Nemko Test Report:	2L0452RUS1
Applicant:	L.R. Nelson Corp. One Sprinkler Lane Peoria, IL 61615-9544
Equipment Under Test: **(E.U.T.)**	EZ Pro, Model 8602
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, RF Group Manager
Date:	12/12/02
Total Number of Pages:	56

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Section 1. Summary of Test Results

Manufacturer: L.R. Nelson Corp.

Model No.: EZ Pro, Model 8602

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 15.247 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted is accordance with 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
☐	Family Listing		

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	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dBµV	23.05 dBuV	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB Bandwidth	85 kHz	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	Customer Supplied	Customer Supplied	Customer Supplied
Time of Occupancy	15.247(a)(1)(ii)	≤ 0.4 sec in 30 sec	0.3 sec in 30 sec.	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	≤ 1 MHz		Complies
Peak Power Output	15.247(b)	4 Watts EIRP	29.5 mW	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc	N/A	N/A
Spurious Emissions (Radiated)	15.247(c)	Table 15.209(a)	See Data	Complies

Footnotes:

The device does not have a detachable antenna.

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

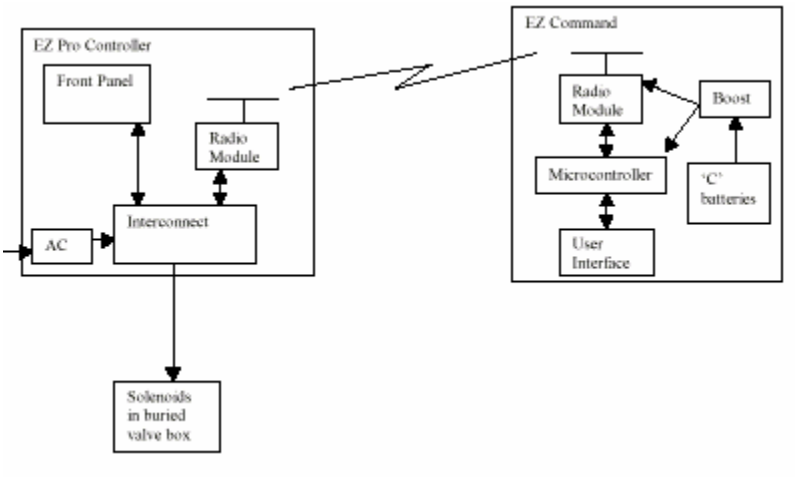
General Equipment Information

Frequency Band:	2455 to 2467 MHz
Number of Channels:	75
Channel Spacing:	85 kHz
User Frequency Adjustment:	Software controlled

Theory of Operation

The 8602 module was designed for point to point operation between a pair of modules, one designated as master and the other designated as slave. Point to multi-point is not supported.

System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 12/9/2002

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/-1.7 dB

Test Data - Powerline Conducted Emissions

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

Nemko Dallas, Inc.

Data Plot **Powerline Conducted Emissions**

Page 1 of 2 Complete X

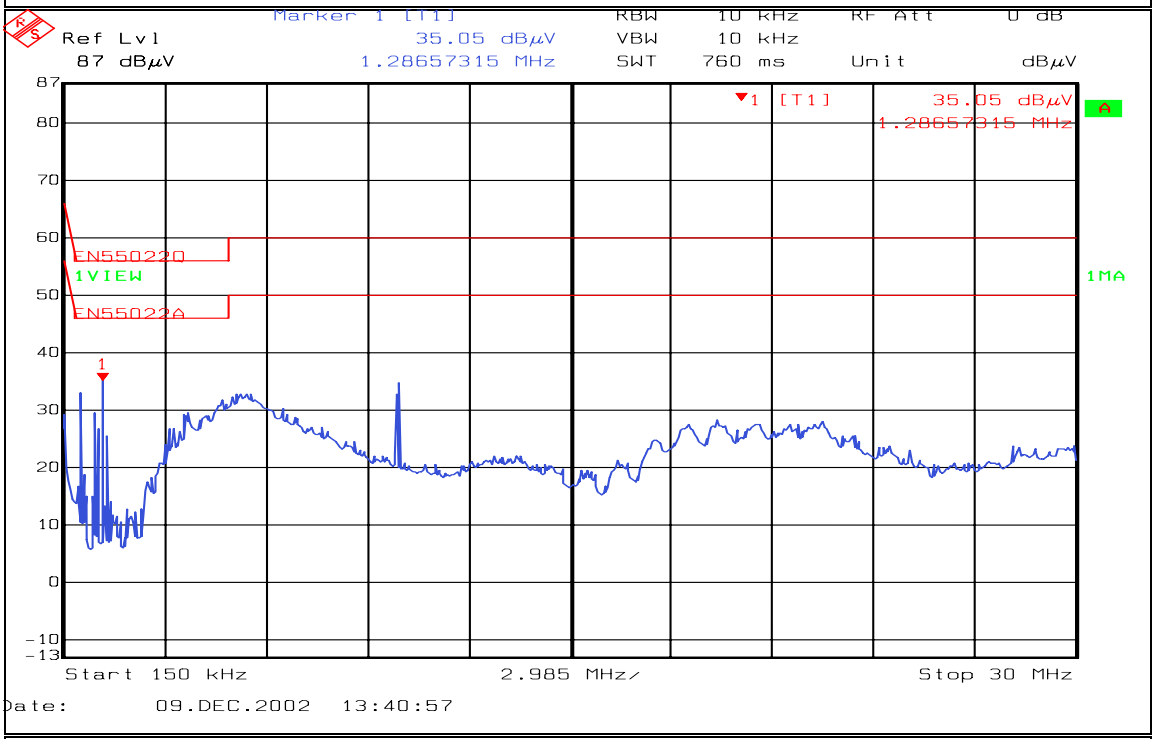
Job No.:	2L0452R	Date:	12/9/2002	Preliminary:	
Specification:	15.207	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	EZ PRO MODULE				
Configuration:	TX FULL POWER				
Sample Number:	1				
Location:	Lab 2	RBW:	10 kHz	Measurement	
Detector Type:	Peak	VBW:	10 kHz	Distance:	NA m

Test Equipment Used

Antenna:		L.I.S.N.:	1258
Pre-Amp:		Cable #1:	1547
Filter:	1555	Cable #2:	1129
Receiver:	1036	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Hot side**

Worst case emission 35.05 dBuV at 1.2 MHz (10.95 dB below AVERAGE spec)

Test Data - Powerline Conducted Emissions

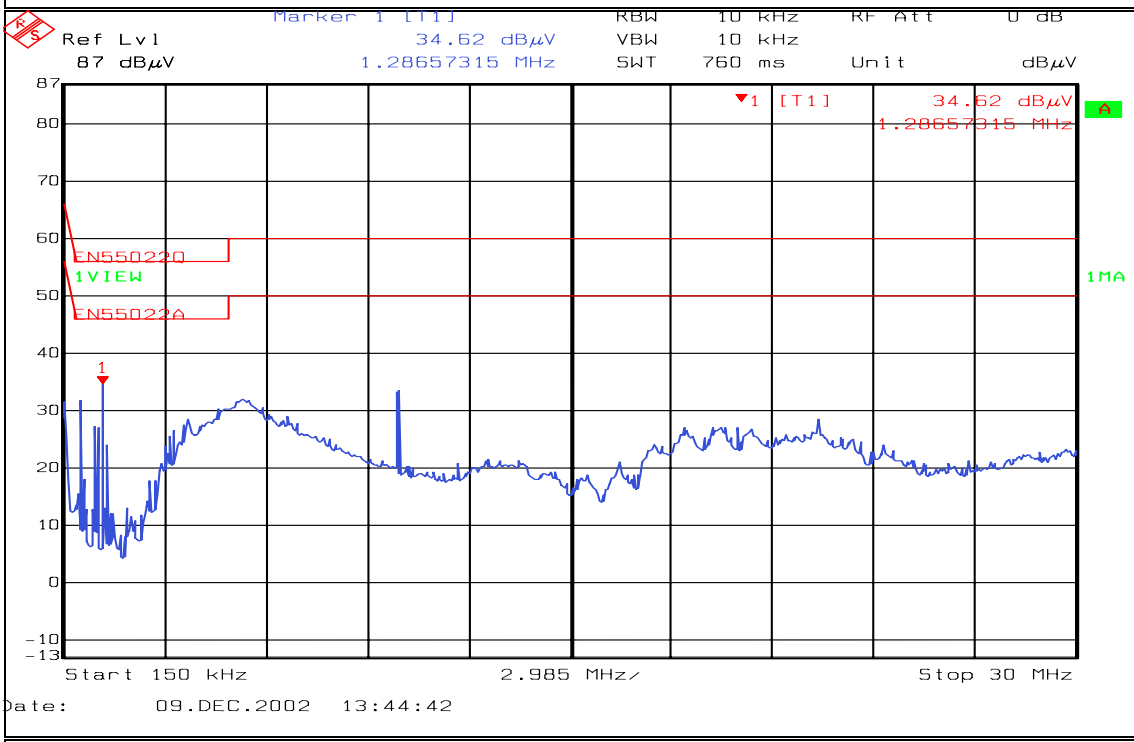
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Powerline Conducted Emissions**

Page 2 of 2

Job No.:	2L0452R	Date:	12/9/2002
Specification:	15.2	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	EZ PRO MODULE		
Configuration:	TX FULL POWER		



Notes: **Neutral side**
Worst case emission 34.6 dBuV at 1.2 MHz (11.4 dB below AVERAGE spec)

Photographs - Powerline Conducted Emissions

Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE:3/16/01

Test Results: Complies.

Measurement Data: Measured 20 dB bandwidth: 82.7 kHz max

Channel Separation: 85 kHz

Measurement Uncertainty: +/-1.7 dB

Test Data - Channel Separation

Data Plot **CHANNEL SEPARATION**

Page 1 of 1 Complete X

Job No.: 0L0528R Date: 3/16/01 Preliminary

Specification: 15.247 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 50

E.U.T.: EZ Pro

Configuration: Transmit modulated data

Sample Number: S08

Location: Lab 1 RBW: 3 kHz

Detector Type: Peak VBW: 3 kHz

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1043

Filter: Cable #2:

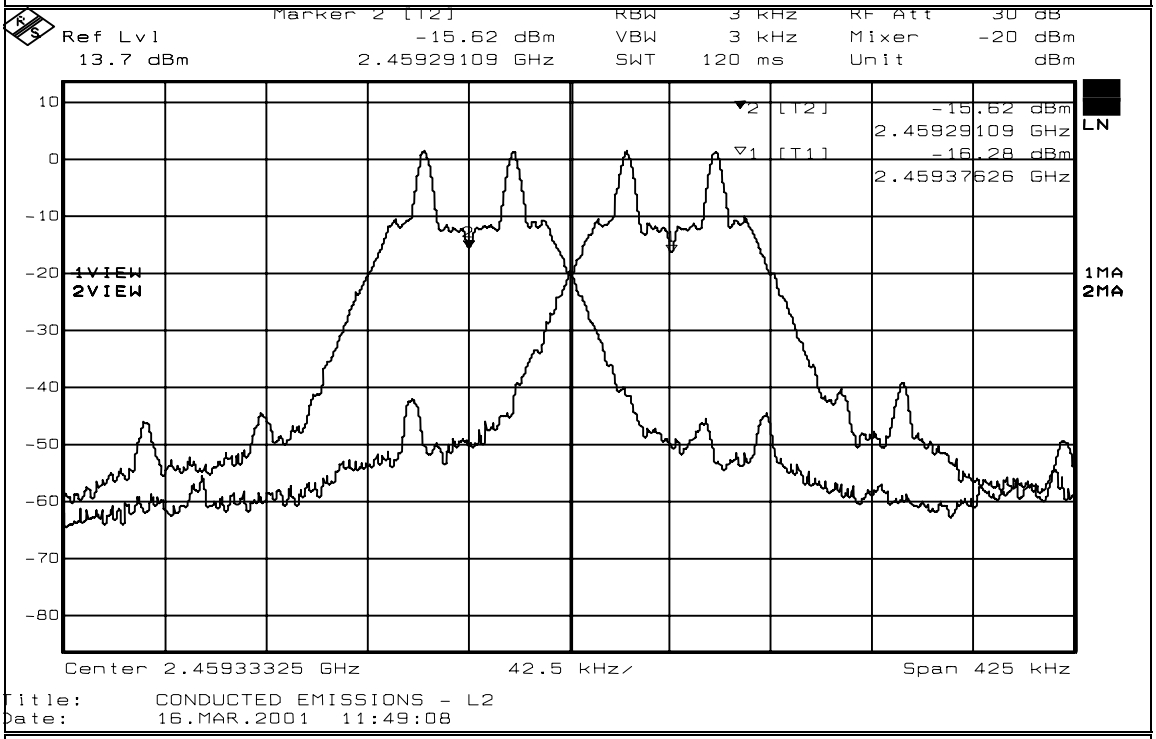
Receiver: 1036 Cable #3:

Attenuator #1 Cable #4:

Attenuator #2: Mixer:

Additional equipment used: #802 Near Field Probe Set

Measurement Uncertainty: +/-3.6 dB



Notes: **HOP GROUP 1 - CHANNELS 39 & 40**

CHANNEL SEPERATION = 85 kHz

Section 5. Pseudorandom Hopping Algorithm

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)
TESTED BY: Supplied by Customer	DATE:

Test Results: Complies.

Measurement Data: See sample hopping sequence.

Number of Hopping Frequencies: 75

Number of Hopping Patterns: 8

Proposal for modification of the Nelson EZ-Pro radio system firmware to comply with pseudo-random hopping requirements of the FCC.

The Nelson EZ-Pro radio system is installed into two different types of host units: The Pro Controller (fixed, AC powered) and the EZ Programmer (mobile, battery powered). The radios are strapped by the connector wiring of the host unit into either a Master or Slave configuration. The Pro Controller contains the Master radio, and the EZ Programmer contains the Slave.

Prior to a connection attempt, a unique four-byte ID is loaded into each by the operator through the front panel user interface. This ID is used for radio addressing and connection authentication.

The Master radio is placed into a listen-only state in which it slowly hops through all available channels listening for a valid packet from a Slave radio. If one is received but does not match the stored ID, it is ignored and the radio remains in a listen-only state. The radio does not transmit during this time.

When a connection is desired, the operator activates the Slave radio, which causes it to start a transmit/receive sequence attempting to contact a Master radio. Each short transmit burst is followed immediately by a longer listen window, then the radio hops to the next channel and repeats this sequence.

When the Master radio hears a valid packet from the Slave, it validates the received ID against its own. If they match, the Master replies immediately to the Slave and is placed into “connected” mode. Upon receipt of a valid message from the Master, the Slave is now also in “connected” mode. The two radios hop in sync and continue to exchange data for the duration of the connection. This connection can be continuous, but in the interest of power savings, the Slave may terminate the connection at any time. In this case, the Master radio reverts to listen-only mode and slowly hops through all available channels listening for a valid packet from a Slave radio.

For the hopping scheme, we propose to implement a two-table lookup system. The end result is that the overall hopping pattern is much longer than the number of channels in the system.

One table, the “synthesizer table”, contains the synthesizer register values for each of the 75 channels, numbered 0-74, and the other table, the “pr pattern table” contains a long list pseudo-randomly arranged pointers to entries in the synthesizer table. This table’s length is a multiple of 75, guaranteeing that each channel is occupied an equal amount of time.

The Slave radio data header contains a pointer indicating the current index into the pr pattern table. The Master then uses this information to determine where it should hop next. The following diagram illustrates the new lookup scheme.

Synthesizer Table

```
;Hop group  0 :
  retlw   12h       ; LO= 2084
;Hop group  1 :
  retlw   16h       ; LO= 2085
;Hop group  2 :
  retlw   1ah       ; LO= 2086
;Hop group  3:
  retlw   1eh       ; LO= 2087
;Hop group  4 :
  retlw   12h       ; LO= 2084
;Hop group  5 :
  retlw   16h       ; LO= 2085
;Hop group  6 :
  retlw   1ah       ; LO= 2086
;Hop group  7:
  retlw   1eh       ; LO= 2087


;TX channel  0 :
        retlw     012h
        retlw     08Ch
        retlw     033h   ; Freq= 370.9775 MHz
;TX channel  1 :
        retlw     012h
        retlw     08Dh
        retlw     04Ah   ; Freq= 371.0625 MHz
;TX channel  2 :
        retlw     012h
        retlw     08Eh
        retlw     060h   ; Freq= 371.1475 MHz
;TX channel  3 :
        retlw     012h
        retlw     08Fh
        retlw     077h   ; Freq= 371.2325 MHz
;TX channel  4 :
        retlw     012h
        retlw     090h
        retlw     08Dh   ; Freq= 371.3175 MHz
;TX channel  5 :
        retlw     012h
        retlw     091h
```

```
        retlw    0A4h   ; Freq= 371.4025 MHz
;TX channel  6 :
        retlw    012h
        retlw    092h
        retlw    0BAh   ; Freq= 371.4875 MHz
;TX channel  7 :
        retlw    012h
        retlw    093h
        retlw    0D1h   ; Freq= 371.5725 MHz
;TX channel  8 :
        retlw    012h
        retlw    094h
        retlw    0E7h   ; Freq= 371.6575 MHz
;TX channel  9 :
        retlw    012h
        retlw    095h
        retlw    0FEh   ; Freq= 371.7425 MHz
;TX channel  10 :
        retlw    012h
        retlw    097h
        retlw    014h   ; Freq= 371.8275 MHz
;TX channel  11 :
        retlw    012h
        retlw    098h
        retlw    02Bh   ; Freq= 371.9125 MHz
;TX channel  12 :
        retlw    012h
        retlw    099h
        retlw    041h   ; Freq= 371.9975 MHz
;TX channel  13 :
        retlw    012h
        retlw    09Ah
        retlw    058h   ; Freq= 372.0825 MHz
;TX channel  14 :
        retlw    012h
        retlw    09Bh
        retlw    06Eh   ; Freq= 372.1675 MHz
;TX channel  15 :
        retlw    012h
        retlw    09Ch
        retlw    085h   ; Freq= 372.2525 MHz
;TX channel  16 :
        retlw    012h
```

```
        retlw    09Dh
        retlw    09Ch   ; Freq= 372.3375 MHz
;TX channel  17 :
        retlw    012h
        retlw    09Eh
        retlw    0B2h   ; Freq= 372.4225 MHz
;TX channel  18 :
        retlw    012h
        retlw    09Fh
        retlw    0C8h   ; Freq= 372.5075 MHz
;TX channel  19 :
        retlw    012h
        retlw    0A0h
        retlw    0DFh   ; Freq= 372.5925 MHz
;TX channel  20 :
        retlw    012h
        retlw    0A1h
        retlw    0F6h   ; Freq= 372.6775 MHz
;TX channel  21 :
        retlw    012h
        retlw    0A3h
        retlw    00Ch   ; Freq= 372.7625 MHz
;TX channel  22 :
        retlw    012h
        retlw    0A4h
        retlw    023h   ; Freq= 372.8475 MHz
;TX channel  23 :
        retlw    012h
        retlw    0A5h
        retlw    039h   ; Freq= 372.9325 MHz
;TX channel  24 :
        retlw    012h
        retlw    0A6h
        retlw    050h   ; Freq= 373.0175 MHz
;TX channel  25 :
        retlw    012h
        retlw    0A7h
        retlw    066h   ; Freq= 373.1025 MHz
;TX channel  26 :
        retlw    012h
        retlw    0A8h
        retlw    07Dh   ; Freq= 373.1875 MHz
;TX channel  27 :
```

```
        retlw   012h
        retlw   0A9h
        retlw   093h   ; Freq= 373.2725 MHz
;TX channel  28 :
        retlw   012h
        retlw   0AAh
        retlw   0AAh   ; Freq= 373.3575 MHz
;TX channel  29 :
        retlw   012h
        retlw   0ABh
        retlw   0C0h   ; Freq= 373.4425 MHz
;TX channel  30 :
        retlw   012h
        retlw   0ACh
        retlw   0D7h   ; Freq= 373.5275 MHz
;TX channel  31 :
        retlw   012h
        retlw   0ADh
        retlw   0EEh   ; Freq= 373.6125 MHz
;TX channel  32 :
        retlw   012h
        retlw   0AFh
        retlw   004h   ; Freq= 373.6975 MHz
;TX channel  33 :
        retlw   012h
        retlw   0B0h
        retlw   01Ah   ; Freq= 373.7825 MHz
;TX channel  34 :
        retlw   012h
        retlw   0B1h
        retlw   031h   ; Freq= 373.8675 MHz
;TX channel  35 :
        retlw   012h
        retlw   0B2h
        retlw   048h   ; Freq= 373.9525 MHz
;TX channel  36 :
        retlw   012h
        retlw   0B3h
        retlw   05Eh   ; Freq= 374.0375 MHz
;TX channel  37 :
        retlw   012h
        retlw   0B4h
        retlw   075h   ; Freq= 374.1225 MHz
```

```
;TX channel  38 :
        retlw     012h
        retlw     0B5h
        retlw     08Bh   ; Freq= 374.2075 MHz
;TX channel  39 :
        retlw     012h
        retlw     0B6h
        retlw     0A2h   ; Freq= 374.2925 MHz
;TX channel  40 :
        retlw     012h
        retlw     0B7h
        retlw     0B8h   ; Freq= 374.3775 MHz
;TX channel  41 :
        retlw     012h
        retlw     0B8h
        retlw     0CFh   ; Freq= 374.4625 MHz
;TX channel  42 :
        retlw     012h
        retlw     0B9h
        retlw     0E5h   ; Freq= 374.5475 MHz
;TX channel  43 :
        retlw     012h
        retlw     0BAh
        retlw     0FCh   ; Freq= 374.6325 MHz
;TX channel  44 :
        retlw     012h
        retlw     0BCh
        retlw     012h   ; Freq= 374.7175 MHz
;TX channel  45 :
        retlw     012h
        retlw     0E3h
        retlw     03Dh   ; Freq= 377.7775 MHz
;TX channel  46 :
        retlw     012h
        retlw     0E4h
        retlw     054h   ; Freq= 377.8625 MHz
;TX channel  47 :
        retlw     012h
        retlw     0E5h
        retlw     06Ah   ; Freq= 377.9475 MHz
;TX channel  48 :
        retlw     012h
        retlw     0E6h
```

```
        retlw    081h   ; Freq= 378.0325 MHz
;TX channel  49 :
        retlw    012h
        retlw    0E7h
        retlw    097h   ; Freq= 378.1175 MHz
;TX channel  50 :
        retlw    012h
        retlw    0E8h
        retlw    0AEh   ; Freq= 378.2025 MHz
;TX channel  51 :
        retlw    012h
        retlw    0E9h
        retlw    0C4h   ; Freq= 378.2875 MHz
;TX channel  52 :
        retlw    012h
        retlw    0EAh
        retlw    0DBh   ; Freq= 378.3725 MHz
;TX channel  53 :
        retlw    012h
        retlw    0EBh
        retlw    0F2h   ; Freq= 378.4575 MHz
;TX channel  54 :
        retlw    012h
        retlw    0EDh
        retlw    008h   ; Freq= 378.5425 MHz
;TX channel  55 :
        retlw    012h
        retlw    0EEh
        retlw    01Eh   ; Freq= 378.6275 MHz
;TX channel  56 :
        retlw    012h
        retlw    0EFh
        retlw    035h   ; Freq= 378.7125 MHz
;TX channel  57 :
        retlw    012h
        retlw    0F0h
        retlw    04Ch   ; Freq= 378.7975 MHz
;TX channel  58 :
        retlw    012h
        retlw    0F1h
        retlw    062h   ; Freq= 378.8825 MHz
;TX channel  59 :
        retlw    012h
```

```
        retlw   0F2h
        retlw   079h   ; Freq= 378.9675 MHz
;TX channel  60 :
        retlw   012h
        retlw   0F3h
        retlw   08Fh   ; Freq= 379.0525 MHz
;TX channel  61 :
        retlw   012h
        retlw   0F4h
        retlw   0A6h   ; Freq= 379.1375 MHz
;TX channel  62 :
        retlw   012h
        retlw   0F5h
        retlw   0BCh   ; Freq= 379.2225 MHz
;TX channel  63 :
        retlw   012h
        retlw   0F6h
        retlw   0D3h   ; Freq= 379.3075 MHz
;TX channel  64 :
        retlw   012h
        retlw   0F7h
        retlw   0E9h   ; Freq= 379.3925 MHz
;TX channel  65 :
        retlw   012h
        retlw   0F9h
        retlw   000h   ; Freq= 379.4775 MHz
;TX channel  66 :
        retlw   012h
        retlw   0FAh
        retlw   016h   ; Freq= 379.5625 MHz
;TX channel  67 :
        retlw   012h
        retlw   0FBh
        retlw   02Dh   ; Freq= 379.6475 MHz
;TX channel  68 :
        retlw   012h
        retlw   0FCh
        retlw   044h   ; Freq= 379.7325 MHz
;TX channel  69 :
        retlw   012h
        retlw   0FDh
        retlw   05Ah   ; Freq= 379.8175 MHz
;TX channel  70 :
```

```
        retlw   012h
        retlw   0FEh
        retlw   070h   ; Freq= 379.9025 MHz
;TX channel  71 :
        retlw   012h
        retlw   0FFh
        retlw   087h   ; Freq= 379.9875 MHz
;TX channel  72 :
        retlw   013h
        retlw   000h
        retlw   09Eh   ; Freq= 380.0725 MHz
;TX channel  73 :
        retlw   013h
        retlw   001h
        retlw   0B4h   ; Freq= 380.1575 MHz
;TX channel  74 :
        retlw   013h
        retlw   002h
        retlw   0CBh   ; Freq= 380.2425 MHz
```

Pseudo-random Table

```
prtable
        movlw    prtbl2<
        movwf    pclath
        movf     tall,w
        addwf    2,1
prtbl2
;seed =  6826
        retlw    25      ;0
        retlw    64      ;1
        retlw    29      ;2
        retlw    12      ;3
        retlw    45      ;4
        retlw    16      ;5
        retlw    5  ;6
        retlw    26      ;7
        retlw    59      ;8
        retlw    7  ;9
        retlw    0  ;a
        retlw    60      ;b
        retlw    2  ;c
        retlw    70      ;d
        retlw    9  ;e
        retlw    54      ;f
        retlw    46      ;10
        retlw    23      ;11
        retlw    65      ;12
        retlw    11      ;13
        retlw    44      ;14
        retlw    69      ;15
        retlw    48      ;16
        retlw    14      ;17
        retlw    47      ;18
        retlw    40      ;19
        retlw    57      ;1a
        retlw    51      ;1b
        retlw    15      ;1c
        retlw    21      ;1d
        retlw    53      ;1e
        retlw    20      ;1f
        retlw    50      ;20
        retlw    63      ;21
```

```
        retlw   71      ;22
        retlw   66      ;23
        retlw   52      ;24
        retlw   13      ;25
        retlw   67      ;26
        retlw   24      ;27
        retlw   73      ;28
        retlw   19      ;29
        retlw   30      ;2a
        retlw   3  ;2b
        retlw   35      ;2c
        retlw   38      ;2d
        retlw   74      ;2e
        retlw   41      ;2f
        retlw   27      ;30
        retlw   1  ;31
        retlw   68      ;32
        retlw   72      ;33
        retlw   28      ;34
        retlw   36      ;35
        retlw   49      ;36
        retlw   18      ;37
        retlw   43      ;38
        retlw   31      ;39
        retlw   58      ;3a
        retlw   42      ;3b
        retlw   8  ;3c
        retlw   34      ;3d
        retlw   32      ;3e
        retlw   4  ;3f
        retlw   62      ;40
        retlw   6  ;41
        retlw   37      ;42
        retlw   17      ;43
        retlw   10      ;44
        retlw   55      ;45
        retlw   61      ;46
        retlw   56      ;47
        retlw   22      ;48
        retlw   39      ;49
        retlw   33      ;4a
;seed =  8866
        retlw   39      ;4b
```

```
retlw   60      ;4c
retlw   32      ;4d
retlw   68      ;4e
retlw   26      ;4f
retlw   45      ;50
retlw   42      ;51
retlw   15      ;52
retlw   46      ;53
retlw   29      ;54
retlw   25      ;55
retlw   63      ;56
retlw   54      ;57
retlw   40      ;58
retlw   9 ;59
retlw   66      ;5a
retlw   50      ;5b
retlw   65      ;5c
retlw   20      ;5d
retlw   30      ;5e
retlw   11      ;5f
retlw   72      ;60
retlw   7 ;61
retlw   18      ;62
retlw   34      ;63
retlw   38      ;64
retlw   19      ;65
retlw   49      ;66
retlw   10      ;67
retlw   74      ;68
retlw   52      ;69
retlw   12      ;6a
retlw   53      ;6b
retlw   13      ;6c
retlw   44      ;6d
retlw   14      ;6e
retlw   43      ;6f
retlw   48      ;70
retlw   70      ;71
retlw   57      ;72
retlw   21      ;73
retlw   62      ;74
retlw   28      ;75
retlw   69      ;76
```

```
        retlw   37      ;77
        retlw   47      ;78
        retlw   56      ;79
        retlw   5 ;7a
        retlw   73      ;7b
        retlw   6 ;7c
        retlw   41      ;7d
        retlw   59      ;7e
        retlw   67      ;7f
        retlw   33      ;80
        retlw   24      ;81
        retlw   61      ;82
        retlw   17      ;83
        retlw   3 ;84
        retlw   27      ;85
        retlw   23      ;86
        retlw   58      ;87
        retlw   71      ;88
        retlw   51      ;89
        retlw   1 ;8a
        retlw   4 ;8b
        retlw   22      ;8c
        retlw   36      ;8d
        retlw   16      ;8e
        retlw   35      ;8f
        retlw   2 ;90
        retlw   8 ;91
        retlw   64      ;92
        retlw   0 ;93
        retlw   31      ;94
        retlw   55      ;95
;seed =  4596
        retlw   17      ;96
        retlw   26      ;97
        retlw   23      ;98
        retlw   13      ;99
        retlw   19      ;9a
        retlw   16      ;9b
        retlw   10      ;9c
        retlw   51      ;9d
        retlw   9 ;9e
        retlw   56      ;9f
        retlw   34      ;a0
```

```
retlw   2 ;a1
retlw   61      ;a2
retlw   64      ;a3
retlw   31      ;a4
retlw   46      ;a5
retlw   63      ;a6
retlw   41      ;a7
retlw   36      ;a8
retlw   68      ;a9
retlw   47      ;aa
retlw   32      ;ab
retlw   28      ;ac
retlw   54      ;ad
retlw   70      ;ae
retlw   52      ;af
retlw   48      ;b0
retlw   18      ;b1
retlw   20      ;b2
retlw   25      ;b3
retlw   71      ;b4
retlw   6 ;b5
retlw   24      ;b6
retlw   53      ;b7
retlw   58      ;b8
retlw   4 ;b9
retlw   74      ;ba
retlw   38      ;bb
retlw   69      ;bc
retlw   66      ;bd
retlw   15      ;be
retlw   44      ;bf
retlw   5 ;c0
retlw   1 ;c1
retlw   8 ;c2
retlw   33      ;c3
retlw   60      ;c4
retlw   30      ;c5
retlw   7 ;c6
retlw   73      ;c7
retlw   29      ;c8
retlw   11      ;c9
retlw   27      ;ca
retlw   3 ;cb
```

```
retlw   42      ;cc
retlw   45      ;cd
retlw   22      ;ce
retlw   40      ;cf
retlw   43      ;d0
retlw   14      ;d1
retlw   0  ;d2
retlw   37      ;d3
retlw   49      ;d4
retlw   55      ;d5
retlw   21      ;d6
retlw   62      ;d7
retlw   65      ;d8
retlw   57      ;d9
retlw   12      ;da
retlw   72      ;db
retlw   35      ;dc
retlw   59      ;dd
retlw   67      ;de
retlw   39      ;df
retlw   50      ;e0
```

Section 6. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE:3/19/01

Test Results: Complies.

Measurement Data:

Maximum Dwell Time On Any Channel: 300 mS in 30 seconds

See Plot

Test Data-Time of Occupancy

Data Plot **Time of Occupancy**

Page 1 of 2 Complete X

Job No.: 0L0528R Date: 3/19/01 Preliminary

Specification: 15.247 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 50

E.U.T.: EZ Pro

Configuration: Transmit modulated data

Sample Number: S08

Location: Lab 1 RBW: Refer to Plots

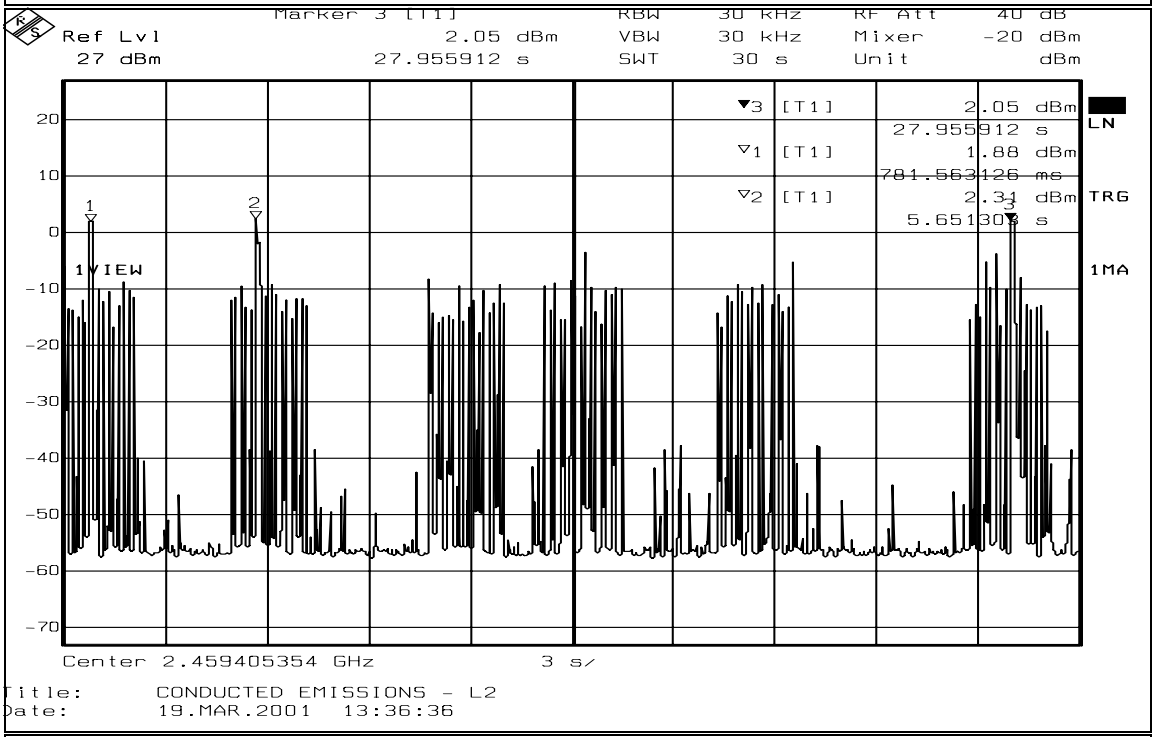
Detector Type: Peak VBW: Refer to Plots

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1043
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used: #802 Near Field Probe Set

Measurement Uncertainty: +/-3.6 dB



Notes: **3 PULSES IN 30 SECOND PERIOD**

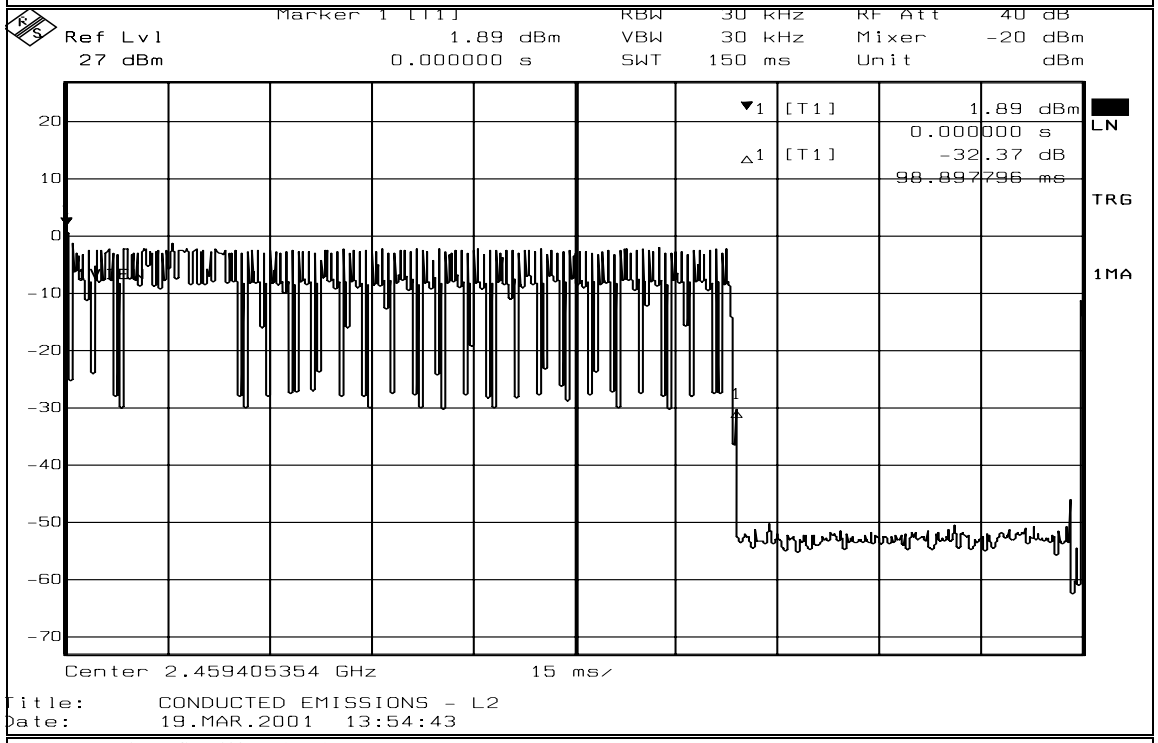
100 mS / pulse

Test Data-Time of Occupancy

Data Plot Time of Occupancy

Page 2 of 2

Job No.:	0L0528R	Date:	3/19/01
Specification:	15.2	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	EZ Pro		
Configuration:	Transmit modulated data		



Notes: **1 PULSE =100 Ms (Base)**

Section 7. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
TESTED BY: David Light	DATE:12/9/20021

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

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 **Occupied Bandwidth**

Page 1 of 1 Complete x

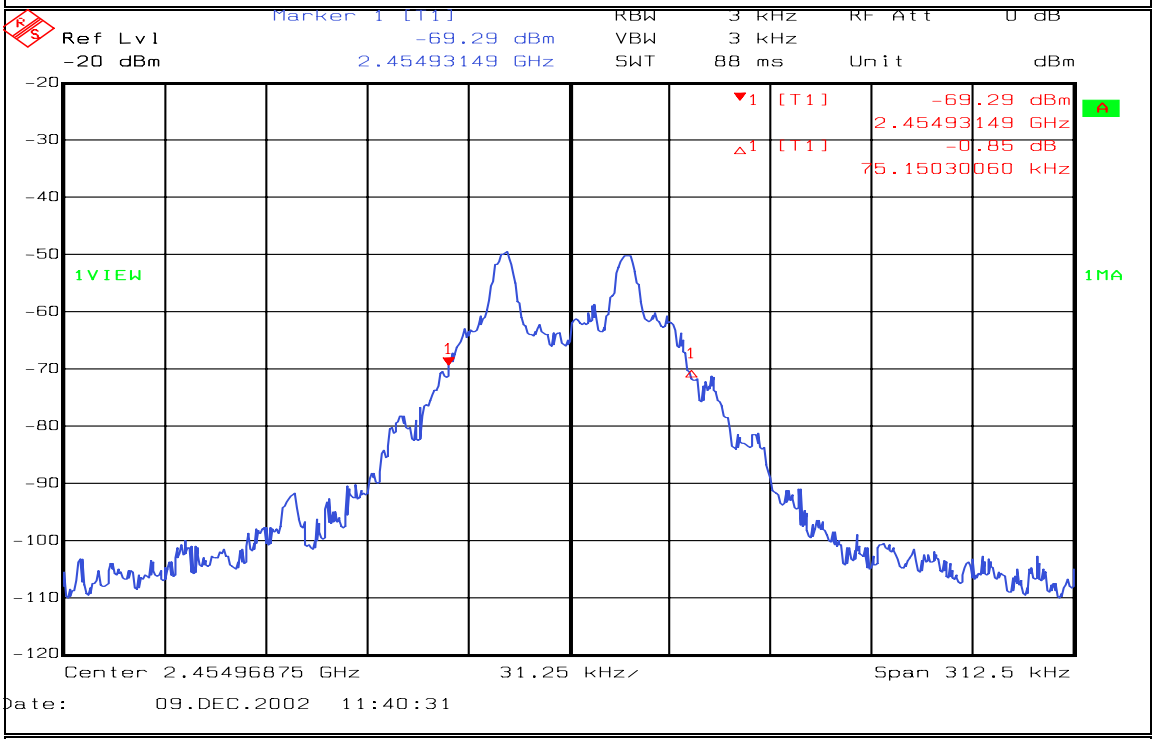
Job No.:	2L0452R	Date:	12/9/2002	Preliminary:	
Specification:	15.247	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:					
Configuration:	TX FULL POWER				
Sample Number:	1				
Location:	AC 3	RBW:	100 kHz	Measurement	
Detector Type:	Peak	VBW:	100 kHz	Distance:	3 m

Test Equipment Used

Antenna:	1304	Directional Coupler:	
Pre-Amp:		Cable #1:	1484
Filter:		Cable #2:	1485
Receiver:	1036	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used:

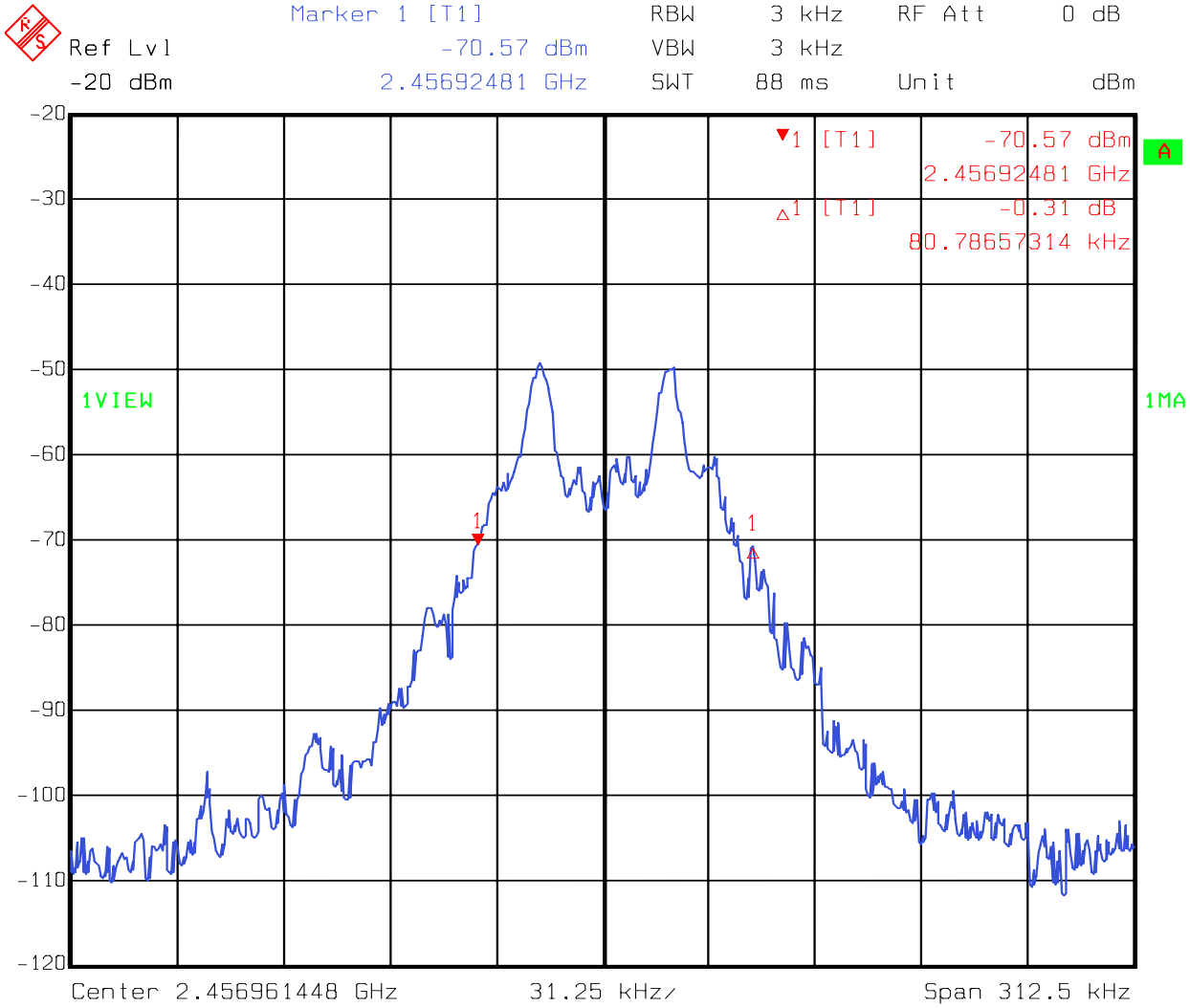
Measurement Uncertainty: +/-1.7 dB



Notes: **20 dB Bandwidth = 75.2 kHz**
Plot shows lowest operating channel to be compliant at lower band edge

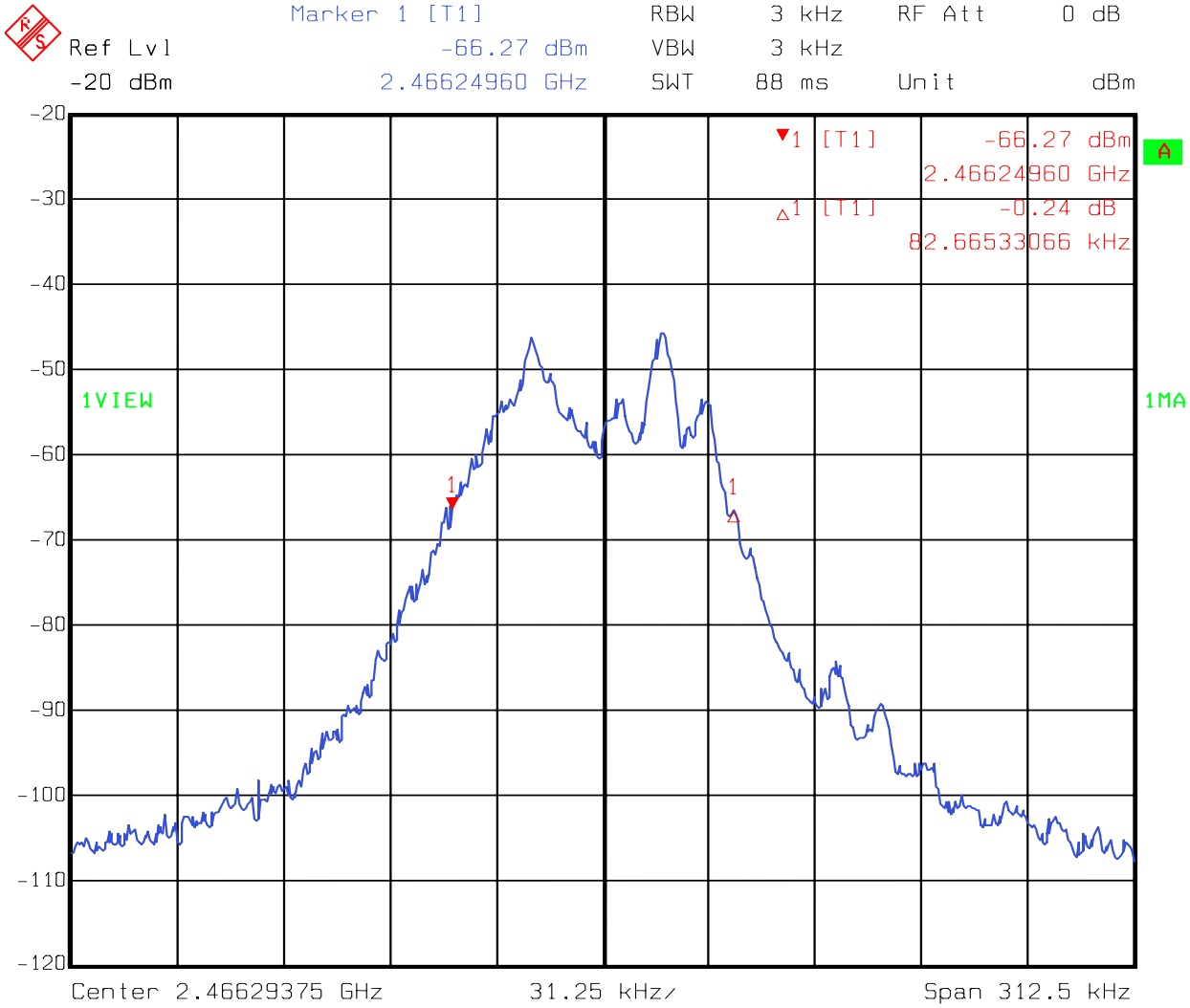
Lowest channel

Test Data – Occupied Bandwidth



Mid band

Test Data – Occupied Bandwidth



Highest channel

Section 8. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: David Light	DATE: 12/9/2002

Test Results: Complies.

Measurement Data: See attached plots.

Detachable antenna? ☐ Yes ☒ No

If yes, state the type of non-standard connector used:

Maximum Peak eirp: 29.5 mW.

Antennas: The only antenna used with the product is a non-detachable antenna that is integrated on the PWB.

Note:

1) **The unit was tested at +/- 15% supply voltage with no change in output power.**
2) **The unit was tested on three axis'.**

Measurement Uncertainty: +/-1.7 dB

Test Data – Peak Power Output

Nemko Dallas, Inc.

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

EIRP Substitution Method

Page 1 of 1 Complete X
Job No.: 2L0452R Date: 12/5/02 Preliminary
Specification: 15.247 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.:
Configuration: TX FULL POWER - LYING FLAT (WORST CASE)
Sample No: 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: 1016 Cable #1: 1484
Filter: Cable #2: 1485
Receiver: 1036 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)	Limit (dBm)	EIRP (dBm)	EIRP (mW)	Polarity	Comments
										Lowest channel
2455	-31.2	37.0		0	8.9	36	14.7	29.5121	H	
2455	-37.8	34.2		0	8.9	36	5.3	3.3625	V	
										Mid band
2457	-39.8	34.2		0	8.9	36	3.3	2.1216	V	
2457	-32.5	37.0		0	8.9	36	13.4	21.8776	H	
										Highest channel
2467	-31.2	37.0		0	8.9	36	14.7	29.5121	H	
2467	-38.8	34.2		0	8.9	36	4.3	2.6710	V	

Notes:

Section 9. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
TESTED BY: David Light	DATE:12/9/2002

Test Results: Complies.

Measurement Data: See attached table.

Duty Cycle Calculation: None

Measurement Uncertainty: +/-1.7 dB

Test Data - Radiated Emissions (Restricted Bands)

Nemko Dallas, Inc.

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

Radiated Emissions

Page 1 of 2

Job No.:	2L0452R	Date:	12/5/2002
Specification:	15.247	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	EZ Pro module		
Configuration:	Lying flat (worst case) - Tx full power		
Sample Number:	1		
Location:	AC 3	RBW:	1 MHz
Detector Type:	Peak	Peak VBW:	1 MHz
		Avg VBW:	10 MHz

Test Equipment Used

Antenna:	1304	Directional Coupler:	#N/A
Pre-Amp:	1016	Cable #1:	1484
Filter:	1482	Cable #2:	1485
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	#N/A	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:

Measurement Uncertainty: +/- .7 dB

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
Lowest Channel								Horizontal
4.9100	47	33.9	4.3	32.7	52.5	54	-1.5	
7.3650	46.5	36.3	5.3	32.9	55.2	74	-18.8	
7.365	39.3	36.3	5.3	32.9	48.0	54	-6.0	Average
12.275	44.8	39.9	7.3	35.1	56.9	74	-17.1	
12.275	31.8	39.9	7.3	35.1	43.9	54	-10.1	Average
								Vertical
4.9100	50.7	33.9	4.3	32.7	56.2	74	-17.8	
4.9100	45.8	33.9	4.3	32.7	51.3	54	-2.7	Average
7.3650	46.8	36.3	5.3	32.9	55.5	74	-18.5	Average
7.365	36.8	36.3	5.3	32.9	45.5	54	-8.5	
12.275	44	39.9	7.3	35.1	56.1	74	-17.9	Average
12.275	33.2	39.9	7.3	35.1	45.3	54	-8.7	

Notes: **Continued on next page**

Test Data - Radiated Emissions

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

Nemko Dallas, Inc.

Radiated Spurious Emissions

Page 2 of 2 **Continuation Page**

Job No.: Date: 12/9/2002

Specification: CFR 47, Part 15 Temperature(°F): 22

Tested By: #N/A Relative Humidity(%) 40

E.U.T.: EZ Pro module

Configuration: Lying flat (worst case) - Tx full power

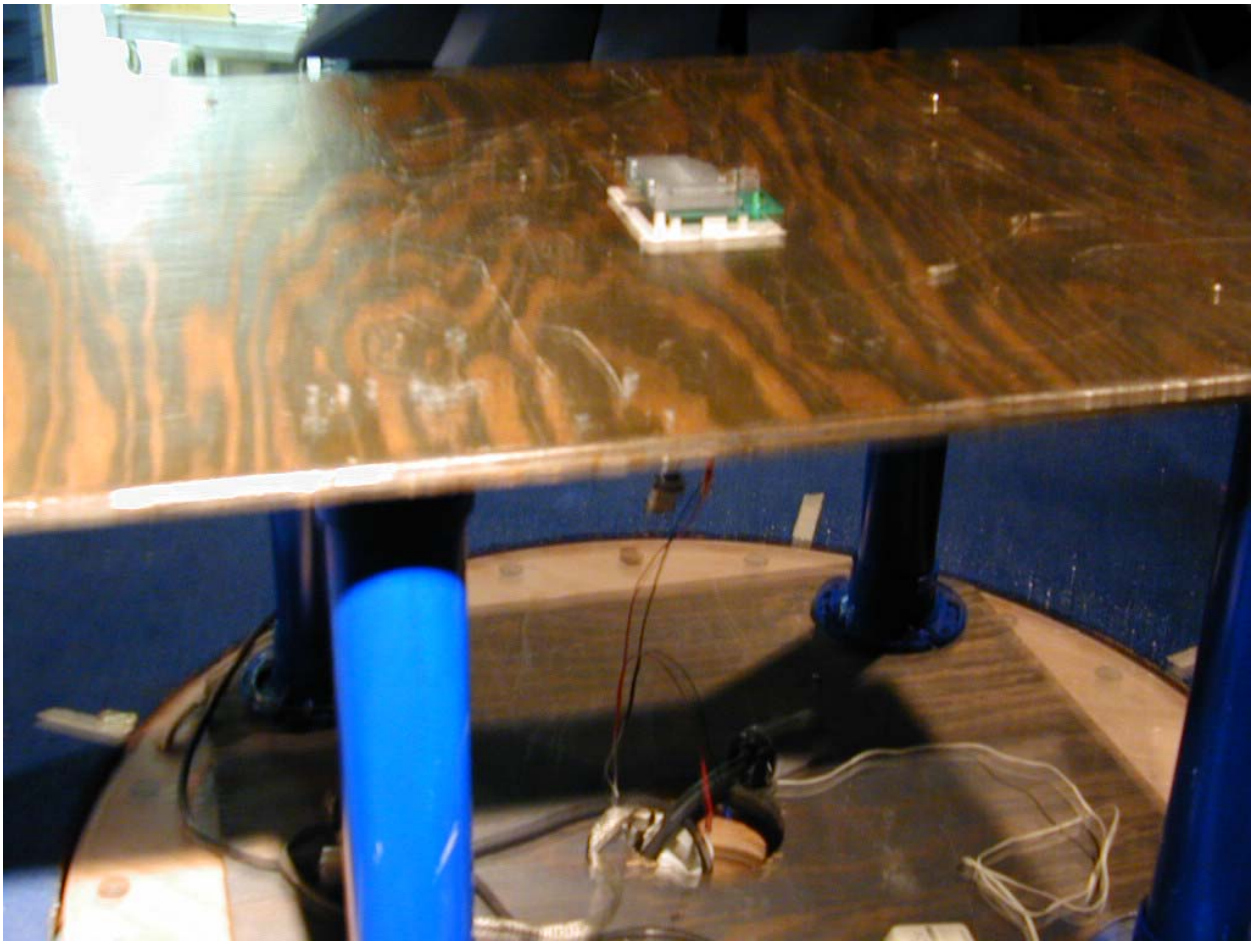
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
Mid band								Vertical
4.914	50.5	33.9	4.3	32.7	56.0	74	-18.0	
4.914	47.2	33.9	4.3	32.7	52.7	54	-1.3	Average
7.371	45.6	36.3	5.3	32.9	54.3	74	-19.7	
7.371	41.4	36.3	5.3	32.9	50.1	54	-3.9	Average
12.285	44.6	39.9	7.3	35.1	56.7	74	-17.3	
12.285	35.3	39.9	7.3	35.1	47.4	54	-6.6	Average
								Horizontal
4.914	45.5	33.9	4.3	32.7	51.0	54	-3.0	
7.371	36.3	36.3	5.3	32.9	45.0	54	-9.0	
12.285	43.8	39.9	7.3	35.1	55.9	74	-18.1	
12.285	35.7	39.9	7.3	35.1	47.8	54	-6.2	Average
High channel								Horizontal
4.933	44.4	33.9	4.3	32.7	49.9	54	-4.1	
7.399	43.2	36.3	5.3	32.9	51.9	54	-2.1	
12.331	44.2	39.9	7.3	35.1	56.3	74	-17.7	
12.331	35.4	39.9	7.3	35.1	47.5	54	-6.5	Average
								Vertical
4.933	49.8	33.9	4.3	32.7	55.3	74	-18.7	
4.933	45.7	33.9	4.3	32.7	51.2	54	-2.8	Average
7.399	45.6	36.3	5.3	32.9	54.3	74	-19.7	
7.399	39.8	36.3	5.3	32.9	48.5	54	-5.5	Average
12.331	44.1	39.9	7.3	35.1	56.2	74	-17.8	
12.331	35.4	39.9	7.3	35.1	47.5	54	-6.5	Average

Notes:	All measurements are PEAK unless otherwise noted
	Searched spectrum to the 10th harmonic of highest channel

Radiated Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW



Section 10. Test Equipment List

Calibration list for tests done March 2001

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date	Cal. Due
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99	07/16/01
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99	06/14/01
1043	Flexable cable 1m	Astrolab Inc. 32027-2-29094K-1M	0	01/29/01	01/29/02
802	Near Field Probe Set	EMCO 7405	103	CNR	CNR
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	Cal B4 Use	N/A
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	05/24/00	05/24/01
968	Filter, High pass 5khz	Solartron 7930-5.0	933124	08/04/00	08/04/01
674	LIMITER	HP 11947A	3107A02200	11/04/00	11/04/01
1328	CABLE, .5m	KTL RG223	N/A	03/12/01	03/12/02
1534	CABLE, 9M	KTL RG223	NA	08/30/00	08/30/01
969	lisn	Schwarzbeck 8120	8120281	07/01/00	07/01/01
1578	50 Ohm Load	Mini-Circuits MCLBTRM-50	920513	01/12/01	01/12/02
1578	50 Ohm Load	Mini-Circuits MCLBTRM-50	920513	01/12/01	01/12/02
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	05/25/00	05/25/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	05/25/00	05/25/01

Calibration list for tests done December 2002

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/03/03
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02	07/15/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02	07/15/03
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1555	Filter high pass 5KHz	Solar Electronics 7930-5.0	933125	06/06/02	06/06/03
1258	LISN .15mhz-30mhz	EMCO 0	1305	07/09/02	07/09/03
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1547	CABLE .6m	KTL RG223	N/A	08/06/02	08/06/03
1129	CABLE, 9.5m	KTL RG58	N/A	06/06/02	06/06/03

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 250µV (48 dBµV) 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 sec./.001 sec.)/75 chan. = 400 x 1 msec. = 400 msec. or 0.4 sec. in 30 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:
Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

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 (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

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 (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

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

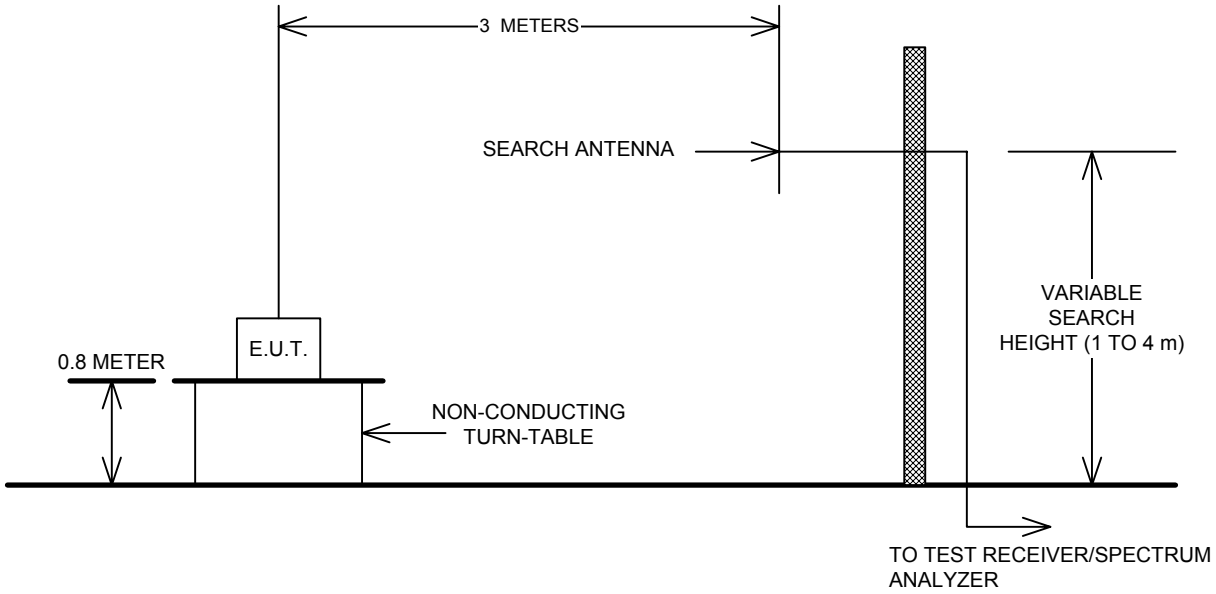
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218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

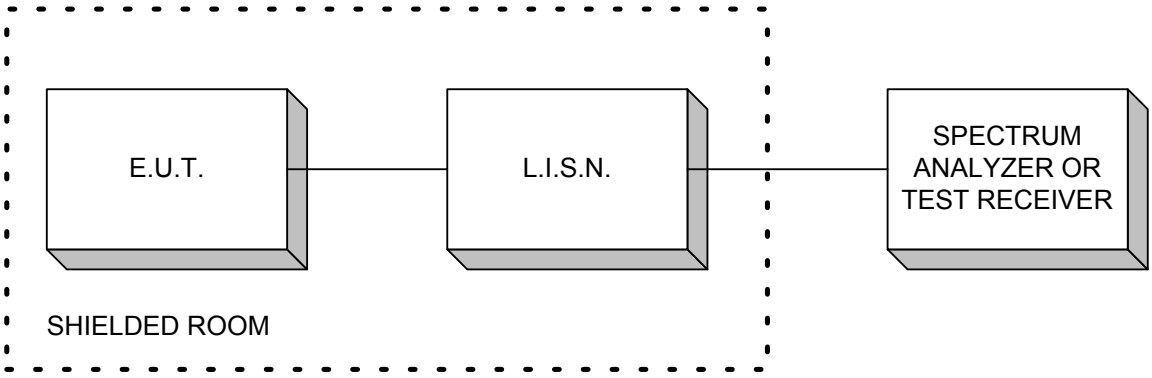
Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals