Nemko USA, Inc.
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Certification Test Report

In Accordance With:	FCC Part 15 Subpart C, 15.231 RSS-210 Issue 8, December 2010
Applicant:	Directed, Inc. 1 Viper Way Vista, CA 92081
Equipment Under Test (EUT): Model:	One Button 2-way ASK remote 7213A
FCC ID: IC:	EZSDEI7213 1513A-7213
Tested By:	Nemko USA Inc. 2210 Faraday Avenue, Suite 150 Carlsbad, CA 92008
Test Report Number: Date: Project Number NEX Number	2012 08212548 FCCTR August 07, 2012 10223091 212548
Total Number of Pages:	25

Applicant Affirmation

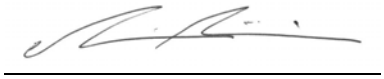
Minas Minassian representing Directed, Inc. hereby affirms:

a) That he/she has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;

b) That the device in this test report will be representative of production units;

c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.

d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

Minas Minassian	
Printed name of official	Signature of official
1 Viper Way	August 07, 2012
Address	Date
760-598-6200 ext.1231	minas.minassian@directed.com
Telephone number	Email address of official

NOTE—This affirmation must be signed by the responsible party before it is submitted to a regulatory body for approval.

Section 1. Summary of Test Results

1.1 General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	One Button 2-way ASK remote
Model:	7213A
Specification:	FCC Part 15 Subpart C, 15.231 RSS-210 Issue 8, December 2010
Date Received in Laboratory:	July 05, 2012
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

1.2 Report Release History

REVISION	DATE	COMMENTS
-	August 07, 2012	Prepared By: Andreas Gillmeier
-	August 07, 2012	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Andreas Gillmeier, Sr. EMC/Wireless Engineer

Alan Laudani, EMC/RF Test Engineer

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Section 2: Equipment Under Test

2.1 Theory of Operation

The 7213a is a One Button 2-way ASK remote. Its function is to remotely Start/Alarm the Vehicle. It has a build-in receiver to get confirmation from the car that the Starter/Alarm was successful. The EUT was exercised by transmitting on 433.92 MHz.

Highest frequency generated or used: 434 MHz

2.2 Technical Specifications of the EUT

Manufacturer:	Directed, Inc.
Operating Frequency:	433.9 MHz
Measured Power:	72.9 dBuV/m @ 3m
Modulation:	ASK
Antenna Data:	Helical antenna
Antenna Connector:	NONE
Power Source:	(2) 3.3V battery (CR2032) for 6 V

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231
Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.

RSS-210 Issue 8 December 2010
Annex 1 - Momentarily Operated Devices and Remote Control

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.

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	22 - 24 ^{o}C
Humidity range	:	52 - 57 %
Pressure range	:	100.4 - 100.9 kPa
Power supply range	:	+/- 5% of rated voltages

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
E1018	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	835363/0003	2/23/2012	2/23/2013
110	Antenna, LPA	Electrometrics	LPA-25	1217	4/1/2011	4/1/2013
128	Antenna, Bicon	EMCO	3104	2882	3/21/2011	3/21/2013
E1029	Preamplifier (20MHz to 18GHz)	A.H. Systems, Inc.	PAM-0118	343	2/21/2012	2/21/2013
752	Antenna, DRG Horn, .7-18GHz	EMCO	3115	4943	12/2/2010	12/2/2012
901	Preamplifier	Sonoma	310 N	130607	10/27/2011	10/27/2012
911	Spectrum Analyzer	Agilent	E4440A	US41421266	10/27/2011	10/27/2012

FCC Test Site US5058/IC Test Site 2040B-3

Section 4: Observations

4.1 Modifications Performed During Assessment

Adjustment of bias current for LNA to reduce spurious emissions of the receiver.

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Tests Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.

Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results.
RSS-210 Issue 8 December 2010
RSS-Gen Issue 3 December 2010

The column headed “Required” indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these tests.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 Test Results

Part 15	RSS	Test Description	Required	Result
15.231 (b)	A1.1.2	Field Strengths and Frequency Bands	Y	Pass
15.231 (e)	A1.1.5	Reduced Field Strengths	N	NA
15.215(c) 15.231(c)	A1.1.3	Occupied Bandwidth/ 99% Bandwidth	Y	Pass
15.231 (a)	A1.1 Table A RSS-Gen 7.2.2	Types of Momentary Signals	Y	Pass
15.231 (d)	A1.1.4	Frequency Stability	N	NA**
15.231 (b)	A1.1.2	Spurious Emissions	Y	Pass
15.231 (e)	A1.1.5	Spurious Emissions (reduced field strengths)	N	NA
15.207 (a)	RSS-Gen 7.2.4	Power line Conducted Emissions	N	NA*
15.107 (a)	RSS-Gen 7.2.4	Receiver Spurious Conducted Emissions	N	NA***
15.109 (a)	RSS-Gen 6.1	Receiver Spurious Radiated Emissions	N	Pass*

* Battery Powered
** Not transmitting in band requiring Frequency Stability
*** No antenna connector, integral antenna only

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Appendix A: Test Results

Conducted Emissions

Not applicable as EUT is battery powered.

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Occupied Bandwidth

A1.1. The 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

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.

15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sec. Sec. 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

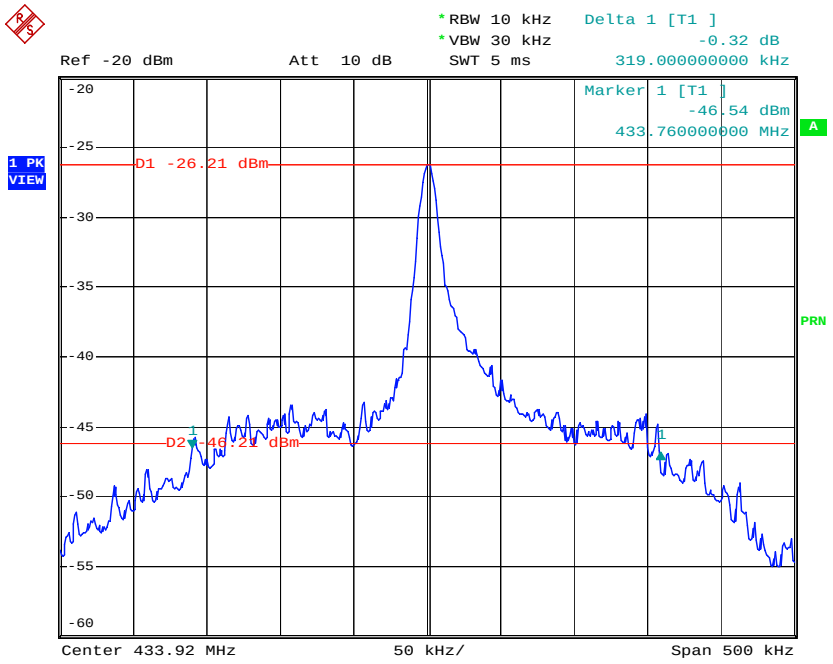
Test Conditions:

Client	Directed, Inc.	Temperature	22	°C
NEX #	212548	Relative Humidity	52	%
EUT Name	One Button 2-way ASK remote			
EUT Model	7213A	Test Location	Hallway	
Governing Doc	CFR 47, Part 15C	Test Engineer	Andreas Gillmeier	
Basic Standard	Sec. 15.231 Transmit	Date of test	07/05/2012	

Test Results:
Measured Occupied Bandwidth: 319.0 kHz
Measured 99% Bandwidth = 420.0 kHz

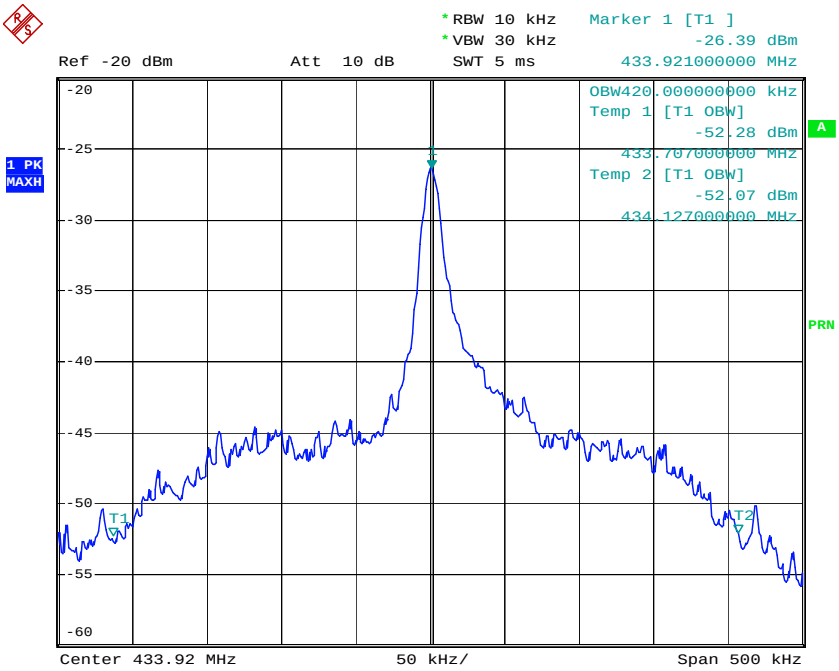
Plots

20 dB bandwidth:



Date: 5.JUL.2012 15:02:19

99% bandwidth:



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Frequency Stability

The EUT does not transmit within the 40.66—40.70 MHz band, therefore this test is not applicable.

Types of Momentary Signals

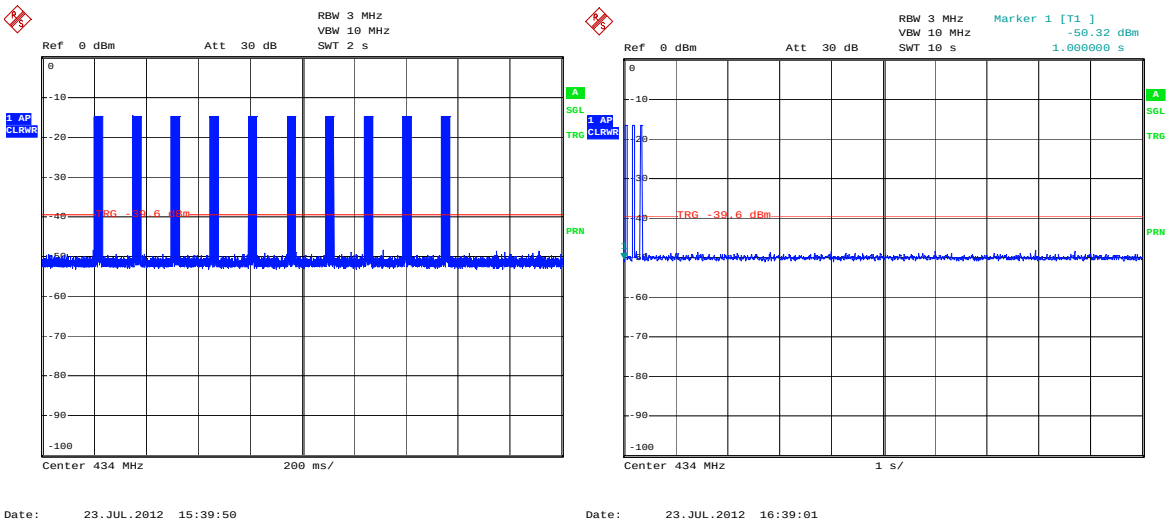
RSS A1.1.1(a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all transmission times. When released, the transmitter shall cease transmission (holdover time of up to 5 seconds is permitted).

15.231(a)(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation

15.231(e) 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

Client	Directed, Inc.	Temperature	24	°C
NEX #	212548	Relative Humidity	45	%
EUT Name	One Button 2-way ASK remote			
EUT Model	7213A	Test Location	Ground Plane 3	
Governing Doc	CFR 47, Part 15C	Test Engineer	Andreas Gillmeier	
Basic Standard	Sec. 15.231 Transmit	Date of test	7/23/2012	

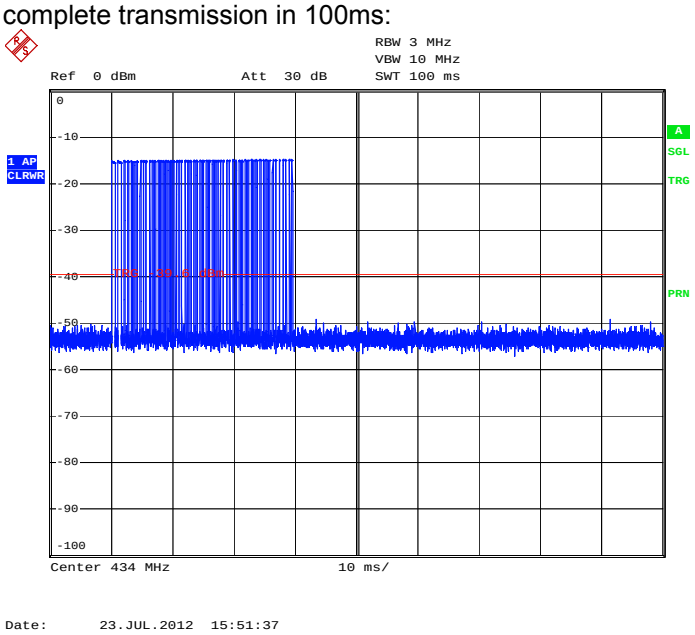
Once the button is pressed it transmits 10 bursts within about 1400ms (7 x 200ms) of which each lasts about 30ms and then ceases transmission:



This second plot shows no transmissions after initial burst, it caught the last three bursts.

Duty Cycle

This plot shows one complete transmission in 100ms:



In one 30.2 ms pulse train is the following amounts of burst

Duration	Number	total time
0.103 ms	1	0.103 ms
0.129 ms	15	1.931 ms
0.155 ms	38	5.871 ms
0.180 ms	4	0.721 ms
0.515 ms	2	1.030 ms
	---	---
	60	9.656 ms

Duty cycle factor = 20 x log(on /100 ms)

= 20 x log(9.656ms/100ms)
= -20.3 dB ----→ maximum permissible duty cycle correction (-20 dB) applied.

Field Strength and Radiated Spurious Emissions

RSS210 Annex 1

A1.1.2 (1) The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in Table A.

Fundamental Frequency (MHz), excluding restricted band frequencies of Table 1	Field Strength of Fundamental (Note 1) microvolts/m at 3 metres, (watts, e.i.r.p.)	Field Strength of Unwanted Emissions (Note 1) microvolts/m at 3 metres
40.66-40.70	See Section A2.7	
70-130	1,250 (470 nW)	125
130-174	1,250 to 3,750*	125 to 375
174-260 (Note 2)	3,750 (4.2 µW)	375
260-470 (Note 2)	3,750 to 12,500*	375 to 1,250
Above 470	12,500 (47 µW)	1,250

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]1,250 to 3,750	[1]125 to 375
174–260	3,750	375
260–470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

At 434 MHz this interpolates to 11000 microVolts/m or 80.8 dBuV/m at 3m
Unwanted emissions 60.8 or FCC15.209/RSS Table 2, whatever is higher.

Client	Directed, Inc.	Temperature	21	°C
NEX #	212548	Relative Humidity	49	%
EUT Name	One Button 2-way ASK remote			
EUT Model	7213A	Test Location	10 m Chamber	
Governing Doc	CFR 47, Part 15C	Test Engineer	Andreas Gillmeier	
Basic Standard	Sec. 15.231 Transmit	Date of test	June 20, 2012	

Test Results:

See Table. EUT complies for fundamental power and spurious emissions.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic (4350 MHz).

These results apply to emissions that may be found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was investigated with a fresh battery. The emissions were measured with a test mode to repeat the emission so measurements could be maximized for the rotation of the sample and height and polarity of the measurement antenna.

All Measurements below 1GHz were performed at 3m employing a CISPR quasi-peak detector, except for the radio's fundamental. Peak measurements above 1GHz were done utilizing RBW of 1MHz and VBW of 3MHz. Average measurements above 1GHz were done peak + duty cycle factor.

Measurements made at the 3 meter distance of the 10m Semi-anechoic chamber, all measurements max hold after peaking for EUT rotation and antenna height from 1 to 4 meters.

Fundamental power was measured at 1 MHz RBW, 3 MHz VBW to ensure capture of entire emissions envelope. Average reading of Fundamental power therefore was peak + duty cycle factor.

No other emissions found within 20 dB of the limits.

Emissions were measured on a 80cm (height) table

Since the EUT has no defined use position: emissions were measured at x, y and z EUT configurations.

Note: Corrected Reading Computations
Average = Peak Maximum Meter Reading + Antenna Factor + Path Loss + DUTY CYCLE FACTOR
72.9 = 72.3 + 16.6 + 4.0 –20.0

EUT passes
Limit paragraph 231(a) = 11000 uV/m
Corrected Average Reading = 72.9 dBuV/m
$10^{(72.3/20)}$ = 4416 uV/m

Radiated Emissions Data

Job # :	10227455	Date :	July 5, 2012	Page 1 of 1	
NEX#:	212548	Time :			
		Staff :	AG		
Client Name :	Directed			EUT Voltage :	3V batt
EUT Name :	One Button 2-way ASK remote			EUT Frequency :	N/A
EUT Model # :	7213a			Phase:	N/A
EUT Serial # :	N/A				
EUT Config. :	transmit in test mode				
				Distance < 1000 MHz:	3 m
				Distance > 1000 MHz:	3 m
Specification :	FCC Part 15.231				
Loop Ant. #:	NA				
Bicon Ant.#:	128_3m	Temp. (°C) :	22		
Log Ant.#:	110_3m	Humidity (%) :	52		
DRG Ant. #	752	Spec Analyzer #:	911		
Cable LF#:	SAC_10m	Analyzer Display #:	911		
Cable HF#:	WCC	Quasi-Peak Detector #:	911		
Preamp LF#:	901	**Duty Cycle (%):**	9.66		
Preamp HF#	_E1029				

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average = Peak + Duty Cycle Factor	
DCF = 20 x log(duty cyle)	

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side DEG	Ant. Height cm	Max. Reading (dBµV)	Corrected Reading (dBµV)	Spec. limit (dBµV)	CR/SL Diff. (dB)	Pass Fail	Comment
433.9	58.2	72.3	P	196.0	100.0	72.3	92.9	100.8	-7.9	Pass	flat on table (LED on right)
433.9	58.2	72.3	A	196.0	100.0	72.3	72.9	80.8	-7.9	Pass	flat on table (LED on right)
433.9	66.1	70.1	P	157.0	100.0	70.1	90.7	100.8	-10.1	Pass	up on long edge (LED right)
433.9	66.1	70.1	A	157.0	100.0	70.1	70.7	80.8	-10.1	Pass	up on long edge (LED right)
433.9	67.3	65.2	P	305.0	110.0	67.3	87.9	100.8	-12.9	Pass	up on short edge (LED up)
433.9	67.3	65.2	A	305.0	110.0	67.3	67.9	80.8	-12.9	Pass	up on short edge (LED up)
867.9		58.2	P	17.0	100.0	58.2	54.7	80.8	-26.1	Pass	flat on table (LED on right)
867.9		54.0	Q	17.0	100.0	54.0	50.5	60.8	-10.3	Pass	flat on table (LED on right)
867.9		58.2	A	17.0	100.0	58.2	34.7	60.8	-26.1	Pass	flat on table (LED on right)
867.9		54.5	P	346.0	100.0	54.5	51.0	80.8	-29.8	Pass	up on long edge (LED right)
867.9		39.8	Q	346.0	100.0	39.8	36.3	60.8	-24.5	Pass	up on long edge (LED right)
867.9		54.5	A	346.0	100.0	54.5	31.0	60.8	-29.8	Pass	up on long edge (LED right)
451.4	46.5	52.6	P	172.0	100.0	52.6	41.2	80.8	-39.6	Pass	up on long edge (LED right)
451.4	33.5	47.5	Q	172.0	100.0	47.5	36.1	60.8	-24.7	Pass	up on long edge (LED right)
451.4	46.5	52.6	A	172.0	100.0	52.6	21.2	60.8	-39.6	Pass	up on long edge (LED right)
451.4		55.2	P	190.0	95.0	55.2	43.8	80.8	-37.0	Pass	flat on table (LED on right)
451.4		39.4	Q	190.0	95.0	39.4	28.0	60.8	-32.8	Pass	flat on table (LED on right)
451.4		55.2	A	190.0	95.0	55.2	23.8	60.8	-37.0	Pass	flat on table (LED on right)
1302.0	47.9	54.3	P	90.0	114.0	54.3	40.6	74.0	-33.4	Pass	flat on table (LED on right)
1302.0	47.9	54.3	A	90.0	114.0	54.3	20.6	54.0	-33.4	Pass	flat on table (LED on right)
1756.0	59.4	68.4	P	154.0	100.0	68.4	57.8	80.8	-23.0	Pass	flat on table (LED on right)
1756.0	59.4	68.4	A	154.0	100.0	68.4	37.8	60.8	-23.0	Pass	flat on table (LED on right)
2170.0	74.7	81.3	P	309.0	100.0	81.3	73.5	80.8	-7.3	Pass	flat on table (LED on right)
2170.0	74.7	81.3	A	309.0	100.0	81.3	53.5	60.8	-7.3	Pass	flat on table (LED on right)
2603.0	62.0	66.0	P	97.0	100.0	66.0	60.3	80.8	-20.5	Pass	flat on table (LED on right)
2603.0	62.0	66.0	A	97.0	100.0	66.0	40.3	60.8	-20.5	Pass	flat on table (LED on right)
3037.0	53.0	52.2	P	327.0	100.0	53.0	49.3	80.8	-31.5	Pass	flat on table (LED on right)
3037.0	53.0	52.2	A	327.0	100.0	53.0	29.3	60.8	-31.5	Pass	flat on table (LED on right)
3471.0	55.3	57.1	P	311.0	100.0	57.1	53.8	80.8	-27.0	Pass	flat on table (LED on right)
3471.0	55.3	57.1	A	311.0	100.0	57.1	33.8	60.8	-27.0	Pass	flat on table (LED on right)
3905.0	65.9	66.1	P	318.0	100.0	66.1	63.8	74.0	-10.2	Pass	flat on table (LED on right)
3905.0	65.9	66.1	A	318.0	100.0	66.1	43.8	54.0	-10.2	Pass	flat on table (LED on right)
4339.0	48.6	51.4	P	212.0	120.0	51.4	50.7	74.0	-23.3	Pass	flat on table (LED on right)
4339.0	48.6	51.4	A	212.0	120.0	51.4	30.7	54.0	-23.3	Pass	flat on table (LED on right)
2170.0	79.8	79.0	P	83.0	145.0	79.8	72.0	80.8	-8.8	Pass	up on long edge (LED right)
2170.0	79.8	79.0	A	83.0	145.0	79.8	52.0	60.8	-8.8	Pass	up on long edge (LED right)
	AVERAGE = PEAK + DC FACTOR										

Conducted Emissions Test Data—Receive Mode

EUT does not have need for AC power as it is battery powered.

Radiated Emissions Test Data—Receive Mode

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Table 1 - Spurious Emission Limits for Receivers

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Client	Directed, Inc.	Temperature	24	°C
Pan #	212548	Relative Humidity	57	%
EUT Name	One Button 2-way ASK remote			
EUT Model	7213A	Test Location	10 m Chamber	
Governing Doc	CFR 47, Part 15B	Test Engineer	Andreas Gillmeier	
Basic Standard	Sec. 15.207 Class “A or B”	Date of test	08/03/2012	

No emissions noted within 20 dB of the limit in the range of 30 to 2500 MHz.
No emissions evident while in standby mode.

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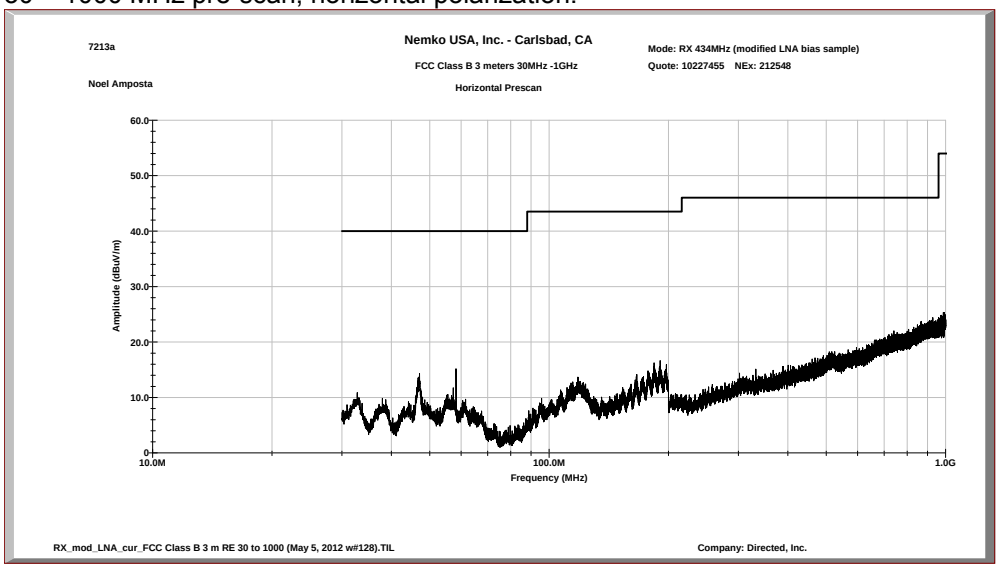
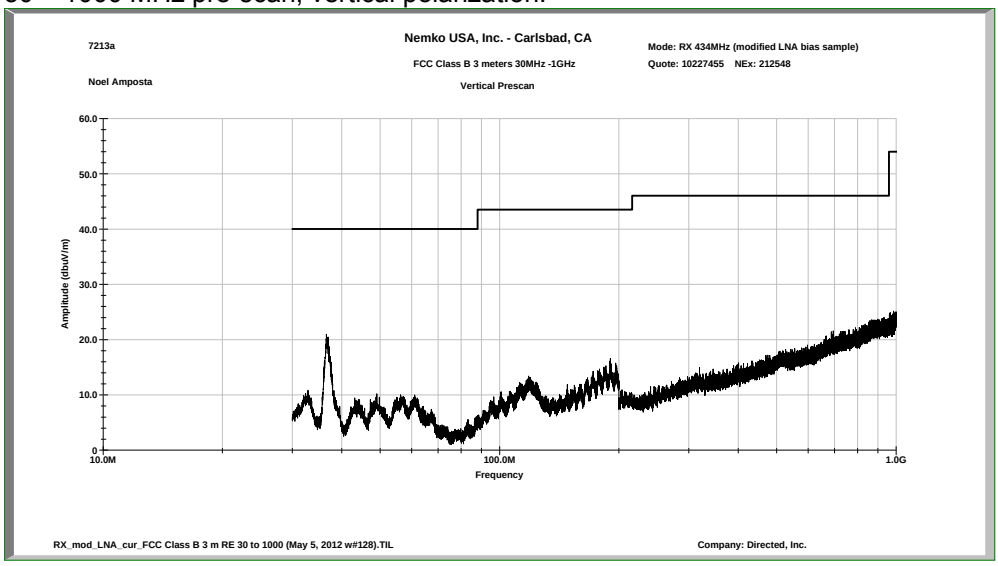
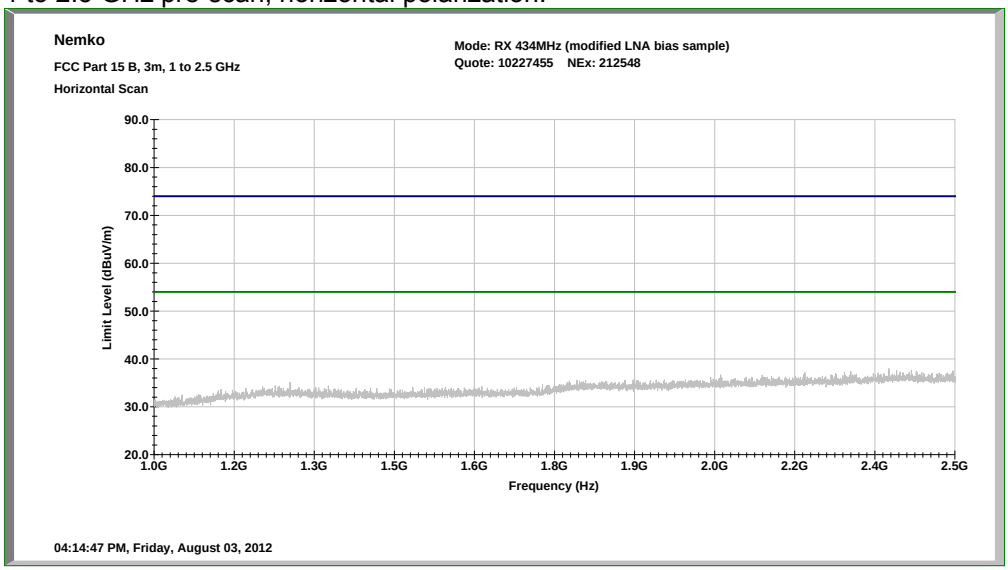
30 – 1000 MHz pre-scan, horizontal polarization:



30 – 1000 MHz pre-scan, vertical polarization:



1 to 2.5 GHz pre-scan, horizontal polarization:



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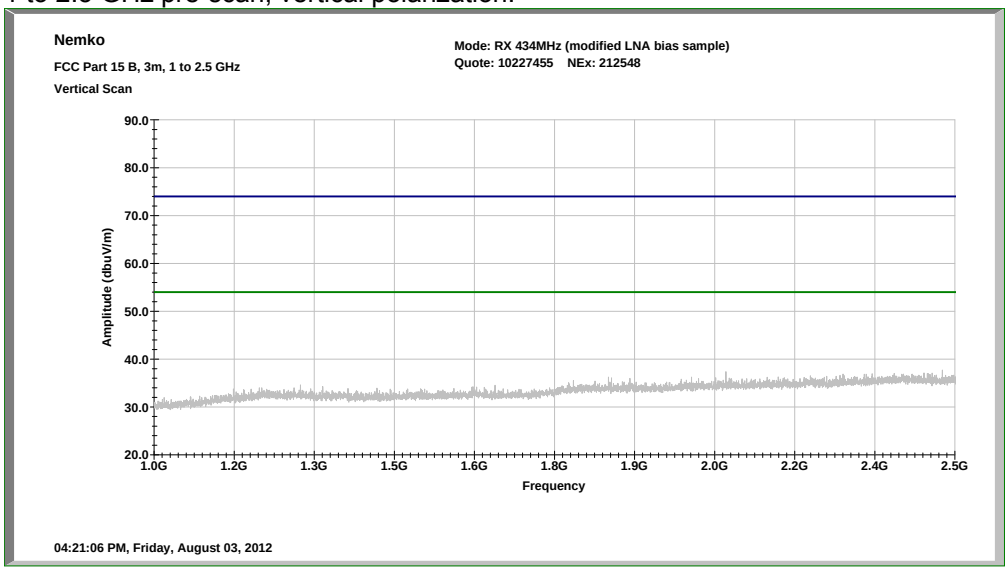

APPENDIX B

B. Radiated Emissions Measurement Uncertainties

1. Introduction

ISO/IEC 17025:2005 and ANSI/NCSL Z540.3: 2006 require that all measurements contained in a test report be “traceable”. “Traceability” is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: “the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*”.

The purposes of this Appendix are to “state the *Measurement Uncertainties*” of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

Radiated Emissions Measurement Detection Systems	Applicable Frequency Range	"U” for a k=2 Coverage Factor
Spectrum Analyzer with QPA & Preamplifier	30 MHz - 200 MHz	+3.9 dB, -4.0 dB
Spectrum Analyzer with QPA & Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
Spectrum Analyzer with Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
Spectrum Analyzer with Preamplifier	18 GHz - 40 GHz	+/- 3.4 dB

NOTES:
1. Applies to 3 and 10 meter measurement distances
2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate)
3. Excludes the Repeatability of the EUT

3. Practical Explanation of the Meaning of Radiated Emissions Measurement Uncertainties

In general, a "Statement of Measurement Uncertainty" means that with a certain (specified) confidence level, the "true" value of a measurand will be between a (stated) upper bound and a (stated) lower bound.

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ANSI Z540.2 (2002) Guide to the Expression of Uncertainty in Measurement*
- NIS 81:1994, *The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- NIST Technical Note 1297(1994), *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an "exNEXded uncertainty", U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

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APPENDIX C

C. Nemko USA, Inc. Test Equipment & Facilities Calibration Program

Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540.3: 2006, ISO 10012:2003, ISO/IEC 17025:2005, and ISO-9000: 2000. Nemko USA, Inc.'s calibrations program therefore meets or exceeds the US national commercial and military requirements [N.B. ANSI/NCSL Z540.1-1994 replaced MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceabilty to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a "calibration sticker" on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or A2LA) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16-1(2003) or ANSI C63.5-2004, including the "Three-Antenna Method". Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or A2LA) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA's Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Sub clause 16.6 and Annex G.2 of CISPR 16-1 (2003), and, ANSI C63.4-2003 when performing the normalized site attenuation measurements.