

**Nemko USA, Inc.**

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER  
**EQUIPMENT:** HS-BLU277 Series      **PROJECT NO.:**4695RUS1



**Nemko Test Report:** 4695RUS1rev1

**Applicant:** J & M Corporation  
1415 South Cherry Avenue  
Tucson, AZ 85713  
USA

**Equipment Under Test:** HS-BLU277 Series  
**(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 May 2007

APPROVED BY:



Harry Ward, Verificator

DATE: 8<sup>th</sup> May 2007

**Total Number of Pages:** 32

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**Section 1. Summary of Test Results**

Manufacturer: J &amp; M Corporation

Model No.: HS-BLU277 Series

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 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.

<input checked="" type="checkbox"/>	New Submission	<input type="checkbox"/>	Production Unit
<input type="checkbox"/>	Class II Permissive Change	<input checked="" type="checkbox"/>	Pre-Production Unit

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

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

See "Summary of Test Data".



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**Summary Of Test Data**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>RESULT</b>
Powerline Conducted Emissions	15.207(a)	NA
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:**

- 1) The device does not connect to the AC mains
- 2) The device has an integral antenna
- 3) Conducted peak power was calculated using known antenna gain of the EUT.

**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:** 2402 to 2480 MHz

**Number of Channels:** 79

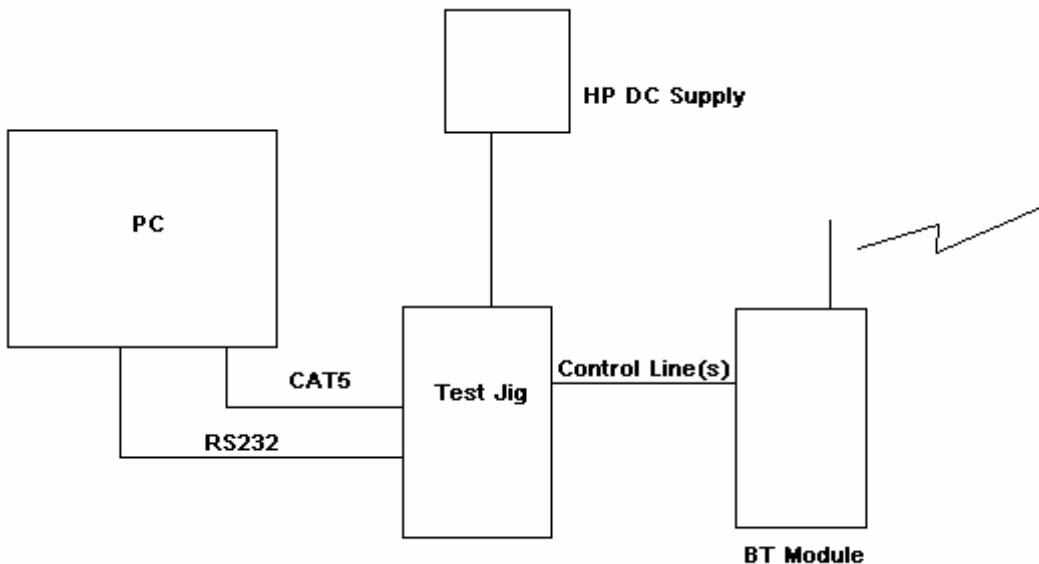
**Channel Spacing:** 1 MHz

**Peak Power:** 2.6 mW / 4.1 dBm (Calculated. See page 18)

**User Frequency Adjustment:** Software controlled

**Description of EUT**

The J&M Bluetooth Wireless Headset will allow connection to Bluetooth devices such as Bluetooth enabled MP3 players, Bluetooth enabled Cell Phones, and Bluetooth Enabled Navigation Systems. The J&M Bluetooth Wireless Headset also has a built in intercom that will allow a passenger to use an existing standard J&M Headset and connect to the Bluetooth Headset via a wired connection.

**Test Configuration**

All transmitter tests were conducted with the EUT attached to a test jig and PC so that the radio could be configured to operate at desired frequencies, modulation and power. The power was supplied by a DC power supply at 3.7 Vdc

**Section 3. Channel Separation**

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 08 May 2007

**Test Results:** Complies.**Measurement Data:** See 20 dB BW plot

Measured 20 dB bandwidth: 922 kHz Max  
Channel Separation: 1 MHz

**Equipment Used:** 1036-802-1082**Measurement Uncertainty:** 1X10<sup>-7</sup>ppm**Temperature:** 22 °C**Relative Humidity:** 45 %

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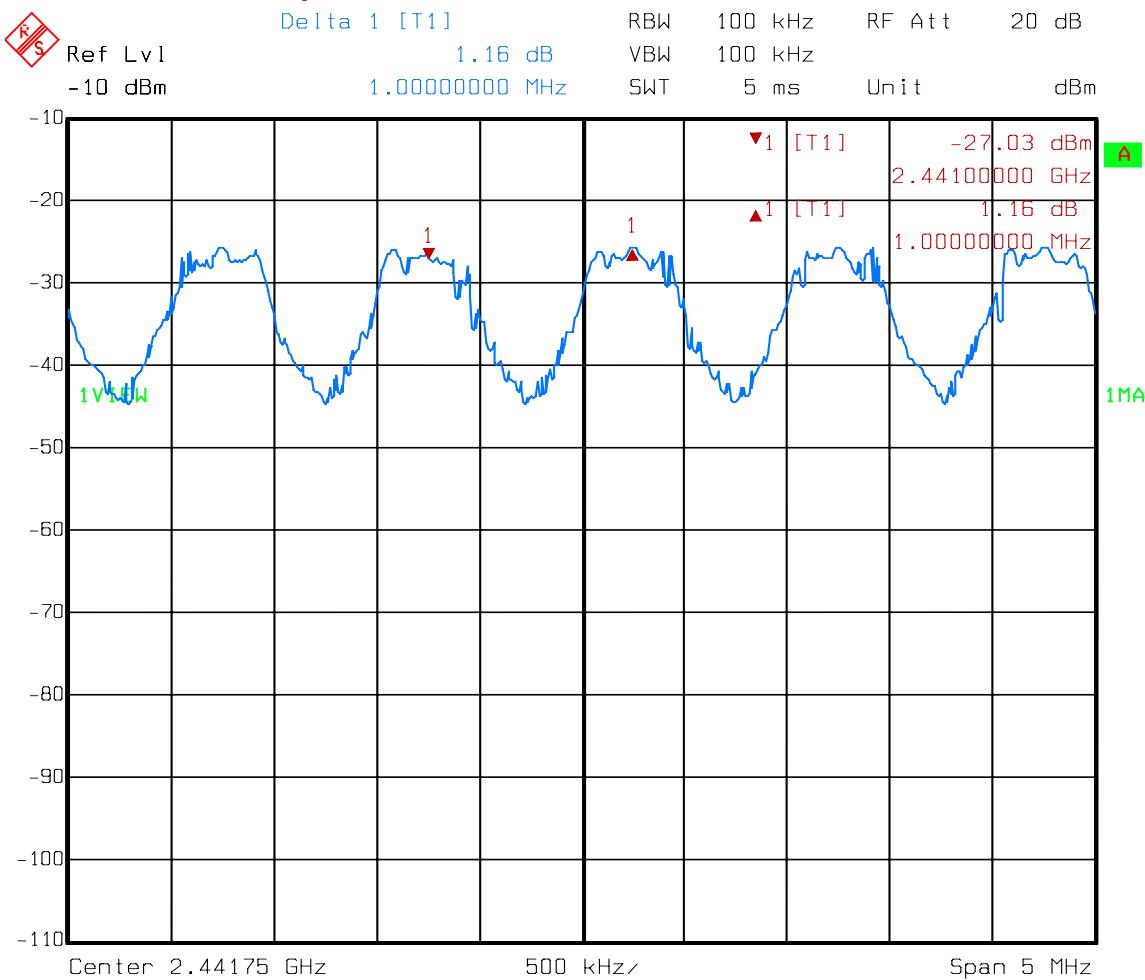
## FCC PART 15, SUBPART C

# FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

*EQUIPMENT:* HS-BLU277 Series

PROJECT NO.:4695RUS1

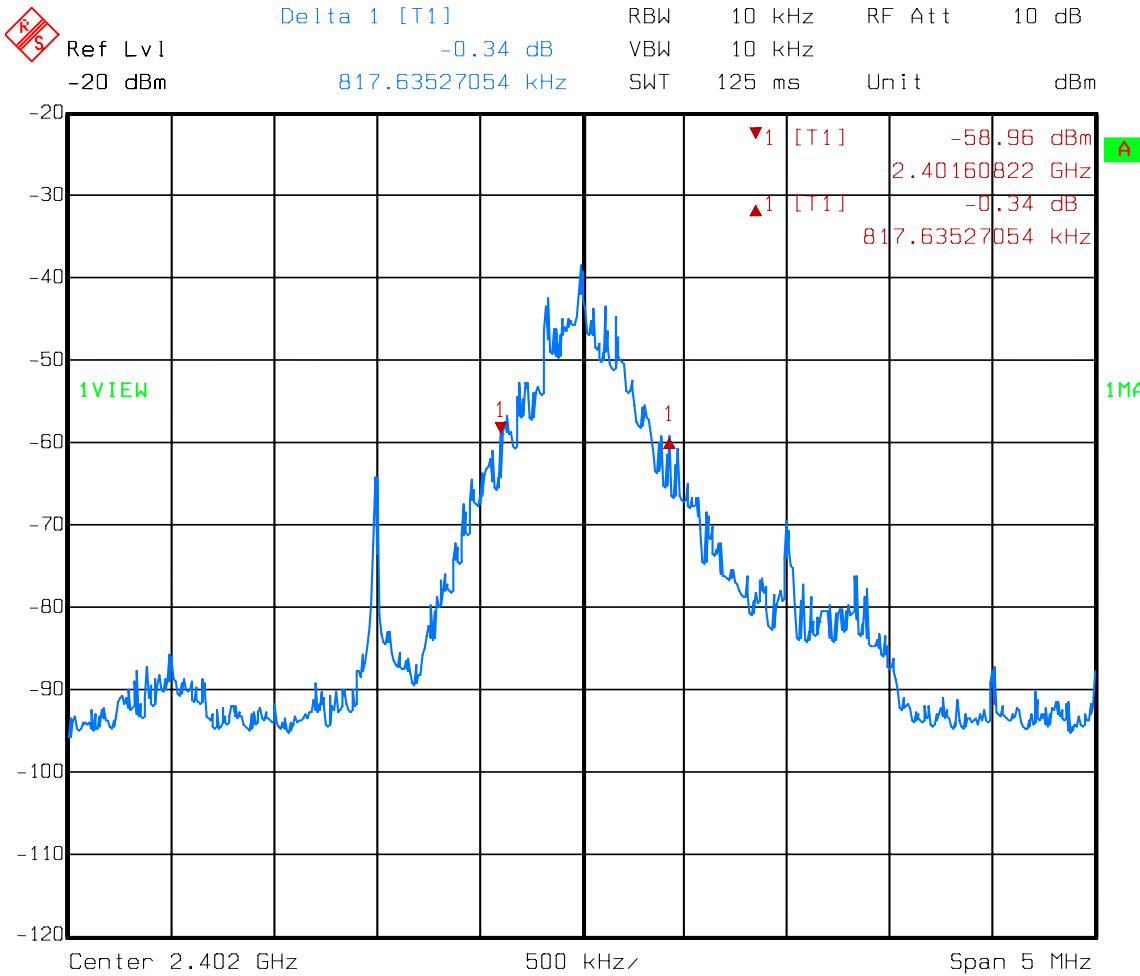
## Test Data – Channel Separation



Date: 08.MAY 2007 09:04:42

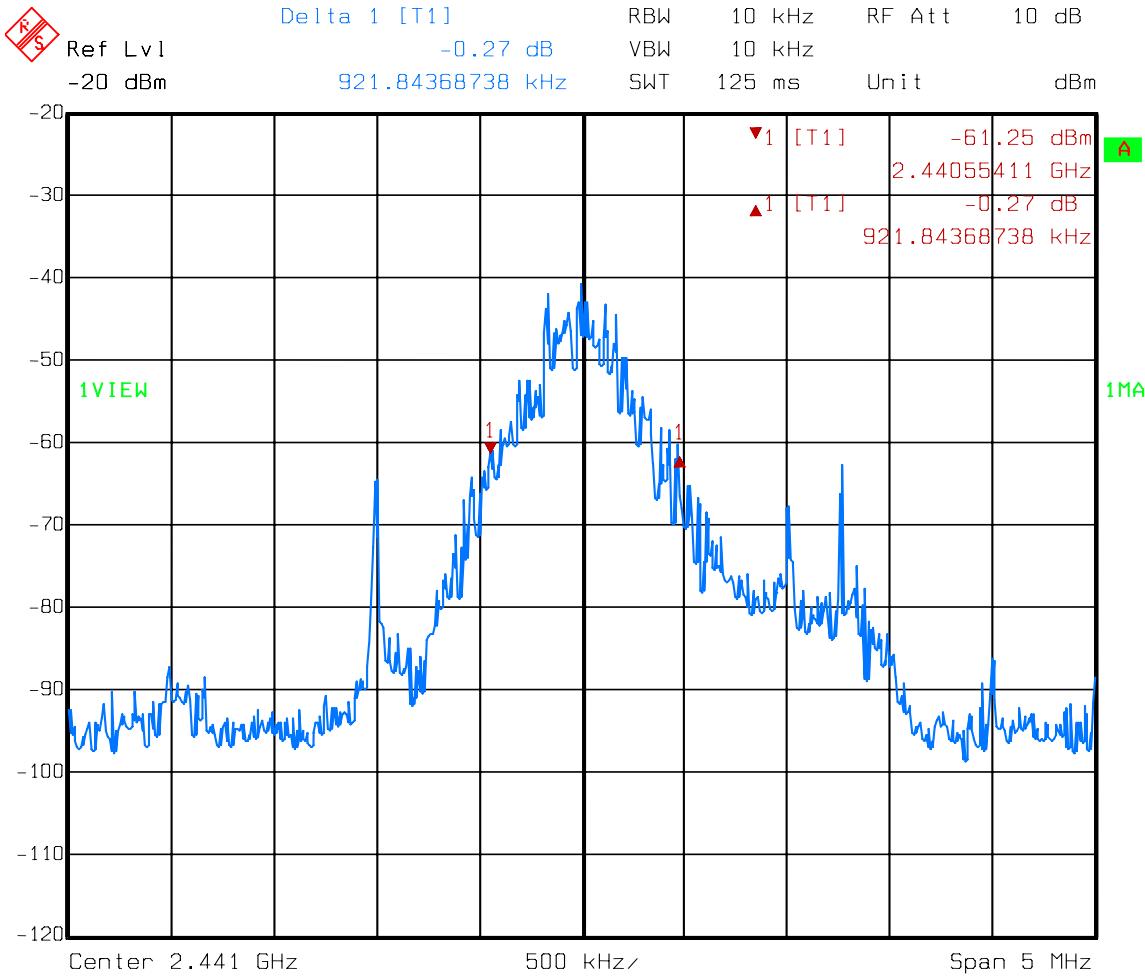
## Test Data – 20 dB Bandwidth

## Low Channel



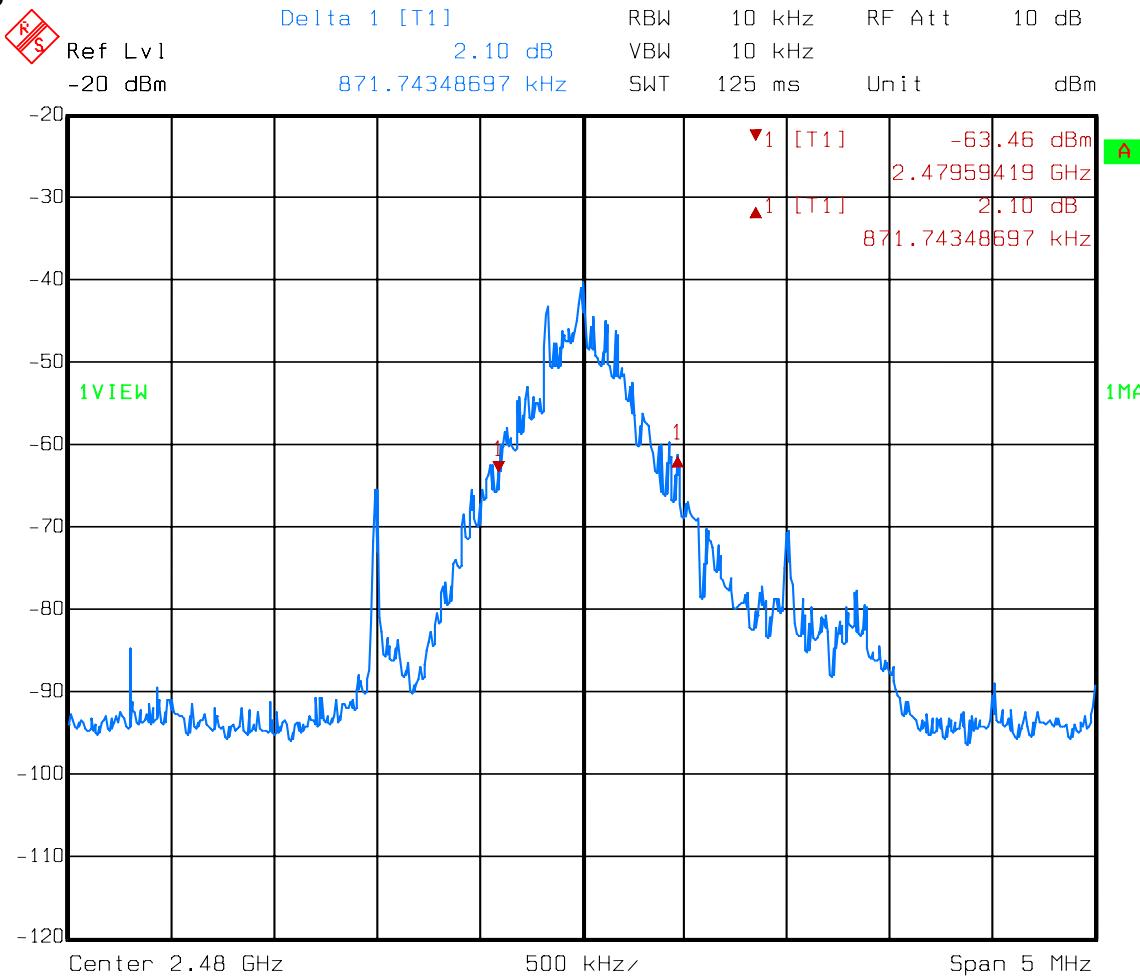
## Test Data – 20 dB Bandwidth

## Mid Channel



## Test Data – 20 dB Bandwidth

## High Channel



**Section 4. Time of Occupancy**

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 08 May 2007

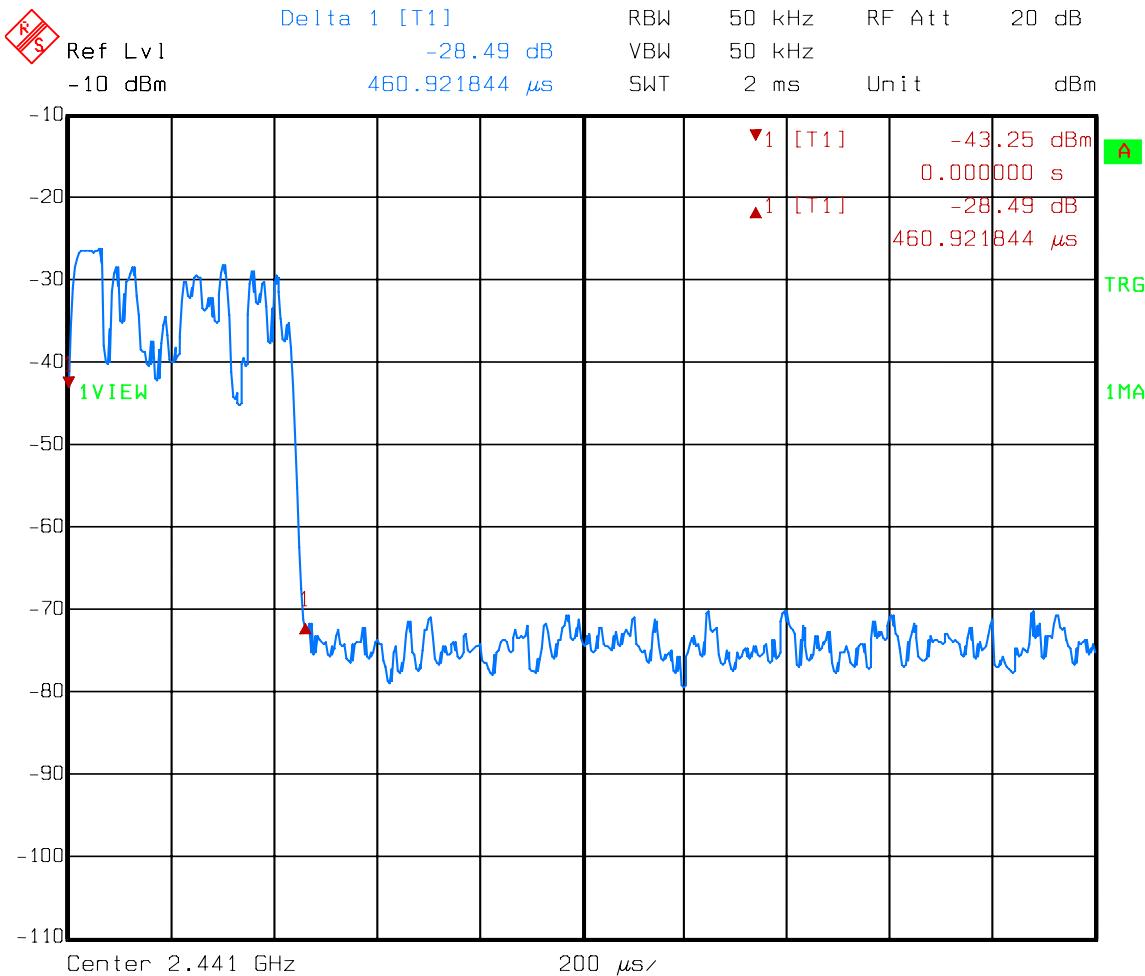
**Test Results:** Complies.**Measurement Data:**

Maximum Dwell Time On Any Channel: 0.152 S in 31.6 S

**Equipment Used:** 1036-802-1082**Measurement Uncertainty:** 1X10<sup>-7</sup>ppm**Temperature:** 22 °C**Relative Humidity:** 45 %

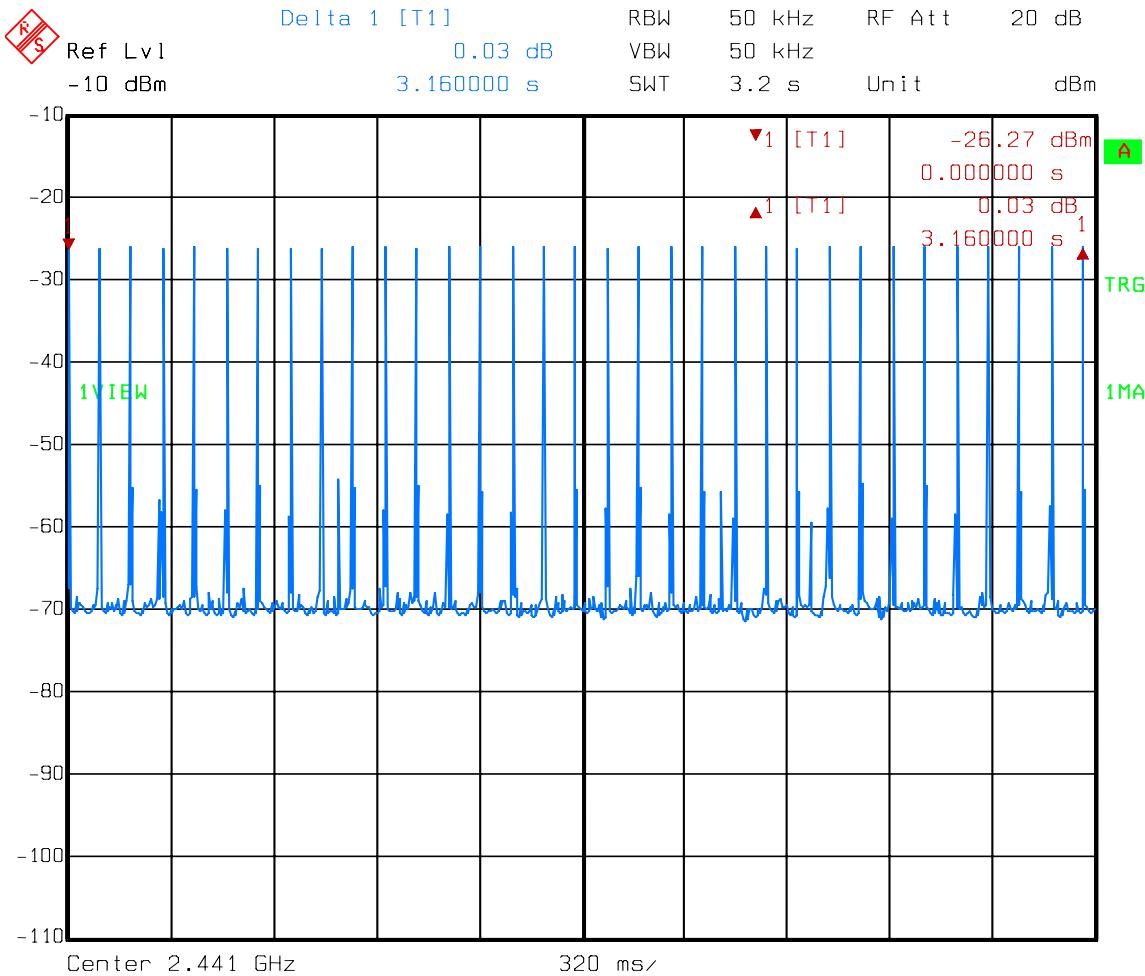
## Test Data – Time of Occupancy

## Pulse Width



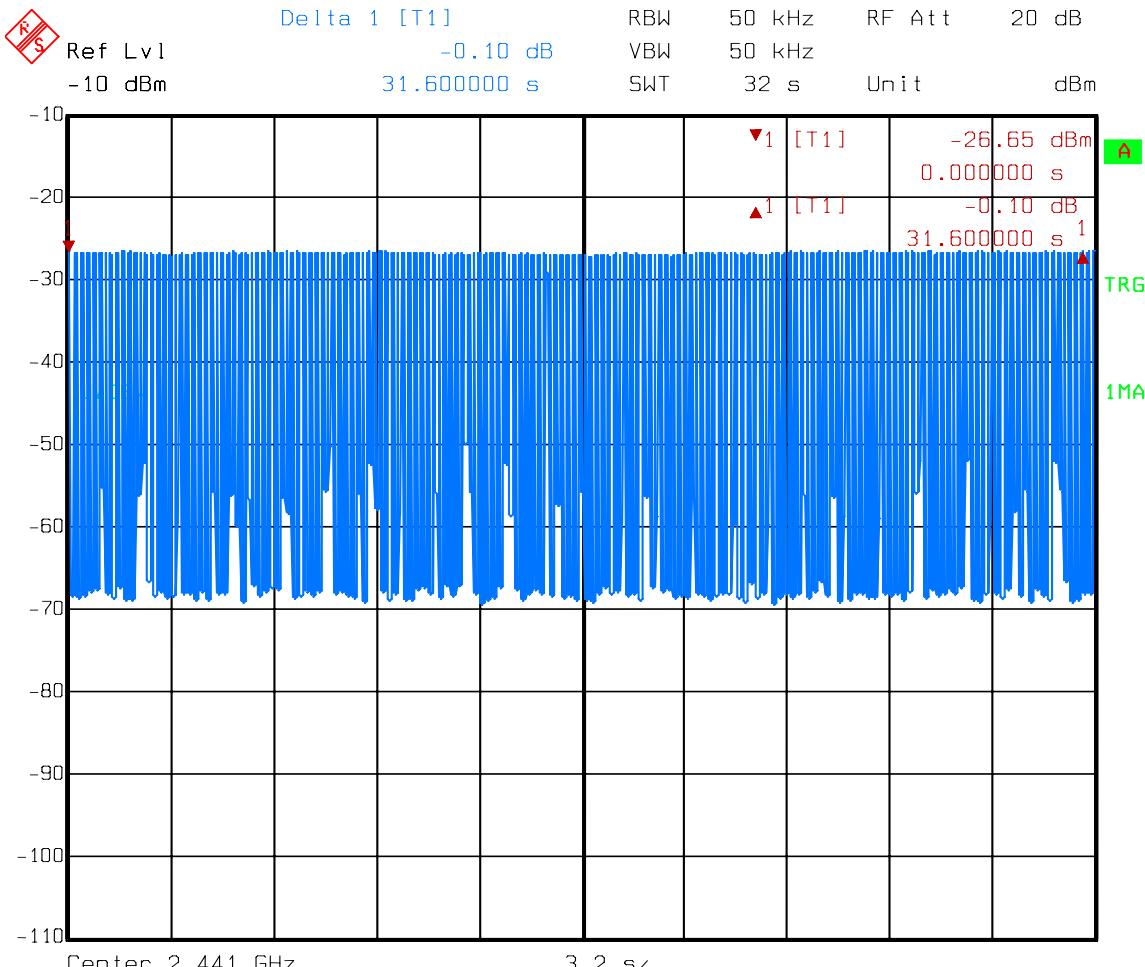
**Test Data – Time of Occupancy**

Time ON in 3.16 seconds



**Test Data – Time of Occupancy**

Time ON in 31.6 seconds

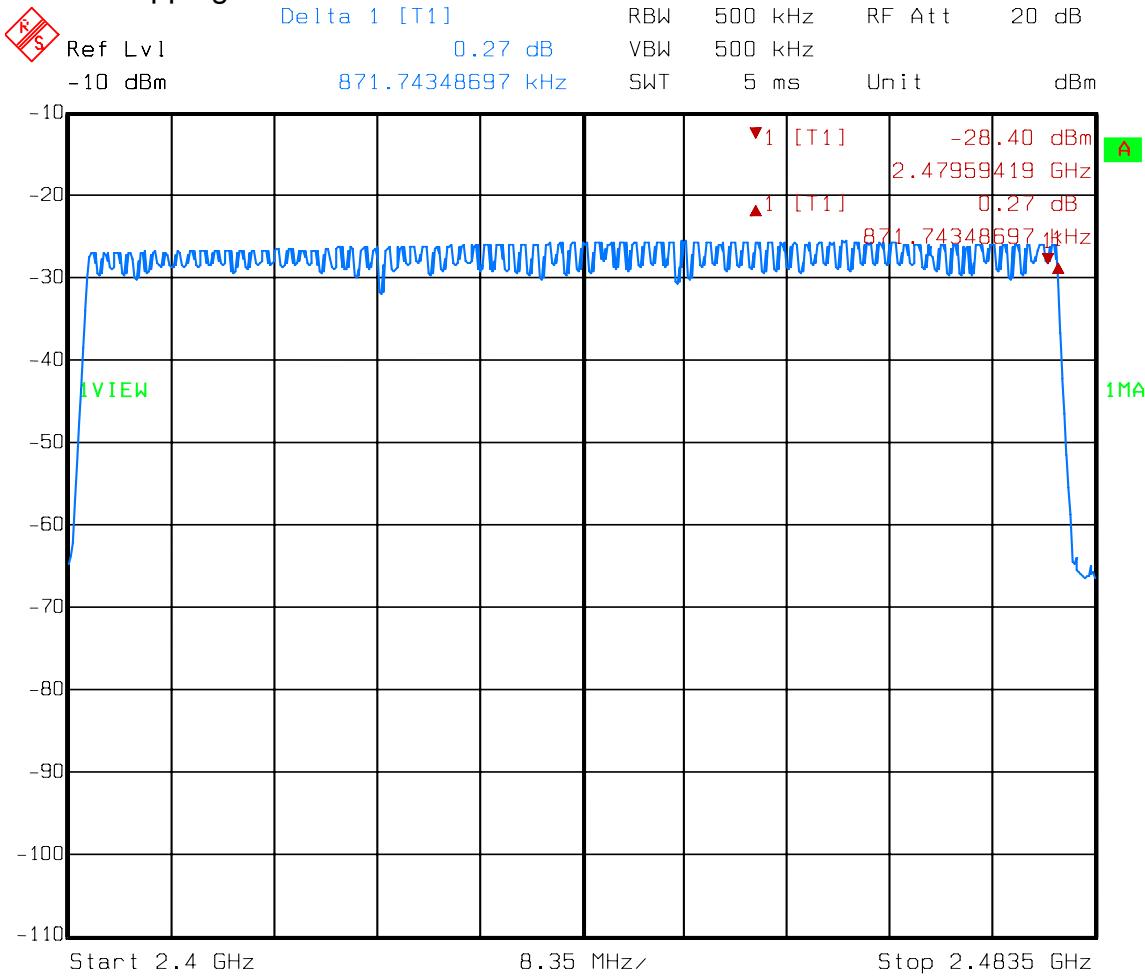


Limit = 0.4 seconds in 0.4 X Number of channels = 0.4 seconds in 31.6 seconds

Transmit time = 461  $\mu$ s X 330 pulses (in 31.6 S) = 0.152 seconds in 31.6 seconds

## Test Data – Time of Occupancy

## Number of hopping channels



**Section 5. Peak Power Output**

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: David Light	DATE: 08 May 2007

**Test Results:** Complies.**Measurement Data:** See data below.Detachable antenna?  Yes  No

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

- 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:** 1464-1484-1485-993**Measurement Uncertainty:** 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 45 %

**Test Data – Peak Output Power**

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)	Substitution Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2480	-40.5	-5.6	7.8	2.2	36.0	-33.8
2441	-38.8	-3.9	7.8	3.9	36.0	-32.1
2402	-38.6	-3.7	7.8	4.1	36.0	-31.9

EIRP = Substitution Level (dBm) + Substitution Antenna Gain (dBi)

Antenna Gain = 0 dBi (2.6 mW)

Calculated conducted power = +4.1 dBm

**Section 6. Spurious Emissions (Radiated)**

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 08 May 2007

**Test Results:** Complies. The worst case emission was 52.8 dB $\mu$ V/m at 2483.5 MHz. This is 1.2 dB below the specification limit of 54 dB $\mu$ V/m.

**Measurement Data:** See attached table.

**Notes:**

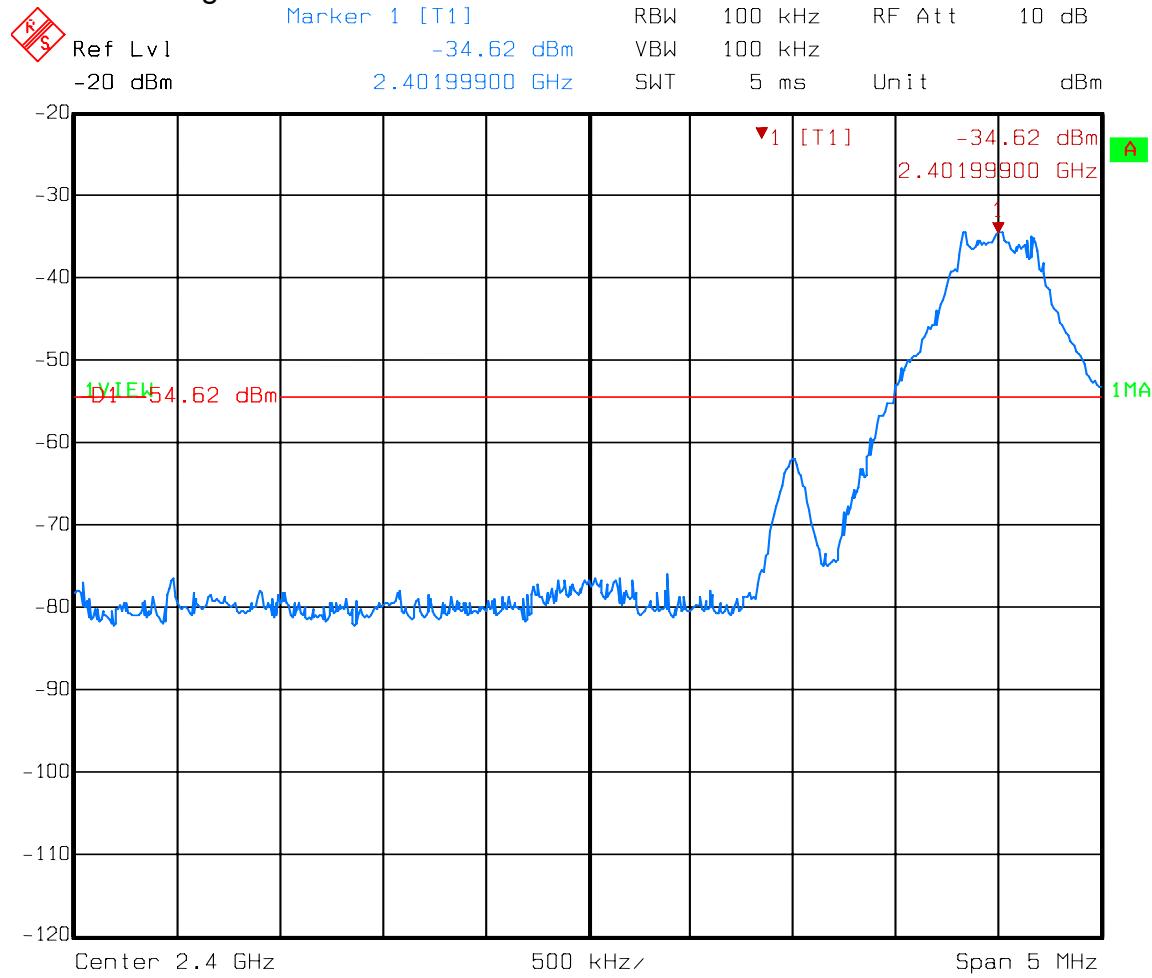
- For handheld devices, the EUT was tested on three orthogonal axis'
- The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- The device was tested on three channels per 15.31(l).
- No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o). Band edge data is presented below to demonstrate compliance at upper and lower band edges.

**Equipment Used:** 1464-1484-1485-1016-791-759-760-993

**Measurement Uncertainty:** +/-3.6 dB

**Temperature:** 22 °C

**Relative Humidity:** 45 %

**Test Data - Radiated Emissions****Low Band Edge**

**Test Data - Radiated Emissions**

<b>Measurement Data:</b>							Test Distance: 3 Meters			
Freq MHz	Rdng dB $\mu$ V	Horn dB	Cable dB	Cable dB	Pre-A dB	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant	
2483.5 Peak	53.5	+29.0	+0.8	+2.3	+32.8	+0.0	52.8	54.0	-1.2	Vert
2483.5 Peak	52.2	+29.0	+0.8	+2.3	+32.8	+0.0	51.5	54.0	-2.5	Horiz

**Analyzer settings:**

Below 1 GHz – RBW=VBW=100 kHz – Peak detector

Above 1 GHz – RBW=VBW=1 MHz – Peak detector

**Section 7. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1484	Cable	Storm PR90-010-072	N/A	10/02/06	10/02/07
1485	Cable	Storm PR90-010-216	N/A	10/02/06	10/02/07
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
802	Near Field Probe Set	EMCO 7405	103	N/A	N/A
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/01/07	05/01/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	05/01/08
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	03/30/07	03/29/08
760	Antenna biconical	Electro Metrics MFC-25	477	01/19/07	01/19/08
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07

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FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER  
*EQUIPMENT:* HS-BLU277 Series PROJECT NO.:4695RUS1

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## **ANNEX A - TEST DETAILS**

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 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)(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)
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**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 ( $\mu$ 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 ( $\mu$ 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

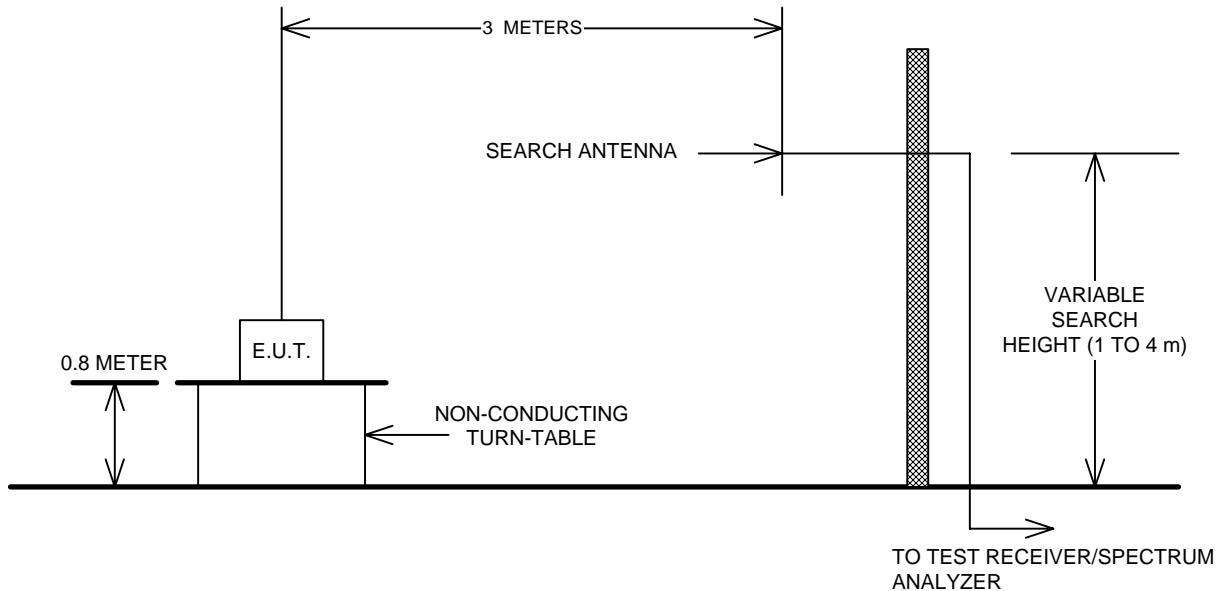
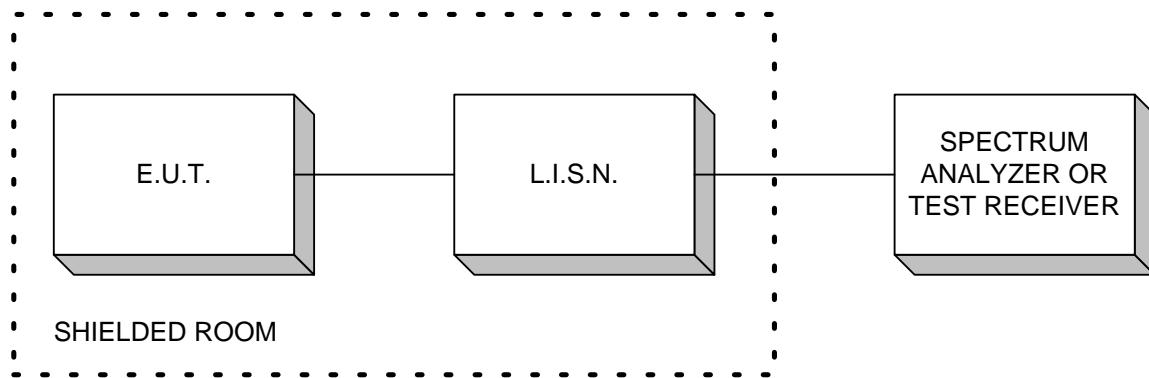
**Nemko USA, Inc.**

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*EQUIPMENT:* HS-BLU277 Series PROJECT NO.:4695RUS1

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**ANNEX B - TEST DIAGRAMS**

**Test Site For Radiated Emissions****Conducted Emissions**

**Peak Power at Antenna Terminals**

