Electromagnetic Compatibility Test Report

Tests Performed on a Data Comm for Business

Transmitter Transciever, Model DCB-LX 1

Radiometrics Document RP-7612

ACCREDITED
TESTING CERT #1495.01

Product Detail:
FCC ID: 2AA2N-LX1
IC: N/A
Equipment type: 900 MHz Low power transmitter

Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C
FCC Part 15 CFR Title 47: 2012
Industry Canada RSS-210, Issue 8: 2010 as required for Category I Equipment

This report concerns: Original Grant for Certification
FCC Part 15.249

Tests Performed For:	*Test Facility:*
Data Comm for Business 2949 CR 1000E Dewey, IL 61840	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446 (815) 293-0772

Test Date(s): (Month-Day-Year)
July 26 to July 31, 2013

Document RP-7612 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	October 17, 2013		
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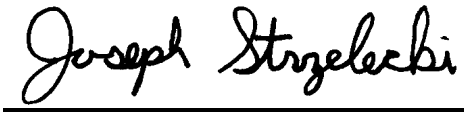
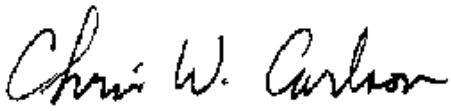
1 ADMINISTRATIVE DATA

Equipment Under Test: A Data Comm for Business, Transmitter Model: DCB-LX 1 Serial Number: 60600001 This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) June 12, 2013	*Test Date(s): (Month-Day-Year)* July 26 to July 31, 2013
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*Test Witnessed By:* The tests were not witnessed by Data Comm for Business
Radiometrics' Personnel Responsible for Test:  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	*Test Report Approved By*  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Transmitter, Model DCB-LX 1, manufactured by Data Comm for Business. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-9300 MHz	FCC Part 15	Pass
Occupied Bandwidth Test	Fundamental Freq.	FCC Part 15	Pass

AC Conducted emissions are not required since the EUT is battery powered.

2.1 RF Exposure Compliance Requirements

Since the power output is 0.5 mW, the EUT meets the FCC requirement for RF exposure. There are no power level adjustments. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a 902 - 922 MHz ISM band radio, Model DCB-LX 1, manufactured by Data Comm for Business. The EUT was in good working condition during the tests, with no known defects.

The EUT is designed for point to multipoint operation. The EUT transmits and receives serial asynchronous RS232 data. It is designed to operate at distances up to 3000 feet.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is a half wave monopole. The antenna has a reverse polarity TNC connector type that is not readily available to the general public. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

Data Comm for Business is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

Since the EUT is wall mounted, it was placed in an upright configuration during the tests. The EUT was tested as a stand-alone device. Power was supplied with a 12 Volt battery.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Transmitter	E	Data Comm for Business	DCB-LX 1	60600001

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

List of System Cables

QTY	Length (m)	Cable Description	Shielded?
1	1.6	Power and data cable connected to a battery	No

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

The following modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report: The EUT had a 62kOhm Resistor installed at R37.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2012	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2009	2009	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2009	2009	American National Standard for Testing Unlicensed Wireless Devices
IC RSS-210 Issue 8	2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 3	2010	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

The test procedures used are in accordance with the Industry Canada RSS-GEN and ANSI document C63.4, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/24/13
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/16/13
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	12/05/12
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/14/11
HPF-07	Mini-Circuits	High Pass Filter	VHF-1500+	31121	1.7-8 GHz	24 Mo.	08/06/12
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	04/02/12
REC-11	Hewlett Packard	Spectrum Analyzer	E7405A	US39110103	9Hz-26.5GHz	12 Mo.	06/13/13
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	12 Mo.	05/25/12

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests. In addition, a high pass filter was used to reduce the fundamental emission.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 9300 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.1.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

10.1.2 Radiated Emissions Test Results

Test Date	July 26, 2013
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C
Notes	Since the EUT Passed the limits in the peak mode, Average and Quasi-peak tests were not performed; The QP and average levels were set to the peak levels.

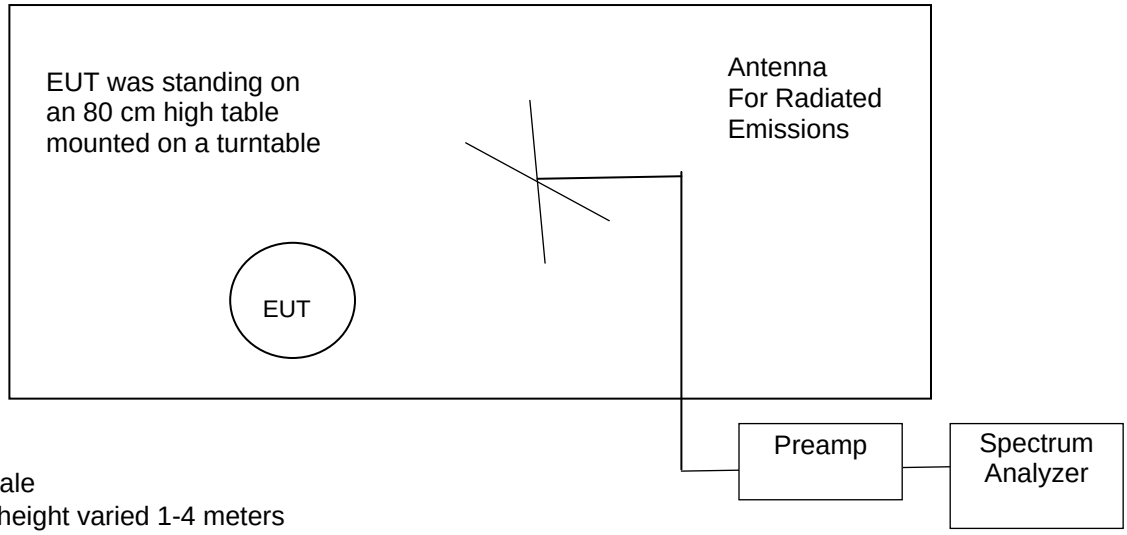
		Spectrum Analyzer Readings					EUT	Peak	QP/Av	Peak	QP/Av	Margin
hrm #	Tx Freq	Vertical		Horizontal		Corr. Fact.	Emission Freq MHz	Tot. FS dBuV/m		Limit dBuV/m		Under Limit
		Peak	QP/Av	Peak	QP/Av							
1	903.4	85.3	85.3	74.3	74.3	6.5	903.4	91.8	91.8	94	94	2.2
2	903.4	37.4	37.4	37.6	37.6	1.8	1806.7	39.4	39.4	74	54	14.6
3	903.4	41.2	41.2	37.1	37.1	6.0	2710.1	47.2	47.2	74	54	6.8
4	903.4	36.7	36.7	36.5	36.5	9.6	3613.5	46.3	46.3	74	54	7.7
1	912.4	85.6	85.6	75.1	75.1	6.6	912.4	92.2	92.2	94	94	1.8
2	912.4	38.2	38.2	37.9	37.9	1.8	1824.7	40.0	40.0	74	54	14.0
3	912.4	42.8	42.8	37.5	37.5	5.9	2737.1	48.7	48.7	74	54	5.3
4	912.4	36.7	36.7	35.6	35.6	9.6	3649.5	46.3	46.3	74	54	7.7
1	921.4	85.3	85.3	74.9	74.9	6.3	921.4	91.6	91.6	94	94	2.4
2	921.4	37.3	37.3	38.1	38.1	1.7	1842.7	39.8	39.8	74	54	14.2
3	921.4	43.7	39.9	38.8	38.8	6.2	2764.1	49.9	46.1	74	54	7.9
4	921.4	36.2	36.2	36.5	36.5	9.7	3685.5	46.2	46.2	74	54	7.8
Column numbers (see below for explanations)												
1	2.0	3	4	5	6	7	8	9	10	11	12	13

Column #1. hrm = Harmonic
Column #2. Frequency of Transmitter.
Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #4. Average Reading based on peak reading reduced by the Duty cycle correction
Column #5. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #8. Frequency of Tested Emission
Column #9. Highest peak field strength at listed frequency.
Column #10. Highest Average field strength at listed frequency.
Column #11. Peak Limit.
Column #12. Quasi-peak limit for frequencies below 1 GHz; Average Limit above 1 GHz.
Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

Judgment: Passed by 1.8 dB
No emissions were detected from 4.7 to 9.3 GHz.

Figure 1. Drawing of Radiated Emissions Setup

Chamber E, anechoic



Notes:
- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cords not shown. They are connected to AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer	High Pass Filter
30 to 1000 MHz	ANT-44	AMP-22	REC-03	None
1 to 10 GHz	ANT-13	AMP-05	REC-11	HPF-07

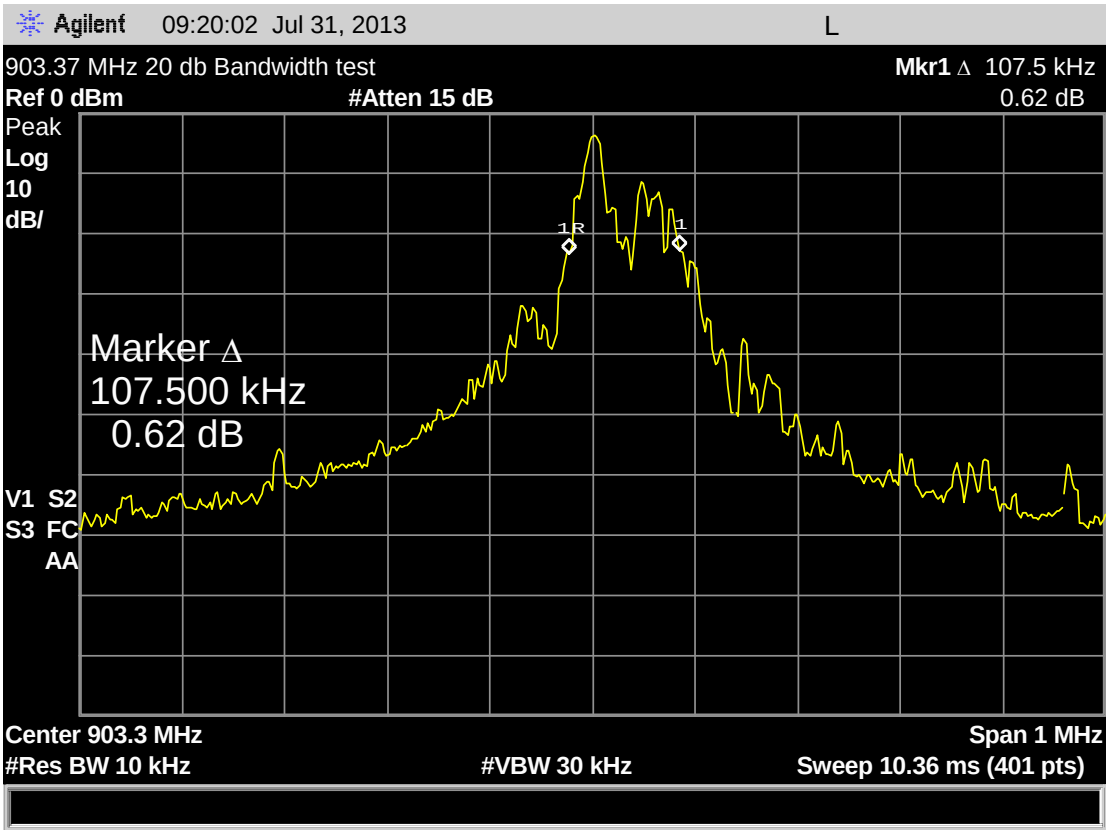
10.2 Occupied Bandwidth Data

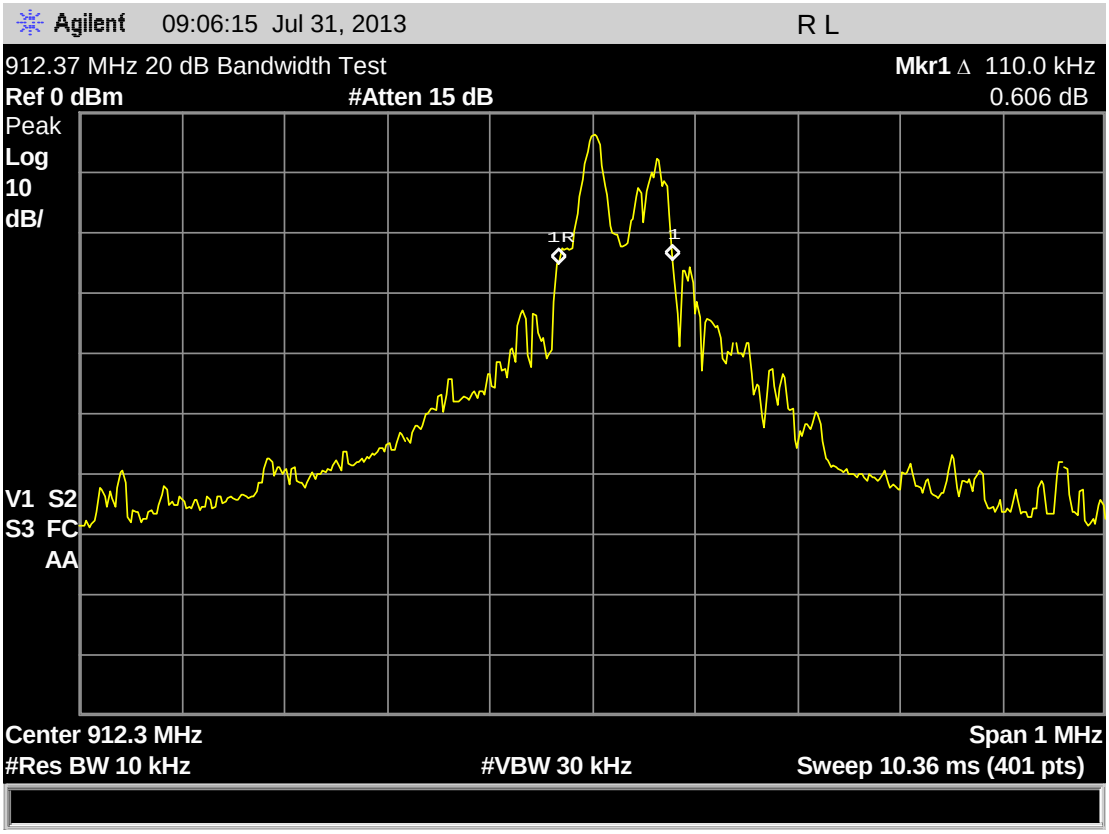
The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth.

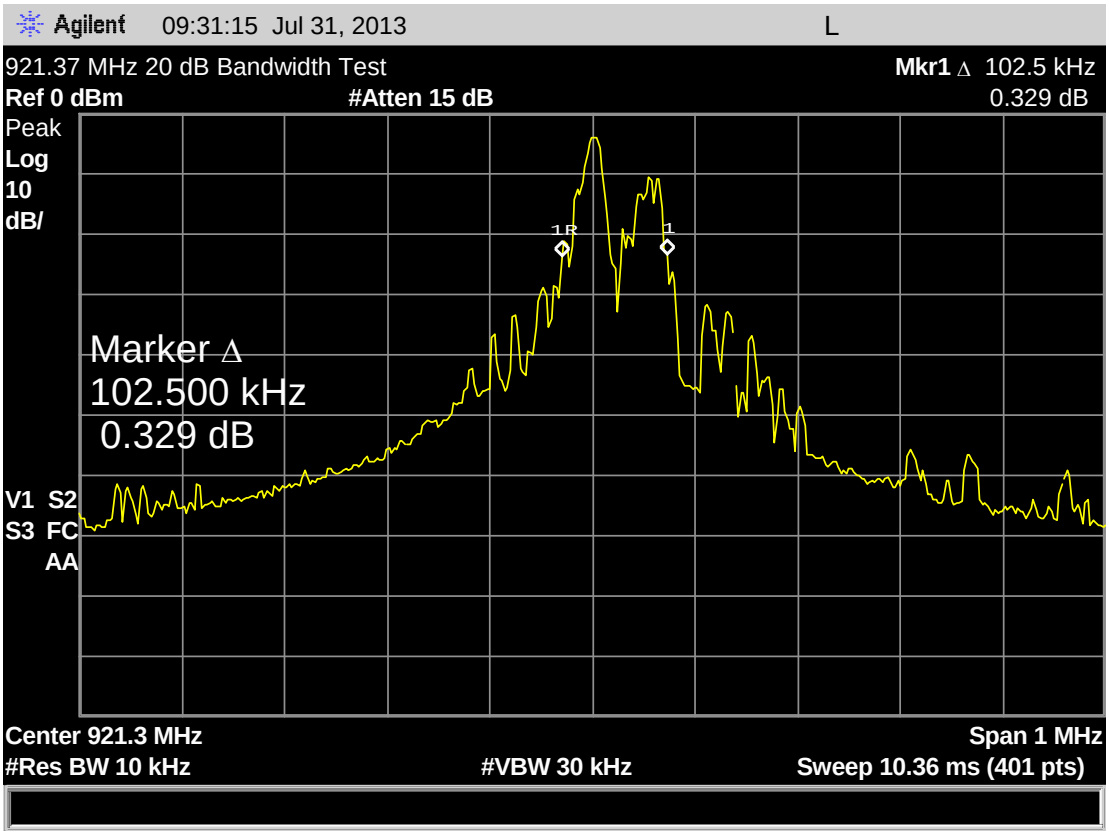
A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of the occupied bandwidth for the EUT are supplied on the following page.

Frequency MHz	20 dB Bandwidth kHz
903.37	107.5
912.37	110.0
921.37	102.5

Figure 2. Occupied Bandwidth Plots







10.3 Unintentional Emissions

Manufacturer	Data Comm	Specification	FCC Part 15 Subpart B
Model	DCB-LX 1	Test Date	07/20/2011
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain; Bi-Log = (ANT-44)		
Configuration	Receive mode		

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
33.2	28.2 P	16.3	H/44	-18.5	25.9	40.0	14.1
56.4	33.7 P	12.0	H/44	-18.3	27.4	40.0	12.6
162.8	33.2 P	10.3	H/44	-17.9	25.6	43.5	17.9
220.0	28.5 P	11.4	H/44	-17.8	22.1	46.0	23.9
228.9	28.2 P	11.6	H/44	-17.8	22.0	46.0	24.0
362.8	28.6 P	14.5	H/44	-17.5	25.6	46.0	20.4
484.3	29.8 P	17.6	H/44	-17.2	30.2	46.0	15.8
569.0	28.0 P	19.5	H/44	-16.8	30.6	46.0	15.4
815.0	28.0 P	21.4	H/44	-15.7	33.8	46.0	12.2
989.0	27.1 P	23.1	H/44	-14.8	35.4	54.0	18.6
32.0	39.3 Q	16.3	V/44	-18.6	37.0	40.0	3.0
40.0	40.5 Q	15.8	V/44	-18.5	37.8	40.0	2.2
40.7	35.0 Q	15.6	V/44	-18.5	32.1	40.0	7.9

42.9	37.7 Q	15.3	V/44	-18.4	34.6	40.0	5.4
48.4	34.6 P	14.4	V/44	-18.4	30.6	40.0	9.4
56.4	39.2 P	12.0	V/44	-18.3	32.9	40.0	7.1
72.4	34.5 P	7.3	V/44	-18.2	23.6	40.0	16.4
75.2	36.0 P	7.0	V/44	-18.2	24.8	40.0	15.2
77.6	47.6 Q	6.9	V/44	-18.2	36.3	40.0	3.7
96.8	37.2 P	8.9	V/44	-18.0	28.1	43.5	15.4
107.6	30.2 P	11.2	V/44	-18.1	23.4	43.5	20.1
131.6	39.3 P	13.4	V/44	-17.8	34.9	43.5	8.6
132.8	37.0 P	13.1	V/44	-17.8	32.3	43.5	11.2
144.0	41.6 P	10.2	V/44	-17.9	33.9	43.5	9.6
152.4	44.2 P	9.7	V/44	-17.9	36.0	43.5	7.5
159.6	38.0 P	10.4	V/44	-17.9	30.5	43.5	13.0
166.0	28.6 P	9.9	V/44	-17.9	20.7	43.5	22.8
196.8	33.7 P	10.4	V/44	-17.7	26.3	43.5	17.2
221.6	29.0 P	11.5	V/44	-17.8	22.7	46.0	23.3
226.1	29.3 P	11.7	V/44	-17.8	23.3	46.0	22.7
353.2	28.7 P	14.7	V/44	-17.5	25.9	46.0	20.1
500.5	29.3 P	17.5	V/44	-17.1	29.6	46.0	16.4
533.0	28.4 P	18.2	V/44	-17.0	29.6	46.0	16.4
769.0	27.6 P	20.8	V/44	-15.8	32.5	46.0	13.5
988.0	27.9 P	23.1	V/44	-14.8	36.1	54.0	17.9

Judgment: Passed by 2.2 dB