



Nemko Test Report: 13791RUS1

Applicant: Sirit, Inc.
1321 Valwood Parkway
Carrollton, TX 75006

Equipment Under Test: IDentity Max Desktop Reader-019
(E.U.T.)

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

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

TESTED BY:



David Light, Senior Wireless Engineer

DATE: 08 June, 2008

**APPROVED
BY:**



DATE: 27 June, 2008

Total Number of Pages: 39

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Section 1. Summary of Test Results

Manufacturer: Sirit, Inc.

Model No.: Identity Max Reader-019

Serial No.: ENG001

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 C63.4-2003. 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. NONE

See " Summary of Test Data".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a)	Complies
Channel Separation	15.247(a)(1)	Complies
Time of Occupancy	15.247(a)(1)	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	Complies
Peak Power Output	15.247(b)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d)	Complies
Spurious Emissions (Radiated)	15.247(d)	Complies

Footnotes:

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

General Equipment Information

Frequency Band: ☒ 902 – 928 MHz
 ☐ 2400 – 2483.5 MHz
 ☐ 5725 – 5850 MHz

Operating Frequency Range: 902.75 to 927.25

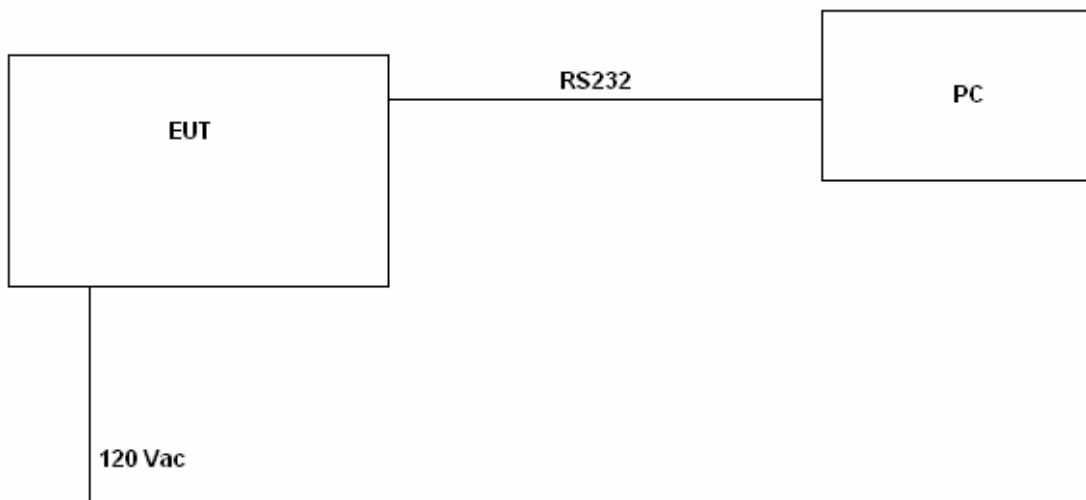
Number of Channels: 50

Channel Spacing: 500 kHz

User Frequency Adjustment: Software controlled

Description of EUT

The Sirit Identity Max Desktop Reader is an RFID reader device that transmits and receives in the 900 MHz ISM band.

System Diagram

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 18 June 2008

Test Results: Complies. The worst case emission was 52.59 dB μ V at 0.175 MHz. This is 2.13 dB below the average specification limit of 54.72 dB μ V.

Test Data: Refer to attached plots

Equipment Used: 1325-1258-1663-674

Measurement Uncertainty: +/- 1.7 dB

Temperature: 21 °C

Relative Humidity: 35 %

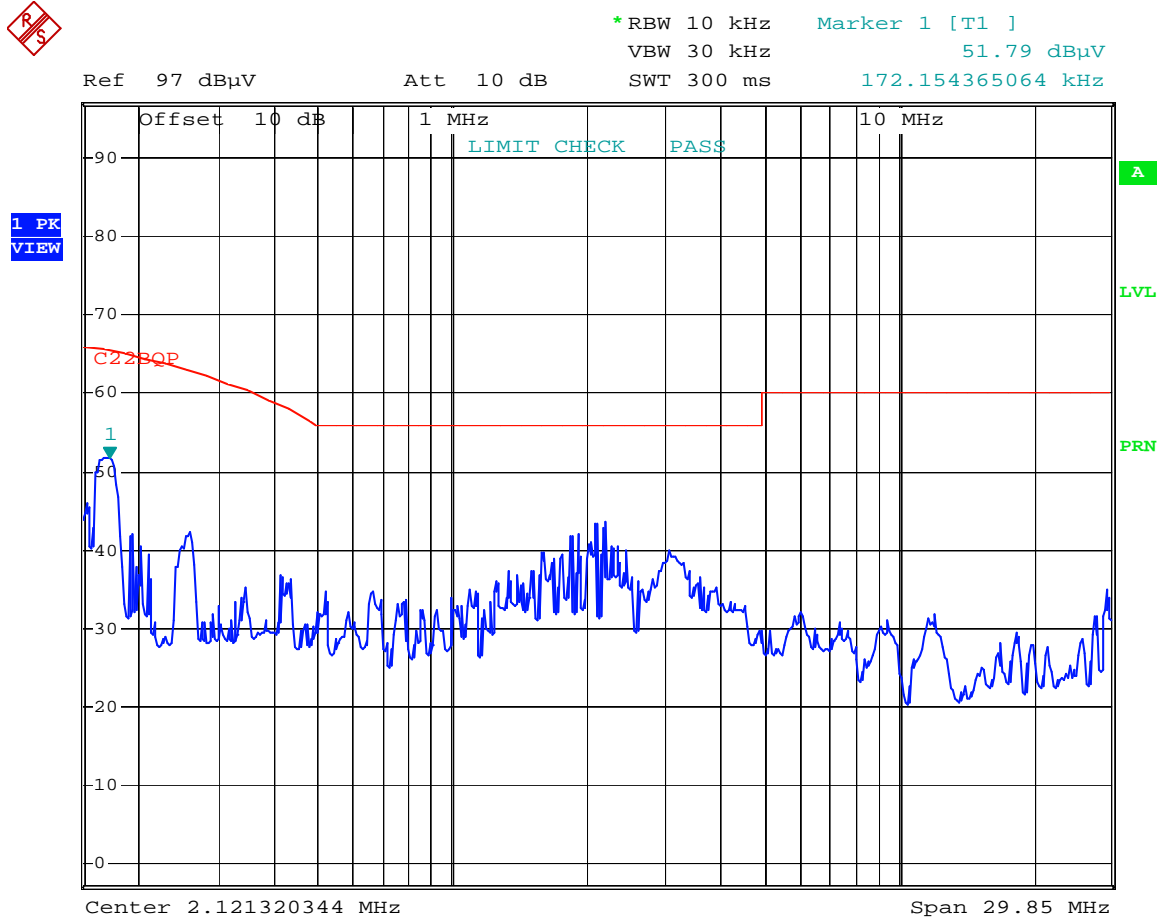
Power Supply: Jameco model S15AB8050200

Input: 100-240 Vac

Output: 5 Vdc

Test Data – Powerline Conducted Emissions

L1 - Peak



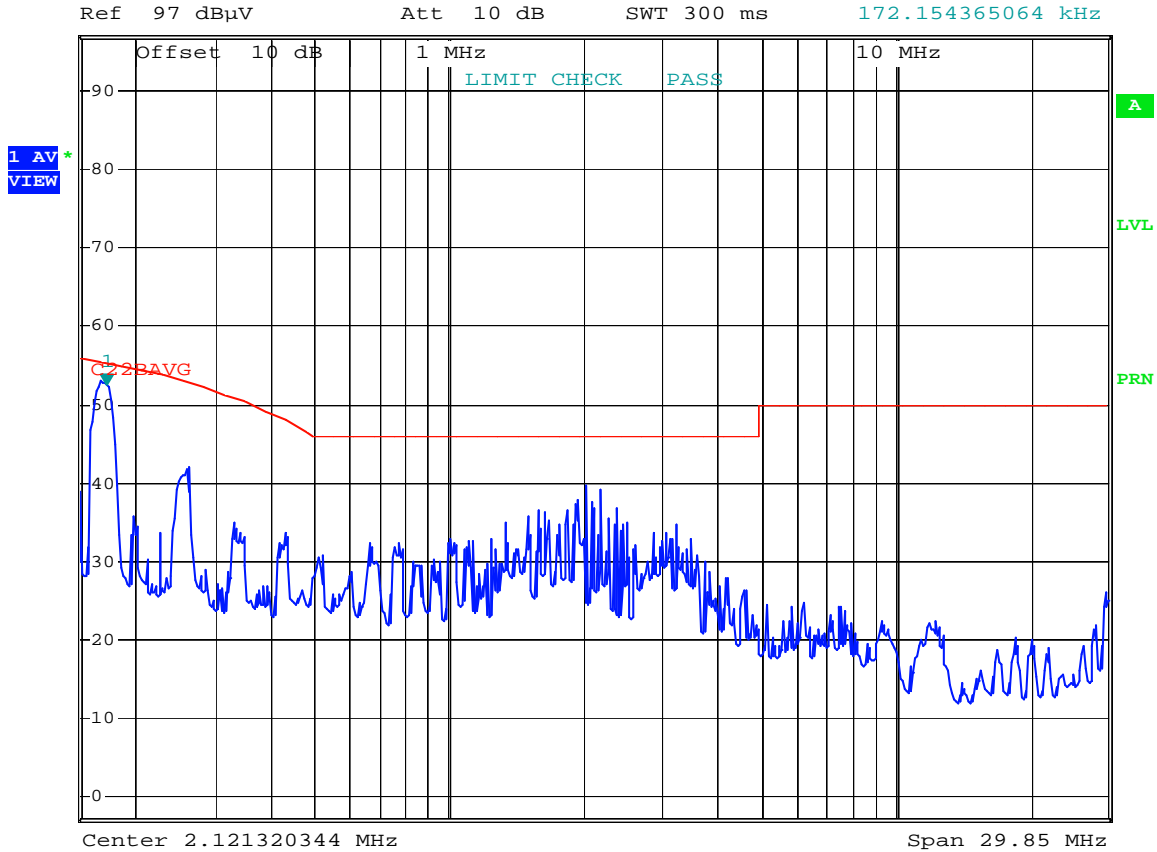
Date: 18.JUN.2008 14:23:39

Test Data – Powerline Conducted Emissions

L1 – Average



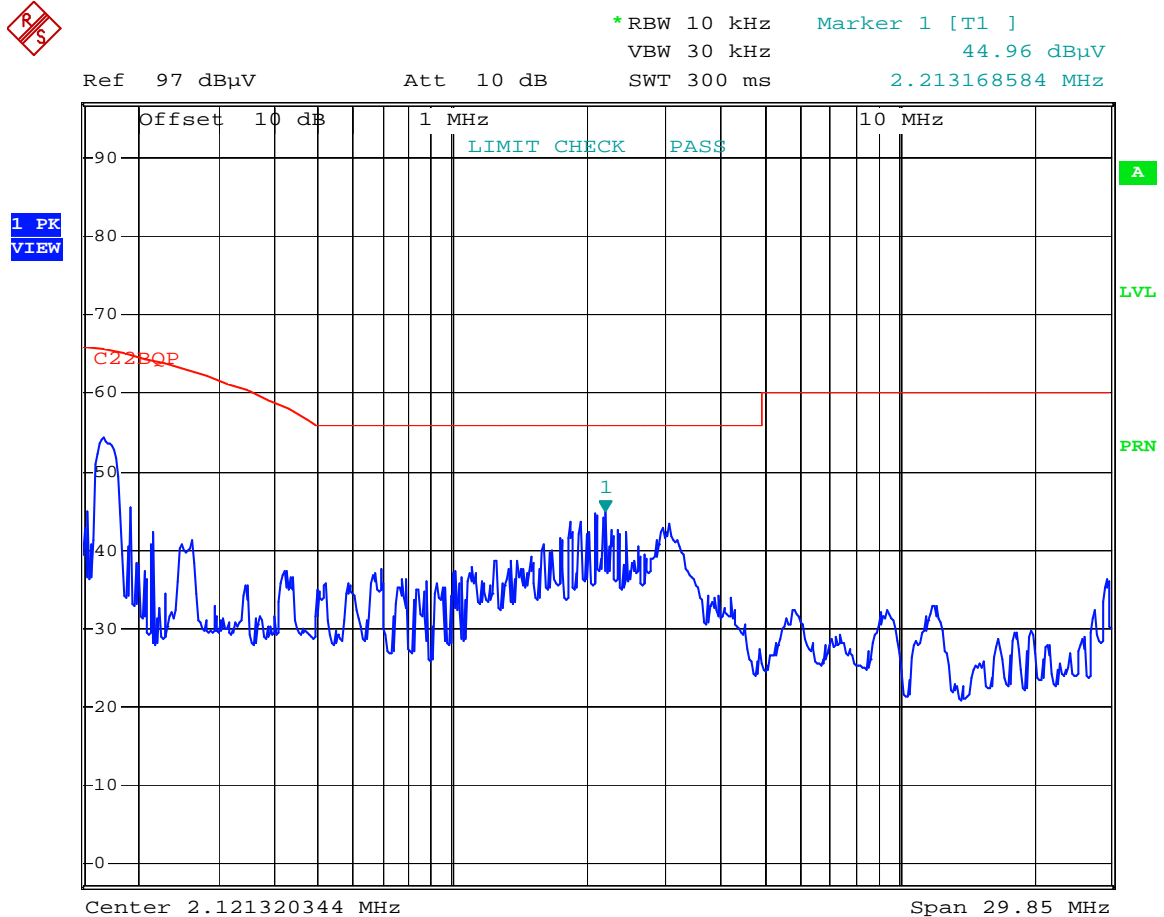
*RBW 10 kHz Marker 1 [T1]
 VBW 100 kHz 52.61 dBµV
 SWT 300 ms 172.154365064 kHz



Date: 18.JUN.2008 14:22:31

Test Data – Powerline Conducted Emissions

L2 - Peak



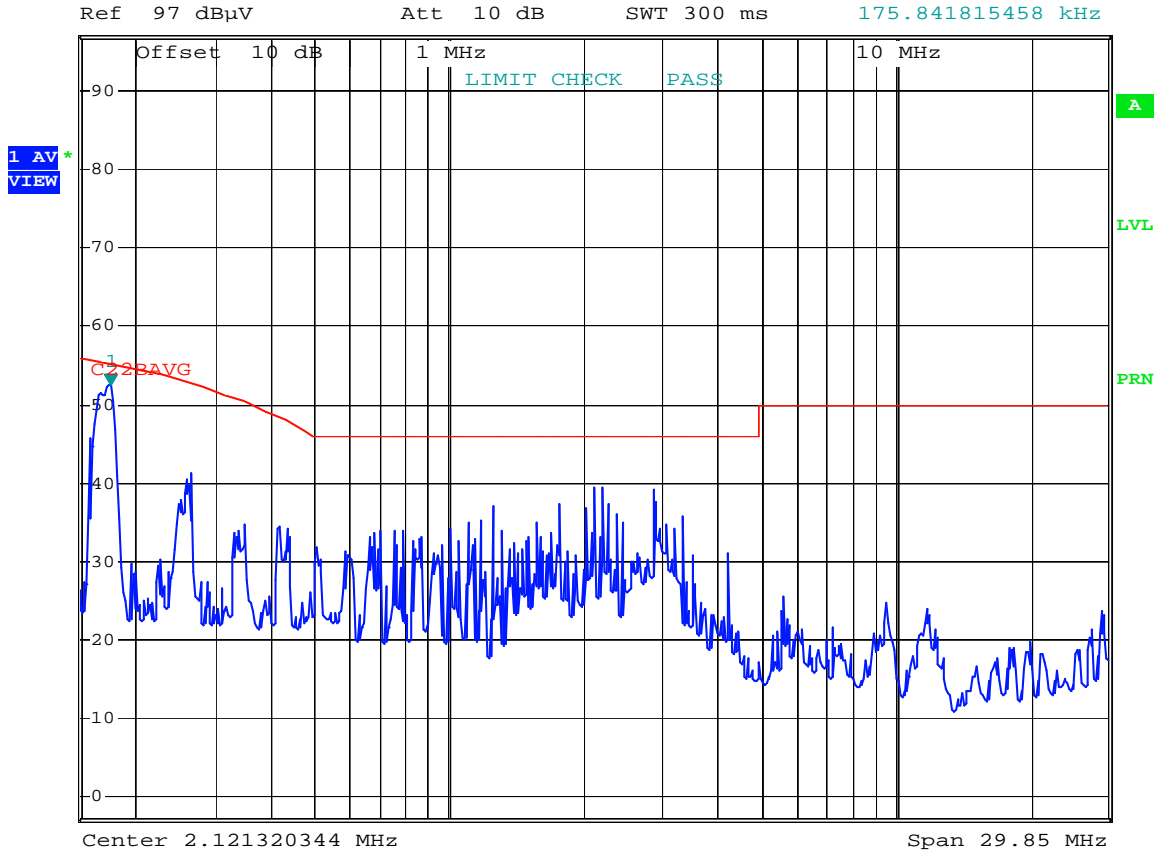
Date: 18.JUN.2008 14:24:39

Test Data – Powerline Conducted Emissions

L2 – Average



*RBW 10 kHz Marker 1 [T1]
 VBW 100 kHz 52.59 dBµV
 SWT 300 ms 175.841815458 kHz



Date: 18.JUN.2008 14:26:09

Test Setup Photos – Powerline Conducted Emissions



Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 18 June 2008

Test Results: Complies.

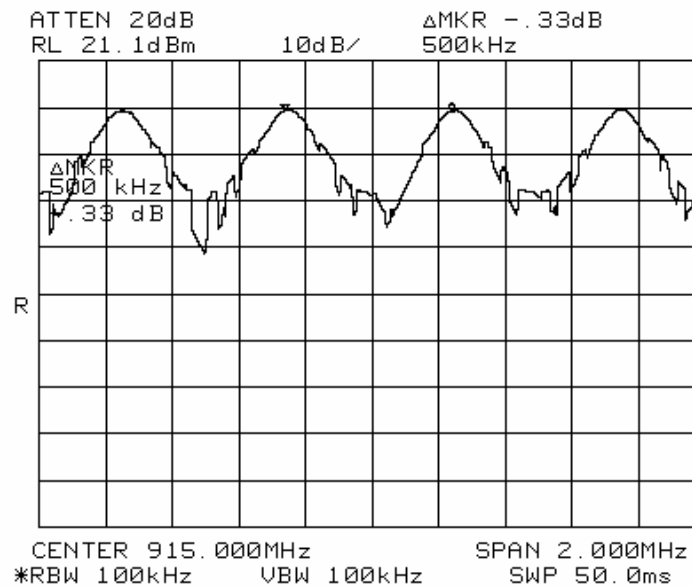
Measurement Data: See 20 dB BW plot
Measured 20 dB bandwidth: 327 kHz
Channel Separation: 500 kHz

Equipment Used: 1464-1082-1472

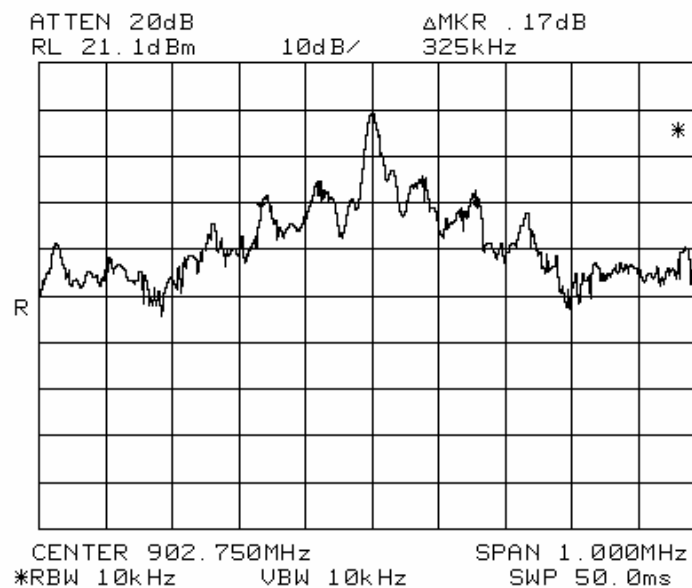
Measurement Uncertainty: 1×10^{-7} ppm

Temperature: 21 °C

Relative Humidity: 35 %

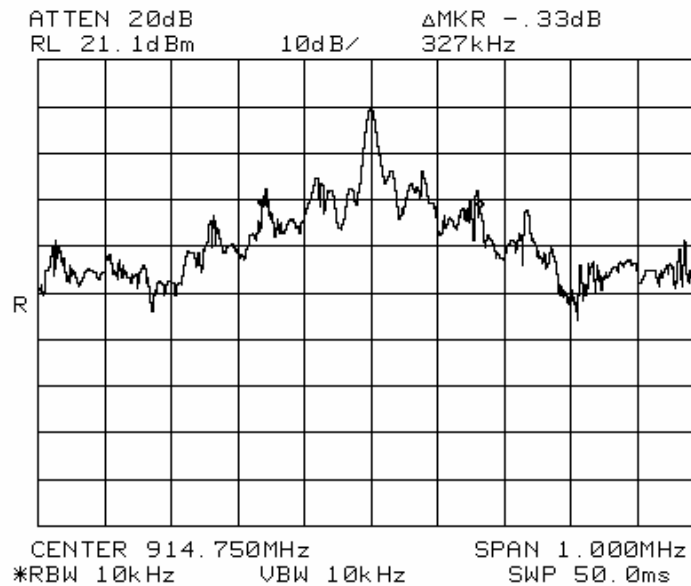
Test Data – Channel Separation**Test Data – 20 dB Bandwidth**

Low Channel

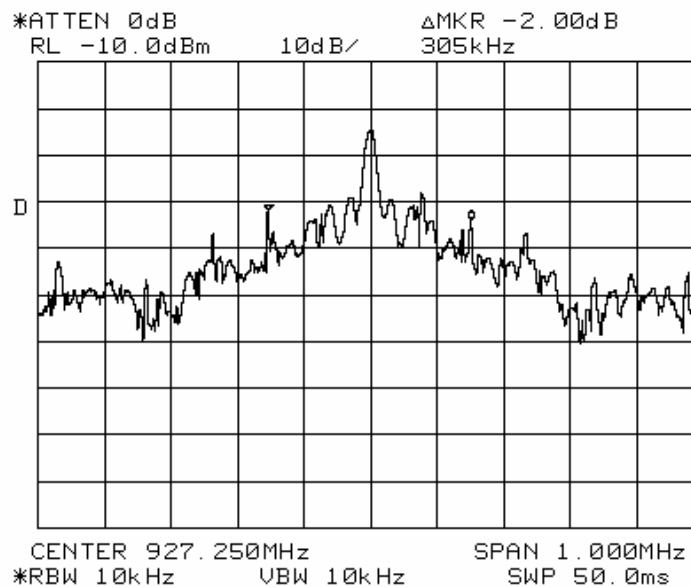


Test Data – 20 dB Bandwidth

Mid Channel



High Channel



Section 5. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 18 June 2008

Test Results: Complies.

Measurement Data:

Maximum Dwell Time On Any Channel: 200 mS in 10 seconds
Number of Hopping Channels: 50

Equipment Used: 1464-1082-1472

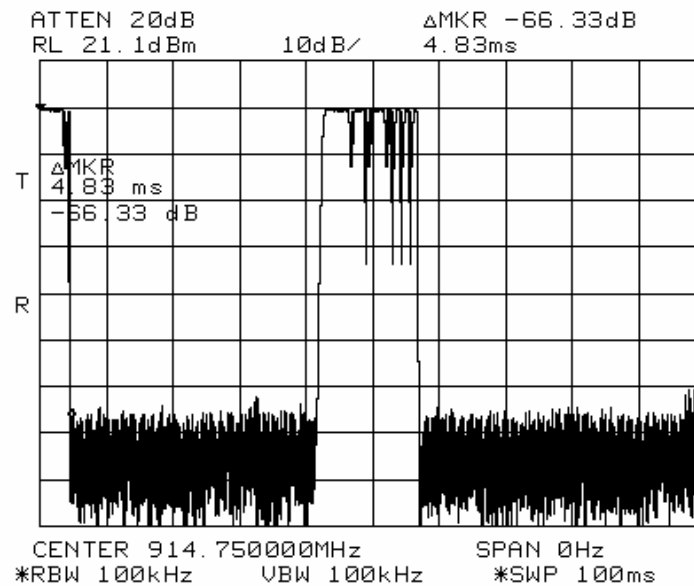
Measurement Uncertainty: 1X10⁻⁷ppm

Temperature: 21 °C

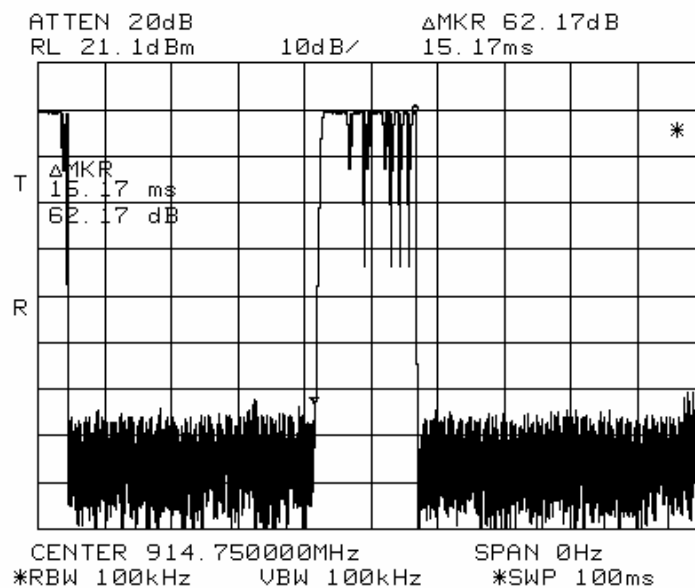
Relative Humidity: 35 %

Test Data – Time of Occupancy

4.83 mS Short Pulse



15.17 mS Long Pulse

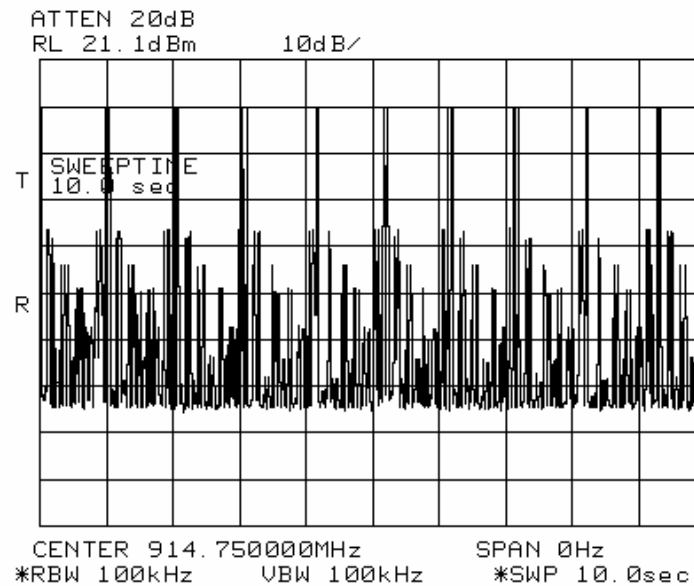


20 mS in 100 mS

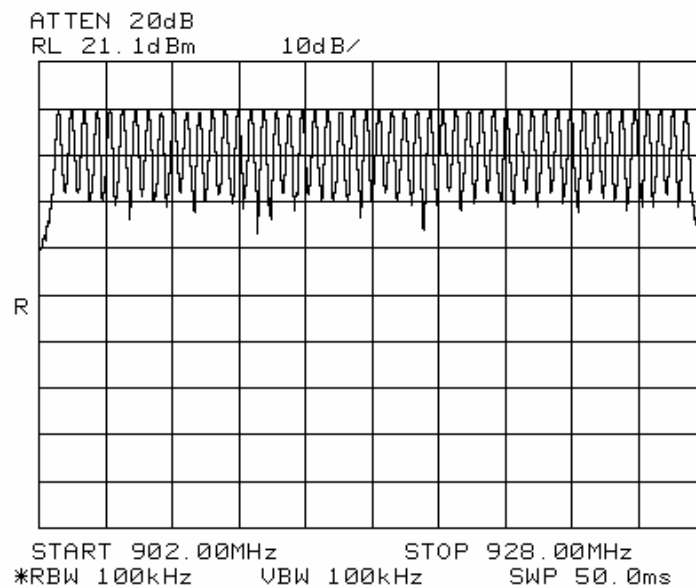
 $20 \log (20/100) = -14 \text{ dB}$ duty cycle correction

Test Data – Time of Occupancy

20 mS X 10 = 200 mS in 10 seconds



Number of Channels = 50



Section 6. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: David Light	DATE: 18 June 2008

Test Results: Complies.**Measurement Data:** See attached plots.

Detachable antenna?

☐ Yes☒ No

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

Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)	Antenna Type	Gain (dBi)	E.I.R.P. (dBm)	E.I.R.P. (mW)
902.75	10.1	10.2	Linear	5.5	15.6	36.3
914.75	10.4	11.0	Linear	5.5	15.9	38.9
927.25	10.8	12.0	Linear	5.5	16.3	42.7
Maximum EIRP (mW): 42.7						

Measurement Bandwidth: RBW=VBW=1 MHz Peak Detector

- ☒ This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.
- ☐ For battery powered equipment, the device was tested with a fresh battery per 15.31(e).
- ☒ The device was tested on three channels per 15.31(l).
- ☐ This test was performed radiated.

Equipment Used: 1464-1082-1472**Measurement Uncertainty:** 1.7 dB**Temperature:** 21 °C**Relative Humidity:** 35 %

Section 7. Spurious Emissions (Antenna Conducted)

NAME OF TEST: Spurious Emissions (Antenna Conducted)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 18 June 2008

Test Results:

Complies.

Measurement Data:

Refer to attached plots

Equipment Used:

1464-1082-1472

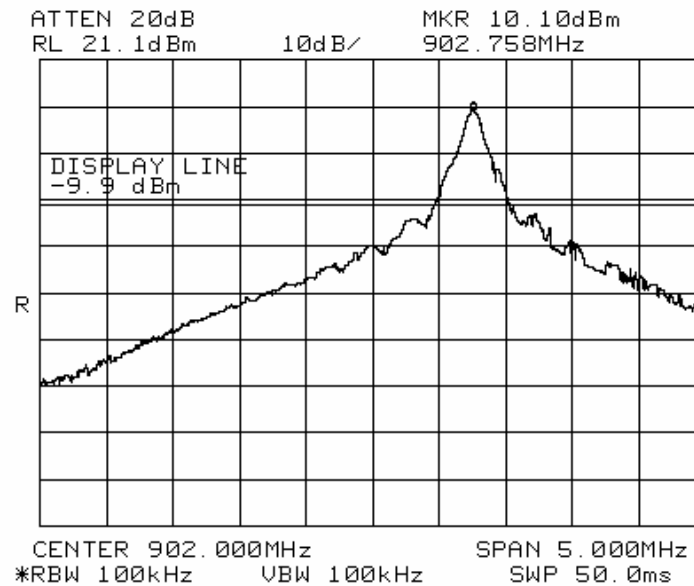
Measurement Uncertainty: 1X10⁻⁷ppm**Temperature:** 21 °C**Relative Humidity:** 35 %**Spectrum Analyzer Settings:** RBW=VBW=100 kHz Peak Detector

The device was tested on three channels per 15.31(l).

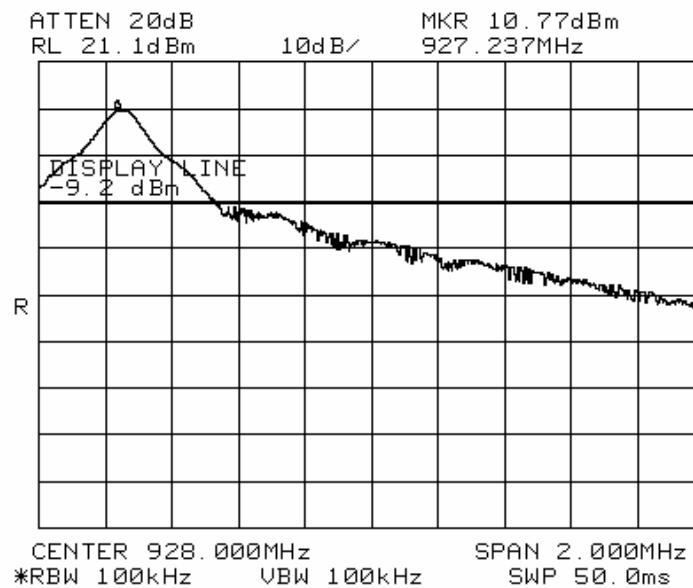
The spectrum was searched from 30 MHz to the 10th harmonic of the highest carrier frequency.

Test Data – Spurious Emissions at Antenna Terminals

Lower Band Edge

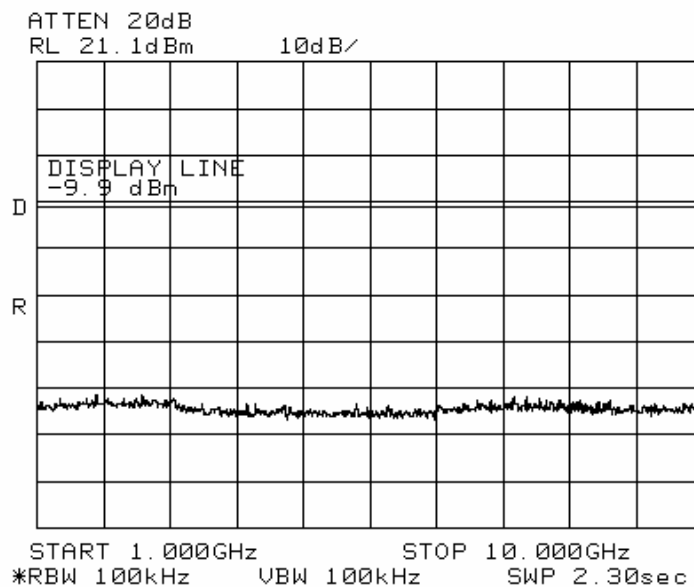
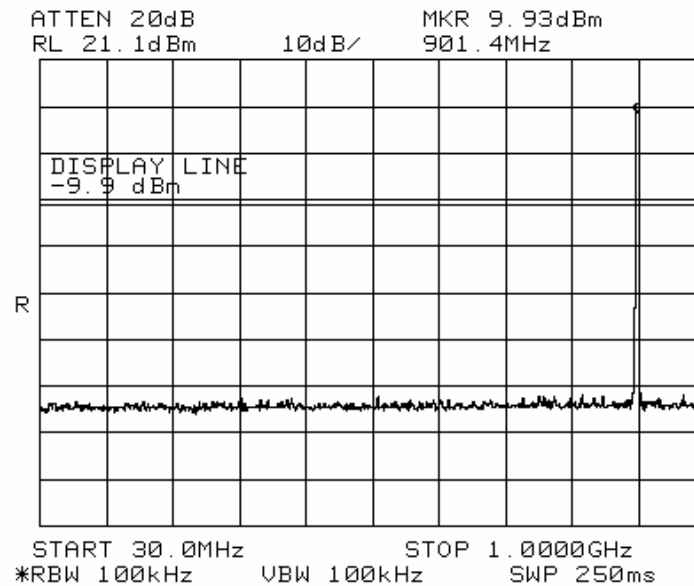


Upper Band Edge



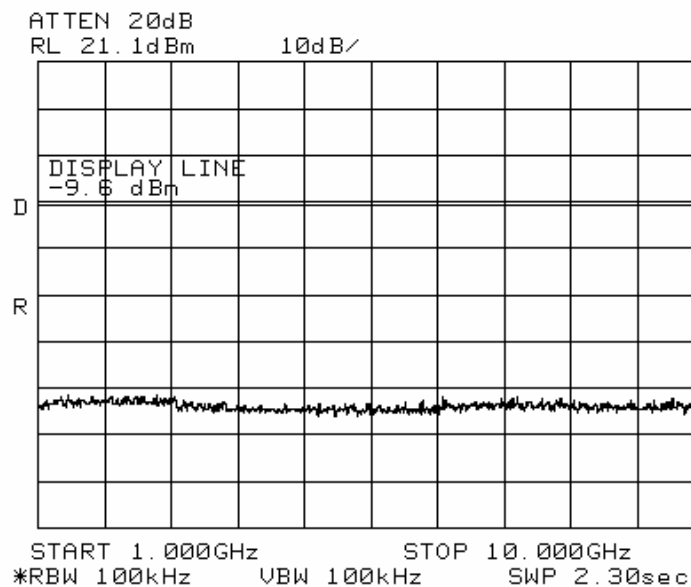
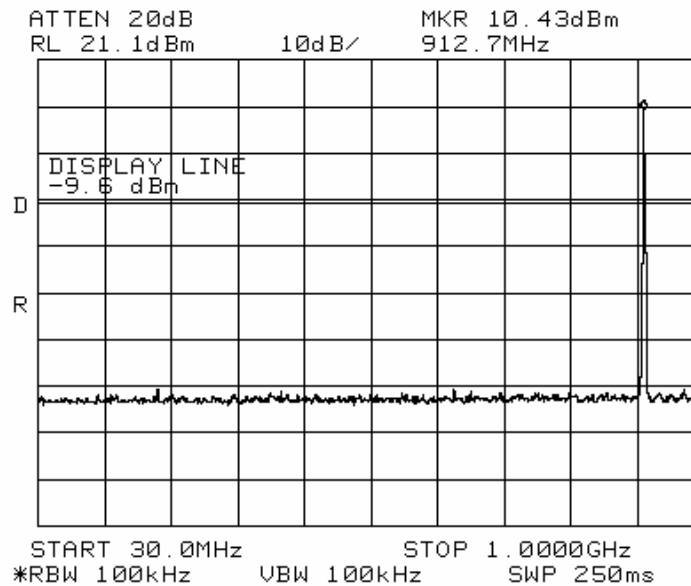
Test Data – Spurious Emissions at Antenna Terminals

Low Channel



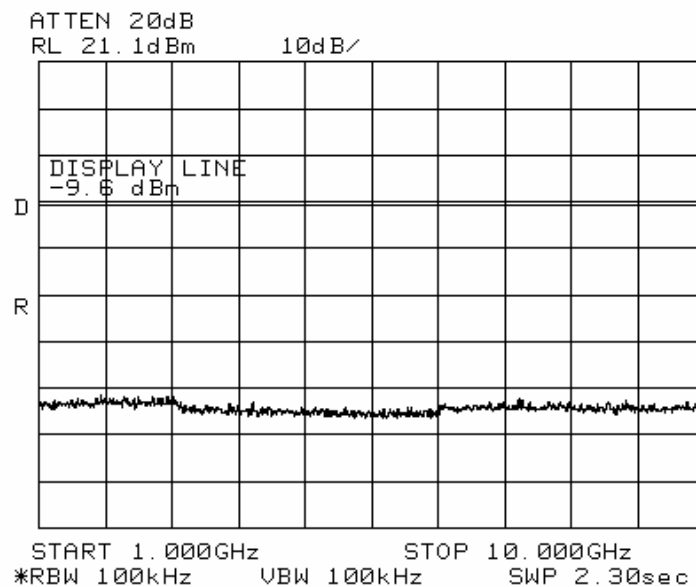
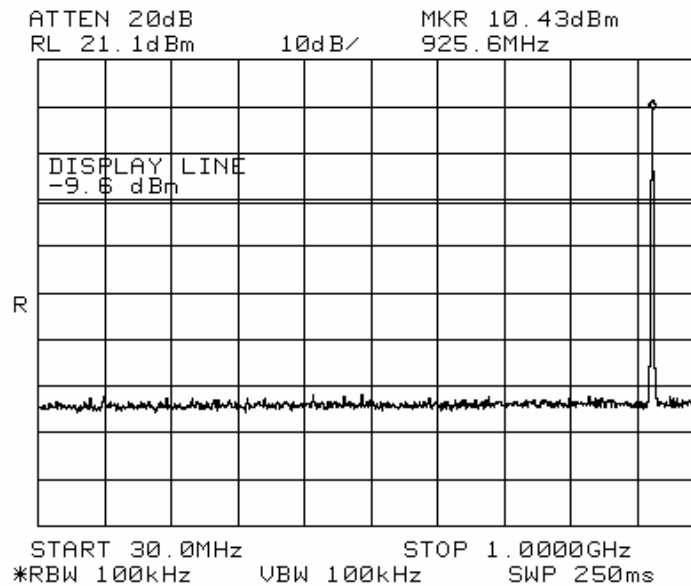
Test Data – Spurious Emissions at Antenna Terminals

Mid Channel



Test Data – Spurious Emissions at Antenna Terminals

High Channel



Section 8. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 18 June 2008

Test Results: Complies.

Measurement Data: There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

Analyzer Settings: RBW=VBW=1 MHz Peak Detector

Duty Cycle Calculation:

Duty Cycle correction factor (dB) = $20 \log (r_{\text{ON}} \text{ in ms}/100\text{ms})$

Duty cycle correction = $20 \log (20/100) = -14 \text{ dB}$

Notes:

- ☐ For handheld devices, the EUT was tested on three orthogonal axis'
- ☒ The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- ☒ The device was tested on three channels per 15.31(l).
- ☒ All emissions within 20 dB of the specification limit are reported per 15.31(o).

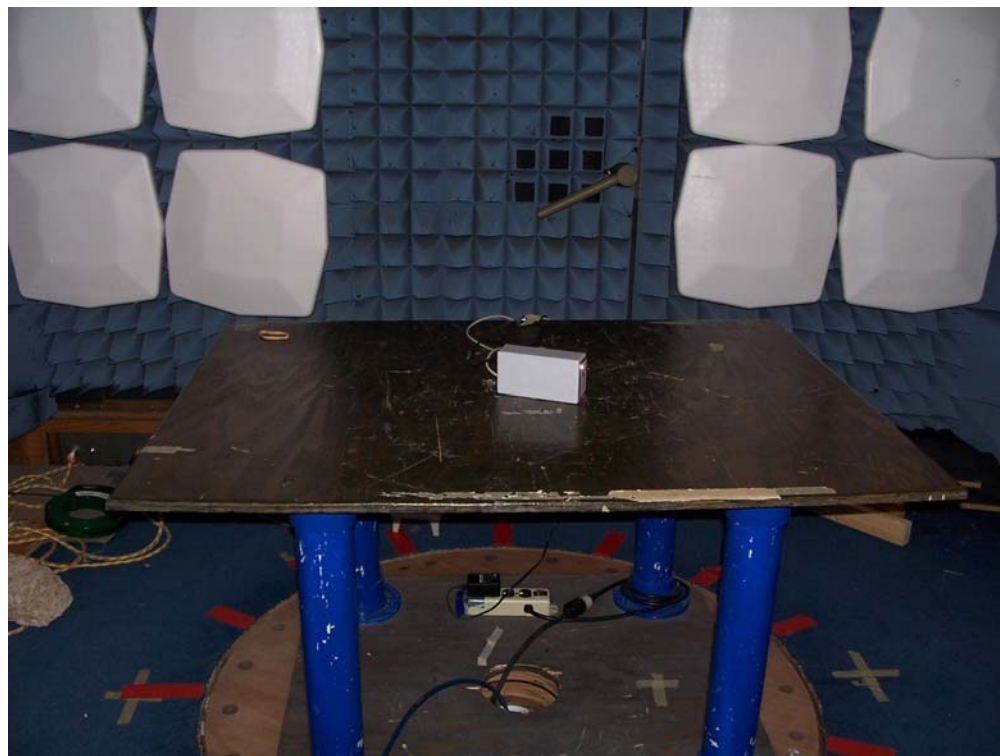
Equipment Used: 1464-1484-1485-1016-993-1763-1783-1025

Measurement Uncertainty: +/-3.6 dB

Temperature: 21 °C

Relative Humidity: 35 %

Radiated Photographs



Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1325	CABLE	Nemko USA, Inc. RG223	N/A	04/20/06	04/20/07
1258	LISN .15mhz-30mhz	EMCO 3825/2	1305	06/20/07	06/19/08
1663	Spectrum Analyzer	Rhode & Schwarz FSP3	100073	07/23/07	07/22/08
674	LIMITER	HP 11947A	3107A02200	CBU	NA
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1783	Cable	Nemko USA, Inc. None	None	06/12/08	06/12/09
1763	Bilog Antenna	Schaffner CBL 6111D	22926	09/21/07	09/20/08
1025	PREAMP, 25dB	Nemko USA, Inc. LNA25	399	12/07/07	12/06/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/09
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1485	Cable	Storm PR90-010-216	N/A	05/07/08	05/07/09

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions

PARA. NO.: 15.207(a)

Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Conducted Emission (MHz)	Limit (dBmV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
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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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

NAME OF TEST: Time of Occupancy

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

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 0.4 seconds multiplied by the number of hopping channels employed.
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

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)(1)

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	Not defined
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(d)
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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 ($\mu\text{V/m}$ @ 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(d)

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 ($\mu\text{V/m}$ @ 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**

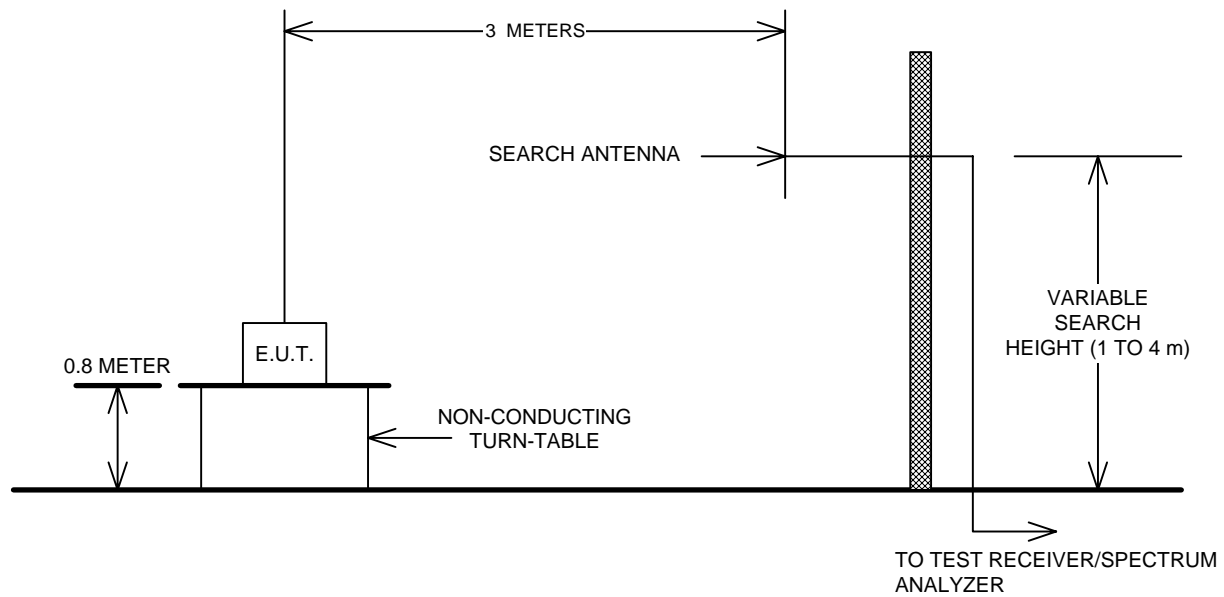
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218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

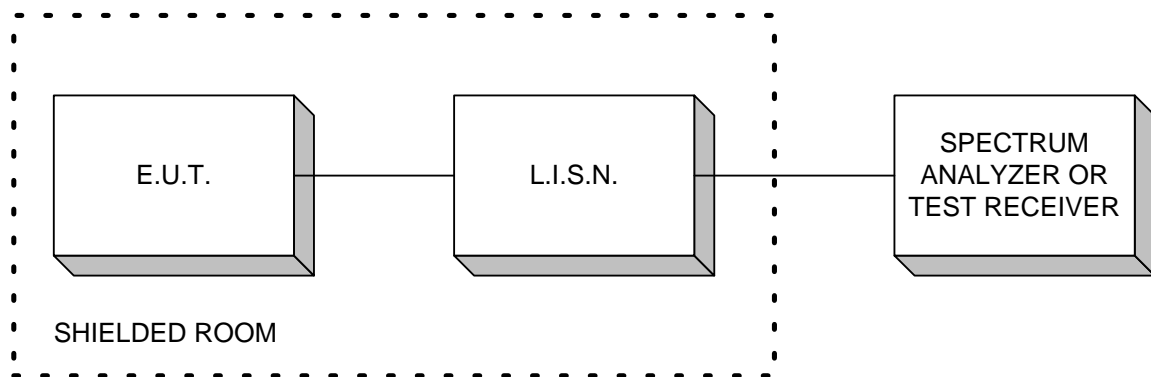
Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions



Conducted Emissions



Peak Power at Antenna Terminals

