Nemko-CCL, Inc.

1940 West Alexander Street
Salt Lake City, UT 84119
801-972-6146

Test Report

Certification

Test Of: 7756V, 7756X, PDRS-7504, GSRS-7504, & ASRS-7504

IC: 1513A-7756

Test Specifications:

RSS-Gen Issue 3 (December 2010)
RSS-210 Issue 8 (December 2010)

Test Report Serial No: 230383-9-3.2

Applicant:
DEI Headquarters Inc.
1 Viper Way
Vista, CA 92081

Dates of Test: May 29 - June 7, 2013

Report Issue Date: July 11, 2013

Accredited Testing Laboratory By:

NVLAP Lab Code 100272-0

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Nemko-CCL, Inc. to document compliance of the device described below with the requirements of RSS-Gen Issue 3 (December 2010) and RSS-210 Issue 8 (December 2010). This report may be reproduced in full. Partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: DEI Headquarters Inc.
- Manufacturer: DEI Headquarters Inc.
- Brand Name: DEI Headquarters Inc.
- Model Number: 7756V, 7756X, PDRS-7504, GSRS-7504, & ASRS-7504
- IC: 1513A-7756

On this 11th day July 2013, I, individually, and for Nemko-CCL, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has recognized that the Nemko-CCL, Inc. EMC testing facilities are in good standing, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Nemko-CCL, Inc.

Tested by: Mark M. Feil
EMC Engineer

Reviewed by: Thomas C. Jackson
General Manager

TABLE OF CONTENTS

PAGE

SECTION 1.0 CLIENT INFORMATION

1.1 Applicant:

Company Name:	DEI Headquarters Inc. 1 Viper Way Vista, CA 92081
Contact Name:	Minas Minassian
Title:	Sr. Director, HW/RF Systems

1.2 Manufacturer:

Company Name:	DEI Headquarters Inc. 1 Viper Way Vista, CA 92081
Contact Name:	Minas Minassian
Title:	Sr. Director, HW/RF Systems

SECTION 2.0 EQUIPMENT UNDER TEST (EUT)

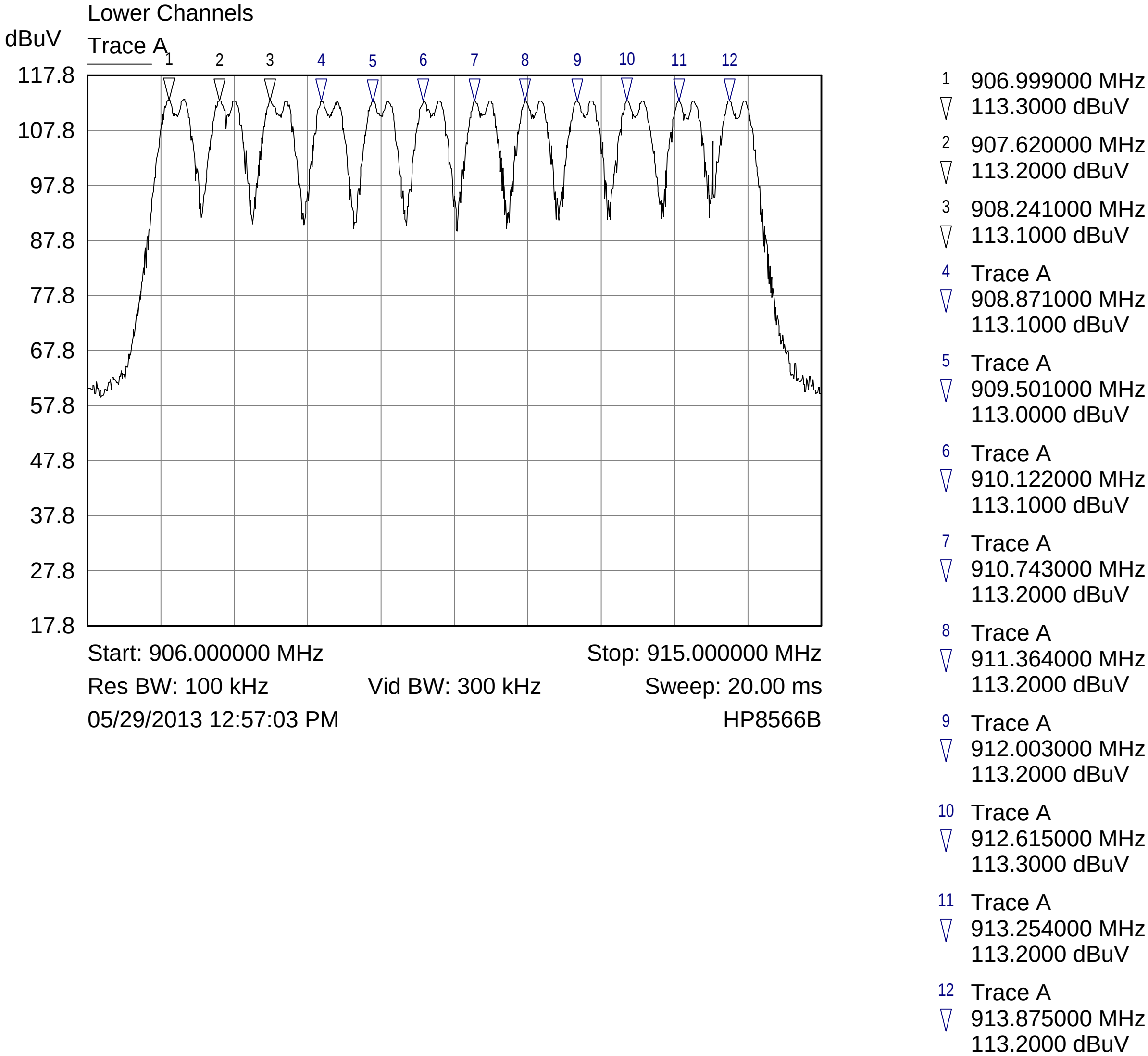
2.1 Identification of EUT:

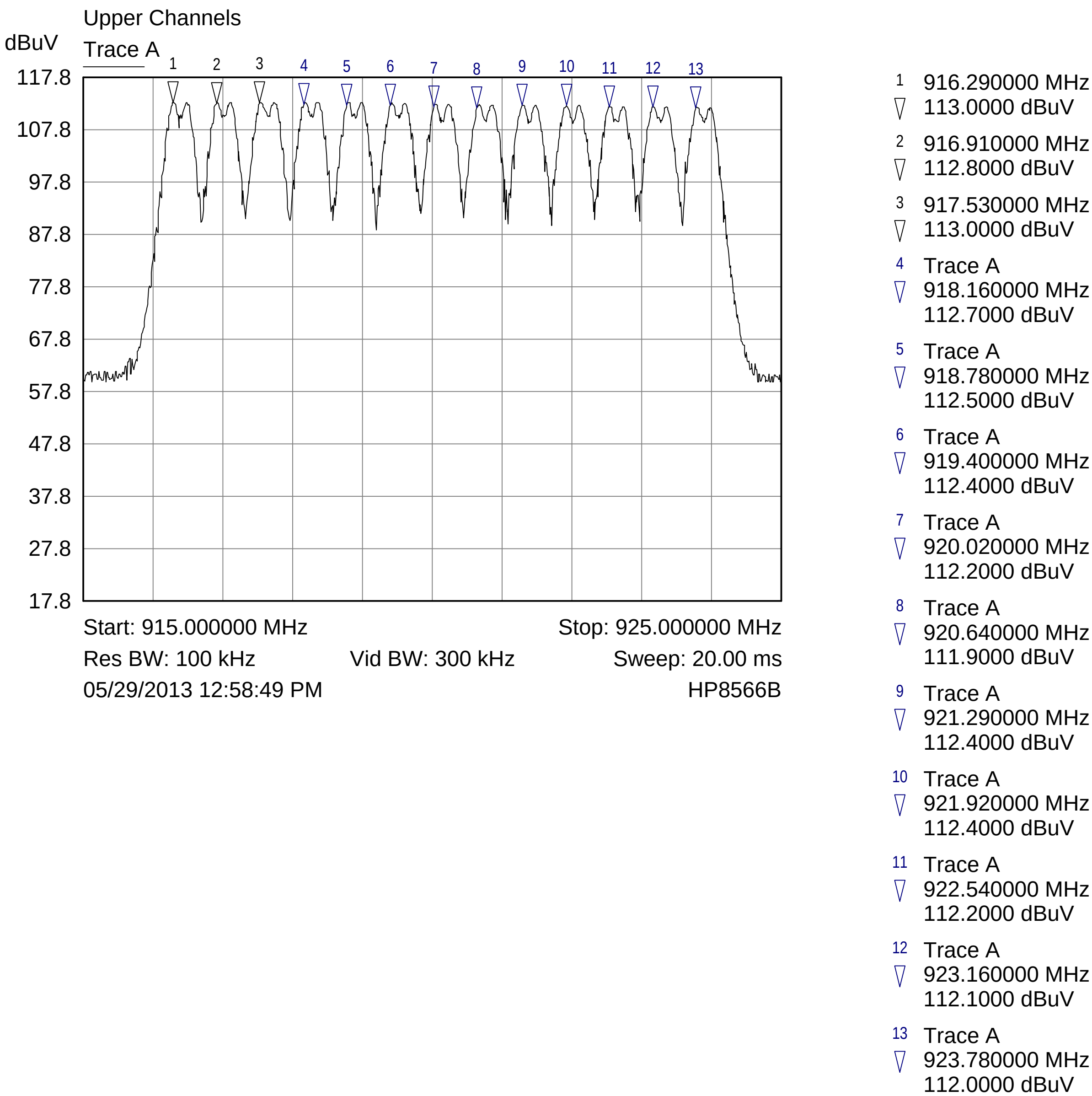
Brand Name:	DEI Headquarters Inc.
Model Number:	7756V, 7756X, PDRS-7504, GSRS-7504, & ASRS-7504
Dimensions:	6.7 cm x 3.6 cm x 0.8 cm

2.2 Description of EUT:

The 7756V was tested as a representative of models 7756V, 7756X, PDRS-7504, GSRS-7504, & ASRS-7504. The differences in the models are cosmetic only. The 7756V, only, will be referred to throughout the remainder of this report. The 7756V is a handheld key fob, exercised by push buttons to arm/disarm, lock/unlock, start vehicle systems, etc. A continuous transmit mode was configured by the applicant for RF testing. The device is powered by a 3.7 V battery.

The 7756V transceiver operates using 25 channels, spaced 622 KHz apart, in the 902 MHz to 928 MHz frequency band. The 7756V transceiver uses a helical antenna extending from a trace on the PCB. Testing was performed at the upper channel (923.835 MHz), the middle channel (916.395 MHz), and the lower channel (907.095 MHz). See the plots of the channels below.


Lower Channels
dBuV
Trace A
1 2 3 4 5 6 7 8 9 10 11 12
117.8
107.8
97.8
87.8
77.8
67.8
57.8
47.8
37.8
27.8
17.8
Start: 906.000000 MHz
Stop: 915.000000 MHz
Res BW: 100 kHz
Vid BW: 300 kHz
Sweep: 20.00 ms
05/29/2013 12:57:03 PM
HP8566B
1 906.999000 MHz 113.3000 dBuV
2 907.620000 MHz 113.2000 dBuV
3 908.241000 MHz 113.1000 dBuV
4 Trace A 908.871000 MHz 113.1000 dBuV
5 Trace A 909.501000 MHz 113.0000 dBuV
6 Trace A 910.122000 MHz 113.1000 dBuV
7 Trace A 910.743000 MHz 113.2000 dBuV
8 Trace A 911.364000 MHz 113.2000 dBuV
9 Trace A 912.003000 MHz 113.2000 dBuV
10 Trace A 912.615000 MHz 113.3000 dBuV
11 Trace A 913.254000 MHz 113.2000 dBuV
12 Trace A 913.875000 MHz 113.2000 dBuV



This report covers the circuitry of the devices subject to RSS-Gen and RSS-210. The circuitry of the device subject to ICES-003 has been tested to ICES-003 and found to comply. Compliance is shown in Nemko-CCL report #230382-9-1.1.

2.3 EUT and Support Equipment:

The EUT and support equipment used during the test are listed below:

Brand Name Model Number Serial Number	IC ID Number or Compliance	Description	Name of Interface Ports / Interface Cables
BN: DEI Headquarters Inc. MN: 7756V (Note 1)	1513A-7756	Key fob remote	None

Note: (1) EUT

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Modification Incorporated/Special Accessories on EUT:

No modifications were made during testing to comply with the specification.

SECTION 3.0 TEST SPECIFICATION, METHODS & PROCEDURES

3.1 Test Specification:

Title: RSS-Gen Issue 3 (December 2010)
RSS-210 Issue 8 (December 2010)

Purpose of Test: The tests were performed to demonstrate initial compliance.

3.2 Requirements:

3.2.1 RSS-Gen 4.6.1 Occupied Bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

3.2.2 RSS-Gen Section 5.6 Exposure of Humans to RF Fields

Category I and Category II equipment shall comply with the applicable requirements of RSS-102.

3.2.3 RSS-Gen Section 7.1.2 Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

User manuals for transmitters shall display the following notice in a conspicuous location:

> Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

The notice may be affixed to the device instead of displayed in the user manual.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

> This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi) and required impedance for each.

3.2.4 RSS-Gen Section 7.1.3 User Manual

User manuals for licence-exempt LPDs shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both.

> This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

3.2.5 RSS-Gen 7.1.4 Radio Apparatus Containing Digital Circuits (ICES-003)

Radio apparatus containing digital circuitry which can function separately from the operation of a transmitter or an associated transmitter, shall comply with ICES-003. In such cases, the labeling requirements of the applicable RSS apply, rather than the labeling requirements in ICES-003.

3.2.6 RSS-Gen 7.2.2 Emissions Falling Within Restricted Frequency Bands

Restricted bands, identified in Table 1, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:

(a) Fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of Table 1;
(b) Unwanted emissions falling into restricted bands of Table 1 shall comply with the limits specified in RSS-Gen;
(c) Unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

3.2.7 RSS-Gen Section 7.2.4 AC Power Lines Conducted Emission Limits

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN).

Table 4 – AC Power Lines Conducted Emission Limits

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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.

3.2.8 RSS-210 Annex 8

This annex applies to systems that employ frequency hopping (FH) and digital modulation technology in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz. Systems in these bands may employ frequency hopping, digital modulation and/or a combination (hybrid) of both techniques.

A frequency hopping system that synchronizes with another or several other systems (to avoid frequency collision among them) via off-air sensing or via connecting cables is not hopping randomly and therefore is not in compliance with RSS-210.

3.2.9 RSS-210 A8.1 Frequency Hopping Systems

Frequency hopping systems are spread spectrum systems in which the carrier is modulated with coded information in a conventional manner, causing a conventional spreading of the radio frequency (RF) energy about the carrier frequency. The frequency of the carrier is not fixed, but changes at fixed intervals under the direction of a coded sequence.

Frequency hopping systems are not required to employ all available hopping frequencies during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section in case the transmitter is presented with a continuous data (or information) stream.

Incorporation of intelligence into a frequency hopping system that enables it to recognize other users of the band and to avoid occupied frequencies is permitted provided that the frequency hopping system does it individually, and independently chooses or adapts its hopset. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The following applies to frequency hopping systems in each of the three bands:

(a) The bandwidth of a frequency hopping channel is the -20 dB emission bandwidth, measured with the hopping stopped. The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.

(b) 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 band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(c) For frequency hopping systems in the band 902-928 MHz: if the -20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the -20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum allowed -20 dB bandwidth of the hopping channel is 500 kHz.

(d) Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

(e) Frequency hopping systems operating in the band 5725-5850 MHz shall use at least 75 hopping channels. The maximum -20 dB bandwidth of the hopping channel shall be 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30-second period.

3.2.10 RSS-210 A8.4 Transmitter Output Power and e.i.r.p. Requirements

(1) For frequency hopping systems operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

(2) For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

(3) For frequency hopping systems operating in the band 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

(4) For systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W. As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

(5) Point-to-point systems in the bands 2400-2483.5 MHz and 5725-5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be allowed to operate at greater than 4 W e.i.r.p. under the same conditions as for point-to-point systems.

Note: “Fixed point-to-point operation” excludes point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information.

(6) Transmitters may operate in the band 2400-2483.5 MHz, employing antenna systems that emit multiple directional beams simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers, provided that the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels) shall not exceed the applicable output power limit specified in sections A8.4 (2) and (4).

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the applicable power limit specified in sections A8.4 (2) and (4). If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the applicable limit specified in sections A8.4 (2) and (4). In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the applicable limit specified in sections A8.4 (2) and (4) by more than 8 dB.

(iv) Transmitters that transmit a single directional beam shall operate under the provisions of sections A8.4 (2), (4) and (5).

3.2.11 RSS-210 Section A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in RSS-Gen is not required.

3.3 Test Procedure:

The testing was performed according to the procedures in RSS-Gen Issue 3 and RSS-210 Issue 8. Testing was performed at Nemko-CCL, Inc.'s Wanship open area test site #2, located at 29145 Old Lincoln Highway, Wanship, UT. This site has been registered with Industry Canada, and was accepted under Industry Canada Assigned Code 2041A-2 effective until February 14, 2015.

Nemko-CCL, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2013.

SECTION 4.0 OPERATION OF EUT DURING TESTING

4.1 Operating Environment:

Power Supply: 3.7 V DC (battery)

4.2 Operating Modes:

The transmitter was tested while in a constant transmit mode at the desired frequency, using either the upper, middle, or lower channel, and on three orthogonal axes. A new battery(s) was used for testing.

4.3 EUT Exercise Software:

DEI Headquarters Inc. software was used to exercise the transmitter.

SECTION 5.0 SUMMARY OF TEST RESULTS

5.1 RSS-Gen and RSS-210

The 7756V, 7756X, PDRS-7504, GSRS-7504, & ASRS-7504 transceivers were subjected to each of the tests shown in the summary table below.

5.1.1 Summary of Tests:

Section	Environmental Phenomena	Frequency Range (MHz)	Result
RSS-Gen 4.6.1	Occupied Bandwidth	902 – 928	Complied
RSS-Gen 5.6	Exposure of Humans to RF Fields	902 – 928	Complied
RSS-Gen 6	Spurious Emissions	30 – 2775	Complied
RSS-Gen 7.1.2	Transmitter Antenna	N/A	Complied
RSS-Gen 7.1.3	User Manual Notice for Licence-Exempt Apparatus	N/A	Complied
RSS-Gen 7.1.4	Radio Apparatus Containing Digital Circuits (ICES-003)	30 – 5000	Complied
RSS-Gen 7.2.2	Emissions Falling Within Restricted Frequency Bands	0.032 – 9250	Complied
RSS-Gen 7.2.4	AC Power Line Conducted Emissions Limits	N/A	N/A
RSS-210 A8.1(a)	20 dB Bandwidth and System Bandwidth and Hopping Sequence	902 – 928	Complied
RSS-210 A8.1(b)	Channel Separation	902 – 928	Complied
RSS-210 A8.1(d)	Time of Occupancy	902 – 928	Complied
A8.4 (2)	Transmitter Output Power and e.i.r.p Requirements	902 – 928	Complied
A8.5	Out of Band Emissions	0.032 – 9250	Complied

5.2 Result

In the configuration tested, the transceiver complied with the requirements of the specification.

SECTION 6.0 MEASUREMENTS AND RESULTS

6.1 General Comments:

This section contains the test results and determinations only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Appendix 1 of this report.

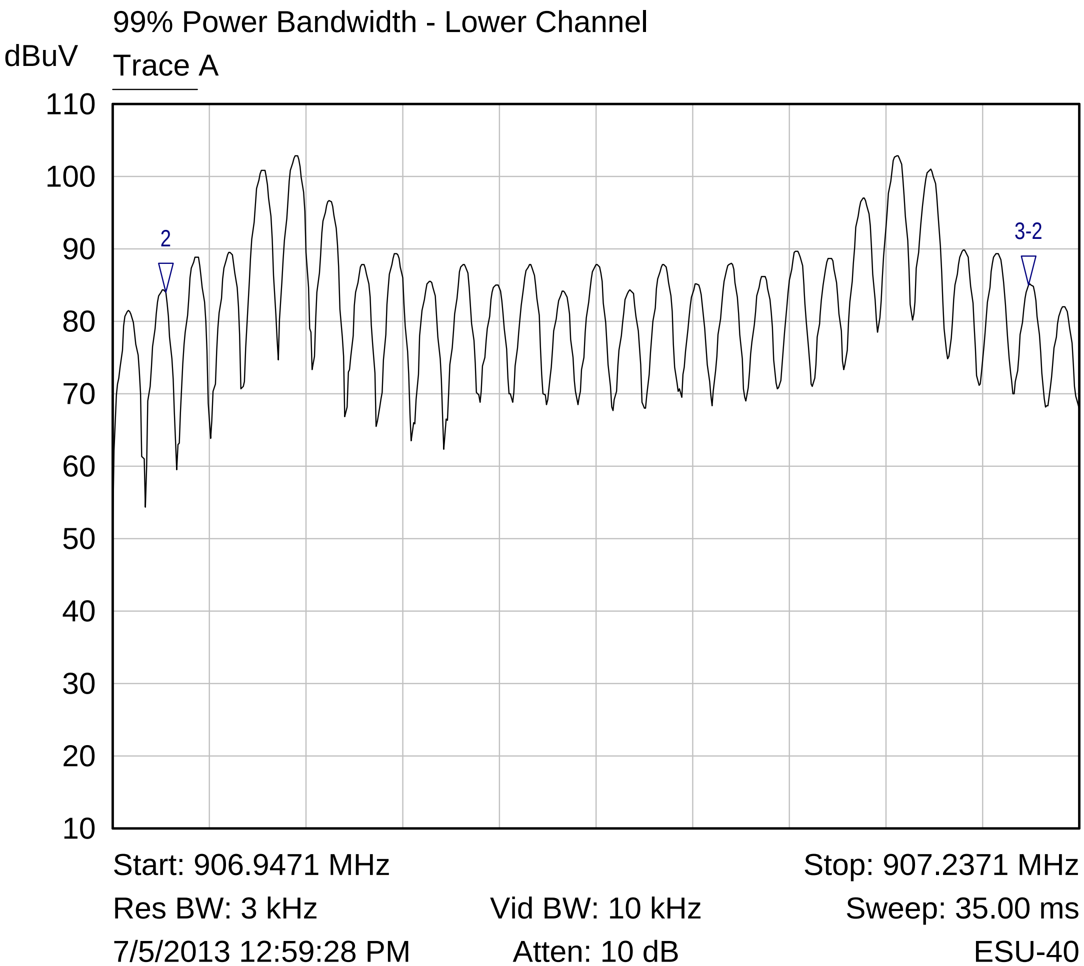
6.2 Test Results:

6.2.1 RSS-Gen 4.6.1 Occupied Bandwidth

The 99% emission bandwidth was measured with the Rohde & Schwartz ESU40 using Industry Canada procedures. The measurements are shown and summarized in the plots and table below.

Frequency (MHz)	Emission 99% occupied bandwidth (kHz)
907.095	258.9
916.395	259.8
923.835	259.3

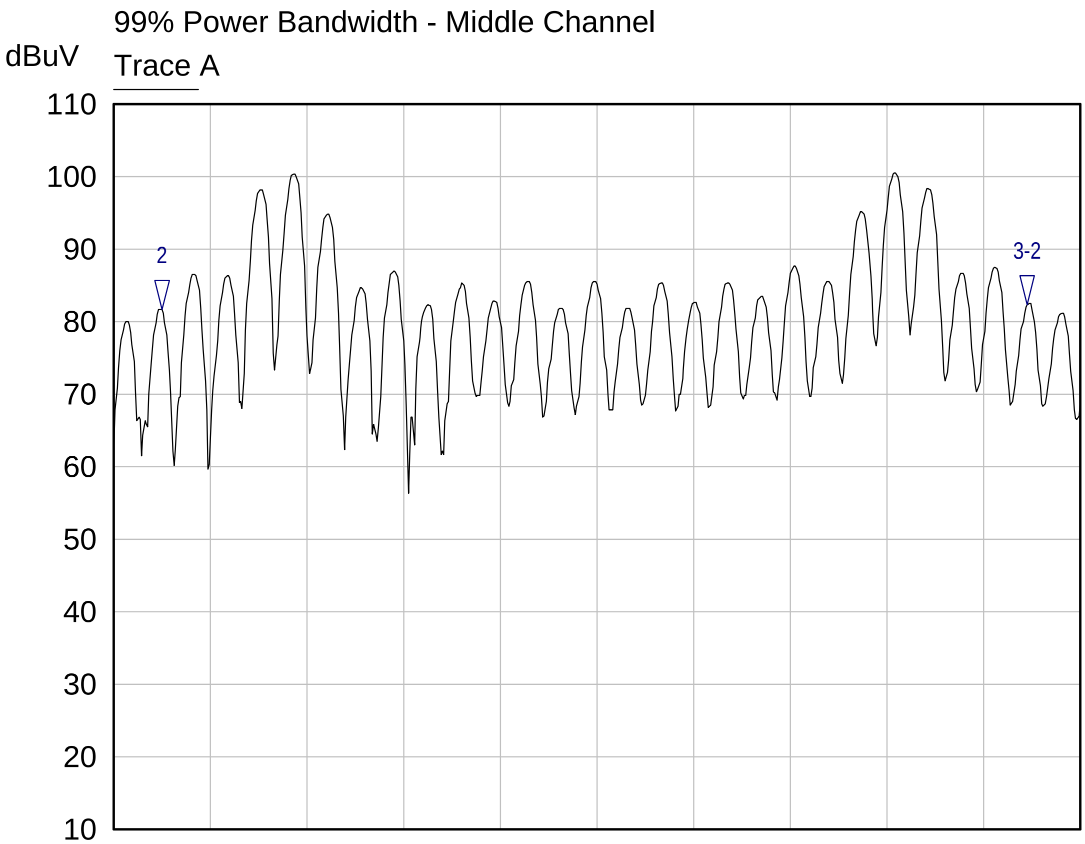
Lower Channel Bandwidth



Mkr	Trace	X-Axis	Value	Notes
2 ▽	Trace A	906.9629 MHz	84.00 dBuV	
3-2 ▽	Trace A	258.8622 kHz	0.95 dB	

Trace A BW, Lower Channel

Middle Channel Bandwidth

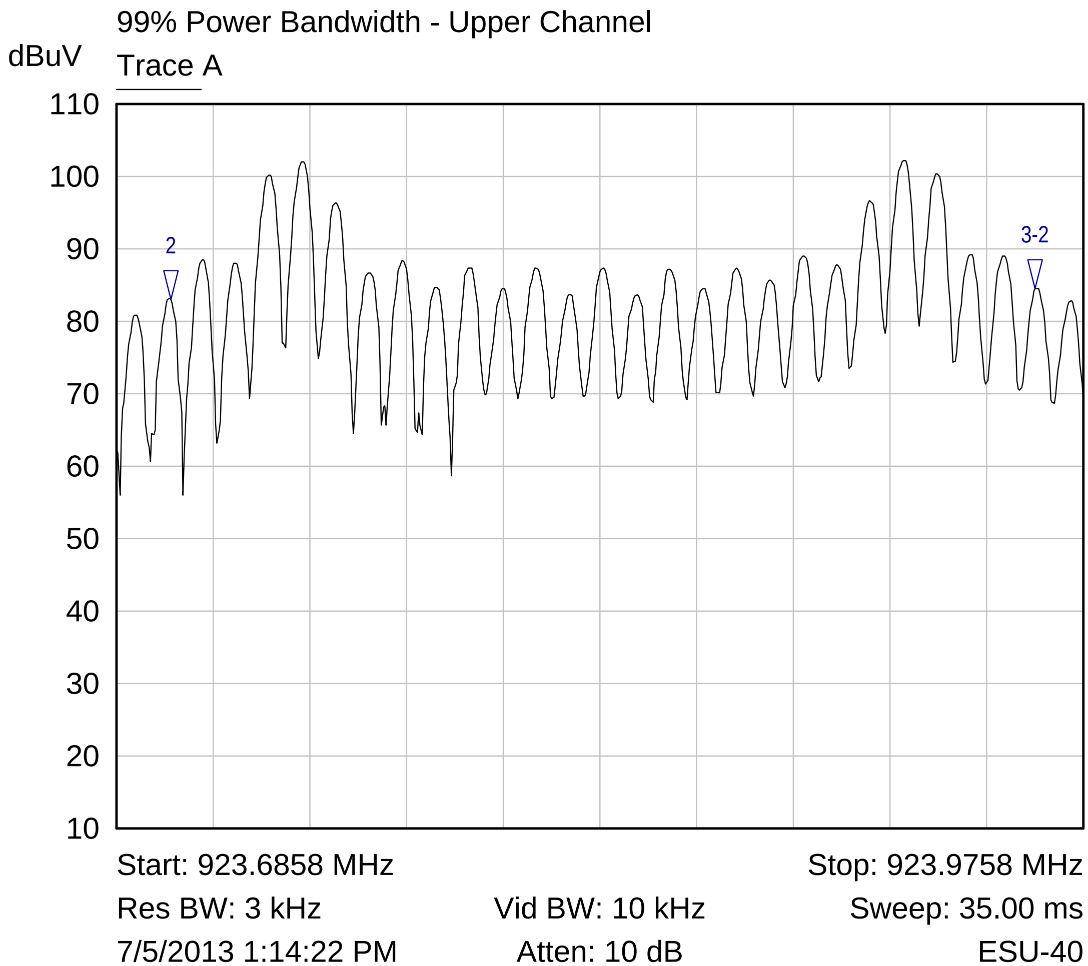


Start: 916.2476 MHz   Stop: 916.5376 MHz
Res BW: 3 kHz   Vid BW: 10 kHz   Sweep: 35.00 ms
7/5/2013 1:09:51 PM   Atten: 10 dB   ESU-40

Mkr	Trace	X-Axis	Value	Notes
2 ▽	Trace A	916.2620 MHz	81.71 dBuV	
3-2 ▽	Trace A	259.7917 kHz	0.60 dB	

Trace A   BW, Middle Channel

Upper Channel Bandwidth



Mkr	Trace	X-Axis	Value	Notes
2 ▽	Trace A	923.7020 MHz	83.03 dBuV	
3-2 ▽	Trace A	259.3269 kHz	1.48 dB	

Trace A BW, Upper Channel

6.2.2 RSS-Gen 5.6 Exposure of Humans to RF Fields

See documents filed with this report.

6.2.3 RSS-Gen 6 Receiver Spurious Emission Standard

As per Notice 2012 DRS0126, this section is not required.

6.2.4 RSS-Gen 7.1.2 Antenna Requirement

The 7756V transceiver uses a helical antenna extending from a trace on the PCB.

6.2.5 RSS-Gen 7.1.3 User Manual

The User Manual contains the following statement:

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

See documents filed with this report for a copy of the User Manual.

6.2.6 RSS-Gen 7.1.4 Digital Circuits

The 7756V was tested to the requirements of ICES-003 and found to comply. See Nemko-CCL, Inc. Test Report #230383-9-1.1.

6.2.7 RSS-Gen 7.2.2 Emissions Falling Within Restricted Frequency Bands & RSS-210 A8.5 Out-of-Band Emissions

The frequency range from 0.032 MHz to 9250 MHz was investigated to measure any radiated emissions. Shown below are plots with the EUT tuned to the upper, middle, and lower channels. Emissions that fell into the restricted bands of RSS-Gen Table 3 met the respective limit. The tables show the worst-case emissions measured. Worst case emissions were with the EUT placed on edge. The noise floor was a minimum of 6 dB below the limit. All emissions were found to be within the respective limits; including those in the restricted bands. Emissions outside the restricted bands were also compared to, and found within the restricted band limits, which are tighter; therefore, the EUT complies with the specification.

AVERAGE FACTOR

See Appendix 3 for the average factor calculation.

Transmitting at the Lowest Frequency (907.095 MHz)

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1814.2	Peak	Vertical	45.3	13.6	29.9	0.0	43.5	74.0	-30.5
1814.2	Average	Vertical	42.5	10.8	29.9	-0.1	40.7	54.0	-13.4
1814.2	Peak	Horizontal	44.9	13.2	29.9	0.0	43.1	74.0	-30.9
1814.2	Average	Horizontal	42.1	10.4	29.9	-0.1	40.3	54.0	-13.8
2721.3	Peak	Vertical	44.3	12.6	32.9	0.0	45.5	74.0	-28.5
2721.3	Average	Vertical	41.1	9.4	32.9	-0.1	42.3	54.0	-11.7
2721.3	Peak	Horizontal	41.7	10.0	32.9	0.0	42.9	74.0	-31.1
2721.3	Average	Horizontal	37.1	5.4	32.9	-0.1	38.3	54.0	-15.8
3628.4	Peak	Vertical	41.1	9.3	35.8	0.0	45.1	74.0	-28.9
3628.4	Average	Vertical	36.4	4.6	35.8	-0.1	40.4	54.0	-13.7
3628.4	Peak	Horizontal	38.8	7.0	35.8	0.0	42.8	74.0	-31.2
3628.4	Average	Horizontal	33.6	1.8	35.8	-0.1	37.6	54.0	-16.5
4535.5	Peak	Vertical	41.9	10.0	37.1	0.0	47.1	74.0	-26.9
4535.5	Average	Vertical	37.2	5.3	37.1	-0.1	42.4	54.0	-11.7
4535.5	Peak	Horizontal	45.5	13.6	37.1	0.0	50.7	74.0	-23.3
4535.5	Average	Horizontal	42.5	10.6	37.1	-0.1	47.7	54.0	-6.4
5442.6	Peak	Vertical	36.6	4.9	39.2	0.0	44.1	74.0	-29.9
5442.6	Average	Vertical	27.8	-3.9	39.2	-0.1	35.3	54.0	-18.8
5442.6	Peak	Horizontal	37.5	5.8	39.2	0.0	45.0	74.0	-29.0
5442.6	Average	Horizontal	28.0	-3.7	39.2	-0.1	35.5	54.0	-18.6
6349.7	Peak	Vertical	37.2	5.9	39.9	0.0	45.7	74.0	-28.3
6349.7	Average	Vertical	28.8	-2.5	39.9	-0.1	37.3	54.0	-16.8
6349.7	Peak	Horizontal	36.1	4.8	39.9	0.0	44.6	74.0	-29.4
6349.7	Average	Horizontal	26.7	-4.6	39.9	-0.1	35.2	54.0	-18.9
7256.8	Peak	Vertical	35.2	4.6	41.9	0.0	46.4	74.0	-27.6
7256.8	Average	Vertical	26.8	-3.8	41.9	-0.1	38.0	54.0	-16.1

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
7256.8	Peak	Horizontal	35.8	5.2	41.9	0.0	47.0	74.0	-27.0
7256.8	Average	Horizontal	27.9	-2.7	41.9	-0.1	39.1	54.0	-15.0
8163.9	Peak	Vertical	32.3	2.1	43.3	0.0	45.4	74.0	-28.6
8163.9	Average	Vertical	20.0	-10.2	43.3	-0.1	33.1	54.0	-21.0
8163.9	Peak	Horizontal	31.6	1.4	43.3	0.0	44.7	74.0	-29.3
8163.9	Average	Horizontal	19.7	-10.5	43.3	-0.1	32.8	54.0	-21.3
9071.0	Peak	Vertical	32.0	2.0	44.4	0.0	46.5	74.0	-27.5
9071.0	Average	Vertical	20.0	-10.0	44.4	-0.1	34.5	54.0	-19.6
9071.0	Peak	Horizontal	33.9	3.9	44.4	0.0	48.4	74.0	-25.6
9071.0	Average	Horizontal	26.0	-4.0	44.4	-0.1	40.5	54.0	-13.6

Transmitting at the Middle Frequency (916.395 MHz)

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1832.8	Peak	Vertical	56.4	24.7	30.0	0.0	54.7	74.0	-19.3
1832.8	Average	Vertical	55.5	23.8	30.0	-0.1	53.8	54.0	-0.3
1832.8	Peak	Vertical	51.6	19.9	30.0	0.0	49.9	74.0	-24.1
1832.8	Average	Vertical	50.3	18.6	30.0	-0.1	48.6	54.0	-5.5
2749.2	Peak	Vertical	48.6	16.9	33.0	0.0	49.9	74.0	-24.1
2749.2	Average	Vertical	46.6	14.9	33.0	-0.1	47.9	54.0	-6.2
2749.2	Peak	Vertical	42.2	10.5	33.0	0.0	43.5	74.0	-30.5
2749.2	Average	Vertical	38.0	6.3	33.0	-0.1	39.3	54.0	-14.8
3665.6	Peak	Vertical	47.3	15.5	35.9	0.0	51.4	74.0	-22.6
3665.6	Average	Vertical	44.6	12.8	35.9	-0.1	48.7	54.0	-5.4
3665.6	Peak	Vertical	46.8	15.0	35.9	0.0	50.9	74.0	-23.1
3665.6	Average	Vertical	44.3	12.5	35.9	-0.1	48.4	54.0	-5.7
4582.0	Peak	Vertical	48.4	16.5	37.2	0.0	53.7	74.0	-20.3
4582.0	Average	Vertical	43.8	11.9	37.2	-0.1	49.1	54.0	-5.0
4582.0	Peak	Vertical	46.4	14.5	37.2	0.0	51.7	74.0	-22.3
4582.0	Average	Vertical	42.9	11.0	37.2	-0.1	48.2	54.0	-5.9
5498.4	Peak	Vertical	38.2	6.5	39.3	0.0	45.8	74.0	-28.2
5498.4	Average	Vertical	31.3	-0.4	39.3	-0.1	38.9	54.0	-15.2
5498.4	Peak	Vertical	35.6	3.9	39.3	0.0	43.2	74.0	-30.8
5498.4	Average	Vertical	26.9	-4.8	39.3	-0.1	34.5	54.0	-19.6
6414.8	Peak	Vertical	37.2	5.9	39.9	0.0	45.8	74.0	-28.2
6414.8	Average	Vertical	29.5	-1.8	39.9	-0.1	38.1	54.0	-16.0
6414.8	Peak	Vertical	35.1	3.8	39.9	0.0	43.7	74.0	-30.3
6414.8	Average	Vertical	26.7	-4.6	39.9	-0.1	35.3	54.0	-18.8
7331.2	Peak	Vertical	35.3	4.7	42.1	0.0	46.8	74.0	-27.2
7331.2	Average	Vertical	27.0	-3.6	42.1	-0.1	38.5	54.0	-15.6
7331.2	Peak	Vertical	35.2	4.6	42.1	0.0	46.7	74.0	-27.3
7331.2	Average	Vertical	26.0	-4.6	42.1	-0.1	37.5	54.0	-16.6
8247.6	Peak	Vertical	33.3	3.1	43.4	0.0	46.6	74.0	-27.4

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
8247.6	Average	Vertical	22.9	-7.3	43.4	-0.1	36.2	54.0	-17.9
8247.6	Peak	Vertical	31.9	1.7	43.4	0.0	45.2	74.0	-28.8
8247.6	Average	Vertical	20.7	-9.5	43.4	-0.1	34.0	54.0	-20.1
9164.0	Peak	Vertical	33.5	3.6	44.4	0.0	48.0	74.0	-26.0
9164.0	Average	Vertical	24.5	-5.4	44.4	-0.1	39.0	54.0	-15.1
9164.0	Peak	Vertical	33.8	3.9	44.4	0.0	48.3	74.0	-25.7
9164.0	Average	Vertical	26.1	-3.8	44.4	-0.1	40.6	54.0	-13.5

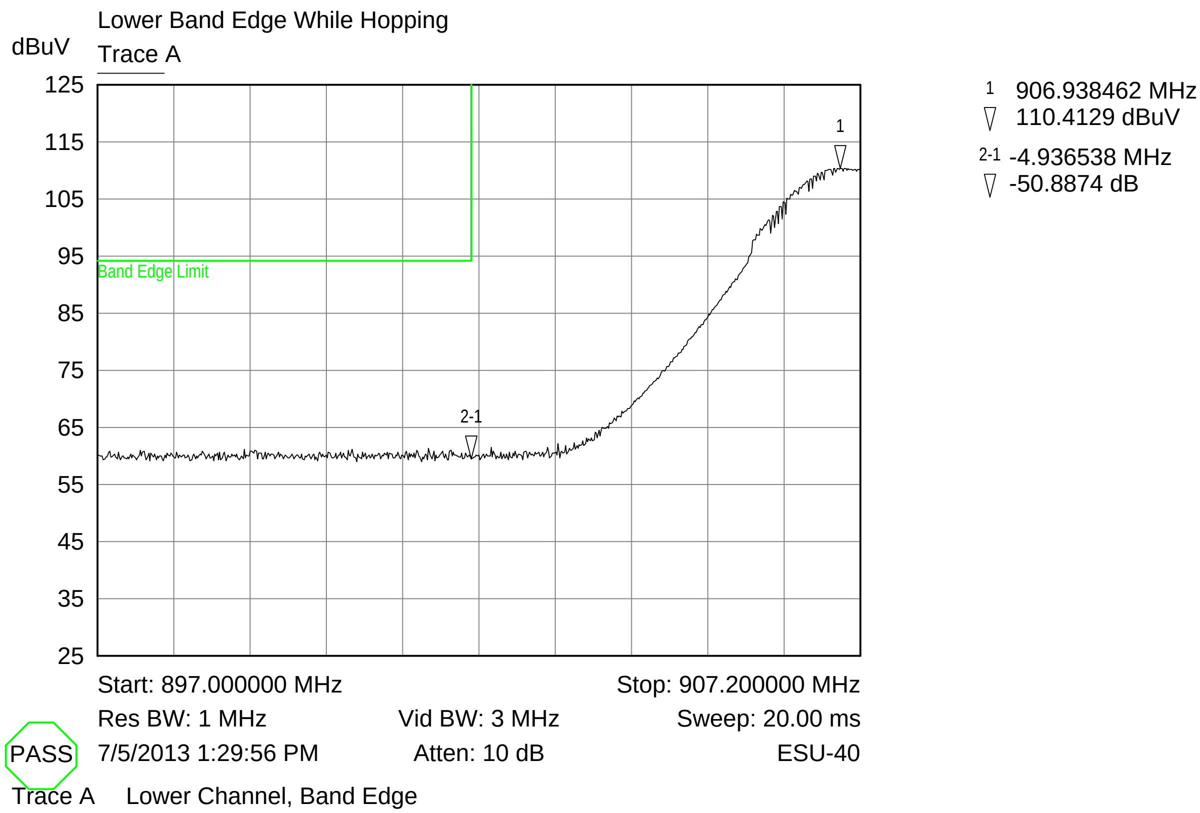
Transmitting at the Highest Frequency (923.835 MHz)

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1847.6	Peak	Vertical	50.2	18.5	30.1	0.0	48.6	74.0	-25.4
1847.6	Average	Vertical	48.6	16.9	30.1	-0.1	47.0	54.0	-7.1
1847.6	Peak	Vertical	47.6	15.9	30.1	0.0	46.0	74.0	-28
1847.6	Average	Vertical	43.5	11.8	30.1	-0.1	41.9	54.0	-12.2
2771.5	Peak	Vertical	44.2	12.5	33.1	0.0	45.6	74.0	-28.4
2771.5	Average	Vertical	41.1	9.4	33.1	-0.1	42.5	54.0	-11.6
2771.5	Peak	Vertical	38.5	6.8	33.1	0.0	39.9	74.0	-34.1
2771.5	Average	Vertical	33.0	1.3	33.1	-0.1	34.4	54.0	-19.7
3695.3	Peak	Vertical	46.0	14.2	36.0	0.0	50.2	74.0	-23.8
3695.3	Average	Vertical	43.5	11.7	36.0	-0.1	47.7	54.0	-6.4
3695.3	Peak	Vertical	45.6	13.8	36.0	0.0	49.8	74.0	-24.2
3695.3	Average	Vertical	43.1	11.3	36.0	-0.1	47.3	54.0	-6.8
4619.1	Peak	Vertical	48.0	16.1	37.3	0.0	53.4	74.0	-20.6
4619.1	Average	Vertical	43.7	11.8	37.3	-0.1	49.1	54.0	-5.0
4619.1	Peak	Vertical	46.2	14.3	37.3	0.0	51.6	74.0	-22.4
4619.1	Average	Vertical	43.5	11.6	37.3	-0.1	48.9	54.0	-5.2
5542.9	Peak	Vertical	37.4	5.7	39.4	0.0	45.1	74.0	-28.9
5542.9	Average	Vertical	29.0	-2.7	39.4	-0.1	36.7	54.0	-17.4
5542.9	Peak	Vertical	34.7	3.0	39.4	0.0	42.4	74.0	-31.6
5542.9	Average	Vertical	25.6	-6.1	39.4	-0.1	33.3	54.0	-20.8
6466.7	Peak	Vertical	35.8	4.5	39.9	0.0	44.4	74.0	-29.6
6466.7	Average	Vertical	28.3	-3.0	39.9	-0.1	36.9	54.0	-17.2
6466.7	Peak	Vertical	33.0	1.7	39.9	0.0	41.6	74.0	-32.4
6466.7	Average	Vertical	25.5	-5.8	39.9	-0.1	34.1	54.0	-20.0
7390.6	Peak	Vertical	35.6	5.0	42.3	0.0	47.3	74.0	-26.7
7390.6	Average	Vertical	28.5	-2.1	42.3	-0.1	40.2	54.0	-13.9
7390.6	Peak	Vertical	35.3	4.7	42.3	0.0	47.0	74.0	-27.0
7390.6	Average	Vertical	28.1	-2.5	42.3	-0.1	39.8	54.0	-14.3
8314.4	Peak	Vertical	32.1	2.0	43.5	0.0	45.5	74.0	-28.5

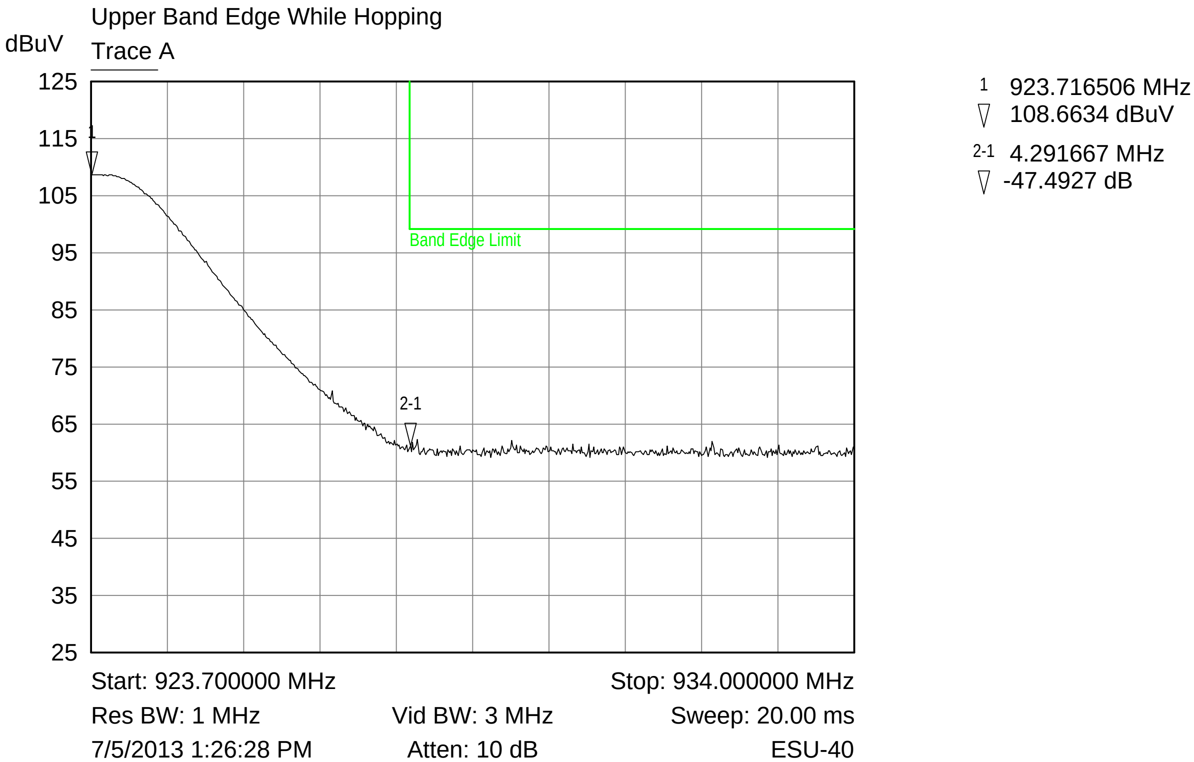
Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Amp Adjusted Meas. (dB)	Correction Factor (dB)	Averaging Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
8314.4	Average	Vertical	21.3	-8.8	43.5	-0.1	34.7	54.0	-19.4
8314.4	Peak	Vertical	31.1	1.0	43.5	0.0	44.5	74.0	-29.5
8314.4	Average	Vertical	19.9	-10.2	43.5	-0.1	33.3	54.0	-20.8
9238.2	Peak	Vertical	33.4	3.5	44.5	0.0	48.0	74.0	-26.0
9238.2	Average	Vertical	24.4	-5.5	44.5	-0.1	39.0	54.0	-15.1
9238.2	Peak	Vertical	37.7	7.8	44.5	0.0	52.3	74.0	-21.7
9238.2	Average	Vertical	26.0	-3.9	44.5	-0.1	40.6	54.0	-13.5

No other emissions in the restricted bands were seen above the noise floor. Noise floor was greater than 6 dB below the limit.

Lower Band Edge



Upper Band Edge



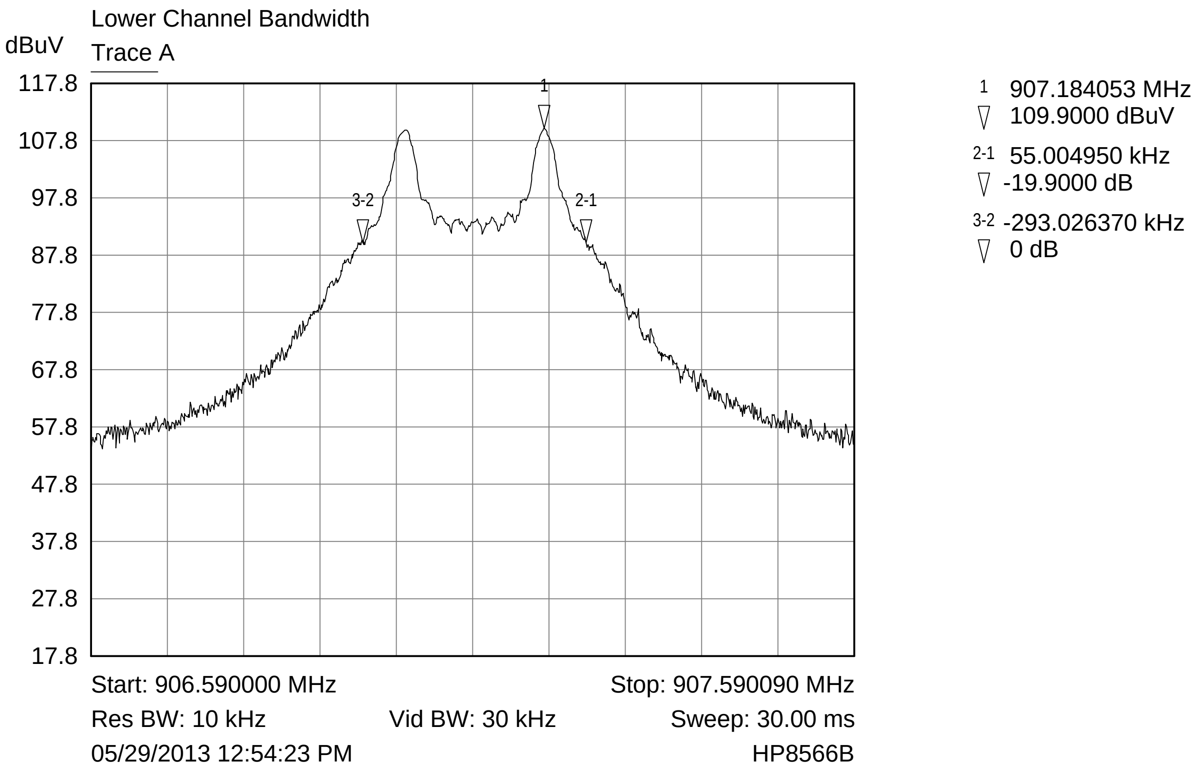
Trace A Upper Channel, Band Edge

6.2.8 RSS-210 A8.1(a) Emission Bandwidth

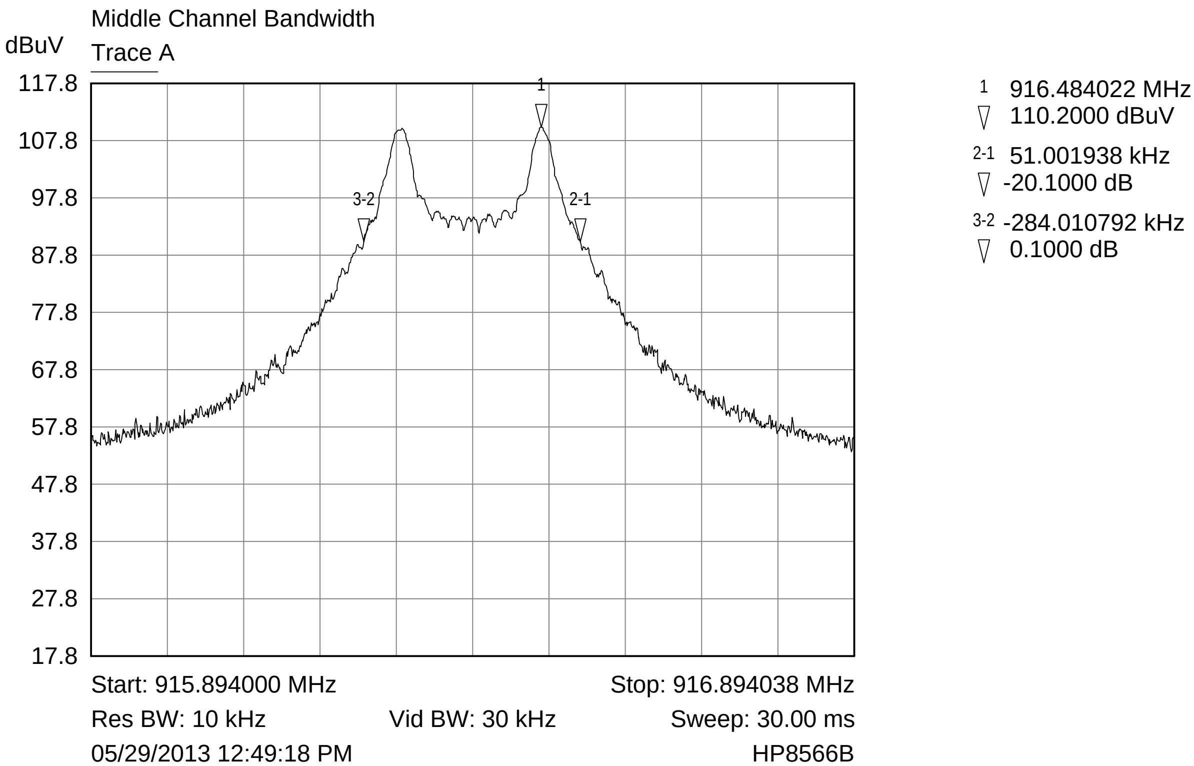
Frequency (MHz)	Emission 20 dB Bandwidth (kHz)
907.095	293
916.395	284
923.835	282

The system RF bandwidth is 7.225 MHz (25 channels x 0.289 MHz). The channel hopset is described in the operational description of the device filed for certification.

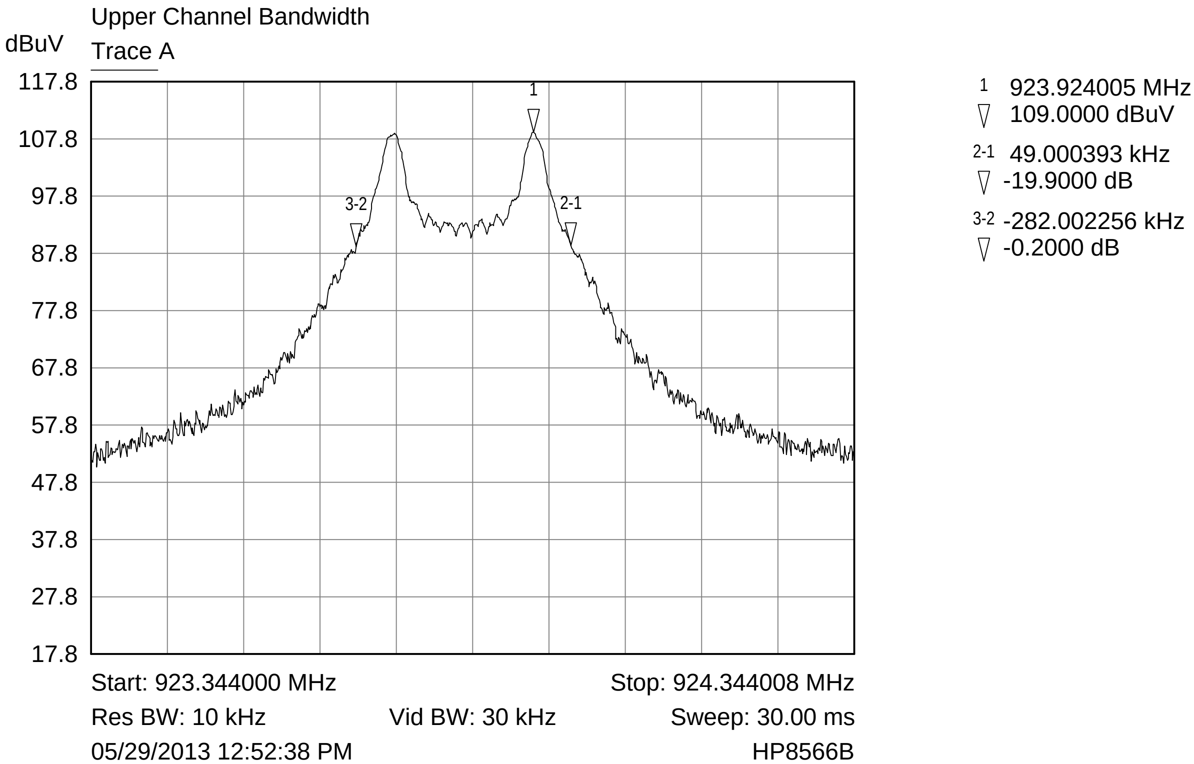
Lowest Channel Bandwidth



Middle Channel Bandwidth

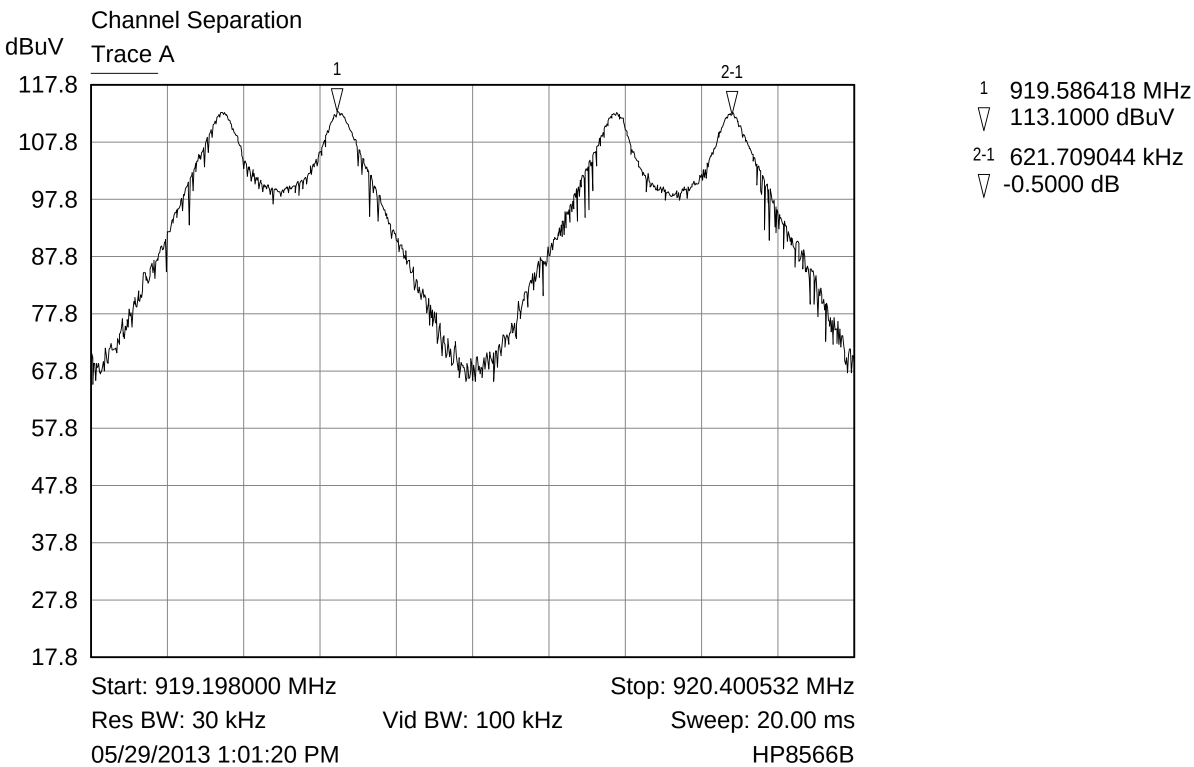


Upper Channel Bandwidth



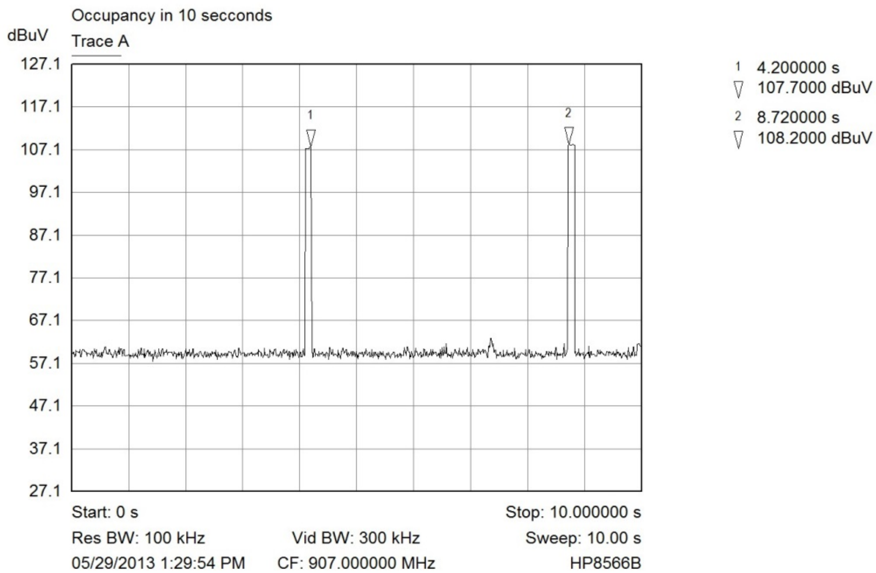
6.2.9 RSS-210 A8.1(b) Channel Separation

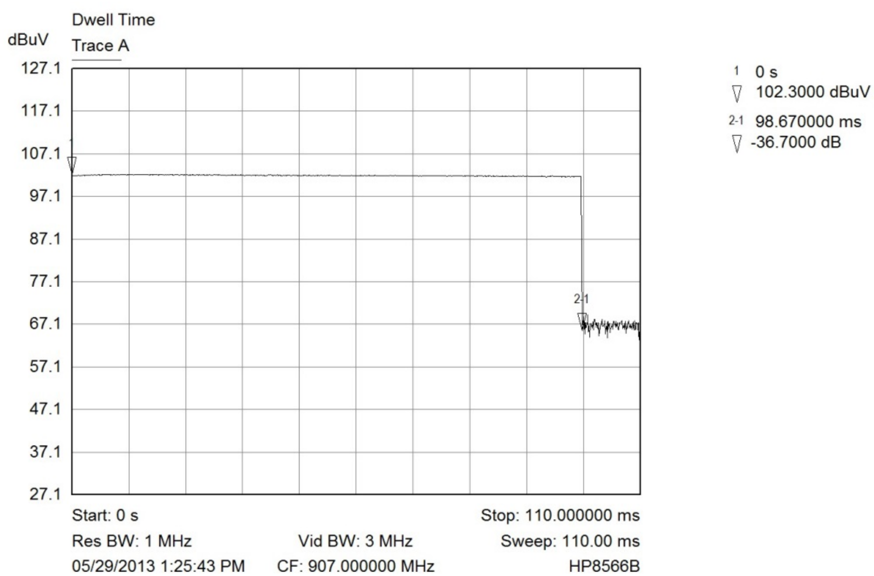
The EUT must have the hopping channel carrier frequencies separated by 25 kHz or the 20 dB bandwidth, whichever is greater. A plot showing a 622 kHz channel separation is shown below. The 20 dB bandwidth is 293.0 kHz and is shown in section 6.2.8.



6.2.10 RSS-210 A8.1(d) Time of Occupancy

The EUT uses 25 channels that have a bandwidth greater than 250 kHz; therefore, the EUT must have an average time of occupancy on any frequency that is not greater than 0.4 seconds in a period of 10 seconds (0.4 seconds x 25 channels). The EUT transmits 0.198 seconds in 10 seconds. See the plots and calculations below.





From the plot, the EUT transmits up to 2 times per second for 98.7 ms at each transmission.

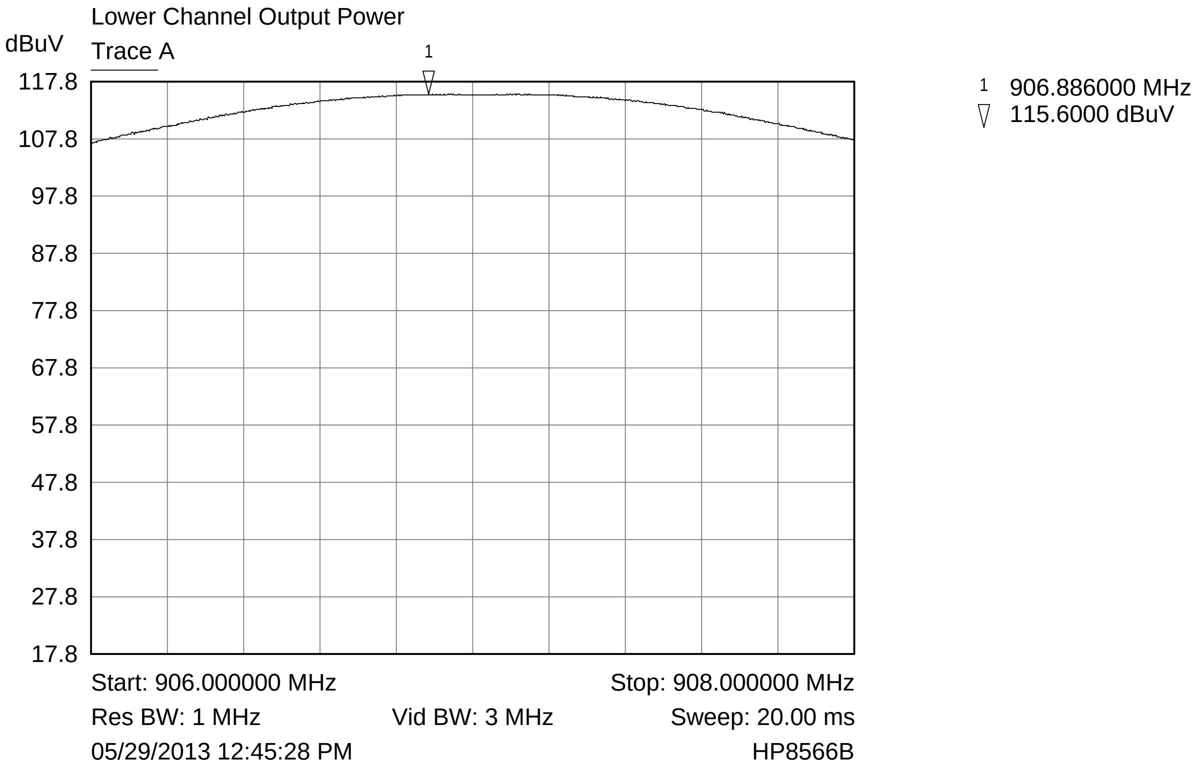
2 hits at 98.7 ms = 0.197 s occupancy

6.2.11 RSS-210 A8.4(1) Transmitter Output Power and e.i.r.p.

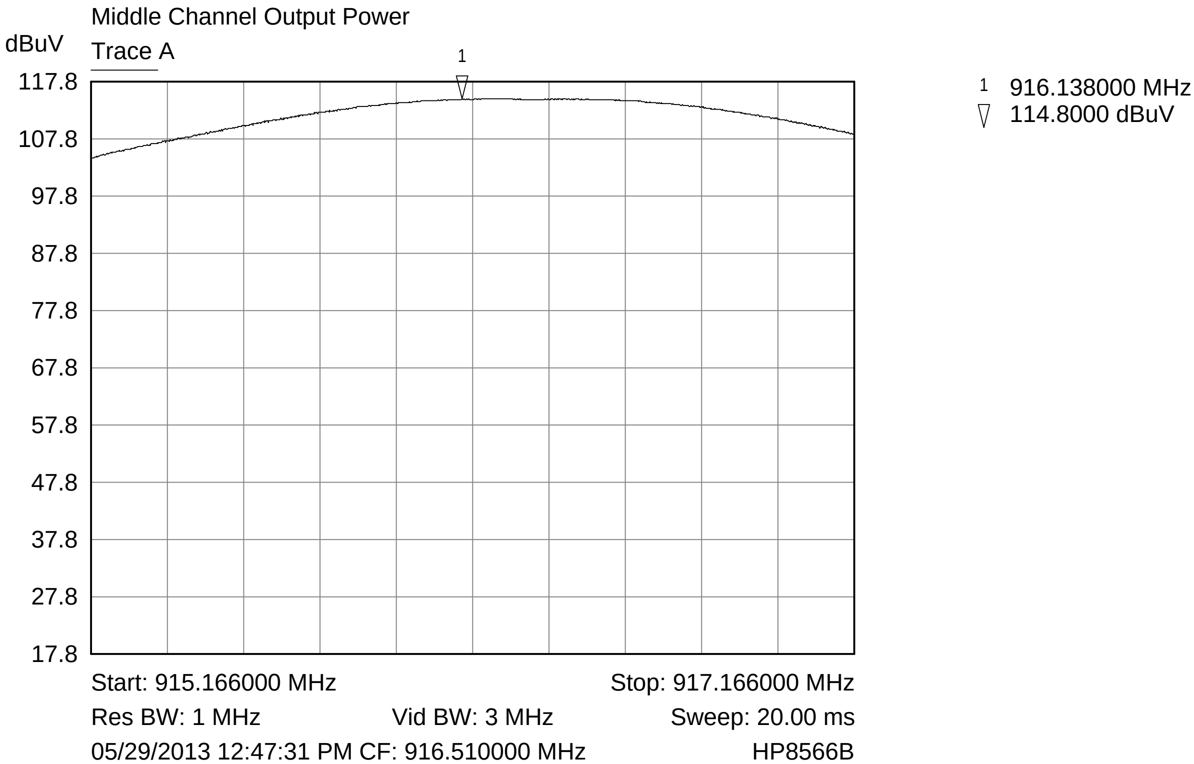
The EUT uses 25 hopping channels. The limit for this device is 1 Watt e.i.r.p. Radiated power measurements were made and the plots are shown below with the results of summarized in the table.

Frequency (MHz)	Measured Output Power (dBuV)	Measured Output Power (mW)
907.095	115.6	108.2
916.395	114.8	90.6
923.835	114.1	77.1

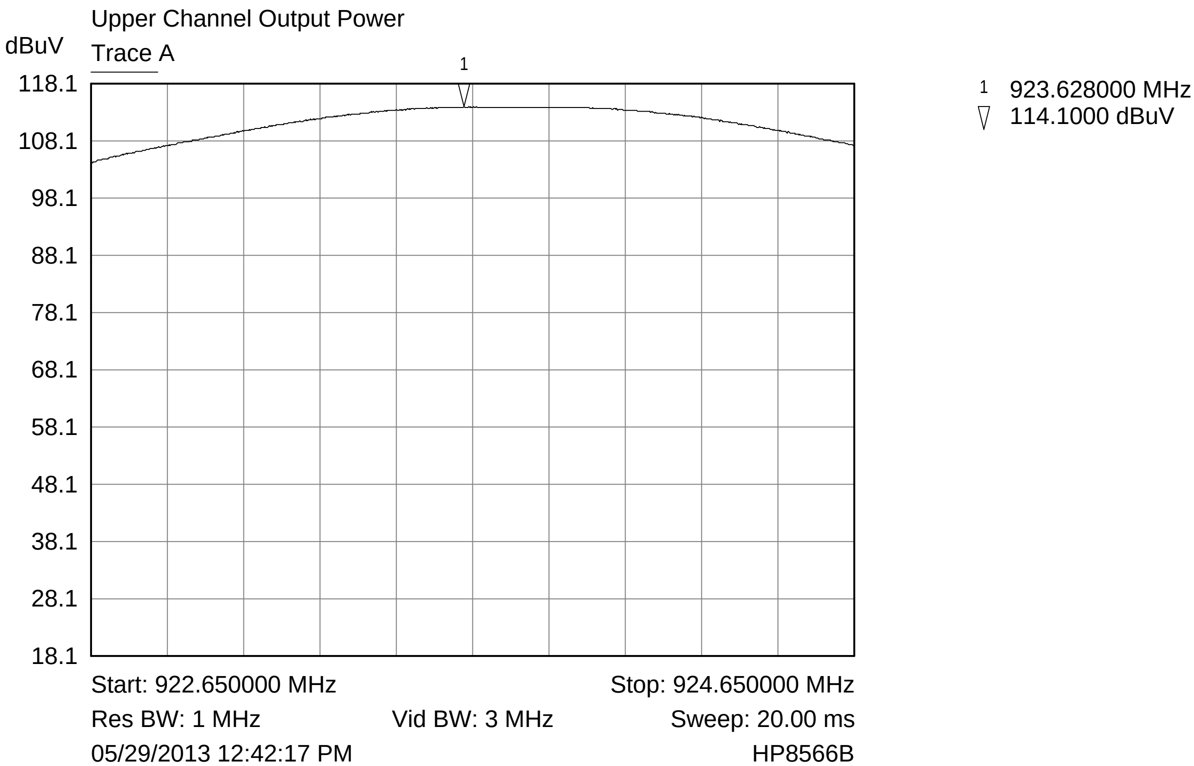
Lowest Channel



Middle Channel



Upper Channel



APPENDIX 1 TEST PROCEDURES AND TEST EQUIPMENT

A1 RSS-Gen Radiated Spurious Emissions

The radiated emissions from the intentional radiator were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A loop antenna was used to measure emissions below 30 MHz. Emission readings more than 20 dB below the limit at any frequency may not be listed in the reported data. For frequencies between 9 kHz and 30 MHz, or the lowest frequency generated or used in the device greater than 9 kHz, and less than 30 MHz, the spectrum analyzer resolution bandwidth was set to 9 kHz and the video bandwidth was set to 30 kHz. For average measurements, the spectrum analyzer average detector was used.

For frequencies above 30 MHz, an amplifier and preamplifier were used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For peak emissions above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz. For average measurements above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the average detector of the analyzer was used.

A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range of 1 GHz to 18 GHz and a standard gain horn antenna was used at frequencies above 18 GHz at a distance of 3 meters and/or 1 meter from the EUT. The readings obtained by the antenna are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the intentional radiator was varied to find the maximum radiated emission. The intentional radiator was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cables were manipulated manually by a technician to obtain worst case radiated emissions. The intentional radiator was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there are multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

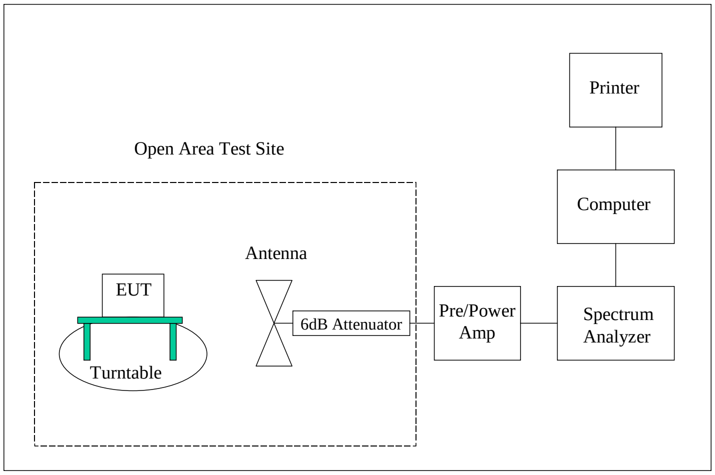
Desktop intentional radiators are measured on a non-conducting table 80 centimeters above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the intentional radiator. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

For radiated emission testing at 30 MHz or above that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Due Date of Calibration
Wanship Open Area Test Site #1	Nemko-CCL, Inc.	N/A	N/A	04/19/2012	04/19/2015
Wanship Open Area Test Site #2	Nemko-CCL, Inc.	N/A	N/A	12/07/2012	12/07/2013
Test Software	Nemko-CCL, Inc.	Radiated Emissions	Revision 1.3	N/A	N/A
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	100064	07/28/2012	07/28/2013
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711	02/06/2013	02/06/2014
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137	02/06/2013	02/06/2014
Loop Antenna	EMCO	6502	9111-2675	03/04/2013	03/04/2015
Biconilog Antenna	EMCO	3142	9601-1009	04/25/2013	04/25/2015
Double Ridged Guide Antenna	EMCO	3115	9604-4779	03/07/2013	03/07/2015
900 MHz Filter	Microtronics	HPM50108-03	001	05/17/2013	05/17/2014
High Frequency Amplifier	Miteq	AFS4-01001800-43-10P-4	1096455	05/06/2013	05/06/2014
6’ High Frequency Cable	Microcoax	UFB197C-0-0720-000000	1296	05/02/2013	05/02/2014
20’ High Frequency Cable	Microcoax	UFB197C-1-3120-000000	1297	05/02/2013	05/02/2014
3 Meter Radiated Emissions Cable Wanship Site #2	Microcoax	UFB205A-0-4700-000000	1295	05/02/2013	05/02/2014
Pre/Power-Amplifier	Hewlett Packard	8447F	3113A05161	08/27/2012	08/27/2013

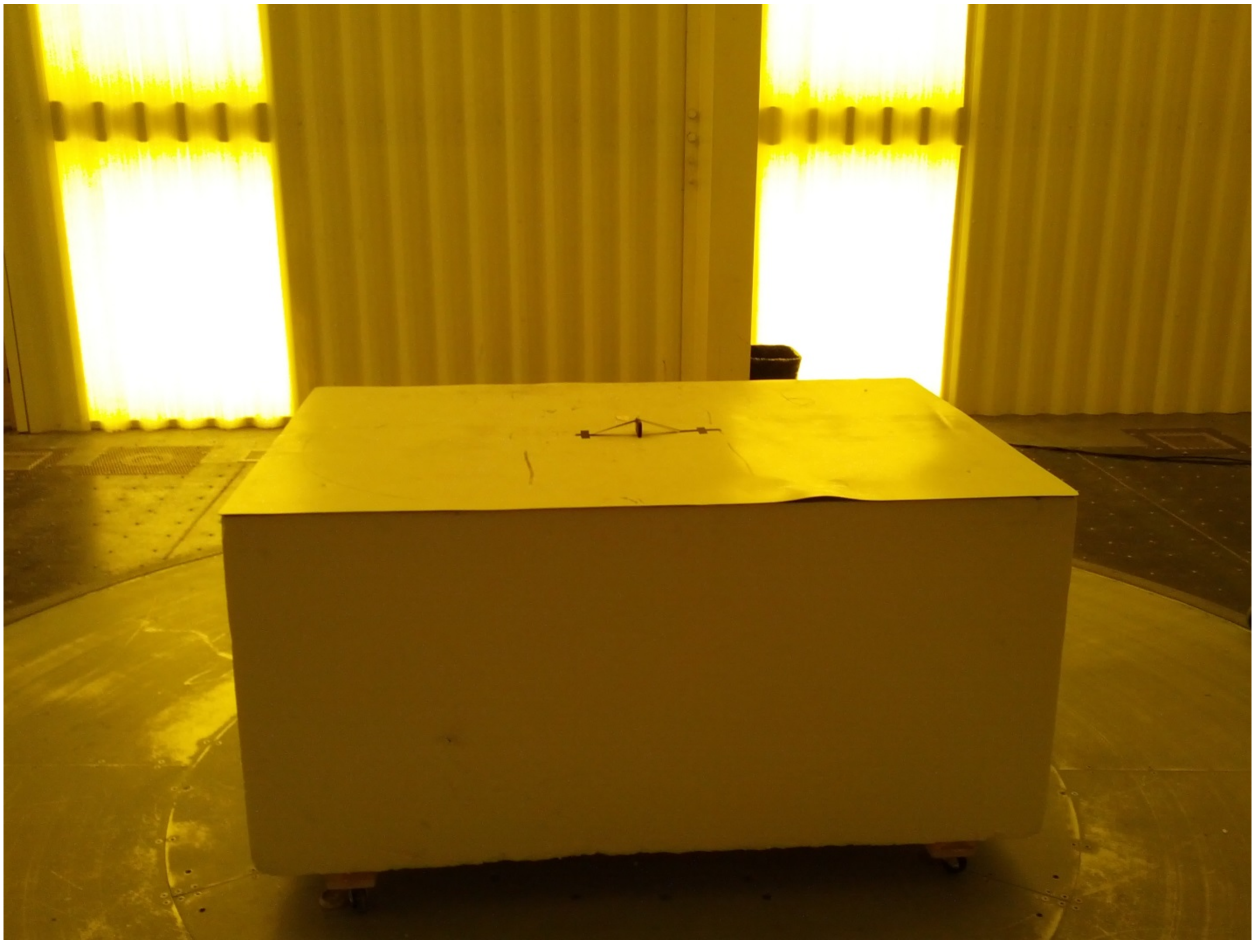
An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Radiated Emissions Test Setup

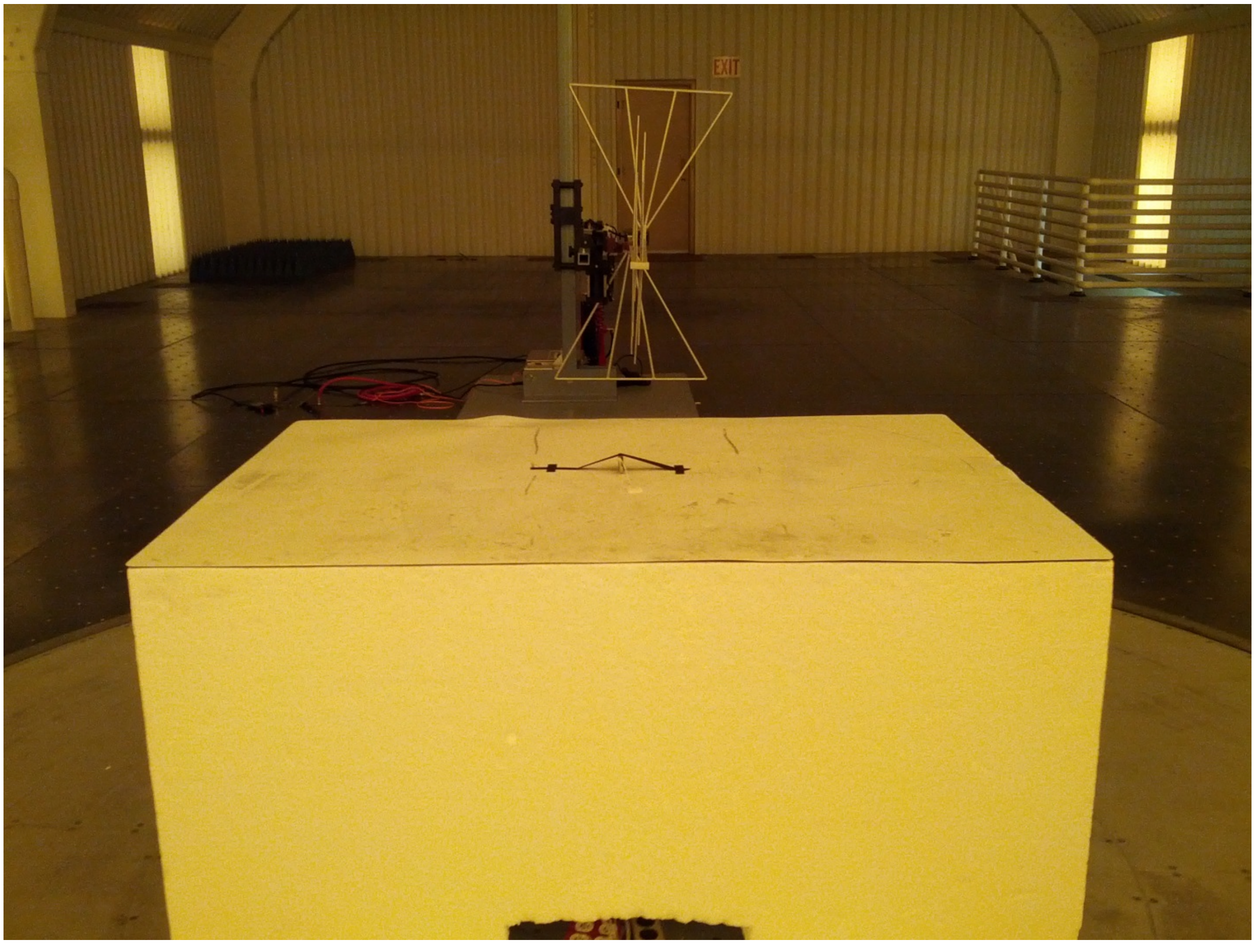


APPENDIX 2 PHOTOGRAPHS

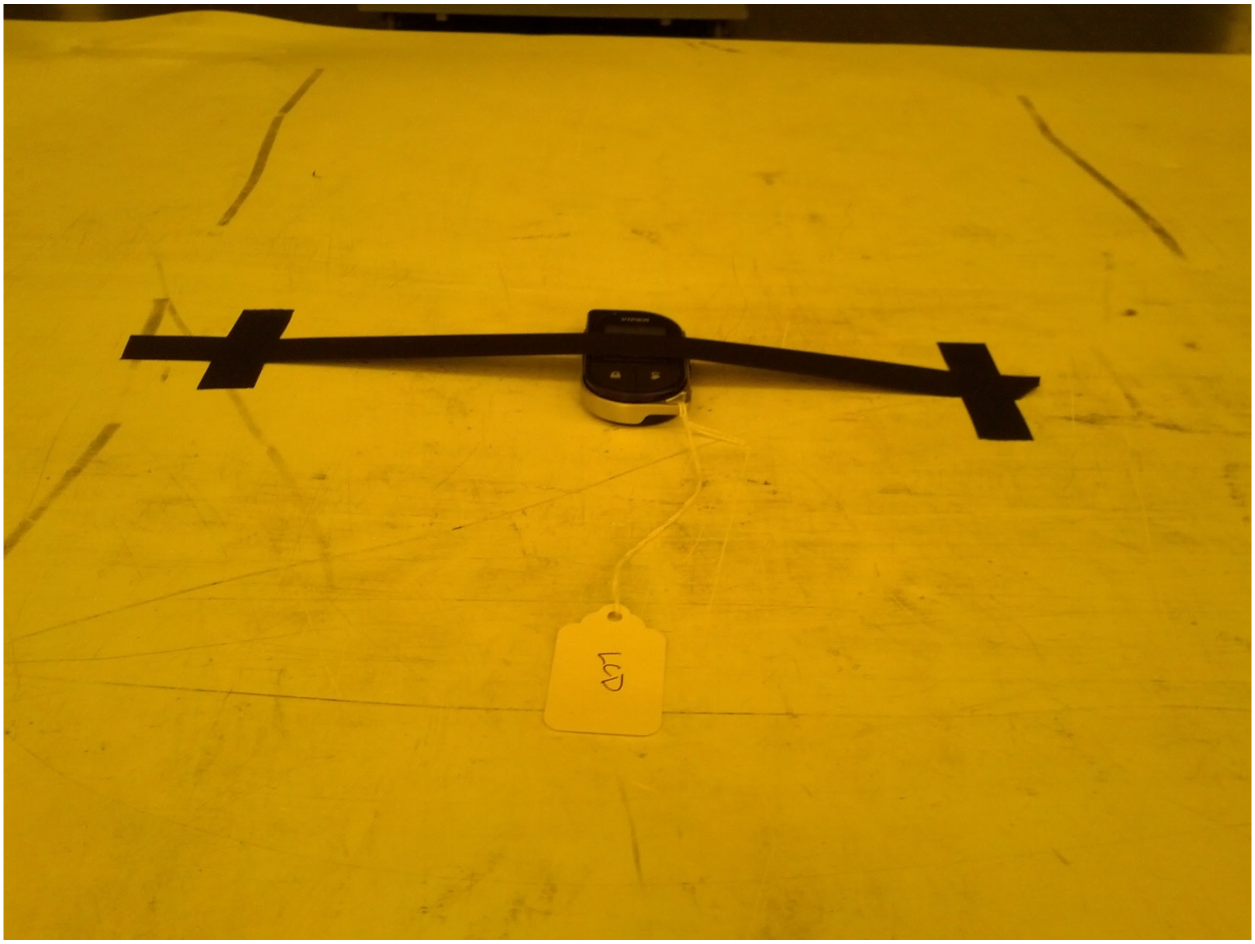
Photograph 1 – Front View Radiated Disturbance Worst Case Configuration (EUT on edge)



Photograph 2 – Back View Radiated Disturbance Worst Case Configuration (EUT on edge)

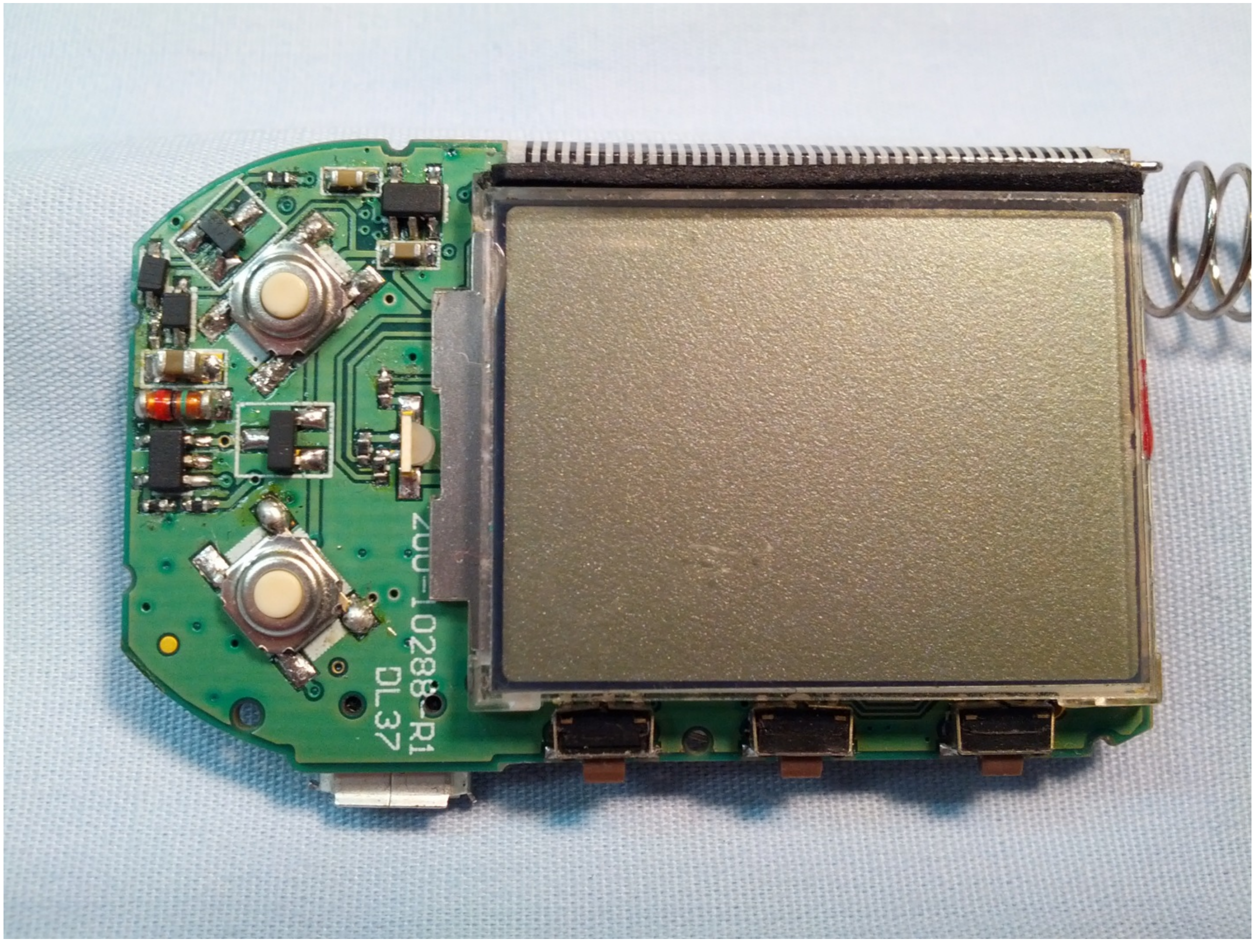


Photograph 3 – EUT Orientation for Radiated Tests - Flat

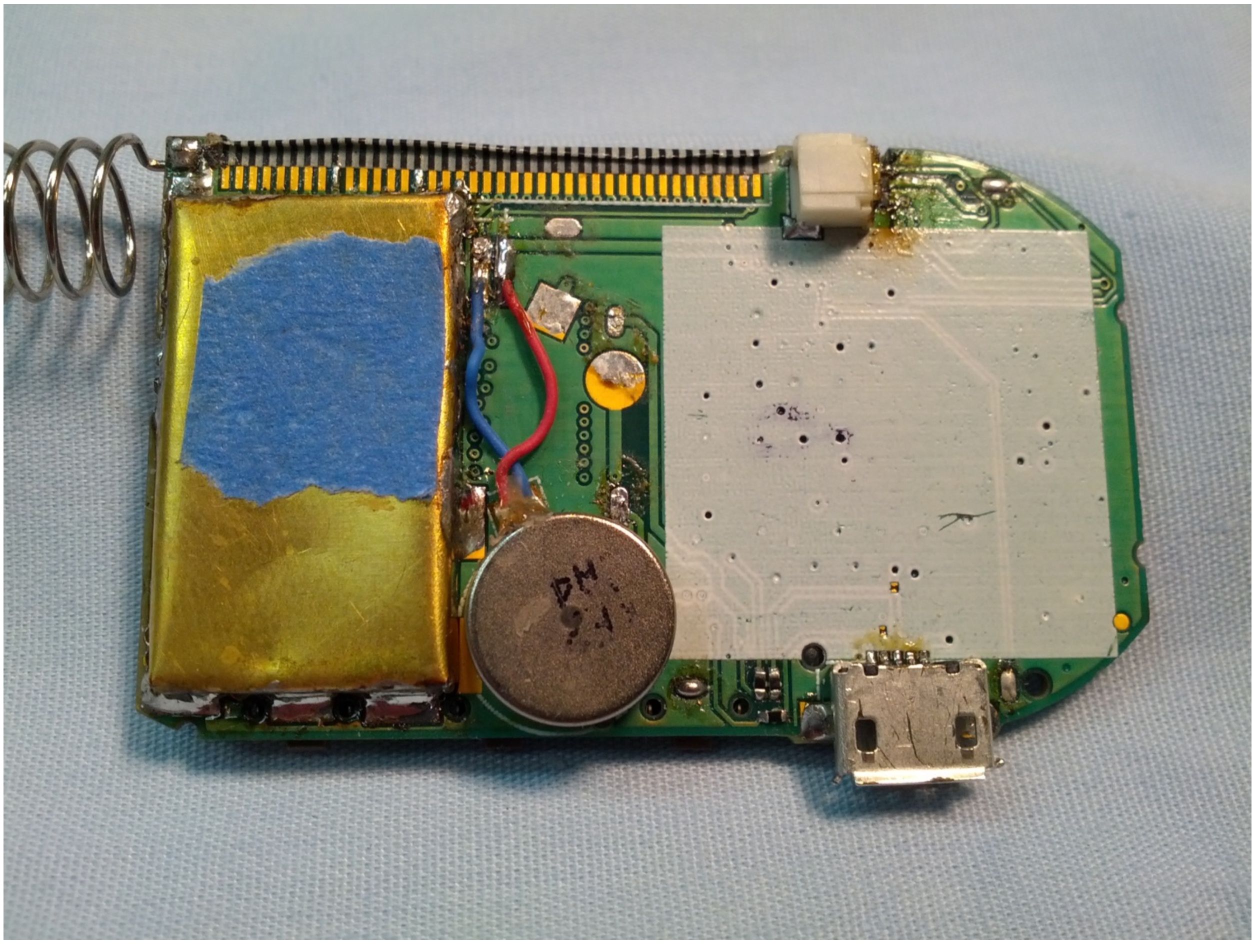


Photograph 4 – EUT Orientation for Radiated Tests - Vertical

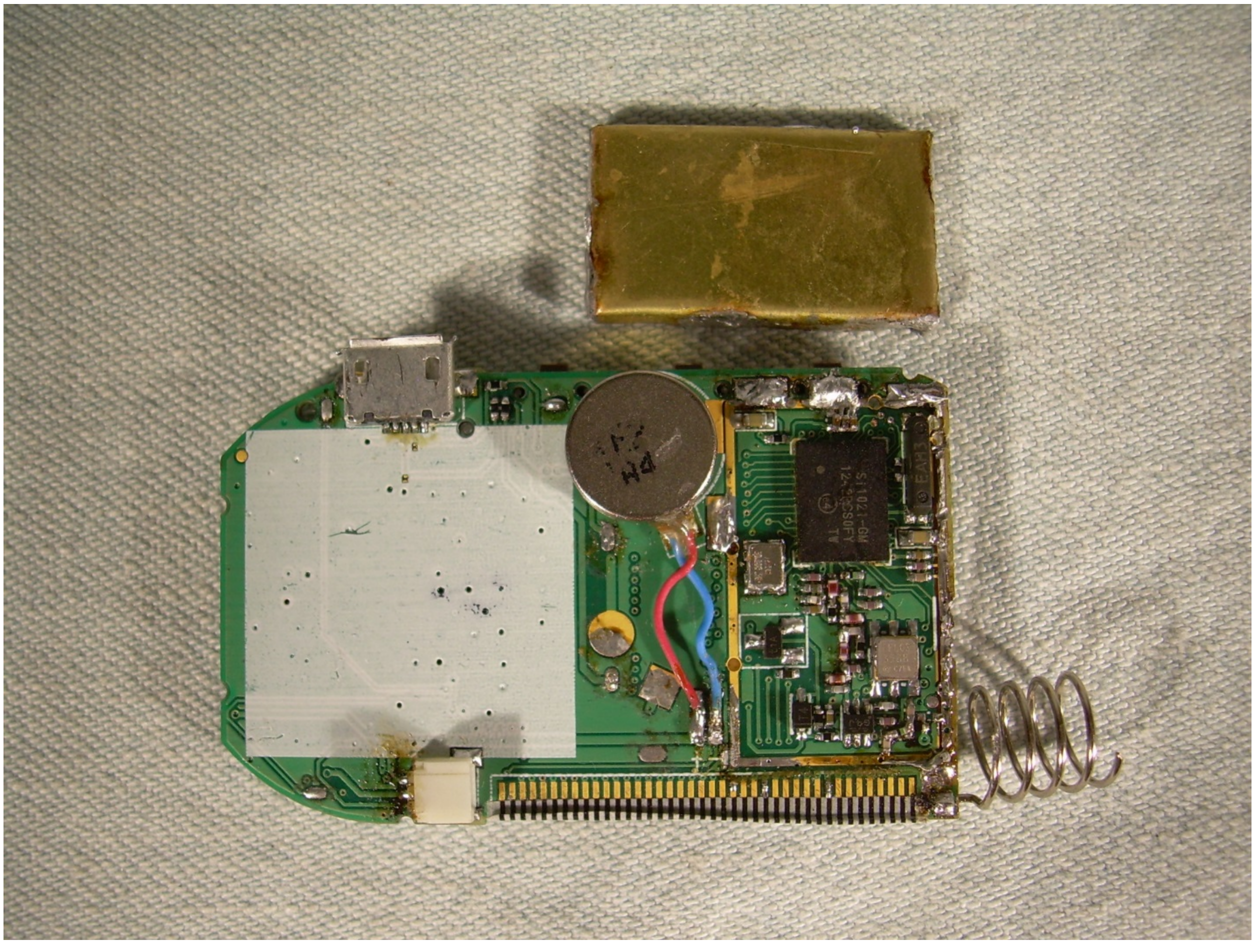
Photograph 5 – View of the Front Side of the PCB



Photograph 6 – View of the Back Side of the PCB



Photograph 7 – View of the Back Side of the PCB with RF Shield Removed



APPENDIX 3 AVERAGE FACTOR CALCULATION

The average factor is calculated by taking the average over the 100 millisecond period over which the average is greatest, as specified in §15.35(C). The pulse widths and pulse period needed to make the average factor and duty calculations are shown in the graphs below.

Pulse Period: 98.7 ms

Total On Time for Pulse Period / Total On Time for Worst 100 ms:
1 pulse x 98.7 = 98.7 ms

Duty Cycle (using the full pulse width shown below):
98.7 ms / 100 ms = 98.7 %

Average Factor (using the worst case 100 ms period shown below):
20 log (0.987) = -0.1 dB