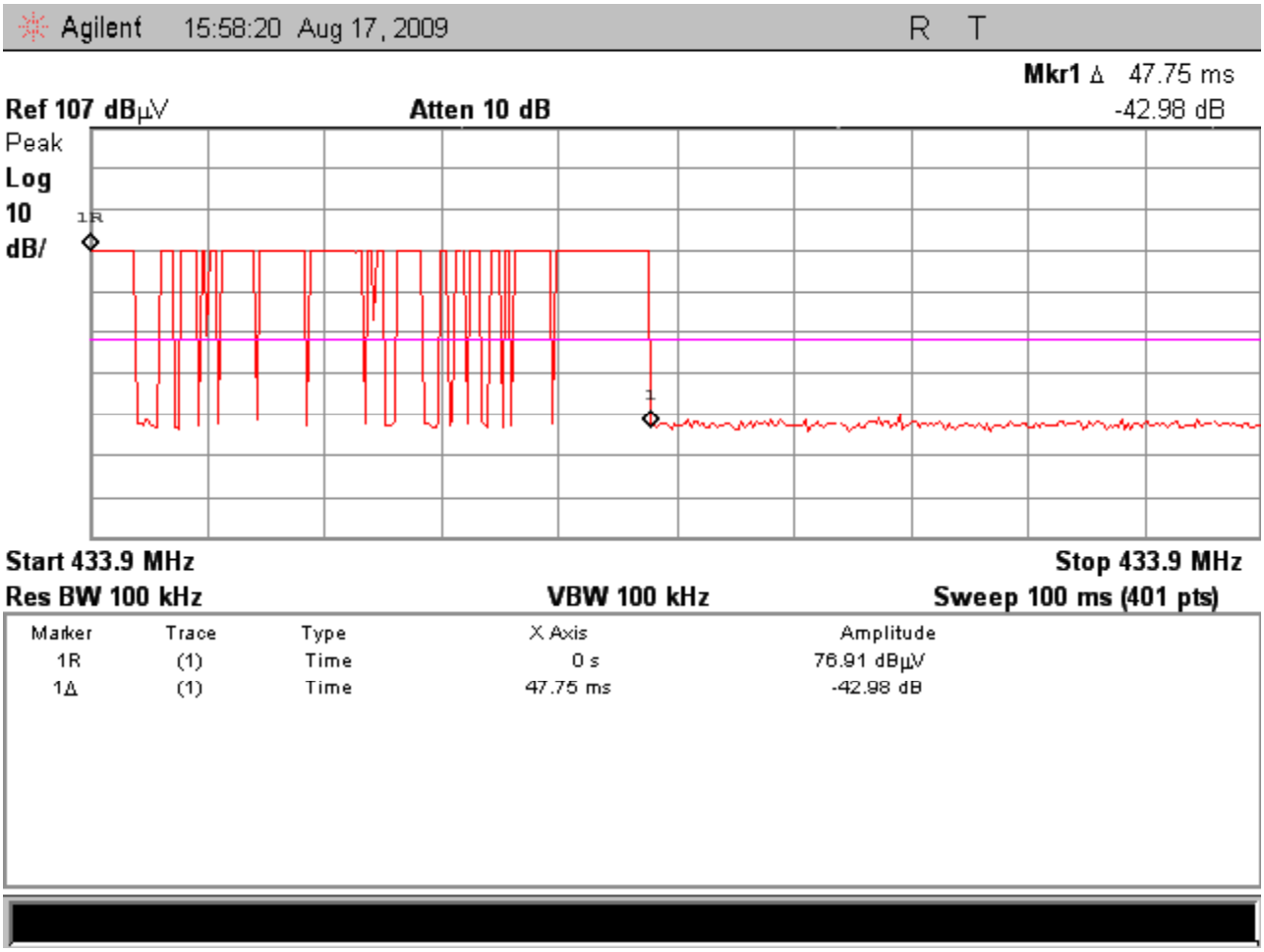


Figure 7.2-1 – Plot of the Shutter Up Command Transmission Event

Figure 7.2-2 below shows the response of the DUT, as a function of time, whilst transmitting the shutter up signaling sequence repeatedly by holding the up button down continuously. The DUT limits the duration of the transmission as shown below.[2] The DUT sends sixteen bursts within a period 4.6 seconds then ceases transmission.

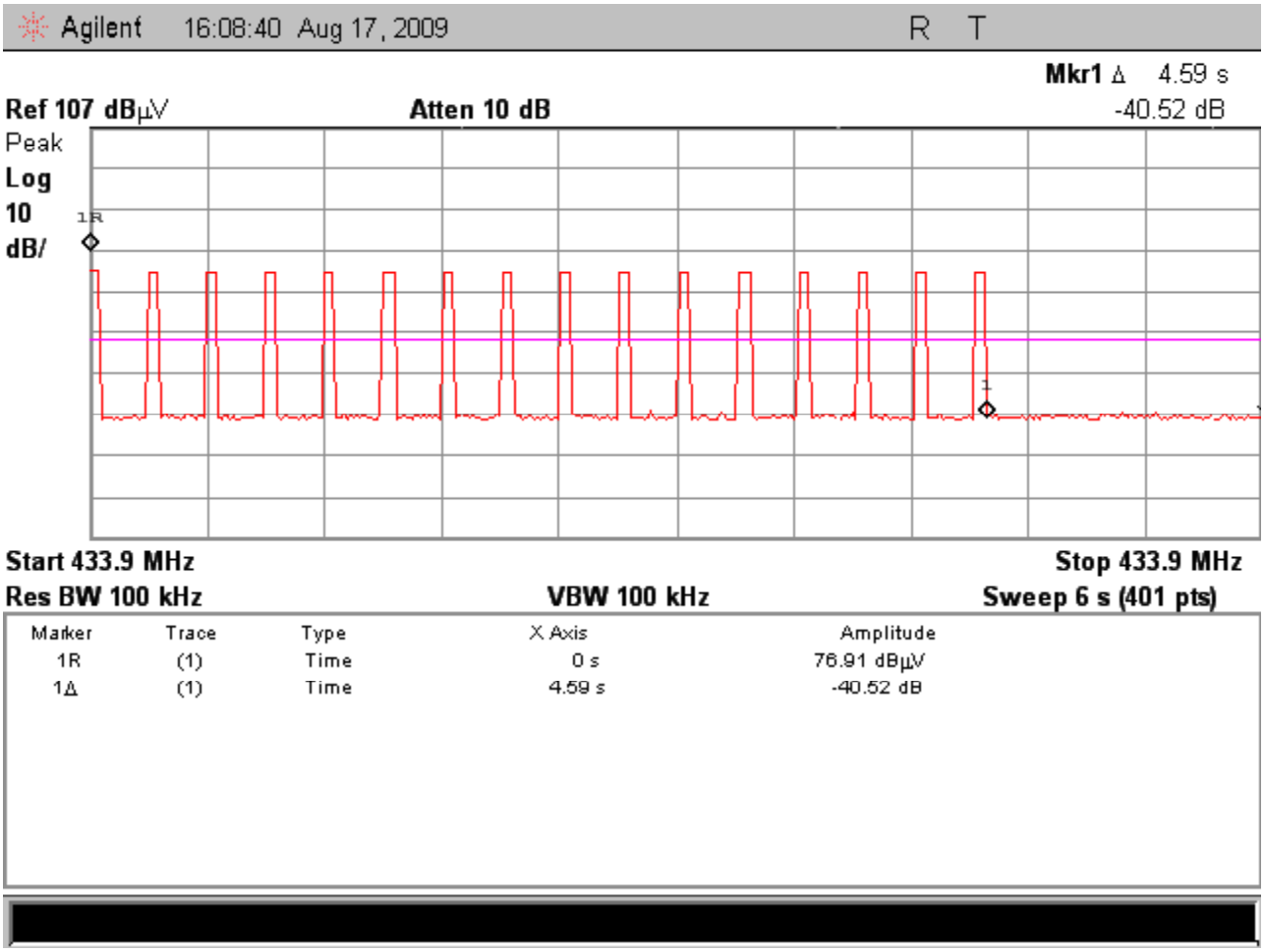


Figure 7.2-2 – Plot of the Repeated Shutter Up Command Transmission Event

[2] For field strength measurements, this duration limitation was defeated by a special firmware load that allowed for repeated transmissions as long as any button was held down.

Figure 7.2-3 below shows the response of the DUT, as a function of time, whilst transmitting the shutter up command signal. The markers were centered on an intentional quiet interval of at least 2 msec following the preamble in the data sequence. Since, the duty cycle is somewhat data dependent a conservative estimate of the duty cycle may be derived by subtracting only 2 msec from the transmission interval. This results in a T_{ON} time of 46 msec. The resulting duty cycle over the FCC mandated period of 100 msec was 46%.

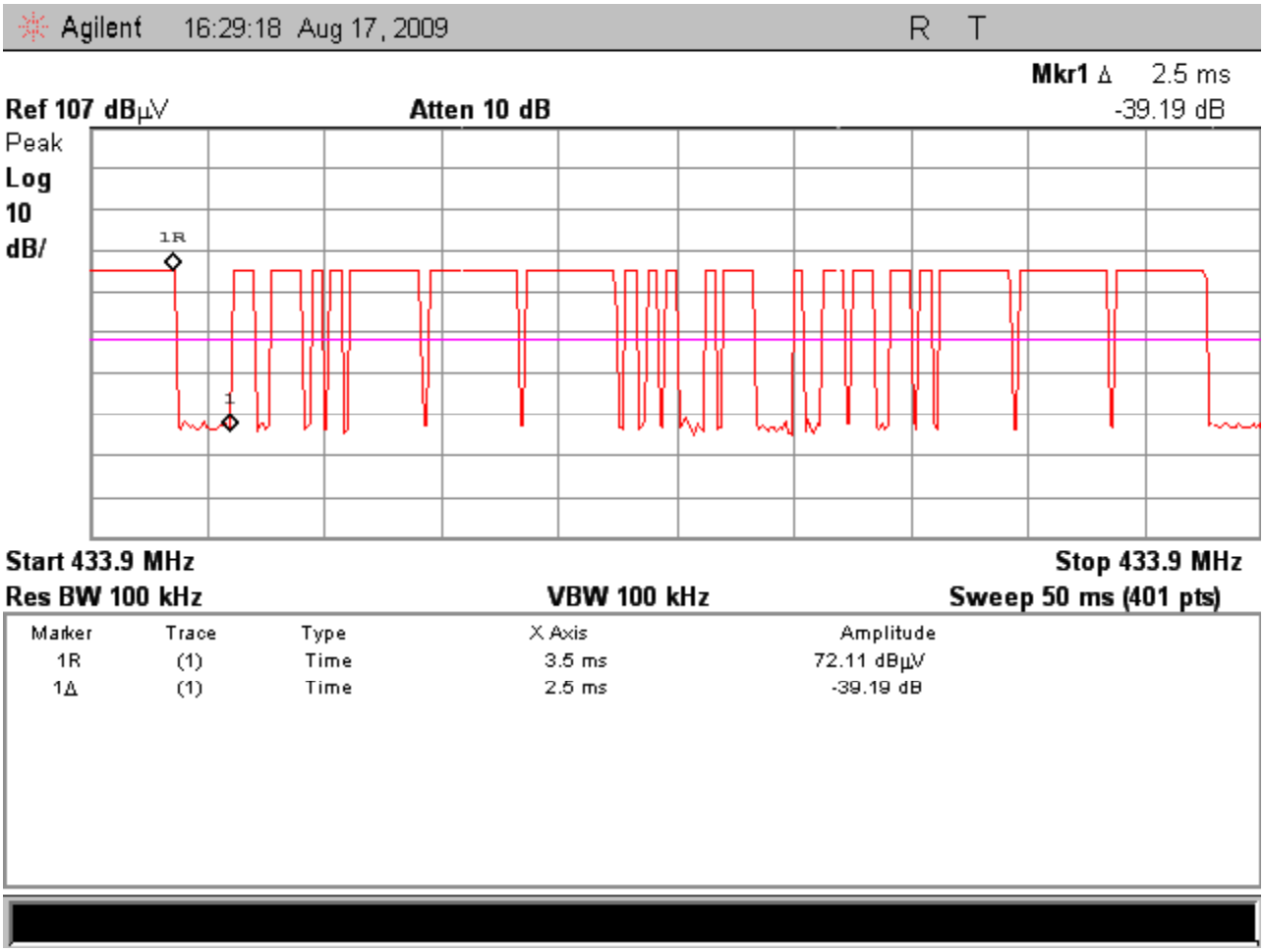


Figure 7.2-3 – Zoomed Plot of the Shutter Up Command Transmission Event

Table 7.2-1 – Time Domain Results

Parameter	Result	Notes
Transmitter deactivation time (seconds)	48 msec	Compliant with 15.231 (a) (1)
Permitted periodic transmissions	None	Transmission only occurs when the button is pressed.
T_{TOTAL} (seconds)	4.6 seconds	See Figure 7.2-2. This is the maximum period over which the transmitter could be on.
T_{ON} (seconds)	46 msec	See Figure 7.2-3
T_{PERIOD} (seconds)	100 msec	FCC prescribed averaging period.
Duty Cycle	46 %	
Duty Cycle Correction Factor	-6.7 dB	The average level may be reduced by applying this factor to the measured peak level.

Notes:

T_{ON} was calculated by approximating the on times during the pulse train. T_{PERIOD} was 100 msec. The actual period was less than 50 msec but the FCC prescribes an averaging period of 100 msec. The duty cycle was calculated using eq. 3. The duty cycle correction factor was calculated using eq. 2.

$DC = (T_{on} / T_{period})$ (eq. 3)

$DC_{CORR} = 20LOG(T_{on} / T_{period})$ (eq. 2)

Test Personnel:

August 17, 2009	Peter J. Walsh, NCE	
Date	Name	Signature

7.3 Test Instrumentation Used, Time Domain Measurement

Type	Manufacturer/ Model No.	Serial Number	Calibration Due Date
Spectrum Analyzer	Agilent E7405A	MY42000055	3-16-2011
Near Field Probe	Electro-Metrics / EHFP-30	196	NCR

Calibration and Traceability: All measuring and test equipment are calibrated and are traceable to the National Institute for Standards and Technology (NIST) and Methods.

7.4 Time Domain Characteristics Photographs

Photo 7.4-1 – Time Domain Test Set-up

8 BANDWIDTH REQUIREMENT

Reference: 47 C.F.R. § 15.231

Section 15.231 Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

(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.

8.1 Test Procedure

The test procedure was the same used for the time domain tests as described in Section 7 of this report except that the spectrum analyzer's resolution bandwidth was set to 10 kHz, the center frequency was set to the transmitter's fundamental frequency and its span set to 500 kHz in order to make the bandwidth measurement. The bandwidth limit was calculated using eq. 4 below.

$BW = f_{center} \times 0.0025 = 433.92 \times 0.0025 = 1.0848$ MHz (eq. 4)

8.2 Test Data

Compliance Verdict: PASS

Figure 8.2-1 below shows the 20 dB bandwidth of the DUT's modulated carrier frequency. The measured bandwidth of 49.5 kHz was well within the maximum allowed bandwidth of 1.0848 MHz.

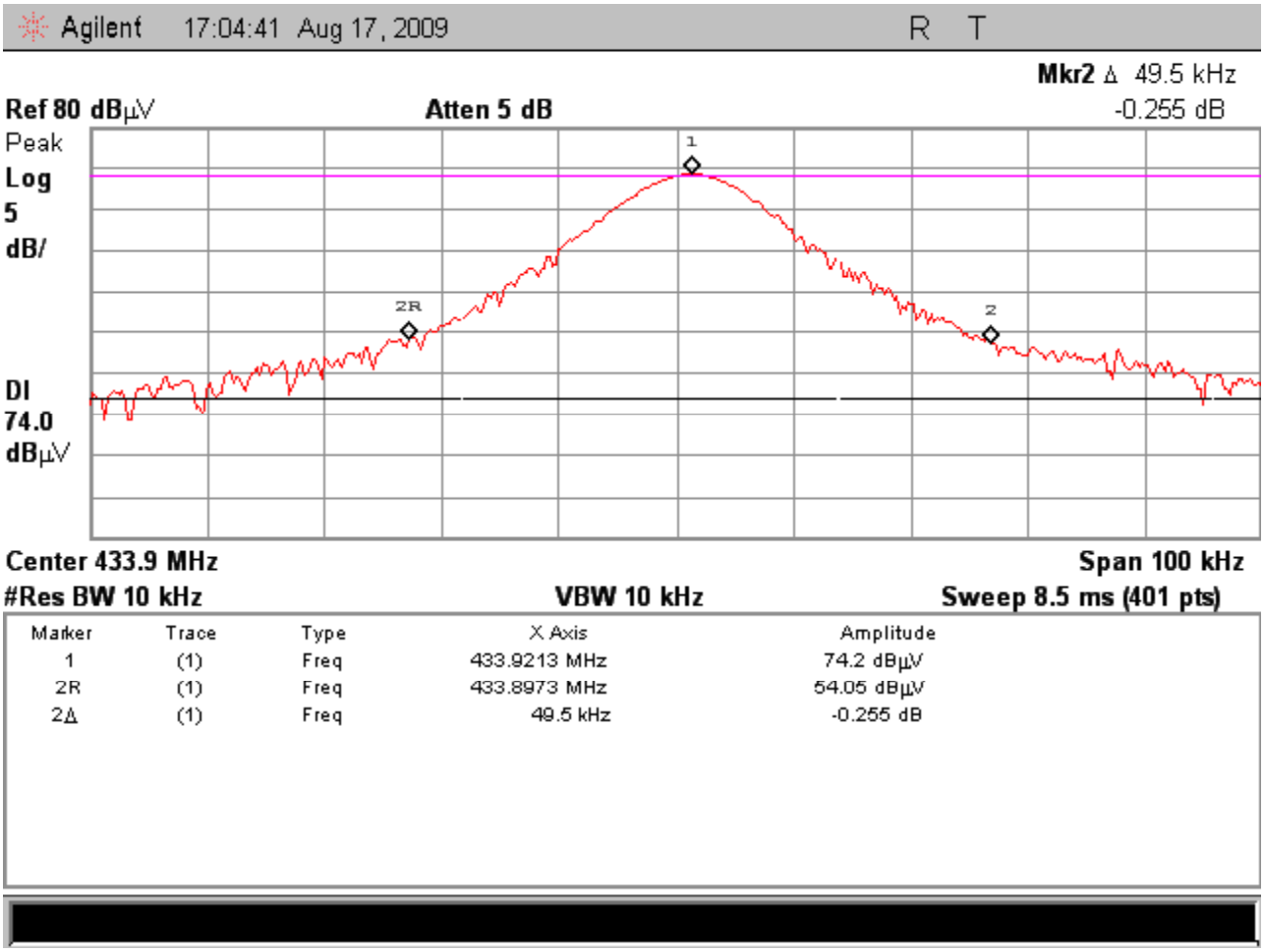


Figure 8.2-1 – 20 dB Bandwidth

Test Personnel:

August 17, 2009	Peter J. Walsh, NCE	
Date	Name	Signature

8.3 Test Instrumentation Used, Bandwidth Measurement

Type	Manufacturer/ Model No.	Serial Number	Calibration Due Date
Spectrum Analyzer	Agilent E7405A	MY42000055	3-16-2011
Near Field Probe	Electro-Metrics / EHFP-30	196	NCR

Calibration and Traceability: All measuring and test equipment are calibrated and are traceable to the National Institute for Standards and Technology (NIST) and Methods.

8.4 Bandwidth Measurement Photographs

Refer to Section 7.4 in this report for a photograph of the test set-up as it was the same as for the time domain measurements.

9 ANTENNA REQUIREMENT

Reference: 47 C.F.R. § 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

9.1 Test Procedure

Inspect the DUT.

9.2 Test Data

Compliance Verdict: PASS

The DUT uses a trace on the circuit board. As such the antenna is considered as permanently attached and not accessible to the user.

9.3 Antenna Photographs

Photo 9.3-1 below shows the DUT's antenna. Note that the antenna is comprised of the circuit board traces and the air core wire inductor installed between E1 and E3.

Photo 9.3-1 - Antenna

10 LABELING AND USER'S GUIDE REQUIREMENTS

10.1 FCC Label Statement

The FCC compliance label should include the following information:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note that because of the physical size of the unit, the above warning will be included in the user manual.

The FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

The FCC ID number will be: XDX-100-HR

Figure 10.1-1 below shows a sample of the label and its placement on the DUT.

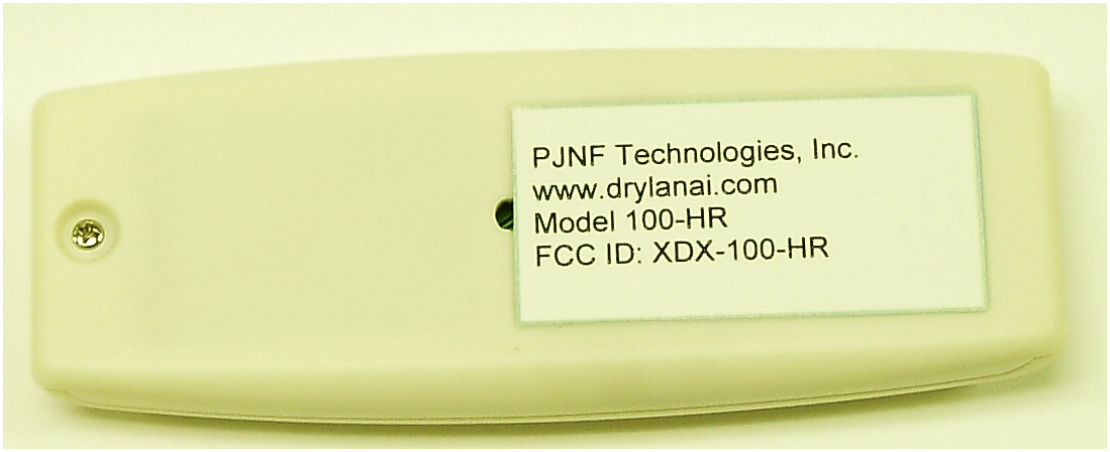


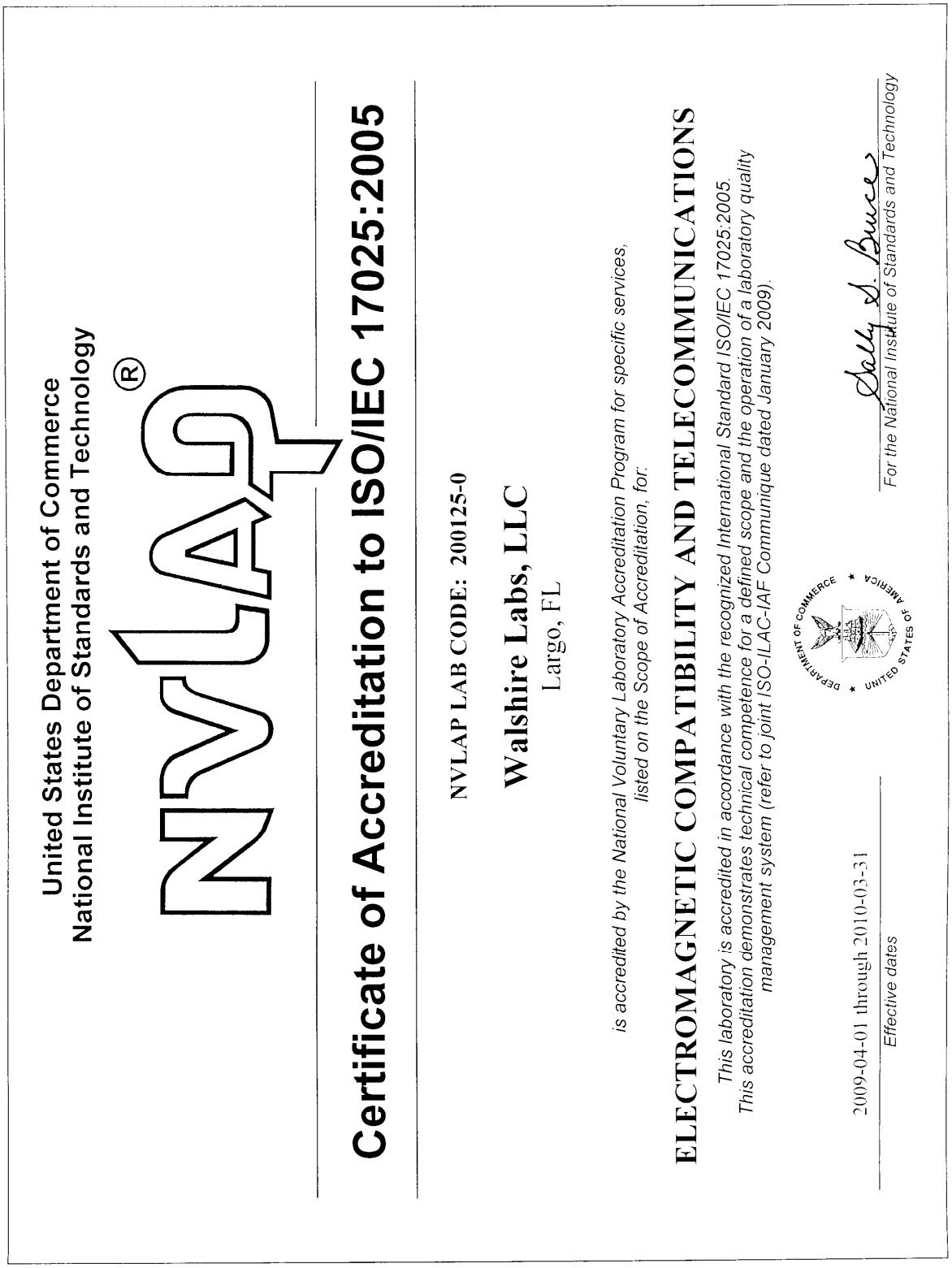
Figure 10.1-1 – Sample Label

10.2 Instruction Manual Statement

The instruction manual must contain the following statements:

- Changes or modifications not expressly approved by the responsible party could void the user's authority to operate the equipment.
- This device may only be used with the approved antennas that are shipped with the unit and installed by the manufacturer. The use of any other antennas will invalidate the unit's FCC Part 15 certification.
- To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication. Operating the device with the supplied, internal antenna will ensure that this requirement is met.
- Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

ANNEX A NVLAP CERTIFICATE of ACCREDITATION



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200125-0

Walshire Labs, LLC
Largo, FL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2009-04-01 through 2010-03-31
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

ANNEX B NVLAP SCOPE of ACCREDITATION

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Walshire Labs, LLC
8545 126th Ave N.
Largo, FL 33773
Mr. Peter Walsh, NCE
Phone: 727-530-8637 Fax:
E-Mail: peter_walsh@walshirelabs.com
URL: http://www.walshirelabs.com

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS **NVLAP LAB CODE 200125-0**

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/CIS22c1	IEC/CISPR 22, Edition 5 (2005) and EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c3	IEC/CISPR 22, Edition 5 (2005) + A1(2005): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c4	EN 55022 (1998) + A1(2000) + A2(2003): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/FCC15b	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators

2009-04-01 through 2010-03-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

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NVLAP-01S (REV. 2005-05-19)

National Voluntary Laboratory Accreditation Program

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200125-0

NVLAP Code	*Designation / Description*
12/FCC15c	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart C: Intentional Radiators
12/T51a	AS/NZS CISPR 22 (2004): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/VCCIb	Agreement of VCCI V-3 (2006.04): Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2006.04
12/VCCIc	Agreement of VCCI V-3 (2007.04): Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2007.04
12/VCCId	Agreement of VCCI V-3 (2008.04): Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2008.04

Radio Test Methods

12/BETS7a	Document AT-34-04-RT: Testing Procedures for Type Approval testing per BETS-7, Issue 1 (November 1, 1996)

Telecommunications Test Methods:

12/CS03a	Industry Canada CS-03, Issue 9, Amendment 1 (2005): Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility
12/T01	Terminal Equipment Network Protection Standards, FCC/ACTA Method - 47 CFR Part 68 - Analog and Digital
12/T01a	68.302 (Par. c,d,e,f) Environmental simulation; 68.304 Leakage current limit.; 68.306 Hazardous voltage limit.; 68.308 Signal power limit.; 68.310 Longitudinal balance limit.; 68.312 On-hook impedance limit.; 68.314 Billing protection
12/T01b	68.316 and 68.317 Hearing Aid Compatibility: technical standards

2009-04-01 through 2010-03-31
Effective dates

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200125-0

NVLAP Code	*Designation / Description*
12/T01c	68.302 Environmental simulation (Par. a,b)
12/TIA1096	ANSI/TIA-1096 (2006-08): Telephone Terminal Equipment Connector Requirements for Connection of Terminal Equipment to the Telephone Network
12/TIA968	ANSI/TIA-968-A (2003): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network
12/TIA968a	ANSI/TIA-968-A-1 (2003): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 1
12/TIA968b	ANSI/TIA-968-A-2 (2004): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 2
12/TIA968c	ANSI/TIA-968-A-3 (2005): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 3
12/TIA968d	ANSI/TIA-968-A-4 (2006-11): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 4
12/TIA968e	ANSI/TIA-968-A-5 (2007-07): Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 5

2009-04-01 through 2010-03-31

Effective dates

Sally S. Bruce

For the National Institute of Standards and Technology

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ANNEX C DISCLOSURE STATEMENT

Walshire Labs, LLC represents to the client that testing was done in accordance with standard procedures as applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy. Walshire Labs Inc. test reports only apply to the specific sample(s) tested. This report is the property of the client. This report shall not be reproduced except in full without the expressed written approval of Walshire Labs, LLC.

TERMS and CONDITIONS

ARTICLE 1 *- Services, Walshire Labs will:*

1.1 Act for Client in a professional manner, using the degree of care and skill ordinarily exercised by and consistent with the standards of the profession.

1.2 Provide only those services that lie within the technical and professional area of expertise and capability of the Lab.

1.3 Perform all technical services in accordance with accepted laboratory test principles and practices.

1.4 Use test equipment which has been calibrated within a period not exceeding the manufacturer's recommendation and which is traceable to the NIST.

1.6 Consider all reports to be the confidential property of the client, and distribute reports only to those persons designated by the client.

ARTICLE 2 *- Client's Responsibilities, The Client will:*

2.1 Provide all information necessary for proper performance of technical services.

2.2 Designate a person who is authorized to transmit instructions, receive information and test data reports, interpret and define Client's policies, and make decisions regarding technical services, as may be required at Clients expense.

2.3 Deliver without cost, representative samples of product for technical evaluation, together with any relevant data.

2.4 Furnish such labor and equipment necessary to handle sample product and to facilitate the technical evaluation.

2.5 The Client shall provide prior to the start of evaluation testing a signed Purchase Order for the amount agreed to by both parties.

ARTICLE 3 *- General Requirements.*

3.1 The only warranty made by Walshire Labs, in connection with services performed thereunder is that it will use that degree of care and skill as stated in Article 1.1 and 1.3 above. No other warranty, expressed or implied, is made or intended for services provided thereunder.

3.2 Walshire Labs shall supply technical services and prepare reports based solely on product samples submitted. The Client understands that application of the data to other devices is highly speculative and should be applied with extreme caution.

3.3 Walshire Labs agrees to exercise ordinary care in receiving, preserving, and shipping any test sample to be tested, but assumes no responsibility for damages, either direct or consequential, which arise or are alleged to arise from loss, damage or destruction of the sample due to the act of examination, modification or testing, or technical analysis, or circumstances beyond our control.

3.4 The Client recognizes that generally accepted error variances apply and agrees to consider such error variances in its use of test data.

3.5 It is agreed between Walshire Labs and Client that no distribution of any test reports, etc. shall be made to any third party without the prior written consent of both parties.

3.6 Test Reports may not be used by the Client to claim product endorsement by NVLAP or any agency of the U.S. Government.

ARTICLE 4 *- Payment.*

4.1 The Client agrees to pay for services and expenses as covered in the Purchase Order or modified by Article 2.2. Walshire Labs will present an invoice at the completion of work and will be paid within 15 days of receipt by Client.