NEMKO Test Report:	1L0564RUS1
Applicant:	Ryko Manufacturing Company 11600 NW 54th Ave. PO Box 38 Grimes, Iowa 50111
Equipment Under Test: **(E.U.T.)**	24631-000 418 MHz RF Transmitter
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 Dallas, Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 Tom Tidwell, RF Group Manager
Date:	
Total Number of pages:	

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Section 1. Summary of Test Results

Manufacturer: Ryko Manufacturing Company

Model No.: 24631-000

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 C63.4-1992. 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".

NVLAP LAB CODE: 100426-0

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)	Complies
Alternate Field Strength Requirements	15.231(e)	N/A
Powerline Conducted Emissions	15.207	Complies

Footnotes:

The EUT complies with the transmission requirements of 15.231(a), therefore 15.231(e) is not applicable.

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

General Equipment Information

Frequency Range:	418 MHz
Operating Frequency(ies) of Sample:	418 MHz
Type of Emission:	Pulsed
Supply Power Requirement:	3 Volt Lithium battery
Duty Cycle Correction Factor:	-8.6 dB

Description of E.U.T.

The EUT is a simple code transmitter based on an off-the-shelf Encoder/Decoder chip set. The transmitter transmits a unique identifying code.

Modifications Incorporated in E.U.T.

To achieve compliance the following change was made: a T network (Voltage divider) was added at input to antenna to reduce power output of the carrier.

Justification

The E.U.T. was configured for testing as per typical installation.

The following combinations were investigated to establish worst case configuration:

(1) Mounted upright

(2) Lying flat

Exercise Mode

The E.U.T. exercise mode used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise mode:

(1) Continuous transmit

Section 3. Equipment Configuration

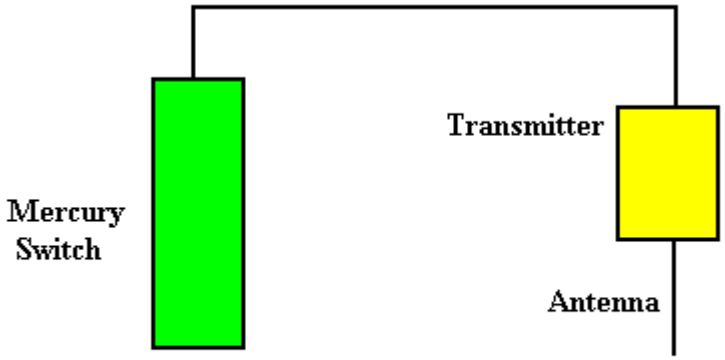
Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Transmitter	24631-000	None	
(B)	Mercury switch	Unknown	None	
(C)				
(D)				
(E)				
(F)				
(G)				

Inter-connection Cables:

There are no detachable cables.

Configuration of the Equipment Under Test (E.U.T)



Section 4. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: David Light	DATE: 1/16/2002

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.

Rationale for Compliance with Transmission Requirements

15.231(a)(1) **15.231(a)(2) :**	☒ Manual activation ☐ Automatic activation	TX deactivation time:
15.231(a)(3) :	☐ Regular, predetermined transmissions ☐ Polling or supervisory transmissions	TX rate and duration:
15.231(a)(4) :	☐ Alarm device operating during the pendancy of alarm condition	
	☐ Non-alarm device	

Test Data – Transmission Requirements

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Release Time**

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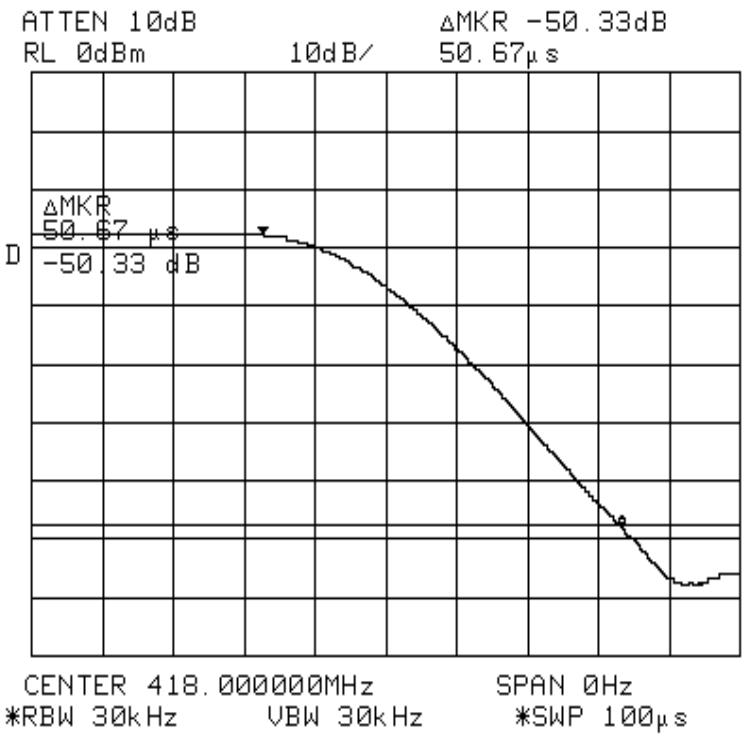
Job No.:	1L0564R	Date:	1/16/2002	Preliminary:	
Specification:	CFR 47, Part 15.231	Temperature(°C):	22		
Tested By:	Lance Walker	Relative Humidity(%)	50		
E.U.T.:	Model 418 MHz Intentional Radiator				
Configuration:	Max Transmit				
Sample Number:	S01				
Location:	Lab 2	RBW:	Refer to plots	Measurement	
Detector Type:	Peak	VBW:	Refer to plots	Distance:	N/A m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1083
Filter:		Cable #2:	
Receiver:	1464	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used: 802

Measurement Uncertainty: +/-1.7 dB



Notes: **Release time 50.7 uS display line at -77.6 dBm (Noise Floor)**

Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: David Light	DATE: 4/4/2002

Minimum Standard:

Permissible Field Strength Limits (Momentarily Operated Devices

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters; (watts)	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters; (watts)
40.66 - 40.70	2,250	225
70-130	1, 250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

Notes:

# Use quasi-peak or averaging meter.	*For 130 - 174 MHz: FS (microvolts/m) = (56.82 x F) - 6136*
** Linear interpolation with frequency F in MHz*	*For 260 - 470 MHz: FS (microvolts/m) = (41.67 x F) - 7083*

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

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
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 77.9 dBµV/m @ 3m at 418 MHz. This is 2.4 dB below the specification limit of 80.3 dBµV/m.

NOTE: The testing was performed with a fully charged battery.

Test Data: See attached table.

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 3 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

NEMKO Dallas, Inc.

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
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Radiated Emissions Data

Complete X
Preliminary

Job # : 1L0564R Test # : 1
Page 1 of 1

Client Name : Ryko Mfg
EUT Name : 418 MHz Transmitter
EUT Model # : N/A
EUT Part # : N/A
EUT Serial # : S01
EUT Config. : Max Tx

Specification : FCC Part 15.231 Reference :

Rod. Ant. #:		Temp. (deg. C) :	22	Date :	4/4/02
Bicon Ant.#:	1479	Humidity (%) :	50	Time :	12:00
Log Ant.#:	759	EUT Voltage :		Staff :	Light
Bilog Ant.#:		EUT Frequency :	DC	Photo ID:	NA
Dipole Ant.#:		Phase:	NA	Peak Bandwidth:	100 kHz
Cable#:	1983	Location:	A-OATS	Video Bandwidth	100 kHz
Preamp#:	762	Distance:	3 M		
Limiter#:	NA				
Atten #:	NA				
Detector#:	1036				

Measurements above 1 GHz were made in anechoic chamber using the following test equipment
Horn 1304, Preamp 1016, Spectrum analyzer 1464, Cables 1484-1485-1083
RBW 1 MHz/ VBW 1 MHz

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Duty Cycle (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
											Mounted upright
418	H	-8.6	52	16	5.5	0.0	64.9	80.3	-15.4	Pass	Carrier
418	V	-8.6	65	16	5.5	0.0	77.9	80.3	-2.4	Pass	Carrier
836	V	-8.6	53.5	21.9	8.0	24.2	50.6	60.3	-9.7	Pass	
836	H	-8.6	46.7	21.9	8.0	24.2	43.8	60.3	-16.5	Pass	
1254	H	-8.6	62.9	23.1	1.6	32.2	46.8	54.0	-7.2	Pass	
1254	V	-8.6	58.3	23.1	1.6	32.2	42.2	54.0	-11.8	Pass	
1672	H	-8.6	59.6	24.3	2.1	32.8	44.6	54.0	-9.4	Pass	
1672	V	-8.6	57.6	24.3	2.1	32.8	42.6	54.0	-11.4	Pass	
2090	H	-8.6	59.1	27.9	2.9	33.3	48.0	54.0	-6.0	Pass	
2090	V	-8.6	58.4	27.9	2.9	33.3	47.3	54.0	-6.7	Pass	
2508	H	-8.6	58.8	28.2	3.1	33.8	47.7	54.0	-6.3	Pass	
2508	V	-8.6	55.9	28.2	3.1	33.8	44.8	54.0	-9.2	Pass	

Scanned to the 10th harmonic, Upright position is determined to be worst case configuration

Test Data – Duty Cycle

Dallas Headquarters:
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Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Duty Cycle Correction**

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Complete X
Preliminary:

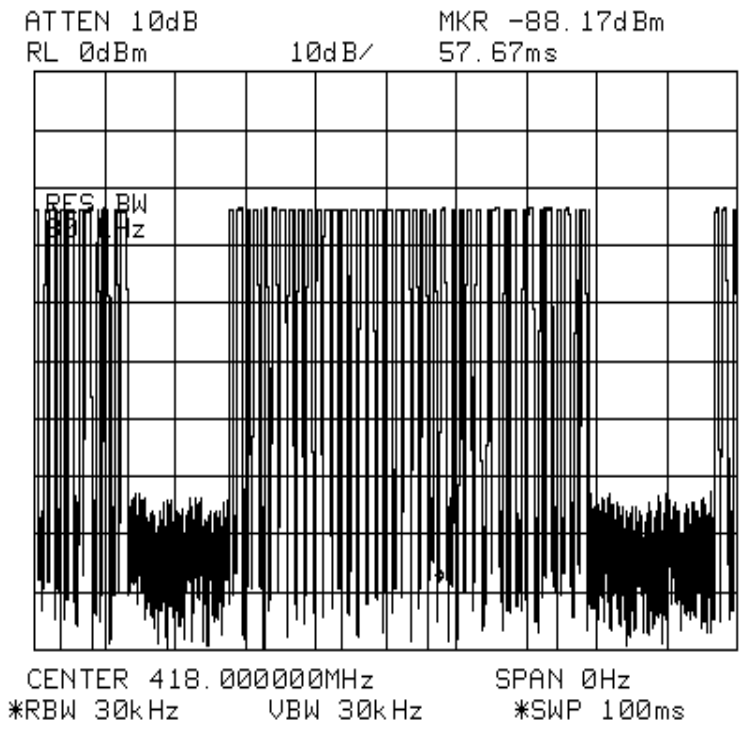
Job No.:	1L0564R	Date:	1/16/2002
Specification:	fcc15231	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	50
E.U.T.:	Model 418 MHz Intentional Radiator		
Configuration:	Max Transmit		
Sample Number:	S01		
Location:	Lab 2	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

Measurement Distance: N/A m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1083
Filter:		Cable #2:	
Receiver:	1464	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

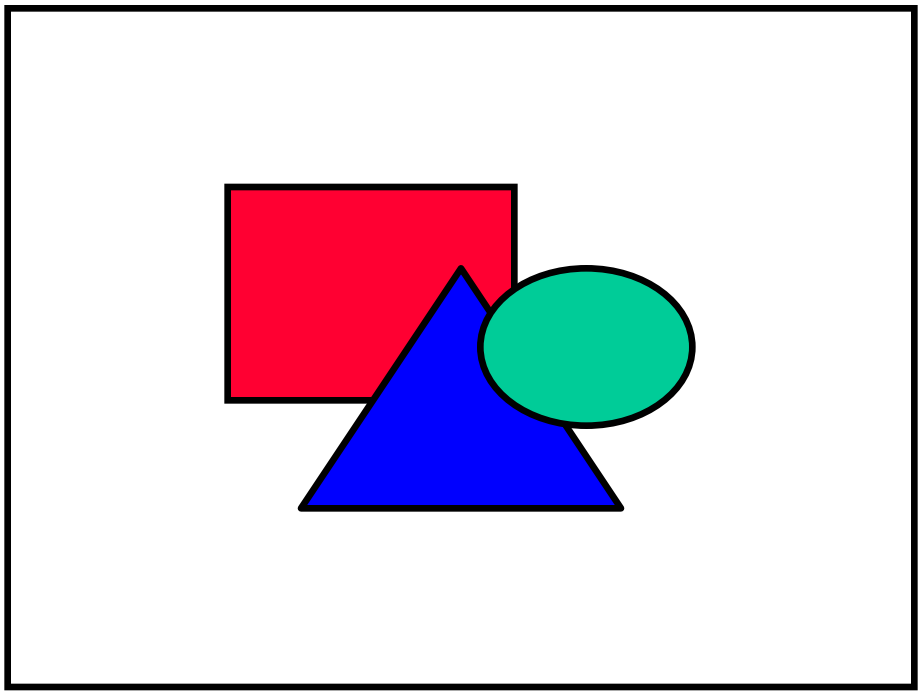
Additional equipment used: 802
Measurement Uncertainty: +/-1.7 dB



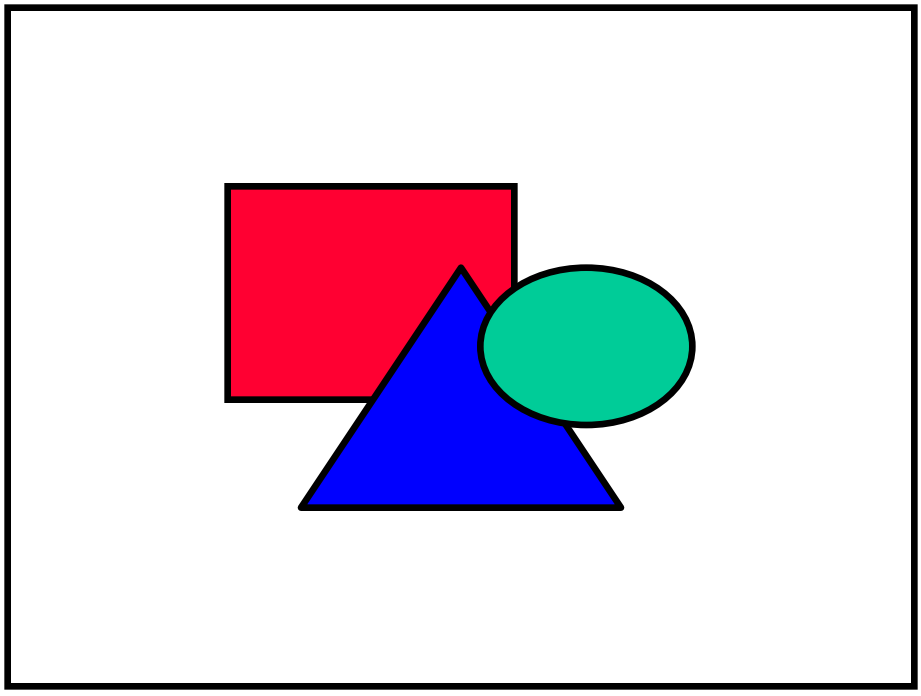
Notes:
43 broad pulses, 13 narrow pulses
total pulse time = 37.1429 mS
20log(37.1429/100)=-8.6 dB Correction Factor

Radiated Photographs (Worst Case Configuration)

FRONT VIEW



REAR VIEW



Section 6. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Lance Walker	DATE: 1/16/2002

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. See attached graph.

Test Data: See attached graph.

Test Data – Occupied Bandwidth

Dallas Headquarters:
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Lewisville, TX 75057
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Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **20 dB BW**

Page 1 of 1 Complete X

Job No.: 1L0564R Date: 1/16/2001 Preliminary:

Specification: CFR 47, Part 15.231 Temperature(°C): 22

Tested By: Lance Walker Relative Humidity(%) 50

E.U.T.: Model 418 MHz Intentional Radiator

Configuration: Normal Tx Max Hold

Sample Number: S01

Location: Lab 2 RBW: Refer to plots Measurement

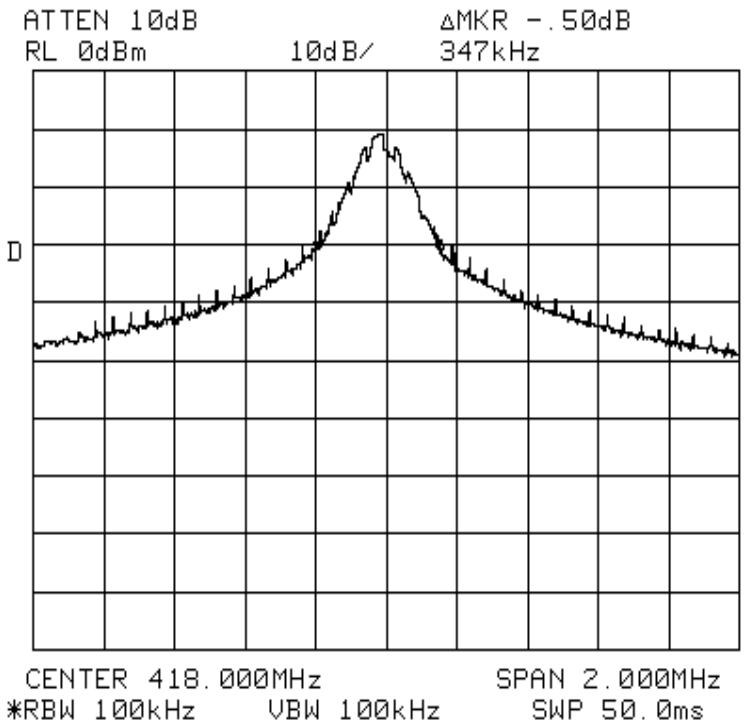
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1083
Filter:		Cable #2:	
Receiver:	1464	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used: 802

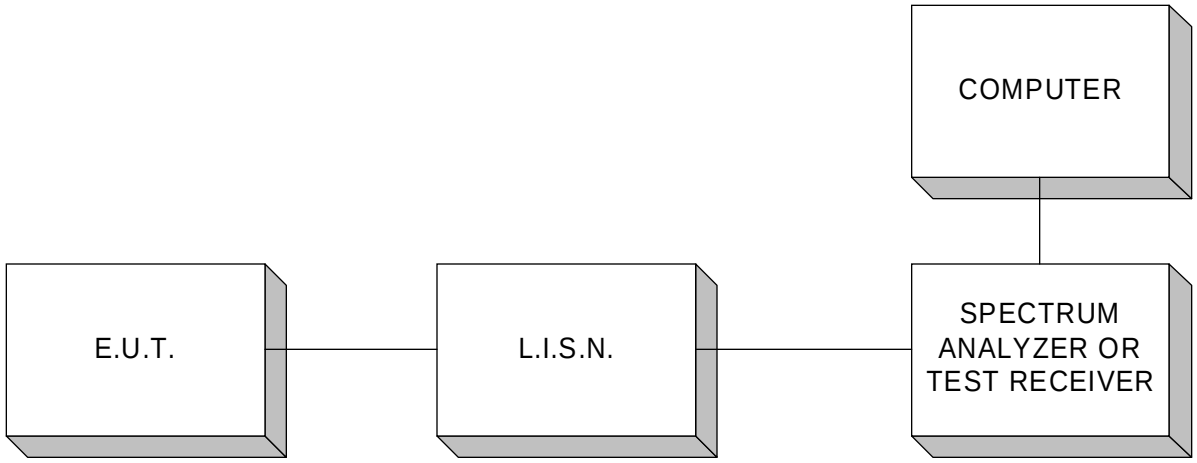
Measurement Uncertainty: +/-1.7 dB



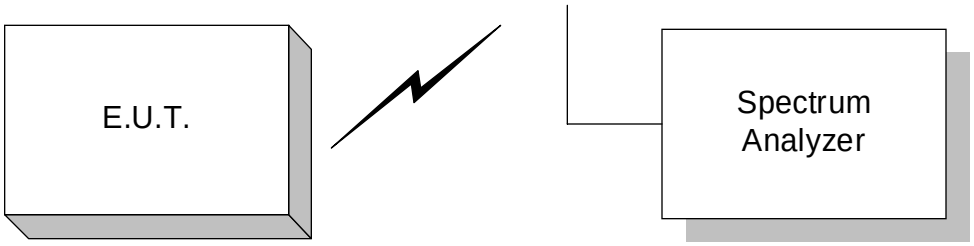
Notes: **20 dB BW, allowed up to 1.045 MHz**

Section 7. Block Diagrams

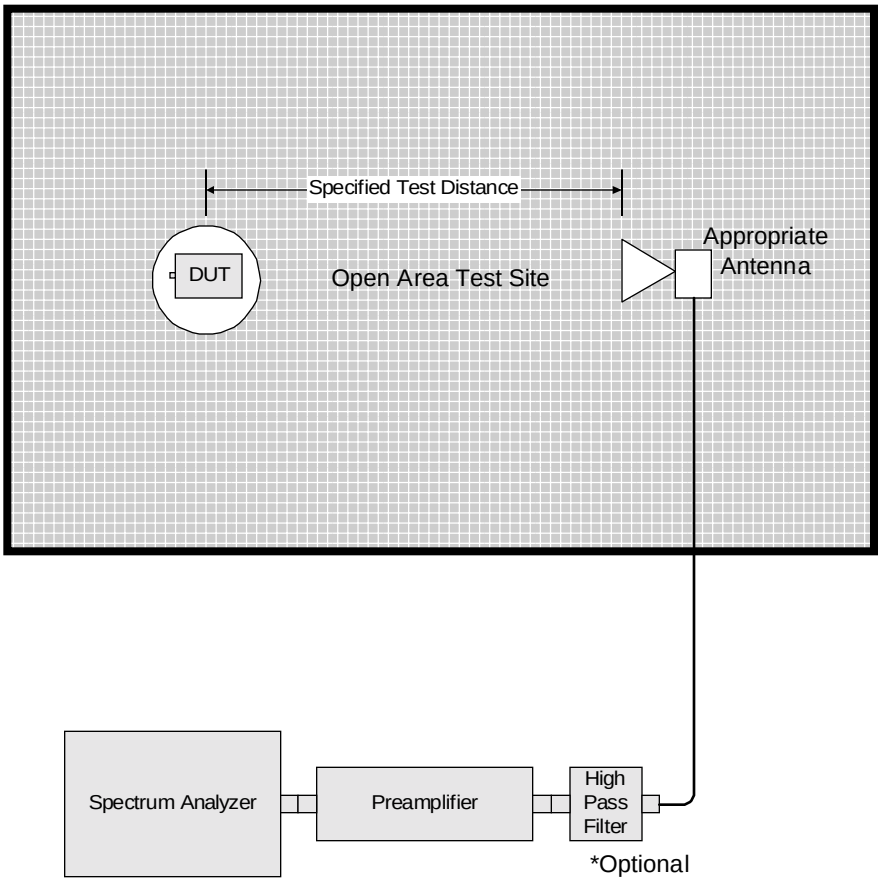
Conducted Emissions



Occupied Bandwidth, Duty Cycle

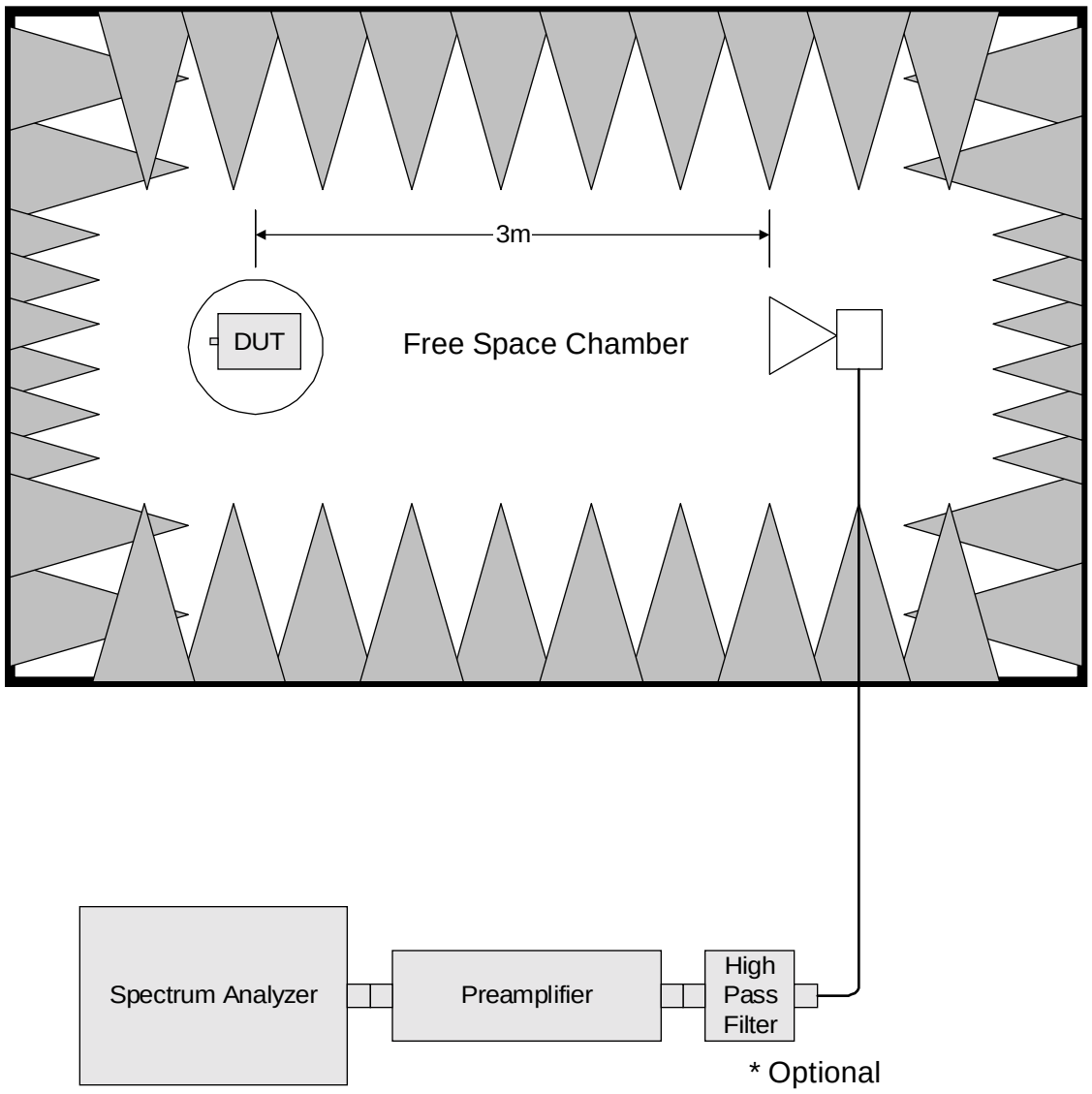


Outdoor Test Site For Radiated Emissions



Radiated Emissions 30 MHz - 1 GHz

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



Radiated Emissions above 1 GHz

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/02	01/02/03
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	06/01/01	06/01/02
802	Near Field Probe Set	EMCO 7405	103	N/A	N/A
1479	Bi Conical Antenna 20-330 Mhz	A. H. Systems SAS-200/540	496	03/31/01	06/31/02
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/01/01	05/01/02
1983	CABLE	KTL Site A OATS	N/A	09/25/01	09/25/02
762	27dB GAIN PREAMP	ICC 27dB LNA	946	05/29/01	05/29/01
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/18/02

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			