



Nemko Test Report: 4929RUS1

Applicant: Axiom Manufacturing
2841 Industrial Lane
Garland, TX 75041

Equipment Under Test: AXM042201 (315MHZ)
(E.U.T.)

In Accordance With: **FCC Part 15, Subpart C**
For Low Power Transmitters Operating Periodically
In The Band 40.66 - 40.77 MHz And Above 70 MHz

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, TX 75057-3136

TESTED BY: _____ **DATE:** 13 August 2007
David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** 3 October 2007
Mike Cantwell, Frontline Manager

Total Number of Pages: 20

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Section 1. Summary of Test Results

Manufacturer: Axiom Manufacturing

Model No.: AXM042201 (315MHZ)

Serial No: None

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, Paragraph 15.231. All tests were conducted using measurement procedure 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.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".



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This report applies only to the items tested.

Summary Of Test Data

Name of Test	Paragraph No.	Results
Transmission Requirements	15.231(a)	Complies
Radiated Emissions	15.231(b)	Complies
Occupied Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	NA
Alternate Field Strength Requirements	15.231(e)	Complies
Powerline Conducted Emissions	15.207	NA

Footnotes:

The device operates above 40.70 MHz

The device is battery powered.

Nemko USA, Inc.

FCC PART 15, SUBPART C

PERIODICALLY OPERATED LOW POWER TRANSMITTERS

EQUIPMENT: AXM042201 (315MHZ)

PROJECT NO.:

4929RUS1

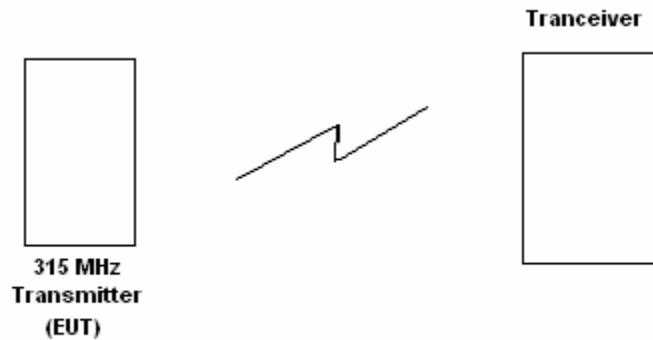
Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range:	315 MHz fixed
Operating Frequency(ies) of Sample:	315 MHz
Type of Emission:	FSK
Supply Power Requirement:	3 Vdc
Duty Cycle Correction Factor:	None

Description of E.U.T.

Tire Pressure sensor and transmitter with integrated antenna. Module designed for small size and battery power, to fit in car wheel assembly. Application is for evaluation of automotive safety system.



Section 3. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: David Light	DATE: 7/31/07

Minimum Standard: 15.231(a) Continuous transmissions such as voice, video or data transmissions are not permitted.

15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds after being released.

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

15.231(a)(3) Periodic transmissions at regular pre-determined intervals are not permitted. However polling or supervisory transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

15.231(a)(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.

Test Results: [Complies.](#)

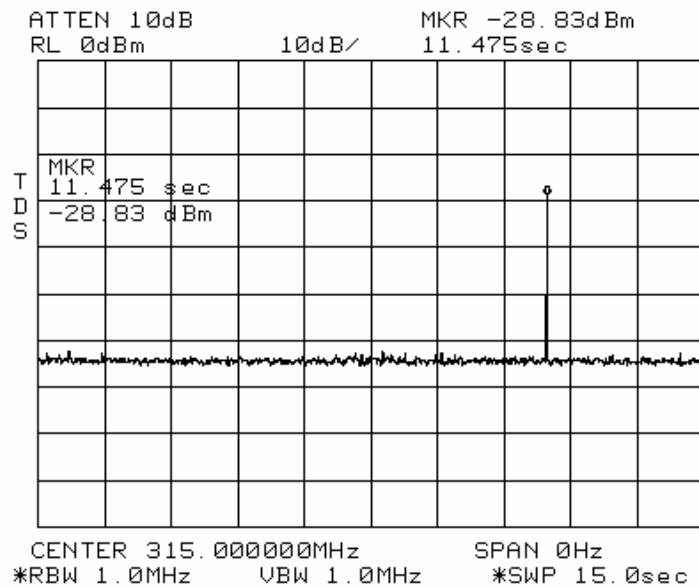
Test Data: [Compliance was determined by verification of technical specifications and a functional test on the equipment.](#)

[Refer to plots on page 8](#)

Rationale for Compliance with Transmission Requirements

15.231(a)(1)	<input type="checkbox"/> Manual activation	TX deactivation time:
15.231(a)(2) :	<input checked="" type="checkbox"/> Automatic activation	
15.231(a)(3) :	<input checked="" type="checkbox"/> Regular, predetermined transmissions <input type="checkbox"/> Polling or supervisory transmissions	TX rate and duration:
15.231(a)(4) :	<input type="checkbox"/> Alarm device operating during the pendency of alarm condition <input checked="" type="checkbox"/> Non-alarm device	

Deactivation time less than one second.



Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: David Light	DATE: 7/31/07

Minimum Standard:

Permissible Field Strength Limits (Momentarily Operated Devices)

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters
40.66 - 40.70	1000	100
70-130	500	500
130-174	500-1500	50-150
174-260 (note 1)	1500	150
260-470 (note 1)	1500-5000	150-500
Above 470	5000	500

Notes:

# Use quasi-peak or averaging meter.	For 130 - 174 MHz: $FS \text{ (microvolts/m)} = (22.73 \times F) - 2454.5$
* Linear interpolation with frequency F in MHz	For 260 - 470 MHz: $FS \text{ (microvolts/m)} = (16.7 \times F) - 2833.3$

Any emissions that fall within the restricted bands of 15.205 shall not exceed the following limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m} @ 3\text{m}$)	Field Strength ($\text{dB}\mu\text{V/m} @ 3\text{m}$)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results: Complies. The worst-case emission level is 67.6 $\text{dB}\mu\text{V/m} @ 3\text{m}$ at 315 MHz. This is 0.1 dB below the specification limit.

Test Data: See attached table(s).

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 1 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.

Test Data - Radiated Emissions

Radiated Emissions Data												
Complete	<input checked="" type="checkbox"/>					Job #:	4929	Test #:	REHE-01			
Preliminary						Page	1	of	1			
Client Name :	Axiom Manufacturing											
EUT Name :	EVB315MXPY8300											
EUT Model # :	EVB315MXPY8301											
EUT Part # :	AXM0422-01											
EUT Serial # :	None											
EUT Config. :	Tx continuous											
Specification :	15.231 / 15.205						Reference :	CFR 47				
Rod. Ant. #:		Temp. (deg. C) :	23				Date :	07/31/07				
Bicon Ant. #:	760	Humidity (%) :	45				Time :	1:00				
Log Ant. #:	759	EUT Voltage :	3				Staff :	David Light				
Bilog Ant. #:		EUT Frequency :	dc				Photo ID:					
Dipole Ant. #:		Phase:					Peak Bandwidth:	100 KHz				
Cable#:	1514	Location:	B OATS				Video Bandwidth	100 KHz				
Preamp#:	1554	Distance:	3 meters				QP Bandwidth:	120 KHz				
Limiter#:	na	Barometric pressure:	1016									
Atten #:	na											
Detector#:	1659											
Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Unc.	Comment
315	V	0	69.9	17.7	5.0	25.1	67.5	67.7	-0.2	Pass		Carrier
315	H	0	70	17.7	5.0	25.1	67.6	67.7	-0.1	Pass		Carrier
630	V	0	41	19.1	7.4	25.2	42.3	47.7	-5.4	Pass		
630	H	0	39	19.1	7.4	25.2	40.3	47.7	-7.4	Pass		
945	V	0	27.6	23.8	9.2	25.1	35.5	47.7	-12.2	Pass		
945	H	0	34.9	23.8	9.2	25.1	42.8	47.7	-4.9	Pass		
868	V	0	37	21.9	9.0	25.2	42.7	47.7	-5.0	Pass		
868	H	0	33.3	21.9	9.0	25.2	39.0	47.7	-8.7	Pass		

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Spectrum searched from 30 to 1000 MHz.

All readings are peak unless otherwise noted.

Test Data - Radiated Emissions

Freq MHz	Rdng dB μ V	Pre-A dB	Cable Horn dB	Cable dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1260.0	55.2		+0.1	+1.5	+0.0	49.2	54.0	-4.8	Horiz
		-31.2	+23.6						
1575.0	49.0		+0.6	+1.9	+0.0	44.4	54.0	-9.6	Horiz
		-32.1	+25.0						
1890.0	46.7		+0.7	+2.1	+0.0	44.9	54.0	-9.1	Horiz
		-32.3	+27.7						
2205.0	43.3		+0.6	+2.2	+0.0	41.9	54.0	-12.1	Horiz
		-32.9	+28.7						
2520.0	45.8		+0.8	+2.4	+0.0	45.2	54.0	-8.8	Horiz
		-32.8	+29.0						
2835.0	45.7		+0.8	+2.8	+0.0	46.2	54.0	-7.8	Horiz
		-32.6	+29.5						
3150.0	44.7		+0.8	+2.7	+0.0	45.1	54.0	-8.9	Horiz
		-32.9	+29.8						
1260.0	49.8		+0.1	+1.5	+0.0	43.8	54.0	-10.2	Vert
		-31.2	+23.6						
1575.0	52.2		+0.6	+1.9	+0.0	47.6	54.0	-6.4	Vert
		-32.1	+25.0						
1890.0	46.7		+0.7	+2.1	+0.0	44.9	54.0	-9.1	Vert
		-32.3	+27.7						
2205.0	43.7		+0.6	+2.2	+0.0	42.3	54.0	-11.7	Vert
		-32.9	+28.7						
2520.0	45.7		+0.8	+2.4	+0.0	45.1	54.0	-8.9	Vert
		-32.8	+29.0						
2835.0	44.8		+0.8	+2.8	+0.0	45.3	54.0	-8.7	Vert
		-32.6	+29.5						
3150.0	46.2		+0.8	+2.7	+0.0	46.6	54.0	-7.4	Vert
		-32.9	+29.8						

RBW=VBW=1 MHz

All readings are PEAK unless otherwise specified.

Section 5. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: David Light	DATE: 7/31/07

Minimum Standard: 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.

Test Results: [Complies.](#) .

Test Data: See attached graph.

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FCC PART 15, SUBPART C

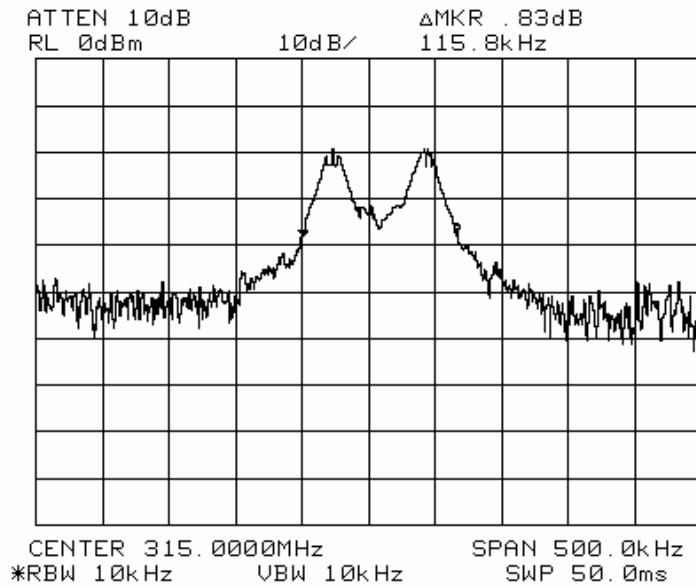
PERIODICALLY OPERATED LOW POWER TRANSMITTERS

EQUIPMENT: AXM042201 (315MHZ)

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Test Data – Occupied Bandwidth



Limit = 0.25% of CF = 787.5 kHz

Section 6. Periodic Alternate Field Strength Requirements

NAME OF TEST: Periodic Alternate Field Strength Requirements	PARA. NO.: 15.231(e)
TESTED BY: David Light	DATE: 7/31/07

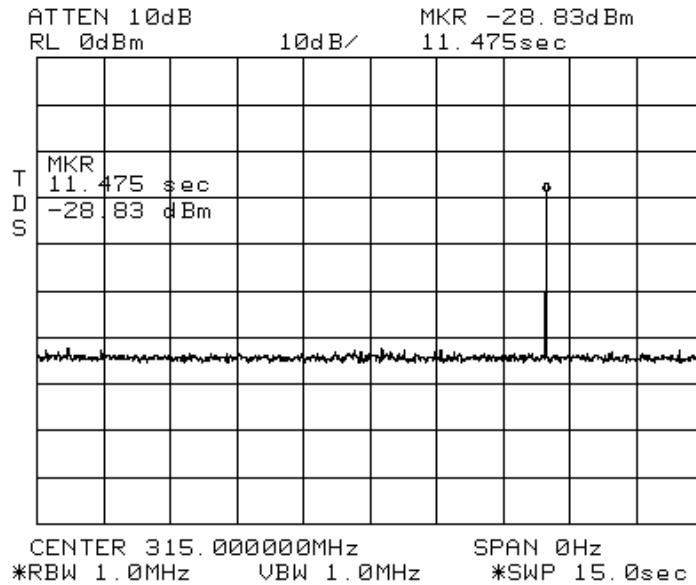
Minimum Standard: 15.231(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following.

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (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

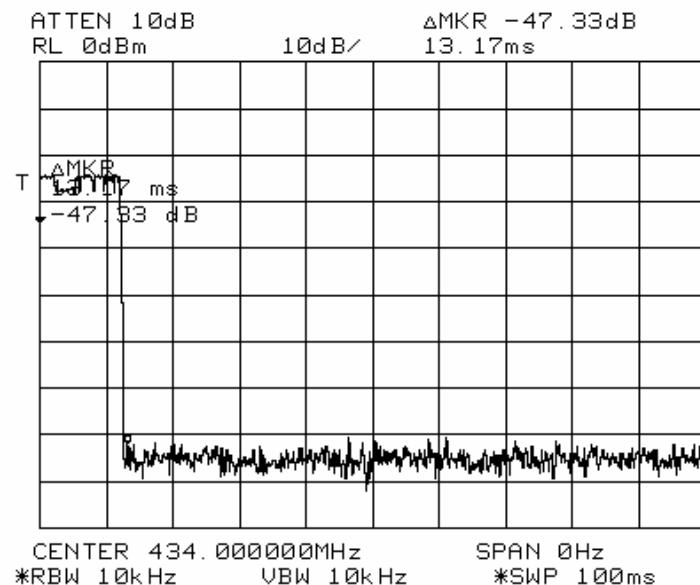
In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of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

Test Results: Complies.

Test Data: See attached plots.

Test Data - Periodic Alternate Field Strength Requirements

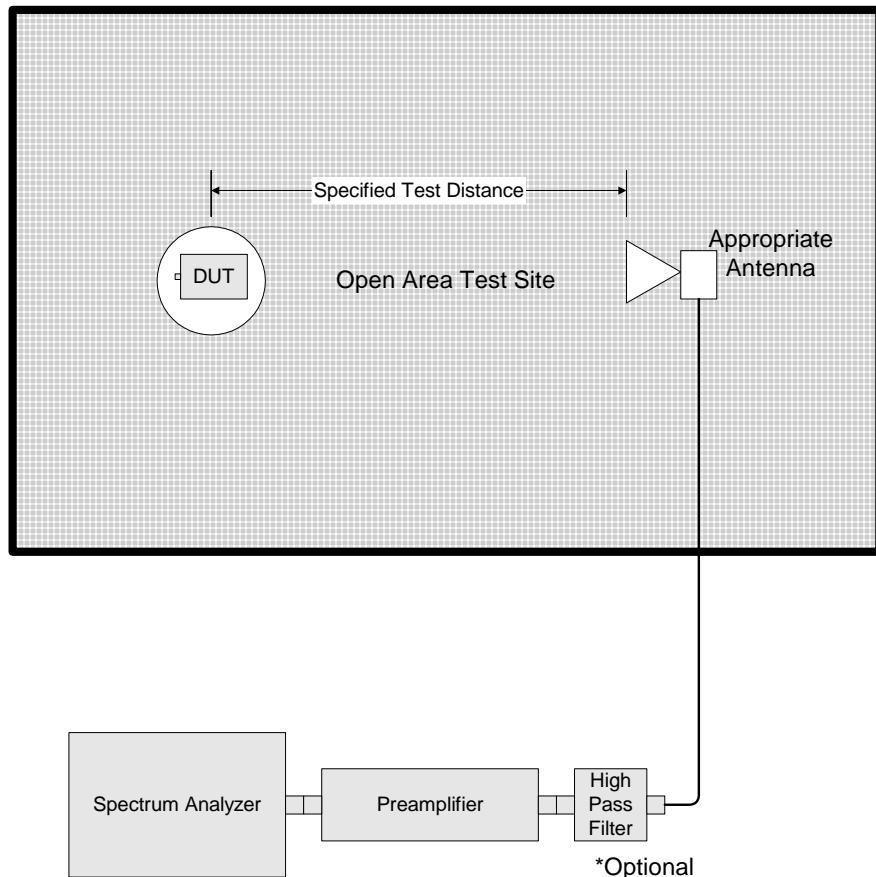
One transmission every 11.475 seconds.



Pulse duration 13.17 ms

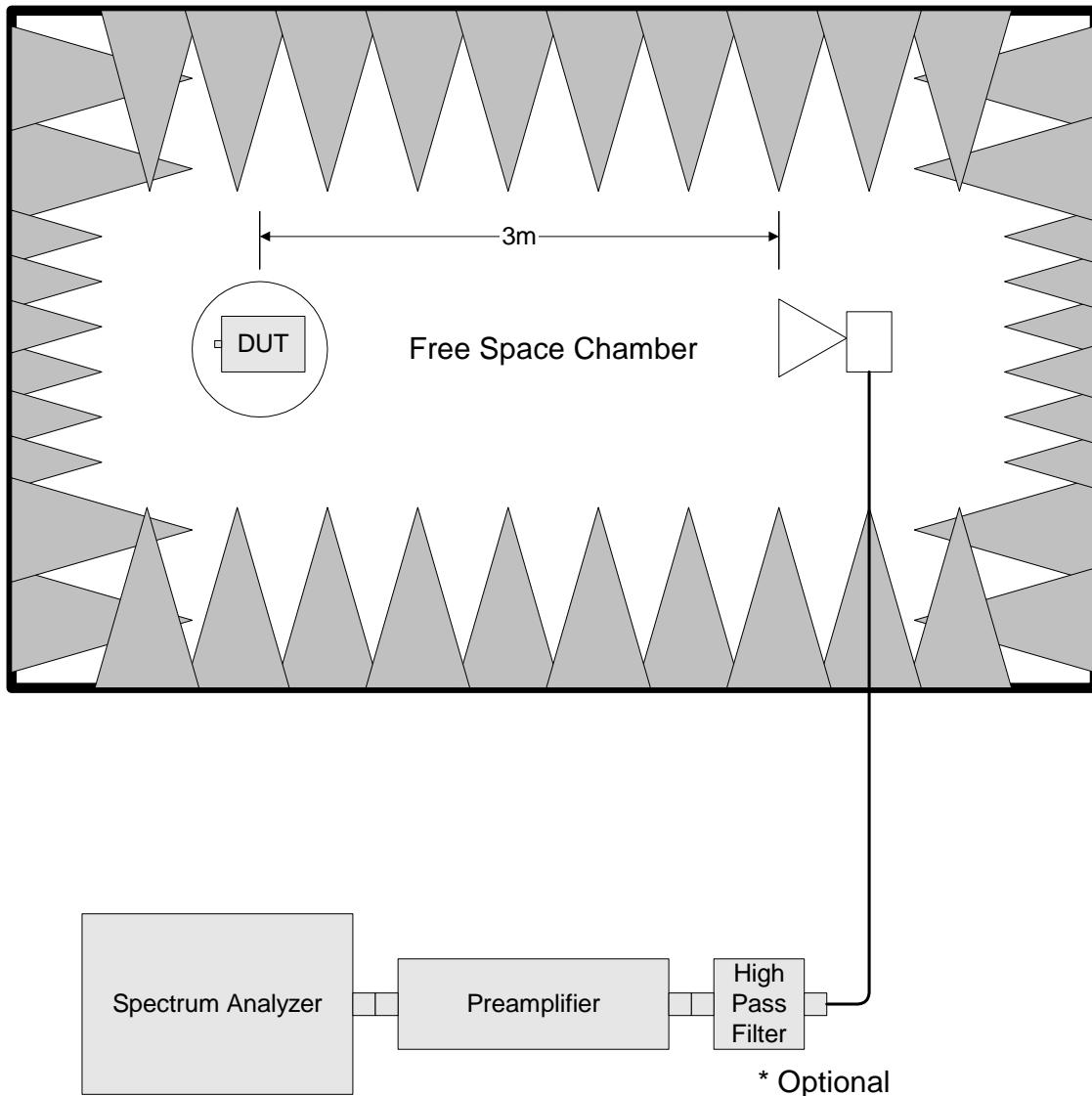
Section 7. Block Diagrams

Outdoor Test Site For Radiated Emissions



Radiated Emissions 30 MHz - 1 GHz

The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.



Nemko USA, Inc.**FCC PART 15, SUBPART C****PERIODICALLY OPERATED LOW POWER TRANSMITTERS****EQUIPMENT: AXM042201 (315MHZ)****PROJECT NO.:****4929RUS1**

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
760	Antenna biconical	Electro Metrics MFC-25	477	01/19/07	01/19/08
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	03/30/07	03/29/08
1514	CABLE ASSY, LAB 2-B OATS	Nemko USA, Inc. SITE B OATS	N/A	06/08/07	06/08/08
1554	Amplifier, RF	RF Consultants LNA-25	0	09/29/06	09/29/07
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
1484	Cable	Storm PR90-010-072	N/A	05/02/07	05/01/08
1485	Cable	Storm PR90-010-216	N/A	05/02/07	05/01/08

Nemko USA, Inc.

FCC PART 15, SUBPART C

PERIODICALLY OPERATED LOW POWER TRANSMITTERS

EQUIPMENT: AXM042201 (315MHZ)

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ANNEX A - RESTRICTED BANDS

Annex A**Restricted Bands of Operation**

(a) Except as shown in paragraph (d) of this section, 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
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	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	2655-2900	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	Above 38.6
13.36 - 13.41			