

Nemko Test Report: 4L0375RUS1rev2

Applicant: Hitachi America

**Equipment Under Test:
(E.U.T.)** μ -Chip Reader

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Frequency Hopping Transmitters

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Authorized By: Tom Tidwell, Frontline Group Manager

Date: 11/11/04

Table of Contents

Section 1.	Summary of Test Results	3
Section 2.	Equipment Under Test (E.U.T.).....	5
Section 3.	Powerline Conducted Emissions	7
Section 4.	Channel Separation	11
Section 5.	Time of Occupancy.....	14
Section 6.	Occupied Bandwidth.....	17
Section 7.	Peak Power Output	21
Section 8.	Spurious Emissions	23
Section 9.	Test Equipment List	27
ANNEX A - TEST DETAILS		28
ANNEX B - TEST DIAGRAMS.....		38

Section 1. Summary of Test Results

Manufacturer: Hitachi America

Model No.: MRA201SL

Serial No.: 3

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 15.247 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-2001. 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. NONE

**NVLAP LAB CODE: 100426-0**

Nemko Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
Powerline Conducted Emissions	15.207(a)	0.15 -0.5 MHz 66 to 56 dB μ V Peak 0.15 – 0.5 MHz 56 to 46 dB μ V Avg. 0.5 – 5.0 MHz 56 dB μ V Peak, 46 dB μ V Avg. 5.0 – 30.0 MHz 60 dB μ V Peak, 50 dB μ V Avg.	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB Bandwidth	Complies
Time of Occupancy	15.247(a)(1)(ii)	≤ 0.4 sec in 30 sec	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	≤ 1 MHz	Complies
Peak Power Output	15.247(b)	1 Watt	Complies
Spurious Emissions (Conducted))	15.247(c)	-20 dBc	NA
Spurious Emissions (Radiated)	15.247(c)	Table 15.209(a)	Complies

Footnotes:

The antenna is permanently attached.

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

General Equipment Information

Frequency Band: 2401 to 2475 MHz

Number of Channels: 75

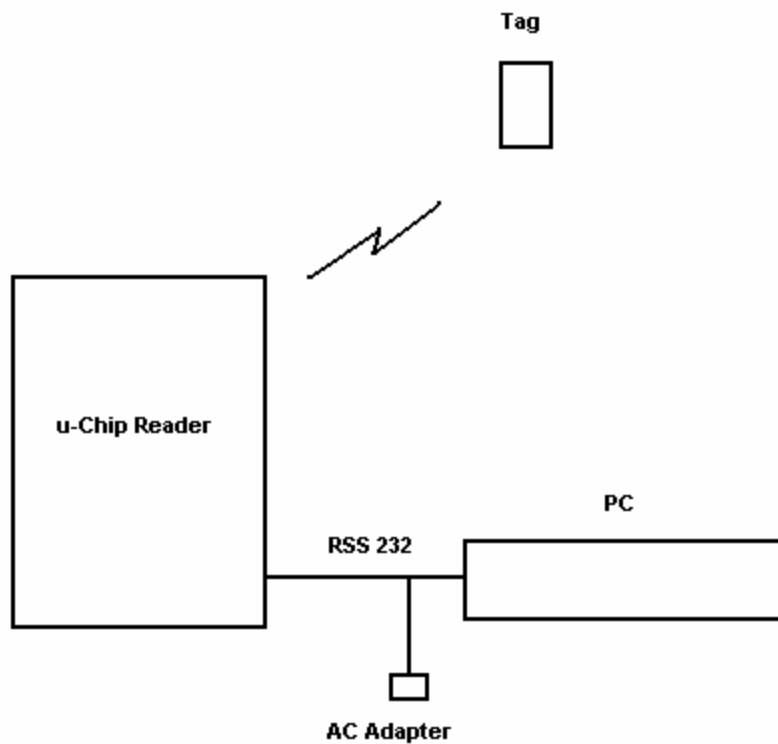
Channel Spacing: 1 MHz

User Frequency Adjustment: Software controlled

Theory of Operation

The MRA201SL μ -chip reader is an evaluation reader that allows customers considering developing a system using our smallest RFID IC, the " μ -chip," to verify its features and capabilities.

System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data: See attached plots.

Equipment Used: 545-1533-1267-704

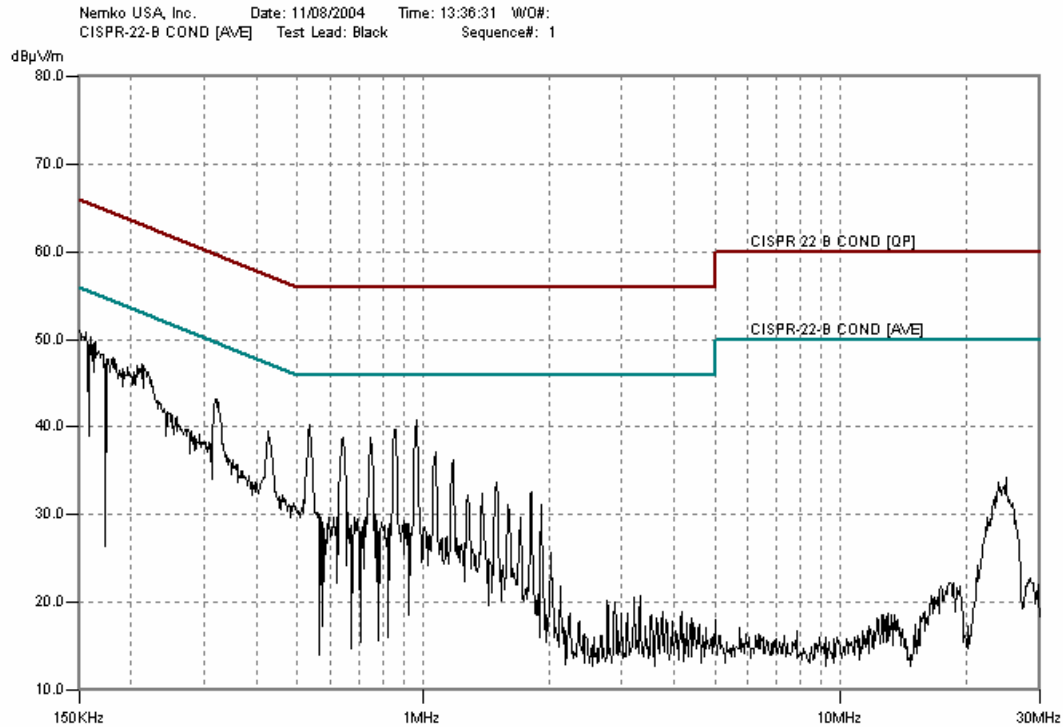
Measurement Uncertainty: +/- 1.7 dB

Temperature: 25 °C

Relative Humidity: 50 %

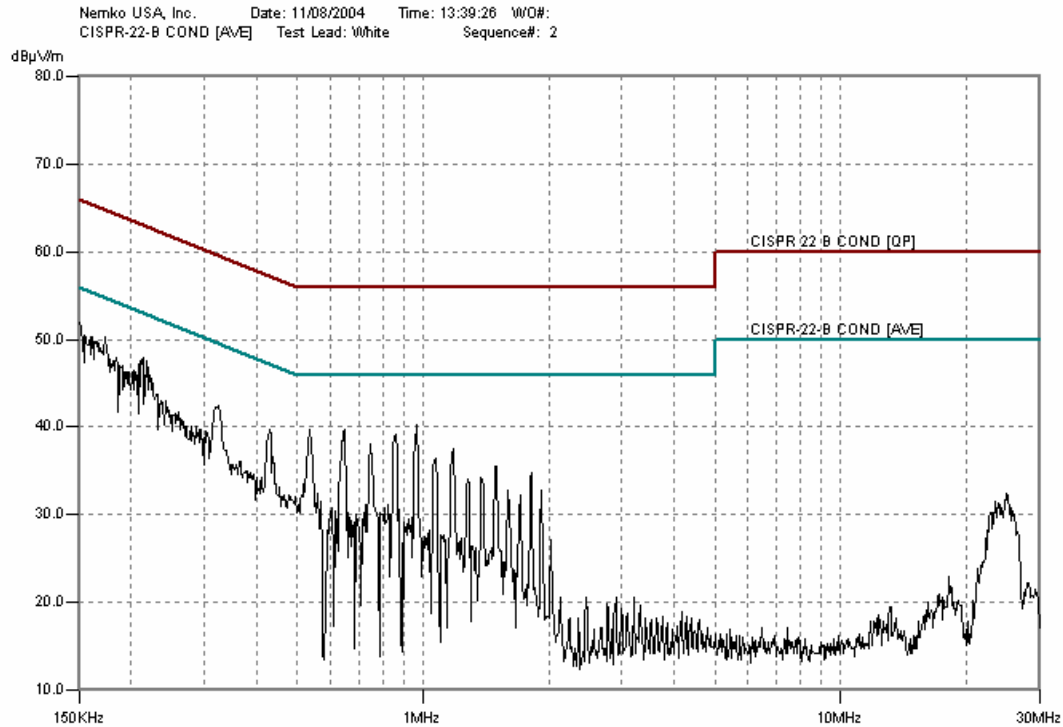
Data – Powerline Conducted Emissions

Hot Wire

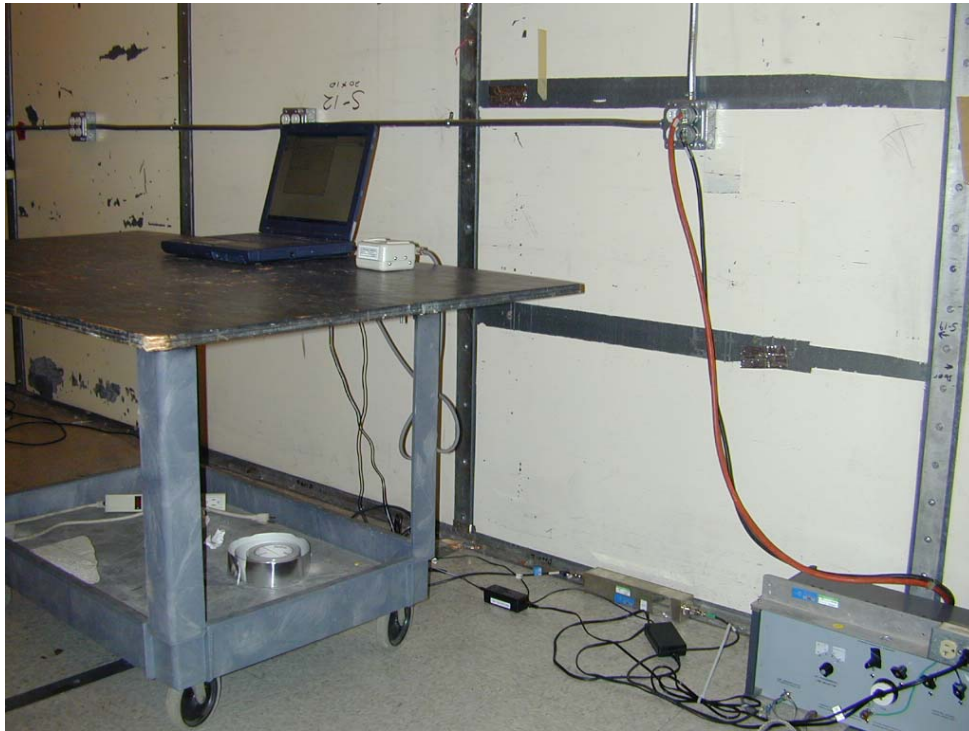


Data – Powerline Conducted Emissions

Neutral Wire



Test Setup Photos



Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data: See 20 dB BW plot
Measured 20 dB bandwidth:
Channel Separation:

Measurement Uncertainty: +/- 1.7 dB

Temperature: °C

Relative Humidity: %

Test Data – Channel Separation



Nemko Dallas, Inc.

Dallas Headquarters:

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

Data Plot		Channel Separation	
Page <u>1</u> of <u>4</u>		Complete <u>X</u>	
Job No.: 4L0375	Date: _____	Preliminary: _____	
Specification: 15.247	Temperature(°C): _____	Measurement Distance: <u>na</u> m	
Tested By: David Light	Relative Humidity(%): _____		
E.U.T.: <u>U-Chip Reader</u>			
Configuration: <u>TX - Lying on sie (Worst case emission)</u>			
Sample Number: <u>1</u>	RBW: <u>Refer to plots</u>	Measurement Distance: <u>na</u> m	
Location: <u>AC 3</u>	VBW: <u>Refer to plots</u>		
Detector Type: <u>Peak</u>			
Test Equipment Used			
Antenna: <u>802</u>	Directional Coupler: _____	ATTEN 10dB ΔMKR .50dB RL 0dBm 10dB/ 1.00MHz	
Pre-Amp: _____	Cable #1: <u>1045</u>		
Filter: _____	Cable #2: _____		
Receiver: <u>1464</u>	Cable #3: _____		
Attenuator #1: _____	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____		CENTER 2.45000GHz SPAN 10.000MHz *RBW 100kHz VBW 100kHz SWP 50.0ms	
Measurement Uncertainty: <u>+/-1.7 dB</u>			
Notes: <u>Channel separation 1 MHz</u>			

Test Data – Hopping Channels



Dallas Headquarters:

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

Nemko Dallas, Inc.

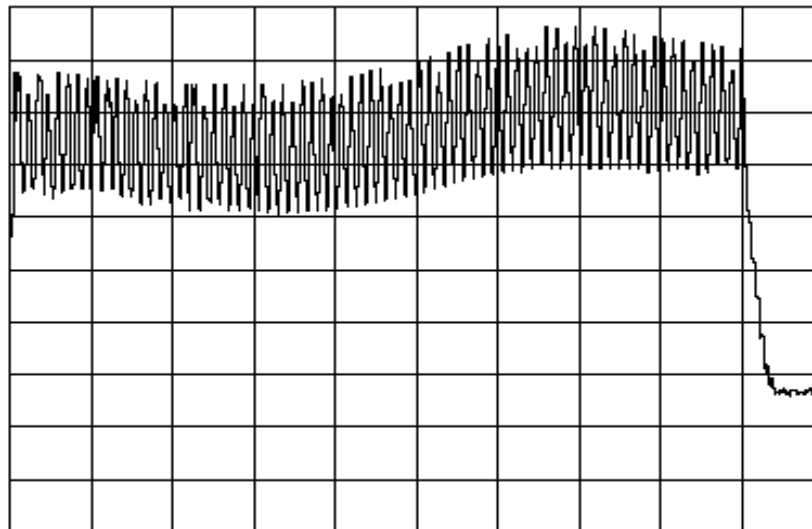
Data Plot

Page 2 of 4

Job No.: 4L0375 Date: _____
Specification: 15.2 Temperature(°C): _____
Tested By: David Light Relative Humidity(%) _____
E.U.T.: U-Chip Reader _____
Configuration: TX - Lying on sie (Worst case emission) _____

Channel Separation

ATTEN 10dB
RL 0dBm 10dB/



START 2.40000GHz STOP 2.48350GHz
*RBW 100kHz VBW 100kHz SWP 50.0ms

Notes: 75 Channels

Section 5. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data:

	23.66 mS per hop
Maximum Dwell Time On Any Channel:	14 hops in 30 seconds
	0.34 seconds within 30 seconds

Test Data – Time of Occupancy



Dallas Headquarters:

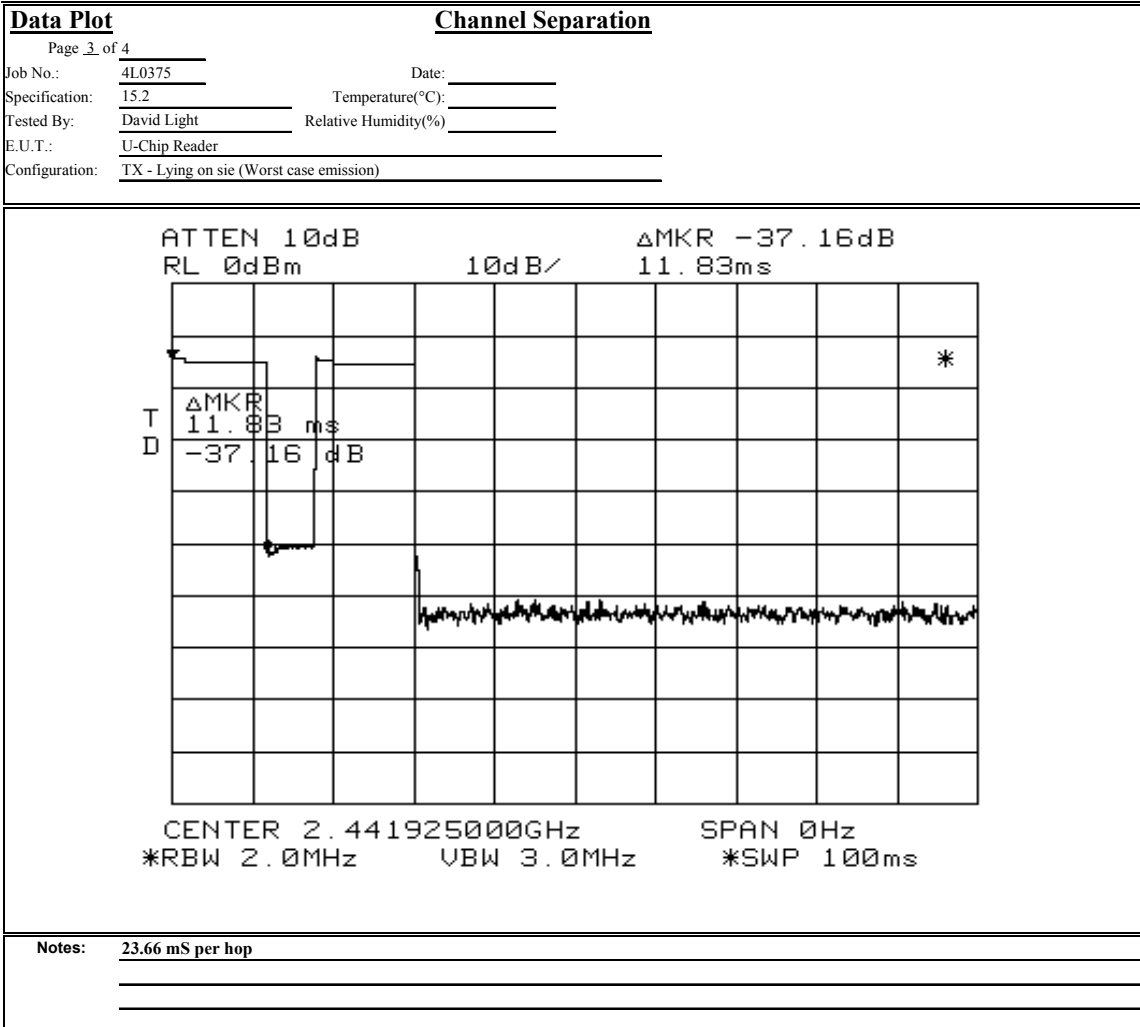
802 N. Kealy

Lewisville, TX 75057

Tel: (972) 436-9600

Fax: (972) 436-2667

Nemko Dallas, Inc.



Test Data – Time of Occupancy



Dallas Headquarters:

802 N. Kealy

Lewisville, TX 75057

Tel: (972) 436-9600

Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot		Channel Separation	
Page 4, of 4			
Job No.:	4L0375	Date:	
Specification:	15.2	Temperature(°C):	
Tested By:	David Light	Relative Humidity(%)	
E.U.T.:	U-Chip Reader		
Configuration:	TX - Lying on sie (Worst case emission)		

ATTEN 10dB
RL 0dBm 10dB/

DISPLAY LINE
-15.8 dBm

T D

CENTER 2.441925000GHz SPAN 0Hz
*RBW 2.0MHz VBW 3.0MHz *SWP 30.0sec

Notes:	14 hops in 30 seconds
	Time of occupancy = .34 seconds

Section 6. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data: See attached plots.

Test Data – Occupied Bandwidth



Nemko Dallas, Inc.

Dallas Headquarters:

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

Data Plot		Spurious Emissions at Antenna Terminals	
Page <u>1</u> of <u>3</u>		Complete <u>X</u>	
Job No.: <u>4L0375</u>	Date: <u>11/8/2004</u>	Preliminary: <u> </u>	
Specification: <u>15.247</u>	Temperature(°C): <u>25</u>		
Tested By: <u>David Light</u>	Relative Humidity(%) <u>50</u>		
E.U.T.: <u>TAG READER</u>			
Configuration: <u>TX</u>			
Sample Number: <u>1</u>			
Location: <u>Lab 2</u>	RBW: <u>Refer to plots</u>	Measurement	
Detector Type: <u>Peak</u>	VBW: <u>Refer to plots</u>	Distance: <u>NA</u> m	
Test Equipment Used			
Antenna: <u>802</u>	Directional Coupler: <u> </u>		
Pre-Amp: <u> </u>	Cable #1: <u>#N/A</u>		
Filter: <u> </u>	Cable #2: <u> </u>		
Receiver: <u>1036</u>	Cable #3: <u> </u>		
Attenuator #1: <u> </u>	Cable #4: <u> </u>		
Attenuator #2: <u> </u>	Mixer: <u> </u>		
Additional equipment used: <u> </u>			
Measurement Uncertainty: <u>+/-1.7 dB</u>			
ATTEN 10dB RL 0dBm 10dB/ ΔMKR 1.00dB 750kHz ΔMKR 750 kHz 1.00 dB CENTER 2.400876GHz SPAN 2.000MHz *RBW 30kHz VBW 30kHz SWP 50.0ms			
Notes: <u>Lowest channel</u>			

Test Data – Occupied Bandwidth



Dallas Headquarters:

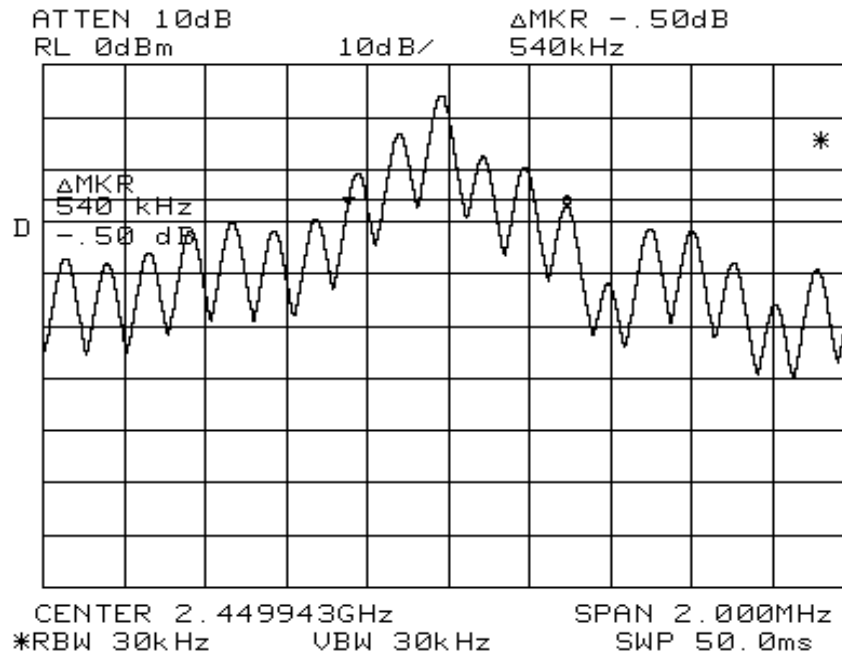
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot

Page 2 of 3

Job No.: 4L0375 Date: 11/8/2004
Specification: 15.2 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 50
E.U.T.: TAG READER
Configuration: TX

Spurious Emissions at Antenna Terminals

Notes: Mid channel

Test Data – Occupied Bandwidth



Dallas Headquarters:

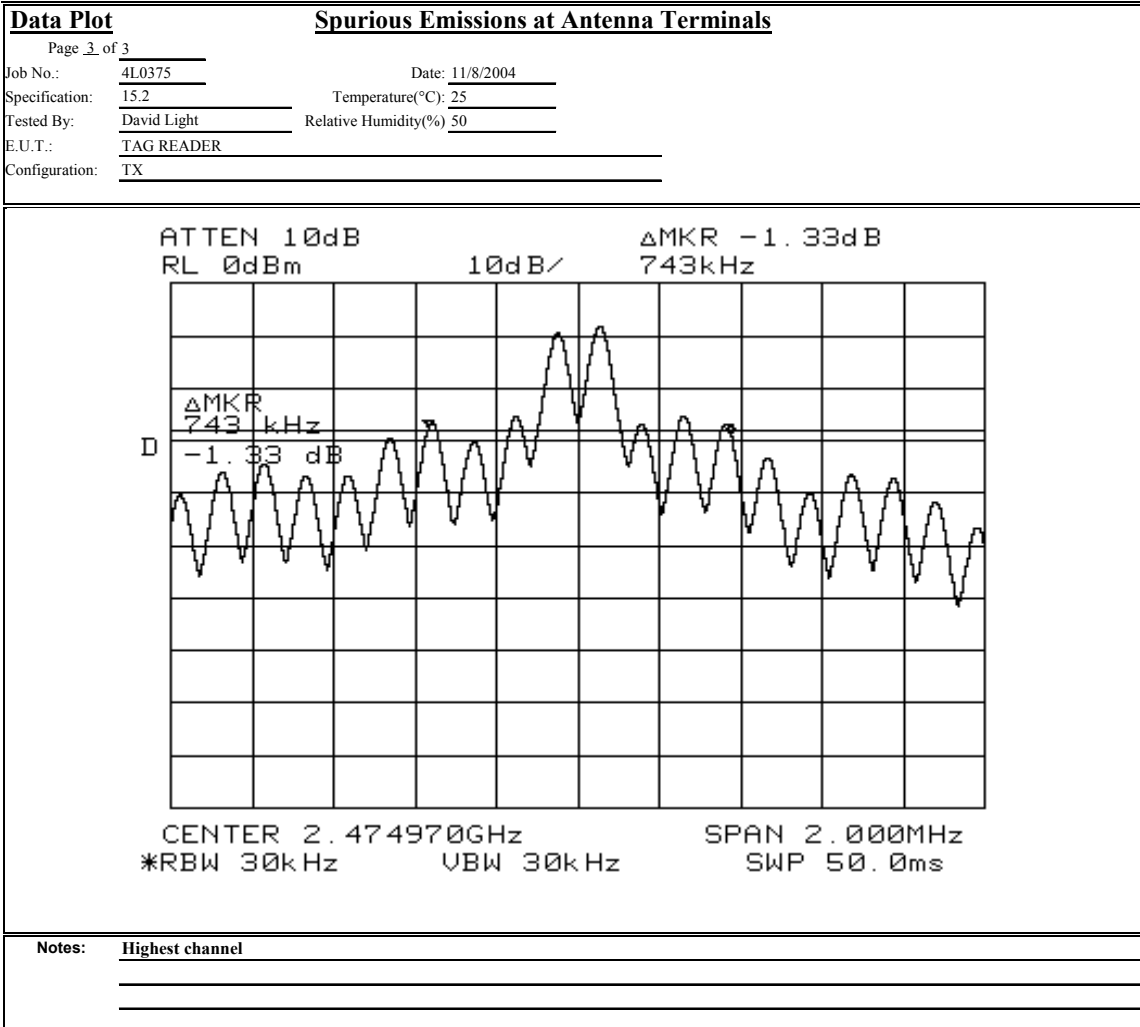
802 N. Kealy

Lewisville, TX 75057

Tel: (972) 436-9600

Fax: (972) 436-2667

Nemko Dallas, Inc.



Section 7. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data: See attached data.
Detachable antenna? ☐ Yes ☒ No
If yes, state the type of non-standard connector used:

Max EIRP measure = 530.88mW

Antenna Gain = 6dBi

Conducted power = 133mW

Calculation:

Conducted Power = EIRP - dBi = 27.24996dBm - 6dBi = 21.24996dBm = 133.0509mW

Test Data – E.I.R.P.



Nemko Dallas, Inc.

Dallas Headquarters:

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

Field Strength of Spurious Emissions

Page 1 of 1

Job No.: 4L0375 Date: 11/8/04 Complete X
 Specification: 15.247 Temperature(°C): 25 Preliminary _____
 Tested By: David Light Relative Humidity(%) 50
 E.U.T.: TAG READER
 Configuration: TX - LYING ON SIDE (WORST CASE EMISSION)
 Sample No: 1
 Location: AC 3 RBW: 1 MHz Measurement
 Detector Type: Peak VBW: 1 MHz Distance: 3 m

Test Equipment Used

Antenna: 1304 Directional Coupler: _____
 Pre-Amp: _____ Cable #1: 1484
 Filter: _____ Cable #2: 1485
 Receiver: 1464 Cable #3: _____
 Attenuator #1: _____ Cable #4: _____
 Attenuator #2: _____ Mixer: _____
 Additional equipment used: _____
 Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
2400.96	-15.8	34.1		0	9.0		27.3	530.88	V	
2400.96	-22.0	36.7		0	6.9		21.5	142.232879	H	
2450	-17.5	34.1		0	9.0		25.6	358.921935	V	
2450	-24.3	36.7		0	6.9		19.2	83.752928	H	
2475	-18.0	34.1		0	9.0		25.1	319.89	V	
2475	-26.2	36.7		0	6.9		17.3	54.075432	H	

Notes: Power was varied +/- 15% with no effect on output power
 The device was tested on 3 axis'

Section 8. Spurious Emissions

NAME OF TEST: Spurious Emissions	PARA. NO.: 15.247(c)
TESTED BY: David Light	DATE: 11/8/04

Test Results: Complies.

Measurement Data: See attached data.

Note: No emissions were detected above the noise floor. Radiated upper and lower band edge data is provided to demonstrate compliance.

The device was tested at 2401, 2450 and 2475 MHz.

The spectrum was searched from 30 MHz to the 10 harmonic of the carrier.

Test Data – Lower Band Edge



Nemko Dallas, Inc.

Dallas Headquarters:

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

Data Plot

Page 1 of 1

Job No.: 4L0375

Date: 11/8/2004

Complete X

Specification: 15.247

Temperature(°C): 25

Preliminary: _____

Tested By: David Light

Relative Humidity(%) 50

E.U.T.: TAG READER

Configuration: TX

Sample Number: 1

Location: AC 3

RBW: 100 kHz

Measurement

Detector Type: Peak

VBW: 100 kHz

Distance: 3 m

Test Equipment Used

Antenna: 1304

Directional Coupler: _____

Pre-Amp: _____

Cable #1: 1484

Filter: _____

Cable #2: 1485

Receiver: 1464

Cable #3: _____

Attenuator #1: _____

Cable #4: _____

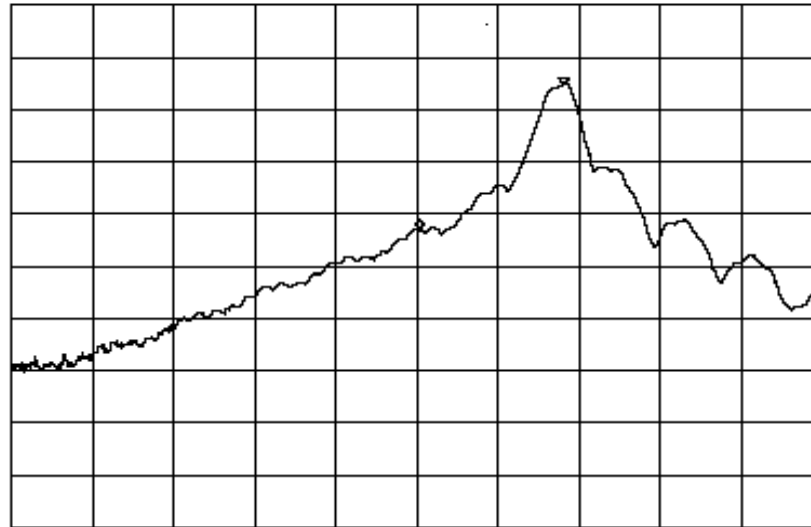
Attenuator #2: _____

Mixer: _____

Additional equipment used: _____

Measurement Uncertainty: +/-1.7 dB

*ATTEN 0dB
RL -10.0dBm 10dB/ Δ MKR -27.83dB
-892kHz



CENTER 2.400000GHz SPAN 5.000MHz
*RBW 100kHz VBW 100kHz SWP 50.0ms

Notes: Lowest channel

Test Data – Upper Band Edge



Dallas Headquarters:

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

Nemko Dallas, Inc.

Radiated Spurious Emissions								
Page <u>3</u> of <u>3</u>		Continuation Page						
Job No.: 4L0375		Date: 11/8/2004						
Specification: 15.247		Temperature(°C): 25						
Tested By: #N/A		Relative Humidity(%) 50						
E.U.T.: RFID READER								
Configuration: TX								
Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
								2475 MHz
2483.50	32.2	28.2	3.1	0	63.5	74	-10.5	Peak - V
2483.50	20	28.2	3.1	0	51.3	54	-2.7	Average - V
2483.50	32.2	28.2	3.1	0	63.5	74	-10.5	Peak - H
2483.50	20	28.2	3.1	0	51.3	54	-2.7	Average - H
Notes:		-12.2 dB Duty cycle correction included in average readings.						

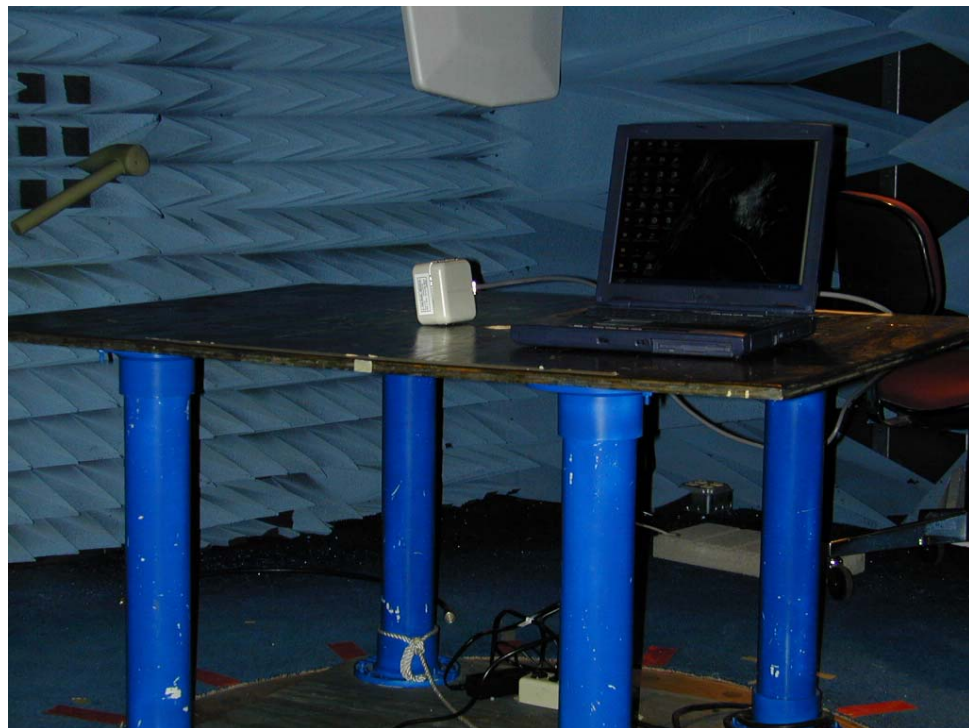
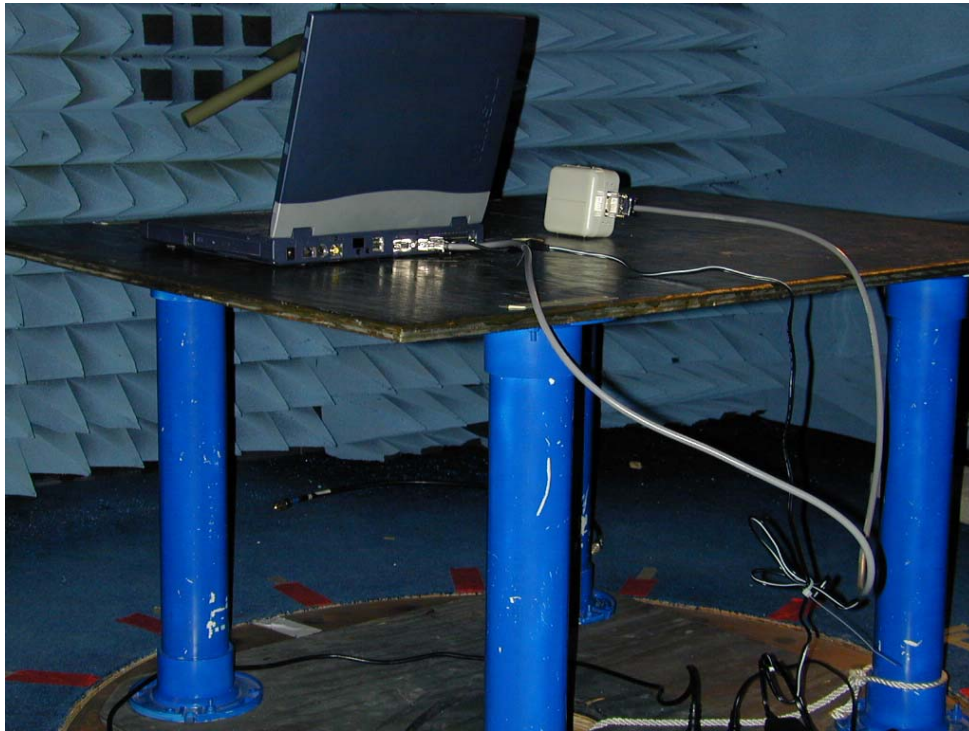
Setup:

30 MHz-1 GHz 100 kHz RBW/100 kHz VBW

>1 GHz 1 MHz RBW, 1 MHz VBW Peak

> 1 GHz 1 MHz RBW/1 MHz VBW Average +Duty Cycle Correction

Test Setup Photos



Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	07/30/04	07/31/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/02/04	08/02/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	06/06/04	06/06/05
802	Near Field Probe Set	EMCO 7405	103	N/A	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1045	CABLE 2m	Astrolab Inc. 32027-2-29094-72TC	N/A	08/26/04	08/26/05
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	07/23/04	07/23/05
1479	Bi Conical Antenna 20-330 Mhz	A. H. Systems SAS-200/540	496	07/02/03	07/01/04
1983	CABLE	KTL Site A OATS	N/A	03/11/04	03/11/05
791	PREAMP, 25dB	ICC LNA25	398	10/27/03	10/26/04
545	LISN	Schwarz Beck 8120	8120350	09/17/04	09/17/05
704	FILTER, HIGH PASS, 5 KHz	SOLAR 7930-5.0	933126	02/05/04	02/04/05
1267	CABLE, 14.8m	KTL RG223	N/A	07/27/04	07/27/05

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
---	----------------------

Minimum Standard:

The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250 μ V (48 dB μ V) across 50 ohms.

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
----------------------------------	-------------------------

Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)
--	-------------------------

Minimum Standard:

The system shall hop to channel frequencies that are selected from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

NAME OF TEST: Time of Occupancy

PARA. NO.: 15.247(a)(1)(ii)

Minimum Standard:

Frequency Band (MHz)	20 dB Bandwidth	No. of Hopping Channels	Average Time of Occupancy
902 - 928	<250 kHz	50	=<0.4 sec. in 20 sec.
902 - 928	=>250 kHz	25	=<0.4 sec. in 10 sec.
2400 - 2483.5	-----	75	=<0.4 sec. in 30 sec.
5725 - 5850	-----	75	=<0.4 sec. in 30 sec.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: 1 MHz

VBW: = RBW

Span: 0 Hz

LOG dB/div.: 10 dB

Sweep: Sufficient to see one hop time sequence.

Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table (10, 20, or 30 seconds).

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

$(30 \text{ sec.} / .001 \text{ sec.}) / 75 \text{ chan.} = 400 \times 1 \text{ msec.} = 400 \text{ msec. or } 0.4 \text{ sec. in } 30 \text{ sec.}$

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 15.247(a)(2)

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	1 MHz
5725 – 5850	1 MHz

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: At least 1% of span/div.

VBW: >RBW

Span: Sufficient to display 20 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Peak Power Output

PARA. NO.: 15.247(b)

Minimum Standard:

Frequency Band (MHz)	No. of Hopping Channels	Maximum Peak Power Output at Antenna Port
902 - 928	at least 50	1 watt
902 – 928	25 - 49	0.25 watts
2400 – 2483.5	75	1 watt
5725 – 5850	75	1 watt

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

The RBW of the spectrum analyzer shall be set to a value greater than the measured 20 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247(c)
---	----------------------

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μ V/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

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions

PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μ V/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

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

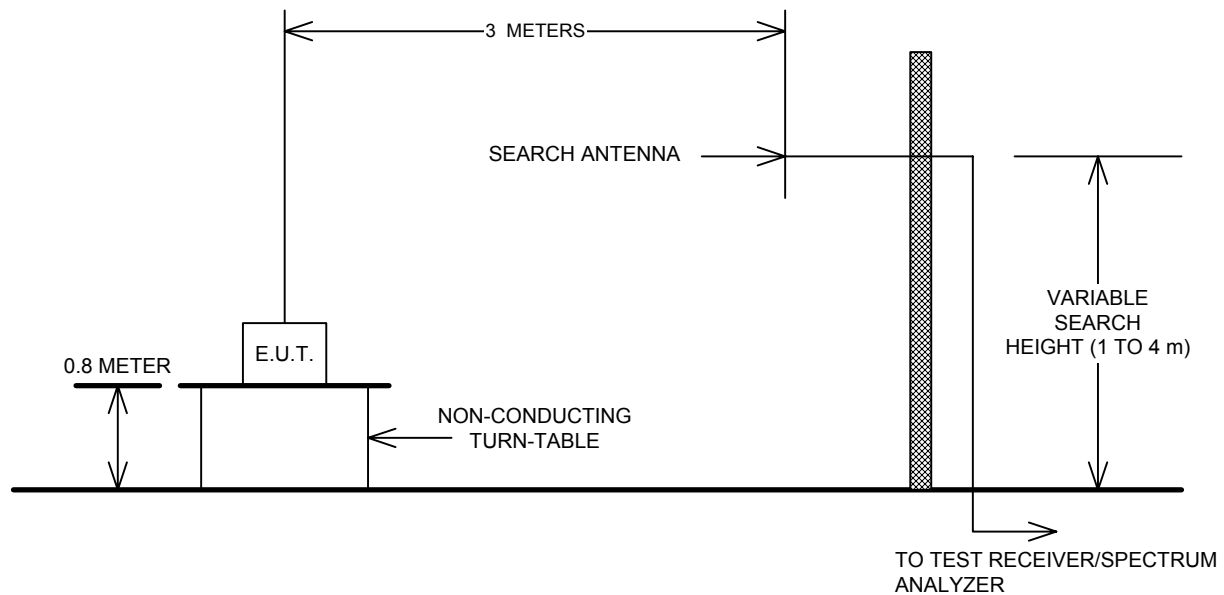
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	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	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	1718		

Number of channels tested:

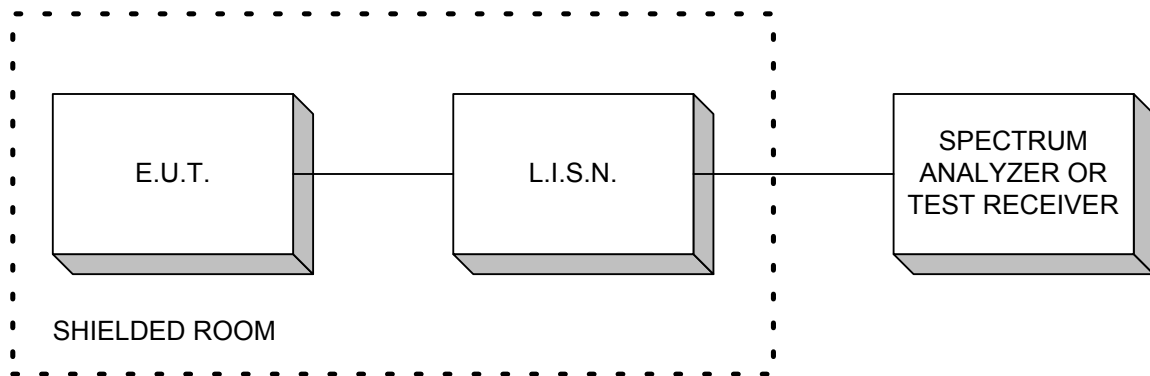
Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals

